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Anne Arundel County, Maryland
Department of Public Works
Watershed and Ecosystem Services

Aquatic Biological Assessment of the Watersheds of Anne Arundel County, Maryland: 2004

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Introduction

The Chesapeake Bay is the largest estuary in North America (USEPA 2004). It has a drainage area of over 64,000 square miles and is located in six states. Many important plant and animal species inhabit the Bay and millions of people live, work, and play along its waters. However, this kind of intense usage can have undesirable impacts on the ecological health of the Bay ecosystem. The conversion of forests and fields to developed land, the filling and draining of wetlands and streams, and the replacement of natural shoreline with shores hardened with stone or piers are just a handful of examples illustrating the impacts of human activities on the Bay.

Despite its large size, the health of the Chesapeake Bay is directly related to the water and habitat quality of the thousands of streams and rivers that provide fresh water to this system (Staver et al. 1996). Healthy streams and rivers are necessary for healthy coastal areas (Growns and James 2005, Batel et al. 2002). Additionally, since Anne Arundel County's attractiveness as a place to live and work is partially related to its coastal resources, the protection of streams and rivers is vital to maintain the high quality of life and economic growth enjoyed by its citizens. For example, it is estimated that approximately $1.7 billion was spent in Anne Arundel County on heritage tourism in 2004, of which natural resources related tourism is considered to be a primary component (AAC 2005), underscoring the economic importance of the Chesapeake Bay to the County.

Anne Arundel County has approximately 1,500 miles of streams and rivers within its borders. Protecting these resources first requires having basic information about their overall conditions. To collect this information, the County has implemented a Countywide Biological Monitoring Program to characterize the biological and habitat conditions of the major watersheds of the County. A five-year sampling cycle, begun in 2004, will result in complete coverage of the County by 2008. This report summarizes the results of sampling performed in 2004, or the first year of this cycle. Following this introductory section, this report is organized as follows:

Methods - A description of the methods used to evaluate biological community health and habitat conditions in and near the stream channel.

Results and Discussion of Stream Monitoring – Comparisons of conditions are made between sampling units. Next, overall results are presented for each individual sampling unit and the conditions of selected subwatersheds found within each sampling unit are discussed. Detailed data summaries of each station sampled are found in Appendix B. Discussions are held in the context provided by reference conditions developed in past work done by the Maryland Department of Natural Resources (DNR), which are used to evaluate reach and sampling unit health. General recommendations to correct the causes of any observed impairment are made.

Conclusions and Recommendations - A list of recommendations generated by the study.

Appendices - Summaries of conditions found at each sampling site, a master taxa list, and field sheets used are found at the end of this document.

Methods

Prior Reporting

These samples were initially collected as part of the deployment of the County's Watershed Management Tool, or WMT, within the Severn River watershed and are reported in Piper (2005). At the time of data collection, the Maryland Biological Stream Survey (MBSS) of the DNR released revised Benthic Index of Biotic Integrity (BIBI) metrics. Because subsequent work for the Countywide Biological Monitoring Program (CBMP) and for WMT deployment in future watersheds would use these new metrics, the original samples were reanalyzed using the new metric conditions. These new values are reported in this document. Additionally, in order to adhere to the QA/QC requirements specific to the CBMP, some additional processing of the benthic samples was necessary. This processing is fully described in the Data Analysis section of this report.

Site Selection

Sampling locations for the implementation of the Anne Arundel County Biological Monitoring and Assessment Program were developed as part of the overall *Sampling and Analysis Plan for Anne Arundel County Biological Monitoring and Assessment Program* (Tetra Tech 2005). Sites were randomly selected from a 1:100,000-scale map of the County's streams. The County was separated into 24 monitoring sampling units and ten sites were selected at random in each sampling unit. Ten additional alternate sites were selected in each sampling unit to serve as replacement sites should any of the primary sites prove unsuitable for sampling. Both primary and alternate sites were identified in a latitude/longitude (lat/long) coordinate format. All sample site reaches were 75 m in length. For the 2004 sampling season, five sampling units were assessed: Lower Patapsco, Severn Run, Severn River, Middle Patuxent, and Ferry Branch (see **Figure 1**).

Alternate Site Selection

During field sampling, sites that were not considered suitable for sampling were removed from the study. Reasons for removal of sites included a lack of a defined channel, a dry channel, a beaver pond or other form of impoundment, or an overlap with another site. An alternate site was then selected from a list provided by the County. The reason for elimination was noted on a field sheet along with the selected alternate site. **Table 1** lists the alternate site selection and reasoning.

Field Methods

Sites were located in the field using a handheld Global Positioning System (GPS) to navigate to the predetermined lat/long coordinates for each site. The lat/long coordinate represents the mid-point of the 75-meter sampling segment.

Table 1–Field Sampling- Alternate Sites Chosen

Original Site	Alternate Site	Reason
03-03	03-16A	Dry swale.
03-06	03-13A	No defined channel/expansive wetland.
03-08	03-17A	Backwatered by beaver.
03-10	03-12A	Site overlapped with site 11-6.
09-03	09-11A	Backwatered by beaver.
09-04	09-12A	Impounded.
10-05	10-11A	Backwatered by beaver.
10-07	10-20A	Backwatered by beaver.
18-01	18-11A	Backwatered by beaver.
18-08	18-12A	Unsafe to access.
18-10	18-20A	Impounded

Each site was marked in the field, at the upstream and downstream limits, with tree tags and flagging. All field data collection was conducted in accordance with the *Sampling and Analysis Plan for Anne Arundel County Biological Monitoring and Assessment Program* (Tetra Tech 2005). These methods are summarized below.

Aquatic Habitat

Aquatic habitat was visually evaluated in each 75-meter segment utilizing both the United States Environmental Protection Agency's (EPA) Rapid Bioassessment Protocol (RPB) (Barbour 1999) and the Maryland Biological Stream Survey (MBSS) Physical Habitat Index (MPHI) (Paul et al. 2002). The EPA protocol is based on the quality of the velocity depth regime, epifaunal

substrate, embeddedness, sediment deposition, frequency of riffles, channel alteration, channel flow status, bank vegetative protection, bank stability, and riparian vegetative zones.

The MPHI is partly based on the EPA protocol but it incorporates other parameters also found to be indicative of habitat quality in other Maryland streams. These additional parameters include shading, distance to the nearest road, instream habitat, bank erosion, and instream woody debris and rootwads. These parameters are shown on an example field sheet in ***Appendix C: Sample Field Sheets***.

Benthic Macroinvertebrates

Benthic macroinvertebrate collection was conducted using the MBSS Spring index period protocols. This method emphasizes the community composition and relative abundance of organisms in the most favorable habitats. The most favorable habitat is a riffle area followed by, in order, gravel/broken peat and/or clay lumps in a run area, snags/logs that create a partial dam or are in a run area, undercut banks and associated root mats in moving water, submerged aquatic vegetation (SAV) and associated bottom substrate in moving water, and detrital/sand areas in moving water. The most favorable habitats were sampled in proportion to their dominance in the segment.

Starting at the downstream end of the 75-meter segment, the various habitats are sampled for organisms using a D-net. In riffles and runs, the D-net is firmly placed in the substrate while the organisms are dislodged from any rocks and gravel by gently agitating a one square-foot patch directly upstream of the net opening. Any large rocks and cobbles present in the one square foot patch are gently placed within the net and cleaned to remove organisms. To sample undercut banks, the net is used to gently agitate one square-foot of roots and other substrate making up the bank. For logs and snags, the surface of the log is gently rubbed with the net and/or by the sampler. These procedures are repeated until a total of 20 square feet is sampled within the 75-meter segment.

Water quality

Field water quality measurements were collected in-situ at upstream, midstream and downstream locations at all monitoring stations so that an average for the reach could be calculated. All in-situ parameters were measured with a HydroLab MiniSonde® probe and Surveyor® 4 data storage device. Field tested parameters included the following:

- pH
- Temperature
- Dissolved oxygen (DO)
- Turbidity
- Total Dissolved Solids (TDS)
- Conductivity

Once collected, the sample is placed into 1 L plastic sampling containers and preserved with ethanol before being transferred to the laboratory for further processing.

Data Analysis

Land Use and Impervious Surface Evaluation

The County has an extensive Geographic Information System geodatabase, which was used to characterize land use and impervious surface distributions for the areas evaluated during this assessment. All geoprocessing work was done using ArcGIS 9.1. Individual land use coverages were developed for each sampling unit and for the drainage upstream of each sampling point from a countywide coverage. Additionally, shapefiles of impervious surfaces were also created for each sampling unit and for the land area draining to each sampling point from a countywide coverage of impervious surfaces. This information is summarized for each sample station in ***Appendix A: Individual Site Summaries.***

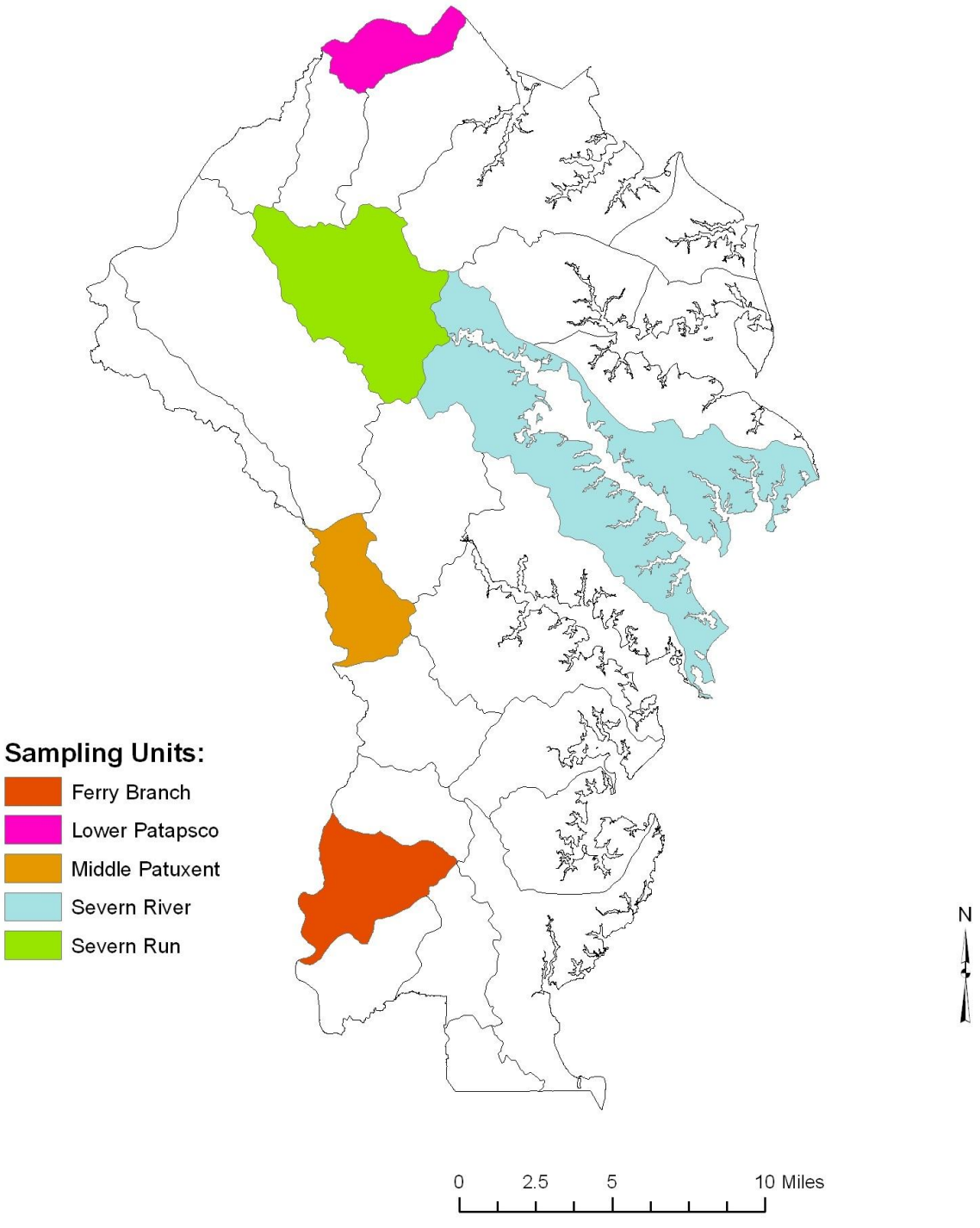


Figure 1 – 2004 Sampling Units

Both the impervious coverage and the land use coverage were developed from aerial photography collected in 2004. Both of these coverages are vector type data and were developed at a map scale of 1:2400.

Aquatic Habitat

Each individual metric of the EPA RBP is scored from zero to 20 and all are totaled to calculate the final score (see example field sheet in ***Appendix C: Sample Field Sheets***). The maximum total of the standard EPA RBP is 200 points. In some cases, this 200-point total is used to represent the reference condition. However, a total of 168 points was used to represent the reference conditions of Anne Arundel County, based on an assumption of similar conditions found in Prince George's County streams by Stribling et al. (1999). **Table 2** shows the narrative rankings for the EPA protocols based on this 168-point reference condition.

Table 2– EPA RBP Scoring

Score	Narrative
151 +	Comparable
126 – 150	Supporting
101 – 125	Partially Supporting
0 – 100	Non-supporting

Source: Stribling et al. 1999

The MPHI in Coastal Plain streams is calculated using the following parameters: distance to the nearest road (remoteness), instream habitat, epifaunal substrate, instream woody debris and rootwads, shading, and bank erosion, all adjusted as necessary for watershed size as described in Paul et al. (2002). Narrative condition descriptions and scoring ranges come from Boward (per. comm.). **Table 3** summarizes the scoring ranges and associated narrative rankings for MPHI protocols.

Table 3–MPHI Scoring

Score	Narrative
81-100	Minimally Degraded
66-80.9	Partially Degraded
51-65.9	Degraded
0-50.9	Severely Degraded

Source: Paul et al. (2002), Boward (per. comm.)

Benthic Macroinvertebrates

In the laboratory, the samples were transferred to a subsampling tray that displayed 60 five-centimeter (cm) grids on the bottom of the tray. A random number between one and 60 was chosen to determine the first grid to sample in order to reach a 120-organism subsample. If the total number of organisms removed from the first grid was equal to or greater than 120, subsampling was complete for the sample. If the number of organisms is less, then another grid was randomly selected. Regardless of the number of grids examined, the last grid chosen was always picked in its entirety. Consequently, many subsamples exceeded 120 organisms. Some samples had values as high as 150 organisms.

Since the metrics were developed for a 100 insect sample, potential bias is introduced unless the subsample is resampled down to within the target number (100 ± 20) of insects. For samples that exceeded 120 organisms, the original subsamples were processed using a specially designed visual basic macro in an Excel spreadsheet developed to randomly adjust the original values downward until the target subsample value is reached. In the future, samples will be subsampled during the sampling process down to the 100-bug target.

Subsamples (including Chironomidae) from each monitoring segment were identified to genus, or the lowest taxonomic level possible, using common taxonomic references. The final classification and abundance of each organism was entered into a database. The database contained information on the tolerance value, functional feeding group, and habit (characteristic behavior) of each taxonomic group. This database information has been updated since the initial development of the MBSS Benthic Index of Biotic Integrity (BIBI). The tolerance values in particular have been updated using a new urban stressor index (Bressler 2005). These data were exported along with the specific data from each sample into a spreadsheet for calculation of community metrics. A list of all taxa identified is provided in ***Appendix B: Master Taxa List***. This list includes the handful of taxa identified originally but eliminated from the BIBI

calculations during the digital processing of original subsample.

DNR has developed a BIBI that compares the macroinvertebrate community within a given stream to reference macroinvertebrate communities in the least-impaired streams. The DNR BIBI is based on statewide reference streams in each physiographic province. The BIBI for the Coastal Plain uses seven community metrics found to characterize macroinvertebrate community health in Maryland's Coastal Plain streams. The metrics calculated for Coastal Plain streams are as follows:

Total Number of Taxa- This metric reflects the health of the community through a measurement of the total number of unique taxa in a sample. An increase in taxa is directly related to the increase in water quality, habitat diversity, and/or habitat suitability.

Number of EPT Taxa- The richness of the generally intolerant insect orders of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). This value summarizes taxa richness with macroinvertebrates that are generally considered to be intolerant of pollution. Therefore, a higher number of taxa within the sample suggest better water quality conditions.

Percent Ephemeroptera- The percentage of insects from the Ephemeroptera order that make up the total sample. The degree to which mayflies dominate the community can indicate the relative success of these generally pollution intolerant individuals in sustaining reproduction.

Number of Ephemeroptera Taxa- The total number of taxa from the Ephemeroptera order. This metric generally increases with better water and habitat quality.

Percent Intolerant to Urban- The percentage of insects making up the sample that have a tolerance value less than or equal to three. This metric generally increases without urban stressors.

Number of Scraper Taxa- The number of taxa that feed on periphyton and associated microfauna. This metric generally increases without perturbation.

Percent Climbers- The percentage of individuals in the sample that live primarily on stem type surfaces. This metric generally increases without stressors.

Each metric is scored a five, three, or one using the thresholds listed in **Table 4.** Then each of the metric scores is added together and the resulting average is the BIBI score. **Table 5** shows the scores and narrative rankings of the MBSS BIBI.

Table 4–MBSS BIBI Metrics

Metric	Threshold		
	1	3	5
Number of Taxa	< 14	14-21	>= 22
Number of EPT Taxa	< 2	2-4	>= 5
Number of Ephemeroptera Taxa	< 1	1	>= 2
Percent Intolerant to Urban	<10	10-27	>= 28
Percent Ephemeroptera	< 0.8	0.8-10.9	>= 11
Number of Scraper Taxa	< 1	1	>= 2
Percent Climbers	< 0.9	0.9-7.9	>= 8

Source: Southerland et al. (2005)

Table 5–MBSS BIBI Scoring

BIBI Score	Narrative Ranking	Characteristics
4.0 – 5.0	Good	Comparable to reference streams considered to be minimally impacted, biological metrics fall within the upper 50 % of reference site conditions.
3.0 – 3.9	Fair	Comparable to reference conditions, but some aspects of biological integrity may not resemble the qualities of minimally impacted streams.
2.0 – 2.9	Poor	Significant deviation from reference conditions, indicating some degradation. On average, biological metrics fall below the 10th percentile of reference site values.
1.0 - 1.9	Very Poor	Strong deviation from reference conditions, with most aspects of biological integrity not resembling the qualities of minimally impacted streams, indicating severe degradation. On average, most or all metrics fall below the 10th percentile of reference site values.

Water Quality

Water quality data from each site was compiled and, when available, compared to Maryland water quality standards for Use I streams. **Table 6** shows the standards for these streams.

Table 6–Maryland COMAR Standards

Parameter	Standard
pH	6.5 to 8.5
Dissolved Oxygen (mg/L)	Minimum of 5 mg/L
Conductivity (mS/cm)	No state standard
Turbidity (NTU)	Maximum of 150 NTU and maximum monthly average of 50 NTU
Temperature (°C)	Maximum of 32°C (90°F) or ambient temperature, whichever is greater

Source: COMAR 26.08.02.03-3

Results and Discussion

This section first makes comparisons about conditions across all sampling units. Then, each sampling unit is discussed individually. Biological conditions and habitat quality are discussed. Conditions within selected subwatersheds are also discussed when the data allow such discussions. However, the random nature of the site selection process allows for the extrapolation of averaged results across all subwatersheds within a given sampling unit, even in areas where no data were directly collected. For details, see Hill and Stribling (2004).

Comparisons Between Sampling Units

This section compares results among sampling units. **Table 7** summarizes overall biological and habitat conditions for each sampling unit.

Biological Assessment Summary

Overall, the BIBI scores throughout the sampling units were equally split between impaired and somewhat unimpaired sites (**Figure 2**). Thirty six percent of sites were in the "Fair" category while 14% of sites were in the "Good" category. Eight percent were characterized as "Very Poor" and 42% fell into the "Poor" range.

As shown in **Table 7**, three of five units (Lower Patapsco, Middle Patuxent, and Severn Run) had aggregate BIBI scores in the "Poor" range while two of five (Ferry Branch and Severn River) had combined scores of "Fair." The Ferry Branch sampling unit had the highest average BIBI score (3.20 ± 0.81). The Lower Patapsco sampling unit had the lowest average planning unit BIBI score (2.60 ± 0.60), with the half of the sites scored in the "Poor" or "Very Poor" range.

The benthic communities of the sampling units were generally comprised of several genera of midges (Chironomidae), amphipods, isopods, aquatic worms, and some EPT taxa. Sites within sampling units scoring in the "Good" range generally had a higher overall taxa richness and better representation from sensitive EPT taxa. The mayfly genus *Leptophlebia* and the caddisfly genus *Cheumatopsyche* were most commonly found at less impaired sites. The amphipod genus *Crangonyx* was found at almost every site sampled. The isopod genus *Caecidotea* was found at the majority of sites as well. A very diverse midge population—dominated by the genera *Parametriocnemus, Polypedilum, Orthocladius, and Thienemannimyia*—made up the majority of the remainder of the communities.

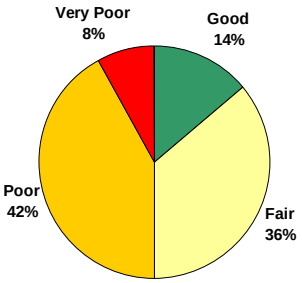


Figure 2 – Summary of Year 1 BIBI Scores

Habitat Assessment Summary

Aggregate habitat scores show only low to moderate habitat degradation throughout the sampling units **(Table 7 and Figure 3)**. As shown in **Table 7**, habitat conditions as evaluated using the MBSS PHI ranked as " Partially Degraded" for all but one sampling unit, with Ferry Branch ranked as "Minimally Degraded." The Ferry Branch sampling unit had the highest combined MBSS PHI score at 86.7 ± 5.6 while the Lower Patapsco sampling unit had the lowest (67.1 ± 11.8).

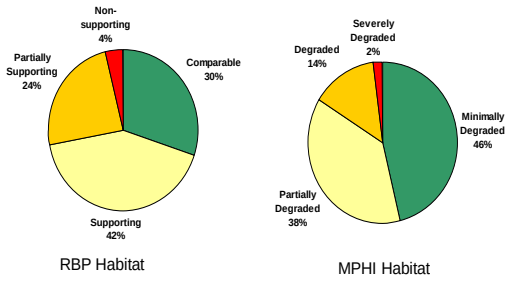


Figure 3 – Summary of Year 1 Habitat Scores

Similar results were observed using the EPA RBP habitat assessment information, habitat was classified as "Partially Supporting" (the next to lowest category in this method) in only one sampling unit, Lower Patapsco (123.8 ± 17.8). Ferry Branch was ranked as "Comparable" to reference conditions with a high score at 153.0 ±15.1. The Middle Patuxent, Severn Run, and Severn River sampling units were all ranked as "Supporting."

In general, higher quality benthic communities tended to be located in streams within the sampling units that had substantial forested riparian buffers. Such buffers allow for plenty of influx of instream woody debris and rootwads, as well as a high amount of shading. In general, the size of these larger streams may allow for the development of more complex niches for benthic macroinvertebrates. The common location of small headwater streams within these sampling units was closer to residential and commercial land uses and usually resulted in a more impacted benthic community. In addition, some of the sites in the smaller headwater tributaries may experience very low, or even subterranean, flows seasonally that could limit biological communities.

Generally, habitat and biological community conditions tend to be related. The quality of reach habitat conditions dictates the level of potential biological health that a particular site can achieve, all other factors being equal. In essence, this means that sites with "Good" BIBI scores tend to be associated with "Minimally Degraded" or "Comparable" habitat, those with "Fair" BIBIs scores tend to have "Partially Degraded" or "Supporting" habitat, and so on. When biological community health and habitat conditions do not correlate well, it is a possible indicator of human

Table 7–Summary of BIBI and habitat scores across sampling units.

Sampling Unit	Average BIBI Score ±SD / Condition Narrative	Average MBSS PHI Score ±SD / Condition Narrative	Average EPA RBP Habitat Score ±SD / Condition Narrative
Lower Patapsco	2.69 ±0.61 Poor	67.1 ±11.8 Partially Degraded	123.8 ±17.8 Partially Supporting
Middle Patuxent	2.94 ±0.71 Poor	79.1 ±6.7 Partially Degraded	144.2 ±11.1 Supporting
Ferry Branch	3.20 ±0.81 Fair	86.7 ±5.6 Minimally Degraded	153.0 ±15.1 Comparable
Severn Run	2.80 ±0.74 Poor	76.6 ±7.4 Partially Degraded	136.3 ±22.0 Supporting
Severn River	3.09 ±0.86 Fair	78.1 ±11.7 Partially Degraded	139.2 ±25.4 Supporting

impacts, which tend to manifest themselves in two basic ways. First, when biological conditions are better than expected for the habitat quality observed (i.e. - a BIBI of "Good" and a habitat rating of "Degraded" or "Severely Degraded"), nutrient enrichment from agricultural activities or other sources is often suspected. Conversely, when biological conditions are worse than

expected for the observed habitat quality (i.e.- a BIBI of "Poor" and a habitat rating of "Minimally Degraded" or "Comparable"), then pollutant impacts, excessive high flow conditions, geomorphic instability, or some other stressor might be the causative agent.

In these sampling units, the two habitat methods gave similar results showing a trend towards water quality impairments depressing biological communities relative to available habitat. As illustrated in **Tables 8 and 9**, around half of the sites sampled showed depressed biological conditions compared to available habitat.

Table 8–Comparison of sample site biological scores to EPA RBP habitat condition.

EPA RBP Habitat Scores	BIBI Score			
	Good	Fair	Poor	Very Poor
Comparable	09-10 21-03 21-08	10-09 18-04 18-11A 21-06 21-07 21-09	09-09 **10-08** **10-10** 10-11A **18-06** **21-10**	
Supporting	09-01 10-03 18-20A	03-05 03-13A 18-02 18-12A 21-02 21-05	03-07 03-17A 09-06 09-07 09-08 09-11A 18-03 18-09 21-04 03-04	**03-01** **18-05**
Partially Supporting	**10-04**	03-12A 10-01 10-02 10-06 18-07	03-02 03-09 09-02 09-12A 21-01	10-20A
Non-Supporting			09-05	03-16A

Green cells contain stations where the biological community was less impaired than the habitat scores would predict.
Orange cells contain stations where biological community matched available habitat.
Pink cells contain stations where the biological community was more impaired than the habitat scores would predict.
Stations in bold type have biological conditions that differ by at least two qualitative habitat categories in both methods.

In contrast, only around 15 to 20 % of sites had enhanced biological conditions compared to available habitat

However, while similar results were achieved, the two habitat assessment methods are not identical, so a conservative approach for categorizing the impacts to the stream biota beyond habitat factors is necessary. Consequently, only sites characterized by both methods as either potentially impacted by water quality degradation or possibly

Table 9–Comparison of sample site biological scores to MBSS PHI habitat condition.

MBSS PHI Score	BIBI Score			
	Good	Fair	Poor	Very Poor
Minimally Degraded	09-01 09-10 21-03 21-08	10-01 10-06 10-09 18-04 18-11A 18-12A 21-02 21-05 21-06 21-07 21-09	03-07 09-07 09-11A **10-08** **10-10** **18-06** 21-04 **21-10**	
Partially Degraded	10-03 **10-04** 18-20A	03-05 18-02 18-07	03-17A 09-05 09-06 09-08 09-09 09-12A 10-11A 18-03 18-09 21-01 03-04	**03-01** 10-20A **18-05**
Degraded		03-12A 03-13A 10-02	03-02 03-09 09-02	
Severely Degraded				03-16A

Green cells contain stations where the biological community was less impaired than the habitat scores would predict.
Orange cells contain stations where biological community matched available habitat.
Pink cells contain stations where the biological community was more impaired than the habitat scores would predict
Stations in bold type have biological conditions that differ by at least two qualitative habitat categories in both methods.

enriched by excessive nutrient concentrations are listed in **Table 10**. These sites should be considered potential candidates for future water quality investigations.

Table 10–Reaches in which habitat and biological conditions are somewhat mismatched, as similarly characterized by both habitat assessment methods.

Possible Water Quality Impairment	Possible Enrichment
03-01, 03-04, 03-07, 03-17A, 09-05, 09-06, 09-07, 09-08, 09-09, 09-11A, 10-08, 10-09, 10-10, 10-11A, 10-20A, 18-03, 18-04, 18-05,18-06, 18-09, 18-11A, 21-04, 21-06, 21-07, 21-09, 21-10	03-12A, 10-02, 10-03, 10-04, 18-20A

Water Quality Assessment Summary

Basic water quality parameters measured within all of the sampling units were generally consistent and within Maryland State standards listed in **Table 6**. Five sites had pH values lower than 6.5, ranging from 5.2 to 6.1. This may be due to natural causes such as low pH groundwater flows associated with glauconitic soils to smaller tributary streams. Two sites had dissolved oxygen values slightly less (4.55 mg/L for both) than the required 5.0 mg/L.

Of the sites listed in **Table 10** as having potential water quality impairment, only 10-11A, 18-05, and 09-07 were outside the standard for the parameters measured, having pH values of 6.10, 5.20, and 5.77, respectively.

Individual Sampling Unit Discussions

This section summarizes conditions found within each sampling unit. Discussions of potential impacts to observed habitat and biological conditions are discussed here. For detailed site descriptions, please see ***Appendix A: Individual Site Summaries.***

When appropriate, conditions within individual subwatershed comprising the sampling unit are discussed. However, it should be noted that even when site-specific data are available for a particular subwatershed, the unit wide results characterize basic conditions of streams throughout the unit.

Severn Run

Comprising the western half of the Severn River watershed, the Severn Run sampling unit is approximately 15,000 acres and is located in the northwestern portion of the County (**Figure 1**). The balance is comprised of drainage to the Severn Run mainstem (**Figure 4**). The land use of the Severn Run sampling unit is approximately 48% forested, 37 % residential, and 13 % urban land, including industrial, commercial, and transportation Rights of Way. An additional 2% of other miscellaneous land uses exist. Impervious surfaces comprise 20% of the overall Severn Run sampling unit.

Ten primary sites and one replicate site (not mapped) were sampled within the Severn Run sampling unit (**Figure 4**). Seven of ten sites were located within the unnamed subwatersheds draining to the Severn Run mainstem. The other three sites (09-01, 09-07, and 09-11A) were located within the Jabez Branch and Picture Spring Branch subwatersheds.

Aquatic Habitat

The MBSS PHI rated 40 % of the streams within the Severn Run sampling unit as "Minimally Degraded", 40 % of streams were rated as "Partially Degraded", and 20 % were rated "Degraded" (**Figure 5**). The average PHI score was 76.4 $\pm$ 7.4, or "Partially Degraded" overall. The RBP habitat assessment rated 20% of streams as "Comparable" to the reference condition, 50% as "Supporting," 20% as "Partially Supporting" and 10 % were rated as "Non-Supporting." The average EPA RBP score was 136.3 $\pm$ 22.0, or "Supporting" overall.

However, while habitat was judged to be supporting in the unit, some problems were identified. Throughout the unit, moderately high levels of sediment deposition were observed, meaning that fine sediments were found to have filled some pools and impacted about 20 to 50% of the total length of the reaches assessed.

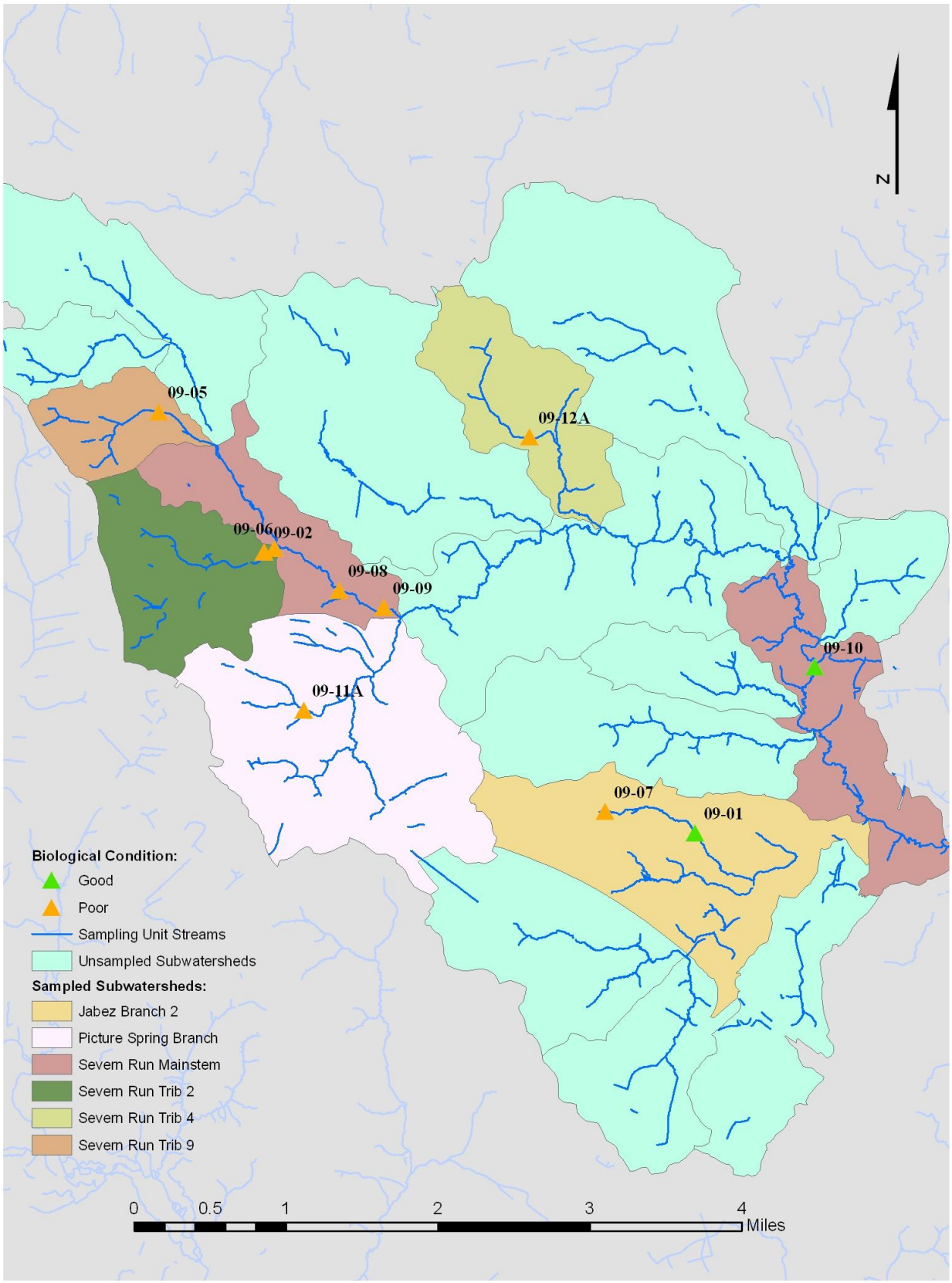


Figure 4 – Severn Run Site Locations

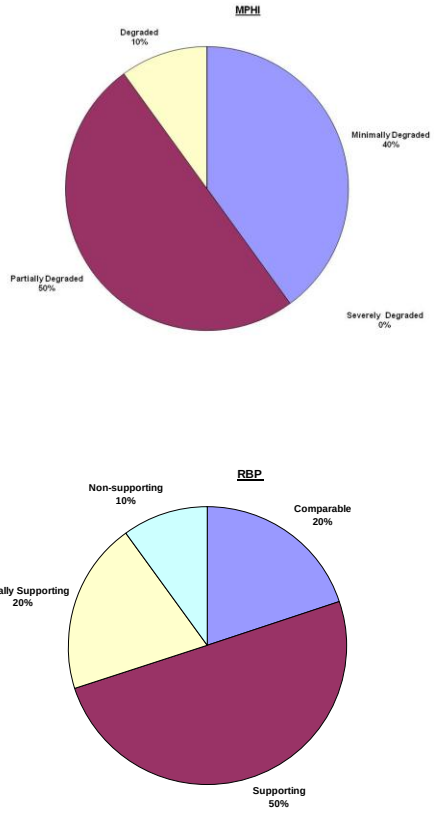


Figure 5 – Severn Run Habitat Scores

Additionally, pool substrate tended to be mostly clay or mud bottom with little available habitat. Overall, levels of epifaunal substrate were also low, indicating habitat impairment.

Benthic Macroinvertebrates

As shown in **Figure 6**, the MBSS BIBI rated 20% of the streams within the Severn Run sampling unit as "Good" and 80% as "Poor". The average BIBI score was 2.80 ± 0.74, which is within the "Poor" range.

Overall, the sampling unit was dominated by the relatively pollution tolerant caddisfly *Cheumatopsyche*, the amphipod *Crangonyx*, and midges of the genus *Thienemannimyia*. Black fly (*Simulium*) and other midges (*Tanytarsus* and *Hydrobaenus*) also made up a significant portion of the observed insect population at these stations.

Generally, the sampling unit showed moderate taxa richness and a low presence of sensitive EPT taxa. The sites scoring in the "Good" range (09-10, 09-01) had high overall taxa richness and had the highest percentages of insects sensitive to the impacts of urbanization of all the sites sampled in the unit. In fact, these sites were dominated by caddisfly (*Cheumatopsyche* sp., *Lype* sp., *Pycnopsyche* sp.) and blackfly (*Prosimulium* sp.) taxa.

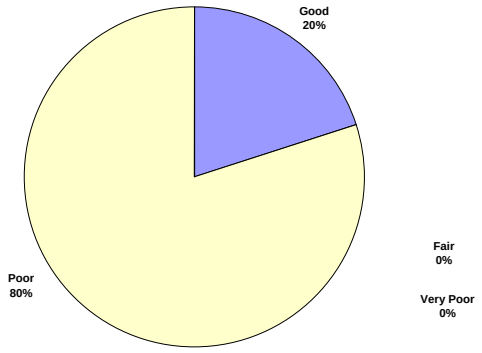


Figure 6 – Severn Run BIBI Scores

The single site sampled within the Picture Spring Branch subwatershed (09-11A) scored in the lower end of the "Poor" range. Low numbers of organisms intolerant to pollution are the primary cause of this low BIBI score.

Sites sampled within the Jabez Branch subwatershed varied, with a headwater site (09-07) rating "Poor" and a second site downstream (09-01) scoring "Good."

Detailed data on each site can be found in ***Appendix A: Individual Site Summaries***.

Water Quality

Water quality conditions are summarized in **Table 11**. Temperature and turbidity values sampled in the Severn Run sampling unit were within Maryland's Use I stream standards. Excluding the low pH value observed at Site 9-07, no unusual water quality measurements were collected at any of the sample sites.

Table 11–Average water quality values – Severn Run

Value ± Standard Deviation					
Temp.*	TSS*	D.O.*	pH	Cond.*	Turb.*
7.7 ± 1.9	162 ± 57.8	8.5 ± 0.6	7.0 ± 0.5	248 ± 81.9	18.0 ± 102.

**Units: Temp. (°C), D.O. and TSS (mg/L), Cond. (µmhos/cm), Turb. (NTU)*

Summary

Overall, stream reaches within the Severn Run sampling unit generally show depressed biological community conditions in comparison to available habitat. Aquatic habitat scores for the MBSS PHI varied, ranging from "Degraded" to "Minimally Degraded," but with most sites in the "Minimally Degraded" or "Partially Degraded" categories. EPA RBP scores showed slightly better conditions, with most sites judged as "Comparable" or "Supporting." Average biological conditions within the sampling unit were rated as "Poor."

Significant amounts of imperviousness (~20%) exist in the sampling unit and approximately half of the sampling unit is comprised of developed lands. Runoff from these impervious areas is likely adversely impacting water quality conditions within this sampling unit, which would partially explain the discrepancy between observed habitat quality and biological conditions. Additional investigations to determine the exact causes of such impacts are necessary.

As part of WMT deployment throughout the County described earlier, the subwatersheds in this sampling unit have been fully assessed and ranked. See OECR (2006) for full details.

Severn River

The Severn River sampling unit, which is approximately 28,920 acres and is located in the middle portion of the County (**Figure 1**), comprises the lower eastern half of the Severn River watershed. The sampling unit is primarily comprised of the Whitehall, Spa, Weems, Maynadier, and Gumbottom Creek subwatersheds. Many other unnamed tributary subwatersheds comprise the remainder of the flow into the tidal river. The major land uses of the Severn River sampling unit include approximately 40% forested areas, 3% agricultural, and 12% urban land, including industrial, commercial, and transportation. Approximately 43% of the sampling unit is residential land use. Impervious surfaces comprise 20% of the overall Severn River sampling unit. The highest concentration of urban land use occurs in the areas near the City of Annapolis along the US Route 50 corridor in the southern third of the unit. However, the extensive residential land use was distributed throughout the sampling unit, ensuring that some level of imperviousness was found in all its subwatersheds. Generally, residential land uses were concentrated along the drainage divides found within a subwatershed, resulting in a systematic distribution of this land use. Commercial / Industrial land uses were clustered around major road intersections or along major roads in general. Agricultural areas occurred in the upper and lower portions of the drainage, with the highest concentration occurring in the Whitehall Creek watershed.

Eight primary sites and two alternate sites were sampled within the Severn River sampling unit (**Figure 7**). Four of the sites (10-01, 10-02, 10-03, and 10-09,) were located within the Maynadier Creek subwatershed. Three of the sites (10-04, 10-06, and 10-11A) were located within the Gumbottom Branch subwatershed. The remaining sites—10-08, 10-10, and 10-20A—were located in the Bear Branch, Chartwell Branch, and Luce Creek subwatersheds, respectively.

Aquatic Habitat

As shown in **Figure 8**, the MBSS PHI rated 40 % of the streams within the Severn River sampling unit as "Partially Degraded", while 10% of streams were rated as "Degraded." Half of the reaches were judged to have "Minimally Degraded" habitat quality. The average MBSS PHI score was 78.1 $\pm$ 11.7, or "Partially Degraded." Forty percent of streams were rated as "Comparable," 10 % were rated as "Supporting," and 50 % of streams were rated as "Partially Supporting" by the EPA RBP habitat assessment. The average score of 139.2 $\pm$ 25.4 gives this sampling unit an overall rating of "Supporting."

Overall, the sites showed a wide variety of habitat scores and variable individual habitat metrics. However, excessive sediment deposition and poor pool habitat was consistently observed across the unit. Additionally, many sites showed depressed levels of the substrate appropriate for thriving aquatic insect communities, although this was not a consistent problem among sites.

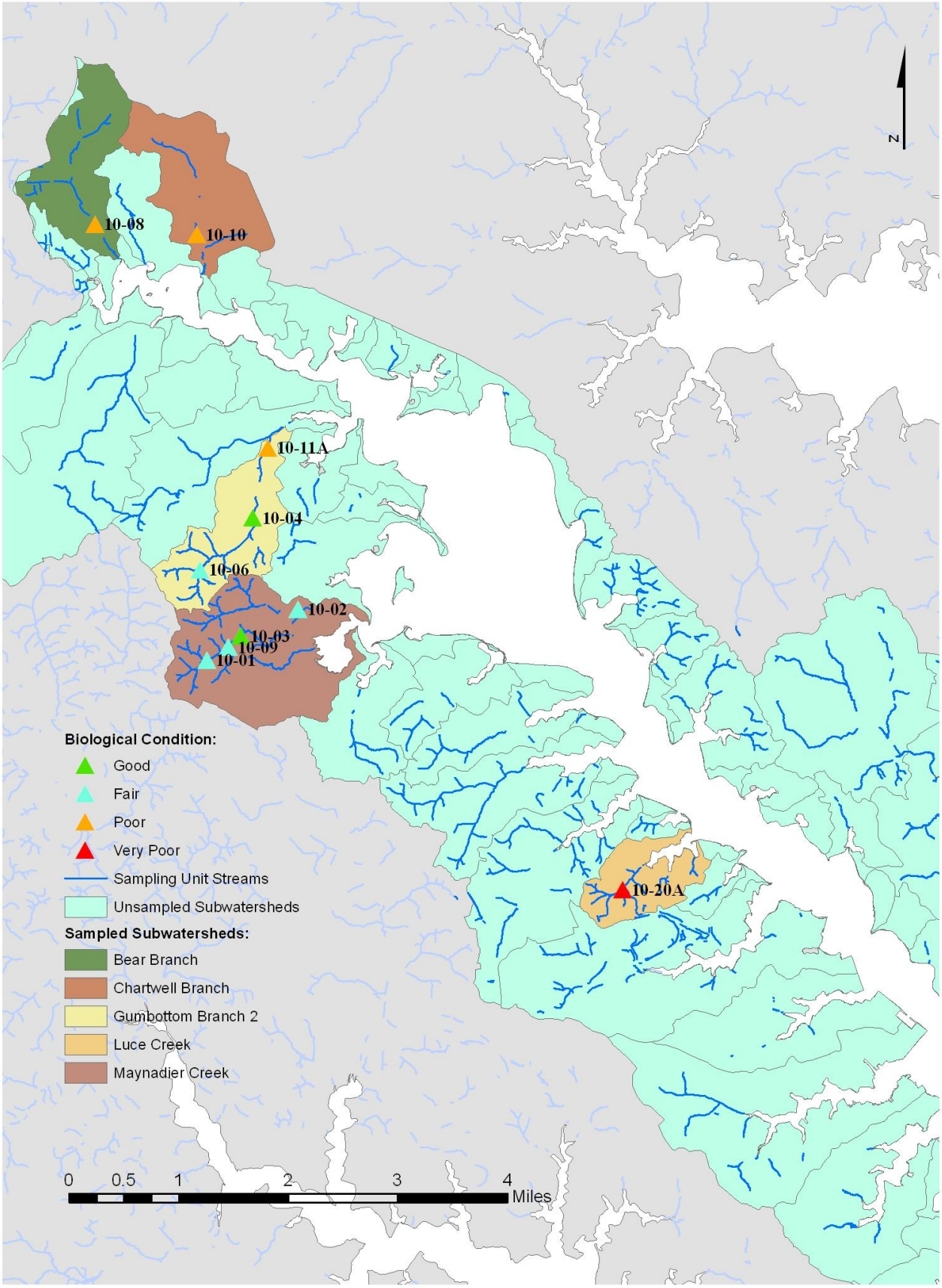


Figure 7 – Severn River Site Locations

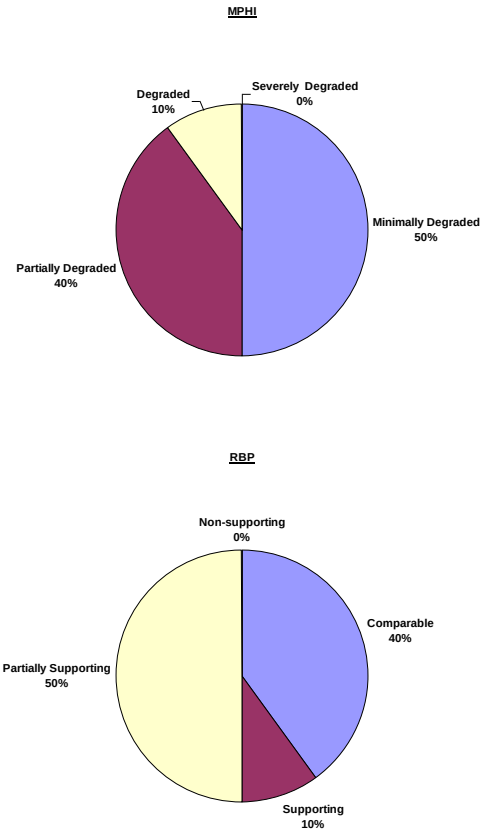


Figure 8 – Severn River Habitat Scores

Benthic Macroinvertebrates

The MBSS BIBI rated 40 % of the streams within the Severn River sampling unit as "Fair", 20% as "Good", 30% as "Poor", and 10% as "Very Poor" (**Figure 9**). The average BIBI score was 3.09 ± 0.86, which is within the "Fair" range. Generally, sites scoring in the "Fair" and "Good" ranges had much higher taxa richness when compared with sites scoring in the "Poor" or "Very Poor" range. The "Fair" and "Good" sites also had generally more pollution-intolerant species present than more degraded stations (8% versus 1%) and were located in the Gumbottom Branch and Maynadier Creek subwatersheds. The one site scoring in the "Very Poor" range was located within the Luce Creek subwatershed.

Generally, midges (*Parametriocnemus* sp., *Thienemannimyia* sp.), blackflies (*Simulium* sp), caddisflies (*Cheumatopsyche* sp.) and amphipods (*Crangonyx* sp.*)* dominated these samples.

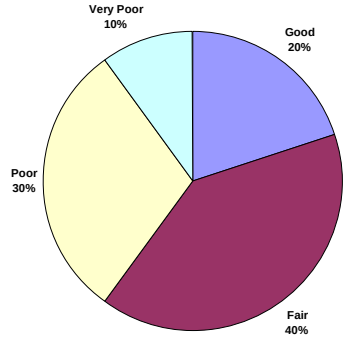


Figure 9 – Severn River BIBI Scores

Detailed data on each site can be found in ***Appendix A: Individual Site Summaries***.

Water Quality

Temperature and turbidity values sampled in the Severn River sampling unit were within Maryland's Use I stream standards. The pH values at two of the sampling locations were below what is considered acceptable for Use I streams. Conductivity values ranged from very low in streams with large forested buffers and a large distance to the nearest roadway to relatively high in sites that were situated near roadways. **Table 12** shows the average water quality values and their standard deviations.

Table 12–Average water quality values – Severn River

Value ± Standard Deviation					
Temp.*	TSS*	D.O.*	pH	Cond.*	Turb.*
7.5 ± 2.6	136.8 ±46.9	8.7 ± 0.6	6.6 ± 0.4	213.7 ± 73.1	9.4 ± 7.5

**Units: Temp. (°C), D.O. and TSS (mg/L), Cond. (µmhos/cm), Turb. (NTU)*

Summary

The Severn River sampling unit contains variable benthic communities and aquatic habitat conditions, but biological scores generally tracked with available habitat conditions. Aquatic habitat scores throughout the unit showed low to moderate degradation. MBSS PHI scores were in the "Minimally Degraded" or "Partially Degraded" range. EPA RBP scores were generally judged as "Comparable" or "Supporting". As

described above, benthic macroinvertebrate community scores were mostly in the "Fair" range. No significant issues were observed in the water quality measurements collected during sample collection.

As part of WMT deployment throughout the County described earlier, the subwatersheds in this sampling unit have been fully assessed and ranked. See OECR (2006) for full details.

Lower Patapsco

The Lower Patapsco sampling unit is approximately 4,040 acres and is located in the northern portion of the County (**Figure 1**). The sampling unit is primarily comprised of Holly Branch, an unnamed tributary in the next subwatershed west of Holly Branch, and numerous small catchment areas that directly drain to the Patapsco mainstem. The dominant land uses of the sampling unit include 35% residential, 36 % forested, and 4.2 % urban land, with the urban land category including industrial, commercial, and transportation uses. Impervious surfaces comprise 31 % of the Lower Patapsco sampling unit. The majority of residential land occurs in an east-west swath along the southern edge of the unit. Most industrial / commercial land occurs near the I-695 and Baltimore-Washington Parkway (BWP) interchange and west along the BWP. Generally speaking, large forest buffers (~800 to 1000 feet) appear to exist between the mainstem of the Patapsco and the surrounding developed land. The Lower Patapsco sampling unit had the most impaired habitat conditions of all units assessed surrounding developed land. An exception occurs in the northeastern corner of the sampling unit, where the Harbor Tunnel Thruway and the surrounding neighborhoods come very close to the river.

Six primary sites, four alternate sites, and one replicate site were sampled within the Lower Patapsco sampling unit (**Figure 10**). Three of the sites (03-09, 03-01, and 03-12A) were located on the mainstem of Holly Creek. Five of the sites (03-02, 03-16A, 03-04, 03-13A, and 03-17A) were located on a large unnamed tributary between Holly Creek and Stony Run (Stony Run is not part of this sampling unit). The remainder of the sites (03-07, 03-05, and the replicate site) were located on another unnamed tributary directly draining to the Patapsco mainstem.

Aquatic Habitat

The MBSS PHI rated 40 % of the streams within the Lower Patapsco sampling unit as "Partially Degraded", while 40 % of streams were rated as "Degraded" (**Figure 11**). One sample reach was rated "Severely Degraded". Only one reach achieved the highest habitat designation of "Minimally Degraded." The average PHI score was 67.1 $\pm$ 11.8. Using the EPA RBP habitat assessment method, 60 % of streams were rated as "Supporting", 30 % were rated as "Partially Supporting", and 10 % were rated as "Non-Supporting". An average score of 123.8 $\pm$ 17.8 (resulting in a unit-wide classification of "Partially Supporting") was observed during this round of sampling. In particular, levels of epifaunal substrate, sediment deposition, pool substrate, and instream habitat showed consistently depressed levels across the unit. There was fair consistency in habitat quality between Holly Creek and the unnamed tributary. However, one exception was in the bank stability metric measured in both methods. The sites in the unnamed tributary scored much lower than in the Holly Branch sites.

Benthic Macroinvertebrates

The MBSS BIBI rated 40 % of the streams within the Lower Patapsco sampling unit as "Fair", and 40 % as "Poor", and 20 % as "Very Poor" (**Figure 12**). The average BIBI score for the unit was 2.69 $\pm$ 0.61, which is within the "Poor" range. This sampling unit had the lowest average BIBI score of all units assessed. Generally, most sites had low numbers of organisms that are sensitive to the impacts associated with watershed urbanization. The Chironomidae, a family of organisms collectively known as midges and tolerant to variable and/or poor water quality, dominated the sites in this sampling unit. *Orthocladius*, *Hydrobaenus*, *Brillia*, and *Eukiefferiella*—all midge genera—made up 40% of all organisms observed at Lower Patapsco sites.

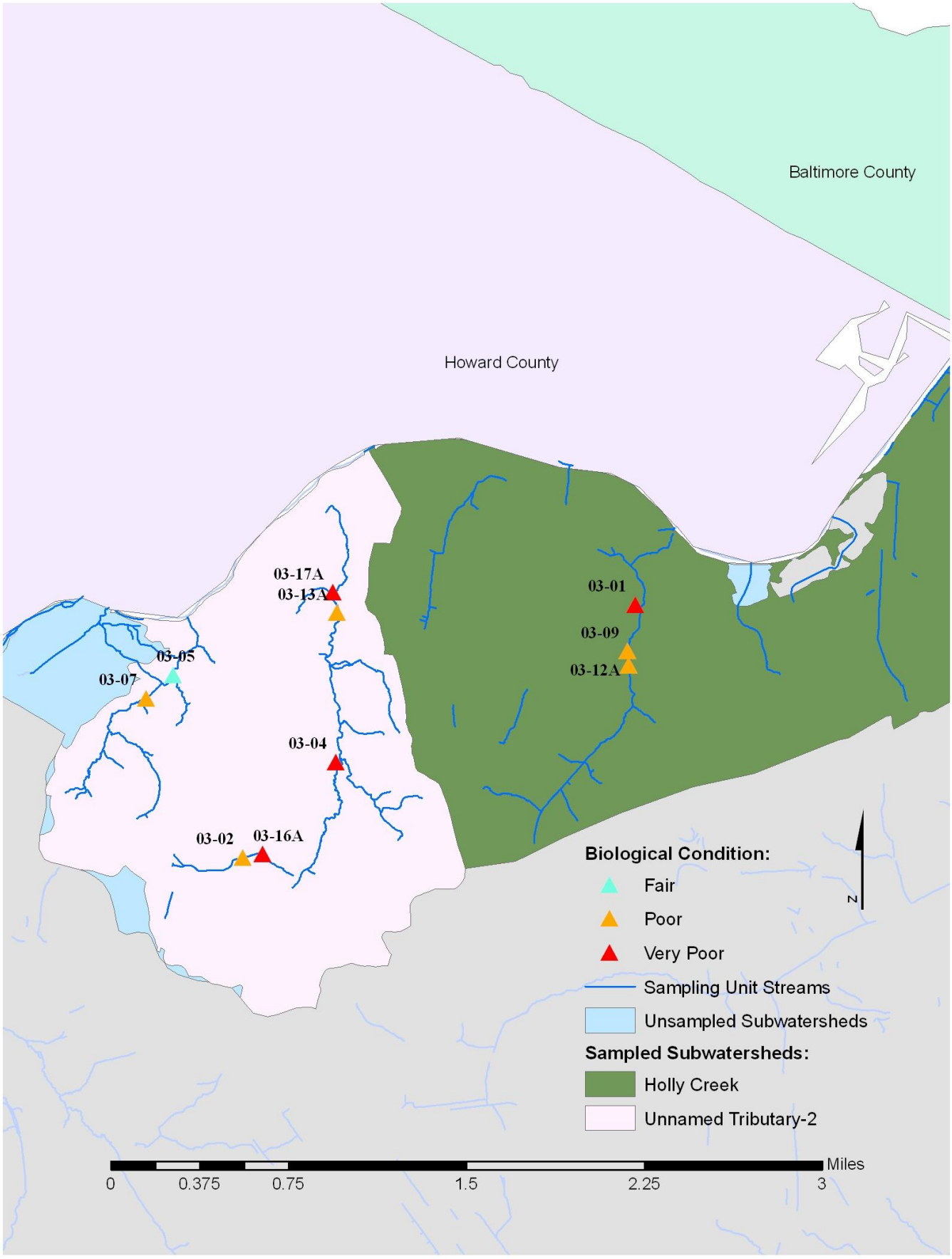


Figure 10 – Lower Patapsco Sampling Sites

Sites located within the Holly Creek subwatershed ranged from "Very Poor" to "Fair" biological condition, with the "Fair" site scored at 3.00, or the bottom limit of this category. This subwatershed, like the sampling unit overall, was dominated by the midge genera *Orthocladius*, *Hydrobaenus*, and *Brillia*.

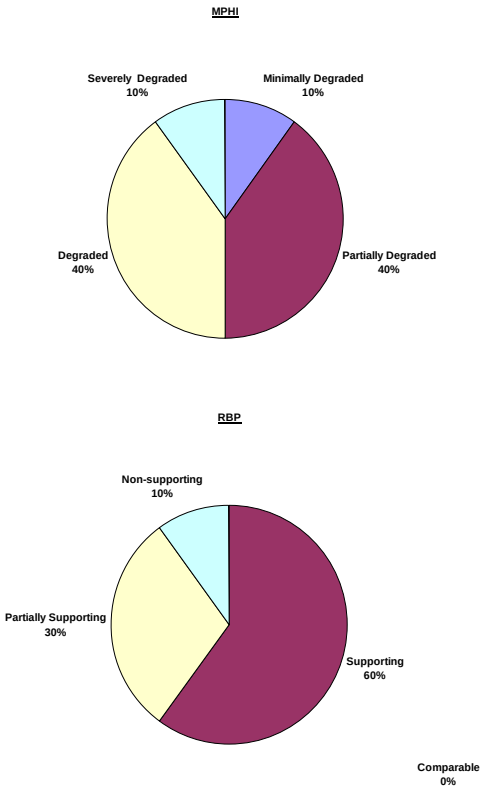


Figure 11– Lower Patapsco Habitat Scores

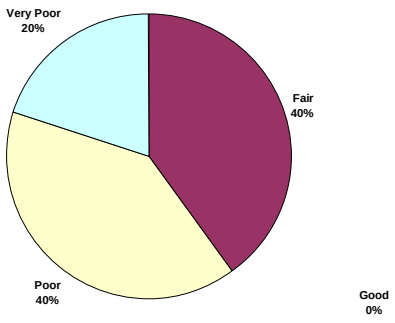


Figure 12 – Lower Patapsco BIBI Scores

Conditions within the unnamed tributary were similar to Holly Creek, with BIBI values ranging from "Very Poor" to "Fair." The dominant organisms found here included members of the midge genera *Hydrobaenus* and *Orthocladius*, the worm family *Lumbricidae*, and the amphipod genus *Crangonyx*. Like the midge genera described above, the prevalence of worms and amphipods in substantial numbers is also symptomatic of water quality degradation within this subwatershed and the larger sampling unit.

Detailed data on each site can be found in ***Appendix A: Individual Site Summaries***.

Water Quality

Temperature and turbidity values sampled in the Lower Patapsco sampling unit were within Maryland's Use I stream standards. At 4.55, the pH values at two of 10 sampling locations (03-02 and 03-16A) were below acceptable levels for Use I streams. Conductivity values at stations 03-02 and 03-16A were also the highest in the unit, at 880 and 1554 µmhos/cm, respectively. There was approximately 1.3 inches of rain recorded at the Baltimore-Washington International Airport over the three days proceeding sample collection at these stations (NCDC 2004). Additionally, both sites are located on the same reach just downstream of a variety of commercial and light industrial land uses, some of which appear to have stormwater management in place while others do not. Consequently, the exact reason for these high levels (the average for the unit without these stations is 367 µmhos/cm) is unclear and should be investigated further to determine if this occurrence of high values was unique to the sampling event or is a persistent impact. **Table 13** shows the average water quality values and their standard deviations.

Table 13–Average water quality values – Lower Patapsco

Value/Standard Deviation					
Temp.*	TSS*	D.O.*	pH	Cond.*	Turb.*
12.6 ± 1.2	272 ±124	6.9 ± 1.3	7.7 ± 0.2	537 ± 401	8.2 ± 8.1

**Units: Temp. (°C), D.O. and TSS (mg/L), Cond. (µmhos/cm), Turb. (NTU)*

Summary

The Lower Patapsco Run sampling has the poorest biological condition of all the units assessed in this first year of sampling. Biological conditions were generally poor and habitat quality was also the lowest of all units sampled, regardless of the method used.

This sampling unit overall has an imperviousness cover level of approximately 30%, well beyond the 10% level typically associated with the minimal or no impact conditions found in undeveloped or lightly developed watersheds (Schueler and Claytor 1996). The impacts associated with urban development, particularly in this sampling unit where little or no stormwater management was installed during the development of this part of the County, are the likely stressors depressing the biological conditions of this area.

Middle Patuxent

The Middle Patuxent sampling unit is approximately 6,332 acres and is located in the west central portion of the County (**Figure 1**). Only one named subwatershed, Ropers Branch, exists in this sampling unit (**Figure 13**). Land use in the Middle Patuxent is comprised of approximately 50 % forested land, 20 % agricultural, and 20 % residential land. The balance of the sampling unit is comprised of small amounts of commercial, industrial and transportation right-of-way. Impervious surfaces comprise approximately 7 % of the overall Middle Patuxent sampling unit. Approximately two thirds of the development in this sampling unit is located south of U.S. Route 50, which bisects the area.

Seven primary sites, three alternate, and one replicate site (not shown) were sampled within the Middle Patuxent sampling unit (**Figure 13**). Three of the sites (18-02, 18-07, 18-20A) were located in the Cox Branch subwatershed. The other sites are located on unnamed tributaries to the Patuxent River.

Aquatic Habitat

The MBSS PHI rated 40 % of the streams within the Middle Patuxent sampling unit as "Minimally Degraded" and 60 % of streams were rated as "Partially Degraded." No reaches were rated as "Degraded" or "Severely Degraded" (**Figure 14**). The average PHI score was 79.1± 6.7, which is at the very high end of the "Partially Degraded" range. Thirty percent of streams were rated as "Comparable", 60 % were rated as "Supporting", and 10 % were rated "Partially Supporting" by the EPA RBP habitat assessment. The average EPA RBP score was resulted in a "Supporting" rating at 144.2 ± 11.1.

Throughout the sampling unit, habitat conditions were of mostly high quality. Some level of excess sediment deposition was observed at nearly all sites, but high levels of bank vegetation, large riparian areas, a good mix of pools and riffles, and a nearly completely closed tree canopy were observed at nearly all stations.

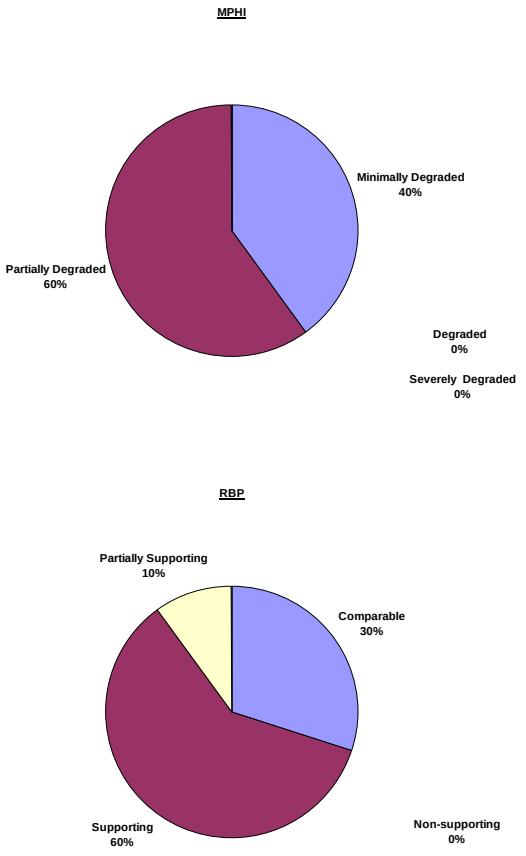


Figure 14 – Middle Patuxent Habitat Scores

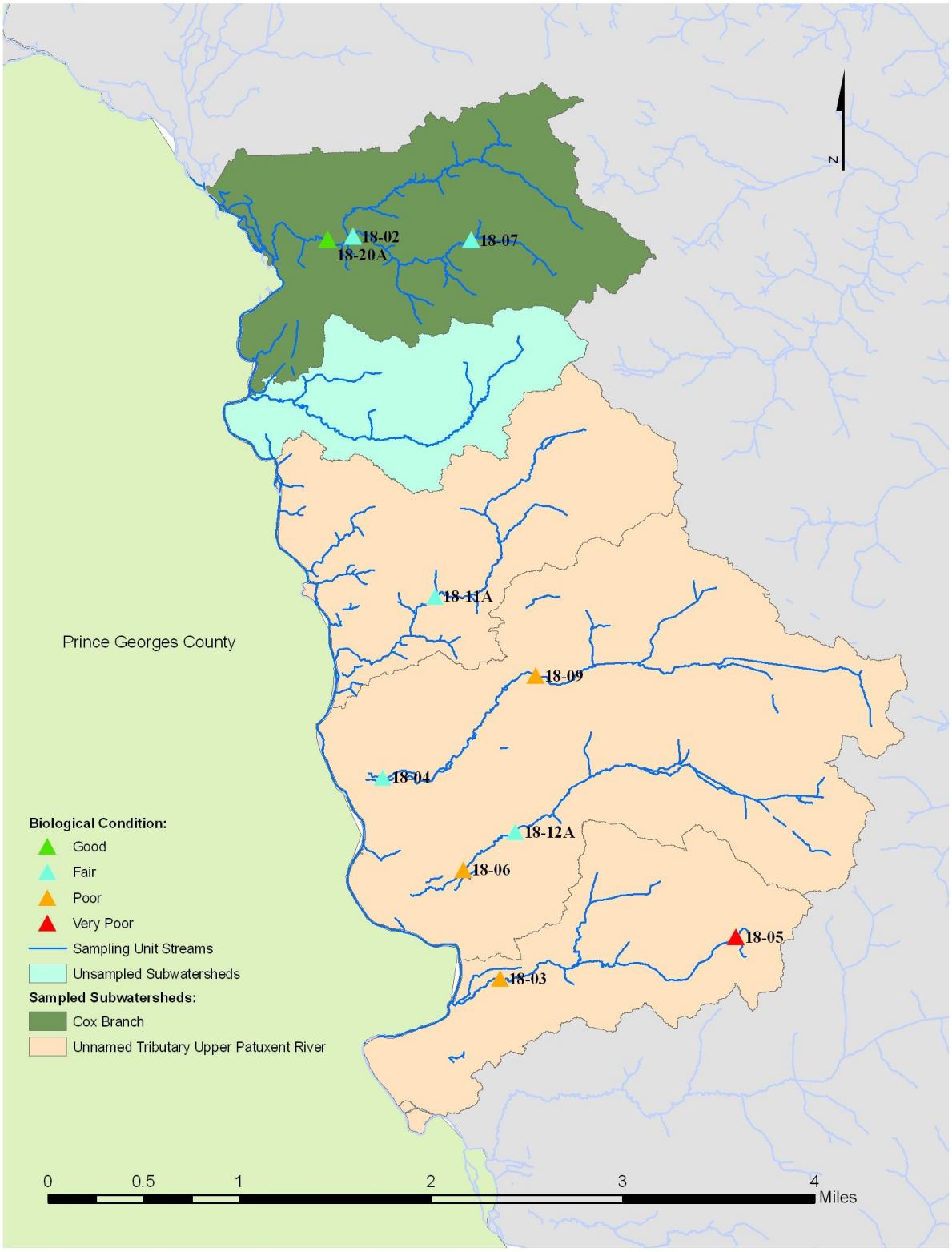


Figure 13 – Middle Patuxent Sampling Sites

Benthic Macroinvertebrates

The MBSS BIBI rated 10 % of the streams within the Middle Patuxent as "Very Poor", 30 % as "Poor", 50 % as "Fair", and 10 % as "Good" (**Figure 15**). The average BIBI score for Middle Patuxent was 2.94 ± 0.71, which while within the "Poor" range, is just 0.06 units from scoring in the "Fair" range.

The sites in this sampling unit were dominated by the amphipod genus *Crangonyx*, with this group making up approximately 22% of all organisms collected. The midge genus *Orthocladius* comprised around 10% of all organisms collected. The isopod genus *Caecidotea* comprised approximately 9% of organisms collected while the stonefly genus *Amphinemura* made up around 6% of the total. These groups, excluding the stonefly, tend to be generalists that are able to adapt to watershed disturbance.

Detailed data on each site can be found in ***Appendix A: Individual Site Summaries***.

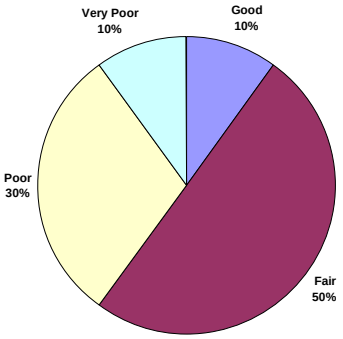


Figure 15 – Middle Patuxent BIBI Scores

Water Quality

Temperature, turbidity, and dissolved oxygen values within the Middle Patuxent sampling unit were within Maryland's Use I stream standards. The pH of one site (18-05) was below Use I standards, at 5.20. This site was also rated "Very Poor" for biological conditions. It is unknown if these two factors are related. **Table 14** shows the average water quality values and their standard deviations.

Table 14–Average water quality values – Middle Patuxent

Value/Standard Deviation					
Temp.*	TSS*	D.O.*	pH	Cond.*	Turb.*
12.4 ± 1.8	130± 46	7.9 ± 0.6	7.1 ± 0.7	202 ± 72	14.6 ± 11.1

**Units: Temp. (°C), D.O. and TSS (mg/L), Cond. (µmhos/cm), Turb. (NTU)*

Summary

In the Middle Patuxent sampling unit, biological conditions are somewhat depressed in relation to available habitat quality. Biological conditions, while rated "Poor," were only 0.03 units from being classified as "Fair." A "Fair' classification would be appropriate for the observed habitat quality in this unit. It is possible that this sampling unit is undergoing a transition to more degraded conditions. Current imperviousness in this unit is around 7%, which is close to, but just under, the 10% threshold typically associated with degraded biological conditions. Additionally, while some sensitive taxa were observed, moderately tolerant generalists were the dominant insect groups observed in this sampling unit. Taken together, these factors indicate a potential transition from an area with somewhat high level of ecological function toward a lower level. However, without additional sampling in the future, the actual condition trajectory of this sampling unit is currently an open question.

Aquatic habitat conditions were of mostly high quality, with many sites in the "Supporting" or "Partially Degraded" categories. As shown in **Table 7**, this unit had the second highest average scores for both the MPHI and US EPA RBP habitat assessments. However, some habitat impairments existed across the stations in this sampling unit. A moderate level of sediment deposition occurs across the unit. Furthermore, somewhat impaired levels of woody debris habitat were observed in both habitat assessments.

Ferry Branch

The Ferry Branch sampling unit is approximately 8.037 acres and is located in the southwestern portion of the County along the Patuxent River (**Figure 1**). In addition to Ferry Branch, this sampling unit is comprised of the Galloway Creek, Two Run Branch, and the Wilson Owens Branch subwatersheds. Sample reaches were located in Galloway Creek, Ferry Branch, and Wilson Owens Branch. The land use of the Ferry Branch sampling unit is approximately 48 % forested, 20 % agricultural, and 6 % urban land, including industrial, commercial, and transportation. Approximately 18 % of the sampling unit is residential land use. Impervious surfaces comprise 6.7 % of the overall Ferry Branch sampling unit. Approximately half of all impervious surface found in this sampling unit is concentrated in Wilson Owens Branch, 25 % is found in Galloway Creek, and approximately 17 % is located in Ferry Branch.

All ten primary sites and one replicate site were sampled within the in this sampling unit (**Figure 16**). No alternate sites were necessary. Six sites were located within the Ferry Branch subwatershed. One of the sites was located within Galloway Creek. Three of the sites were located within the Wilson Owens Branch subwatershed.

Aquatic Habitat

The MBSS PHI rated 90 % of the streams within the Ferry Branch sampling unit as "Minimally Degraded" and 10 % of streams were rated as "Partially Degraded." No streams were placed into the lower habitat categories (**Figure 17**). The average PHI score was 86.7 $\pm$ 5.6, giving this sampling unit an overall habitat condition of "Minimally Degraded." Sixty percent of streams were rated as "Comparable" to reference conditions, 30 % were rated as "Supporting", and 10 % were rated as "Partially Supporting" by the EPA RBP habitat assessment. The average EPA RBP score was 153.0 $\pm$ 15.1, giving this sampling unit an overall condition rating of "Comparable." For this sampling unit, habitat conditions were judged approximately equivalent using the two methods.

The sites in this sampling unit had the highest combined scores for both assessment methods. Generally, the sites were well shaded with a high amount of instream woody debris and other kinds of epifaunal substrate. Sediment impacts observed in other sampling units were observed to a lesser degree at these stations. Streamside forests were wide and provided a closed canopy at all sites.

Aquatic habitat conditions within the Ferry Branch subwatershed were generally "Minimally Degraded" with all six stations scoring in that range. EPA RBP scores showed similar conditions with five of six sites judged "Comparable" to reference conditions and one site judged "Supporting." Within the Wilson Owens Branch subwatershed similar circumstances were observed, with two of three sites judged "Minimally Degraded" while the other site was "Partially Degraded." Very few impairments were observed in these subwatersheds.

Only one site was sampled within the Galloway Creek subwatershed. This site scored in the "Minimally Degraded" range for the MBSS PHI while the EPA RBP scored it in the "Comparable" to reference conditions. Poor pool variability was the major impairment observed in the RBP method. For the MBSS PHI a low remoteness score was given due to the site's proximity to MD Route 4.

Benthic Macroinvertebrates

The MBSS BIBI rated 20 % of the streams within Ferry Branch as "Good", 50 % as "Fair", and 30 % as "Poor." No sites were scored as "Very Poor" (**Figure 18**). The average BIBI score for Ferry Branch sampling unit was 3.20 $\pm$ 0.81, which is within the "Fair" range and was the highest average score of all sampling units evaluated.

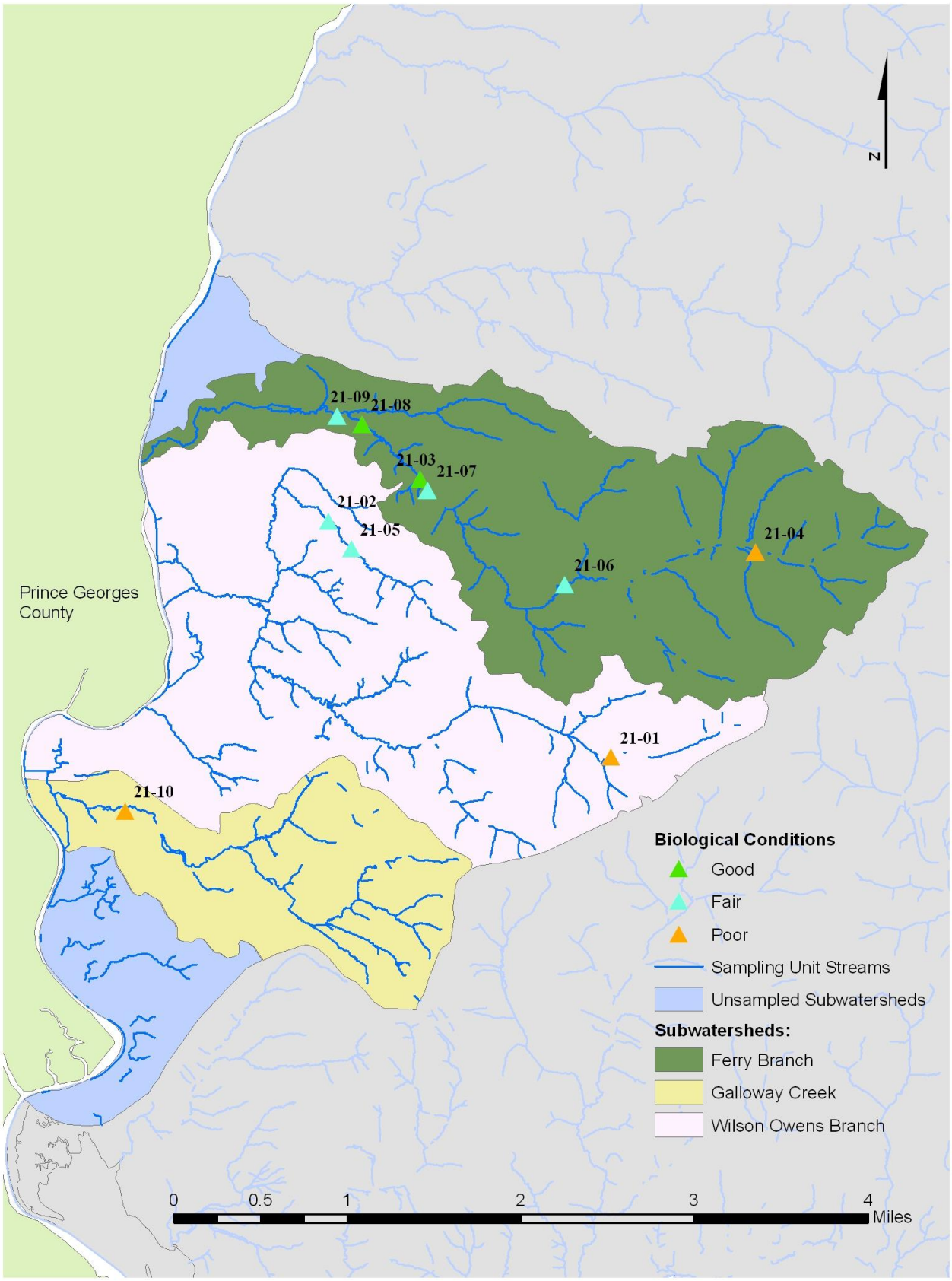
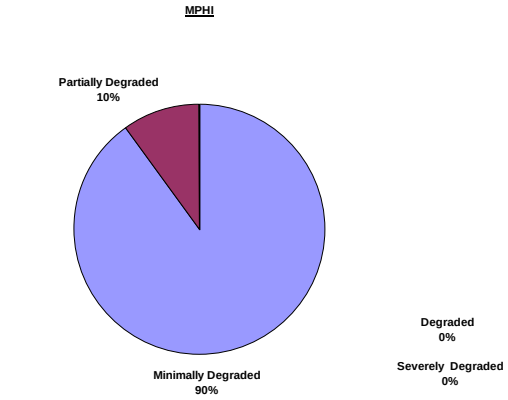


Figure 16 – Ferry Branch Sampling Sites



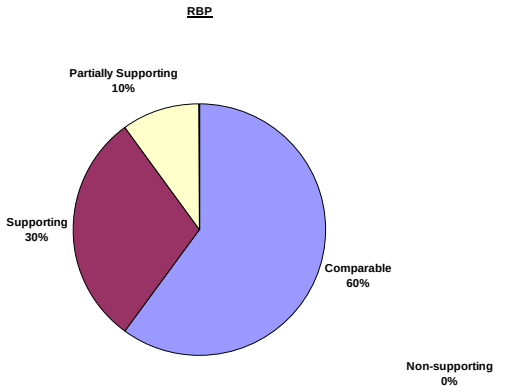


Figure 17 – Ferry Branch Habitat Scores

Generally, sites within the Ferry Branch sampling unit that scored within the "Good" range were the larger streams that were characterized by good overall taxa richness as well as good EPT taxa richness. Sites scoring in the "Fair" range had similar taxa composition with slightly higher overall tolerance values. The site scoring in the "Poor" range contained generally a very tolerant benthic community and were dominated by midges, aquatic worms, and amphipods.

The six sites sampled within the Ferry Branch subwatershed had BIBI scores ranging from "Poor" to "Good." The sites scoring in the "Good" range had very high EPT taxa richness, high percentages of *Ephemeroptera* taxa present, and a good distribution of overall taxa abundances. The site scoring "Poor" was located on a small headwater tributary in the eastern part of the sampling unit.

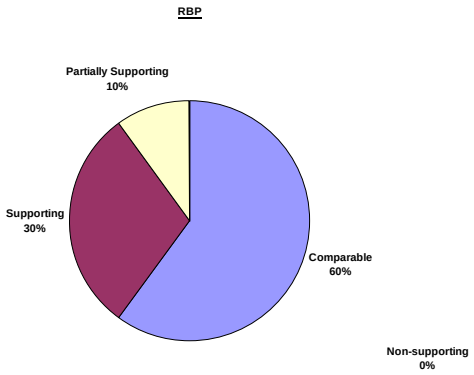


Figure 18 –Ferry Branch BIBI Scores

The three sites sampled in the Wilson Owens Branch subwatershed were dominated by tolerant organisms like amphipods in the genus *Crangonyx* and by midges in the genus *Polypedilum.* which together made up 48% of all organisms found at these stations. However, stonefly (*Amphinemura* sp.) and caddisfly (*Ironoquia* sp.) taxa were also found in this subwatershed, although in much lower numbers. Sites in this watershed ranged from "Poor" to Fair."

One site was sampled in the Galloway Creek subwatershed. Although aquatic habitat was measured as high quality at this site, the BIBI scored in the "Poor" range. This site was heavily dominated by members of the tolerant isopod genus *Caecidotea*, with nearly half the organisms collected found in this genus. The midge genus *Paratanytarsus* was the next dominant taxon, making up approximately 15% of all organisms found at this site. Some significant road drainage from MD Route 4 just north of this site along with the significant watershed development draining to this reach likely explains the poor score for this reach.

Detailed data on each site can be found in ***Appendix A: Individual Site Summaries***.

Water Quality

There were no values outside ranges acceptable for Use I waters found in this sampling unit, when

considered individually or as a unit average. Summarized results are found in **Table 15**.

Table 15–Average water quality values – Ferry Branch

Value/Standard Deviation					
Temp.*	TSS*	D.O.*	pH	Cond.*	Turb.*
15.6 ± 1.1	111 ±14.9	8.3 ± 0.3	7.1 ± 0.1	174 ± 23.1	16.7 ± 9.8

**Units: Temp. (°C), D.O. and TSS (mg/L), Cond. (µmhos/cm), Turb. (NTU)*

Summary

While there was some variability within the Ferry Branch sampling unit, overall scores indicate a moderate quality biological community exists here, supported by high quality habitat conditions.

Generally, however, the observed habitat conditions ("Comparable" and "Minimally Degraded") are typically associated with an overall BIBI unit score of "Good" rather than the "Fair" levels actually observed. It is possible that water quality impacts, currently unknown, are slightly depressing biological communities in this sampling unit. Conversely, it is also possible that this sampling unit is on the road to recovery from past intensive agricultural activities that undoubtedly impacted this area to a much greater degree than they do presently. No obvious water chemistry problems were observed during the routine measurements collected at each sampling reach concurrent with the biological and habitat data. Additional investigations are necessary to determine the type and magnitude of any water quality perturbation that might be present here and the overall trajectory of this area's ecological condition.

Conclusions and Recommendations

In general, biological conditions within the 2004 sampling units tended to be depressed relative to observed habitat quality. Habitat conditions within all sampling units were classified by the RBP method as "Partially Supporting" and/or "Partially Degraded" by the MBSS PHI, or better. Such a disparity between biological communities and habitat conditions is typically indicative of water quality impacts associated with runoff from developed or agricultural lands.

With the current information, it is not possible to determine if the degradation in the biological communities has stopped and these areas are in the process of recovering from past agricultural impacts, or if these were high quality communities that have been degraded and will continue on a downward trajectory until some future endpoint is reached. For example, there is some evidence that such agricultural stressors, even if ended as long as fifty years ago, can influence the current biota present in streams (Harding et al. 1998). Additional future data collection will be required to determine the ultimate ecological trajectory of these sampling units.

One potential issue associated with the interpretation of biological data concerns the influence of natural climatic variability on streamflow and its associated potential impact on aquatic communities. Impairments observed during this assessment might be attributable to such impacts associated with a severe drought that occurred from mid-2001 to mid-2002 (MDSCO 2006). To better understand and characterize this potential confounding variable, the DNR MBSS maintains a network of high quality sites that are measured each year as an indicator of such stressors. Called Sentinel Sites, these reaches are located in are areas where anthropogenic impacts are virtually non-existent. Consequently, any variability from year to year is likely associated with natural and not anthropogenic perturbations.

Prochaska (2005) reports that for the sites located in the Western Coastal Plain, a depression in BIBI scores did occur from 2002 to 2003. However, all sites had fully recovered to their long-term average values in 2004. Nevertheless, it is possible that sites impacted by human activities like those evaluated during this assessment would not recover so quickly, which might explain the observed disparity between habitat conditions and biological communities. Repeating the sampling in these units is necessary to get at the answer to this question.

While overall habitat quality tended to be high, there were some impairments commonly observed throughout the sampling units. Excessive sediment deposition was a commonly observed problem. Even sites that scored high on all other habitat metrics would typically show depressed scores on this metric. Associated with this issue, pool substrate and the variability of pool habitat also tended to be depressed. Thirty percent of all sites had sediment deposition conditions in the "Partially Supporting" or "Non-supporting" categories while over 55% of all sites scored in these lower categories for pool habitat variability. The causative factors of such habitat conditions are typically associated with watershed wide geomorphic disturbances linked to disturbed stream flow characteristics that cause stream channels to enlarge or otherwise adjust. The qualitative habitat assessment performed here does not provide sufficient insight into these underlying processes. Additional assessments, such as geomorphological characterizations and flow regime evaluations would provide such insight.

In three of the sampling units (Severn Run, Severn River and Middle Patuxent), extensive watershed assessment and characterization has occurred (OECR 2004, OECR 2006). The details of this work will not be discussed here. However, a variety of habitat restoration, stormwater management, and habitat protection options have been proposed for some of the subwatersheds found in these sampling units. These management activities should be pursued to the extent feasible.

Based upon the results of this assessment, the following recommendations are made:

Continue Assessment Efforts. This first five year monitoring cycle provides a crucial baseline necessary to understand overall biological conditions within the County. To understand ecological trends and possible recovery associated with management activities, repeated sampling of this nature is necessary.

Address Water Quality Impairments. Given the depressed biological conditions related to available habitat, it seems likely that runoff from upstream land uses is impacting the water quality of these systems and adversely effecting the biological communities. To the extent feasible, best management practice installation and/or retrofits should be occur in these sampling units.

Geomorphic Assessments. The pervasive instream sedimentation observed is likely due to causative agents that act well outside the assessment reaches sampled here. For sites that have the most severe problems, additional assessments that look at the physical conditions of the stream channel are necessary in order to understand the corrective measures necessary to solve this problem.

Build on Existing Assessments. Comprehensive watershed assessments have been performed in the entire Severn River watershed and in part of the Patuxent River. The recommendations from those studies should be implemented to the extent feasible.

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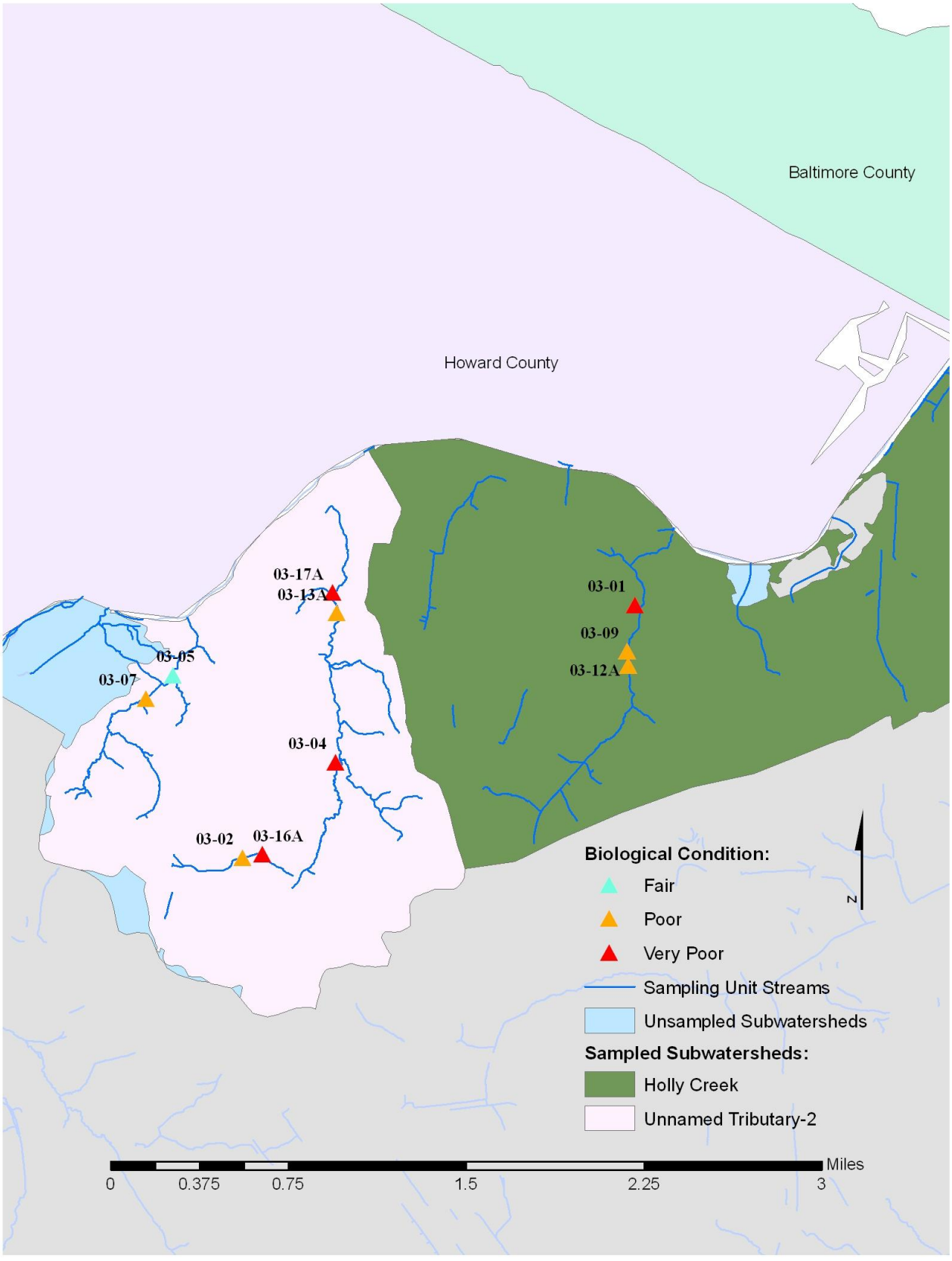
Appendix A:
Individual Site Summaries

Lower Patapsco Sampling Unit



03-01 Lower Patapsco Sampling Unit

Upstream

Downstream

Location/Site Access: Located upstream of Nursery Road.
ADC Map: 02G05
Latitude/Longitude: 38.220685 / 76.644667

Land Use Analysis:

Land Use	Acres	% Area
Commercial	37.4	6.5
Industrial	4.6	0.8
Open Space	37.6	6.5
Residential 1/2-acre	20.2	3.5
Residential 1/4-acre	309.8	53.6
Residential 1/8-acre	14.7	2.5
Transportation	43.2	7.5
Woods	110.8	19.2
Total	**578.3**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
183.3	578.3	31.7

Results:

- Biological condition: "Very Poor"
- Habitat scores:
  RBP: "Supporting"
  MPHI: "Partially Degraded"

Recommendations:

- Biological conditions are depressed related to available habitat. Site should be investigated for possible water quality impairments.
- Conductivity in this sampling unit higher than others, also indicative of a water quality impairment. Investigate possible sources.
- Additional investigations needed to determine if numerous habitat impairments observed, including eroding banks, poor levels of substrate, and somewhat high levels of sediment deposition, can be corrected.
- Investigate potential stormwater management possibilities in upstream residential areas.

03-01 Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Very Poor
BIBI Score	1.86

Metric Scores

Total Taxa	1
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	3

Calculated Metric Values

Total Taxa	13
EPT Taxa	1
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	2
Scraper Taxa	2
% Climbers	3.9

Taxa List

Physidae	1
Crangonyx	5
Caecidotea	1
Chironomidae	1
Chironomidae	4
Brillia	14
Eukiefferiella	12
Hydrobaenus	19
Nanocladius	2
Orthocladius	23
Parametriocnemus	11
Polypedilum	1
Tanytarsus	1
Thienemannimyia	6
Cheumatopsyche	1

Total Individuals **102**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	578.3
Remoteness	59
Percent Shading	79
Epifaunal Substrate	84
Instream Habitat	82
Instream Wood Debris	62
Bank Stability	84
PHI Score	75.0
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	6
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	8
Channel Flow Status	9
Channel Alteration	20
Channel Sinuosity	12
Pool Substrate Characterization	9
Pool Variability	10
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	13
Epifaunal Substrate	12
EPA Habitat Score	135
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.86
pH	7.40
Conductivity (umhos/cm)	455.8
Temperature (°C)	12.79
TDS (mg/L)	291.7
Turbidity (NTUs)	10.7

03-02 Lower Patapsco Sampling Unit

Downstream

Upstream

Location/Site Access: Located downstream of Winterson Road.
ADC Map: 02B07
Latitude/Longitude: 38.205317 / 76.675581

Land Use Analysis:

Land Use	Acres	% Area
Commercial	70.5	46.8
Industrial	1.4	1.0
Open Space	7.3	4.8
Residential 1-acre	1.7	1.1
Residential 1/2-acre	0.8	0.6
Residential 1/4-acre	19.9	13.2
Transportation	15.4	10.2
Woods	33.7	22.3
Total	**150.8**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
71.7	150.8	47.7

Results:

- Biological condition: "Poor"
- Habitat scores:
  - RBP: "Partially Supporting"
  - MPHI: "Degraded"

Recommendations:

- Biological condition matches observed habitat quality.
- Second highest conductivity in this sampling unit observed at this site. Investigate possible sources.
- Investigate stormwater management potential in extensive commercial land uses upstream.
- Extensive habitat impairments include poor pool quality, sediment deposition, low amounts of epifaunal substrate. Determine need, feasibility of any restoration activities.

03-02 Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.43

Metric Scores

Total Taxa	3
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	20
EPT Taxa	0
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	0
Scraper Taxa	2
% Climbers	16.5

Taxa List

Physidae	2
Tubificidae	4
Lumbricidae	34
Collembola	1
Agabus	6
Copelatus (adult)	4
Hoperius	2
Lampyridae (subaquatic)	1
Bezzia/Palpomyia	2
Chironomidae (larva)	1
Chironomus	1
Glyptotendipes	1
Hydrobaenus	9
Larsia	2
Polypedilum	1
Smittia	1
Tanytarsus	6
Culicidae	1
Molophilus	1
Noctuidae	3
Ischnura	2
Mollusca (terrestrial)	3
Isopoda (terrestrial)	2
Diplopoda (terrestrial)	5
Diptera (terrestrial)	2
Coleoptera (terrestrial)	5
Total Individuals	**85**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	150.8
Remoteness	16
Percent Shading	85
Epifaunal Substrate	41
Instream Habitat	68
Instream Wood Debris	71
Bank Stability	89
PHI Score	61.7
PHI Narrative Ranking	Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	9
Bank Stability- Right Bank	7
Vegetative Protection- Left Bank	5
Vegetative Protection- Right Bank	10
Channel Flow Status	15
Channel Alteration	17
Channel Sinuosity	6
Pool Substrate Characterization	7
Pool Variability	13
Riparian Vegetative Zone Width- Left Bank	7
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	7
Epifaunal Substrate	3
EPA Habitat Score	116
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	4.55
pH	7.90
Conductivity (umhos/cm)	880.7
Temperature (°C)	12.85
TDS (mg/L)	563.6
Turbidity (NTUs)	6.1

03-04 Lower Patapsco Sampling Unit

Upstream

Downstream

Location/Site Access: Located west of Bartell Ave.
ADC Map: 02D06
Latitude/Longitude: 39.211121 / 76.668260

Land Use Analysis:

Land Use	Acres	% Area
Commercial	83.7	15.1
Industrial	67.7	12.2
Open Space	31.4	5.7
Residential 1-acre	11.6	2.1
Residential 1/2-acre	12.9	2.3
Residential 1/4-acre	189.7	34.2
Transportation	29.8	5.4
Woods	127.7	23.0
Total	**554.5**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
205.0	554.5	37.0

Results:

- Biological condition: "Poor"
- Habitat scores:
  - RBP: "Supporting"
  - MPHI: "Partially Degraded"

Recommendations:

- Biological conditions are somewhat degraded in relation to observed habitat quality.
- Determine if stormwater management opportunities exist on extensive commercial / industrial and residential land uses upstream.
- Significant habitat impairments include high sedimentation rates, poor pool quality, and moderate depression in amount of epifaunal substrate. Additional assessments are necessary to determine feasibility, need for any corrective actions.

03-04 Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	2.71

Metric Scores

Total Taxa	5
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	23
EPT Taxa	0
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	1
Scraper Taxa	4
% Climbers	13.0

Taxa List

Physidae	1
Sphaeriidae	2
Tubificidae	4
Lumbricidae	14
Amphipoda	1
Caecidotea	1
Helichus	1
Agabus	2
Hoperius	3
Hydroporus	2
Stenelmis	1
Diptera	1
Chironomidae	3
Chironomus	1
Eukiefferiella	9
Hydrobaenus	45
Larsia	2
Orthocladius	9
Parachironomus	1
Tanytarsus	4
Culicidae	1
Simulium	2
Sialis	1
Calopteryx	1
Somatochlora	1

Total Individuals **113**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	554.5
Remoteness	38
Percent Shading	79
Epifaunal Substrate	85
Instream Habitat	77
Instream Wood Debris	56
Bank Stability	92

PHI Score	71.1
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	9
Bank Stability- Right Bank	8
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	8
Channel Flow Status	14
Channel Alteration	20
Channel Sinuosity	14
Pool Substrate Characterization	8
Pool Variability	8
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	8
Epifaunal Substrate	12

EPA Habitat Score	138
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.39
pH	7.70
Conductivity (umhos/cm)	389.8
Temperature (°C)	15.39
TDS (mg/L)	252.8
Turbidity (NTUs)	6.4

03-05 Lower Patapsco Sampling Unit

Downstream

Upstream

Location/Site Access: Located upstream of Gloria Ave.
ADC Map: 02B05
Latitude/Longitude: 39.216479 / 76.681021

Land Use Analysis:

Land Use	Acres	% Area
Commercial	50.7	18.2
Industrial	3.2	1.2
Open Space	25.6	9.2
Residential 1-acre	10.0	3.6
Residential 1/2-acre	7.5	2.7
Residential 2-acre	4.0	1.4
Transportation	21.9	7.9
Utility	11.8	4.2
Woods	143.9	51.7
Total	**278.6**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
64.8	278.6	23.2

Results:

- Biological condition: "Fair"
- Habitat scores:
  - RBP: "Supporting"
  - MPHI: "Partially Degraded"

Recommendations:

- Biological conditions are appropriate to observed habitat quality.
- Extensive instability observed along the right bank (upstream). Other habitat impairments observed include moderate sediment deposition, poor pool habitat quality. Determine if corrective actions are necessary through additional assessments.
- Investigate potential stormwater management opportunities in commercial land uses upstream.

03-05 Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.57

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	3
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	30
EPT Taxa	7
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	20
Scraper Taxa	4
% Climbers	14.9

Taxa List

Physidae	1
Lumbricidae	1
Tubificidae	1
Cyclopoida	1
Helichus (adult)	1
Agabus (larva)	6
Agabus (adult)	1
Hoperius	9
Hydroporus	3
Cymbiodyta (adult)	1
Bezzia/Palpomyia	1
Chironomidae (larva)	4
Chironomidae (pupa)	2
Diamesa	1
Eukiefferiella	7
Hydrobaenus	4
Larsia	2
Parametriocnemus	1
Stenochironomus	1
Tanytarsini	1
Thienemannimyia	8
Simulium	11
Dicranota	1
Tipula	15
Noctuidae	1
Calopteryx	3
Leuctridae	6
Amphinemura	1
Diplectrona	11
Hydropsyche	1
Symphytopsyche	2
Ironoquia	4
Neophylax	1
Total Individuals	**114**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	278.6
Remoteness	92
Percent Shading	79
Epifaunal Substrate	100
Instream Habitat	67
Instream Wood Debris	67
Bank Stability	74
PHI Score	79.8
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	3
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	8
Channel Flow Status	7
Channel Alteration	20
Channel Sinuosity	10
Pool Substrate Characterization	9
Pool Variability	12
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	12
Epifaunal Substrate	14
EPA Habitat Score	131
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.74
pH	8.00
Conductivity (umhos/cm)	249.4
Temperature (°C)	11.02
TDS (mg/L)	159.5
Turbidity (NTUs)	29.9

03-07 Lower Patapsco Sampling Unit

Downstream

Upstream

Location/Site Access: Located between River and West Nursery Roads.
ADC Map: 02A6
Latitude/Longitude: 39.215057 / 76.683150

Land Use Analysis:

Land Use	Acres	% Area
Commercial	51.3	22.9
Open Space	25.5	11.4
Residential 1-acre	10.3	4.6
Residential 1/2-acre	8.0	3.5
Residential 2-acre	4.0	1.8
Transportation	14.5	6.5
Utility	9.1	4.0
Woods	101.7	45.4
Total	**224.2**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
57.3	224.2	25.6

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are comparable to observed habitat quality.
- Determine if retrofit opportunities for stormwater management exist in the extensive commercial areas upstream of sampling reach.
- Moderate instability observed along left bank (downstream). Additionally, poor variability in pool habitat observed. Perform additional assessments to determine if correction is necessary.

03-07 Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.00

Metric Scores

Total Taxa	5
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	3
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	22
EPT Taxa	3
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	23
Scraper Taxa	1
% Climbers	8.7

Taxa List

Haplotaxida	1
Naididae	10
Tubificidae	2
Agabus	4
Agabus	1
Hoperius	1
Hydrobius	1
Hydroporus	2
Hydrobius	1
Bezzia/Palpomyia	2
Chironomidae	2
Eukiefferiella	32
Larsia	1
Parametriocnemus	5
Prodiamesa	1
Thienemannimyia	2
Simulium	8
Dicranota	1
Tipula	8
Calopteryx	5
Somatochlora	3
Leuctridae	8
Diplectrona	11
Ironoquia	3

Total Individuals 115

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	224.2
Remoteness	97
Percent Shading	85
Epifaunal Substrate	100
Instream Habitat	70
Instream Wood Debris	69
Bank Stability	71

PHI Score	81.9
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	4
Bank Stability- Right Bank	6
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	9
Channel Flow Status	8
Channel Alteration	20
Channel Sinuosity	13
Pool Substrate Characterization	16
Pool Variability	9
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	14
Epifaunal Substrate	15

EPA Habitat Score	142
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.32
pH	7.80
Conductivity (umhos/cm)	219
Temperature (°C)	12.97
TDS (mg/L)	140
Turbidity (NTUs)	1.3

03-09 Lower Patapsco Sampling Unit

Downstream

Upstream

Location/Site Access: Located just downstream of Lake Front Drive.
ADC Map: 02G05
Latitude/Longitude: 39.217825 / 76.645256

Land Use Analysis:

Land Use	Acres	% Area
Commercial	35.2	6.8
Industrial	4.6	0.9
Open Space	38.0	7.3
Residential 1/2-acre	5.7	1.1
Residential 1/4-acre	281.5	54.1
Residential 1/8-acre	14.7	2.8
Transportation	41.0	7.9
Woods	99.9	19.2
Total	**520.5**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
173.5	520.5	33.3

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Partially Supporting"
    - MPHI: "Degraded"

Recommendations:

- Biological conditions are as expected for the level of habitat quality observed.
- Determine if stormwater management opportunities exist in the extensive residential areas upstream of sample reach.
- Habitat impairments include moderate to severe levels of bank instability observed on both banks, excessive sediment deposition, impaired riparian area conditions. Additional assessments are necessary to determine what, if any, corrective measures are appropriate.

03-09 Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.71

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	3

Calculated Metric Values

Total Taxa	15
EPT Taxa	4
% Ephemeroptera	1.0
Number of Ephemeroptera	1
% Intolerant to Urban	4
Scraper Taxa	1
% Climbers	2.0

Taxa List

Caecidotea	8
Chironomidae	2
Brillia	16
Eukiefferiella	2
Hydrobaenus	10
Orthocladius	37
Parametriocnemus	3
Prodiamesa	1
Tanytarsus	1
Thienemannimyia	7
Simulium	4
Limonia	1
Baetis	1
Cheumatopsyche	1
Hydropsyche	3
Dolophilodes	3

Total Individuals **100**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	520.5
Remoteness	27
Percent Shading	68
Epifaunal Substrate	85
Instream Habitat	78
Instream Wood Debris	63
Bank Stability	67
PHI Score	64.7
PHI Narrative Ranking	Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	4
Bank Stability- Right Bank	5
Vegetative Protection- Left Bank	6
Vegetative Protection- Right Bank	8
Channel Flow Status	9
Channel Alteration	20
Channel Sinuosity	8
Pool Substrate Characterization	8
Pool Variability	12
Riparian Vegetative Zone Width- Left Bank	6
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	9
Epifaunal Substrate	12
EPA Habitat Score	117
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.64
pH	7.70
Conductivity (umhos/cm)	477.1
Temperature (°C)	13.59
TDS (mg/L)	305.2
Turbidity (NTUs)	8.4

03-12A Lower Patapsco Sampling Unit

Downstream

Upstream

Location/Site Access: Located just upstream of Lake Front Drive.
ADC Map: 02G05
Latitude/Longitude: 39.216949 / 76.645179

Land Use Analysis:

Land Use	Acres	% Area
Commercial	29.5	6.1
Industrial	4.6	1.0
Open Space	35.2	7.3
Residential 1/4-acre	262.7	54.7
Residential 1/8-acre	14.7	3.1
Transportation	39.3	8.2
Woods	94.1	19.6
Total	**480.1**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
158.0	480.1	32.9

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Partially Supporting"
    - MPHI: "Degraded"

Recommendations:

- Biological conditions are somewhat enhanced in comparison to available habitat. Possibly related to excessive nutrient inputs enriching community productivity.
- Limited opportunities are likely to exist for riparian area improvements at this site due to existing infrastructure, but additional assessments are recommended to determine what might be feasible.
- The potential for stormwater management retrofits on the extensive residential and commercial land areas upstream of the sample site should be investigated.

03-12A Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.00

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	3

Calculated Metric Values

Total Taxa	14
EPT Taxa	3
% Ephemeroptera	2.2
Number of Ephemeroptera	1
% Intolerant to Urban	2
Scraper Taxa	2
% Climbers	7.7

Taxa List

Physidae	2
Haplotaxidae	1
Naididae	5
Lumbricidae	0
Lumbriculidae	2
Caecidotea	5
Chironomidae	3
Brillia	3
Hydrobaenus	10
Orthocladius	41
Prodiamesa	0
Tanytarsus	3
Thienemannimyia	6
Simulium	4
Baetis	2
Hydropsychidae	0
Hydropsyche	2
Dolophilodes	2

Total Individuals **91**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	480.1
Remoteness	11
Percent Shading	59
Epifaunal Substrate	51
Instream Habitat	40
Instream Wood Debris	58
Bank Stability	95
PHI Score	52.1
PHI Narrative Ranking	Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	9
Bank Stability- Right Bank	9
Vegetative Protection- Left Bank	7
Vegetative Protection- Right Bank	2
Channel Flow Status	14
Channel Alteration	11
Channel Sinuosity	6
Pool Substrate Characterization	6
Pool Variability	5
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	1
Sediment Deposition	15
Epifaunal Substrate	6
EPA Habitat Score	101
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.11
pH	7.50
Conductivity (umhos/cm)	459.3
Temperature (°C)	12.05
TDS (mg/L)	294
Turbidity (NTUs)	5.8

03-13A Lower Patapsco Sampling Unit

Upstream

Downstream

Location/Site Access: Located SW of intersection of Hammonds Ferry Rd. and Evelyn Ave.
ADC Map: 02D05
Latitude/Longitude: 39.220259 / 76.668117

Land Use Analysis:

Land Use	Acres	% Area
Commercial	112.1	12.4
Industrial	109.1	12.1
Open Space	47.8	5.3
Residential 1-acre	19.9	2.2
Residential 1/2-acre	12.9	1.4
Residential 1/4-acre	301.9	33.4
Residential 2-acre	1.4	0.2
Transportation	51.7	5.7
Utility	8.6	0.9
Water	0.5	0.1
Woods	237.1	26.3
Total	**903.1**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
306.6	903.1	33.9

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Degraded"

Recommendations:

- Habitat quality results were mixed for this site, but trending toward less than expected impairment based on the biological community observed.
- Habitat quality impairments observed moderate bank instability, moderate sediment input, somewhat low levels of epifaunal substrate, and impacted pool habitat. Additional assessments are necessary to determine what corrective measures might be necessary.
- Potential stormwater management retrofits in the upstream residential and commercial / industrial land uses should be investigated.

03-13A Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.29

Metric Scores

Total Taxa	5
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	23
EPT Taxa	2
% Ephemeroptera	1.0
Number of Ephemeroptera	1
% Intolerant to Urban	4
Scraper Taxa	1
% Climbers	14.3

Taxa List

Naididae	1
Lumbricidae	1
Crangonyx	13
Agabus	2
Hydroporus	1
Chironomidae	2
Brillia	13
Diamesa	3
Hydrobaenus	7
Larsia	9
Orthocladius	17
Parametriocnemus	4
Polypedilum	3
Prodiamesa	3
Tanytarsus	5
Thienemannimyia	4
Simulium	1
Tipula	2
Baetis	1
Calopteryx	3
Argia	1
Somatochlora	1
Symphytopsyche	1

Total Individuals **98**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	903.1
Remoteness	43
Percent Shading	73
Epifaunal Substrate	82
Instream Habitat	61
Instream Wood Debris	54
Bank Stability	45
PHI Score	59.5
PHI Narrative Ranking	Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	2
Bank Stability- Right Bank	2
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	7
Channel Flow Status	9
Channel Alteration	20
Channel Sinuosity	12
Pool Substrate Characterization	16
Pool Variability	10
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	11
Epifaunal Substrate	12
EPA Habitat Score	129
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.45
pH	7.70
Conductivity (umhos/cm)	344.8
Temperature (°C)	12.1
TDS (mg/L)	220.6
Turbidity (NTUs)	2.2

03-16A Lower Patapsco Sampling Unit


Upstream


Downstream

Location/Site Access: Located downstream of Winterson Road.
ADC Map: 02C07
Latitude/Longitude: 39.205503 / 76.674034

Land Use Analysis:

Land Use	Acres	% Area
Commercial	70.4	43.9
Industrial	4.5	2.8
Open Space	8.9	5.5
Residential 1-acre	1.8	1.1
Residential 1/2-acre	1.0	0.6
Residential 1/4-acre	19.8	12.3
Transportation	16.0	10.0
Woods	38.0	23.7
Totals	**160.3**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
74.3	160.3	46.3

Results:

- Biological condition: "Very Poor"
- Habitat scores:
    - RBP: "Non-supporting"
    - MPHI: "Severely Degraded"

Recommendations:

- Biological conditions are appropriate for observed habitat quality.
- Collected water chemistry data indicate impairment in this reach—for example, highest conductivity observed here of all sites evaluated.
- Numerous habitat impairments observed including bank instability, excessive sediment deposition, poor instream habitat and poor channel morphology. Additional assessments are necessary to determine suitable corrective actions.
- Opportunities to treat the large amount of commercial land use in this subwatershed with stormwater management should be pursued to the extent feasible.

03-16A Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Very Poor
BIBI Score	1.57

Metric Scores

Total Taxa	1
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	3

Calculated Metric Values

Total Taxa	12
EPT Taxa	0
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	2
Scraper Taxa	1
% Climbers	6.6

Taxa List

Lumbricidae	10
Tubificidae	8
Agabus (larva)	5
Agabus (adult)	2
Copelatus	17
Hoperius	2
Diamesa	2
Hydrobaenus	7
Orthocladius	3
Paratanytarsus	1
Potthastia	1
Ormosia	1
Noctuidae	2

Total Individuals **61**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	160.3
Remoteness	22
Percent Shading	45
Epifaunal Substrate	58
Instream Habitat	51
Instream Wood Debris	67
Bank Stability	45
PHI Score	48.0
PHI Narrative Ranking	Severely Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	2
Bank Stability- Right Bank	2
Vegetative Protection- Left Bank	6
Vegetative Protection- Right Bank	8
Channel Flow Status	3
Channel Alteration	18
Channel Sinuosity	9
Pool Substrate Characterization	5
Pool Variability	5
Riparian Vegetative Zone Width- Left Bank	7
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	8
Epifaunal Substrate	6
EPA Habitat Score	89
EPA Narrative Ranking	Non-supporting

Water Chemistry

Dissolved Oxygen (mg/L)	4.55
pH	7.30
Conductivity (umhos/cm)	1554
Temperature (°C)	12.04
TDS (mg/L)	No Data
Turbidity (NTUs)	4.8

03-17A Lower Patapsco Sampling Unit

Upstream

Downstream

Location/Site Access: Located upstream of West Nursery Road.
ADC Map: 02D05
Latitude/Longitude: 39.221491/ 76.668439

Land Use Analysis:

Land Use	Acres	% Area
Commercial	112.8	12.4
Industrial	109.7	12.0
Open Space	49.0	5.4
Residential 1-acre	19.0	2.1
Residential 1/2-acre	12.9	1.4
Residential 1/4-acre	306.6	33.6
Residential 2-acre	1.4	0.2
Transportation	52.2	5.7
Utility	8.6	0.9
Water	0.5	0.1
Woods	240.4	26.3
Total	**913.3**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
310.0	913.3	33.9

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- The biological community was more impaired than expected for the observed habitat quality, pointing toward water quality impairments at this location.
- High levels of sediment deposition and bank erosion were observed in this reach. Geomorphic assessments are needed to determine the necessity and extent of improvements.
- As the upstream drainage area is approximately 34% impervious surface, opportunities for stormwater management should be pursued to the extent feasible.

03-17A Lower Patapsco Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.71

Metric Scores

Total Taxa	3
EPT Taxa	1
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	19
EPT Taxa	1
% Ephemeroptera	2.0
Number of Ephemeroptera	1
% Intolerant to Urban	2
Scraper Taxa	1
% Climbers	12.0

Taxa List

Lumbricidae	3
Lumbriculidae	2
Crangonyx	21
Bezzia/Palpomyia	1
Brillia	15
Diamesa	2
Hydrobaenus	4
Larsia	1
Orthocladius	16
Parametriocnemus	10
Paratanytarsus	1
Potthastia	2
Tanytarsus	6
Thienemannimyia	3
Simulium	4
Tipula	1
Baetis	2
Calopteryx	3
Argia	1

Total Individuals **98**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	913.3
Remoteness	59
Percent Shading	91
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	71
Bank Stability	45
PHI Score	77.7
PHI Narrative Ranking	Partially Degraded

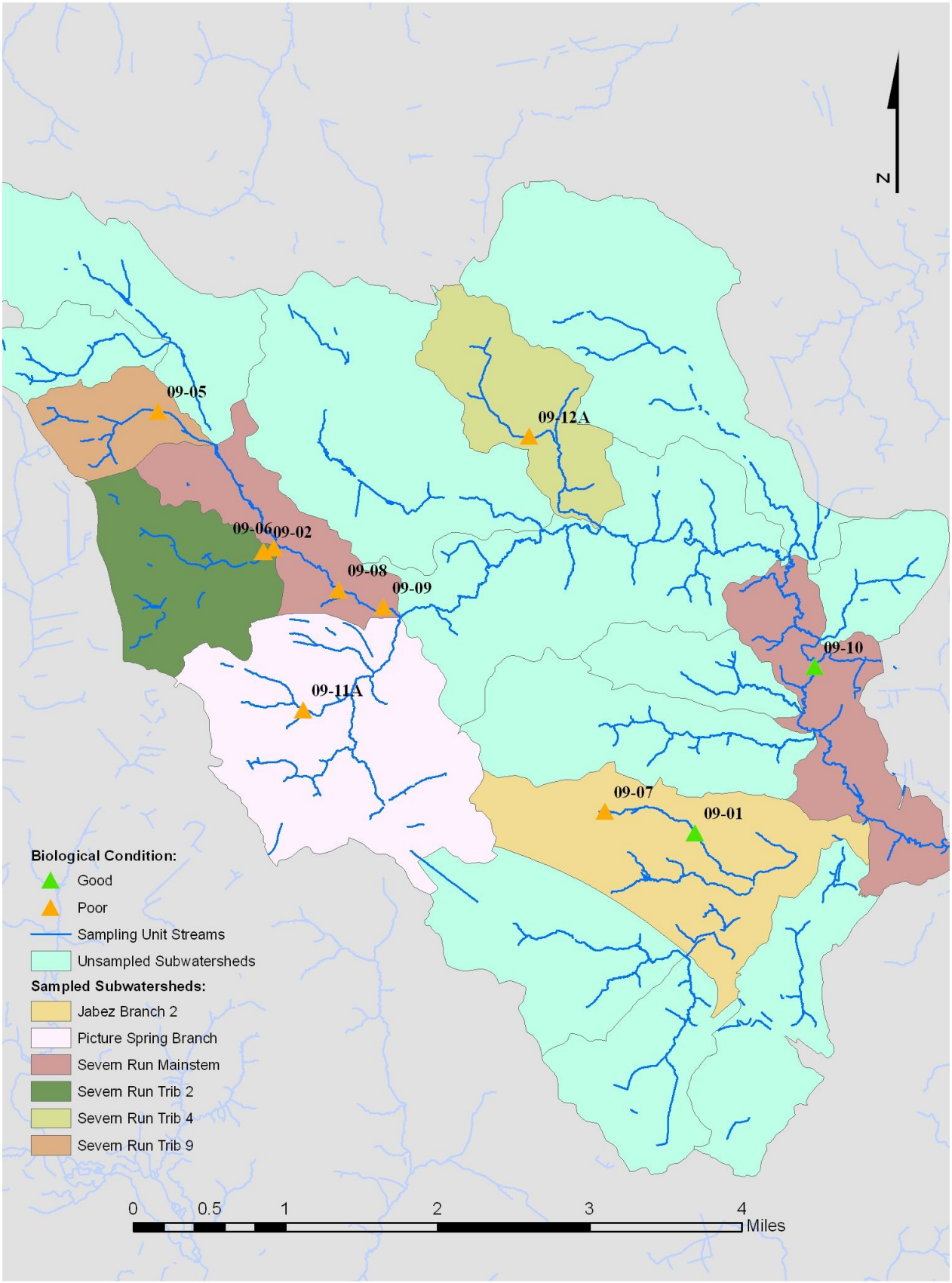
EPA Rapid Bioassessment

Bank Stability- Left Bank	2
Bank Stability- Right Bank	2
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	7
Channel Alteration	17
Channel Sinuosity	14
Pool Substrate Characterization	17
Pool Variability	14
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	12
Epifaunal Substrate	17
EPA Habitat Score	140
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.31
pH	7.80
Conductivity (umhos/cm)	339
Temperature (°C)	11.62
TDS (mg/L)	217
Turbidity (NTUs)	6.3

Severn Run Sampling Unit



09-01 Severn Run Sampling Unit


Downstream


Upstream

Location/Site Access: Located east of Nashua Court.
ADC Map: 13F04
Latitude/Longitude: 39.08090 / 76.65085

Land Use Analysis:

Land Use	Acres	% Area
Commercial	1.0	0.3
Industrial	8.4	2.1
Open Space	15.4	3.8
Residential 1-acre	61.5	15.0
Residential 1/2-acre	73.9	18.0
Residential 2-acre	1.8	0.4
Transportation	22.7	5.5
Utility	2.7	0.7
Woods	222.5	54.3
Total	**409.9**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
43.2	409.9	10.5

Results:

- Biological condition: "Good"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Minimally Degraded"

Recommendations:

- Habitat quality results were mixed for this site, but trending toward less than expected impairment based on the biological community observed.
- Bank stability was the major habitat impairment observed in this reach. Additional investigations are necessary to determine any appropriate restoration measures.
- For the one third of the upstream drainage in residential and commercial land uses, the necessity of stormwater best management practices installation or retrofits should be investigated.

09-01 Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Good
BIBI Score	4.14

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	3
Number of Ephemeroptera	5
% Intolerant to Urban	3
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	22
EPT Taxa	10
% Ephemeroptera	4.7
Number of Ephemeroptera	2
% Intolerant to Urban	23
Scraper Taxa	1
% Climbers	28.1

Taxa List

Lumbriculidae	1
Anchytarsus	1
Chironomidae (larva)	3
Bethbilbeckia	1
Hydrobaenus	1
Orthocladiinae	1
Parakiefferiella	1
Parametriocnemus	1
Polypedilum	1
Tanytarsus	2
Thienemannimyia	8
Simuliidae (pupa)	2
Prosimulium	32
Simulium	5
Tipula	2
Baetis	5
Leptophlebia	1
Nigronia	1
Chloroperlidae	3
Leuctra (adult)	5
Leuctra (nymph)	2
Eccoptura	2
Berea	1
Diplectrona	1
Hydropsyche	2
Pycnopsyche	11

Total Individuals **96**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	409.9
Remoteness	100
Percent Shading	100
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	68
Bank Stability	50
PHI Score	86.4
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	4
Bank Stability- Right Bank	1
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	8
Channel Flow Status	15
Channel Alteration	18
Channel Sinuosity	15
Pool Substrate Characterization	14
Pool Variability	8
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	18
Epifaunal Substrate	16
EPA Habitat Score	145
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.95
pH	7.10
Conductivity (umhos/cm)	139.8
Temperature (°C)	7.19
TDS (mg/L)	89.2
Turbidity (NTUs)	5.6

09-02 Severn Run Sampling Unit

Upstream

Downstream

Location/Site Access: Located near intersection of Bragg Blvd and Aircraft Ct.
ADC Map: 06H12
Latitude/Longitude: 39.10776 / 76.70337

Land Use Analysis:

Land Use	Acres	% Area
Commercial	45.7	6.6
Forested Wetland	6.3	0.9
Open Space	46.1	6.6
Open Wetland	1.2	0.2
Residential 1-acre	1.1	0.2
Residential 1/2-acre	0.7	0.1
Residential 1/4-acre	161.7	23.2
Residential 1/8-acre	215.3	30.9
Transportation	36.5	5.2
Woods	182.2	26.1
Total	**696.9**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
277.5	696.9	39.8

Results:

- Biological condition: "Poor"
- Habitat scores:
  - RBP: "Partially Supporting"
  - MPHI: "Degraded"

Recommendations:

- Biological conditions are as expected for the habitat quality observed at this site.
- Stormwater management needs should be addressed in developed lands upstream of this sample reach, which occupy nearly 60% of the drainage area.
- Poor pool distribution and substrate, low levels of substrate suitable for use by aquatic insects, and an impacted riparian buffer area are the primary habitat problems identified in this reach. Additional assessments are necessary to determine feasibility, need of any corrective actions.

09-02 Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.43

Metric Scores

Total Taxa	3
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	20
EPT Taxa	1
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	17.8

Taxa List

Sphaeriidae	5
Physella	5
Hoplonemertea	1
Helobdella	1
Lumbriculidae	1
Tubificidae	1
Bezzia/Palpomyia	1
Chironomidae (adult)	3
Chironomidae (pupa)	1
Brillia	2
Chironominae	1
Hydrobaenus	15
Phaenopsectra	1
Stenochironomus	3
Tanytarsini	1
Tanytarsus	11
Thienemanniella	2
Thienemannimyia	14
Tipula	1
Calopteryx	1
Enallagma	2
Somatochlora	1
Cheumatopsyche	33
Coleoptera (terrestrial)	1

Total Individuals **107**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	696.9
Remoteness	54
Percent Shading	68
Epifaunal Substrate	54
Instream Habitat	53
Instream Wood Debris	65
Bank Stability	89
PHI Score	64.0
PHI Narrative Ranking	Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	8
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	8
Channel Flow Status	17
Channel Alteration	15
Channel Sinuosity	7
Pool Substrate Characterization	5
Pool Variability	10
Riparian Vegetative Zone Width- Left Bank	7
Riparian Vegetative Zone Width- Right Bank	7
Sediment Deposition	15
Epifaunal Substrate	7
EPA Habitat Score	122
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.14
pH	7.30
Conductivity (umhos/cm)	362.3
Temperature (°C)	9.25
TDS (mg/L)	262.5
Turbidity (NTUs)	27.4

09-05 Severn Run Sampling Unit

Upstream

Downstream

Location/Site Access: Located upstream of Reese Road.
ADC Map: 06F10
Latitude/Longitude: 39.12119 / 76.71628

Land Use Analysis:

Land Use	Acres	% Area
Commercial	46.8	17.5
Open Space	27.3	10.2
Residential 1/2-acre	0.3	0.1
Transportation	6.6	2.5
Water	0.9	0.3
Woods	185.1	69.3
Total	**267.1**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
41.6	267.1	15.6

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Non-supporting"
    - MPHI: "Degraded"

Recommendations:

- Biological community is in better condition than would be predicted by available habitat.
- Poor bank stability, impacted riparian area, high sediment input, and low levels of suitable habitat were habitat impairments identified. Additional assessments are needed to determine feasibility and correctability of these impairments.
- Potential for stormwater retrofits should be determined in the commercial and residential land uses upstream of the sample reach.

09-05 Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.71

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	3
% Intolerant to Urban	3
Scraper Taxa	3
% Climbers	3

Calculated Metric Values

Total Taxa	15
EPT Taxa	4
% Ephemeroptera	0.0
Number of Ephemeroptera	1
% Intolerant to Urban	17
Scraper Taxa	1
% Climbers	4.2

Taxa List

Lumbricidae	7
Crangonyx	1
Agabus	1
Cybister (adult)	1
Hydroporus (adult)	1
Chironomidae (pupa)	4
Diplocladius	8
Diptera (pupa)	1
Diptera (terrestrial)	1
Hydrobaenus	20
Larsia	14
Simulium	15
Tipula	2
Somatochlora	1
Capniidae	1
Leuctridae	1
Ostrocerca	13
Limnephilidae	3

Total Individuals **95**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	267.1
Remoteness	86
Percent Shading	73
Epifaunal Substrate	43
Instream Habitat	73
Instream Wood Debris	64
Bank Stability	63
PHI Score	67.3
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	4
Bank Stability- Right Bank	4
Vegetative Protection- Left Bank	6
Vegetative Protection- Right Bank	7
Channel Flow Status	10
Channel Alteration	12
Channel Sinuosity	3
Pool Substrate Characterization	8
Pool Variability	7
Riparian Vegetative Zone Width- Left Bank	6
Riparian Vegetative Zone Width- Right Bank	8
Sediment Deposition	7
Epifaunal Substrate	4
EPA Habitat Score	86
EPA Narrative Ranking	Non-supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.88
pH	7.30
Conductivity (umhos/cm)	225.9
Temperature (°C)	3.77
TDS (mg/L)	144.5
Turbidity (NTUs)	19.8

09-06 Severn Run Sampling Unit


Downstream


Upstream

Location/Site Access: Located upstream of train tracks and south of Crest Road.
ADC Map: 06H12
Latitude/Longitude: 39.10801 / 76.70210

Land Use Analysis:

Land Use	Acres	% Area
Commercial	45.7	6.5
Forested Wetland	6.3	0.9
Open Space	46.1	6.6
Open Wetland	1.2	0.2
Residential 1-acre	1.1	0.2
Residential 1/2-acre	0.7	0.1
Residential 1/4-acre	161.9	23.1
Residential 1/8-acre	217.6	31.0
Transportation	36.5	5.2
Woods	184.7	26.3
Total	**702.1**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
278.7	702.1	39.7

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological community is more impaired than would be predicted by available habitat.
- Approximately 60% developed land in upstream watershed. Additional assessments necessary to determine need, feasibility of stormwater management facilities installation and / or retrofits.
- Bank stability, excessive sediment, and lack of suitable colonization substrate are some of the habitat impairments identified. Correction, to the extent feasible and necessary, should be considered at this sample reach.

09-06 Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.43

Metric Scores

Total Taxa	3
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	20
EPT Taxa	1
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	5
Scraper Taxa	5
% Climbers	20.4

Taxa List

Sphaeriidae	8
Fossaria	2
Physella	10
Aeolosomatidae	1
Tubificidae	1
Lumbricidae	2
Crangonyx	1
Collembola	1
Ancyronyx	4
Stenelmis	6
Prionocyphon	2
Hydrobaenus	5
Orthocladiinae	1
Orthocladius	3
Stenochironomus	8
Tanytarsini	1
Tanytarsus	6
Thienemannimyia	3
Pseudolimnophila	1
Tipula	1
Notonecta (adult)	1
Cheumatopsyche	35

Total Individuals **103**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	702.1
Remoteness	81
Percent Shading	100
Epifaunal Substrate	66
Instream Habitat	58
Instream Wood Debris	86
Bank Stability	71

PHI Score	76.9
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	5
Bank Stability- Right Bank	5
Vegetative Protection- Left Bank	7
Vegetative Protection- Right Bank	7
Channel Flow Status	18
Channel Alteration	18
Channel Sinuosity	15
Pool Substrate Characterization	6
Pool Variability	15
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	11
Epifaunal Substrate	9

EPA Habitat Score	136
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.03
pH	7.20
Conductivity (umhos/cm)	350
Temperature (°C)	9.34
TDS (mg/L)	224
Turbidity (NTUs)	37.8

09-07 Severn Run Sampling Unit

Only one photo available for this sample station.

Unknown orientation

Location/Site Access: Located upstream of Gambrills Road, then south of Arabian Court.
ADC Map: 13D04
Latitude/Longitude: 39.08296 / 76.66182
Note: Photo taken near reach on 28 February 2002 and not during Year 1 (2004) sampling work.

Land Use Analysis:

Land Use	Acres	% Area
Industrial	8.3	3.9
Open Space	2.6	1.2
Residential 1-acre	20.4	9.6
Residential 1/2-acre	20.5	9.7
Transportation	13.7	6.5
Utility	1.8	0.9
Woods	144.5	68.2
Total	**211.9**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
21.7	211.9	15.0

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Minimally Degraded"

Recommendations:

- Habitat conditions should support a higher quality biological community than the one observed.
- Stormwater management investigations suggested for the approximately 20% of the upstream area in residential and industrial land use.
- Moderate impairments include the lack of epifaunal substrate, excessive sediment, and a lack of pool diversity. Perform additional assessments to determine feasibility and necessity of corrective actions.

09-07 Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.14

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	3

Calculated Metric Values

Total Taxa	16
EPT Taxa	2
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	1
Scraper Taxa	1
% Climbers	3.7

Taxa List

Sphaeriidae	1
Lumbriculidae	1
Crangonyx	47
Caecidotea	1
Chironomidae	0
Apsectrotanypus	5
Parametriocnemus	1
Phaenopsectra	5
Pseudorthocladius	1
Thienemannimyia	10
Simulium	30
Chrysops	1
Tipula	1
Sialis	1
Calopteryx	1
Pycnopsyche	1
Ptilostomis	1

Total Individuals **108**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	211.9
Remoteness	70
Percent Shading	68
Epifaunal Substrate	85
Instream Habitat	92
Instream Wood Debris	94
Bank Stability	100
PHI Score	84.9
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	10
Bank Stability- Right Bank	10
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	8
Channel Flow Status	18
Channel Alteration	20
Channel Sinuosity	11
Pool Substrate Characterization	12
Pool Variability	5
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	10
Epifaunal Substrate	11
EPA Habitat Score	145
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.14
pH	5.70
Conductivity (umhos/cm)	107.2
Temperature (°C)	8.4
TDS (mg/L)	68.7
Turbidity (NTUs)	7.8

09-08 Severn Run Sampling Unit

Downstream

Upstream

Location/Site Access: Located upstream of Telegraph Road.
ADC Map: 06K13
Latitude/Longitude: 39.10397 / 76.69425

Land Use Analysis:

Land Use	Acres	% Area
Commercial	130.9	4.9
Forested Wetland	6.3	0.2
Industrial	28.4	1.1
Open Space	157.6	5.9
Open Wetland	1.2	0.0
Pasture/Hay	9.2	0.3
Residential 1-acre	37.4	1.4
Residential 1/2-acre	107.9	4.1
Residential 1/4-acre	674.3	25.4
Residential 1/8-acre	499.6	18.8
Residential 2-acre	2.8	0.1
Row Crops	1.0	0.0
Transportation	111.2	4.2
Water	2.7	0.1
Woods	880.7	33.2
Total	**2651.2**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
836.9	2651.2	31.6

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological community is more impaired than expected based upon available habitat, indicative of a water chemistry problem within the reach.
- Habitat impairments identified include moderate sediment deposition and marginal levels of vegetation on the stream banks within the reach. Additional assessment needed to determine need, feasibility of correction.
- Determine need, feasibility of either new stormwater management or BMP retrofits for developed lands upstream.

09-08 Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.43

Metric Scores

Total Taxa	3
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	21
EPT Taxa	1
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	3
Scraper Taxa	4
% Climbers	29.5

Taxa List

Sphaeriidae	4
Lumbricidae	1
Tubificidae	3
Crangonyx	13
Copelatus	1
Elmidae	1
Dubiraphia (larva)	1
Dubiraphia (adult)	1
Oulimnius	2
Stenelmis	3
Gyrinus (adult)	1
Dineutus (adult)	2
Chironomidae (larva)	1
Chironomidae (pupa)	4
Brillia	2
Hydrobaenus	7
Phaenopsectra	11
Polypedilum	8
Prodiamesia	1
Stenochironomus	3
Tanytarsus	20
Thienemannimyia	13
Calopteryx	1
Cheumatopsyche	1

Total Individuals **105**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	2651.2
Remoteness	11
Percent Shading	100
Epifaunal Substrate	92
Instream Habitat	83
Instream Wood Debris	65
Bank Stability	89
PHI Score	73.4
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	8
Vegetative Protection- Left Bank	7
Vegetative Protection- Right Bank	5
Channel Flow Status	18
Channel Alteration	17
Channel Sinuosity	13
Pool Substrate Characterization	12
Pool Variability	16
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	11
Epifaunal Substrate	15
EPA Habitat Score	150
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.57
pH	7.30
Conductivity (umhos/cm)	266.4
Temperature (°C)	8.54
TDS (mg/L)	170.4
Turbidity (NTUs)	19.9

09-09 Severn Run Sampling Unit


Downstream


Upstream

Location/Site Access: Located upstream of Burns Crossing Road.
ADC Map: 06K13
Latitude/Longitude: 39.10232 / 76.68866

Land Use Analysis:

Land Use	Acres	% Area
Commercial	131.9	4.8
Forested Wetland	6.3	0.2
Industrial	34.5	1.3
Open Space	166.0	6.1
Open Wetland	1.2	0.0
Pasture/Hay	14.2	0.5
Residential 1-acre	37.5	1.4
Residential 1/2-acre	127.2	4.6
Residential 1/4-acre	673.8	24.6
Residential 1/8-acre	500.4	18.2
Residential 2-acre	2.8	0.1
Row Crops	1.2	0.0
Transportation	118.0	4.3
Water	2.7	0.1
Woods	925.4	33.7
Total	**2742.9**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
853	2742.9	31.6

Results:
- Biological condition: "Poor"
- Habitat scores:
  - RBP: "Comparable"
  - MPHI: "Partially Degraded"

Recommendations:
- Biological community is more impaired than expected given available habitat. Water quality impact from upstream areas is the likely cause.
- Bank stability was primary habitat impairment observed in reach. Additional assessment activities are needed to determine magnitude, necessity, of any corrective work.
- Stormwater management should be priority for upstream drainage in this reach. New facility and retrofit opportunities should be investigated and implemented to the extent feasible.

09-09 Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.71

Metric Scores

Total Taxa	5
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	29
EPT Taxa	1
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	5
Scraper Taxa	5
% Climbers	24.3

Taxa List

Sphaeriidae	5
Physella	3
Tubificidae	3
Lumbricidae	3
Crangonyx	29
Elmidae	1
Optioservus (larva)	1
Optioservus (adult)	2
Stenelmis	1
Gyrinus (adult)	1
Peltodytes (adult)	1
Hydrobius (larva)	1
Hydrobius (adult)	1
Chironomidae (larva)	1
Chironomidae (pupa)	7
Diplocladius	1
Euryhapsis	1
Larsia	1
Orthocladiinae	3
Orthocladius	3
Phaenopsectra	1
Polypedilum	3
Tanytarsus	8
Thienemannimyia	11
Dolichopodidae	1
Allognosta	1
Tipula	1
Lepidoptera	1
Boyeria	3
Calopteryx	6
Ischnura	1
Hagenius	1
Erythemis	1
Macromia	1
Cheumatopsyche	2
Total Individuals	**111**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	2742.9
Remoteness	16
Percent Shading	100
Epifaunal Substrate	92
Instream Habitat	94
Instream Wood Debris	82
Bank Stability	84
PHI Score	78.0
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	7
Bank Stability- Right Bank	7
Vegetative Protection- Left Bank	7
Vegetative Protection- Right Bank	9
Channel Flow Status	18
Channel Alteration	20
Channel Sinuosity	9
Pool Substrate Characterization	17
Pool Variability	17
Riparian Vegetative Zone Width- Left Bank	9
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	12
Epifaunal Substrate	15
EPA Habitat Score	157
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	8.69
pH	7.20
Conductivity (umhos/cm)	311.7
Temperature (°C)	8.12
TDS (mg/L)	199.4
Turbidity (NTUs)	26

09-10 Severn Run Sampling Unit

Upstream

Downstream

Location/Site Access: Located northwest of the Najoles Rd. and Benfield Blvd. intersection.
ADC Map: 13H01
Latitude/Longitude: 39.09658 / 76.63621

Land Use Analysis:

Land Use	Acres	% Area
Commercial	409.5	4.0
Forested Wetland	6.3	0.1
Industrial	367.1	3.5
Open Space	538.5	5.2
Open Wetland	1.2	0.0
Pasture/Hay	28.5	0.3
Residential 1-acre	154.3	1.5
Residential 1/2-acre	1357.4	13.1
Residential 1/4-acre	2181.7	21.1
Residential 1/8-acre	730.6	7.1
Residential 2-acre	55.0	0.5
Row Crops	158.0	1.5
Transportation	467.4	4.5
Utility	53.6	0.5
Water	8.3	0.1
Woods	3846.0	37.1
Total	10363.5	100.0

Impervious (acres)	Total Area Above site	% Impervious
2455.8	10363.5	23.7

Results:

- Biological condition: "Good"
- Habitat scores:
  - RBP: "Comparable"
  - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are appropriate for the observed habitat quality.
- Bank stability and the amount of vegetation holding the banks together were the primary habitat impairment observed in this reach. However, determining the necessity for any corrective actions requires a detailed fluvial geomorphic study in addition to the qualitative evaluations performed as part of this assessment.
- To preserve this high quality biological community, the developed land uses should be evaluated for potential stormwater management BMP installations and/or retrofits.

09-10 Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Good
BIBI Score	4.14

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	3
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	26
EPT Taxa	5
% Ephemeroptera	2.6
Number of Ephemeroptera	1
% Intolerant to Urban	16
Scraper Taxa	6
% Climbers	16.4

Taxa List

Sphaeriidae	1
Physella	1
Amphipoda	1
Helichus	5
Ancyronyx	4
Dubiraphia	1
Macronychus	1
Stenelmis	1
Stenelmis	1
Diptera	1
Brillia	2
Hydrobaenus	4
Larsia	1
Orthocladiinae	2
Polypedilum	1
Tanytarsini	1
Tanytarsus	6
Thienemannimyia	1
Xylotopus	2
Hemerodromia	1
Tipula	1
Stenonema	3
Nigronia	5
Sialis	1
Calopteryx	4
Gomphus	1
Hydropsychidae	2
Cheumatopsyche	47
Hydropsyche	3
Symphytopsyche	3
Lype	8

Total Individuals **116**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	10363.5
Remoteness	97
Percent Shading	85
Epifaunal Substrate	100
Instream Habitat	86
Instream Wood Debris	47
Bank Stability	77

PHI Score	81.9
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	6
Bank Stability- Right Bank	6
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	7
Channel Flow Status	18
Channel Alteration	20
Channel Sinuosity	16
Pool Substrate Characterization	13
Pool Variability	16
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	13
Epifaunal Substrate	19

EPA Habitat Score	162
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	9.15
pH	6.5
Conductivity (umhos/cm)	228.7
Temperature (°C)	5.6
TDS (mg/L)	146.3
Turbidity (NTUs)	8.3

09-11A Severn Run Sampling Unit


Downstream


Upstream

Location/Site Access: Located between Lokus Rd. and MD 170.
ADC Map: 12J02
Latitude/Longitude: 39.09273 / 76.69859

Land Use Analysis:

Land Use	Acres	% Area
Industrial	20.4	9.4
Open Space	12.1	5.6
Residential 1-acre	4.4	2.0
Residential 1/2-acre	10.9	5.0
Residential 1/8-acre	0.7	0.3
Transportation	14.1	6.5
Water	0.1	0.1
Woods	154.7	71.2
Total	**217.4**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
27.9	217.4	12.8

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological community shows greater impairment than expected for observed habitat quality, indicating that one or more water quality impacts exist here.
- Investigate the potential to install best management practices to treat the commercial and residential land uses upstream of this site, or retrofit inadequate facilities as necessary.
- Impairments observed included poor pool variability, low levels of epifaunal substrate, and some sediment deposition. The necessity to implement any corrective actions must be determined by additional assessment activities.

09-11A Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.14

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	3

Calculated Metric Values

Total Taxa	21
EPT Taxa	4
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	2
Scraper Taxa	1
% Climbers	6.7

Taxa List

Sphaeriidae	22
Planorbidae	1
Tubificidae	1
Lumbriculidae	1
Lumbricidae	1
Crangonyx	9
Caecidotea	6
Dineutus	1
Hydroporus	3
Chironomidae	1
Larsia	2
Parametriocnemus	5
Thienemannimyia	34
Tipula	7
Aquarius	1
Sialis	1
Calopteryx	1
Cordulegaster	1
Cheumatopsyche	3
Diplectrona	1
Hydropsyche	1
Limnephilidae	1

Total Individuals **104**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	217.4
Remoteness	27
Percent Shading	100
Epifaunal Substrate	91
Instream Habitat	98
Instream Wood Debris	81
Bank Stability	89
PHI Score	81.1
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	8
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	15
Channel Alteration	19
Channel Sinuosity	10
Pool Substrate Characterization	10
Pool Variability	4
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	13
Epifaunal Substrate	12
EPA Habitat Score	137
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.27
pH	7.20
Conductivity (umhos/cm)	250.4
Temperature (°C)	7.28
TDS (mg/L)	160.2
Turbidity (NTUs)	12

09-12A Severn Run Sampling Unit


Downstream


Upstream

Location/Site Access: Located south of the intersection of Sandy Hill and Quarterfield Roads.
ADC Map: 07C10
Latitude/Longitude: 39.11858 / 76.67099

Land Use Analysis:

Land Use	Acres	% Area
Commercial	0.1	0.0
Open Space	2.6	0.8
Residential 1/2-acre	22.1	6.7
Residential 1/4-acre	179.1	54.7
Residential 1/8-acre	17.2	5.3
Transportation	12.0	3.7
Water	1.0	0.3
Woods	93.5	28.5
Grand Total	327.7	100.0

Impervious (acres)	Total Area Above site	% Impervious
71.9	327.7	21.9

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Partially Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Habitat quality results were mixed for this site, but trending toward more than expected impairment based on the biological community observed.
- Habitat impairments observed include poor pool quality, low levels of epifaunal substrate, and high impact from sediment deposition. Additional assessments necessary to determine appropriate remedies for these impairments.
- Investigate potential for additional stormwater management on the extensive developed lands in this watershed.

09-12A Severn Run Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.71

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	16
EPT Taxa	2
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	0
Scraper Taxa	5
% Climbers	58.9

Taxa List

Sphaeriidae	1
Lymnaeidae	1
Physidae	34
Planorbidae	2
Tubificidae	1
Lumbriculidae	11
Stenelmis	2
Bezzia/Palpomyia	4
Chironomidae	1
Hydrobaenus	1
Larsia	11
Orthocladius	2
Tanytarsus	2
Thienemannimyia	5
Enallagma	1
Cheumatopsyche	7
Limnephilidae	26
Diplopoda	1

Total Individuals **112**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	327.7
Remoteness	70
Percent Shading	91
Epifaunal Substrate	48
Instream Habitat	77
Instream Wood Debris	62
Bank Stability	84
PHI Score	71.9
PHI Narrative Ranking	Partially Degraded

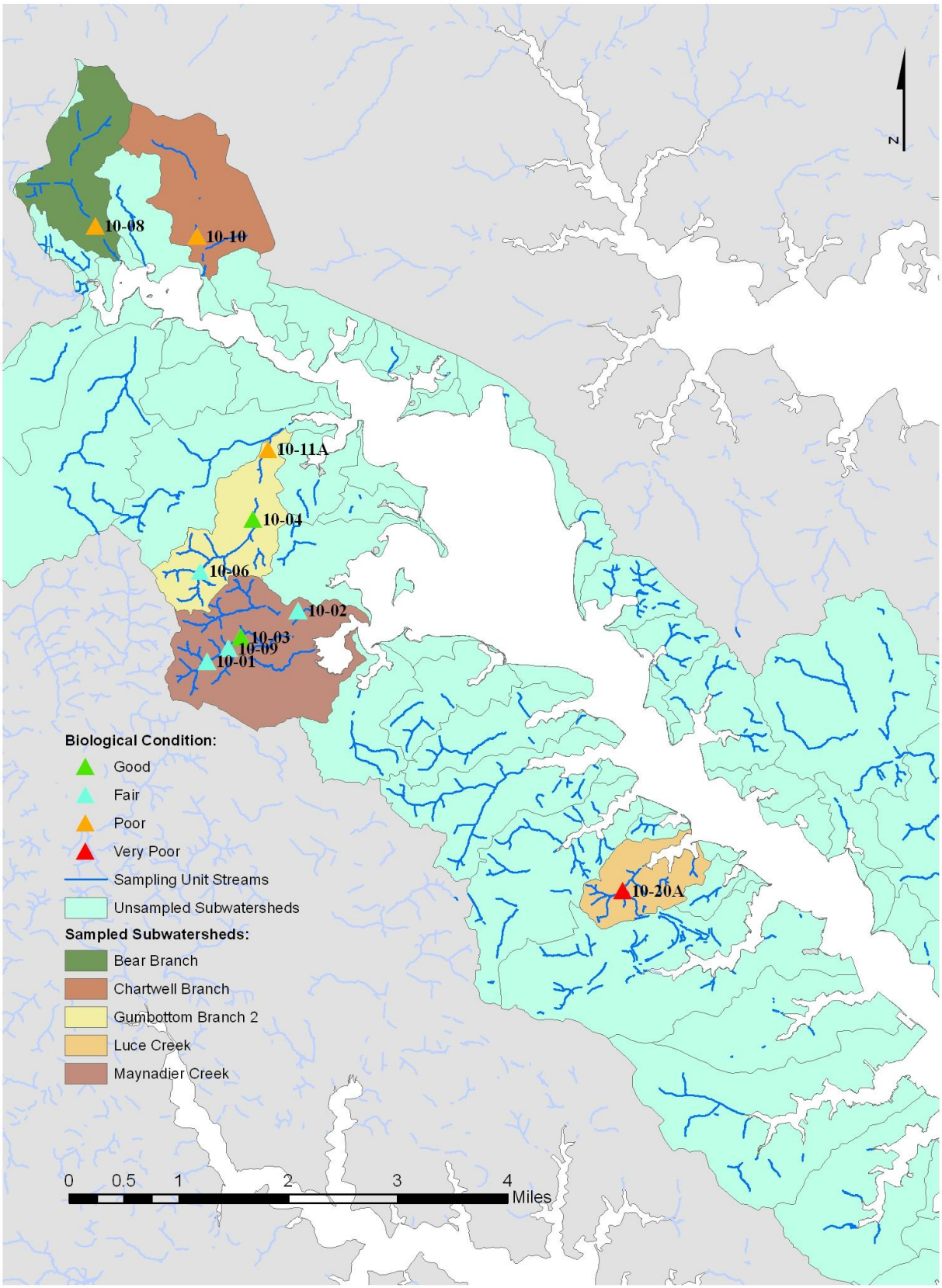
EPA Rapid Bioassessment

Bank Stability- Left Bank	7
Bank Stability- Right Bank	7
Vegetative Protection- Left Bank	7
Vegetative Protection- Right Bank	7
Channel Flow Status	17
Channel Alteration	20
Channel Sinuosity	11
Pool Substrate Characterization	7
Pool Variability	9
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	6
Epifaunal Substrate	5
EPA Habitat Score	123
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	9.05
pH	6.9
Conductivity (umhos/cm)	237.6
Temperature (°C)	9.88
TDS (mg/L)	152.1
Turbidity (NTUs)	15.8

Severn River Sampling Unit



10-01 Severn River Sampling Unit

Upstream

Downstream

Location/Site Access: Located northwest of Wild Cranberry Drive.
ADC Map: 14D13
Latitude/Longitude: 39.03099 / 76.59807

Land Use Analysis:

Land Use	Acres	% Area
Commercial	14.1	10.7
Open Space	2.8	2.1
Residential 1-acre	10.2	7.7
Residential 1/2-acre	32.8	24.9
Residential 2-acre	1.1	0.8
Transportation	9.0	6.8
Woods	61.9	47.0
Total	**131.9**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
27.3	131.9	20.7

Results:

- Biological condition: "Fair"
- Habitat scores:
  - RBP: "Partially Supporting
  - MPHI: Minimally Degraded"

Recommendations:

- Biological conditions showed mixed results in relation to habitat quality observed.
- Bank stability, lack of vegetative bank protection, low levels of epifaunal substrate, and moderate sediment loads in-channel were identified as top habitat impairments. Additional investigations necessary to determine need and feasibility of any possible corrective actions.
- Investigate feasibility of stormwater best management practices installation / retrofits for residential and commercial land uses in upstream drainage area.

10-01 Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.29

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	1
% Climbers	5

Calculated Metric Values

Total Taxa	23
EPT Taxa	5
% Ephemeroptera	3.0
Number of Ephemeroptera	1
% Intolerant to Urban	9
Scraper Taxa	0
% Climbers	16.0

Taxa List

Sphaeriidae	2
Tubificidae	6
Lumbriculidae	3
Crangonyx	11
Hydroporus	2
Hydrobius (adult)	3
Anchytarsus	12
Bezzia/Palpomyia	2
Chironomidae (larva)	4
Parakiefferiella	3
Parametriocnemus	5
Pseudorthocladius	3
Tanytarsus	1
Thienemannimyia	23
Dicranota	1
Leptophlebia	3
Nigronia	1
Sialis	2
Calopteryx	1
Cordulegaster	1
Leuctra	3
Diplectrona	1
Limnephilidae	2
Pycnopsyche	3
Ptilostomis	2

Total Individuals **100**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	131.9
Remoteness	75
Percent Shading	100
Epifaunal Substrate	94
Instream Habitat	100
Instream Wood Debris	90
Bank Stability	67
PHI Score	87.8
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	6
Bank Stability- Right Bank	3
Vegetative Protection- Left Bank	6
Vegetative Protection- Right Bank	4
Channel Flow Status	12
Channel Alteration	20
Channel Sinuosity	14
Pool Substrate Characterization	7
Pool Variability	9
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	12
Epifaunal Substrate	12
EPA Habitat Score	125
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.87
pH	6.70
Conductivity (umhos/cm)	279.6
Temperature (°C)	6.78
TDS (mg/L)	179.5
Turbidity (NTUs)	4.7

10-02 Severn River Sampling Unit

Upstream

Downstream

Location/Site Access: Located upstream of River Road.
ADC Map: 14F12
Latitude/Longitude: 39.03746 / 76.58225

Land Use Analysis:

Land Use	Acres	% Area
Commercial	21.4	3.9
Open Space	5.8	1.1
Residential 1-acre	25.7	4.7
Residential 1/2-acre	113.7	20.7
Residential 2-acre	1.1	0.2
Transportation	12.2	2.2
Utility	6.5	1.2
Woods	363.5	66.1
Total	**550.0**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
54.4	550.0	9.9

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Partially Supporting"
    - MPHI: "Degraded"

Recommendations:

- Biological community enhanced relative to habitat quality observed.
- Bank stability, lack of vegetative bank protection, low levels of epifaunal substrate, and moderate sediment loads in-channel were identified as top habitat impairments. Additional investigations necessary to determine need and feasibility of any possible corrective actions.
- Investigate feasibility of stormwater best management practices installation / retrofits for residential land uses in upstream drainage area.

10-02 Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.29

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	3
Scraper Taxa	5
% Climbers	3

Calculated Metric Values

Total Taxa	16
EPT Taxa	2
% Ephemeroptera	3.3
Number of Ephemeroptera	1
% Intolerant to Urban	12
Scraper Taxa	3
% Climbers	4.4

Taxa List

Crangonyx	4
Hydroporus (adult)	2
Helichus (adult)	2
Tropisternus	1
Diptera (pupa)	3
Diptera (adult)	1
Brillia	5
Hydrobaenus	8
Orthocladius	4
Parametriocnemus	24
Phaenopsectra	1
Polypedilum	1
Tanytarsus	1
Thienemannimyia	10
Simulium	4
Tipula	5
Leptophlebia	3
Leuctra	11

Total Individuals **90**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	550.0
Remoteness	38
Percent Shading	91
Epifaunal Substrate	38
Instream Habitat	38
Instream Wood Debris	59
Bank Stability	45

PHI Score	51.6
PHI Narrative Ranking	Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	2
Bank Stability- Right Bank	2
Vegetative Protection- Left Bank	7
Vegetative Protection- Right Bank	4
Channel Flow Status	13
Channel Alteration	19
Channel Sinuosity	14
Pool Substrate Characterization	4
Pool Variability	8
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	6
Epifaunal Substrate	4

EPA Habitat Score	103
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	9.37
pH	6.60
Conductivity (umhos/cm)	118.9
Temperature (°C)	5.42
TDS (mg/L)	76.2
Turbidity (NTUs)	4.8

10-03 Severn River Sampling Unit

Downstream

Upstream

Location/Site Access: Located east southeast of Palisades Drive.
ADC Map: 14E03
Latitude/Longitude: 39.03746 / 76.58225

Land Use Analysis:

Land Use	Acres	% Area
Commercial	14.1	6.2
Open Space	2.8	1.2
Residential 1-acre	10.2	4.5
Residential 1/2-acre	73.9	32.6
Residential 2-acre	1.1	0.5
Transportation	9.0	4.0
Woods	115.3	50.9
Total	**226.4**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
37.7	226.4	16.7

Results:

- Biological condition: "Good"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological community was less impaired than expected given measured habitat quality.
- Lack of bank vegetation and low scores on bank stability were primary habitat impairments identified. Any corrective measures proposed would require additional evaluation to determine feasibility and necessity.
- Investigate potential installation or retrofit of stormwater management best management practices in upstream drainage.
- Management measures should focus on preserving high quality biological community.

10-03 Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Good
BIBI Score	4.43

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	5
Number of Ephemeroptera	3
% Intolerant to Urban	3
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	28
EPT Taxa	7
% Ephemeroptera	14.3
Number of Ephemeroptera	1
% Intolerant to Urban	10
Scraper Taxa	3
% Climbers	10.2

Taxa List

Sphaeriidae	1
Hoplonemertea	1
Lumbriculidae	2
Tubificidae	5
Crangonyx	9
Hydroporus	1
Helodidae	2
Anchytarsus	1
Staphylinidae	1
Diptera	1
Bezzia/Palpomyia	1
Chironomidae	1
Brillia	4
Larsia	9
Parametriocnemus	8
Phaenopsectra	9
Paracladopelma	3
Thienemannimyia	3
Dolichopodidae	1
Dicranota	1
Hexatoma	2
Leptophlebia	14
Calopteryx	1
Cordulegaster	1
Leuctra	5
Hydatophylax	1
Pycnopsyche	4
Polycentropus	3
Lype	2
Neophylax	1
Total Individuals	**98**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	226.4
Remoteness	59
Percent Shading	85
Epifaunal Substrate	79
Instream Habitat	92
Instream Wood Debris	81
Bank Stability	50
PHI Score	74.3
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	2
Bank Stability- Right Bank	3
Vegetative Protection- Left Bank	7
Vegetative Protection- Right Bank	6
Channel Flow Status	15
Channel Alteration	20
Channel Sinuosity	14
Pool Substrate Characterization	10
Pool Variability	14
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	7
Epifaunal Substrate	10
EPA Habitat Score	128
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	9.33
pH	No Data
Conductivity (umhos/cm)	211
Temperature (°C)	3.14
TDS (mg/L)	134.9
Turbidity (NTUs)	3

10-04 Severn River Sampling Unit

Upstream

Upstream

Location/Site Access: Located upstream of Old Herald Harbor Road.
ADC Map: 14E10
Latitude/Longitude: 39.04977 / 76.59000

Land Use Analysis:

Land Use	Acres	% Area
Commercial	4.4	1.1
Open Space	0.1	0.0
Residential 1/2-acre	54.5	13.9
Residential 1-acre	54.2	13.8
Residential 2-acre	3.8	1.0
Row Crops	6.4	1.6
Transportation	10.8	2.8
Utility	3.3	0.8
Woods	254.9	65.0
Grand Total	**392.4**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
30.9	392.4	2.8

Results:

- Biological condition: "Good"
- Habitat scores:
  - RBP: "Partially Supporting"
  - MPHI: "Partially Degraded"

Recommendations:

- Biological community is significantly enhanced in relation to observed habitat quality.
- Low levels of imperviousness should be preserved to ensure survival of high quality biological community. Management efforts should focus on watershed preservation activities.
- Bank stability, excessive sediment deposition, and low amounts of suitable substrate were the main habitat impairments observed in this reach. Additional assessment work is necessary to determine the what, if any, restoration should occur within this reach.

10-04 Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Good
BIBI Score	4.14

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	5
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	23
EPT Taxa	5
% Ephemeroptera	18.6
Number of Ephemeroptera	1
% Intolerant to Urban	7
Scraper Taxa	3
% Climbers	12.0

Taxa List

Lumbricidae	2
Tubificidae	2
Crangonyx	13
Caecidotea	7
Helichus (adult)	1
Hydroporus (adult)	1
Diptera (pupa)	1
Chironomidae (pupa)	3
Brillia	1
Diplocladius	1
Hydrobaenus	2
Larsia	3
Orthocladius	1
Parametriocnemus	2
Phaenopsectra	1
Polypedilum	4
Tanypodinae	1
Tanytarsini	1
Thienemannimyia	6
Xylotopus	0
Simulium	13
Hexatoma	0
Tipula	3
Leptophlebia	19
Leuctra	6
Diplectrona	1
Limnephilidae	6
Ptilostomis	1

Total Individuals **102**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	392.4
Remoteness	59
Percent Shading	100
Epifaunal Substrate	81
Instream Habitat	86
Instream Wood Debris	66
Bank Stability	45
PHI Score	72.9
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	2
Bank Stability- Right Bank	2
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	8
Channel Flow Status	12
Channel Alteration	20
Channel Sinuosity	10
Pool Substrate Characterization	10
Pool Variability	9
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	9
Epifaunal Substrate	11
EPA Habitat Score	121
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	9.26
pH	5.9
Conductivity (umhos/cm)	169.9
Temperature (°C)	7.36
TDS (mg/L)	108
Turbidity (NTUs)	6

10-06 Severn River Sampling Unit


Downstream


Upstream

Location/Site Access: Located west of Harbor Oak Drive.
ADC Map: 14D11
Latitude/Longitude: 39.04288 / 76.59918

Land Use Analysis:

Land Use	Acres	% Area
Commercial	4.4	3.4
Residential 1-acre	4.8	3.7
Residential 1/2-acre	42.7	32.7
Residential 2-acre	3.8	2.9
Row Crops	5.3	4.1
Transportation	7.3	5.6
Utility	1.1	0.8
Woods	61.2	46.9
Total	**130.5**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
19.2	130.5	14.7

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Partially Supporting"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions in relation to observed habitat quality are mixed.
- Pool substrate, excessive sediment deposition, and a deficiency in epifaunal substrate were the primary habitat limitations identified in the habitat assessments. Additional assessments are necessary to determine feasibility and necessity of any restoration activities.
- Opportunities to implement stormwater management retrofits should be realized as possible in the extensive residential areas upstream of the sampling reach.

10-06 Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.57

Metric Scores

Total Taxa	5
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	22
EPT Taxa	3
% Ephemeroptera	0.9
Number of Ephemeroptera	1
% Intolerant to Urban	8
Scraper Taxa	2
% Climbers	11.0

Taxa List

Sphaeriidae	1
Lumbricidae	2
Tubificidae	2
Crangonyx	4
Hydroporus	1
Anchytarsus	1
Bezzia/Palpomyia	15
Hydrobaenus	9
Larsia	4
Parametriocnemus	22
Phaenopsectra	1
Polypedilum	6
Tanytarsus	1
Thienemannimyia	17
Dicranota	1
Molophilus	5
Ormosia	1
Tipula	2
Leptophlebiidae	1
Sialis	1
Leuctra	8
Pycnopsyche	2

Total Individuals **107**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	130.5
Remoteness	100
Percent Shading	100
Epifaunal Substrate	59
Instream Habitat	92
Instream Wood Debris	84
Bank Stability	95

PHI Score	88.4
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	9
Bank Stability- Right Bank	9
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	8
Channel Flow Status	15
Channel Alteration	20
Channel Sinuosity	13
Pool Substrate Characterization	8
Pool Variability	3
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	6
Epifaunal Substrate	6

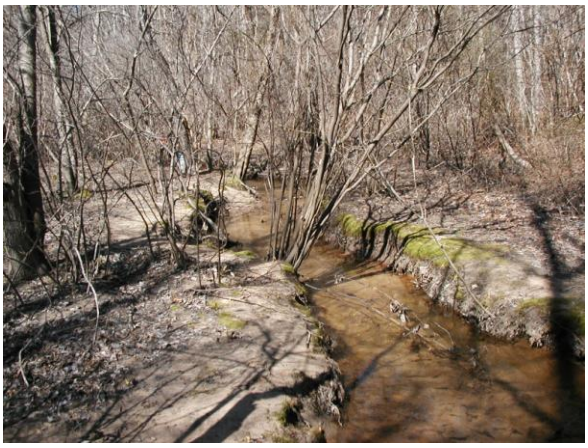
EPA Habitat Score	125
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	9.08
pH	7.00
Conductivity (umhos/cm)	203.6
Temperature (°C)	5.45
TDS (mg/L)	130.3
Turbidity (NTUs)	6.9

10-08 Severn River Sampling Unit

Downstream



Upstream

Location/Site Access: Located upstream of West Benfield Road.
ADC Map: 14A03
Latitude/Longitude: 39.08877 / 76.61675

Land Use Analysis:

Land Use	Acres	% Area
Commercial	33.1	5.7
Industrial	34.1	5.9
Open Space	53.0	9.1
Residential 1-acre	7.3	1.3
Residential 1/2-acre	62.3	10.7
Residential 1/4-acre	206.6	35.6
Row Crops	12.1	2.1
Transportation	44.6	7.7
Woods	126.9	21.9
Total	**580.0**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
172.3	580.0	29.7

Results:

- Biological condition: "Poor"
- Habitat scores:
  - RBP: "Comparable"
  - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are much more impaired that predicted from available habitat conditions, a likely indication of severe water quality impairment.
- Investigate retrofit opportunities for stormwater management within the extensive residential and commercial / industrial land uses comprising nearly 60% of the upstream drainage area to this reach.
- Inspection of photos from this site shows high levels of fine sediment deposition in the adjacent floodplain, possibly indicating an overload of sediment to this system that could depress the biological community. Additional investigations are necessary to confirm this observation.

10-08 Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.71

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	16
EPT Taxa	3
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	3
Scraper Taxa	3
% Climbers	43.6

Taxa List

Tubificidae	1
Lumbriculidae	1
Stenelmis (larva)	1
Diptera (pupa)	1
Chironomidae (pupa)	9
Hydrobaenus	6
Larsia	4
Orthocladius	1
Polypedilum	1
Tanytarsus	29
Thienemannimyia	11
Tipula	5
Boyeria	1
Calopteryx	2
Enallagma	1
Cheumatopsyche	2
Ptilostomis	1
Lype	1
Isopoda (terrestrial)	1
Lampyridae (terrestrial)	1

Total Individuals **78**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	580.0
Remoteness	43
Percent Shading	79
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	100
Bank Stability	100

PHI Score	87.0
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	10
Bank Stability- Right Bank	10
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	17
Channel Alteration	20
Channel Sinuosity	14
Pool Substrate Characterization	18
Pool Variability	16
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	17
Epifaunal Substrate	15

EPA Habitat Score	175
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	8.4
pH	7.00
Conductivity (umhos/cm)	362.2
Temperature (°C)	8.84
TDS (mg/L)	231.7
Turbidity (NTUs)	9.2

10-09 Severn River Sampling Unit

Downstream

Upstream

Location/Site Access: Located south of Palisades Drive.
ADC Map: 14E03
Latitude/Longitude: 39.03267 / 76.59439

Land Use Analysis:

Land Use	Acres	% Area
Commercial	14.1	6.7
Open Space	2.8	1.3
Residential 1-acre	10.2	4.8
Residential 1/2-acre	71.4	33.9
Residential 2-acre	1.1	0.5
Transportation	9.0	4.3
Woods	101.9	48.4
Total	**210.5**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
37.3	210.5	17.7

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological community is more impaired than expected for available habitat, indicative of a water quality impact from upstream land uses.
- Minor habitat impairments observed include low levels of sinuosity, somewhat low levels of epifaunal substrate, and poor pool habitat varibility.
- Investigate retrofit opportunities for stormwater management in the extensive residential land uses upstream of sample site in order to improve water quality.

10-09 Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.00

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	18
EPT Taxa	4
% Ephemeroptera	3.7
Number of Ephemeroptera	1
% Intolerant to Urban	3
Scraper Taxa	1
% Climbers	12.1

Taxa List

Hoplonemertea	1
Tubificidae	4
Crangonyx	17
Hydrobius	3
Haliplus	1
Anchytarsus	17
Chironomidae	1
Chironomidae	2
Larsia	15
Parametriocnemus	15
Phaenopsectra	2
Polypedilum	3
Thienemannimyia	10
Ptychoptera	1
Hexatoma	2
Leptophlebia	4
Sialis	1
Leuctra	2
Diplectrona	1
Limnephilidae	3
Pycnopsyche	2

Total Individuals **107**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	210.5
Remoteness	75
Percent Shading	91
Epifaunal Substrate	97
Instream Habitat	100
Instream Wood Debris	82
Bank Stability	95

PHI Score	90.1
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	9
Bank Stability- Right Bank	9
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	15
Channel Alteration	20
Channel Sinuosity	11
Pool Substrate Characterization	14
Pool Variability	10
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	16
Epifaunal Substrate	13

EPA Habitat Score	155
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	9.07
pH	6.60
Conductivity (umhos/cm)	235.3
Temperature (°C)	6.38
TDS (mg/L)	150.7
Turbidity (NTUs)	3.5

10-10 Severn River Sampling Unit


Downstream


Upstream

Location/Site Access: Located upstream of Benfield Road.
ADC Map: 14D03
Latitude/Longitude: 39.08727 / 76.59944

Land Use Analysis:

Land Use	Acres	% Area
Commercial	20.0	3.3
Open Space	88.5	14.4
Open Wetland	4.9	0.8
Residential 1/2-acre	29.8	4.9
Residential 1/4-acre	348.5	56.7
Transportation	19.1	3.1
Water	4.7	0.8
Woods	99.1	16.1
Total	**614.7**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
113.5	614.7	18.5

Results:
- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"

Recommendations:
- Biological conditions are greatly impaired in the context of measured habitat quality, indicating water quality impairment associated with upstream runoff to this stream reach exist.
- Determine feasibility of stormwater management retrofit / installation in extensive residential land uses in upstream contributing drainage area.

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.14

Metric Scores

Total Taxa	1
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	9
EPT Taxa	2
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	0
Scraper Taxa	1
% Climbers	14.3

Taxa List

Sphaeriidae	5
Physella	2
Hoplonemertea	1
Naididae	1
Chironomidae (pupa)	1
Chironomidae (adult)	1
Tanytarsus	11
Thienemannimyia	9
Odontomyia	1
Cheumatopsyche	58
Symphytopsyche	1

Total Individuals **91**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	614.7
Remoteness	38
Percent Shading	73
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	79
Bank Stability	100

PHI Score	81.6
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	10
Bank Stability- Right Bank	10
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	20
Channel Alteration	20
Channel Sinuosity	16
Pool Substrate Characterization	16
Pool Variability	16
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	16
Epifaunal Substrate	15

EPA Habitat Score	177
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	9.26
pH	6.80
Conductivity (umhos/cm)	256.7
Temperature (°C)	9.53
TDS (mg/L)	164.2
Turbidity (NTUs)	3.3

10-11A Severn River Sampling Unit

Downstream

Upstream

Location/Site Access: Located upstream of Plum Creek Drive.
ADC Map: 14F08
Latitude/Longitude: 39.08727 / 76.59944

Land Use Analysis:

Land Use	Acres	% Area
Commercial	4.6	0.8
Open Space	0.1	0.0
Residential 1/2-acre	112.6	19.1
Residential 1-acre	63.5	10.7
Residential 2-acre	5.6	0.9
Row Crops	6.4	1.1
Transportation	16.4	2.8
Utility	3.3	0.6
Woods	378.6	64.1
Grand Total	**591.1**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
44.8	591.1	7.6

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological community degraded in comparison to available habitat, indicative of water chemistry impairments associated with runoff from developed areas upstream.
- Poor distribution of pool depths and moderately low levels of epifaunal substrate were major habitat impairments observed in this stream reach.
- Additional investigations necessary to determine possible types and sources of water quality impairments that might be present in this stream reach.

10-11A Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.71

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	3

Calculated Metric Values

Total Taxa	14
EPT Taxa	2
% Ephemeroptera	1.1
Number of Ephemeroptera	1
% Intolerant to Urban	0
Scraper Taxa	1
% Climbers	3.1

Taxa List

Sphaeriidae	16
Crangonyx	4
Caecidotea	10
Ostracoda	1
Larsia	1
Parametriocnemus	2
Phaenopsectra	1
Polypedilum	1
Thienemannimyia	2
Hemerodromia	1
Simulium	52
Chrysops	1
Leptophlebia	1
Limnephilidae	2
Coleoptera	1
Pisces	1

Total Individuals **97**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	591.1
Remoteness	43
Percent Shading	91
Epifaunal Substrate	90
Instream Habitat	76
Instream Wood Debris	64
Bank Stability	100

PHI Score	77.5
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	10
Bank Stability- Right Bank	10
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	19
Channel Alteration	20
Channel Sinuosity	14
Pool Substrate Characterization	14
Pool Variability	5
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	17
Epifaunal Substrate	13

EPA Habitat Score	160
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	8.59
pH	6.1
Conductivity (umhos/cm)	162.6
Temperature (°C)	9.8
TDS (mg/L)	104.1
Turbidity (NTUs)	6.7

10-20A Severn River Sampling Unit

Upstream

Upstream

Location/Site Access: Located west of North Lawrence Avenue.
ADC Map: 20E06
Latitude/Longitude: 39.00020 / 76.52751

Land Use Analysis:

Land Use	Acres	% Area
Commercial	8.1	8.3
Open Space	4.4	4.5
Residential 1/2-acre	34.6	35.4
Residential 1/4-acre	18.5	18.9
Residential 1/8-acre	1.1	1.1
Residential 2-acre	0.2	0.2
Transportation	2.1	2.2
Woods	28.7	29.4
Total	**97.9**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
22.0	97.9	22.5

Results:

- Biological condition: "Very Poor"
- Habitat scores:
    - RBP: "Partially Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological community moderately more impaired than expected in context of available habitat quality.
- Investigate stormwater management conditions of upstream residential and commercial lands and implement retrofits as necessary.
- High sediment deposition, poor pool variability, and lack of suitable epifaunal substrate were primary impairments observed in this reach. Additional assessments are needed to determine feasibility and necessity of possible restoration activities.

10-20A Severn River Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Very Poor
BIBI Score	1.57

Metric Scores

Total Taxa	3
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	1
% Climbers	3

Calculated Metric Values

Total Taxa	14
EPT Taxa	1
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	0
Scraper Taxa	0
% Climbers	2.1

Taxa List

Sphaeriidae	9
Hoplonemertea	1
Lumbriculidae	1
Tubificidae	2
Crangonyx	6
Caecidotea	5
Bezzia/Palpomyia	1
Chironomidae (larva)	3
Chironomidae (pupa)	3
Larsia	3
Parametriocnemus	49
Polypedilum	2
Thienemannimyia	3
Tipula	3
Calopteryx	1
Polycentropus	2
Coleoptera (terrestrial)	1

Total Individuals **95**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	97.9
Remoteness	65
Percent Shading	85
Epifaunal Substrate	38
Instream Habitat	67
Instream Wood Debris	73
Bank Stability	95
PHI Score	70.3
PHI Narrative Ranking	Partially Degraded

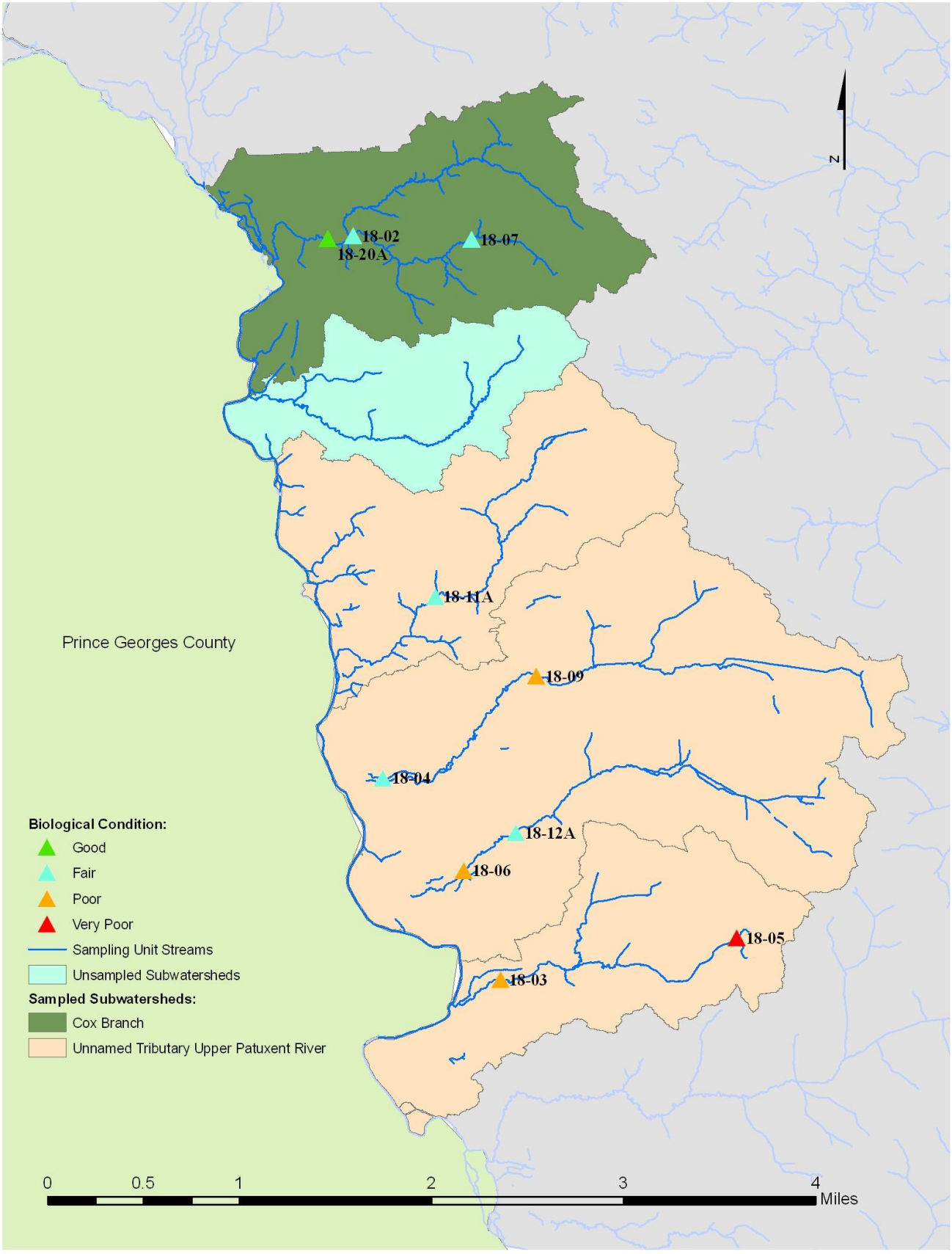
EPA Rapid Bioassessment

Bank Stability- Left Bank	9
Bank Stability- Right Bank	9
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	8
Channel Flow Status	16
Channel Alteration	20
Channel Sinuosity	11
Pool Substrate Characterization	7
Pool Variability	7
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	5
Epifaunal Substrate	2
EPA Habitat Score	123
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.44
pH	6.7
Conductivity (umhos/cm)	137.5
Temperature (°C)	12.13
TDS (mg/L)	88
Turbidity (NTUs)	9.2

Middle Patuxent Sampling Unit



18-02 Middle Patuxent Sampling Unit


Upstream


Downstream

Location/Site Access: Located north of Arrowhead Farms Road.
ADC Map: 17K08
Latitude/Longitude: 38.985749 / 76.691529

Land Use Analysis:

Land Use	Acres	% Area
Commercial	6.9	1.5
Open Space	25.2	5.5
Pasture/Hay	3.3	0.7
Residential 1-acre	53.9	11.8
Residential 1/2-acre	39.0	8.5
Residential 2-acre	0.0	0.0
Row Crops	130.3	28.4
Transportation	5.8	1.3
Woods	194.1	42.3
Total	**458.6**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
22.6	458..6	4.9

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological conditions are appropriate for the observed level of habitat quality.
- Investigate potential implementation of best management practices for the agricultural and residential lands found in the upstream drainage area.
- Moderate levels of bank instability and sediment deposition were the primary habitat impairments observed at this sampling reach. Additional assessment is necessary to determine need, feasibility of any possible corrective actions.

18-02 Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.29

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	3
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	23
EPT Taxa	6
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	25
Scraper Taxa	1
% Climbers	13.4

Taxa List

Tubificidae	5
Crangonyx	13
Anchytarsus	1
Prionocyphon	1
Scirtes	1
Bezzia/Palpomyia	2
Chironomidae (larva)	2
Chironomidae (pupa)	5
Brillia	6
Eukiefferiella	4
Larsia	4
Orthocladius	10
Paratendipes	5
Polypedilum	7
Prodiamesa	1
Tanytarsus	2
Thienemannimyia	10
Tipula	3
Nigronia	1
Haploperla	5
Leuctra	11
Amphinemura	8
Diplectrona	1
Pycnopsyche	3
Agarodes	1

Total Individuals **112**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	458.6
Remoteness	75
Percent Shading	100
Epifaunal Substrate	86
Instream Habitat	73
Instream Wood Debris	55
Bank Stability	67

PHI Score	76.2
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	5
Bank Stability- Right Bank	4
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	10
Channel Flow Status	16
Channel Alteration	20
Channel Sinuosity	13
Pool Substrate Characterization	16
Pool Variability	10
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	12
Epifaunal Substrate	12

EPA Habitat Score	148
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.57
pH	7.60
Conductivity (umhos/cm)	152.7
Temperature (°C)	10.05
TDS (mg/L)	97.5
Turbidity (NTUs)	3.6

18-03 Middle Patuxent Sampling Unit

Downstream

Upstream

Location/Site Access: Located downstream Patuxent River Road.
ADC Map: 23B06
Latitude/Longitude: 38.929592 / 76.677508

Land Use Analysis:

Land Use	Acres	% Area
Commercial	16.6	2.5
Open Space	19.1	2.8
Pasture/Hay	149.7	22.3
Residential 1-acre	125.5	18.7
Residential 1/2-acre	84.2	12.6
Residential 2-acre	26.2	3.9
Row Crops	82.7	12.3
Transportation	14.6	2.2
Woods	152.3	22.7
Total	**671.0**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
64.9	671.0	9.7

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological conditions are somewhat more impaired than expected for the observed level of habitat quality. Water quality impact from polluted runoff is possible cause of depressed community.
- Determine feasibility, necessity of BMP implementation in residential and agricultural lands upstream of sample reach.
- Habitat impairments observed include moderate sediment deposition and poor pool habitat quality. Some moderate to minor bank instability was also observed. Perform assessments as necessary to determine need, feasibility of correction.

18-03 Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.43

Metric Scores

Total Taxa	5
EPT Taxa	1
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	25
EPT Taxa	1
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	2
Scraper Taxa	1
% Climbers	8.9

Taxa List

Physidae	1
Tubificidae	4
Crangonyx	49
Gammarus	3
Caecidotea	3
Lampyridae (subaquatic)	1
Chironomidae (pupa)	1
Diamesa	3
Eukiefferiella	1
Orthocladiinae	1
Orthocladius	2
Paracladopelma	1
Parametriocnemus	4
Paratanytarsus	1
Polypedilum	1
Prodiamesa	1
Tanytarsus	3
Clinocera	1
Simulium	1
Dicranota	3
Lepidoptera	1
Nigronia	1
Calopteryx	1
Pycnopsyche	1
Nematoda	1
Total Individuals	**90**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	671.0
Remoteness	54
Percent Shading	100
Epifaunal Substrate	89
Instream Habitat	92
Instream Wood Debris	60
Bank Stability	84
PHI Score	79.7
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	6
Bank Stability- Right Bank	8
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	9
Channel Flow Status	15
Channel Alteration	20
Channel Sinuosity	15
Pool Substrate Characterization	14
Pool Variability	9
Riparian Vegetative Zone Width- Left Bank	8
Riparian Vegetative Zone Width- Right Bank	8
Sediment Deposition	13
Epifaunal Substrate	15
EPA Habitat Score	148
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.6
pH	7.80
Conductivity (umhos/cm)	255
Temperature (°C)	12.5
TDS (mg/L)	163.2
Turbidity (NTUs)	13.7

18-04 Middle Patuxent Sampling Unit

Upstream

Downstream

Location/Site Access: Located west of Sunshine Avenue.
ADC Map: 22K03
Latitude/Longitude: 38.944840/ 76.688823

Land Use Analysis:

Land Use	Acres	% Area
Commercial	68.5	5.4
Open Space	55.4	4.4
Pasture/Hay	82.1	6.5
Residential 1-acre	172.1	13.7
Residential 1/2-acre	68.1	5.4
Residential 2-acre	49.0	3.9
Row Crops	365.7	29.0
Transportation	60.8	4.8
Water	5.5	0.4
Woods	331.8	26.4
Total	**1259.1**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
150.5	1259.1	12.0

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are somewhat depressed in comparison to available habitat, indicative of possible water quality impairment.
- Determine need, feasibility of installing best management practices on agricultural and residential lands in upstream drainage.
- Excessive sedimentation and lack of pool habitat along with low levels of epifaunal substrate are the primary habitat impairments observed. Determine need, feasibility of corrective actions through additional assessments.

18-04 Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.57

Metric Scores

Total Taxa	5
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	26
EPT Taxa	4
% Ephemeroptera	1.0
Number of Ephemeroptera	1
% Intolerant to Urban	3
Scraper Taxa	2
% Climbers	13.7

Taxa List

Planorbidae	1
Sphaeriidae	1
Naididae	1
Vejdovskyella	1
Cyclopoida	1
Caecidotea	1
Hydroporus	3
Dineutus (adult)	2
Chironomidae (larva)	1
Chironomidae (pupa)	3
Paralauterborniella	1
Diamesa	6
Hydrobaenus	7
Larsia	1
Orthocladiinae	4
Orthocladius	37
Parametriocnemus	9
Polypedilum	5
Potthastia	1
Tanytarsus	3
Thienemanniella	3
Thienemannimyia	2
Simulium	1
Hexatoma	2
Baetis	1
Haploperla	1
Calopteryx	1
Cheumatopsyche	1
Ironoquia	1
Total Individuals	**102**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	1259.1
Remoteness	86
Percent Shading	100
Epifaunal Substrate	85
Instream Habitat	80
Instream Wood Debris	53
Bank Stability	100
PHI Score	84.0
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	10
Bank Stability- Right Bank	10
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	10
Channel Flow Status	19
Channel Alteration	20
Channel Sinuosity	10
Pool Substrate Characterization	8
Pool Variability	15
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	6
Epifaunal Substrate	13
EPA Habitat Score	151
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	7.55
pH	7.20
Conductivity (umhos/cm)	236.7
Temperature (°C)	15.03
TDS (mg/L)	151.5
Turbidity (NTUs)	7.2

18-05 Middle Patuxent Sampling Unit


Downstream


Upstream

Location/Site Access: Located upstream of Double Gate Court.
ADC Map: 23F05
Latitude/Longitude: 38.932666/ 76.654647

Land Use Analysis:

Land Use	Acres	% Area
Open Space	1.1	1.5
Pasture/Hay	6.9	9.8
Residential 1-acre	1.7	2.4
Residential 1/2-acre	35.4	50.4
Row Crops	12.5	17.8
Transportation	1.9	2.7
Woods	10.8	15.3
Total	**70.2**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
9.4	70.2	13.4

Results:

- Biological condition: "Very Poor"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological conditions are much more impaired than expected for observed habitat quality, indicative of water quality impacts. However, the small contributing drainage area might also be responsible for poor biological conditions.
- Determine feasibility, necessity of installing stormwater best management practices on residential and agricultural lands in upstream watershed.
- Poor pool quality, decreased riparian area width on the right bank (downstream), and low amounts of epifaunal substrate are the primary habitat impairments observed in this reach. Feasibility, necessity of correction should be determined by additional assessments.

18-05 Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Very Poor
BIBI Score	1.57

Metric Scores

Total Taxa	1
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	1
% Climbers	3

Calculated Metric Values

Total Taxa	9
EPT Taxa	3
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	5
Scraper Taxa	0
% Climbers	2.8

Taxa List

Tubificidae	1
Crangonyx	79
Caecidotea	17
Prodiamesa	1
Tanytarsus	2
Ironoquia	3
Dolophilodes	1
Oligostomis	1
Nematoda	1

Total Individuals **106**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	70.2
Remoteness	27
Percent Shading	91
Epifaunal Substrate	58
Instream Habitat	82
Instream Wood Debris	79
Bank Stability	100
PHI Score	72.8
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	10
Bank Stability- Right Bank	10
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	10
Channel Flow Status	20
Channel Alteration	20
Channel Sinuosity	12
Pool Substrate Characterization	9
Pool Variability	4
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	5
Sediment Deposition	20
Epifaunal Substrate	5
EPA Habitat Score	145
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	6.76
pH	5.20
Conductivity (umhos/cm)	326.5
Temperature (°C)	13.19
TDS (mg/L)	208.9
Turbidity (NTUs)	2.6

18-06 Middle Patuxent Sampling Unit

Downstream

Upstream

Location/Site Access: Located downstream from Patuxent River Road.
ADC Map: 23B04
Latitude/Longitude: 38.944840/ 76.688823

Land Use Analysis:

Land Use	Acres	% Area
Commercial	0.01	0.0
Open Space	52.7	6.9
Pasture/Hay	80.2	10.6
Residential 1-acre	43.2	5.7
Residential 1/2-acre	113.9	15.0
Residential 2-acre	50.7	6.7
Row Crops	226.4	29.8
Transportation	11.6	1.5
Water	0.9	0.1
Woods	179.4	23.6
Total	**759.0**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
44.4	759.0	5.8

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are much more impaired than expected for observed habitat quality, indicative of water quality impacts.
- Distribution of best management practices for the residential and agricultural land uses in the upstream drainage should investigated. Implement treatment technologies as necessary to improve water quality.
- Decreased riparian area width on the right bank (downstream), along with somewhat depressed levels of epifaunal substrate, were the primary habitat impairments observed in this reach. Correct as necessary after proper reevaluation to determine necessity, feasibility.

18-06 Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.43

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	20
EPT Taxa	2
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	5
Scraper Taxa	1
% Climbers	20.4

Taxa List

Sphaeriidae	1
Naididae	2
Crangonyx	31
Caecidotea	2
Isotomidae	3
Macronychus (adult)	1
Hydrobaenus	9
Larsia	1
Orthocladius	15
Polypedilum	11
Psectrocladius	3
Thienemannimyia	1
Empididae (pupa)	1
Hemerodromia	1
Simulium	1
Hexatoma	1
Nigronia	4
Boyeria	1
Calopteryx	2
Cheumatopsyche	1
Pycnopsyche	1

Total Individuals **93**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	759.0
Remoteness	97
Percent Shading	100
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	56
Bank Stability	100
PHI Score	92.1
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	10
Bank Stability- Right Bank	10
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	10
Channel Flow Status	19
Channel Alteration	20
Channel Sinuosity	8
Pool Substrate Characterization	17
Pool Variability	12
Riparian Vegetative Zone Width- Left Bank	9
Riparian Vegetative Zone Width- Right Bank	4
Sediment Deposition	15
Epifaunal Substrate	16
EPA Habitat Score	160
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	7.47
pH	6.80
Conductivity (umhos/cm)	204.2
Temperature (°C)	14.49
TDS (mg/L)	132.7
Turbidity (NTUs)	5

18-07 Middle Patuxent Sampling Unit


Downstream


Upstream

Location/Site Access: Located south or Kirchner Lane.
ADC Map: 18B08
Latitude/Longitude: 38.985442 / 76.680089

Land Use Analysis:

Land Use	Acres	% Area
Commercial	6.9	3.1
Open Space	20.0	8.9
Pasture/Hay	0.1	0.0
Residential 1-acre	25.6	11.4
Residential 1/2-acre	7.8	3.5
Row Crops	92.2	41.1
Transportation	1.9	0.8
Woods	69.5	31.0
Total	**224.0**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
10.9	224.0	4.5

Results:

- Biological condition: "Fair"
- Habitat scores:
  - RBP: "Partially Supporting"
  - MPHI: "Partially Degraded"

Recommendations:

- Habitat assessment results were mixed for this site, but biological community observed is trending toward less than expected impairment based on the observed habitat quality; possibly caused by nutrient enrichment of system by agricultural runoff.
- Determine level of best management practice implementation in upstream drainage area—enhance if necessary.
- High levels of sediment deposition, marginal variability and quality of pool habitat, and some bank instability are the primary habitat impairments observed in this reach. Determine necessity and feasibility of corrective action with additional assessments.

18-07 Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.00

Metric Scores

Total Taxa	5
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	26
EPT Taxa	3
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	5
Scraper Taxa	2
% Climbers	8.3

Taxa List

Tubificidae	1
Lumbriculidae	1
Crangonyx	57
Caecidotea	3
Collembola	4
Helichus	1
Agabus	1
Bezzia/Palpomyia	1
Chironomidae	1
Chironomus	1
Hydrobaenus	9
Larsia	1
Parakiefferiella	3
Paratendipes	2
Polypedilum	5
Prodiamesa	1
Tanypodinae	2
Thienemannimyia	7
Chrysops	1
Dicranota	3
Hexatoma	1
Molophilus	2
Tipula	2
Noctuidae	1
Sialis	1
Leuctra	1
Ironoquia	4
Pycnopsyche	3

Total Individuals **120**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	224.0
Remoteness	43
Percent Shading	79
Epifaunal Substrate	50
Instream Habitat	86
Instream Wood Debris	78
Bank Stability	81

PHI Score	69.5
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	5
Bank Stability- Right Bank	8
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	14
Channel Alteration	15
Channel Sinuosity	14
Pool Substrate Characterization	12
Pool Variability	10
Riparian Vegetative Zone Width- Left Bank	7
Riparian Vegetative Zone Width- Right Bank	7
Sediment Deposition	8
Epifaunal Substrate	5

EPA Habitat Score	123
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.89
pH	7.00
Conductivity (umhos/cm)	109.3
Temperature (°C)	12.62
TDS (mg/L)	70
Turbidity (NTUs)	3.6

18-09 Middle Patuxent Sampling Unit


Upstream


Downstream

Location/Site Access: Located upstream of Governor Bridge Road.
ADC Map: 23C01
Latitude/Longitude: 38.952487 / 76.673933

Land Use Analysis:

Land Use	Acres	% Area
Commercial	67.4	7.0
Open Space	45.0	4.7
Pasture/Hay	66.9	7.0
Residential 1-acre	154.7	16.1
Residential 1/2-acre	22.4	2.3
Residential 2-acre	16.4	1.7
Row Crops	291.8	30.4
Transportation	50.8	5.3
Water	5.5	0.6
Woods	238.2	24.8
Total	**959.1**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
129.2	959.1	13.5

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological community somewhat more degraded than expected given available habitat quality, typically indicative of a water chemistry imbalance.
- Determine necessity, feasibility of best management practice installation on agricultural and residential lands in upstream drainage area.
- Habitat impairments include poor riparian area conditions, widespread bank instability, and moderate sediment deposition. Correct as feasible and necessary through careful additional assessment.

18-09 Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.71

Metric Scores

Total Taxa	5
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	23
EPT Taxa	3
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	2
Scraper Taxa	1
% Climbers	10.2

Taxa List

Naididae	1
Lumbriculidae	3
Crangonyx	2
Caecidotea	31
Hydroporus (adult)	1
Diptera (pupa)	1
Bezzia/Palpomyia	2
Brillia	3
Chironomus	1
Eukiefferiella	4
Hydrobaenus	2
Larsia	4
Orthocladius	5
Parametriocnemus	4
Polypedilum	6
Rheotanytarsus	1
Thienemanniella	2
Thienemannimyia	4
Hemerodromia	1
Simulium	1
Nigronia	2
Cheumatopsyche	1
Hydropsyche	2
Polycentropus	4

Total Individuals **88**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	959.1
Remoteness	38
Percent Shading	79
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	68
Bank Stability	74
PHI Score	76.4
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	5
Bank Stability- Right Bank	6
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	8
Channel Flow Status	17
Channel Alteration	15
Channel Sinuosity	10
Pool Substrate Characterization	9
Pool Variability	16
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	3
Sediment Deposition	9
Epifaunal Substrate	16
EPA Habitat Score	134
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.86
pH	7.00
Conductivity (umhos/cm)	254.7
Temperature (°C)	12.58
TDS (mg/L)	163
Turbidity (NTUs)	13.9

18-11A Middle Patuxent Sampling Unit


Downstream


Upstream

Location/Site Access: Located near Lerch Farm Court.
ADC Map: 18A13
Latitude/Longitude: 38.958515 / 76.683715

Land Use Analysis:

Land Use	Acres	% Area
Commercial	10.3	1.4
Open Space	175.7	24.5
Pasture/Hay	78.6	11.0
Residential 1-acre	52.7	7.4
Residential 1/2-acre	35.8	5.0
Residential 2-acre	22.2	3.1
Row Crops	39.6	5.5
Transportation	15.9	2.2
Woods	286.1	39.9
Total	**716.9**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
33.0	716.9	4.6

Results:
- Biological condition: "Fair"
- Habitat scores:
  - RBP: "Comparable"
  - MPHI: "Minimally Degraded"

Recommendations:
- Biological conditions are depressed relative to observed habitat quality, indicative water quality impacts within this reach.
- Investigate necessity of stormwater management for residential, agricultural lands in upstream drainage.
- Excessive sediment deposition, poor pool quality, and mildly depressed levels of appropriate epifaunal substrate were the dominant observed habitat impairments. Additional assessments are necessary to determine need, feasibility of any corrective actions.

18-11A Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.29

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	1
% Climbers	5

Calculated Metric Values

Total Taxa	23
EPT Taxa	6
% Ephemeroptera	1.0
Number of Ephemeroptera	1
% Intolerant to Urban	8
Scraper Taxa	0
% Climbers	18.0

Taxa List

Crangonyx	3
Caecidotea	18
Anchytarsus	6
Bezzia/Palpomyia	1
Chironomidae	3
Alotanypus	1
Chironomus	1
Eukiefferiella	4
Larsia	2
Orthocladius	8
Parakiefferiella	3
Paratendipes	2
Polypedilum	6
Thienemannimyia	4
Hemerodromia	1
Simulium	13
Chrysops	1
Baetis	1
Nigronia	1
Nigronia	1
Calopteryx	4
Leuctridae	5
Diplectrona	1
Limnephilidae	2
Pycnopsyche	3
Polycentropus	5

Total Individuals **100**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	716.9
Remoteness	54
Percent Shading	100
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	65
Bank Stability	89
PHI Score	84.7
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	8
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	10
Channel Flow Status	15
Channel Alteration	20
Channel Sinuosity	12
Pool Substrate Characterization	10
Pool Variability	12
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	12
Epifaunal Substrate	17
EPA Habitat Score	154
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	7.95
pH	7.40
Conductivity (umhos/cm)	85.9
Temperature (°C)	11.06
TDS (mg/L)	54.9
Turbidity (NTUs)	3.8

18-12A Middle Patuxent Sampling Unit

Upstream

Downstream

Location/Site Access: Located upstream of Patuxent River Road.
ADC Map: 23B04
Latitude/Longitude: 38.940664 / 76.675974

Land Use Analysis:

Land Use	Acres	% Area
Open Space	36.7	5.8
Pasture/Hay	80.4	12.7
Residential 1-acre	30.3	4.8
Residential 1/2-acre	109.8	17.3
Residential 2-acre	33.8	5.3
Row Crops	181.0	28.5
Transportation	7.8	1.2
Water	0.9	0.1
Woods	153.7	24.2
Total	**634.4**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
37.2	634.4	4.9

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Minimally Degraded"

Recommendations:

- Habitat quality results were mixed for this site, but trending toward more than expected impairment based on the biological community observed.
- Determine the need, feasibility of stormwater management for the extensive agricultural and residential land uses found in this watershed.
- Poor pool habitat, sediment deposition, and some moderate bank instability were the primary habitat impairments identified in this reach. Additional assessment is necessary to determine need, feasibility of any corrective actions.

18-12A Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.00

Metric Scores

Total Taxa	3
EPT Taxa	5
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	18
EPT Taxa	5
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	4
Scraper Taxa	2
% Climbers	19.6

Taxa List

Naididae	3
Crangonyx	34
Gammarus	1
Caecidotea	9
Collembola	1
Chironomidae	1
Chironomidae	3
Brillia	3
Orthocladius	10
Parametriocnemus	3
Polypedilum	12
Sympotthastia	2
Tanytarsus	1
Simulium	3
Tipula	1
Calopteryx	2
Cheumatopsyche	2
Limnephilidae	1
Pycnopsyche	3
Lype	1
Neophylax	1

Total Individuals **97**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	634.4
Remoteness	65
Percent Shading	79
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	63
Bank Stability	84
PHI Score	81.7
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	6
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	9
Channel Flow Status	8
Channel Alteration	20
Channel Sinuosity	14
Pool Substrate Characterization	12
Pool Variability	11
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	12
Epifaunal Substrate	18
EPA Habitat Score	146
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.57
pH	7.30
Conductivity (umhos/cm)	204.8
Temperature (°C)	13.14
TDS (mg/L)	131.2
Turbidity (NTUs)	3

18-20A Middle Patuxent Sampling Unit


Downstream


Upstream

Location/Site Access: Located north of Arrowhead Farms Road.
ADC Map: 17K08
Latitude/Longitude: 38.985527 / 76.693953

Land Use Analysis:

Land Use	Acres	% Area
Commercial	35.4	3.9
Industrial	6.9	0.8
Open Space	73.8	8.1
Pasture/Hay	4.4	0.5
Residential 1-acre	95.4	10.5
Residential 1/2-acre	107.0	11.8
Residential 1/4-acre	62.3	6.9
Residential 1/8-acre	12.6	1.4
Residential 2-acre	1.4	0.2
Row Crops	130.4	14.4
Transportation	19.0	2.1
Woods	358.6	39.5
Total	**907.2**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
103.7	907.2	11.4

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Biological conditions enhanced relative to the observed level of habitat quality.
- Watershed enhancements should include best management practice installation, as appropriate, on the agricultural and develop lands within the upstream drainage area.
- Moderate bank instability, poor pool habitat, low levels of woody material and other epifaunal substrate, and overwide channel conditions were the primary habitat impairments observed. Additional assessments are necessary to determine the need, feasibility of corrective actions.

18-20A Middle Patuxent Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	4.14

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	5
Scraper Taxa	3
% Climbers	5

Calculated Metric Values

Total Taxa	23
EPT Taxa	5
% Ephemeroptera	1.1
Number of Ephemeroptera	1
% Intolerant to Urban	51
Scraper Taxa	1
% Climbers	10.5

Taxa List

Naididae	1
Tubificidae	4
Crangonyx	1
Caecidotea	2
Hydroporus	1
Laccornis (adult)	1
Bezzia/Palpomyia	1
Chironomidae (larva)	1
Chironomidae (pupa)	4
Brillia	2
Eukiefferiella	5
Hydrobaenus	8
Paratendipes	1
Polypedilum	1
Sympotthastia	3
Tanytarsus	1
Simulium	4
Molophilus	1
Tipula	2
Baetis	1
Calopteryx	1
Leuctra	3
Amphinemura	42
Trichoptera (adult)	1
Pycnopsyche	3

Total Individuals **95**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	907.2
Remoteness	75
Percent Shading	100
Epifaunal Substrate	76
Instream Habitat	61
Instream Wood Debris	51
Bank Stability	84
PHI Score	74.4
PHI Narrative Ranking	Partially Degraded

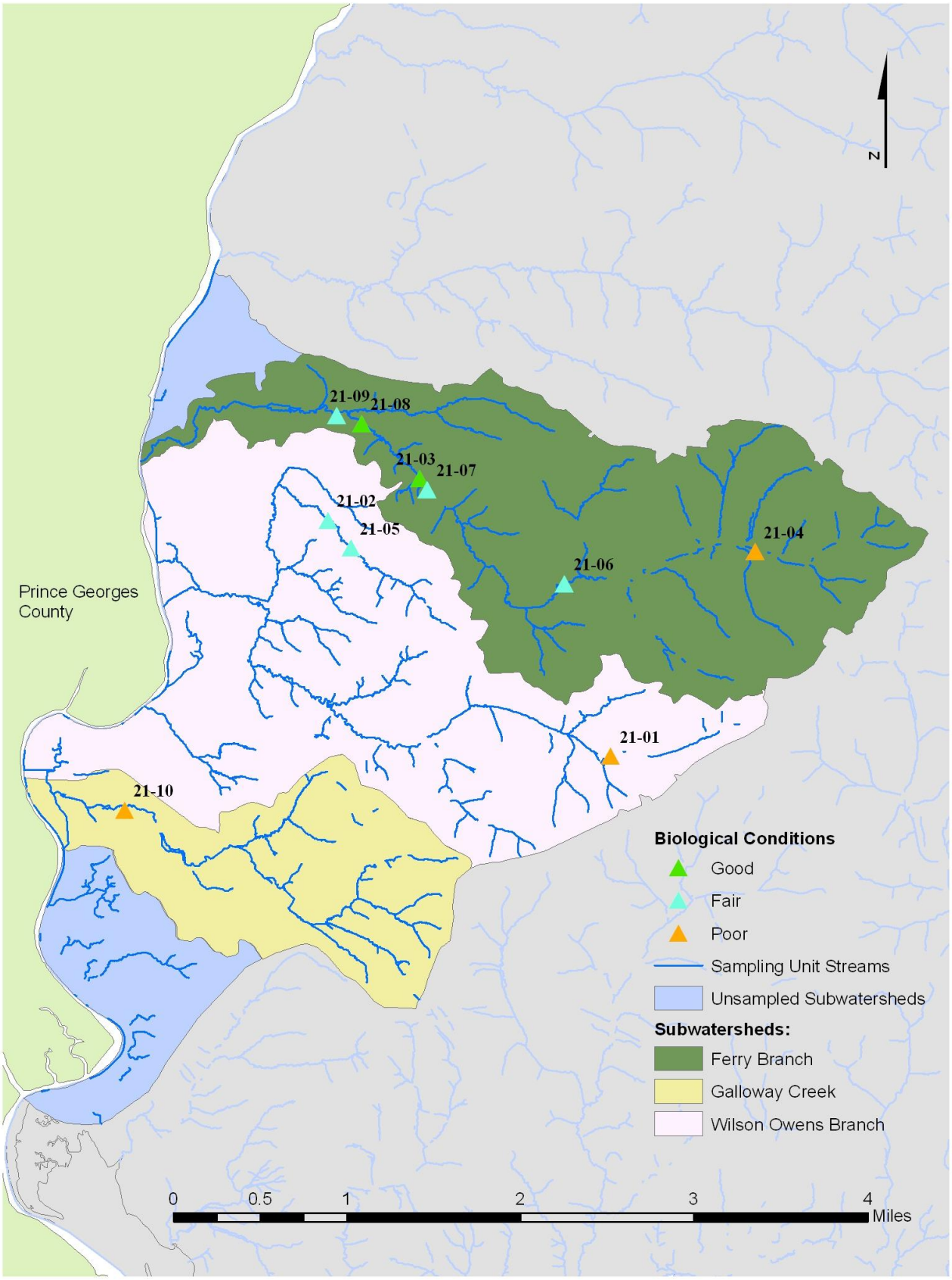
EPA Rapid Bioassessment

Bank Stability- Left Bank	9
Bank Stability- Right Bank	5
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	10
Channel Flow Status	11
Channel Alteration	14
Channel Sinuosity	11
Pool Substrate Characterization	10
Pool Variability	9
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	13
Epifaunal Substrate	11
EPA Habitat Score	133
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.28
pH	7.7
Conductivity (umhos/cm)	191.4
Temperature (°C)	9.32
TDS (mg/L)	122.4
Turbidity (NTUs)	9.7

Ferry Branch Sampling Unit



21-01 Ferry Branch Sampling Unit

Upstream

Downstream

Location/Site Access: Just north of end of Farmhouse Lane.
ADC Map: 28J11
Latitude/Longitude: 38.829363 / 76.634006

Land Use Analysis:

Land Use	Acres	% Area
Open Space	11.0	4.8
Pasture/Hay	26.3	11.4
Residential 1-acre	42.7	18.5
Residential 2-acre	8.9	3.9
Row Crops	55.9	24.2
Transportation	7.7	3.3
Woods	78.2	33.9
Total	**230.6**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
11.3	230.6	4.9

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Partially Supporting"
    - MPHI: "Partially Degraded"

Recommendations:

- Habitat assessment results were mixed for this site, but biological community observed is trending toward more than expected impairment based on the observed habitat quality.
- High levels of bank instability observed. Perform geomorphic assessment work to determine cause of bank instability, develop appropriate restoration plan, if necessary.
- Mixed agricultural and urban land uses should be evaluated for potential BMP implementation.

21-01 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.43

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	3
Scraper Taxa	1
% Climbers	5

Calculated Metric Values

Total Taxa	17
EPT Taxa	3
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	12
Scraper Taxa	0
% Climbers	31.0

Taxa List

Naididae	1
Tubificidae	2
Crangonyx	42
Gammarus	4
Caecidotea	3
Cyclopoida	1
Hydroporus	1
Tropisternus	1
Polypedilum	28
Prodiamesa	4
Dicranota	1
Tipula	1
Dixa	1
Trepobates	1
Amphinemura	6
Cheumatopsyche	1
Ironoquia	2

Total Individuals **100**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	230.6
Remoteness	38
Percent Shading	91
Epifaunal Substrate	90
Instream Habitat	97
Instream Wood Debris	72
Bank Stability	67

PHI Score	75.9
PHI Narrative Ranking	Partially Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	4
Bank Stability- Right Bank	5
Vegetative Protection- Left Bank	4
Vegetative Protection- Right Bank	4
Channel Flow Status	15
Channel Alteration	15
Channel Sinuosity	13
Pool Substrate Characterization	13
Pool Variability	8
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	4
Sediment Deposition	15
Epifaunal Substrate	12

EPA Habitat Score	122
EPA Narrative Ranking	Partially Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.48
pH	7.00
Conductivity (umhos/cm)	191.1
Temperature (°C)	13.59
TDS (mg/L)	122.3
Turbidity (NTUs)	30.6

21-02 Ferry Branch Sampling Unit

Upstream

Downstream

Location/Site Access: West of Ed Prout Road.
ADC Map: 28B10
Latitude/Longitude: 38.832401 / 76.679941

Land Use Analysis:

Land Use	Acres	% Area
Commercial	1.7	0.8
Open Space	19.5	9.0
Pasture/Hay	2.9	1.3
Residential 1-acre	46.8	21.5
Residential 1/2-acre	61.9	28.5
Residential 2-acre	2.1	1.0
Row Crops	15.0	6.9
Transportation	7.8	3.6
Woods	59.3	27.3
Total	217.1	100.0

Impervious (acres)	Total Area Above site	% Impervious
22.3	217.1	10.3

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Minimally Degraded"

Recommendations:

- Habitat assessment results were mixed for this site, but biological community observed is trending toward more than expected impairment based on the observed habitat quality.
- Additional assessments necessary to determine feasibility of stormwater best management practices retrofits on residential land uses.
- Habitat impairments include excessive channel width, resulting in poor baseflow habitat, and poor pool quality associated with excessive sediment inputs. Additional assessments are recommended to determine feasibility, correctability of observed impacts.

21-02 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.57

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	3
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	22
EPT Taxa	5
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	13
Scraper Taxa	2
% Climbers	25.8

Taxa List

Naididae	1
Lumbriculidae	1
Crangonyx	19
Gammarus	2
Caecidotea	6
Hoperius	1
Hydroporus	2
Chironomidae	1
Chironomidae	1
Brillia	2
Eukiefferiella	6
Harnischia	2
Hydrobaenus	3
Larsia	2
Parametriocnemus	1
Polypedilum	16
Thienemannimyia	3
Chrysops	1
Dicranota	5
Calopteryx	1
Haploperla	1
Amphinemura	7
Eccoptura	1
Limnephilidae	1
Ironoquia	3
Total Individuals	**89**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	217.1
Remoteness	81
Percent Shading	100
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	82
Bank Stability	81
PHI Score	90.5
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	5
Bank Stability- Right Bank	8
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	9
Channel Alteration	20
Channel Sinuosity	16
Pool Substrate Characterization	13
Pool Variability	11
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	13
Epifaunal Substrate	16
EPA Habitat Score	149
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	7.9
pH	7.00
Conductivity (umhos/cm)	166.8
Temperature (°C)	16.44
TDS (mg/L)	106.7
Turbidity (NTUs)	10.6

21-03 Ferry Branch Sampling Unit


Downstream


Upstream

Location/Site Access: North of Green Meadows Road.
ADC Map: 28C10
Latitude/Longitude: 38.835858 / 76.669800

Land Use Analysis:

Land Use	Acres	% Area
Commercial	14.7	0.7
Open Space	79.7	3.8
Pasture/Hay	310.6	14.7
Residential 1-acre	59.1	2.8
Residential 1/2-acre	194.6	9.2
Residential 2-acre	74.0	3.5
Row Crops	437.2	20.7
Transportation	28.2	1.3
Water	1.1	0.1
Woods	912.8	43.2
Total	**2112.0**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
22.3	217.1	10.3

Results:

- Biological condition: "Good"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are as expected for observed level of habitat quality.
- Protect current watershed conditions to maintain high quality riparian area system.
- Determine need for best management practices installation on upstream agricultural lands.
- Only minor streambank erosion observed here. Determine need for correction with additional assessments.

21-03 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Good
BIBI Score	4.43

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	3
Number of Ephemeroptera	5
% Intolerant to Urban	3
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	25
EPT Taxa	10
% Ephemeroptera	6.1
Number of Ephemeroptera	2
% Intolerant to Urban	10
Scraper Taxa	4
% Climbers	32.3

Taxa List

Tubificidae	1
Lumbriculidae	1
Crangonyx	9
Gammarus	3
Helichus	1
Hydroporus	1
Tropisternus	2
Chironomidae (larva)	1
Chironomidae (pupa)	2
Brillia	3
Parametriocnemus	17
Paratanytarsus	1
Paratendipes	5
Polypedilum	23
Thienemannimyia	3
Simulium	6
Tipula	2
Baetis	5
Stenonema	1
Boyeria	1
Amphinemura	2
Eccoptura	1
Isoperla	1
Trichoptera	1
Cheumatopsyche	1
Ironoquia	3
Lype	1
Neophylax	1
Total Individuals	**99**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	2112.0
Remoteness	100
Percent Shading	100
Epifaunal Substrate	100
Instream Habitat	86
Instream Wood Debris	65
Bank Stability	84
PHI Score	89.0
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	7
Bank Stability- Right Bank	7
Vegetative Protection- Left Bank	10
Vegetative Protection- Right Bank	10
Channel Flow Status	14
Channel Alteration	20
Channel Sinuosity	14
Pool Substrate Characterization	13
Pool Variability	14
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	13
Epifaunal Substrate	17
EPA Habitat Score	159
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	8.18
pH	7.10
Conductivity (umhos/cm)	161.6
Temperature (°C)	16.54
TDS (mg/L)	103.4
Turbidity (NTUs)	10.9

21-04 Ferry Branch Sampling Unit


Upstream


Downstream

Location/Site Access: Just north of end of Farmhouse Lane.
ADC Map: 28J11
Latitude/Longitude: 38.829363 / 76.634006

Land Use Analysis:

Land Use	Acres	% Area
Commercial	5.0	1.5
Open Space	11.7	3.4
Pasture/Hay	72.9	21.4
Residential 1-acre	14.9	4.4
Residential 1/2-acre	10.0	2.9
Residential 2-acre	14.1	4.1
Row Crops	101.3	29.7
Transportation	8.3	2.4
Woods	102.3	30.1
Total	**340.5**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
13.7	340.5	4.0

Results:

- Biological condition: "Poor"
- Habitat scores:
  - RBP: "Supporting"
  - MPHI: "Minimally Degraded"

Recommendations:

- Biological community is of lower quality expected for observed habitat conditions.
- Perform assessment to determine if a water quality impairment depressing biological community exists.
- Habitat scores show depressed levels of necessary habitat for macroinvertabrates. Determine if epifaunal substrate could be enhanced in this reach.
- Determine the feasibility of best management practice implementation on upstream agricultural lands, as necessary.

21-04 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.14

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	1
% Climbers	5

Calculated Metric Values

Total Taxa	14
EPT Taxa	4
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	7
Scraper Taxa	0
% Climbers	20.0

Taxa List

Crangonyx	53
Gammarus	8
Caecidotea	2
Chironomidae	1
Larsia	1
Polypedilum	19
Thienemanniella	1
Thienemannimyia	1
Hemerodromia	1
Dicranota	2
Calopteryx	1
Amphinemura	2
Cheumatopsyche	2
Ironoquia	5
Pycnopsyche	1

Total Individuals **100**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	340.5
Remoteness	100
Percent Shading	91
Epifaunal Substrate	94
Instream Habitat	99
Instream Wood Debris	59
Bank Stability	67

PHI Score	84.9
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	3
Bank Stability- Right Bank	5
Vegetative Protection- Left Bank	8
Vegetative Protection- Right Bank	8
Channel Flow Status	17
Channel Alteration	20
Channel Sinuosity	6
Pool Substrate Characterization	16
Pool Variability	9
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	16
Epifaunal Substrate	13

EPA Habitat Score	141
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.64
pH	7.10
Conductivity (umhos/cm)	189.2
Temperature (°C)	14.95
TDS (mg/L)	121.3
Turbidity (NTUs)	24.6

21-05 Ferry Branch Sampling Unit

Upstream

Downstream

Location/Site Access: Just west of Green Meadows Road and Ed Prout Road intersection.
ADC Map: 28B11
Latitude/Longitude: 38.830069 / 76.677189

Land Use Analysis:

Land Use	Acres	% Area
Commercial	1.7	0.9
Open Space	19.5	9.8
Pasture/Hay	0.4	0.2
Residential 1-acre	36.9	18.5
Residential 1/2-acre	61.9	31.1
Residential 2-acre	2.1	1.1
Row Crops	15.0	7.5
Transportation	7.6	3.8
Woods	54.0	27.1
Total	**199.2**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
21.2	199.2	10.7

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Supporting"
    - MPHI: "Minimally Degraded"

Recommendations:

- Habitat assessment results were mixed for this site, but biological community observed is trending toward more than expected impairment based on the observed habitat quality.
- Some impairment noted in right bank riparian area. Pool quality was judged marginal. Additional investigation is necessary to determine need for any restoration.
- Determine necessity and feasibility of best management practice installation on residential land uses.

21-05 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.00

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	3
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	19
EPT Taxa	4
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	20
Scraper Taxa	2
% Climbers	25.0

Taxa List

Tubificidae	1
Crangonyx	22
Cyclopoida	1
Caecidotea	2
Hoperius	1
Hydroporus	3
Chironomidae (pupa)	1
Eukiefferiella	7
Hydrobaenus	2
Paratanytarsus	1
Polypedilum	17
Thienemannimyia	7
Simulium	1
Dicranota	10
Tipula	1
Nigronia	1
Calopteryx	2
Amphinemura	13
Diplectrona	2
Limnephilidae (pupa)	1
Ironoquia	4

Total Individuals **100**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	199.2
Remoteness	59
Percent Shading	100
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	82
Bank Stability	97

PHI Score	89.9
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	9
Bank Stability- Right Bank	9
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	15
Channel Alteration	20
Channel Sinuosity	7
Pool Substrate Characterization	16
Pool Variability	10
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	4
Sediment Deposition	13
Epifaunal Substrate	14

EPA Habitat Score	145
EPA Narrative Ranking	Supporting

Water Chemistry

Dissolved Oxygen (mg/L)	8.2
pH	7.00
Conductivity (umhos/cm)	174.7
Temperature (°C)	16.07
TDS (mg/L)	111.9
Turbidity (NTUs)	5.8

21-06 Ferry Branch Sampling Unit

Upstream

Downstream

Location/Site Access: Northwest of Grenock Drive.
ADC Map: 28F11
Latitude/Longitude: 38.827017 / 76.654389

Land Use Analysis:

Land Use	Acres	% Area
Commercial	6.4	0.4
Open Space	43.7	2.7
Pasture/Hay	281.7	17.6
Residential 1-acre	52.0	3.2
Residential 1/2-acre	110.9	6.9
Residential 2-acre	69.1	4.3
Row Crops	410.7	25.6
Transportation	22.2	1.4
Water	1.1	0.1
Woods	606.3	37.8
Total	**1604.0**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
52.6	1604.0	3.3

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are slightly impaired in comparison to observed habitat conditions.
- Consider possible water quality assessment to determine if site water chemistry is depressing biological community.
- Some moderate bank erosion observed. Additional investigation needed to determine if restoration required.
- Determine the feasibility of best management practice implementation on upstream agricultural lands.

21-06 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.29

Metric Scores

Total Taxa	5
EPT Taxa	3
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	3
Scraper Taxa	1
% Climbers	5

Calculated Metric Values

Total Taxa	25
EPT Taxa	4
% Ephemeroptera	4.2
Number of Ephemeroptera	1
% Intolerant to Urban	19
Scraper Taxa	0
% Climbers	26.3

Taxa List

Naididae	2
Tubificidae	5
Lumbriculidae	1
Crangonyx	12
Gammarus	1
Caecidotea	2
Agabus	1
Hydroporus	1
Dineutus	1
Tropisternus	1
Chironomidae	2
Chironomidae	1
Brillia	2
Eukiefferiella	8
Larsia	1
Parametriocnemus	3
Polypedilum	17
Potthastia	1
Tanytarsus	1
Thienemannimyia	2
Simulium	4
Dicranota	2
Baetis	4
Calopteryx	1
Amphinemura	5
Cheumatopsyche	2
Ironoquia	12
Total Individuals	**95**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	1604.0
Remoteness	92
Percent Shading	91
Epifaunal Substrate	89
Instream Habitat	88
Instream Wood Debris	53
Bank Stability	74
PHI Score	81.3
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	7
Bank Stability- Right Bank	6
Vegetative Protection- Left Bank	6
Vegetative Protection- Right Bank	6
Channel Flow Status	14
Channel Alteration	20
Channel Sinuosity	16
Pool Substrate Characterization	15
Pool Variability	16
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	13
Epifaunal Substrate	14
EPA Habitat Score	153
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	8.57
pH	7.10
Conductivity (umhos/cm)	163
Temperature (°C)	15.43
TDS (mg/L)	104.3
Turbidity (NTUs)	13.8

21-07 Ferry Branch Sampling Unit

Upstream

Downstream

Location/Site Access: North of Meadow Farms Court.
ADC Map: 28C10
Latitude/Longitude: 38.834907 / 76.669007

Land Use Analysis:

Land Use	Acres	% Area
Commercial	14.7	0.7
Open Space	79.7	3.8
Pasture/Hay	310.6	14.7
Residential 1-acre	59.1	2.8
Residential 1/2-acre	194.6	9.2
Residential 2-acre	74.0	3.5
Row Crops	437.2	20.7
Transportation	28.2	1.3
Water	1.1	0.1
Woods	910.0	43.1
Total	**2109.2**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
77.5	2109.2	3.7

Results:

- Biological condition: "Fair"
- Habitat scores:
  - RBP: "Comparable"
  - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are slightly impaired in comparison to observed habitat conditions.
- Consider possible water quality assessment to determine if site water chemistry is depressing biological community.
- ~10 foot high eroding bank within reach. Additional assessment necessary to determine if restoration / stabilization necessary.
- Determine necessity and feasibility of best management practice installation on agricultural land uses.

21-07 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.86

Metric Scores

Total Taxa	5
EPT Taxa	5
% Ephemeroptera	5
Number of Ephemeroptera	3
% Intolerant to Urban	3
Scraper Taxa	1
% Climbers	5

Calculated Metric Values

Total Taxa	24
EPT Taxa	6
% Ephemeroptera	15.3
Number of Ephemeroptera	1
% Intolerant to Urban	17
Scraper Taxa	0
% Climbers	35.1

Taxa List

Lumbriculidae	1
Crangonyx	4
Gammarus	4
Caecidotea	1
Hydroporus	1
Chironomidae (larva)	1
Paralauterborniella	1
Brillia	3
Eukiefferiella	13
Glyptotendipes	4
Parametriocnemus	2
Paratanytarsus	5
Polypedilum	18
Thienemannimyia	3
Simulium	5
Tipula	1
Baetis	17
Nigronia	1
Boyeria	1
Calopteryx	1
Amphinemura	12
Eccoptura	1
Isoperla	2
Cheumatopsyche	7
Ironoquia	2

Total Individuals **111**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	2109.2
Remoteness	100
Percent Shading	100
Epifaunal Substrate	88
Instream Habitat	97
Instream Wood Debris	88
Bank Stability	84

PHI Score	92.7
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	6
Bank Stability- Right Bank	9
Vegetative Protection- Left Bank	7
Vegetative Protection- Right Bank	9
Channel Flow Status	16
Channel Alteration	20
Channel Sinuosity	15
Pool Substrate Characterization	17
Pool Variability	18
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	14
Epifaunal Substrate	15

EPA Habitat Score	166
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	8.15
pH	7.00
Conductivity (umhos/cm)	162.4
Temperature (°C)	16.53
TDS (mg/L)	103.9
Turbidity (NTUs)	10.5

21-08 Ferry Branch Sampling Unit

Upstream

Downstream

Location/Site Access: Near the end of Ben Jones Lane.
ADC Map: 28B9
Latitude/Longitude: 38.834907 / 76.669007

Land Use Analysis:

Land Use	Acres	% Area
Commercial	14.9	0.7
Open Space	80.5	3.6
Pasture/Hay	311.3	13.9
Residential 1-acre	68.6	3.1
Residential 1/2-acre	194.4	8.7
Residential 2-acre	74.4	3.3
Row Crops	447.3	20.0
Transportation	27.6	1.2
Water	1.1	0.0
Woods	1015.6	45.4
Total	**2235.7**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
78.3	2235.7	3.5

Results:

- Biological condition: "Good"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological community expected for habitat quality observed.
- Preserve upstream watershed quality to protect this high quality riverine system.
- Somewhat high level of sedimentation observed during this assessment. Additional assessments needed to determine if significant problem exists.
- Determine need and feasibility of best management practice installation on agricultural lands and residential areas in upstream watershed.

21-08 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Good
BIBI Score	4.14

Metric Scores

Total Taxa	3
EPT Taxa	5
% Ephemeroptera	3
Number of Ephemeroptera	5
% Intolerant to Urban	3
Scraper Taxa	5
% Climbers	5

Calculated Metric Values

Total Taxa	20
EPT Taxa	7
% Ephemeroptera	9.1
Number of Ephemeroptera	2
% Intolerant to Urban	10
Scraper Taxa	2
% Climbers	39.4

Taxa List

Tubificidae	1
Crangonyx	14
Bezzia/Palpomyia	4
Chironomidae (larva)	2
Chironomidae (pupa)	2
Eukiefferiella	14
Paralauterborniella	2
Parametriocnemus	3
Polypedilum	28
Thienemannimyia	2
Simulium	1
Dicranota	1
Baetis	8
Stenonema	1
Boyeria	1
Calopteryx	2
Somatochlora	1
Haploperla	2
Amphinemura	4
Eccoptura	1
Cheumatopsyche	4
Ironoquia	1
Total Individuals	**99**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	2235.7
Remoteness	100
Percent Shading	79
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	70
Bank Stability	92
PHI Score	90.1
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	9
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	14
Channel Alteration	20
Channel Sinuosity	14
Pool Substrate Characterization	18
Pool Variability	17
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	11
Epifaunal Substrate	19
EPA Habitat Score	168
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	8.32
pH	7.10
Conductivity (umhos/cm)	154.4
Temperature (°C)	16.5
TDS (mg/L)	98.8
Turbidity (NTUs)	12.9

21-09 Ferry Branch Sampling Unit

Upstream

Downstream

Location/Site Access: Near the end of Ben Jones Lane.
ADC Map: 28B9
Latitude/Longitude: 38.834907 / 76.669007

Land Use Analysis:

Land Use	Acres	% Area
Commercial	15.1	0.6
Open Space	100.7	3.9
Pasture/Hay	370.0	14.4
Residential 1-acre	95.7	3.7
Residential 1/2-acre	213.5	8.3
Residential 2-acre	82.4	3.2
Row Crops	487.3	18.9
Transportation	34.1	1.3
Water	1.7	0.1
Woods	1171.3	45.5
Total	**2571.8**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
89.6	2571.8	3.5

Results:

- Biological condition: "Fair"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"

Recommendations:

- Biological conditions are slightly impaired in comparison to observed habitat conditions.
- Consider possible water quality assessment to determine if site water chemistry is depressing biological community.
- ~10 foot high eroding bank within sampling reach. Additional assessment necessary to determine if restoration / stabilization is necessary.
- Determine need and feasibility of best management practice installation on agricultural lands and residential areas in upstream watershed.

21-09 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Fair
BIBI Score	3.00

Metric Scores

Total Taxa	3
EPT Taxa	5
% Ephemeroptera	3
Number of Ephemeroptera	3
% Intolerant to Urban	1
Scraper Taxa	1
% Climbers	5

Calculated Metric Values

Total Taxa	19
EPT Taxa	5
% Ephemeroptera	6.6
Number of Ephemeroptera	1
% Intolerant to Urban	8
Scraper Taxa	0
% Climbers	39.6

Taxa List

Naididae	3
Tubificidae	2
Crangonyx	13
Hydroporus	1
Bezzia/Palpomyia	1
Chironomidae (pupa)	4
Eukiefferiella	9
Parametriocnemus	5
Paratanytarsus	2
Polypedilum	28
Thienemannimyia	3
Simulium	3
Tipula	1
Baetis	6
Calopteryx	1
Somatochlora	1
Haploperla	2
Amphinemura	3
Cheumatopsyche	2
Ironoquia	1

Total Individuals **91**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	2571.8
Remoteness	97
Percent Shading	85
Epifaunal Substrate	100
Instream Habitat	100
Instream Wood Debris	77
Bank Stability	92
PHI Score	91.8
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	9
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	9
Channel Flow Status	15
Channel Alteration	20
Channel Sinuosity	16
Pool Substrate Characterization	17
Pool Variability	18
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	10
Sediment Deposition	14
Epifaunal Substrate	19
EPA Habitat Score	174
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	8.35
pH	7.10
Conductivity (umhos/cm)	147.7
Temperature (°C)	16.4
TDS (mg/L)	93.2
Turbidity (NTUs)	12.4

21-10 Ferry Branch Sampling Unit

Downstream

Upstream

Location/Site Access: Located just south of Route 4 and Route 408 intersection.
ADC Map: 31H-J2
Latitude/Longitude: 38.808209 / 76.701471

Land Use Analysis:

Land Use	Acres	% Area
Commercial	8.0	0.7
Open Space	42.1	3.7
Pasture/Hay	12.4	1.1
Residential 1-acre	46.4	4.1
Residential 1/2-acre	31.0	2.8
Residential 1/8-acre	93.0	8.3
Residential 2-acre	28.5	2.5
Row Crops	141.4	12.6
Transportation	60.9	5.4
Water	1.8	0.2
Woods	659.7	58.6
Total	**1125.3**	**100.0**

Impervious (acres)	Total Area Above site	% Impervious
116.4	2571.8	3.5

Results:

- Biological condition: "Poor"
- Habitat scores:
    - RBP: "Comparable"
    - MPHI: "Minimally Degraded"
    -

Recommendations:

- Biological conditions significantly worse than expected given observed habitat quality.
- Consider possible water quality assessment to determine if site water chemistry is depressing biological community.
- Determine need for possible best management practice installation on agricultural lands in the contributing drainage area.
- Habitat impairments observed include poor riparian area width in places along with marginal pool habitat. Determine need, feasibility of correction with additional assessments.

21-10 Ferry Branch Sampling Unit

Biological Condition

BIBI and Metric Scores

Narrative Rating	Poor
BIBI Score	2.14

Metric Scores

Total Taxa	3
EPT Taxa	3
% Ephemeroptera	1
Number of Ephemeroptera	1
% Intolerant to Urban	1
Scraper Taxa	3
% Climbers	3

Calculated Metric Values

Total Taxa	17
EPT Taxa	2
% Ephemeroptera	0.0
Number of Ephemeroptera	0
% Intolerant to Urban	5
Scraper Taxa	1
% Climbers	3.6

Taxa List

Naididae	3
Tubificidae	1
Lumbriculidae	1
Crangonyx	5
Caecidotea	49
Oulimnius	1
Chironomidae (larva)	3
Brillia	1
Orthocladiinae	4
Orthocladius	2
Parametriocnemus	1
Paratanytarsus	21
Polypedilum	3
Rheotanytarsus	1
Thienemannimyia	5
Simulium	2
Calopteryx	1
Cheumatopsyche	3
Ironoquia	4

Total Individuals **111**

Physical Habitat

Maryland Biological Stream Survey PHI

Drainage area (acres)	1125.3
Remoteness	27
Percent Shading	100
Epifaunal Substrate	80
Instream Habitat	92
Instream Wood Debris	92
Bank Stability	95
PHI Score	81.1
PHI Narrative Ranking	Minimally Degraded

EPA Rapid Bioassessment

Bank Stability- Left Bank	8
Bank Stability- Right Bank	10
Vegetative Protection- Left Bank	9
Vegetative Protection- Right Bank	10
Channel Flow Status	19
Channel Alteration	20
Channel Sinuosity	7
Pool Substrate Characterization	14
Pool Variability	11
Riparian Vegetative Zone Width- Left Bank	10
Riparian Vegetative Zone Width- Right Bank	4
Sediment Deposition	18
Epifaunal Substrate	13
EPA Habitat Score	153
EPA Narrative Ranking	Comparable

Water Chemistry

Dissolved Oxygen (mg/L)	7.79
pH	7.10
Conductivity (umhos/cm)	226.3
Temperature (°C)	13.87
TDS (mg/L)	144.7
Turbidity (NTUs)	35.3

Appendix B:
Master Taxa List

Lower Patapsco Sampling Unit—03

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
03-01	Basommatophora	Physidae	not identified	not identified	Physidae	1
03-01	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	7
03-01	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	1
03-01	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1
03-01	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	5
03-01	Diptera	Chironomidae	Brillia	sp.	Brillia	24
03-01	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	14
03-01	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	24
03-01	Diptera	Chironomidae	Nanocladius	sp.	Nanocladius	5
03-01	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	34
03-01	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	14
03-01	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	1
03-01	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	2
03-01	Diptera	Chironomidae	Thienemannimyia	gp.	Thienemannimyia	8
03-01	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	1
03-01	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	1
03-02	Basommatophora	Physidae	not identified	not identified	Physidae	2
03-02	Haplotaxida	Tubificidae w.o.h.c.	not Identified	not Identified	Tubificidae	4
03-02	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	34
03-02	Collembola	not identified	not identified	not identified	Collembola	1
03-02	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	6
03-02	Coleoptera	Dytiscidae	Copelatus	sp.	Copelatus	4
03-02	Coleoptera	Dytiscidae	Hoperius	sp.	Hoperius	2
03-02	Coleoptera	Lampyridae	not identified	not identified	Lampyridae	1
03-02	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	2
03-02	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1
03-02	Diptera	Chironomidae	Chironomus	sp.	Chironomus	1
03-02	Diptera	Chironomidae	Glyptotendipes	sp.	Glyptotendipes	1
03-02	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	9
03-02	Diptera	Chironomidae	Larsia	sp.	Larsia	2
03-02	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	1
03-02	Diptera	Chironomidae	Smittia	sp.	Smittia	1
03-02	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	6
03-02	Diptera	Culicidae	not identified	not identified	Culicidae	1
03-02	Diptera	Tipulidae	Molophilus	sp.	Molophilus	1
03-02	Lepidoptera	Noctuidae	not Identified	not Identified	Noctuidae	3
03-02	Odonata	Coenagrionidae	Ischnura	sp.	Ischnura	2
03-02	not identified	not identified	not identified	not identified	Mollusca	3
03-02	not identified	not identified	not identified	not identified	Isopoda	2
03-02	not identified	not identified	not identified	not identified	Diplopoda	5
03-02	not identified	not identified	not identified	not identified	Diptera	2
03-02	not identified	not identified	not identified	not identified	Coleoptera	5
03-04	Basommatophora	Physidae	not identified	not identified	Physidae	1
03-04	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	2
03-04	Haplotaxida	Tubificidae w.o.h.c.	not Identified	not Identified	Tubificidae	4
03-04	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	14
03-04	Amphipoda	not Identified	not Identified	not Identified	Amphipoda	1
03-04	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	1
03-04	Coleoptera	Dryopidae	Helichus	sp.	Helichus	1
03-04	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	2

Lower Patapsco Sampling Unit—03

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
03-04	Coleoptera	Dytiscidae	Hoperius	sp.	Hoperius	3
03-04	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	2
03-04	Coleoptera	Elmidae	Stenelmis	sp.	Stenelmis	1
03-04	Diptera	not Identified	not Identified	not Identified	Diptera	1
03-04	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	3
03-04	Diptera	Chironomidae	Chironomus	sp.	Chironomus	1
03-04	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	9
03-04	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	45
03-04	Diptera	Chironomidae	Larsia	sp.	Larsia	2
03-04	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	9
03-04	Diptera	Chironomidae	Parachironomus	sp.	Parachironomus	1
03-04	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	4
03-04	Diptera	Culicidae	not identified	not identified	Culicidae	1
03-04	Diptera	Simuliidae	Simulium	sp.	Simulium	2
03-04	Megaloptera	Sialidae	Sialis	sp.	Sialis	1
03-04	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
03-04	Odonata	Corduliidae	Somatochlora	sp.	Somatochlora	1
03-05	Basommatophora	Physidae	not identified	not identified	Physidae	1
03-05	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	1
03-05	Haplotaxida	Tubificidae	not Identified	not Identified	Tubificidae	1
03-05	Cyclopoida	not identified	not identified	not identified	Cyclopoida	1
03-05	Coleoptera	Dryopidae	Helichus	sp.	Helichus	1
03-05	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	6
03-05	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	1
03-05	Coleoptera	Dytiscidae	Hoperius	sp.	Hoperius	9
03-05	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	3
03-05	Coleoptera	Hydrophilidae	Cymbiodyta	sp.	Cymbiodyta	1
03-05	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
03-05	Diptera	Chironomidae	not identified	not identified	Chironomidae	4
03-05	Diptera	Chironomidae	not identified	not identified	Chironomidae	2
03-05	Diptera	Chironomidae	Diamesa	sp.	Diamesa	1
03-05	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	7
03-05	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	4
03-05	Diptera	Chironomidae	Larsia	sp.	Larsia	2
03-05	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	1
03-05	Diptera	Chironomidae	Stenochironomus	sp.	Stenochironomus	1
03-05	Diptera	Chironomidae	Tanytarsini	not identified	Tanytarsini	1
03-05	Diptera	Chironomidae	Thienemannimyia	gp.	Thienemannimyia	8
03-05	Diptera	Simuliidae	Simulium	sp.	Simulium	11
03-05	Diptera	Tipulidae	Dicranota	sp.	Dicranota	1
03-05	Diptera	Tipulidae	Tipula	sp.	Tipula	15
03-05	Lepidoptera	Noctuidae	not Identified	not identified	Noctuidae	1
03-05	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	3
03-05	Plecoptera	Leuctridae	not Identified	not identified	Leuctridae	6
03-05	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	1
03-05	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	11
03-05	Trichoptera	Hydropsychidae	Hydropsyche	sp.	Hydropsyche	1
03-05	Trichoptera	Hydropsychidae	Symphytopsyche	sp.	Symphytopsyche	2
03-05	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	4
03-05	Trichoptera	Uenoidae	Neophylax	sp.	Neophylax	1
03-07	Basommatophora	Physidae	not identified	not identified	Physidae	1

Lower Patapsco Sampling Unit—03

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
03-07	Haplotaxida	not identified	not identified	not identified	Haplotaxida	1
03-07	Haplotaxida	Naididae	not identified	not identified	Naididae	12
03-07	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	2
03-07	Collembola	not identified	not identified	not identified	Collembola	1
03-07	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	5
03-07	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	1
03-07	Coleoptera	Dytiscidae	Hoperius	sp.	Hoperius	2
03-07	Coleoptera	Dytiscidae	Hydrobius	sp.	Hydrobius	1
03-07	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	4
03-07	Coleoptera	Hydrophilidae	Cymbiodyta	sp.	Cymbiodyta	1
03-07	Coleoptera	Hydrophilidae	Hydrobius	sp.	Hydrobius	1
03-07	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	2
03-07	Diptera	Chironomidae	not identified	not identified	Chironomidae	2
03-07	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	43
03-07	Diptera	Chironomidae	Larsia	sp.	Larsia	3
03-07	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	9
03-07	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	1
03-07	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	1
03-07	Diptera	Chironomidae	Thienemannimyia	gp.	Thienemannimyia	3
03-07	Diptera	Simuliidae	Simulium	sp.	Simulium	9
03-07	Diptera	Tipulidae	Dicranota	sp.	Dicranota	1
03-07	Diptera	Tipulidae	Tipula	sp.	Tipula	11
03-07	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	7
03-07	Odonata	Corduliidae	Somatochlora	sp.	Somatochlora	4
03-07	Plecoptera	Leuctridae	not identified	not identified	Leuctridae	9
03-07	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	1
03-07	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	12
03-07	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	4
03-09	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	1
03-09	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	10
03-09	Diptera	Chironomidae	not identified	not identified	Chironomidae	2
03-09	Diptera	Chironomidae	not identified	not identified	Chironomidae	4
03-09	Diptera	Chironomidae	Brillia	sp.	Brillia	21
03-09	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	4
03-09	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	13
03-09	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	43
03-09	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	4
03-09	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	1
03-09	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	3
03-09	Diptera	Chironomidae	Thienemannimyia	gp.	Thienemannimyia	11
03-09	Diptera	Simuliidae	Simulium	sp.	Simulium	10
03-09	Diptera	Stratiomyidae	Odontomyia	sp.	Odontomyia	1
03-09	Diptera	Tipulidae	Limonia	sp.	Limonia	1
03-09	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	1
03-09	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	1
03-09	Trichoptera	Hydropsychidae	Hydropsyche	sp.	Hydropsyche	4
03-09	Trichoptera	Philopotamidae	Dolophilodes	sp.	Dolophilodes	3
03-12A	Basommatophora	Physidae	not identified	not identified	Physidae	2
03-12A	Haplotaxida	Haplotaxidae	not identified	not identified	Haplotaxidae	1
03-12A	Haplotaxida	Naididae	not identified	not identified	Naididae	7
03-12A	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	1

Lower Patapsco Sampling Unit—03

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
03-12A	Lumbriculida	Lumbriculidae	not Identified	not Identified	Lumbriculidae	2
03-12A	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	7
03-12A	Diptera	Chironomidae	not identified	not identified	Chironomidae	4
03-12A	Diptera	Chironomidae	Brillia	sp.	Brillia	5
03-12A	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	15
03-12A	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	71
03-12A	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	1
03-12A	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	4
03-12A	Diptera	Chironomidae	Thienemannimyia	gp.	Thienemannimyia	11
03-12A	Diptera	Simuliidae	Simulium	sp.	Simulium	6
03-12A	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	2
03-12A	Trichoptera	Hydropsychidae	not identified	not identified	Hydropsychidae	1
03-12A	Trichoptera	Hydropsychidae	Hydropsyche	sp.	Hydropsyche	2
03-12A	Trichoptera	Philopotamidae	Dolophilodes	sp.	Dolophilodes	2
03-13A	Haplotaxida	Naididae	not identified	not identified	Naididae	2
03-13A	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	2
03-13A	Amphipod	Crangonyctidae	Crangonyx	sp.	Crangonyx	16
03-13A	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	2
03-13A	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
03-13A	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
03-13A	Diptera	Chironomidae	Brillia	sp.	Brillia	21
03-13A	Diptera	Chironomidae	Chironomus	sp.	Chironomus	1
03-13A	Diptera	Chironomidae	Diamesa	sp.	Diamesa	4
03-13A	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	8
03-13A	Diptera	Chironomidae	Larsia	sp.	Larsia	11
03-13A	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	21
03-13A	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	8
03-13A	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	5
03-13A	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	4
03-13A	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	6
03-13A	Diptera	Chironomidae	Thienemannimyia	gp.	Thienemannimyia	4
03-13A	Diptera	Simuliidae	Simulium	sp.	Simulium	4
03-13A	Diptera	Tipulidae	Tipula	sp.	Tipula	3
03-13A	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	1
03-13A	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	3
03-13A	Odonata	Coenagrionidae	Argia	sp.	Argia	1
03-13A	Odonata	Corduliidae	Somatochlora	sp.	Somatochlora	1
03-13A	Trichoptera	Hydropsychidae	Symphytopsyche	sp.	Symphytopsyche	1
03-16A	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	10
03-16A	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	8
03-16A	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	5
03-16A	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	2
03-16A	Coleoptera	Dytiscidae	Copelatus	sp.	Copelatus	17
03-16A	Coleoptera	Dytiscidae	Hoperius	sp.	Hoperius	2
03-16A	Diptera	Chironomidae	Diamesa	sp.	Diamesa	2
03-16A	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	7
03-16A	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	3
03-16A	Diptera	Chironomidae	Paratanytarsus	sp.	Paratanytarsus	1
03-16A	Diptera	Chironomidae	Potthastia	sp.	Potthastia	1
03-16A	Diptera	Tipulidae	Ormosia	sp.	Ormosia	1
03-16A	Lepidoptera	Noctuidae	not identified	not identified	Noctuidae	2

Lower Patapsco Sampling Unit—03

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
03-16A	not identified	not identified	not identified	not identified	Isopoda	1
03-16A	not identified	not identified	not identified	not identified	Diplopoda	1
03-16A	not identified	not identified	not identified	not identified	Diptera	1
03-16A	not identified	not identified	not identified	not identified	Coleoptera	2
03-17A	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	3
03-17A	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	2
03-17A	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	30
03-17A	Cladocera	Daphnidae	not identified	not identified	Daphnidae	1
03-17A	Coleoptera	Dytiscidae	not identified	not identified	Dytiscidae	1
03-17A	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
03-17A	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
03-17A	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
03-17A	Diptera	Chironomidae	Brillia	sp.	Brillia	19
03-17A	Diptera	Chironomidae	Diamesa	sp.	Diamesa	2
03-17A	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	5
03-17A	Diptera	Chironomidae	Larsia	sp.	Larsia	1
03-17A	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	19
03-17A	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	14
03-17A	Diptera	Chironomidae	Paratanytarsus	sp.	Paratanytarsus	1
03-17A	Diptera	Chironomidae	Potthastia	sp.	Potthastia	2
03-17A	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	8
03-17A	Diptera	Chironomidae	Thienemannimyia	gp.	Thienemannimyia	7
03-17A	Diptera	Simuliidae	Simulium	sp.	Simulium	7
03-17A	Diptera	Tipulidae	Tipula	sp.	Tipula	1
03-17A	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	2
03-17A	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	4
03-17A	Odonata	Coenagrionidae	Argia	sp.	Argia	1

Middle Patuxent Sampling Unit—18

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
18-02	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	7
18-02	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	13
18-02	Coleoptera	Ptilodactylidae	Anchytarsus	sp.	Anchytarsus	1
18-02	Coleoptera	Scirtidae	Prionocyphon	sp.	Prionocyphon	1
18-02	Coleoptera	Scirtidae	Scirtes	sp.	Scirtes	1
18-02	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	2
18-02	Diptera	Chironomidae	not identified	not identified	Chironomidae	2
18-02	Diptera	Chironomidae	not identified	not identified	Chironomidae	5
18-02	Diptera	Chironomidae	Brillia	sp.	Brillia	6
18-02	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	6
18-02	Diptera	Chironomidae	Larsia	sp.	Larsia	4
18-02	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	10
18-02	Diptera	Chironomidae	Paratendipes	sp.	Paratendipes	6
18-02	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	7
18-02	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	1
18-02	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	4
18-02	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	11
18-02	Diptera	Empididae	Clinocera	sp.	Clinocera	1
18-02	Diptera	Tipulidae	Dicranota	sp.	Dicranota	2
18-02	Diptera	Tipulidae	Tipula	sp.	Tipula	4
18-02	Lepidoptera	Noctuidae	not identified	not identified	Noctuidae	1
18-02	Megaloptera	Corydalidae	Nigronia	fasciatus	Nigronia	1
18-02	Plecoptera	Chloroperlidae	Haploperla	sp.	Haploperla	5
18-02	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	11
18-02	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	10
18-02	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	1
18-02	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	5
18-02	Trichoptera	Sericostomatidae	Agarodes	sp.	Agarodes	1
18-02	Trichoptera	Uenoidae	Neophylax	sp.	Neophylax	1
18-03	Basommatophora	Physidae	not identified	not identified	Physidae	1
18-03	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	1
18-03	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	6
18-03	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	79
18-03	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	8
18-03	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	4
18-03	Coleoptera	Lampyridae	not identified	not identified	Lampyridae	1
18-03	Coleoptera	Ptilodactylidae	Anchytarsus	sp.	Anchytarsus	1
18-03	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
18-03	Diptera	Chironomidae	Brillia	sp.	Brillia	3
18-03	Diptera	Chironomidae	Diamesa	sp.	Diamesa	5
18-03	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	6
18-03	Diptera	Chironomidae	Orthocladiinae	not identified	Orthocladiinae	3
18-03	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	3
18-03	Diptera	Chironomidae	Paracladopelma	sp.	Paracladopelma	1
18-03	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	6
18-03	Diptera	Chironomidae	Paratanytarsus	sp.	Paratanytarsus	1

Middle Patuxent Sampling Unit—18

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
18-03	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	4
18-03	Diptera	Chironomidae	Potthastia	sp.	Potthastia	1
18-03	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	1
18-03	Diptera	Chironomidae	Tanytarsini	not identified	Tanytarsini	1
18-03	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	3
18-03	Diptera	Empididae	Clinocera	sp.	Clinocera	1
18-03	Diptera	Simuliidae	Simulium	sp.	Simulium	2
18-03	Diptera	Tipulidae	Dicranota	sp.	Dicranota	4
18-03	Lepidoptera	not Identified	not identified	not identified	Lepidoptera	1
18-03	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	1
18-03	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
18-03	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	1
18-03	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	1
18-03	not identified	not identified	not identified	not identified	Nematoda	1
18-04	Basommatophora	Planorbidae	not identified	not identified	Planorbidae	1
18-04	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	1
18-04	Haplotaxida	Naididae	not identified	not identified	Naididae	1
18-04	Haplotaxida	Tubificidae	Vejdovskyella	comata	Vejdovskyella	1
18-04	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	1
18-04	Cyclopoida	not identified	not identified	not identified	Cyclopoida	2
18-04	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	1
18-04	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	3
18-04	Coleoptera	Gyrinidae	Dineutus	sp.	Dineutus	2
18-04	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
18-04	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
18-04	Diptera	Chironomidae	not identified	not identified	Chironomidae	6
18-04	Diptera	Chironomidae	Apedilum	sp.	Paralauterborniella	1
18-04	Diptera	Chironomidae	Diamesa	sp.	Diamesa	13
18-04	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	11
18-04	Diptera	Chironomidae	Larsia	sp.	Larsia	2
18-04	Diptera	Chironomidae	Metriocnemus	sp.	Metriocnemus	1
18-04	Diptera	Chironomidae	Omisus	sp.	Omisus	1
18-04	Diptera	Chironomidae	Orthocladiinae	sp.	Orthocladiinae	4
18-04	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	61
18-04	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	15
18-04	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	7
18-04	Diptera	Chironomidae	Potthastia	sp.	Potthastia	2
18-04	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	5
18-04	Diptera	Chironomidae	Thienemanniella	gp.	Thienemanniella	5
18-04	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	7
18-04	Diptera	Empididae	Hemerodromia	sp.	Hemerodromia	1
18-04	Diptera	Simuliidae	Simulium	sp.	Simulium	2
18-04	Diptera	Tipulidae	Hexatoma	sp.	Hexatoma	5
18-04	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	1
18-04	Plecoptera	Chloroperlidae	Haploperla	sp.	Haploperla	1
18-04	Odonata	Aeshnidae	Boyeria	sp.	Boyeria	1
18-04	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	2
18-04	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	1

Middle Patuxent Sampling Unit—18

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
18-04	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	1
18-05	Tricladida	Planariidae	not identified	not identified	Planariidae	1
18-05	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	1
18-05	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	1
18-05	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	97
18-05	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	17
18-05	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
18-05	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	1
18-05	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	3
18-05	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	5
18-05	Trichoptera	Philopotamidae	Dolophilodes	sp.	Dolophilodes	3
18-05	Trichoptera	Phryganeidae	Oligostomis	sp.	Oligostomis	1
18-05	not identified	not identified	not identified	not identified	Nematoda	1
18-06	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	2
18-06	Haplotaxida	Naididae	not identified	not identified	Naididae	3
18-06	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	45
18-06	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	1
18-06	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	5
18-06	Collembola	Isotomidae	not identified	not identified	Isotomidae	3
18-06	Coleoptera	Elmidae	Macronychus	sp.	Macronychus	1
18-06	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
18-06	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	10
18-06	Diptera	Chironomidae	Larsia	sp.	Larsia	1
18-06	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	25
18-06	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	18
18-06	Diptera	Chironomidae	Potthastia	sp.	Potthastia	2
18-06	Diptera	Chironomidae	Psectrocladius	sp.	Psectrocladius	5
18-06	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	1
18-06	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	3
18-06	Diptera	Empididae	not identified	not identified	Empididae	2
18-06	Diptera	Empididae	Hemerodromia	sp.	Hemerodromia	1
18-06	Diptera	Simuliidae	Simulium	sp.	Simulium	1
18-06	Diptera	Tipulidae	Hexatoma	sp.	Hexatoma	1
18-06	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	7
18-06	Odonata	Aeshnidae	Boyeria	sp.	Boyeria	2
18-06	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	3
18-06	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	2
18-06	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	2
18-06	Trichoptera	Polycentropodidae	Polycentropus	sp.	Polycentropus	1
18-09	Haplotaxida	Naididae	not identified	not identified	Naididae	1
18-09	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	1
18-09	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	4
18-09	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	2
18-09	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	47
18-09	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
18-09	Diptera	not identified	not identified	not identified	Diptera	3
18-09	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	2
18-09	Diptera	Chironomidae	Brillia	sp.	Brillia	4

Middle Patuxent Sampling Unit—18

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
18-09	Diptera	Chironomidae	Chironomus	sp.	Chironomus	1
18-09	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	8
18-09	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	4
18-09	Diptera	Chironomidae	Larsia	sp.	Larsia	5
18-09	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	8
18-09	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	4
18-09	Diptera	Chironomidae	Paratendipes	sp.	Paratendipes	1
18-09	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	9
18-09	Diptera	Chironomidae	Rheotanytarsus	sp.	Rheotanytarsus	1
18-09	Diptera	Chironomidae	Thienemanniella	gp.	Thienemanniella	4
18-09	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	11
18-09	Diptera	Empididae	Hemerodromia	sp.	Hemerodromia	2
18-09	Diptera	Simuliidae	Simulium	sp.	Simulium	1
18-09	Diptera	Tipulidae	Dicranota	sp.	Dicranota	1
18-09	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	3
18-09	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
18-09	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	1
18-09	Trichoptera	Limnephilidae	Hydropsyche	sp.	Hydropsyche	4
18-09	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	1
18-09	Trichoptera	Polycentropodidae	Polycentropus	sp.	Polycentropus	5
18-11A	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	3
18-11A	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	24
18-11A	Coleoptera	Ptilodactylidae	Anchytarsus	sp.	Anchytarsus	7
18-11A	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
18-11A	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
18-11A	Diptera	Chironomidae	Alotanypus	sp.	Alotanypus	1
18-11A	Diptera	Chironomidae	Chironomus	sp.	Chironomus	1
18-11A	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	4
18-11A	Diptera	Chironomidae	Larsia	sp.	Larsia	2
18-11A	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	10
18-11A	Diptera	Chironomidae	Parakiefferiella	sp.	Parakiefferiella	4
18-11A	Diptera	Chironomidae	Paratendipes	sp.	Paratendipes	3
18-11A	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	6
18-11A	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	6
18-11A	Diptera	Empididae	Hemerodromia	sp.	Hemerodromia	2
18-11A	Diptera	Simuliidae	Simulium	sp.	Simulium	15
18-11A	Diptera	Tabanidae	Chrysops	sp.	Chrysops	1
18-11A	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	1
18-11A	Megaloptera	Corydalidae	Nigronia	fasciatus	Nigronia	1
18-11A	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	1
18-11A	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	6
18-11A	Plecoptera	Leuctridae	not identified	not identified	Leuctridae	7
18-11A	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	2
18-11A	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	2
18-11A	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	6
18-11A	Trichoptera	Polycentropodidae	Phylocentropus	sp.	Phylocentropus	1
18-11A	Trichoptera	Polycentropodidae	Polycentropus	sp.	Polycentropus	7
18-12A	Haplotaxida	Naididae	not identified	not identified	Naididae	4

Middle Patuxent Sampling Unit—18

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
18-12A	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	1
18-12A	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	50
18-12A	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	2
18-12A	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	12
18-12A	Collembola	not identified	not identified	not identified	Collembola	1
18-12A	Coleoptera	Ptilodactylidae	Anchytarsus	sp.	Anchytarsus	1
18-12A	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
18-12A	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
18-12A	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
18-12A	Diptera	Chironomidae	Brillia	sp.	Brillia	4
18-12A	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	13
18-12A	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	4
18-12A	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	16
18-12A	Diptera	Chironomidae	Sympotthastia	sp.	Sympotthastia	4
18-12A	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	3
18-12A	Diptera	Simuliidae	Simulium	sp.	Simulium	6
18-12A	Diptera	Tipulidae	Tipula	sp.	Tipula	1
18-12A	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	3
18-12A	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	2
18-12A	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	1
18-12A	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	3
18-12A	Trichoptera	Psychomyiidae	Lype	sp.	Lype	1
18-12A	Trichoptera	Uenoidae	Neophylax	sp.	Neophylax	1
18-20A	Haplotaxida	Naididae	not identified	not identified	Naididae	1
18-20A	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	6
18-20A	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	1
18-20A	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	3
18-20A	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	3
18-20A	Coleoptera	Dytiscidae	Copelatus	sp.	Copelatus	1
18-20A	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
18-20A	Coleoptera	Dytiscidae	Laccornis	sp.	Laccornis	1
18-20A	Coleoptera	Elmidae	Ancyronyx	sp.	Ancyronyx	1
18-20A	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
18-20A	Diptera	Chironomidae	not identified	not identified	Chironomidae	2
18-20A	Diptera	Chironomidae	not identified	not identified	Chironomidae	5
18-20A	Diptera	Chironomidae	Brillia	sp.	Brillia	7
18-20A	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	7
18-20A	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	12
18-20A	Diptera	Chironomidae	Larsia	sp.	Larsia	3
18-20A	Diptera	Chironomidae	Paratendipes	sp.	Paratendipes	5
18-20A	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	4
18-20A	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	1
18-20A	Diptera	Chironomidae	Sympotthastia	sp.	Sympotthastia	7
18-20A	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	3
18-20A	Diptera	Simuliidae	Simulium	sp.	Simulium	8
18-20A	Diptera	Tipulidae	Molophilus	sp.	Molophilus	1
18-20A	Diptera	Tipulidae	Tipula	sp.	Tipula	2
18-20A	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	1

Middle Patuxent Sampling Unit—18

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
18-20A	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
18-20A	Plecoptera	Chloroperlidae	Haploperla	sp.	Haploperla	1
18-20A	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	6
18-20A	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	61
18-20A	Trichoptera	not identified	not identified	not identified	Trichoptera	1
18-20A	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	4
18-20A	Trichoptera	Psychomyiidae	Lype	sp.	Lype	1

Ferry Branch Sampling Unit—21

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
21-01	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	1
21-01	Haplotaxida	Naididae	not identified	not identified	Naididae	2
21-01	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	3
21-01	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	1
21-01	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	57
21-01	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	11
21-01	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	5
21-01	Cyclopoida	not identified	not identified	not identified	Cyclopoida	1
21-01	Collembola	Isotomidae	not identified	not identified	Isotomidae	1
21-01	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
21-01	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
21-01	Coleoptera	Hydrophilidae	Tropisternus	sp.	Tropisternus	1
21-01	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
21-01	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	1
21-01	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	41
21-01	Diptera	Chironomidae	Prodiamesa	sp.	Prodiamesa	4
21-01	Diptera	Tipulidae	Dicranota	sp.	Dicranota	1
21-01	Diptera	Tipulidae	Tipula	sp.	Tipula	1
21-01	Diptera	Dixidae	Dixa	sp.	Dixa	1
21-01	Hemiptera	Gerridae	Trepobates	sp.	Trepobates	1
21-01	Megaloptera	Corydalidae	Nigronia	fasciatus	Nigronia	1
21-01	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	9
21-01	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	1
21-01	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	4
21-02	Haplotaxida	Naididae	not identified	not identified	Naididae	1
21-02	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	1
21-02	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	1
21-02	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	2
21-02	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	36
21-02	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	4
21-02	Cyclopoida	not identified	not identified	not identified	Cyclopoida	1
21-02	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	10
21-02	Coleoptera	Dytiscidae	Agabus	dp.	Agabus	1
21-02	Coleoptera	Dytiscidae	Hoperius	sp.	Hoperius	1
21-02	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	7
21-02	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
21-02	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
21-02	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
21-02	Diptera	Chironomidae	Brillia	sp.	Brillia	2
21-02	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	9
21-02	Diptera	Chironomidae	Harnischia	sp.	Harnischia	2
21-02	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	4
21-02	Diptera	Chironomidae	Larsia	sp.	Larsia	5
21-02	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	2
21-02	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	31

Ferry Branch Sampling Unit—21

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
21-02	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	3
21-02	Diptera	Simuliidae	Simulium	sp.	Simulium	1
21-02	Diptera	Tabanidae	Chrysops	sp.	Chrysops	1
21-02	Diptera	Tipulidae	Dicranota	sp.	Dicranota	7
21-02	Diptera	Tipulidae	Hexatoma	sp.	Hexatoma	1
21-02	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
21-02	Plecoptera	Chloroperlidae	Haploperla	sp.	Haploperla	1
21-02	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	13
21-02	Plecoptera	Perlidae	Eccoptura	sp.	Eccoptura	1
21-02	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	1
21-02	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	4
21-02	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	1
21-02	Trichoptera	Uenoidae	Neophylax	sp.	Neophylax	1
21-03	Haplotaxida	Naididae	not identified	not identified	Naididae	1
21-03	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	2
21-03	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	1
21-03	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	20
21-03	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	3
21-03	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	1
21-03	Coleoptera	Dryopidae	Helichus	sp.	Helichus	1
21-03	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
21-03	Coleoptera	Hydrophilidae	Tropisternus	sp.	Tropisternus	4
21-03	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
21-03	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
21-03	Diptera	Chironomidae	Brillia	sp.	Brillia	5
21-03	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	24
21-03	Diptera	Chironomidae	Paratanytarsus	sp.	Paratanytarsus	1
21-03	Diptera	Chironomidae	Paratendipes	sp.	Paratendipes	5
21-03	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	37
21-03	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	3
21-03	Diptera	Simuliidae	Simulium	sp.	Simulium	7
21-03	Diptera	Tipulidae	Tipula	sp.	Tipula	2
21-03	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	7
21-03	Ephemeroptera	Heptageniidae	Stenonema	sp.	Stenonema	1
21-03	Odonata	Aeshnidae	Boyeria	sp.	Boyeria	1
21-03	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	4
21-03	Plecoptera	Perlidae	Eccoptura	sp.	Eccoptura	1
21-03	Plecoptera	Perlodidae	Isoperla	bilineata	Isoperla	1
21-03	Trichoptera	not identified	not identified	not identified	Trichoptera	1
21-03	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	1
21-03	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	4
21-03	Trichoptera	Psychomyiidae	Lype	diversa	Lype	1

Ferry Branch Sampling Unit—21

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
21-03	Trichoptera	Uenoidae	Neophylax	sp.	Neophylax	3
21-04	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	89
21-04	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	11
21-04	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	4
21-04	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
21-04	Diptera	Chironomidae	Larsia	sp.	Larsia	1
21-04	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	26
21-04	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	1
21-04	Diptera	Chironomidae	Thienemanniella	gp.	Thienemanniella	2
21-04	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	1
21-04	Diptera	Empididae	Hemerodromia	sp.	Hemerodromia	1
21-04	Diptera	Tabanidae	Chrysops	sp.	Chrysops	1
21-04	Diptera	Tipulidae	Dicranota	sp.	Dicranota	3
21-04	Diptera	Tipulidae	Tipula	sp.	Tipula	1
21-04	Megaloptera	Corydalidae	Nigronia	fasciatus	Nigronia	1
21-04	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
21-04	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	3
21-04	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	3
21-04	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	7
21-04	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	1
21-05	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	1
21-05	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	35
21-05	Cyclopoida	not identified	not identified	not identified	Cyclopoida	1
21-05	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	2
21-05	Coleoptera	Dryopidae	Helichus	sp.	Helichus	1
21-05	Coleoptera	Dytiscidae	Hoperius	sp.	Hoperius	1
21-05	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	3
21-05	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
21-05	Diptera	Chironomidae	not identified	not identified	Chironomidae	2
21-05	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	14
21-05	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	3
21-05	Diptera	Chironomidae	Paratanytarsus	sp.	Paratanytarsus	1
21-05	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	25
21-05	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	8
21-05	Diptera	Simuliidae	Simulium	sp.	Simulium	2
21-05	Diptera	Tipulidae	Dicranota	sp.	Dicranota	14
21-05	Diptera	Tipulidae	Tipula	sp.	Tipula	1
21-05	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	1
21-05	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	4
21-05	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	20
21-05	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	2
21-05	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	1
21-05	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	7

Ferry Branch Sampling Unit—21

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
21-05	not identified	not identified	not identified	not identified	Isopoda	1
21-06	Haplotaxida	Naididae	not identified	not identified	Naididae	2
21-06	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	5
21-06	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	3
21-06	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	21
21-06	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	2
21-06	Cyclopoida	not identified	not identified	not identified	Cyclopoida	1
21-06	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	6
21-06	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	1
21-06	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
21-06	Coleoptera	Gyrinidae	Dineutus	sp.	Dineutus	1
21-06	Coleoptera	Hydrophilidae	Tropisternus	sp.	Tropisternus	1
21-06	Diptera	Chironomidae	not identified	not identified	Chironomidae	4
21-06	Diptera	Chironomidae	not identified	not identified	Chironomidae	2
21-06	Diptera	Chironomidae	Brillia	sp.	Brillia	4
21-06	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	12
21-06	Diptera	Chironomidae	Larsia	sp.	Larsia	1
21-06	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	4
21-06	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	26
21-06	Diptera	Chironomidae	Potthastia	sp.	Potthastia	1
21-06	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	1
21-06	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	3
21-06	Diptera	Simuliidae	Simulium	sp.	Simulium	5
21-06	Diptera	Tipulidae	Dicranota	sp.	Dicranota	3
21-06	Diptera	Tipulidae	Tipula	sp.	Tipula	1
21-06	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	6
21-06	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	1
21-06	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
21-06	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	6
21-06	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	4
21-06	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	21
21-07	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	4
21-07	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	5
21-07	Amphipoda	Gammaridae	Gammarus	sp.	Gammarus	12
21-07	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	1
21-07	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
21-07	Diptera	Chironomidae	not identified	not identified	Chironomidae	2
21-07	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
21-07	Diptera	Chironomidae	Apedilum	sp.	Paralauterborniella	4
21-07	Diptera	Chironomidae	Brillia	sp.	Brillia	4
21-07	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	17
21-07	Diptera	Chironomidae	Glyptotendipes	sp.	Glyptotendipes	4
21-07	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	4
21-07	Diptera	Chironomidae	Paratanytarsus	sp.	Paratanytarsus	7
21-07	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	25

Ferry Branch Sampling Unit—21

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
21-07	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	3
21-07	Diptera	Simuliidae	Simulium	sp.	Simulium	6
21-07	Diptera	Tipulidae	Tipula	sp.	Tipula	1
21-07	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	25
21-07	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	1
21-07	Odonata	Aeshnidae	Boyeria	sp.	Boyeria	1
21-07	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
21-07	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	16
21-07	Plecoptera	Perlidae	Eccoptura	sp.	Eccoptura	1
21-07	Plecoptera	Perlidae	Perlesta	sp.	Perlesta	2
21-07	Plecoptera	Perlodidae	Isoperla	sp.	Isoperla	3
21-07	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	7
21-07	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	2
21-08	Haplotaxida	Tubificidae	not Identified	not Identified	Tubificidae	1
21-08	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	17
21-08	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	1
21-08	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	4
21-08	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
21-08	Diptera	Chironomidae	not identified	not identified	Chironomidae	7
21-08	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	18
21-08	Diptera	Chironomidae	Paralauterborniella	sp.	Paralauterborniella	4
21-08	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	5
21-08	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	42
21-08	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	2
21-08	Diptera	Simuliidae	Simulium	sp.	Simulium	1
21-08	Diptera	Tipulidae	Dicranota	sp.	Dicranota	2
21-08	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	12
21-08	Ephemeroptera	Heptageniidae	Stenonema	sp.	Stenonema	1
21-08	Odonata	Aeshnidae	Boyeria	sp.	Boyeria	1
21-08	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	3
21-08	Odonata	Corduliidae	Somatochlora	sp.	Somatochlora	1
21-08	Plecoptera	Chloroperlidae	Haploperla	sp.	Haploperla	2
21-08	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	8
21-08	Plecoptera	Perlidae	Eccoptura	sp.	Eccoptura	1
21-08	Plecoptera	Perlidae	Perlesta	sp.	Perlesta	1
21-08	Plecoptera	Perlodidae	Isoperla	sp.	Isoperla	1
21-08	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	9
21-08	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	2
21-08	Trichoptera	Uenoidae	Neophylax	sp.	Neophylax	2
21-09	Haplotaxida	Naididae	not identified	not identified	Naididae	3
21-09	Haplotaxida	Tubificidae w.o.h.c.	not identified	not identified	Tubificidae	2
21-09	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	19
21-09	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
21-09	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
21-09	Diptera	Chironomidae	not identified	not identified	Chironomidae	7

Ferry Branch Sampling Unit—21

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
21-09	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	20
21-09	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	8
21-09	Diptera	Chironomidae	Paratanytarsus	sp.	Paratanytarsus	3
21-09	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	47
21-09	Diptera	Chironomidae	Rheotanytarsus	sp.	Rheotanytarsus	1
21-09	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	1
21-09	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	3
21-09	Diptera	Simuliidae	Simulium	sp.	Simulium	6
21-09	Diptera	Tipulidae	Tipula	sp.	Tipula	1
21-09	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	19
21-09	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
21-09	Odonata	Corduliidae	Somatochlora	sp.	Somatochlora	1
21-09	Plecoptera	Chloroperlidae	Haploperla	sp.	Haploperla	6
21-09	Plecoptera	Nemouridae	Amphinemura	sp.	Amphinemura	7
21-09	Plecoptera	Perlidae	not identified	not identified	Perlidae	1
21-09	Trichoptera	Brachycentridae	not identified	not identified	Brachycentridae	1
21-09	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	3
21-09	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	2
21-09	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	1
21-10	Haplotaxida	Naididae	not identified	not identified	Naididae	3
21-10	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	1
21-10	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	1
21-10	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	13
21-10	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	92
21-10	Coleoptera	Elmidae	Oulimnius	sp.	Oulimnius	1
21-10	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
21-10	Diptera	Chironomidae	Brillia	sp.	Brillia	2
21-10	Diptera	Chironomidae	Eukiefferiella	sp.	Eukiefferiella	2
21-10	Diptera	Chironomidae	Orthocladiinae	not identified	Orthocladiinae	7
21-10	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	4
21-10	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	4
21-10	Diptera	Chironomidae	Paratanytarsus	sp.	Paratanytarsus	32
21-10	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	4
21-10	Diptera	Chironomidae	Rheotanytarsus	sp.	Rheotanytarsus	4
21-10	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	6
21-10	Diptera	Simuliidae	Simulium	sp.	Simulium	3
21-10	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
21-10	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	5
21-10	Trichoptera	Limnephilidae	Ironoquia	sp.	Ironoquia	4

Severn Run Sampling Unit—09

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
09-01	Lumbriculida	Lumbriculidae	not Identified	not Identified	Lumbriculidae	1
09-01	Coleoptera	Ptilodactylidae	Anchytarsus	bicolor	Anchytarsus	2
09-01	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	3
09-01	Diptera	Chironomidae	Bethbilbeckia	sp.	Bethbilbeckia	1
09-01	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	1
09-01	Diptera	Chironomidae	Larsia	sp.	Larsia	1
09-01	Diptera	Chironomidae	Orthocladiinae	not identified	Orthocladiinae	1
09-01	Diptera	Chironomidae	Parakiefferiella	sp.	Parakiefferiella	1
09-01	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	2
09-01	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	4
09-01	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	2
09-01	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	10
09-01	Diptera	Simuliidae	not identified	not Identified	Simuliidae	2
09-01	Diptera	Simuliidae	Prosimulium	sp.	Prosimulium	44
09-01	Diptera	Simuliidae	Simulium	sp.	Simulium	6
09-01	Diptera	Tipulidae	Molophilus	sp.	Molophilus	1
09-01	Diptera	Tipulidae	Tipula	sp.	Tipula	2
09-01	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	8
09-01	Ephemeroptera	Leptophlebiidae	Leptophlebia	sp.	Leptophlebia	1
09-01	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	2
09-01	Plecoptera	Chloroperlidae	not identified	not Identified	Chloroperlidae	3
09-01	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	7
09-01	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	2
09-01	Plecoptera	Perlidae	Eccoptura	sp.	Eccoptura	5
09-01	Trichoptera	Beraeidae	Berea	sp.	Berea	1
09-01	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	3
09-01	Trichoptera	Hydropsychidae	Hydropsyche	sp.	Hydropsyche	2
09-01	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	11
09-02	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	4
09-02	Basommatophora	Physidae	Physella	sp.	Physella	4
09-02	Hoplonemertea	not identified	not identified	not identified	Hoplonemertea	1
09-02	Rhynchobdellida	Glossiphoniidae	Helobdella	not identified	Helobdella	1
09-02	Lumbriculida	Lumbriculidae	not Identified	not Identified	Lumbriculidae	1
09-02	Haplotaxida	Tubificidae w.o.h.c.	not Identified	not Identified	Tubificidae	1
09-02	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
09-02	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	3
09-02	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1
09-02	Diptera	Chironomidae	Brillia	sp.	Brillia	2
09-02	Diptera	Chironomidae	Chironominae	not Identified	Chironominae	1
09-02	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	13
09-02	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	1
09-02	Diptera	Chironomidae	Stenochironomus	sp.	Stenochironomus	3
09-02	Diptera	Chironomidae	Tanytarsini	not identified	Tanytarsini	0
09-02	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	11
09-02	Diptera	Chironomidae	Thienemanniella	gp.	Thienemanniella	0
09-02	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	12
09-02	Diptera	Tipulidae	Tipula	sp.	Tipula	1
09-02	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
09-02	Odonata	Coenagrionidae	Enallagma	sp.	Enallagma	2

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Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
09-02	Odonata	Corduliidae	Somatochlora	sp.	Somatochlora	1
09-02	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	30
09-02	Coleoptera	not identified	not identified	not identified	Coleoptera	1
09-05	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	8
09-05	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	1
09-05	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	1
09-05	Coleoptera	Dytiscidae	Agabus	sp.	Agabus	1
09-05	Coleoptera	Dytiscidae	Cybister	sp.	Cybister	1
09-05	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	2
09-05	Diptera	Chironomidae	not identified	not identified	Chironomidae	5
09-05	Diptera	Chironomidae	Diplocladius	sp.	Diplocladius	11
09-05	Diptera	not identified	not identified	not identified	Diptera	3
09-05	Diptera	not identified	not identified	not identified	Diptera	1
09-05	Diptera	Dolichopodidae	not identified	not identified	Dolichopodidae	1
09-05	Diptera	Tipulidae	Hexatoma	sp.	Hexatoma	1
09-05	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	28
09-05	Diptera	Chironomidae	Larsia	sp.	Larsia	15
09-05	Diptera	Simuliidae	Simulium	sp.	Simulium	23
09-05	Diptera	Tipulidae	Tipula	sp.	Tipula	2
09-05	Ephemeroptera	Baetidae	Baetis	sp.	Baetis	1
09-05	Odonata	Corduliidae	Somatochlora	sp.	Somatochlora	1
09-05	Plecoptera	Capniidae	not identified	not identified	Capniidae	1
09-05	Plecoptera	Leuctridae	not identified	not identified	Leuctridae	1
09-05	Plecoptera	Nemouridae	Ostrocerca	sp.	Ostrocerca	19
09-05	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	6
09-06	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	8
09-06	Basommatophora	Lymnaeidae	Fossaria	sp.	Fossaria	2
09-06	Basommatophora	Physidae	Physella	sp.	Physella	10
09-06	Haplotaxida	Aeolosomatidae	not identified	not identified	Aeolosomatidae	1
09-06	Haplotaxida	Tubificidae w.h.c.	not Identified	not Identified	Tubificidae	1
09-06	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	2
09-06	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	1
09-06	Collembola	not identified	not identified	not identified	Collembola	1
09-06	Coleoptera	Elmidae	Ancyronyx	sp.	Ancyronyx	4
09-06	Coleoptera	Elmidae	Stenelmis	sp.	Stenelmis	6
09-06	Coleoptera	Scirtidae	Prionocyphon	sp.	Prionocyphon	2
09-06	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	5
09-06	Diptera	Chironomidae	Orthocladiinae	not identified	Orthocladiinae	1
09-06	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	3
09-06	Diptera	Chironomidae	Stenochironomus	sp.	Stenochironomus	8
09-06	Diptera	Chironomidae	Tanytarsini	not identified	Tanytarsini	1
09-06	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	6
09-06	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	3
09-06	Diptera	Tipulidae	Pseudolimnophila	sp.	Pseudolimnophila	1
09-06	Diptera	Tipulidae	Tipula	sp.	Tipula	1
09-06	Hemiptera	Notonectidae	Notonecta	sp.	Notonecta	1
09-06	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	35
09-07	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	2
09-07	Lumbriculida	Lumbriculidae	not Identified	not Identified	Lumbriculidae	3
09-07	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	67

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Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
09-07	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	3
09-07	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	3
09-07	Diptera	Chironomidae	Apsectrotanypus	sp.	Apsectrotanypus	8
09-07	Diptera	Chironomidae	Parakiefferiella	sp.	Parakiefferiella	1
09-07	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	2
09-07	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	7
09-07	Diptera	Chironomidae	Pseudorthocladius	sp.	Pseudorthocladius	1
09-07	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	13
09-07	Diptera	Simuliidae	Simulium	sp.	Simulium	37
09-07	Diptera	Tabanidae	Chrysops	sp.	Chrysops	1
09-07	Diptera	Tipulidae	Tipula	sp.	Tipula	1
09-07	Megaloptera	Sialidae	Sialis	sp.	Sialis	1
09-07	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
09-07	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	1
09-07	Trichoptera	Phryganeidae	Ptilostomis	sp.	Ptilostomis	1
09-08	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	4
09-08	Basommatophora	Physidae	not identified	not identified	Physidae	1
09-08	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	1
09-08	Haplotaxida	Tubificidae	not Identified	not Identified	Tubificidae	3
09-08	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	16
09-08	Coleoptera	Dryopidae	Copelatus	sp.	Copelatus	1
09-08	Coleoptera	Elmidae	not Identified	not Identified	Elmidae	1
09-08	Coleoptera	Elmidae	Dubiraphia	sp.	Dubiraphia	3
09-08	Coleoptera	Elmidae	Dubiraphia	sp.	Dubiraphia	1
09-08	Coleoptera	Elmidae	Oulimnius	sp.	Oulimnius	2
09-08	Coleoptera	Elmidae	Stenelmis	sp.	Stenelmis	3
09-08	Coleoptera	Gyrinidae	Gyrinus	sp.	Gyrinus	1
09-08	Coleoptera	Gyrinidae	Dineutus	sp.	Dineutus	2
09-08	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
09-08	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1
09-08	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	4
09-08	Diptera	Chironomidae	Brillia	sp.	Brillia	5
09-08	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	9
09-08	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	12
09-08	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	12
09-08	Diptera	Chironomidae	Prodiamesia	sp.	Prodiamesia	1
09-08	Diptera	Chironomidae	Stenochironomus	sp.	Stenochironomus	5
09-08	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	28
09-08	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	16
09-08	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
09-08	Odonata	Gomphidae	not Identified	not Identified	Gomphidae	1
09-08	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	2
09-08					Isopoda	1
09-09	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	5
09-09	Basommatophora	Physidae	Physella	sp.	Physella	3
09-09	Haplotaxida	Tubificidae w.h.c.	not Identified	not Identified	Tubificidae	3
09-09	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	3
09-09	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	29
09-09	Coleoptera	Elmidae	not Identified	not Identified	Elmidae	1
09-09	Coleoptera	Elmidae	Optioservus	sp.	Optioservus	1

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Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
09-09	Coleoptera	Elmidae	Optioservus	sp.	Optioservus	2
09-09	Coleoptera	Elmidae	Stenelmis	sp.	Stenelmis	1
09-09	Coleoptera	Gyrinidae	Gyrinus	sp.	Gyrinus	1
09-09	Coleoptera	Halipidae	Peltodytes	sp.	Peltodytes	1
09-09	Coleoptera	Hydrophilidae	Hydrobius	sp.	Hydrobius	1
09-09	Coleoptera	Hydrophilidae	Hydrobius	sp.	Hydrobius	1
09-09	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1
09-09	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	7
09-09	Diptera	Chironomidae	Diplocladius	sp.	Diplocladius	1
09-09	Diptera	Chironomidae	Euryhapsis	sp.	Euryhapsis	1
09-09	Diptera	Chironomidae	Larsia	sp.	Larsia	1
09-09	Diptera	Chironomidae	Orthocladiinae	not identified	Orthocladiinae	3
09-09	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	3
09-09	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	1
09-09	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	3
09-09	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	8
09-09	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	11
09-09	Diptera	Dolichopodidae	not Identified	not Identified	Dolichopodidae	1
09-09	Diptera	Stratiomyidae	Allognosta	sp.	Allognosta	1
09-09	Diptera	Tipulidae	Tipula	sp.	Tipula	1
09-09	Lepidoptera	not identified	not Identified	not Identified	Lepidoptera	1
09-09	Odonata	Aeshnidae	Boyeria	sp.	Boyeria	3
09-09	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	6
09-09	Odonata	Coenagrionidae	Ischnura	sp.	Ischnura	1
09-09	Odonata	Gomphidae	Hagenius	sp.	Hagenius	1
09-09	Odonata	Libellulidae	Erythemis	sp.	Erythemis	1
09-09	Odonata	Macromiidae	Macromia	sp.	Macromia	1
09-09	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	2
09-10	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	1
09-10	Basommatophora	Physidae	Physella	sp.	Physella	1
09-10	Amphipoda	not identified	not identified	not identified	Amphipoda	1
09-10	Coleoptera	Dryopidae	Helichus	sp.	Helichus	5
09-10	Coleoptera	Elmidae	Ancyronyx	sp.	Ancyronyx	4
09-10	Coleoptera	Elmidae	Dubiraphia	sp.	Dubiraphia	1
09-10	Coleoptera	Elmidae	Macronychus	sp.	Macronychus	1
09-10	Coleoptera	Elmidae	Stenelmis	sp.	Stenelmis	1
09-10	Coleoptera	Elmidae	Stenelmis	sp.	Stenelmis	1
09-10	Diptera	not Identified	not Identified	not Identified	Diptera	1
09-10	Diptera	Chironomidae	Brillia	sp.	Brillia	2
09-10	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	4
09-10	Diptera	Chironomidae	Larsia	sp.	Larsia	1
09-10	Diptera	Chironomidae	Orthocladiinae	not Identified	Orthocladiinae	2
09-10	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	1
09-10	Diptera	Chironomidae	Tanytarsini	not identified	Tanytarsini	1
09-10	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	6
09-10	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	1
09-10	Diptera	Chironomidae	Xylotopus	sp.	Xylotopus	2
09-10	Diptera	Empididae	Hemerodromia	sp.	Hemerodromia	1
09-10	Diptera	Tipulidae	Tipula	sp.	Tipula	1
09-10	Ephemeroptera	Heptageniidae	Stenonema	sp.	Stenonema	3

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Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
09-10	Megaloptera	Corydalidae	Nigronia	serricornis	Nigronia	5
09-10	Megaloptera	Sialidae	Sialis	sp.	Sialis	1
09-10	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	4
09-10	Odonata	Gomphidae	Gomphus	sp.	Gomphus	1
09-10	Trichoptera	Hydropsychidae	not Identified	not Identified	Hydropsychidae	2
09-10	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	47
09-10	Trichoptera	Hydropsychidae	Hydropsyche	sp.	Hydropsyche	3
09-10	Trichoptera	Hydropsychidae	Symphytopsyche	sp.	Symphytopsyche	3
09-10	Trichoptera	Psychomyiidae	Lype	diversa	Lype	8
09-11	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	22
09-11	Basommatophora	Planorbidae	not Identified	not Identified	Planorbidae	1
09-11	Haplotaxida	Tubificidae w.h.c.	not Identified	not Identified	Tubificidae	1
09-11	Lumbriculida	Lumbriculidae	not Identified	not Identified	Lumbriculidae	1
09-11	Haplotaxida	Lumbricidae	not Identified	not Identified	Lumbricidae	1
09-11	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	9
09-11	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	6
09-11	Coleoptera	Gyrinidae	Dineutus	sp.	Dineutus	1
09-11	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	3
09-11	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1
09-11	Diptera	Chironomidae	Larsia	sp.	Larsia	2
09-11	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	5
09-11	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	34
09-11	Diptera	Tipulidae	Tipula	sp.	Tipula	7
09-11	Hemiptera	Gerridae	Aquarius	sp.	Aquarius	1
09-11	Megaloptera	Sialidae	Sialis	sp.	Sialis	1
09-11	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
09-11	Odonata	Cordulegastridae	Cordulegaster	sp.	Cordulegaster	1
09-11	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	3
09-11	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	1
09-11	Trichoptera	Hydropsychidae	Hydropsyche	sp.	Hydropsyche	1
09-11	Trichoptera	Limnephilidae	not Identified	not Identified	Limnephilidae	1
09-12	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	1
09-12	Basommatophora	Lymnaeidae	not identified	not identified	Lymnaeidae	1
09-12	Basommatophora	Physidae	not identified	not identified	Physidae	34
09-12	Basommatophora	Planorbidae	not identified	not identified	Planorbidae	2
09-12	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	1
09-12	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	11
09-12	Coleoptera	Elmidae	Stenelmis	sp.	Stenelmis	2
09-12	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	4
09-12	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
09-12	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	1
09-12	Diptera	Chironomidae	Larsia	sp.	Larsia	11
09-12	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	2
09-12	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	2
09-12	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	5
09-12	Odonata	Coenagrionidae	Enallagma	sp.	Enallagma	1
09-12	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	7
09-12	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	26
09-12	not identified	not identified	not identified	not identified	Diplopoda	1

Severn River Sampling Unit—10

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
10-01	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	2
10-01	Haplotaxida	Tubificidae w.h.c.	not Identified	not Identified	Tubificidae	9
10-01	Lumbriculida	Lumbriculidae	not Identified	not Identified	Lumbriculidae	3
10-01	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	14
10-01	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	2
10-01	Coleoptera	Hydrophilidae	Hydrobius	sp.	Hydrobius	4
10-01	Coleoptera	Ptilodactylidae	Anchytarsus	bicolor	Anchytarsus	13
10-01	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	6
10-01	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	4
10-01	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1
10-01	Diptera	Chironomidae	Chironominae	not identified	Chironominae	1
10-01	Diptera	Chironomidae	Parakiefferiella	sp.	Parakiefferiella	5
10-01	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	9
10-01	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	1
10-01	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	1
10-01	Diptera	Chironomidae	Pseudorthocladius	sp.	Pseudorthocladius	5
10-01	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	1
10-01	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	33
10-01	Diptera	Tipulidae	Dicranota	sp.	Dicranota	1
10-01	Diptera	Tipulidae	Molophilus	sp.	Molophilus	1
10-01	Diptera	Tipulidae	Pseudolimnophila	sp.	Pseudolimnophila	1
10-01	Ephemeroptera	Leptophlebiidae	Leptophlebia	sp.	Leptophlebia	5
10-01	Megaloptera	Corydalidae	Nigronia	fasciatus	Nigronia	1
10-01	Megaloptera	Sialidae	Sialis	sp.	Sialis	2
10-01	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	3
10-01	Odonata	Cordulegastridae	Cordulegaster	sp.	Cordulegaster	1
10-01	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	3
10-01	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	1
10-01	Trichoptera	Limnephilidae	not Identified	not Identified	Limnephilidae	2
10-01	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	5
10-01	Trichoptera	Phryganeidae	Ptilostomis	sp.	Ptilostomis	2
10-01	Trichoptera	Polycentropodidae	Polycentropus	sp.	Polycentropus	1
10-02	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	4
10-02	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	2
10-02	Coleoptera	Dryopidae	Helichus	sp.	Helichus	2
10-02	Coleoptera	Hydrophilidae	Tropisternus	sp.	Tropisternus	1
10-02	Diptera	not identified	not identified	not identified	Diptera	7
10-02	Diptera	not identified	not identified	not identified	Diptera	2
10-02	Diptera	Chironomidae	Brillia	sp.	Brillia	8
10-02	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	23
10-02	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	8
10-02	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	48
10-02	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	2
10-02	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	2
10-02	Diptera	Chironomidae	Stenochironomus	sp.	Stenochironomus	1
10-02	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	1
10-02	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	20

Severn River Sampling Unit—10

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
10-02	Diptera	Ptychopteridae	Bittacomorpha	sp.	Bittacomorpha	1
10-02	Diptera	Simuliidae	Simulium	sp.	Simulium	9
10-02	Diptera	Tipulidae	Molophilus	sp.	Molophilus	1
10-02	Diptera	Tipulidae	Tipula	sp.	Tipula	9
10-02	Ephemeroptera	Leptophlebidae	Leptophlebia	sp.	Leptophlebia	9
10-02	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	33
10-02	Plecoptera	Nemouridae	not identified	not identified	Nemouridae	1
10-02	Trichoptera	Lepidostomatidae	Lepidostoma	sp.	Lepidostoma	2
10-02	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	1
10-02	Trichoptera	Phryganeidae	Ptilostomis	sp.	Ptilostomis	2
10-03	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	3
10-03	Hoplonemertea	not identified	not identified	not identified	Hoplonemertea	1
10-03	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	2
10-03	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	7
10-03	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	12
10-03	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	2
10-03	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
10-03	Coleoptera	Helodidae	not identified	not identified	Helodidae	2
10-03	Coleoptera	Ptilodactylidae	Anchytarsus	sp.	Anchytarsus	2
10-03	Coleoptera	Staphylinidae	not identified	not identified	Staphylinidae	1
10-03	Diptera	not identified	not identified	not identified	Diptera	1
10-03	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
10-03	Diptera	Chironomidae	not identified	not identified	Chironomidae	1
10-03	Diptera	Chironomidae	Brillia	sp.	Brillia	4
10-03	Diptera	Chironomidae	Larsia	sp.	Larsia	14
10-03	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	11
10-03	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	11
10-03	Diptera	Chironomidae	Paracladopelma	sp.	Paracladopelma	4
10-03	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	4
10-03	Diptera	Dolichopodidae	not identified	not identified	Dolichopodidae	1
10-03	Diptera	Tipulidae	Dicranota	sp.	Dicranota	1
10-03	Diptera	Tipulidae	Hexatoma	sp.	Hexatoma	2
10-03	Diptera	Tipulidae	Tipula	sp.	Tipula	1
10-03	Ephemeroptera	Leptophlebidae	Leptophlebia	sp.	Leptophlebia	21
10-03	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
10-03	Odonata	Cordulegastridae	Cordulegaster	sp.	Cordulegaster	2
10-03	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	6
10-03	Trichoptera	Limnephilidae	Hydatophylax	sp.	Hydatophylax	2
10-03	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	4
10-03	Trichoptera	Polycentropodidae	Polycentropus	sp.	Polycentropus	3
10-03	Trichoptera	Psychomyiidae	Lype	diversa	Lype	2
10-03	Trichoptera	Uenoidae	Neophylax	sp.	Neophylax	1
10-04	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	3
10-04	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	2
10-04	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	18
10-04	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	8
10-04	Coleoptera	Dryopidae	Helichus	sp.	Helichus	1
10-04	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	3

Severn River Sampling Unit—10

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
10-04	Diptera	not identified	not identified	not identified	Diptera	2
10-04	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
10-04	Diptera	Chironomidae	Brillia	sp.	Brillia	1
10-04	Diptera	Chironomidae	Diplocladius	sp.	Diplocladius	1
10-04	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	2
10-04	Diptera	Chironomidae	Larsia	sp.	Larsia	4
10-04	Diptera	Chironomidae	Orthocladius	sp.	Orthocladius	1
10-04	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	3
10-04	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	1
10-04	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	6
10-04	Diptera	Chironomidae	Tanypodinae	not identified	Tanypodinae	2
10-04	Diptera	Chironomidae	Tanytarsini	not identified	Tanytarsini	1
10-04	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	8
10-04	Diptera	Chironomidae	Xylotopus	sp.	Xylotopus	1
10-04	Diptera	Simuliidae	Simulium	sp.	Simulium	22
10-04	Diptera	Tipulidae	Hexatoma	sp.	Hexatoma	1
10-04	Diptera	Tipulidae	Tipula	sp.	Tipula	5
10-04	Ephemeroptera	Leptophlebiidae	Leptophlebia	sp.	Leptophlebia	22
10-04	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	10
10-04	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	1
10-04	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	9
10-04	Trichoptera	Phryganeidae	Ptilostomis	sp.	Ptilostomis	2
10-06	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	1
10-06	Haplotaxida	Lumbricidae	not identified	not identified	Lumbricidae	2
10-06	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	2
10-06	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	5
10-06	Coleoptera	Dytiscidae	Hydroporus	sp.	Hydroporus	1
10-06	Coleoptera	Hydrophilidae	Tropisternus	sp.	Tropisternus	1
10-06	Coleoptera	Ptilodactylidae	Anchytarsus	sp.	Anchytarsus	1
10-06	Diptera	not identified	not identified	not identified	Diptera	1
10-06	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	18
10-06	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	10
10-06	Diptera	Chironomidae	Larsia	sp.	Larsia	4
10-06	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	26
10-06	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	2
10-06	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	9
10-06	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	1
10-06	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	18
10-06	Diptera	Tipulidae	Dicranota	sp.	Dicranota	2
10-06	Diptera	Tipulidae	Molophilus	sp.	Molophilus	7
10-06	Diptera	Tipulidae	Ormosia	sp.	Ormosia	1
10-06	Diptera	Tipulidae	Tipula	sp.	Tipula	2
10-06	Ephemeroptera	Leptophlebiidae	not identified	not identified	Leptophlebiidae	1
10-06	Megaloptera	Sialidae	Sialis	sp.	Sialis	1
10-06	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	9
10-06	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	3
10-06	Diptera	not identified	not identified	not identified	Diptera	1
10-08	Haplotaxida	Tubificidae w.o.h.c.	not identified	not identified	Tubificidae	1

Severn River Sampling Unit—10

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
10-08	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	1
10-08	Coleoptera	Elmidae	Stenelmis	sp.	Stenelmis	1
10-08	Diptera	not identified	not identified	not identified	Diptera	1
10-08	Diptera	Chironomidae	not identified	not identified	Chironomidae	9
10-08	Diptera	Chironomidae	Hydrobaenus	sp.	Hydrobaenus	6
10-08	Diptera	Chironomidae	Larsia	sp.	Larsia	4
10-08	Diptera	Chironomidae	Orthocladius	not identified	Orthocladius	1
10-08	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	1
10-08	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	29
10-08	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	11
10-08	Diptera	Tipulidae	Tipula	sp.	Tipula	5
10-08	Odonata	Aeshnidae	Boyeria		Boyeria	1
10-08	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	2
10-08	Odonata	Coenagrionidae	Enallagma	sp.	Enallagma	1
10-08	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	2
10-08	Trichoptera	Phryganeidae	Ptilostomis	sp.	Ptilostomis	1
10-08	Trichoptera	Psychomyiidae	Lype	diversa	Lype	1
10-08					Isopoda	1
10-08					Lampyridae	1
10-09	Hoplonemertea	not identified	not identified	not identified	Hoplonemertea	1
10-09	Haplotaxida	Tubificidae w.h.c.	not Identified	not Identified	Tubificidae	4
10-09	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	17
10-09	Coleoptera	Hydrophilidae	Hydrobius	sp.	Hydrobius	3
10-09	Coleoptera	Halipidae	Haliplus	sp.	Haliplus	1
10-09	Coleoptera	Ptilodactylidae	Anchytarsus	sp.	Anchytarsus	17
10-09	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1
10-09	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	2
10-09	Diptera	Chironomidae	Larsia	sp.	Larsia	15
10-09	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	15
10-09	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	2
10-09	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	3
10-09	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	10
10-09	Diptera	Ptychopteridae	Ptychoptera	sp.	Ptychoptera	1
10-09	Diptera	Tipulidae	Hexatoma	sp.	Hexatoma	2
10-09	Ephemeroptera	Leptophlebiidae	Leptophlebia	sp.	Leptophlebia	4
10-09	Megaloptera	Sialidae	Sialis	sp.	Sialis	1
10-09	Plecoptera	Leuctridae	Leuctra	sp.	Leuctra	2
10-09	Trichoptera	Hydropsychidae	Diplectrona	modesta	Diplectrona	1
10-09	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	3
10-09	Trichoptera	Limnephilidae	Pycnopsyche	sp.	Pycnopsyche	2
10-10	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	7
10-10	Basommatophora	Physidae	Physella	sp.	Physella	5
10-10	Hoplonemertea	not identified	not identified	not identified	Hoplonemertea	3
10-10	Haplotaxida	Naididae	not identified	not identified	Naididae	1
10-10	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	1
10-10	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	1
10-10	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	2
10-10	Diptera	Chironomidae	not Identified	not Identified	Chironomidae	1

Severn River Sampling Unit—10

Site ID	Order	Family	Genus	Species	Final ID	Number of Individuals
10-10	Diptera	Chironomidae	Parakiefferiella	sp.	Parakiefferiella	1
10-10	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	1
10-10	Diptera	Chironomidae	Stenochironomus	sp.	Stenochironomus	1
10-10	Diptera	Chironomidae	Tanytarsus	sp.	Tanytarsus	14
10-10	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	19
10-10	Diptera	Stratiomyidae	Odontomyia	sp.	Odontomyia	1
10-10	Odonata	Libellulidae	Dythemis	sp.	Dythemis	1
10-10	Trichoptera	Hydropsychidae	Cheumatopsyche	sp.	Cheumatopsyche	113
10-10	Trichoptera	Hydropsychidae	Symphytopsyche	sp.	Symphytopsyche	1
10-11	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	24
10-11	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	1
10-11	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	9
10-11	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	13
10-11	Ostracoda	not identified	not identified	not identified	Ostracoda	1
10-11	Diptera	Chironomidae	Apsectrotanypus	sp.	Apsectrotanypus	1
10-11	Diptera	Chironomidae	Larsia	sp.	Larsia	2
10-11	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	2
10-11	Diptera	Chironomidae	Phaenopsectra	sp.	Phaenopsectra	1
10-11	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	3
10-11	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	2
10-11	Diptera	Empididae	Hemerodromia	sp.	Hemerodromia	1
10-11	Diptera	Simuliidae	Simulium	sp.	Simulium	70
10-11	Diptera	Tabanidae	Chrysops	sp.	Chrysops	1
10-11	Ephemeroptera	Leptophlebidae	Leptophlebia	sp.	Leptophlebia	1
10-11	Trichoptera	Limnephilidae	not identified	not identified	Limnephilidae	3
10-11	Coleoptera	not identified	not identified	not identified	Coleoptera	1
10-11	not identified	not identified	not identified	not identified	Pisces	1
10-20	Veneroida	Sphaeriidae	not identified	not identified	Sphaeriidae	9
10-20	Hoplonemertea	not identified	not identified	not identified	Hoplonemertea	1
10-20	Lumbriculida	Lumbriculidae	not identified	not identified	Lumbriculidae	3
10-20	Haplotaxida	Tubificidae	not identified	not identified	Tubificidae	7
10-20	Amphipoda	Crangonyctidae	Crangonyx	sp.	Crangonyx	7
10-20	Isopoda	Asellidae	Caecidotea	sp.	Caecidotea	6
10-20	Diptera	Ceratopogonidae	Bezzia/Palpomyia	gp.	Bezzia/Palpomyia	1
10-20	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
10-20	Diptera	Chironomidae	not identified	not identified	Chironomidae	3
10-20	Diptera	Chironomidae	Larsia	sp.	Larsia	4
10-20	Diptera	Chironomidae	Parametriocnemus	sp.	Parametriocnemus	78
10-20	Diptera	Chironomidae	Polypedilum	sp.	Polypedilum	3
10-20	Diptera	Chironomidae	Thienemannimyia	sp.	Thienemannimyia	4
10-20	Diptera	Tipulidae	Hexatoma	sp.	Hexatoma	1
10-20	Diptera	Tipulidae	Tipula	sp.	Tipula	4
10-20	Hemiptera	Veliidae	Microvelia	sp.	Microvelia	1
10-20	Megaloptera	Corydalidae	Nigronia	fasciatus	Nigronia	1
10-20	Odonata	Calopterygidae	Calopteryx	sp.	Calopteryx	1
10-20	Trichoptera	Polycentropodidae	Polycentropus	sp.	Polycentropus	2
10-20	Coleoptera	not identified	not identified	not identified	Coleoptera	1

Appendix C:
Sample Field Sheets

Benthic Spring Sampling Data Sheet

SITE Watershed Code | Segment | Type | Year (2005) — Reviewed By: _____

BASIN — Sample Label Verified By: _____ — 2nd Reviewer: _____

DATE Year | Month | Day — Crew: _____

TIME (Military) — Project: _____

Distance from Nearest Road to Site (m)

Remoteness

Bank Erosion

	Left Bank	Right Bank
Extent		
Severity		
1=min		
2=mod		
3=severe		
Eroded Area (m2 X 10)		
Bank Stability		

Benthic Habitat Sampled

(Square feet; Total = 20 square feet)

- Riffle
- Rootwad/Woody Debris
- Leaf Pack
- Macrophytes
- Undercut Banks
- Other
- (Specify)

Stream Width (m)

- 0 m
- 75 m

LANDUSE (Y/N)

- Old Field
- Deciduous Forest
- Coniferous Forest
- Wetland
- Surface Mine
- Landfill
- Residential
- Commercial/Industrial
- Cropland
- Pasture
- Orchard/Vineyard/Nursery
- Golf Course

RIPARIAN VEGETATION (facing upstream)

	Left Bank	Right Bank
Width (50m max)		
Adjacent Land Cover		
Vegetation Type (see back)		
Buffer Breaks (Y/N)		

Buffer Break Types (M=minor; S=severe)

Storm Drain		
Tile Drain		
Impervious Drainage		
Gully		
Orchard		
Crop		
Pasture		
New Construction		
Dirt Road		
Gravel Road		
Raw Sewage		
Railroad		

CHANNELIZATION

Evidence of Channel Straightening or Dredging (Y/N)

TYPE	EXTENT (m) Left Bank	Bottom	Right Bank
Concrete			
Gabion			
Rip-rap			
Earthen Berm			
Drege Spoil off Channel			
Pipe Culvert			

HABITAT ASSESSMENT

- Instream Habitat (0-20)
- Epifaunal Substrate (0-20)
- Velocity/Depth Diversity (0-20)
- Pool/Glide/Eddy Quality (0-20)
- Extent (0-20)
- Riffle/Run Quality (0-20)
- Extent (0-20)
- Embeddedness (%)
- Shading (%)
- Trash Rating

WATER QUALITY PARAMETERS

- Temperature ©
- DO (mg/L)
- pH
- Cond (ms/cm)
- Turbidity (NTU)

Meter Calibrations by: _____

Sampleability

- Benthos
- Habitat Assessment
- Water Quality

Road Culvert

- Culvert in Segment? (y/n)
- Sampleable? (y/n)
- Length of Culvert (m)
- Width of Culvert (m)

Maximum Depth (cm)

- No. Instream Woody Debris
- No. of Dewatered Woody Debris
- No. of Instream Rootwads
- No. of Dewatered Rootwads

PHOTODOCUMENTATION

Picture Number _____ Subject _____

Picture Number _____ Subject _____

Picture Number _____ Subject _____

Picture Number _____ Subject _____

Site Acces Route _____

Sampling Consd (_____num. Anodes) _____

Comments _____

Habitat Parameter	Optimal 16-20	Sub-Optimal 11-15	Marginal 6-10	Poor 0-5
Instream Habitat	Greater than 50% of a variety of cobble, boulder, submerged logs, undercut banks, snags rootwads, aquatic plants or other stable habitat.	30-50% of stable habitat. Adequate habitat.	10-30% mix of stable habitat. Habitat availability less than desirable.	Less than 10% of stable habitat. Lack of habitat is obvious.
Epifaunal Substrate	Preferred substrate abundant, stable, and at full colonization potential (riffles well developed and dominated by cobble; and/or woody debris prevalent, no new, and not transient)	Abundance of cobble with gravel &/or boulders common; or woody debris, aquatic veg., undercut banks, or other productive common but not prevalent/suited for full colonization.	Large boulders and/or bedrock prevalent; cobble, woody debris, or other preferred surfaces uncommon.	Stable substrates lacking; or particles are over 75% surrounded by fine sediment or flocculent material.
Velocity/Depth Diversity	Slow (<0.3 m/s), deep (>0.5m); slow, shallow (<0.5m); fast (>0.3m/s), deep; fast, shallow habitats all present.	Only 3 of the 4 habitat categories present.	Only 2 of the 4 habitat categories present.	Dominated by 1 velocity/depth category (usually pools).
Pool/Glide/Eddy Quality	Complex cover/&/or depth > 1.5m; both deep (>0.5m)/shallows (<0.2m) present.	Deep (>0.5m) areas present; but only moderate cover.	Shallows (<0.2m) prevalent in pool/glide/eddy habitat; little cover.	Max depth <0.2m in pool/glide/eddy habitat; or absent completely.
Riffle/Run Quality	Riffle/run depth generally >10 cm, with maximum depth greater than 50 cm (maximum score); substrate stable (e.g. cobble, boulder) & variety of current velocities.	Riffle/run depth generally 5-10 cm, variety of current velocities.	Riffle/run depth generally 1-5 cm; primarily a single current velocity.	Riffle/run depth <1 cm; or riffle/run substrates concreted.
Embeddedness	Percentage that gravel, cobble, and boulder particles are surrounded by line sediment or flocculent material.			
Shading	Percentage of segment that is shaded (duration is considered in scoring). 0%= fully exposed to sunlight all day in summer; 100% fully and densely shaded in summer.			
Trash Rating	Little or no human refuse visible from stream channel or riparian zone.	Refuse present in minor amounts.	Refuse present in moderate amounts.	Refuse abundant and unsightly.
Bank Stability	Upper banks stable, 0-10% of banks with erosional scars and little potential for future problems.	Moderately stable. 10-30% of banks with erosional scars, mostly healed over. Slight potential in extreme floods.	Moderately unstable. 30-60% of banks with erosional scars and high erosion potential during extreme high flow.	Unstable. Many eroded areas. "Raw" areas frequent along straight sections and bends. Side slopes >60 common.
Remoteness	Stream segment more than ¼ mile from nearest road; access difficult and little or no evidence of human activity.	Stream segment within ¼ mile of but not immediately accessible to roadside access by trail; site with moderately wild character.	Stream within ¼ mile of roadside and accessible by trail; anthropogenic activities readily evident.	Segment immediately adjacent to roadside access; visual, olfactory, and/or auditory displeasure experienced.

Vegetation Types
G- Grasses/Forbes
R- Regen Deciduous/Shrubs (<4"DBH)
Y- Young Deciduous (4-12" DBH)
M- Mature Deciduous (12-24" DBH)
O- Old Deciduous (>24" DBH)
A- Regen Coniferous (<4" DBH)
B- Young Coniferous (4-12" DBH)
C- Mature Coniferous (12-24" DBH)
D- Old Coniferous (>24" DBH)
L- Lawn

Riparian Buffer Zone/ Adjacent Land Cover Types
FR- Forest
OF- Old Field
EM- Emergent Vegetation
LN- Mowed Lawn
TG- Tall Grass
LO- Logged Area
SL- Bare Soil
RR- Railroad
PV- Paved Road
PK- Parking Lot/Industrial/Commercial
GR- Gravel Road
DI- Dirt Road
PA- Pasture
OR- Orchard
CP- Cropland
HO-Housing

Sampleability Codes
s- Sampleable
1- Dry Stream Bed
2- Too Deep
3- Marsh, no defined channel
4- Excessive Riparian Vegetation
5- Impoundment
6- Tidally Influenced
7- Permissions Denied
8- Unsafe (Describe in Comments)
9- Beaver
10- Other _____

Instream Blockage Codes
DM- Dam
PC- Pipe Culvert
F- Fishway
GW- Guaging Station Weir
G- Gabion
PX- Pipeline Crossing
AC- Arch Culvert
BC- Box Culvert
TG- Tide Guage

(Note: Height is measured in meters from stream surface to water surface above structure)

Other Notes:

HABITAT ASSESSMENT FIELD DATA SHEET-LOW GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION	
STATION #_____	STREAM CLASS	
LAT _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY	DATE _____ TIME	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET-LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _____