Frederick County Stream Survey Round Three — Year One (2018) Annual Monitoring Results

Frederick County
Office of Sustainability and
Environmental Resources

Frederick County Stream Survey Round Three—Year One (2018) Annual Monitoring Results

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Prepared for:

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Table of Contents

1 Introduction 3
1.1 Background and Purpose 3
2 Sampling Design and Site Selection 5
3 Biological Sampling 9
3.1 Methods 9
3.1.1 Benthic Macroinvertebrate Sampling and Processing 9
3.1.2 Biological Data Analysis 10
3.2 Results 11
4 Habitat 14
4.1 Methods 14
4.1.1 Field Procedures 14
4.1.2 Data Analysis 15
4.2 Results 15
5 Water Quality 17
5.1 Methods 17
5.1.1 Field and Laboratory Procedures 17
5.1.2 Water Quality Standards 18
5.2 Results 20
6 Land Use Analysis and Impervious Surface Summary 24
6.1 Subwatershed Summaries 24
6.2 Land Use Analysis 30
7 Comparison of Results of Repeated Sites 32
7.1 Benthic Macroinvertebrate Community 32
7.2 Habitat 35
7.3 Water Quality 38
8 Conclusions 39
9 References 41

Appendices

Appendix A – Representative Photolog
Appendix B – Benthic Macroinvertebrates
Appendix C – Physical Habitat
Appendix D – Water Quality
Appendix E – Land Use, Imperviousness, and Subwatershed Summaries

Figures

Figure 1 – Frederick County Watersheds 7
Figure 2 – Biological Sampling Locations 8
Figure 3 – Biological Sampling Results 12
Figure 4 – Percentage of Sites in each BIBI Category 13
Figure 5 – Physical Habitat Assessment Results 16
Figure 6 – Percentage of Sites in each PHI Category 17
Figure 7 – Total Nitrogen Concentrations 22
Figure 8 – Total Phosphorus Concentrations) 23
Figure 9 – Land Use percentage for each site's drainage area 27
Figure 10 – Frederick County 2010 Land Use/ Land Cover 28
Figure 11 – Frederick County Impervious Surface Cover 29
Figure 12 – Regressions for BIBI Score versus Percent Forest, Percent Urban and Percent Impervious land uses 31
Figure 13 – Repeat Biomonitoring Sites- BIBI Scores 34
Figure 14 – Repeat Biomonitoring Sites- PHI Rating 37

Tables

Table 1 – Summary of Sampling Progress/Sampling Schedule 4
Table 2 – Biological Index Scoring for Highlands Benthic Macroinvertebrates 11
Table 3 – BIBI Scoring and Rating 11
Table 4 – BIBI Summary Data 13
Table 5 – PHI Habitat Parameters 14
Table 6 – MBSS PHI Scoring 15
Table 7 – Water Quality Parameters 18
Table 8 – Maryland COMAR Standards for Use I-P, III-P, and IV-P Waters 19
Table 9 – Water Quality Criteria 19
Table 10 – MBSS Water Quality Categories for Nutrients 20
Table 11 – Land Cover Categories 24
Table 12 – Land Use Distribution and Impervious Area Cover by Subwatershed 26
Table 13 – Regression Analysis, BIBI versus Land Use 30
Table 14 – BIBI Rating Comparison 33
Table 15 – PHI Rating Comparison 36

1 Introduction

Frederick County has been assessing the ecological health of its streams through the Frederick County Stream Survey (FCSS) program since 2007. The program surveys water quality, biological and habitat conditions annually to determine the condition of the County's watersheds and streams, and to identify problems and potential stressors. Two to three sites per watershed are sampled each year, resulting in a total of 50 sites sampled per year.

The purpose of this report is to present the results of sampling during 2018. The sampling design of the FCSS (KCI, 2018) calls for two to three sites sampled each year in each watershed such that each watershed is sampled completely with a total of 10 sites in a four year period, or Round. Spreading sampling effort in each watershed across all four years of Round 3 should reduce uncertainty in watershed condition by accounting for natural variability across all years, i.e. climatic effects on stream health due to abnormally dry or wet years as observed by the Maryland Biological Stream Survey (MBSS; Saville et al, 2014). After sampling is completed in 2021, ecological conditions for each watershed will be presented resulting from a larger analysis of the entire Round 3 FCSS data set of ten sites per watershed.

1.1 Background and Purpose

In 2007, a pilot study was launched in the Bennett and Catoctin Creek watersheds (Versar Inc., 2009). The design and sampling protocols were developed, tested, and refined at this time. The first round of FCSS sampling began in 2008 and continued through 2011. The second round of FCSS began in 2013 and continued through 2016. Fifty randomly selected sites stratified across the 20 watersheds in the County were sampled each year. Yearly FCSS reports, as well as final Round 1 and Round 2 FCSS reports are available online at www.frederickcountymd.gov/7578/Water-Quality-Monitoring

Prior to Round 3, the County reviewed the design and methodology of its Countywide biological monitoring program. A Sampling and Analysis Plan (SAP) was developed and provides a description of the sampling design, data collection, analysis, and reporting methods, as well as quality assurance and quality control (QA/QC) procedures (KCI, 2018). Additionally, a set of Standard Operating Procedure (SOP) documents were developed to standardize several elements of the data collection methods. The SAP includes two changes that the County elected to make for Round 3 sampling:

- Implement a partial replacement survey design that includes 40% fixed sites from previous rounds and 60% of new, randomly-selected sites in each watershed. This modification improves trend detection by reducing the among site variability by the proportion of repeat sites. The inclusion of new random sites ensures that assessments continue to approximate area wide conditions and are not overly constrained to the subset of sites selected originally.
- Increase the water quality grab sampling parameters for laboratory analysis from 10 analytes in previous rounds to 15 analytes to be consistent with MBSS parameters, and to add additional metals and chlorides analytes which may be of specific interest in the future. For example, Maryland Department of the Environment (MDE) is in the process of developing water quality standards for chlorides which could ultimately result in chloride Total Maximum Daily Loads (TMDLs) being implemented. Chloride data could help the County identify streams and watersheds where chloride levels are a concern.

Round 3 of the FCSS began in 2018 and this report presents findings from the first year of sampling. In 2018, a total of 30 randomly selected sites were sampled and 20 previously sampled sites were revisited. The 20 revisit sites consisted of 10 sites previously sampled in Round 1 and 10 sites previously sampled in Round 2. Table 1 presents the sampling progress to date.

Table 1 – Summary of Sampling Progress/Sampling Schedule

Year	Number of Sites
Pilot Study	
2007	15
Round 1	
2008	50
2009	50
2010	50
2011	50
Round 2	
2013	50
2014	50
2015	50
2016	50
Round 3	
2018	50
2019	50
2020	50
2021	50

Each site is assessed by physical habitat, and sampled for benthic macroinvertebrates, and water quality. Benthic macroinvertebrates can be used as the basis of biological assessments because they respond to cumulative effects of physical habitat alteration, point source pollution, and nonpoint source contaminants; different aspects of the benthic assemblage change in response to degraded conditions (Barbour et al. 1999).

Physical habitat is visually assessed at each sampling location to reflect current conditions of physical complexity of the stream channel, the capacity of the stream to support a healthy biota, and the potential of the channel to maintain normal rates of erosion and other hydrogeomorphic functions. Physical habitat of the stream channel can be affected by farming operations, increased housing density, and other urban-suburban developments; all of which may cause sedimentation, degradation of riparian vegetation, and bank instability, leading to reduced overall habitat quality (Richards et al. 1996).

Water chemistry parameters are measured at each site (*in situ*) and grab samples are collected for laboratory analysis at every site to supplement biological and physical data. Water chemistry data provides a general indication of the chemical constituents of a waterbody, and may indicate the presence of water quality stressors.

The combined use of biological, physical, and chemical data is beneficial for detecting impairment and providing insight into the potential types of stressors and stressor sources. Observed biological responses allow prioritization of more detailed, diagnostic investigations based on the severity. The data is used by

County watershed managers to support watershed planning, Total Maximum Daily Load (TMDL) implementation, and watershed restoration efforts.

2 Sampling Design and Site Selection

In 2018, Frederick County updated the design and methodology of its countywide biological monitoring program prior to the start of Round 3 sampling. The changes to the existing program were developed to enhance the program's ability to detect trends through the re-sampling of sites from Round 1 and 2. Specific details on changes made to the sampling design can be found in the Sampling and Analysis Plan (SAP) for the Frederick County Stream Survey (KCI, 2018).

The site selection process is described in detail in Section 2 of the Sampling and Analysis Plan (KCI, 2018). The County has divided its watershed areas into 20 Primary Sampling Units (PSUs; Figure 1), which were used as the basis for random site selection. A total of 10 sites were needed per PSU, 6 of which were randomly selected new sites, and 4 of which were repeated from previous sampling (2 sites from Round 1 and 2 sites from Round 2). Sampling a subset of sites in all watersheds each year minimizes the influence of weather variation on the survey results.

New random sample points were randomly generated in ERSI ArcGIS along the Maryland Biological Stream Survey (MBSS) stream layer (mbss100c). Revisit sites were selected at random from the list of sites sampled in each PSU during Round 1 and Round 2. Sampling of any given site was dependent upon permission being granted by the owner(s) of the parcel(s) where the site was located and those parcels that were crossed to access a site. Permission is not guaranteed for any given site and field crews may encounter conditions that render a site unsampleable; therefore, additional sites were identified to ensure sampling targets were met. A total of 18 random sites and 12 repeat sites were selected to ensure alternate sites were available in the event that the primarily chosen site was unsampleable (e.g. lack of landowner permission, dry channel, safety issues, etc.).

Following MBSS protocol, streams larger than fourth-order were eliminated because they are generally not wadeable. In addition, the mainstem of Little Pipe Creek, which serves as the boundary between Frederick County and Carroll County, was excluded from the stream stratum to simplify the permission process, to avoid permission from landowners in both counties to access the mainstem sites, and to limit the characterization of watersheds to the information collected from tributaries that are entirely within Frederick County.

Each site was assigned a site code(e.g., BALL-102-R-2018), containing the PSU code (i.e., BALL), stream order (i.e., 1), a two-digit sequential number (i.e., 01), either an "R" or an "F" indicating that the site is a randomly selected site (i.e., R) or a fixed "revisit" site (i.e., F), and the year to be sampled (i.e., 2018).

Fixed (revisit) sites' codes were retained from the previous Rounds' codes when possible and the "R" was replaced with "F" to indicate a fixed site. Several original site IDs were found to be duplicates, (ex. GLAD-108-R-2008 and GLAD-108-R-2013); in these instances the duplicate site was renamed with the next available site number.

Permission was requested to access sites on public and private land. Landowners were notified if a site fell within their property or if crossing their property was necessary to access a site. Letters describing the FCSS were sent to each landowner and a self-addressed, stamped return postcard was enclosed to simplify

landowner response. Permission for public properties was secured through the agency owning or managing the properties. Only those sites where all landowners granted permission, both access sites and sample sites, were visited for sampling (Figure 2). More detail on the landowner permission process is available in SOP-FCSS-FO-009 in the Sampling and Analysis Plan (KCI, 2018).

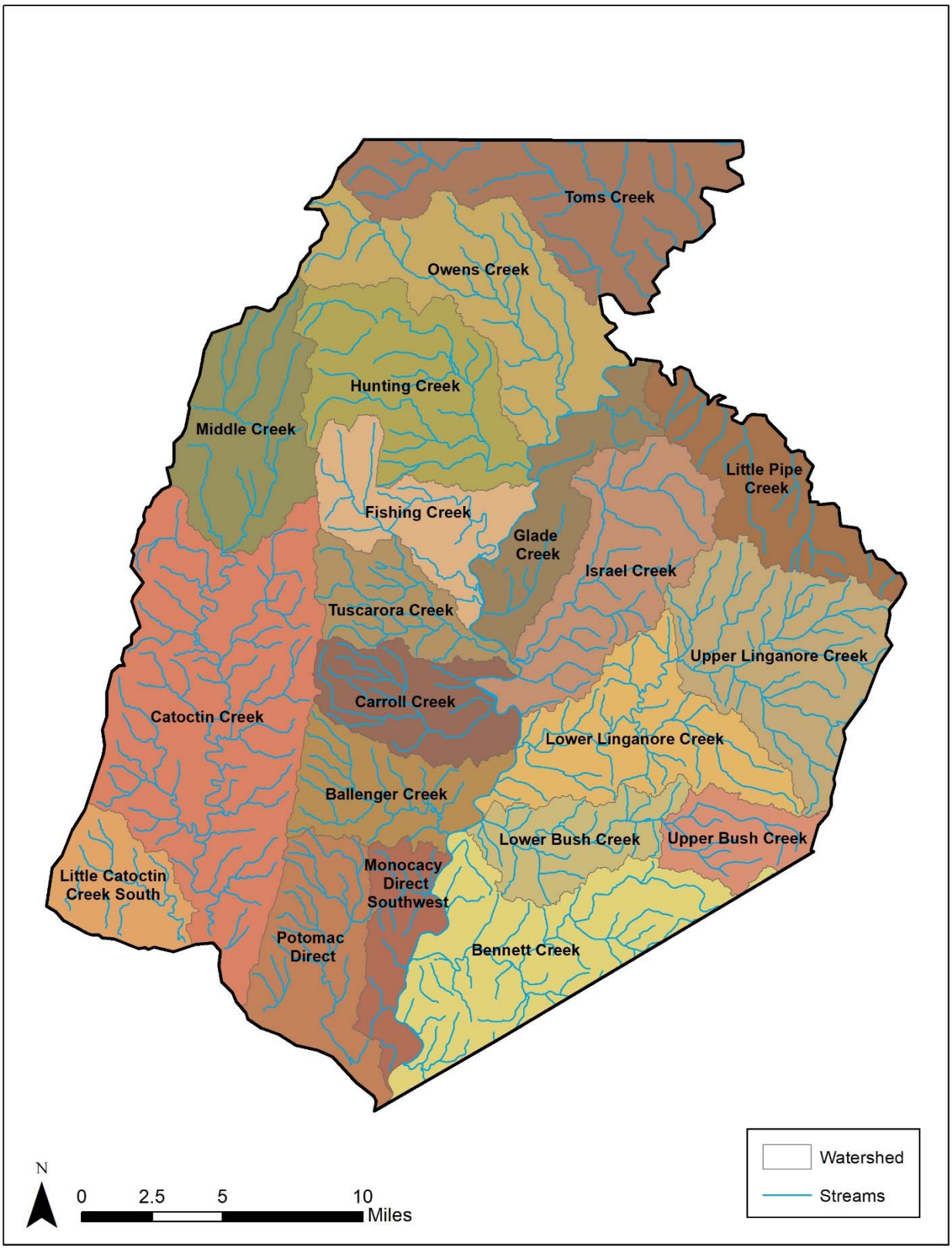

Figure 1 – Frederick County Watersheds

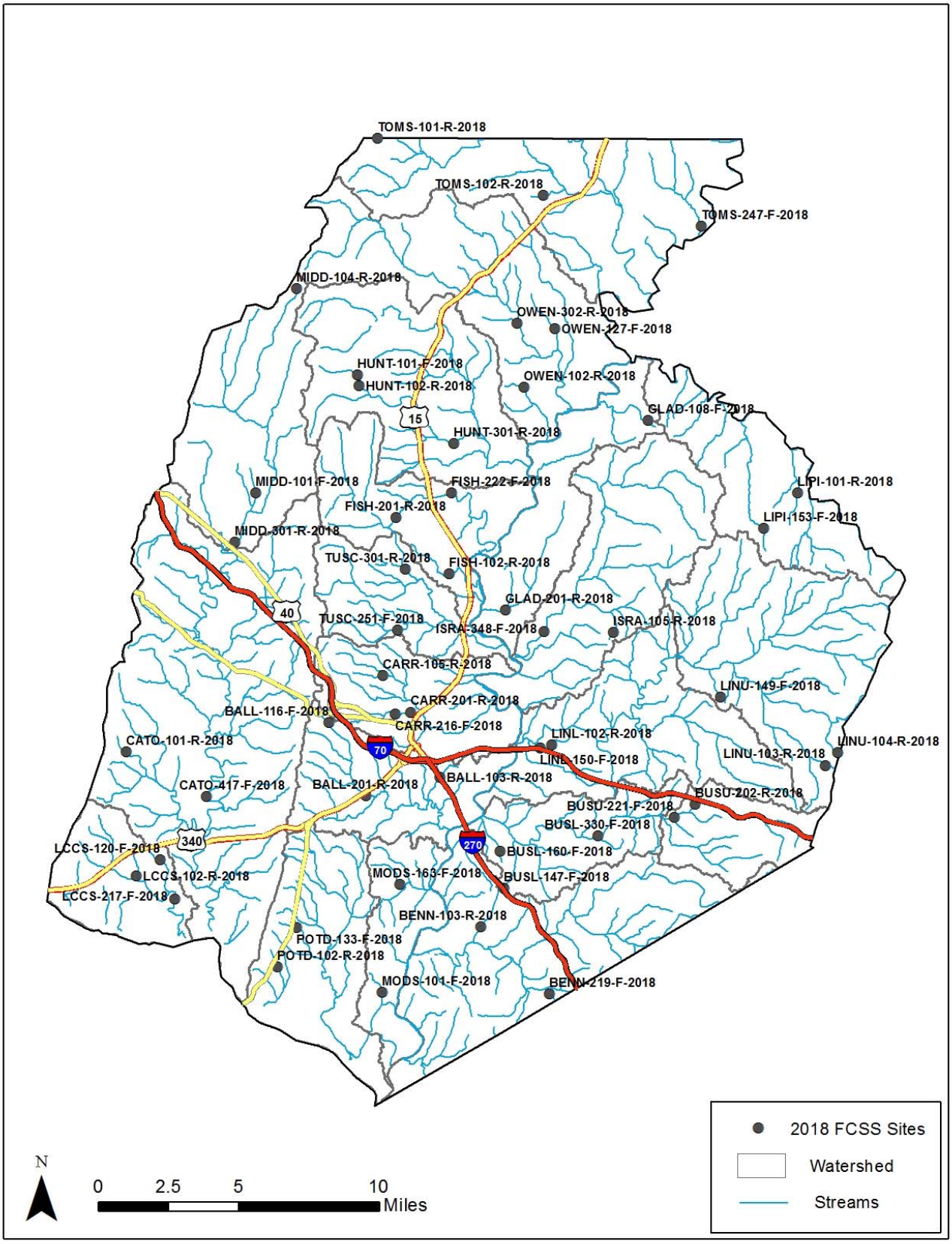

Figure 2 – Biological Sampling Locations

3 Biological Sampling

Assessing the ecological health of a stream involves the sampling and assessment of one or more biological communities of the stream. Most commonly, benthic macroinvertebrates are used as a rapid and cost-effective way to assess stream and watershed ecological health. The use of benthic macroinvertebrates, which are small animals without backbones that live on stones, logs, sediments, and plants of aquatic environments, as the basis of biological assessments offers many considerable advantages. For instance, benthic macroinvertebrates are relatively sedentary and easy to sample in large numbers; they respond to cumulative effects of physical habitat alteration, point source pollution, and nonpoint source contaminants; the different aspects of the benthic assemblage change in response to degraded conditions (Barbour et al. 1999).

3.1 Methods

3.1.1 Benthic Macroinvertebrate Sampling and Processing

Biological assessment methods for the FCSS are designed to be consistent and comparable with the methods used by the Maryland Department of Natural Resources (DNR) in their Maryland Biological Stream Survey (MBSS). The County has adopted the MBSS methodology to be consistent with statewide monitoring programs and programs adopted by other Maryland counties. The methods have been developed locally and are calibrated to Maryland's ecophysiographic regions and stream types. The Sampling and Analysis Plan (SAP; KCI, 2018) provides a description of the sampling design, data collection, analysis, and reporting methods, as well as quality assurance and quality control (QA/QC) procedures.

Benthic macroinvertebrate samples were collected during the Spring Index Period (March 1st through April 30th). A range of the most productive habitat types within the site were sampled using a D-frame net. In this multi-habitat sampling approach, a total of twenty jabs, sampling approximately 1 square foot of habitat each, are distributed among the most productive habitats present within the 75-meter site and sampled in proportion to their prevalence within the segment. The most productive stream habitats are riffles, followed by rootwads, woody debris, leaf packs, submerged macrophytes, and undercut banks.

Benthic macroinvertebrate samples were processed and subsampled according to methods described in the MBSS Laboratory Methods for Benthic Macroinvertebrate Processing and Taxonomy (Boward and Friedman, 2000). Subsampling is conducted to standardize the sample size and reduce variation caused by samples of different sizes. In this method the sample is spread evenly across a gridded tray and each grid is picked clean of organisms until a count of 120 or more is reached. The 120-organism target is used to allow for specimens that are missing parts or are not a late enough instar for proper identification and still result in a 100-organism subsample.

The samples were sent to a lab (Cole Ecological, Inc.) for processing and identification. Identification of the samples was conducted to the genus level for most organisms. Groups including Oligochaeta (group of worms) and Nematomorpha (horsehair and Gordian worms) were identified to the family level while Nematoda (roundworms) was left at phylum. Individuals of early instars or those that were damaged were identified to the lowest possible level, which in most cases was family. Chironomidae (midges) was further subsampled depending on the number of individuals in the sample and the numbers in each subfamily or tribe. Most taxa were identified using a stereoscope. Temporary slide mounts were used to identify Oligochaeta to family with a compound scope. Chironomid sorting to subfamily and tribe was also conducted using temporary slide mounts. Permanent slide mounts were then used for final genus level identification. Results were logged on a bench sheet and entered into a spreadsheet for analysis.

3.1.2 Biological Data Analysis

Data were analyzed using methods developed by MBSS as outlined in the *New Biological Indicators to Better Assess the Condition of Maryland Streams* (Southerland et al., 2005). The Benthic Index of Biotic Integrity (BIBI) approach involves statistical analysis using metrics that have a predictable response to water quality and/or habitat impairment. The metrics selected fall into five major groups including taxa richness, taxa composition, tolerance to perturbation, trophic (feeding) classification and taxa habit.

Raw values from each metric are given a score of 1, 3 or 5 based on ranges of values developed for each metric. The results are combined into a scaled BIBI score ranging from 1.0 to 5.0, and a corresponding narrative rating is applied. Three sets of metric calculations have been developed for Maryland streams based on broad physiographic regions: coastal plain, piedmont, and combined highlands physiogeographic regions. Frederick County subwatersheds are all located in the highlands physiogeographic region.

The following metrics and BIBI scoring were used for data analysis:

Highlands BIBI Metrics:

Total Number of Taxa – Equals the richness of the community in terms of the total number of genera at the genus level or higher. A large variety of genera typically indicate better overall water quality, habitat diversity and/or suitability, and community health.

Number of Ephemeroptera Taxa – Equals the total number Ephemeroptera Taxa in the sample. Ephemeroptera are generally considered pollution sensitive, thus communities dominated by Ephemeroptera usually indicate lower disturbances in water quality.

Number of EPT Taxa – Equals the richness of genera within the Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). EPT taxa are generally considered pollution sensitive, thus higher levels of EPT taxa would be indicative of higher water quality.

Percent Intolerant Urban – Equals the percentage of individuals in the sample that are considered intolerant to urbanization (tolerance values [TV] = 0 – 3). The percent of intolerant urban is expected to decrease with decreasing water quality.

Percent Tanytarsini – Equals the percentage of individuals in the sample that are in the Tanytarsini tribe of midges. An increase in the percentage of Tanytarsini taxa is generally an indicator of increasing water quality.

Percent Scrapers – Equals the percentage of the total number of individuals who are adapted to feed by scraping periphyton or other algal material and the associated microbes from substrates. Higher percentages of scrapers are representative of a decrease in stressors and higher water quality.

Percent Swimmers – Equals the percentage of the total number of individuals who are adapted for locomotion in the open water column. Higher percentages of swimmers are representative of a decrease in stressors and higher water quality.

Percent Diptera – Equals the percentage of individuals in the sample that are in the order Diptera. An increase in the percentage of Diptera taxa is generally an indicator of decreasing water quality.

Information on trophic groups, functional feeding groups, and habits were obtained from MBSS's master taxa list, and are updated annually. Scoring criteria for the highlands BIBI is shown below in Table 2. The raw metric value ranges are given with the corresponding score of 1, 3, or 5. Table 3 provides the BIBI scoring ranges and corresponding biological condition ratings.

Table 2 – Biological Index Scoring for Highlands Benthic Macroinvertebrates

Metric	Score		
	5	3	1
Total Number of Taxa	≥25	15 – 24	<15
Number of EPT Taxa	≥11	5 – 10	<5
Number of Ephemeroptera Taxa	≥4	2 – 3	<2
Percent Intolerant Urban	≥51	12 – 50	<12
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Table 3 – BIBI Scoring and Rating

BIBI Score	Narrative Rating
4.0 – 5.0	Good
3.0 – 3.9	Fair
2.0 – 2.9	Poor
1.0 – 1.9	Very Poor

3.2 Results

Benthic macroinvertebate sampling was conducted at 50 sites between March 13, 2018 and April 23, 2018. Site representative photographs can be found in Appendix A. Figure 3 presents the location and BIBI category of each sampling site. Overall, the majority of the BIBI scores throughout the sampling sites were categorized as 'Poor' (52%), followed by 'Fair' (24%) and 'Very Poor' (18%). Only three of the 50 sampled sites (6%) were categorized as 'Good' (Figure 4). Individual BIBI scores ranged from 1.00 ('Very Poor') to 4.25 ('Good'). Overall, the 50 sampling sites throughout the county had a mean BIBI value that resulted in 'Poor' biological condition ratings. Of the 20 PSUs, five (25%) had an average BIBI rating of 'Fair' while 14 (70%) PSUs received a rating of 'Poor' and only one PSU (5%) received an average rating of 'Very Poor'. Table 4 presents the BIBI score and rating of each sampling site. Site specific data and assessment results can be found in Appendix B.

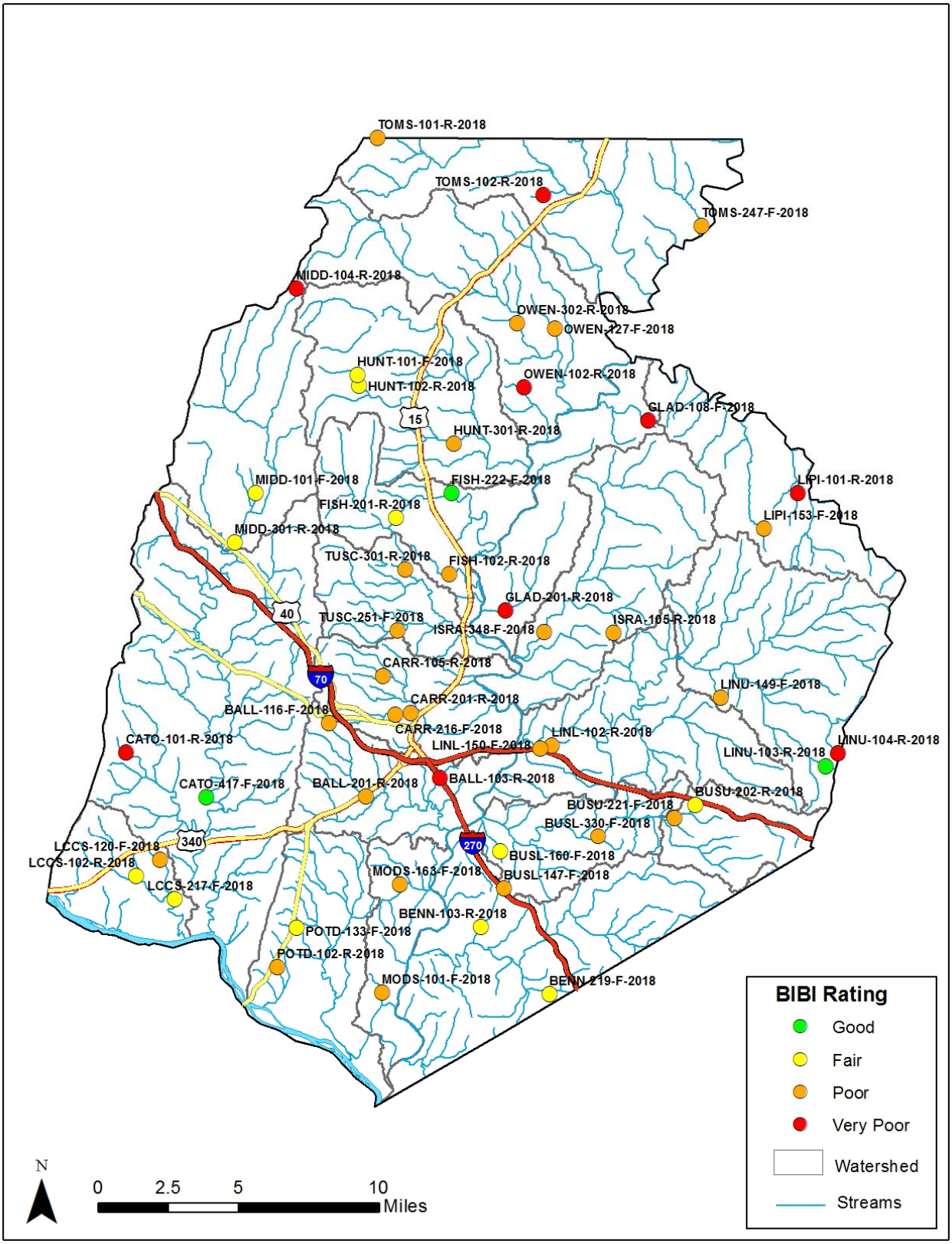

Figure 3 – Biological Sampling Results

Table 4 – BIBI Summary Data

Site ID	BIBI	BIBI Rating	Site ID	BIBI	BIBI Rating
BALL-103-R-2018	1.00	Very Poor	ISRA-348-F-2018	2.75	Poor
BALL-116-F-2018	2.50	Poor	ISRA-348-F-2018 QC	3.00	Fair
BALL-201-R-2018	2.75	Poor	LCCS-102-R-2018	3.50	Fair
BENN-103-R-2018	3.00	Fair	LCCS-120-F-2018	2.50	Poor
BENN-219-F-2018	3.75	Fair	LCCS-217-F-2018	3.50	Fair
BENN-219-F-2018 QC	3.50	Fair	LCCS-217-F-2018 LD	3.25	Fair
BUSL-147-F-2018	2.25	Poor	LINL-102-R-2018	2.25	Poor
BUSL-160-F-2018	3.50	Fair	LINL-150-F-2018	2.00	Poor
BUSL-330-F-2018	2.50	Poor	LINU-103-R-2018	4.00	Good
BUSL-330-F-2018 QC	2.75	Poor	LINU-104-R-2018	1.75	Very Poor
BUSU-202-R-2018	3.00	Fair	LINU-149-F-2018	2.00	Poor
BUSU-221-F-2018	2.75	Poor	LIPI-101-R-2018	1.25	Very Poor
CARR-105-R-2018	2.25	Poor	LIPI-153-F-2018	2.75	Poor
CARR-105-R-2018 LD	2.50	Poor	MIDD-101-F-2018	3.00	Fair
CARR-201-R-2018	2.75	Poor	MIDD-104-R-2018	1.75	Very Poor
CARR-216-F-2018	2.25	Poor	MIDD-301-R-2018	3.50	Fair
CATO-101-R-2018	1.25	Very Poor	MODS-101-F-2018	2.50	Poor
CATO-417-F-2018	4.00	Good	MODS-163-F-2018	2.25	Poor
FISH-102-R-2018	2.50	Poor	OWEN-102-R-2018	1.75	Very Poor
FISH-201-R-2018	3.25	Fair	OWEN-127-F-2018	2.50	Poor
FISH-222-F-2018	4.25	Good	OWEN-302-R-2018	2.75	Poor
GLAD-108-F-2018	1.50	Very Poor	POTD-102-R-2018	2.75	Poor
GLAD-201-R-2018	1.75	Very Poor	POTD-133-F-2018	3.50	Fair
HUNT-101-F-2018	3.00	Fair	TOMS-101-R-2018	2.25	Poor
HUNT-102-R-2018	3.25	Fair	TOMS-102-R-2018	1.50	Very Poor
HUNT-102-R-2018 LD	4.00	Good	TOMS-247-F-2018	2.75	Poor
HUNT-301-R-2018	2.75	Poor	TUSC-251-F-2018	2.75	Poor
ISRA-105-R-2018	2.50	Poor	TUSC-301-R-2018	2.00	Poor

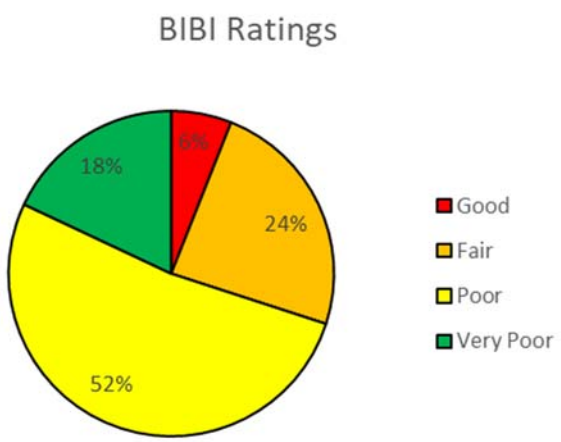

Figure 4 – Percentage of Sites in each BIBI Category

4 Habitat

Physical habitat was visually assessed at each sampling site to reflect current conditions of physical complexity of the stream channel, to estimate the capacity of the stream to support healthy biota, and to compare habitat quality to a minimally disturbed stream. Physical habitat of the stream channel can be affected by farming operations, increased housing density, and other urban-suburban developments; all of which may cause degradation of riparian vegetation, increased storm flows, increased sedimentation, and bank instability, leading to reduced overall habitat quality (Richards et al. 1996).

4.1 Methods

4.1.1 Field Procedures

Each biological monitoring site was characterized based on visual observation of physical characteristics and various habitat parameters. The MBSS Physical Habitat Index (PHI; Paul et al., 2003) was used to visually assess the physical habitat at each site. The assessment techniques rely on subjective scoring of selected habitat parameters. To reduce individual sampler bias, the assessment was completed as a team with discussion and agreement of the scoring for each parameter. In addition to the visual assessments, photo-documentation of the assessment site was performed. Photographs were taken facing in the upstream and downstream direction from each of three locations within the sampling site (downstream end, mid-point, and upstream end) to document general site conditions. Additional photographs were occasionally taken to document important or unusual site features.

The PHI incorporates the results of a series of habitat parameters selected for Coastal Plain, Piedmont, and Highlands regions. While all parameters were rated during the field assessment, the Highlands parameters were used to develop the PHI score. In developing the PHI, MBSS identified five parameters that have the most discriminatory power for the Highlands streams (Table 5). Each habitat parameter was given an assessment score ranging from 0-20, with the exception of shading (percentage) and riparian width (average riparian width of right and left banks). More detail for each habitat parameter is available in the SAP (KCI, 2018) and the MBSS sampling manual (Stranko et al, 2019).

Table 5 – PHI Habitat Parameters

Parameters Assessed	Parameter Description
Remoteness	Distance from access or human activities
Shading	Percent of site throughout the day that is shaded from sunlight
Epifaunal Substrate	Relative quality of stream habitat for insects
Riparian Width	Width of the vegetated stream buffer adjacent to the site
Bank Stability	Relative impact of stream banks due to erosion

Source: Paul et al. 2003

During the Spring Index Period, field crews conducted vernal pool searches in the 50-meter wide buffer zone (each side) perpendicular to the 75-meter study site. Vernal pools are defined by MBSS as “small, temporary bodies of water that provide vitally important habitat for many amphibians and aquatic invertebrates”, typically being less than one acre (as small as one square meter), and not directly connected to a flowing stream. If encountered, information on the location and size of vernal pools, as well as fish or amphibian species found in or immediately adjacent to the pool were recorded for each site.

4.1.2 Data Analysis

Using the raw habitat values recorded in the field, a scaled PHI score (ranging from 0-100) for each parameter is calculated following the methods described in Paul et al. (2003). Calculated metric scores are then averaged to obtain the overall PHI index score, and a corresponding narrative rating of the physical habitat condition is applied (Table 6).

Table 6 – MBSS PHI Scoring

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

Source: Paul et al. 2003

4.2 Results

Physical habitat conditions were assessed during the spring sampling season. Sites were visited between March 13, 2018 and April 23, 2018. Summary physical habitat data for each site can be found in Appendix C along with a map displaying habitat categories for each site in Figure 5.

A majority of the sites received ratings of 'Partially Degraded' (42%), 'Severely Degraded' (26%), and 'Degraded' (26%). Only a small portion of the sites received the highest rating of 'Minimally Degraded' (6%). PHI scores ranged from 34.4 ('Severely Degraded') to 86.0 ('Minimally Degraded') (Figure 6). With only five metrics being used to calculate the PHI score, each metric holds a large amount of weight (20%) in the final score.

Remoteness and percent shading generally scored the lowest of all the parameters and contributed greatly to the low habitat scores. Remoteness scores are based on the distance between the stream site mid-point and the nearest road. Percent shading is the percentage of the stream that is shaded by from sunlight, typically by shrub and tree shrub canopy cover. Streams with more shading tend to have cooler more habitable water. Bank stability scores were generally very high at sites sampled during 2018.

While habitat quality is an important factor influencing biological condition, it is not the only factor affecting biological condition, which can sometimes result in sites with biological results not aligning with habitat conditions. Site CATO-417-F is a good example of the misconnection between BIBI and PHI ratings as it was one of 3 sites to receive a BIBI rating of 'Good', but the PHI was rated as 'Degraded'. The epifaunal substrate and bank stability both received optimal ratings, which are both integral parts of the actual benthic habitat. A road ran along the portion of this stream where the site was located, which caused the very low remoteness rating. This road not only affects the remoteness score but also the riparian buffer zone score. Although these two metrics scored low, the actual benthic habitat was categorized as 'Optimal' and the site received a 'Good' BIBI rating. One of the other two sites that received 'Good' BIBI ratings was also affected by remoteness and buffer width scoring low while having 'Optimal' instream benthic habitat. Site specific data and habitat assessment results can be found in Appendix C.

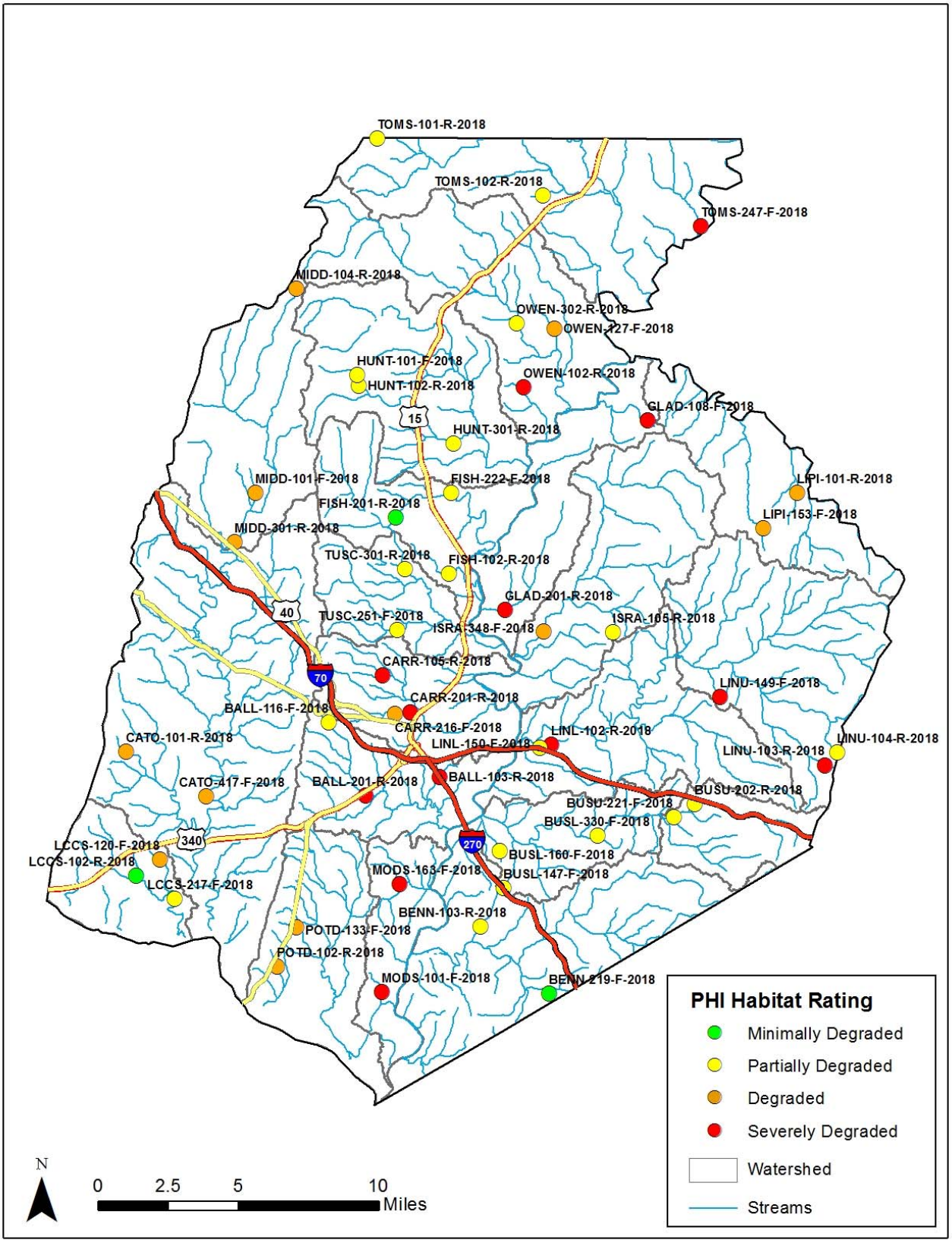

Figure 5 – Physical Habitat Assessment Results

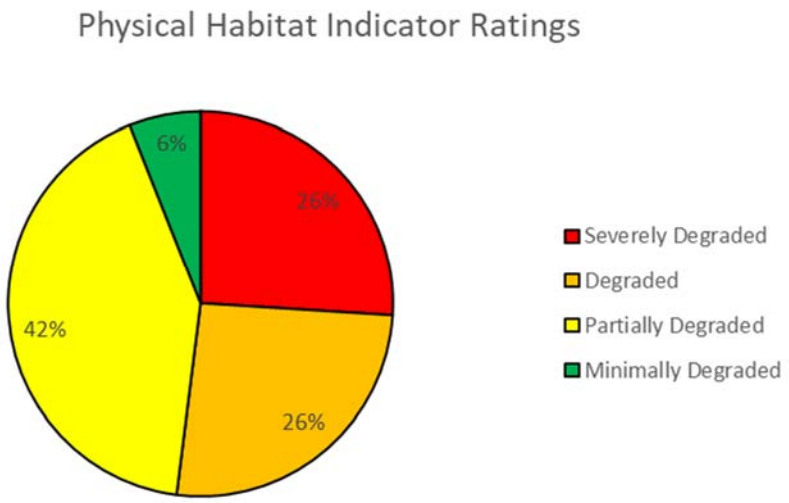

Figure 6 – Percentage of Sites in each PHI Category

5 Water Quality

Water quality sampling, including *in situ* and grab samples, provide additional data to characterize the health of streams throughout the County and to identify areas in need of restoration. Water quality sampling was conducted along with biological sampling and habitat assessments during the spring sampling season. Sites were sampled between March 13, 2018 and April 23, 2018.

5.1 Methods

5.1.1 Field and Laboratory Procedures

Water quality grab samples for laboratory analysis were collected at each site during the spring sampling visit, following MBSS procedures (Stranko et al. 2017). Samples were collected in triple-rinsed bottles from a suitable location along the thalweg with sufficient depth to submerge the bottle without disturbing the bottom sediments. Bottles were labeled prior to sampling with sample ID, date, time, and parameters for analysis. Samples were preserved on ice immediately after collection and transported to the lab within 48 hours. A total of three duplicate samples and one field blank were collected for quality assurance purposes. All grab samples were analyzed by University of Maryland Center for Environmental Science – Appalachian Laboratory. The laboratory methods are consistent with Analytical Laboratory Standard Operating Procedures for the Maryland Biological Stream Survey (Kline and Morgan, 2006). A complete list of analytical parameters and methods, including maximum reporting limits, is presented in Table 7 below.

Table 7 – Water Quality Parameters

Parameter	Maximum Reporting Limit*	Method Number
Turbidity	1 NTU	APHA 2130B
Total Nitrogen	0.2	APHA 4500-N C
Total Phosphorus	0.05	APHA 4500-P H
Ammonia-N	0.2	USGS (1993) NWQL I-2525
TKN (calculated)	0.2	NA
Nitrate-Nitrogen	0.05	APHA 4500-NO3 E
Nitrite-Nitrogen	0.05	APHA 4500-NO2 B
Dissolved Organic Carbon	0.5	APHA 5310 C
Orthophosphate	0.05	APHA 4500-P G
Total Organic Carbon	1.0	APHA 5310 C
Total Copper	0.004	APHA 3125
Total Lead	0.002	APHA 3125
Total Zinc	0.03	APHA 3125
Chloride	0.02	APHA 4110B
Total Hardness	1.0	APHA 2340B

*All values in mg/L, except as noted.

To supplement the water quality grab sampling, *in situ* water quality measurements were taken at each site during the spring sampling visit. Field measured water chemistry parameters include pH, specific conductivity, dissolved oxygen, temperature, and turbidity. All measurements were collected from the upstream end of the site, prior to any other sampling activities to ensure that measurements were not influenced by sampling activities within the stream. Most *in situ* parameters (i.e., temperature, pH, conductivity, and dissolved oxygen) were measured with an YSI Professional Plus series multiprobe Turbidity was measured with a Hach 2100 Turbidimeter. Water quality meters were regularly inspected, maintained, and calibrated to ensure proper usage and accuracy of the readings. Calibration logs were kept by field crew leaders and checked by the project manager regularly.

5.1.2 Water Quality Standards

Each body of water in Maryland is assigned a Designated Use Classification, which sets attainable goals for designated uses of that water body. Streams in Frederick County are designated as Use Class I-P, III-P, or IV-P, which have the following designated uses:

- **Use Class I-P**: Water Contact Recreation, Protection of Aquatic Life, and Public Water Supply
- **Use Class III-P:** Nontidal Cold Water and Public Water Supply
- **Use Class IV-P:** Recreational Trout Waters and Public Water Supply

Each designated use has corresponding water quality standards for pH, dissolved oxygen, turbidity, and temperature that are defined in the *Code of Maryland Regulations (COMAR) 26.08.02.08 – Stream Segment Designations* (Table 8). Both the State of Maryland and USEPA have developed numerical water quality criteria for several pollutants, and are presented in Table 9.

Since no numerical water quality criteria currently exist for nutrients, comparisons are drawn with analysis performed by MBSS. Using the state-wide stream dataset, MBSS has established water quality categories for nutrients from Southerland et al, 2005 listed in Table 10. Currently, there are no standards available for conductivity. However, Morgan et al. (2007) identified a critical threshold of impairment (BIBI ratings of 'Poor' and 'Very Poor') of BIBI scores for Maryland streams at 247 µS/cm and above.

Table 8 – Maryland COMAR Standards for Use I-P, III-P, and IV-P Waters

Parameter	Standard
pH (SU)	6.5 to 8.5
Dissolved Oxygen (mg/L)	Minimum of 5 mg/L
Conductivity (µS/cm)	No State standard
Turbidity (NTU)	Maximum of 150 Nephelometric Turbidity Units (NTU's) and maximum monthly average of 50 NTU
Temperature (°C)	Use I-P: Maximum of 32°C (90°F) or ambient temperature of the surface water, whichever is greater
	Use III-P: Maximum of 20°C (68°F) or ambient temperature of the surface water, whichever is greater
	Use IV-P: Maximum of 23.9°C (75°F) or ambient temperature of surface waters, whichever is greater

Source: Code of Maryland Regulations (COMAR) 26.08.02.03-3 – Water Quality

Table 9 – Water Quality Criteria

Parameter	Criteria	
	Acute	Chronic
Chloride (mg/L)**	860	230
Total Kjehldal Nitrogen (mg/L)	none	none
Dissolved Organic Carbon (mg/L)	none	none
Total Organic Carbon (mg/L)	none	none
Magnesium (mg/L)	none	none
Calcium (mg/L)	none	none
Hardness (mg equivalent $CaCO_3$/L)	none	none
Total Copper (µg/L)***	13	9
Total Zinc (µg/L)***	120	120
Total Lead (µg/L)***	65	2.5
Turbidity (NTU)***	150	50

** EPA National Recommended Water Quality Criteria for Aquatic Life
*** COMAR 26.08.02.03-2: Numerical Criteria for Toxic Substances in Surface Waters

Table 10 – MBSS Water Quality Categories for Nutrients

Parameter	Low	Moderate	High
Nitrate (NO3)	< 1.0	1.0 – 5.0	> 5.0
Nitrite (NO2)	< 0.0025	0.0025 – 0.01	> 0.01
Ammonia (NH3)	< 0.03	0.03 – 0.07	> 0.07
TN	< 1.5	1.5 – 7.0	>7.0
TP	< 0.025	0.025 – 0.070	> 0.070
Ortho-PO4	< 0.008	0.008 – 0.03	> 0.03

(Southerland et al., 2005a). All units are in mg/L.

5.2 Results

Water quality results for in situ water quality measurements and lab-analyzed grab samples from each site can be found in Appendix D.

In situ water quality measurements were within COMAR standards for temperature, dissolved oxygen, and turbidity at all sites. High pH values, which were outside the acceptable range of values set forth by COMAR (i.e., 6.5-8.5), were recorded at three sites. The three sites, BUSU-202-R-2018, BUSU-221-F-2018, and BUSL-330-F-2018 are in close proximity to each other, and receive drainage from I-70. Karst topography occurs throughout Frederick County and specifically in this area due to the dissolution of limestone and marble bedrock. The geology of this area is considered by USGS as Urbana Formation which consists of phyllite, metasiltstone, quartzite and marble. Marble is a metamorphosed limestone primarily made of carbonate minerals and when degraded by acidic water, dissolution occurs releasing carbon dioxide. This release of carbon dioxide could be causing the increase in pH levels at this site. Another possible reason for the increase in pH is that all three sites were sampled in the mid-afternoon when photosynthesis is at its peak. Large amounts of algae were present on the stream bottom which resulted in high dissolved oxygen readings of 16.64 mg/L, 14.78 mg/L and 17.74 mg/L respectively. This increase in dissolved oxygen is known to lead to higher pH readings in freshwater streams and could have an effect on the elevated pH readings at these three site locations (Geiger, Mesner, 2005).

More than half of the sites sampled had specific conductivity values that exceeded 247 µS/cm, which is the critical threshold between 'Fair' and 'Poor' stream quality determined for urban Maryland streams, based on BIBI scores (Morgan et al., 2007). Average specific conductivity was 380.7 µS/cm and values ranged from 40.5 to 1,972.0 µS/cm. Sites with high specific conductivity are not only indicative of increased anthropogenic disturbance, but also likely to see degraded biological conditions. Specific conductivity is related to the type and concentrations of inorganic ions in solution. Natural sources within a watershed can include salt from poorly drained soils, salt from ground water, and erosion from geologic formations of marine origin. Increased stream inorganic ion concentrations (i.e., conductivity) in urban systems typically results from runoff over impervious surfaces, passage through pipes, and exposure to other infrastructure (Cushman, 2006). Roadway pollutants tend to concentrate along the edge of a road, making them susceptible to runoff to streams from rainfall or snow melt and flow-off from wind or vehicle turbulence. While elevated conductivity may not directly affect stream biota, its constituents (e.g., chloride, metals, and nutrients) may be present at levels that can cause considerable biological impairment.

With the exception of one site (CARR-201-R-2018), all 2018 chloride values met EPA standards for chronic (i.e., <230 mg/L) and acute (i.e., <860 mg/L) exposure. CARR-201-R-2018 had a chloride concentration of 583.60 mg/L, well above the chronic criteria. All other values ranged from 2.20 to 182.69 mg/L.

All sites met COMAR standards for heavy metal concentrations. Total lead concentrations ranged from below detection limit (<0.006 µg/L) to 0.712 µg/L. Total zinc concentrations ranged from below detection limit (0.078 µg/L) to 7.306 µg/L. Total copper concentrations ranged from below detection limit (0.008 µg/L) to 4.797 µg/L. Lead and zinc are of concern due to human health impacts, and copper because of its lethal effects on aquatic life.

Total nitrogen, nitrite, and nitrate concentrations were varied for all sites sampled in 2018. For total nitrogen (Figure 7), only two sites (4%) fell in the high category used by MBSS; MODS-163-F-2018 and GLAD-201-R-201, fourteen sites (28%) fell in the low category, and 34 sites (68%) fell within the moderate category. For nitrite, five sites (10%) fell in the high category, 32 sites (64%) were moderate, and 13 sites (26%) had low concentrations. Four sites (8%) had high nitrate concentrations, 36 sites (72%) were moderate, and 10 sites (20%) had low concentrations. Total ammonia concentrations were generally low, with only one site in the moderate category and all others with low concentrations. Nitrogen is of concern because of its effect on eutrophication in the Chesapeake Bay. Excess nitrogen can lead to blooms of algae in the downstream receiving waters and the Bay. Algae blooms consume large amounts of dissolved oxygen in the deeper portions of the Bay when the algae dies off, sinks to the bottom, and decays. Sources of nitrogen pollution include atmospheric deposition, residential fertilizer, urban stormwater runoff, agricultural runoff, and wastewater treatment plants. Ammonia is a concern because at high enough concentrations it can be toxic to aquatic life.

Total phosphorus concentrations were all found to be in the moderate (30%) and low (70%) categories for sites sampled in 2018 (Figure 8). Four sites (8%) were found to have high orthophosphate concentrations, 11 sites (22%) had moderate concentrations, and 35 sites (70%) had low concentrations. Phosphorus is of concern because of its effect on eutrophication in lakes and reservoirs, and to a lesser extent in the Chesapeake Bay. Excess phosphorus can lead to blooms of algae in freshwater which consume large amounts of dissolved oxygen when the algae dies off, sinks to the bottom, and decays. Sources of phosphorus pollution include residential fertilizer, urban stormwater runoff, agricultural runoff, and wastewater treatment plants.

No water quality criteria exist for dissolved organic carbon (DOC), total organic carbon (TOC), magnesium, calcium, or hardness. Values for these parameters ranged from 0.53 to 4.20 mg/L for DOC, 0.60 to 4.26 mg/L for TOC, 0.65 to 24.81 mg/L for magnesium, 1.85 to 97.97 mg/L for calcium, and 8.71 to 295.28 mg/L for hardness. Water quality results can be found in Appendix D. Organic carbon is important in identifying sources of acidity in freshwater. Magnesium, calcium, and hardness are important for shell development in freshwater mussels and snails.

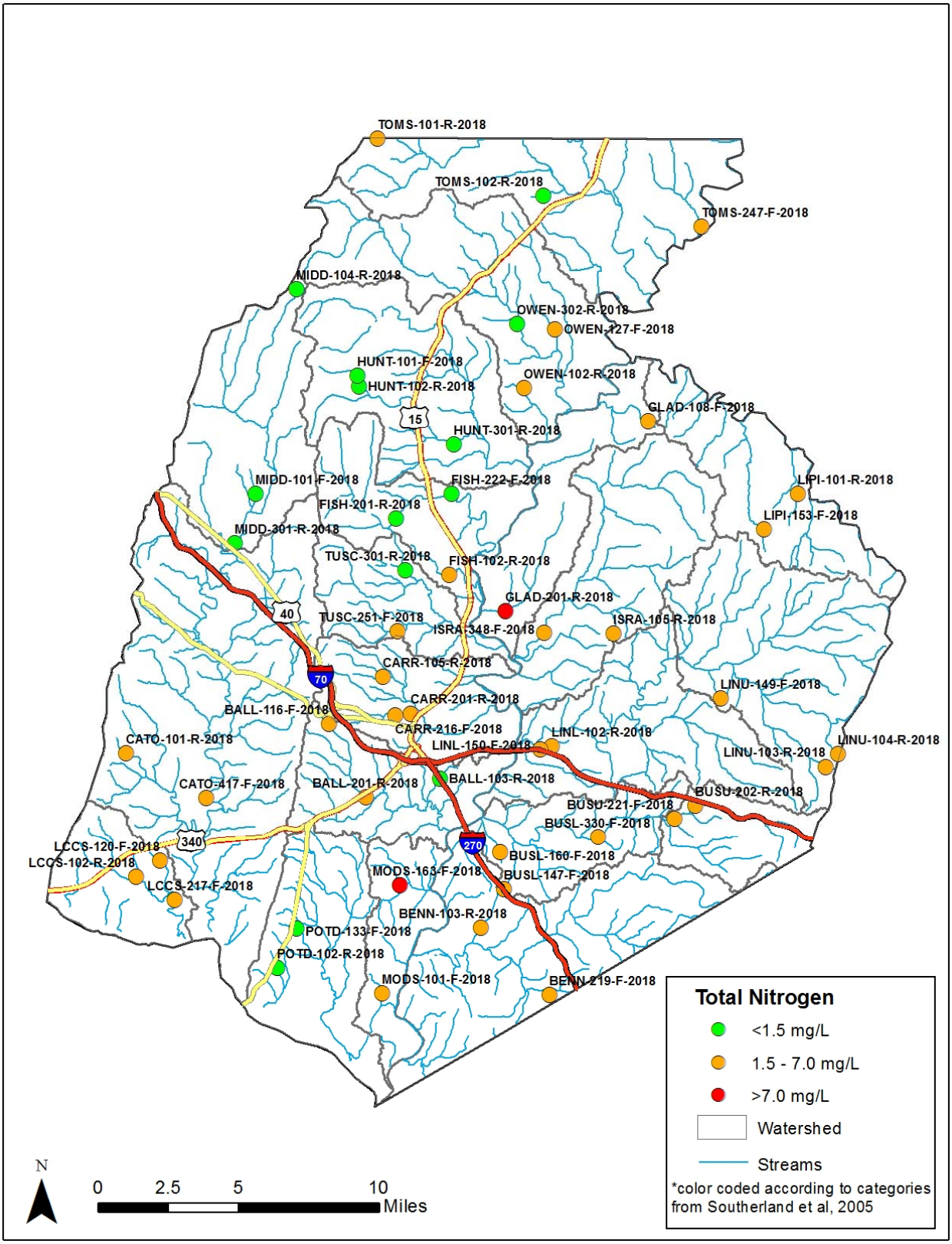

Figure 7 – Total Nitrogen Concentrations

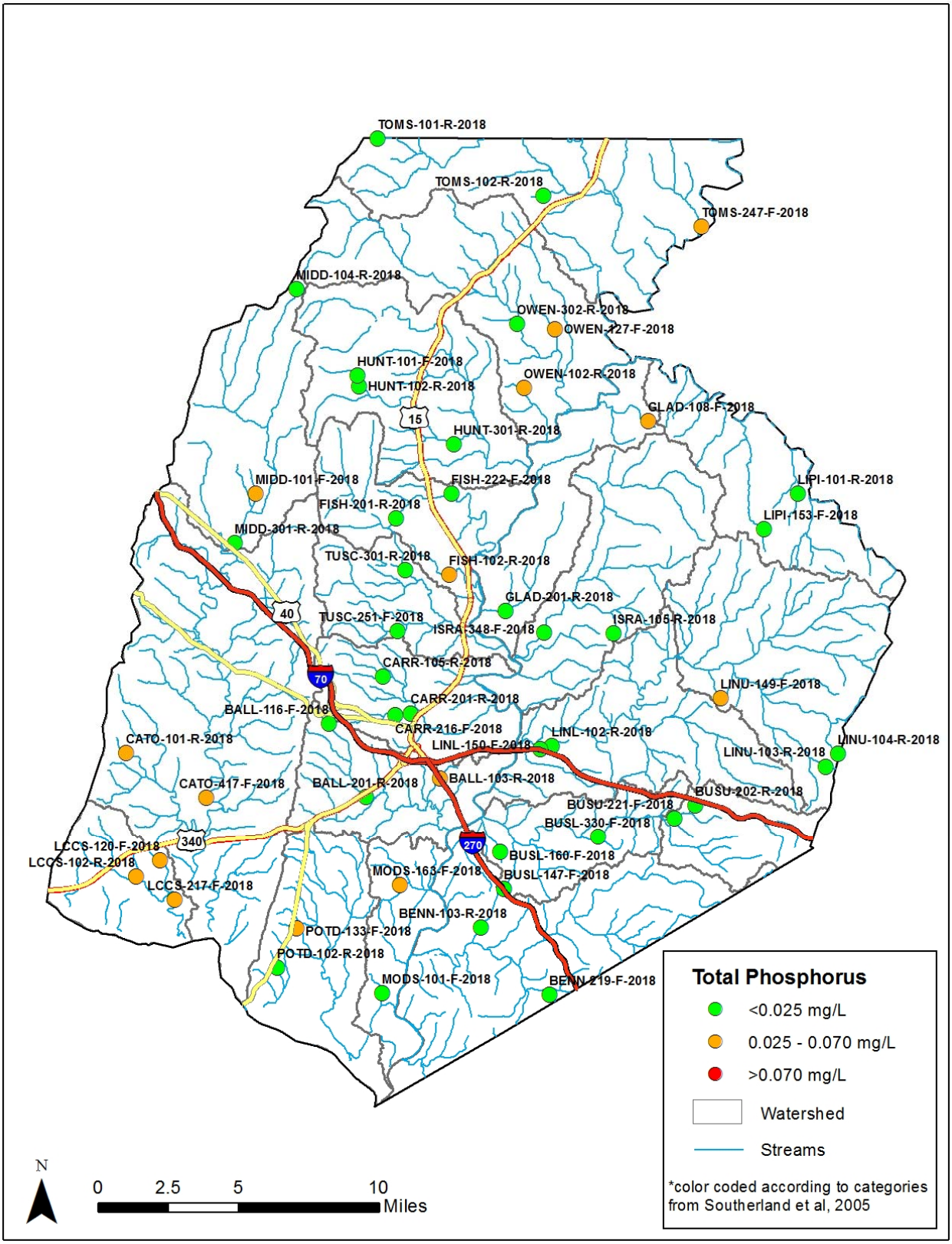

Figure 8 – Total Phosphorus Concentrations)

6 Land Use Analysis and Impervious Surface Summary

6.1 Subwatershed Summaries

An analysis was conducted to calculate the percent impervious surface coverage and land use distribution for each of the site drainage areas to evaluate the effect of imperviousness and land use on biological condition. Drainage areas were first delineated for each sampling site using a combination of ArcGIS Hydro tools and two-foot contours. Land use was derived from Maryland Department of Planning (MDP) 2010 land use for Frederick County. Impervious area data for sites with contributing drainage area wholly within Frederick County were derived using Frederick County's planimetric impervious surface layers which includes buildings, parking lots, sidewalks and roadways. For three sites with contributing drainage area outside of Frederick County (two sites draining from Carroll County and one site draining from Montgomery County), impervious data from adjoining counties were used along with Frederick County data to provide a total impervious area upstream of those sites. One site in Toms Creek (TOMS-101-R-2018) drained a small portion of Pennsylvania; impervious data from Pennsylvania was not available and the reported impervious total is for Frederick County's portion only. Land use categories from MDP were combined to general land use categories of agriculture, forest, open land, or urban according to the groupings in Table 11 below.

Table 11 – Land Cover Categories

Category	MDP Description	MDP Code
Agriculture	Agricultural Buildings	242
Agriculture	Cropland	21
Agriculture	Feeding Operations	24
Agriculture	Feeding Operations	241
Agriculture	Large Lot Subdivision (Agriculture)	191
Agriculture	Orchards	23
Agriculture	Pasture	22
Agriculture	Row And Garden Crops	25
Forest	Brush	44
Forest	Deciduous Forest	41
Forest	Evergreen Forest	42
Forest	Large Lot Subdivision (Forest)	192
Forest	Mixed Forest	43
Open	Bare Exposed Rock	72
Open	Bare Ground	73
Open	Barren Land	70
Open	Beaches	71
Open	Water	50
Open	Wetlands	60
Urban	Commercial	14
Urban	Extractive	17
Urban	High-Density Residential	13
Urban	Industrial	15
Urban	Institutional	16

Category	MDP Description	MDP Code
Urban	Low-Density Residential	11
Urban	Medium-Density Residential	12
Urban	Open Urban Land	18
Urban	Transportation	80

A similar analysis of land use and impervious surface coverage was performed for each of Frederick County's subwatersheds. These subwatersheds are entirely within Frederick County, stopping at the Frederick County border. Table 12 shows the total area of each subwatershed, percent impervious surface area, and land use distribution. Catoctin Creek is the largest subwatershed, totaling 58,541 acres, while the smallest subwatershed is Upper Bush Creek, with 8,842 acres. Carroll Creek had the largest percent of impervious area, with 28 percent impervious cover. Five subwatersheds shared the minimum of 3 percent impervious surface: Fishing Creek, Little Pipe Creek, Middle Creek, Owens Creek, and Toms Creek. Along with having the highest percent impervious, Carroll Creek also had the highest percentage of urban land use, at 65 percent. Both Little Pipe Creek and Owens Creek had 7 percent urban land use, the lowest of all subwatersheds. Hunting Creek had the highest percent of forest land use at 61 percent while Glade Creek had the lowest at 10 percent. The highest percentage of agricultural land use was 81 percent within Little Pipe Creek while the lowest was 21 percent at Carroll Creek. Little Catoctin Creek South had the largest amount of open space at 7 percent due to the Potomac River running through the length of the entire subwatershed. Eleven of the twenty subwatersheds did not have open space land use. Individual site land use graph (Figure 9), countywide land use (Figure 10), and impervious surface (Figure 11) maps are presented below. Individual subwatershed land use summaries and land use percentages at each site are included in Appendix E.

Table 12 – Land Use Distribution and Impervious Area Cover by Subwatershed

Subwatershed	Total Acreage	% Impervious	Land Use			
			% Urban	% Forest	% Agriculture	% Open Space
Ballenger Creek (BALL)	14,852	18%	47%	16%	36%	1%
Bennett Creek (BENN)	31,064	4%	17%	44%	38%	1%
Carroll Creek (CARR)	14,852	28%	65%	13%	21%	0%
Catoctin Creek (CATO)	58,541	4%	17%	27%	56%	1%
Fishing Creek (FISH)	15,853	3%	10%	52%	39%	0%
Glade Creek (GLAD)	14,800	5%	14%	10%	74%	2%
Hunting Creek (HUNT)	26,971	4%	11%	61%	28%	0%
Israel Creek (ISRA)	24,694	5%	17%	25%	58%	0%
Little Catoctin Creek South (LCCS)	11,149	6%	20%	27%	46%	7%
Little Pipe Creek (LIPI)	17,503	3%	7%	12%	81%	0%
Lower Bush Creek (BUSL)	12,495	9%	22%	35%	42%	2%
Lower Linganore Creek (LINL)	24,135	7%	26%	32%	40%	1%
Middle Creek (MIDD)	21,534	3%	9%	54%	36%	0%
Monocacy Direct Southwest (MODS)	9,967	6%	16%	15%	68%	1%
Owens Creek (OWEN)	29,903	3%	7%	45%	48%	0%
Potomac Direct (POTD)	18,585	4%	13%	26%	56%	4%
Toms Creek (TOMS)	30,435	3%	9%	37%	54%	0%
Tuscarora Creek (TUSC)	11,643	9%	28%	45%	28%	0%
Upper Bush Creek (BUSU)	8,842	9%	43%	28%	29%	0%
Upper Linganore Creek (LINU)	28,950	4%	11%	25%	64%	0%

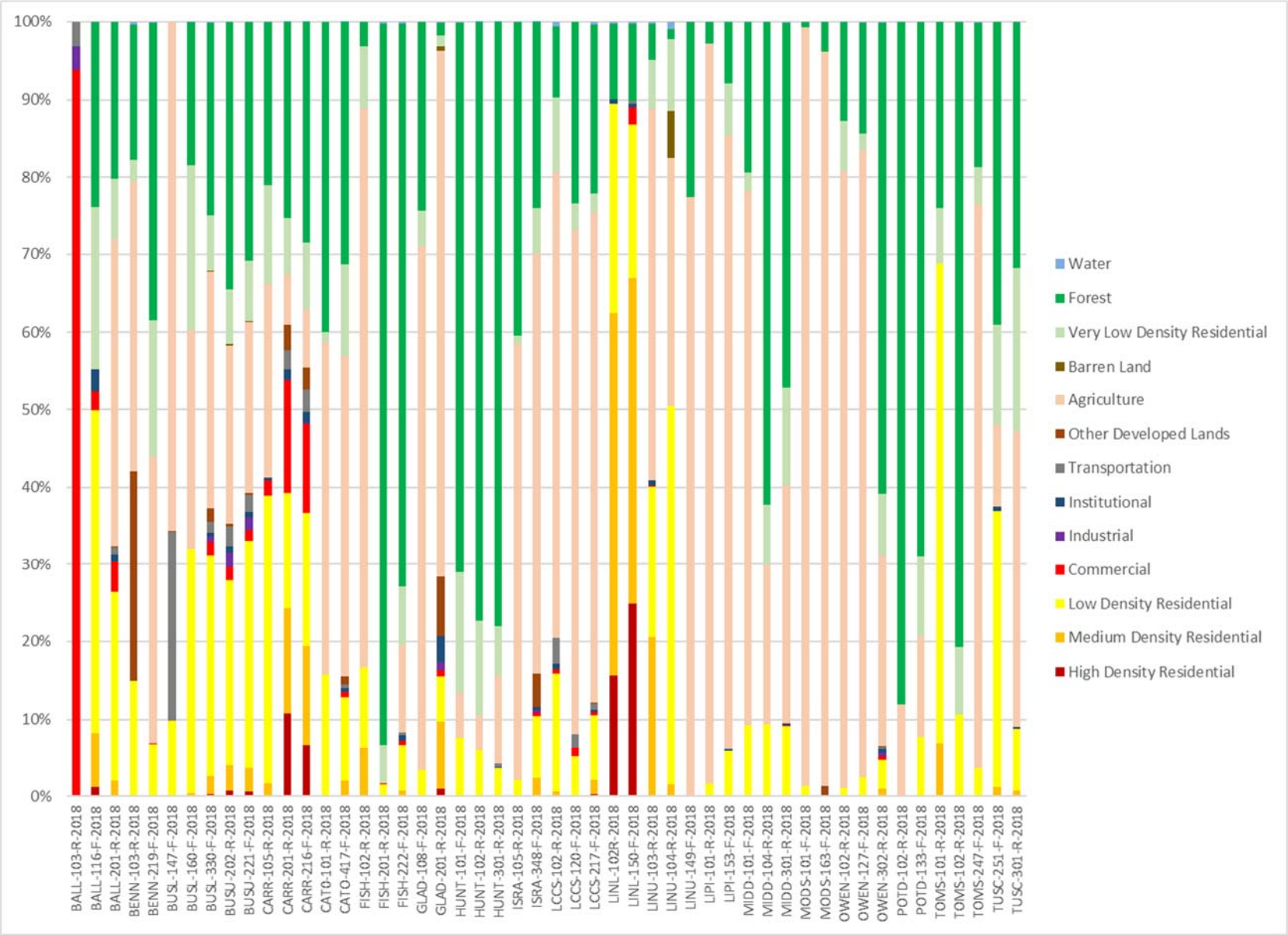

Figure 9 – Land Use percentage for each site's drainage area

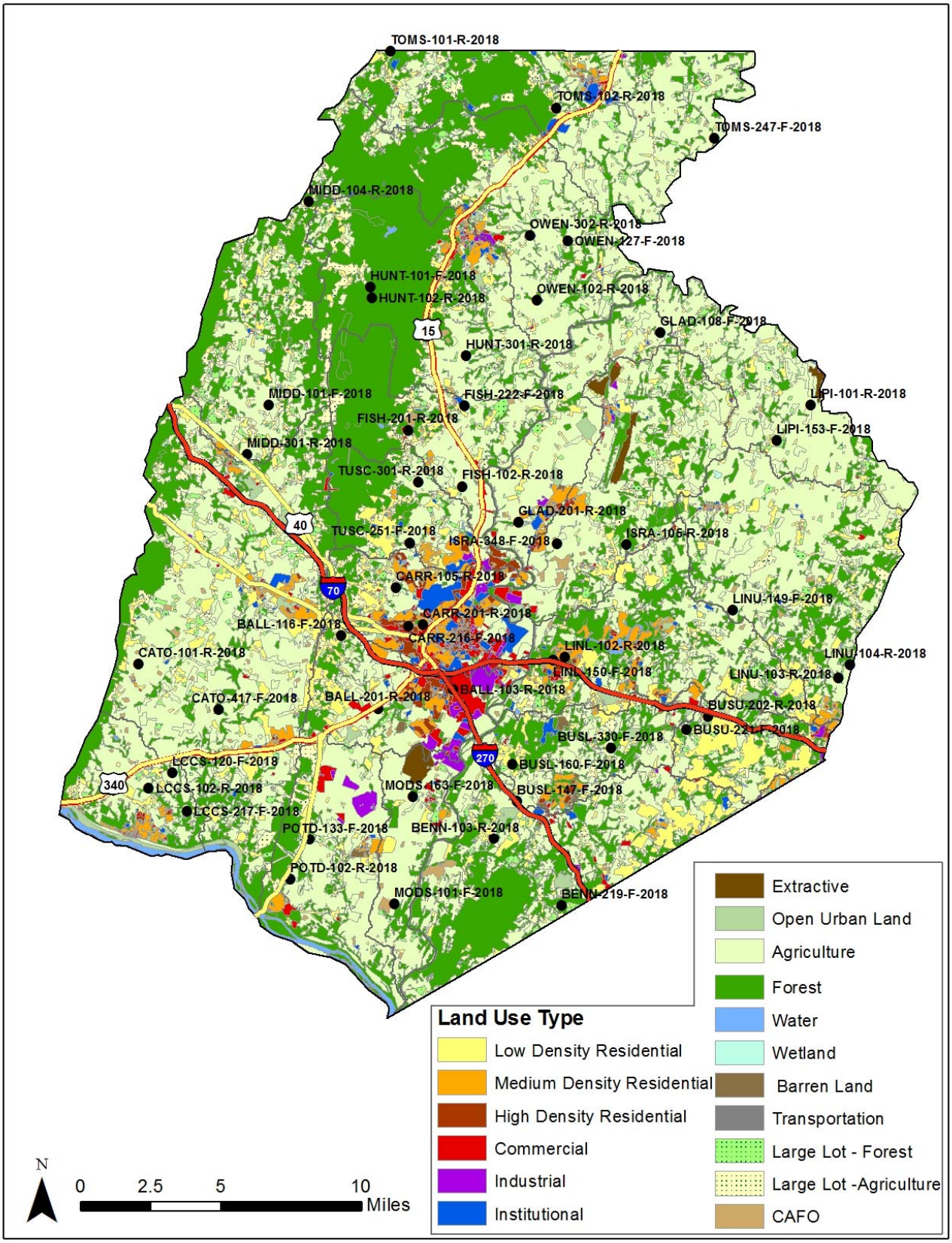

Figure 10 – Frederick County 2010 Land Use/ Land Cover

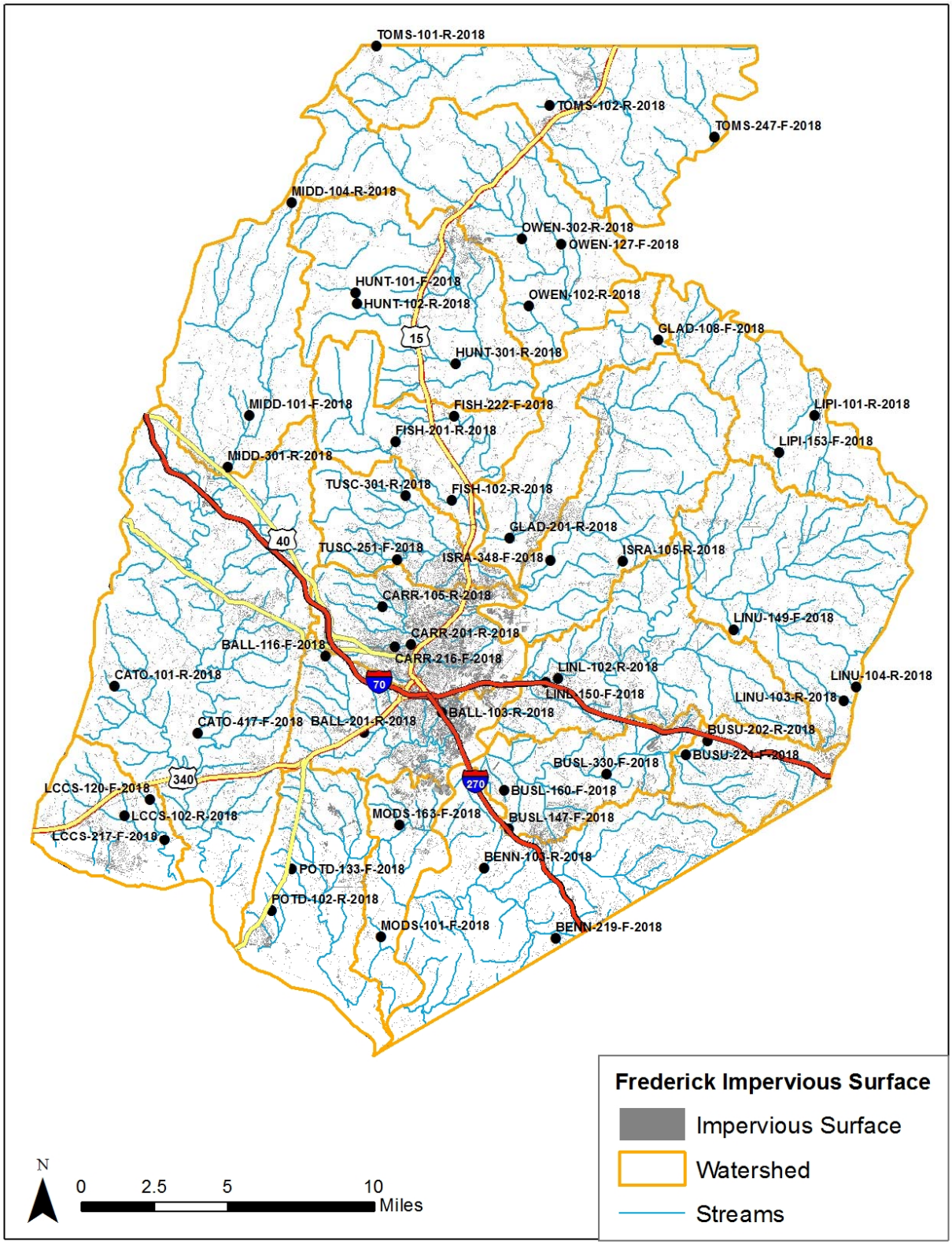

Figure 11 – Frederick County Impervious Surface Cover

6.2 Land Use Analysis

Analyses were conducted to investigate the relationship between site drainage area land use and the resulting BIBI scores for each site. The MBSS has found that in the state-wide dataset land use factors that are most influential in potential changes in BIBI score are percent forest, percent urban and percent impervious (Southerland et al, 2005a). Results of linear regressions using 2018 FCSS data indicate a significant positive relationship between BIBI and percent forest, and a significant negative relationship between BIBI and percent impervious (P-values: 0.04 and 0.02; α=0.05). BIBI and percent urban land use had a negative relationship but was not significant ((P-value: 0.1335; α=0.05); Table 13). A positive or negative (+/-) slope indicates how the BIBI scores are affected by land use type. For percent forest, a positive slope indicates that as percent forest increases, BIBI score increases. For percent impervious and percent urban, a negative slope indicates that as impervious surface and urban land use increases, BIBI score decreases.

Table 13 – Regression Analysis, BIBI versus Land Use

	Slope	*P-value*
Percent Forest	0.7713	**0.04**
Percent Urban	-0.6261	0.13
Percent Impervious	-2.3126	**0.02**

Bold values indicate significance at an α less than 0.05

Figure 12 displays regressions between BIBI scores and percent forest land use, percent urban land use, or percent impervious surface cover. All three regressions have low R^2 values, indicating that land use is only one of multiple factors that are affecting BIBI scores in Frederick County streams, a very similar pattern to what is observed in the state-wide MBSS dataset. As visible from the graphs, there is a lot of variance within each regression, which is to be expected in this type of field-based environmental sampling. While there is a great deal of variance, the significance of the regressions of BIBI scores with percent forest and percent impervious shows that changes in land use have a real effect on BIBI scores.

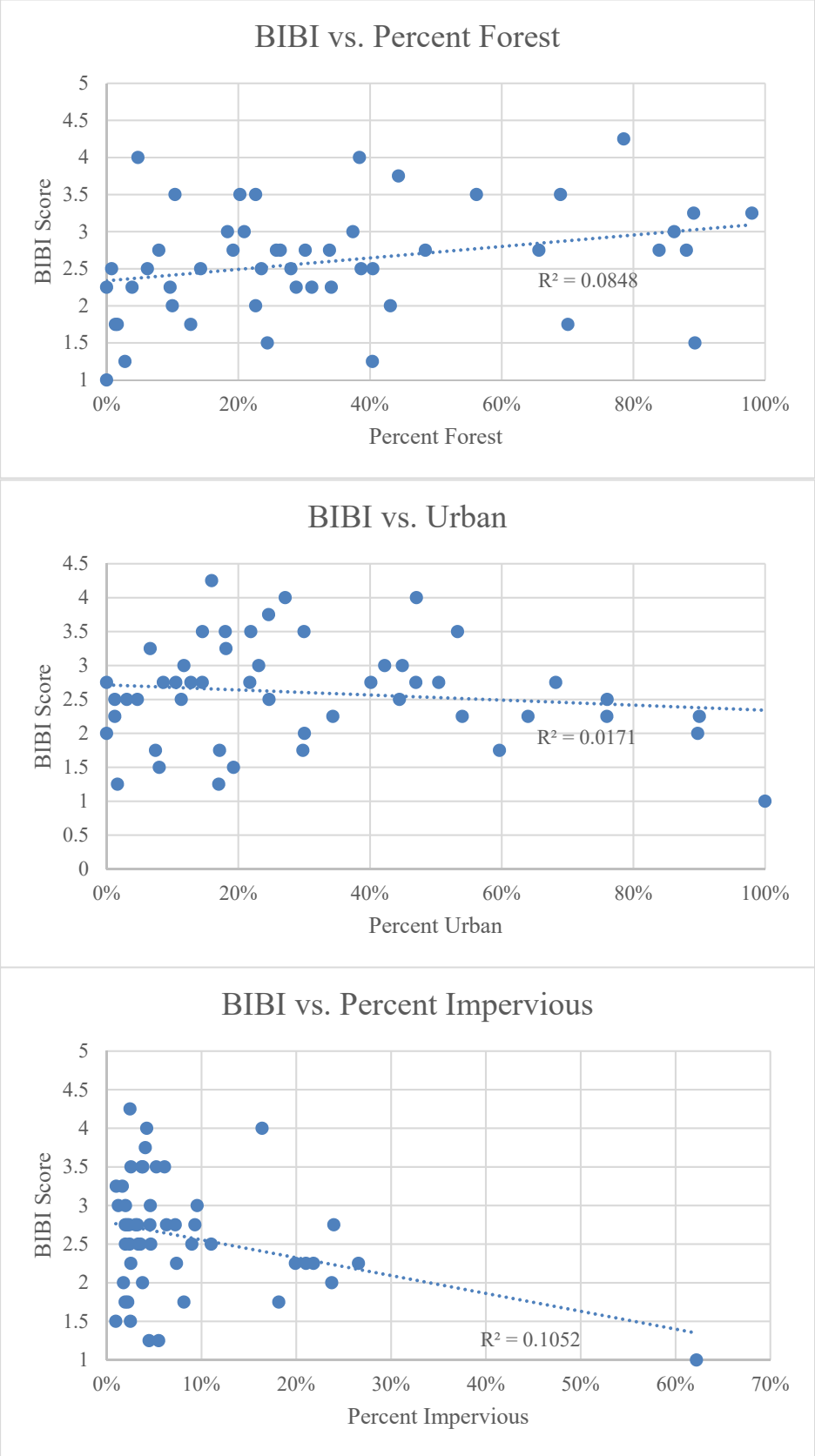

Figure 12 – Regressions for BIBI Score versus Percent Forest, Percent Urban and Percent Impervious land uses

7 Comparison of Results of Repeated Sites

A total of 24 sites initially visited during Round 1 or Round 2 were randomly selected to be re-sampled in 2018. The same parameters were collected during the 2018 visit as was collected during the initial Round 1 or Round 2 visit. A comparison of data from both visits is presented in the following sections in an effort to detect changes and trends.

7.1 Benthic Macroinvertebrate Community

On average, 2018 BIBI scores of revisit sites across the County were 0.19 points higher than those from previous visits during Round 1 and Round 2 (2008-2016). Five of the 24 sites (20.8%) saw no change and only five sites had a decrease in BIBI score. A total of 14 sites had higher BIBI scores during 2018 when compared to the first visit, with 2018 BIBI scores ranging from 0.25 points to 1.50 points higher (Table 14, Figure 13). Two sites, CATO-417-F and MIDD-101-F had BIBI scores higher in 2018 by 1.00 and 1.50 in 2018 respectively, while HUNT-101-F and TUSC-251-F had BIBI scores lower by 1.5 and 1.0 points respectively.

Table 14 – BIBI Rating Comparison

Site ID	Previous Year Sampled	Previous BIBI	Previous BIBI Rating	2018 BIBI	2018 BIBI Rating	BIBI Difference
BALL-116-F	2014	2.25	Poor	2.50	Poor	0.25
BENN-219-F	2014	3.50	Fair	3.75	Fair	0.25
BUSL-147-F	2016	2.25	Poor	2.25	Poor	0.00
BUSL-160-F	2011	2.75	Poor	3.50	Fair	0.75
BUSL-330-F	2009	2.50	Poor	2.50	Poor	0.00
BUSU-221-F	2014	3.25	Fair	2.75	Poor	-0.50
CARR-216-F	2014	1.75	Very Poor	2.25	Poor	0.50
CATO-417-F	2014	3.00	Fair	4.00	Good	1.00
FISH-222-F	2009	3.50	Fair	4.25	Good	0.75
GLAD-108-F	2013	1.50	Very Poor	1.50	Very Poor	0.00
HUNT-101-F	2013	4.50	Good	3.00	Fair	-1.50
ISRA-348-F	2016	3.50	Fair	2.75	Poor	-0.75
LCCS-120-F	2014	1.75	Very Poor	2.50	Poor	0.75
LCCS-217-F	2014	2.75	Poor	3.50	Fair	0.75
LINL-150-F	2016	2.25	Poor	2.00	Poor	-0.25
LINU-149-F	2016	1.50	Very Poor	2.00	Poor	0.50
LIPI-153-F	2011	2.25	Poor	2.75	Poor	0.50
MIDD-101-F	2008	1.50	Very Poor	3.00	Fair	1.50
MODS-101-F	2013	2.00	Poor	2.50	Poor	0.50
MODS-163-F	2011	2.00	Poor	2.25	Poor	0.25
OWEN-127-F	2014	2.50	Poor	2.50	Poor	0.00
POTD-133-F	2009	3.50	Fair	3.50	Fair	0.00
TOMS-247-F	2016	2.50	Poor	2.75	Poor	0.25
TUSC-251-F	2016	3.75	Fair	2.75	Poor	-1.00

Bars in the BIBI Difference column indicate magnitude (length) and direction (color) of change in BIBI scores between samples. A red, negative value indicates the BIBI score from 2018 was lower than the first sample.

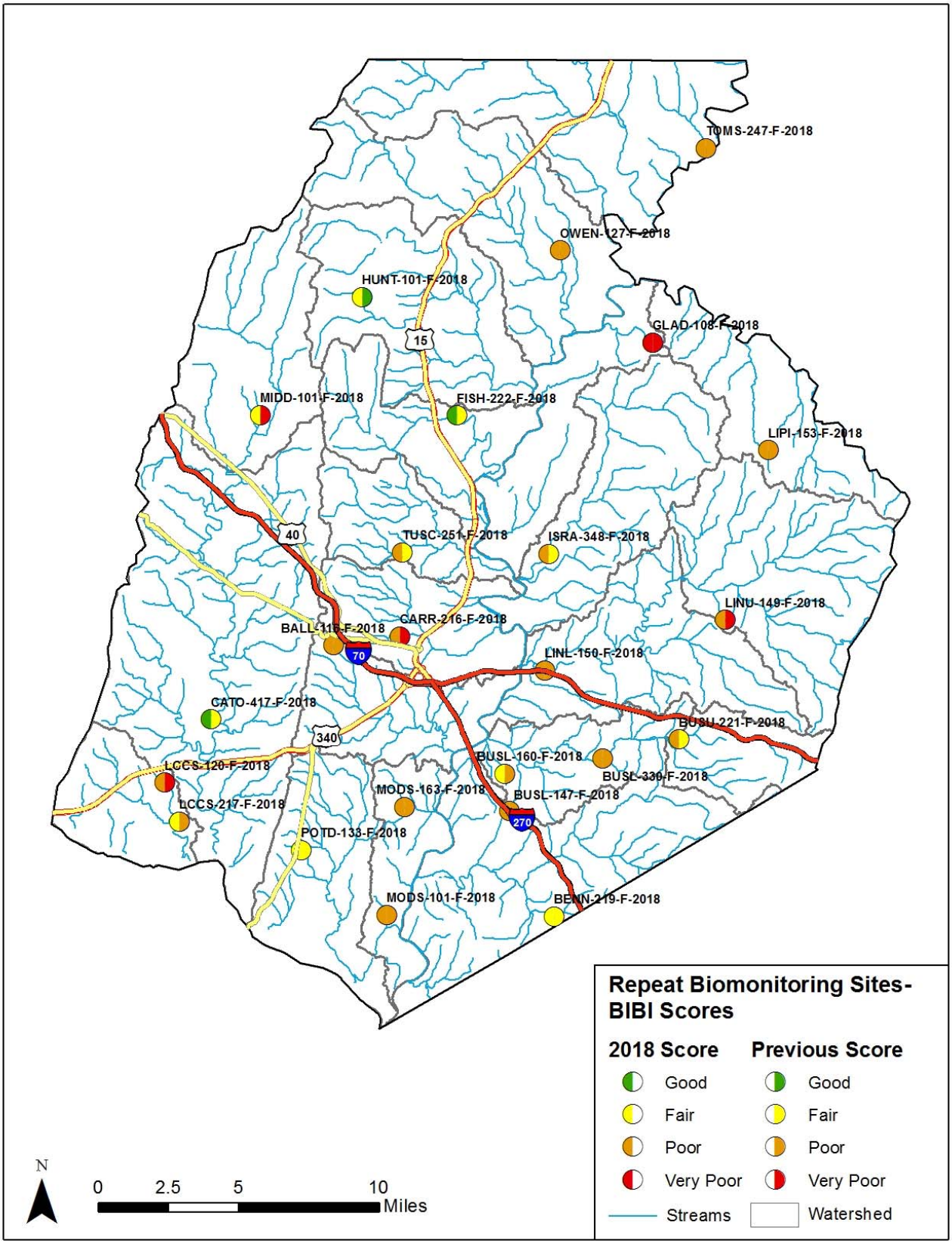

Figure 13 – Repeat Biomonitoring Sites- BIBI Scores

7.2 Habitat

On average, 2018 PHI scores were consistent with previous scores. Twelve of 24 repeat sites in total scored higher in 2018 while 9 of those 12 sites increased enough to move up into a different rating category. Twelve sites also scored lower in 2018 and 4 of the 12 sites dropped in rating category. Two sites, LINU-149-F and MODS-163-F, were scored much lower (<20 points) in 2018 when compared to the previous assessment (Table 15, Figure 14). MODS-163-F scored 28.99 points lower in 2018, primarily a result of a lower riparian zone and epifaunal substrate score. LINU-149-F scored 20.97 points lower in 2018 due to increased bank erosion and a lower epifaunal substrate score. Site ISRA-348-F scored 20.63 points higher in 2018, the largest increase of all sites. GLAD-108-F and CATO-417-F both scored higher in 2018 than previous years with increases of 18.48 and 17.23 respectively. Higher scores in 2018 were commonly a result of higher shading, epifaunal substrate, and riparian buffer scores. Overall, there is not an apparent relationship between an increase or decrease in BIBI and a change in habitat score or water quality. For example, MIDD-101-F had the largest BIBI increase of 1.5 points, but also had a decrease in PHI from 'Partially Degraded' to 'Degraded'. Similarly, MODS-163-F had a modest BIBI increase of 0.25 points but had a large decrease in PHI score of 29 points which moved it down two categories from 'Partially Degraded' to 'Severely Degraded'.

Table 15 – PHI Rating Comparison

Site ID	Previous Year Sampled	Previous PHI	Previous PHI Rating	2018 PHI	2018 PHI Rating	PHI Difference
BALL-116-F	2014	77.48	Partially Degraded	74.34	Partially Degraded	-3.14
BENN-219-F	2014	86.49	Minimally Degraded	83.38	Minimally Degraded	-3.10
BUSL-147-F	2016	63.74	Degraded	69.47	Partially Degraded	5.74
BUSL-160-F	2011	62.93	Degraded	66.71	Partially Degraded	3.77
BUSL-330-F	2009	65.99	Degraded	69.97	Partially Degraded	3.99
BUSU-221-F	2014	80.32	Partially Degraded	77.47	Partially Degraded	-2.84
CARR-216-F	2014	70.97	Partially Degraded	65.91	Degraded	-5.06
CATO-417-F	2014	42.36	Severely Degraded	59.59	Degraded	17.23
FISH-222-F	2009	53.89	Degraded	67.22	Partially Degraded	13.33
GLAD-108-F	2013	28.55	Severely Degraded	47.03	Severely Degraded	18.48
HUNT-101-F	2013	73.29	Partially Degraded	67.43	Partially Degraded	-5.87
ISRA-348-F	2016	37.48	Severely Degraded	58.11	Degraded	20.63
LCCS-120-F	2014	57.68	Degraded	57.71	Degraded	0.03
LCCS-217-F	2014	68.24	Partially Degraded	72.80	Partially Degraded	4.56
LINL-150-F	2016	64.69	Degraded	72.06	Partially Degraded	7.37
LINU-149-F	2016	63.30	Degraded	42.32	Severely Degraded	-20.97
LIPI-153-F	2011	62.38	Degraded	62.05	Degraded	-0.33
MIDD-101-F	2008	67.22	Partially Degraded	60.79	Degraded	-6.43
MODS-101-F	2013	40.67	Severely Degraded	45.29	Severely Degraded	4.62
MODS-163-F	2011	73.01	Partially Degraded	44.02	Severely Degraded	-28.99
OWEN-127-F	2014	40.00	Severely Degraded	55.06	Degraded	15.05
POTD-133-F	2009	58.63	Degraded	57.73	Degraded	-0.90
TOMS-247-F	2016	43.06	Severely Degraded	41.40	Severely Degraded	-1.66
TUSC-251-F	2016	73.78	Partially Degraded	69.98	Partially Degraded	-3.80

Bars in the PHI Difference column indicate magnitude (length) and direction (color) of change in PHI scores between samples. A red, negative value indicates the PHI score from 2018 was lower than the first sample.

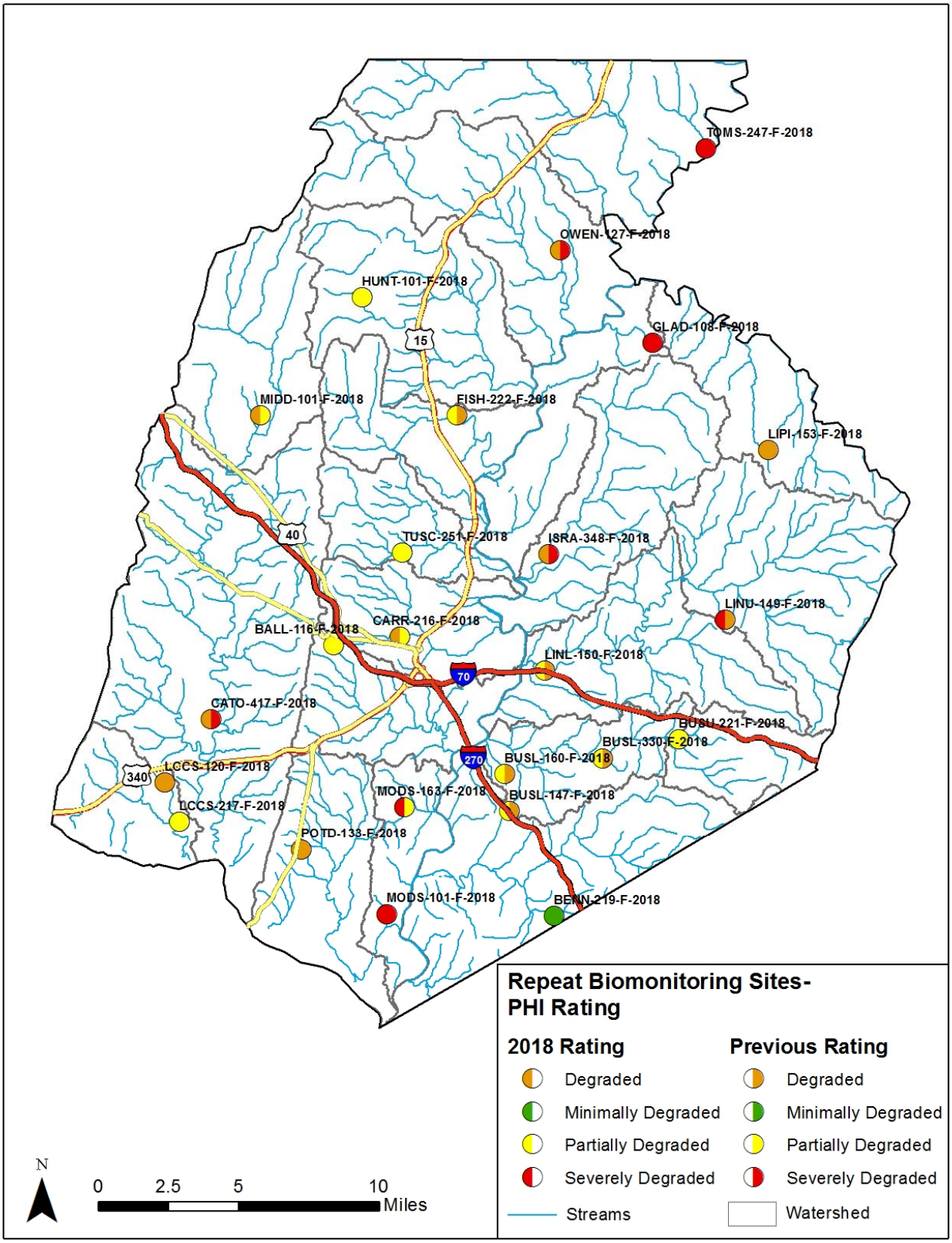

Figure 14 – Repeat Biomonitoring Sites- PHI Rating

7.3 Water Quality

Water quality grab samples were collected and analyzed during all Rounds of sampling, allowing for comparison of several parameters over time. Water quality data color coded according to categories established by Southerland et al. (2005) from state-wide MBSS data can be found in Appendix D. In general, water quality conditions were consistent between sampling years. Only two sites had the concentration of an individual parameter increase or decrease by two general MBSS categories. BUSL-330-F had orthophosphate concentrations in the high category (0.0344 mg/L) in 2009 and the low (0.0033 mg/L) in 2018. LCCS-217-F had low orthophosphate concentrations (0.0058 mg/L) in 2014 and high concentrations (0.0349 mg/L) in 2018.

Several sites had parameters in high concentrations during both sampling visits. While this data only represents two points in time and more data is necessary for conclusive results, high concentrations of a parameter during both sampling visits is likely indicative of chronic conditions. Nitrite was found to be high during both visits at BUSU-221-F and MODS-101-F, and nitrate was found in high concentrations at both MODS-101-F and MODS-163-F. High concentrations of orthophosphate was found at GLAD-108-F and total nitrogen was found in high concentrations at MODS-163-F during both visits. Repeat sites with elevated nutrients tended to be sites where agriculture dominated the upstream land use. This pattern may be coincidental, there were other repeat sites dominated by agricultural land use that did not have nutrients as elevated as the sites referenced above. BIBI and water quality (WQ) comparisons show similar results as an increase or decrease in WQ at a particular site did not result in a similar increase or decrease in BIBI score. A detailed analysis at the end of the Round Three of the FCSS will investigate the patterns for statistical significance.

8 Conclusions

The benthic macroinvertebrate community throughout the sampling sites visited during 2018 were mostly categorized as 'Poor' (52%), followed by 'Fair' (24%) and 'Very Poor' (18%). Only three of the 50 sampled sites (6%) were categorized as 'Good'. The range of BIBI scores at individual sites ranged from 1.00 'Very Poor', to 4.25 'Good' on a 1.00 – 5.00 scale. The mean BIBI value of all sites sampled in 2018 resulted in a 'Poor' biological condition rating (2.60). The 2018 revisited sites scored slightly higher than previous years (mean difference 0.19) with two sites increasing by 1.0 or more and two sites decreasing by 1.0 or more.

The majority of sites sampled in 2018 received habitat ratings of 'Partially Degraded' (42%), 'Severely Degraded' (26%), and 'Degraded' (26%). Only three of the sites (6%), received the highest rating of 'Minimally Degraded'. PHI scores ranged from 34.4 ('Severely Degraded') to 86.0 ('Minimally Degraded') on a 0.0 to 100.0 scale. The habitat scores at the 2018 revisit sites showed an even split with 50 percent increasing and 50 percent decreasing. One site had a notably lower score but as discussed, this difference in physical habitat score did not occur with a concomitant decrease in BIBI score as that site saw an increase in BIBI score. With only five metrics included in the scoring, each one has a large contribution to the overall habitat score such as remoteness, which tended to score the lowest of all parameters across most sites and was a main contributor to some of the lower scores.

In situ water quality measurements were within COMAR standards for temperature, dissolved oxygen, and turbidity at all sites; although three sites recorded high pH values that were outside the acceptable range of values set forth by COMAR (i.e., 6.5-8.5). Over half of the sites sampled had elevated specific conductivity values that exceeded 247 uS/cm, which is the critical threshold between 'Fair' and 'Poor' stream quality determined for Maryland streams, based on BIBI scores (Morgan et al., 2007). The high specific conductivity values indicate anthropogenic disturbance as well as degraded biological conditions. All sites were below COMAR standards for heavy metal concentrations while only one site exceeded the EPA standard for acute and chronic chloride exposure. The majority of nutrients (nitrogen, nitrate, and nitrite) were found in moderate concentrations while ammonia, total phosphorus, and orthophosphorus were mainly found in low concentrations.

Biological communities respond to a combination of environmental factors, commonly referred to as stressors. Stressors can be organized according to the five major determinants of biological integrity in aquatic ecosystems, which include water chemistry, energy source, habitat structure, flow regime, and biotic interactions (Karr et al., 1986; Angermeier and Karr, 1994; Karr and Chu, 1998). The cumulative effects of human activities within the County's sampling units often results in an alteration of at least one, if not several, of these factors with detrimental consequences for the aquatic biota. Determining which specific stressors are responsible for the observed degradation within a stream or watershed is a challenging task, given that many stressors co-exist and synergistic effects can occur. Furthermore, an added challenge in identifying the stressors affecting stream biota is that the water quality and physical habitat data collected by the County's monitoring program are not comprehensive (i.e., they do not include many possible stressors). For instance, there is virtually no data available regarding biotic interactions and energy sources, and only limited data regarding flow regime variables, such as land use and impervious cover, are included. Stressor relationships with stream biotic components, and their derived indices (i.e., BIBI), are often difficult to partition from complex temporal–spatial data sets primarily due to the potential array of multiple stressors working at the site to landscape scale in small

streams (Helms et al. 2005; Miltner et al., 2004; Morgan and Cushman, 2005; Volstad et al., 2003; Morgan et al., 2007). Therefore, it should be noted that the current level of analysis cannot identify all stressors for the impaired sites, nor will the stressors identified include all of the stressors present. 2018 represents year one of the third round of county-wide coverage by the FCSS and this report is meant to summarize results from the current year. At the end of this third round, a comprehensive analysis will be performed on the entire dataset to investigate possible relationships between ecological stream health and potential stressors.

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Appendix A: Representative Site Photolog

BALL-103-R-2018 - Upstream

BALL-103-R-2018 - Downstream

BALL-116-F-2018 - Upstream

BALL-116-F-2018 - Downstream

BALL-201-R-2018 - Upstream

BALL-201-R-2018 - Downstream

BENN-103-R-2018 - Upstream

BENN-103-R-2018 - Downstream

BENN-219-F-2018 - Upstream

BENN-219-F-2018 - Downstream

BUSL-147-F-2018 - Upstream

BUSL-147-F-2018 - Downstream

BUSL-160-F-2018 - Upstream

BUSL-160-F-2018 - Downstream

BUSL-330-F-2018 - Upstream

BUSL-330-F-2018 - Downstream

BUSU-202-R-2018 - Upstream

BUSU-202-R-2018 - Downstream

BUSU-221-F-2018 - Upstream

BUSU-221-F-2018 - Downstream

CARR-105-R-2018 - Upstream

CARR-105-R-2018 - Downstream

CARR-201-R-2018 - Upstream

CARR-201-R-2018 - Downstream

CARR-216-F-2018 - Upstream

CARR-216-F-2018 - Downstream

CATO-101-R-2018 - Upstream

CATO-101-R-2018 - Downstream

CATO-417-F-2018 - Upstream

CATO-417-F-2018 - Downstream

FISH-102-R-2018 - Upstream

FISH-102-R-2018 - Downstream

FISH-201-R-2018 - Upstream

FISH-201-R-2018 - Downstream

FISH-222-F-2018 - Upstream

FISH-222-F-2018 - Downstream

GLAD-108-F-2018 - Upstream

GLAD-108-F-2018 - Downstream

GLAD-201-R-2018 - Upstream

GLAD-201-R-2018 - Downstream

HUNT-101-F-2018 - Upstream

HUNT-101-F-2018 - Downstream

HUNT-102-R-2018 - Upstream

HUNT-102-R-2018 - Downstream

HUNT-301-R-2018 - Upstream

HUNT-301-R-2018 - Downstream

ISRA-105-R-2018 - Upstream

ISRA-105-R-2018 - Downstream

ISRA-348-F-2018 - Upstream

ISRA-348-F-2018 - Downstream

LCCS-102-R-2018 - Upstream

LCCS-102-R-2018 - Downstream

LCCS-120-F-2018 - Upstream

LCCS-120-F-2018 - Downstream

LCCS-217-F-2018 - Upstream

LCCS-217-F-2018 - Downstream

LINL-102-R-2018 - Upstream

LINL-102-R-2018 - Downstream

LINL-150-F-2018 - Upstream

LINL-150-F-2018 - Downstream

LINU-103-R-2018 - Upstream

LINU-103-R-2018 - Downstream

LINU-104-R-2018 - Upstream

LINU-104-R-2018- Downstream

LINU-149-F-2018 - Upstream

LINU-149-F-2018 - Downstream

LIPI-101-R-2018 - Upstream

LIPI-101-R-2018 - Downstream

LIPI-153-F-2018 - Upstream

LIPI-153-F-2018 - Downstream

MIDD-101-F-2018 - Upstream

MIDD-101-F-2018 - Downstream

MIDD-104-R-2018 - Upstream

MIDD-104-R-2018 - Downstream

MIDD-301-R-2018 - Upstream

MIDD-301-R-2018 - Downstream

MODS-101-F-2018 - Upstream

MODS-101-F-2018 - Downstream

MODS-163-F-2018 - Upstream

MODS-163-F-2018 - Downstream

OWEN-102-R-2018 - Upstream

OWEN-102-R-2018 - Downstream

OWEN-127-F-2018 - Upstream

OWEN-127-F-2018 - Downstream

OWEN-302-R-2018 - Upstream

OWEN-302-R-2018 - Downstream

POTD-102-R-2018 - Upstream

POTD-102-R-2018 - Downstream

POTD-133-F-2018 - Upstream

POTD-133-F-2018 - Downstream

TOMS-101-R-2018 - Upstream

TOMS-101-R-2018 - Downstream

TOMS-102-R-2018 - Upstream

TOMS-102-R-2018 - Downstream

TOMS-247-F-2018 - Upstream

TOMS-247-F-2018 - Downstream

TUSC-251-F-2018 - Upstream

TUSC-251-F-2018 - Downstream

TUSC-301-R-2018 - Upstream

TUSC-301-R-2018 - Downstream

Appendix B: Benthic Macroinvertebrate Data

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/11/2018 Checked date: 10/1/2018

Metric	BALL-103-R-2018	BALL-116-F-2018	BALL-201-R-2018	BENN-103-R-2018	BENN-219-F-2018
Raw Scores	**Raw Scores**				
Total Number of Taxa	8	21	27	27	29
Number of EPT Taxa	0	11	6	7	9
Number of Ephemeroptera Taxa	0	1	3	3	5
Percent Intolerant Urban	0	49	1	61	58
Percent Tanytarsini	0	1	2	1	3
Percent Scrapers	15	3	5	15	19
Percent Swimmers	0	1	8	2	10
Percent Diptera	12	39	29	28	35
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	1	3	5	5	5
Number of EPT Taxa	1	3	1	1	3
Number of Ephemeroptera Taxa	1	1	3	3	5
Percent Intolerant Urban	1	3	1	3	3
Percent Tanytarsini	1	3	3	3	3
Percent Scrapers	1	3	3	5	5
Percent Swimmers	1	1	3	1	3
Percent Diptera	1	3	3	3	3
BIBI Score	***1.00***	***2.50***	***2.75***	***3.00***	***3.75***
Narrative Rating	***Very Poor***	***Poor***	***Poor***	***Fair***	***Fair***

Notes: 26 individuals total; sites with <60 indiv score a 1.00

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/11/2018 Checked date: 10/1/2018

Metric	BENN-219-F-2018 QC	BUSL-147-F-2018	BUSL-160-F-2018	BUSL-330-F-2018	BUSL-330-F-2018 QC
Raw Scores	**Raw Scores**				
Total Number of Taxa	27	34	33	27	25
Number of EPT Taxa	11	6	10	6	5
Number of Ephemeroptera Taxa	4	1	3	4	3
Percent Intolerant Urban	53	11	44	5	12
Percent Tanytarsini	1	33	5	22	13
Percent Scrapers	13	8	21	6	7
Percent Swimmers	3	2	1	1	3
Percent Diptera	41	77	41	62	57
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	5	5	5	5	5
Number of EPT Taxa	3	1	3	1	1
Number of Ephemeroptera Taxa	3	1	3	3	3
Percent Intolerant Urban	3	1	3	1	1
Percent Tanytarsini	3	5	5	5	5
Percent Scrapers	5	3	5	3	3
Percent Swimmers	3	1	1	1	3
Percent Diptera	3	1	3	1	1
BIBI Score	***3.50***	***2.25***	***3.50***	***2.50***	***2.75***
Narrative Rating	***Fair***	***Poor***	***Fair***	***Poor***	***Poor***

Notes: Quality Control Site Quality Control Site

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/11/2018 Checked date: 10/1/2018

Metric	BUSU-202-R-2018	BUSU-221-F-2018	CARR-105-R-2018	CARR-105-R-2018 LD	CARR-201-R-2018
Raw Scores	**Raw Scores**				
Total Number of Taxa	31	28	25	19	25
Number of EPT Taxa	8	6	8	9	4
Number of Ephemeroptera Taxa	3	3	2	3	0
Percent Intolerant Urban	10	7	11	9	0
Percent Tanytarsini	10	15	0	1	9
Percent Scrapers	19	4	68	20	13
Percent Swimmers	1	4	1	2	0
Percent Diptera	77	76	69	69	42
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	5	5	5	3	5
Number of EPT Taxa	3	1	3	3	1
Number of Ephemeroptera Taxa	3	3	1	3	1
Percent Intolerant Urban	1	1	1	1	1
Percent Tanytarsini	5	5	1	3	5
Percent Scrapers	5	3	5	5	5
Percent Swimmers	1	3	1	1	1
Percent Diptera	1	1	1	1	3
BIBI Score	***3.00***	***2.75***	***2.25***	***2.50***	***2.75***
Narrative Rating	***Fair***	***Poor***	***Poor***	***Poor***	***Poor***

Notes: Laboratory Duplicate

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/11/2018 Checked date: 10/1/2018

Metric	CARR-216-F-2018	CATO-101-R-2018	CATO-417-F-2018	FISH-102-R-2018	FISH-201-R-2018
Raw Scores	**Raw Scores**				
Total Number of Taxa	27	20	29	31	21
Number of EPT Taxa	3	2	12	6	12
Number of Ephemeroptera Taxa	0	0	7	3	4
Percent Intolerant Urban	1	5	26	10	86
Percent Tanytarsini	9	0	7	3	1
Percent Scrapers	9	1	18	10	2
Percent Swimmers	0	2	7	3	30
Percent Diptera	78	79	14	83	49
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	5	3	5	5	3
Number of EPT Taxa	1	1	3	1	3
Number of Ephemeroptera Taxa	1	1	5	3	3
Percent Intolerant Urban	1	1	1	1	5
Percent Tanytarsini	5	1	5	3	3
Percent Scrapers	3	1	5	3	1
Percent Swimmers	1	1	3	3	5
Percent Diptera	1	1	5	1	3
BIBI Score	***2.25***	***1.25***	***4.00***	***2.50***	***3.25***
Narrative Rating	***Poor***	***Very Poor***	***Good***	***Poor***	***Fair***

Notes:

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/12/2018 Checked date: 10/2/2018

Metric	FISH-222-F-2018	GLAD-108-F-2018	GLAD-201-R-2018	HUNT-101-F-2018	HUNT-102-R-2018
Raw Scores	**Raw Scores**				
Total Number of Taxa	47	17	11	18	22
Number of EPT Taxa	19	0	0	10	13
Number of Ephemeroptera Taxa	9	0	0	4	4
Percent Intolerant Urban	43	24	0	59	68
Percent Tanytarsini	10	0	1	2	0
Percent Scrapers	42	4	1	2	16
Percent Swimmers	5	0	0	38	41
Percent Diptera	34	92	5	35	30
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	5	3	1	3	3
Number of EPT Taxa	5	1	1	3	3
Number of Ephemeroptera Taxa	5	1	1	3	3
Percent Intolerant Urban	3	1	1	3	3
Percent Tanytarsini	5	1	3	3	1
Percent Scrapers	5	3	1	1	5
Percent Swimmers	3	1	1	5	5
Percent Diptera	3	1	5	3	3
BIBI Score	***4.25***	***1.50***	***1.75***	***3.00***	***3.25***
Narrative Rating	***Good***	***Very Poor***	***Very Poor***	***Fair***	***Fair***

Notes:

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/12/2018 Checked date: 10/2/2018

Metric	HUNT-102-R-2018 LD	HUNT-301-R-2018	ISRA-105-R-2018	ISRA-348-F-2018	ISRA-348-F-2018 QC
Raw Scores	**Raw Scores**				
Total Number of Taxa	19	17	30	35	28
Number of EPT Taxa	13	7	9	5	5
Number of Ephemeroptera Taxa	5	4	3	2	4
Percent Intolerant Urban	73	84	23	6	14
Percent Tanytarsini	1	1	7	6	8
Percent Scrapers	17	8	2	16	13
Percent Swimmers	43	9	2	1	3
Percent Diptera	25	79	68	38	58
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	3	3	5	5	5
Number of EPT Taxa	3	1	3	1	1
Number of Ephemeroptera Taxa	5	3	3	1	3
Percent Intolerant Urban	3	5	1	1	1
Percent Tanytarsini	3	3	5	5	5
Percent Scrapers	5	3	1	5	5
Percent Swimmers	5	3	1	1	3
Percent Diptera	5	1	1	3	1
BIBI Score	***4.00***	***2.75***	***2.50***	***2.75***	***3.00***
Narrative Rating	***Good***	***Poor***	***Poor***	***Poor***	***Fair***

Notes: Laboratory Duplicate Quality Control Site

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/12/2018 Checked date: 10/2/2018

Metric	LCCS-102-R-2018	LCCS-120-F-2018	LCCS-217-F-2018	LCCS-217-F-2018 LD	LINL-102-R-2018
Raw Scores	**Raw Scores**				
Total Number of Taxa	33	27	31	26	28
Number of EPT Taxa	16	4	9	10	2
Number of Ephemeroptera Taxa	7	2	6	6	0
Percent Intolerant Urban	23	6	10	20	0
Percent Tanytarsini	2	13	10	5	15
Percent Scrapers	7	24	17	14	4
Percent Swimmers	6	0	4	2	0
Percent Diptera	45	69	62	51	89
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	5	5	5	5	5
Number of EPT Taxa	5	1	3	3	1
Number of Ephemeroptera Taxa	5	1	5	5	1
Percent Intolerant Urban	1	1	1	1	1
Percent Tanytarsini	3	5	5	5	5
Percent Scrapers	3	5	5	5	3
Percent Swimmers	3	1	3	1	1
Percent Diptera	3	1	1	1	1
BIBI Score	***3.50***	***2.50***	***3.50***	***3.25***	***2.25***
Narrative Rating	***Fair***	***Poor***	***Fair***	***Fair***	***Poor***

Notes: Laboratory Duplicate

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/12/2018 Checked date: 10/2/2018

Metric	LINL-150-F-2018	LINU-103-R-2018	LINU-104-R-2018	LINU-149-F-2018	LIPI-101-R-2018
Raw Scores	**Raw Scores**				
Total Number of Taxa	18	34	18	15	17
Number of EPT Taxa	3	8	0	1	3
Number of Ephemeroptera Taxa	0	4	0	0	0
Percent Intolerant Urban	0	49	1	5	1
Percent Tanytarsini	4	4	7	1	0
Percent Scrapers	4	24	0	3	2
Percent Swimmers	0	19	0	0	1
Percent Diptera	44	38	98	31	50
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	3	5	3	3	3
Number of EPT Taxa	1	3	1	1	1
Number of Ephemeroptera Taxa	1	3	1	1	1
Percent Intolerant Urban	1	3	1	1	1
Percent Tanytarsini	3	5	5	3	1
Percent Scrapers	3	5	1	3	1
Percent Swimmers	1	5	1	1	1
Percent Diptera	3	3	1	3	1
BIBI Score	***2.00***	***4.00***	***1.75***	***2.00***	***1.25***
Narrative Rating	***Poor***	***Good***	***Very Poor***	***Poor***	***Very Poor***

Notes:

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name:	Frederick County Stream Survey - 2018		
Project Number:	171701239.13		
Prepared by:	SSLD	Checked by:	AJB
Prepared date:	9/12/2018	Checked date:	10/2/2018

Metric	LIPI-153-F-2018	MIDD-101-F-2018	MIDD-104-R-2018	MIDD-301-R-2018	MODS-101-F-2018
Raw Scores	**Raw Scores**				
Total Number of Taxa	28	28	16	32	21
Number of EPT Taxa	6	9	3	10	0
Number of Ephemeroptera Taxa	1	5	0	6	0
Percent Intolerant Urban	12	26	51	36	18
Percent Tanytarsini	3	4	0	3	7
Percent Scrapers	15	4	4	14	15
Percent Swimmers	3	4	0	28	1
Percent Diptera	31	68	88	52	34
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	5	5	3	5	3
Number of EPT Taxa	1	3	1	3	1
Number of Ephemeroptera Taxa	1	5	1	5	1
Percent Intolerant Urban	1	1	3	1	1
Percent Tanytarsini	3	3	1	3	5
Percent Scrapers	5	3	3	5	5
Percent Swimmers	3	3	1	5	1
Percent Diptera	3	1	1	1	3
BIBI Score	***2.75***	***3.00***	***1.75***	***3.50***	***2.50***
Narrative Rating	***Poor***	***Fair***	***Very Poor***	***Fair***	***Poor***

Notes:

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/12/2018 Checked date: 10/2/2018

Metric	MODS-163-F-2018	OWEN-102-R-2018	OWEN-127-F-2018	OWEN-302-R-2018	POTD-102-R-2018
Raw Scores	**Raw Scores**				
Total Number of Taxa	13	16	24	22	31
Number of EPT Taxa	3	2	9	11	7
Number of Ephemeroptera Taxa	2	0	2	4	3
Percent Intolerant Urban	2	23	70	60	27
Percent Tanytarsini	2	0	0	1	19
Percent Scrapers	30	39	14	8	8
Percent Swimmers	2	0	0	10	9
Percent Diptera	22	84	71	74	73
BIBI Scores	**BIBI Scores**				
Total Number of Taxa	1	3	5	3	5
Number of EPT Taxa	1	1	3	3	1
Number of Ephemeroptera Taxa	1	1	1	3	3
Percent Intolerant Urban	1	1	3	3	1
Percent Tanytarsini	3	1	1	3	5
Percent Scrapers	5	5	5	3	3
Percent Swimmers	1	1	1	3	3
Percent Diptera	5	1	1	1	1
BIBI Score	***2.25***	***1.75***	***2.50***	***2.75***	***2.75***
Narrative Rating	***Poor***	***Very Poor***	***Poor***	***Poor***	***Poor***

Notes:

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: AJB
Prepared date: 9/12/2018 Checked date: 10/2/2018

Metric	POTD-133-F-2018	TOMS-101-R-2018	TOMS-102-R-2018	TOMS-247-F-2018	TUSC-251-F-2018	TUSC-301-R-2018
Raw Scores	**Raw Scores**					
Total Number of Taxa	33	22	11	31	28	30
Number of EPT Taxa	12	6	3	11	9	7
Number of Ephemeroptera Taxa	5	1	0	4	4	2
Percent Intolerant Urban	35	72	96	47	9	10
Percent Tanytarsini	1	5	0	1	1	3
Percent Scrapers	22	5	1	3	8	4
Percent Swimmers	14	0	0	1	3	1
Percent Diptera	31	81	71	86	82	79
BIBI Scores	**BIBI Scores**					
Total Number of Taxa	5	3	1	5	5	5
Number of EPT Taxa	3	1	1	3	3	1
Number of Ephemeroptera Taxa	5	1	1	3	3	1
Percent Intolerant Urban	1	3	5	3	1	1
Percent Tanytarsini	3	5	1	3	3	3
Percent Scrapers	5	3	1	3	3	3
Percent Swimmers	3	1	1	1	3	1
Percent Diptera	3	1	1	1	1	1
BIBI Score	***3.50***	***2.25***	***1.50***	***2.75***	***2.75***	***2.00***
Narrative Rating	***Fair***	***Poor***	***Very Poor***	***Poor***	***Poor***	***Poor***

Notes:

Combined Highlands		Score	
Metric	**5**	**3**	**1**
Total Number of Taxa	≥24	15 - 23	<15
Number of EPT Taxa	≥14	8 - 13	<8
Number Ephemeroptera Taxa	≥5	3 - 4	<3
Percent Intolerant Urban	≥80	38 - 79	<38
Percent Tanytarsini	≥4	0.1 - 3.9	<0.1
Percent Scrapers	≥13	3 - 12	<3
Percent Swimmers	≥18	3 - 17	<3
Percent Diptera	≤26	27 - 49	>50

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BALL-103-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	1	Shredder	cn, bu	9.6
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	1	Shredder	sp	6.7
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Gastropoda	Basommatophor	Lymnaeidae	not identified	Lymnaeidae	I	1	Scraper	cb	6.9
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	2	Scraper	cb	8
Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	A	1	Filterer	bu	5.7
Insecta	Diptera	Chironomidae	Smittia	Smittia	I	1	Collector	lentic	6.6
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	18	Collector	cn	8.4

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BALL-116-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Perlidae	Acroneuria	Acroneuria	I	3	Predator	cn	2.5
Insecta	Plecoptera	Capniidae	Allocapnia	Allocapnia	I	1	Shredder	cn	4.2
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	37	Shredder	sp, cn	3
Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	3	Shredder	cn	3.1
Insecta	Ephemeroptera	Baetidae	Baetis	Baetis	I	1	Collector	sw, cb, cn	3.9
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	5	Filterer	cn	6.5
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	2	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	9	Shredder	0	7.7
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	12	Filterer	cn	2.7
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	3	Filterer	cn	7.5
Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra	I	2	Shredder	cn	0.4
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	A	1	Collector	bu	6.6
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	3	Scraper	cn	2.7
Insecta	Diptera	Empididae	Neoplasta	Neoplasta	I	2	Predator	0	na
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	U	18	Collector	sp, bu	9.2
Insecta	Trichoptera	Polycentropodidae	Polycentropus	Polycentropus	I	1	Filterer	cn	1.1
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	4	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	10	Collector	sp	8.2

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BALL-201-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Baetis	Baetis	I	10	Collector	sw, cb, cn	3.9
Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	2	Collector	sp	7
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	P	3	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	10	Shredder	0	7.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	1	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Gastropoda	Basommatophor	Ancylidae	Ferrissia	Ferrissia	A	1	Scraper	cb	7
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	12	Shredder	sp	6.7
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	1	Shredder	sp	4.9
Insecta	Coleoptera	Elmidae	Microcylloepus	Microcylloepus	I	1	Collector	0	4.8
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	1	Collector	cb, sp	2.1
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	63	Collector	bu	8.5
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	2	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	4	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	1	Shredder	sp, cb, cn	3.1
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	1	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	3	Filterer	cn	5.7
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	2	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	U	6	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BENN-103-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	59	Shredder	sp, cn	3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	6	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	2	Filterer	cn	4.4
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	1	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	3	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	1	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	7	Shredder	0	7.7
Insecta	Diptera	Ceratopogonidae	Dasyhelea	Dasyhelea	I	1	Collector	sp	3.6
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	1	Collector	cn, sw	2.3
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	1	Collector	sp	6.1
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	2	Shredder	sp	6.7
Insecta	Odonata	Gomphidae	not identified	Gomphidae	I	2	Predator	bu	2.2
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	1	Filterer	sw, cn	2.5
Gastropoda	Basommatophor	Lymnaeidae	not identified	Lymnaeidae	I	1	Scraper	cb	6.9
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	3	Scraper	cn	3
Gastropoda	Basommatophor	Planorbidae	Menetus	Menetus	A	1	Scraper	cb	7.6
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	12	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	2	Collector	sp, bu	9.2
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	1	Scraper	cb	8
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	2	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	2	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	7	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	4	Collector	sp	5.1
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	1	Shredder	bu	6.7
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	2	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BENN-219-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acentrella	Acentrella	I	4	Collector	sw, cn	4.9
Insecta	Plecoptera	Capniidae	Allocapnia	Allocapnia	I	1	Shredder	cn	4.2
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	40	Shredder	sp, cn	3
Insecta	Diptera	Ceratopogonidae	Bezzia	Bezzia	I	1	Predator	bu	3.3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	3	Filterer	cn	6.5
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	2	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	3	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	7	Shredder	0	7.7
Insecta	Coleoptera	Elmidae	Dubiraphia	Dubiraphia	A	1	Scraper	cn, cb	5.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	7	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	2	Scraper	cn, sp	4.5
Insecta	Odonata	Gomphidae	not identified	Gomphidae	I	1	Predator	bu	2.2
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	2	Filterer	sw, cn	2.5
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	I	1	Collector	bu	6.6
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	15	Scraper	cn	3
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	2	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	U	5	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	U	2	Collector	sp	4.6
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	1	Scraper	cb	8
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	6	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	3	Filterer	cn	2.4
Insecta	Plecoptera	Pteronarcyidae	Pteronarcys	Pteronarcys	I	1	Shredder	cn, sp	1.1
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	9	Collector	sp	6.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	2	Filterer	cn	5.7
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	1	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Sublettea	Sublettea	I	2	Collector	-	10
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	2	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BENN-219-F-2018 QC

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acentrella	Acentrella	I	2	Collector	sw, cn	4.9
Insecta	Plecoptera	Perlidae	Acroneuria	Acroneuria	I	1	Predator	cn	2.5
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	56	Shredder	sp, cn	3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	2	Filterer	cn	4.4
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	2	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	2	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	2	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	2	Shredder	0	7.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	1	Collector	cn, sw	2.3
Gastropoda	Basommatophor	Ancylidae	Ferrissia	Ferrissia	A	1	Scraper	cb	7
Insecta	Diptera	Tipulidae	Hexatoma	Hexatoma	I	1	Predator	bu, sp	1.5
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	2	Filterer	sw, cn	2.5
Insecta	Plecoptera	Perlodidae	Isoperla	Isoperla	I	2	Predator	cn, sp	2.4
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	14	Scraper	cn	3
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	1	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	2	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	A	1	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	3	Collector	sp	4.6
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	2	Scraper	cb	8
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	20	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	16	Collector	sp	6.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	3	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	6	Predator	sp	8.2

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BUSL-147-F-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	2	Shredder	sp, cn	3
Insecta	Diptera	Ceratopogonidae	Bezzia	Bezzia	I	1	Predator	bu	3.3
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	4	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	1	Collector	sp	8.5
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	1	Collector	sw, cn	2.3
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	3	Filterer	cn	2.7
Insecta	Coleoptera	Dytiscidae	not identified	Dytiscidae	I	2	Predator	sw, dv	5.4
Insecta	Coleoptera	Psephenidae	Ectopria	Ectopria	I	1	Scraper	cn	2.2
Oligochaeta	Haplotaxida	Enchytraeidae	not identified	Enchytraeidae	A	1	Collector	bu	9.1
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	1	Shredder	sp	6.7
Insecta	Coleoptera	Dryopidae	Helichus	Helichus	A	1	Scraper	cn	6.4
Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	1	Shredder	sp	4.9
Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra	I	1	Shredder	cn	0.4
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	3	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Parachaetocladius	Parachaetocladius	I	1	Collector	sp	3.3
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	13	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	3	Collector	bu	6.6
Insecta	Diptera	Psychodidae	Pericoma	Pericoma	I	1	Collector	0	4
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	4	Scraper	cb	8
Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	I	6	Filterer	bu	5.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	14	Shredder	cb, cn	6.3
Insecta	Diptera	Tipulidae	Pseudolimnophila	Pseudolimnophila	I	3	Predator	bu	2.8
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	2	Filterer	cn	7.2
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	5	Collector	cb, sp, cn	4.2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	1	Scraper	cn	7.1
Insecta	Diptera	Tabanidae	not identified	Tabanidae	I	2	Predator	0	2.8
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	37	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	8	Predator	sp	8.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	1	Shredder	bu	6.7
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	5	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	1	Predator	sp	5.3

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Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BUSL-160-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Ameletidae	Ameletus	Ameletus	I	1	Collector	sw, cb	2.6
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	40	Shredder	sp, cn	3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	11	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	2	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	18	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	4	Shredder	0	7.7
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	2	Filterer	cn	2.7
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Gastropoda	Basommatophor	Ancylidae	Ferrissia	Ferrissia	A	3	Scraper	cb	7
Turbellaria	Tricladida	Dugesiidae	Girardia	Girardia	A	1	Predator	sp	9.3
Insecta	Odonata	Gomphidae	not identified	Gomphidae	I	1	Predator	bu	2.2
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	8	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	5	Scraper	cn	3
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	11	Scraper	cn	2.7
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	1	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	5	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	1	Collector	sp	7.7
Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	1	Collector	bu	6.6
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	1	Scraper	cb	8
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	2	Filterer	cn	2.4
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	1	Filterer	bu	6.5
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	1	Collector	cb, sp, cn	4.2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	1	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Stictochironomus	Stictochironomus	I	1	Collector	bu	9.2
Insecta	Odonata	Gomphidae	Stylogomphus	Stylogomphus	I	1	Predator	bu	2.2
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	U	3	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	5	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	2	Shredder	bu	6.7
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	6	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BUSL-330-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	2	Shredder	sp, cn	3
Insecta	Diptera	Tipulidae	Antocha	Antocha	P	1	Collector	cn	8
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	5	Filterer	-	6.6
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	1	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	23	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	10	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	1	Collector	bu	9
Insecta	Diptera	Empididae	not identified	Empididae	P	6	Predator	sp, bu	7.5
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	1	Collector	cn, sw	2.3
Insecta	Diptera	Empididae	Hemerodromia	Hemerodromia	I	1	Predator	sp, bu	7.9
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	4	Scraper	sp	7.2
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	1	Filterer	sw, cn	2.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	2	Scraper	cn	3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	43	Collector	bu	8.5
0	0	0	0	Nematoda	A	1	0	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	3	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Parakiefferiella	Parakiefferiella	I	1	Collector	sp	2.1
Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	1	Collector	bu	6.6
Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	1	0	0	na
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Potthastia	Potthastia	I	1	Collector	sp	0.01
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	U	3	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	2	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	U	26	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1

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Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
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FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BUSL-330-F-2018 QC

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	6	Shredder	sp, cn	3
Insecta	Diptera	Tipulidae	Antocha	Antocha	P	1	Collector	cn	8
Insecta	Diptera	Ceratopogonidae	not identified	Ceratopogonidae	I	1	Predator	sp, bu	3.6
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	4	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	4	Filterer	-	6.6
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	1	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	24	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	1	Collector	bu	9
Insecta	Diptera	Empididae	not identified	Empididae	P	6	Predator	sp, bu	7.5
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	2	Scraper	sp	7.2
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	4	Filterer	sw, cn	2.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	38	Collector	bu	8.5
Insecta	Diptera	Empididae	Neoplasta	Neoplasta	I	1	Predator	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	4	Scraper	cn	5.4
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	A	3	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	3	Collector	bu	6.6
Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	1	0	0	na
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	6	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Potthastia	Potthastia	I	3	Collector	sp	0.01
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	U	6	Collector	sp	6.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	6	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	U	14	Filterer	cb, cn	4.9
Turbellaria	not identified	not identified	not identified	Turbellaria	I	1	Predator	sp	4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	2	Collector	sp	5.1

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Project Name: Frederick County Stream Survey - 2018
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FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BUSU-202-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	3	Shredder	sp, cn	3
Insecta	Diptera	Ceratopogonidae	Bezzia	Bezzia	I	1	Predator	bu	3.3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	3	Filterer	cn	6.5
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	1	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	3	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	40	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	10	Collector	sp	8.5
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	2	Scraper	cn, sp	4.5
Turbellaria	Tricladida	Dugesiidae	Girardia	Girardia	A	1	Predator	sp	9.3
Insecta	Trichoptera	Glossosomatidae	Glossosoma	Glossosoma	U	3	Scraper	cn	0.01
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	8	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	1	Filterer	sw, cn	2.5
Insecta	Coleoptera	Elmidae	Microcylloepus	Microcylloepus	A	1	Collector	0	4.8
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	1	Collector	cb, sp	2.1
Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	2	Filterer	cn	4.9
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	2	Collector	bu	8.5
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	5	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	1	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	5	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	5	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	8	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	3	Filterer	cn	7.2
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	3	Filterer	cn	5.7
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	A	2	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	5	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	9	Filterer	cb, cn	4.9
Insecta	Ephemeroptera	Ephemerellidae	Teloganopsis	Teloganopsis	I	1	Collector	0	na
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	U	2	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: BUSU-221-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	2	Collector	cn	8
Insecta	Trichoptera	Hydropsychidae	Ceratopsyche	Ceratopsyche	I	1	Collector	0	na
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	6	Filterer	cn	6.5
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	3	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	4	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	3	Collector	sp	8.5
Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	1	Collector	bu	9
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	3	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	20	Scraper	sp	7.2
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	2	Filterer	sw, cn	2.5
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	11	Collector	bu	8.5
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	3	Scraper	cn	2.7
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	3	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	not identified	Orthocladiinae	P	2	Collector	0	7.6
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	14	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	1	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	U	6	Collector	sp	7.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	11	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	4	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	U	3	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	12	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	2	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	3	Predator	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	2	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: CARR-105-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	4	Shredder	sp, cn	3
Insecta	Ephemeroptera	Baetidae	not identified	Baetidae	I	1	Collector	sw, cn	2.3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	3	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	3	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	4	Collector	sp	4.1
Turbellaria	Tricladida	Dugesiidae	Cura	Cura	A	2	0	sp	6.5
Insecta	Coleoptera	Elmidae	not identified	Elmidae	I	3	Collector	cn	4.8
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	72	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	2	Scraper	cn	2.7
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	U	13	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	7	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	U	4	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Parakiefferiella	Parakiefferiella	I	1	Collector	sp	2.1
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Phaenopsectra	Phaenopsectra	I	1	Collector	cn	8.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	3	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	3	Filterer	cn	2.4
Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	3	Scraper	cn	4.4
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	A	4	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	1	Collector	sp	8.2
Insecta	Ephemeroptera	Ephemerellidae	Teloganopsis	Teloganopsis	I	1	Collector	0	na
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	3	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	4	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: CARR-105-R-2018 LD

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	1	Shredder	sp, cn	3
Insecta	Ephemeroptera	Baetidae	not identified	Baetidae	I	1	Collector	sw, cn	2.3
Insecta	Ephemeroptera	Baetidae	Baetis	Baetis	I	1	Collector	sw, cb, cn	3.9
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	3	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Chironomini	Chironomini	I	2	0	0	5.9
Insecta	Plecoptera	Perlidae	Eccoptura	Eccoptura	I	1	Predator	cn	0.6
Insecta	Diptera	Empididae	not identified	Empididae	I	5	Predator	sp, bu	7.5
Insecta	Coleoptera	Elmidae	Macronychus	Macronychus	A	1	Scraper	cn	6.8
Insecta	Plecoptera	Nemouridae	not identified	Nemouridae	I	2	Shredder	sp, cn	2.9
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	2	Scraper	cn	2.7
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	U	15	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	not identified	Orthocladiinae	U	77	Collector	0	7.6
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	A	2	Scraper	cn	2.7
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	2	Filterer	cn	2.4
Enopla	Hoplonemertea	Tetrastemmatidae	Prostoma	Prostoma	A	1	Predator	0	7.3
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	A	5	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	not identified	Tanytarsini	I	1	Collector	0	3.5
Insecta	Ephemeroptera	Ephemerellidae	Teloganopsis	Teloganopsis	I	2	Collector	0	na

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.1
Prepared by: SSLD Checked by: SKB
Prepared date: 9/11/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: CARR-201-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Ablabesmyia	Ablabesmyia	I	1	Predator	sp	8.1
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	5	Collector	cn	8
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	10	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	A	3	Collector	sp	6.7
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	23	Shredder	cn, bu	9.6
Insecta	Diptera	Ceratopogonidae	Dasyhelea	Dasyhelea	I	1	Collector	sp	3.6
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	1	Shredder	sp	6.7
Turbellaria	Tricladida	Dugesiidae	Girardia	Girardia	A	1	Predator	sp	9.3
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	6	Filterer	cn	7.5
Oligochaeta	Lumbricina	not identified	not identified	Lumbricina	A	1	Collector	bu	na
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	A	3	Collector	bu	6.6
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	26	Collector	bu	8.5
0	0	0	0	Nematoda	A	1	0	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	3	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	2	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	4	Collector	sp	7.7
Insecta	Diptera	Psychodidae	Pericoma	Pericoma	I	1	Collector	0	4
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Insecta	Trichoptera	Psychomyiidae	Psychomyia	Psychomyia	I	1	Collector	cn	4.9
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	4	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	3	Filterer	cn	7.2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	U	12	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	4	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

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Project Number: 171701239.1
Prepared by: SSLD Checked by: SKB
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FCSS2018_BIBI_Combined_Highlands_v1 - 1.xlsx
Version: 1
Site Name: CARR-216-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Ablabesmyia	Ablabesmyia	I	1	Predator	sp	8.1
Insecta	Diptera	Tipulidae	Antocha	Antocha	U	3	Collector	cn	8
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	4	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	13	Shredder	0	7.7
Insecta	Diptera	Ceratopogonidae	Dasyhelea	Dasyhelea	I	6	Collector	sp	3.6
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	21	Collector	sp	8.5
Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	1	Collector	bu	9
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	9	Shredder	sp	6.7
Insecta	Trichoptera	Glossosomatidae	Glossosoma	Glossosoma	I	1	Scraper	cn	0.01
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	7	Scraper	sp	7.2
Insecta	Trichoptera	Psychomyiidae	Lype	Lype	I	1	Scraper	cn	4.7
Gastropoda	Basommatophor	Planorbidae	Menetus	Menetus	A	1	Scraper	cb	7.6
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	8	Collector	bu	8.5
Insecta	Diptera	Empididae	Neoplasta	Neoplasta	I	2	Predator	0	na
Insecta	Diptera	Chironomidae	Neozavrelia	Neozavrelia	I	1	0	0	na
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	4	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Phaenopsectra	Phaenopsectra	I	1	Collector	cn	8.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	1	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	6	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	3	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Stictochironomus	Stictochironomus	I	1	Collector	bu	9.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	4	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	2	Shredder	bu	6.7
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	3	Collector	cn	8.4

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Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: CATO-101-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	1	Shredder	sp, cn	3
Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	A	2	Collector	sp	2.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	3	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	57	Collector	sp	8.5
Insecta	Coleoptera	Dytiscidae	not identified	Dytiscidae	I	2	Predator	sw, dv	5.4
Oligochaeta	Haplotaxida	Enchytraeidae	not identified	Enchytraeidae	A	2	Collector	bu	9.1
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	1	Filterer	cn	4.9
Insecta	Hemiptera	Veliidae	Microvelia	Microvelia	A	1	Predator	SK	6
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	8	Collector	bu	8.5
0	0	0	0	Nematoda	A	1	0	0	na
Insecta	Diptera	Chironomidae	not identified	Orthocladiinae	P	1	Collector	0	7.6
Insecta	Plecoptera	Perlodidae	not identified	Perlodidae	I	2	Predator	cn	2.2
Insecta	Diptera	Tipulidae	Pilaria	Pilaria	I	2	Predator	bu	4.8
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	12	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Smittia	Smittia	I	2	Collector	lentic	6.6
Insecta	Diptera	Stratiomyidae	not identified	Stratiomyidae	I	1	Collector	0	na
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	5	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	4	Collector	cn	8.4

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Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: CATO-417-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Perlidae	Acroneuria	Acroneuria	I	1	Predator	cn	2.5
Insecta	Coleoptera	Hydrophilidae	Berosus	Berosus	I	1	Collector	sw, dv, cb	4.1
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	15	Collector	sp	2.1
Insecta	Diptera	Ceratopogonidae	not identified	Ceratopogonidae	I	1	Predator	sp, bu	3.6
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	4	Filterer	-	6.6
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	1	Predator	cn	7.4
Insecta	Odonata	Coenagrionidae	not identified	Coenagrionidae	I	1	Predator	cb	9
Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	A	1	Collector	sp	6.7
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	4	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Cryptochironomus	Cryptochironomus	I	1	Predator	sp, bu	7.6
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	8	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	3	Filterer	cn	7.5
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	1	Filterer	sw, cn	2.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	10	Scraper	cn	3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	1	Collector	bu	8.5
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	3	Scraper	cn	5.4
Insecta	Plecoptera	Perlidae	Perlesta	Perlesta	I	2	Predator	cn	1.6
Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	51	0	0	na
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Insecta	Trichoptera	Glossosomatidae	Protoptila	Protoptila	I	3	Scraper	0	2.8
Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	3	Scraper	cn	4.4
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	8	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	U	6	Filterer	cb, cn	4.9
Insecta	Ephemeroptera	Ephemerellidae	Teloganopsis	Teloganopsis	I	11	Collector	0	na
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	6	Collector	cn	8.4

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: FISH-102-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	1	Collector	cn	8
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	7	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	2	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	3	Collector	sp	4.1
Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	A	2	Collector	sp	6.7
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	2	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	1	Shredder	0	7.7
Insecta	Diptera	Ceratopogonidae	Dasyhelea	Dasyhelea	I	2	Collector	sp	3.6
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	32	Collector	sp	8.5
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	5	Collector	sp	6.1
Insecta	Ephemeroptera	Baetidae	Heterocloeon	Heterocloeon	I	1	Scraper	sw,cn	5
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	7	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	not identified	Hydropsychidae	P	1	Filterer	cn	5.7
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	3	Filterer	sw, cn	2.5
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	1	Collector	cb, sp	2.1
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	1	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	1	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	11	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	7	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	2	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	2	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	12	Filterer	cn	5.7
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	1	Filterer	bu	6.5
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	2	Filterer	cn	2.4
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	U	3	Scraper	cn	7.1
Insecta	Ephemeroptera	Heptageniidae	Stenonema	Stenonema	I	1	Scraper	cn	4.6
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	3	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	2	Collector	sp	5.1

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Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: FISH-201-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	12	Shredder	sp, cn	3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	3	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	1	Collector	sp	8.5
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	1	Filterer	cn	2.7
Insecta	Plecoptera	Perlodidae	Diploperla	Diploperla	I	1	Predator	cn	2.2
Insecta	Ephemeroptera	Heptageniidae	Epeorus	Epeorus	I	1	Scraper	cn	1.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	35	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Baetidae	Heterocloeon	Heterocloeon	I	1	Scraper	sw,cn	5
Insecta	Plecoptera	Leuctridae	not identified	Leuctridae	I	1	Shredder	sp, cn	0.8
Insecta	Trichoptera	Brachycentridae	Micrasema	Micrasema	I	5	Shredder	cn, sp	2.3
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	2	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	1	Scraper	cn	2.7
Insecta	Ephemeroptera	Leptophlebiidae	Paraleptophlebia	Paraleptophlebia	I	5	Collector	sw, cn, sp	2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Plecoptera	Perlodidae	not identified	Perlodidae	I	2	Predator	cn	2.2
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	53	Filterer	cn	2.4
Insecta	Plecoptera	Nemouridae	Prostoia	Prostoia	I	2	Shredder	sp, cn	4.5
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	1	Collector	cb, sp, cn	4.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	3	Shredder	bu	6.7

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Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: FISH-222-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Trichoptera	Glossosomatidae	Agapetus	Agapetus	I	2	Scraper	cn	2
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	1	Shredder	sp, cn	3
Insecta	Diptera	Blephariceridae	Blepharicera	Blepharicera	I	1	Scraper	cn	4
Insecta	Odonata	Aeshnidae	Boyeria	Boyeria	I	1	Predator	cb, sp	6.3
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	1	Collector	sp	2.1
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	7	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	3	Filterer	-	6.6
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	A	1	Collector	sp	6.7
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	1	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	2	Shredder	0	7.7
Insecta	Ephemeroptera	Ephemerellidae	Drunella	Drunella	I	2	Scraper	cn, sp	1.9
Insecta	Coleoptera	Elmidae	Dubiraphia	Dubiraphia	U	6	Scraper	cn, cb	5.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	1	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	2	Scraper	cn, sp	4.5
Gastropoda	Basommatophor	Ancylidae	Ferrissia	Ferrissia	A	1	Scraper	cb	7
Gastropoda	Basommatophor	Planorbidae	Helisoma	Helisoma	A	1	Scraper	cb	7.6
Insecta	Diptera	Empididae	Hemerodromia	Hemerodromia	I	3	Predator	sp, bu	7.9
Insecta	Ephemeroptera	Heptageniidae	not identified	Heptageniidae	I	1	Scraper	cn	2.6
Insecta	Ephemeroptera	Baetidae	Heterocloeon	Heterocloeon	I	3	Scraper	sw,cn	5
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	3	Filterer	cn	7.5
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	3	Filterer	sw, cn	2.5
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	I	1	Collector	bu	6.6
Gastropoda	Basommatophor	Lymnaeidae	not identified	Lymnaeidae	I	2	Scraper	cb	6.9
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	7	Scraper	cn	3
Insecta	Trichoptera	Brachycentridae	Micrasema	Micrasema	I	1	Shredder	cn, sp	2.3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	4	Collector	bu	8.5
0	0	0	0	Nematoda	A	2	0	0	na
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	21	Scraper	cn	2.7
Insecta	Ephemeroptera	Ephemerellidae	Penelomax	Penelomax	I	1	Collector	0	2
Insecta	Plecoptera	Perlidae	Perlesta	Perlesta	I	1	Predator	cn	1.6
Insecta	Diptera	Chironomidae	Phaenopsectra	Phaenopsectra	I	1	Collector	cn	8.7
Insecta	Trichoptera	Polycentropodidae	Polycentropus	Polycentropus	I	1	Filterer	cn	1.1
Gastropoda	Basommatophor	Planorbidae	Promenetus	Promenetus	A	1	Scraper	cb	7.6
Insecta	Coleoptera	Elmidae	Promoresia	Promoresia	U	5	Scraper	cn	0.01
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	11	Filterer	cn	2.4
Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	1	Scraper	cn	4.4
Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	4	Shredder	sp, cb, cn	3.1
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	4	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	7	Filterer	cn	5.7
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	A	1	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Sublettea	Sublettea	I	2	Collector	-	10
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	5	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	4	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

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Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: GLAD-108-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	37	Collector	sp	7
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	23	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	3	Collector	sp	8.5
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	2	Shredder	sp	6.7
Turbellaria	Tricladida	Dugesiidae	Girardia	Girardia	A	5	Predator	sp	9.3
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	4	Scraper	sp	7.2
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	A	1	Collector	bu	6.6
Gastropoda	Basommatophora	Planorbidae	Menetus	Menetus	A	1	Scraper	cb	7.6
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	5	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	2	Collector	sp	4.6
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	6	Filterer	cn	2.4
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	4	Filterer	cn	5.7
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	1	Filterer	bu	6.5
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	25	Filterer	cn	2.4
Insecta	Diptera	Stratiomyidae	not identified	Stratiomyidae	I	6	Collector	0	na
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2

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Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: GLAD-201-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	4	Shredder	cn, bu	9.6
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	73	Shredder	sp	6.7
Malacostraca	Isopoda	Asellidae	Lirceus	Lirceus	A	66	Collector	sp	3.3
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	1	Scraper	cn	5.4
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	2	Filterer	bu	6.5
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	1	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4
Turbellaria	not identified	not identified	not identified	Turbellaria	I	1	Predator	sp	4

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FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: HUNT-101-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Ameletidae	Ameletus	Ameletus	I	1	Collector	sw, cb	2.6
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	27	Shredder	sp, cn	3
Insecta	Ephemeroptera	Baetidae	Baetis	Baetis	I	17	Collector	sw, cb, cn	3.9
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	9	Collector	sp	8.5
Insecta	Ephemeroptera	Heptageniidae	Epeorus	Epeorus	I	3	Scraper	cn	1.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	32	Collector	cn, sw	2.3
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	U	21	Collector	sp	6.1
Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra	I	1	Shredder	cn	0.4
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	2	Collector	cb, sp	2.1
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	10	Filterer	cn	2.4
Insecta	Plecoptera	Pteronarcyidae	Pteronarcys	Pteronarcys	I	1	Shredder	cn, sp	1.1
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	1	Filterer	bu	6.5
Insecta	Plecoptera	Chloroperlidae	Sweltsa	Sweltsa	I	1	Predator	cn	1.9
Insecta	Plecoptera	Taeniopterygidae	not identified	Taeniopterygidae	I	2	Shredder	0	3.1
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	2	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	1	Predator	sp	5.3

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Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: HUNT-102-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Perlidae	Acroneuria	Acroneuria	I	2	Predator	cn	2.5
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	5	Shredder	sp, cn	3
Insecta	Ephemeroptera	Baetidae	Baetis	Baetis	I	22	Collector	sw, cb, cn	3.9
Insecta	Diptera	Ceratopogonidae	Bezzia	Bezzia	I	1	Predator	bu	3.3
Insecta	Diptera	Chironomidae	Brillia	Brillia	I	1	Shredder	bu, sp	7.4
Insecta	Plecoptera	Chloroperlidae	not identified	Chloroperlidae	I	1	Predator	cn	1.6
Insecta	Ephemeroptera	Heptageniidae	Epeorus	Epeorus	I	18	Scraper	cn	1.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	23	Collector	cn, sw	2.3
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	U	5	Collector	sp	6.1
Insecta	Plecoptera	Perlodidae	Isoperla	Isoperla	I	1	Predator	cn, sp	2.4
Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	Lepidostoma	I	1	Shredder	cb, sp, cn	0.01
Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra	I	1	Shredder	cn	0.4
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	A	3	Scraper	cn	2.7
Insecta	Ephemeroptera	Leptophlebiidae	Paraleptophlebia	Paraleptophlebia	I	8	Collector	sw, cn, sp	2
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	3	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	20	Filterer	cn	2.4
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Diptera	Chironomidae	Stilocladius	Stilocladius	I	2	Collector	sp	6.6
Insecta	Plecoptera	Chloroperlidae	Sweltsa	Sweltsa	I	2	Predator	cn	1.9
Insecta	Plecoptera	Peltoperlidae	Tallaperla	Tallaperla	I	3	Shredder	cn, sp	1.5
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	1	Shredder	bu	6.7
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	6	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: HUNT-102-R-2018 LD

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Perlidae	Acroneuria	Acroneuria	I	2	Predator	cn	2.5
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	9	Shredder	sp, cn	3
Insecta	Ephemeroptera	Baetidae	Baetis	Baetis	I	21	Collector	sw, cb, cn	3.9
Insecta	Diptera	Chironomidae	Chironomini	Chironomini	I	1	0	0	5.9
Insecta	Ephemeroptera	Heptageniidae	Epeorus	Epeorus	I	15	Scraper	cn	1.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	23	Collector	cn, sw	2.3
Insecta	Diptera	Tipulidae	Hexatoma	Hexatoma	I	1	Predator	bu, sp	1.5
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	Lepidostoma	I	1	Shredder	cb, sp, cn	0.01
Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra	I	2	Shredder	cn	0.4
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Insecta	Diptera	Chironomidae	not identified	Orthocladiinae	U	10	Collector	0	7.6
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	6	Scraper	cn	2.7
Insecta	Ephemeroptera	Leptophlebiidae	Paraleptophlebia	Paraleptophlebia	I	10	Collector	sw, cn, sp	2
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	19	Filterer	cn	2.4
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Plecoptera	Chloroperlidae	Sweltsa	Sweltsa	I	2	Predator	cn	1.9
Insecta	Plecoptera	Peltoperlidae	Tallaperla	Tallaperla	I	1	Shredder	cn, sp	1.5
Insecta	Diptera	Chironomidae	not identified	Tanytarsini	I	1	Collector	0	3.5

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

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Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: HUNT-301-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	1	Shredder	sp, cn	3
Insecta	Diptera	Blephariceridae	Blepharicera	Blepharicera	I	1	Scraper	cn	4
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	5	Filterer	cn	6.5
Insecta	Megaloptera	Corydalidae	Corydalus	Corydalus	I	1	Predator	cn, cb	1.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	3	Collector	sp	8.5
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	10	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Baetidae	Heterocloeon	Heterocloeon	I	1	Scraper	sw,cn	5
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	1	Filterer	sw, cn	2.5
Gastropoda	Mesogastropoda	Pleuroceridae	Leptoxis	Leptoxis	A	1	Scraper	cb	10
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	3	Scraper	cn	3
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	4	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	4	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	2	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	87	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: ISRA-105-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	15	Shredder	sp, cn	3
Insecta	Diptera	Chironomidae	Brillia	Brillia	I	1	Shredder	bu, sp	7.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	1	Collector	sp	8.5
Insecta	Diptera	Tipulidae	Dicranota	Dicranota	I	1	Predator	sp, bu	1.1
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	2	Collector	sw, cn	2.3
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	1	Filterer	cn	2.7
Insecta	Plecoptera	Perlodidae	Diploperla	Diploperla	I	1	Predator	cn	2.2
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	2	Shredder	sp	6.7
Insecta	Ephemeroptera	Leptophlebiidae	Habrophlebiodes	Habrophlebiodes	I	13	Scraper	0	na
Insecta	Diptera	Chironomidae	Heleniella	Heleniella	I	1	Predator	sp	0.9
Insecta	Plecoptera	Perlodidae	Isoperla	Isoperla	I	1	Predator	cn, sp	2.4
Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra	I	1	Shredder	cn	0.4
Insecta	Diptera	Chironomidae	Nilotanypus	Nilotanypus	I	1	Predator	sp	6.6
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	20	Collector	sp	4.6
Insecta	Diptera	Tipulidae	Pedicia	Pedicia	I	1	Predator	bu	4.8
Insecta	Diptera	Chironomidae	Phaenopsectra	Phaenopsectra	I	1	Collector	cn	8.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	8	Shredder	cb, cn	6.3
Insecta	Diptera	Tipulidae	Pseudolimnophila	Pseudolimnophila	I	1	Predator	bu	2.8
Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	1	Shredder	sp, cb, cn	3.1
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	2	Collector	sp	6.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	3	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Stilocladius	Stilocladius	I	1	Collector	sp	6.6
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	8	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	15	Predator	sp	8.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	1	Shredder	bu	6.7
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	U	10	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	2	Predator	sp	5.3

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Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: ISRA-348-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	1	Collector	sw, cn	2.6
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	1	Collector	cn	8
Insecta	Odonata	Coenagrionidae	Argia	Argia	I	1	Predator	cn, cb, sp	9.3
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	7	Collector	sp	2.1
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	4	Filterer	-	6.6
Bivalvia	Veneroida	Corbiculidae	Corbicula	Corbicula	A	1	Filterer	bu	6
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	I	2	Collector	sp	6.7
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	8	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cryptochironomus	Cryptochironomus	I	1	Predator	sp, bu	7.6
Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	1	Collector	bu	9
Insecta	Coleoptera	Elmidae	not identified	Elmidae	I	2	Collector	cn	4.8
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	4	Collector	sp	6.1
Gastropoda	Basommatophor	Ancylidae	Ferrissia	Ferrissia	A	2	Scraper	cb	7
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Trichoptera	Hydroptilidae	not identified	Hydroptilidae	I	1	0	0	4
Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	6	Filterer	cn	4.9
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	43	Collector	bu	8.5
0	0	0	0	Nematoda	A	3	0	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	U	5	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	U	7	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parakiefferiella	Parakiefferiella	I	1	Collector	sp	2.1
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	U	2	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	3	Collector	sp	7.7
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	1	Scraper	cb	8
Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	1	Scraper	cn	4.4
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	1	Collector	sp	6.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	8	Filterer	cn	5.7
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	U	12	Scraper	cn	7.1
Insecta	Plecoptera	Taeniopterygidae	Strophopteryx	Strophopteryx	I	1	Shredder	sp, cn	3.3
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	4	Collector	cn	8.4

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FCSS2018_BIBI_Combined_Highlands_v1 - 2.xlsx
Version: 1
Site Name: ISRA-348-F-2018 QC

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	2	Collector	sw, cn	2.6
Insecta	Ephemeroptera	Ameletidae	Ameletus	Ameletus	I	1	Collector	sw, cb	2.6
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	1	Collector	cn	8
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	12	Collector	sp	2.1
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	1	Filterer	-	6.6
Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	A	4	Collector	sp	6.7
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	10	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	4	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Cryptochironomus	Cryptochironomus	I	1	Predator	sp, bu	7.6
Insecta	Coleoptera	Elmidae	not identified	Elmidae	I	2	Collector	cn	4.8
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	1	Collector	sp	6.1
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	2	Scraper	sp	7.2
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	2	Scraper	cn	3
Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	7	Filterer	cn	4.9
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	10	Collector	bu	8.5
Insecta	Diptera	Empididae	Neoplasta	Neoplasta	I	1	Predator	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	2	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	U	12	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	3	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	6	Collector	sp	7.7
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	4	Filterer	cn	5.7
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	U	9	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	3	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	8	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	4	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	3	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

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Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LCCS-102-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	19	Shredder	sp, cn	3
Insecta	Ephemeroptera	Baetidae	Baetis	Baetis	I	7	Collector	sw, cb, cn	3.9
Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	A	2	Collector	sp	2.6
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	1	Collector	sp	2.1
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	22	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	3	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	37	Collector	sp	8.5
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	2	Collector	sw, cn	2.3
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	1	Filterer	cn	2.7
Insecta	Plecoptera	Perlidae	Eccoptura	Eccoptura	I	2	Predator	cn	0.6
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Insecta	Diptera	Chironomidae	Glyptotendipes	Glyptotendipes	I	1	Filterer	bu, cn	6.6
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	4	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	7	Filterer	cn	7.5
Insecta	Trichoptera	Hydropsychidae	not identified	Hydropsychidae	P	2	Filterer	cn	5.7
Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	1	Shredder	sp	4.9
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	4	Scraper	cn	3
0	0	0	0	Nematoda	A	1	0	0	na
Insecta	Diptera	Chironomidae	Nilotanypus	Nilotanypus	I	1	Predator	sp	6.6
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	2	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	2	Collector	sp	4.6
Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	1	0	0	na
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	5	Shredder	cb, cn	6.3
Insecta	Diptera	Tipulidae	Pseudolimnophila	Pseudolimnophila	I	1	Predator	bu	2.8
Insecta	Diptera	Psychodidae	not identified	Psychodidae	P	1	0	0	4
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	8	Collector	sp	6.2
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Insecta	Ephemeroptera	Heptageniidae	Stenacron	Stenacron	I	1	Collector	cn	2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	2	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	3	Filterer	cb, cn	4.9
Turbellaria	not identified	not identified	not identified	Turbellaria	I	1	Predator	sp	4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LCCS-120-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	1	Shredder	sp, cn	3
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	1	Collector	cn	8
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	1	Collector	sp	2.1
Malacostraca	Decapoda	Cambaridae	not identified	Cambaridae	I	1	Shredder	sp	2.8
Insecta	Diptera	Ceratopogonidae	not identified	Ceratopogonidae	I	2	Predator	sp, bu	3.6
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	6	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Cryptochironomus	Cryptochironomus	I	3	Predator	sp, bu	7.6
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	20	Collector	sp	8.5
Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	1	Collector	bu	9
Oligochaeta	Haplotaxida	Enchytraeidae	not identified	Enchytraeidae	A	3	Collector	bu	9.1
Hirudinea	Pharyngobdellida	Erpobdellidae	not identified	Erpobdellidae	A	1	Predator	sp	10
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	2	Scraper	cn, sp	4.5
Turbellaria	Tricladida	Dugesiidae	Girardia	Girardia	A	1	Predator	sp	9.3
Insecta	Odonata	Gomphidae	not identified	Gomphidae	I	1	Predator	bu	2.2
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	10	Scraper	sp	7.2
Gastropoda	Basommatophor	Lymnaeidae	not identified	Lymnaeidae	I	1	Scraper	cb	6.9
0	0	0	0	Nematoda	A	7	0	0	na
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	17	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Insecta	Diptera	Tipulidae	Pseudolimnophila	Pseudolimnophila	I	4	Predator	bu	2.8
Insecta	Diptera	Simuliidae	not identified	Simuliidae	P	2	Filterer	cn	3.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	U	17	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	16	Filterer	cb, cn	4.9
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	2	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	1	Predator	sp	5.3

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LCCS-217-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Ablabesmyia	Ablabesmyia	I	1	Predator	sp	8.1
Insecta	Ephemeroptera	Baetidae	Acentrella	Acentrella	I	4	Collector	sw, cn	4.9
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	2	Shredder	sp, cn	3
Insecta	Odonata	Coenagrionidae	Argia	Argia	I	2	Predator	cn, cb, sp	9.3
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	5	Collector	sp	2.1
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	7	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	6	Filterer	-	6.6
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	1	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	23	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	17	Collector	sp	8.5
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	1	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Insecta	Diptera	Empididae	Hemerodromia	Hemerodromia	I	1	Predator	sp, bu	7.9
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	U	9	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	A	1	Collector	bu	6.6
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	4	Scraper	cn	3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	3	Collector	bu	8.5
Insecta	Diptera	Chironomidae	Nilotanypus	Nilotanypus	I	1	Predator	sp	6.6
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	2	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Phaenopsectra	Phaenopsectra	I	1	Collector	cn	8.7
Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	9	0	0	na
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	3	Shredder	cb, cn	6.3
Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	4	Scraper	cn	4.4
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	U	3	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	2	Filterer	cn	5.7
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	U	3	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	3	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	2	Shredder	bu	6.7

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LCCS-217-R-2018 LD

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acentrella	Acentrella	I	1	Collector	sw, cn	4.9
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	4	Shredder	sp, cn	3
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	1	Collector	cn	8
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	8	Collector	sp	2.1
Insecta	Odonata	Calopterygidae	Calopteryx	Calopteryx	I	1	Predator	cb	8.3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	2	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Chironomini	Chironomini	I	3	0	0	5.9
Insecta	Megaloptera	Corydalidae	Corydalus	Corydalus	I	2	Predator	cn, cb	1.4
Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	A	1	Collector	sp	6.7
Insecta	Diptera	Chironomidae	not identified	Diamesinae	U	22	Collector	0	7.1
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	1	Collector	cn, sw	2.3
Insecta	Diptera	Empididae	Hemerodromia	Hemerodromia	I	2	Predator	sp, bu	7.9
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	8	Scraper	cn	3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	6	Collector	bu	8.5
Insecta	Diptera	Chironomidae	not identified	Orthocladiinae	U	26	Collector	0	7.6
Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	11	0	0	na
Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	3	Scraper	cn	4.4
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	3	Filterer	cn	5.7
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	1	Filterer	bu	6.5
Insecta	Ephemeroptera	Heptageniidae	Stenacron	Stenacron	I	2	Collector	cn	2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	U	7	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	not identified	Tanypodinae	I	2	Predator	0	7.5
Insecta	Diptera	Chironomidae	not identified	Tanytarsini	I	6	Collector	0	3.5
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LINL-102-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	sw calc (HIDE ME!)	Habit3 (HIDE ME!)	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	1	Collector	sp	0	sp	7
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	3	Filterer	cn	0	cn	6.5
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	0	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	16	Shredder	cn, bu	0	bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	5	Shredder	0	0	0	7.7
Insecta	Diptera	Ceratopogonidae	Dasyhelea	Dasyhelea	I	1	Collector	sp	0	sp	3.6
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	16	Collector	sp	0	sp	8.5
Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	2	Collector	bu	0	bu	9
Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	0	sp	5.9
Oligochaeta	Haplotaxida	Enchytraeidae	not identified	Enchytraeidae	A	1	Collector	bu	0	bu	9.1
Gastropoda	Basommatophor	Ancylidae	Ferrissia	Ferrissia	A	2	Scraper	cb	0	cb	7
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	3	Scraper	sp	0	sp	7.2
Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	1	Shredder	sp	0	sp	4.9
Insecta	Diptera	Tipulidae	Limonia	Limonia	I	2	Shredder	bu, sp	0	sp	4.8
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	A	1	Collector	bu	0	bu	6.6
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	1	Collector	bu	0	bu	8.5
0	0	0	0	Nematoda	A	2	0	0	0		na
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	1	Collector	sp, bu	0	bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	2	Collector	sp	0	sp	4.6
Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	2	Collector	sp	0	sp	7.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	17	Shredder	cb, cn	0	cn	6.3
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	2	Filterer	cn	0	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	0	cn	5.7
Insecta	Diptera	Chironomidae	Stictochironomus	Stictochironomus	I	1	Collector	bu	0	bu	9.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	14	Filterer	cb, cn	0	cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	0	sp	5.1
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	2	Collector	cn	0	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	U	20	Collector	sp	0	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LINL-150-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	6	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	3	Filterer	cn	4.4
Bivalvia	Veneroida	Corbiculidae	Corbicula	Corbicula	A	2	Filterer	bu	6
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	4	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	33	Collector	sp	8.5
Gastropoda	Basommatophor	Ancylidae	Ferrissia	Ferrissia	A	1	Scraper	cb	7
Turbellaria	Tricladida	Dugesiidae	Girardia	Girardia	A	1	Predator	sp	9.3
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	4	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	2	Filterer	cn	7.5
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	A	1	Collector	bu	6.6
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	58	Collector	bu	8.5
Insecta	Diptera	Chironomidae	Neozavrelia	Neozavrelia	I	1	0	0	na
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	3	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	2	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	6	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	3	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.1
Prepared by: SSLD Checked by: SKB
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FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LINU-103-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	3	Collector	sw, cn	2.6
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	8	Shredder	sp, cn	3
Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	2	Shredder	cn	3.1
Insecta	Diptera	Chironomidae	Brillia	Brillia	I	1	Shredder	bu, sp	7.4
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	7	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	2	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	4	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	3	Collector	sp	8.5
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	24	Collector	sw, cn	2.3
Insecta	Coleoptera	Elmidae	Dubiraphia	Dubiraphia	I	1	Scraper	cn, cb	5.7
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Turbellaria	Tricladida	Dugesiidae	Girardia	Girardia	A	1	Predator	sp	9.3
Insecta	Diptera	Empididae	Hemerodromia	Hemerodromia	I	1	Predator	sp, bu	7.9
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra	I	5	Shredder	cn	0.4
Oligochaeta	Lumbriculida	Lumbriculidae	not identified	Lumbriculidae	A	1	Collector	bu	6.6
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	2	Scraper	cn	2.7
Insecta	Diptera	Empididae	Neoplasta	Neoplasta	I	1	Predator	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	2	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	U	4	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	U	27	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	5	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	6	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	5	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	6	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Stilocladius	Stilocladius	I	1	Collector	sp	6.6
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	1	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Ephemeroptera	Ephemerellidae	Teloganopsis	Teloganopsis	I	3	Collector	0	na
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	3	Predator	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	U	5	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.1
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LINU-104-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Ablabesmyia	Ablabesmyia	I	1	Predator	sp	8.1
Insecta	Diptera	Ceratopogonidae	Bezzia	Bezzia	I	1	Predator	bu	3.3
Insecta	Diptera	Chironomidae	Brillia	Brillia	I	3	Shredder	bu, sp	7.4
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	P	1	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	3	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	5.9
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	2	Collector	bu	8.5
Insecta	Diptera	Empididae	Neoplasta	Neoplasta	I	1	Predator	0	na
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	U	4	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	84	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	1	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	U	14	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	2	Filterer	cn	7.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Stilocladius	Stilocladius	I	2	Collector	sp	6.6
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	1	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	7	Filterer	cb, cn	4.9
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LINU-149-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Ceratopogonidae	not identified	Ceratopogonidae	I	3	Predator	sp, bu	3.6
Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	1	Collector	sp	7
Insecta	Megaloptera	Corydalidae	Chauliodes	Chauliodes	I	1	Predator	cn, cb	1.4
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cryptochironomus	Cryptochironomus	I	1	Predator	sp, bu	7.6
Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	19	Collector	bu	6.6
Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	A	31	Filterer	bu	5.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	5	Shredder	cb, cn	6.3
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	26	Filterer	bu	6.5
Gastropoda	Basommatophor	Lymnaeidae	Stagnicola	Stagnicola	I	4	Scraper	cb	7.8
Insecta	Diptera	Tabanidae	not identified	Tabanidae	I	5	Predator	0	2.8
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	25	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	3	Predator	sp	5.3

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LIPI-101-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	1	Shredder	sp, cn	3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	3	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	U	8	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	1	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	U	11	Collector	sp	8.5
Insecta	Coleoptera	Dytiscidae	not identified	Dytiscidae	I	1	Predator	sw, dv	5.4
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	8	Shredder	sp	6.7
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	not identified	Hydropsychidae	P	1	Filterer	cn	5.7
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	45	Collector	bu	8.5
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	U	2	Collector	sp	4.6
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	1	Scraper	cb	8
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	2	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	27	Filterer	cn	5.7
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	8	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	U	2	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
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FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: LIPI-153-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	1	Collector	cn	8
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	12	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	1	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	2	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	1	Collector	sp	8.5
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	4	Collector	sw, cn	2.3
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	2	Filterer	cn	2.7
Insecta	Coleoptera	Elmidae	Dubiraphia	Dubiraphia	I	2	Scraper	cn, cb	5.7
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	53	Shredder	sp	6.7
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	1	Collector	cb, sp	2.1
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	2	Collector	bu	8.5
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	8	Scraper	cn	2.7
Insecta	Diptera	Empididae	Neoplasta	Neoplasta	I	1	Predator	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	U	10	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	2	Collector	sp	4.6
Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	A	1	Filterer	bu	5.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	18	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	1	Filterer	cn	2.4
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	1	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	1	Collector	cb, sp, cn	4.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	3	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	2	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	8	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
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FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: MIDD-101-F-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acentrella	Acentrella	I	1	Collector	sw, cn	4.9
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	21	Shredder	sp, cn	3
Insecta	Diptera	Ceratopogonidae	Bezzia	Bezzia	I	3	Predator	bu	3.3
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	1	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	30	Collector	sp	8.5
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	4	Collector	sw, cn	2.3
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	1	Collector	cn, sw	2.3
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	2	Scraper	cn, sp	4.5
Insecta	Diptera	Empididae	Hemerodromia	Hemerodromia	I	1	Predator	sp, bu	7.9
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Plecoptera	Perlodidae	Isoperla	Isoperla	I	1	Predator	cn, sp	2.4
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	2	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Paraphaenocladius	Paraphaenocladius	I	1	Collector	sp	4
Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	I	1	Filterer	bu	5.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	2	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	U	4	Filterer	cn	2.4
Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	1	Scraper	cn	4.4
Insecta	Diptera	Tipulidae	Pseudolimnophila	Pseudolimnophila	I	3	Predator	bu	2.8
Insecta	Diptera	Simuliidae	Simulium	Simulium	U	22	Filterer	cn	5.7
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	3	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	10	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	5	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	5	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	4	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	5	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: MIDD-104-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	9	Collector	sp	8.5
Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	2	Collector	sp	5.9
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	25	Collector	sp	6.1
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	3	Scraper	sp	7.2
Insecta	Trichoptera	Limnephilidae	not identified	Limnephilidae	I	2	Shredder	cb, sp, cn	3.4
Insecta	Plecoptera	Nemouridae	not identified	Nemouridae	I	8	Shredder	sp, cn	2.9
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	1	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Trichoptera	Philopotamidae	not identified	Philopotamidae	I	1	Filterer	cn	2.6
Insecta	Diptera	Chironomidae	Platysmittia	Platysmittia	I	2	0	0	6.6
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	37	Filterer	cn	2.4
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	10	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	4	Collector	sp	5.1
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	4	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
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FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: MIDD-301-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acentrella	Acentrella	I	2	Collector	sw, cn	4.9
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	1	Shredder	sp, cn	3
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	1	Collector	cn	8
Insecta	Diptera	Chironomidae	Cardiocladius	Cardiocladius	I	1	Predator	bu, cn	10
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Insecta	Diptera	Empididae	Clinocera	Clinocera	I	4	Predator	cn	7.4
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	3	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	5	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	2	Collector	sp	8.5
Insecta	Ephemeroptera	Ephemerellidae	Drunella	Drunella	I	10	Scraper	cn, sp	1.9
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	27	Collector	cn, sw	2.3
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	1	Collector	sp	6.1
Insecta	Ephemeroptera	Baetidae	Heterocloeon	Heterocloeon	I	3	Scraper	sw,cn	5
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	2	Scraper	sp	7.2
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	3	Filterer	sw, cn	2.5
Insecta	Diptera	Tipulidae	Limonia	Limonia	I	2	Shredder	bu, sp	4.8
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	2	Scraper	cn	3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	3	Collector	bu	8.5
Insecta	Diptera	Chironomidae	Neozavrelia	Neozavrelia	I	4	0	0	na
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	28	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Insecta	Trichoptera	Polycentropodidae	not identified	Polycentropodidae	I	1	0	cn	0.2
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	1	Filterer	cn	2.4
Enopla	Hoplonemertea	Tetrastemmatidae	Prostoma	Prostoma	I	5	Predator	0	7.3
Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	1	Shredder	sp, cb, cn	3.1
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	2	Collector	sp	6.2
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	P	1	Filterer	cn	7.2
Insecta	Diptera	Chironomidae	Stictochironomus	Stictochironomus	I	1	Collector	bu	9.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	3	Filterer	cb, cn	4.9
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: MODS-101-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	A	12	Collector	sp	2.6
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	1	Shredder	0	7.7
Turbellaria	Tricladida	Dugesiidae	Cura	Cura	A	7	0	sp	6.5
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	4	Collector	sp	8.5
Insecta	Coleoptera	Dytiscidae	not identified	Dytiscidae	I	1	Predator	sw, dv	5.4
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	39	Shredder	sp	6.7
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	8	Collector	cb, sp	2.1
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	3	Collector	bu	8.5
Insecta	Hemiptera	Nepidae	not identified	Nepidae	A	1	Predator	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	U	11	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	5	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Insecta	Diptera	Tipulidae	Pseudolimnophila	Pseudolimnophila	I	4	Predator	bu	2.8
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	1	Collector	sp	6.2
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	4	Filterer	bu	6.5
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	2	Collector	cb, sp, cn	4.2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	U	9	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	U	6	Predator	sp	8.2
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	3	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	10	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/27/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 3.xlsx
Version: 1
Site Name: MODS-163-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Baetis	Baetis	I	2	Collector	sw, cb, cn	3.9
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	2	Collector	sw, cn	2.3
Insecta	Coleoptera	Elmidae	Dubiraphia	Dubiraphia	I	1	Scraper	cn, cb	5.7
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	71	Shredder	sp	6.7
Malacostraca	Isopoda	Asellidae	Lirceus	Lirceus	A	4	Collector	sp	3.3
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	U	51	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	22	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	8	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	3	Collector	cb, sp, cn	4.2
Insecta	Diptera	Tabanidae	not identified	Tabanidae	I	1	Predator	0	2.8
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	1	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	3	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/28/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: OWEN-102-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Capniidae	Allocapnia	Allocapnia	I	3	Shredder	cn	4.2
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	10	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	3	Collector	sp	5.9
Oligochaeta	Haplotaxida	Enchytraeidae	not identified	Enchytraeidae	A	1	Collector	bu	9.1
Hirudinea	Rhynchobdellida	Glossiphoniidae	Helobdella	Helobdella	A	1	Predator	sp	6
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	58	Scraper	sp	7.2
Insecta	Trichoptera	Limnephilidae	not identified	Limnephilidae	I	3	Shredder	cb, sp, cn	3.4
Insecta	Diptera	Chironomidae	Natarsia	Natarsia	I	1	Predator	sp	6.6
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	13	Collector	sp, bu	9.2
Insecta	Diptera	Psychodidae	Pericoma	Pericoma	I	2	Collector	0	4
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	1	Scraper	cb	8
Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	A	6	Filterer	bu	5.7
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	4	Filterer	bu	6.5
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	35	Filterer	cn	2.4
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	4	Shredder	bu	6.7
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	A	5	Collector	cn	8.4

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

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FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: OWEN-127-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Capniidae	Allocapnia	Allocapnia	I	7	Shredder	cn	4.2
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	3	Shredder	sp, cn	3
Insecta	Diptera	Ceratopogonidae	Bezzia	Bezzia	I	1	Predator	bu	3.3
Insecta	Ephemeroptera	Caenidae	Caenis	Caenis	I	1	Collector	sp	2.1
Insecta	Diptera	Ceratopogonidae	not identified	Ceratopogonidae	I	1	Predator	sp, bu	3.6
Insecta	Plecoptera	Perlodidae	Clioperla	Clioperla	I	2	Predator	cn	1.7
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	6	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	1	Collector	sp	8.5
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	2	Collector	sp	6.1
Malacostraca	Amphipoda	Hyalellidae	Hyalella	Hyalella	A	1	Shredder	sp	4.2
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Trichoptera	Limnephilidae	not identified	Limnephilidae	I	1	Shredder	cb, sp, cn	3.4
Insecta	Plecoptera	Nemouridae	not identified	Nemouridae	I	1	Shredder	sp, cn	2.9
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	12	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	6	Collector	sp, bu	9.2
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	1	Scraper	cb	8
Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	I	1	Filterer	bu	5.7
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	56	Filterer	cn	2.4
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	4	Filterer	cn	2.4
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	1	Scraper	cn	7.1
Insecta	Ephemeroptera	Heptageniidae	Stenonema	Stenonema	I	1	Scraper	cn	4.6
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	1	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

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FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: OWEN-302-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Capniidae	Allocapnia	Allocapnia	I	1	Shredder	cn	4.2
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	8	Shredder	sp, cn	3
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	3	Collector	sp	8.5
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	2	Collector	cn, sw	2.3
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	1	Collector	sp	6.1
Insecta	Ephemeroptera	Baetidae	Heterocloeon	Heterocloeon	I	6	Scraper	sw,cn	5
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Ephemeroptera	Isonychiidae	Isonychia	Isonychia	I	4	Filterer	sw, cn	2.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Insecta	Coleoptera	Elmidae	Macronychus	Macronychus	A	1	Scraper	cn	6.8
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	1	Scraper	cn	2.7
Insecta	Plecoptera	Taeniopterygidae	Oemopteryx	Oemopteryx	I	1	Shredder	sp, cn	1.8
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	23	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	4	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	1	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Paraphaenocladius	Paraphaenocladius	I	1	Collector	sp	4
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	U	55	Filterer	cn	2.4
Insecta	Plecoptera	Nemouridae	Prostoia	Prostoia	I	3	Shredder	sp, cn	4.5
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	1	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	P	1	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

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FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: POTD-102-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	5	Shredder	sp, cn	3
Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	2	Shredder	cn	3.1
Insecta	Diptera	Ceratopogonidae	not identified	Ceratopogonidae	I	1	Predator	sp, bu	3.6
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	2	Shredder	0	7.7
Insecta	Diptera	Ceratopogonidae	Dasyhelea	Dasyhelea	I	1	Collector	sp	3.6
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	11	Collector	sw, cn	2.3
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	3	Filterer	cn	2.7
Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	5.9
Insecta	Plecoptera	Perlidae	Eccoptura	Eccoptura	I	1	Predator	cn	0.6
Insecta	Ephemeroptera	Leptophlebiidae	Habrophlebiodes	Habrophlebiodes	I	3	Scraper	0	na
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	7	Collector	cb, sp	2.1
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	1	Collector	bu	8.5
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	2	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	not identified	Orthocladiinae	P	2	Collector	0	7.6
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	1	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parakiefferiella	Parakiefferiella	I	1	Collector	sp	2.1
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	4	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	1	Collector	sp	7.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	39	Shredder	cb, cn	6.3
Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	8	Filterer	cn	7.2
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	3	Collector	cb, sp, cn	4.2
Insecta	Coleoptera	Elmidae		Stenelmis	I	2	Scraper	cn	7.1
Insecta	Diptera	Chironomidae	not identified	Tanytarsini	I	1	Collector	0	3.5
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	2	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	2	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	5	Predator	sp	8.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	1	Shredder	bu	6.7
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

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Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/28/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: POTD-133-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	12	Shredder	sp, cn	3
Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	1	Shredder	cn	3.1
Insecta	Diptera	Ceratopogonidae	not identified	Ceratopogonidae	I	2	Predator	sp, bu	3.6
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	2	Shredder	0	7.7
Insecta	Ephemeroptera	Baetidae	Diphetor	Diphetor	I	1	Collector	sw, cn	2.3
Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	4	Filterer	cn	2.7
Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	5.9
Insecta	Plecoptera	Perlidae	Eccoptura	Eccoptura	I	3	Predator	cn	0.6
Oligochaeta	Haplotaxida	Enchytraeidae	not identified	Enchytraeidae	A	1	Collector	bu	9.1
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	17	Collector	cn, sw	2.3
Gastropoda	Basommatophor	Ancylidae	Ferrissia	Ferrissia	A	1	Scraper	cb	7
Insecta	Ephemeroptera	Leptophlebiidae	Habrophlebiodes	Habrophlebiodes	I	18	Scraper	0	na
Insecta	Coleoptera	Dryopidae	Helichus	Helichus	A	1	Scraper	cn	6.4
Insecta	Diptera	Empididae	Hemerodromia	Hemerodromia	I	1	Predator	sp, bu	7.9
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	8	Collector	bu	8.5
Insecta	Diptera	Chironomidae	Nilotanypus	Nilotanypus	I	1	Predator	sp	6.6
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	A	6	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	8	Collector	sp	4.6
Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	A	1	Filterer	bu	5.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	12	Shredder	cb, cn	6.3
Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	1	Shredder	sp, cb, cn	3.1
Insecta	Diptera	Chironomidae		Rheocricotopus	I	1	Collector	sp	6.2
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	1	Collector	cb, sp, cn	4.2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	A	1	Scraper	cn	7.1
Insecta	Ephemeroptera	Ephemerellidae	Teloganopsis	Teloganopsis	I	7	Collector	0	na
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	8	Predator	sp	8.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	2	Shredder	bu	6.7
Turbellaria	not identified	not identified	not identified	Turbellaria	I	2	Predator	sp	4
Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	1	Predator	sp	5.3

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Prepared by: SSLD Checked by: SKB
Prepared date: 9/12/2018 Checked date: 9/28/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: TOMS-101-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	10	Shredder	sp, cn	3
Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	1	Shredder	cn	3.1
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	6	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	6	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	4	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	3	Collector	sp	8.5
Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Insecta	Diptera	Empididae	Hemerodromia	Hemerodromia	I	1	Predator	sp, bu	7.9
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Plecoptera	Leuctridae	not identified	Leuctridae	I	1	Shredder	sp, cn	0.8
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	5	Collector	cb, sp	2.1
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	2	Scraper	cn	2.7
Insecta	Diptera	Empididae	Neoplasta	Neoplasta	I	1	Predator	0	na
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	2	Scraper	cb	8
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	U	72	Filterer	cn	2.4
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	1	Predator	cn	2.1
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	2	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	1	Collector	cb, sp, cn	4.2
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	I	6	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Oligochaeta	Tubificida	Tubificidae	not identified	Tubificidae	I	1	Collector	cn	8.4
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland; na indicates information for the particular taxa was not available.

Project Name: Frederick County Stream Survey
Project Number: 171701239.13
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Prepared date: 9/12/2018 Checked date: 9/28/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: TOMS-102-R-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	2	Shredder	sp, cn	3
Insecta	Coleoptera	Dryopidae	Helichus	Helichus	A	1	Scraper	cn	6.4
Insecta	Plecoptera	Perlodidae	Isoperla	Isoperla	I	2	Predator	cn, sp	2.4
Insecta	Diptera	Chironomidae	Limnophyes	Limnophyes	I	1	Collector	sp	8.6
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	2	Collector	bu	8.5
Insecta	Plecoptera	Nemouridae	not identified	Nemouridae	I	31	Shredder	sp, cn	2.9
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	28	Filterer	cn	2.4
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	66	Filterer	cn	2.4
Insecta	Diptera	Tabanidae	not identified	Tabanidae	I	1	Predator	0	2.8
Turbellaria	not identified	not identified	not identified	Turbellaria	I	1	Predator	sp	4
Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	1	Predator	sp	5.3

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FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: TOMS-247-F-2018

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	1	Collector	sw, cn	2.6
Insecta	Odonata	Coenagrionidae	Argia	Argia	I	1	Predator	cn, cb, sp	9.3
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	2	Collector	sp	4.1
Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	5.9
Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	15	Collector	sp	6.1
Insecta	Diptera	Chironomidae	Glyptotendipes	Glyptotendipes	I	1	Filterer	bu, cn	6.6
Malacostraca	Amphipoda	Hyalellidae	Hyalella	Hyalella	A	1	Shredder	sp	4.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	2	Shredder	sp	4.9
Insecta	Trichoptera	Limnephilidae	Limnephilus	Limnephilus	I	1	Shredder	cb, sp, cn	3.4
Oligochaeta	Lumbricina	not identified	not identified	Lumbricina	A	1	Collector	bu	na
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	34	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	2	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Paraphaenocladius	Paraphaenocladius	I	1	Collector	sp	4
Insecta	Plecoptera	Perlidae	Perlesta	Perlesta	I	1	Predator	cn	1.6
Gastropoda	Basommatophor	Physidae	Physella	Physella	A	1	Scraper	cb	8
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	U	47	Filterer	cn	2.4
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	3	Filterer	cn	5.7
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	1	Filterer	bu	6.5
Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	16	Filterer	cn	2.4
Insecta	Ephemeroptera	Heptageniidae	Stenacron	Stenacron	I	3	Collector	cn	2
Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	A	1	Scraper	cn	7.1
Insecta	Ephemeroptera	Heptageniidae		Stenonema	I	1	Scraper	cn	4.6
Insecta	Plecoptera	Taeniopterygidae	not identified	Taeniopterygidae	I	1	Shredder	0	3.1
Insecta	Plecoptera	Taeniopterygidae	Taeniopteryx	Taeniopteryx	I	1	Shredder	sp, cn	4.8
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	2	Predator	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1

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Prepared date: 9/12/2018 Checked date: 9/28/2018

FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: TUSC-251-F-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Diptera	Chironomidae	Ablabesmyia	Ablabesmyia	I	1	Predator	sp	8.1
Insecta	Diptera	Tipulidae	Antocha	Antocha	I	2	Collector	cn	8
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	3	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	2	Shredder	0	7.7
Insecta	Diptera	Ceratopogonidae	Dasyhelea	Dasyhelea	I	3	Collector	sp	3.6
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	20	Collector	sp	8.5
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	2	Collector	cn, sw	2.3
Insecta	Trichoptera	Glossosomatidae	Glossosoma	Glossosoma	I	2	Scraper	cn	0.01
Insecta	Ephemeroptera	Baetidae	Heterocloeon	Heterocloeon	I	1	Scraper	sw,cn	5
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	3	Filterer	cn	7.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	1	Collector	bu	8.5
Insecta	Diptera	Chironomidae	Neozavrelia	Neozavrelia	I	1	0	0	na
Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	A	1	Scraper	cn	5.4
Insecta	Diptera	Chironomidae	not identified	Orthocladiinae	I	1	Collector	0	7.6
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	U	39	Collector	sp, bu	9.2
Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	3	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	3	Filterer	cn	2.4
Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	1	Shredder	sp, cb, cn	3.1
Insecta	Diptera	Simuliidae	Simulium	Simulium	I	16	Filterer	cn	5.7
Bivalvia	Veneroida	Pisidiidae	not identified	Sphaeriidae	I	1	Filterer	bu	6.5
Insecta	Diptera	Chironomidae		Stempellinella	I	1	Collector	cb, sp, cn	4.2
Insecta	Ephemeroptera	Ephemerellidae	Teloganopsis	Teloganopsis	I	1	Collector	0	na
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	U	4	Collector	sp	5.1

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FCSS2018_BIBI_Combined_Highlands_v1 - 4.xlsx
Version: 1
Site Name: TUSC-301-R-2018

KCI TECHNOLOGIES

Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	2	Shredder	sp, cn	3
Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	1	Collector	sp	7
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	2	Shredder	cn, bu	9.6
Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	2	Shredder	0	7.7
Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I	21	Collector	sp	8.5
Insecta	Coleoptera	Elmidae	Dubiraphia	Dubiraphia	A	1	Scraper	cn, cb	5.7
Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	2	Collector	cn, sw	2.3
Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	A	15	Shredder	sp	6.7
Turbellaria	Tricladida	Dugesiidae	Girardia	Girardia	A	1	Predator	sp	9.3
Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	U	2	Scraper	sp	7.2
Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	3
Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	2	Collector	cb, sp	2.1
Oligochaeta	Haplotaxida	Naididae	not identified	Naididae	A	1	Collector	bu	8.5
Insecta	Trichoptera	Uenoidae	Neophylax	Neophylax	I	1	Scraper	cn	2.7
Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	1	Collector	sp, bu	9.2
Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	U	2	Collector	sp	4.6
Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	P	1	Collector	sp	7.7
Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	26	Shredder	cb, cn	6.3
Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	U	5	Filterer	cn	2.4
Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	2	Collector	sp	6.2
Insecta	Diptera	Simuliidae	Simulium	Simulium	U	19	Filterer	cn	5.7
Insecta	Diptera	Chironomidae		Stilocladius	I	1	Collector	sp	6.6
Insecta	Diptera	Chironomidae	Sympotthastia	Sympotthastia	U	6	Collector	sp	8.2
Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia Group	I	1	Predator	sp	8.2
Insecta	Diptera	Tipulidae	Tipula	Tipula	I	1	Shredder	bu	6.7
Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	U	10	Collector	sp	5.1

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Appendix C: Habitat Assessment Data

Site	Scaled Metrics					Scores	
	Epifaunal Substrate	Bank Stability	Percent Shading	Riparian Width	Remoteness	PHI	PHI Rating
BALL-103-R-2018	5.56	100.00	70.13	50.00	13.44	47.8	Severely Degraded
BALL-116-F-2018	61.11	92.26	87.37	100.00	30.99	74.3	Partially Degraded
BALL-201-R-2018	55.56	61.36	56.37	60.00	13.44	49.3	Severely Degraded
BENN-103-R-2018	72.22	66.87	70.13	100.00	61.02	74.0	Partially Degraded
BENN-219-F-2018	83.33	85.20	87.37	100.00	61.02	83.4	Minimally Degraded
BUSL-147-R-2018	33.33	91.11	56.37	100.00	66.55	69.5	Partially Degraded
BUSL-160-F-2018	50.00	86.41	80.88	90.00	26.25	66.7	Partially Degraded
BUSL-330-R-2018	72.22	72.35	87.37	90.00	27.93	70.0	Partially Degraded
BUSU-202-R-2018	77.78	81.00	65.34	90.00	61.02	75.0	Partially Degraded
BUSU-221-F-2018	77.78	63.78	60.78	100.00	85.03	77.5	Partially Degraded
CARR-105-R-2018	55.56	57.60	65.34	14.00	47.96	48.1	Severely Degraded
CARR-201-R-2018	38.89	100.00	56.37	5.00	8.26	41.7	Severely Degraded
CARR-216-F-2018	88.89	67.16	60.78	73.00	39.73	65.9	Degraded
CATO-101-R-2018	77.78	79.22	65.34	37.00	47.96	61.5	Degraded
CATO-417-F-2018	88.89	86.41	56.37	55.00	11.27	59.6	Degraded
FISH-102-R-2018	83.33	88.07	60.78	70.00	47.96	70.0	Partially Degraded
FISH-201-R-2018	94.44	95.64	75.25	100.00	47.06	82.5	Minimally Degraded
FISH-222-F-2018	88.89	98.93	52.05	70.00	26.25	67.2	Partially Degraded
GLAD-108-F-2018	55.56	96.52	8.18	20.00	54.91	47.0	Severely Degraded
GLAD-201-R-2018	72.22	92.94	8.18	48.00	28.99	50.1	Severely Degraded
HUNT-101-F-2018	88.89	95.64	65.34	70.00	17.27	67.4	Partially Degraded
HUNT-102-R-2018	94.44	88.78	70.13	75.00	21.40	70.0	Partially Degraded
HUNT-301-R-2018	94.44	91.80	60.78	60.00	66.55	74.7	Partially Degraded
ISRA-105-R-2018	44.44	35.60	70.13	100.00	85.03	67.0	Partially Degraded
ISRA-348-F-2018	83.33	80.24	0.00	75.00	51.97	58.1	Degraded
LCCS-102-R-2018	88.89	93.62	80.88	90.00	76.38	86.0	Minimally Degraded
LCCS-120-F-2018	44.44	72.35	70.13	30.00	71.64	57.7	Degraded
LCCS-217-R-2018	61.11	82.75	75.25	90.00	54.91	72.8	Partially Degraded
LINL-102-R-2018	55.56	98.49	30.20	45.00	11.27	48.1	Severely Degraded
LINL-150-F-2018	66.67	94.52	70.13	100.00	28.99	72.1	Partially Degraded
LINU-103-R-2018	61.11	91.34	0.00	0.00	19.47	34.4	Severely Degraded
LINU-104-R-2018	55.56	86.17	65.34	75.00	54.91	67.4	Partially Degraded
LINU-149-F-2018	33.33	39.36	56.37	16.00	66.55	42.3	Severely Degraded
LIPI-101-R-2018	55.56	97.84	0.00	100.00	39.73	58.6	Degraded
LIPI-153-F-2018	55.56	86.41	65.34	55.00	47.96	62.1	Degraded
MIDD-101-F-2018	72.22	90.18	0.00	75.00	66.55	60.8	Degraded
MIDD-104-R-2018	88.89	97.84	56.37	58.00	6.74	61.6	Degraded
MIDD-301-R-2018	88.89	96.30	43.49	55.00	11.27	59.0	Degraded
MODS-101-F-2018	33.33	76.37	52.05	25.00	39.73	45.3	Severely Degraded
MODS-163-R-2018	44.44	94.52	43.49	10.00	27.66	44.0	Severely Degraded
OWEN-102-R-2018	22.22	83.98	56.37	50.00	23.15	47.1	Severely Degraded
OWEN-127-F-2018	50.00	71.94	30.20	100.00	23.15	55.1	Degraded
OWEN-302-R-2018	94.44	88.90	56.37	100.00	54.91	78.9	Partially Degraded
POTD-102-R-2018	50.00	92.49	75.25	12.00	47.96	55.5	Degraded
POTD-133-F-2018	72.22	91.57	70.13	15.00	39.73	57.7	Degraded
TOMS-101-R-2018	88.89	96.74	47.77	100.00	47.96	76.3	Partially Degraded
TOMS-102-R-2018	66.67	93.39	75.25	90.00	35.86	72.2	Partially Degraded
TOMS-247-F-2018	55.56	100.00	8.18	17.00	26.25	41.4	Severely Degraded
TUSC-251-F-2018	88.89	73.16	56.37	100.00	31.46	70.0	Partially Degraded
TUSC-301-R-2018	83.33	94.07	60.78	100.00	35.86	74.8	Partially Degraded

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Project Number: 171701239.13
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		Raw Data					Scaled Metrics					Scores	
Site	Subshed Area (ac)	Epifaunal Substrate	Bank Stab (0-20)	Percent Shading	Riparian Width	Remoteness Score	Epifaunal Substrate	Bank Stability	Percent Shading	Riparian Width	Remoteness	PHI	PHI Rating
BALL-103-R-2018	300	1	20	75	25	3	5.56	100.00	70.13	50.00	13.44	47.8	Severely Degraded
BALL-116-F-2018	254	11	18	90	50	6	61.11	92.26	87.37	100.00	30.99	74.3	Partially Degraded
BALL-201-R-2018	3696	10	10	60	30	3	55.56	61.36	56.37	60.00	13.44	49.3	Severely Degraded
BENN-103-R-2018	659	13	11	75	50	12	72.22	66.87	70.13	100.00	61.02	74.0	Partially Degraded
BENN-219-F-2018	2584	15	16	90	50	12	83.33	85.20	87.37	100.00	61.02	83.4	Minimally Degraded
BUSL-147-F-2018	30	6	17	60	50	13	33.33	91.11	56.37	100.00	66.55	69.5	Partially Degraded
BUSL-160-F-2018	176	9	16	85	45	5	50.00	86.41	80.88	90.00	26.25	66.7	Partially Degraded
BUSL-330-F-2018	12159	13	12	90	45	6	72.22	72.35	87.37	90.00	27.93	70.0	Partially Degraded
BUSU-202-R-2018	4197	14	15	70	45	12	77.78	81.00	65.34	90.00	61.02	75.0	Partially Degraded
BUSU-221-F-2018	4996	14	10	65	50	17	77.78	63.78	60.78	100.00	85.03	77.5	Partially Degraded
CARR-105-R-2018	304	10	9	70	7	10	55.56	57.60	65.34	14.00	47.96	48.1	Severely Degraded
CARR-201-R-2018	2811	7	20	60	3	2	38.89	100.00	56.37	5.00	8.26	41.7	Severely Degraded
CARR-216-F-2018	2400	16	11	65	37	8	88.89	67.16	60.78	73.00	39.73	65.9	Degraded
CATO-101-R-2018	426	14	14	70	19	10	77.78	79.22	65.34	37.00	47.96	61.5	Degraded
CATO-417-F-2018	55708	16	16	60	28	2	88.89	86.41	56.37	55.00	11.27	59.6	Degraded
FISH-102-R-2018	1240	15	16	65	35	10	83.33	88.07	60.78	70.00	47.96	70.0	Partially Degraded
FISH-201-R-2018	6200	17	19	80	50	9	94.44	95.64	75.25	100.00	47.06	82.5	Minimally Degraded
FISH-222-F-2018	9071	16	20	55	35	5	88.89	98.93	52.05	70.00	26.25	67.2	Partially Degraded
GLAD-108-F-2018	189	10	19	10	10	11	55.56	96.52	8.18	20.00	54.91	47.0	Severely Degraded
GLAD-201-R-2018	4754	13	18	10	24	6	72.22	92.94	8.18	48.00	28.99	50.1	Severely Degraded

Score	Narrative Rating
81-100	Minimally Degraded
66.0-80.9	Partially Degraded
51.0-65.9	Degraded
0-50.9	Severely Degraded

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 9/26/2018 Checked date: 10/1/2018

		Raw Data					Scaled Metrics					Scores	
Site	Subshed Area (ac)	Epifaunal Substrate	Bank Stab (0-20)	Percent Shading	Riparian Width	Remoteness Score	Epifaunal Substrate	Bank Stability	Percent Shading	Riparian Width	Remoteness	PHI	PHI Rating
HUNT-101-F-2018	1200	16	19	70	35	3	88.89	95.64	65.34	70.00	17.27	67.4	Partially Degraded
HUNT-102-R-2018	1528	17	17	75	37.5	4	94.44	88.78	70.13	75.00	21.40	70.0	Partially Degraded
HUNT-301-R-2018	6910	17	18	65	30	13	94.44	91.80	60.78	60.00	66.55	74.7	Partially Degraded
ISRA-105-R-2018	53	8	5	75	50	17	44.44	35.60	70.13	100.00	85.03	67.0	Partially Degraded
ISRA-348-F-2018	18726	15	14	5	37.5	10	83.33	80.24	0.00	75.00	51.97	58.1	Degraded
LCCS-102-R-2018	576	16	18	85	45	15	88.89	93.62	80.88	90.00	76.38	86.0	Minimally Degraded
LCCS-120-F-2018	169	8	12	75	15	14	44.44	72.35	70.13	30.00	71.64	57.7	Degraded
LCCS-217-F-2018	5419	11	15	80	45	11	61.11	82.75	75.25	90.00	54.91	72.8	Partially Degraded
LINL-102-R-2018	284	10	20	30	22.5	2	55.56	98.49	30.20	45.00	11.27	48.1	Severely Degraded
LINL-150-F-2018	384	12	18	75	50	6	66.67	94.52	70.13	100.00	28.99	72.1	Partially Degraded
LINU-103-R-2018	496	11	17	5	0	4	61.11	91.34	0.00	0.00	19.47	34.4	Severely Degraded
LINU-104-R-2018	413	10	16	70	37.5	11	55.56	86.17	65.34	75.00	54.91	67.4	Partially Degraded
LINU-149-F-2018	48	6	6	60	8	13	33.33	39.36	56.37	16.00	66.55	42.3	Severely Degraded
LIPI-101-R-2018	459	10	19	1	50	8	55.56	97.84	0.00	100.00	39.73	58.6	Degraded
LIPI-153-F-2018	571	10	16	70	27.5	10	55.56	86.41	65.34	55.00	47.96	62.1	Degraded
MIDD-101-F-2018	362	13	17	2	37.5	13	72.22	90.18	0.00	75.00	66.55	60.8	Degraded
MIDD-104-R-2018	132	16	19	60	29	1	88.89	97.84	56.37	58.00	6.74	61.6	Degraded
MIDD-301-R-2018	16591	16	19	45	27.5	2	88.89	96.30	43.49	55.00	11.27	59.0	Degraded
MODS-101-F-2018	429	6	13	55	12.5	8	33.33	76.37	52.05	25.00	39.73	45.3	Severely Degraded
MODS-163-F-2018	572	8	18	45	5	6	44.44	94.52	43.49	10.00	27.66	44.0	Severely Degraded

Score	Narrative Rating
81-100	Minimally Degraded
66.0-80.9	Partially Degraded
51.0-65.9	Degraded
0-50.9	Severely Degraded

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD
Prepared date: 9/26/2018
Checked by: SKB
Checked date: 10/1/2018

		Raw Data					Scaled Metrics					Scores	
Site	Subshed Area (ac)	Epifaunal Substrate	Bank Stab (0-20)	Percent Shading	Riparian Width	Remoteness Score	Epifaunal Substrate	Bank Stability	Percent Shading	Riparian Width	Remoteness	PHI	PHI Rating
OWEN-102-R-2018	221	4	15	60	25	5	22.22	83.98	56.37	50.00	23.15	47.1	Severely Degraded
OWEN-127-F-2018	738	9	12	30	50	5	50.00	71.94	30.20	100.00	23.15	55.1	Degraded
OWEN-302-R-2018	16155	17	17	60	50	11	94.44	88.90	56.37	100.00	54.91	78.9	Partially Degraded
POTD-102-R-2018	243	9	18	80	6	10	50.00	92.49	75.25	12.00	47.96	55.5	Degraded
POTD-133-F-2018	180	13	17	75	7.5	8	72.22	91.57	70.13	15.00	39.73	57.7	Degraded
TOMS-101-R-2018	67	16	19	50	50.0	10	88.89	96.74	47.77	100.00	47.96	76.3	Partially Degraded
TOMS-102-R-2018	104	12	18	80	45	7	66.67	93.39	75.25	90.00	35.86	72.2	Partially Degraded
TOMS-247-F-2018	3700	10	20	10	8.5	5	55.56	100.00	8.18	17.00	26.25	41.4	Severely Degraded
TUSC-251-F-2018	2087	16	13	60	50	6	88.89	73.16	56.37	100.00	31.46	70.0	Partially Degraded
TUSC-301-R-2018	965	15	18	65	50	7	83.33	94.07	60.78	100.00	35.86	74.8	Partially Degraded

Score	Narrative Rating
81-100	Minimally Degraded
66.0-80.9	Partially Degraded
51.0-65.9	Degraded
0-50.9	Severely Degraded

Appendix D: Water Quality Data

KCI - Frederick County Project - Spring 2018

Grab Sample WQ																		
Sample ID	**Date Collected**	**Chloride (mg/L)**	**Total Phosphorus (mg/L)**	**Total Nitrogen (mg/L)**	**Orthophosphate (mg/L)**	**Total Ammonia Nitrogen (mg/L)**	**Nitrite-N (mg/L)**	**Nitrate-N (mg/L)**	**Total Kjehldal Nitrogen - calculated (mg/L)**	**Dissolved Organic Carbon (mg/L)**	**Total Organic Carbon (mg/L)**	**Magnesium (mg/L)**	**Calcium (mg/L)**	**Hardness (mg equivalent $CaCO_3$/L)**	**Total Copper (µg/L)**	**Total Zinc (µg/L)**	**Total Lead (µg/L)**	**Turbidity (NTU)**
BALL-103-R-2018	04/05/18	182.69	0.045	0.813	0.0054	0.0063	0.0106	0.2995	0.5028	1.4430	1.4439	9.359	63.51	197.1	3.997	7.006	0.255	4.6
BALL-116-F-2018	04/03/18	116.79	0.007	2.939	<0.0031	0.0084	0.0034	2.8881	0.0471	0.8595	0.8704	19.640	29.62	154.8	0.448	0.238	0.012	0.4
BALL-201-R-2018	04/03/18	71.15	0.013	3.320	<0.0031	0.0089	0.0092	3.2423	0.0689	1.1698	1.1858	14.740	37.49	154.3	0.315	<0.078	0.033	1.2
BENN-103-R-2018	04/04/18	30.50	0.008	2.697	<0.0031	0.0064	0.0062	2.6833	0.0076	1.1922	1.1864*	3.412	45.22	127.0	0.240	<0.078	0.008	0.4
BENN-219-F-2018	04/04/18	20.06	0.012	1.761	<0.0031	0.0059	0.0036	1.6747	0.0831	1.0266	1.0432	3.818	13.18	48.6	0.306	<0.078	0.029	1.5
BENN-219-F-2018-QC	04/04/18	19.70	0.011	1.720	<0.0031	0.0045	0.0034	1.6705	0.0456	1.0371	1.0477	3.668	12.90	47.3	0.306	<0.078	0.027	2.2
BUSL-147-F-2018	04/18/18	128.27	0.016	3.008	0.0082	0.0085	0.0047	2.9350	0.0678	0.9591	0.9134*	3.745	61.66	169.4	0.247	0.095	0.072	2.0
BUSL-160-F-2018	04/03/18	70.42	0.011	2.486	0.0036	0.0051	0.0032	2.3716	0.1107	1.3607	1.3761	9.226	17.66	82.1	0.752	1.017	0.380	3.1
BUSL-330-F-2018	04/23/18	73.61	0.018	2.536	0.0033	0.0055	0.0095	2.3511	0.1753	1.2871	1.2686*	4.834	29.04	92.4	0.578	0.097	0.053	2.0
BUSL-330-F-2018-QC	04/23/18	73.22	0.016	2.522	0.0031	0.0049	0.0091	2.3497	0.1632	1.2322	1.2677	4.847	27.87	89.6	0.589	0.378	0.055	2.1
BUSU-202-R-2018	03/28/18	129.42	0.024	2.834	0.0099	0.0032	0.0132	2.7193	0.1013	0.8416	0.8594	8.322	26.92	101.5	0.517	0.486	0.021	1.0
BUSU-221-F-2018	03/29/18	118.82	0.022	2.847	0.0087	0.0085	0.0182	2.7019	0.1264	1.0691	1.0705	7.860	26.62	98.8	0.633	0.384	0.028	1.2
CARR-105-R-2018	03/29/18	81.08	0.005	3.599	0.0036	0.0064	0.0030	3.5558	0.0397	1.6154	1.6696	6.840	13.23	61.2	0.435	0.309	0.028	0.4
CARR-201-R-2018	04/05/18	**583.60**	0.008	1.853	<0.0031	0.0042	0.0049	1.6583	0.1897	0.7285	0.6832*	13.920	57.12	200.0	0.450	2.810	0.046	0.7
CARR-216-F-2018	03/29/18	170.34	0.008	1.645	0.0043	0.0048	0.0039	1.5924	0.0487	0.8907	0.8986	13.480	51.77	184.8	0.613	1.965	0.039	0.9
CATO-101-R-2018	04/23/18	39.57	0.052	3.683	0.0372	0.0124	0.0098	3.4919	0.1813	2.7552	2.7674	4.643	20.75	70.9	1.281	1.025	0.063	1.9
CATO-417-F-2018	04/23/18	31.94	0.042	2.037	0.0204	0.0190	0.0061	1.8503	0.1807	1.6310	1.6036*	4.560	19.28	66.9	1.019	0.783	0.151	4.8
FISH-102-R-2018	03/27/18	51.96	0.032	2.177	0.0121	0.0066	0.0084	1.8723	0.2964	3.6407	3.7043	9.970	33.95	125.8	4.797	0.101	0.058	2.7
FISH-201-R-2018	03/27/18	4.06	<0.004	0.141	<0.0031	0.0032	<0.0022	0.1107	0.0284	0.8472	0.8448*	0.653	2.412	8.7	0.103	0.380	0.054	0.6
FISH-222-F-2018	03/27/18	13.73	0.009	0.343	0.0041	0.0051	<0.0022	0.2132	0.1271	1.8142	1.8305	2.486	9.710	34.5	0.266	0.123	0.072	1.3
GLAD-108-F-2018	03/27/18	42.29	0.042	2.101	0.0317	0.0117	0.0033	1.7640	0.3338	3.8980	4.1246	5.127	14.31	56.8	0.948	2.133	0.097	3.0
GLAD-201-R-2018	03/27/18	59.73	0.017	8.202	0.0032	0.0044	0.0080	7.9903	0.2035	0.6376	0.6846	12.300	97.97	295.3	0.139	0.145	0.042	0.8
HUNT-101-F-2018	03/13/18	20.54	<0.004	0.671	0.0039	0.0030	<0.0022	0.5622	0.1065	1.1760	1.1691*	3.590	8.480	36.0	0.357	0.100	0.026	0.9
HUNT-102-R-2018	03/13/18	15.83	<0.004	0.437	<0.0031	<0.0026	<0.0022	0.3857	0.0487	0.9203	0.9769	2.541	5.871	25.1	0.273	0.801	0.035	0.9
HUNT-301-R-2018	03/13/18	14.57	0.006	0.456	<0.0031	0.0031	<0.0022	0.3574	0.0960	1.1865	1.1983	2.640	7.682	30.1	0.262	0.623	0.097	1.4
ISRA-105-R-2018	03/28/18	2.74	0.009	1.877	<0.0031	0.0072	<0.0022	1.8383	0.0363	0.7855	0.8359	2.691	3.774	20.5	0.569	1.673	0.333	3.1
ISRA-348-F-2018	03/28/18	34.28	0.023	2.551	0.0037	0.0052	0.0085	2.2502	0.2924	2.3770	2.4105	7.421	35.13	118.3	0.748	<0.078	0.069	2.8
ISRA-348-F-2018-QC	03/28/18	34.00	0.015	2.540	0.0036	0.0056	0.0087	2.2528	0.2785	2.3180	2.4357	6.880	32.75	110.1	0.749	0.125	0.074	3.3
LCCS-102-R-2018	04/18/18	80.69	0.046	3.314	0.0237	0.0070	0.0049	3.1267	0.1819	1.7960	1.9230	5.077	34.88	108.0	1.012	0.676	0.131	4.3
LCCS-120-F-2018	04/18/18	53.59	0.041	2.761	0.0182	0.0082	0.0044	2.4594	0.2972	3.1095	3.1161	4.958	27.20	88.3	1.037	0.291	0.149	7.6
LCCS-217-F-2018	04/18/18	38.04	0.065	4.046	0.0349	0.0166	0.0074	3.8970	0.1416	2.7225	2.649*	4.630	24.10	79.2	1.110	0.699	0.215	7.8
LINL-102-R-2018	03/29/18	169.41	0.012	2.039	0.0044	0.0091	0.0041	1.8954	0.1390	1.1833	1.1846	13.260	46.52	170.8	0.730	0.114	0.016	0.9
LINL-150-F-2018	04/05/18	151.26	0.010	2.129	<0.0031	0.0045	0.0041	2.0355	0.0891	0.7398	0.7647	15.090	49.57	185.9	0.455	<0.078	0.009	1.4
LINU-103-R-2018	04/03/18	81.14	0.011	6.056	<0.0031	0.0078	0.0047	5.3174	0.7338	0.5793	0.6038	8.735	15.64	75.0	0.304	0.999	0.040	1.4
LINU-104-R-2018	04/05/18	39.01	0.010	3.982	<0.0031	0.0054	0.0041	3.9415	0.0365	0.6859	0.7136	6.110	12.11	55.4	0.178	1.060	0.051	1.5
LINU-149-F-2018	04/23/18	32.13	0.039	2.890	0.0170	0.0078	0.0038	2.6952	0.1914	2.3338	2.3171*	5.557	60.26	173.4	0.725	0.125	0.081	6.8
LIPI-101-R-2018	03/28/18	30.09	0.019	4.692	<0.0031	0.0074	0.0174	4.5462	0.1286	1.5865	1.6231	17.870	63.82	232.9	0.776	<0.078	0.049	3.9
LIPI-153-F-2018	03/28/18	43.52	0.015	4.779	0.0056	0.0087	0.0080	4.6130	0.1580	1.8555	1.8695	17.740	50.85	200.0	0.458	<0.078	0.019	1.5
MIDD-101-F-2018	04/23/18	12.89	0.029	1.408	0.0060	0.0052	0.0033	1.2132	0.1914	1.1312	1.0541*	4.477	15.87	58.1	0.586	0.215	0.064	3.0
MIDD-104-R-2018	03/13/18	2.20	0.006	0.814	<0.0031	0.0038	<0.0022	0.6225	0.1892	2.5550	2.5815	3.120	5.080	25.5	0.768	0.403	0.071	3.5
MIDD-301-R-2018	04/05/18	26.68	0.007	1.480	0.0039	0.0049	<0.0022	1.3184	0.1590	1.9396	1.9581	5.690	12.85	55.5	0.544	<0.078	0.029	1.7
MODS-101-F-2018	04/04/18	12.53	0.015	5.613	0.0042	0.0164	0.0115	5.2284	0.3731	0.6454	0.6676	7.910	85.15	245.2	0.133	<0.078	0.102	3.4
MODS-163-F-2018	04/18/18	17.96	0.064	7.086	0.0064	0.0164	0.0072	7.1242	-0.0455	0.7928	0.8682	5.015	86.16	235.8	0.435	1.537	0.712	15.2
OWEN-102-R-2018	03/15/18	16.91	0.068	2.625	0.0477	0.0089	0.0037	2.3608	0.2605	3.3572	3.4403	3.817	16.43	56.7	0.866	0.266	0.190	13.2
OWEN-127-F-2018	03/15/18	22.12	0.030	3.835	0.0247	0.0048	0.0037	3.6847	0.1464	2.8170	2.8572	5.791	27.56	92.7	0.850	<0.078	0.034	2.5
OWEN-302-R-2018	03/15/18	22.80	0.005	1.189	<0.0031	0.0036	<0.0022	1.0360	0.1508	1.1140	1.1400	4.280	14.24	53.2	0.293	<0.078	0.017	0.8
POTD-102-R-2018	04/04/18	36.46	0.015	0.170	0.0045	0.0566	<0.0022	0.0378	0.1302	2.3743	2.3733*	9.956	18.30	86.7	0.391	0.443	0.199	3.6
POTD-133-F-2018	04/18/18	18.07	0.034	1.129	0.0085	0.0074	0.0025	0.8985	0.2281	4.1976	4.2612	2.747	11.61	40.3	0.786	2.460	0.331	4.0
TOMS-101-R-2018	03/13/18	161.04	<0.004	2.056	0.0036	<0.0026	<0.0022	1.9530	0.1012	0.5346	0.517*	24.810	48.57	223.4	0.316	<0.078	0.017	0.6
TOMS-102-R-2018	03/15/18	2.61	<0.004	0.310	<0.0031	<0.0026	<0.0022	0.2178	0.0895	1.6752	1.6858	1.229	1.849	9.7	0.599	7.306	0.147	0.5
TOMS-247-F-2018	03/15/18	24.72	0.047	4.696	0.0290	0.0085	0.0069	4.3611	0.3279	3.7922	3.8559	10.010	33.73	125.4	1.382	0.577	0.075	5.6
TOMS-BDG-B-2018	03/15/18	0.04	<0.004	<0.022	<0.0031	<0.0026	<0.0022	<0.0041	0.0157	0.1326	0.1116*	<0.067	<0.02	<0.78	<0.008	<0.078	<0.006	<0.1
TUSC-251-F-2018	03/29/18	44.05	0.007	2.099	0.0040	0.0043	<0.0022	2.0193	0.0770	1.7427	1.8346	5.026	15.46	59.3	0.316	0.817	0.036	0.6
TUSC-301-R-2018	04/03/18	28.19	0.019	1.201	0.0057	0.0058	0.0040	1.0313	0.1652	2.3090	2.3291	7.460	32.13	110.9	0.596	0.297	0.078	2.6

Project Name: Frederick County Stream Survey - 2018
Project Number: 171701239.13
Prepared by: SSLD Checked by: SKB
Prepared date: 10/2/2018 Checked date: 10/3/2018

***In-Situ* Water Quality Summary Data**

Site	Temp (°C)	pH	DO (mg/L)	Specific Cond (uS/cm)	Turbidity (NTU)
BALL-103-R-2018	4.4	7.78	12.15	**1972.0**	5.4
BALL-116-F-2018	8.0	7.73	12.35	**547.5**	0.8
BALL-201-R-2018	9.7	8.07	13.27	**478.9**	2.0
BENN-103-R-2018	9.4	7.96	9.39	**316.7**	1.4
BENN-219-F-2018	10.3	7.78	11.39	178.5	1.8
BUSL-147-F-2018	14.3	7.81	11.48	**557.8**	2.0
BUSL-160-F-2018	9.1	7.91	12.84	**379.6**	2.5
BUSL-330-F-2018	15.6	**9.07**	17.74	**409.7**	2.7
BUSU-202-R-2018	7.5	**8.66**	16.64	**524.1**	1.3
BUSU-221-F-2018	11.6	**9.17**	14.78	**507.8**	1.4
CARR-105-R-2018	8.2	7.99	12.82	**352.9**	0.9
CARR-201-R-2018	6.2	7.92	13.93	**745.5**	1.2
CARR-216-F-2018	9.6	8.17	13.47	**727.0**	1.2
CATO-101-R-2018	15.7	7.93	13.13	**304.8**	3.9
CATO-417-F-2018	11.9	7.77	14.20	**248.4**	8.6
FISH-102-R-2018	5.7	8.43	16.15	**374.0**	3.4
FISH-201-R-2018	4.8	7.40	12.85	40.5	0.9
FISH-222-F-2018	4.8	7.53	13.62	118.6	1.8
GLAD-108-F-2018	5.6	7.87	12.56	244.7	3.9
GLAD-201-R-2018	11.9	7.98	14.61	**649.8**	1.9
HUNT-101-F-2018	3.5	7.50	13.22	134.8	1.3
HUNT-102-R-2018	4.6	7.63	12.79	106.3	1.9
HUNT-301-R-2018	6.8	7.94	13.64	112.0	2.0
ISRA-105-R-2018	6.9	7.87	12.28	64.3	3.0
ISRA-348-F-2018	6.4	8.24	16.08	**319.9**	3.4
LCCS-102-R-2018	8.4	7.56	13.66	**449.7**	6.1
LCCS-120-F-2018	9.7	7.59	13.04	**363.4**	6.9
LCCS-217-F-2018	6.4	7.48	14.01	**297.0**	
LINL-102-R-2018	10.9	8.12	11.94	**746.0**	1.8
LINL-150-F-2018	8.4	8.06	13.97	**880.0**	
LINU-103-R-2018	9.5	7.58	12.48	**383.4**	2.0
LINU-104-R-2018	10.9	7.96	12.27	242.2	1.8
LINU-149-F-2018	12.9	7.75	11.31	**340.7**	
LIPI-101-R-2018	7.3	7.85	11.14	**456.4**	4.3
LIPI-153-F-2018	7.2	7.79	12.88	**431.9**	1.8
MIDD-101-F-2018	10.2	7.82	14.28	180.3	3.8
MIDD-104-R-2018	1.2	7.68	13.05	70.3	3.9
MIDD-301-R-2018	4.6	7.64	13.33	203.1	1.7
MODS-101-F-2018	11.1	7.68	10.75	**463.9**	3.6
MODS-163-F-2018	14.3	8.23	11.30	**510.3**	20.3
OWEN-102-R-2018	6.3	7.69	12.99	179.3	13.4
OWEN-127-F-2018	3.3	7.67	15.13	245.9	2.9
OWEN-302-R-2018	3.4	8.00	14.71	173.7	1.3
POTD-102-R-2018	8.6	7.63	9.82	**293.1**	3.9
POTD-133-F-2018	6.0	7.60	14.27	161.6	5.0
TOMS-101-R-2018	2.5	7.81	13.79	**611.3**	1.9
TOMS-102-R-2018	6.0	7.00	11.82	43.4	0.9
TOMS-247-F-2018	1.0	7.58	13.91	**344.6**	6.1
TUSC-251-F-2018	7.1	7.74	12.11	246.6	1.0
TUSC-301-R-2018	8.2	7.53	11.81	**298.4**	

Bold values indicate water quality standards or criteria exceedance

Repeat Sites Water Quality Comparison

Site ID	Date Collected	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)	Orthophosphate (mg/L)	Total Ammonia Nitrogen (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	Total Kjehldal Nitrogen - calculated (mg/L)	Dissolved Organic Carbon (mg/L)	Turbidity (NTU)
BALL-116	04/03/18	0.007	2.939	<0.0031	0.0084	0.0034	2.8881	0.0471	0.8595	0.4
BALL-116	03/19/14	0.008	3.399	0.0043	0.0101	0.0044	3.2143	0.1805	1.3506	0.0
BENN-219	04/04/18	0.012	1.761	<0.0031	0.0059	0.0036	1.6747	0.0831	1.0266	1.5
BENN-219	04/01/14	0.018	1.883	0.0051	0.0061	0.0039	1.6988	0.1798	1.5270	8.0
BUSL-147	04/18/18	0.016	3.008	0.0082	0.0085	0.0047	2.9350	0.0678	0.9591	2.0
BUSL-147	03/24/16	0.019	3.158	0.0070	0.0061	0.0042	3.1351	0.0187	0.6077	3.0
BUSL-160	04/03/18	0.011	2.486	0.0036	0.0051	0.0032	2.3716	0.1107	1.3607	3.1
BUSL-160	04/18/11	0.018	3.509	0.0068	0.0059	0.0021	3.2244	0.2825	2.1072	2.0
BUSL-330	04/23/18	0.018	2.536	0.0033	0.0055	0.0095	2.3511	0.1753	1.2871	2.0
BUSL-330	04/27/09	0.068	2.271	0.0344	0.0406	0.0288	1.9954	0.2466	1.5663	5.0
BUSU-221	03/29/18	0.022	2.847	0.0087	0.0085	0.0182	2.7019	0.1264	1.0691	1.2
BUSU-221	04/01/14	0.030	3.004	0.0147	0.0073	0.0101	2.8240	0.1700	1.0931	7.0
CARR-216	03/29/18	0.008	1.645	0.0043	0.0048	0.0039	1.5924	0.0487	0.8907	0.9
CARR-216	03/19/14	0.008	2.143	0.0037	0.0051	0.0070	1.9594	0.1761	1.2334	0.0
CATO-417	04/23/18	0.042	2.037	0.0204	0.0190	0.0061	1.8503	0.1807	1.6310	4.8
CATO-417	03/27/14	0.015	1.745	0.0064	0.0034	0.0081	1.5399	0.1969	1.6062	1.0
FISH-222	03/27/18	0.009	0.343	0.0041	0.0051	<0.0022	0.2132	0.1271	1.8142	1.3
FISH-222	04/29/09	0.019	0.252	0.0011	0.0093	0.0019	0.1064	0.1436	1.4644	4.0
GLAD-108	03/27/18	0.042	2.101	0.0317	0.0117	0.0033	1.7640	0.3338	3.8980	3.0
GLAD-108	03/20/08	0.293	10.040	0.2380	0.0207	0.0171	7.2005	2.8226	5.7597	18.0
HUNT-101	03/13/18	<0.004	0.671	0.0039	0.0030	<0.0022	0.5622	0.1065	1.1760	0.9
HUNT-101	04/03/13	0.008	0.523	0.0029	0.0038	0.0010	0.4815	0.0407	0.9739	1.0
ISRA-348	03/28/18	0.023	2.551	0.0037	0.0052	0.0085	2.2502	0.2924	2.3770	2.8
ISRA-348	04/14/16	0.017	2.399	0.0043	0.0094	0.0139	2.1784	0.2066	1.6088	4.0
LCCS-120	04/18/18	0.041	2.761	0.0182	0.0082	0.0044	2.4594	0.2972	3.1095	7.6
LCCS-120	03/27/14	0.039	1.836	0.0084	0.0099	0.0035	1.6136	0.2190	2.1912	6.0
LCCS-217	04/18/18	0.065	4.046	0.0349	0.0166	0.0074	3.8970	0.1416	2.7225	7.8
LCCS-217	03/27/14	0.021	3.616	0.0058	0.0043	0.0174	3.3590	0.2398	2.0178	2.0
LINL-150	04/05/18	0.010	2.129	<0.0031	0.0045	0.0041	2.0355	0.0891	0.7398	1.4
LINL-150	03/21/16	0.018	2.373	0.0030	0.0074	0.0040	2.2614	0.1078	1.0242	7.0
LINU-149	04/23/18	0.039	2.890	0.0170	0.0078	0.0038	2.6952	0.1914	2.3338	6.8
LINU-149	03/21/16	0.026	3.536	0.0127	0.0065	0.0040	3.4839	0.0482	1.9617	4.0
LIPI-153	03/28/18	0.015	4.779	0.0056	0.0087	0.0080	4.6130	0.1580	1.8555	1.5
LIPI-153	04/19/11	0.036	4.037	0.0265	0.0432	0.0094	3.6086	0.4191	2.2178	3.0
MIDD-101	04/23/18	0.029	1.408	0.0060	0.0052	0.0033	1.2132	0.1914	1.1312	3.0
MIDD-101	03/25/08	0.032	1.404	0.0248	0.0111	0.0051	1.1284	0.2707	1.3005	3.0
MODS-101	04/04/18	0.015	5.613	0.0042	0.0164	0.0115	5.2284	0.3731	0.6454	3.4
MODS-101	04/04/13	0.015	5.183	0.0043	0.0144	0.0116	5.0284	0.1431	1.4049	8.0
MODS-163	04/18/18	0.064	7.086	0.0064	0.0164	0.0072	7.1242	-0.0455	0.7928	15.2
MODS-163	04/26/11	0.019	8.229	0.0033	0.0164	0.0070	7.7106	0.5116	1.0110	29.0
OWEN-127	03/15/18	0.030	3.835	0.0247	0.0048	0.0037	3.6847	0.1464	2.8170	2.5
OWEN-127	03/18/14	0.045	2.304	0.0309	0.0054	0.0053	1.9605	0.3385	2.9409	7.0
POTD-133	04/18/18	0.034	1.129	0.0085	0.0074	0.0025	0.8985	0.2281	4.1976	4.0
POTD-133	04/29/09	0.050	1.000	0.0070	0.0136	0.0046	0.7194	0.2757	2.3124	21.0
TOMS-247	03/15/18	0.047	4.696	0.0290	0.0085	0.0069	4.3611	0.3279	3.7922	5.6
TOMS-247	04/05/16	0.034	0.672	0.0088	0.0102	0.0057	0.1946	0.4720	5.5059	2.0
TUSC-251	03/29/18	0.007	2.099	0.0040	0.0043	<0.0022	2.0193	0.0770	1.7427	0.6
TUSC-251	03/30/16	0.007	1.853	0.0030	0.0052	0.0040	1.7482	0.1012	1.3398	1.0

Appendix E: Land Use and Imperviousness

			Land Use													
Site	Total Acreage	Impervious Surface	High Density Residential	Medium Density Residential	Low Density Residential	Commer-cial	Industrial	Institutional	Transporta-tion	Other Developed Lands	Agriculture	Barren Land	Very Low Density Residential	Forest	Water	Grand Total
BALL-103-R-2018	300	62%	0.0%	0.0%	0.0%	93.8%	3.0%	0.0%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
BALL-116-F-2018	254	11%	1.2%	7.0%	41.7%	2.5%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	20.7%	24.0%	0.0%	100%
BALL-201-R-2018	3,696	7%	0.1%	2.0%	24.4%	4.0%	0.0%	0.9%	0.9%	0.1%	39.6%	0.0%	7.8%	20.2%	0.0%	100%
BENN-103-R-2018	659	5%	0.0%	0.0%	15.0%	0.0%	0.0%	0.0%	0.0%	27.1%	37.3%	0.0%	2.9%	17.4%	0.4%	100%
BENN-219-F-2018	2,584	4%	0.0%	0.0%	6.8%	0.1%	0.0%	0.0%	0.0%	0.0%	37.0%	0.0%	17.7%	38.3%	0.2%	100%
BUSL-147-F-2018	30	21%	0.0%	0.0%	9.8%	0.0%	0.0%	0.0%	24.4%	0.1%	65.6%	0.0%	0.0%	0.0%	0.0%	100%
BUSL-160-F-2018	176	6%	0.0%	0.4%	31.6%	0.0%	0.0%	0.0%	0.0%	0.0%	28.2%	0.0%	21.3%	18.5%	0.0%	100%
BUSL-330-F-2018	12,159	9%	0.3%	2.3%	28.6%	1.8%	0.6%	0.5%	1.4%	1.8%	30.5%	0.1%	7.2%	24.9%	0.1%	100%
BUSU-202-R-2018	4,197	10%	0.7%	3.3%	23.9%	1.7%	1.9%	0.8%	2.6%	0.3%	23.1%	0.2%	7.0%	34.5%	0.0%	100%
BUSU-221-F-2018	4,996	9%	0.6%	3.0%	29.5%	1.4%	1.6%	0.7%	2.2%	0.2%	22.1%	0.2%	7.7%	30.8%	0.0%	100%
CARR-105-R-2018	304	7%	0.0%	1.6%	37.3%	2.0%	0.0%	0.3%	0.0%	0.0%	24.9%	0.0%	12.8%	21.0%	0.0%	100%
CARR-201-R-2018	2,811	24%	10.8%	13.6%	14.9%	14.5%	0.1%	1.3%	2.5%	3.2%	6.4%	0.0%	7.3%	25.3%	0.0%	100%
CARR-216-F-2018	2,400	20%	6.6%	12.8%	17.2%	11.4%	0.2%	1.4%	2.9%	2.9%	7.5%	0.0%	8.5%	28.4%	0.0%	100%
CAT0-101-R-2018	426	5%	0.0%	0.0%	15.8%	0.0%	0.0%	0.0%	0.0%	0.0%	43.0%	0.0%	1.2%	40.0%	0.0%	100%
CATO-417-F-2018	55,708	4%	0.1%	1.9%	10.9%	0.6%	0.0%	0.5%	0.4%	1.1%	41.5%	0.0%	11.6%	31.3%	0.0%	100%
FISH-102-R-2018	1,240	5%	0.0%	6.3%	10.4%	0.0%	0.0%	0.0%	0.0%	0.0%	72.1%	0.0%	7.9%	3.2%	0.0%	100%
FISH-201-R-2018	6,200	1%	0.0%	0.1%	1.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	93.1%	0.3%	100%
FISH-222-F-2018	9,071	2%	0.0%	0.7%	6.0%	0.6%	0.0%	0.7%	0.4%	0.0%	11.2%	0.0%	7.6%	72.7%	0.2%	100%
GLAD-108-F-2018	189	3%	0.0%	0.0%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	67.6%	0.0%	4.6%	24.4%	0.0%	100%
GLAD-201-R-2018	4,754	8%	0.9%	8.9%	5.8%	0.8%	1.1%	3.3%	0.0%	7.7%	67.8%	0.6%	1.4%	1.6%	0.1%	100%
HUNT-101-F-2018	1,200	2%	0.0%	0.0%	7.6%	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	0.0%	15.5%	71.0%	0.1%	100%
HUNT-102-R-2018	1,528	2%	0.0%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	4.6%	0.0%	12.2%	77.2%	0.1%	100%
HUNT-301-R-2018	6,910	2%	0.0%	0.2%	3.4%	0.1%	0.0%	0.0%	0.5%	0.0%	11.4%	0.0%	6.3%	78.1%	0.0%	100%
ISRA-105-R-2018	53	2%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	56.5%	0.0%	1.0%	40.4%	0.0%	100%
ISRA-348-F-2018	18,726	5%	0.2%	2.2%	8.1%	0.5%	0.3%	0.4%	0.0%	4.3%	54.2%	0.0%	5.9%	24.0%	0.1%	100%
LCCS-102-R-2018	576	5%	0.1%	0.4%	15.3%	0.6%	0.0%	0.7%	3.3%	0.0%	60.3%	0.0%	9.6%	9.1%	0.6%	100%
LCCS-120-F-2018	169	3%	0.0%	0.2%	5.0%	1.2%	0.0%	0.0%	1.7%	0.0%	65.1%	0.0%	3.3%	23.5%	0.0%	100%
LCCS-217-F-2018	5,419	4%	0.2%	1.9%	8.4%	0.5%	0.0%	0.2%	0.8%	0.1%	63.2%	0.0%	2.4%	21.9%	0.3%	100%
LINL-102R-2018	284	22%	15.7%	46.9%	26.9%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	9.7%	0.3%	100%
LINL-150-F-2018	384	24%	24.9%	42.1%	19.9%	2.2%	0.0%	0.5%	0.3%	0.0%	0.0%	0.0%	0.0%	10.0%	0.2%	100%
LINU-103-R-2018	496	16%	0.1%	20.5%	19.5%	0.1%	0.0%	0.7%	0.0%	0.0%	48.0%	0.0%	6.2%	4.8%	0.2%	100%
LINU-104-R-2018	413	18%	0.0%	1.6%	48.9%	0.0%	0.0%	0.0%	0.0%	0.0%	31.9%	6.1%	9.2%	1.3%	0.9%	100%
LINU-149-F-2018	48	2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.3%	0.0%	0.0%	22.7%	0.0%	100%
LIPI-101-R-2018	459	4%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	95.5%	0.0%	0.0%	2.8%	0.0%	100%
LIPI-153-F-2018	571	3%	0.0%	0.0%	5.8%	0.0%	0.0%	0.3%	0.0%	0.0%	79.3%	0.0%	6.7%	7.9%	0.0%	100%
MIDD-101-F-2018	362	1%	0.0%	0.0%	9.2%	0.0%	0.0%	0.0%	0.0%	0.0%	68.9%	0.0%	2.5%	19.4%	0.0%	100%
MIDD-104-R-2018	132	2%	0.0%	0.0%	9.3%	0.0%	0.0%	0.0%	0.0%	0.0%	20.6%	0.0%	7.9%	62.2%	0.0%	100%
MIDD-301-R-2018	16,591	3%	0.0%	0.1%	9.1%	0.1%	0.0%	0.2%	0.0%	0.1%	30.9%	0.0%	12.4%	47.2%	0.1%	100%
MODS-101-F-2018	429	4%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	98.0%	0.0%	0.0%	0.8%	0.0%	100%
MODS-163-F-2018	572	3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	94.9%	0.0%	0.0%	3.9%	0.0%	100%
OWEN-102-R-2018	221	2%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	79.8%	0.0%	6.4%	12.8%	0.0%	100%
OWEN-127-F-2018	738	2%	0.0%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	0.0%	80.9%	0.0%	2.2%	14.3%	0.1%	100%
OWEN-302-R-2018	16,155	3%	0.2%	0.8%	3.7%	0.5%	0.4%	0.5%	0.3%	0.2%	24.6%	0.0%	7.9%	60.7%	0.1%	100%
POTD-102-R-2018	243	2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.9%	0.0%	0.0%	88.1%	0.0%	100%
POTD-133-F-2018	180	4%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	13.0%	0.0%	10.3%	68.9%	0.0%	100%
TOMS-101-R-2018	67	27%	0.0%	6.9%	62.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.2%	24.0%	0.0%	100%
TOMS-102-R-2018	104	1%	0.0%	0.0%	10.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.6%	80.7%	0.0%	100%
TOMS-247-F-2018	3,700	2%	0.0%	0.1%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	72.7%	0.0%	5.0%	18.5%	0.2%	100%
TUSC-251-F-2018	2,087	6%	0.0%	1.2%	35.7%	0.0%	0.0%	0.6%	0.0%	0.0%	10.5%	0.0%	12.9%	39.1%	0.0%	100%
TUSC-301-R-2018	965	4%	0.0%	0.7%	8.0%	0.0%	0.0%	0.2%	0.0%	0.0%	38.2%	0.0%	21.1%	31.7%	0.0%	100%

Ballenger Creek – 3 sites

The Ballenger Creek subwatershed is 14,852 acres, located in the central portion of Frederick County and encompasses portions of the City of Frederick. This subwatershed is 47 percent urban land use, 36 percent agriculture, 16 percent forest and 1 percent open. Of the 47 percent urban, 13 percent is considered low density residential and 11 percent is considered commercial land use. The land use of BALL-103-R-2018's 300 acre drainage area is 100 percent urban with 94 percent of that being commercial land cover. This drainage area has 62 percent impervious surface coverage. The dominant land use for BALL-116-F-2018's 254 acre drainage area is 55 percent urban and 39 percent forest. Low density residential land cover is the majority of urban land use totaling 42 percent. Eleven percent of this drainage area is covered by impervious surfaces. BALL-201-R-2018, with a drainage area of 3,696 acres, has a slightly different land use distribution compared to the other sites in Ballenger Creek, with 42 percent agriculture, 32 percent urban and 26 percent forest. The dominant urban land cover type was low density residential at 24 percent. Impervious surfaces covered 7 percent of the drainage area.

Bennett Creek – 2 sites

The Bennett Creek subwatershed is 31,064 acres and located in the southeastern portion of Frederick County bordering Montgomery County. This subwatershed's land use is 44 percent forest, 38 percent agriculture, 17 percent urban and 1 percent open space. Of the urban land use, the majority of the land cover is low density residential at 13 percent. BENN-103-R-2018 has a drainage of 659 acres and is comprised of mostly urban and agriculture land use at 42 and 39 percent respectively. Other developed land and low density residential were the two dominant urban land cover types at 27 and 15 percent respectively. This drainage area is covered by 5 percent impervious surfaces. BENN-219-F-2018 is located on the border of Frederick county and Montgomery county and because of this, a majority of the 2,584 acre drainage area is located in Montgomery county. The land use for this drainage area is 49 percent agriculture, 44 percent forest, and 7 percent urban. The dominant urban land cover type is low density residential at 7 percent. This drainage are is covered by 4 percent impervious surface.

Lower Bush Creek – 3 sites

The Lower Bush Creek subwatershed is 12,495 acres and located in the central eastern portion of the county. This subwatershed's land use is 42 percent agriculture, 35 percent forest, 22 percent urban and 2 percent open space. The dominant urban land cover type is low density residential at 10 percent. Site BUSL-147-F-2018 is located immediately adjacent to Interstate 270, and has a drainage area of 30 acres, of which 21 percent is impervious surface. Agriculture and urban are the only land use in this drainage are and consist of 66 and 34 percent, respectively. The main urban land cover type is considered transportation at 24 percent. BUSL-160-F-2018 has a drainage area of 176 acres and 6 percent of that is impervious surface. The land use of this drainage area is 48 percent agriculture, 32 percent urban and 20 percent forest. The dominant urban land cover type is low density residential at 32 percent and very low density residential at 21 percent. The third site in this subwatershed, BUSL-330-F-2018, has a drainage area of 12,159 acres and 9 percent of that is impervious surfaces. The land use breakdown for this drainage area is 37 percent urban, 37 percent forest, 27 percent agriculture and less than 1 percent open space. The most dominant urban land cover type is low density residential at 29 percent.

Upper Bush Creek – 2 sites

The Upper Bush Creek subwatershed is 8,842 acres and located in the eastern portion of the county, bordering both Carroll and Montgomery counties. Interstate I-70 runs through this subwatershed. The

land use consists of 43 percent urban, 29 percent agriculture, 28 percent forest and less than 1 percent open space. The main urban land cover type is low density residential at 36 percent. Site BUSU-202-R-2018 has a drainage area of 4,197 acres, of which 10 percent is impervious surfaces. Forest is the largest land use in this drainage area at 37 percent, while urban, agriculture and open space make up 35, 27 and less than 1 percent, respectively. The dominant urban land cover type is low density residential at 24 percent. The second site in this subwatershed, BUSU-221-F-2018, has a drainage area of 4,996 acres and 9 percent of that is impervious surfaces. The land use breakdown for this drainage area is 39 percent urban, 34 percent forest, 27 percent agriculture and less than 1 percent open space. The dominant urban land cover type is low density residential at 30 percent.

Carroll Creek – 3 sites

The Carroll Creek subwatershed is 14,852 acres and located in the center of Frederick County and contains a large portion of the city of Frederick. The land use of this subwatershed consists of 65 percent urban, 21 percent agriculture, 13 percent forest and less than 1 percent open space. The dominant urban land cover types are medium density residential, commercial, and institutional at 15, 13 and 12 percent, respectively. Site CARR-105-R-2018 has a drainage area of 304 acres, of which 7 percent is impervious surface. Urban land use dominates the drainage area at 41 percent, while agriculture and forest make up the rest at 30 and 29 percent, respectively. The dominant urban land cover type is low density residential at 37 percent. CARR-201-R-2018 has a drainage area of 2,811 acres and 24 percent is impervious surfaces. The land use of the drainage area is 61 percent urban, 30 percent forest and 9 percent agriculture. The dominant urban land cover types are low density residential (15%), commercial (14%), medium density residential (14%) and high density residential (11%). The third site in this subwatershed, CARR-216-F-2018, has a drainage area of 2,400 acres and 20 percent of that is impervious surfaces. The land use breakdown for this drainage area is 56 percent urban, 34 percent forest and 10 percent agriculture. The dominant urban land cover types are low and medium density residential areas at 17 and 13 percent, respectively.

Catoctin Creek – 2 sites

Catoctin Creek subwatershed is 58,541 acres and located in western Frederick County on the border with Washington County. Only four percent of the subwatershed is covered by impervious surfaces. The land cover breakdown is 56 percent agriculture, 27 percent forest, 17 percent urban and less than 1 percent open space. Low density residential is the largest urban land cover type at 11 percent. CATO-101-R-2018 has a drainage area of 426 acres with five percent impervious surface cover. This site has land use of 44 percent agriculture, 40 percent forest and 16 percent urban. The dominant urban land cover type is low density residential at 16 percent. Site CATO-417-F-2018 was the largest site sampled with a drainage area of 55,709 acres. The impervious cover totals 4 percent in this drainage area. The dominant land use is 46 percent agriculture, 38 percent forest and 16 percent urban. The major urban land cover type is low density residential at 11 percent.

Fishing Creek – 3 sites

Fishing Creek subwatershed is 15,853 acres and located in the upper central portion of Frederick County. A small portion (3%) of the subwatershed is covered by impervious surfaces. The land use is 52 percent forest, 39 percent agriculture, and 9 percent urban. The largest urban land cover type is low density residential at 7 percent. FISH-102-R-2018 has a drainage area of 1,240 acres with five percent

impervious surface cover. This site has land use of 77 percent agriculture, 17 percent urban and 6 percent forest. The dominant urban land cover type is low density residential at 10 percent. Site FISH-201-R-2018 has a drainage area of 6,200 acres with impervious surface coverage of only one percent. The land use is 98 percent forest and 2 percent urban. The highest urban land cover type is low density residential at 1 percent. The third site in this subwatershed, FISH-222-F-2018, has a drainage area of 9,071 acres and only two percent is covered by impervious surfaces. The land use is 79 percent forest, 13 percent agriculture and 8 percent urban. The largest urban land cover type is low density residential at 6 percent.

Glade Creek – 2 sites

Glade Creek subwatershed is 14,800 acres and located upper central portion of Frederick County. Five percent of this subwatershed is covered by impervious surfaces. The land use is 74 percent agriculture, 14 percent urban, 10 percent forest and 2 percent open space. The largest urban land cover type is low density residential at 6 percent. GLAD-108-F-2018 has a drainage area of 189 acres and 3 percent is covered by impervious surfaces. The land use is 72 percent agriculture, 24 percent forest and 3 percent urban. The largest urban land cover type is low density residential at 3 percent. Site GLAD-201-R-2018 has a drainage area of 4,754 acres of which 8 percent is covered by impervious surfaces. The land use is 69 percent agriculture, 28 percent urban, 2 percent forest and less than 1 percent open space. The largest urban land cover types are medium density residential and other developed lands at 9 and 8 percent respectively.

Hunting Creek – 3 sites

Hunting Creek subwatershed is 26,971 acres and located in the northern central portion of Frederick County. Four percent of this subwatershed is covered by impervious surfaces. The land use is 61 percent forest, 28 percent agriculture, and 11 percent urban. The largest urban land cover type is low density residential at 5 percent. HUNT-101-F-2018 has a drainage area of 1,200 acres with two percent covered by impervious surfaces. The land use is 86 percent forest, 8 percent urban and 6 percent agriculture. The largest urban land cover type is low density residential at 8 percent. Site HUNT-102-R-2018 has a drainage area of 1,528 acres and 2 percent is covered by impervious surfaces. The land use is 89 percent forest, 6 percent urban and 5 percent agriculture. The largest urban land cover type is low density residential at 6 percent. The third site in this subwatershed, HUNT-301-R-2018, has a drainage area of 6,910 acres and 2 percent is covered by impervious surfaces. The land cover is 84 percent forest, 12 percent agriculture and 4 percent urban. The largest urban land cover type is low density residential at 3 percent.

Israel Creek – 2 sites

Israel Creek subwatershed is 24,694 acres and located in the central northeast portion of Frederick County. Five percent of the subwatershed is covered by impervious surfaces. The land use is 58 percent agriculture, 25 percent forest, 17 percent urban and <1 percent open space. The largest urban land cover type is low density residential at 8 percent. ISRA-105-R-2018 has a drainage area of 53 acres and 2 percent is covered by impervious surfaces. The land use is primarily agriculture at 57 percent, forest at 40 percent and urban at 2 percent. The largest urban land cover type is low density residential at 2 percent. Site ISRA-348-F-2018 has a drainage area of 18,726 acres of which 5 percent is impervious

surface. The land use is 58 percent agriculture, 26 percent forest and 16 percent urban. The largest urban land cover type is low density residential at 8 percent.

Little Catoctin Creek South -3 sites

Little Catoctin Creek South subwatershed is 11,149 acres and located in the southwestern corner of Frederick County on the border of Washington County and the Potomac River. Six percent of the subwatershed is covered by impervious surfaces. The land use is 46 percent agriculture, 27 percent forest, 20 percent urban and 7 percent open space. The largest urban land cover type is low density residential at 7 percent. LCCS-102-R-2018 has a drainage area of 576 acres and 5 percent impervious surface cover. The land use is 69 percent agriculture, 20 percent urban, 10 percent forest and 1 percent open space. The largest urban land cover type is low density residential at 15 percent. Site LCCS-120-F-2018 has a drainage area of 169 acres, of which 3 percent is impervious surface. The land use is 68 percent agriculture, 24 percent forest and 8 percent urban. The greatest amount of urban land cover comes from low density residential at 5 percent. The third site in this subwatershed, LCCS-217-F-2018, has a drainage area of 5,419 acres and 4 percent is covered by impervious surfaces. The land use is 65 percent agriculture, 23 percent forest and 12 percent urban. The largest urban land cover type is low density residential at 8 percent.

Lower Linganore Creek – 2 sites

Lower Linganore Creek subwatershed is 24,135 acres and located towards the eastern portion of Frederick County. Seven percent of the subwatershed is covered by impervious surfaces. The overall land use is 40 percent agriculture, 32 percent forest, 26 percent urban and 1 percent open space. The largest urban land cover type is low and medium density residential at 14 and 7 percent respectively. LINL-102-R-2018 has a drainage area of 284 acres and 22 percent impervious cover. The land use is 90 percent urban and 10 percent forest. The largest urban land cover types are medium, low and high density residential at 47, 27 and 16 percent, respectively. Site LINL-150-F-2018 has a drainage area of 384, of which 24 percent is impervious surface. The land use is 90 percent urban and 10 percent forest. The major urban land cover types are medium, high and low density residential at 42, 25 and 20 percent, respectively.

Upper Linganore Creek – 3 sites

Upper Linganore Creek subwatershed is 28,950 acres and is located on the eastern border of Frederick County with Carroll County. This subwatershed is covered by a total of 4 percent impervious surfaces. LINU-103-R-2018 has a drainage area of 496 acres and is covered by 16 percent impervious surfaces. The land use is 54 percent agriculture, 41 percent urban and 5 percent forest. The primary urban land cover types are medium and low density residential, both at 20 percent. Site LINU-104-R-2018 has a drainage area of 413 acres, of which 18 percent is covered by impervious surfaces. The land use consists of 51 percent urban, 41 percent agriculture, 7 percent open space and 1 percent forests. The main urban land cover type is low density residential at 49 percent. The third site of this subwatershed, LINU-149-F-2018, has the second smallest drainage area of 48 acres, with 2 percent impervious surface coverage. The land use is 77 percent agriculture and 23 percent forest. There is no urban land cover in this drainage area.

Little Pipe Creek – 2 sites

Little Pipe Creek subwatershed is 17,503 acres and is located on the northeastern border of Frederick County with Carroll County. This subwatershed is covered by a total of 3 percent impervious surfaces. The land use consist of 81 percent agriculture, 12 percent forest and 7 percent urban. The largest urban land cover type is low density residential at 5 percent. LIPI-101-R-2018 has a drainage area of 459 acres and consists of 4 percent impervious surface coverage. The land use is 95 percent agriculture, 3 percent forest and 2 percent urban. The main urban land cover type is low density residential at 2 percent. Site LIPI-153-F-2018 has a drainage area of 571 acres, of which 3 percent is covered by impervious surface. The land use is 86 percent agriculture, 8 percent forest and 6 percent urban. The primary urban land cover type is low density residential at 6 percent.

Middle Creek – 3 sites

Middle Creek subwatershed is 21,534 acres and is located on the northwestern border of Frederick County with Washington County. This subwatershed is covered by a total of 3 percent impervious surfaces. The land use consists of 54 percent forest, 36 percent agriculture and 9 percent urban. The main urban land cover type is low density residential at 8 percent. MIDD-101-F-2018 has a drainage area of 362 acres and a 1 percent impervious surface coverage. The land use is 70 percent agriculture, 21 percent forest and 9 percent urban. The main urban land cover type is low density residential at 9 percent. Site MIDD-104-R-2018 has a drainage area of 132 acres and is covered by 2 percent impervious surfaces. The land use consists of 70 percent forest, 21 percent agriculture and 9 percent urban. The major urban land cover type is low density residential at 9 percent. The third site of this subwatershed, MIDD-301-R-2018, has the third largest drainage area of 16,591 acres and an impervious surface coverage of 3 percent. The land use consists of 56 percent forest, 34 percent agriculture and 9 percent urban. The main urban land cover type is low density residential at 9 percent.

Monocacy Direct Southwest – 2 sites

Monocacy Direct Southwest subwatershed is 9,967 acres and is located in the southern portion of Frederick County. This subwatershed is covered by a total of 6 percent impervious surfaces. The land use consists of 68 percent agriculture, 16 percent urban, 15 percent forest and 1 percent open space. The major urban land cover types are other developed land at 6 percent and low density residential at 4 percent. MODS-101-F-2018 has a drainage area of 429 acres and 4 percent impervious surface coverage. The land use is 98 percent agriculture, 1 percent urban and 1 percent forest. The largest urban land cover type is low density residential at 1 percent. Site MODS-163-F-2018 has a drainage area of 572 acres and 3 percent impervious surfaces. The land use is 95 percent agriculture, 4 percent forest and 1 percent urban. The urban land cover type is other developed lands at 1 percent.

Owens Creek – 3 sites

Owens Creek subwatershed is 29,903 acres and is located in the northern portion of Frederick County. This subwatershed has a total of 3 percent impervious surface coverage. The land use is 48 percent agriculture, 45 percent forest and 7 percent urban.The largest urban land cover type is low density residential, at 5 percent. OWEN-102-R-2018 has a drainage area of 221 acres with a percent impervious surfaces at 2 percent. Land use is 86 percent agriculture, 13 percent forest and 1 percent urban. The main urban land cover type is low density residential at 1 percent. Site OWEN-127-F-2018 has a drainage area of 738 acres and an impervious surface coverage of 2 percent. Land use is 83 percent

agriculture, 14 percent forest and 2 percent urban. The largest urban land cover type is low density residential at 2 percent. The third site in this subwatershed, OWEN-302-R-2018, has a drainage area of 16,155 acres with an impervious surface coverage of 3 percent. Land use is 66 percent forest, 28 percent agriculture and 7 percent urban. The largest urban land cover type is low density residential at 4 percent.

Potomac Direct – 2 sites

Potomac Direct subwatershed is 18,585 acres and is located along the southern border of Frederick County, which follows the Potomac River. This subwatershed has 4 percent impervious surface coverage. The land use is 56 percent agriculture, 26 percent forest, 13 percent urban and 4 percent open space. The major urban land cover types are low density residential and commercial at 5 and 3 percent, respectively. POTD-102-R-2018 has a drainage area of 243 acres and an impervious surface coverage of 2 percent. The land use consists of 88 percent forest and 12 percent agriculture. There is no urban land use in this drainage area. Site POTD-133-F-2018 has a drainage area of 180 acres with an impervious surface coverage of 4 percent. The land use is 69 percent forest, 23 percent agriculture and 8 percent urban. The major urban land cover type is low density residential at 8 percent.

Toms Creek – 3 sites

Toms Creek subwatershed is 30,435 acres and is located at the northern border of Frederick County with Carroll County, Washington County and Pennsylvania. This subwatershed has an impervious surface coverage of 3 percent. The land use consists of 54 percent agriculture, 37 percent forest and 9 percent urban. The largest urban land cover type is low density residential at 5 percent. TOMS-101-R-2018 has a drainage area of 67 acres with a percent impervious surfaces of 27 percent, the highest impervious cover of all site drainage areas sampled in 2018. The land use is 69 percent urban and 31 percent forest. The main urban land cover types are low and medium density residential at 62 and 7 percent, respectively. Site TOMS-102-R-2018 has a drainage area of 104 acres, of which 1 percent is impervious surfaces. The land use is 89 percent forest and 11 percent urban. The largest urban land cover type is low density residential at 11 percent. The third site in this subwatershed, TOMS-247-F-2018, has a drainage area of 3,700 acres with an impervious surface coverage of 2 percent. The land use consists of 77 percent agriculture, 19 percent forest and 4 percent urban. The largest urban land cover type is low density residential at 4 percent.

Tuscarora Creek – 2 sites

Tuscarora Creek subwatershed is 11,643 acres and is located in the central portion of Frederick County. This subwatershed has an impervious surface coverage of 9 percent. The land use consists of 45 percent forest, 28 percent urban and 28 percent agriculture. The largest urban land cover type is low and medium density residential at 14 and 9 percent, respectively. TUSC-251-F-2018 has a drainage area of 2,087 acres with an impervious surface coverage of 6 percent. The land use is 48 percent forest, 38 percent urban and 14 percent agriculture. The largest urban land cover type is low density residential at 36 percent. Site TUSC-301-R-2018 has a drainage area of 965 acres of which 4 percent is impervious surfaces. The land use is 48 percent agriculture, 43 percent forest and 9 percent urban. The major urban land cover type is low density residential at 8 percent.