CCR Environmental, Inc.

Natural Resource Consultants

2018 MONITORING REPORT

LONG-TERM HABITAT AND BIOLOGICAL MONITORING

CITY OF SANDY SPRINGS, FULTON COUNTY, GEORGIA

Prepared for:

City of Sandy Springs
Stormwater Services
7840 Roswell Road, Bldg 500
Sandy Springs, GA 30350

February 2019

3772 Pleasantdale Road, Suite 150
Atlanta, GA 30340
ccr@ccrenvironmental.com

TABLE OF CONTENTS

1.0 INTRODUCTION……...1

2.0 STUDY AREA DESCRIPTION…… 1
2.1 Study Sites……... 1

3.0 METHODOLOGY……. 1
3.1 Physical Habitat Assessment……... 2
3.2 Benthic Macroinvertebrate Community Assessment……...3

4.0 RESULTS……... 4
4.1 Physical Habitat Assessment……... 4
4.2 Benthic Macroinvertebrate Community Assessment……...4

5.0 DISCUSSION……5
5.1 Physical Habitat Assessment……... 5
5.2 Benthic Macroinvertebrate Community Assessment……...5
5.3 Comparison of Previous Study Data with Current Study Data……6

6.0 SUMMARY……6

7.0 LITERATURE CITED……... 8

FIGURES

TABLES

APPENDICES

1.0 INTRODUCTION

Biological integrity was evaluated at three monitoring locations in and around the City of Sandy Springs, Georgia by examining habitat and macroinvertebrate communities. This monitoring effort is part of the long-term (watershed) monitoring requirement that the City is performing to comply with the Metropolitan North Georgia Water Planning District district-wide Watershed Monitoring Plan (MNGWPD-WMP). Under the MNGWPD-WMP, biological monitoring is conducted every other year, and this monitoring was initiated in 2009/2010.

2.0 STUDY AREA DESCRIPTION

The study area is located in northwestern Georgia in Sandy Springs, which is just north of the City of Atlanta, in Fulton County. The monitoring stations were located within the Southern Inner Piedmont Sub-Ecoregion (45a) in the Piedmont Ecoregion (Griffith *et al.*, 2001).

2.1 Study Sites

Three monitoring stations were selected to evaluate biological integrity (Figure 1). These sites were selected to represent watershed inputs (*e.g.*, NPDES discharges) into the study streams and effects of land use in the drainage area. Site locations and designations were as follows:

CK-1: Ball Mill Creek at Spalding Drive;
LI-2: Long Island Creek at Northside Drive;
MA-1: Marsh Creek at Brandon Mill Road.

In order to sample within the limits of the City of Sandy Springs, the Ball Mill Creek monitoring site has been moved downstream relative to previous monitoring efforts from the Dunwoody Club Drive crossing (BM-1) to the Spalding Drive crossing. This site has now been designated CK-1. All of the sites are located in the Chattahoochee River basin. Applicable reference site data were provided by the Georgia Department of Natural Resources (GDNR) and generally have been incorporated into the macroinvertebrate assessment scoring criteria.

3.0 METHODOLOGY

Biological monitoring of study sites was conducted under methods outlined in the GDNR's *Macroinvertebrate Biological Assessment of Wadeable Streams in Georgia – Standard Operating Procedures (SOP)* (2007), which was modified after EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish* (Barbour *et al*., 1999) and *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish* (Plafkin *et al*., 1989). The primary components of the biological monitoring plan included physical habitat assessments and benthic macroinvertebrate sampling.

Prior to biological surveys, water quality was assessed using a YSI Pro Plus multi-parameter

meter via in situ measurements of the following parameters: water temperature, pH, dissolved oxygen (DO), DO percent saturation (DO%), specific conductance, and salinity. Turbidity was measured using a LaMotte 2020*we* Turbidimeter.

The benthic macroinvertebrate community assessments were conducted at all study sites in November of 2018. Sampling occurred within a 100-meter reach at each monitoring station. Benthic macroinvertebrates were generally collected via dip netting, and techniques followed methods outlined in the GDNR's SOP (GDNR, 2007). Macroinvertebrate samples were preserved and analyzed in the laboratory. Physical habitat assessments and pebble counts also were performed in November of 2018. Physical habitat assessments, pebble counts, and *in situ* water quality parameter measurements were used to supplement the macroinvertebrate data.

3.1 Physical Habitat Assessment

Habitat assessments were conducted at all monitoring stations in accordance with the GDNR Environmental Protection Division's (EPD) protocol using the Habitat Assessment Field Data Sheet (High Gradient Streams). The data sheets require visual evaluation of physical habitat parameters, including substrate, sedimentation, channel morphology and flow, bank stability and vegetation, and riparian zone condition. The Data Sheet has ten Habitat Parameters (HP's), and each HP has a scoring range of 0-20 or 0-10. Each HP is divided into four Condition Categories (*i.e.*, optimal, suboptimal, marginal, and poor), and each category has a range of scoring values.

The Data Sheets were completed by two trained assessors, and an average of the two scores was calculated to produce a total habitat assessment score. The total habitat score was used to derive an ecological condition rating as follows: optimal (166-200) - meets natural expectations; suboptimal (113-153) - less than desirable but satisfies expectations in most areas; marginal (60-100) - moderate levels of degradation with severe degradation at frequent intervals in area; poor (0-44) - substantially altered with severe degradation. Each condition rating equates to the sums of each Condition Category (Table 1).

Assessing habitat allows the quality of the structure of the surrounding habitat that influences water quality and condition of the aquatic biota to be evaluated. This assessment may aid in identifying non-water quality affiliated factors of biological impairment, if present. In addition to the Habitat Assessment Field Data Sheets, the following data sheets also were completed at each site: Physical Characterization/Water Quality Field Sheets, Water Chemistry Field Sheets, Benthic Macroinvertebrate Field Data Sheets, and Velocity/Discharge Field Sheets.

A Pebble Count Field Sheet also was completed at each site as part of the habitat assessment. Substrate within a stream is an integral component to examine when determining stream structure and function. As part of the habitat assessment, therefore, a pebble count was also conducted at each study site. Pebble counts consist of selecting a random location within the designated survey reach by pacing off seven feet, and picking up the first pebble touched (without looking) by the toe of the assessor's foot. The pebble or particle was then assigned to a size class defined by a modified Wentworth size class (Table 2; Bevenger and King, 1995). The pebble count was performed by traversing the stream against the current until 100 particle measurements were obtained. Data were analyzed, and a percent contribution and cumulative

distribution (%) was determined using Excel® spreadsheets created by the U.S. Forest Service for analyzing pebble count data (Bunte and Abt, 2001).

Finally, cross-section profiles were completed at each monitoring site by establishing a transect. Each transect was established in a representative section of the survey reach (usually near the 50 meter mark), and the transect location was marked with paint and/or flagging (*i.e.,* bench marks) at each site. Transects consisted of positioning 4-foot pieces of rebar (head and tail pins) on each side of the river/stream just beyond the top of the bank. The rebar was driven into the ground, and a measuring tape (tag line) was tightly strung between the posts to measure horizontal distances across the transect. A leveling rod was used to measure depths (elevations) below the tape/headpin at select locations across the tag line, as well as to measure water depths. Each cross-section location was photographed, and the profile was plotted for visual presentation. Additionally, velocity readings were taken using a Rickly USGS Price AA current meter and digitizer at measured intervals along the transect.

3.2 Benthic Macroinvertebrate Community Assessment

As previously discussed, the benthic macroinvertebrate community was assessed in accordance with EPD's SOP (GDNR, 2007). Standardized semi-quantitative sampling for macroinvertebrates was conducted at each site for a variety of habitat types, including riffles, undercut banks/roots, woody debris, sand, and leaf packs/coarse particulate organic matter (CPOM). Sampling generally consisted of collecting 20 jabs or kicks (+3, depending on presence of macrophytes) within the survey reach. Jabs and kicks cover a linear distance of approximately one meter. In riffle/run habitats, the following number of jabs/kicks is collected (if present): 6 in riffle habitat (split between faster and slower currents), 5 in woody debris, 3 in undercut banks/roots, 3 in leaf packs/CPOM, and 3 in the sandy areas. If a habitat type is absent or not sufficient to supply the full compliment of jabs/kicks, these are allocated evenly between the other habitat types.

"D" frame dip nets with a 500-micron mesh were used for all sampling. All samples were composited into a single container at each site and preserved in formalin solution for preservation and transport to the laboratory. Analysis and data evaluation were conducted in the laboratory on a sub-sample of 200 individuals (± 20%). Macroinvertebrates were taxonomically identified and enumerated.

The GDNR is updating all the macroinvertebrate metric calculation guidelines (Appendix A). In 2007, new metrics were developed by the GDNR for the Southern Inner Piedmont Sub-Ecoregion (45a). A total of six metrics were selected for assessing this sub-ecoregion: 1) Plecoptera Taxa, 2) % Trichoptera, 3) % Chironomus Cricotopus/TC, 4) Tolerant Taxa, 5) % Scraper, and 6) Clinger Taxa. The GDNR provided a spreadsheet for calculating index scores for each site, and these scores correspond to numeric rankings, narrative descriptions, and stream health ratings (Table 3). The numeric rankings are used by the GDNR to make management decisions related to stream monitoring (Table 4). *The GEPD currently is re-evaluating these numeric rankings, narrative descriptions, and stream health ratings; however, the previous ranking, descriptions, and ratings were provided to allow for some assessment of macroinvertebrate community health.*

4.0 RESULTS

Habitat assessments (including pebble counts) and benthic macroinvertebrate collections at monitoring sites were performed on November 20, 2018. The fall was wet, and study streams appeared to be at or just above base flow at the time of the habitat and benthic macroinvertebrate community assessments (NOAA, 2018).

Photographs of the monitoring stations are presented in Appendix B. Monitoring sites were located on small to medium-sized streams. Stream widths ranged from approximately 4 to 38 feet, and depths ranged from about 1 inch to 3.5 feet. Erosion and sedimentation were problematic at all of the sites; however, there was a significant amount of stable substrate types present at the sites. Most study streams were incised, and bank stability was generally moderate to poor. The study reaches were open to heavily shaded (approximately 10% to 85%). Land use surrounding the sites was generally a mixture of residential and forested areas, but the watersheds were in an urban setting.

The *in situ* water quality parameters measured at all monitoring stations generally were within state standards and acceptable levels for protection of aquatic biota (USEPA, 1986; GDNR, 2018). Water temperature ranged from 11.6 to 12.5 degrees Celsius (º C); DO ranged from 8.67 to 8.97 milligrams per liter (mg/L); DO% ranged from 83.2 to 84.5; pH ranged from 6.93 to 7.05 standard units (s.u.); specific conductance ranged from 113 to 169 microsiemens per centimeter (µS/cm); turbidity ranged from 5.6 to 7.5 nephelometric turbidity units (NTU); and salinity ranged from 0.05 to 0.08 parts per thousand (ppt). Water quality measurements from all sites are presented in Table 5.

4.1 Physical Habitat Assessment

A copy of all field data sheets are found in Appendix C, and the results of the GDNR/EPD habitat assessments are presented in Table 6. Sites LI-2 and MA-1 scored in the “suboptimal” condition category, while CK-1 scored in the “marginal to suboptimal” category.

Pebble count data and results are presented in Table 7. The sites had moderate amounts of sand and silt (9% to 26%), but the most abundant single substrate type at the study sites was gravel (29% to 49%). Sites CK-1 and MA-1 also had considerable amounts (39% and 62%, respectively) of cobble, boulder, and bedrock.

Channel cross-section profile plots for the monitoring sites are presented in Appendix D. Excessive rip-rap and rock outcropping along the banks at MA-1 prevented the establishment of a transect and channel cross-section at this site.

4.2 Benthic Macroinvertebrate Community Assessment

The raw benthic macroinvertebrate data are found in Appendix E, and the macroinvertebrate multi-metric calculation spreadsheets for each site are presented in Appendix F. Multi-metric index scores were fairly similar among sites (40 – 48), and a summary of the spreadsheets is presented in Table 8. Site LI-2 scored in the “fair” narrative description rating range with a

stream health rating of "B", while CK-1 and MA-1 scored in the "poor" narrative description rating range with stream health ratings of "C". It should be noted that LI-2 and MA-1 had less than the full sub-sample of 200 individuals (± 20%), *i.e.*, 81 and 68 individuals, respectively.

5.0 DISCUSSION

As previously mentioned, *in situ* water quality measurements were within state standards and at acceptable levels for protection of aquatic biota. All of the sites had normal water temperatures, normal/typical DO levels, and near neutral pH levels. Turbidity levels at the study sites were very low, despite fairly extensive erosion and sedimentation in the streams. Studies in the Piedmont and Blue Ridge sections of Georgia have shown a strong correlation between TSS and turbidity levels and their negative impacts of fish communities (Meyers *et al.*, 1999; Walters *et al.*, 2001). Significant impacts to fish communities in these studies were shown at base flow turbidity levels of 10 NTU. Prior to the cited studies, a Georgia Board of Regent's Scientific Panel had recommended a 25 NTU in-stream limit for the protection of aquatic communities in streams with a "fishing" classification (Kundell and Rasmussen, 1995). All of the sites had turbidity levels below 10 NTU.

The only *in situ* water quality measurements that were somewhat elevated were the specific conductance levels, *i.e.*, 113 – 169 µS/cm, indicating probable pollutants' presence in the study streams. Wenner *et al.* (2003) found that elevated specific conductance levels were good indicators of pollution in Piedmont streams in Georgia and that minimally impacted streams in this area had specific conductance values around 50 µS/cm. These levels, however, are common in urban/suburban settings such as the study area.

5.1 Physical Habitat Assessment

Habitat conditions at the sites were moderately degraded and fairly similar between sites. Habitat assessment scores at LI-2 and MA-1 were near the bottom of the "suboptimal" condition category range, while CK-1 scored in the "marginal to suboptimal" condition category.

The primary causes of habitat degradation observed during the study were bank erosion and sedimentation and impacts to the riparian zone (*i.e.*, presence of residential lawns adjacent to the streams in the survey reaches). These impacts were reflected in somewhat reduced scoring values for HPs #2 (Embeddedness), #4 (Sediment Deposition), #7 (Frequency of Riffles), #8 (Bank Stability), #9 (Bank Vegetative Protection), and #10 (Riparian Vegetative Zone). Sediment in waterways has a variety of detrimental effects on aquatic biota, including smothering fish eggs and benthic macroinvertebrates, clogging fish gills, reducing feeding and growth, and reducing photosynthetic activity (Kerr, 1995; Kundell and Rasmussen, 1995; Waters, 1995).

5.2 Benthic Macroinvertebrate Community Assessment

Benthic macroinvertebrate community conditions also were moderately degraded at the monitoring locations. The degraded macroinvertebrate community conditions generally reflected

the (degraded) habitat conditions. Sites CK-1 and MA-1 had multi-metric index scores in the upper end of the "poor" narrative description range, while LI-2 scored near the lower end of the "fair" range.

5.3 Comparison of Previous Study Data with Current Study Data

In order to evaluate long-term trends at these sites, it is critical to compare the previously collected data with the current data. This monitoring effort was the fifth one performed by CCR Environmental, Inc. (CCR, 2009, 2012, 2014, and 2016). It also should be noted again that the Ball Mill Creek sampling location was moved downstream in 2016 in order for sampling to occur within the limits of the City of Sandy Springs.

Tables 9 – 10 provide habitat and macroinvertebrate monitoring data from 2010 through 2018. Linear regressions of these data are presented in Appendix G for trend determination. Regression lines with positive slopes indicate that parameter levels are increasing, which means conditions are improving. Negative-sloped regression lines indicate declining levels and deteriorating conditions. If the slope line value was less than 0.01, then the trend was considered flat with unchanging conditions. Linear regressions were not generated for CK-1, since 2016 was the first year of data collection in the site's new location.

Habitat assessment scores have varied only slightly over the years, and condition ratings have remained the same at each site between studies (Table 9). Habitat assessment scores are trending upward slightly at LI-2 and MA-1.

The benthic macroinvertebrate community assessment multi-metric index scores at LI-2 and MA-1 have varied considerably over years, which resulted in narrative descriptions/condition ratings fluctuating between "fair" and "poor" (Table 10). Scores at CK-1 were nearly identical in 2016 and 2018 were in the "poor" rating range. Multi-metric index scores are trending slightly downward over time at LI-2 and MA-1, although the 2018 score at LI-2 was the highest to date.

Table 11 provides a summary of the trend analyses for LI-2 and MA-1. Habitat conditions are improving slightly at both sites, *i.e.,* scoring trending upward. Conversely, macroinvertebrate community conditions are trending slightly downward at both sites.

6.0 SUMMARY

An assessment of habitat conditions/quality and macroinvertebrate communities was conducted to assess conditions of biotic integrity at three monitoring stations located in and around the City of Sandy Springs in Fulton County, Georgia. All sites were located in the Southern Inner Piedmont Sub-Ecoregion (45a) and within the Chattahoochee River basin. This study was conducted using the protocols and methods outlined by GDNR (2007).

A summary of habitat and macroinvertebrate community assessments for the 2018 study is presented in Table 12. Habitat conditions were moderately degraded at all of the study sites with

habitat assessment scores in the lower end of the “suboptimal” condition rating range to the middle of the “marginal to suboptimal” rating range. Bank erosion and sedimentation and impacts to the riparian zone were the primary causes of habitat degradation observed during the study. Benthic macroinvertebrate community conditions at the study sites reflected the habitat conditions and were moderately degraded. Multi-metric index scores were in the lower “fair” to upper “poor” narrative description ranges.

In order to evaluate long-term trends at the study sites, linear regressions of the monitoring data previously collected by CCR since 2009/10 were performed. The regressions were only performed for data from LI-2 and MA-2, since CK-1 was relocated in 2016, *i.e.*, too few data. At LI-2 and MA-1, habitat assessment scores are trending slightly upward over time; whereas, benthic macroinvertebrate assessment scores at these sites are trending slightly downward over time.

7.0 LITERATURE CITED

Barbour, M.T., J. Gerritsen, B.D. Snyder, J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. EPA 841-B-99-002. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

Bevenger, G. S., and R. M. King. 1995. A pebble count procedure for assessing watershed cumulative effects. Research Paper RM-RP-319. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Bunte, K., and S.R. Abt. 2001. Sampling surface and subsurface particle-size distributions in wadable gravel- and cobble-bed streams for analyses in sediment transport, hydraulics, and stream-bed monitoring: U.S. Department of Agriculture Forest Service Rocky Mountain Research Station General Technical Report RMRS-GTR-74.

CCR Environmental, Inc. (CCR). 2009. Biological Monitoring Report, City of Sandy Springs. Prepared for City of Sandy Springs, Sandy Springs, GA.

CCR. 2012. 2012 Biological Monitoring Report, City of Sandy Springs. Prepared for City of Sandy Springs, Sandy Springs, GA.

CCR. 2014. 2014 Biological Monitoring Report, City of Sandy Springs. Prepared for City of Sandy Springs, Sandy Springs, GA.

CCR. 2016. 2016 Biological Monitoring Report, City of Sandy Springs. Prepared for City of Sandy Springs, Sandy Springs, GA.

Georgia Department of Natural Resources (GDNR). 2007. Standard Operating Procedures: Macroinvertebrate Biological Assessment of Wadeable Streams in Georgia. Georgia Department of Natural Resources, Georgia Environmental Protection Division, Water Protection Branch. Atlanta, GA.

GDNR. 2018. Georgia Rules and Regulations for Water Quality Control, Chapter 391-3-6.03-Water Use Classifications and Water Quality Standards (revised October 2, 2015). Environmental Protection Division, Water Protection Branch, Atlanta, GA.

Griffith, G.R., J.M. Omernik, T. Foster, and J.A. Comstock. 2001. Ecoregions of Georgia. USEPA, National Health and Environmental Effects Research Laboratory, Corvallis, OR.

Kerr, S.J. 1995. Silt, Turbidity and Suspended Sediments in the Aquatic Environment: an Annotated Bibliography and Literature Review. Ontario Ministry of Natural Resources, Southern Region Science & Technology Transfer Unit Technical Report TR-008, Ontario, Canada.

Kundell, J.E., and T.C. Rasmussen. 1995. Erosion and Sedimentation: Scientific and Regulatory

Issues. Georgia Board of Regents; Scientific Panel, University of Georgia, Athens, GA.

Meyers, J.L., A.B. Sutherland, K.H. Barnes, D.M. Walters, and B.J. Freeman. 1999. A scientific basis for erosion and sedimentation standards in the Blue Ridge physiographic province, pages 321-324 *in* K.J. Hatcher, ed. Proceedings of the 1999 Georgia Water Resources Conference. The Institute of Ecology, University of Georgia, Athens, GA.

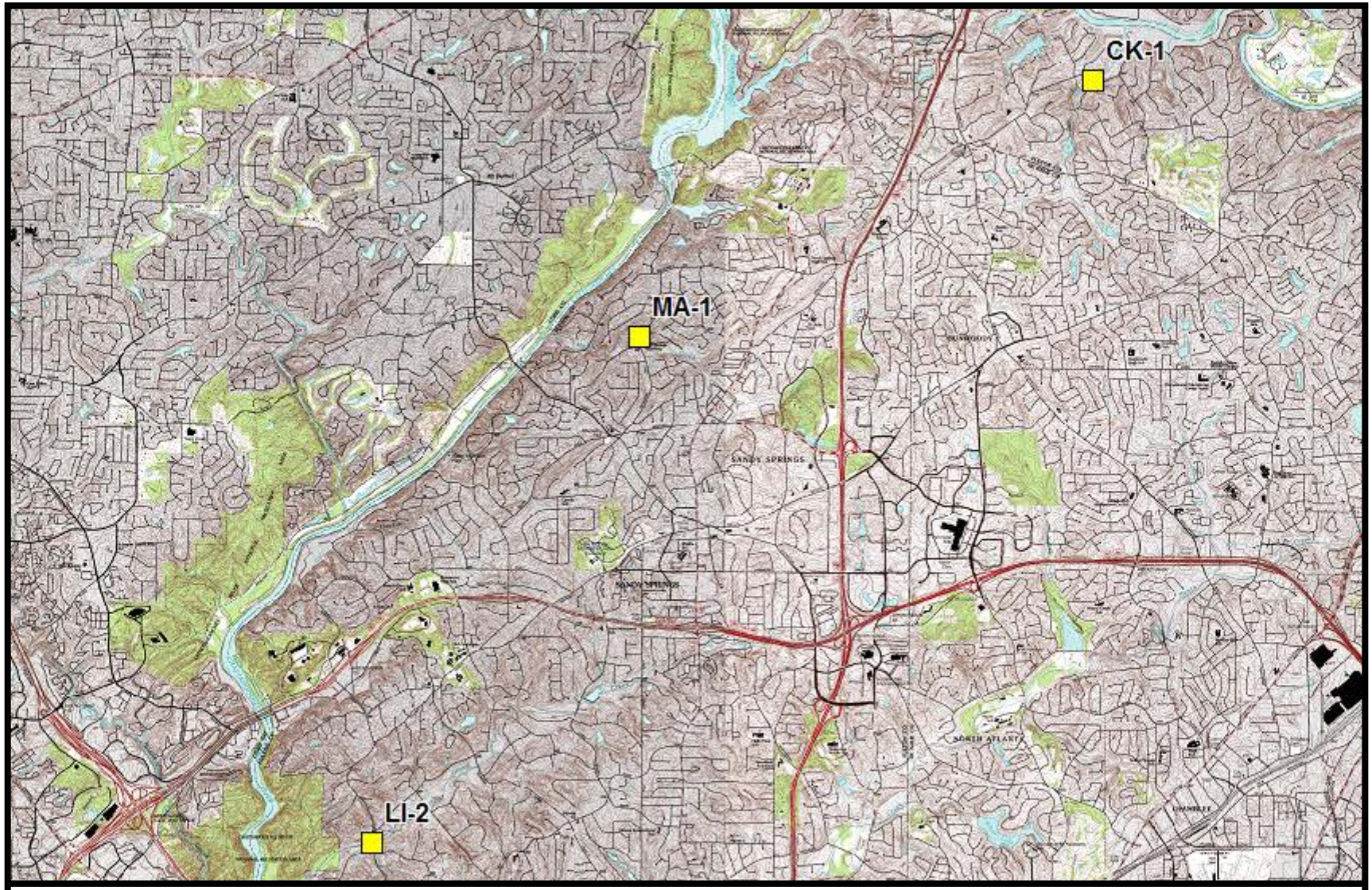
NOAA (National Oceanic and Atmospheric Administration). 2018. Rainfall Scorecard – Atlanta. National Weather Service Weather Forecast Office, Peachtree City, GA. http://www.srh.noaa.gov/ffc/?n=rainfall_scorecard

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, and R.M. Hughes. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. EPA/444/4-89-001. U.S. EPA, Assessment and Watershed Protection Division, Washington, D.C.

USEPA (United States Environmental Protection Agency). 1986. Quality Criteria for Water. EPA 440/5-86-001. Office of Water, Regulations and Standards, Washington, DC.

Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society Monograph 7, Bethesda, MD.

Wenner, D.B., M. Ruhlman, and S. Eggert. 2003. The importance of specific conductivity for assessing environmentally impaired streams, pages 531-537 *in* K.J. Hatcher, ed. Proceedings of the 2003 Georgia Water Resources Conference. The Institute of Ecology, University of Georgia, Athens, GA.



Source: Sandy Springs and Chamblee, GA, USGS 7.5 minute series topographic quadrangles.

NORTH

0 3000 6000 12000 Feet

Key

Study Site

2/19/19

Figure 1. 2018 Monitoring Locations
Long-term Habitat and Biological Monitoring
City of Sandy Springs, Fulton County, Georgia

CCR ENVIRONMENTAL, INC.
NATURAL RESOURCE CONSULTANTS

TABLE 1. HABITAT ASSESSMENT SCORING

CONDITION CATEGORIES	SCORING VALUE RANGES
Optimal	200 – 166
Suboptimal	153 – 113
Marginal	100 – 60
Poor	44 – 0

TABLE 2. MODIFIED WENTWORTH PARTICLE SIZE CLASSES USED TO DETERMINE PEBBLE COUNT SIZE DISTRIBUTION

Size Class	Size Range (mm)
Silt/Clay	<0.062
Sand	
Very Fine	0.062-0.125
Fine	0.125-0.25
Medium	0.25-0.50
Coarse	0.50-1.0
Very Coarse	1-2
Gravel	
Very Fine	2-4
Fine	4-8
Medium	8-16
Coarse	16-32
Very Coarse	32-64
Cobble	
Small	64-128
Large	128-256
Boulder	
Small	256-512
Medium	512-1024
Large - Very Large	1024-4096
Bedrock	>4096

TABLE 3. MULTI-METRIC INDEX SCORING RANGES AND CORRESPONDING NUMERIC RANKINGS, NARRATIVE DESCRIPTIONS, AND STREAM HEALTH RATINGS FOR SOUTHERN INNER PIEDMONT (45a) SUB-ECOREGION

Index Score	Numeric Ranking	Narrative Description	Stream Health Rating
≥75	1	Very Good	A
71-74	2	Good	A
43-70	3	Fair	B
19-42	4	Poor	C
≤18	5	Very Poor	C

TABLE 4. GDNR GUIDELINES FOR STREAM MONITORING

Numeric Ranking	Management Decision
1	Continue periodic monitoring to detect change baseline reference condition
2	Continue periodic monitoring to detect change baseline reference condition
3	Frequent monitoring critical to detect change in ecological status, lower range especially
4	Frequent monitoring necessary to determine remediation needs and if remediation has been successful
5	Frequent monitoring necessary to determine remediation needs and if remediation has been successful

TABLE 5. SUMMARY OF *IN SITU* WATER QUALITY DATA

Site	Temp (ºC)	pH (s.u.)	DO (mg/L)	DO (%)	Sp. Cond. (µS/cm)	Salinity (PPT)	Turbidity (NTU)
CK-1	11.6	6.93	8.97	84.5	121	0.06	6.5
LI-2	12.5	7.05	8.67	83.2	169	0.08	7.5
MA-1	12.4	6.95	8.68	83.3	113	0.05	5.6

TABLE 6. SUMMARY OF HABITAT ASSESSMENT SCORES

Habitat Parameter	**CK-1**	**LI-2**	**MA-1**
#1 – Epifaunal Substrate/Instream Cover	12.5	13.5	13
#2 – Embeddedness	8.5	11	11
#3 – Velocity/Depth Combinations	15	16	15
#4 – Sediment Deposition	7.5	10	10
#5 – Channel Flow Status	14	13.5	14.5
#6 – Channel Alteration	15	15.5	14.5
#7 – Frequency of Riffles	6.5	9	15.5
#8 – Bank Stability	7.5	11	14.5
#9 – Bank Vegetative Protection	8.5	10	7.5
#10 – Riparian Vegetative Zone	10	8.5	9
Total Average Score	105	118	124.5
Condition Category	Marginal to Suboptimal	Suboptimal	Suboptimal

TABLE 7. SUMMARY OF PEBBLE COUNT DATA

Size Class	*Size Range (mm)*	**CK-1**		**LI-2**		**MA-1**	
		Total	*% Cumm.*	*Total*	*% Cumm.*	*Total*	*% Cumm.*
Silt/Clay	<0.062		0		0		0
Sand							
Very Fine	0.062-0.125		0		0		0
Fine	0.125-0.25		0		0		0
Medium	0.25-0.50	4	4	3	3	5	5
Coarse	0.50-1.0	11	15	15	18	3	8
Very Coarse	1-2	7	22	8	26	1	9
Gravel							
Very Fine	2-4	6	28	1	27	1	10
Fine	4-6	4	32		27	2	12
Fine	6-8	3	35	3	30		12
Medium	8-12	1	36	4	34	2	14
Medium	12-16	2	38	3	37	2	16
Coarse	16-24	3	41	10	47	3	19
Coarse	24-32	3	44	14	61	6	25
Very Coarse	32-48	5	49	6	67	4	29
Very Coarse	48-64	12	61	8	75	9	38
Cobble							
Small	64-96	19	80	6	81	7	45
Small	96-128	11	91	5	86	13	58
Large	128-192	6	97	2	88	9	67
Large	192-256	2	99	3	91	4	71
Boulder							
Small	256-384	1	100		91	5	76
Small	384-512		100		91	1	77
Medium	512-1024		100		91		77
Lg - Very Lg	1024-4096		100		91		77
Bedrock	>4096		100	9	100	23	100

TABLE 8. SUMMARY OF MACROINVERTEBRATE MULTI-METRIC INDEX SCORES

Site	Index Score	Numeric Ranking	Narrative Description	Stream Health Rating
CK-1	42	4	Poor	C
LI-2	48	3	Fair	B
MA-1	40	4	Poor	C

TABLE 9. COMPARISON OF HABITAT ASSESSMENT SCORES AND CONDITION CATEGORIES BETWEEN STUDIES

Site	Study	Habitat Score	Ecological Condition Category
CK-1	2018	105	Marginal to Suboptimal
	2016	105	Marginal to Suboptimal
LI-2	2018	118	Suboptimal
	2016	116	Suboptimal
	2014	114	Suboptimal
	2012	116	Suboptimal
	2010	117	Suboptimal
MA-1	2018	124.5	Suboptimal
	2016	121	Suboptimal
	2014	123	Suboptimal
	2012	124	Suboptimal
	2010	119	Suboptimal

TABLE 10. COMPARISON OF BENTHIC MACROINVERTEBRATE COMMUNITY SCORES AND NARRATIVE DESCRIPTIONS BETWEEN STUDIES

Site	Study	Multi-Metric Index Score	Narrative Description
CK-1	2018	42	Poor
	2016	41	Poor
LI-2	2018	48	Fair
	2016	30	Poor
	2014	40	Poor
	2012	46	Fair
	2010	43	Fair
MA-1	2018	40	Poor
	2016	46	Fair
	2014	38	Poor
	2012	56	Fair
	2010	36	Poor

TABLE 11. SUMMARY OF DATA TREND ANALYSES, 2010-16

Site	Habitat Assessment Scores	Macroinvertebrate Multi-Metric Index Scores
LI-2		
MA-1		

= Declining Conditions

= Improving Conditions

TABLE 12. SUMMARY OF HABITAT AND MACROINVERTEBRATE ASSESSMENTS

Site	Habitat Score/Condition Category	Multi-metric Index Score/ Narrative Description
CK-1	105/Marginal to Suboptimal	42/Poor
LI-2	118/Suboptimal	48/Fair
MA-1	124.5/Suboptimal	40/Poor

APPENDIX A

MACROINVERTEBRATE METRIC CALCULATION GUIDELINES

GADNR/EPD WATERSHED PROTECTION BRANCH
Macroinvertebrate Metric Calculation Guidelines

For the macroinvertebrate biotic indices, Georgia is divided into 23 subecoregions. The tidal sites are also separated into a category, thus giving the state of Georgia twenty-four discrete macroinvertebrate indices. Once you have determined which index to use based on the sample location in the state, an excel spreadsheet has been developed (or will be developed in the future) to calculate the index score which determines the stream ranking, narrative description, and stream health rating of each of the sampling locations.

To calculate the index, fill in the information on the metric calculation sheets (*i.e.* HBI, %Tolerant taxa, %Predator, EPT taxa, Simpson's Diversity Index) in the excel file for the subecoregion you are working. On the first metric work sheet, fill in the site name or identification number. A different excel file will need to be completed for each sample location. Fill in the numbers of individuals of a particular family, functional feeding group, habit, etc.; as well as taxa numbers, total number of individuals per site, tolerance values, etc. for each of the metric worksheets. There will be 5 to 8 metric worksheets per each index. Once the data has been filled in for each of the metric worksheets then the metrics will be standardized and all calculations will be tabulated. The results can be found in the ranking classification worksheet. Tolerance values, North Carolina tolerance values (for use with the NCBI metric), functional feeding groups, and habit can be found in the GA EPD Macroinvertebrate Taxa List. (Taxa list is formatted for legal size paper.)

GA EPD will continue to refine and calibrate the macroinvertebrate indices. As more data is collected and analyzed, the metrics will be adjusted.

Explanations of the metric equations are below:

When calculating the metrics, each taxa is counted even if it is possible they could be the same genus or species due to not being able to identify the organisms to a lower taxonomic level. This affects metrics that use taxa numbers. For example Perlodidae, *Isoperla sp.*, and *Isoperla clio* are counted as separate taxa.

Metric Calculations

Richness Metrics:

Ephemeroptera, Plecoptera, Trichoptera Taxa (EPT Taxa)

EPT Taxa = **#of Ephemer. taxa + #of Plecoptera taxa + #of Trichoptera taxa**

- The taxonomic level of Order is used to determine if an individual is considered to be Ephemeroptera taxa, Plecoptera taxa, & Trichoptera taxa or not Ephemeroptera taxa, Plecoptera taxa, & Trichoptera taxa.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List (**This list can be found on the EPD website www.gaepd.gov**).

Plecoptera Taxa

Plecoptera Taxa = **# of Plecoptera taxa**

- The taxonomic level of Order is used to determine if an individual is considered to be Plecoptera taxa or not Plecoptera taxa.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

Coleoptera Taxa

Coleoptera Taxa = **# of Coleoptera taxa**

(note – do not count adult and larvae as separate taxa)

- The taxonomic level of Order is used to determine if an individual is considered to be Coleoptera taxa or not Coleoptera taxa.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

Diptera Taxa

Diptera Taxa = **# of Diptera taxa**

- The taxonomic level of Order is used to determine if an individual is considered to be Diptera taxa or not Diptera taxa.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

Chironomidae Taxa

Chironomidae Taxa = **# of Chironomidae taxa**

- The taxonomic level of Family is used to determine if an individual is considered to be Chironomidae taxa or not Chironomidae taxa.
- The taxonomic level of Family can be found in the GA EPD Macroinvertebrate Taxa List.

Tanytarsini Taxa

Tanytarsini Taxa = **# of Tanytarsini taxa**

- The taxonomic level of Tribe is used to determine if an individual is considered to be Tanytarsini taxa or not Tanytarsini taxa. Tanytarsini is a tribe in the family of Chironomidae.
- The taxonomic level of Tribe can be found in the GA EPD Macroinvertebrate Taxa List.

Margalef's Index

$$Dm = \frac{(S-1)}{LN(N)}$$

Dm = Margalef's Index (Diversity)
S = Number of Species in a site
N = Total number of Individuals in a sample
LN = natural log

- Do not count larvae and adult for Coleoptera as separate species.
- Species represent any level of taxonomic identification.

Shannon-Wiener Index (base-e)

Shannon-Wiener (base-e) = $\mathbf{- \Sigma ((p_i) * LN(p_i))}$

- $p_i = n_i/N$ (relative abundance for each species)
- n_i = number of a species
- N = total number of all species
- LN = natural log (base e)

Simpson's Diversity Index:

$$D = \frac{\Sigma\, n(n-1)}{N(N-1)}$$

n = total number of organisms of a particular species (no matter what level of taxonomic identification)
N = total number of organisms of all species (total # of individuals in sample)

Composition Metrics:

% Ephemeroptera, Plecoptera, Trichoptera (%EPT)

$$\%\ EPT = 100 * \frac{\textbf{(\# of Ephemeroptera + \# of Plecoptera + \# of Trichoptera)}}{\textbf{Total Individuals in sample}}$$

- The taxonomic level of Order is used to determine if an individual is considered to be Ephemeroptera taxa, Plecoptera taxa, & Trichoptera taxa or not Ephemeroptera taxa, Plecoptera taxa, & Trichoptera taxa.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

% Amphipoda

%Amp = 100 * **[# Individual Amphipods / Total Individuals in sample]**

- The taxonomic level of Order is used to determine if an individual is considered to be Amphipoda or not Amphipoda.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

% Chironomidae

%Chir = **100 * [# Individual Chironomidaes / Total Individuals in sample]**

- The taxonomic level of Family is used to determine if an individual is considered to be Chironomidae or not Chironomidae.
- The taxonomic level of Family can be found in the GA EPD Macroinvertebrate Taxa List.

% Coleoptera

%Coleoptera = 100 * [# Individual Coleoptera / Total Individuals in sample]

- The taxonomic level of Order is used to determine if an individual is considered to be Coleoptera or not Coleoptera.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

% Diptera

%Diptera = **100 * [# Individual Diptera / Total Individuals in sample]**

- The taxonomic level of Order is used to determine if an individual is considered to be Diptera or not Diptera.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

% Gastropoda

% Gastropoda = **100 * [# Individual Gastropoda / Total Individuals in sample]**

- The taxonomic level of Class is used to determine if an individual is considered to be Gastropoda individual or not a Gastropoda individual.
- The taxonomic level of Class can be found in the GA EPD Macroinvertebrate Taxa List.

% Isopoda

% Isopoda = 100 * [# Individual Isopoda / Total Individuals in sample]

- The taxonomic level of Order is used to determine if an individual is considered to be Isopoda individual or not an Isopoda individual.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

% Non-Insect

%NonIns = **100 * [# Individual Non-Insect / Total Individuals in sample]**

- The taxonomic level of Class is used to determine if an individual is considered to be an Insect or Non-Insect.
- The taxonomic level of Class can be found in the GA EPD Macroinvertebrate Taxa List.

% Odonata

%Odonata = **100 * [# Individual Odonata / Total Individuals in sample]**

- The taxonomic level of Order is used to determine if an individual is considered to be Odonata or not Odonata.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

% Plecoptera

%Plec = 100 * [# Individual Plecoptera / Total Individuals in sample]

- The taxonomic level of Order is used to determine if an individual is considered to be Plecoptera or not Plecoptera.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

% Tanytarsini

%Tanytarsini = **100 * [# Individual Tanytarsini / Total Individuals in sample]**

- The taxonomic level of Tribe is used to determine if an individual is considered to be Tanytarsini or not Tanytarsini. Tanytarsini is a tribe in the family of Chironomidae.
- The taxonomic level of Tribe can be found in the GA EPD Macroinvertebrate Taxa List.

% Oligochaeta

%Oligo = **100 * [# Individual Oligochaeta / Total Individuals in sample]**

- The taxonomic level of Subclass is used to determine if an individual is considered to be Oligochaeta or not Oligochaeta.
- The taxonomic level of Subclass can be found in the GA EPD Macroinvertebrate Taxa List.

% Trichoptera

%Tri = **100 * [# Individual Trichoptera / Total Individuals in sample]**

- The taxonomic level of Order is used to determine if an individual is considered to be Trichoptera or not Trichoptera.
- The taxonomic level of Order can be found in the GA EPD Macroinvertebrate Taxa List.

% (Orthocladiinae / Total Chironomidae)

$$\%(\text{Ortho/TC}) = \mathbf{100} * \frac{\textbf{\# Individual Orthocladiinae}}{\textbf{Total Chironomidae in sample}}$$

- The taxonomic level of Subfamily is used to determine if an individual is considered to be Orthocladiinae or not Orthocladiinae.
- The taxonomic level of Family is used to determine if an individual is considered to be Chironomidae or not Chironomidae.
- The taxonomic level of Family and Subfamily can be found in the GA EPD Macroinvertebrate Taxa List.

% (Tanypodinae / Total Chironomidae)

$$\%(\text{Tany/TC}) = \mathbf{100} * \frac{\textbf{\# Individual Tanypodinae}}{\textbf{Total Chironomidae in sample}}$$

- The taxonomic level of Subfamily is used to determine if an individual is considered to be Tanypodinae or not Tanypodinae.
- The taxonomic level of Family is used to determine if an individual is considered to be Chironomidae or not Chironomidae.
- The taxonomic level of Family and Subfamily can be found in the GA EPD Macroinvertebrate Taxa List.

% (Hydropsychidae / Total Trichoptera)

$$\%(\text{Hydro/TT}) = \mathbf{100} * \frac{\textbf{\# Individual Hydropsychidae}}{\textbf{Total Trichoptera}}$$

- The taxonomic level of Family is used to determine if an individual is considered to be Hydropsychidae or not Hydropsychidae.
- The taxonomic level of Order is used to determine if an individual is considered to be Total Trichoptera or not Trichoptera.
- The taxonomic level of Family and Order can be found in the GA EPD Macroinvertebrate Taxa List.

% (Hydropsychidae / Total Ephemeroptera + Plecoptera + Trichoptera)

$$\%(\text{Hydro/(EPT)}) = \mathbf{100} * \frac{\textbf{\# Individual Hydropsychidae}}{\textbf{(\# of Epheme. + \# of Plecoptera + \# of Trichoptera)}}$$

- The taxonomic level of Family is used to determine if an individual is considered to be Hydropsychidae or not Hydropsychidae.
- The taxonomic level of Order is used to determine if an individual is considered to be Ephemeroptera taxa, Plecoptera taxa, & Trichoptera taxa or not Ephemeroptera taxa, Plecoptera taxa, & Trichoptera taxa.
- The taxonomic level of Order and Family can be found in the GA EPD Macroinvertebrate Taxa List.

% (Chironomus + Cricotopus / Total Chironomidae)

$$\%(\text{Chiro+Crico/TC}) = \mathbf{100} * \frac{\textbf{(\# Indiv. Chironomus + \# Indiv. Cricotopus)}}{\textbf{Total Chironomidae in sample}}$$

- The taxonomic level of genus is used to determine if an individual is considered to be Chironomus and Cricotopus or not Chironomus and Cricotopus.
- The taxonomic level of Family is used to determine if an individual is considered to be Chironomidae or not Chironomidae.
- The taxonomic level of Family and genus can be found in the GA EPD Macroinvertebrate Taxa List.

Tolerance/Intolerance Metrics:

Tolerant Taxa

Tolerant Taxa = **# of Tolerant taxa**

- Tolerant Individuals have a tolerance value ≥7
- Tolerance scores can be found in the GA EPD Macroinvertebrate Taxa List.

*** Please note it is the number of tolerant taxa not the number of tolerant individuals.** (Do not count adult and larvae for beetles as two separate taxa.)

% Tolerant Individuals

%TolInd = **100 * [# Tolerant Individuals / Total Individuals in sample]**

- Tolerant Individuals have a tolerance value ≥7
- Tolerance scores can be found in the GA EPD Macroinvertebrate Taxa List.

Intolerant Taxa

Intolerant Taxa = **# of Intolerant taxa**

- Intolerant Individuals have tolerance values ≤ 3.
- Tolerance scores can be found in the GA EPD Macroinvertebrate Taxa List.
- Please note it is the number of tolerant taxa not the number of tolerant individuals. (Do not count adult and larvae for beetles as two separate taxa.)

% Intolerant Individuals

%IntolInd = **100 * [# Intolerant Individuals / Total Individuals in sample]**

- Intolerant Individuals have a tolerance value ≤3.
- Tolerance values can be found in the GA EPD Macroinvertebrate Taxa List.

% Dominant Individuals

$$\% \text{ Dominant Individuals} = 100 * \frac{\textbf{\# Individual for Dominant Taxa}}{\textbf{Total Individuals in sample}}$$

- Determine the dominant taxa (max individuals per taxa) in a site.

Dominant Individuals

Dominant Individuals = **# Individuals in sample for the Dominant taxa**

- Determine the dominant taxa (largest number of individuals per taxa) in a site.

Beck's Index

Beck's Index = **[2*(C1 Taxa)] + (C2 Taxa)**

- C1 Taxa = # of Taxa with Tolerance values ≤ 1.
- C2 Taxa = # of Taxa with Tolerance values > 1 and ≥ 4.

Hilsenhoff Biotic Index

$$HBI = \frac{\Sigma\, n_i\, a_i}{N}$$

N = Number of total organisms
n_i = number of specimens in each taxonomic group
a_i = the pollution tolerance score for that taxonomic group

(Tolerance scores can be found in the GA EPD Macroinvertebrate Taxa List.)

North Carolina Biotic Index

$$NCBI = \frac{\Sigma\, n_i\, nc_i}{N}$$

N = Number of total organisms
n_i = number of specimens in each taxonomic group
nc_i = the North Carolina pollution tolerance score for that taxonomic group

- To calculate the NCBI only use the individuals that have a North Carolina tolerance value in the GA EPD Macroinvertabrate Taxa List. **Exclude all individuals that do not have a NC tolerance value when calculating this metric.**
- North Carolina tolerance scores can be found in the GA EPD Macroinvertebrate Taxa List under the column heading NCTV.

Functional Feeding Group Metrics:

% Scraper

%Scraper = **100 * [# Individual Scraper / Total Individuals in sample]**

- Scraper is a functional feeding group.
- Functional feeding groups can be found in the GA EPD Macroinvertebrate Taxa List.

Scraper Taxa

Scraper Taxa = **# of Scraper taxa**

- The functional feeding group is used to determine if an individual is considered to be a Scraper taxa or not a Scraper taxa.
- The functional feeding group can be found in the GA EPD Macroinvertebrate Taxa List.

% Collector

%Coll = **100 * [# Individual Collector / Total Individuals in sample]**

- Collector is a functional feeding group.
- Functional feeding groups can be found in the GA EPD Macroinvertebrate Taxa List.

Collector Taxa

Collector Taxa = **# of Collector taxa**

- The functional feeding group is used to determine if an individual is considered to be a Collector taxa or not a Collector taxa.
- The functional feeding group can be found in the GA EPD Macroinvertebrate Taxa List.

% Predator

%Pred = **100 * [# Individual Predator / Total Individuals in sample]**

- Predator is a functional feeding group.
- Functional feeding groups can be found in the GA EPD Macroinvertebrate Taxa List.

Predator Taxa

Predator Taxa = **# of Predator taxa**

- The functional feeding group is used to determine if an individual is considered to be a Predator taxa or not a Predator taxa.
- The functional feeding group can be found in the GA EPD Macroinvertebrate Taxa List.

% Shredder

%Shed = **100 * [# Individual Shredder / Total Individuals in sample]**

- Shredder is a functional feeding group.
- Functional feeding groups can be found in the GA EPD Macroinvertebrate Taxa List.

Shredder Taxa

Shredder Taxa = **# of Shredder taxa**

- The functional feeding group is used to determine if an individual is considered to be a Shredder taxa or not a Shredder taxa.
- The functional feeding group can be found in the GA EPD Macroinvertebrate Taxa List.

% Filterer

%Filt = **100 * [# Individual Filterer / Total Individuals in sample]**

- Filterer is a functional feeding group.
- Functional feeding groups can be found in the GA EPD Macroinvertebrate Taxa List.

Filterer Taxa

Filterer Taxa = **# of Filterer taxa**

- The functional feeding group is used to determine if an individual is considered to be a Filterer taxa or not a Filter taxa.
- The functional feeding group can be found in the GA EPD Macroinvertebrate Taxa List.

Habit Metrics:

Clinger Taxa

Clinger Taxa = **# of Clinger taxa**

- The functional feeding group is used to determine if an individual is considered to be a Clinger taxa or not a Shredder taxa.
- The functional feeding group can be found in the GA EPD Macroinvertebrate Taxa List.

% Clinger

%Clinger = **100 * [# Individual Clingers / Total Individuals in sample]**

- Clinger is a functional feeding group.
- Functional feeding groups can be found in the GA EPD Macroinvertebrate Taxa List.

Burrower Taxa

Burrower Taxa = **# of Burrower taxa**

- The habit is used to determine if an individual is considered to be a Burrower taxa or not a Burrower taxa.
- The habit can be found in the GA EPD Macroinvertebrate Taxa List.

SprawlerTaxa

Sprawler Taxa = **# of Sprawler taxa**

- The habit is used to determine if an individual is considered to be a Sprawler taxa or not a Sprawler taxa.
- The habit can be found in the GA EPD Macroinvertebrate Taxa List.

Swimmer Taxa

Swimmer Taxa = # of Swimmer taxa

- The habit is used to determine if an individual is considered to be a Swimmer taxa or not a Swimmer taxa.
- The habit can be found in the GA EPD Macroinvertebrate Taxa List.

APPENDIX B

PHOTO-DOCUMENTATION OF STUDY AREA

View of Site CK-1 (11.20.18)

View of Site CK-1 (11.20.18)

View of Cross Section at Site CK-1 (11.20.18)

View of Cross Section at Site CK-1 (11.20.18)

View of Site LI-2 (11.20.18)

View of Site LI-2 (11.20.18)

View of Site MA-1 (11.20.18)

View of Site MA-1 (11.20.18)

APPENDIX C

HABITAT ASSESSMENT WORKSHEETS, PEBBLE COUNT DATA SHEETS, PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD SHEETS, WATER CHEMISTRY FIELD SHEETS, BENTHIC MACROINVERTEBRATE FIELD DATA SHEETS, CHANNEL CROSS-SECTION FIELD SHEETS, AND VELOCITY/DISCHARGE FIELD SHEETS

PHYSICAL CHARACTERIZATION AND WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME: Ball Mill Cr.		**MON LOC ID:** CK-1
BIO SITE ID:	**DATE:** 11-20-18	**GPS ERROR (+/-) ft:**
LATITUDE (DD):	**LONGITUDE (DD):**	
START TIME: 10:00	**END TIME:**	**TIME ZONE:** EST EDT
INVESTIGATORS: JP CD		
EPD OFFICE: WP1--Atlanta	WP2--Brunswick	WP3--Cartersville WP4--Tifton
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measure/Observation Field Replicate Msr/Obs	
FORM COMPLETED BY: JP	**PROJECT/REASON FOR SURVEY:**	

STREAM CHARACTERIZATION (Circle Items from List)

STREAM TYPE:	Coldwater Warmwater **Refer to GA EPD Water Quality Standards in GA Rules and Regulations.**
SALINE TYPE:	Brackish Fresh Saline Unsure
WATER APPEARANCE:	Blackwater Clearwater Unsure Unsure/Black Unsure/Clear
TIDAL CYCLE:	1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A
STREAM ORIGIN:	Mixed Origin Spring Fed Swamp/Bog Unsure/Unknown Other_____
STREAM SUBSYSTEM:	Ephemeral Intermittent Perennial Tidal Unsure/Unknown

VISUAL CONDITIONS (Circle Items from List)

WATER LEVEL/FLOW:	Normal Low	Above Normal Flood	Normal, but no Velocity Drought Impact
WEATHER NOW (circle and fill in all that apply):	____% Cloud Cover Showers (intermittent)	Clear (0% cloud cover)/Sunny Storm (heavy rain)	Rain (Steady Rain) Snow
WEATHER PAST 24 HOURS (circle or fill in all that apply):	____% Cloud Cover Showers (intermittent)	Clear (0% cloud cover)/Sunny Storm (heavy rain)	Rain (Steady Rain) Snow Unsure (past)
Heavy rain in the last 7 days?	Yes No	**Heavy rain in the last 24 hours?**	Yes No

WATER QUALITY (Circle Items from List)

WATER ODORS:	Normal/None	Petroleum	Fishy	Sewage	Chemical	Other_____
WATER COLOR /APPEARANCE:	Clear Tannic (Tea-colored)	Foamy (natural or pollution) Milky (cloudy white or gray)	Green (algal coloration evident)			Other_____ Muddy (cloudy brown)
WATER SURFACE OILS:	None	Sheen	Globs	Flecks	Slick	Other_____
TURBIDITY (visual observation):	Clear	Slightly Turbid	Turbid	Stained	Opaque	Other_____

SEDIMENT/SUBSTRATE (Circle Items from List)

ODOR:	None	Normal	Sewage	Chemical	Anaerobic	Petroleum Other_____
DEPOSITS:	None Relict Shells	Sludge Clay	Sawdust Organics	Paper Fiber Silt	Sand Other	Petroleum
OILS:	Absent	Moderate	Profuse	Slight		
UNDERSIDES OF LOOSE STONES BLACK IN COLOR?:	Yes	No	N/A			
PREDOMINANT SUBSTRATE(S):	Bedrock Concrete	Boulders Fines	Cement Gravel	Clay Hardpan	Cobble Sand	Boulders/RipRap Silt Other

ORGANIC SUBSTRATE COMPONENTS (Enter Number - does not necessarily add up to 100%)

Substrate Type (Indicate if 0%):	**% Composition in Sampling Area:**
Detritus – Coarse Particulate Organic Matter - sticks, wood, coarse plants	<2
Muck/Mud – Fine Particulate Organic Matter – black, very fine organics	
Marl – Gray, Shell Fragments	

COMMENTS (Include Impacts and TMDL Info.):

Homeowner described worry about u/s dam & rumor that it's failing → mention to City/County

Revision Date 03-22-2016

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

RIPARIAN ZONE/INSTREAM FEATURES (Circle All Applicable from List OR Enter Number)

PREDOMINANT LAND USE: (watershed wide land use)	Agricultural (Unspecified)	Agriculture and Mining	Ag Row Crops
	Pasture (Unspecified)	Livestock	Cropland
	Residential	Rural Residential	Urban
	Commercial	Industrial	Mining
	Planted Pine (Silviculture)	Selective Cut	Old Growth Forest
	Forest (Unspecified)	Mature Timber (40+ years)	Forest Fire
	Clear-cut Forest (<10 yrs)	Second Growth Forest (10-40 years)	Wetland
	Heavy Grazing Pressure (trampled)	Light Grazing Pressure (cow pies/not trampled)	
	Other(s):		

LOCAL WATERSHED NPS POLLUTION: No Evidence | Some Potential Sources | Obvious Sources

CANOPY COVER: Open (0-10%) | Partly Open (11-45%) | Partly Shaded (46-80%) | Shaded (81-100%) (40-80%)

LOCAL WATER EROSION: None | Light | Moderate | Heavy

BEAVER ACTIVITY OBSERVATIONS: (If active dam in reach, do not sample.)
- Inactive Beaver Dam, Little Effect on Stream
- No Beaver Activity Evident
- Old Beaver Dam Activity, Little Effect
- Inactive Beaver Dam Affecting Stream
- Beaver Cutting Evident, Little Effect on Stream
- Active Beaver Dam Affecting Stream
- Active Beaver Dam not Affecting Stream (downstream of reach)

LIVESTOCK DAMAGE OBSERVATIONS:
- No Livestock Damage
- Stable (0-25% Damage, Little/No Erosion)
- Moderate (26-50% Damage, <50% Plant Biomass)
- High (51-75% Damage, <25% Plant Biomass)
- Severe (76-100% Damage, Little/No Plant Biomass Remains)

HIGH WATER MARK: 3 (ft) | **AVERAGE STREAM WIDTH:** 14 (ft) (8-20')

AVERAGE STREAM DEPTH FOR EACH: Riffle 0.1 (ft) Run/Glide 0.7 (ft) Pool 2.5 (ft) (1'-3')

% EACH MORPHOLOGICAL TYPE (Adds up to 100%): Riffle 20 % Run/Glide 55 % Pool 25 %

STREAM CHANNELIZED?: Yes No | **IF YES, REACH LENGTH CHANNELIZED:** Full Partial

STREAM DREDGING?: Yes No | **RECENT RESTORATION CONDUCTED (last 10 years):** Yes No

DAM PRESENT?: Yes No | **IF DAM PRESENT:** Upstream Downstream In Stream Reach

RIPARIAN VEGETATION (18 meter buffer) (Circle Items from List)

PREDOMINANT TYPE: Trees Shrubs Grasses Herbaceous Other_____

PREVALENT RIPARIAN VEGETATION COMPOSITION (circle all that apply):
- Coniferous Dominated (canopy more than 50% conifer)
- Annual Grasses and Herbs
- Deciduous trees (Alder, Cottonwood, Maple)
- Mixed Conifer and Deciduous
- Forested (dominated by trees, with brushy understory)
- No Vegetation (bare soil, rock)
- Grass (bank covered with tall grasses, sedges, etc.)
- Perennial and Mixed Tree Species
- Perennial Grasses, Forbs, Sedges, and Rushes
- Perennial and Shrubs
- Shrubs (Willow, Salmonberry, some Alder)
- Shrubs and Mixed Tree Species

PREVALENT RIPARIAN VEGETATION SPECIES (circle all that apply):

American Beech	Ash	Bamboo	Bamboo Grass	Bay Magnolia	Birch
Cedar	Bay	Black Gum	Black Locust	Box Elder	Fern
Cherry	Cane	Cypress	Dogwood	Elder	Honeysuckle
Green Ash	Elm	Hemlock	Hickory	Holly	Magnolia
Ironwood	Fir	Kudzu	Live Oak	Loblolly Pine	Persimmon
Mountain Laurel	Oak	Microstegium	Mimosa	Maple	Redbud
Poplar	Pine	Privet	Red Maple	Red Oak	Spanish Moss
Rhododendron	Tupelo	River Birch	River Cane	Saw Palmetto	Tag Alder
Short Leaf Pine	Walnut	Sweet Bay	Sweet Gum	Sycamore	Wax Myrtle
Swamp Tupelo	White Oak	Turkey Oak	Water Oak	White Pine	Willow
Willow Oak	Other(s)_____				

AQUATIC VEGETATION (Circle Items from List)

PREDOMINANT TYPE: None | Attached Algae | Floating Algae | Free Floating | Rooted Emergent | Rooted Floating | Rooted Submergent | Other

PORTION OF REACH COVERED BY AQUATIC VEGETATION: <10 %

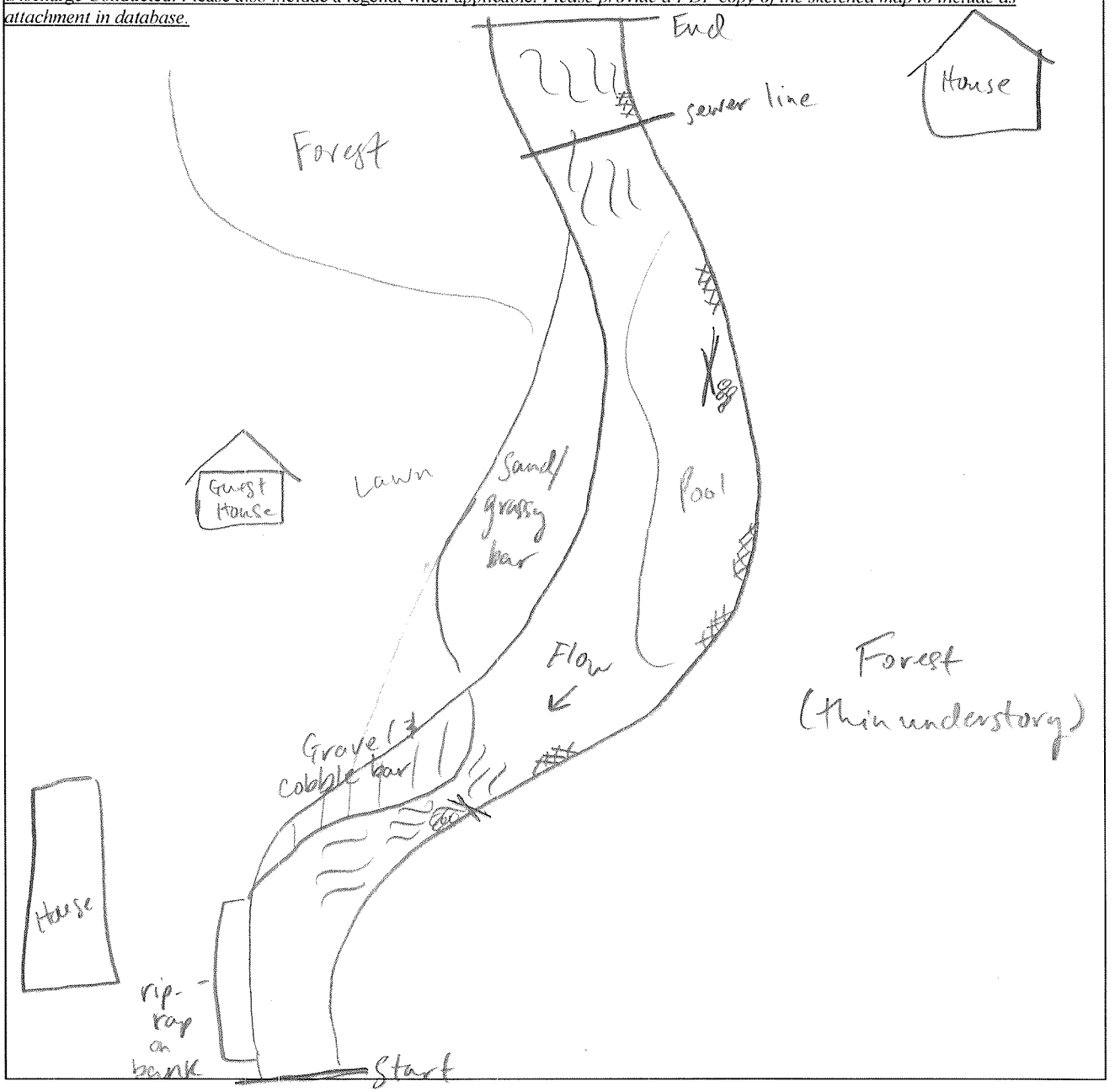
PREVALENT AQUATIC VEGETATION SPECIES:

Arrowhead	Brown Algae	Cattail	Filamentous Algae
Foxtail	Green Algae	Hydrilla	Iron bacteria/Algae
Lemna	Moss	Parrot Feather	Sagittaria
Vallisneria	No Aquatic Vegetation	Other(s)_____	

PHYSICAL CHARACTERIZATION MAP SKETCH (MAP)

STREAM NAME: Ball Mill Cr.		**MON LOC ID:** CK-1	
BIO SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**	
LATITUDE (DD):		**LONGITUDE (DD):**	
START TIME: 10:00	**END TIME:**	**TIME ZONE:** (EST) EDT	
INVESTIGATORS: JP CD			
EPD OFFICE: Atlanta Brunswick Cartersville Tifton		**MAP SKETCH ATTACHED:** Yes No	
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measure/Observation Field Replicate Msr/Obs		
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
MAP/FORM COMPLETED BY: JP	**PROJECT/REASON FOR SURVEY:**		

SITE LOCATION/MAP:
Draw a map (including bends in stream when applicable) of the site and indicate Areas Sampled, Habitats, Land Use on LB and RB, Plants, Discharge Conducted. Please also include a legend, when applicable. *Please provide a PDF copy of the sketched map to include as attachment in database.*



WATERSHED ASSESSMENT BENTHIC MACROINVERTEBRATE COLLECTION FIELD DATA SHEET

STREAM NAME: Ball Mill Cr.		**MON LOC ID:** CK-1
WA SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**
LATITUDE (DD):	**LONGITUDE (DD):**	
START TIME: 10:00	**END TIME:**	**TIME ZONE:** EST EDT
INVESTIGATORS: JP CD		
FIELD COLLECTOR:	**FIELD PROCESSOR:**	
SAMPLE TYPE: Targeted	**PROJECT:** Watershed Assessment	**ACTIVITY TYPE:** Routine Replicate
WATER APPEARANCE: Blackwater Clearwater Unsure Unsure/Black Unsure/Clear		
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A		
GRADIENT: High Gradient Low Gradient	**REALLOCATED:** Yes No	
FORM COMPLETED BY: CD	**PROJECT/REASON FOR SURVEY:**	

HABITAT TYPES *(Adds up to 100%)*	**Indicate the percentage of each habitat type present:** Riffles 50 % Snags 5 % Banks/ root mats 15 % Leaf packs 10 % Soft/Sandy sediment 20 % Submerged Macrophytes 0 % Other (_____) ____ %
SAMPLE COLLECTION	Gear used: **D-frame, 500 µm net** How were the samples collected? **Wading** **Indicate the number of jabs/kicks taken in each habitat type:** Riffles (fast) 4 Riffles (slow) 3 Snags 3 Banks/ root mats 4 Soft/Sandy sediment 3 Leaf packs 3 Submerged Macrophytes (when present, up to 3 jabs) 0 Other (_____) ____ **Total # of Jabs:** 20 **# of Jabs Reallocated (if any):** 2 **Total # of Bottles collected:** _____
GENERAL COMMENTS	Lacks LWD - all other habitat types common
PHOTOS (If any taken)	

ESTIMATED ABUNDANCE / QUALITATIVE LISTING OF AQUATIC BIOTA

***Indicate estimated abundance*:** **0 = Absent/Not Observed** **1 = Rare** **2 = Common** **3 = Abundant** **4 = Dominant**

Periphyton	0 1 2 3 4	Slimes	0 1 2 3 4
Filamentous Algae	0 1 2 3 4	Macroinvertebrates	0 1 2 3 4 ← CD
Macrophytes	0 1 2 3 4	Fish	0 1 2 3 4

ESTIMATED ABUNDANCE / FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance:
0 = Absent/Not Observed **1 = Rare (1-3 organisms** **2 = Common (3-9 organisms)**
3= Abundant (>10 organisms) **4 = Dominant (>50 organisms)**

Porifera	0 1 2 3 4	Anisoptera(Dra)	0 1 2 3 4	Trichoptera	0 1 2 3 4
Hydrozoa	0 1 2 3 4	Zygoptera	0 1 2 3 4	Ephemeroptera	0 1 2 3 4
Platyhelminthes	0 1 2 3 4	Hemiptera	0 1 2 3 4	Plecoptera	0 1 2 3 4
Turbellaria	0 1 2 3 4	Coleoptera	0 1 2 3 4	Megaloptera	0 1 2 3 4
Hirudinea	0 1 2 3 4	Lepidoptera	0 1 2 3 4	Sialidae	0 1 2 3 4
Oligochaeta	0 1 2 3 4	Tipulidae	0 1 2 3 4	Corydalidae	0 1 2 3 4
Isopoda	0 1 2 3 4	Empididae	0 1 2 3 4	Other	0 1 2 3 4
Amphipoda	0 1 2 3 4	Simuliidae	0 1 2 3 4		
Decapoda	0 1 2 3 4	Tabanidae	0 1 2 3 4		
Gastropoda	0 1 2 3 4	Culicidae	0 1 2 3 4		
Bivalvia	0 1 2 3 4	Chironomidae	0 1 2 3 4		

Biological *In situ* and Grab Sample Water Chemistry Field Sheet (Front)

STREAM NAME: Ball Mill Cr.		**MON LOC ID:** CK-1	
BIO SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**	
LATITUDE (DD):	**LONGITUDE (DD):**		
START TIME: 10:00	**END TIME:**	**TIME ZONE:** EST or EDT	
INVESTIGATORS: JP CD			
FIELD MEASURER/COLLECTOR:	**FIELD RECORDER:**		
EPD OFFICE: WP1–Atlanta	WP2–Brunswick	WP3–Cartersville	WP4–Tifton
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measurement/Observation	Field Replicate Msr/Obs	
COMPOSITE TYPE: Horizontal Single	Horizontal Multi	None (Grab)	
PROJECT/REASON FOR SURVEY:			

In-situ Field Chemistry Data			
Water Temperature: 11.6	° C	**Model of Sonde:**	
Air Temperature:	° C	**Serial # of Unit:**	
Specific Conductance: 121	(µmhos/cm)	**Salinity:** 0.06	PPT ~~PPB~~
Dissolved Oxygen (mg/L): 8.97		**Dissolved Oxygen:** 84.5	%
pH: 6.93		**Battery Volts:**	
Turbidity: 16.5	NTU	**Turbidity Instrument #:**	

In- situ Handheld Fluorometer Measurements	
Benthic Chlorophyll *a* Bottle #:	**Notes:**
In Vivo Reading (ppb): (Water Column Chlorophyll *a*)	***Diatom Sample Reading (ppb):*** (Benthic Chlorophyll *a*)

Grab Water Quality Filtering				
Parameter	**Time Frozen:**	**Filtered By:**	**# of Filters:**	**Volume filtered (ml):**
Chlorophyll *a*				

STREAM CHARACTERIZATION (Circle All that Apply)							
SALINE TYPE:	Brackish	Fresh	Saline	Unsure			
WATER APPEARANCE:	Blackwater	Clearwater	Unsure	Unsure/Black	Unsure/Clear		
STREAM ORIGIN:	Mixture of Origins	Spring Fed	Swamp/Bog	Unsure/Unknown	Other_____		
WATER CLARITY:	Clear	Slightly Turbid	Turbid	Stained	Opaque	Other_____	
STREAM SUBSYSTEM:	Ephemeral	Intermittent	Perennial	Tidal	Unsure/Unknown		
TIDAL CYCLE:	1/4 ebb	1/2 ebb	3/4 ebb	Low Tide	1/4 flood	1/2 flood	3/4 flood	High Tide	N/A
STREAM TYPE:	Coldwater	Warmwater					
WATER COLOR:	Clear	Foamy (natural or pollution)	Green (algal coloration evident)	Other_____			
	Tannic (Tea-colored)	Muddy (cloudy brown)	Milky (cloudy white or gray)	Other_____			
DOMINANT SUBSTRATE(S):	Bedrock	Boulders	Cement	Clay	Cobble	Boulders/RipRap	
	Concrete	Fines	Gravel	Hardpan	Sand	Silt	Other_____

VISUAL CONDITIONS (Circle Items from List)			
WATER LEVEL/FLOW:	Normal	Above Normal	Normal, but no Velocity
	Low	Flood	Drought Impact
WEATHER PAST 24 HOURS (circle and fill in all that apply):	_____% Cloud Cover	Clear (0% cloud cover)/Sunny	Rain (Steady Rain)
	Showers (intermittent)	Storm (heavy rain)	Snow
	Unsure (past)		
WEATHER NOW (circle and fill in all that apply):	_____% Cloud Cover	Clear (0% cloud cover) /Sunny	Rain (Steady Rain)
	Showers (intermittent)	Storm (heavy rain)	Snow

SUBSTRATE PARTICLE COUNT FIELD SHEET

STREAM NAME: Brill Mill Cr.		**DATE:** 11-2018	**START TIME:** 10:00	**END TIME:**	
MON LOC ID: CK-1	**BIO SITE ID:**	**TIME ZONE:** ~~EST~~ EDT		**GPS ERROR: +/- (ft):**	
MEASURER: JP	**RECORDER:** JP	**LATITUDE:**		**LONGITUDE:**	
INVESTIGATORS: JP CD					
SAMPLE TYPE: Targeted	Probabilistic	**ACTIVITY TYPE:**	Field Measure/Observation	Field Replicate Msr/Obs	
EPD OFFICE:	WP1–Atlanta	WP2–Brunswick	WP3–Cartersville	WP4–Tifton	
WATER APPEARANCE:	Blackwater	Clearwater	Unsure	Unsure/Black	Unsure/Clear
TIDAL CYCLE:	1/4 ebb	1/2 ebb	3/4 ebb	Low Tide	1/4 flood	1/2 flood	3/4 flood	High Tide	N/A
PROJECT/REASON FOR SURVEY:					
COMMENTS:					

				Total Transects:		
Inches	**Particle**	**Millimeter**		**Particle Count**	**TOTAL #**	**% Cum**
	Silt/Clay	<.062	S/C			
	Very Fine	0.062-0.125	S			
	Fine	0.126-0.25	A			
	Medium	0.26-0.50	N	IIII	4	
	Coarse	0.51-1.0	D	~~IIII~~ ~~IIII~~ I	11	
	Very Coarse	1.01-2.0	S	~~IIII~~ II	7	22
.08-.16	Very Fine	2.01-4		~~IIII~~ I	6	
.17-.24	Fine	4.01-6	G	IIII	4	
.25-.31		6.01-8	R	III	3	
.32-.47	Medium	8.01-12	A	I	1	
.48-.63		12.01-16	V	II	2	
.64-.94	Coarse	16.01-24	E	III	3	
.95-1.26		24.01-32	L	III	3	
1.27-1.9	Very Coarse	32.01-48	S	~~IIII~~	5	
1.91-2.5		48.01-64		~~IIII~~ ~~IIII~~ II	12	61
2.51-3.8	Small	64.01-96	C	~~IIII~~ ~~IIII~~ ~~IIII~~ IIII	19	
3.81-5.0		96.01-128	O	~~IIII~~ ~~IIII~~ I	11	
5.01-7.6	Large	128.01-192	B	~~IIII~~ I	6	
7.61-10		192.01-256	L	II	2	99
10.01-15	Small	256.01-384	B	I	1	
15.01-20		384.01-512	L			
20.01-40	Medium	512.01-1024	D			
40.01-160	Lrg -Very Lrg	1024.01-4096	R			100
	Bedrock		BD			
				TOTALS	100	100

*** % Cumulative = % Cumulative for each substrate type (silt/clay, sands, gravels, cobbles, boulders, or bedrock)**

Discharge/Cross Section Field Sheet

Stream Name: Ball Mill Cr.	**Date:** 11.20.18	**Start Time:** 10:00	**End Time:**
EPD Office: WP1–Atlanta WP2–Brunswick WP3–Cartersville WP4–Tifton		**Time Zone** EST EDT	
Mon Loc ID: CK-1	**File Name:**	**Recorder:** CD	**Measurer:** JP
Investigators: JP CD		**Project/Reason for Survey:**	
Instrument #:	**Latitude:**	**Longitude:**	**GPS Error: +/-** _____ **(ft)**
Location Comments:		**Tape reading @ Water Starting Edge (ft):**	**Water Ending Edge (ft):**
Compass Direction of Tag Line: ____ °	**Bank Start (Facing DS) :** LB to RB RB to LB	**Point A Pin Location:** Left Bank Right Bank	
Water Appearance: Blackwater Clearwater Unsure Unsure/Black Unsure/Clear		**Stream Wadeable?:** Yes No	
Tidal Cycle: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
Start Tape Down (ft):	**End Tape Down (ft):**	**Start Staff Gage Height (ft):**	**End Staff Gage Height (ft):**
Sampling Type: Targeted Probabilistic	**Camera:**	**Photo #s:** US: DS: LB: RB:	
XS Benchmark #1:		**Photo #s:**	**Direction:** **Distance (feet):**
XS Benchmark #2:		**Photo #s:**	**Direction:** **Distance (feet):**
Other Photos/Locations/Description:		**Activity Type:** Routine Replicate	

NOTE: For depths 2.5 feet or deeper- velocity readings should be taken at 0.2 and 0.8 depth.

Pre-Deployment Diagnostics					Setup Parameters					
Recorder status	**H2O T (F°)**	**%BATTERY**	**Raw Data**	**Time Changed?** Yes No	**Units** Standard	**Averaging time (sec)** RIS 40	**Data Collection Mode** Discharge			**Salinity**
Station #	1 0	2 3	3 4.3	4 6.0	5 8.0	Edge 6 9.0	7 12.0	8 15.0	9 18.0	10 21.0
Location on Tape	0.0	0.9	1.2	2.7	3.3	5.0	5.5	5.9	5.8	5.8
Water Depth							0.5	0.8	0.8	0.8
Velocity .2										
Velocity .6										
Velocity .8										
Station #	Edge 11 24.7	12 27.6	13 30.4	14 35.2	15 38.9	16 40.6	17	18	19	20
Location on Tape	5.1	5.1	3.9	3.5	1.5	1.3				
Water Depth										
Velocity .2										
Velocity .6										
Velocity .8										
Station #	21	22	23	24	25	26	27	28	29	30
Location on Tape										
Water Depth										
Velocity .2										
Velocity .6										
Velocity .8										

Tot Discharge: 3.1 cfs **Mean Velocity:** 0.33 ft/s @ 0.6 ft deep **Tot Width:** 15.7 ft. **Tot Area:**

Comments: 0.33 ft/s x 0.6 ft(dp) x 15.7 ft(w) = 3.1 cfs

Bio Site ID: _____ **Units: Discharge - ft^3/s Velocity – ft/s Width – ft Area – ft^2 Location on Tape – ft Water Depth -ft**

Revision Date 03-22-2016

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME: Ball Mill Cr.		**MON LOC ID:** CK-1	
BIO SITE ID:		**DATE:** 11.20.18	
START TIME: 10:00	**END TIME:**	**TIME ZONE:** EST or EDT	
FORM COMPLETED BY/ASSESSOR: JP			
COMMENTS:			

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Note: Look at substrate in run areas.	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization (straigtening) or dredging absent or minimal; stream with normal pattern.	Some channelization or shoring structures present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream ≤7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstructions are important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 8 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 16 to 25.	Generally all flat water or shallow riffles, occasional bend; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 108

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME: Ball Mill Cr.		**MON LOC ID:** CK-1	
BIO SITE ID:		**DATE:** 11.20.18	
START TIME: 10:00	**END TIME:**	**TIME ZONE:** EST or EDT	
FORM COMPLETED BY/ASSESSOR: CP			
COMMENTS:			

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Note: Look at substrate in run areas.	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization (straigtening) or dredging absent or minimal; stream with normal pattern.	Some channelization or shoring structures present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream ≤7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstructions are important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 8 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 16 to 25.	Generally all flat water or shallow riffles, occasional bend; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 102

HIGH GRADIENT HABITAT ASSESSMENT AVERAGE

STREAM NAME: Ball Mill Cr.		**MON LOC ID:** CK-1	
BIO SITE ID:	**DATE:** 11-20-18	**FORM COMPLETED BY:**	
LATITUDE (DD):	**LONGITUDE (DD):**	**GPS ERROR (+/-) ft.:**	
START TIME: 10:00	**END TIME:**	**TIME ZONE:** EST EDT	
INVESTIGATORS:			
EPD OFFICE: WP1–Atlanta	WP2–Brunswick	WP3–Cartersville	WP4–Tifton
SAMPLE TYPE: Targeted	Probabilistic	**ACTIVITY TYPE:** Field Msr/Obs Habitat	Field Replicate Habitat
WATER APPEARANCE: Blackwater	Clearwater	Unsure	Unsure/Black Unsure/Clear
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
PROJECT/REASON FOR SURVEY:	**COMMENTS:**		

Habitat Parameter Scores	Habitat Parameter Scores	Habitat Parameter Scores	AVERAGE
ASSESSOR : JP	**ASSESSOR :**	**ASSESSOR :** CD	
1. Epifaunal Substrate/ Instream Cover 12	1. Epifaunal Substrate/ Instream Cover	1. Epifaunal Substrate/ Instream Cover 13	12.5
2. Embeddedness 9	2. Embeddedness	2. Embeddedness 8	8.5
3. Velocity/Depth Regime 16	3. Velocity/Depth Regime	3. Velocity/Depth Regime 14	15
4. Sediment Deposition 8	4. Sediment Deposition	4. Sediment Deposition 7	7.5
5. Channel Flow Status 14	5. Channel Flow Status	5. Channel Flow Status 14	14
6. Channel Alteration 15	6. Channel Alteration	6. Channel Alteration 15	15
7. Frequency of Riffles (or bends) 7	7. Frequency of Riffles (or bends)	7. Frequency of Riffles (or bends) 6	6.5
8. Bank Stability LB 3 RB 5	8. Bank Stability LB RB	8. Bank Stability LB 3 RB 4	LB 3 RB 4.5 Total 7.5
9. Bank Vegetative Protection LB 4 RB 5	9. Bank Vegetative Protection LB RB	9. Bank Vegetative Protection LB 4 RB 4	LB 4 RB 4.5 Total 8.5
10. RiparianVegetative Zone Width LB 7 RB 3	10. RiparianVegetative Zone Width LB RB	10. RiparianVegetative Zone Width LB 6 RB 4	LB 6.5 RB 3.5 Total 10
Total Score: 108	**Total Score:**	**Total Score:** 102	**TOTAL AVERAGE SCORE:** 105
Comments:	Comments:	Comments:	

NOTE: When you average each parameter it must be a whole number. Use normal rounding procedures. Individually round each LB and RB score before totaling the final parameter score.

Revision Data 12-08-2015

PHYSICAL CHARACTERIZATION AND WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME: Long Island Cr.		**MON LOC ID:** LI-2
BIO SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**
LATITUDE (DD):	**LONGITUDE (DD):**	
START TIME: 1250	**END TIME:**	**TIME ZONE:** EST EDT
INVESTIGATORS: JP CD		
EPD OFFICE: WP1--Atlanta	WP2--Brunswick	WP3--Cartersville WP4--Tifton
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measure/Observation Field Replicate Msr/Obs	
FORM COMPLETED BY: JP	**PROJECT/REASON FOR SURVEY:**	

STREAM CHARACTERIZATION (Circle Items from List)

STREAM TYPE:	Coldwater Warmwater **Refer to GA EPD Water Quality Standards in GA Rules and Regulations.**
SALINE TYPE:	Brackish Fresh Saline Unsure
WATER APPEARANCE:	Blackwater Clearwater Unsure Unsure/Black Unsure/Clear
TIDAL CYCLE:	1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A
STREAM ORIGIN:	Mixed Origin Spring Fed Swamp/Bog Unsure/Unknown Other_____
STREAM SUBSYSTEM:	Ephemeral Intermittent Perennial Tidal Unsure/Unknown

VISUAL CONDITIONS (Circle Items from List)

WATER LEVEL/FLOW:	Normal Low	Above Normal Flood	Normal, but no Velocity Drought Impact
WEATHER NOW (circle and fill in all that apply):	_____% Cloud Cover Showers (intermittent)	Clear (0% cloud cover)/Sunny Storm (heavy rain)	Rain (Steady Rain) Snow
WEATHER PAST 24 HOURS (circle or fill in all that apply):	_____% Cloud Cover Showers (intermittent)	Clear (0% cloud cover)/Sunny Storm (heavy rain)	Rain (Steady Rain) Snow Unsure (past)
Heavy rain in the last 7 days?	Yes No	**Heavy rain in the last 24 hours?**	Yes No

WATER QUALITY (Circle Items from List)

WATER ODORS:	Normal/None	Petroleum	Fishy	Sewage	Chemical	Other_____
WATER COLOR /APPEARANCE:	Clear Tannic (Tea-colored)	Foamy (natural or pollution) Milky (cloudy white or gray)	Green (algal coloration evident)			Other_____ Muddy (cloudy brown)
WATER SURFACE OILS:	None	Sheen	Globs	Flecks	Slick	Other_____
TURBIDITY (visual observation):	Clear	Slightly Turbid	Turbid	Stained	Opaque	Other_____

SEDIMENT/SUBSTRATE (Circle Items from List)

ODOR:	None	Normal	Sewage	Chemical	Anaerobic	Petroleum Other_____
DEPOSITS:	None Relict Shells	Sludge Clay	Sawdust Organics	Paper Fiber Silt	Sand Other	Petroleum
OILS:	Absent	Moderate	Profuse	Slight		
UNDERSIDES OF LOOSE STONES BLACK IN COLOR?:	Yes	No	N/A			
PREDOMINANT SUBSTRATE(S):	Bedrock Concrete	Boulders Fines	Cement Gravel	Clay Hardpan	Cobble Sand	Boulders/RipRap Silt Other

ORGANIC SUBSTRATE COMPONENTS (Enter Number - does not necessarily add up to 100%)

Substrate Type (Indicate if 0%):	**% Composition in Sampling Area:**
Detritus – Coarse Particulate Organic Matter - sticks, wood, coarse plants	<5
Muck/Mud – Fine Particulate Organic Matter – black, very fine organics	
Marl – Gray, Shell Fragments	

COMMENTS (Include Impacts and TMDL Info.):

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

RIPARIAN ZONE/INSTREAM FEATURES (Circle All Applicable from List OR Enter Number)

PREDOMINANT LAND USE: (watershed wide land use)

Agricultural (Unspecified)	Agriculture and Mining	Ag Row Crops
Pasture (Unspecified)	Livestock	Cropland
Residential	Rural Residential	Urban
Commercial	Industrial	Mining
Planted Pine (Silviculture)	Selective Cut	Old Growth Forest
Forest (Unspecified)	Mature Timber (40+ years)	Forest Fire
Clear-cut Forest (<10 yrs)	Second Growth Forest (10-40 years)	Wetland
Heavy Grazing Pressure (trampled)	Light Grazing Pressure (cow pies/not trampled)	

Other(s):

LOCAL WATERSHED NPS POLLUTION: No Evidence Some Potential Sources Obvious Sources

CANOPY COVER: Open (0-10%) Partly Open (11-45%) Partly Shaded (46-80%) Shaded (81-100%) 65-85%

LOCAL WATER EROSION: None Light Moderate Heavy

BEAVER ACTIVITY OBSERVATIONS: (If active dam in reach, do not sample.)

Inactive Beaver Dam, Little Effect on Stream	No Beaver Activity Evident
Old Beaver Dam Activity, Little Effect	Inactive Beaver Dam Affecting Stream
Beaver Cutting Evident, Little Effect on Stream	Active Beaver Dam Affecting Stream
Active Beaver Dam not Affecting Stream (downstream of reach)	

LIVESTOCK DAMAGE OBSERVATIONS:

No Livestock Damage	Stable (0-25% Damage, Little/No Erosion)
Moderate (26-50% Damage, <50% Plant Biomass)	High (51-75% Damage, <25% Plant Biomass)
Severe (76-100% Damage, Little/No Plant Biomass Remains)	

HIGH WATER MARK: 2-3 (ft) **AVERAGE STREAM WIDTH:** 20 (ft) (4-30') ↳ most

AVERAGE STREAM DEPTH FOR EACH: Riffle 0.1 (ft) Run/Glide ____ (ft) Pool 3 (ft)

% EACH MORPHOLOGICAL TYPE (Adds up to 100%): Riffle ____ % Run/Glide ____ % Pool ____ % 15-24'

STREAM CHANNELIZED?: Yes No **IF YES, REACH LENGTH CHANNELIZED:** Full Partial

STREAM DREDGING?: Yes No **RECENT RESTORATION CONDUCTED (last 10 years):** Yes No

DAM PRESENT?: Yes No **IF DAM PRESENT:** Upstream Downstream In Stream Reach

RIPARIAN VEGETATION (18 meter buffer) (Circle Items from List)

PREDOMINANT TYPE: Trees Shrubs Grasses Herbaceous Other ____

PREVALENT RIPARIAN VEGETATION COMPOSITION (circle all that apply):

Coniferous Dominated (canopy more than 50% conifer)	Annual Grasses and Herbs
Deciduous trees (Alder, Cottonwood, Maple)	Mixed Conifer and Deciduous
Forested (dominated by trees, with brushy understory)	No Vegetation (bare soil, rock)
Grass (bank covered with tall grasses, sedges, etc.)	Perennial and Mixed Tree Species
Perennial Grasses, Forbs, Sedges, and Rushes	Perennial and Shrubs
Shrubs (Willow, Salmonberry, some Alder)	Shrubs and Mixed Tree Species

PREVALENT RIPARIAN VEGETATION SPECIES (circle all that apply):

American Beech	Ash	Bamboo	Bamboo Grass	Bay Magnolia	Birch
Cedar	Bay	Black Gum	Black Locust	Box Elder	Fern
Cherry	Cane	Cypress	Dogwood	Elder	Honeysuckle
Green Ash	Elm	Hemlock	Hickory	Holly	Magnolia
Ironwood	Fir	Kudzu	Live Oak	Loblolly Pine	Persimmon
Mountain Laurel	Oak	Microstegium	Mimosa	Maple	Redbud
Poplar	Pine	Privet	Red Maple	Red Oak	Spanish Moss
Rhododendron	Tupelo	River Birch	River Cane	Saw Palmetto	Tag Alder
Short Leaf Pine	Walnut	Sweet Bay	Sweet Gum	Sycamore	Wax Myrtle
Swamp Tupelo	White Oak	Turkey Oak	Water Oak	White Pine	Willow
Willow Oak	Other(s) ____				

AQUATIC VEGETATION (Circle Items from List)

PREDOMINANT TYPE:

None	Attached Algae	Floating Algae	Free Floating
Rooted Emergent	Rooted Floating	Rooted Submergent	Other

PORTION OF REACH COVERED BY AQUATIC VEGETATION: 10-15 %

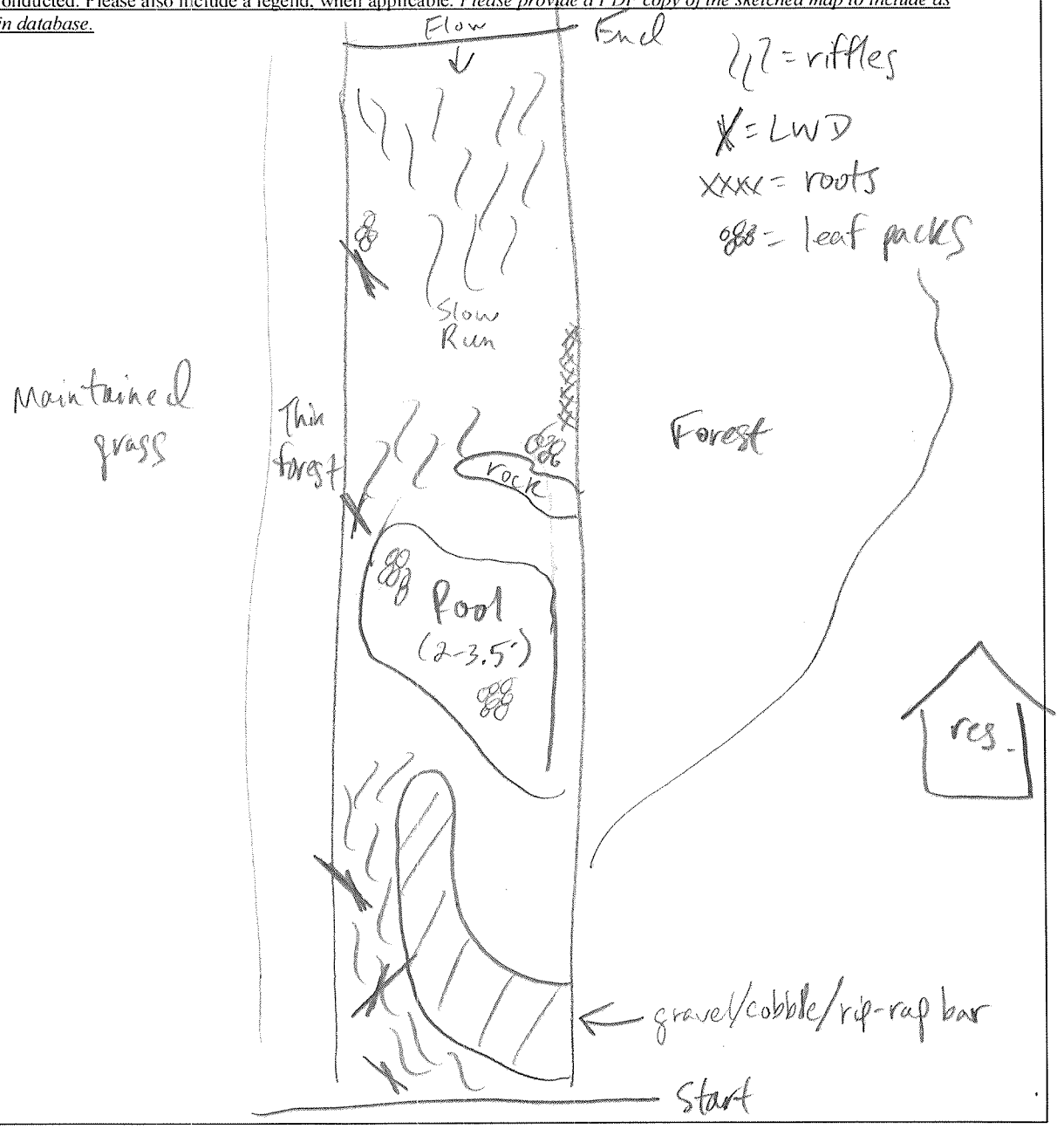
PREVALENT AQUATIC VEGETATION SPECIES:

Arrowhead	Brown Algae	Cattail	Filamentous Algae
Foxtail	Green Algae	Hydrilla	Iron bacteria/Algae
Lemna	Moss	Parrot Feather	Sagittaria
Vallisneria	No Aquatic Vegetation	Other(s) ____	

PHYSICAL CHARACTERIZATION MAP SKETCH (MAP)

STREAM NAME: Long Island Dr.		**MON LOC ID:** LI-2	
BIO SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**	
LATITUDE (DD):		**LONGITUDE (DD):**	
START TIME: 12:50	**END TIME:**	**TIME ZONE:**	EST EDT
INVESTIGATORS: JP CD			
EPD OFFICE: Atlanta Brunswick Cartersville Tifton		**MAP SKETCH ATTACHED:**	Yes No
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measure/Observation Field Replicate Msr/Obs		
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
MAP/FORM COMPLETED BY: JP	**PROJECT/REASON FOR SURVEY:**		

SITE LOCATION/MAP:
Draw a map (including bends in stream when applicable) of the site and indicate Areas Sampled, Habitats, Land Use on LB and RB, Plants, Discharge Conducted. Please also include a legend, when applicable. *Please provide a PDF copy of the sketched map to include as attachment in database.*



WATERSHED ASSESSMENT BENTHIC MACROINVERTEBRATE COLLECTION FIELD DATA SHEET

STREAM NAME: Long Island Cr.		**MON LOC ID:** LI-2	
WA SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**	
LATITUDE (DD):		**LONGITUDE (DD):**	
START TIME: 12:50	**END TIME:**	**TIME ZONE:** (EST) EDT	
INVESTIGATORS: JP CD			
FIELD COLLECTOR: CD		**FIELD PROCESSOR:** CD	
SAMPLE TYPE: Targeted	**PROJECT:** Watershed Assessment	**ACTIVITY TYPE:** Routine Replicate	
WATER APPEARANCE: Blackwater Clearwater Unsure Unsure/Black Unsure/Clear			
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
GRADIENT: (High Gradient) Low Gradient		**REALLOCATED:** Yes No	
FORM COMPLETED BY: CD	**PROJECT/REASON FOR SURVEY:**		

HABITAT TYPES *(Adds up to 100%)*	**Indicate the percentage of each habitat type present:** Riffles 50 % Snags 10 % Banks/ root mats 15 % Leaf packs 10 % Soft/Sandy sediment 15 % Submerged Macrophytes 0 % Other (_____) ____ %
SAMPLE COLLECTION	Gear used: **D-frame, 500 µm net** How were the samples collected? **Wading** **Indicate the number of jabs/kicks taken in each habitat type:** Riffles (fast) 3 Riffles (slow) 3 Snags 5 Banks/ root mats 3 Soft/Sandy sediment 3 Leaf packs 3 Submerged Macrophytes (when present, up to 3 jabs) 0 Other (_____) ____ **Total # of Jabs:** 20 **# of Jabs Reallocated (if any):** 0 **Total # of Bottles collected:** _____
GENERAL COMMENTS	All habitat types were available.
PHOTOS (If any taken)	

ESTIMATED ABUNDANCE / QUALITATIVE LISTING OF AQUATIC BIOTA

***Indicate estimated abundance*:** **0 = Absent/Not Observed** **1 = Rare** **2 = Common** **3 = Abundant** **4 = Dominant**

Periphyton	0 1 (2) 3 4	Slimes	(0) 1 2 3 4
Filamentous Algae	(0) 1 2 3 4	Macroinvertebrates	0 (1) 2 3 4
Macrophytes	(0) 1 2 3 4	Fish	0 1 2 (3) 4

ESTIMATED ABUNDANCE / FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance:
0 = Absent/Not Observed **1 = Rare (1-3 organisms** **2 = Common (3-9 organisms)**
3= Abundant (>10 organisms) **4 = Dominant (>50 organisms)**

Porifera	0 1 2 3 4	Anisoptera(Dra)	0 1 2 3 4	Trichoptera	0 1 2 3 4
Hydrozoa	0 1 2 3 4	Zygoptera	0 1 2 3 4	Ephemeroptera	0 1 2 3 4
Platyhelminthes	0 1 2 3 4	Hemiptera	0 1 2 3 4	Plecoptera	0 1 2 3 4
Turbellaria	0 1 2 3 4	Coleoptera	0 1 2 3 4	Megaloptera	0 1 2 3 4
Hirudinea	0 1 2 3 4	Lepidoptera	0 1 2 3 4	Sialidae	0 1 2 3 4
Oligochaeta	0 1 2 3 4	Tipulidae	0 1 2 3 4	Corydalidae	0 1 2 3 4
Isopoda	0 1 2 3 4	Empididae	0 1 2 3 4	Other	0 1 2 3 4
Amphipoda	0 1 2 3 4	Simuliidae	0 1 2 3 4		
Decapoda	0 1 2 3 4	Tabanidae	0 1 2 3 4		
Gastropoda	0 1 2 3 4	Culicidae	0 1 2 3 4		
Bivalvia	0 1 2 3 4	Chironomidae	0 1 2 3 4		

Biological *In situ* and Grab Sample Water Chemistry Field Sheet (Front)

STREAM NAME: Long Island Cr.		**MON LOC ID:** LI-2	
BIO SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**	
LATITUDE (DD):	**LONGITUDE (DD):**		
START TIME: 12:50	**END TIME:**	**TIME ZONE:** EST or EDT	
INVESTIGATORS: JP CD			
FIELD MEASURER/COLLECTOR: JP	**FIELD RECORDER:** JP		
EPD OFFICE: WP1–Atlanta	WP2–Brunswick	WP3–Cartersville	WP4–Tifton
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measurement/Observation	Field Replicate Msr/Obs	
COMPOSITE TYPE: Horizontal Single	Horizontal Multi	None (Grab)	
PROJECT/REASON FOR SURVEY:			

In-situ Field Chemistry Data			
Water Temperature: 12.5	° C	**Model of Sonde:**	
Air Temperature:	° C	**Serial # of Unit:**	
Specific Conductance: 169	(µmhos/cm)	**Salinity:** 0.08	PPT ~~PPB~~
Dissolved Oxygen (mg/L): 8.67		**Dissolved Oxygen:** 83.2	%
pH: 7.05		**Battery Volts:**	
Turbidity: 7.5	NTU	**Turbidity Instrument #:**	

In- situ Handheld Fluorometer Measurements	
Benthic Chlorophyll *a* Bottle #:	**Notes:**
In Vivo Reading (ppb): (Water Column Chlorophyll *a*)	***Diatom Sample Reading (ppb):*** (Benthic Chlorophyll *a*)

Grab Water Quality Filtering				
Parameter	**Time Frozen:**	**Filtered By:**	**# of Filters:**	**Volume filtered (ml):**
Chlorophyll *a*				

STREAM CHARACTERIZATION (Circle All that Apply)							
SALINE TYPE:	Brackish	Fresh	Saline	Unsure			
WATER APPEARANCE:	Blackwater	Clearwater	Unsure	Unsure/Black	Unsure/Clear		
STREAM ORIGIN:	Mixture of Origins	Spring Fed	Swamp/Bog	Unsure/Unknown	Other_____		
WATER CLARITY:	Clear	Slightly Turbid	Turbid	Stained	Opaque	Other_____	
STREAM SUBSYSTEM:	Ephemeral	Intermittent	Perennial	Tidal	Unsure/Unknown		
TIDAL CYCLE:	1/4 ebb	1/2 ebb	3/4 ebb	Low Tide	1/4 flood	1/2 flood	3/4 flood	High Tide	N/A
STREAM TYPE:	Coldwater	Warmwater					
WATER COLOR:	Clear	Foamy (natural or pollution)	Green (algal coloration evident)	Other_____			
	Tannic (Tea-colored)	Muddy (cloudy brown)	Milky (cloudy white or gray)	Other_____			
DOMINANT SUBSTRATE(S):	Bedrock	Boulders	Cement	Clay	Cobble	Boulders/RipRap	
	Concrete	Fines	Gravel	Hardpan	Sand	Silt	Other_____

VISUAL CONDITIONS (Circle Items from List)			
WATER LEVEL/FLOW:	Normal	Above Normal	Normal, but no Velocity
	Low	Flood	Drought Impact
WEATHER PAST 24 HOURS (circle and fill in all that apply):	_____% Cloud Cover	Clear (0% cloud cover)/Sunny	Rain (Steady Rain)
	Showers (intermittent)	Storm (heavy rain)	Snow
	Unsure (past)		
WEATHER NOW (circle and fill in all that apply):	_____% Cloud Cover	Clear (0% cloud cover) /Sunny	Rain (Steady Rain)
	Showers (intermittent)	Storm (heavy rain)	Snow

SUBSTRATE PARTICLE COUNT FIELD SHEET

STREAM NAME: Long Island Cr.		**DATE:** 11-20-18	**START TIME:** 12:50	**END TIME:**	
MON LOC ID: LI-20	**BIO SITE ID:**	**TIME ZONE:** EST EDT		**GPS ERROR: +/- (ft):**	
MEASURER: JP	**RECORDER:** JP	**LATITUDE:**		**LONGITUDE:**	
INVESTIGATORS: JP CD					
SAMPLE TYPE: Targeted Probabilistic		**ACTIVITY TYPE:** Field Measure/Observation Field Replicate Msr/Obs			
EPD OFFICE: WP1–Atlanta WP2–Brunswick WP3–Cartersville WP4–Tifton					
WATER APPEARANCE: Blackwater Clearwater Unsure Unsure/Black Unsure/Clear					
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A					
PROJECT/REASON FOR SURVEY:					
COMMENTS:					

				Total Transects:		
Inches	**Particle**	**Millimeter**		**Particle Count**	**TOTAL #**	**% Cum**
	Silt/Clay	<.062	S/C			
	Very Fine	0.062-0.125	S			
	Fine	0.126-0.25	A			
	Medium	0.26-0.50	N	III	3	
	Coarse	0.51-1.0	D	~~IIII~~ ~~IIII~~ ~~IIII~~	15	
	Very Coarse	1.01-2.0	S	~~IIII~~ III	8	26
.08-.16	Very Fine	2.01-4		I	1	
.17-.24	Fine	4.01-6	G			
.25-.31		6.01-8	R	III	3	
.32-.47	Medium	8.01-12	A	IIII	4	
.48-.63		12.01-16	V	III	3	
.64-.94	Coarse	16.01-24	E	~~IIII~~ ~~IIII~~	10	
.95-1.26		24.01-32	L	~~IIII~~ ~~IIII~~ IIII	14	
1.27-1.9	Very Coarse	32.01-48	S	~~IIII~~ I	6	
1.91-2.5		48.01-64		~~IIII~~ III	8	75
2.51-3.8	Small	64.01-96	C	~~IIII~~ I	6	
3.81-5.0		96.01-128	O	~~IIII~~	5	
5.01-7.6	Large	128.01-192	B	II	2	
7.61-10		192.01-256	L	III	3	91
10.01-15	Small	256.01-384	B			
15.01-20		384.01-512	L			
20.01-40	Medium	512.01-1024	D			
40.01-160	Lrg -Very Lrg	1024.01-4096	R			
	Bedrock		BD	~~IIII~~ IIII	9	100
				TOTALS	100	100

*** % Cumulative = % Cumulative for each substrate type (silt/clay, sands, gravels, cobbles, boulders, or bedrock)**

Discharge/Cross Section Field Sheet

Stream Name: Long Island Cr.	**Date:** 11-20-18	**Start Time:** 12:50	**End Time:**
EPD Office: WP1–Atlanta WP2–Brunswick WP3–Cartersville WP4–Tifton		**Time Zone** EST EDT	
Mon Loc ID: LI-2	**File Name:**	**Recorder:** JP	**Measurer:** JP
Investigators: JP CD		**Project/Reason for Survey:**	
Instrument #:	**Latitude:**	**Longitude:**	**GPS Error: +/-** _____ **(ft)**
Location Comments:		**Tape reading @ Water Starting Edge (ft):**	**Water Ending Edge (ft):**
Compass Direction of Tag Line: ____ °	**Bank Start (Facing DS) :** LB to RB RB to LB	**Point A Pin Location:** Left Bank Right Bank	
Water Appearance: Blackwater Clearwater Unsure Unsure/Black Unsure/Clear		**Stream Wadeable?:** Yes No	
Tidal Cycle: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
Start Tape Down (ft):	**End Tape Down (ft):**	**Start Staff Gage Height (ft):**	**End Staff Gage Height (ft):**
Sampling Type: Targeted Probabilistic	**Camera:**	**Photo #s: US: DS: LB: RB:**	
XS Benchmark #1:		**Photo #s:**	**Direction:** / **Distance (feet):**
XS Benchmark #2:		**Photo #s:**	**Direction:** / **Distance (feet):**
Other Photos/Locations/Description:		**Activity Type:** Routine Replicate	

NOTE: For depths 2.5 feet or deeper- velocity readings should be taken at 0.2 and 0.8 depth.

Pre-Deployment Diagnostics					Setup Parameters					
Recorder status	**H2O T (F°)**	**%BATTERY**	**Raw Data**	**Time Changed?** Yes No	**Units** Standard	**Averaging time (sec)** 40	**Data Collection Mode** Discharge			**Salinity**
Station #	1 0	2 3	3 5	4 7	5 9	6 12	7 12.1	8 15	9 18	10 21
Location on Tape	0	0.7	1.8	3.5	5.1	7.1	7.4 W.E.	8.5	9.2	9.7
Water Depth								1.1	1.8	2.3
Velocity .2										
Velocity .6										
Velocity .8										
Station #	11 24	12 27	13 30	14 33	15 36	16 39	17 42	18 45	19 48	20 50
Location on Tape	9.7	9.7	9.8	10.0	9.6	9.0	8.1	7.6	7.5	7.4
Water Depth	2.3	2.3	2.4	2.6	2.2	1.6	0.7	0.2	0.1	W.E
Velocity .2										
Velocity .6										
Velocity .8										
Station #	21 54	22 57	23 61	24 64	25 65.7	26 67.9	27	28	29	30
Location on Tape	5.6	5.0	4.8	2.8	1.3	1.1				
Water Depth										
Velocity .2										
Velocity .6										
Velocity .8										

Tot Discharge:	9.4 cfs	**Mean Velocity:**	0.84 ft/s	**Tot Width:**	14 Ft	depth = 0.8'	**Tot Area:**

Comments: Flows taken u/s of X-section in area of more rep. flow

Bio Site ID: _____

Units: Discharge - ft^3/s Velocity – ft/s Width – ft Area – ft^2 Location on Tape – ft Water Depth -ft

Revision Date 03-22-2016

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME: Long Island Cr.		**MON LOC ID:** LI-2	
BIO SITE ID:		**DATE:** 11.20.18	
START TIME: 12:50	**END TIME:**	**TIME ZONE:** EST or EDT	
FORM COMPLETED BY/ASSESSOR: JP			
COMMENTS:			

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Note: Look at substrate in run areas.	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization (straigtening) or dredging absent or minimal; stream with normal pattern.	Some channelization or shoring structures present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream ≤7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstructions are important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 8 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 16 to 25.	Generally all flat water or shallow riffles, occasional bend; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 116

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME: Long Island Cr.		**MON LOC ID:** LI-2	
BIO SITE ID:		**DATE:** 11.20.18	
START TIME:	**END TIME:**	**TIME ZONE:** EST or EDT	
FORM COMPLETED BY/ASSESSOR: CD			
COMMENTS:			

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness Note: Look at substrate in run areas.	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization (straigtening) or dredging absent or minimal; stream with normal pattern.	Some channelization or shoring structures present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream ≤7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstructions are important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 8 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 16 to 25.	Generally all flat water or shallow riffles, occasional bend; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 120

HIGH GRADIENT HABITAT ASSESSMENT AVERAGE

STREAM NAME: Long Island Cr.		**MON LOC ID:** LI-2	
BIO SITE ID:	**DATE:** 11.20.18	**FORM COMPLETED BY:**	
LATITUDE (DD):	**LONGITUDE (DD):**	**GPS ERROR (+/-) ft.:**	
START TIME:	**END TIME:**	**TIME ZONE:** EST EDT	
INVESTIGATORS:			
EPD OFFICE: WP1–Atlanta	WP2–Brunswick	WP3–Cartersville	WP4–Tifton
SAMPLE TYPE: Targeted	Probabilistic	**ACTIVITY TYPE:** Field Msr/Obs Habitat	Field Replicate Habitat
WATER APPEARANCE: Blackwater	Clearwater	Unsure	Unsure/Black Unsure/Clear
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
PROJECT/REASON FOR SURVEY:	**COMMENTS:**		

Habitat Parameter Scores	Habitat Parameter Scores	Habitat Parameter Scores	AVERAGE
ASSESSOR : JP	**ASSESSOR :**	**ASSESSOR :** CD	
1. Epifaunal Substrate/ Instream Cover 13	1. Epifaunal Substrate/ Instream Cover	1. Epifaunal Substrate/ Instream Cover 14	13.5
2. Embeddedness 11	2. Embeddedness	2. Embeddedness 11	11
3. Velocity/Depth Regime 16	3. Velocity/Depth Regime	3. Velocity/Depth Regime 16	16
4. Sediment Deposition 10	4. Sediment Deposition	4. Sediment Deposition 10	10
5. Channel Flow Status 13	5. Channel Flow Status	5. Channel Flow Status 14	13.5
6. Channel Alteration 15	6. Channel Alteration	6. Channel Alteration 16	15.5
7. Frequency of Riffles (or bends) 9	7. Frequency of Riffles (or bends)	7. Frequency of Riffles (or bends) 9	9
8. Bank Stability LB 5 RB 5	8. Bank Stability LB RB	8. Bank Stability LB 6 RB 6	LB 5.5 RB 5.5 Total 11
9. Bank Vegetative Protection LB 5 RB 5	9. Bank Vegetative Protection LB RB	9. Bank Vegetative Protection LB 5 RB 5	LB 5 RB 5 Total 10
10. RiparianVegetative Zone Width LB 5 RB 4	10. RiparianVegetative Zone Width LB RB	10. RiparianVegetative Zone Width LB 4 RB 4	LB 4.5 RB 4 Total 8.5
Total Score: 116	**Total Score:**	**Total Score:** 120	**TOTAL AVERAGE SCORE:** 118
Comments:	Comments:	Comments:	

NOTE: When you average each parameter it must be a whole number. Use normal rounding procedures. Individually round each LB and RB score before totaling the final parameter score.

Revision Data 12-08-2015

PHYSICAL CHARACTERIZATION AND WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME: Marsh Cr.		**MON LOC ID:** MA-1
BIO SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**
LATITUDE (DD):	**LONGITUDE (DD):**	
START TIME: 11:35	**END TIME:**	**TIME ZONE:** EST EDT
INVESTIGATORS: JP CD		
EPD OFFICE: WP1–Atlanta	WP2–Brunswick	WP3–Cartersville WP4–Tifton
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measure/Observation Field Replicate Msr/Obs	
FORM COMPLETED BY: JP	**PROJECT/REASON FOR SURVEY:**	

STREAM CHARACTERIZATION (Circle Items from List)

STREAM TYPE:	Coldwater Warmwater **Refer to GA EPD Water Quality Standards in GA Rules and Regulations.**
SALINE TYPE:	Brackish Fresh Saline Unsure
WATER APPEARANCE:	Blackwater Clearwater Unsure Unsure/Black Unsure/Clear
TIDAL CYCLE:	1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A
STREAM ORIGIN:	Mixed Origin Spring Fed Swamp/Bog Unsure/Unknown Other_____
STREAM SUBSYSTEM:	Ephemeral Intermittent Perennial Tidal Unsure/Unknown

VISUAL CONDITIONS (Circle Items from List)

WATER LEVEL/FLOW:	Normal Low	Above Normal Flood	Normal, but no Velocity Drought Impact
WEATHER NOW (circle and fill in all that apply):	_____% Cloud Cover Showers (intermittent)	Clear (0% cloud cover)/Sunny Storm (heavy rain)	Rain (Steady Rain) Snow
WEATHER PAST 24 HOURS (circle or fill in all that apply):	_____% Cloud Cover Showers (intermittent)	Clear (0% cloud cover)/Sunny Storm (heavy rain)	Rain (Steady Rain) Snow Unsure (past)
Heavy rain in the last 7 days?	Yes No	**Heavy rain in the last 24 hours?**	Yes No

WATER QUALITY (Circle Items from List)

WATER ODORS:	Normal/None	Petroleum	Fishy	Sewage	Chemical	Other_____
WATER COLOR /APPEARANCE:	Clear	Foamy (natural or pollution) Tannic (Tea-colored)	Green (algal coloration evident) Milky (cloudy white or gray)			Other_____ Muddy (cloudy brown)
WATER SURFACE OILS:	None	Sheen	Globs	Flecks	Slick	Other_____
TURBIDITY (visual observation):	Clear	Slightly Turbid	Turbid	Stained	Opaque	Other_____

SEDIMENT/SUBSTRATE (Circle Items from List)

ODOR:	None	Normal	Sewage	Chemical	Anaerobic	Petroleum Other_____
DEPOSITS:	None Relict Shells	Sludge Clay	Sawdust Organics	Paper Fiber Silt	Sand Other_____	Petroleum
OILS:	Absent	Moderate	Profuse	Slight		
UNDERSIDES OF LOOSE STONES BLACK IN COLOR?:	Yes	No	N/A			
PREDOMINANT SUBSTRATE(S):	Bedrock Concrete	Boulders Fines	Cement Gravel	Clay Hardpan	Cobble Sand	Boulders/RipRap Silt Other_____

ORGANIC SUBSTRATE COMPONENTS (Enter Number - does not necessarily add up to 100%)

Substrate Type (Indicate if 0%):	**% Composition in Sampling Area:**
Detritus – Coarse Particulate Organic Matter - sticks, wood, coarse plants	<5
Muck/Mud – Fine Particulate Organic Matter – black, very fine organics	
Marl – Gray, Shell Fragments	

COMMENTS (Include Impacts and TMDL Info.):

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

RIPARIAN ZONE/INSTREAM FEATURES (Circle All Applicable from List OR Enter Number)

PREDOMINANT LAND USE: (watershed wide land use)

Agricultural (Unspecified)	Agriculture and Mining	Ag Row Crops
Pasture (Unspecified)	Livestock	Cropland
Residential	Rural Residential	Urban
Commercial	Industrial	Mining
Planted Pine (Silviculture)	Selective Cut	Old Growth Forest
Forest (Unspecified)	Mature Timber (40+ years)	Forest Fire
Clear-cut Forest (<10 yrs)	Second Growth Forest (10-40 years)	Wetland
Heavy Grazing Pressure (trampled)	Light Grazing Pressure (cow pies/not trampled)	

Other(s):

LOCAL WATERSHED NPS POLLUTION: No Evidence | Some Potential Sources | Obvious Sources

CANOPY COVER: Open (0-10%) | Partly Open (11-45%) | Partly Shaded (46-80%) | Shaded (81-100%) 10-65%

LOCAL WATER EROSION: None | Light | Moderate | Heavy

BEAVER ACTIVITY OBSERVATIONS: (If active dam in reach, do not sample.)

Inactive Beaver Dam, Little Effect on Stream	No Beaver Activity Evident
Old Beaver Dam Activity, Little Effect	Inactive Beaver Dam Affecting Stream
Beaver Cutting Evident, Little Effect on Stream	Active Beaver Dam Affecting Stream
Active Beaver Dam not Affecting Stream (downstream of reach)	

LIVESTOCK DAMAGE OBSERVATIONS:

No Livestock Damage	Stable (0-25% Damage, Little/No Erosion)
Moderate (26-50% Damage, <50% Plant Biomass)	High (51-75% Damage, <25% Plant Biomass)
Severe (76-100% Damage, Little/No Plant Biomass Remains)	

HIGH WATER MARK: 2 (ft) | **AVERAGE STREAM WIDTH:** 14 (ft) (6-20')

AVERAGE STREAM DEPTH FOR EACH: Riffle 0.1 (ft) Run/Glide 0.4 (ft) Pool 2 (ft) (1'-2.5')

% EACH MORPHOLOGICAL TYPE (Adds up to 100%): Riffle 60 % Run/Glide 30 % Pool 10 %

STREAM CHANNELIZED?: Yes No | **IF YES, REACH LENGTH CHANNELIZED:** Full Partial

STREAM DREDGING?: Yes No | **RECENT RESTORATION CONDUCTED (last 10 years):** Yes No

DAM PRESENT?: Yes No | **IF DAM PRESENT:** Upstream Downstream In Stream Reach

RIPARIAN VEGETATION (18 meter buffer) (Circle Items from List)

PREDOMINANT TYPE: Trees Shrubs Grasses Herbaceous Other

PREVALENT RIPARIAN VEGETATION COMPOSITION (circle all that apply):

Coniferous Dominated (canopy more than 50% conifer)	Annual Grasses and Herbs
Deciduous trees (Alder, Cottonwood, Maple)	Mixed Conifer and Deciduous
Forested (dominated by trees, with brushy understory)	No Vegetation (bare soil, rock) — RB (sewer R-O-W)
Grass (bank covered with tall grasses, sedges, etc.)	Perennial and Mixed Tree Species
Perennial Grasses, Forbs, Sedges, and Rushes	Perennial and Shrubs
Shrubs (Willow, Salmonberry, some Alder)	Shrubs and Mixed Tree Species

PREVALENT RIPARIAN VEGETATION SPECIES (circle all that apply):

American Beech	Ash	Bamboo	Bamboo Grass	Bay Magnolia	Birch
Cedar	Bay	Black Gum	Black Locust	Box Elder	Fern
Cherry	Cane	Cypress	Dogwood	Elder	Honeysuckle
Green Ash	Elm	Hemlock	Hickory	Holly	Magnolia
Ironwood	Fir	Kudzu	Live Oak	Loblolly Pine	Persimmon
Mountain Laurel	Oak	Microstegium	Mimosa	Maple	Redbud
Poplar	Pine	Privet	Red Maple	Red Oak	Spanish Moss
Rhododendron	Tupelo	River Birch	River Cane	Saw Palmetto	Tag Alder
Short Leaf Pine	Walnut	Sweet Bay	Sweet Gum	Sycamore	Wax Myrtle
Swamp Tupelo	White Oak	Turkey Oak	Water Oak	White Pine	Willow
Willow Oak	Other(s)				

AQUATIC VEGETATION (Circle Items from List)

PREDOMINANT TYPE: None | Attached Algae | Floating Algae | Free Floating | Rooted Emergent | Rooted Floating | Rooted Submergent | Other

PORTION OF REACH COVERED BY AQUATIC VEGETATION: 30-40 %

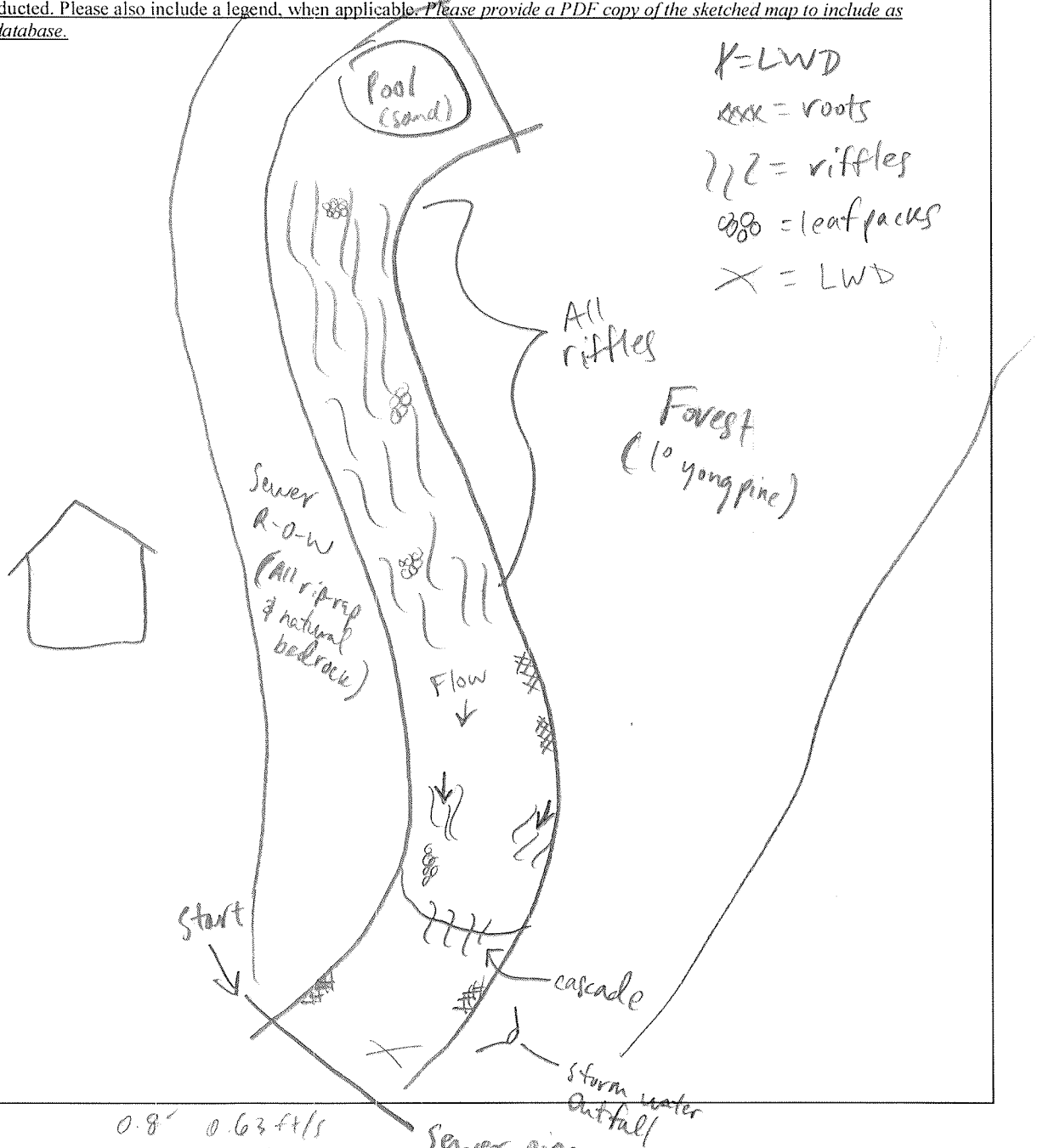
PREVALENT AQUATIC VEGETATION SPECIES:

Arrowhead	Brown Algae	Cattail	Filamentous Algae
Foxtail	Green Algae	Hydrilla	Iron bacteria/Algae
Lemna	Moss	Parrot Feather	Sagittaria
Vallisneria	No Aquatic Vegetation	Other(s)	

PHYSICAL CHARACTERIZATION MAP SKETCH (MAP)

STREAM NAME: Marsh Cr.		**MON LOC ID:** MA-1	
BIO SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**	
LATITUDE (DD):		**LONGITUDE (DD):**	
START TIME: 1:35	**END TIME:**	**TIME ZONE:**	EST EDT
INVESTIGATORS:			
EPD OFFICE: Atlanta Brunswick Cartersville Tifton		**MAP SKETCH ATTACHED:**	Yes No
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measure/Observation Field Replicate Msr/Obs		
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
MAP/FORM COMPLETED BY: JP	**PROJECT/REASON FOR SURVEY:**		

SITE LOCATION/MAP:
Draw a map (including bends in stream when applicable) of the site and indicate Areas Sampled, Habitats, Land Use on LB and RB, Plants, Discharge Conducted. Please also include a legend, when applicable. *Please provide a PDF copy of the sketched map to include as attachment in database.*



0.8' 0.63 ft/s
0.8 0.64
0.4 0.67
0.7' 0.65 ← × 16'(w) =

Revision Date 03-22-2016

WATERSHED ASSESSMENT BENTHIC MACROINVERTEBRATE COLLECTION FIELD DATA SHEET

STREAM NAME: Marsh Cr.		**MON LOC ID:** MA-1	
WA SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**	
LATITUDE (DD):		**LONGITUDE (DD):**	
START TIME: 11:35	**END TIME:**	**TIME ZONE:** (EST) EDT	
INVESTIGATORS: JP CD			
FIELD COLLECTOR: CD		**FIELD PROCESSOR:** CD	
SAMPLE TYPE: Targeted	**PROJECT:** Watershed Assessment	**ACTIVITY TYPE:** Routine Replicate	
WATER APPEARANCE: Blackwater Clearwater Unsure Unsure/Black Unsure/Clear			
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
GRADIENT: High Gradient Low Gradient		**REALLOCATED:** Yes No	
FORM COMPLETED BY: CD	**PROJECT/REASON FOR SURVEY:**		

HABITAT TYPES *(Adds up to 100%)*	**Indicate the percentage of each habitat type present:** Riffles 70 % Snags 5 % Banks/ root mats 5 % Leaf packs 10 % Soft/Sandy sediment 10 % Submerged Macrophytes ____ % Other (____) ____ %
SAMPLE COLLECTION	Gear used: **D-frame, 500 µm net** How were the samples collected? **Wading**
	Indicate the number of jabs/kicks taken in each habitat type: Riffles (fast) 4 Riffles (slow) 4 Snags 1 Banks/ root mats 3 Soft/Sandy sediment 4 Leaf packs 4 Submerged Macrophytes (when present, up to 3 jabs) 0 Other (____) ____
	Total # of Jabs: 20 **# of Jabs Reallocated (if any):** 4 **Total # of Bottles collected:** ____
GENERAL COMMENTS	Site lacks Earthen banks and contains few root wads and undercut banks. Exposed bedrock and boulders make up stream banks.
PHOTOS (If any taken)	

ESTIMATED ABUNDANCE / QUALITATIVE LISTING OF AQUATIC BIOTA

***Indicate estimated abundance*:** **0 = Absent/Not Observed** **1 = Rare** **2 = Common** **3 = Abundant** **4 = Dominant**

Periphyton	0 1 (2) 3 4	Slimes	(0) 1 2 3 4
Filamentous Algae	(0) 1 2 3 4	Macroinvertebrates	(0) 1 2 3 4
Macrophytes	(0) 1 2 3 4	Fish	(0) 1 2 3 4

ESTIMATED ABUNDANCE / FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance:
0 = Absent/Not Observed **1 = Rare (1-3 organisms** **2 = Common (3-9 organisms)**
3= Abundant (>10 organisms) **4 = Dominant (>50 organisms)**

Porifera	0 1 2 3 4	Anisoptera(Dra)	0 1 2 3 4	Trichoptera	0 1 2 3 4
Hydrozoa	0 1 2 3 4	Zygoptera	0 1 2 3 4	Ephemeroptera	0 1 2 3 4
Platyhelminthes	0 1 2 3 4	Hemiptera	0 1 2 3 4	Plecoptera	0 1 2 3 4
Turbellaria	0 1 2 3 4	Coleoptera	0 1 2 3 4	Megaloptera	0 1 2 3 4
Hirudinea	0 1 2 3 4	Lepidoptera	0 1 2 3 4	Sialidae	0 1 2 3 4
Oligochaeta	0 1 2 3 4	Tipulidae	0 1 2 3 4	Corydalidae	0 1 2 3 4
Isopoda	0 1 2 3 4	Empididae	0 1 2 3 4	Other	0 1 2 3 4
Amphipoda	0 1 2 3 4	Simuliidae	0 1 2 3 4		
Decapoda	0 1 2 3 4	Tabanidae	0 1 2 3 4		
Gastropoda	0 1 2 3 4	Culicidae	0 1 2 3 4		
Bivalvia	0 1 2 3 4	Chironomidae	0 1 2 3 4		

Biological *In situ* and Grab Sample Water Chemistry Field Sheet (Front)

STREAM NAME: Marsh Cr.		**MON LOC ID:** MA-1	
BIO SITE ID:	**DATE:** 11.20.18	**GPS ERROR (+/-) ft:**	
LATITUDE (DD):	**LONGITUDE (DD):**		
START TIME: 11:35	**END TIME:**	**TIME ZONE:** EST or EDT	
INVESTIGATORS: JP CD			
FIELD MEASURER/COLLECTOR: JP	**FIELD RECORDER:** JP		
EPD OFFICE: WP1–Atlanta	WP2–Brunswick	WP3–Cartersville	WP4–Tifton
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Measurement/Observation	Field Replicate Msr/Obs	
COMPOSITE TYPE: Horizontal Single	Horizontal Multi	None (Grab)	
PROJECT/REASON FOR SURVEY:			

***In-situ* Field Chemistry Data**	
Water Temperature: 12.4 ° C	**Model of Sonde:**
Air Temperature: ° C	**Serial # of Unit:**
Specific Conductance: 113 (µmhos/cm) µS/cm	**Salinity:** 0.05 PPT ~~PPB~~
Dissolved Oxygen (mg/L): 8.68	**Dissolved Oxygen:** 83.3 %
pH: 6.95	**Battery Volts:**
Turbidity: 5.6 NTU	**Turbidity Instrument #:**

***In- situ* Handheld Fluorometer Measurements**	
Benthic Chlorophyll *a* Bottle #:	**Notes:**
In Vivo Reading (ppb): (Water Column Chlorophyll *a*)	***Diatom Sample Reading (ppb):*** (Benthic Chlorophyll *a*)

Grab Water Quality Filtering				
Parameter	**Time Frozen:**	**Filtered By:**	**# of Filters:**	**Volume filtered (ml):**
Chlorophyll *a*				

STREAM CHARACTERIZATION (Circle All that Apply)							
SALINE TYPE:	Brackish	Fresh	Saline	Unsure			
WATER APPEARANCE:	Blackwater	Clearwater	Unsure	Unsure/Black	Unsure/Clear		
STREAM ORIGIN:	Mixture of Origins	Spring Fed	Swamp/Bog	Unsure/Unknown	Other_____		
WATER CLARITY:	Clear	Slightly Turbid	Turbid	Stained	Opaque	Other_____	
STREAM SUBSYSTEM:	Ephemeral	Intermittent	Perennial	Tidal	Unsure/Unknown		
TIDAL CYCLE:	1/4 ebb	1/2 ebb	3/4 ebb	Low Tide	1/4 flood	1/2 flood	3/4 flood	High Tide	N/A
STREAM TYPE:	Coldwater	Warmwater					
WATER COLOR:	Clear	Foamy (natural or pollution)	Green (algal coloration evident)	Other_____			
	Tannic (Tea-colored)	Muddy (cloudy brown)	Milky (cloudy white or gray)	Other_____			
DOMINANT SUBSTRATE(S):	Bedrock	Boulders	Cement	Clay	Cobble	Boulders/RipRap	
	Concrete	Fines	Gravel	Hardpan	Sand	Silt	Other_____

VISUAL CONDITIONS (Circle Items from List)			
WATER LEVEL/FLOW:	Normal	Above Normal	Normal, but no Velocity
	Low	Flood	Drought Impact
WEATHER PAST 24 HOURS (circle and fill in all that apply):	_____% Cloud Cover	Clear (0% cloud cover)/Sunny	Rain (Steady Rain)
	Showers (intermittent)	Storm (heavy rain)	Snow
	Unsure (past)		
WEATHER NOW (circle and fill in all that apply):	_____% Cloud Cover	Clear (0% cloud cover) /Sunny	Rain (Steady Rain)
	Showers (intermittent)	Storm (heavy rain)	Snow

SUBSTRATE PARTICLE COUNT FIELD SHEET

STREAM NAME: Marsh Cr.		**DATE:** 11.20.18	**START TIME:** 11:35	**END TIME:**	
MON LOC ID: MA-1	**BIO SITE ID:**	**TIME ZONE:** EST	EDT	**GPS ERROR: +/- (ft):**	
MEASURER: JP	**RECORDER:** JP	**LATITUDE:**		**LONGITUDE:**	
INVESTIGATORS: JP CD					
SAMPLE TYPE: Targeted	Probabilistic	**ACTIVITY TYPE:**	Field Measure/Observation	Field Replicate Msr/Obs	
EPD OFFICE:	WP1–Atlanta	WP2–Brunswick	WP3–Cartersville	WP4–Tifton	
WATER APPEARANCE:	Blackwater	Clearwater	Unsure	Unsure/Black	Unsure/Clear
TIDAL CYCLE:	1/4 ebb	1/2 ebb	3/4 ebb	Low Tide	1/4 flood	1/2 flood	3/4 flood	High Tide	N/A
PROJECT/REASON FOR SURVEY:					
COMMENTS:					

				Total Transects:		
Inches	**Particle**	**Millimeter**		**Particle Count**	**TOTAL #**	**% Cum**
	Silt/Clay	<.062	S/C			
	Very Fine	0.062-0.125	S			
	Fine	0.126-0.25	A			
	Medium	0.26-0.50	N	~~IIII~~	5	
	Coarse	0.51-1.0	D	IIII	3	
	Very Coarse	1.01-2.0	S	I	1	9
.08-.16	Very Fine	2.01-4		I	1	
.17-.24	Fine	4.01-6	G	II	2	
.25-.31		6.01-8	R			
.32-.47	Medium	8.01-12	A	II	2	
.48-.63		12.01-16	V	II	2	
.64-.94	Coarse	16.01-24	E	III	3	
.95-1.26		24.01-32	L	~~IIII~~ I	6	
1.27-1.9	Very Coarse	32.01-48	S	IIII	4	
1.91-2.5		48.01-64		~~IIII~~ IIII	9	38
2.51-3.8	Small	64.01-96	C	~~IIII~~ I	7	
3.81-5.0		96.01-128	O	~~IIII~~ ~~IIII~~ III	13	
5.01-7.6	Large	128.01-192	B	~~IIII~~ IIII	9	
7.61-10		192.01-256	L	IIII	4	71
10.01-15	Small	256.01-384	B	~~IIII~~	5	
15.01-20		384.01-512	L	I	1	
20.01-40	Medium	512.01-1024	D			
40.01-160	Lrg -Very Lrg	1024.01-4096	R			77
	Bedrock		BD	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~III~~	23	100
				TOTALS	100	100

*** % Cumulative = % Cumulative for each substrate type (silt/clay, sands, gravels, cobbles, boulders, or bedrock)**

Discharge/Cross Section Field Sheet

Stream Name: Marsh Cr.	**Date:** 11.20.18	**Start Time:** 11:35	**End Time:**
EPD Office: WP1–Atlanta WP2–Brunswick WP3–Cartersville WP4–Tifton		**Time Zone** EST EDT	
Mon Loc ID: MA-1	**File Name:**	**Recorder:** JP	**Measurer:** JP
Investigators: JP CD	**Project/Reason for Survey:**		
Instrument #:	**Latitude:**	**Longitude:**	**GPS Error: +/-** _____ **(ft)**
Location Comments:	**Tape reading @ Water Starting Edge (ft):**	**Water Ending Edge (ft):**	
Compass Direction of Tag Line: ____°	**Bank Start (Facing DS) :** LB to RB RB to LB	**Point A Pin Location:** Left Bank Right Bank	
Water Appearance: Blackwater Clearwater Unsure Unsure/Black Unsure/Clear	**Stream Wadeable?:** Yes No		
Tidal Cycle: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
Start Tape Down (ft):	**End Tape Down (ft):**	**Start Staff Gage Height (ft):**	**End Staff Gage Height (ft):**
Sampling Type: Targeted Probabilistic	**Camera:**	**Photo #s: US: DS: LB: RB:**	
XS Benchmark #1:	**Photo #s:**	**Direction:**	**Distance (feet):**
XS Benchmark #2:	**Photo #s:**	**Direction:**	**Distance (feet):**
Other Photos/Locations/Description:	**Activity Type:** Routine Replicate		

NOTE: For depths 2.5 feet or deeper- velocity readings should be taken at 0.2 and 0.8 depth.

Pre-Deployment Diagnostics					**Setup Parameters**					
Recorder status	**H2O T (F°)**	**%BATTERY**	**Raw Data**	**Time Changed?**	**Units**	**Averaging time (sec)**	**Data Collection Mode**			**Salinity**
				Yes No	Standard	40	Discharge			
Station #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Location on Tape										
Water Depth										
Velocity .2										
Velocity .6										
Velocity .8										
Station #	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Location on Tape										
Water Depth										
Velocity .2										
Velocity .6										
Velocity .8										
Station #	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Location on Tape										
Water Depth										
Velocity .2										
Velocity .6										
Velocity .8										
Tot Discharge: 7.3 cfs	**Mean Velocity:** 0.65 ft/s				**Tot Width:** 16' Avg Dep = 0.7		**Tot Area:**			

Comments: Too much rock & rip-rap on RB to hammer rebar into, so no x-section; much of lower LB composed of rock outcrop

Bio Site ID: _____

Units: Discharge - ft³/s Velocity – ft/s Width – ft Area – ft² Location on Tape – ft Water Depth -ft

Revision Date 03-22-2016

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME: Marsh Cr.		**MON LOC ID:** MA-1	
BIO SITE ID:		**DATE:** 11-20-18	
START TIME: 11:35	**END TIME:**	**TIME ZONE:** EST or EDT	
FORM COMPLETED BY/ASSESSOR: JP			
COMMENTS:			

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Note: Look at substrate in run areas.	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization (straigtening) or dredging absent or minimal; stream with normal pattern.	Some channelization or shoring structures present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream ≤7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstructions are important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 8 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 16 to 25.	Generally all flat water or shallow riffles, occasional bend; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 128

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME: Marsh Cr.		**MON LOC ID:** MA-1	
BIO SITE ID:		**DATE:** 11.20.18	
START TIME: 11:35	**END TIME:**	**TIME ZONE:** EST or EDT	
FORM COMPLETED BY/ASSESSOR: CD			
COMMENTS:			

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness Note: Look at substrate in run areas.	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization (straigtening) or dredging absent or minimal; stream with normal pattern.	Some channelization or shoring structures present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream ≤7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstructions are important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 8 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 16 to 25.	Generally all flat water or shallow riffles, occasional bend; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream.**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Bank Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 121

HIGH GRADIENT HABITAT ASSESSMENT AVERAGE

STREAM NAME: Marsh Cr.		**MON LOC ID:** MA-1	
BIO SITE ID:	**DATE:** 11.20.18	**FORM COMPLETED BY:**	
LATITUDE (DD):	**LONGITUDE (DD):**	**GPS ERROR (+/-) ft.:**	
START TIME:	**END TIME:**	**TIME ZONE:** EST EDT	
INVESTIGATORS:			
EPD OFFICE: WP1–Atlanta	WP2–Brunswick	WP3–Cartersville	WP4–Tifton
SAMPLE TYPE: Targeted Probabilistic	**ACTIVITY TYPE:** Field Msr/Obs Habitat Field Replicate Habitat		
WATER APPEARANCE: Blackwater Clearwater Unsure Unsure/Black Unsure/Clear			
TIDAL CYCLE: 1/4 ebb 1/2 ebb 3/4 ebb Low Tide 1/4 flood 1/2 flood 3/4 flood High Tide N/A			
PROJECT/REASON FOR SURVEY:	**COMMENTS:**		

Habitat Parameter Scores	Habitat Parameter Scores	Habitat Parameter Scores	AVERAGE
ASSESSOR : JP	**ASSESSOR :**	**ASSESSOR :** CD	
1. Epifaunal Substrate/ Instream Cover 14	1. Epifaunal Substrate/ Instream Cover	1. Epifaunal Substrate/ Instream Cover 12	13
2. Embeddedness 10	2. Embeddedness	2. Embeddedness 12	11
3. Velocity/Depth Regime 16	3. Velocity/Depth Regime	3. Velocity/Depth Regime 14	15
4. Sediment Deposition 10	4. Sediment Deposition	4. Sediment Deposition 10	10
5. Channel Flow Status 15	5. Channel Flow Status	5. Channel Flow Status 14	14.5
6. Channel Alteration 15	6. Channel Alteration	6. Channel Alteration 14	14.5
7. Frequency of Riffles (or bends) 16	7. Frequency of Riffles (or bends)	7. Frequency of Riffles (or bends) 15	15.5
8. Bank Stability LB 7 RB 8	8. Bank Stability LB RB	8. Bank Stability LB 7 RB 7	LB 7 RB 7.5 Total 14.5
9. Bank Vegetative Protection LB 6 RB 2	9. Bank Vegetative Protection LB RB	9. Bank Vegetative Protection LB 5 RB 2	LB 5.5 RB 2 Total 7.5
10. RiparianVegetative Zone Width LB 7 RB 2	10. RiparianVegetative Zone Width LB RB	10. RiparianVegetative Zone Width LB 6 RB 3	LB 6.5 RB 2.5 Total 9
Total Score: 128	**Total Score:**	**Total Score:** 121	**TOTAL AVERAGE SCORE:** 124.5
Comments:	Comments:	Comments:	

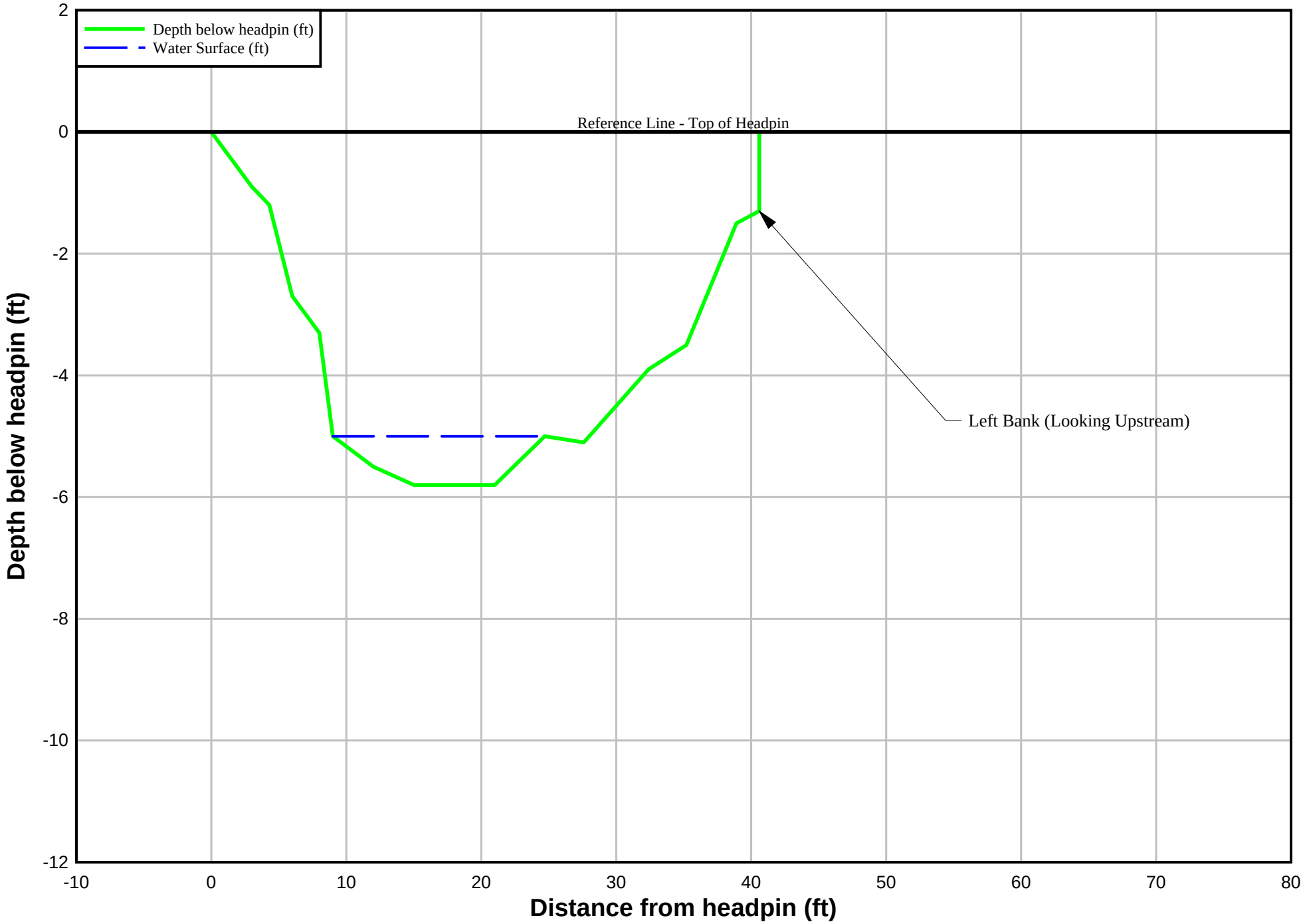
NOTE: When you average each parameter it must be a whole number. Use normal rounding procedures. Individually round each LB and RB score before totaling the final parameter score.

Revision Data 12-08-2015

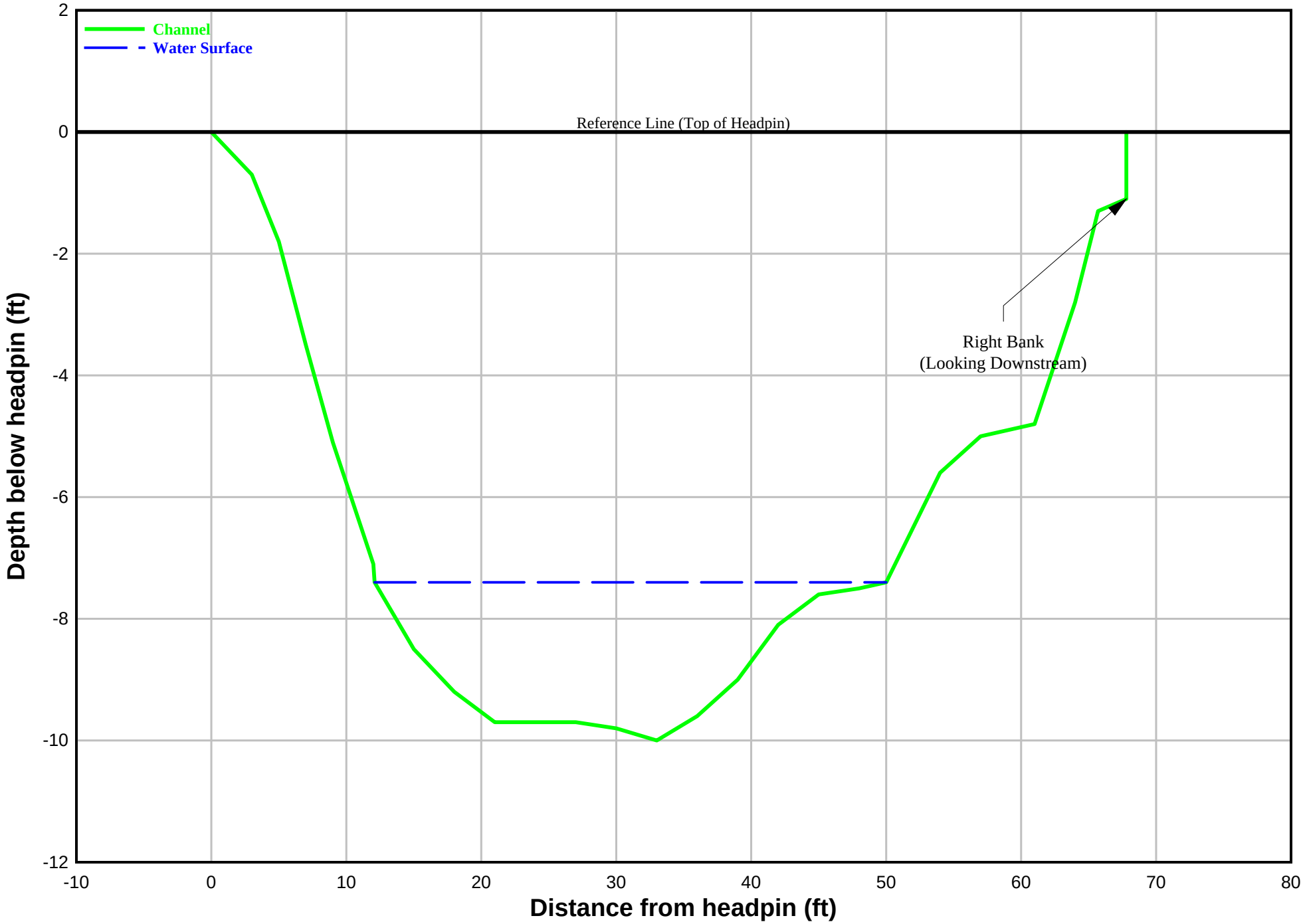
APPENDIX D

CROSS-SECTION PROFILES

CK-1
2018


Depth below headpin (ft)
Water Surface (ft)
Reference Line - Top of Headpin
Left Bank (Looking Upstream)
Depth below headpin (ft)
Distance from headpin (ft)
2
0
-2
-4
-6
-8
-10
-12
-10
0
10
20
30
40
50
60
70
80

LI-2
2018


Channel
Water Surface
Reference Line (Top of Headpin)
Right Bank
(Looking Downstream)
Depth below headpin (ft)
Distance from headpin (ft)
2
0
-2
-4
-6
-8
-10
-12
-10
0
10
20
30
40
50
60
70
80

APPENDIX E

RAW MACROINVERTEBRATE DATA

T.V. = TOLERANCE VALUE
F.F.G. = FUNCTIONAL FEEDING GROUP

BENTHIC MACROINVERTEBRATES COLLECTED FROM SANDY SPRINGS IN 2018

Site	Phylum	Class	Order	Family	Final ID	TV	FFG	Habit	# Collected
CK-1	Annelida	Clitellata			Oligochaeta	8.275	CG	UN	8
	Arthopoda	Insecta	Diptera	Psychodidae	Psychodidae				1
	Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus bicinctus	8.7	OM	UN	5
	Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius complex	7.035	UN	UN	3
	Arthropoda	Insecta	Diptera	Chironomidae	Nanocladius	7.2	CG	SP	3
	Arthropoda	Insecta	Diptera	Chironomidae	Paratanytarsus	7.7	CG	CN	5
	Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum aviceps	4	UN	UN	3
	Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum halterale group	7.2	UN	UN	1
	Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	7.25	CG	SP	3
	Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus pellucidus	6.4	CF	CN	3
	Arthropoda	Insecta	Diptera	Chironomidae	Stenochironomus	6.4	SH	BU	1
	Arthropoda	Insecta	Diptera	Chironomidae	Thienemanniella	6	CG	SP	2
	Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	6	PR	SP	2
	Arthropoda	Insecta	Diptera	Chironomidae	Tvetenia bavarica	4	CG	SP	5
	Arthropoda	Insecta	Diptera	Empididae	Empididae	8.1	PR	SP	1
	Arthropoda	Insecta	Diptera	Simuliidae	Simulium	4.4	CF	CN	2
	Arthropoda	Insecta	Diptera	Tipulidae	Tipula	7.7	SH	BU	27
	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae	4	CG	SW	1
	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis flavistriga	7.2	CG	UN	1
	Arthropoda	Insecta	Odonata	Calopterygidae	Calopteryx	8.3	PR	CB	3
	Arthropoda	Insecta	Odonata	Coenagrionidae	Enallagma	9	PR	CB	7
	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	6.6	CF	CN	32
	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche betteni	8.1	CF	CN	30
	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	4	CF	CN	9
	Arthropoda	Insecta	Trichoptera	Philopotamidae	Chimarra	2.8	CF	CN	21
	Mollusca	Bivalvia	Veneroida	Corbiculidae	Corbicula fluminea	6.3	CF	UN	2
	Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidiidae	7.25	CG	UN	6
	Mollusca	Gastropoda	Basommatophora	Ancylidae	Ferrissia	6.9	SC	UN	1
	Mollusca	Gastropoda	Basommatophora	Physidae	Physidae	9.1	SC	UN	7
	Mollusca	Gastropoda	Basommatophora	Planorbidae	Planorbidae	7.45	SC	UN	1
									196

BENTHIC MACROINVERTEBRATES COLLECTED FROM SANDY SPRINGS IN 2018

Site	Phylum	Class	Order	Family	Final ID	TV	FFG	Habit	# Collected
LI-2	Annelida	Clitellata			Oligochaeta	8.275	CG	UN	14
	Arthropoda	Insecta	Diptera	Ceratopogonidae	Atrichopogon	6.8	PR	UN	1
	Arthropoda	Insecta	Diptera	Chironomidae	Ablabesmyia mallochi	7.6	OM	SP	1
	Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius cultriger	7.7	CG	SP	2
	Arthropoda	Insecta	Diptera	Chironomidae	Phaenopsectra	6.8	SC	CN	2
	Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum aviceps	4	UN	UN	2
	Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum illinoense group	9.2	UN	UN	1
	Arthropoda	Insecta	Diptera	Chironomidae	Pseudochironomus	4.2	CG	BU	1
	Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus exiguus group	6.4	CF	UN	1
	Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus pellucidus	6.4	CF	CN	3
	Arthropoda	Insecta	Diptera	Chironomidae	Thienemanniella	6	CG	SP	3
	Arthropoda	Insecta	Diptera	Chironomidae	Tribelos	6.6	CG	BU	1
	Arthropoda	Insecta	Diptera	Empididae	Empididae	8.1	PR	SP	2
	Arthropoda	Insecta	Diptera	Tipulidae	Antocha	4.6	CG	CN	1
	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis flavistriga	7.2	CG	UN	2
	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis intercalaris	5.8	OM	UN	4
	Arthropoda	Insecta	Odonata	Aeshnidae	Boyeria vinosa	6.3	PR	CB	1
	Arthropoda	Insecta	Odonata	Calopterygidae	Calopteryx	8.3	PR	CB	4
	Arthropoda	Insecta	Odonata	Coenagrionidae	Argia	6	PR	UN	3
	Arthropoda	Insecta	Odonata	Coenagrionidae	Enallagma	9	PR	CB	7
	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Ceratopsyche sparna	3.2	CF	CN	1
	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	6.6	CF	CN	3
	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche betteni	8.1	CF	CN	4
	Arthropoda	Malacostraca	Decapoda	Cambaridae	Orconectes	2.7	UN	UN	1
	Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidiidae	7.25	CG	UN	2
	Mollusca	Gastropoda	Basommatophora	Ancylidae	Ferrissia	6.9	SC	UN	1
	Mollusca	Gastropoda	Basommatophora	Physidae	Physidae	9.1	SC	UN	13
									81

BENTHIC MACROINVERTEBRATES COLLECTED FROM SANDY SPRINGS IN 2018

Site	Phylum	Class	Order	Family	Final ID	TV	FFG	Habit	# Collected
MA-1	Annelida	Clitellata			Oligochaeta	8.275	CG	UN	8
	Arthropoda	Insecta	Diptera	Chironomidae	Chironomus	9.8	CG	BU	1
	Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus bicinctus	8.7	OM	UN	3
	Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	7.035	UN	UN	1
	Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum aviceps	4	UN	UN	2
	Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	6	PR	SP	11
	Arthropoda	Insecta	Diptera	Chironomidae	Tribelos	6.6	CG	BU	1
	Arthropoda	Insecta	Diptera	Empididae	Empididae	8.1	PR	SP	3
	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae	4	CG	SW	2
	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis flavistriga	7.2	CG	UN	6
	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis intercalaris	5.8	OM	UN	1
	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	2.248	SC	CN	2
	Arthropoda	Insecta	Odonata	Calopterygidae	Calopteryx	8.3	PR	CB	2
	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	6.6	CF	CN	3
	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche betteni	8.1	CF	CN	12
	Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidiidae	7.25	CG	UN	4
	Mollusca	Gastropoda	Basommatophora	Physidae	Physidae	9.1	SC	UN	6
									68

APPENDIX F

MULTI-METRIC CALCULATION SPREADSHEETS

GADNR/EPD MACROINVERTEBRATE MULTI-METRIC INDICES
PIEDMONT (45)
Southern Inner Piedmont - 45a Metric Index

Macroinvertebrate Ranking of Subecoregion 45a (Southern Inner Piedmont)	
Metrics	**Standardized Metric Scores/Index Score/Site Ranking**
Plecoptera Taxa	0.00
% Trichoptera	100.00
% Chironomus Cricotopus/TC	61.80
Tolerant Taxa	43.75
% Scraper	11.51
Clinger Taxa	35.35
Site Index Score	42
Numeric Ranking	4
Narrative Description	Poor
Stream Health Rating	C

Site Name or Site Identification Number
CK-1

Numeric Ranking	Narrative Description	Stream Health Rating	Index Score
1	Very Good	A	> = 75
2	Good	A	71 - 74
3	Fair	B	43 - 70
4	Poor	C	19 - 42
5	Very Poor	C	< = 18

Numeric Ranking	Management Decision
1	Continue periodic monitoring to detect change baseline reference condition
2	Continue periodic monitoring to detect change baseline reference condition
3	Frequent monitoring critical to detect change in ecological status, lower range especially
4	Frequent monitoring necessary to determine remediation needs and if remediation has been successful
5	Frequent monitoring necessary to determine remediation needs and if remediation has been successful

GADNR/EPD MACROINVERTEBRATE MULTI-METRIC INDICES
PIEDMONT (45)
Southern Inner Piedmont - 45a Metric Index

Macroinvertebrate Ranking of Subecoregion 45a (Southern Inner Piedmont)	
Metrics	**Standardized Metric Scores/Index Score/Site Ranking**
Plecoptera Taxa	0.00
% Trichoptera	31.09
% Chironomus Cricotopus/TC	100.00
Tolerant Taxa	75.00
% Scraper	49.51
Clinger Taxa	30.30
Site Index Score	48
Numeric Ranking	3
Narrative Description	Fair
Stream Health Rating	B

Site Name or Site Identification Number
LI-2

Numeric Ranking	Narrative Description	Stream Health Rating	Index Score
1	Very Good	A	> = 75
2	Good	A	71 - 74
3	Fair	B	43 - 70
4	Poor	C	19 - 42
5	Very Poor	C	< = 18

Numeric Ranking	Management Decision
1	Continue periodic monitoring to detect change baseline reference condition
2	Continue periodic monitoring to detect change baseline reference condition
3	Frequent monitoring critical to detect change in ecological status, lower range especially
4	Frequent monitoring necessary to determine remediation needs and if remediation has been successful
5	Frequent monitoring necessary to determine remediation needs and if remediation has been successful

GADNR/EPD MACROINVERTEBRATE MULTI-METRIC INDICES
PIEDMONT (45)
Southern Inner Piedmont - 45a Metric Index

Macroinvertebrate Ranking of Subecoregion 45a (Southern Inner Piedmont)	
Metrics	**Standardized Metric Scores/Index Score/Site Ranking**
Plecoptera Taxa	0.00
% Trichoptera	69.43
% Chironomus Cricotopus/TC	42.10
Tolerant Taxa	81.25
% Scraper	29.49
Clinger Taxa	15.15
Site Index Score	40
Numeric Ranking	4
Narrative Description	Poor
Stream Health Rating	C

Site Name or Site Identification Number
MA-1

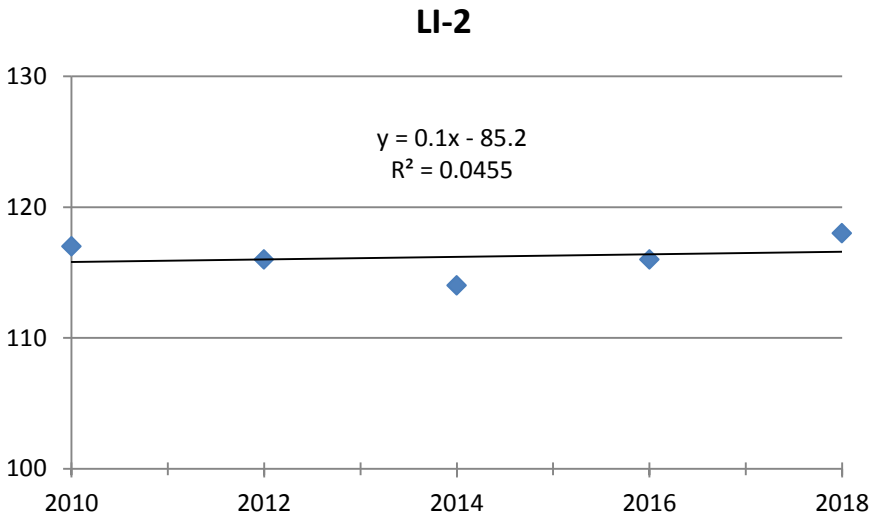
Numeric Ranking	Narrative Description	Stream Health Rating	Index Score
1	Very Good	A	> = 75
2	Good	A	71 - 74
3	Fair	B	43 - 70
4	Poor	C	19 - 42
5	Very Poor	C	< = 18

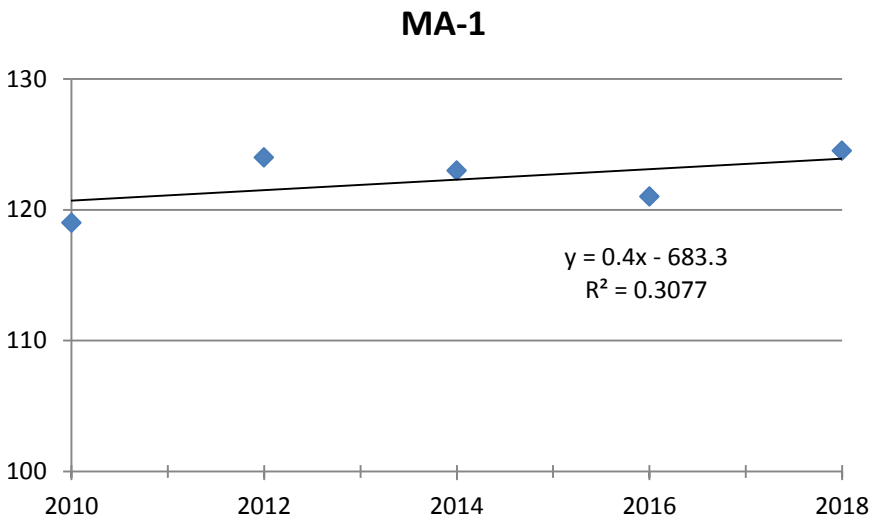
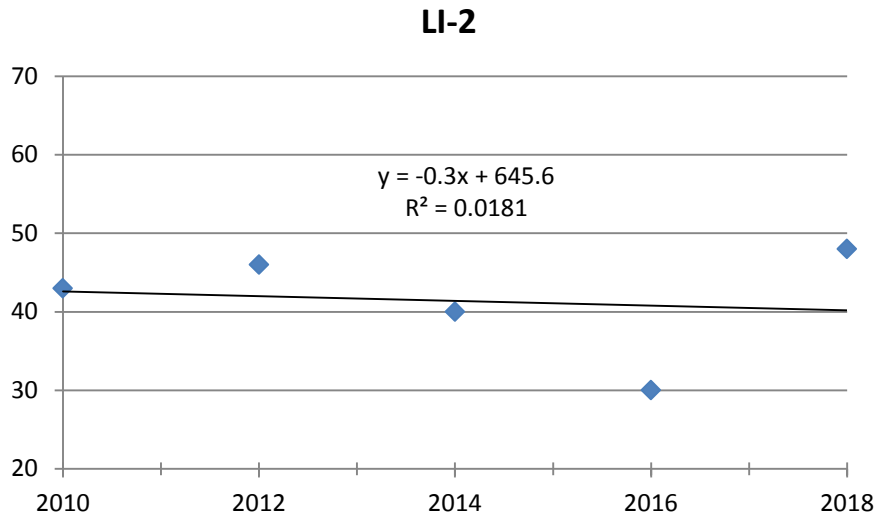
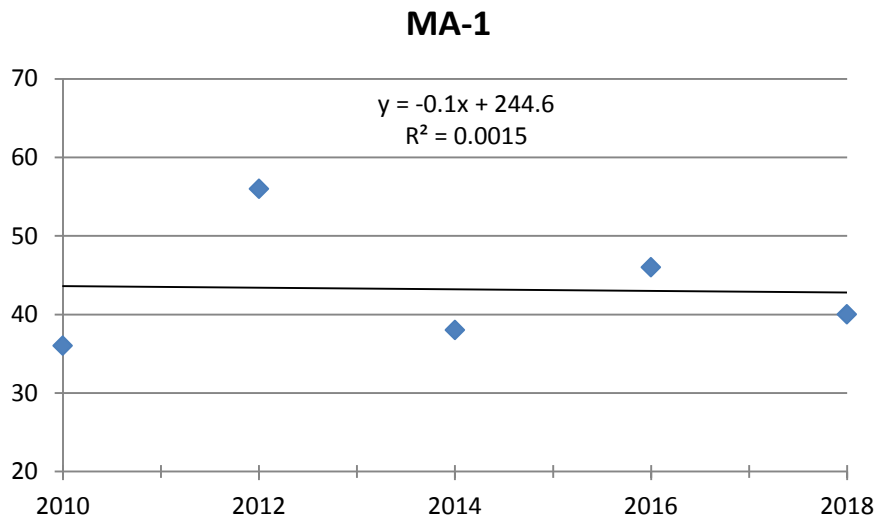
Numeric Ranking	Management Decision
1	Continue periodic monitoring to detect change baseline reference condition
2	Continue periodic monitoring to detect change baseline reference condition
3	Frequent monitoring critical to detect change in ecological status, lower range especially
4	Frequent monitoring necessary to determine remediation needs and if remediation has been successful
5	Frequent monitoring necessary to determine remediation needs and if remediation has been successful

APPENDIX G

TREND ANALYSIS REGRESSION GRAPHS

HABITAT ASSESSMENT SCORES, 2010-18





BENTHIC MACROINVERTEBRATE COMMUNITY MULTI-METRIC INDEX SCORES, 2010-18