Final Report
Lake Conway-Point Remove Watershed Monitoring and Assessment
Project Number: 17-500

Executive Summary

Introduction to Lake Conway-Point Remove Watershed

Lake Conway-Point Remove (LCPR) is a priority watershed for the Arkansas Nonpoint Source Pollution Management Program because it has listed streams on the Arkansas Department of Environmental Quality (ADEQ) 2008 303(d) list. The LCPR watershed (HUC 11110203) is approximately 1,140 mi^2 in size (Figure 2) and sub-watershed range in size from 5 mi^2 to 147 mi^2. The watershed is primarily located in the Arkansas River Valley with small portions in the Ouachita Mountains and the Boston Mountains ecoregions (Omernick, 1987). The watershed spans seven counties: Conway, Faulkner, Perry, Pope, Pulaski, Van Buren and Yell counties.

The watershed ultimately drains to the Arkansas River but not all through one outlet. LCPR is atypical in that it does not have one mainstream system to which all smaller streams flow. Rather, there are several stream systems in this HUC that ultimately drain to the Arkansas River, the largest of which is Point Remove Creek. The watershed is dominated by forest land-uses (42%). Agricultural land-uses (mostly pasture) comprise a fairly high percentage (27%), while developed areas make up approximately 25% of the watershed (NLCD, 2011).

The LCPR watershed is designated as a “priority watershed” in Arkansas by the Arkansas Natural Resource Center (ANRC). This monitoring and assessment project has supplemented a recent water quality study in the watershed completed by Equilibrium and began in 2011. The 2017 study stations overlapped with four of the twelve previously monitored stations in this project. The data collected during this study and the past studies will be used by the Lake Conway–Point Remove Watershed Alliance (LCPRWA) and its partners for the development of a 9-element watershed management plan for the LCPR watershed.

Non-point Source Problem

ANRC designated the LCPR watershed as a priority watershed in the Nonpoint Source Pollution Management Plan during the 2006-2011 Plan and in the 2018-2023 Plan. The pollutants of concern in the watershed are sediment, pathogens, metals, nutrients, chlorides, and low dissolved oxygen.

The ADEQ has three streams in the LCPR watershed on the 2016 Arkansas 303(d) list, Stone Dam, Whig and White Oak Creek. Stone Dam Creek is on the 303(d) list for non-attainment of the Water Quality Standards (WQS) for parameters ammonia and nitrate. Whig Creek is listed on the 303(d) list for non-attainment of the WQS for parameters nitrate and copper, however a TMDL was completed for copper and now has 303(1b) status. White Oak Creek is on the 303(d) list for non-attainment of the WQS for the parameter mercury. Nutrients and metals appear to be the principal concern in the watershed today. Several sources are believed to be contributors to these elevated levels including runoff from agriculture and pasture land use, runoff from the developed areas around Russellville and Conway, point source discharges and stream bank erosion.

Before this project, there has been several recent water quality studies completed in the LCPR watershed. Project 09-1000 focused on water quality monitoring at two sites in the Galla Creek sub-watershed (10-HUC 1111020303). Ongoing Projects 11-600 and 15-300 were completed by Equilibrium, a nonprofit company. Equilibrium has collected water quality samples at twelve stream stations over the two grant periods, 2012-2017. Four of the Equilibrium stream stations were sampled during the current, 2018-2019, monitoring and assessment study. The data collected by Equilibrium focused on baseflow water quality. Review of these sampling projects reveal they are thorough but not comprehensive enough to provide the data necessary to complete development of a management plan. Completion of this project coupled with the recent assessment work will have filled in many data gaps that exist in the draft plan, help determine sediment and nutrient loading in each sub-watershed and assess likely sources of the loading.

Project Objectives

The objective of the project was to collect physio-chemical data from the major drainages in the LCPR watershed in an effort to quantify loading of key pollutants (nutrients and turbidity/sediment) and delineate possible sources of the pollutants. Monitoring included water quality sampling, in-situ measurements, flow measurement, sediment sampling and unified stream assessment (USA). As mentioned, data collected during this project will ultimately be used by the LCPRWA to update and complete their draft 9-element WMP. This monitoring and assessment phase filled in many data gaps that existed in the draft plan and helped determine sediment and nutrient loading in each sub-watershed and assess likely sources of the loading. Using this new data, the LCPRWA will work with local watershed stakeholders to coordinate and complete a final 9-element Watershed Management Plan (WMP). The WMP will include identification of critical sub-watersheds at a small scale (10 and 12-digit HUC) and ranked implementation measures to reduce non-point source pollution loading from critical areas.

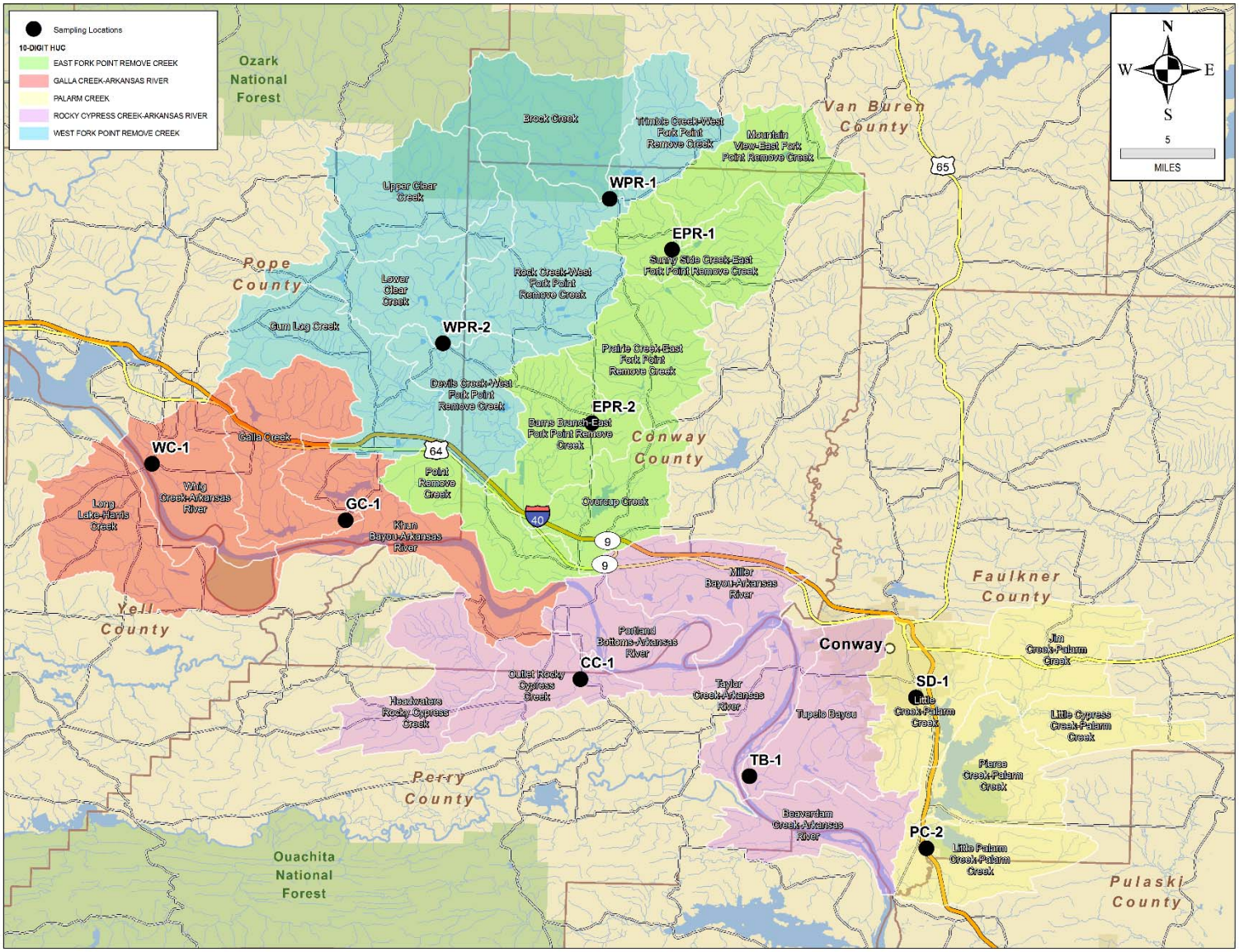

Figure 1. General overview of the Lake Conway Point Remove watershed with sample locations noted.

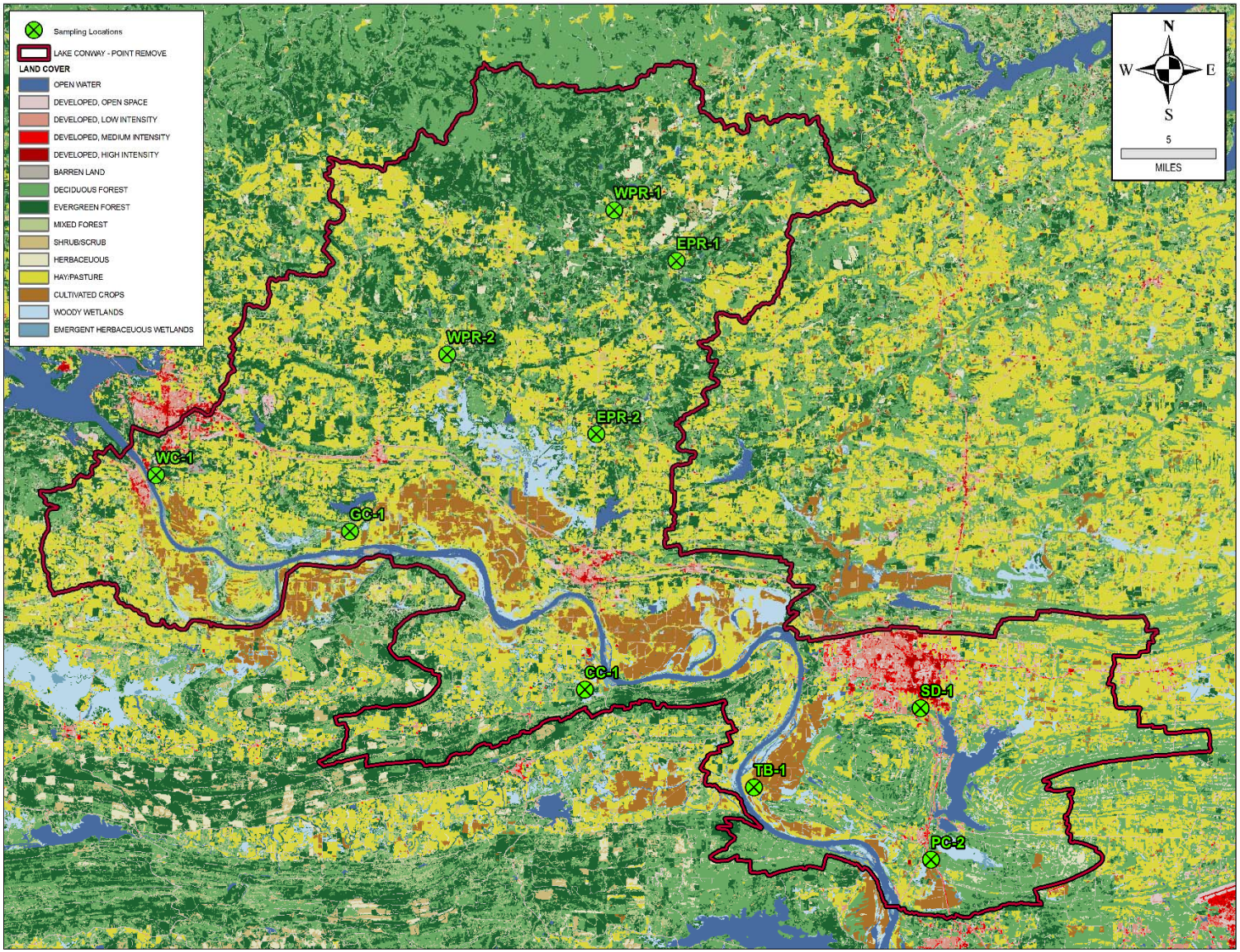

Figure 2. Land use land cover map of the project area.

Tasks and Timeline Completed During Project

The project work began on December 28, 2017 when the project was awarded to the environmental contractor. A complete watershed reconnaissance was completed in March of 2018. A Quality Assurance Project Plan was approved by the ANRC and EPA with an effective date of April 10, 2018. Level loggers were installed at five locations between March and April of 2018. At least 25 baseflow samples were collected at each station from May of 2018 to May of 2019. Seven storm samples were collected at each station from October of 2018 to April of 2019. The unified stream assessments were completed during April to August of 2019. The final report is to be submitted by June 30, 2020, but has been submitted early, ahead of schedule.

Project Cooperators

The project was funded with a 319 grant from the ANRC and EPA Region 6 which was awarded to the LCPRWA. The LCPRWA contracted GBM^c & Associates (GBM^c) (an environmental consulting group) and the University of Central Arkansas (UCA). The group at GBM^c collected the storm water monitoring, the USAs, and coordinated with UCA. The UCA group completed the baseflow monitoring, submitted water quality samples, analyzed data, and provided it to GBM^c to compile for this report. The water quality samples (storm and baseflow samples) were sent the Arkansas Water Resource Laboratory (AWRC). LCPRWA provided match in the form of grant reporting and coordination. UCA provided match in the form of sampling water quality. A state certified laboratory, AWRC, partnered with the LCPRWA on this project and supplied match for the monitoring tasks in the form of deeply discounted sample analysis. The federal portion of the grant was $74,496 and the match portion was $44,278, which was entirely in-kind match accumulated mostly through laboratory analyses, sample handling, and grant coordination.

Project Chronology

The project was divided into several tasks that are described below. Significant milestones and/or challenges are included with each description as well as the party responsible for the task and the timeline involved in task completion.

Task 1. Financial Review

Audit of Grant Expenditures in January of 2019 was completed by the LCPRA to ensure funds were being utilized effectively to meet the project objectives.

Task 2. Quality Assurance Project Plan (QAPP)

A QAPP was prepared to direct monitoring efforts completed during the project and to ensure the objectives and goals of the project were well represented through accurate and precise data collection and analysis. A Quality Assurance Project Plan was completed by GBM^c & Associates and the LCPRWA that was approved by the ANRC and EPA on April 10, 2018.

Task 3. Monitoring and Assessment

Monthly baseflow events and seven storm flow events were collected at the ten sites. There were a varying number of baseflow samples due to the May 2019 Arkansas River flooding. The flooding caused several of the sampling locations to flow in the opposite direction due to the river backing up into its tributaries. During the flood duration, sampling sites where it was apparent that the Arkansas River was heavily influencing them, water quality samples were not collected. Water samples collected by GBM^c and UCA were delivered to the AWRC laboratory where they were analyzed for several key parameters including ammonia, nitrate-nitrite, soluble reactive phosphorus (SRP), TDS, total phosphorus (TP), and TSS. Results of the monitoring and assessment efforts are provided in the conclusions section of this report.

During each sampling event *in-situ* parameters were measured. *In-situ* parameters consisted of pH, temperature, dissolved oxygen, specific conductance, and turbidity.

Flow was measured during each sample event following the USGS velocity-area method, conditions allowing. If conditions did not allow (i.e. too deep to wade and/or velocity too high to safely measure), an alternative such as the floating orange method and/or the developed rating curve from the onsite level loggers were used to estimate flow. Five automated level measuring gages were installed for this study and included a gauge at Galla Creek (GC-1), Whig Creek (WC-1), Stone Dam (SD-1), Tupelo Bayou (TB-1) and Little Creek (LC-1) site locations. The upstream East Point Remove (EPR-1), upstream West Point Remove (WPR-1) and Cypress Creek (CC-1) had automated level measuring gages already installed from the previous study competed by Equilibrium. The downstream West (WPR-2) and East (EPR-2) Point Remove sites have USGS gages at those three site locations. Automatic level measuring gages continuously measured stream level (stage) and recorded the data every 15 minutes. Flow at various levels was correlated with stage to develop a rating curve for each gage. Gages allowed river flow to be better estimated when flow couldn't be measured instream due to safety concerns. This data was used to more effectively calculate pollutant loading in the watershed.

The desktop analysis (NPS Assessment) was completed by GBMc primarily through GIS analysis and included assessment of land-use, cattle and chicken have

numbers within each sub-watershed. The desktop analysis was used in conjunction with the USAs to determine possible sources that are contributing to each sub-watershed loading results. The USAs were completed by GBMc on not only the main stem tributaries of each key sub-watersheds but also on both the upstream and downstream sections of the East and West Point Remove Creeks. The USAs provide qualitative and semi-quantitative analysis of stream corridor condition including channel stability, bank erosion potential, riparian buffer, non-point source threats and other stream disturbances (unpaved roads, culverts, cattle access, pipe outfalls, etc.). The USAs, the desktop analysis, watershed reconnaissance (windsheld surveys) and the monitoring and assessment has provided a comprehensive evaluation of the watershed.

Task 4. Reporting and Grant Coordination

An important component of the project was reporting of progress and expenditures to the ANRC. Several quarterly reports, two annual reports and this Final Report were a part of that effort. Grant coordination and reporting was completed by LCPRWA, GBMc, and UCA.

Lessons Learned

The project was successful due largely to the efforts and coordination between LCPRWA, UCA and GBMc who agreed to work together to assess watershed loading and identify potential key sources of pollutants in the LCPR watershed.

Lessons learned:

- All contractors should go out in the field sampling together to ensure the same methods are being employed by all parties.

Technical Transfer

Good and accurate watershed management planning requires an abundance of data from each of the main sub-watersheds in the basin and a vast amount of knowledge of the basin characteristics and land uses.

- Water quality data is most useful when it is connected to flow data. Monitoring for watershed management should always include measurement of flow so the constituent loading can be calculated.
- Time spent walking stream corridors (USA’s) and driving through the watershed (windshield surveys) are invaluable to the identification of non-point source issues in a watershed.

- Storm flow data often provide different results when compared to baseflow data. Storm flow data are critical when the objective is to identify nonpoint source pollution. More time and money should be allocated to efforts to collect accurate flow data and water quality sampling during the rising limb of a storm water runoff in future watershed projects.

EPA Feedback Loop

We appreciate the funding of this project and hope to work with the ANRC and the EPA in the future on such projects. The ANRC staff was very helpful in submission of the reports required by the 319 grant program. This help was appreciated and invaluable to the success of the project.

Project Success Conclusions

This project is considered a success as it resulted in the identification of nonpoint source issues in watershed; it was completed according to the workplan and QAPP. The project was completed on time and within budget.

Water Quality Conclusions

Monthly baseflow events and seven storm flow events were collected at the ten sites. Site names and acronyms can be found below. As mentioned, varying number of baseflow samples are due to the May 2019 Arkansas River flooding. Concentrations of analytes fluctuated due to size of storm event, flow conditions, and size of watershed. To minimize the variability in concentration, the sampling results were converted to loading, using either flow that was measured or flow that was estimated with installed level loggers. The loading results were converted to pounds per mi^2 using the watershed area for each sampling site to normalize the results for comparison (Figures 3-9). Data can be found in Appendix A.

- Cypress Creek (CC-1)
- East Point Remove Upstream (EPR-1)
- East Point Remove Downstream (EPR-2)
- Galla Creek (GC-1)
- Little Creek (LC-1)
- Stone Dam Creek (SD-1)
- Tupelo Bayou (TB-1)
- Whig Creek (WC-1)
- West Point Remove Upstream (WPR-1)
- West Point Remove Downstream (WPR-2)

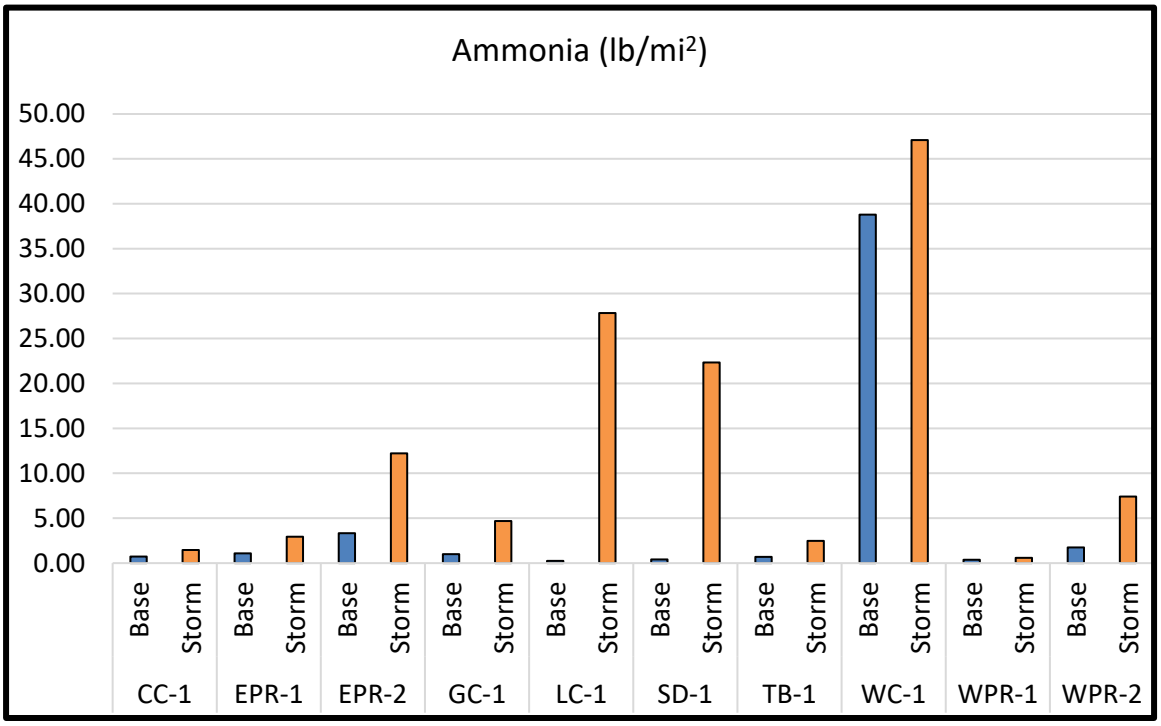

Figure 3. Average ammonia results (lb/mi^2) from each sampling site during baseflow and storm flow events.

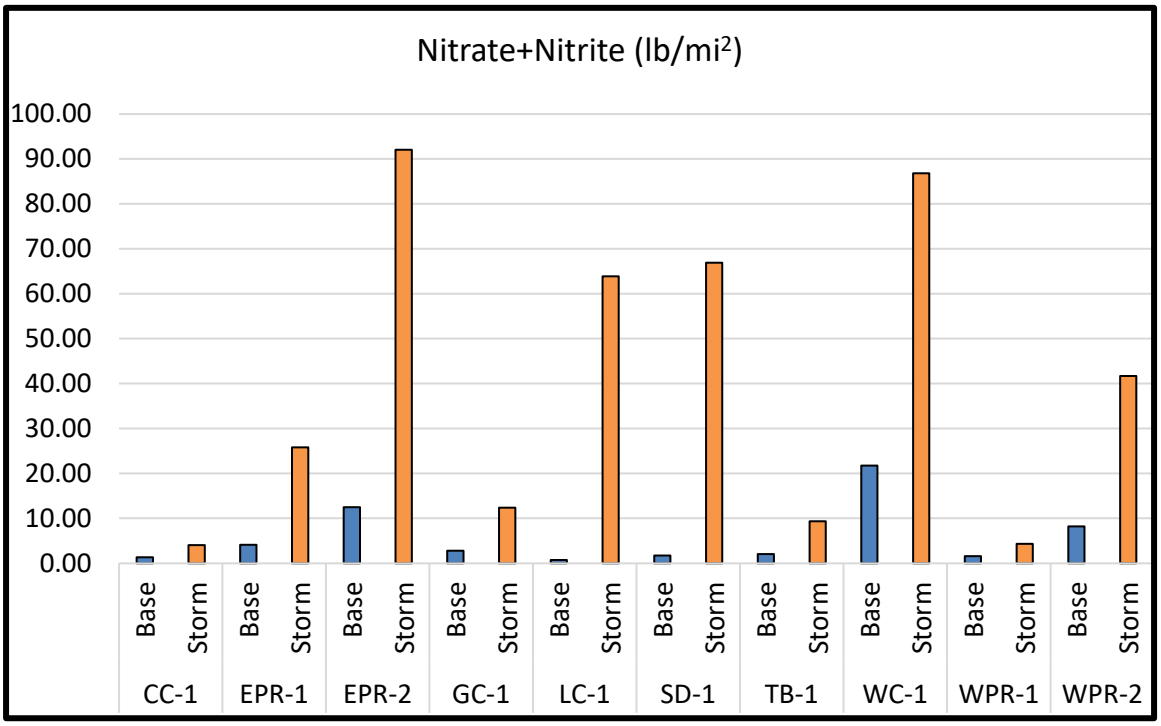

Figure 4. Average nitrate-nitrite results (lb/mi^2) from each sampling site during baseflow and storm flow events.

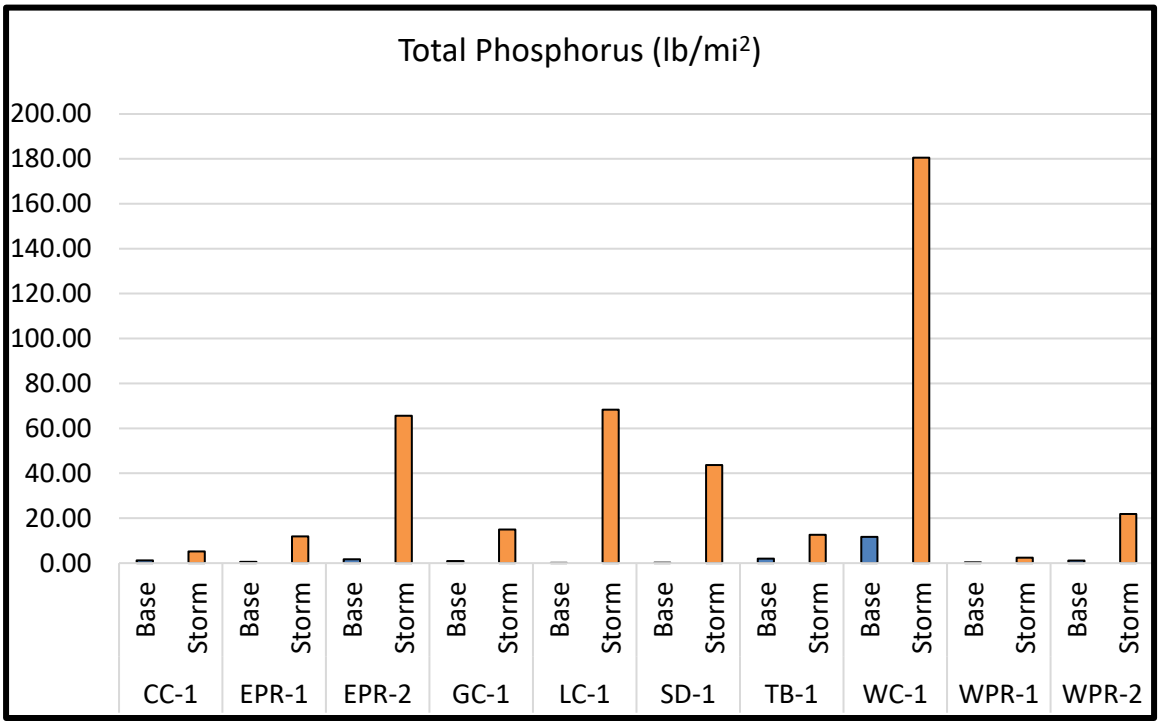

Figure 5. Average total phosphorus results (lb/mi^2) from each sampling site during baseflow and storm flow events.

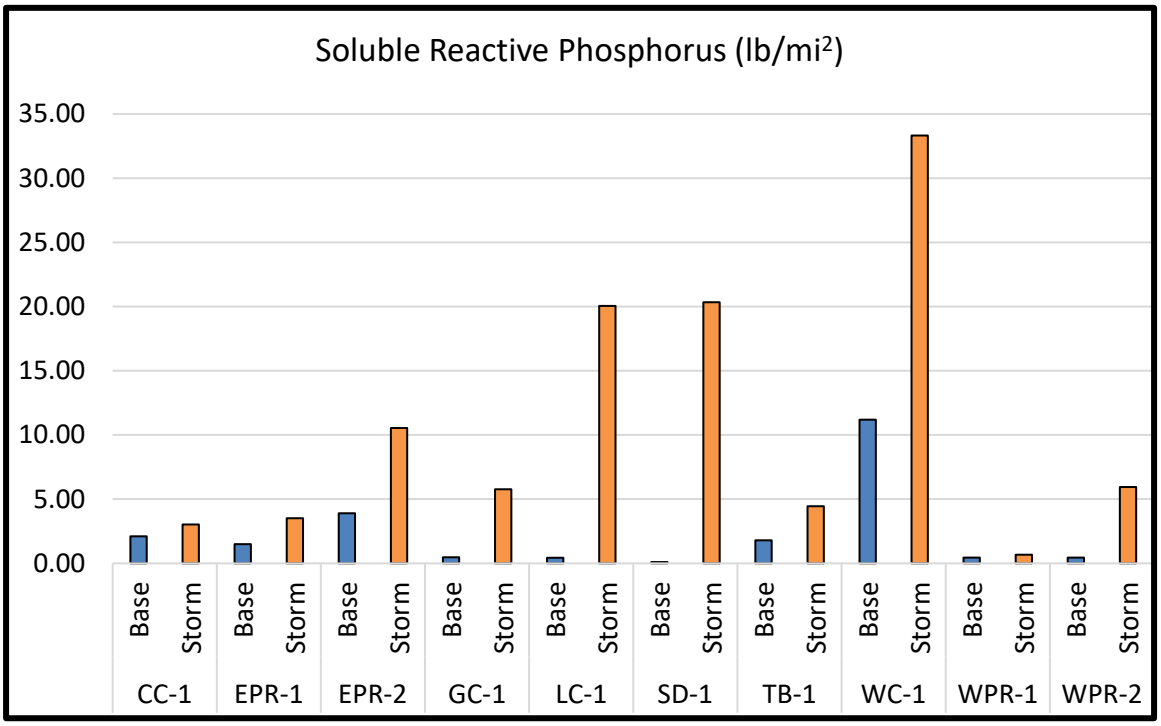

Figure 6. Average soluble reactive phosphorus results (lb/mi^2) from each sampling site during baseflow and storm flow events.

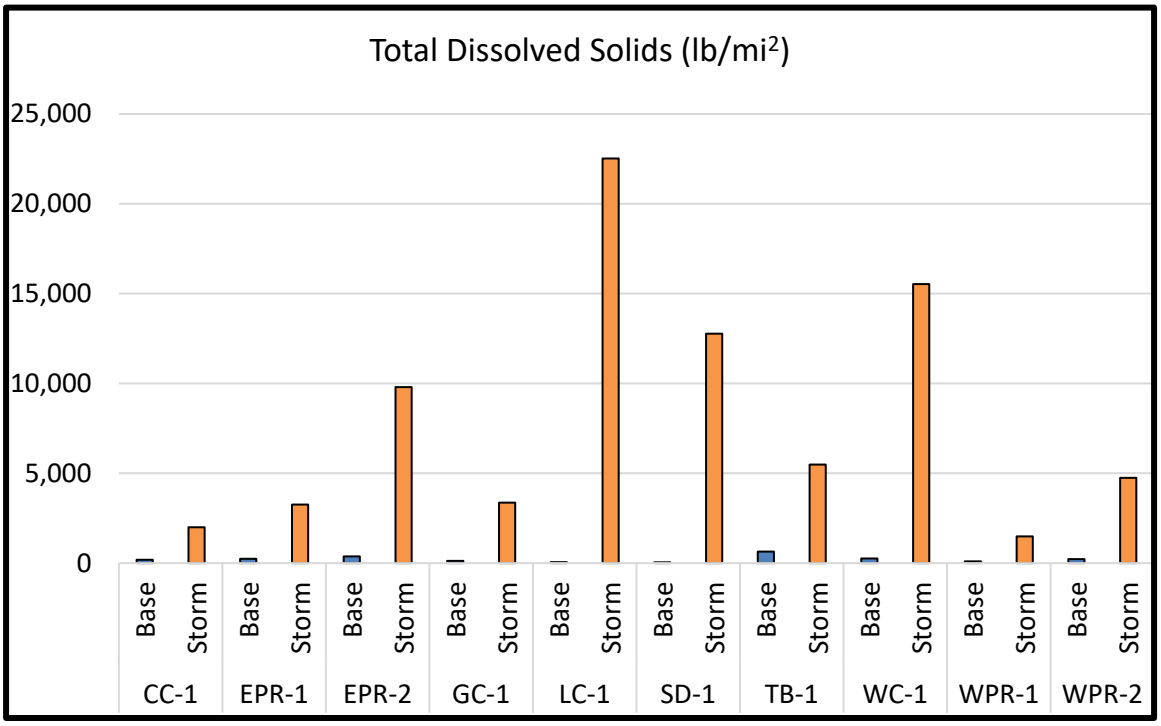

Figure 7. Average total dissolved solids results (lb/mi^2) from each sampling site during baseflow and storm flow events.

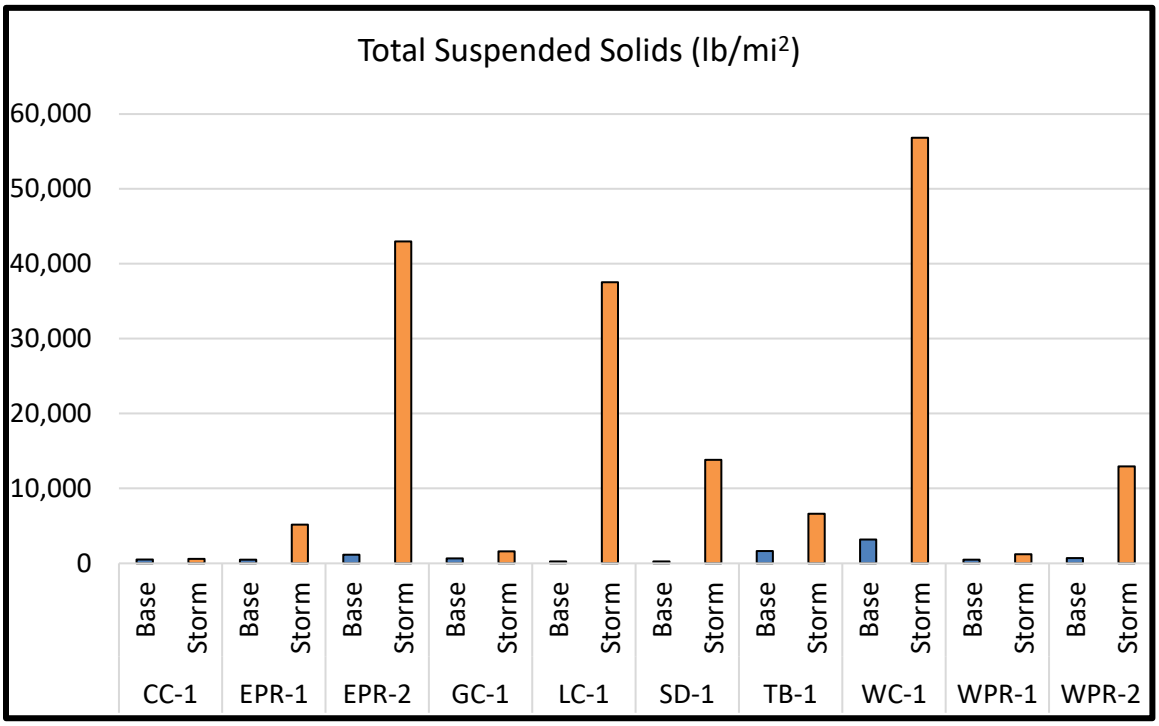

Figure 8. Average total suspended solids results (lb/mi^2) from each sampling site during baseflow and storm flow events.

Results varied significantly between baseflow and stormflow events furthering the importance of storm water data when determining potential nonpoint sources in a watershed. For example, on average storm flow concentrations of TSS at LC-1, a 5 mi^2 watershed, were nearly as high as EPR-2, whose watershed size is 42.7 mi^2.

Of the ten sampling stations, there are 4 stations that receive point sources. Gala Creek and Little Creek receive discharge that is less than 0.1 MGD. Tupelo Bayou receives wastewater from the City of Conway wastewater treatment plant. Whig Creek receives wastewater from the City Corporation – Russellville Water and Sewer System.

Sediment Sampling Conclusions

Sediment data indicates some streams have higher nutrient levels within their sediment. Streams with higher nutrient levels have potential to be transporters of higher nutrients if the sediment is easily eroded/suspended. Sediment samples were collected in December, 2018. Benthic sediment samples were collected with three replicates from each sub-watershed. Sediment samples were analyzed for nitrogen (%) and total phosphorus (mg/L). A summary of the sediment data results are in Table 1 below and all data can be found in Appendix A.

Table 1. Summary of sediment sample data collected in December, 2018.

Sample Location	Average of Nitrogen (%)	Average of Total Phosphorus (mg/L)
CC-1	0.06	413.00
EPR-1	0.05	316.33
EPR-2	0.05	279.00
GC-1	0.14	593.67
LC-1	0.15	682.67
SD-1	0.07	1,562.33
TB-1	0.27	761.67
WC-1	0.09	577.00
WPR-1	0.05	114.00
WPR-2	0.15	150.00

Potential Nonpoint Sources

Land use land cover data was determined for each sub-watershed (Figure 10). Desktop analysis of potential NPS that have been found to be important watershed contributors were also calculated and included land use/land cover, number of chicken houses and number of cattle in each sub-watershed (Table 2). There were also ten unified stream assessments (Table 3) completed in the watershed. Field sheets can be found in

Appendix B. The desktop analysis portion of the study was used to assess what land use types could be the main contributors to nutrient and TSS loading. Chicken houses were counted from google earth in each sub-watershed. The numbers of chicken houses counted was then divided by the watershed area to achieve a number of chicken houses per mi^2. County census numbers were used to calculate the number of cows in each sub-watershed. County number of cows was divided by the county area to get a number per area then multiplied by the watershed area to result in number of cows per mi^2 each sub-watershed. This data combined with the water quality data was used to find potential nonpoint source pollution for each sub-watershed. The data collected during this project will be valuable information in helping to draft a LCPR WMP and where to focus efforts of restoration and/or stormwater BMPs in the watershed.

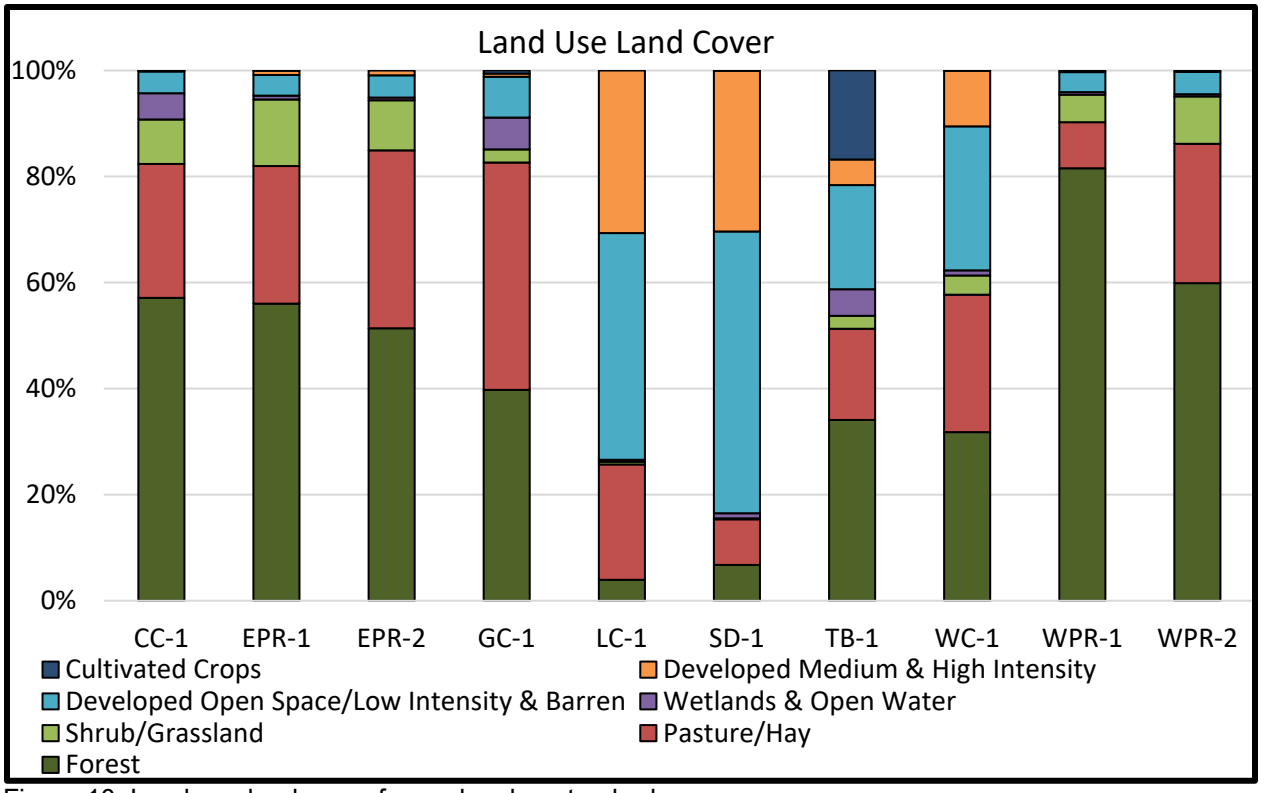

Figure 10. Land use land cover for each sub-watershed.

Table 2. Desktop analysis for each sub-watershed.

Site	Watershed Area (mi^2)	Chicken houses ($\#/mi^2$)[1]	Cows in each Watershed (#)	Pasture/Hay Land Use (%)	Cultivated Crop Land Use (%)	Developed Land Use (%)
CC-1	58.2	0.84	1,535	25.27	0.00	4.31
EPR-1	56.8	0.48	3,707	25.95	0.00	4.74
EPR-2	42.7	0.96	2,787	33.57	0.00	5.11
GC-1	44.9	1.07	2,027	42.88	0.60	8.29
LC-1	5.0	0.00	269	21.77	0.00	73.44
SD-1	8.0	0.00	428	8.59	0.03	83.48
TB-1	41.1	0.00	2,197	17.19	16.80	24.46
WC-1	13.4	0.07	605	25.95	0.01	37.71
WPR-1	73.5	0.35	4,799	8.68	0.00	4.09
WPR-2	147.8	0.96	6,670	26.29	0.00	4.48

[1]Chicken houses were counted in each sub-watershed via google earth and divided by sub-watershed area to achieve $\#/mi^2$.

[2]The most current census number for cows in each respective county were used in this calculation. The number of cows in each county were decided by the area of each county then multiplied by each watershed area to determine cows per sub-watershed.

Table 3. USAs were completed on all ten sub-watersheds and significant findings noted in this table.

Site	% Stream with Bank Erosion (BE)	% Moderate Hazard BE	% High Hazard BE	BEHI Score	BEHI Category	Biggest Impacts on Reach
CC-1	100	100.0	0.0	8.5	Very Low	Bank erosion & channelization
EPR-1	80	5.9	74.1	30.6	High	Bank erosion
EPR-2	40	5.1	30.0	4	Very Low	Cultivated crops & bank erosion
GC-1	49	25.9	19.7	24.8	Moderate	Impacted buffers & bank erosion
LC-1	0	0.0	0.0	0	Very Low	Stormwater outfalls, bridge, & urban land use
SD-1	13	6.5	0.0	36.5	High	Stormwater outfalls, low water bridge crossings, & bank erosion
TB-1	100	0.0	100.0	32.6	High	Bank erosion, crop land use, & stormwater outfalls draining nearby crop fields
WC-1	93	17.8	75.0	23.3	High	Bank erosion, impacted buffers, & urban land use
WPR-1	0	0.0	0.0	0	Very Low	None
WPR-2	41	12.9	0.0	29.9	Moderate-high	Bank erosion

When assessing the pollutant loads (lb/mi^2) during base flow events, the sub-watersheds with the largest pollutant loads are WC-1, WPR-1, WPR-2, and EPR-1. During a storm event is when NPS pollution enters a stream, the sub-watersheds with the highest loads for storm events are WC-1, LC-1 and SD-1. One thing these three smaller sub-watersheds have in common is a higher percentage of urban land use. Impacts observed in two of the sub-watersheds were stormwater outfalls and bridges that are typically associated with urban land use. Urban land use also may be causing the bank erosion, and impacted buffers (also observed) as encroachment occurs and more runoff energy enters from paved surfaces within the watersheds. Based on the storm event water quality results and NPS assessments, the following sub-watersheds are believed to be key contributors:

- WC-1
- LC-1
- SD-1
- EPR-2

Appendix A

Data

Date Sampled	Sample ID	Time Sampled	Storm or Base flow Sampling	Temp C	D.O. (mg/L)	D.O. %	Sp. Cond (µS)	pH	Turbidity (ntu)	Ammonia (mg/L)	Nitrate+Nitrite (mg/L)	SRP (mg/L)	Total Phosphorus (mg/L)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)
5/30/2018	CC-1	1300	Base	29.76	4.05	53.00	109.00			0.07	0.23	0.16	0.22	88.20	9.60
6/13/2018	CC-1	1300	Base	27.10	2.78	35.00	102.00			0.09	0.16	0.15	0.22	16.20	79.60
6/27/2018	CC-1	1300	Base	27.63	3.14	39.70	136.00			0.02	0.08	0.05	0.10	8.30	96.90
9/9/2018	CC-1	1300	Base	29.95	5.27	62.60	74.00			0.19	0.46	0.43	0.48	65.80	78.20
9/30/2018	CC-1	1300	Base	20.17	6.47	70.00	71.00			0.04	0.40	0.09	0.17	76.70	5.20
10/15/2018	CC-1	1205	Storm	16.00	6.30	63.80	61.20	6.20	37.50	0.03	0.14	0.14	0.23	89.30	16.60
10/21/2018	CC-1	1300	Base	13.67	9.96	95.70	60.00			0.03	0.36	0.07	0.10	6.60	75.10
11/1/2018	CC-1	935	Storm	15.20	6.30	63.10	44.20	6.00	53.40	0.01	0.11	0.15	0.27	63.30	25.30
11/11/2018	CC-1	1300	Base	8.35	13.55	115.80	58.00			0.02	0.17	0.08	0.12	2.60	54.90
11/27/2018	CC-1	1300	Base	5.36	13.28	105.20	74.00			0.07	0.38	0.07	0.09	2.50	67.30
12/14/2018	CC-1	1115	Storm	9.80	8.16	71.90	45.20	5.63	59.60	0.09	0.20	0.08	0.16	76.00	15.10
12/17/2018	CC-1	1300	Base	9.20	6.82	59.20	38.00			0.14	0.04	0.72	0.12	15.40	61.30
12/30/2018	CC-1	1300	Base	5.94	5.09	40.80	52.00			0.03	0.12	0.06	0.10	7.40	50.20
1/13/2019	CC-1	1300	Base	6.54	16.76	136.50	60.00			0.02	0.28	0.03	0.06	3.70	83.80
1/23/2019	CC-1	1120	Storm	6.10	13.01	104.70	35.30	6.20	57.60	0.04	0.23	0.06	0.18	74.20	37.90
1/27/2019	CC-1	1300	Base	4.51	14.87	114.60	47.00			0.02	0.15	0.03	0.05	26.90	42.70
2/11/2019	CC-1	1245	Storm	6.30	12.29	100.50	30.00	5.90	64.20	0.05	0.09	0.10	0.10	50.40	14.60
2/17/2019	CC-1	1300	Base	6.48	18.70	152.10	37.00			0.04	0.17	0.04	0.08	5.90	56.20
2/27/2019	CC-1	1300	Base	10.76	10.59	95.20	38.00			0.04	0.14	0.04	0.07	6.80	36.40
3/16/2019	CC-1	1300	Base	11.76	16.86	155.50	50.00			0.03	0.08	0.05	0.10	55.30	8.00
3/31/2019	CC-1	1300	Base	14.38	9.90	96.80	76.00			0.07	0.16	0.06	0.09	5.20	53.30
4/4/2019	CC-1	1425	Storm	13.92	8.17		73.00	6.41	59.40	0.21	0.03	0.06	0.16	86.90	29.00
4/18/2019	CC-1	1130	Storm	16.50	6.42	65.60	37.40	6.48	61.80	0.04	0.07	0.10	0.19	60.00	15.50
4/23/2019	CC-1	1300	Base	17.78	13.74	144.30	40.00			0.09	0.08	0.07	0.11	11.10	54.70
4/30/2019	CC-1	1300	Base	19.78	15.51	169.80	67.00			0.08	0.21	0.11	0.15	8.40	50.70
5/15/2019	CC-1	1300	Base	20.06	8.42	92.70	60.00			0.12	0.15	0.12	0.14	8.70	58.40
5/29/2019	CC-1	1300	Base	No Samples Taken						No Sample Taken					
6/13/2019	CC-1	1300	Base	No Samples Taken						No Sample Taken					
5/30/2018	EPR-1	1030	Base	24.38	9.24	110.60	44.00			0.09	0.29	0.01	0.05	39.80	9.50
6/13/2018	EPR-1	1030	Base	28.19	3.21	41.20	53.00			0.04	0.55	0.04	0.02	5.80	46.40
6/27/2018	EPR-1	1030	Base	29.37	6.00	78.40	60.00			0.03	0.19	0.01	0.02	2.30	41.60
9/9/2018	EPR-1	1030	Base	24.67	7.86	95.00	50.00			0.03	0.27	0.04	0.04	6.70	41.60
9/30/2018	EPR-1	1030	Base	2.88	8.23	91.60	57.00			0.00	0.29	0.01	0.03	44.40	2.70
10/15/2018	EPR-1	1300	Storm	17.20	8.50	89.00	52.20	6.40	16.90	0.07	0.45	0.01	0.05	46.00	10.60
10/21/2018	EPR-1	1030	Base	15.03	17.55	174.20	51.00			0.03	0.64	0.01	0.04	5.50	55.60
11/1/2018	EPR-1	900	Storm	15.10	10.10	100.00	37.30	5.70	32.60	0.01	0.50	0.05	0.11	24.20	27.50
11/11/2018	EPR-1	1030	Base	11.36	17.26	157.60	42.00			0.01	0.53	0.01	0.02	2.50	30.90
11/27/2018	EPR-1	1030	Base	6.97	17.42	143.26	44.00			0.01	0.42	0.00	0.02	1.90	45.30
12/14/2018	EPR-1	1120	Storm	9.40	11.60	101.00	38.20	5.30	19.80	0.02	0.52	0.02	0.06	40.20	13.30
12/17/2018	EPR-1	1030	Base	8.95	7.37	63.90	41.00			0.60	0.02	0.96	0.05	94.70	41.60
12/30/2018	EPR-1	1030	Base	7.74	9.41	78.60	41.00			0.01	0.57	0.01	0.04	9.20	39.00
1/13/2019	EPR-1	1030	Base	6.59	16.34	132.90	39.00			0.01	0.54	0.00	0.02	3.70	63.30
1/23/2019	EPR-1	1205	Storm	6.70	12.30	101.00	31.50	5.70	21.60	0.02	0.47	0.03	0.08	42.00	15.60
1/27/2019	EPR-1	1030	Base	6.34	14.62	118.40	37.00			0.02	0.40	0.01	0.03	15.20	33.80
1/29/2019	EPR-2	1000	Base	6.39	17.20	139.60	39.00			0.02	0.73	0.02	0.04	17.00	25.60
2/11/2019	EPR-1	1240	Storm	7.30	12.32	101.50	20.00	4.89	88.40	0.04	0.19	0.05	0.18	41.80	90.60
2/17/2019	EPR-1	1030	Base	7.94	18.10	152.40	29.00			0.07	0.40	0.04	0.08	8.90	61.80
2/27/2019	EPR-1	1030	Base	9.13	12.73	109.60	33.00			0.02	0.41	0.02	0.04	7.20	35.10
3/16/2019	EPR-1	1030	Base	8.65	18.40	157.60	36.00			0.02	0.43	0.02	0.04	38.00	6.70
3/31/2019	EPR-1	1030	Base	10.95	11.18	101.30	34.00			0.04	0.22	0.01	0.02	2.70	21.10
4/4/2019	EPR-1	1540	Storm	13.60	11.60	111.70	38.30	6.10	9.50	0.19	0.01	0.00	0.04	24.90	6.10
4/18/2019	EPR-1	1250	Storm	15.00	9.66	96.30	34.90	5.29	37.10	0.03	0.25	0.04	0.12	43.60	38.10
4/23/2019	EPR-1	1030	Base	15.78	12.60	126.80	36.00			0.02	0.28	0.02	0.05	8.10	37.80
4/30/2019	EPR-1	1030	Base	19.07	20.05	216.30	39.00			0.01	0.27	0.01	0.03	4.00	23.80
5/15/2019	EPR-1	1030	Base	17.48	9.60	100.30	38.00			0.02	0.28	0.02	0.05	7.90	39.60
5/29/2019	EPR-1	1030	Base	22.94	10.55	122.70	41.00			0.02	0.34	0.04	0.07	7.00	51.30
6/13/2019	EPR-1	1030	Base							0.02	0.16	0.02	0.04	9.30	43.30
5/30/2018	EPR-2	1000	Base	24.88	6.21	74.70	44.00			0.04	0.33	0.03	0.07	44.70	15.30
6/13/2018	EPR-2	1000	Base	29.30	2.97	39.00	53.00			0.04	0.25	0.01	0.03	5.00	39.60
6/27/2018	EPR-2	1000	Base	31.15	5.42	72.60	55.00			0.01	0.12	0.01	0.03	14.80	38.20
9/9/2018	EPR-2	1000	Base	24.77	7.37	88.60	49.00			0.05	0.50	0.12	0.13	9.90	44.90
9/30/2018	EPR-2	1000	Base	20.55	8.87	98.50	56.00			0.00	0.47	0.01	0.03	45.80	4.50
10/15/2018	EPR-2	1505	Storm	17.20	9.20	95.00	56.70	6.20	17.80	0.12	0.72	0.02	0.08	56.20	17.30
10/21/2018	EPR-2	1000	Base	15.24	14.28	142.10	55.00			0.01	0.88	0.02	0.07	20.20	52.90
11/1/2018	EPR-2	1040	Storm	15.30	10.00	100.00	38.80	5.70	59.70	0.02	0.59	0.06	0.21	34.20	69.50
11/11/2018	EPR-2	1000	Base	10.86	16.91	152.30	46.00			0.01	0.72	0.01	0.03	1.60	38.70
11/27/2018	EPR-2	1000	Base	6.59	18.39	150.00	50.00			0.00	0.57	0.00	0.02	1.90	46.00
12/14/2018	EPR-2	835	Storm	9.50	11.30		42.00	4.90	39.70	0.04	0.65	0.04	0.13	48.20	45.00
12/17/2018	EPR-2	1000	Base	9.40	13.54	119.20	39.00			0.58	0.01	0.69	0.03	7.40	38.90
12/30/2018	EPR-2	1000	Base	8.19	9.57	80.90	36.00			0.01	0.71	0.01	0.04	5.10	36.70
1/13/2019	EPR-2	1000	Base	6.74	16.39	134.10	44.00			0.00	0.74	0.01	0.02	1.40	67.20
1/23/2019	EPR-2	1430	Storm	7.00	12.10	100.00	34.30	5.90	43.60	0.03	0.58	0.03	0.12	48.20	38.80
2/11/2019	EPR-2	1435	Storm	7.48	12.84	107.20	241.00	4.60	241.00	0.05	0.25	0.03	0.37	40.00	290.30
2/17/2019	EPR-2	1000	Base	7.78	11.40	95.60	33.00			0.03	0.48	0.07	0.11	12.00	28.70
2/27/2019	EPR-2	1000	Base	9.26	13.24	114.70	34.00			0.01	0.45	0.02	0.05	6.30	35.10
3/16/2019	EPR-2	1000	Base	9.20	14.27	123.50	27.00			0.03	0.54	0.02	0.05	43.60	7.00
3/31/2019	EPR-2	1000	Base	12.37	11.02	103.40	40.00			0.04	0.25	0.01	0.02	3.30	21.30
4/4/2019	EPR-2	1640	Storm	14.00	10.80	106.00	40.20	6.30	3.80	0.22	0.00	0.00	0.03	19.80	2.90
4/18/2019	EPR-2	1330	Storm	15.80	9.32	94.30	42.80	5.56	31.40	0.11	0.39	0.14	0.26	45.10	59.30
4/23/2019	EPR-2	1000	Base	15.58	14.19	142.30	33.00			0.01	0.39	0.03	0.05	8.80	41.10
4/30/2019	EPR-2	1000	Base	18.87	18.76	201.50	41.00			0.01	0.40	0.02	0.04	6.60	26.40
5/15/2019	EPR-2	1000	Base	17.83	9.15	96.30	39.00			0.02	0.39	0.03	0.05	7.30	41.10
5/29/2019	EPR-2	1000	Base	23.72	8.98	106.10	43.00			0.06	0.22	0.03	0.07	13.50	52.40
6/13/2019	EPR-2	1000	Base							0.01	0.23	0.01	0.04	5.20	43.60
5/30/2018	GC-1	1330	Base	26.61	4.73	58.90	69.00			0.11	0.41	0.08	0.37	118.40	148.90
6/13/2018	GC-1	1330	Base	27.77	2.90	35.00	86.00			0.10	0.50	0.10	0.29	56.20	104.00
6/27/2018	GC-1	1330	Base	26.75	2.50	31.30				0.10	0.54	0.11	0.27	29.50	108.40
9/9/2018	GC-1	1330	Base	25.36	4.52	55.10	91.00			0.07	0.18	0.15	0.17	18.00	73.60
9/30/2018	GC-1	1330	Base	21.87	8.52	97.10	69.00			0.02	0.28	0.05	0.13	63.10	19.20
10/15/2018	GC-1	1300	Storm	16.40	5.92	64.60	60.60	6.20	529.00	0.05	0.50	0.10	0.21	78.20	49.40
10/21/2018	GC-1	1330	Base	14.22	10.38	101.00	64.00			0.07	0.35	0.05	0.09	11.80	69.60
11/1/2018	GC-1	1045	Storm	14.90	6.30	62.30	54.90	6.00	64.90	0.18	0.28	0.17	0.32	74.40	51.30
11/11/2018	GC-1	1330	Base	9.12	15.31	132.70	63.00			0.06	0.38	0.05	0.08	6.70	49.60
11/27/2018	GC-1	1330	Base	5.23	13.14	103.20	66.00			0.03	0.29	0.04	0.08	7.70	58.90
12/14/2018	GC-1	1230	Storm	8.90	8.64	73.60	69.40	5.89	42.20	0.05	0.19	0.07	0.16	76.20	40.90
12/17/2018	GC-1	1330	Base	8.21	7.39	63.20	61.00			0.32	0.04	0.07	0.12	10.80	62.90
12/30/2018	GC-1	1330	Base	6.06	5.72	45.90	57.00			0.03	0.34	0.05	0.09	10.30	51.30
1/13/2019	GC-1	1330	Base	5.99	12.83	102.90	67.00			0.03	0.34	0.03	0.06	1.40	81.80
1/23/2019	GC-1	1215	Storm	5.10	14.22		53.60	5.86	27.70	0.07	0.21	0.06	0.11	54.40	16.20
1/27/2019	GC-1	1330	Base	4.52	13.90	107.10	55.00			0.02	0.41	0.02	0.04	19.20	45.60
2/11/2019	GC-1	1345	Storm	6.30	13.12	106.20	40.30	6.25	33.00	0.04	0.30	0.07	0.14	41.80	20.90
2/17/2019	GC-1	1330	Base	5.34	22.20	175.40	43.00			0.04	0.44	0.03	0.09	6.80	48.40
2/27/2019	GC-1	1330	Base	11.66	10.26	94.40	51.00			0.03	0.26	0.04	0.06	10.60	51.80
3/16/2019	GC-1	13330	Base	10.95	16.16	145.60	67.00			0.02	0.18	0.04	0.09	56.40	10.80
3/31/2019	GC-1	1330	Base	12.60	11.44	107.60	68.00			0.09	0.18	0.09	0.12	9.00	49.60
4/4/2019	GC-1	1525	Storm	14.82	8.70		75.00	6.24	35.40	0.19	0.05	0.09	0.17	89.30	16.20
4/18/2019	GC-1	1225	Storm	16.50	6.32	64.10	45.40	6.50	38.20	0.08	0.12	0.18	0.71	56.70	20.00
4/23/2019	GC-1	1330	Base	18.43	18.51	197.10	54.00			0.09	0.21	0.07	0.12	17.50	56.20
4/30/2019	GC-1	1330	Base	19.67	18.88	206.10	56.00			0.09	0.27	0.08	0.15	26.60	43.80
5/15/2019	GC-1	1330	Base	19.93	8.66	95.10	58.00			0.07	0.23	0.07	0.11	19.60	57.10
5/29/2019	GC-1	1330		No Samples Taken											
6/13/2019	GC-1	1330		No Samples Taken											
5/30/2018	LC-1	800	Base	29.26	6.09	80.00	175.00			0.04	0.18	0.02	0.07	101.60	21.70
6/13/2018	LC-1	800	Base	25.03	3.21	40.00	180.00			0.08	0.26	0.03	0.06	56.60	102.00
6/27/2018	LC-1	800	Base							0.06	0.21	0.02	0.09	45.20	83.10
9/9/2018	LC-1	800	Base	25.04	4.43	53.10	99.00			0.08	0.30	0.04	0.13	21.50	95.10
9/30/2018	LC-1	800	Base	21.67	9.36	105.80	159.00			0.01	0.14	0.02	0.04	96.00	8.90
10/15/2018	LC-1	900	Storm	15.10	8.92	88.60	60.00	6.33	829.00	0.03	0.22	0.04	0.44	132.90	448.00
10/21/2018	LC-1	800	Base	13.46	10.49	100.40	141.00			0.05	0.23	0.02	0.08	22.10	104.00
11/1/2018	LC-1	610	Storm	16.00	9.20	93.20	61.20	6.00	72.40	0.03	0.32	0.05	0.15	58.20	32.30
11/11/2018	LC-1	800	Base	8.20	11.93	100.70	150.00			0.04	0.29	0.45	0.05	4.80	87.10
11/27/2018	LC-1	800	Base	6.95	7.34	60.50	187.00			0.03	0.09	0.02	0.06	14.60	116.20
12/14/2018	LC-1	815	Storm	10.70	9.61	96.70	50.70	5.50	50.50	0.02	0.30	0.03	0.10	82.90	20.40
12/17/2018	LC-1	800	Base	7.89	7.14	59.60	126.00			0.40	0.04	0.71	0.05	8.50	85.30
12/30/2018	LC-1	800	Base	10.51	4.92	44.20	49.00			0.05	0.33	0.03	0.06	8.10	72.00
1/13/2019	LC-1	800	Base	8.45	15.25	130.90	150.00			0.01	0.28	0.01	0.04	13.30	118.20
1/23/2019	LC-1	805	Storm	6.40	15.00	120.00			4.14	0.10	0.17	0.10	0.13	54.00	62.30
1/27/2019	LC-1	800	Base	8.87	14.95	128.90	187.00			0.01	0.42	0.01	0.03	16.10	101.60
2/11/2019	LC-1	950	Storm	7.30	13.43	107.90	35.20	5.11	113.00	0.07	0.16	0.07	0.15	39.30	67.30
2/17/2019	LC-1	800	Base	8.21	18.97	160.00	126.00			0.02	0.37	0.01	0.03	3.90	43.30
2/27/2019	LC-1	800	Base	13.00	-	-	112.60			0.02	0.32	0.02	0.03	4.00	84.90
3/16/2019	LC-1	800	Base	14.17	17.35	168.20	124.00			0.02	0.30	0.02	0.03	87.30	5.20
3/31/2019	LC-1	800	Base	16.23	10.76	109.50	171.00			0.04	0.07	0.01	0.03	2.70	90.00
4/4/2019	LC-1	1125	Storm	13.80	9.42		76.00	6.06	175.00	0.31	0.07	0.03	0.22	76.90	118.60
4/18/2019	LC-1	915	Storm	16.80	7.98	82.40	38.60	5.40	143.00	0.07	0.11	0.05	0.17	60.70	67.90
4/23/2019	LC-1	800	Base	21.66	18.31	207.00	169.00			0.06	0.35	0.03	0.05	4.50	91.60
4/30/2019	LC-1	800	Base	23.07	16.65	193.30	155.00			0.04	0.18	0.02	0.05	4.90	74.40
5/15/2019	LC-1	800	Base	26.68	7.10	89.00	135.00			0.03	0.22	0.09	0.03	5.50	92.20
5/29/2019	LC-1	800	Base	27.87	10.65	135.80	156.00			0.04	0.10	0.03	0.06	2.60	115.60
6/13/2019	LC-1	800	Base							0.03	0.07	0.02	0.03	20.50	105.30

Date Sampled	Sample ID	Time Sampled	Storm or Base flow Sampling	Temp C	D.O. (mg/L)	D.O. %	Sp. Cond (µS)	pH	Turbidity (ntu)	Ammonia (mg/L)	Nitrate+Nitrite (mg/L)	SRP (mg/L)	Total Phosphorus (mg/L)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)
5/30/2018	SD-1	830	Base	29.67	6.00	78.50	154.00			0.17	0.28	0.04	0.11	96.20	20.30
6/13/2018	SD-1	830	Base	27.11	2.80	35.50	158.00			0.24	0.07	0.10	0.20	9.00	97.30
6/27/2018	SD-1	830	Base	27.81	3.34	41.50	120.00			0.17	0.16	0.06	0.13	46.20	65.30
9/9/2018	SD-1	830	Base	24.82	5.77	69.60	68.00			0.08	0.36	0.08	0.12	19.30	69.10
9/30/2018	SD-1	830	Base	21.21	7.83	88.10	154.00			0.05	0.90	0.03	0.08	106.20	14.10
10/15/2018	SD-1	950	Storm	14.50	7.43	72.90	31.00	7.80	143.00	0.05	0.37	0.06	0.20	40.90	104.70
10/21/2018	SD-1	830	Base	7.38	9.67	14.29	128.00			0.05	0.57	0.04	0.09	12.80	98.40
11/1/2018	SD-1	700	Storm	16.20	8.10	83.00	77.00	6.61	60.70	0.04	0.68	0.10	0.18	79.60	23.90
11/11/2018	SD-1	830	Base	8.44	14.86	110.80	153.00			0.04	1.01	0.04	0.07	7.10	97.80
11/27/2018	SD-1	830	Base	8.10	11.34	97.00	225.00			0.02	0.16	0.02	0.05	9.40	163.10
12/14/2018	SD-1	900	Storm	10.80	8.75	78.10	82.80	6.20	49.80	0.02	0.51	0.07	0.14	86.40	17.10
12/17/2018	SD-1	830	Base	8.32	7.95	63.30	161.00			0.87	0.04	0.03	0.06	5.00	104.20
12/30/2018	SD-1	830	Base	7.08	8.69	71.40	161.00			0.04	0.78	0.04	0.07	7.40	90.70
1/13/2019	SD-1	830	Base	7.50	14.27	119.10	173.00			0.02	0.86	0.02	0.04	4.20	131.60
1/23/2019	SD-1	850	Storm	6.10	14.28	115.20	29.00	5.90	76.80	0.05	0.31	0.07	0.18	69.30	61.60
1/27/2019	SD-1	830	Base	7.52	17.71	147.80	162.00			0.02	0.97	0.02	0.03	12.00	95.30
2/11/2019	SD-1	1015	Storm	7.10	12.16	100.50	31.90	5.45	83.00	0.06	0.20	0.09	0.18	48.00	73.00
2/17/2019	SD-1	830	Base	7.71	22.61	189.90	157.00			0.05	0.72	0.02	0.03	3.00	41.60
2/27/2019	SD-1	830	Base	12.60	-	-	107.60			0.03	0.89	0.02	0.04	3.50	93.60
3/16/2019	SD-1	830	Base	13.71	18.00	173.10	145.00			0.03	0.74	0.03	0.05	97.60	3.50
3/31/2019	SD-1	830	Base	15.47	10.24	101.70	208.00			0.06	0.14	0.02	0.05	10.50	108.90
4/4/2019	SD-1	1230	Storm	13.90	7.70		49.00	6.98	117.00	0.47	0.19	0.07	0.23	68.20	78.30
4/18/2019	SD-1	945	Storm	16.80	8.12	83.70	43.40	6.49	71.60	0.08	0.29	0.12	0.21	51.60	30.70
4/23/2019	SD-1	830	Base	20.70	15.07	168.00	169.00			0.09	0.79	0.03	0.06	9.40	116.70
4/30/2019	SD-1	830	Base	22.14	13.91	162.60	173.00			0.06	0.66	0.04	0.08	11.60	114.40
5/15/2019	SD-1	830	Base	27.17	7.06	89.10	186.00			0.09	0.54	0.09	0.08	14.30	110.70
5/29/2019	SD-1	830	Base	28.61	8.44	109.00	208.00			0.03	0.11	0.06	0.10	13.30	142.00
6/13/2019	SD-1	830	Base							0.04	0.01	0.06	0.11	6.70	108.20
5/30/2018	TB-1	900	Base	30.16	4.69	62.10	227.00			0.12	0.04	0.03	0.22	129.10	45.20
6/13/2018	TB-1	900	Base	27.59	2.13	27.30	273.00			0.23	0.10	0.05	0.25	42.40	154.40
6/27/2018	TB-1	900	Base	27.80	1.92	24.70	345.00			0.12	0.08	0.03	0.26	63.80	189.10
9/9/2018	TB-1	900	Base	23.65	5.54	65.70	82.00			0.05	0.20	0.47	0.57	191.30	127.80
9/30/2018	TB-1	900	Base	21.74	5.94	67.90	90.00			0.12	0.25	0.04	0.19	85.60	59.50
10/15/2018	TB-1	1045	Storm	16.90	5.91	61.20	87.70	6.50	76.10	0.05	0.34	0.08	0.22	77.60	56.00
10/21/2018	TB-1	900	Base	16.48	7.77	79.50	785.00			0.07	0.34	0.07	0.15	52.10	414.90
11/1/2018	TB-1	715	Storm	16.80	6.60	68.00	45.00	6.50	176.00	0.02	0.12	0.21	0.32	80.20	104.50
11/11/2018	TB-1	900	Base	9.73	12.58	110.70	77.00			0.04	0.20	0.05	0.13	26.10	67.10
11/27/2018	TB-1	900	Base	7.65	8.28	69.20	116.00			0.04	0.19	0.05	0.10	29.90	78.90
12/14/2018	TB-1	1015	Storm	9.80	9.32	82.30	38.60	5.85	86.80	0.03	0.17	0.05	0.16	74.90	36.20
12/17/2018	TB-1	900	Base	8.92	7.63	65.90	42.00			0.11	0.04	0.75	0.24	88.50	87.80
12/30/2018	TB-1	900	Base	7.64	7.91	66.00	128.00			0.11	0.19	0.07	0.22	44.50	59.80
1/13/2019	TB-1	900	Base	6.34	12.78	102.80	141.00			0.04	0.31	0.05	0.14	42.50	130.00
1/23/2019	TB-1	1025	Storm	6.60	14.40	117.30	54.60	6.20	482.00	0.04	0.00	0.03	0.42	160.60	242.00
1/27/2019	TB-1	900	Base	5.64	-	-	-			0.04	0.21	0.03	0.08	62.70	39.60
2/11/2019	TB-1	1130	Storm	6.20	13.55	110.00	38.00	5.65	106.00	0.05	0.16	0.05	0.15	68.20	32.80
2/17/2019	TB-1	900	Base	6.30	21.33	172.60	45.00			0.05	0.09	0.07	0.15	44.50	56.90
2/27/2019	TB-1	900	Base	10.60	-	-	50.40			0.05	0.08	0.05	0.14	72.50	61.80
3/16/2019	TB-1	900	Base	13.31	16.20	154.70	60.00			0.05	0.14	0.04	0.15	65.80	68.40
3/31/2019	TB-1	900	Base	15.05	10.45	103.70	151.00			0.06	0.03	0.05	0.16	47.80	89.10
4/4/2019	TB-1	1325	Storm	15.32	7.50		165.00	7.01	116.00	0.05	0.08	0.03	0.21	115.80	76.50
4/18/2019	TB-1	1035	Storm	17.00	7.68	79.30	48.70	6.67	960.00	0.08	0.31	0.06	0.16	150.70	354.70
4/23/2019	TB-1	900	Base	21.09	12.00	135.00	60.00			0.12	0.10	0.08	0.23	83.70	95.30
4/30/2019	TB-1	900	Base	22.79	13.36	154.60	97.00			0.18	0.15	0.06	0.22	93.60	66.90
5/15/2019	TB-1	900	Base	-	-	-	-			0.05	0.07	0.14	0.15	10.50	61.60
5/29/2019				No Samples Taken											
6/13/2019				No Samples Taken											
5/30/2018	WC-1	1230	Base	25.40	5.37	65.50	300.00			0.24	6.33	2.79	3.21	194.20	79.60
6/13/2018	WC-1	1230	Base	27.15	2.91	36.80	544.00			2.00	1.88	1.97	2.20	7.40	292.40
6/27/2018	WC-1	1230	Base	28.07	4.21	53.30	522.00			0.06	2.40	3.88	4.02	9.30	288.20
9/9/2018	WC-1	1230	Base	25.62	7.94	97.10	535.00			0.30	1.33	1.24	1.11	4.30	294.90
9/30/2018	WC-1	1230	Base	23.10	7.22	84.30	417.00			0.00	4.49	1.19	1.27	236.00	5.40
10/15/2018	WC-1	1015	Storm	17.10	8.71	91.00	100.00	6.30	281.00	0.04	1.20	0.46	1.29	97.30	341.40
10/21/2018	WC-1	1230	Base	16.45	9.01	92.00	234.00			0.05	1.70	1.92	2.13	15.30	152.40
11/1/2018	WC-1	720	Storm	15.80	8.20	83.00	88.40	5.60	144.00	0.07	0.59	0.05	1.14	89.10	152.80
11/11/2018	WC-1	1230	Base	11.93	13.85	128.50	301.00			0.09	3.05	0.08	0.14	5.30	170.40
11/27/2018	WC-1	1230	Base	9.88	12.48	118.80	424.00			0.10	2.00	3.26	3.71	5.00	263.60
12/14/2018	WC-1	1405	Storm	11.50	10.10	93.00	145.90	6.30	125.00	0.04	0.52	0.13	0.39	124.90	42.90
12/17/2018	WC-1	1230	Base	10.25	6.71	5.91	190.00			1.49	0.07	2.08	0.38	12.50	119.80
12/30/2018	WC-1	1230	Base	8.17	7.22	61.10	215.00			0.12	0.82	0.07	0.13	10.10	127.60
1/13/2019	WC-1	1230	Base	9.27	10.29	89.50	300.00			2.64	0.82	0.24	0.36	2.70	190.40
1/23/2019	WC-1	830	Storm	6.60	11.10	90.00	94.70	5.40	135.00	0.85	0.37	0.02	1.33	73.30	173.90
1/27/2019	WC-1	1230	Base	7.53	14.92	124.40	263.00			1.17	0.79	0.08	0.17	16.70	145.80
2/11/2019	WC-1	1020	Storm	6.62	11.48	93.60	42.00	4.54	323.00	0.21	0.20	0.05	0.65	75.60	408.90
2/17/2019	WC-1	1230	Base	7.57	19.10	159.50	285.00			4.53	1.45	0.05	0.09	7.30	44.00
2/27/2019	WC-1	1230	Base	12.92	11.20	105.90	256.00			1.22	0.73	0.20	0.28	8.90	14.00
3/16/2019	WC-1	1230	Base	11.23	16.70	152.50	280.00			0.41	0.74	0.30	0.41	152.00	11.20
3/31/2019	WC-1	1230	Base	14.41	10.57	103.60	431.00			2.82	0.83	0.88	1.04	13.10	223.30
4/4/2019	WC-1	1225	Storm	15.00	6.40	63.00	437.80	6.50	165.00		0.47	0.50	1.15	207.10	171.60
4/18/2019	WC-1	1015	Storm	16.50	8.00	82.00	90.70	5.54	320.00	0.35	0.36	0.34	1.03	89.80	440.20
4/23/2019	WC-1	1230	Base	18.89	16.26	174.40	219.00			1.50	1.19	0.63	0.75	13.10	127.60
4/30/2019	WC-1	1230	Base	20.16	16.29	179.60	308.00			1.91	1.30	0.40	0.55	13.80	164.20
5/15/2019	WC-1	1230	Base	20.72	9.08	101.40	304.00			2.92	1.12	1.84	1.86	7.40	168.90
5/29/2019				No Samples Taken											
6/13/2019				No Samples Taken											
5/30/2018	WPR-1	1100	Base	24.08	7.32	86.10	30.00			0.03	0.09	0.00	0.05	28.20	10.20
6/13/2018	WPR-1	1100	Base	26.61	3.76	46.80	34.00			0.02	0.27	0.00	0.03	22.10	36.80
6/27/2018	WPR-1	1100	Base	27.26	6.26	78.60	37.00			0.02	0.34	0.01	0.03	4.90	33.60
9/9/2018	WPR-1	1100	Base	24.10	7.70	91.60	35.00			0.02	0.22	0.02	0.02	1.30	37.80
9/30/2019	WPR-1	1100	Base	20.12	7.99	87.80	49.00			0.00	0.18	0.00	0.02	33.10	1.80
10/15/2018	WPR-1	1215	Storm	16.70	9.40	96.00	35.10	6.40	12.90	0.00	0.18	0.00	0.04	33.60	9.50
10/21/2018	WPR-1	1100	Base	15.79	13.43	135.40	31.00			0.04	0.83	0.02	0.05	6.30	52.00
11/1/2018	WPR-1	830	Storm	15.20	10.00	100.00	24.70	5.50	23.10	0.01	0.18	0.03	0.04	40.00	12.30
11/11/2018	WPR-1	1100	Base	11.51	15.53	142.30	26.00			0.01	0.16	0.00	0.02	2.30	26.00
11/27/2018	WPR-1	1100	Base	7.74	15.78	132.30	27.00			0.00	0.15	0.01	0.06	2.70	36.20
12/14/2018	WPR-1	1025	Storm	9.10	11.80		22.10	5.10	13.40	0.01	0.13	0.00	0.02	37.10	5.30
12/17/2018	WPR-1	1100	Base	9.40	7.44	64.80	23.00			0.18	0.01	0.27	0.02	3.00	32.00
12/30/2018	WPR-1	1100	Base	8.28	7.72	65.20	22.00			0.03	0.13	0.01	0.03	2.90	27.10
1/13/2019	WPR-1	1100	Base	7.13	14.85	122.50	23.00			0.00	0.13	0.00	0.01	9.70	42.20
1/23/2019	WPR-1	1020	Storm	6.70	12.30	100.00	19.50	5.60	16.00	0.02	0.09	0.01	0.03	32.00	8.00
1/27/2019	WPR-1	1100	Base	6.59	14.27	115.90	22.00			0.00	0.13	0.00	0.01	16.90	21.30
2/11/2019	WPR-1	1205	Storm	7.45	12.08	100.30	15.00	4.28	32.00	0.01	0.07	0.01	0.07	29.30	41.90
2/17/2019	WPR-1	1100	Base	7.85	19.81	166.40	17.00			0.01	0.06	0.02	0.03	5.80	22.00
2/27/2019	WPR-1	1100	Base	8.70	14.96	128.20	20.00			0.00	0.07	0.00	0.01	2.30	28.40
3/16/2019	WPR-1	1100	Base	9.40	18.39	159.40	20.00			0.00	0.08	0.00	0.02	22.00	2.40
3/31/2019	WPR-1	1100	Base	11.76	11.78	108.70	22.00			0.03	0.04	0.00	0.01	2.30	17.60
4/4/2019	WPR-1	1455	Storm	13.10	11.10	105.70	22.60	5.90	7.40	0.05	0.01	0.00	0.03	20.90	2.00
4/18/2019	WPR-1	1135	Storm	14.40	9.64	95.00	21.40	5.14	16.70	0.01	0.04	0.02	0.05	28.00	9.50
4/23/2019	WPR-1	1100	Base	14.70	19.69	194.00	21.00			0.00	0.04	0.01	0.03	4.90	34.20
4/30/2019	WPR-1	1100	Base	17.60	24.26	253.90	23.00			0.03	0.04	0.00	0.02	3.30	28.90
5/15/2019	WPR-1	1100	Base	16.83	10.09	104.00	22.00			0.01	0.04	0.01	0.02	4.30	31.60
5/29/2019	WPR-1	1100	Base	22.26	10.93	125.70	25.00			0.01	0.08	0.02	0.04	7.00	44.20
6/13/2019	WPR-1	1100	Base							0.01	0.04	0.01	0.03	0.70	39.60
5/30/2018	WPR-2	1130	Base	26.69	5.45	67.50	40.00			0.02	0.27	0.01	0.03	31.80	5.80
6/13/2018	WPR-2	1130	Base	28.71	3.21	41.00	51.00			0.08	0.33	0.03	0.03	3.20	42.80
6/27/2018	WPR-2	1130	Base	30.12	4.33	57.50	60.00			0.04	0.22	0.02	0.02	2.50	50.70
9/9/2018	WPR-2	1130	Base	25.59	7.32	89.50	45.00			0.04	0.39	0.07	0.03	2.20	46.00
9/30/2018	WPR-2	1130	Base	21.41	8.50	95.90	58.00			0.00	0.33	0.01	0.08	47.80	2.50
10/15/2018	WPR-2	1420	Storm	17.30	8.80	92.00	54.10	6.40	31.00	0.04	0.91	0.07	0.15	50.20	34.40
10/21/2018	WPR-2	1130	Base	15.01	12.14	119.90	47.00			0.01	0.31	0.00	0.03	6.70	43.60
11/1/2018	WPR-2	950	Storm	15.50	9.80	98.00	38.70	5.90	42.30	0.01	0.61	0.08	0.19	54.00	37.80
11/11/2018	WPR-2	1130	Base	10.86	15.67	141.50	39.00			0.01	0.64	0.01	0.04	2.80	40.40
11/27/2018	WPR-2	1130	Base	6.51	15.80	128.00	43.00			0.00	0.63	0.01	0.02	3.00	43.80
12/14/2018	WPR-2	920	Storm	9.30	11.60		38.20	5.30	24.30	0.05	0.55	0.02	0.08	41.30	22.20
12/17/2018	WPR-2	1130	Base	8.74	7.59	65.70	38.00			0.67	0.01	0.01	0.12	22.90	38.20
12/30/2018	WPR-2	1130	Base	7.75	7.43	61.40	39.00			0.01	0.71	0.02	0.05	6.10	36.40
1/13/2019	WPR-2	1130	Base	6.74	10.57	85.90	37.00			0.01	0.65	0.01	0.02	8.10	62.90
1/23/2019	WPR-2	1355	Storm	6.70	12.40	101.00	31.60	5.90	26.80	0.09	0.53	0.04	0.09	41.30	29.30
1/27/2019	WPR-2	1130	Base	5.74	14.75	117.50	35.00			0.00	0.65	0.01	0.02	15.00	36.40
2/11/2019	WPR-2	1345	Storm	6.61	12.89	105.00	22.00	4.87	137.00	0.08	0.28	0.06	0.25	42.90	183.10
2/17/2019	WPR-2	1130	Base	6.84	14.56	118.60	29.00			0.02	0.44	0.05	0.09	7.70	30.20
2/27/2019	WPR-2	1130	Base	9.40	14.45	125.90	31.00			0.01	0.48	0.02	0.03	4.20	28.20
3/16/2019	WPR-2	1130	Base	9.42	18.82	163.70	33.00			0.01	0.45	0.01	0.03	34.70	5.00
3/31/2019	WPR-2	1130	Base	12.53	11.19	105.10	33.00			0.02	0.24	0.01	0.02	3.10	28.70
4/4/2019	WPR-2	1415	Storm	13.80	10.70	103.50	35.00	5.90	5.70	0.22	0.01	0.00	0.03	20.20	2.90
4/18/2019	WPR-2	1100	Storm	15.40	9.44	94.80	38.90	5.49	88.70	0.08	0.34	0.09	0.26	54.20	104.90
4/23/2019	WPR-2	1130	Base	15.74	17.22	173.50	33.00			0.01	0.35	0.02	0.05	8.40	29.10
4/30/2019	WPR-2	1130	Base	18.73	20.99	224.80	35.00			0.01	0.29	0.01	0.04	8.00	31.30
5/15/2019	WPR-2	1130	Base	17.91	10.41	110.00	35.00			0.01	0.32	0.03	0.04	7.30	36.90
5/29/2019	WPR-2	1130	Base	23.84	9.29	110.00	38.00			0.03	0.31	0.03	0.08	6.30	50.20
6/13/2019	WPR-2	1130	Base							0.02	0.20	0.04	0.04	5.30	40.00

Sample Location	<	Nitrogen (%)	Total P (ppm)
SD-1		0.07	1486
SD-1		0.06	1483
SD-1		0.07	1718
TB-1		0.17	618
TB-1		0.18	594
TB-1		0.46	1073
WC-1		0.1	516
WC-1		0.1	610
WC-1		0.08	605
CC-1		0.07	396
CC-1		0.06	413
CC-1		0.06	430
LC-1		0.13	691
LC-1		0.17	668
LC-1		0.15	689
GC-1		0.17	648
GC-1		0.15	593
GC-1		0.11	540
WPR-2		0.32	168
WPR-2	<	0.05	127
WPR-2		0.07	155
WPR-1	<	0.05	109
WPR-1	<	0.05	115
WPR-1	<	0.05	118
EPR-2	<	0.05	306
EPR-2	<	0.05	276
EPR-2	<	0.05	255
EPR-1	<	0.05	437
EPR-1	<	0.05	305
EPR-1	<	0.05	207

Appendix B

Field Sheets

Unified Stream Assessment (USA)

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
CC-1	Cypress Creek	8/8/19 @ 1130	ENJ DMB

REACH START	REACH END
LAT:	LAT:
LONG:	LONG:

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐Heavy rain ☐Steady rain ☐Showers ☐Clear/sunny
☒Mostly cloudy ☐Partly cloudy

Weather – Current conditions
☐Heavy rain ☐Steady rain ☐Showers ☐Clear/sunny
☒Mostly cloudy ☐Partly cloudy

Stream Classification
☒ Perennial ☐ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order_____

Stream Origin
☐ Spring-fed ☒ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☐ Moderate ☒ Low ☐ None
Base Flow as %Channel Width: ☐0-25% ☐50-75% ☑25-50% ☐75-100% **Flows Measured:** Yes / (No)
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☐ Moderate ☑ Low

Channel Morphology **System:** Step/Pool - (Riffle/Pool) - Pool (circle)
☑ Riffle 10 % ☐ Run _____% ☑ Pool 90 % ☐ Steps _____%

Dominant Substrate
☑Silt/clay (fine or slick) ☐Cobble (2.5-10")
☐Sand (gritty) ☐Boulder (>10")
☐Gravel (0.1-2.5") ☐Bed Rock

Dominant In-Stream Habitats
☐Woody Debris ☐Root Wads ☐Leaf Packs
☐Deposition ☐Undercut Bank
☐Aquatic Plants ☑Overhanging Vegetation
Habitat Quality: ☑Poor ☐Fair ☐Good ☐ Optimal

Land use
☑ Forest 85 % ☐ Pasture _____% ☐ Urban _____%
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☑ Industrial 15 % ☐ Sub-Urban____%

Local Watershed NPS Pollution
☐ Industrial Storm Water
☐ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☐ Other_____ ☑No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 85 % ☑ Shrub/Sapling 15 % ☐ Herbs/Grasses ____% ☐ Turf/Crops ____%
Riparian Width: ☐<10 ft ☐11-25 ft ☐ 26-50 ft ☑> 50 ft

Stream Shading (water surface)
☐Mostly shaded (≥75% coverage) ☑Partially shaded (≥25% coverage)
☐Halfway shaded (≥50% coverage) ☐Unshared (<25% coverage)

Water Quality Observations

Odors Noted:
☒Normal/None ☐ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other_____

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☐ Clear ☒ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☑ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

Lvery bayou like u/s of bridge

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream: CC-1	Date: 8/8/19	Initials: ENJ DMB

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description
ID-1	just US of bridge to the end of ENJ's track	2	3	Channelization of entire creek

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER-1	RB Downstream Top of erosion ENJ GPS	L (M) H VH EX (circle one)	40	3	Bank: Height 6 ft, Angle 80 Deg Protection: Roots 15 %, Root Depth 1 ft Vegetation 10 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - % 100
ER-2	LB downstream RB as well but ENT GPS less	L (M) H VH EX (circle one)	refer to ENJ's GPS	2	Bank: Height 4 ft, Angle 70 Deg Protection: Roots 5 %, Root Depth 1 ft Vegetation 5 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - %
ER		L M H VH EX (circle one)			Bank: Height ft, Angle Deg Protection: Roots %, Root Depth ft Vegetation % [4]Material: Silt/Clay Sand / Gravel Cobble - %
ER		L M H VH EX (circle one)			Bank: Height ft, Angle Deg Protection: Roots %, Root Depth ft Vegetation % [4]Material: Silt/Clay Sand / Gravel Cobble - %
ER		L M H VH EX (circle one)			Bank: Height ft, Angle Deg Protection: Roots %, Root Depth ft Vegetation % [4]Material: Silt/Clay Sand / Gravel Cobble - %

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA, Cont.

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
CC-1	Cypress Creek	7/8/19 1130	EWJ/DMB

OTHER INFO:

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☐ Poor ☑ Fair ☐ Good
Habitat: ☐ Poor ☑ Fair ☐ Good
Vegetation: ☐ Forest ☐ Shrub/Sapling ☐ Tall grasses ☐ Turf/crops
Encroachment: ☐ Poor ☐ Fair ☐ Good

Periphyton (attached algae):
Filamentous: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Suspended Algae (phytoplankton) abundance:
☐ None noticeable (water basically clear)
☑ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☐ None ☑ Sparse ☐ Moderate ☐ Abundant
Emergent: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☐ None ☐ Sparse ☑ Moderate ☐ Abundant

Aquatic Life Observed:
☑ Fish ☐ Snails ☐ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☐ Cattle ☐ Beaver ☐ Deer ☐ Other_____

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☐ Outfalls(OT): 1 2 3 Wpt_____
☐ Stream Crossing(SC): 1 2 3 Wpt_____
☑ Bank Erosion(ER): 1 (2) 3 Wpt_____
☑ Channel Modification(CM): 1 2 (3) Wpt U/S of bridge to end of ENT's track
☐ Impacted Buffers(IB): 1 2 3 Wpt_____
☐ Trash(TR): 1 2 3 Wpt_____
☐ Utilities(UT): 1 2 3 Wpt_____
☐ Other_____: 1 2 3 Wpt_____

Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☐ Sediment Deposition
☐ Widening ☐ Aggrading ☐ Bank Failure ☐ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☐ Bank scour ☐ Slope failure ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 4 (ft) Bankfull Depth 8 (ft) Wetted Width: 30 (ft) Riffle/Run Depth 0.3 (ft)
Rt bank Ht: 3.5 (ft) Bankfull Width 50 (ft)) TOB Width: 50 (ft) Pool Depth 4.5 (ft)

Channel Stability:
Lt Bank: Angle 65 degrees
LtBank Vegetation protection: 10 % cover
LtBank Erosion Hazard: L M (H) VH EX (circle one)
Length Lt Bank Affected: Veloto to ENT's GPS
Wpt(s):_____
Rt Bank: Angle 50 degrees
RtBank Vegetation protection 30 % cover
RtBank Erosion Hazard: L (M) H VH EX (circle one)
Length Rt Bank Affected: <
Wpt(s):_____

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	Fair: Forested or developed near stream. Vehicle access limited.	Difficult: Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5	4 3	(2) 1

Notes: (biggest problem(s) you see in survey reach)
Creek very channelized. Almost bayou-like

Restoration Potential:
☐ Riparian reforestation ☐ Bank stabilization
☐ Stormwater retrofit ☐ Outfall stabilization
☑ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other_____

Place sketch of reach on back of page.

Unified Stream Assessment (USA)

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
EPR-1 U/S	Section	6/29/19	EMT PMB

REACH START	REACH END
LAT:	LAT:
LONG:	LONG:

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐ Heavy rain ☐ Steady rain ☐ Showers ☑ Clear/sunny
☐ Mostly cloudy ☐ Partly cloudy

Weather – Current conditions
☐ Heavy rain ☐ Steady rain ☐ Showers ☑ Clear/sunny
☐ Mostly cloudy ☐ Partly cloudy

Stream Classification
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order_____

Stream Origin
☐ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☑ Moderate ☐ Low ☐ None
Base Flow as %Channel Width: ☐ 0-25% ☑ 50-75% ☐ 25-50% ☐ 75-100% **Flows Measured:** Yes / No
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☑ Moderate ☐ Low

Channel Morphology **System:** Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 15 % ☑ Run 20 % ☑ Pool 50 % ☐ Steps _____%

Dominant Substrate
☑ Silt/clay (fine or slick) ☐ Cobble (2.5-10")
☐ Sand (gritty) ☐ Boulder (>10")
☐ Gravel (0.1-2.5") ☐ Bed Rock

Dominant In-Stream Habitats
☑ Woody Debris ☑ Root Wads ☑ Leaf Packs
☐ Deposition ☑ Undercut Bank
☑ Aquatic Plants ☑ Overhanging Vegetation
Habitat Quality: ☐ Poor ☑ Fair ☐ Good ☐ Optimal

Land use
☑ Forest 70 % ☑ Pasture 30 % ☐ Urban _____%
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☐ Industrial_____% ☐ Sub-Urban_____%

Local Watershed NPS Pollution
☐ Industrial Storm Water
☐ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☐ Other_____ ☐ No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 100 % ☐ Shrub/Sapling ____% ☐ Herbs/Grasses ____% ☐ Turf/Crops ____%
Riparian Width: ☐ <10 ft ☐ 11-25 ft ☑ 26-50 ft ☐ > 50 ft

Stream Shading (water surface)
☐ Mostly shaded (≥75% coverage) ☑ Partially shaded (≥25% coverage)
☐ Halfway shaded (≥50% coverage) ☐ Unshared (<25% coverage)

Water Quality Observations

Odors Noted:
☑ Normal/None ☐ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other_____

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☑ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream:	Date:	Initials:

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description
N/A				

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER LB	Wpt 22 start LB goes d/s to wpt 23	L M (H) VH EX (circle one)	wpt to wpt	1	Bank: Height 7 ft, Angle 85 Deg Protection: Roots 15 %, Root Depth 2.5 ft Vegetation 80 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - %
ER LB	wpt 24	L (M) H VH EX (circle one)	26 yds going d/s	1	Bank: Height 3.5 ft, Angle 80 Deg Protection: Roots 40 %, Root Depth 2 ft Vegetation 35 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - %
ER LB	from 25 to 26 wpt	L M (H) VH EX (circle one)		1	Bank: Height 5.5 ft, Angle 85 Deg Protection: Roots 70 %, Root Depth 2.5 ft Vegetation 40 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - %
ER RB		L M (H) VH EX (circle one)	41 yds	1	Bank: Height 5 ft, Angle 75 Deg Protection: Roots 10 %, Root Depth 1.5 ft Vegetation 5 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - %
ER		L M H VH EX (circle one)			Bank: Height ____ ft, Angle ____ Deg Protection: Roots ____ %, Root Depth ____ ft Vegetation ____ % [4]Material: Silt/Clay Sand / Gravel Cobble - %

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA, Cont.

REACH ID: EDR-1 U/S Section	STREAM:	DATE/TIME: 6/29/19	INITIALS: EW/DMR
OTHER INFO:			

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☑ Poor ☐ Fair ☐ Good   Vegetation: ☑ Forest ☐ Shrub/Sapling ☐ Tall grasses ☐ Turf/crops
Habitat: ☐ Poor ☑ Fair ☐ Good   Encroachment: ☐ Poor ☑ Fair ☐ Good

Periphyton (attached algae):
Filamentous: ☐ None ☑ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Suspended Algae (phytoplankton) abundance:
☐ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Emergent: ☐ None ☑ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Aquatic Life Observed:
☑ Fish ☐ Snails ☐ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☐ Cattle ☑ Beaver ☐ Deer ☐ Other________

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☐ Outfalls(OT): 1 2 3 Wpt________
☐ Stream Crossing(SC): 1 2 3 Wpt________
☑ Bank Erosion(ER): 1 (2) 3 Wpt________
☐ Channel Modification(CM): 1 2 3 Wpt________
☑ Impacted Buffers(IB): 1 (2) 3 Wpt________
☐ Trash(TR): 1 2 3 Wpt________
☐ Utilities(UT): 1 2 3 Wpt________
☐ Other________: 1 2 3 Wpt________
Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☐ Sediment Deposition
☐ Widening ☐ Aggrading ☐ Bank Failure ☐ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☐ Bank scour ☐ Slope failure ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 6 (ft) Bankfull Depth 4.5 (ft) Wetted Width: 50 (ft) Riffle/Run Depth 1 (ft)
Rt bank Ht: 3 (ft) Bankfull Width 55 (ft) TOB Width: 60 (ft) Pool Depth 3 (ft)

Channel Stability:
Lt Bank: Angle 85 degrees
LtBank Vegetation protection: 15 % cover
LtBank Erosion Hazard: L M (H) VH EX (circle one)
Length Lt Bank Affected: all
Wpt(s):________

Rt Bank: Angle ~~70~~ 40 degrees
RtBank Vegetation protection 25 % cover
RtBank Erosion Hazard: (L) M H VH EX (circle one)
Length Rt Bank Affected:________
Wpt(s):________

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	**Fair:** Forested or developed near stream. Vehicle access limited.	**Difficult:** Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5 4	3 2	1

Notes: (biggest problem(s) you see in survey reach)

Place sketch of reach on back of page.

Restoration Potential:
☐ Riparian reforestation ☑ Bank stabilization
☐ Stormwater retrofit ☐ Outfall stabilization
☐ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other ________

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

-in field 1400 ft was roughly calculated as surveyed

Unified Stream Assessment (USA)

REACH ID: EPR-2	STREAM: East Fork Point Remove	DATE/TIME: 8-8-19 1455	INITIALS: ENJ DMB
REACH START		REACH END Could see to where ENJ's	
LAT:		LAT: gps has marked EPR C	
LONG:		LONG:	

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐Heavy rain ☐Steady rain ☐Showers ☐Clear/sunny
☒Mostly cloudy ☐Partly cloudy

Weather – Current conditions
☐Heavy rain ☐Steady rain ☐Showers ☐Clear/sunny
☒Mostly cloudy ☐Partly cloudy

Stream Classification
☒Perennial ☐ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order____

Stream Origin
☐ Spring-fed ☒ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☐ Moderate ☑ Low ☐ None
Base Flow as %Channel Width: ☑0-25% ☐50-75% ☐25-50% ☐75-100% **Flows Measured:** Yes / No
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☐ Moderate ☑ Low

Channel Morphology **System:** Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 25 % ☑ Run 10 % ☑ Pool 65 % ☐ Steps _____%

Dominant Substrate
☑Silt/clay (fine or slick) ☑Cobble (2.5-10")
☐Sand (gritty) ☐Boulder (>10")
☐Gravel (0.1-2.5") ☐Bed Rock

Dominant In-Stream Habitats
☑Woody Debris ☑Root Wads ☑Leaf Packs
☐Deposition ☑Undercut Bank
☑Aquatic Plants ☐Overhanging Vegetation
Habitat Quality: ☐Poor ☐Fair ☑Good ☐ Optimal

Land use
☐ Forest _____% ☑ Pasture 100 % ☐ Urban _____%
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☐ Industrial_____% ☐ Sub-Urban____%

Local Watershed NPS Pollution
☐ Industrial Storm Water
☐ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☑ Other Haying ☐ No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 70 % ☐ Shrub/Sapling ____% ☑ Herbs/Grasses 30 % ☐ Turf/Crops ____%
Riparian Width: ☐<10 ft ☑11-25 ft ☐ 26-50 ft ☐ > 50 ft

Stream Shading (water surface)
☐Mostly shaded (≥75% coverage) ☐Partially shaded (≥25% coverage)
☑Halfway shaded (≥50% coverage) ☐Unshared (<25% coverage)

Water Quality Observations
Odors Noted:
☑ Normal/None ☐ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other_____

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☑ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream:	Date:	Initials:
EPR-2	8-8-19	DMB ENJ

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER-1 NW	ENT GPS ~~LB~~ Down-Stream WP 27	L (M) H VH EX (circle one)	24 yd	2	Bank: Height 3 ft, Angle 90 Deg Protection: Roots 80 %, Root Depth 2.5 ft Vegetation 40 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - % 100
Property Cleared up to bank by 12 ft-15ft ER-2	RB downstream WP 28 @ end downstream	L M H (VH) EX (circle one)	55 yd	2.5	Bank: Height 7 ft, Angle 80 Deg Protection: Roots 30 %, Root Depth 2.5 ft Vegetation 20 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - % 100
ER-3	LB downstream WP 29 @ Beginning downstream	(L) M H VH EX (circle one)	21 yd	1.5	Bank: Height 3 ft, Angle 80 Deg Protection: Roots 80 %, Root Depth 3 ft Vegetation 5 % 50 [4]Material: (Silt/Clay) Sand / Gravel (Cobble) 50 %
ER-4	RB downstream WP 30 @ end downstream	L M (H) VH EX (circle one)	85 yd	1	Bank: Height 9 ft, Angle 85 Deg Protection: Roots 75 %, Root Depth 8 ft Vegetation 25 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - % 100
ER		L M H VH EX (circle one)			Bank: Height ____ ft, Angle ____ Deg Protection: Roots ____ %, Root Depth ____ ft Vegetation ____ % [4]Material: Silt/Clay Sand / Gravel Cobble - % ____

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4] Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA, Cont.

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
EPR-2	East Point Remove	8/8/19 1455	ENJ/DMB
OTHER INFO:			

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☐ Poor ☑ Fair ☐ Good
Habitat: ☐ Poor ☐ Fair ☑ Good
Vegetation: ☑ Forest ☑ Shrub/Sapling ☐ Tall grasses ☐ Turf/crops
Encroachment: ☐ Poor ☑ Fair ☐ Good

Periphyton (attached algae):
Filamentous: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Suspended Algae (phytoplankton) abundance:
☑ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☐ None ☑ Sparse ☐ Moderate ☐ Abundant
Emergent: ☐ None ☑ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Aquatic Life Observed:
☒ Fish ☐ Snails ☐ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☐ Cattle ☒ Beaver ☐ Deer ☐ Other_____

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☐ Outfalls(OT): 1 2 3 Wpt_____
☐ Stream Crossing(SC): 1 2 3 Wpt_____
☑ Bank Erosion(ER): 1 (2) 3 Wpt See ENJ's gps
☐ Channel Modification(CM): 1 2 3 Wpt_____
☑ Impacted Buffers(IB): 1 (2) 3 Wpt agric either side
☐ Trash(TR): 1 2 3 Wpt_____
☐ Utilities(UT): 1 2 3 Wpt_____
☐ Other_____: 1 2 3 Wpt_____
Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☐ Sediment Deposition
☐ Widening ☐ Aggrading ☐ Bank Failure ☐ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☑ Bank scour ☐ Slope failure ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 5 (ft) Bankfull Depth 7.5 (ft) Wetted Width: 32 (ft) Riffle/Run Depth 0.5 (ft)
Rt bank Ht: 6 (ft) Bankfull Width 36 (ft)) TOB Width: 56 (ft) Pool Depth 2 (ft)

Channel Stability:
Lt Bank: Angle 55 degrees
LtBank Vegetation protection: 75 % cover
LtBank Erosion Hazard: L (M) H VH EX (circle one)
Length Lt Bank Affected: less than right
Wpt(s): check ENJ's gps
Rt Bank: Angle 60 degrees
RtBank Vegetation protection 60 % cover
RtBank Erosion Hazard: L M (H) VH EX (circle one)
Length Rt Bank Affected:_____
Wpt(s): ←

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	**Fair:** Forested or developed near stream. Vehicle access limited.	**Difficult:** Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5 4	3	2 1

Notes: (biggest problem(s) you see in survey reach)
The farmers are cutting right up to the banks in spots on either side 10-12 ft from stream. Too much energy when high flow events occur scouring banks

Place sketch of reach on back of page.

Restoration Potential:
☑ Riparian reforestation ☐ Bank stabilization
☐ Stormwater retrofit ☐ Outfall stabilization
☐ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other_____

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

Unified Stream Assessment (USA)

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
GC-1	Gala Creek	8/14/19	ENJ/DKF

REACH START wpt 47	REACH END wpt 48
LAT: 35° 13.383'	LAT: 35 13.640
LONG: 93° 2.433	LONG: 93° 02.524

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: (y) / n
☐Heavy rain ☐Steady rain ☐Showers ☑Clear/sunny
☐Mostly cloudy ☐Partly cloudy

Weather – Current conditions
☐Heavy rain ☑Steady rain ☐Showers ☐Clear/sunny
☐Mostly cloudy ☐Partly cloudy

Stream Classification
☐ Perennial ☑ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order_____

Stream Origin
☐ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☐ Moderate ☑ Low ☐ None
Base Flow as %Channel Width: ☑0-25% ☐50-75% ☐25-50% ☐75-100%
Flows Measured: Yes / No
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☑ Moderate ☐ Low

Channel Morphology
System: Step/Pool - Riffle/Pool - Pool (circle)
☑Riffle 5 % ☑Run 15 % ☑Pool 80 % ☐ Steps _____%

Dominant Substrate
☑Silt/clay (fine or slick) ☐Cobble (2.5-10")
☐Sand (gritty) ☐Boulder (>10")
☐Gravel (0.1-2.5") ☐Bed Rock

Dominant In-Stream Habitats
☑Woody Debris ☑Root Wads ☐Leaf Packs
☐Deposition ☐Undercut Bank
☐Aquatic Plants ☑Overhanging Vegetation
Habitat Quality: ☐Poor ☑Fair ☐Good ☐ Optimal

Land use
☐ Forest _____% ☑ Pasture 100 % ☐ Urban _____%
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☐ Industrial_____% ☐ Sub-Urban____%

Local Watershed NPS Pollution
☐ Industrial Storm Water
☐ Urban/Sub-Urban Storm Water ☐ Row crops
☑ Cattle ☐ Other_____ ☐ No evidence

Riparian Buffer
Vegetation Type: ☑Forest 10 % ☐ Shrub/Sapling ____% ☐ Herbs/Grasses ____% ☑Turf/Crops 90 %
Riparian Width: ☐<10 ft ☐11-25 ft ☐ 26-50 ft ☑> 50 ft 10-30 ft forest then pasture

Stream Shading (water surface)
☑Mostly shaded (≥75% coverage) ☐Partially shaded (≥25% coverage)
☐Halfway shaded (≥50% coverage) ☐Unshared (<25% coverage)

Water Quality Observations

Odors Noted:
☐ Normal/None ☐ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☑ Other Cattle

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☐ None ☐ Sludge ☐ Sawdust ☐ Oils ☑ Sand ☐ Relict shells

USA, Cont.

REACH ID: GC-1	STREAM: Gala Creek	DATE/TIME: 8/14/19	INITIALS: ENJ TDKF
OTHER INFO:			

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☑ Poor ☐ Fair ☐ Good
Habitat: ☑ Poor ☑ Fair ☐ Good
Vegetation: ☑ Forest ☐ Shrub/Sapling ☐ Tall grasses ☑ Turf/crops
Encroachment: ☑ Poor ☐ Fair ☐ Good

Periphyton (attached algae):
Filamentous: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☐ None ☐ Sparse ☐ Moderate ☐ Abundant

Suspended Algae (phytoplankton) abundance:
☑ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Emergent: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☐ None ☐ Sparse ☐ Moderate ☐ Abundant

Aquatic Life Observed:
☑ Fish ☑ Snails ☑ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☑ Cattle ☑ Beaver ☐ Deer ☐ Other_____

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☐ Outfalls(OT): 1 2 3 Wpt_____
☐ Stream Crossing(SC): 1 2 3 Wpt_____
☑ Bank Erosion(ER): 1 (2) 3 Wpt_____
☐ Channel Modification(CM): 1 2 3 Wpt_____
☑ Impacted Buffers(IB): 1 (2) 3 Wpt_____
☐ Trash(TR): 1 2 3 Wpt_____
☐ Utilities(UT): 1 2 3 Wpt_____
☐ Other_____: 1 2 3 Wpt_____
Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☐ Sediment Deposition
☐ Widening ☐ Aggrading ☑ Bank Failure ☐ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☑ Bank scour ☐ Slope failure ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 12 (ft) Bankfull Depth 3.0 (ft) Wetted Width: 15 (ft) Riffle/Run Depth 0.3 (ft)
Rt bank Ht: 14 (ft) Bankfull Width 25 (ft)) TOB Width: 15.40 (ft) Pool Depth 3 (ft)

Channel Stability:
Lt Bank: Angle 65 degrees
LtBank Vegetation protection: 60 % cover
LtBank Erosion Hazard: L (M) H VH EX (circle one)
Length Lt Bank Affected: refer to RE#1
Wpt(s): ENJ's gps

Rt Bank: Angle 70 degrees
RtBank Vegetation protection 55 % cover
RtBank Erosion Hazard: L (M) H VH EX (circle one)
Length Rt Bank Affected: ←
Wpt(s): ←

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	**Fair:** Forested or developed near stream. Vehicle access limited.	**Difficult:** Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5	4 (3) 2	1

Notes: (biggest problem(s) you see in survey reach)
Property owners adjacent to stream are mowing to 5-25 ft of river. Also evidence of cattle in most of the legth of the stream

Place sketch of reach on back of page.

Restoration Potential:
☑ Riparian reforestation ☐ Bank stabilization
☐ Stormwater retrofit ☐ Outfall stabilization
☐ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other _____

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream:	Date:	Initials:
GC-1	8/14/19	ENT/DKF

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description
N/A				

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI landowner mows up to RB
ER 1	wypt 41 ENT Both Banks RB is much worse	L (M) (H) VH EX (circle one)	4 yds	2	RB LB / RB LB Bank: Height 12 8 ft, Angle 75 55 Deg Protection: Roots 15 %, Root Depth 3 ft Vegetation 25 % [4]Material: (Silt/Clay) (Sand) / Gravel Cobble - % 50/50
ER	LB Began c wpt 41 all the way to wypt 42	L (M) H VH EX (circle one)	36 yds + 314	2	Bank: Height 6 ft, Angle 85 Deg Protection: Roots 25 %, Root Depth 6 ft Vegetation 35 % [4]Material: (Silt/Clay) (Sand) / Gravel Cobble - % 50/50
ER	wypt 43 to wypt 44	L M (H) VH EX (circle one)	refer to gps pts	1	Bank: Height 9 ft, Angle 80 Deg Protection: Roots 45 %, Root Depth 3.5 ft Vegetation 40 % [4]Material: (Silt/Clay) (Sand) / Gravel Cobble - % 50/50
ER	wypt 46 RB ↑ to end	L (M) H VH EX (circle one)	28 yds	2	Bank: Height 6.5 ft, Angle 70 Deg Protection: Roots 55 %, Root Depth 4.5 ft Vegetation 5 % [4]Material: (Silt/Clay) (Sand) / Gravel Cobble - % 50/50
ER	17 yds u/s of 47 wpt	(L) M H VH EX (circle one)	refer to gps	1	Bank: Height 8 ft, Angle 85 Deg Protection: Roots 30 %, Root Depth 4.5 ft Vegetation 50 % [4]Material: (Silt/Clay) (Sand) / Gravel Cobble - % 50/50

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

Unified Stream Assessment (USA)

REACH ID: LC-1	STREAM: Little Creek	DATE/TIME: 4/30/19 8:35	INITIALS:
REACH START		REACH END	
LAT:		LAT:	
LONG:		LONG:	

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐Heavy rain ☐Steady rain ☐Showers ☐Clear/sunny
☑Mostly cloudy ☐Partly cloudy

Weather – Current conditions
☐Heavy rain ☐Steady rain ☐Showers ☐Clear/sunny
☑Mostly cloudy ☐Partly cloudy

Stream Classification
☐ Perennial ☑ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order_____

Stream Origin
☐ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other________

Hydrology
Flow: ☐ High ☑ Moderate ☐ Low ☐ None
Base Flow as %Channel Width: ☐0-25% ☐50-75% ☐25-50% ☑75-100% **Flows Measured:** Yes / (No)
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: ________ft/mi
Sinuosity: ☐ High ☐ Moderate ☑ Low

Channel Morphology **System:** Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 15 % ☑ Run 10 % ☑ Pool 75 % ☐ Steps ______%

Dominant Substrate
☐Silt/clay (fine or slick) ☑Cobble (2.5-10")
☐Sand (gritty) ☐Boulder (>10")
☐Gravel (0.1-2.5") ☑Bed Rock

Dominant In-Stream Habitats
☑Woody Debris ☑Root Wads ☐Leaf Packs
☐Deposition ☐Undercut Bank ☑ Boulders
☐Aquatic Plants ☐Overhanging Vegetation
Habitat Quality: ☐Poor ☐Fair ☐Good ☐ Optimal

Land use
☐ Forest _____% ☐ Pasture _____% ☑ Urban 100%
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☐ Industrial_____% ☐ Sub-Urban____%

Local Watershed NPS Pollution
☑ Industrial Storm Water
☑ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☐ Other____________ ☐ No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 20 % ☑ Shrub/Sapling 80 % ☐ Herbs/Grasses ____% ☐ Turf/Crops ____%
Riparian Width: ☐<10 ft ☑11-25 ft ☐ 26-50 ft ☐ > 50 ft

Stream Shading (water surface)
☐Mostly shaded (≥75% coverage) ☐Partially shaded (≥25% coverage)
☑Halfway shaded (≥50% coverage) ☐Unshaded (<25% coverage)

Water Quality Observations

Odors Noted:
☑ Normal/None ☑ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other____________

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other__________

Turbidity/Water Clarity:
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other________________

Sediment Deposits: ☑ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream:	Date:	Initials:
Little Creek	4/30/19	ENT WHG

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description
1	SW-1	1	1	SW outfall from road ditch
2	Bridge no gps taken	1	1	Bridge
3	SW-2	2	2	Trash in outfall, been removed
4	SW-3	1	1	Outfall from facility on d/s left bank barely dripping

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER	No real bank erosion in places it might have been bedrock protecting it.	L M H VH EX (circle one)			Bank: Height _____ft, Angle _____Deg Protection: Roots_____%, Root Depth _____ft Vegetation _____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER	2 spots had been restored w/ riprap on both sides w/ [illegible]	L M H VH EX (circle one)			Bank: Height _____ft, Angle _____Deg Protection: Roots_____%, Root Depth _____ft Vegetation _____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER	see notes + ENT pictures	L M H VH EX (circle one)			Bank: Height _____ft, Angle _____Deg Protection: Roots_____%, Root Depth _____ft Vegetation _____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height _____ft, Angle _____Deg Protection: Roots_____%, Root Depth _____ft Vegetation _____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height _____ft, Angle _____Deg Protection: Roots_____%, Root Depth _____ft Vegetation _____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

from bowling up

Unified Stream Assessment (USA)

REACH ID: LC-1	STREAM: Little Creek	DATE/TIME: 4/20/19 815	INITIALS: ENT/WHG
REACH START ENT GPS		REACH END finished by 930	
LAT:		LAT:	
LONG:		LONG:	

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐ Heavy rain ☐ Steady rain ☐ Showers ☐ Clear/sunny
☑ Mostly cloudy ☐ Partly cloudy

Weather – Current conditions
☐ Heavy rain ☐ Steady rain ☐ Showers ☐ Clear/sunny
☑ Mostly cloudy ☐ Partly cloudy

Stream Classification
☐ Perennial ☑ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order_____

Stream Origin
☐ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other________

Hydrology
Flow: ☐ High ☑ Moderate ☐ Low ☐ None
Base Flow as %Channel Width: ☐ 0-25% ☐ 50-75% ☐ 25-50% ☑ 75-100% **Flows Measured:** Yes / (No)
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: ________ft/mi
Sinuosity: ☐ High ☐ Moderate ☑ Low

Channel Morphology **System:** Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 15 % ☑ Run 10 % ☑ Pool 75 % ☐ Steps ______%

Dominant Substrate (mostly [illegible] on average)
☐ Silt/clay (fine or slick) ☑ Cobble (2.5-10")
☐ Sand (gritty) ☐ Boulder (>10")
☐ Gravel (0.1-2.5") ☑ Bed Rock

Dominant In-Stream Habitats
☑ Woody Debris ☑ Root Wads ☐ Leaf Packs
☐ Deposition ☐ Undercut Bank ☑ Boulders
☐ Aquatic Plants ☐ Overhanging Vegetation
Habitat Quality: ☐ Poor ☐ Fair ☐ Good ☐ Optimal

Land use
☐ Forest _____% ☐ Pasture _____% ☑ Urban 100 %
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☐ Industrial_____% ☐ Sub-Urban____%

Local Watershed NPS Pollution
☑ Industrial Storm Water
☑ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☐ Other____________ ☐ No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 20 % ☑ Shrub/Sapling 80 % ☐ Herbs/Grasses ____% ☐ Turf/Crops ____%
Riparian Width: ☐ <10 ft ☑ 11-25 ft ☐ 26-50 ft ☐ > 50 ft

Stream Shading (water surface)
☐ Mostly shaded (≥75% coverage) ☐ Partially shaded (≥25% coverage)
☑ Halfway shaded (≥50% coverage) ☐ Unshaded (<25% coverage)

Water Quality Observations
Odors Noted:
☑ Normal/None ☑ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other____________

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other__________

Turbidity/Water Clarity:
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other________________

Sediment Deposits: ☑ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA, Cont.

REACH ID: LC1	STREAM: Little Creek	DATE/TIME: 4/30/19 815	INITIALS: ENT WHG
OTHER INFO:			

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☐ Poor ☑ Fair ☑ Good
Habitat: ☐ Poor ☑ Fair ☐ Good
Vegetation: ☐ Forest ☐ Shrub/Sapling ☐ Tall grasses ☐ Turf/crops
Encroachment: ☐ Poor ☐ Fair ☐ Good

Periphyton (attached algae):
Filamentous: ☐ None ☑ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Suspended Algae (phytoplankton) abundance:
☑ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Emergent: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Aquatic Life Observed:
☑ Fish ☐ Snails ☐ Crawfish ☑ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☐ Cattle ☐ Beaver ☐ Deer ☐ Other_____

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☐ Outfalls(OT): 1 2 3 Wpt SW outfall(s)
☐ Stream Crossing(SC): 1 2 3 Wpt_____
☐ Bank Erosion(ER) : 1 2 3 Wpt_____
☐ Channel Modification(CM) : 1 2 3 Wpt_____
☐ Impacted Buffers(IB): 1 2 3 Wpt_____
☐ Trash(TR): 1 2 3 Wpt_____
☐ Utilities(UT): 1 2 3 Wpt_____
☐ Other_____: 1 2 3 Wpt_____
Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☐ Sediment Deposition
☐ Widening ☐ Aggrading ☐ Bank Failure ☑ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☐ Bank scour ☐ Slope failure ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 2 (ft) Bankfull Depth 1 (ft) Wetted Width: 17 (ft) Riffle/Run Depth 0.4 (ft)
Rt bank Ht: 2 (ft) Bankfull Width 25 (ft)) TOB Width: 25 (ft) Pool Depth 0.9 (ft)

Channel Stability:
Lt Bank: Angle 25 degrees
LtBank Vegetation protection: 85 % cover
LtBank Erosion Hazard: (L) M H VH EX (circle one)
Length Lt Bank Affected: None
Wpt(s):_____
Rt Bank: Angle 20 degrees
RtBank Vegetation protection 90 % cover
RtBank Erosion Hazard: (L) M H VH EX (circle one)
Length Rt Bank Affected: None
Wpt(s):_____

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	**Fair:** Forested or developed near stream. Vehicle access limited.	**Difficult:** Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5	4 3 2	1

Notes: (biggest problem(s) you see in survey reach)

Restoration Potential:
☐ Riparian reforestation ☐ Bank stabilization
☑ Stormwater retrofit ☐ Outfall stabilization
☐ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other _____

Place sketch of reach on back of page.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

Unified Stream Assessment (USA)

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
SD-1	Stone Dam	4/30/19 940	ENJ/WHG

REACH START	REACH END
LAT:	LAT:
LONG:	LONG:

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐ Heavy rain ☐ Steady rain ☐ Showers ☐ Clear/sunny
☑ Mostly cloudy ☐ Partly cloudy

Weather – Current conditions
☐ Heavy rain ☐ Steady rain ☐ Showers ☐ Clear/sunny
☑ Mostly cloudy ☐ Partly cloudy

Stream Classification
☐ Perennial ☑ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order____

Stream Origin
☐ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☑ Moderate ☐ Low ☐ None
Base Flow as %Channel Width: ☐ 0-25% ☐ 50-75% ☑ 25-50% ☐ 75-100% **Flows Measured:** Yes / No
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☐ Moderate ☑ Low

Channel Morphology **System:** Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 10 % ☑ Run 5 % ☑ Pool 85 % ☐ Steps _____%

Dominant Substrate
☐ Silt/clay (fine or slick) ☑ Cobble (2.5-10")
☐ Sand (gritty) ☐ Boulder (>10")
☐ Gravel (0.1-2.5") ☐ Bed Rock

Dominant In-Stream Habitats
☑ Woody Debris ☐ Root Wads ☐ Leaf Packs
☐ Deposition ☐ Undercut Bank
☐ Aquatic Plants ☑ Overhanging Vegetation
Habitat Quality: ☐ Poor ☑ Fair ☐ Good ☐ Optimal

Land use
☑ Forest 10 % ☐ Pasture _____% ☑ Urban 40 %
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☐ Industrial_____% ☑ Sub-Urban 40 50 %

Local Watershed NPS Pollution
☐ Industrial Storm Water
☑ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☐ Other_____ ☐ No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 40 % ☑ Shrub/Sapling 60 % ☐ Herbs/Grasses ____% ☑ Turf/Crops 20 %
Riparian Width: ☐ <10 ft ☑ 11-25 ft ☐ 26-50 ft ☐ > 50 ft

Stream Shading (water surface)
☐ Mostly shaded (≥75% coverage) ☐ Partially shaded (≥25% coverage)
☑ Halfway shaded (≥50% coverage) ☐ Unshared (<25% coverage)

Water Quality Observations
Odors Noted:
☑ Normal/None ☐ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other_____

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☑ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream: SD-1	Date: 4/30/19	Initials: ENT/WHG

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description
1	at or near start	1	2	low water crossing & outfall
2	SW/ENT	1	1	SW outfall point
3	SD 1D-3 GPS	1	2	Low water crossing
4	SD SW-2	1	2	SW outfall / Tributary crossing
5	SD 1D-3	1	2	Low water crossing
6	SD 1D-4	1	2	"

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER -1	ENT ER-1 GPS	L (circled) M H VH EX (circle one)	600ft [illegible] ER-1 end	1	Bank: Height 3 ft, Angle 90 Deg Protection: Roots 35 %, Root Depth 2.5 ft Vegetation 15 % [4]Material: Silt/Clay (circled) Sand / Gravel Cobble - %____
ER	SD 1D-5	L M (circled) H VH EX (circle one)	150ft	3	Bank: Height 3.75 ft, Angle 70 Deg Protection: Roots 5 %, Root Depth 1.5 ft Vegetation 5 % [4]Material: Silt/Clay (circled) Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ____ft, Angle ____Deg Protection: Roots____%, Root Depth ____ft Vegetation ____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ____ft, Angle ____Deg Protection: Roots____%, Root Depth ____ft Vegetation ____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ____ft, Angle ____Deg Protection: Roots____%, Root Depth ____ft Vegetation ____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

 V 1.4 October 2011

USA, Cont.

REACH ID: SD-1	STREAM: Stone Dam	DATE/TIME: 4/30/19 940	INITIALS: EMTWHG
OTHER INFO:			

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☐ Poor ☑ Fair ☐ Good
Habitat: ☐ Poor ☑ Fair ☐ Good
Vegetation: ☑ Forest ☑ Shrub/Sapling ☐ Tall grasses ☑ Turf/crops
Encroachment: ☐ Poor ☑ Fair ☐ Good

Periphyton (attached algae):
Filamentous: ☐ None ☐ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☐ None ☐ Sparse ☑ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Suspended Algae (phytoplankton) abundance:
☑ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Emergent: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Aquatic Life Observed:
☐ Fish ☐ Snails ☑ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☐ Cattle ☐ Beaver ☐ Deer ☐ Other_____

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☑ Outfalls(OT): (1) 2 3 Wpt_____
☐ Stream Crossing(SC): 1 2 3 Wpt_____
☑ Bank Erosion(ER): (1) 2 3 Wpt_____
☐ Channel Modification(CM): 1 2 3 Wpt_____
☑ Impacted Buffers(IB): (1) 2 3 Wpt_____
☑ Trash(TR): (1) 2 3 Wpt_____
☐ Utilities(UT): 1 2 3 Wpt_____
☑ Other Low water crossing: 1 2 (3) Wpt Culvert
Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☐ Sediment Deposition
☐ Widening ☐ Aggrading ☐ Bank Failure ☑ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☑ Bank scour ☐ Slope failure ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 4 (ft) Bankfull Depth 1.5 (ft) Wetted Width: 34 (ft) Riffle/Run Depth 0.8 (ft)
Rt bank Ht: 4.5 (ft) Bankfull Width 36 (ft)) TOB Width: 50 (ft) Pool Depth 3.5 (ft)

Channel Stability:
Lt Bank: Angle 35 degrees
LtBank Vegetation protection: 85 % cover
LtBank Erosion Hazard: L M H VH EX (circle one)
Length Lt Bank Affected: 0%0
Wpt(s):_____

Rt Bank: Angle 45 degrees
RtBank Vegetation protection 75 % cover
RtBank Erosion Hazard: L M H VH EX (circle one)
Length Rt Bank Affected: 30%
Wpt(s):_____

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	**Fair:** Forested or developed near stream. Vehicle access limited.	**Difficult:** Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5	4 3	2 1

Notes: (biggest problem(s) you see in survey reach)

Restoration Potential:
☑ Riparian reforestation ☑ Bank stabilization
☐ Stormwater retrofit ☑ Outfall stabilization
☑ Channel modification ☐ PS investigation
☐ Culvert rehab. ☑ Other Low Crossing

Place sketch of reach on back of page.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

Unified Stream Assessment (USA)

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
TB1	Tyelo Bayou	4/30/19 1530	EM/WHG

REACH START	REACH END
LAT:	LAT:
LONG:	LONG:

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐ Heavy rain ☐ Steady rain ☐ Showers ☑ Clear/sunny
☐ Mostly cloudy ☑ Partly cloudy

Weather – Current conditions
☐ Heavy rain ☐ Steady rain ☐ Showers ☑ Clear/sunny
☐ Mostly cloudy ☑ Partly cloudy

Stream Classification
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order_____

Stream Origin
☐ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☑ Moderate ☐ Low ☐ None
Base Flow as %Channel Width: ☐ 0-25% ☑ 50-75% ☐ 25-50% ☐ 75-100%
Flows Measured: Yes (No)
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☐ Moderate ☑ Low

Channel Morphology
System: Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 5 % ☑ Run 15 % ☑ Pool 80 % ☐ Steps _____%

Dominant Substrate
☑ Silt/clay (fine or slick) ☐ Cobble (2.5-10")
☐ Sand (gritty) ☐ Boulder (>10")
☐ Gravel (0.1-2.5") ☐ Bed Rock

Dominant In-Stream Habitats
☑ Woody Debris ☐ Root Wads ☐ Leaf Packs
☐ Deposition ☐ Undercut Bank
☐ Aquatic Plants ☑ Overhanging Vegetation
Habitat Quality: ☐ Poor ☑ Fair ☐ Good ☐ Optimal

Land use
☐ Forest _____% ☐ Pasture _____% ☐ Urban _____%
☐ Commercial_____% ☑ Row Crops 20 %
☐ Hay_____% ☐ Industrial_____% ☐ Sub-Urban____%

Local Watershed NPS Pollution
☐ Industrial Storm Water
☐ Urban/Sub-Urban Storm Water ☑ Row crops
☐ Cattle ☐ Other_____ ☐ No evidence

Riparian Buffer
Vegetation Type: ☐ Forest ____% ☑ Shrub/Sapling 20 % ☑ Herbs/Grasses 20 % ☑ Turf/Crops 30 %
Riparian Width: ☑ <10 ft ☐ 11-25 ft ☐ 26-50 ft ☐ > 50 ft

Stream Shading (water surface)
☐ Mostly shaded (≥75% coverage) ☑ Partially shaded (≥25% coverage)
☐ Halfway shaded (≥50% coverage) ☐ Unshared (<25% coverage)

Water Quality Observations
Odors Noted:
☑ Normal/None ☐ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other_____

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☐ Clear ☐ Slightly turbid ☑ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☑ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream: TB-1	Date: 4/30/19	Initials: EMS/WHG

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description
1	GC SW-1	1	1	sw outfall draining ~~near~~ nearby fields
2	11 wpt [illegible] Bayou	1	1	sw outfall draining nearby fields

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER	The entire reach was eroded that we looked at	L M (H) VH EX (circle one)		2	Left Bank: Height 5.5 ft, Angle 55 Deg Protection: Roots 5 %, Root Depth 1.5 ft Vegetation 5 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)		Right	Bank: Height 6 ft, Angle 60 Deg Protection: Roots 5 %, Root Depth 1.5 ft Vegetation 5 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ____ft, Angle ____Deg Protection: Roots____%, Root Depth ____ft Vegetation ____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ____ft, Angle ____Deg Protection: Roots____%, Root Depth ____ft Vegetation ____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ____ft, Angle ____Deg Protection: Roots____%, Root Depth ____ft Vegetation ____% [4]Material: Silt/Clay Sand / Gravel Cobble - %____

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA, Cont.

REACH ID: TB-1	STREAM: Tupelo Bayou	DATE/TIME: 4/30/19 1530	INITIALS: [illegible]
OTHER INFO:			

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☑ Poor ☐ Fair ☐ Good — Vegetation: ☐ Forest ☐ Shrub/Sapling ☐ Tall grasses ☑ Turf/crops
Habitat: ☑ Poor ☐ Fair ☐ Good — Encroachment: ☑ Poor ☐ Fair ☐ Good

Periphyton (attached algae):
Filamentous: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Suspended Algae (phytoplankton) abundance:
☑ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Emergent: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Aquatic Life Observed:
☑ Fish ☐ Snails ☑ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☑ Cattle ☐ Beaver ☐ Deer ☐ Other________

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☐ Outfalls(OT): 1 2 3 Wpt________
☐ Stream Crossing(SC): 1 2 3 Wpt________
☑ Bank Erosion(ER): 1 2 (3) Wpt the entire reach
☐ Channel Modification(CM): 1 2 3 Wpt________
☑ Impacted Buffers(IB): 1 2 (3) Wpt [illegible]
☐ Trash(TR): 1 2 3 Wpt________
☐ Utilities(UT): 1 2 3 Wpt________
☐ Other________: 1 2 3 Wpt________

Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Widening ☐ Headcutting
☑ Channelized ☐ Aggrading ☑ Bank scour
☐ Bed Scour ☐ Bank Failure ☐ Slope failure
☐ Sediment Deposition ☐ Culvert Scour (upstream / downstream / top) ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 5.5 (ft) — Bankfull Depth 8 (ft) — Wetted Width: 45 (ft) — Riffle/Run Depth [illegible] (ft)
Rt bank Ht: 6 (ft) — Bankfull Width 51 (ft) — TOB Width: 66 (ft) — Pool Depth 3 (ft)

Channel Stability:
Lt Bank: Angle 55 degrees — Rt Bank: Angle 60 degrees
LtBank Vegetation protection: 5 % cover — RtBank Vegetation protection 5 % cover
LtBank Erosion Hazard: L M (H) VH EX (circle one) — RtBank Erosion Hazard: L M (H) VH EX (circle one)
Length Lt Bank Affected: the entire reach — Length Rt Bank Affected: the entire reach
Wpt(s):________ — Wpt(s):________

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.		Fair: Forested or developed near stream. Vehicle access limited.		Difficult: Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5	4	3	2	1

Notes: (biggest problem(s) you see in survey reach)

Place sketch of reach on back of page.

Restoration Potential:
☐ Riparian reforestation ☑ Bank stabilization
☐ Stormwater retrofit ☑ Outfall stabilization
☑ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other________

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

Unified Stream Assessment (USA)

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
WC-1	Unnig Creek	8/14/19 1440	E MT I DKF

REACH START	REACH END
LAT:	LAT:
LONG:	LONG:

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐ Heavy rain ☐ Steady rain ☑ Showers ☐ Clear/sunny
☐ Mostly cloudy ☐ Partly cloudy

Weather – Current conditions
☐ Heavy rain ☐ Steady rain ☐ Showers ☑ Clear/sunny
☐ Mostly cloudy ☐ Partly cloudy

Stream Classification
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order____

Stream Origin
☐ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☐ Moderate ☑ Low ☐ None
Base Flow as %Channel Width: ☐ 0-25% ☐ 50-75% ☑ 25-50% ☐ 75-100% **Flows Measured:** Yes / No
Stream Gradient: ☐ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☑ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☐ Moderate ☑ Low

Channel Morphology **System:** Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 5 % ☑ Run 75 % ☑ Pool 20 % ☐ Steps _____%

Dominant Substrate
☑ Silt/clay (fine or slick) ☐ Cobble (2.5-10")
☐ Sand (gritty) ☐ Boulder (>10")
☐ Gravel (0.1-2.5") ☐ Bed Rock

Dominant In-Stream Habitats
☐ Woody Debris ☑ Root Wads ☐ Leaf Packs
☑ Deposition ☑ Undercut Bank
☐ Aquatic Plants ☑ Overhanging Vegetation
Habitat Quality: ☑ Poor ☐ Fair ☐ Good ☐ Optimal

Land use
☑ Forest 50 % ☐ Pasture _____% ☐ Urban _____%
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☑ Industrial 50 % ☐ Sub-Urban____%

Local Watershed NPS Pollution
☐ Industrial Storm Water
☐ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☒ Other Wastewater treatment ☐ No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 30 % ☑ Shrub/Sapling 35 % ☑ Herbs/Grasses 35 % ☐ Turf/Crops ____%
Riparian Width: ☐ <10 ft ☐ 11-25 ft ☐ 26-50 ft ☐ > 50 ft

Stream Shading (water surface)
☐ Mostly shaded (≥75% coverage) ☐ Partially shaded (≥25% coverage)
☑ Halfway shaded (≥50% coverage) ☐ Unshared (<25% coverage)

Water Quality Observations
Odors Noted:
☐ Normal/None ☐ Sewage ☐ Anaerobic
☑ Petroleum ☑ Chemical ☐ Fishy ☐ Other_____

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☐ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream:	Date:	Initials:
WC-1	8/11/11 9	ENT RKF

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER	wpt 87 RB 4	L (M) H VH EX (circle one)	50ft	2	Bank: Height 8 ft, Angle 80 Deg Protection: Roots 60-40 %, Root Depth 6 ft Vegetation 5 % [4]Material: (Silt/Clay) Sand / Gravel Cobble - %
ER	Wypt 48 LB at u/s top	L (M) H VH EX (circle one)	46yds	1	Bank: Height 8.5 ft, Angle 50 Deg Protection: Roots 40 %, Root Depth 5.5 ft Vegetation 45 % [4]Material: Silt/Clay Sand / Gravel Cobble - %
ER	Start @ Wpt 49 End at trail LB+RB	L M (H) VH EX (circle one)	Refer to GIS	1	Bank: Height 15 ft, Angle 75 Deg Protection: Roots 40 %, Root Depth 6 ft Vegetation 30 % [4]Material: Silt/Clay Sand / Gravel Cobble - %
ER		L M H VH EX (circle one)			Bank: Height _____ ft, Angle _____ Deg Protection: Roots _____ %, Root Depth _____ ft Vegetation _____ % [4]Material: Silt/Clay Sand / Gravel Cobble - %
ER		L M H VH EX (circle one)			Bank: Height _____ ft, Angle _____ Deg Protection: Roots _____ %, Root Depth _____ ft Vegetation _____ % [4]Material: Silt/Clay Sand / Gravel Cobble - %

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA, Cont.

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
WC1	Whis Creek	8/14/19	DF/ENJ

OTHER INFO:

Average Conditions (check applicable)

Flood Plain Dynamics

Connection: ☒ Poor ☐ Fair ☐ Good
Habitat: ☒ Poor ☐ Fair ☐ Good
Vegetation: ☐ Forest ☐ Shrub/Sapling ☑ Tall grasses ☐ Turf/crops
Encroachment: ☐ Poor ☐ Fair ☐ Good

Periphyton (attached algae):

Filamentous:	☑ None	☐ Sparse	☐ Moderate	☐ Abundant
Prostrate:	☑ None	☐ Sparse	☐ Moderate	☐ Abundant
Floating:	☑ None	☐ Sparse	☐ Moderate	☐ Abundant

Suspended Algae (phytoplankton) abundance:
☑ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:

Submerged:	☑ None	☐ Sparse	☐ Moderate	☐ Abundant
Emergent:	☑ None	☐ Sparse	☐ Moderate	☐ Abundant
Floating:	☑ None	☐ Sparse	☐ Moderate	☐ Abundant

Aquatic Life Observed:
☑ Fish ☐ Snails ☐ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☐ Cattle ☐ Beaver ☑ Deer ☐ Other_____

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)

☐ Outfalls(OT): 1 2 3 Wpt_____
☐ Stream Crossing(SC): 1 2 3 Wpt_____
☑ Bank Erosion(ER): 1 2 3 Wpt_____
☐ Channel Modification(CM): 1 2 3 Wpt_____
☑ Impacted Buffers(IB): 1 2 (3) Wpt_____
☑ Trash(TR): 1 (2) 3 Wpt_____
☐ Utilities(UT): 1 2 3 Wpt_____
☐ Other_____: 1 2 3 Wpt_____

Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:

☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☑ Sediment Deposition
☐ Widening ☐ Aggrading ☐ Bank Failure ☐ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☐ Bank scour ☐ Slope failure ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):

Lt bank Ht: 12 (ft) Bankfull Depth 4.5 (ft) Wetted Width: 8 (ft) Riffle/Run Depth 0.3 (ft)
Rt bank Ht: 15 (ft) Bankfull Width 70 (ft)) TOB Width: 60 (ft) Pool Depth 3.5 (ft)

Channel Stability:

Lt Bank: Angle 70 degrees
LtBank Vegetation protection: 40 % cover
LtBank Erosion Hazard: L M (H) VH EX (circle one)
Length Lt Bank Affected: Refer to ENJ GPS
Wpt(s):_____

Rt Bank: Angle 75 degrees
RtBank Vegetation protection 55 % cover
RtBank Erosion Hazard: L M (H) VH EX (circle one)
Length Rt Bank Affected: Refer to ENJ GPS
Wpt(s):_____

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	Fair: Forested or developed near stream. Vehicle access limited.	Difficult: Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5	4 3 (2)	1

Notes: (biggest problem(s) you see in survey reach)

Restoration Potential:

☑ Riparian reforestation ☑ Bank stabilization
☐ Stormwater retrofit ☐ Outfall stabilization
☐ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other _____

Place sketch of reach on back of page.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

Unified Stream Assessment (USA)

REACH ID: WDR-1 U/S	STREAM:	DATE/TIME: 6/29/19	INITIALS: EWD MB
REACH START		REACH END	
LAT:		LAT:	
LONG:		LONG:	

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐Heavy rain ☐Steady rain ☐Showers ☑Clear/sunny
☐Mostly cloudy ☐Partly cloudy

Weather – Current conditions
☐Heavy rain ☐Steady rain ☐Showers ☑Clear/sunny
☐Mostly cloudy ☐Partly cloudy

Stream Classification
☑Perennial ☐ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order_____

Stream Origin
☑ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☑ Moderate ☐ Low ☐ None
Base Flow as %Channel Width: ☐0-25% ☑50-75% ☐25-50% ☐75-100% **Flows Measured:** Yes / No
Stream Gradient: ☑ High (≥25ft/mi) ☐ Moderate (10-24 ft/mi) ☐ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☑ Moderate ☐ Low

Channel Morphology **System:** Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 38 % ☑ Run 100 % ☑ Pool 12 % ☐ Steps _____%

Dominant Substrate
☐Silt/clay (fine or slick) ☐Cobble (2.5-10")
☐Sand (gritty) ☑Boulder (>10")
☐Gravel (0.1-2.5") ☐Bed Rock

Dominant In-Stream Habitats
☑Woody Debris ☑Root Wads ☑Leaf Packs
☐Deposition ☐Undercut Bank
☑Aquatic Plants ☑Overhanging Vegetation
Habitat Quality: ☐Poor ☐Fair ☐Good ☐ Optimal

Land use
☑ Forest 100 % ☐ Pasture _____% ☐ Urban _____%
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☐ Industrial_____% ☐ Sub-Urban____%

Local Watershed NPS Pollution
☐ Industrial Storm Water
☐ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☐ Other_____ ☑ No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 100 % ☐ Shrub/Sapling ____% ☐ Herbs/Grasses ____% ☐ Turf/Crops ____%
Riparian Width: ☐<10 ft ☐11-25 ft ☐ 26-50 ft ☑ > 50 ft

Stream Shading (water surface)
☑Mostly shaded (≥75% coverage) ☐Partially shaded (≥25% coverage)
☐Halfway shaded (≥50% coverage) ☐Unshared (<25% coverage)

Water Quality Observations
Odors Noted:
☑ Normal/None ☐ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other_____

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☑ None ☐ Sludge ☐ Sawdust ☐ Oils ☐ Sand ☐ Relict shells

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream: WPR-1	Date: 6/29/19	Initials: ENS/DMB

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description
None				

None

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER		L M H VH EX (circle one)			Bank: Height ________ft, Angle ________Deg Protection: Roots______%, Root Depth ______ft Vegetation ______% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ________ft, Angle ________Deg Protection: Roots______%, Root Depth ______ft Vegetation ______% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ________ft, Angle ________Deg Protection: Roots______%, Root Depth ______ft Vegetation ______% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ________ft, Angle ________Deg Protection: Roots______%, Root Depth ______ft Vegetation ______% [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER		L M H VH EX (circle one)			Bank: Height ________ft, Angle ________Deg Protection: Roots______%, Root Depth ______ft Vegetation ______% [4]Material: Silt/Clay Sand / Gravel Cobble - %____

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA, Cont.

REACH ID: WPR-1	STREAM:	DATE/TIME: 6/29/19	INITIALS: EWT OMB
OTHER INFO:			

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☐ Poor ☐ Fair ☑ Good
Habitat: ☐ Poor ☐ Fair ☑ Good
Vegetation: ☑ Forest ☐ Shrub/Sapling ☐ Tall grasses ☐ Turf/crops
Encroachment: ☐ Poor ☐ Fair ☑ Good

Periphyton (attached algae):
Filamentous: ☐ None ☑ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☐ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☐ None ☐ Sparse ☐ Moderate ☐ Abundant

Suspended Algae (phytoplankton) abundance:
☑ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Emergent: ☐ None ☐ Sparse ☑ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Aquatic Life Observed:
☑ Fish ☐ Snails ☐ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☐ Cattle ☐ Beaver ☐ Deer ☐ Other_____

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☐ Outfalls(OT): 1 2 3 Wpt_____
☐ Stream Crossing(SC): 1 2 3 Wpt_____
☐ Bank Erosion(ER) : 1 2 3 Wpt_____
☐ Channel Modification(CM) : 1 2 3 Wpt_____
☐ Impacted Buffers(IB): 1 2 3 Wpt_____
☐ Trash(TR): 1 2 3 Wpt_____
☐ Utilities(UT): 1 2 3 Wpt_____
☐ Other_____: 1 2 3 Wpt_____
Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☐ Sediment Deposition
☐ Widening ☐ Aggrading ☐ Bank Failure ☐ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☐ Bank scour ☐ Slope failure ☑ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 1.5 (ft) Bankfull Depth 2.5 (ft) Wetted Width: 11 (ft) Riffle/Run Depth 0.5 (ft)
Rt bank Ht: 1.5 (ft) Bankfull Width 40 (ft)) TOB Width: 47 (ft) Pool Depth 1.5 (ft)

Channel Stability:
Lt Bank: Angle 40 degrees
LtBank Vegetation protection: 30 % cover MOSTLY ROCKS
LtBank Erosion Hazard: L M H VH EX (circle one)
Length Lt Bank Affected: 0
Wpt(s): 0

Rt Bank: Angle 35 degrees
RtBank Vegetation protection 30 % cover MOSTLY ROCKS
RtBank Erosion Hazard: L M H VH EX (circle one)
Length Rt Bank Affected: 0
Wpt(s): 0

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	**Fair:** Forested or developed near stream. Vehicle access limited.	**Difficult:** Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5	4 3 2	1

Notes: (biggest problem(s) you see in survey reach)

Place sketch of reach on back of page.

Restoration Potential:
☐ Riparian reforestation ☐ Bank stabilization
☐ Stormwater retrofit ☐ Outfall stabilization
☐ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other _____

Unified Stream Assessment (USA)

REACH ID:	STREAM:	DATE/TIME:	INITIALS:
WPR DK section	West Point Reman	6/26/19 1230	ENJ/ DMB
REACH START wpt 20		**REACH END** wpt 17	
LAT:		**LAT:**	
LONG:		**LONG:**	

Average Conditions (check applicable)

Weather – Antecedent (24-h) Rain in past 72-h: y / n
☐Heavy rain ☐Steady rain ☐Showers ☐Clear/sunny
☐Mostly cloudy ☑Partly cloudy

Weather – Current conditions
☐Heavy rain ☐Steady rain ☐Showers ☐Clear/sunny
☐Mostly cloudy ☑Partly cloudy

Stream Classification
☑ Perennial ☐ Intermittent ☐ Ephemeral ☐ Tidal
☐ Coldwater ☐ Coolwater ☐ Warmwater Order_____

Stream Origin
☐ Spring-fed ☑ Mixture of origins ☐ Glacial
☐ Montane (non-glacial) ☐ Swamp/bog ☐ Other_____

Hydrology
Flow: ☐ High ☑ Moderate ☐ Low ☐ None
Base Flow as %Channel Width: ☐0-25% ☑50-75% ☐25-50% ☐75-100% **Flows Measured:** Yes / No
Stream Gradient: ☐ High (≥25ft/mi) ☑ Moderate (10-24 ft/mi) ☐ Low (<10 ft/mi) ~Slope: _____ft/mi
Sinuosity: ☐ High ☑ Moderate ☐ Low

Channel Morphology **System:** Step/Pool - Riffle/Pool - Pool (circle)
☑ Riffle 25 % ☑ Run 50 % ☑ Pool 25 % ☐ Steps _____%

Dominant Substrate
☐Silt/clay (fine or slick) ☐Cobble (2.5-10")
☐Sand (gritty) ☑Boulder (>10")
☐Gravel (0.1-2.5") ☐Bed Rock

Dominant In-Stream Habitats
☑Woody Debris ☑Root Wads ☑Leaf Packs
☐Deposition ☐Undercut Bank
☑Aquatic Plants ☑Overhanging Vegetation
Habitat Quality: ☐Poor ☐Fair ☐Good ☑ Optimal

Land use
☑ Forest 70 % ☑ Pasture 30 % ☐ Urban _____%
☐ Commercial_____% ☐ Row Crops _____%
☐ Hay_____% ☐ Industrial_____% ☐ Sub-Urban____%

Local Watershed NPS Pollution
☐ Industrial Storm Water
☐ Urban/Sub-Urban Storm Water ☐ Row crops
☐ Cattle ☐ Other_____ ☑ No evidence

Riparian Buffer
Vegetation Type: ☑ Forest 70 % ☑ Shrub/Sapling 30 % ☐ Herbs/Grasses ____% ☐ Turf/Crops ____%
Riparian Width: ☐<10 ft ☐11-25 ft ☑ 26-50 ft ☐ > 50 ft

Stream Shading (water surface)
☐Mostly shaded (≥75% coverage) ☑Partially shaded (≥25% coverage)
☐Halfway shaded (≥50% coverage) ☐Unshared (<25% coverage)

Water Quality Observations

Odors Noted:
☑ Normal/None ☐ Sewage ☐ Anaerobic
☐ Petroleum ☐ Chemical ☐ Fishy ☐ Other_____

Water Surface Appearance:
☐ Slick ☐ Sheen ☐ Globs
☐ Flecks ☑ None ☐ Other_____

Turbidity/Water Clarity:
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Sediment Deposits: ☐ None ☐ Sludge ☐ Sawdust ☐ Oils ☑ Sand ☐ Relict shells

USA Reach Impact Data Detail Sheet (optional)

Reach ID/Stream:	Date:	Initials:
WPR DIS section	6/29/19	EM/OMB

Impact I.D.[1]	Coordinates (Lat / Long) or Waypoint	Severity (1-3)[2]	Restoration Opportunity (1-3)[3]	Description
ID-1	wpt 14	1	3	old road but only on one side of stream + not used in many years

BEHI I.D.	Coordinates (Lat / Long) or Waypoint	Bank Erosion Hazard	Bank Lth. (ft)	Rest. Opp. (1-3)[3]	Bank information for BEHI
ER	wpt 13 d/s of ↑	L M H VH EX (circle one)	26yds	2	Bank: Height 3.5 ft, Angle 65 Deg Protection: Roots 55 %, Root Depth ____ ft Vegetation 20 % [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER	wpt 15 u/s of ↑ wpt	L M H VH EX (circle one)	39yds	3	Bank: Height 10 ft, Angle 80 Deg Protection: Roots 45 %, Root Depth 3 ft Vegetation 15 % [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER	wpt 16 walking u/s to beginning meets @ wpt 17	L M H VH EX (circle one)		2	Bank: Height 1.75 ft, Angle 55 Deg Protection: Roots 50 %, Root Depth 1 ft Vegetation 20 % [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER	wpt 20 start 40 yards go u/s	L M H VH EX (circle one)	40yds	2	Bank: Height 6 ft, Angle 50 Deg Protection: Roots 70 %, Root Depth 3 ft Vegetation 20 % [4]Material: Silt/Clay Sand / Gravel Cobble - %____
ER	d/s	L M H VH EX (circle one)			Bank: Height ____ ft, Angle ____ Deg Protection: Roots ____ %, Root Depth ____ ft Vegetation ____ % [4]Material: Silt/Clay Sand / Gravel Cobble - %____

[1] Impacts: Outfall(OT), Bank Erosion(ER), Impacted buffer(IB), Utilities in channel(UT), Stream crossing(SC), Channel modification(CM), Trash in stream(TR), other.
[2] Severity: 1=minor, 2=moderate, 3=severe
[3] Restoration Potential: 1=minimal, 2=moderate, 3=high
[4]Bank material: circle base type, silt/clay or sand and if present circle rock type and note %.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)

USA, Cont.

REACH ID: WPR D/S Section	STREAM:	DATE/TIME: 6/29/19	INITIALS: EWJ/PMB
OTHER INFO:			

Average Conditions (check applicable)

Flood Plain Dynamics
Connection: ☐ Poor ☐ Fair ☑ Good
Habitat: ☐ Poor ☐ Fair ☑ Good
Vegetation: ☑ Forest ☑ Shrub/Sapling ☐ Tall grasses ☐ Turf/crops
Encroachment: ☐ Poor ☑ Fair ☐ Good

Periphyton (attached algae):
Filamentous: ☐ None ☐ Sparse ☐ Moderate ☐ Abundant
Prostrate: ☐ None ☐ Sparse ☐ Moderate ☐ Abundant
Floating: ☐ None ☐ Sparse ☐ Moderate ☐ Abundant
Mats ☑ Mucky

Suspended Algae (phytoplankton) abundance:
☑ None noticeable (water basically clear)
☐ Moderate (water slightly green tinted)
☐ Abundant (water appears green)

Aquatic Plants In Stream:
Submerged: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant
Emergent: ☐ None ☐ Sparse ☑ Moderate ☐ Abundant
Floating: ☑ None ☐ Sparse ☐ Moderate ☐ Abundant

Aquatic Life Observed:
☑ Fish ☐ Snails ☐ Crawfish ☐ Macroinvertebrates

Wildlife/Livestock In or Around Stream (evidence of):
☐ Cattle ☐ Beaver ☐ Deer ☐ Other_____

Reach Impacts: (circle impact level 1=minor, 2=moderate, 3=major, and tag with a GPS waypoint(s) (Wpt) ID)
☐ Outfalls(OT): 1 2 3 Wpt_____
☑ Stream Crossing(SC): (1) 2 3 Wpt 14
☐ Bank Erosion(ER) : (1) 2 3 Wpt_____
☐ Channel Modification(CM) : 1 2 3 Wpt_____
☐ Impacted Buffers(IB): 1 2 3 Wpt_____
☐ Trash(TR): 1 2 3 Wpt_____
☐ Utilities(UT): 1 2 3 Wpt_____
☐ Other_____: 1 2 3 Wpt_____
Notes:

If any of these impacts are significant use back of page 1 (pg. 2) for detailed description.

Channel Dynamics:
☐ Incised (degrading) ☐ Channelized ☐ Bed Scour ☐ Sediment Deposition
☐ Widening ☐ Aggrading ☑ Bank Failure ☐ Culvert Scour (upstream / downstream / top)
☐ Headcutting ☐ Bank scour ☐ Slope failure ☐ None (natural stabile channel)

Channel Dimensions (facing downstream):
Lt bank Ht: 6 (ft) Bankfull Depth 3.5 (ft) Wetted Width: 7yd (ft) Riffle/Run Depth 1.5 (ft)
Rt bank Ht: 3.75 (ft) Bankfull Width 19 (ft)) TOB Width: 22' (ft) Pool Depth 0.75 (ft)

Channel Stability:
Lt Bank: Angle 55 degrees
LtBank Vegetation protection: ~~10~~50 % cover
LtBank Erosion Hazard: (L) M H VH EX (circle one)
Length Lt Bank Affected:_____
Wpt(s):_____

Rt Bank: Angle 50 degrees
RtBank Vegetation protection 95 % cover
RtBank Erosion Hazard: (L) M H VH EX (circle one)
Length Rt Bank Affected:_____
Wpt(s):_____

Reach Accessibility For Restoration

Good: Open area in public ownership. Easy stream channel access by vehicle.	**Fair:** Forested or developed near stream. Vehicle access limited.	**Difficult:** Must cross wetland, steep slope, heavy forest or sensitive areas to get to stream. Access by foot/ATV only.
5	(4) 3	2 1

Notes: (biggest problem(s) you see in survey reach)

Restoration Potential:
☑ Riparian reforestation ☑ Bank stabilization
☐ Stormwater retrofit ☐ Outfall stabilization
☐ Channel modification ☐ PS investigation
☐ Culvert rehab. ☐ Other _____

Place sketch of reach on back of page.

* Modified from *Unified Stream Assessment: A Users Manual*, (Kitchall & Schuller, 2004)