

Mill Creek @ FM 149

TCEQ ID – 21957



Biological Monitoring Summary Packet

EIH Final Report #17-005
August 31, 2017

Prepared by the Environmental Institute of Houston University of Houston - Clear Lake in cooperation with the Houston-Galveston Area Council and the Texas Commission on Environmental Quality





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Summary of the Biological Assessment

Sample Collection

At the request of the Houston-Galveston Area Council (HGAC), under Amendment #6 to the Houston-Galveston Area Council's Clean Rivers Program FY 2016-2017 QAPP, the Environmental Institute of Houston (EIH) conducted an aquatic life monitoring (ALM) study on Mill Creek (segment 1008A), Montgomery County, TX. The sampling events were conducted during index and critical periods (June and August) in 2017. This packet contains a summary of the biological information collected at Texas Commission on Environmental Quality (TCEQ) site 21957 (Mill Creek at FM 149).

The monitoring effort for each sample event included collection of instantaneous flow (discharge), field parameters (temperature, specific conductance, dissolved oxygen [D.O.], and pH), water chemistry (bacteria, nutrients, Chlorophyll, and solids), nekton (seining and electrofishing), benthic macroinvertebrates (RBP kicknet), physical habitat characterization and Twenty-four hour (diel) monitoring for dissolved oxygen.

All measurements were recorded according to protocols outline in the TCEQ's Surface Water Quality Monitoring (SWQM) Procedures Manual Volume 1 (August 2012) and Volume 2 (May 2014). All data represented herein has been submitted to the HGAC for entry into the Surface Water Quality Monitoring Information System (SWQMIS).

Results

Index sampling was performed on June 28, 2017 and critical sampling was performed on August 1, 2017. Flow data were measured using a SonTek Flow Tracker and instantaneous flow values were higher during the index (5.56 cfs) compared to the critical (1.50 cfs) sampling.

During index sampling, instantaneous water temperature was 25.20°C, while diel averaged 25.61°C (range: 24.93-26.10°C, $n = 96$). Instantaneous specific conductance was 245 $\mu\text{S}/\text{cm}$ while diel averaged 219 $\mu\text{S}/\text{cm}$ (range: 191-247 $\mu\text{S}/\text{cm}$, $n = 96$). Instantaneous D.O. was 5.76 mg/L, while diel averaged 5.81 mg/L (range: 5.55-6.09 mg/L, $n = 96$). Instantaneous pH was 7.30, while diel ranged from 6.94-7.03 ($n = 96$).

During critical sampling, instantaneous water temperature was 26.16°C, while diel averaged 27.16°C (range: 25.84-28.86°C, $n = 96$). Instantaneous specific conductance was 260 $\mu\text{S}/\text{cm}$, while diel averaged 253 $\mu\text{S}/\text{cm}$ (range: 252-255 $\mu\text{S}/\text{cm}$, $n = 96$). Instantaneous D.O. was 5.40 mg/L, while diel averaged 5.17 mg/L (range: 4.71-5.78mg/L, $n = 96$). Instantaneous pH was 7.26, while diel ranged from 6.86-7.04 ($n = 96$).

Chloride (30.5 mg/L; 58.0 mg/L), and total phosphorus (0.21 mg/L; 0.34 mg/L levels increased from index to critical periods, respectively. Chlorophyll-a (99.2ug/L; 237ug/L), *E. coli* (31 MPN/100mL; 22 MPN/100mL), Sulfate (21.6 mg/L; 9.8 mg/L), Total suspended solid (14 mg/L; 1 mg/L), total kjeldahl nitrogen (0.6 mg/L; 0.4 mg/L), ammonia nitrogen (0.3 mg/L; 0.1 mg/L),

and nitrate/nitrite nitrogen (0.32 mg/L; 0.1 mg/L) levels all decreased from index to critical periods, respectively.

Ecoregion specific coefficient of variance (CV) adjusted mean nekton and benthic macroinvertebrate IBI scores were 48.17 and 28.33, respectively¹, while mean physical habitat IBI score was 21.5. Un-adjusted mean IBI scores for nekton indicate intermediate ALU, un-adjusted mean benthic IBI score indicates high ALU, and the mean physical habitat IBI score indicates high ALU. The backpack electroshocker battery was not properly holding charge during the index sampling, resulting in non-continuous shocking (breaks to switch out the battery and recharge when necessary) which may have resulted in an under-representation of the fish community during the index event. It is important to note that the minimum number of seconds and all habitat types were sampled irrespective of these equipment difficulties.

Conclusion

Mill Creek (segment 1008A) has one listed impairment for depressed dissolved oxygen (category 5c) and has an intermediate ALU designation. Our results suggest that site 21957 (segment 1008A) is fully supporting its designated ALU rating of Intermediate for benthic macroinvertebrates, nekton, physical habitat and 24hr dissolved oxygen. The coefficient of variance of the adjusted means for the nekton IBIs are greater than 2x the ALU coefficient of variance indicating additional sampling may be needed.

¹ Nekton IBI: 40 (index), 51 (critical) and 45.5 un-adjusted mean; Benthic Macroinvertebrate IBI: 27 (index), 25 (critical), and 26 un-adjusted mean; Physical Habitat IBI: 21 (index) & 22 (critical)

Aquatic Life Monitoring and Habitat Assessment Checklist

Background Information

Name of Water Body: Mill Creek

Segment Number: 1008A Station ID: 21957

On Segment: Yes No

Permit number, if applicable: SPR-0504-383 Check monitoring objective: ALM ALU UAA RWA

Historic Stream Characterization (choose one):

Intermittent Intermittent with perennial pools sufficient to support significant aquatic life use Perennial Unknown

Basis for historic stream characterization (describe): Historical classification for stream characterization was based on topographic USGS maps and previously established TCEQ stream classifications (including TSWQS and 2014 Texas Integrated Report).

Current Aquatic Life Use Designation (if classified segment or site specific standard determined):

Exceptional High Intermediate Limited

Current Assessment Status on the 2014 Water Quality Inventory, 305(b) Report:

Supported Partially Supported Not Supported Concern Not Assessed

Data Entry

Field Data Entry (FDE) Information:

Date Entered Into FDE: _____ RTAG #: _____ (TCEQ Regional Biologists only)

Field Data (CRP Partners only): Tag #'s: Index – I698001; I698005; I698009; I698013; I698017
Critical – I698003; I698007; I698011; I698015; I698019

Objective for Aquatic Life Use Assessment

Is this water body supporting its designated uses? Yes No

Reason: Nekton scores were intermediate and high for the index and critical periods respectively; and benthic macroinvertebrate scores were intermediate for both the index and critical periods. Physical Habitat scores were high for both the index and critical periods. In index and critical sampling periods, diel D.O. averaged 5.81 mg/L and 5.17 mg/L, respectively, with an absolute minima being 5.55mg/L and 4.71 mg/L, respectively. In summation, this site is supporting intermediate ALU for all parameters.

Known or potential causes of Aquatic Life Use concern or impairment: Segment 1008A is listed on the 2014 Texas Integrated Report 303(d) list for depressed dissolved oxygen (category 5c).

Identify Sources of Pollution:

Point Source: Yes No Identify: _____
Nonpoint Source: Yes No Identify: Urban Runoff/Storm Sewers, and On-site Treatment Systems (Septic Systems and Similar Decentralized Systems).

Ambient Toxicity Tests in Water body? Yes No

Results:

	Sediment Chronic	Sediment Acute	Water Chronic	Water Acute
Significant effect				
No significant effect				

Monitoring Information

Biological monitoring conducted during index period (03/15 to 06/30 and 10/01 to 10/15) and critical period (07/01 to 09/30):

Stream Characterization Event 1 Date: 6/28/2017

Flow Severity: <u>Normal</u>	Pools covering <u>31.1</u> % of the <u>209</u> meters assessed	Flowing at <u>5.56</u> cfs
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Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, and construction): There were no site conditions that adversely affected the stream during or directly before each sampling event that we know of. There was an issue with the backpack electrofisher battery not holding charge during the index event. The minimum number of seconds of shocking was achieved, but it required breaks to switch out batteries and re-charge batteries that caused a potential inefficiency in electrofishing sampling.

Stream Characterization Event 2 Date: 8/1/2017

Flow Severity: <u>Normal</u>	Pools covering <u>31.3</u> % of the <u>160</u> meters assessed	Flowing at <u>1.50</u> cfs
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Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, and construction): Likely a more representative sample for nekton due to electroshocking equipment function (new backpack batteries) as compared to the index sampling.

Nekton Sampling Event 1

Minimum 15-minute (900 seconds) electrofishing: Yes No
 Minimum 6 seine hauls (or equivalent effort to sample 60 meters): Yes No
 Fish sampling conducted in all available habitat types: Yes No
 If no, please describe why:

Benthic Macroinvertebrate Sampling Event 1

Indicate method(s) used:

Rapid Bioassessment: 5-minute kicknet Snags
 Quantitative: Surber Snags Dredge

Habitat Assessment Event 1

TCEQ Habitat Protocols: Yes No

Stream Flow Measurement Event 1

Instantaneous measurement: Yes No
 USGS Gage Reading: Yes No

Nekton Sampling Event 2

Minimum 15-minute (900 seconds) electrofishing: Yes No
 Minimum 6 seine hauls (or equivalent effort to sample 60 meters): Yes No
 Fish sampling conducted in all available habitat types: Yes No
 If no, please describe why:

Benthic Macroinvertebrate Sampling Event 2

Indicate method(s) used:

Rapid Bioassessment: 5-minute kicknet Snags
 Quantitative: Surber Snags Dredge

Habitat Assessment Event 2

TCEQ Habitat Protocols: Yes No

Stream Flow Measurement Event 2

Instantaneous measurement: Yes No
 USGS Gage Reading: Yes No

Assessment Results (Optional)

Fish community index Event 1

Exceptional High Intermediate Limited

Fish community index Event 2

Exceptional High Intermediate Limited

Benthic macroinvertebrate community index Event 1

Exceptional High Intermediate Limited

Benthic macroinvertebrate community index Event 2

Exceptional High Intermediate Limited

Habitat index Event 1

Exceptional High Intermediate Limited

Habitat index Event 2

Exceptional High Intermediate Limited

Maps of Sample Location

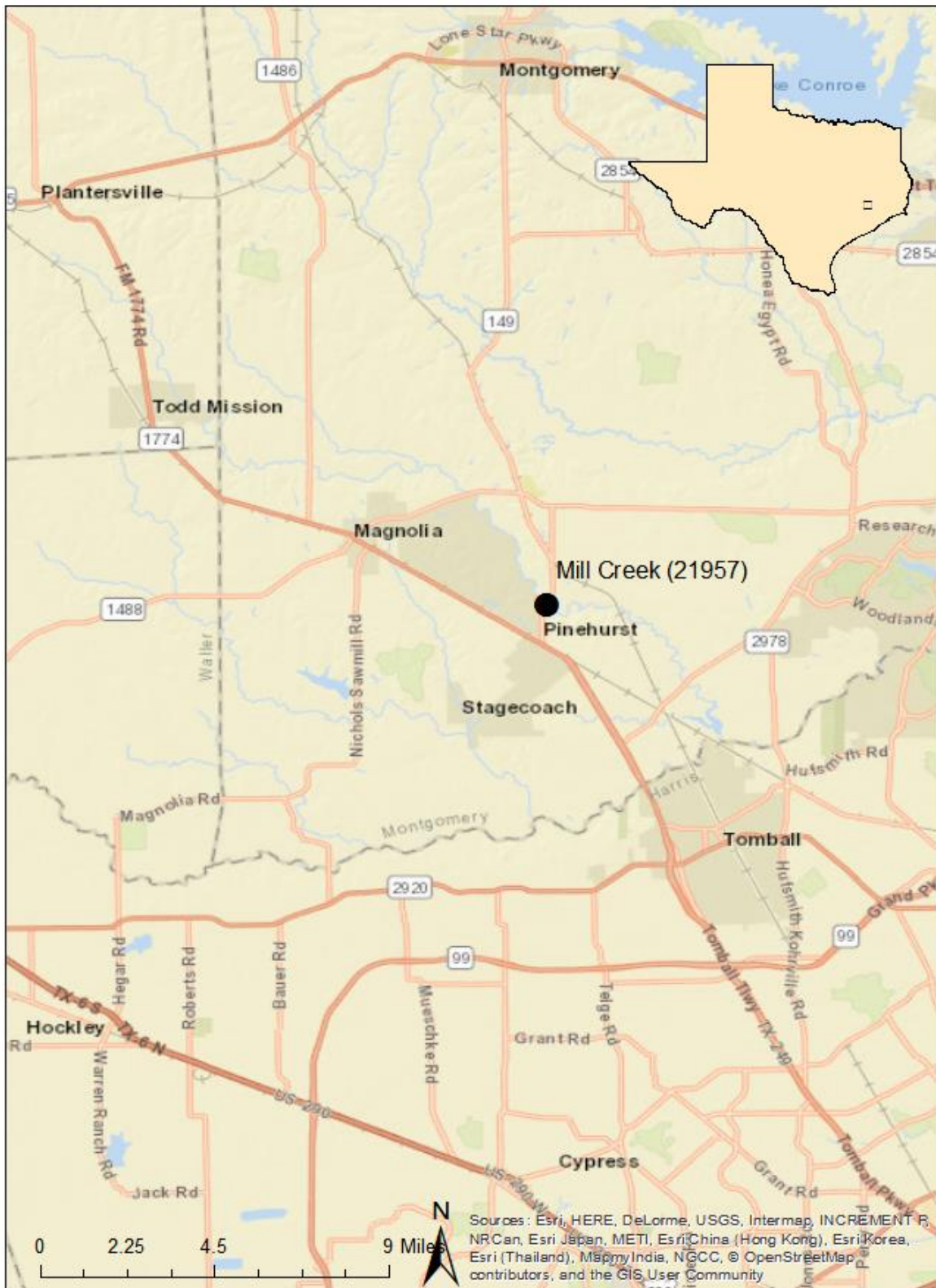


Figure 1 Map of study site, 21957 Mill Creek at FM 149 (Latitude: 30.18653, Longitude: -95.6816)



Figure 2 Sample reach map for index event showing location of physical habitat transects, benthic macroinvertebrate sampling, 24hr dissolved oxygen, and conventional water sampling locations.



Figure 3 Sample reach map for critical event showing location of physical habitat transects, benthic macroinvertebrate sampling, 24hr dissolved oxygen, and conventional water sampling locations.

Nekton Community IBI Data, Summary Data, and Species Lists

Ecoregion 35 Nekton IBI			
Date	6/28/2017	TCEQ ID	21957
Site	Mill Creek @ FM 149		
Metric	Value	Score	
Total Number of Fish Species	14	3	
Number of Native Cyprinid Species	3	3	
Number of Benthic Invertivore Species	2	1	
Number of Sunfish Species	3	3	
% of Individuals as Tolerant Species ^a	19.7	5	
% of Individuals as Omnivores	1.9	5	
% of Individuals as Invertivores	95.8	5	
% of Individuals as Piscivores	2.3	1	
Number of Individuals in Sample	259	3	
Number of Individuals/seine haul	34.6	5	
Number of Individuals/min electrofishing	1.11	1	
% of Individuals as Non-native Species	0	5	
% of Individuals With Disease/Anomaly	0	5	
Regional Score and Aquatic Life Use	40	Intermediate	
^a not including <i>G. affinis</i>			
Scoring Criteria			
Exceptional		> 49	
High		41 – 48	
Intermediate		35 – 40	
Limited		< 35	

Nekton Summary Data			
Date	06/28/2017	TCEQ ID	21957
Site	Mill Creek @ FM 149		
Description	STORET	Value	
Stream order	84161	1	
Minimum seine mesh diagonal (cm)	89930	0.125	
Maximum seine mesh diagonal (cm)	89931	0.125	
Seine length (m)	89941	4.572	
Electrofishing method (1=boat, 2=backpack)	89943	2	
Electrofishing effort (sec)	89944	915	
Seining effort (number of hauls)	89947	7	
Combined length of seine hauls (m)	89948	62	
Seining effort (duration, minutes)	89949	3 :19	
Ecoregion	89961	35	
Area seined (m ²)	89976	283.46	
Total fish species (n)	98003	14	
Number of sunfish species (n)	98008	3	
Total intolerant species (n)	98010	NA	
Omnivore individuals (%)	98017	1.9	
Invertivore individuals (%)	98021	95.8	
Piscivore individuals (%)	98022	2.3	
Individuals with disease or anomaly (%)	98030	0	
Number of native cyprinid species (n)	98032	3	
Individuals as non-native species (%)	98033	0	
Total individuals seining (n)	98039	242	
Total individuals electroshocking (n)	98040	17	
Number of benthic invertivores (n)	98052	2	
Individuals per seine haul (n)	98062	34.6	
Individuals per minute electroshocking (n)	98069	1.11	
Tolerant individuals (except <i>G. affinis</i>) (%)	98070	19.7	

SPECIES LIST AND ABUNDANCE- NEKTON

Date 6/28/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

STORET	Collection Method	(E = electro, S = seine)	E1	E2	E3	ES	S1	S2	S3	S4	S5	S6	S7	Seine	Overall Total
	Collection Effort	(for E: sec; for S: meters)	306	307	302	915	10	6	10	10	10	8	8	62	
	Scientific Name	Common Name				Total								Total	
98564	Ameiurus natalis	Yellow bullhead	1	1	0	2	0	0	1	0	2	0	0	3	5
98773	Aphredoderus sayanus	Pirate perch	0	0	1	1	0	0	0	0	0	0	0	0	1
98487	Cyprinella venusta	Blacktail shiner	0	0	1	1	1	6	20	0	5	0	13	45	46
99078	Etheostoma gracile	Slough darter	0	0	0	0	0	0	0	0	1	0	0	1	1
98677	Fundulus notatus	Blackstripe topminnow	0	1	3	4	3	11	0	8	9	1	12	44	48
98713	Gambusia affinis	Western mosquitofish	0	1	0	1	1	8	43	5	33	5	0	95	96
99094	Lepomis cyanellus	Green sunfish	0	1	1	2	0	0	0	0	0	0	0	0	2
99097	Lepomis macrochirus	Bluegill	3	1	0	4	0	0	0	0	2	0	0	2	6
99101	Lepomis miniatus	Redspotted sunfish	0	0	0	0	0	0	0	1	0	0	0	1	1
99101	Micropterus punctulatus	Spotted bass	0	0	0	0	0	0	2	0	1	0	0	3	3
98441	Notemigonus crysoleucas	Golden shiner	0	0	0	0	0	1	0	30	6	0	6	43	43
98541	Percina sciera	Dusky darter	1	0	0	1	0	0	1	0	0	0	1	2	3
98498	Pimephales vigilax	Bullhead minnow	0	0	0	0	0	0	3	0	0	0	0	3	3
98570	Pylodictis olivaris	Flathead catfish	0	1	0	1	0	0	0	0	0	0	0	0	1
Total Collected			5	6	6	17	5	26	69	44	57	6	32	239	254
Total Taxa			3	6	4	9	3	4	6	4	8	2	4	11	14

Ecoregion 35 Nekton IBI			
Date	8/1/2017	TCEQ ID	21957
Site	Mill Creek @ FM 149		
Metric	Value	Score	
Total number fish species	19	5	
Number native cyprinid species	5	5	
Number benthic invertivore species	3	3	
Number sunfish species	5	5	
Number intolerant species	3	3	
Percent individuals as tolerant ^a	10.1	5	
Percent individuals as omnivores	3.2	5	
Percent individuals as invertivores	91.5	5	
Number individuals in sample	188	2	
Individuals per seine haul	19.3	3	
Individuals per min electrofishing	3.45	1	
Percent individuals as non-natives	0	5	
Percent individuals with disease or anomalies	0.5	5	
Regional Score and Aquatic Life Use	51	High	
^a not including <i>G. affinis</i>			
Scoring Criteria			
Exceptional		> 49	
High		41 – 48	
Intermediate		35 – 40	
Limited		< 35	

Nekton Summary Data			
Date	8/1/2017	TCEQ ID	21957
Site	Mill Creek @ FM 149		
Description	STORET	Value	
Stream order	84161	1	
Minimum seine mesh diagonal (cm)	89930	0.125	
Maximum seine mesh diagonal (cm)	89931	0.125	
Seine length (m)	89941	4.572	
Electrofishing method (1=boat, 2=backpack)	89943	2	
Electrofishing effort (sec)	89944	1208	
Seining effort (number of hauls)	89947	6	
Combined length of seine hauls (m)	89948	60	
Seining effort (duration, minutes)	89949	2:24	
Ecoregion	89961	35	
Area seined (m ²)	89976	274.3	
Total fish species (n)	98003	19	
Number of sunfish species (n)	98008	5	
Total intolerant species (n)	98010	3	
Omnivore individuals (%)	98017	3.2	
Insectivore individuals (%)	98021	91.5	
Piscivore individuals (%)	98022	4.8	
Individuals with disease or anomaly (%)	98030	0.5	
Number of native cyprinid species (n)	98032	5	
Individuals as non-native species (%)	98033	0	
Total individuals seining (n)	98039	116	
Total individuals electroshocking (n)	98040	73	
Number of benthic invertivores (n)	98052	3	
Individuals per seine haul (n)	98062	19.3	
Individuals per minute electroshocking (n)	98069	3.45	
Tolerant individuals (except <i>G. affinis</i>) (%)	98070	10.1	

SPECIES LIST AND ABUNDANCE - NEKTON

Date 8/1/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

STORET	Collection Method	(E = electro, S = seine)	E1	E2	E3	E4	ES	S1	S2	S3	S4	S5	S6	Seine	Overall Total	
	Collection Effort	(for E: sec; for S: meters)	301	302	302	303	1208	10	10	10	10	10	10	60		
	Scientific Name	Common Name					Total								Total	
98564	Ameiurus natalis	Yellow bullhead	1	1	1	2	5	0	0	0	0	0	0	0	5	
98773	Aphredoderus sayanus	Pirate perch	0	0	1	0	1	0	0	0	0	0	0	0	1	
98487	Cyprinella venusta	Blacktail shiner	0	6	0	3	9	0	8	0	5	2	3	18	27	
99078	Etheostoma gracile	Slough darter	0	1	0	1	2	0	0	0	0	1	0	1	3	
98677	Fundulus notatus	Blackstripe topminnow	1	0	1	0	2	3	7	0	11	8	15	44	46	
98713	Gambusia affinis	Western mosquitofish	0	0	1	5	6	0	1	8	1	18	9	37	43	
98013	Ichthyomyzon gagei	Southern Brook Lamprey	0	1	0	0	1	0	0	0	0	0	0	0	1	
99094	Lepomis cyanellus	Green sunfish	2	2	0	1	5	0	0	0	0	0	0	0	5	
99095	Lepomis gulosus	Warmouth	1	0	0	0	1	0	0	0	0	0	0	0	1	
99097	Lepomis macrochirus	Bluegill	0	3	3	3	9	0	0	0	0	0	0	0	9	
99099	Lepomis megalotis	Longear sunfish	2	3	4	6	15	0	0	0	0	0	0	0	15	
99101	Lepomis miniatus	Redspotted sunfish	1	1	1	1	4	0	0	0	0	0	0	0	4	
99089	Micropterus punctulatus	Spotted bass	0	1	0	0	1	0	1	0	0	1	0	2	3	
98441	Notemigonus crysoleucas	Golden shiner	0	0	0	0	0	0	0	0	3	0	0	3	3	
98462	Notropis atrocaudalis	Blackspot shiner	0	0	0	1	1	0	0	0	0	0	0	0	1	
99069	Percina macrolepida	Bigscale logperch	0	0	0	0	0	1	0	0	1	0	0	2	2	
98541	Percina sciera	Dusky darter	0	0	2	4	6	0	0	0	0	2	0	2	8	
98497	Pimephales promelas	Fathead minnow	0	1	0	0	1	0	0	0	0	0	0	0	1	
98498	Pimephales vigilax	Bullhead minnow	0	1	0	2	3	0	0	0	1	6	0	7	10	
Total Collected			7	20	13	27	67	4	17	8	22	38	27	116	183	
Total Taxa			6	11	8	11	17	2	4	1	6	7	3	9	19	

Benthic Community IBI Data, Summary Data, and Species Lists

Qualitative Benthos IBI		
Date	6/28/2017	TCEQ ID 21957
Site	Mill Creek @ FM 149	
Metric	Value	Score
Taxa Richness	24	4
EPT Taxa Abundance	10	4
Biotic Index (HBI)	4.65	2
% Chironomidae	2.39	4
% Dominant Taxon	47.02	1
% Dominant FFG	48.13	2
% Predators	3.38	1
Intolerant : Tolerant	1.56	1
% Total Trichoptera as Hydropsychidae	91.18	1
# of Non-Insect Taxa	9	4
% Collector-Gatherers	48.13	1
% of Total Number as Elmidae	22.20	2
AQUATIC LIFE USE SCORE	27	
AQUATIC LIFE USE RATING	Intermediate	
Scoring Criteria		
Exceptional	>36	
High	29 - 36	
Intermediate	22 - 28	
Limited	<22	

Benthos Summary Data		
Date	6/28/2017	TCEQ ID 21957
Site	Mill Creek @ FM 149	
Description	STORET	Value
Stream order	84161	1
Data reporting units	89899	1
Kicknet effort (m ²)	89903	3
Kicknet effort (min)	89904	5.15
Debris/shoreline effort, min picked (min)	89905	NA
Total n for sample (n)	89906	419
Gravel substrate (%)	89923	60
Macrophyte bed (%)	89926	0
Snags and brush (%)	89927	2
Bedrock (%)	89928	0
Net mesh size (cm)	89946	0.05
Benthic sampler	89950	3
Ecoregion	89961	35
HBI	90007	4.65
EPT index (n)	90008	10
Dominant FFG (%)	90010	48.13
Collector-gatherers (%)	90025	89.50
Predators (%)	90036	5.73
Dominant taxon (%)	90042	47.02
Intolerant : Tolerant taxa	90050	1.56
Non-insect taxa (n)	90052	9
n as Elmidae (%)	90054	22.20
Taxa richness (n)	90055	24
Chironomidae (%)	90062	2.39
Trichoptera as Hydropsychidae (%)	90069	91.18

SPECIES LIST - BENTHIC MACROINVERTEBRATES

Date 6/28/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

STORET	Phylum	Class	Order	Family	Genus	Count
90913	Annelida	Hirudinea				1
90382	Annelida	Oligochaeta				7
91525	Arthropoda	Hydracarina				1
91265	Arthropoda	Crustacea	Amphipoda	Gammaridae	<i>Gammarus</i>	197
91397	Arthropoda	Crustacea	Decapoda	Palaemonidae	<i>Palaemonetes</i>	10
92783	Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae		1
93025	Mollusca	Bivalvia	Veneroida	Sphaeriidae	<i>Eupera</i>	1
90176	Nemertea				<i>Prostoma</i>	1
90072	Platyhelminthes	Turbellaria			<i>Dugesia</i>	2
92253	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i>	93
92491	Arthropoda	Insecta	Diptera	Chironomidae		10
92628	Arthropoda	Insecta	Diptera	Empididae	<i>Hemerodromia</i>	2
92439	Arthropoda	Insecta	Diptera	Tipulidae	<i>Pseudolimnophila</i>	1
91645	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Acentrella</i>	1
91632	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Acerpenna</i>	3
91646	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Baetis</i>	4
91641	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Proclleon</i>	1
91600	Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i>	12
91510	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	<i>Maccaffertium</i>	19
91594	Arthropoda	Insecta	Ephemeroptera	Tricorythidae	<i>Tricorythodes</i>	15
92074	Arthropoda	Insecta	Megaloptera	Corydalidae	<i>Corydalus</i>	3
92292	Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i>	30
92296	Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Hydropsyche</i>	1
92391	Arthropoda	Insecta	Trichoptera	Leptoceridae	<i>Oecetis</i>	3
Total						419

Qualitative Benthos IBI			
Date	7/31//2017	TCEQ ID	21957
Site	Mill Creek @ FM 149		
Metric	Value	Score	
Taxa Richness	16	3	
EPT Taxa Abundance	7	3	
Biotic Index (HBI)	5.32	1	
% Chironomidae	15.14	2	
% Dominant Taxon	29.24	3	
% Dominant FFG	58.05	1	
% Predators	6.88	4	
Intolerant : Tolerant	1.00	1	
% Total Trichoptera as Hydropsychidae	100.00	1	
# of Non-Insect Taxa	5	3	
% Collector-Gatherers	58.05	1	
% of Total Number as Elmidae	29.24	2	
AQUATIC LIFE USE SCORE	25		
AQUATIC LIFE USE RATING	Intermediate		
Scoring Criteria			
Exceptional	>36		
High	29 - 36		
Intermediate	22 - 28		
Limited	<22		

Benthos Summary Data			
Date	7/31/2017	TCEQ ID	21957
Site	Mill Creek @ FM 149		
Description	STORET	Value	
Stream order	84161	1	
Data reporting units	89899	1	
Kicknet effort (m ²)	89903	4	
Kicknet effort (min)	89904	5.56	
Debris/shoreline effort, min picked (min)	89905	NA	
Total n for sample (n)	89906	383	
Gravel substrate (%)	89923	45	
Macrophyte bed (%)	89926	2	
Snags and brush (%)	89927	0	
Bedrock (%)	89928	0	
Net mesh size (cm)	89946	0.05	
Benthic sampler	89950	3	
Ecoregion	89961	35	
HBI	90007	5.32	
EPT index (n)	90008	7	
Dominant FFG (%)	90010	58.05	
Collector-gatherers (%)	90025	97.39	
Predators (%)	90036	16.97	
Dominant taxon (%)	90042	29.24	
Intolerant : Tolerant taxa	90050	1.00	
Non-insect taxa (n)	90052	5	
n as Elmidae (%)	90054	29.24	
Taxa richness (n)	90055	16	
Chironomidae (%)	90062	15.14	
Trichoptera as Hydropsychidae (%)	90069	100	

SPECIES LIST - BENTHIC MACROINVERTEBRATES

Date 7/31/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

STORET	Phylum	Class	Order	Family	Genus	Count
90382	Annelida	Oligochaeta				8
91265	Arthropoda	Crustacea	Amphipoda	Gammaridae	<i>Gammarus</i>	99
92783	Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae		1
93030	Mollusca	Bivalvia	Veneroida	Sphaeriidae	<i>Pisidium</i>	1
90176	Nemertea				<i>Prostoma</i>	2
92253	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i>	112
92478	Arthropoda	Insecta	Diptera	Ceratopogonidae	<i>Bezzia</i>	3
92486	Arthropoda	Insecta	Diptera	Ceratopogonidae	<i>Probezzia</i>	2
92491	Arthropoda	Insecta	Diptera	Chironomidae		58
91645	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Acentrella</i>	1
91632	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Acerpenna</i>	1
91579	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Labiobaetis</i>	1
91600	Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i>	6
91510	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	<i>Maccaffertium</i>	4
91594	Arthropoda	Insecta	Ephemeroptera	Tricorythidae	<i>Tricorythodes</i>	83
92292	Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i>	1
Total						383

Physical Habitat IBI Data, Summary Data, and Transect Data

Habitat Quality Index			
Date	06/28/2017		
Site	Mill Creek @ FM 149		
TCEQ ID	21957		
Metric	Value	Score	
Instream Cover, mean (%)	16.00	2	
Riffles, number of	3	3	
Pools, maximum depth (m)	0.875	3	
Bank Stability	—	1	
Slope component, mean angle (°)	30.0	—	
Erosion component, mean (%)	40.0	—	
Riparian Buffer Vegetation, mean width (m)	>20	3	
Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow)	2	2	
Channel Sinuosity	3	3	
Bottom Substrate, mean gravel or larger (%)	0	2	
Aesthetics (1=Wilderness, 2=Natural, 3=Common, 4=Offensive)	2	2	
AQUATIC LIFE USE SCORE			22
AQUATIC LIFE USE RATING			High
Scoring Criteria			
Exceptional			26 - 31
High			20 - 25
Intermediate			14 - 19
Limited			< 14

Habitat Summary Data

Date 6/28/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

Description	STORET	Value
Instantaneous flow measurement (cfs)	00061	5.5557
Mean stream slope over evaluated reach (m/km)	72051	1.053
Mean instream cover (%)	84159	16.000
Stream order	84161	1
Number of transects	89832	5
Flow measurement method (1=gage, 2=electric, 3=mechanical, 4=weir, 5=doppler)	89835	5
Total number of stream bends	89839	7
Well defined stream bends	89840	2
Moderately defined stream bends	89841	3
Poorly defined stream bends	89842	2
Number of riffles	89843	3
Dominant substrate (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock)	89844	3
Mean substrate gravel or larger (%)	89845	0
Mean bank erosion (%)	89846	40.0
Mean bank slope (°)	89847	30.0
Channel flow status (4=high, 3=moderate, 2=low, 1=no flow)	89848	3
Riparian vegetation	—	
Trees (%)	89849	87.5
Shrubs (%)	89850	0.5
Grasses/forbes (%)	89851	4.0
Cultivated fields (%)	89852	0.0
Other (%)	89853	8
Mean tree canopy (%)	89854	95.600
Drainage area above location (km ²)	89859	146.9
Length of segment evaluated (km)	89860	0.209
Mean stream width (m)	89861	4.0
Mean stream depth (m)	89862	0.388
Maximum pool width (m)	89864	3.30
Maximum pool depth (m)	89865	0.875
Mean width natural buffer vegetation (m)	89866	20.0
Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive)	89867	2
Number of instream cover types	89929	5
Ecoregion	89961	35
Land development (1=unimpacted, 2=low, 3=moderate, 4=high)	89962	2

Habitat Transect Data

Date 6/28/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

Description	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5
Stream type (RI=riffle, RU=run, G=glide, P=pool)	RU	P	RU	P	G
Stream width (m)	4.0	6.6	4.3	5.0	5.7
Left bank slope (°)	55	40	42.5	30	70
Left bank erosion potential (%)	40	25	50	25	30
Left bank width of natural buffer vegetation (m)	20	20	20	20	20
Right bank slope (°)	5	20	38	85	40
Right bank erosion potential (%)	40	20	30	20	30
Right bank width of natural buffer vegetation (m)	20	20	20	20	20
Tree canopy (%)	95.60	100.0	79.4	91.2	100.0
Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)	3	2	3	3	3
Stream depth at point 1 (m)	0	0	0	0	0.121
Stream depth at point 2 (m)	0.699	0.34	0.139	0.171	0.4
Stream depth at point 3 (m)	0.784	0.527	0.174	0.473	0.422
Stream depth at point 4 (m)	0.718	0.726	0.214	0.522	0.425
Stream depth at point 5 (m)	0.599	0.842	0.294	0.452	0.488
Stream depth at point 6 (m)	0.446	0.871	0.435	0.345	0.438
Stream depth at point 7 (m)	0.239	0.884	0.49	0.46	0.382
Stream depth at point 8 (m)	0.094	0.677	0.469	0.556	0.3
Stream depth at point 9 (m)	0.072	0.449	0.393	0.63	0.205
Stream depth at point 10 (m)	0.071	0.272	0.392	0.523	0.122
Stream depth at point 11 (m)	0	0	0.218	0.158	0
Substrate gravel or larger (%)	0	0	0	25	35
Instream cover (%)	16	5	21	22	10
Left bank trees (%)	80	90	95	5	80
Left bank shrubs (%)	1	0	0	5	2
Left bank grasses/forbes (%)	5	5	5	80	9
Left bank cultivated fields (%)	0	0	0	0	0
Left bank other (%)	14	5	0	10	9
Right bank trees (%)	95	95	50	40	100
Right bank shrubs (%)	0	0	0	60	0
Right bank grasses/forbes (%)	3	4	25	0	0
Right bank cultivated fields (%)	0	0	0	0	0
Right bank other (%)	2	1	25	0	0
Transect Latitude (decimal degrees)	30.18622	30.18638	30.18626	30.18588	30.18583
Transect Longitude (decimal degrees)	-95.67988	-95.68026	-95.68077	-95.68105	-95.68156
Total length of reach (m)	209				

Habitat Quality Index

Date 8/1/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

Metric	Value	Score
Instream Cover, mean (%)	20	2
Riffles, number of	4	3
Pools, maximum depth (m)	1.27	4
Bank Stability	—	2
Slope component, mean angle (°)	60.0	—
Erosion component, mean (%)	35.0	—
Riparian Buffer Vegetation, mean width (m)	20.0	3
Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow)	1	1
Channel Sinuosity	2	2
Bottom Substrate, mean gravel or larger (%)	0	3
Aesthetics (1=Wilderness, 2=Natural, 3=Common, 4=Offensive)	2	2
AQUATIC LIFE USE SCORE		22
AQUATIC LIFE USE RATING		High
Scoring Criteria		
Exceptional	26 - 31	
High	20 - 25	
Intermediate	14 - 19	
Limited	< 14	

Habitat Summary Data

Date 8/1/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

Description	STORET	Value
Instantaneous flow measurement (cfs)	00061	1.4994
Mean stream slope over evaluated reach (m/km)	72051	1.053
Mean instream cover (%)	84159	20.00
Stream order	84161	1
Number of transects	89832	5
Flow measurement method (1=gage, 2=electric, 3=mechanical, 4=weir, 5=doppler)	89835	5
Total number of stream bends	89839	5
Well defined stream bends	89840	1
Moderately defined stream bends	89841	2
Poorly defined stream bends	89842	2
Number of riffles	89843	4
Dominant substrate (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock)	89844	3
Mean substrate gravel or larger (%)	89845	0
Mean bank erosion (%)	89846	35.0
Mean bank slope (°)	89847	60.0
Channel flow status (4=high, 3=moderate, 2=low, 1=no flow)	89848	2
Riparian vegetation	—	
Trees (%)	89849	80.0
Shrubs (%)	89850	0.0
Grasses/forbes (%)	89851	13.5
Cultivated fields (%)	89852	0.0
Other (%)	89853	6.5
Mean tree canopy (%)	89854	98.500
Drainage area above location (km ²)	89859	146.9
Length of segment evaluated (km)	89860	0.16
Mean stream width (m)	89861	4.57
Mean stream depth (m)	89862	0.717
Maximum pool width (m)	89864	4.57
Maximum pool depth (m)	89865	1.27
Mean width natural buffer vegetation (m)	89866	20.0
Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive)	89867	2
Number of instream cover types	89929	5
Ecoregion	89961	35
Land development (1=unimpacted, 2=low, 3=moderate, 4=high)	89962	2

Habitat Transect Data

Date 8/1/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

Description	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5
Stream type (RI=riffle, RU=run, G=glide, P=pool)	P	RU	RU	RI	RU
Stream width (m)	4.6	5.7	3.6	2.0	4.4
Left bank slope (°)	85	40	30	25	30
Left bank erosion potential (%)	25	40	20	30	35
Left bank width of natural buffer vegetation (m)	20	20	20	20	20
Right bank slope (°)	35	10	50	60	40
Right bank erosion potential (%)	45	30	25	30	10
Right bank width of natural buffer vegetation (m)	20	20	20	20	20
Tree canopy (%)	67	57	68	57	67
Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)	3	3	4	4	3
Stream depth at point 1 (m)	0	0	0	0	0
Stream depth at point 2 (m)	0.31	0.09	0.19	0.01	0.12
Stream depth at point 3 (m)	0.525	0.215	0.35	0.045	0.19
Stream depth at point 4 (m)	0.75	0.37	0.35	0.06	0.265
Stream depth at point 5 (m)	0.85	0.465	0.36	0.075	0.285
Stream depth at point 6 (m)	1.05	0.43	0.34	0.09	0.325
Stream depth at point 7 (m)	1.18	0.37	0.385	0.125	0.35
Stream depth at point 8 (m)	1.18	0.145	0.4	0.13	0.4
Stream depth at point 9 (m)	0.98	0.19	0.4	0.11	0.39
Stream depth at point 10 (m)	0.8	0.175	0.45	0.09	0.4
Stream depth at point 11 (m)	0.26	0	0	0	0.145
Substrate gravel or larger (%)	0	0	80	75	45
Instream cover (%)	20	50	10	15	15
Left bank trees (%)	75	75	95	50	70
Left bank shrubs (%)	0	0	0	0	0
Left bank grasses/forbes (%)	22	20	5	25	15
Left bank cultivated fields (%)	0	0	0	0	0
Left bank other (%)	3	5	0	25	10
Right bank trees (%)	85	70	98	50	90
Right bank shrubs (%)	0	0	0	35	0
Right bank grasses/forbes (%)	5	28	2	5	10
Right bank cultivated fields (%)	0	0	0	0	0
Right bank other (%)	10	2	0	10	0
Transect Latitude (decimal degrees)	30.18636	30.18635	30.18611	30.18586	30.18581
Transect Longitude (decimal degrees)	-95.68017	-95.68061	-95.68084	-95.68110	-95.68151
Total length of reach (m)	160				

Diel Summary Data and Measurements

Diel Measurement Summary			
Start Date	06/27/2017	Start Time	10:45
End Date	06/28/2017	End Time	10:30
Site	Mill Creek @ FM 149		
TCEQ ID	21957		
Parameter	STORET	Value	
Temp Mean	00209	25.61	
Temp Maximum	00210	26.1	
Temp Minimum	00211	24.93	
Spec Cond Mean	00212	219	
Spec Cond Maximum	00213	247	
Spec Cond Minimum	00214	191	
pH Maximum	00215	7.03	
pH Minimum	00216	6.94	
# Temp Measurements	00221	96	
# Spec Cond Measurements	00222	96	
# pH Measurements	00223	96	
DO Minimum	89855	5.55	
DO Maximum	89856	6.09	
DO Mean	89857	5.81	
# DO Measurements	89858	96	

Diel Data						
Date	6/28/2017	TCEQ ID	21957			
Site Name	Mill Creek @ FM 149					
Date	Time	Temp	pH	Dissolved Oxygen	Dissolved Oxygen	Specific Conductance
(mm/dd/yyyy)	(hh:mm)	(°C)	Std. Units	(mg/L)	(%)	(µS/cm)
06/27/2017	10:45	25.34	6.99	5.78	70.4	191
06/27/2017	11:00	25.39	6.96	5.80	70.7	192
06/27/2017	11:15	25.43	6.95	5.80	70.7	192
06/27/2017	11:30	25.43	6.95	5.79	70.6	193
06/27/2017	11:45	25.46	6.94	5.79	70.7	193
06/27/2017	12:00	25.46	6.94	5.79	70.7	194
06/27/2017	12:15	25.48	6.94	5.82	71.1	195
06/27/2017	12:30	25.51	6.94	5.83	71.3	195
06/27/2017	12:45	25.57	6.95	5.87	71.8	196
06/27/2017	13:00	25.67	6.95	5.91	72.4	197
06/27/2017	13:15	25.78	6.96	5.94	73.0	197
06/27/2017	13:30	25.87	6.96	5.99	73.7	198
06/27/2017	13:45	25.89	6.96	5.98	73.5	198
06/27/2017	14:00	25.89	6.96	5.98	73.6	199
06/27/2017	14:15	25.87	6.96	5.95	73.2	200
06/27/2017	14:30	25.88	6.97	6.01	73.9	200
06/27/2017	14:45	25.91	6.97	6.05	74.5	200
06/27/2017	15:00	25.92	6.97	6.04	74.4	201
06/27/2017	15:15	25.91	6.97	6.03	74.2	201
06/27/2017	15:30	25.90	6.97	6.01	74.0	202
06/27/2017	15:45	25.91	6.97	6.02	74.1	203
06/27/2017	16:00	25.93	6.98	6.03	74.3	203
06/27/2017	16:15	25.94	6.98	6.03	74.3	204
06/27/2017	16:30	25.99	6.98	6.08	74.9	205
06/27/2017	16:45	26.02	6.98	6.08	75.0	206
06/27/2017	17:00	26.05	6.99	6.09	75.1	206
06/27/2017	17:15	26.06	6.98	6.07	74.9	206
06/27/2017	17:30	26.08	6.99	6.08	75.1	207
06/27/2017	17:45	26.08	6.99	6.08	75.0	208
06/27/2017	18:00	26.09	6.99	6.06	74.9	209
06/27/2017	18:15	26.09	6.99	6.05	74.7	209
06/27/2017	18:30	26.09	6.99	6.05	74.7	210
06/27/2017	18:45	26.09	6.98	6.02	74.3	210
06/27/2017	19:00	26.09	6.98	6.01	74.2	211
06/27/2017	19:15	26.10	6.99	6.01	74.2	212
06/27/2017	19:30	26.10	6.99	5.99	74.0	212
06/27/2017	19:45	26.10	6.98	5.97	73.7	213
06/27/2017	20:00	26.10	6.99	5.97	73.8	213
06/27/2017	20:15	26.09	6.99	5.96	73.6	214
06/27/2017	20:30	26.08	6.99	5.96	73.6	214
06/27/2017	20:45	26.06	6.99	5.92	73.1	215
06/27/2017	21:00	26.05	6.99	5.91	73.0	215
06/27/2017	21:15	26.03	6.99	5.91	72.9	216
06/27/2017	21:30	26.01	6.99	5.90	72.8	216
06/27/2017	21:45	25.99	6.99	5.90	72.7	216
06/27/2017	22:00	25.98	6.99	5.90	72.7	217

Date	Time	Temp	pH	Dissolved Oxygen	Dissolved Oxygen	Specific Conductance
06/27/2017	22:15	25.96	6.99	5.89	72.6	217
06/27/2017	22:30	25.95	6.99	5.88	72.4	218
06/27/2017	22:45	25.93	7.00	5.88	72.4	219
06/27/2017	23:00	25.91	7.00	5.87	72.3	219
06/27/2017	23:15	25.90	7.00	5.87	72.2	220
06/27/2017	23:30	25.89	7.00	5.86	72.2	220
06/27/2017	23:45	25.86	7.00	5.85	72.0	221
06/28/2017	00:00	25.83	7.00	5.84	71.8	221
06/28/2017	00:15	25.80	7.00	5.81	71.4	222
06/28/2017	00:30	25.77	7.00	5.80	71.2	222
06/28/2017	00:45	25.75	7.00	5.79	71.1	223
06/28/2017	01:00	25.71	7.00	5.78	70.8	224
06/28/2017	01:15	25.68	7.00	5.75	70.5	226
06/28/2017	01:30	25.64	7.00	5.74	70.4	225
06/28/2017	01:45	25.62	7.00	5.73	70.2	225
06/28/2017	02:00	25.59	7.00	5.72	70.0	226
06/28/2017	02:15	25.56	7.00	5.71	69.9	226
06/28/2017	02:30	25.54	7.00	5.70	69.7	227
06/28/2017	02:45	25.51	7.00	5.68	69.5	228
06/28/2017	03:00	25.48	7.00	5.67	69.3	229
06/28/2017	03:15	25.46	7.00	5.67	69.3	229
06/28/2017	03:30	25.43	7.00	5.65	69.0	230
06/28/2017	03:45	25.39	7.00	5.64	68.8	230
06/28/2017	04:00	25.36	7.00	5.63	68.7	231
06/28/2017	04:15	25.33	7.00	5.64	68.7	232
06/28/2017	04:30	25.30	7.00	5.63	68.5	233
06/28/2017	04:45	25.26	7.00	5.61	68.3	233
06/28/2017	05:00	25.23	7.00	5.62	68.3	234
06/28/2017	05:15	25.20	7.00	5.61	68.2	235
06/28/2017	05:30	25.17	7.01	5.60	68.0	236
06/28/2017	05:45	25.14	7.00	5.60	67.9	236
06/28/2017	06:00	25.11	7.01	5.59	67.8	237
06/28/2017	06:15	25.08	7.01	5.57	67.6	237
06/28/2017	06:30	25.05	7.01	5.58	67.6	239
06/28/2017	06:45	25.02	7.01	5.57	67.4	239
06/28/2017	07:00	25.00	7.01	5.57	67.5	240
06/28/2017	07:15	24.98	7.01	5.57	67.4	240
06/28/2017	07:30	24.96	7.01	5.56	67.3	241
06/28/2017	07:45	24.95	7.01	5.56	67.2	242
06/28/2017	08:00	24.94	7.01	5.55	67.1	242
06/28/2017	08:15	24.93	7.01	5.55	67.1	243
06/28/2017	08:30	24.93	7.01	5.56	67.2	244
06/28/2017	08:45	24.93	7.01	5.55	67.2	244
06/28/2017	09:00	24.94	7.01	5.57	67.4	245
06/28/2017	09:15	24.94	7.01	5.56	67.2	245
06/28/2017	09:30	24.97	7.02	5.59	67.6	245
06/28/2017	09:45	24.98	7.02	5.60	67.8	246
06/28/2017	10:00	24.99	7.02	5.62	68.0	246
06/28/2017	10:15	25.03	7.02	5.64	68.4	247
06/28/2017	10:30	25.06	7.03	5.66	68.7	247

Diel Measurement Summary

Start Date	07/31/2017	Start Time	17:00
End Date	08/01/2017	End Time	8:40
Site	Mill Creek @ FM 149		
TCEQ ID	21957		

Parameter	STORET	Value
Temp Mean	00209	27.16
Temp Maximum	00210	28.68
Temp Minimum	00211	25.84
Spec Cond Mean	00212	253
Spec Cond Maximum	00213	255
Spec Cond Minimum	00214	252
pH Maximum	00215	7.04
pH Minimum	00216	6.86
# Temp Measurements	00221	96
# Spec Cond Measurements	00222	96
# pH Measurements	00223	96
DO Minimum	89855	4.71
DO Maximum	89856	5.78
DO Mean	89857	5.17
# DO Measurements	89858	96

Diel Data						
Date	7/31/2017			TCEQ ID	21957	
Site Name	Mill Creek @ FM 149					
Date (mm/dd/yyyy)	Time (hh:mm)	Temp (°C)	pH Std. Units	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)
07/31/2017	11:00	26.90	6.86	4.80	60.1	255
07/31/2017	11:15	26.97	6.87	4.83	60.7	255
07/31/2017	11:30	27.06	6.88	4.96	62.3	255
07/31/2017	11:45	27.14	6.89	4.97	62.5	255
07/31/2017	12:00	27.18	6.90	5.12	64.6	255
07/31/2017	12:15	27.23	6.91	5.12	64.6	255
07/31/2017	12:30	27.31	6.93	5.25	66.3	254
07/31/2017	12:45	27.40	6.94	5.30	67.0	255
07/31/2017	13:00	27.54	6.95	5.39	68.3	254
07/31/2017	13:15	27.65	6.96	5.49	69.8	255
07/31/2017	13:30	27.78	6.98	5.55	70.6	255
07/31/2017	13:45	27.96	6.99	5.65	72.2	254
07/31/2017	14:00	28.10	7.00	5.67	72.6	254
07/31/2017	14:15	28.23	7.01	5.73	73.6	254
07/31/2017	14:30	28.37	7.01	5.72	73.5	254
07/31/2017	14:45	28.50	7.02	5.75	74.2	254
07/31/2017	15:00	28.64	7.03	5.77	74.6	254
07/31/2017	15:15	28.64	7.03	5.78	74.7	254
07/31/2017	15:30	28.67	7.03	5.77	74.7	254
07/31/2017	15:45	28.68	7.03	5.70	73.8	254
07/31/2017	16:00	28.63	7.03	5.72	73.9	253
07/31/2017	16:15	28.59	7.03	5.72	73.9	253
07/31/2017	16:30	28.56	7.03	5.74	74.1	254
07/31/2017	16:45	28.56	7.03	5.69	73.4	253
07/31/2017	17:00	28.51	7.03	5.72	73.7	253
07/31/2017	17:15	28.51	7.04	5.75	74.2	253
07/31/2017	17:30	28.51	7.04	5.74	74.1	254
07/31/2017	17:45	28.50	7.04	5.70	73.5	253
07/31/2017	18:00	28.56	7.03	5.71	73.7	253
07/31/2017	18:15	28.50	7.02	5.64	72.7	253
07/31/2017	18:30	28.49	7.02	5.67	73.2	253
07/31/2017	18:45	28.43	7.02	5.63	72.5	253
07/31/2017	19:00	28.37	7.01	5.60	72.1	253
07/31/2017	19:15	28.30	7.01	5.55	71.3	253
07/31/2017	19:30	28.21	7.01	5.51	70.7	253
07/31/2017	19:45	28.14	7.01	5.44	69.7	253
07/31/2017	20:00	28.06	7.00	5.37	68.7	253
07/31/2017	20:15	27.99	7.00	5.36	68.5	253
07/31/2017	20:30	27.91	7.00	5.31	67.8	253
07/31/2017	20:45	27.83	7.00	5.27	67.1	253
07/31/2017	21:00	27.77	6.99	5.27	67.1	253
07/31/2017	21:15	27.70	6.99	5.24	66.6	253
07/31/2017	21:30	27.63	6.99	5.21	66.1	253
07/31/2017	21:45	27.55	6.99	5.20	65.9	253
07/31/2017	22:00	27.47	6.99	5.20	65.8	253

Date	Time	Temp	pH	Dissolved Oxygen	Dissolved Oxygen	Specific Conductance
07/31/2017	22:15	27.40	6.99	5.20	65.7	253
07/31/2017	22:30	27.35	6.99	5.18	65.4	253
07/31/2017	22:45	27.29	6.99	5.18	65.4	252
07/31/2017	23:00	27.21	6.99	5.15	64.9	253
07/31/2017	23:15	27.14	6.98	5.11	64.3	253
07/31/2017	23:30	27.08	6.98	5.12	64.4	253
07/31/2017	23:45	27.03	6.98	5.10	64.0	253
08/01/2017	00:00	26.98	6.98	5.10	64.0	255
08/01/2017	00:15	26.91	6.98	5.07	63.5	253
08/01/2017	00:30	26.86	6.98	5.06	63.4	253
08/01/2017	00:45	26.80	6.97	5.01	62.7	253
08/01/2017	01:00	26.75	6.98	5.00	62.5	253
08/01/2017	01:15	26.68	6.97	4.98	62.2	253
08/01/2017	01:30	26.67	6.98	4.99	62.3	252
08/01/2017	01:45	26.61	6.97	4.95	61.7	253
08/01/2017	02:00	26.57	6.97	4.94	61.6	253
08/01/2017	02:15	26.55	6.97	4.93	61.3	252
08/01/2017	02:30	26.50	6.97	4.92	61.2	253
08/01/2017	02:45	26.45	6.96	4.88	60.6	253
08/01/2017	03:00	26.39	6.96	4.84	60.1	253
08/01/2017	03:15	26.37	6.96	4.85	60.2	253
08/01/2017	03:30	26.35	6.96	4.88	60.6	252
08/01/2017	03:45	26.31	6.96	4.85	60.2	253
08/01/2017	04:00	26.30	6.96	4.87	60.4	252
08/01/2017	04:15	26.28	6.96	4.90	60.7	252
08/01/2017	04:30	26.24	6.96	4.88	60.4	252
08/01/2017	04:45	26.21	6.96	4.86	60.2	252
08/01/2017	05:00	26.16	6.96	4.87	60.2	252
08/01/2017	05:15	26.10	6.96	4.82	59.6	253
08/01/2017	05:30	26.09	6.96	4.82	59.6	252
08/01/2017	05:45	26.08	6.96	4.85	59.9	252
08/01/2017	06:00	25.99	6.95	4.80	59.2	253
08/01/2017	06:15	26.02	6.96	4.85	59.9	252
08/01/2017	06:30	25.98	6.96	4.83	59.6	252
08/01/2017	06:45	25.96	6.95	4.81	59.3	252
08/01/2017	07:00	25.94	6.95	4.79	59.0	252
08/01/2017	07:15	25.92	6.95	4.80	59.1	252
08/01/2017	07:30	25.88	6.95	4.78	58.8	252
08/01/2017	07:45	25.84	6.94	4.75	58.4	253
08/01/2017	08:00	25.92	6.95	4.79	58.9	252
08/01/2017	08:15	25.92	6.95	4.71	58.0	252
08/01/2017	08:30	25.93	6.95	4.77	58.8	252
08/01/2017	08:45	25.98	6.95	4.79	59.1	252
08/01/2017	09:00	25.99	6.95	4.79	59.0	252
08/01/2017	09:15	26.04	6.95	4.79	59.2	252
08/01/2017	09:30	26.04	6.94	4.77	58.9	252
08/01/2017	09:45	26.04	6.94	4.76	58.7	252
08/01/2017	10:00	26.09	6.94	4.79	59.1	252
08/01/2017	10:15	26.14	6.94	4.80	59.4	252
08/01/2017	10:30	26.22	6.95	4.84	59.9	252
08/01/2017	10:45	26.25	6.95	4.84	60.0	252

Additional Field Data Measurements

Additional Parameter Data		
Date	06/28/2017	
Site	Mill Creek @ Fm 149	
TCEQ ID	21957	
Description	STORET	Value
<i>E. coli</i> IDEXX Colilert (MPN/100 ml)	31699	122
Holding Time, <i>E. coli</i> IDEXX Colilert (hh:mm)	31704	3:21
TSS (mg/l)	00530	14.3
Ammonia-N, Total (mg/l)	00610	0.1
Nitrate/Nitrite-N, Total (mg/l)	00630	0.07
Total Phosphorus-P (mg/l)	00665	0.430
Total Kjeldahl Nitrogen (mg/l)	00625	0.9
Chloride (mg/l)	00940	40
Sulfate (mg/l)	00945	11.6
Temperature (°C)	00010	25.20
Secchi Depth (m)	00078	0.340
Specific Conductance (µS/cm)	00094	245
DO (mg/L)	00300	5.76
pH (standard units)	00400	7.30
Salinity (ppt)	00480	0.12
Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry)	01351	3
Days Since Last Significant Rainfall (days)	72053	3
Total Water Depth (m)	82903	0.415
Wind Intensity (1=Calm, 2=Slight, 3=Moderate, 4=Strong)	89965	1
Present Weather (1=Clear, 2=Partly Cloudy, 3=Cloudy, 4=Rain, 5=Other)	89966	2
Water Surface (1=Calm, 2=Ripples, 3=Waves, 4=Whitecap)	89968	2
Water Color (1=Brownish, 2=Reddish, 3=Greenish, 4=Blackish, 5=Clear, 6=Other)	89969	1
Water Odor (1=sewage, 2=Chemical, 3=Rotten Egg, 4=Musky, 5=Fishy, 6=None, 7=Other)	89971	6

Additional Parameter Data

Date 8/1/2017
Site Mill Creek @ FM 149
TCEQ ID 21957

Description	STORET	Value
<i>E. coli</i> IDEXX Colilert (MPN/100 ml)	31699	22
Holding Time, <i>E. coli</i> IDEXX Colilert (hh:mm)	31704	4:55
TSS (mg/l)	00530	1
Ammonia-N, Total (mg/l)	00610	0.1
Nitrate/Nitrite-N, Total (mg/l)	00630	0.1
Total Phosphorus-P (mg/l)	00665	0.340
Total Kjeldahl Nitrogen (mg/l)	00625	0.4
Chloride (mg/l)	00940	58
Sulfate (mg/l)	00945	9.8
Temperature (°C)	00010	26.16
Secchi Depth (m)	00078	0.711
Specific Conductance (µS/cm)	00094	260
DO (mg/L)	00300	5.40
pH (standard units)	00400	7.26
Salinity (ppt)	00480	0.12
Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry)	01351	3
Days Since Last Significant Rainfall (days)	72053	16
Total Water Depth (m)	82903	0.289
Wind Intensity (1=Calm, 2=Slight, 3=Moderate, 4=Strong)	89965	1
Present Weather (1=Clear, 2=Partly Cloudy, 3=Cloudy, 4=Rain, 5=Other)	89966	1
Water Surface (1=Calm, 2=Ripples, 3=Waves, 4=Whitecap)	89968	1
Water Color (1=Brownish, 2=Reddish, 3=Greenish, 4=Blackish, 5=Clear, 6=Other)	89969	1
Water Odor (1=sewage, 2=Chemical, 3=Rotten Egg, 4=Musky, 5=Fishy, 6=None, 7=Other)	89971	6

Site Photographs

Index – Transect 1

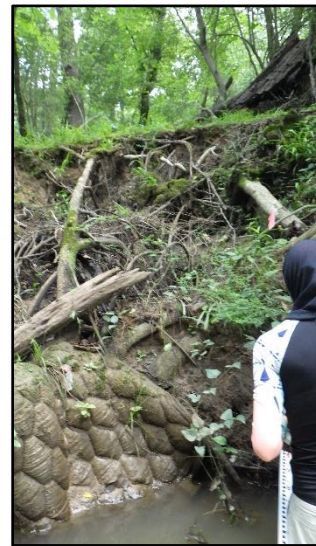
(Bottom of reach)



Upstream taken from transect 1 during index period.



Right bank taken from transect 1 during index period.



Left bank taken from transect 1 during index period.



Downstream taken from transect 1 during index period.

Index – Transect 2



Upstream taken from transect 2 during index period.



Right bank taken from transect 2 during index period.



Left bank taken from transect 2 during index period.



Downstream taken from transect 2 during index period.

Index – Transect 3



Upstream taken from transect 3 during index period.



Right bank taken from transect 3 during index period.

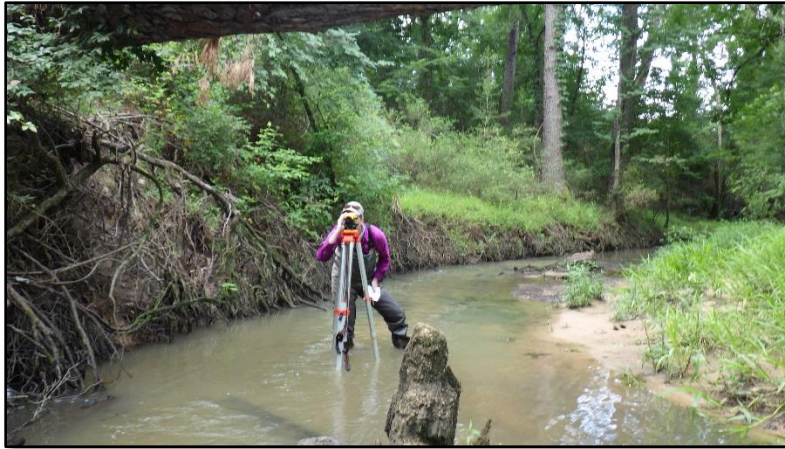


Left bank taken from transect 3 during index period.



Downstream taken from transect 3 during index period.

Index – Transect 4



Upstream taken from transect 4 during index period.



Right bank taken from transect 4 during index period.



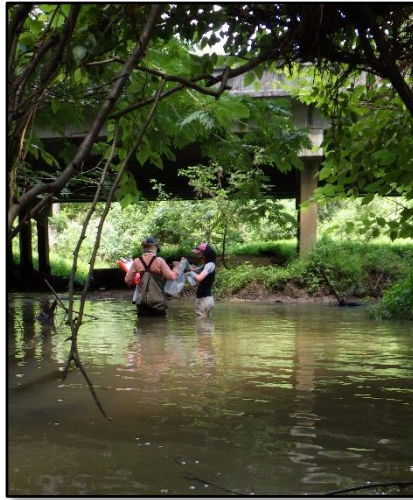
Left bank taken from transect 4 during index period.



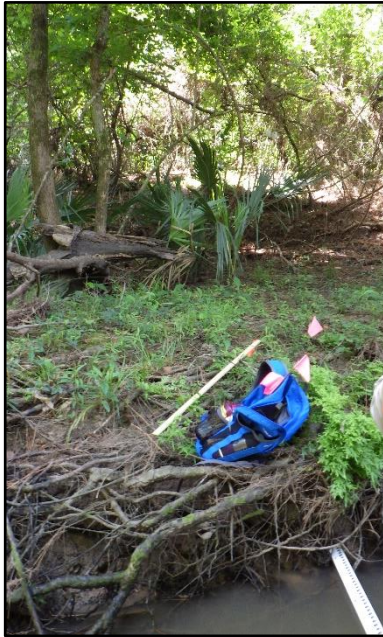
Downstream taken from transect 4 during index period.

Index – Transect 5

(Top of reach)



Upstream taken from transect 5 during index period.



Right bank taken from transect 5 during index period.



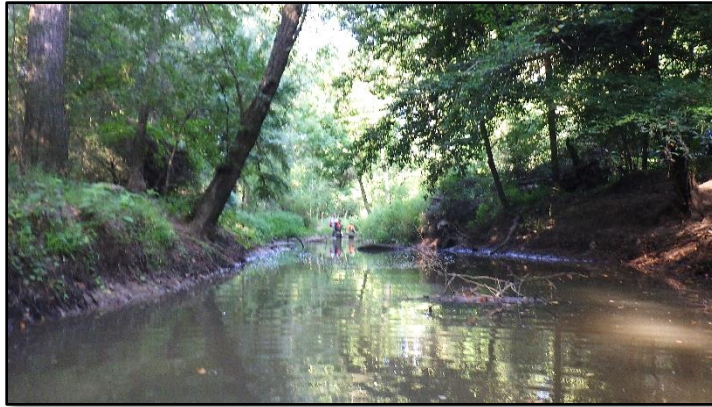
Left bank taken from transect 5 during index period.



Downstream taken from transect 5 during index period.

Critical – Transect 1

(Bottom of reach)



Upstream taken from transect 1 during critical period.



Right bank taken from transect 1 during critical period.



Left bank taken from transect 1 during critical period.



Downstream taken from transect 1 during critical period.

Critical – Transect 2



Upstream taken from transect 2 during critical period.



Right bank taken from transect 2 during critical period.



Left bank taken from transect 2 during critical period.



Downstream taken from transect 2 during critical period.

Critical – Transect 3



Upstream taken from transect 3 during critical period.



Right bank taken from transect 3 during critical period.



Left bank taken from transect 3 during critical period.



Downstream taken from transect 3 during critical period.

Critical – Transect 4



Upstream taken from transect 4 during critical period.



Right bank taken from transect 4 during critical period.



Left bank taken from transect 4 during critical period.



Downstream taken from transect 4 during critical period.

Critical – Transect 5



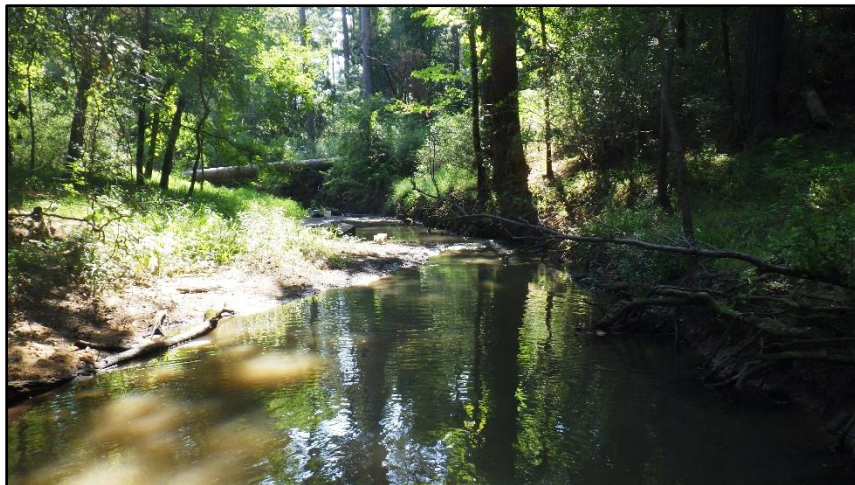
Upstream taken from transect 5 during critical period.



Right bank taken from transect 5 during critical period.



Left bank taken from transect 5 during critical period.

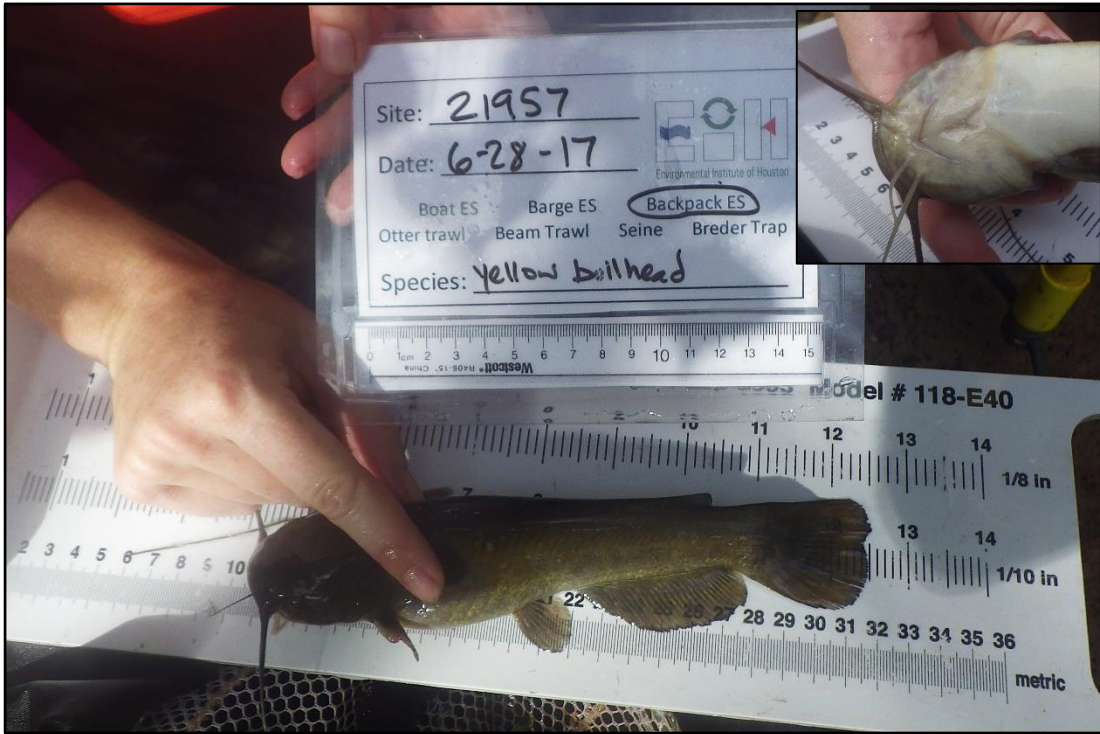


Downstream taken from transect 5 during critical period.

Nekton Photographic Vouchers

Index Period

NOTE: Fish were collected using SWQM protocols. Fish that were photographically vouchered (i.e. > 10cm) were not preserved and released at the site before departure. All other vouchered specimens were preserved, and will be stored at EIH laboratory facilities for 5 years.



Ameiurus natalis (Yellow Bullhead Catfish) captured with backpack electroshocker.

Critical Period



Lepomis megalotis (Longear Sunfish) captured with backpack electroshocker.



Minytrema melanops (Spotted Sucker) captured with seine.



Ameiurus natalis (Yellow Bullhead Catfish) captured with backpack electroshocker.