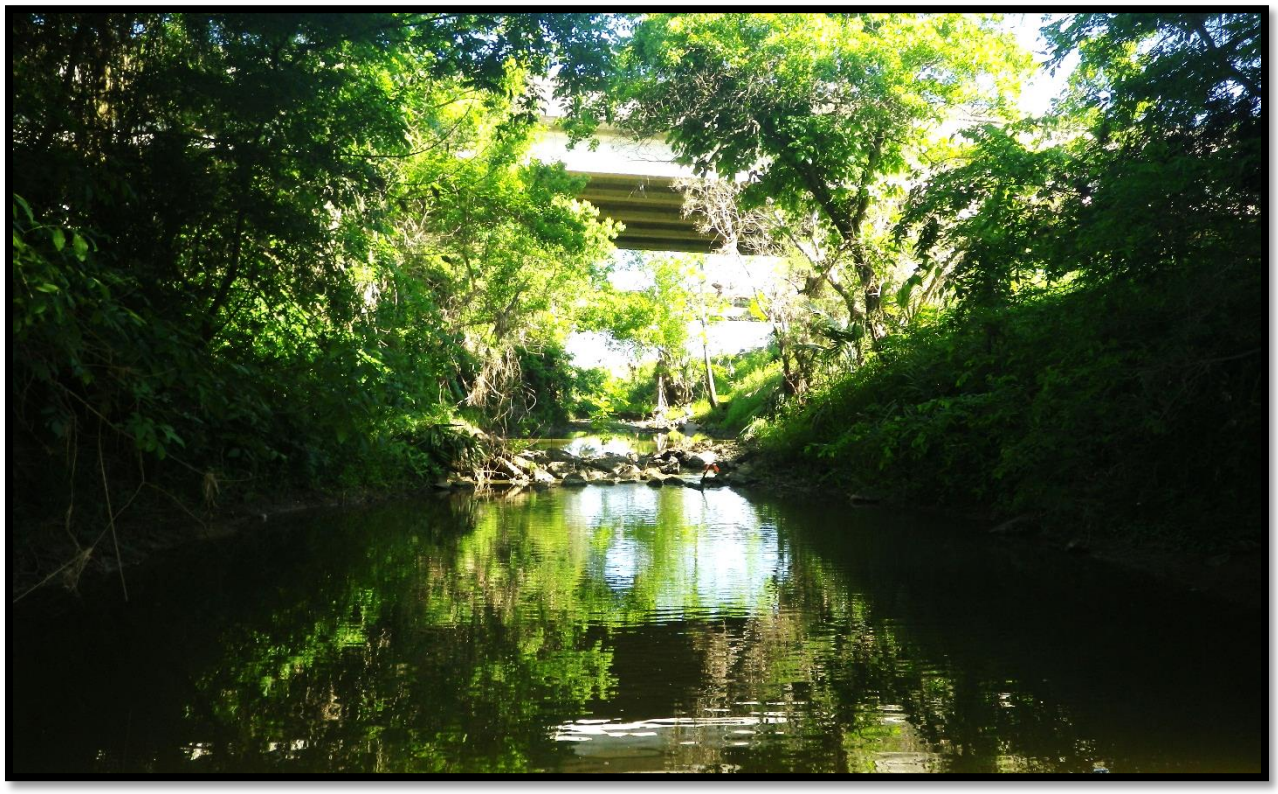
Cedar Bayou Above Tidal @ US90

TCEQ ID – 11120



Biological Monitoring Summary Packet

Table of Contents

November 10, 2014

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

Environmental Institute of Houston

NOTE: Fish were collected using SWQM protocols. Fish that were photographically vouchered (i.e. > 30cm) 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.

Environmental Institute of Houston

Prepared by the Environmental Institute of Houston

University of Houston-Clear Lake
George Guillen, Executive Director
Amanda Moss, Research Associate
Jenny Oakley, Environmental Scientist
Stephen Curtis, Aquatic Scientist

Principal Investigator

Dr. George Guillen
Environmental Institute of Houston
University of Houston Clear Lake
2700 Bay Area Blvd
Houston, Texas 77058

Prepared in cooperation with and for the Houston-Area Galveston Council

Justin Bower, Project Manager
Houston-Galveston Area Council
P.O. Box 22777
Houston, TX 77227-2777

Summary of the Biological Assessment

Sample Collection

At the request of the Houston-Galveston Area Council (H-GAC), in conjunction with the second half of Task 8 of the FY 2013/2014 Development of a Watershed Protection Plan for Cedar Bayou (QAPP), the Environmental Institute of Houston (EIH) conducted an aquatic life monitoring (ALM) study at two sample locations within the Cedar Bayou watershed. These sampling events were conducted during index and critical periods (May and July) in 2014 with previous sampling efforts conducted in the same time frame of 2013 contingent with the first half of Task 8 of the QAPP. This packet contains a summary of the biological information collected by EIH in 2014 at Texas Commission on Environmental Quality (TCEQ) site 11120 (Cedar Bayou Above Tidal at US 90).

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, and solids), nekton (seining and electrofishing), benthic macroinvertebrates (RBP kicknet), and physical habitat characterization. Photographs were taken at each transect of upstream, left bank, downstream, and right bank views. All measurements were recorded according to protocols outline in the TCEQ's Surface Water Quality Monitoring (SWQM) Procedures Manual Volume 1 (October 2008, plus applicable updates) and Volume 2 (June 2007). Additionally, any fish measuring >30 cm in total length were photographically vouchered and released on site while vouchered specimen will be retained at EIH facilities for 5 years.

Twenty-four hour (diel) monitoring for D.O. was also conducted in Cedar Bayou concurrently with biological monitoring and in conjunction with Task 9 (24-hr. D.O. sampling). This data has been submitted to H-GAC for entry into the Surface Water Quality Monitoring Information System (SWQMIS).

Results

Index sampling was performed on 01 May 2014 and critical sampling was performed on 03 July 2014. Instantaneous flow was taken during both sampling events and increased from index (0.4617 cfs) to critical (5.3353 cfs) sampling.

During index sampling, instantaneous water temperature was 20.96°C, while diel averaged 21.88°C (range: 20.58-23.49°C, n = 96). Instantaneous specific conductance was 471 µS/cm while diel averaged 444 µS/cm (range: 429-468 µS/cm, n = 96). Instantaneous D.O. was 9.22 mg/L, while diel averaged 6.25 mg/L (range: 4.83-7.85 mg/L, n = 96). Instantaneous pH was 7.48, while diel ranged from 6.89-7.48 (n = 96).

During critical sampling, instantaneous water temperature was 29.87°C, while diel averaged 30.71°C (range: 28.83-32.34°C, n = 95). Instantaneous specific conductance was 469 µS/cm, while diel averaged 436 µS/cm (range: 400-465 µS/cm, n = 95). Instantaneous D.O. was 5.21 mg/L, while diel averaged 5.92 mg/L (range: 4.36-7.49 mg/L, n = 95). Instantaneous pH was

7.44, while diel ranged from 7.12-7.41 (n = 95). Note, only 95 diel measurements recorded due to glitch; unit skipped a reading at 21:30 on 02 July 2014.

Total suspended solid (21.0 mg/L; 18.7 mg/L), *E. coli* (95 MPN/100mL; 75 MPN/100mL), sulfate (40.4 mg/L; 21.4 mg/L), and turbidity (13.40 NTU, 1.35 NTU) levels all decreased from index to critical periods, respectively. Ammonia nitrogen (<0.10 mg/L; 0.10 mg/L), enterococcus[1] (63 MPN/100mL; 120 MPN/100mL), nitrate/nitrite nitrogen (0.026 mg/L; 0.230 mg/L), total Kjeldahl nitrogen (3.5 mg/L; 3.9 mg/L), orthophosphate phosphorus (0.020 mg/L; 0.160 mg/L), hardness (100 mg/L; 136 mg/L), and total phosphorus (0.178 mg/L; 0.320 mg/L) levels all increased from index to critical periods, respectively.

Ecoregion specific coefficient of variance (CV) adjusted mean nekton and benthic IBI scores were 47.7 and 30.5, respectively[2], while mean physical habitat IBI score was 24. IBI scores for all three parameters indicate high ALU.

Conclusion

Cedar Bayou above tidal (segment 0902) was formerly listed on the 2008 Texas Integrated Report 303(d) list for impaired benthic community. In 2010, it was removed from the Texas Integrated Report 303(d) list due to a change in impairment criteria, but, was included in the 305(b) list of water bodies with concerns for impairment based on depressed D.O. levels and impaired macroinvertebrate communities. Segment 0902 is no longer listed on the 2012 Texas Integrated Report 305(b) or 303(d) lists as impaired or as a water body with concern for impairment.

Based on high ALU designations for all three categories (nekton, benthic macroinvertebrate, and physical habitat) and average diel D.O. levels being > 3.00 mg/L, our results suggest that site 11120 is fully supporting its ALU rating of high.

[1] It is interesting to note that enterococcus levels were > 33 MPN/100mL during both sampling events (value required for listing in 2012 Guidance for Assessing and Reporting Surface Water Quality in Texas).

[2] Nekton IBI: 45 (index & critical); Benthic Macroinvertebrate IBI: 29 (index & critical); Physical Habitat IBI: 24 (index) & 24.5 (critical)

Aquatic Life Monitoring and Habitat Assessment Checklist

Background Information

Name of Water Body: Cedar Bayou Above Tidal @ US 90 Northeast of Crosby, TX
Segment Number: 0902 Station ID: 11120 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 2012 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 2012 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 – TX05355; TX05356; TX05357; TX05358; TX05359
Critical – TX05360; TX05361; TX05362; TX05363; TX05364

Objective for Aquatic Life Use Assessment

Is this water body supporting its designated uses? Yes ☒ No ☐
Reason: Nekton, physical habitat, and benthic macroinvertebrate scores were all high during both critical and index sampling periods indicating full support of the previous ALU designation. In index and critical sampling periods, diel D.O. averaged 6.25 mg/L and 5.92 mg/L, respectively, with absolute minima being 4.83 mg/L and 4.36 mg/L, respectively. In summation, this site is fully supporting high ALU.

Known or potential causes of Aquatic Life Use concern or impairment: Segment 0902 was originally listed on the 2008 Texas Integrated Report 303(d) list for impaired benthic community, but was delisted in 2010 due to a change in impairment criteria. It was listed in the 2010 Texas Integrated Report 305(b) list of water bodies with concerns for depressed D.O. and impaired macroinvertebrate communities, but is not currently listed on the 2012 Texas Integrated Report 305(b) or 303(d) lists.

Identify Sources of Pollution:
Point Source: Yes ☐ No ☒ Identify: _____
Nonpoint Source: Yes ☒ No ☐ Identify: US 90 bridge crossing, drains runoff into water body at upstream portion of sample reach

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: 5/1/2014

Flow Severity:	Pools covering 10 % of	Flowing at 0.4617 cfs
Normal	the 170 meters assessed	(measured)

Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, and construction): Prior to index sampling, drier conditions persisted regionally leading to lower water levels and flow conditions (than compared to critical sampling).

Stream Characterization Event 2 Date: 7/3/2014

Flow Severity:	Pools covering 7.9 % of	Flowing at 5.3353 cfs
Normal	the 214 meters assessed	(measured)

Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, and construction): Recent rain may have caused flooding in surrounding area 2 weeks prior to sampling event. All bodies of water in surrounding area were flowing at higher rates when compared to index sampling, but, for the most part, the second half of the summer season was wetter than the first half (i.e. during 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 ☐

Map of Sample Location

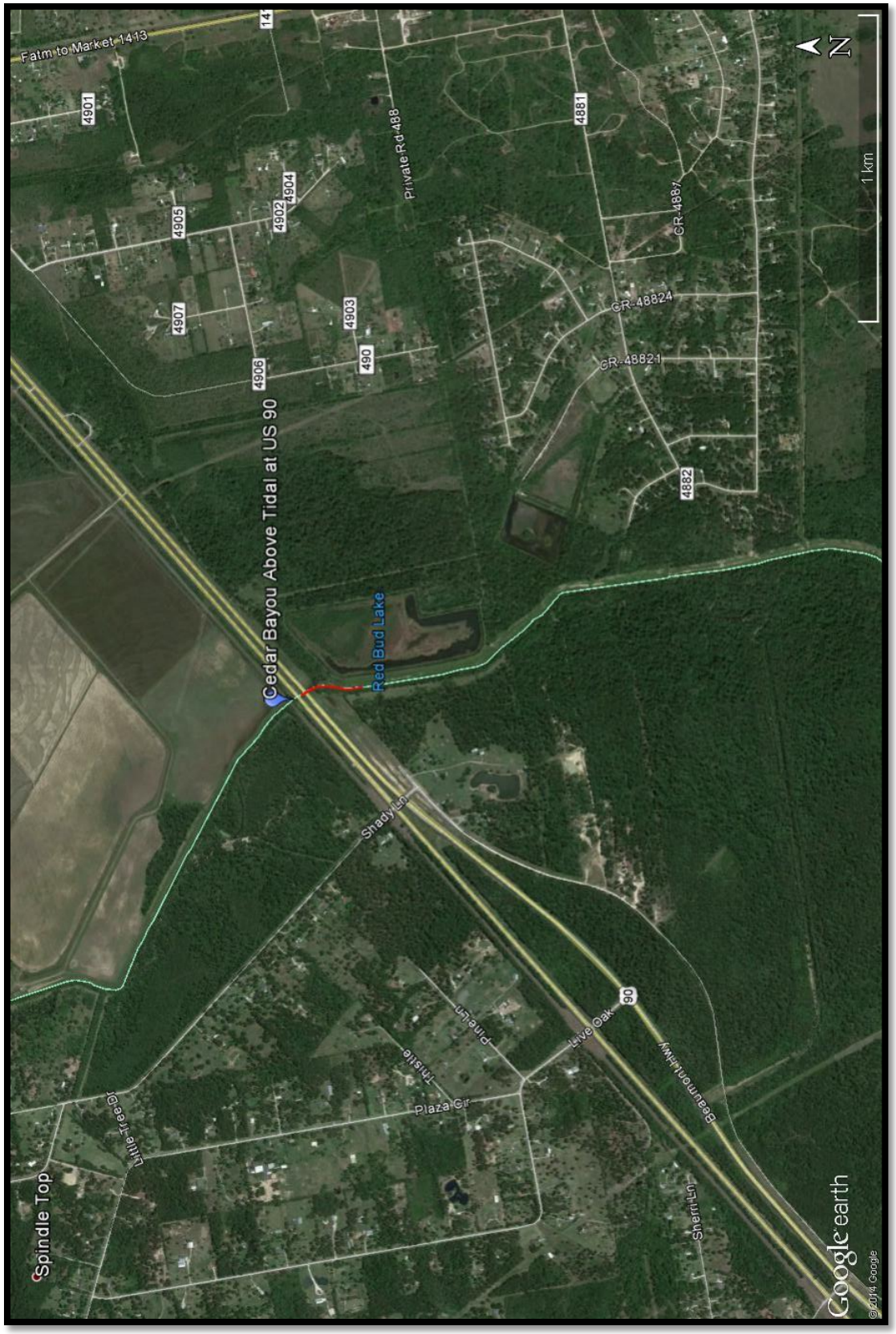


Figure 1 Aerial map of overall sample area (site indicated at top-most transect of reach) including length of evaluated reach (red line, 170m and 214m during index and critical periods, respectively).

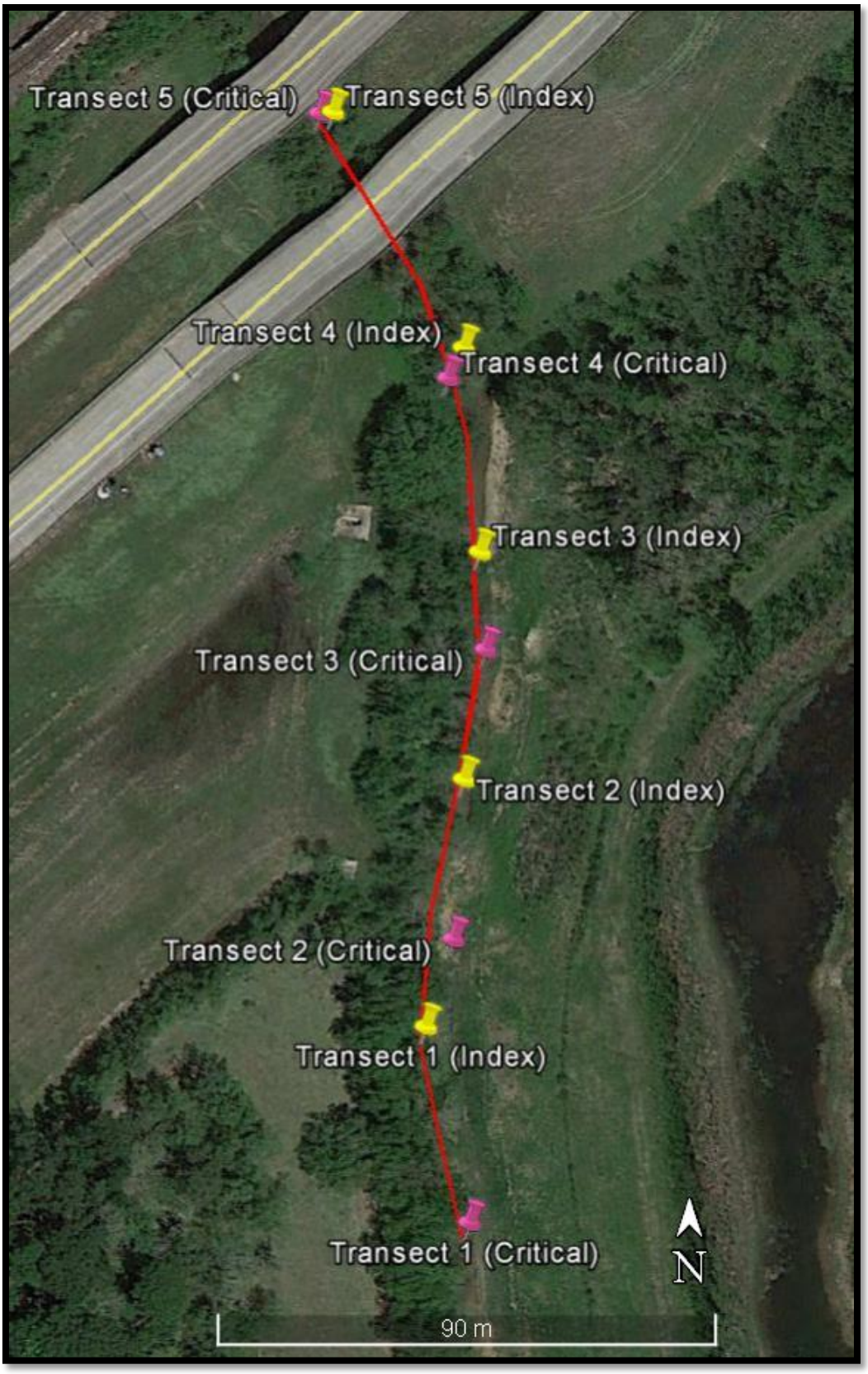


Figure 2 Location of transects for index (yellow pins) and critical (pink pins) sampling periods. Solid red line indicates curvature of Cedar Bayou.

Nekton Community IBI Data, Summary Data, and Species Lists

Ecoregion 34 Nekton IBI			
Date	05/01/2014	**TCEQ ID**	11120
Site	Cedar Bayou Above Tidal @ US90		
Metric		**Value**	**Score**
Total number fish species		14	5
Number native cyprinid species		3	5
Number benthic invertivore species		0	1
Number sunfish species		6	5
Number intolerant species		0	1
Percent individuals as tolerant[a]		10.5	5
Percent individuals as omnivores		4.1	5
Percent individuals as invertivores		92.6	5
Number individuals in sample		391	3
Individuals per seine haul		32.2	1
Individuals per min electrofishing		8.44	5
Percent individuals as non-natives		0.0	5
Percent individuals with disease or anomalies		0.0	5
Regional Score and Aquatic Life Use		**45**	**HIGH**
[a] not including *G. affinis*			
Scoring Criteria			
Exceptional			> 49
High			39 – 48
Intermediate			31 – 38
Limited			< 31

Nekton Summary Data			
Date	05/01/2014	**TCEQ ID**	**11120**
Site	Cedar Bayou Above Tidal @ US90		
Description		**STORET**	**Value**
Stream order		84161	2
Minimum seine mesh diagonal (cm)		89930	0.25
Maximum seine mesh diagonal (cm)		89931	0.25
Seine length (m)		89941	4.572
Electrofishing method (1=boat, 2=backpack)		89943	2
Electrofishing effort (sec)		89944	1408
Seining effort (number of hauls)		89947	6
Combined length of seine hauls (m)		89948	60
Seining effort (duration, minutes)		89949	3:30
Ecoregion		89961	34
Area seined (m^2)		89976	184.7
Total fish species (n)		98003	14
Number of sunfish species (n)		98008	6
Total intolerant species (n)		98010	0
Omnivore individuals (%)		98017	4.1
Insectivore individuals (%)		98021	92.6
Piscivore individuals (%)		98022	N/A
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	193
Total individuals electroshocking (n)		98040	198
Number of benthic invertivores (n)		98052	N/A
Individuals per seine haul (n)		98062	32.2
Individuals per minute electroshocking (n)		98069	8.44
Tolerant individuals (except *G. affinis*) (%)		98070	10.5

SPECIES LIST - NEKTON

Date 05/01/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

	Collection Method	(E = electro, S = seine)	E1	E2	E3		S1	S2	S3	S4	S5	S6		
	Collection Effort	(for E: sec; for S: meters)	436	425	547	ES	10	8	12	10	10	10	Seine	**Overall**
STORET	**Scientific Name**	**Common Name**	#	#	#	Total #	#	#	#	#	#	#	Total #	**Total #**
98564	*Ameiurus natalis*	Yellow bullhead	1	1		2							0	**2**
98474	*Cyprinella lutrensis*	Red shiner	1			1							0	**1**
98487	*Cyprinella venusta*	Blacktail shiner	5	3	7	15			7				7	**22**
98677	*Fundulus notatus*	Blackstripe topminnow	3			3	1		1				2	**5**
98713	*Gambusia affinis*	Western mosquitofish	23	22	30	75		33	50	21	23	33	160	**235**
99094	*Lepomis cyanellus*	Green sunfish	1	2	4	7							0	**7**
99095	*Lepomis gulosus*	Warmouth	2		3	5							0	**5**
99097	*Lepomis macrochirus*	Bluegill	6		2	8			4			2	6	**14**
99099	*Lepomis megalotis*	Longear sunfish	32	10	5	47	1		3				4	**51**
99100	*Lepomis microlophus*	Redear sunfish				0			1				1	**1**
99101	*Lepomis miniatus*	Redspotted sunfish	5	2	2	9			7				7	**16**
99090	*Micropterus salmoides*	Largemouth bass	1			1							0	**1**
98498	*Pimephales vigilax*	Bullhead minnow	3	4	6	13			4				4	**17**
98724	*Poecilia latipinna*	Sailfin molly	3	7	2	12			1			1	2	**14**
		Total Collected				**198**							**193**	**391**
		Total Taxa				**13**							**9**	**14**

Ecoregion 34 Nekton IBI

Date 07/03/2014 **TCEQ ID** 11120
Site Cedar Bayou Above Tidal @ US90

Metric	Value	Score
Total number fish species	15	5
Number native cyprinid species	4	5
Number benthic invertivore species	1	3
Number sunfish species	3	3
Number intolerant species	1	5
Percent individuals as tolerant[a]	2.5	5
Percent individuals as omnivores	16.2	3
Percent individuals as invertivores	83.4	5
Number individuals in sample	1927	1
Individuals per seine haul	34.0	1
Individuals per min electrofishing	2.11	1
Percent individuals as non-natives	0.0	5
Percent individuals with disease or anomalies	0.0	5
Regional Score and Aquatic Life Use	**45**	**HIGH**

[a] not including G. affinis

Scoring Criteria	
Exceptional	> 49
High	39 – 48
Intermediate	31 – 38
Limited	< 31

Nekton Summary Data

Date 05/01/2014 **TCEQ ID** 11120
Site Cedar Bayou Above Tidal @ US90

Description	STORET	Value
Stream order	84161	2
Minimum seine mesh diagonal (cm)	89930	0.25
Maximum seine mesh diagonal (cm)	89931	0.25
Seine length (m)	89941	4.572
Electrofishing method (1=boat, 2=backpack)	89943	2
Electrofishing effort (sec)	89944	1052
Seining effort (number of hauls)	89947	6
Combined length of seine hauls (m)	89948	70
Seining effort (duration, minutes)	89949	3:36
Ecoregion	89961	34
Area seined (m^2)	89976	320.0
Total fish species (n)	98003	15
Number of sunfish species (n)	98008	3
Total intolerant species (n)	98010	1
Omnivore individuals (%)	98017	16.2
Insectivore individuals (%)	98021	83.4
Piscivore individuals (%)	98022	N/A
Individuals with disease or anomaly (%)	98030	0
Number of native cyprinid species (n)	98032	4
Individuals as non-native species (%)	98033	0
Total individuals seining (n)	98039	204
Total individuals electroshocking (n)	98040	37
Number of benthic invertivores (n)	98052	1
Individuals per seine haul (n)	98062	34
Individuals per minute electroshocking (n)	98069	2.11
Tolerant individuals (except *G. affinis*) (%)	98070	2.5

SPECIES LIST - NEKTON

Date 07/03/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

	Collection Method	(E = electro, S = seine)	E1	E2	E3		S1	S2	S3	S4	S5	S6		
	Collection Effort	(for E: sec; for S: meters)	373	317	362	ES	10	10	10	15	15	10	Seine	**Overall**
STORET	**Scientific Name**	**Common Name**	#	#	#	Total #	#	#	#	#	#	#	Total #	**Total #**
98564	*Ameiurus natalis*	Yellow bullhead	23	1	9	33							0	**33**
98487	*Cyprinella venusta*	Blacktail shiner				0	1	7	3	3	1	1	16	**16**
98694	*Fundulus chrysotus*	Golden topminnow	2			2				1		1	2	**4**
98677	*Fundulus notatus*	Blackstripe topminnow				0	5	2	1		2		10	**10**
98713	*Gambusia affinis*	Western mosquitofish		2		2	9	2	6	82		16	115	**117**
98734	*Labidesthes sicculus*	Brook silverside				0	3	1	4				8	**8**
99099	*Lepomis megalotis*	Longear sunfish				0	1					1	2	**2**
99100	*Lepomis microlophus*	Redear sunfish				0	1					2	3	**3**
99101	*Lepomis miniatus*	Redspotted sunfish				0	2						2	**2**
98486	*Lythrurus umbratilus*	Redfin shiner				0		24			1		25	**25**
99090	*Micropterus salmoides*	Largemouth bass				0						1	1	**1**
98515	*Moxostoma poecilurum*	Blacktail redhorse				0						2	2	**2**
98452	*Opsopoeodus emiliae*	Pugnose minnow				0		2					2	**2**
98498	*Pimephales vigilax*	Bullhead minnow				0	1				3	6	10	**10**
98724	*Poecilia latipinna*	Sailfin molly				0	1			2		3	6	**6**
		Total Collected				**37**							**204**	**241**
		Total Taxa				**3**							**14**	**15**

Benthic Community IBI Data, Summary Data, and Species Lists

Qualitative Benthos IBI

Date 05/01/2014 **TCEQ ID** 11120
Site Cedar Bayou Above Tidal @ US90

Metric	Value	Score
Taxa Richness	19	3
EPT Taxa Abundance	6	2
Biotic Index (HBI)	6.49	1
% Chironomidae	18.23	1
% Dominant Taxon	32.51	2
% Dominant FFG	34.40	4
% Predators	10.02	4
Intolerant : Tolerant	0.18	1
% Total Trichoptera as Hydropsychidae	88.57	1
# of Non-Insect Taxa	6	4
% Collector-Gatherers	34.40	2
% of Total Number as Elmidae	3.45	4
AQUATIC LIFE USE SCORE	**29**	
AQUATIC LIFE USE RATING	**High**	

Scoring Criteria	
Exceptional	>36
High	29 - 36
Intermediate	22 - 28
Limited	<22

Benthos Summary Data

Date 05/01/2014 **TCEQ ID** 11120
Site Cedar Bayou Above Tidal @ US90

Description	STORET	Value
Stream order	84161	2
Data reporting units	89899	1
Kicknet effort (m^2)	89903	6
Kicknet effort (min)	89904	10:00
Debris/shoreline effort, min picked (min)	89905	0:00
Total n for sample (n)	89906	203
Gravel substrate (%)	89923	70
Macrophyte bed (%)	89926	0
Snags and brush (%)	89927	0
Bedrock (%)	89928	0
Net mesh size (cm)	89946	0.05
Benthic sampler	89950	3
Ecoregion	89961	34
HBI	90007	6.49
EPT index (n)	90008	6
Dominant FFG (%)	90010	34.40
Collector-gatherers (%)	90025	34.40
Predators (%)	90036	10.02
Dominant taxon (%)	90042	32.51
Intolerant : Tolerant taxa	90050	0.18
Non-insect taxa (n)	90052	6
n as Elmidae (%)	90054	3.45
Taxa richness (n)	90055	19
Chironomidae (%)	90062	18.23
Trichoptera as Hydropsychidae (%)	90069	88.57

SPECIES LIST - BENTHIC MACROINVERTEBRATES

Date 05/01/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

STORET	Phylum	Class	Order	Family	Genus	Count
90382	Annelida	Oligochaeta				5
91525	Arthropoda	Hydracarina				1
91241	Arthropoda	Crustacea	Amphipoda	Taltridae	*Hyalella*	66
91056	Arthropoda	Crustacea	Ostracoda			1
	Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae		11
93036	Mollusca	Bivalvia	Veneroida	Corbiculidae	*Corbicula*	3
92265	Arthropoda	Insecta	Coleoptera	Carabidae		1
92253	Arthropoda	Insecta	Coleoptera	Elmidae	*Stenelmis*	7
92179	Arthropoda	Insecta	Coleoptera	Hydrophilidae	*Paracymus*	1
92193	Arthropoda	Insecta	Coleoptera	Staphylinidae		1
92491	Arthropoda	Insecta	Diptera	Chironomidae		37
91646	Arthropoda	Insecta	Ephemeroptera	Baetidae	*Baetis*	3
91651	Arthropoda	Insecta	Ephemeroptera	Baetidae	*Fallceon*	18
91600	Arthropoda	Insecta	Ephemeroptera	Caenidae	*Caenis*	6
91619	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	*Stenacron*	3
91915	Arthropoda	Insecta	Hemiptera	Hebridae	*Hebrus*	1
91923	Arthropoda	Insecta	Hemiptera	Veliidae	*Rhagovelia*	3
92292	Arthropoda	Insecta	Trichoptera	Hydropsychidae	*Cheumatopsyche*	31
92324	Arthropoda	Insecta	Trichoptera	Hydroptilidae	*Hydroptila*	4
					Total	**203**

Qualitative Benthos IBI

Date 07/03/2014 **TCEQ ID** 11120
Site Cedar Bayou Above Tidal @ US90

Metric	Value	Score
Taxa Richness	14	2
EPT Taxa Abundance	6	2
Biotic Index (HBI)	5.73	1
% Chironomidae	14.72	2
% Dominant Taxon	35.93	2
% Dominant FFG	43.87	3
% Predators	9.67	4
Intolerant : Tolerant	0.38	1
% Total Trichoptera as Hydropsychidae	97.65	1
# of Non-Insect Taxa	6	4
% Collector-Gatherers	25.69	3
% of Total Number as Elmidae	6.06	4

AQUATIC LIFE USE SCORE **29**
AQUATIC LIFE USE RATING **High**

Scoring Criteria	
Exceptional	>36
High	29 - 36
Intermediate	22 - 28
Limited	<22

Benthos Summary Data

Date 07/03/2014 **TCEQ ID** 11120
Site Cedar Bayou Above Tidal @ US90

Description	STORET	Value
Stream order	84161	2
Data reporting units	89899	1
Kicknet effort (m^2)	89903	4
Kicknet effort (min)	89904	5:00
Debris/shoreline effort, min picked (min)	89905	0:00
Total n for sample (n)	89906	231
Gravel substrate (%)	89923	15
Macrophyte bed (%)	89926	0
Snags and brush (%)	89927	0
Bedrock (%)	89928	0
Net mesh size (cm)	89946	0.05
Benthic sampler	89950	3
Ecoregion	89961	34
HBI	90007	5.73
EPT index (n)	90008	6
Dominant FFG (%)	90010	43.87
Collector-gatherers (%)	90025	25.69
Predators (%)	90036	9.67
Dominant taxon (%)	90042	35.93
Intolerant : Tolerant taxa	90050	0.38
Non-insect taxa (n)	90052	6
n as Elmidae (%)	90054	6.06
Taxa richness (n)	90055	14
Chironomidae (%)	90062	14.72
Trichoptera as Hydropsychidae (%)	90069	97.65

SPECIES LIST - BENTHIC MACROINVERTEBRATES

Date 07/03/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

STORET	Phylum	Class	Order	Family	Genus	Count
90913	Annelida	Hirudinea				8
90382	Annelida	Oligochaeta				2
91241	Arthropoda	Crustacea	Amphipoda	Taltridae	Hyalella	14
93030	Mollusca	Bivalvia	Veneroida	Sphaeriidae	Pisidium	1
93036	Mollusca	Bivalvia	Veneroida	Corbiculidae	Corbicula	6
90072	Platyhelminthes	Turbellaria			Dugesia	3
92253	Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	14
92491	Arthropoda	Insecta	Diptera	Chironomidae		34
91646	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis	14
91651	Arthropoda	Insecta	Ephemeroptera	Baetidae	Fallceon	45
91600	Arthropoda	Insecta	Ephemeroptera	Caenidae	Caenis	2
91619	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Stenacron	3
92292	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	83
92324	Arthropoda	Insecta	Trichoptera	Hydroptilidae	Hydroptila	2
					Total	**231**

Physical Habitat IBI Data, Summary Data, and Transect Data

Habitat Quality Index

Date	05/01/2014
Site	Cedar Bayou Above Tidal @ US90
TCEQ ID	11120

Metric	Value	Score
Instream Cover, mean (%)	66.0	4
Riffles, number of	4	3
Pools, maximum depth (m)	1.1	4
Bank Stability	--	2
Slope component, mean angle (°)	39.1	--
Erosion component, mean (%)	12.5	--
Riparian Buffer Vegetation, mean width (m)	>14.1	2
Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow)	3	2
Channel Sinuosity	3	2
Bottom Substrate, mean gravel or larger (%)	30.0	3
Aesthetics (1=Wilderness, 2=Natural, 3=Common, 4=Offensive)	2	2
AQUATIC LIFE USE SCORE	**24**	
AQUATIC LIFE USE RATING	**High**	

Scoring Criteria	
Exceptional	26 - 31
High	20 - 25
Intermediate	14 - 19
Limited	< 14

Habitat Summary Data

Date 05/01/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

Description	STORET	Value
Instantaneous flow measurement (cfs)	00061	0.4617
Mean stream slope over evaluated reach (m/km)	72051	2.029
Mean instream cover (%)	84159	66.0
Stream order	84161	2
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	3
Well defined stream bends	89840	1
Moderately defined stream bends	89841	1
Poorly defined stream bends	89842	1
Number of riffles	89843	4
Dominant substrate (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock)	89844	1
Mean substrate gravel or larger (%)	89845	30.0
Mean bank erosion (%)	89846	12.5
Mean bank slope (°)	89847	39.1
Channel flow status (4=high, 3=moderate, 2=low, 1=no flow)	89848	3
Riparian vegetation	-	-
Trees (%)	89849	36.5
Shrubs (%)	89850	4.5
Grasses/forbes (%)	89851	74.3
Cultivated fields (%)	89852	0.0
Other (%)	89853	5.7
Mean tree canopy (%)	89854	73.24
Drainage area above location (km^2)	89859	181.13
Length of segment evaluated (km)	89860	0.170
Mean stream width (m)	89861	4.52
Mean stream depth (m)	89862	0.225
Maximum pool width (m)	89864	8.8
Maximum pool depth (m)	89865	1.1
Mean width natural buffer vegetation (m)	89866	>14.1
Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive)	89867	2
Number of instream cover types	89929	4
Ecoregion	89961	34
Land development (1=unimpacted, 2=low, 3=moderate, 4=high)	89962	2

Habitat Transect Data

Date 05/01/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

Description	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5
Stream type (RI=riffle, RU=run, G=glide, P=pool)	P	RU	RU	RU	RI / P
Stream width (m)	4.5	4.6	4.5	3.8	5.2
Left bank slope (°)	10	85	30	18	53
Left bank erosion potential (%)	10	10	10	10	10
Left bank width of natural buffer vegetation (m)	>20	>20	>20	8	3
Right bank slope (°)	60	20	42	38	35
Right bank erosion potential (%)	20	20	10	20	5
Right bank width of natural buffer vegetation (m)	>20	>20	18	7	5
Tree canopy (%)	55.9	72.1	57.4	80.9	100.0
Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)	1	1	1	5	6
Stream depth at point 1 (m)	0.1	0.65	0	0.095	0
Stream depth at point 2 (m)	0.28	0.32	0.12	0.155	0.125
Stream depth at point 3 (m)	0.35	0.62	0.255	0.2	0.175
Stream depth at point 4 (m)	0.305	0.7	0.33	0.22	0.185
Stream depth at point 5 (m)	0.25	0.65	0.31	0.225	0.175
Stream depth at point 6 (m)	0.23	0.62	0.315	0.22	0.195
Stream depth at point 7 (m)	0.21	0.52	0.3	0.215	0.14
Stream depth at point 8 (m)	0.2	0.35	0.29	0.21	0.08
Stream depth at point 9 (m)	0.19	0.28	0.3	0.205	0
Stream depth at point 10 (m)	0.15	0.25	0.12	0	0.01
Stream depth at point 11 (m)	0	0	0	0	0
Substrate gravel or larger (%)	0	0	0	60	90
Instream cover (%)	50	70	40	80	90
Left bank trees (%)	0	0	0	20	20
Left bank shrubs (%)	0	0	10	10	0
Left bank grasses/forbes (%)	90	98	90	80	70
Left bank cultivated fields (%)	0	0	0	0	0
Left bank other (%)	10	2	10	10	20
Right bank trees (%)	90	60	50	40	85
Right bank shrubs (%)	5	10	5	5	0
Right bank grasses/forbes (%)	70	30	80	60	75
Right bank cultivated fields (%)	0	0	0	0	0
Right bank other (%)	0	0	0	0	5
Transect Latitude (decimal degrees)	29.97113	29.97153	29.97190	29.97223	29.97268
Transect Longitude (decimal degrees)	-94.98547	-94.98536	-94.98530	-94.98536	-94.98558
Total length of reach (m)			170		

Habitat Quality Index

Date 07/03/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

Metric	Value	Score
Instream Cover, mean (%)	29.4	2
Riffles, number of	3	3
Pools, maximum depth (m)	1.2	4
Bank Stability	--	2.5
Slope component, mean angle (°)	23.9	--
Erosion component, mean (%)	22.0	--
Riparian Buffer Vegetation, mean width (m)	>20	3
Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow)	3	2
Channel Sinuosity	3	3
Bottom Substrate, mean gravel or larger (%)	54.0	4
Aesthetics (1=Wilderness, 2=Natural, 3=Common, 4=Offensive)	2	2
AQUATIC LIFE USE SCORE	**24.5**	
AQUATIC LIFE USE RATING	**High**	

Scoring Criteria	
Exceptional	26 - 31
High	20 - 25
Intermediate	14 - 19
Limited	< 14

Habitat Summary Data

Date 07/03/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

Description	STORET	Value
Instantaneous flow measurement (cfs)	00061	5.3353
Mean stream slope over evaluated reach (m/km)	72051	2.336
Mean instream cover (%)	84159	29.4
Stream order	84161	2
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	3
Well defined stream bends	89840	1
Moderately defined stream bends	89841	1
Poorly defined stream bends	89842	1
Number of riffles	89843	3
Dominant substrate (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock)	89844	1
Mean substrate gravel or larger (%)	89845	54.0
Mean bank erosion (%)	89846	22.0
Mean bank slope (°)	89847	23.9
Channel flow status (4=high, 3=moderate, 2=low, 1=no flow)	89848	3
Riparian vegetation	-	-
Trees (%)	89849	22.5
Shrubs (%)	89850	1.5
Grasses/forbes (%)	89851	54.6
Cultivated fields (%)	89852	0.0
Other (%)	89853	22.5
Mean tree canopy (%)	89854	73.53
Drainage area above location (km^2)	89859	181.13
Length of segment evaluated (km)	89860	0.214
Mean stream width (m)	89861	4.64
Mean stream depth (m)	89862	0.167
Maximum pool width (m)	89864	10.0
Maximum pool depth (m)	89865	1.2
Mean width natural buffer vegetation (m)	89866	>20
Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive)	89867	2
Number of instream cover types	89929	3
Ecoregion	89961	34
Land development (1=unimpacted, 2=low, 3=moderate, 4=high)	89962	2

Habitat Transect Data

Date 07/03/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

Description	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5
Stream type (RI=riffle, RU=run, G=glide, P=pool)	RU	G	G	G / RI	RI
Stream width (m)	3.6	3.5	5.5	5.3	5.3
Left bank slope (°)	11	13	19	46	30
Left bank erosion potential (%)	20	50	40	15	20
Left bank width of natural buffer vegetation (m)	>20	>20	>20	>20	>20
Right bank slope (°)	1	25	45	36	13
Right bank erosion potential (%)	10	15	5	25	20
Right bank width of natural buffer vegetation (m)	>20	>20	>20	>20	>20
Tree canopy (%)	69.1	51.5	55.9	94.1	97.1
Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)	4	1	1	4	5
Stream depth at point 1 (m)	0	0	0	0	0
Stream depth at point 2 (m)	0.13	0.09	0.18	0	0.1
Stream depth at point 3 (m)	0.2	0.17	0.18	0.15	0.3
Stream depth at point 4 (m)	0.21	0.34	0.23	0.19	0.31
Stream depth at point 5 (m)	0.21	0.31	0.31	0.24	0.06
Stream depth at point 6 (m)	0.19	0.32	0.35	0.2	0.04
Stream depth at point 7 (m)	0.16	0.31	0.35	0.18	0.03
Stream depth at point 8 (m)	0.13	0.32	0.37	0.23	0.07
Stream depth at point 9 (m)	0.1	0.32	0.33	0.22	0.05
Stream depth at point 10 (m)	0	0.3	0.31	0.16	0.05
Stream depth at point 11 (m)	-	0	0	0	0
Substrate gravel or larger (%)	60	10	20	85	95
Instream cover (%)	10	5	2	40	90
Left bank trees (%)	0	0	0	0	60
Left bank shrubs (%)	0	0	0	5	0
Left bank grasses/forbes (%)	90	20	75	80	10
Left bank cultivated fields (%)	0	0	0	0	0
Left bank other (%)	10	80	25	15	30
Right bank trees (%)	10	25	10	40	80
Right bank shrubs (%)	10	0	0	0	0
Right bank grasses/forbes (%)	90	70	89	20	2
Right bank cultivated fields (%)	0	0	0	0	0
Right bank other (%)	1	5	1	40	18
Transect Latitude (decimal degrees)	29.97081	29.97127	29.97174	29.97218	29.97261
Transect Longitude (decimal degrees)	-94.98535	-94.98538	-94.98532	-94.98539	-94.98563
Total length of reach (m)			214		

Diel Summary Data and Measurements

Diel Measurement Summary

Start Date	04/30/2014	**Start Time**	0:05
End Date	04/30/2014	**End Time**	23:50
Site	Cedar Bayou Above Tidal @ US90		
TCEQ ID	11120		

Parameter	STORET	Value
Temp Mean	00209	21.88
Temp Maximum	00210	23.49
Temp Minimum	00211	20.58
Spec Cond Mean	00212	444
Spec Cond Maximum	00213	468
Spec Cond Minimum	00214	429
pH Maximum	00215	7.48
pH Minimum	00216	6.89
pH Average		7.18
# Temp Measurements	00221	96
# Spec Cond Measurements	00222	96
# pH Measurements	00223	96
DO Minimum	89855	4.83
DO Maximum	89856	7.85
DO Mean	89857	6.25
# DO Measurements	89858	96

Diel Data

Date 05/01/2014 **TCEQ ID** 11120

Site Name Cedar Bayou Above Tidal @ US90

Date (mm/dd/yyyy)	Time (hh:mm:ss)	Temp (°C)	pH Std. Units	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)
4/30/2014	0:05:32	22.89	6.98	5.31	61.9	468
4/30/2014	0:20:32	22.8	6.97	5.27	61.3	467
4/30/2014	0:35:32	22.67	6.96	5.29	61.3	465
4/30/2014	0:50:32	22.55	6.95	5.27	61	463
4/30/2014	1:05:32	22.43	6.95	5.27	60.9	462
4/30/2014	1:20:32	22.29	6.95	5.28	60.8	460
4/30/2014	1:35:32	22.21	6.94	5.28	60.7	458
4/30/2014	1:50:32	22.08	6.94	5.28	60.6	457
4/30/2014	2:05:32	22	6.94	5.28	60.5	455
4/30/2014	2:20:32	21.94	6.95	5.22	59.7	454
4/30/2014	2:35:32	21.85	6.95	5.24	59.9	453
4/30/2014	2:50:32	21.78	6.95	5.23	59.6	452
4/30/2014	3:05:32	21.69	6.95	5.25	59.8	452
4/30/2014	3:20:32	21.64	6.95	5.22	59.4	451
4/30/2014	3:35:32	21.58	6.95	5.22	59.2	450
4/30/2014	3:50:32	21.54	6.95	5.18	58.8	450
4/30/2014	4:05:32	21.46	6.95	5.15	58.4	449
4/30/2014	4:20:32	21.4	6.96	5.16	58.4	449
4/30/2014	4:35:32	21.34	6.96	5.14	58.1	449
4/30/2014	4:50:32	21.29	6.96	5.13	57.9	450
4/30/2014	5:05:32	21.22	6.96	5.11	57.6	449
4/30/2014	5:20:32	21.15	6.96	5.1	57.4	450
4/30/2014	5:35:32	21.09	6.96	5.07	57.1	450
4/30/2014	5:50:32	21.05	6.95	5.05	56.8	449
4/30/2014	6:05:32	20.99	6.95	5.04	56.6	449
4/30/2014	6:20:32	20.94	6.96	5.01	56.2	449
4/30/2014	6:35:32	20.89	6.96	4.97	55.7	449
4/30/2014	6:50:32	20.82	6.96	4.96	55.5	449
4/30/2014	7:05:32	20.78	6.97	4.96	55.4	446
4/30/2014	7:20:32	20.73	6.92	4.93	55.1	447
4/30/2014	7:35:32	20.7	6.89	4.91	54.9	448
4/30/2014	7:50:32	20.66	6.94	4.91	54.7	448
4/30/2014	8:05:32	20.64	6.98	4.85	54.1	448
4/30/2014	8:20:32	20.63	6.99	4.83	53.8	448
4/30/2014	8:35:32	20.64	7	4.84	54	447
4/30/2014	8:50:32	20.64	7.01	4.84	54	446
4/30/2014	9:05:32	20.63	7.02	4.88	54.4	443
4/30/2014	9:20:32	20.59	7.03	4.9	54.5	442
4/30/2014	9:35:32	20.58	7.04	4.92	54.8	442
4/30/2014	9:50:32	20.59	7.04	5.03	56.1	442
4/30/2014	10:05:32	20.61	7.06	5.02	55.9	440
4/30/2014	10:20:32	20.67	7.08	5.14	57.4	440
4/30/2014	10:35:32	20.75	7.1	5.29	59.1	438
4/30/2014	10:50:32	20.85	7.12	5.43	60.8	436
4/30/2014	11:05:32	20.96	7.14	5.54	62.2	434
4/30/2014	11:20:32	21.1	7.18	5.7	64.2	433
4/30/2014	11:35:32	21.26	7.21	5.92	66.9	432

Date	Time	Temp	pH	Dissolved Oxygen	Dissolved Oxygen	Specific Conductance
(mm/dd/yyyy)	(hh:mm:ss)	(°C)	Std. Units	(mg/L)	(%)	(µS/cm)
4/30/2014	11:50:32	21.4	7.24	6.05	68.4	431
4/30/2014	12:05:32	21.63	7.27	6.26	71.2	430
4/30/2014	12:20:32	21.84	7.31	6.42	73.3	429
4/30/2014	12:35:32	21.98	7.31	6.53	74.8	429
4/30/2014	12:50:32	22.2	7.34	6.76	77.7	429
4/30/2014	13:05:32	22.35	7.35	6.91	79.7	429
4/30/2014	13:20:32	22.63	7.4	7.06	81.8	429
4/30/2014	13:35:32	22.76	7.41	7.16	83.2	429
4/30/2014	13:50:32	22.94	7.43	7.34	85.5	429
4/30/2014	14:05:32	23.07	7.44	7.41	86.6	430
4/30/2014	14:20:32	23.24	7.47	7.52	88.2	430
4/30/2014	14:35:32	23.34	7.46	7.62	89.5	431
4/30/2014	14:50:32	23.46	7.48	7.69	90.5	432
4/30/2014	15:05:32	23.46	7.48	7.76	91.3	433
4/30/2014	15:20:32	23.47	7.47	7.79	91.7	433
4/30/2014	15:35:32	23.49	7.46	7.84	92.3	434
4/30/2014	15:50:32	23.45	7.46	7.82	92	434
4/30/2014	16:05:32	23.42	7.46	7.81	91.9	435
4/30/2014	16:20:32	23.39	7.48	7.84	92.2	436
4/30/2014	16:35:32	23.34	7.46	7.85	92.2	436
4/30/2014	16:50:32	23.33	7.48	7.82	91.8	437
4/30/2014	17:05:32	23.24	7.48	7.82	91.6	437
4/30/2014	17:20:32	23.15	7.45	7.74	90.6	437
4/30/2014	17:35:32	23.06	7.43	7.73	90.3	438
4/30/2014	17:50:32	22.96	7.42	7.69	89.7	438
4/30/2014	18:05:32	22.87	7.41	7.66	89.2	439
4/30/2014	18:20:32	22.78	7.41	7.6	88.3	439
4/30/2014	18:35:32	22.68	7.4	7.58	87.9	439
4/30/2014	18:50:32	22.6	7.38	7.52	87.1	440
4/30/2014	19:05:32	22.51	7.38	7.5	86.7	441
4/30/2014	19:20:32	22.41	7.37	7.48	86.3	441
4/30/2014	19:35:32	22.32	7.35	7.4	85.3	442
4/30/2014	19:50:32	22.23	7.31	7.4	85.1	443
4/30/2014	20:05:32	22.14	7.29	7.37	84.6	443
4/30/2014	20:20:32	22.07	7.29	7.29	83.6	444
4/30/2014	20:35:32	22	7.3	7.26	83.1	445
4/30/2014	20:50:32	21.93	7.29	7.21	82.5	446
4/30/2014	21:05:32	21.87	7.29	7.19	82.1	447
4/30/2014	21:20:32	21.78	7.29	7.15	81.6	447
4/30/2014	21:35:32	21.75	7.28	7.13	81.2	448
4/30/2014	21:50:32	21.7	7.27	7.08	80.7	449
4/30/2014	22:05:32	21.65	7.28	7.06	80.3	449
4/30/2014	22:20:32	21.57	7.27	7.05	80	450
4/30/2014	22:35:32	21.48	7.26	7.02	79.6	450
4/30/2014	22:50:32	21.41	7.25	6.99	79.1	451
4/30/2014	23:05:32	21.33	7.25	6.95	78.5	451
4/30/2014	23:20:32	21.27	7.24	6.92	78.1	451
4/30/2014	23:35:32	21.16	7.23	6.89	77.7	452
4/30/2014	23:50:32	21.1	7.23	6.86	77.1	452

Diel Measurement Summary

Start Date	07/02/2014	**Start Time**	11:15
End Date	07/03/2014	**End Time**	11:00
Site	Cedar Bayou Above Tidal @ US90		
TCEQ ID	11120		

Parameter	STORET	Value
Temp Mean	00209	30.71
Temp Maximum	00210	32.34
Temp Minimum	00211	28.83
Spec Cond Mean	00212	436
Spec Cond Maximum	00213	465
Spec Cond Minimum	00214	400
pH Maximum	00215	7.41
pH Minimum	00216	7.12
pH Average		7.26
# Temp Measurements	00221	95*
# Spec Cond Measurements	00222	95*
# pH Measurements	00223	95*
DO Minimum	89855	4.36
DO Maximum	89856	7.49
DO Mean	89857	5.92
# DO Measurements	89858	95*

*Note, only 95 diel measurements recorded due to glitch; unit skipped a reading at 21:30 on 02 July 2014.

Diel Data

Date 07/03/2014 **TCEQ ID** 11120

Site Name Cedar Bayou Above Tidal @ US90

Date	Time	Temp	pH	Dissolved Oxygen	Dissolved Oxygen	Specific Conductance
(mm/dd/yyyy)	(hh:mm:ss)	(°C)	Std. Units	(mg/L)	(%)	(µS/cm)
7/2/2014	11:15:32	29.65	7.32	5.60	73.7	401
7/2/2014	11:30:32	29.82	7.32	5.78	76.4	401
7/2/2014	11:45:32	30.20	7.34	5.95	79.0	401
7/2/2014	12:00:32	30.37	7.34	6.16	82.1	401
7/2/2014	12:15:32	30.48	7.34	6.31	84.2	400
7/2/2014	12:30:32	30.75	7.35	6.45	86.5	400
7/2/2014	12:45:32	30.88	7.36	6.64	89.3	401
7/2/2014	13:00:32	31.08	7.37	6.77	91.4	402
7/2/2014	13:15:32	31.25	7.38	6.87	93.0	402
7/2/2014	13:30:32	31.45	7.39	7.05	95.7	404
7/2/2014	13:45:32	31.61	7.40	7.14	97.1	405
7/2/2014	14:00:32	31.76	7.40	7.21	98.4	405
7/2/2014	14:15:32	31.84	7.41	7.24	98.9	406
7/2/2014	14:30:32	31.94	7.40	7.29	99.9	408
7/2/2014	14:45:32	31.93	7.40	7.34	100.4	408
7/2/2014	15:00:32	32.04	7.40	7.37	101.1	408
7/2/2014	15:15:32	32.11	7.40	7.38	101.3	410
7/2/2014	15:30:32	32.17	7.40	7.45	102.4	410
7/2/2014	15:45:32	32.25	7.40	7.48	102.9	412
7/2/2014	16:00:32	32.29	7.40	7.48	103.0	413
7/2/2014	16:15:32	32.30	7.40	7.49	103.2	414
7/2/2014	16:30:32	32.32	7.39	7.46	102.8	415
7/2/2014	16:45:32	32.34	7.39	7.44	102.5	417
7/2/2014	17:00:32	32.33	7.38	7.40	101.9	418
7/2/2014	17:15:32	32.33	7.37	7.37	101.5	419
7/2/2014	17:30:32	32.33	7.37	7.33	101.0	420
7/2/2014	17:45:32	32.34	7.37	7.30	100.6	421
7/2/2014	18:00:32	32.33	7.36	7.26	100.1	422
7/2/2014	18:15:32	32.32	7.36	7.23	99.6	423
7/2/2014	18:30:32	32.30	7.35	7.18	98.9	425
7/2/2014	18:45:32	32.28	7.35	7.13	98.2	425
7/2/2014	19:00:32	32.26	7.35	7.10	97.8	426
7/2/2014	19:15:32	32.25	7.35	7.06	97.2	426
7/2/2014	19:30:32	32.25	7.35	7.04	96.8	427
7/2/2014	19:45:32	32.27	7.35	7.01	96.5	428
7/2/2014	20:00:32	32.24	7.35	6.98	96.0	430
7/2/2014	20:15:32	32.20	7.35	6.94	95.4	431
7/2/2014	20:30:32	32.17	7.34	6.90	94.8	432
7/2/2014	20:45:32	32.12	7.34	6.81	93.5	434
7/2/2014	21:00:32	32.07	7.33	6.76	92.7	435
7/2/2014	21:15:32	32.01	7.33	6.71	91.9	435
7/2/2014	21:45:32	31.86	7.31	6.56	89.6	436
7/2/2014	22:00:32	31.77	7.30	6.48	88.5	437
7/2/2014	22:15:32	31.69	7.29	6.41	87.4	438
7/2/2014	22:30:32	31.58	7.27	6.32	86.0	438
7/2/2014	22:45:32	31.48	7.26	6.25	84.8	439
7/2/2014	23:00:32	31.37	7.25	6.16	83.5	440

Date (mm/dd/yyyy)	Time (hh:mm:ss)	Temp (°C)	pH Std. Units	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)
7/2/2014	23:15:32	31.26	7.24	6.07	82.2	441
7/2/2014	23:30:32	31.16	7.23	5.99	81.0	441
7/2/2014	23:45:32	31.04	7.22	5.92	79.8	442
7/3/2014	0:00:32	30.93	7.21	5.84	78.6	442
7/3/2014	0:15:32	30.84	7.21	5.78	77.6	442
7/3/2014	0:30:32	30.74	7.20	5.70	76.5	443
7/3/2014	0:45:32	30.64	7.19	5.63	75.3	444
7/3/2014	1:00:32	30.55	7.19	5.56	74.4	444
7/3/2014	1:15:32	30.46	7.18	5.5	73.4	445
7/3/2014	1:30:32	30.36	7.17	5.42	72.2	445
7/3/2014	1:45:32	30.26	7.17	5.35	71.2	446
7/3/2014	2:00:32	30.16	7.16	5.27	70.0	446
7/3/2014	2:15:32	30.07	7.16	5.20	68.9	447
7/3/2014	2:30:32	29.97	7.15	5.13	67.9	448
7/3/2014	2:45:32	29.88	7.14	5.06	66.9	449
7/3/2014	3:00:32	29.79	7.14	4.98	65.7	449
7/3/2014	3:15:32	29.71	7.13	4.90	64.6	450
7/3/2014	3:30:32	29.63	7.13	4.85	63.8	451
7/3/2014	3:45:32	29.57	7.13	4.80	63.1	451
7/3/2014	4:00:32	29.49	7.12	4.75	62.3	452
7/3/2014	4:15:32	29.43	7.12	4.71	61.8	452
7/3/2014	4:30:32	29.37	7.12	4.67	61.2	453
7/3/2014	4:45:32	29.31	7.12	4.64	60.7	454
7/3/2014	5:00:32	29.26	7.12	4.61	60.2	454
7/3/2014	5:15:32	29.22	7.12	4.57	59.8	455
7/3/2014	5:30:32	29.16	7.12	4.56	59.5	455
7/3/2014	5:45:32	29.12	7.12	4.54	59.2	456
7/3/2014	6:00:32	29.08	7.12	4.52	58.9	456
7/3/2014	6:15:32	29.04	7.13	4.49	58.5	457
7/3/2014	6:30:32	29.00	7.13	4.48	58.3	458
7/3/2014	6:45:32	28.96	7.13	4.46	58.0	458
7/3/2014	7:00:32	28.93	7.13	4.45	57.9	459
7/3/2014	7:15:32	28.91	7.13	4.43	57.6	459
7/3/2014	7:30:32	28.88	7.14	4.42	57.5	460
7/3/2014	7:45:32	28.88	7.14	4.42	57.4	460
7/3/2014	8:00:32	28.86	7.14	4.40	57.1	460
7/3/2014	8:15:32	28.84	7.15	4.38	56.9	461
7/3/2014	8:30:32	28.83	7.15	4.38	56.8	461
7/3/2014	8:45:32	28.85	7.16	4.36	56.6	461
7/3/2014	9:00:32	28.92	7.17	4.42	57.5	461
7/3/2014	9:15:32	29.05	7.18	4.47	58.2	461
7/3/2014	9:30:32	29.14	7.20	4.56	59.6	462
7/3/2014	9:45:32	29.29	7.23	4.69	61.4	462
7/3/2014	10:00:32	29.46	7.25	4.82	63.2	463
7/3/2014	10:15:32	29.63	7.27	4.97	65.4	463
7/3/2014	10:30:32	29.86	7.29	5.15	68.0	464
7/3/2014	10:45:32	30.05	7.31	5.35	71.0	465
7/3/2014	11:00:32	30.42	7.34	5.56	74.2	465

Additional Field Data Measurements

Additional Parameter Data

Date 05/01/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

Description	STORET	Value
***E. coli* IDEXX Colilert (MPN/100 ml)**	31699	95
TSS (mg/l)	00530	21.0
VSS (mg/l)	00535	N/A
Ammonia-N, Total (mg/l)	00610	<0.10
Nitrate/Nitrite-N, Total (mg/l)	00630	0.026
Total Phosphorus-P (mg/l)	00665	0.178
Orthophosphate-P, field filtered (mg/l)	00671	0.020
TOC (mg/l)	00680	N/A
Chloride (mg/l)	00940	60
Sulfate (mg/l)	00945	40.4
TDS, dried @ 180°C (mg/l)	70300	N/A
Temperature (°C)	00010	20.96
Secchi Depth (m)	00078	0.270
Specific Conductance (µS/cm)	00094	471
DO (mg/L)	00300	9.22
pH (standard units)	00400	7.84
Salinity (ppt)	00480	0.23
Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry)	01351	3
Water Clarity (1=Excellent, 2=Good, 3=Fair, 4=Poor)	20424	N/A
Days Since Last Significant Rainfall (days)	72053	17
Total Water Depth (m)	82903	0.494
Turbidity, Observed (1=Low, 2=Medium, 3=High)	88842	N/A
Wind Intensity (1=Calm, 2=Slight, 3=Moderate, 4=Strong)	89965	2
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	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

Additional Parameter Data

Date 07/03/2014
Site Cedar Bayou Above Tidal @ US90
TCEQ ID 11120

Description	STORET	Value
***E. coli* IDEXX Colilert (MPN/100 ml)**	31699	75
TSS (mg/l)	00530	18.7
VSS (mg/l)	00535	N/A
Ammonia-N, Total (mg/l)	00610	0.10
Nitrate/Nitrite-N, Total (mg/l)	00630	0.230
Total Phosphorus-P (mg/l)	00665	0.320
Orthophosphate-P, field filtered (mg/l)	00671	0.160
TOC (mg/l)	00680	N/A
Chloride (mg/l)	00940	60
Sulfate (mg/l)	00945	21.4
TDS, dried @ 180°C (mg/l)	70300	N/A
Temperature (°C)	00010	29.87
Secchi Depth (m)	00078	0.375
Specific Conductance (µS/cm)	00094	469
DO (mg/L)	00300	5.21
pH (standard units)	00400	7.44
Salinity (ppt)	00480	0.22
Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry)	01351	3
Water Clarity (1=Excellent, 2=Good, 3=Fair, 4=Poor)	20424	N/A
Days Since Last Significant Rainfall (days)	72053	6
Total Water Depth (m)	82903	0.687
Turbidity, Observed (1=Low, 2=Medium, 3=High)	88842	N/A
Wind Intensity (1=Calm, 2=Slight, 3=Moderate, 4=Strong)	89965	2
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	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	4

Site Photographs

Index – Transect 1

(Bottom of reach)

Figure 3 View upstream taken from transect 1 during index period.

Figure 4 View of right bank taken from transect 1 during index period.

Figure 5 View of left bank taken from transect 1 during index period.

Figure 6 View downstream taken from transect 1 during index period.

Index – Transect 2

Figure 7 View upstream taken from transect 2 during index period.

Figure 10 View of right bank taken from transect 2 during index period.

Figure 9 View of left bank taken from transect 2 during index period.

Figure 8 View downstream taken from transect 2 during index period.

Index – Transect 3

Figure 11 View upstream taken from transect 3 during index period.

Figure 14 View of right bank taken from transect 3 during index period.

Figure 13 View of left bank taken from transect 3 during index period.

Figure 12 View downstream taken from transect 3 during index period.

Index – Transect 4

Figure 15 View upstream taken from transect 4 during index period.

Figure 18 View of right bank taken from transect 4 during index period.

Figure 17 View of left bank taken from transect 4 during index period.

Figure 16 View downstream taken from transect 4 during index period.

Index – Transect 5

(Top of reach)

Figure 19 View upstream taken from transect 5 during index period.

Figure 22 View of right bank taken from transect 5 during index period.

Figure 21 View of left bank taken from transect 5 during index period.

Figure 20 View downstream taken from transect 5 during index period.

Critical – Transect 1

(Bottom of reach)

Figure 23 View upstream taken from transect 1 during critical period.

Figure 26 View of right bank taken from transect 1 during critical period.

Figure 24 View of left bank taken from transect 1 during critical period.

Figure 25 View downstream taken from transect 1 during critical period.

Critical – Transect 2

.Figure 27 View upstream taken from transect 2 during critical period.

Figure 30 View of right bank taken from transect 2 during critical period.

Figure 29 View of left bank taken from transect 2 during critical period.

Figure 28 View downstream taken from transect 2 during critical period.

Critical – Transect 3

Figure 31 View upstream taken from transect 3 during critical period.

Figure 34 View of right bank taken from transect 3 during critical period.

Figure 33 View of left bank taken from transect 3 during critical period.

Figure 32 View downstream taken from transect 3 during critical period.

Critical – Transect 4

Figure 35 View upstream taken from transect 4 during critical period.

Figure 36 View of right bank taken from transect 4 during critical period.

Figure 37 View of left bank taken from transect 4 during critical period.

Figure 38 View downstream taken from transect 4 during critical period.

Critical – Transect 5

(Top of reach)

Figure 39 View upstream taken from transect 5 during critical period.

Figure 42 View of right bank taken from transect 5 during critical period.

Figure 41 View of left bank taken from transect 5 during critical period.

Figure 40 View downstream taken from transect 5 during critical period.

Nekton Photographic Vouchers

Index Period

Figure 43 *Lepomis gulosus* (warmouth) captured with backpack electroshocker.

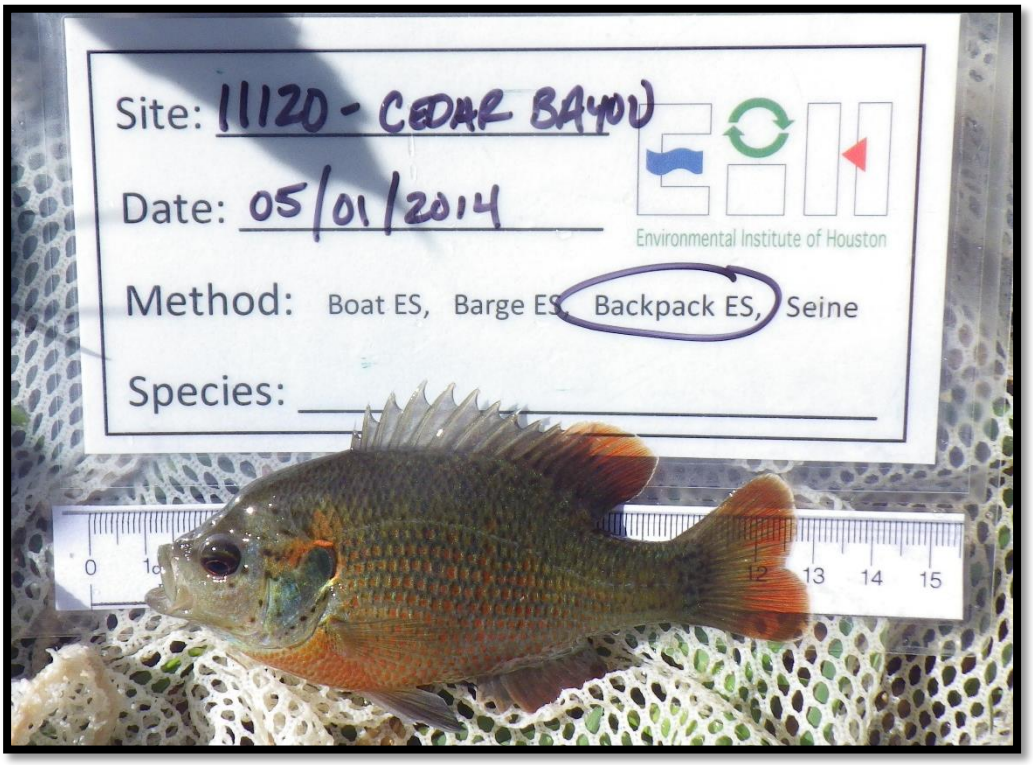


Figure 44 *Lepomis miniatus* (redspotted sunfish) captured with backpack electroshocker.

Figure 45 *Lepomis megalotis* (longear sunfish) captured with backpack electroshocker.

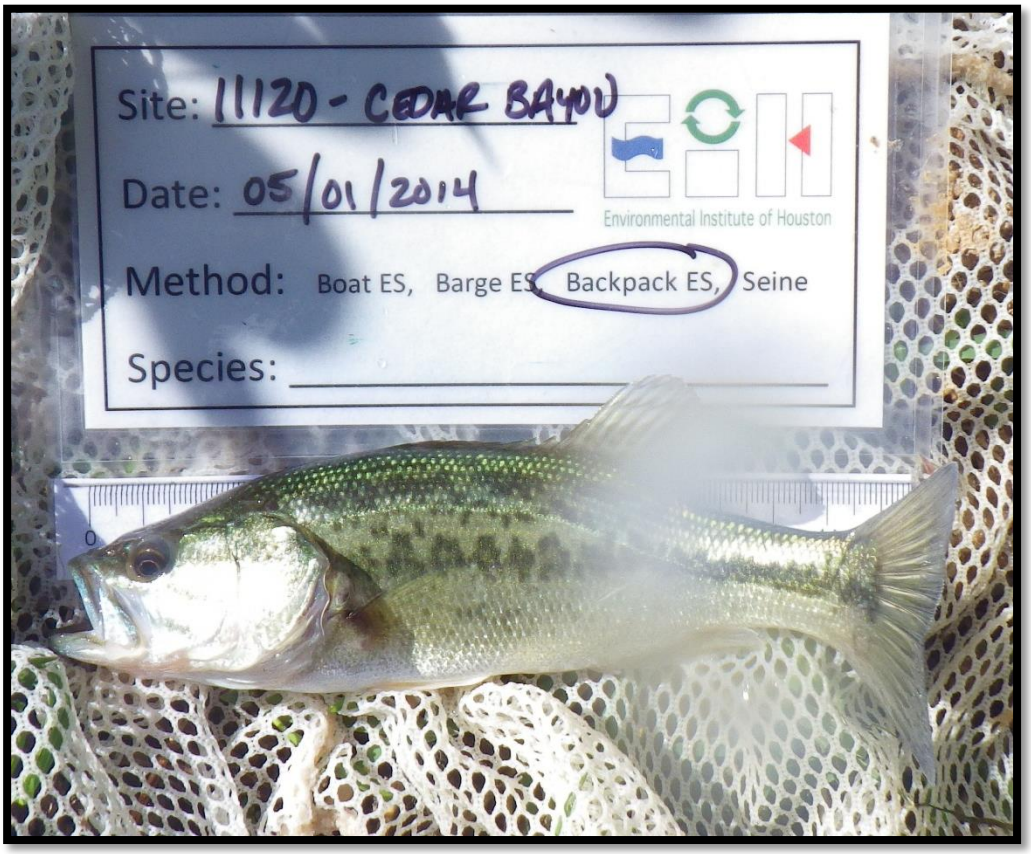


Figure 46 *Micropterus salmoides* (largemouth bass) captured with backpack electroshocker.

Figure 47 *Ameiurus natalis* (yellow bullhead) captured with backpack electroshocker.

Figure 48 *Lepomis cyanellus* (green sunfish) captured with backpack electroshocker.

Figure 49 *Fundulus notatus* (blackstripe topminnow) captured with seine.

Critical Period

No photographs were taken during critical sampling; all fish were brought back to EIH for identification.