

# Cedar Bayou Above Tidal at US 90

## TCEQ ID – 11120



## Biological Monitoring Summary Packet

Summary of Biological Assessment.....	3
Aquatic Life Use Monitoring Checklist.....	5
Map of Sample Location.....	8
Nekton Community IBI Data, Summary Data, and Species List.....	10
Benthic Community IBI Data, Summary Data, and Species List.....	14
Habitat IBI Data, Summary Data, and Transect Data.....	18
Diel Summary Data and Measurements.....	24
Additional Field Data Measurements.....	30
Site Photographs.....	32
Fish Photographic Vouchers.....	42

Prepared by the Environmental Institute of Houston University of Houston  
 Clear Lake in cooperation with the Houston-Galveston Area Council and  
 the Texas State Soil and Water Conservation Board

November 05, 2013



**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.**



## **Prepared by the Environmental Institute of Houston**

---

University of Houston-Clear Lake

George Guillen, Executive Director

Amanda Moss, Senior Research Associate

Jenny Oakley, Environmental Scientist

## **Principal Investigator**

---

Dr. George Guillen, Executive Director

University of Houston Clear Lake - Environmental Institute of Houston

2700 Bay Area Blvd

Houston, Texas 77058

(281) 283-3950

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

---

Justin Bower, Senior Environmental Planner/Project Manager

Houston-Galveston Area Council

P.O. Box 22777

Houston, TX 77227-2777

(713) 499-6653

## Summary of Biological Assessment

### **Sample Collection**

At the request of the Houston-Galveston Area Council (H-GAC), in conjunction with the first half of Task 8 of the FY 2012/2013 Development of a Watershed Protection Plan for Cedar Bayou (CB 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 2013 with additional sampling events anticipated for FY 2014 during the same sample periods. This packet contains a summary of the biological information collected by EIH in 2013 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, respectively. All measurements were recorded according to protocols outlined in the TCEQ's Surface Water Quality Monitoring Procedures Manual Volume 1 (October 2008, plus applicable updates) and Volume 2 (June 2007) (SWQM).

Twenty-four hour (diel) monitoring for dissolved oxygen was also conducted in Cedar Bayou concurrently with biological monitoring and in conjunction with Task 9 (24hr DO 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 15 May 2013 and critical sampling was performed on 1 July 2013. Instantaneous flow was taken during both sampling events and decreased from index (0.1238 cfs) to critical (0.0334 cfs) sampling.

During index sampling, instantaneous water temperature was 22.39°C, while diel averaged 23.47°C (range: 22.08-25.12°C,  $n = 96$ ). Instantaneous specific conductance was 610  $\mu\text{S}/\text{cm}$ , while diel averaged 538  $\mu\text{S}/\text{cm}$  (range: 476-603  $\mu\text{S}/\text{cm}$ ,  $n = 96$ ). Instantaneous D.O. was 2.60 mg/L, while diel averaged 5.24 mg/L (range: 2.41-8.06 mg/L,  $n = 96$ ). Instantaneous pH was 7.18, while diel ranged from 7.12-7.74 ( $n = 96$ ).

During critical sampling, instantaneous water temperature was 25.28°C, while diel averaged 27.09°C (range: 24.63-28.63°C,  $n = 96$ ). Instantaneous specific conductance was 1257  $\mu\text{S}/\text{cm}$ , while diel averaged 1230  $\mu\text{S}/\text{cm}$  (range: 1224-1235  $\mu\text{S}/\text{cm}$ ,  $n = 96$ ). Instantaneous D.O. was 5.49 mg/L, while diel averaged 3.86 mg/L (range: 0.54-8.91 mg/L,  $n = 96$ ). Instantaneous pH was 7.21, while diel ranged from 7.08-7.75 ( $n = 96$ ).

Bacteria (*E. coli*) levels (31 MPN/100mL; 20 MPN/100mL), total nitrate-nitrite nitrogen (1.41 mg/L; <0.02 mg/L), total ammonia nitrogen (0.30 mg/L; <0.10 mg/L), total suspended solids (18.0 mg/L; 12.7 mg/L), sulfates (39.7 mg/L; 25.2 mg/L), and orthophosphate phosphorus (0.12 mg/L; 0.06 mg/L) decreased from index to critical periods, respectively. Chloride (150 mg/L; 335 mg/L) and total phosphorus (0.15 mg/L; 0.20 mg/L) increased from index to critical periods, respectively.

Nekton IBI scores averaged 46.5 indicating high ALU. Benthic macroinvertebrate IBI scores averaged 27.5, initially indicating intermediate ALU. However, after applying the Ecoregion

Specific Coefficient of Variability (ESCOV), the average benthic macroinvertebrate score increased to 29, just making the high ALU classification. Habitat quality IBI scores remained high and averaged 20.75.

### **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 24-hour diel D.O. levels being > 3.00 mg/L, our results suggest that site 11120 is fully supporting its ALU rating of high. It is important to note, though, that there may be a concern for the benthic macroinvertebrate community (which initially averaged intermediate ALU and only reached high ALU classification through use of the ESCOV) and minima D.O. requirements (average = 1.48 mg/L) on this segment.

# Aquatic Life Monitoring and Habitat Assessment Checklist

## Background Information

Name of Water Body: Cedar Bayou Above Tidal at US 90    
Segment Number: 0902 Station ID: 11120 On Segment: Yes  No   
Permit number, if applicable: \_\_\_\_\_ 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: 05/15/2013 sampling: TX02099 – TX02103  
07/01/2013 sampling: TX02104 – TX02108

## Objective for Aquatic Life Use Assessment

Is this water body supporting its designated uses? Yes  No   
Reason: Nekton and physical habitat IBI averages were both high indicating full support of the previous ALU designation. Average benthic macroinvertebrate IBI was intermediate, initially suggesting partial support. Recently, use of a score adjustment (i.e. the Ecoregion Specific Coefficient of Variability, ESCOV) was implemented to benthic IBI data and when accounting for this ESCOV, the average benthic macroinvertebrate IBI score increased to 29, just making the high ALU classification. 24-hr D.O. averaged 4.84 mg/L while absolute minima for D.O. averaged 1.48 mg/L. In summation, this site is fully supporting high ALU but there may be concern for benthic macroinvertebrates and minima D.O. requirements.

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 the 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 (Event 1: 5/15/2013) and critical period (Event 2: 7/1/2013):

#### Stream Characterization Event 1 Date: 05/15/2013

Dry	Pools covering <u>60%</u> of the <u>177</u> meters assessed	Flowing at <u>0.1238</u> cfs (measured)
-----	---	---

Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, and construction): during sampling on 15 May 2013, it began drizzling at the sample site. After returning from the field, it was determined that the last significant rainfall event had occurred 4 days prior to sampling and that the rain received during sampling had minimal effects on water quality, nekton, benthic macroinvertebrates, and physical habitat sampling.

#### Stream Characterization Event 2 Date: 07/01/2013

Dry	Pools covering <u>80%</u> of the <u>154</u> meters assessed	Flowing at <u>0.0334</u> cfs (measured)
-----	---	---

Describe conditions that may have adversely affected stream during each sampling event (for example, recent rains, drought, and construction): no adverse conditions were recorded at the time of sampling on 1 July 2013

#### 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

If no: flow, wetted channel width, photographs, description of bank conditions relative to first event, and description of canopy cover conditions relative to first event must be provided in this packet

**Stream Flow Measurement Event 2**

Instantaneous measurement:  
USGS Gage Reading:

Yes  No   
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

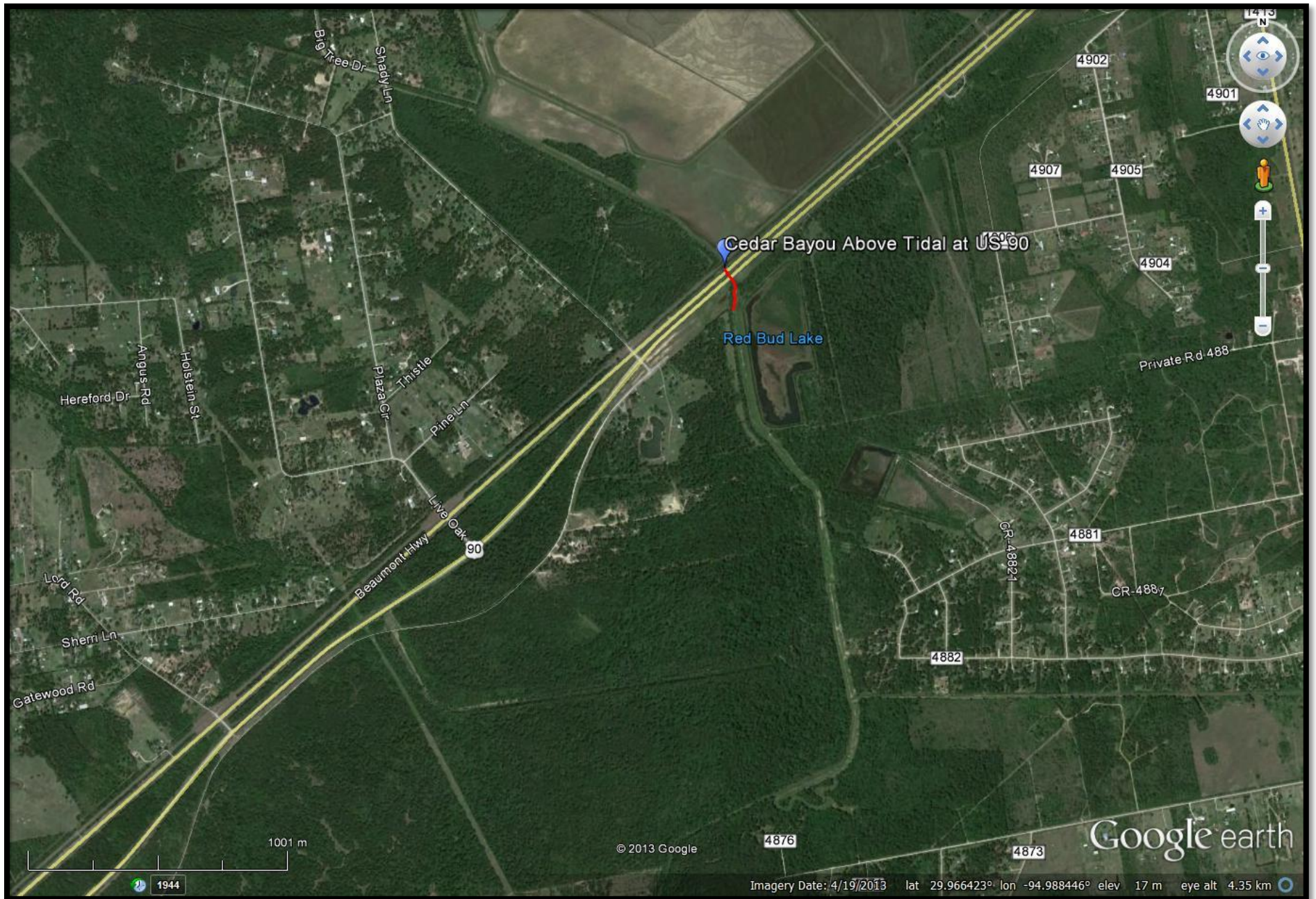
**Habitat index Event 1**

Exceptional  High  Intermediate  Limited

**Habitat index Event 2**

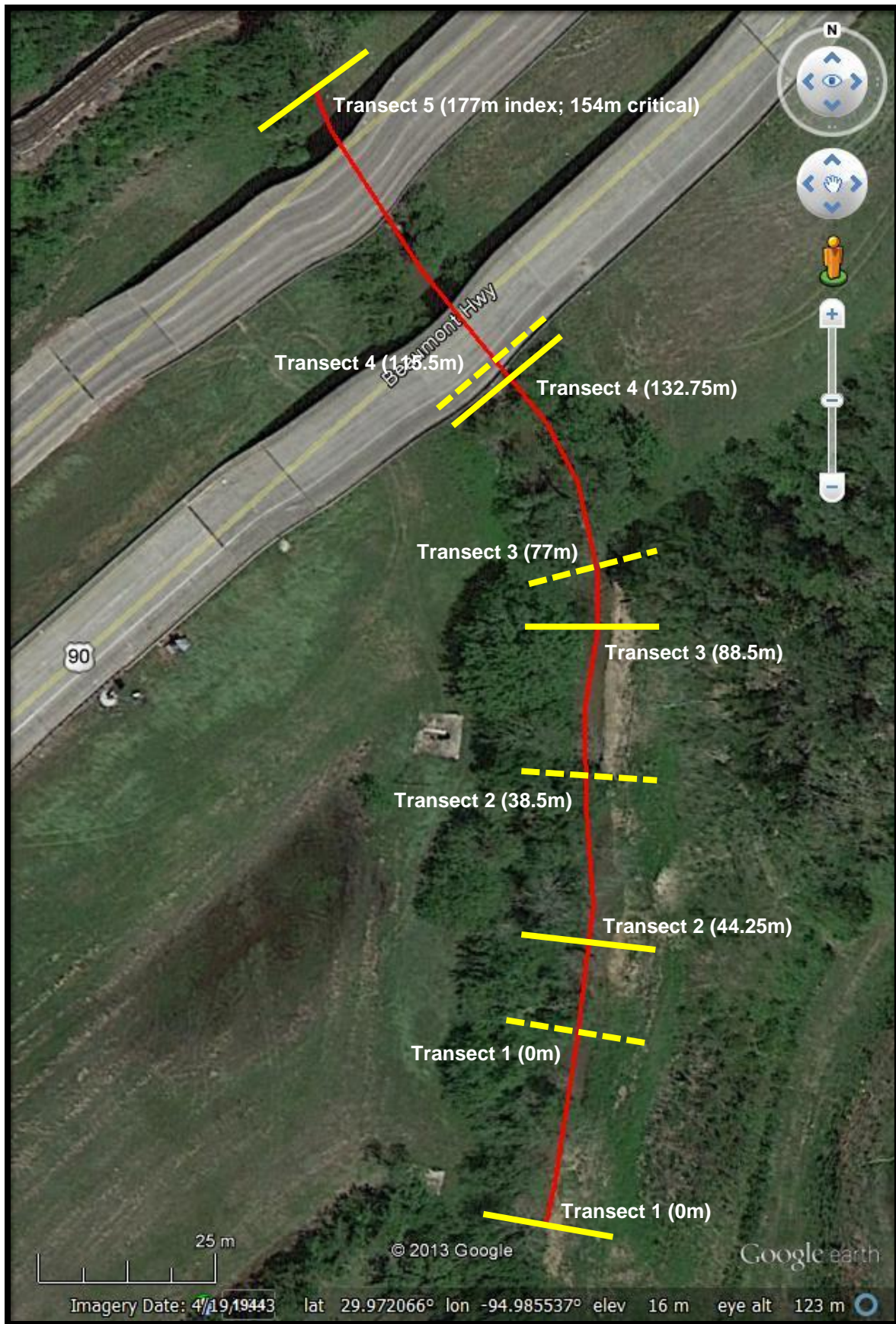
Exceptional  High  Intermediate  Limited





**Figure 1** Aerial map of overall sample area (site indicated at top-most transect of reach) including length of evaluated reach (177m and 154m during index and critical periods, respectively).





**Figure 2** Location of transects for index (solid) and critical (dashed) sampling periods. Locations are approximate. Solid red line indicates curvature of Cedar Bayou.

<b>Ecoregion 34 IBI</b>			
<b>Date</b>	05/15/2013	<b>TCEQ ID</b>	11120
<b>Site</b>	Cedar Bayou Above Tidal at US 90		
<b>Metric</b>	<b>Value</b>	<b>Score</b>	
Total number fish species	15	5	
Number native cyprinid species	3	5	
Number benthic invertivore species	1	3	
Number sunfish species	4	5	
Number intolerant species	0	1	
Percent individuals as tolerant <sup>a</sup>	7.2	5	
Percent individuals as omnivores	6.7	5	
Percent individuals as invertivores	91.3	5	
Number individuals in sample	1927	3	
Individuals per seine haul	270.7	5	
Individuals per min electrofishing	1.75	1	
Percent individuals as non-natives	0.0	5	
Percent individuals with disease or anomalies	0.0	5	
<b>Regional Score and Aquatic Life Use</b>	<b>47</b>	<b>High</b>	
<sup>a</sup> not including <i>G. affinis</i>			
<b>Scoring Criteria</b>			
Exceptional			> 49
High			39 – 48
Intermediate			31 – 38
Limited			< 31

<b>Nekton Summary Data</b>		
<b>Description</b>	<b>STORET</b>	<b>Value</b>
Stream order	84161	2
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	1095
Seining effort (number of hauls)	89947	7
Combined length of seine hauls (m)	89948	103
Seining effort (duration, minutes)	89949	4.20
Ecoregion	89961	34
Area seined (m <sup>2</sup> )	89976	400.6
Total fish species (n)	98003	15
Number of sunfish species (n)	98008	4
Total intolerant species (n)	98010	0
Omnivore individuals (%)	98017	6.7
Insectivore individuals (%)	98021	91.3
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	1895
Total individuals electroshocking (n)	98040	32
Number of benthic invertivores (n)	98052*	N/A
Individuals per seine haul (n)	98062	270.7
Individuals per minute electroshocking (n)	98069	1.75
Tolerant individuals (except <i>G. affinis</i> ) (%)	98070	7.2

\*Not calculated in ecoregion 34 IBI

**SPECIES LIST - NEKTON**

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

STORET	Collection Method	(E = electro, S = seine)	S1	S2	S3	S4	S5	S6	S7	Seine	E1	E2	E3	ES
	Collection Effort	(for E: sec; for S: meters)	15	18	12	20	15	8	15		386	351	358	
	Scientific Name	Common Name	#	#	#	#	#	#	#	Total	#	#	#	Total #
	<i>Aphredoderus sayanus</i>	Pirate perch					1	1		2	5	1	4	10
	<i>Atractosteus spatula</i>	Alligator gar					1			1				
	<i>Cyprinella venusta</i>	Blacktail shiner	31	35	6	2	64		151	289				
	<i>Etheostoma gracile</i>	Slough darter					2	2		4				
	<i>Fundulus chrysotus</i>	Golden topminnow				1	34	6	84	125	1			1
	<i>Fundulus notatus</i>	Blackstripe topminnow	14	1	21	2	17	1	39	95				
	<i>Gambusia affinis</i>	Western mosquitofish	14		108	97	330	62	395	1006	3	1	5	9
	<i>Lepomis cyanellus</i>	Green sunfish				1			1	2		1	1	2
	<i>Lepomis macrochirus</i>	Bluegill		1					3	4				
	<i>Lepomis megalotis</i>	Longear sunfish	2		1		12		18	33			2	2
	<i>Lepomis miniatus</i>	Redspotted sunfish				3	83	2	16	104	1	1	5	7
	<i>Micropterus salmoides</i>	Largemouth bass					10		23	33				
	<i>Opsopoeodus emiliae</i>	Pugnose minnow		1	11	1	1		6	20				
	<i>Pimephales vigilax</i>	Bullhead minnow	3				33		13	49				
	<i>Poecilia latipinna</i>	Sailfin molly			5	4	22	7	90	128		1		1
		<b>Total Collected</b>	64	38	152	111	610	81	839	1883	10	5	17	32
		<b>Total Taxa</b>	5	4	5	7	13	7	12	15	4	5	5	7

\*Unknown cyprinids were juveniles <25mm in length that could not be identified to species. As a result these individuals were excluded from the IBI calculation and totals.

<b>Ecoregion 34 IBI</b>			
<b>Date</b>	07/01/2013	<b>TCEQ ID</b>	11120
<b>Site</b>	Cedar Bayou Above Tidal at US 90		
<b>Metric</b>	<b>Value</b>	<b>Score</b>	
Total number fish species	17	5	
Number native cyprinid species	3	5	
Number benthic invertivore species	1	3	
Number sunfish species	3	3	
Number intolerant species	1	5	
Percent individuals as tolerant <sup>a</sup>	13.9	5	
Percent individuals as omnivores	16.2	3	
Percent individuals as invertivores	82.1	5	
Number individuals in sample	1326	2	
Individuals per seine haul	161.4	3	
Individuals per min electrofishing	1.92	1	
Percent individuals as non-natives	0.0	5	
Percent individuals with disease or anomalies	0.0	5	
<b>Regional Score and Aquatic Life Use</b>	<b>46</b>	<b>High</b>	
<sup>a</sup> not including <i>G. affinis</i>			
<b>Scoring Criteria</b>			
Exceptional			> 49
High			39 – 48
Intermediate			31 – 38
Limited			< 31

<b>Nekton Summary Data</b>		
<b>Description</b>	<b>STORET</b>	<b>Value</b>
Stream order	84161	2
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	993
Seining effort (number of hauls)	89947	8
Combined length of seine hauls (m)	89948	125
Seining effort (duration, minutes)	89949	4.73
Ecoregion	89961	34
Area seined (m <sup>2</sup> )	89976	571.5
Total fish species (n)	98003	17
Number of sunfish species (n)	98008	3
Total intolerant species (n)	98010	1
Omnivore individuals (%)	98017	16.2
Insectivore individuals (%)	98021	82.1
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	1291
Total individuals electroshocking (n)	98040	35
Number of benthic invertivores (n)	98052*	N/A
Individuals per seine haul (n)	98062	161.4
Individuals per minute electroshocking (n)	98069	1.92
Tolerant individuals (except <i>G. affinis</i> ) (%)	98070	13.9

\*Not calculated in ecoregion 34 IBI

### SPECIES LIST - NEKTON

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

STORET	Collection Method	(E = electro, S = seine)	S1	S2	S3	S4	S5	S6	S7	S8	Seine Total #	E1	E2	E3	ES Total #
	Collection Effort	(for E: sec; for S: meters)	#	#	#	#	#	#	#	#		#	#	#	
	Species Name	Common Name													
	<i>Ameiurus natalis</i>	Yellow bullhead							10		10	5	1	24	30
	<i>Aphredoderus sayanus</i>	Pirate perch												2	2
	<i>Cyprinella venusta</i>	Blacktail shiner	22	3	84		1	4	48	11	173				
	<i>Etheostoma chlorosoma</i>	Bluntnose darter							1		1				
	<i>Fundulus blairae</i>	Western starhead topminnow								1	1				
	<i>Fundulus chrysotus</i>	Golden topminnow					3	7		4	14				
	<i>Fundulus notatus</i>	Blackstripe topminnow	7	6	13			2	12		40				
	<i>Gambusia affinis</i>	Western mosquitofish	14		108	369	37	10	94	143	775	1	1		2
	<i>Labidesthes sicculus</i>	Brook silverside	3	4							7				
	<i>Lepomis cyanellus</i>	Green sunfish						1	4		5				
	<i>Lepomis megalotis</i>	Longear sunfish	2		5			8	4		19			1	1
	<i>Lepomis miniatus</i>	Redspotted sunfish	7		12			11	6		36				
	<i>Micropterus punctulatus</i>	Spotted bass	1								1				
	<i>Micropterus salmoides</i>	Largemouth bass	1		3	1	2	9	1		17				
	<i>Notemigonus crysoleucas</i>	Golden shiner	2						2		4				
	<i>Pimephales vigilax</i>	Bullhead minnow			8				5		13				
	<i>Poecilia latipinna</i>	Sailfin molly			46	98	4	2	19	6	175				
		<b>Total Collected</b>	59	13	279	468	47	55	206	164	1291	6	2	27	35
		<b>Total Taxa</b>	9	3	8	3	5	10	12	4	16	2	2	3	4



<b>Qualitative Benthos IBI</b>			
<b>Date</b>	05/15/2013	<b>TCEQ ID</b>	11120
<b>Site</b>	Cedar Bayou Above Tidal at US 90		
	<b>Metric</b>	<b>Value</b>	<b>Score</b>
	Taxa Richness	24	4
	EPT Taxa Abundance	7	3
	Biotic Index (HBI)	6.05	1
	% Chironomidae	40.85	1
	% Dominant Taxon	40.85	1
	% Dominant FFG	33.39	4
	% Predators	22.77	3
	Intolerant : Tolerant	0.16	1
	% Total Trichoptera as Hydropsychidae	48.65	3
	# of Non-Insect Taxa	10	4
	% Collector-Gatherers	33.39	2
	% of Total Number as Elmidae	6.21	4
	<b>AQUATIC LIFE USE SCORE</b>		<b>31</b>
	<b>AQUATIC LIFE USE RATING</b>		<b>High</b>
<b>Scoring Criteria</b>			
	Exceptional		>36
	High		29 - 36
	Intermediate		22 - 28
	Limited		<22

<b>Benthos Summary Data</b>		
<b>Description</b>	<b>STORET</b>	<b>Value</b>
Stream order	84161	2
Data reporting units	89899	1
Kicknet effort (m <sup>2</sup> )	89903	10.5
Kicknet effort (min)	89904	5.1
Debris/shoreline effort, min picked (min)	89905	0.0
Total n for sample (n)	89906	306
Gravel substrate (%)	89923	60
Macrophyte bed (%)	89926	1
Snags and brush (%)	89927	2
Bedrock (%)	89928	0
Net mesh size (cm)	89946	0.05
Benthic sampler	89950	3
Ecoregion	89961	34
HBI	90007	6.05
EPT index (n)	90008	7
Dominant FFG (%)	90010	33.39
Collector-gatherers (%)	90025	33.39
Predators (%)	90036	22.77
Dominant taxon (%)	90042	40.85
Intolerant : Tolerant taxa	90050	0.16
Non-insect taxa (n)	90052	10
n as Elmidae (%)	90054	6.21
Taxa richness (n)	90055	24
Chironomidae (%)	90062	40.85
Trichoptera as Hydropsychidae (%)	90069	48.65

### SPECIES LIST - BENTHIC MACROINVERTEBRATES

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

STORET	Phylum	Class	Order	Family	Genus	Sample
90382	Annelida	Oligochaeta				9
91525	Arthropoda	Hydracarina				4
91241	Arthropoda	Crustacea	Amphipoda	Taltridae	<i>Hyaella</i>	24
91114	Arthropoda	Crustacea	Cladocera			2
91397	Arthropoda	Crustacea	Decapoda	Palaemonidae	<i>Palaemonetes</i>	3
91056	Arthropoda	Crustacea	Ostracoda			1
92900	Mollusca	Gastropoda	Limnophila	Ancylidae	<i>Ferrissia</i>	5
	Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae		3
93036	Mollusca	Bivalvia	Veneroida	Corbiculidae	<i>Corbicula</i>	1
90072	Platyhelminthes	Turbellaria			<i>Dugesia</i>	1
92230	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Dubiraphia</i>	4
92253	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i>	15
92161	Arthropoda	Insecta	Coleoptera	Hydrophilidae	<i>Enochrus</i>	1
91540	Arthropoda	Insecta	Collembola	Isotomidae	<i>Isotomurus</i>	1
92486	Arthropoda	Insecta	Diptera	Ceratopogonidae	<i>Probezzia</i>	22
92491	Arthropoda	Insecta	Diptera	Chironomidae		125
92428	Arthropoda	Insecta	Diptera	Tipulidae	<i>Limnophila</i>	1
91650	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Callibaetis</i>	1
91651	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Fallceon</i>	10
91600	Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i>	34
91619	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	<i>Stenacron</i>	2
92292	Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i>	18
92324	Arthropoda	Insecta	Trichoptera	Hydroptilidae	<i>Hydroptila</i>	18
92330	Arthropoda	Insecta	Trichoptera	Hydroptilidae	<i>Neotrichia</i>	1
<b>Total</b>						<b>306</b>
<b>Total Taxa</b>						<b>24</b>

<b>Qualitative Benthos IBI</b>			
<b>Date</b>	07/01/2013	<b>TCEQ ID</b>	11120
<b>Site</b>	Cedar Bayou Above Tidal at US 90		
	<b>Metric</b>	<b>Value</b>	<b>Score</b>
	Taxa Richness	20	3
	EPT Taxa Abundance	3	1
	Biotic Index (HBI)	6.81	1
	% Chironomidae	20.31	1
	% Dominant Taxon	46.88	1
	% Dominant FFG	48.96	2
	% Predators	10.29	4
	Intolerant : Tolerant	0.23	1
	% Total Trichoptera as Hydropsychidae	No Trich	1
	# of Non-Insect Taxa	9	4
	% Collector-Gatherers	48.96	1
	% of Total Number as Elmidae	5.08	4
	<b>AQUATIC LIFE USE SCORE</b>		<b>24</b>
	<b>AQUATIC LIFE USE RATING</b>		<b>Intermediate</b>
<b>Scoring Criteria</b>			
	Exceptional		>36
	High		29 - 36
	Intermediate		22 - 28
	Limited		<22

<b>Benthos Summary Data</b>		
<b>Description</b>	<b>STORET</b>	<b>Value</b>
Stream order	84161	2
Data reporting units	89899	1
Kicknet effort (m <sup>2</sup> )	89903	37.8
Kicknet effort (min)	89904	5.0
Debris/shoreline effort, min picked (min)	89905	4.0
Total n for sample (n)	89906	256
Gravel substrate (%)	89923	50
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	6.81
EPT index (n)	90008	3
Dominant FFG (%)	90010	48.96
Collector-gatherers (%)	90025	48.96
Predators (%)	90036	10.29
Dominant taxon (%)	90042	46.88
Intolerant : Tolerant taxa	90050	0.23
Non-insect taxa (n)	90052	9
n as Elmidae (%)	90054	5.08
Taxa richness (n)	90055	20
Chironomidae (%)	90062	20.31
Trichoptera as Hydropsychidae (%)	90069	None

### SPECIES LIST - BENTHIC MACROINVERTEBRATES

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

STORET	Phylum	Class	Order	Family	Genus	Sample
90382	Annelida	Oligochaeta				3
91525	Arthropoda	Hydracarina				2
91241	Arthropoda	Crustacea	Amphipoda	Taltridae	<i>Hyalella</i>	120
91397	Arthropoda	Crustacea	Decapoda	Palaemonidae	<i>Palaemonetes</i>	1
91056	Arthropoda	Crustacea	Ostracoda			1
92900	Mollusca	Gastropoda	Limnophila	Ancylidae	<i>Ferrissia</i>	1
	Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae		13
93032	Mollusca	Bivalvia	Veneroida	Sphaeriidae	<i>Sphaerium</i>	1
93036	Mollusca	Bivalvia	Veneroida	Corbiculidae	<i>Corbicula</i>	1
92230	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Dubiraphia</i>	12
92253	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i>	1
92154	Arthropoda	Insecta	Coleoptera	Hydrophilidae	<i>Berosus</i>	4
92478	Arthropoda	Insecta	Diptera	Ceratopogonidae	<i>Bezzia</i>	2
92369	Arthropoda	Insecta	Diptera	Ceratopogonidae	<i>Forcipomyia</i>	1
92488	Arthropoda	Insecta	Diptera	Ceratopogonidae	<i>Stilobezzia</i>	2
92491	Arthropoda	Insecta	Diptera	Chironomidae		52
91650	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Callibaetis</i>	30
91600	Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i>	7
91570	Arthropoda	Insecta	Ephemeroptera	Ephemeridae	<i>Hexagenia</i>	1
91771	Arthropoda	Insecta	Odonata	Libellulidae		1
<b>Total</b>						<b>256</b>
<b>Total Taxa</b>						<b>20</b>

### Habitat Quality Index

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

Metric	Value	Score
Instream Cover, mean (%)	42.0	3
Riffles, number of	3	1
Pools, maximum depth (m)	1.09	4
<b>Bank Stability</b>	-	2.5
Slope component, mean angle (°)	27.0	-
Erosion component, mean (%)	24.9	-
Riparian Buffer Vegetation, mean width (m)	> 16.6	2
Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow)	2	1
Channel Sinuosity	-	2
Bottom Substrate, mean gravel or larger (%)	36.2	3
Aesthetics (1=Wilderness, 2=Natural, 3=Common, 4=Offensive)	2	2
<b>AQUATIC LIFE USE SCORE</b>		<b>20.5</b>
<b>AQUATIC LIFE USE RATING</b>		<b>High</b>

#### Scoring Criteria

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



### Habitat Summary Data

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at US90  
**TCEQ ID** 11120

Description	STORET	Value
Instantaneous flow measurement (cfs)	00061	0.1238
Mean stream slope over evaluated reach (m/km)	72051	3.041
Mean instream cover (%)	84159	42.0
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	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	36.2
Mean bank erosion (%)	89846	24.9
Mean bank slope (°)	89847	27.0
Channel flow status (4=high, 3=moderate, 2=low, 1=no flow)	89848	2
Riparian vegetation	-	-
Trees (%)	89849	29.5
Shrubs (%)	89850	22.5
Grasses/forbes (%)	89851	45.0
Cultivated fields (%)	89852	0.0
Other (%)	89853	17.0
Mean tree canopy (%)	89854	35.0
Drainage area above location (km <sup>2</sup> )	89859	181.13
Length of segment evaluated (km)	89860	0.177
Mean stream width (m)	89861	3.52
Mean stream depth (m)	89862	0.103
Maximum pool width (m)	89864	8.75
Maximum pool depth (m)	89865	1.09
Mean width natural buffer vegetation (m)	89866	> 16.6
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** 05/15/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

Description	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5
Stream type (RI=riffle, RU=run, G=glide, P=pool)	G	RI	G	RI	RI
Stream width (m)	5.5	4.4	3.4	2.0	2.3
Left bank slope (°)	40	25	55	5	35
Left bank erosion potential (%)	25	70	90	35	1
Left bank width of natural buffer vegetation (m)	> 20	> 20	> 20	> 20	8
Right bank slope (°)	45	15	15	30	5
Right bank erosion potential (%)	10	1	10	5	2
Right bank width of natural buffer vegetation (m)	> 20	> 20	> 20	10	8
Tree canopy (%)	38.2	52.9	35.4	45.6	5.9
Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)	1	1	1	1	1
Stream depth at point 1 (m)	0	0	0	0	0
Stream depth at point 2 (m)	0.22	0.04	0.0914	0.02	0.04
Stream depth at point 3 (m)	0.31	0.06	0.1981	0.07	0.08
Stream depth at point 4 (m)	0.28	0.1	0.2743	0.1	0.05
Stream depth at point 5 (m)	0.32	0.1	0.2743	0.14	0.05
Stream depth at point 6 (m)	0.32	0.08	0.2438	0.12	0.04
Stream depth at point 7 (m)	0.33	0.03	0.1676	0.08	0.06
Stream depth at point 8 (m)	0.3	0.03	0.1097	0.06	0.03
Stream depth at point 9 (m)	0.26	0.05	0.1067	0.06	0.02
Stream depth at point 10 (m)	0.15	0.08	0.0549	0.04	0.01
Stream depth at point 11 (m)	0	0	0	0	0
Substrate gravel or larger (%)	5	5	1	80	90
Instream cover (%)	50	70	20	10	60
Left bank trees (%)	5	50	30	40	0
Left bank shrubs (%)	20	5	10	15	0
Left bank grasses/forbes (%)	95	35	10	80	40
Left bank cultivated fields (%)	0	0	0	0	0
Left bank other (%)	0	0	0	0	60*
Right bank trees (%)	40	55	30	25	20
Right bank shrubs (%)	5	20	50	60	40
Right bank grasses/forbes (%)	60	80	20	30	0
Right bank cultivated fields (%)	0	0	0	0	0
Right bank other (%)	0	0	0	50*	60*
Total length of reach (m)			177		

\*Other for right and left bank = mowed grass

### Habitat Quality Index

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

Metric	Value	Score
Instream Cover, mean (%)	41.0	3
Riffles, number of	0	1
Pools, maximum depth (m)	0.75	3.5
<b>Bank Stability</b>	-	1.5
Slope component, mean angle (°)	33.2	-
Erosion component, mean (%)	36.0	-
Riparian Buffer Vegetation, mean width (m)	> 15.3	2
Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow)	3	2
Channel Sinuosity	-	2
Bottom Substrate, mean gravel or larger (%)	46.0	3
Aesthetics (1=Wilderness, 2=Natural, 3=Common, 4=Offensive)	2	2
<b>AQUATIC LIFE USE SCORE</b>		<b>20</b>
<b>AQUATIC LIFE USE RATING</b>		<b>High</b>

#### Scoring Criteria

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

### Habitat Summary Data

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

Description	STORET	Value
Instantaneous flow measurement (cfs)	00061	0.0334
Mean stream slope over evaluated reach (m/km)	72051	3.404
Mean instream cover (%)	84159	41.0
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	2
Well defined stream bends	89840	1
Moderately defined stream bends	89841	0
Poorly defined stream bends	89842	1
Number of riffles	89843	0
Dominant substrate (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock)	89844	1
Mean substrate gravel or larger (%)	89845	46.0
Mean bank erosion (%)	89846	36.0
Mean bank slope (°)	89847	33.2
Channel flow status (4=high, 3=moderate, 2=low, 1=no flow)	89848	3
Riparian vegetation	-	-
Trees (%)	89849	15.7
Shrubs (%)	89850	3.0
Grasses/forbes (%)	89851	66.8
Cultivated fields (%)	89852	0.0
Other (%)	89853	13.5
Mean tree canopy (%)	89854	44.71
Drainage area above location (km <sup>2</sup> )	89859	181.13
Length of segment evaluated (km)	89860	0.154
Mean stream width (m)	89861	4.26
Mean stream depth (m)	89862	0.490
Maximum pool width (m)	89864	8.80
Maximum pool depth (m)	89865	0.75
Mean width natural buffer vegetation (m)	89866	> 15.3
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	3

### Habitat Transect Data

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**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	P	G	P	G
Stream width (m)	4.3	4.5	3.8	7.5	1.2
Left bank slope (°)	86.7	75	75	15	10
Left bank erosion (%)	35	65	15	60	10
Left bank width of natural buffer vegetation (m)	> 20	> 20	15	8	15
Right bank slope (°)	15	20	5	15	5
Right bank erosion (%)	15	5	70	70	15
Right bank width of natural buffer vegetation (m)	> 20	> 20	> 20	5	10
Tree canopy (%)	33.82	48.53	85.29	35.29	20.59
Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)	1	1	1	5	5
Stream depth at point 1 (m)	0	0.37	0.37	0	0
Stream depth at point 2 (m)	0.14	0.595	0.45	0.32	0.095
Stream depth at point 3 (m)	0.235	0.69	0.3	0.44	0.595
Stream depth at point 4 (m)	0.3	0.67	0.47	0.48	0.595
Stream depth at point 5 (m)	0.335	0.67	0.505	0.535	0.6
Stream depth at point 6 (m)	0.445	0.71	0.6	0.585	0.6
Stream depth at point 7 (m)	0.49	0.66	0.67	0.648	0.65
Stream depth at point 8 (m)	0.495	0.6	0.795	0.705	0.65
Stream depth at point 9 (m)	0.54	0.62	0.84	0.71	0.645
Stream depth at point 10 (m)	0.54	0.645	0.58	0.66	0.395
Stream depth at point 11 (m)	0.435	0.5	0.15	0.565	0.08
Substrate gravel or larger (%)	0	0	60	80	90
Instream cover (%)	45	50	20	30	60
Left bank trees (%)	10	5	5	2	5
Left bank shrubs (%)	0	5	5	5	0
Left bank grasses/forbes (%)	90	80	90	53	85
Left bank cultivated fields (%)	0	0	0	0	0
Left bank other (%)	0	10*	0	30*	10*
Right bank trees (%)	25	25	5	5	70
Right bank shrubs (%)	10	0	0	5	0
Right bank grasses/forbes (%)	65	75	95	30	5
Right bank cultivated fields (%)	0	0	0	0	0
Right bank other (%)	0	0	0	60*	25*
Total length of reach (m)			154		

\*Other on right and left bank = exposed substrate



### Diel Measurement Summary

**Start Date** 05/14/2013 **Start Time** 11:00  
**End Date** 05/15/2013 **End Time** 10:45  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

Parameter	STORET	Value
Temp Mean	00209	23.47
Temp Maximum	00210	25.12
Temp Minimum	00211	22.08
Spec Cond Mean	00212	538
Spec Cond Maximum	00213	603
Spec Cond Minimum	00214	476
pH Maximum	00215	7.74
pH Minimum	00216	7.12
# Temp Measurements	00221	96
# Spec Cond Measurements	00222	96
# pH Measurements	00223	96
DO Minimum	89855	2.41
DO Maximum	89856	8.06
DO Mean	89857	5.24
# DO Measurements	89858	96

**Diel Data**

**Date** 05/15/2013 **TCEQ ID** 11120  
**Site Name** Cedar Bayou Above Tidal at US 90

<b>Date</b> (mm/dd/yyyy)	<b>Time</b> (hh:mm:ss)	<b>Temp</b> (°C)	<b>pH</b> Std. Units	<b>Dissolved Oxygen</b> (mg/L)	<b>Dissolved Oxygen</b> (%)	<b>Specific Conductance</b> (µS/cm)
5/14/2013	11:00:32	22.65	7.24	4.55	52.8	476
5/14/2013	11:15:32	22.83	7.27	4.84	56.2	478
5/14/2013	11:30:32	23.02	7.29	5.05	59.0	480
5/14/2013	11:45:32	23.23	7.33	5.52	64.7	482
5/14/2013	12:00:32	23.41	7.35	5.84	68.7	485
5/14/2013	12:15:32	23.59	7.35	6.01	70.9	486
5/14/2013	12:30:32	23.77	7.39	6.34	75.1	486
5/14/2013	12:45:32	23.98	7.43	6.70	79.6	487
5/14/2013	13:00:32	24.09	7.44	7.12	84.8	489
5/14/2013	13:15:32	24.22	7.46	7.33	87.5	489
5/14/2013	13:30:32	24.34	7.50	7.47	89.4	489
5/14/2013	13:45:32	24.42	7.52	7.48	89.6	490
5/14/2013	14:00:32	24.53	7.46	7.69	92.3	490
5/14/2013	14:15:32	24.53	7.51	7.39	88.8	491
5/14/2013	14:30:32	24.64	7.53	7.33	88.2	491
5/14/2013	14:45:32	24.68	7.43	7.51	90.5	492
5/14/2013	15:00:32	24.70	7.39	7.38	88.9	492
5/14/2013	15:15:32	24.81	7.44	7.19	86.8	493
5/14/2013	15:30:32	24.88	7.48	7.22	87.3	493
5/14/2013	15:45:32	24.92	7.49	7.60	92.0	494
5/14/2013	16:00:32	24.92	7.45	7.03	85.0	494
5/14/2013	16:15:32	24.91	7.39	6.91	83.6	495
5/14/2013	16:30:32	24.98	7.44	6.74	81.6	495
5/14/2013	16:45:32	25.02	7.47	7.19	87.2	496
5/14/2013	17:00:32	25.06	7.49	7.54	91.5	497
5/14/2013	17:15:32	25.05	7.44	6.55	79.5	499
5/14/2013	17:30:32	25.07	7.43	6.09	73.9	500
5/14/2013	17:45:32	25.12	7.62	6.27	76.2	502
5/14/2013	18:00:32	25.06	7.74	7.36	89.3	504
5/14/2013	18:15:32	25.00	7.69	8.06	97.7	504
5/14/2013	18:30:32	24.91	7.61	7.94	96.1	508
5/14/2013	18:45:32	24.84	7.61	7.76	93.8	511
5/14/2013	19:00:32	24.75	7.61	7.85	94.7	515
5/14/2013	19:15:32	24.67	7.62	7.75	93.4	518
5/14/2013	19:30:32	24.63	7.59	7.09	85.4	519
5/14/2013	19:45:32	24.52	7.61	7.46	89.6	519
5/14/2013	20:00:32	24.42	7.58	7.15	85.7	520
5/14/2013	20:15:32	24.37	7.52	6.83	81.8	521
5/14/2013	20:30:32	24.25	7.50	6.44	77.0	524
5/14/2013	20:45:32	24.10	7.49	6.79	80.9	527
5/14/2013	21:00:32	24.01	7.48	6.73	80.1	528
5/14/2013	21:15:32	23.96	7.45	6.58	78.2	530
5/14/2013	21:30:32	23.90	7.44	6.51	77.3	531
5/14/2013	21:45:32	23.82	7.42	6.33	75.1	533
5/14/2013	22:00:32	23.76	7.41	6.26	74.1	535
5/14/2013	22:15:32	23.68	7.40	6.16	72.9	537
5/14/2013	22:30:32	23.67	7.38	5.94	70.2	537

<b>Date</b> (mm/dd/yyyy)	<b>Time</b> (hh:mm:ss)	<b>Temp</b> (°C)	<b>pH</b> Std. Units	<b>Dissolved Oxygen</b> (mg/L)	<b>Dissolved Oxygen</b> (%)	<b>Specific Conductance</b> (µS/cm)
5/14/2013	22:45:32	23.56	7.37	5.81	68.5	539
5/14/2013	23:00:32	23.55	7.36	5.70	67.3	540
5/14/2013	23:15:32	23.48	7.34	5.51	65.0	540
5/14/2013	23:30:32	23.43	7.34	5.47	64.4	541
5/14/2013	23:45:32	23.38	7.33	5.32	62.5	541
5/15/2013	0:00:32	23.33	7.32	5.26	61.7	542
5/15/2013	0:15:32	23.26	7.32	5.32	62.4	544
5/15/2013	0:30:32	23.22	7.32	5.24	61.4	545
5/15/2013	0:45:32	23.18	7.31	5.12	60.0	546
5/15/2013	1:00:32	23.11	7.30	5.01	58.7	549
5/15/2013	1:15:32	23.09	7.29	4.86	56.9	549
5/15/2013	1:30:32	23.05	7.29	4.74	55.4	551
5/15/2013	1:45:32	23.02	7.28	4.64	54.2	553
5/15/2013	2:00:32	22.98	7.26	4.46	52.0	554
5/15/2013	2:15:32	22.96	7.25	4.23	49.3	557
5/15/2013	2:30:32	22.89	7.25	4.19	48.8	559
5/15/2013	2:45:32	22.85	7.24	4.20	48.9	560
5/15/2013	3:00:32	22.82	7.23	4.03	46.9	562
5/15/2013	3:15:32	22.77	7.23	3.97	46.2	563
5/15/2013	3:30:32	22.73	7.23	3.93	45.7	564
5/15/2013	3:45:32	22.70	7.22	3.81	44.3	565
5/15/2013	4:00:32	22.67	7.21	3.67	42.6	566
5/15/2013	4:15:32	22.63	7.21	3.58	41.6	568
5/15/2013	4:30:32	22.61	7.19	3.24	37.5	568
5/15/2013	4:45:32	22.57	7.18	3.18	36.8	570
5/15/2013	5:00:32	22.54	7.18	3.06	35.4	571
5/15/2013	5:15:32	22.50	7.17	2.95	34.1	572
5/15/2013	5:30:32	22.45	7.18	3.05	35.2	575
5/15/2013	5:45:32	22.4	7.16	2.84	32.8	577
5/15/2013	6:00:32	22.36	7.16	2.72	31.4	578
5/15/2013	6:15:32	22.32	7.15	2.68	30.9	580
5/15/2013	6:30:32	22.26	7.15	2.70	31.1	582
5/15/2013	6:45:32	22.21	7.15	2.58	29.7	583
5/15/2013	7:00:32	22.17	7.15	2.76	31.7	585
5/15/2013	7:15:32	22.13	7.16	2.72	31.2	588
5/15/2013	7:30:32	22.10	7.14	2.64	30.3	589
5/15/2013	7:45:32	22.09	7.14	2.66	30.5	591
5/15/2013	8:00:32	22.09	7.14	2.46	28.3	593
5/15/2013	8:15:32	22.08	7.12	2.65	30.4	594
5/15/2013	8:30:32	22.08	7.13	2.63	30.2	594
5/15/2013	8:45:32	22.09	7.13	2.41	27.6	595
5/15/2013	9:00:32	22.10	7.13	2.41	27.7	596
5/15/2013	9:15:32	22.13	7.15	2.65	30.4	597
5/15/2013	9:30:32	22.17	7.17	2.87	33.0	600
5/15/2013	9:45:32	22.19	7.17	3.22	37.0	597
5/15/2013	10:00:32	22.23	7.18	3.35	38.6	598
5/15/2013	10:15:32	22.25	7.19	3.34	38.4	600
5/15/2013	10:30:32	22.27	7.18	3.42	39.4	602
5/15/2013	10:45:32	22.29	7.18	3.21	36.9	603

### Diel Measurement Summary

**Start Date** 06/30/2013    **Start Time** 08:00  
**End Date** 07/01/2013    **End Time** 07:45  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

Parameter	STORET	Value
Temp Mean	00209	27.09
Temp Maximum	00210	28.63
Temp Minimum	00211	24.63
Spec Cond Mean	00212	1230
Spec Cond Maximum	00213	1235
Spec Cond Minimum	00214	1224
pH Maximum	00215	7.75
pH Minimum	00216	7.08
# Temp Measurements	00221	96
# Spec Cond Measurements	00222	96
# pH Measurements	00223	96
DO Minimum	89855	0.54
DO Maximum	89856	8.91
DO Mean	89857	3.86
# DO Measurements	89858	96

**Diel Data**

**Date** 07/01/2013 **TCEQ ID** 11120  
**Site Name** Cedar Bayou Above Tidal at US 90

<b>Date</b> (mm/dd/yyyy)	<b>Time</b> (hh:mm:ss)	<b>Temp</b> (°C)	<b>pH</b> Std. Units	<b>Dissolved Oxygen</b> (mg/L)	<b>Dissolved Oxygen</b> (%)	<b>Specific Conductance</b> (µS/cm)
6/30/2013	8:00:32	26.91	7.14	0.62	7.8	1224
6/30/2013	8:15:32	26.87	7.14	0.63	7.9	1224
6/30/2013	8:30:32	26.85	7.13	0.59	7.4	1225
6/30/2013	8:45:32	26.81	7.13	0.63	7.9	1225
6/30/2013	9:00:32	26.81	7.12	0.62	7.8	1226
6/30/2013	9:15:32	26.83	7.12	0.58	7.3	1226
6/30/2013	9:30:32	26.85	7.12	0.62	7.7	1226
6/30/2013	9:45:32	26.91	7.13	0.54	6.7	1226
6/30/2013	10:00:32	26.99	7.13	0.55	7.0	1227
6/30/2013	10:15:32	27.06	7.13	0.91	11.4	1227
6/30/2013	10:30:32	27.13	7.15	1.22	15.4	1227
6/30/2013	10:45:32	27.22	7.16	1.65	20.8	1227
6/30/2013	11:00:32	27.30	7.17	2.13	27.0	1227
6/30/2013	11:15:32	27.39	7.18	2.13	27.1	1227
6/30/2013	11:30:32	27.41	7.17	2.29	29.0	1228
6/30/2013	11:45:32	27.45	7.18	2.37	30.1	1227
6/30/2013	12:00:32	27.49	7.18	2.21	28.0	1227
6/30/2013	12:15:32	27.53	7.18	2.27	28.8	1228
6/30/2013	12:30:32	27.59	7.19	2.47	31.4	1228
6/30/2013	12:45:32	27.71	7.21	2.82	36.0	1228
6/30/2013	13:00:32	27.81	7.24	3.19	40.7	1229
6/30/2013	13:15:32	27.92	7.29	3.59	45.9	1229
6/30/2013	13:30:32	28.02	7.29	4.26	54.6	1230
6/30/2013	13:45:32	28.08	7.30	4.65	59.7	1230
6/30/2013	14:00:32	28.14	7.31	4.66	59.9	1230
6/30/2013	14:15:32	28.21	7.32	5.09	65.5	1230
6/30/2013	14:30:32	28.28	7.34	5.39	69.4	1230
6/30/2013	14:45:32	28.32	7.37	5.42	69.9	1230
6/30/2013	15:00:32	28.39	7.39	5.96	76.9	1230
6/30/2013	15:15:32	28.43	7.38	5.81	75.1	1230
6/30/2013	15:30:32	28.49	7.40	5.79	74.8	1230
6/30/2013	15:45:32	28.51	7.44	6.09	78.7	1230
6/30/2013	16:00:32	28.53	7.44	6.22	80.4	1230
6/30/2013	16:15:32	28.56	7.44	6.45	83.5	1230
6/30/2013	16:30:32	28.61	7.54	6.61	85.6	1230
6/30/2013	16:45:32	28.62	7.53	6.53	84.6	1230
6/30/2013	17:00:32	28.63	7.50	6.47	83.8	1230
6/30/2013	17:15:32	28.63	7.56	6.72	87.1	1230
6/30/2013	17:30:32	28.59	7.62	8.14	105.4	1229
6/30/2013	17:45:32	28.52	7.75	8.91	115.3	1229
6/30/2013	18:00:32	28.44	7.73	8.71	112.5	1229
6/30/2013	18:15:32	28.37	7.72	8.69	112.1	1229
6/30/2013	18:30:32	28.30	7.75	8.74	112.6	1230
6/30/2013	18:45:32	28.24	7.73	8.60	110.7	1230
6/30/2013	19:00:32	28.17	7.70	8.34	107.2	1230
6/30/2013	19:15:32	28.11	7.68	8.14	104.6	1230
6/30/2013	19:30:32	28.06	7.67	7.98	102.4	1230



Date (mm/dd/yyyy)	Time (hh:mm:ss)	Temp (°C)	pH Std. Units	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)
6/30/2013	19:45:32	28.02	7.65	7.75	99.4	1230
6/30/2013	20:00:32	27.99	7.63	7.59	97.3	1230
6/30/2013	20:15:32	27.96	7.58	7.43	95.2	1230
6/30/2013	20:30:32	27.94	7.56	7.28	93.2	1230
6/30/2013	20:45:32	27.89	7.53	7.02	89.8	1231
6/30/2013	21:00:32	27.84	7.50	6.91	88.3	1231
6/30/2013	21:15:32	27.76	7.47	6.57	83.8	1231
6/30/2013	21:30:32	27.70	7.43	6.29	80.2	1231
6/30/2013	21:45:32	27.63	7.42	6.01	76.5	1230
6/30/2013	22:00:32	27.55	7.37	5.79	73.6	1230
6/30/2013	22:15:32	27.47	7.34	5.35	68.0	1231
6/30/2013	22:30:32	27.42	7.31	5.04	64.0	1231
6/30/2013	22:45:32	27.34	7.31	4.90	62.0	1231
6/30/2013	23:00:32	27.25	7.30	4.71	59.5	1231
6/30/2013	23:15:32	27.17	7.28	4.52	57.1	1231
6/30/2013	23:30:32	27.09	7.28	4.33	54.7	1231
6/30/2013	23:45:32	27.02	7.28	4.17	52.5	1231
7/1/2013	0:00:32	26.93	7.28	4.21	52.9	1231
7/1/2013	0:15:32	26.86	7.25	3.97	49.9	1232
7/1/2013	0:30:32	26.77	7.23	3.87	48.5	1231
7/1/2013	0:45:32	26.69	7.23	3.67	45.9	1231
7/1/2013	1:00:32	26.62	7.19	3.48	43.5	1231
7/1/2013	1:15:32	26.54	7.16	3.32	41.4	1231
7/1/2013	1:30:32	26.45	7.18	3.16	39.3	1232
7/1/2013	1:45:32	26.38	7.16	3.00	37.4	1231
7/1/2013	2:00:32	26.31	7.15	2.88	35.8	1231
7/1/2013	2:15:32	26.23	7.14	2.69	33.4	1231
7/1/2013	2:30:32	26.14	7.12	2.43	30.1	1231
7/1/2013	2:45:32	26.06	7.15	2.36	29.2	1231
7/1/2013	3:00:32	25.99	7.11	2.25	27.8	1231
7/1/2013	3:15:32	25.90	7.11	2.15	26.5	1231
7/1/2013	3:30:32	25.82	7.10	1.98	24.3	1231
7/1/2013	3:45:32	25.74	7.13	1.94	23.9	1231
7/1/2013	4:00:32	25.66	7.14	1.78	21.9	1232
7/1/2013	4:15:32	25.58	7.08	1.66	20.3	1232
7/1/2013	4:30:32	25.49	7.10	1.42	17.4	1232
7/1/2013	4:45:32	25.41	7.11	1.34	16.4	1232
7/1/2013	5:00:32	25.35	7.11	1.28	15.7	1232
7/1/2013	5:15:32	25.27	7.11	1.26	15.4	1233
7/1/2013	5:30:32	25.23	7.10	1.17	14.3	1232
7/1/2013	5:45:32	25.13	7.10	1.15	13.9	1232
7/1/2013	6:00:32	25.05	7.12	1.03	12.5	1233
7/1/2013	6:15:32	24.97	7.12	1.04	12.6	1233
7/1/2013	6:30:32	24.92	7.11	1.07	13.0	1233
7/1/2013	6:45:32	24.83	7.12	0.99	12.0	1233
7/1/2013	7:00:32	24.77	7.12	0.92	11.2	1234
7/1/2013	7:15:32	24.71	7.14	0.85	10.3	1234
7/1/2013	7:30:32	24.68	7.14	0.85	10.3	1234
7/1/2013	7:45:32	24.63	7.15	0.84	10.1	1235

### Additional Parameter Data

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

Description	STORET	Value
<i>E. coli</i> IDEXX Colilert (MPN/100 ml)	31699	31
Holding Time, <i>E. coli</i> IDEXX Colilert (hh:mm)	31704	2:55
TSS (mg/l)	00530	18.0
VSS (mg/l)	00535	N/A
Ammonia-N, Total (mg/l)	00610	0.30
Nitrate/Nitrite-N, Total (mg/l)	00630	1.41
Total Phosphorus-P (mg/l)	00665	0.15
Orthophosphate-P, field filtered (mg/l)	00671	0.12
TOC (mg/l)	00680	N/A
Chloride (mg/l)	00940	150
Sulfate (mg/l)	00945	39.7
TDS, dried @ 180°C (mg/l)	70300	N/A
Temperature (°C)	00010	22.39
Secchi Depth (m)	00078	0.620
Specific Conductance (µS/cm)	00094	610
DO (mg/L)	00300	2.60
pH (standard units)	00400	7.18
Salinity (ppt)	00480	0.30
Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry)	01351	2
Water Clarity (1=Excellent, 2=Good, 3=Fair, 4=Poor)	20424	N/A
Days Since Last Significant Rainfall (days)	72053	4
Total Water Depth (m)	82903	0.160
Turbidity, Observed (1=Low, 2=Medium, 3=High)	88842	N/A
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	4
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** 07/01/2013  
**Site** Cedar Bayou Above Tidal at US 90  
**TCEQ ID** 11120

Description	STORET	Value/Split	
<i>E. coli</i> IDEXX Colilert (MPN/100 ml)	31699	20	
Holding Time, <i>E. coli</i> IDEXX Colilert (hh:mm)	31704	3:09	
TSS (mg/l)	00530	12.7	12.1
VSS (mg/l)	00535	5.6	5.6
Ammonia-N, Total (mg/l)	00610	<0.10	<0.10
Nitrate/Nitrite-N, Total (mg/l)	00630	<0.02	<0.02
Total Phosphorus-P (mg/l)	00665	0.20	0.19
Orthophosphate-P, field filtered (mg/l)	00671	0.06	0.06
TOC (mg/l)	00680	10.6	10.5
Chloride (mg/l)	00940	335	335
Sulfate (mg/l)	00945	25.2	25.0
TDS, dried @ 180°C (mg/l)	70300	768	836
Temperature (°C)	00010	25.28	
Secchi Depth (m)	00078	0.950	
Specific Conductance (µS/cm)	00094	1257	
DO (mg/L)	00300	5.49	
pH (standard units)	00400	7.21	
Salinity (ppt)	00480	0.62	
Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry)	01351	2	
Water Clarity (1=Excellent, 2=Good, 3=Fair, 4=Poor)	20424	N/A	
Days Since Last Significant Rainfall (days)	72053	22	
Total Water Depth (m)	82903	0.263	
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	7	



Upstream

**INDEX**

**Bottom of Reach:**

Right bank **TRANSECT** Left bank

**1**

Downstream







Upstream

**INDEX**

**Near bottom of reach:**

Right Bank **TRANSECT** Left Bank  
**2**

Downstream





Upstream

**INDEX**  
**Middle of reach:**

Right Bank **TRANSECT** Left Bank  
**3**

Downstream







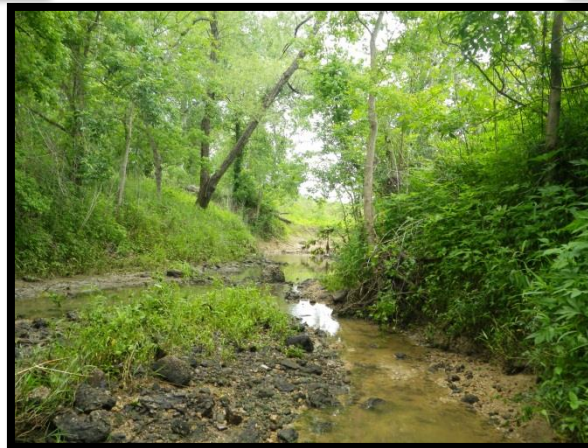
Upstream

**INDEX**

**Near top of reach:**

Right Bank **TRANSECT** Left Bank  
**4**

Downstream







Upstream

**INDEX**  
**Top of reach:**  
**TRANSECT**  
**5**

Right Bank

Left Bank

Downstream







Upstream



Right Bank

**CRITICAL**  
**Bottom of Reach:**

**TRANSECT**

**1**

Left Bank

Downstream





Upstream

**CRITICAL**  
**Near bottom of Reach:**  
 Right Bank **TRANSECT** Left Bank  
**2**

Downstream







Upstream



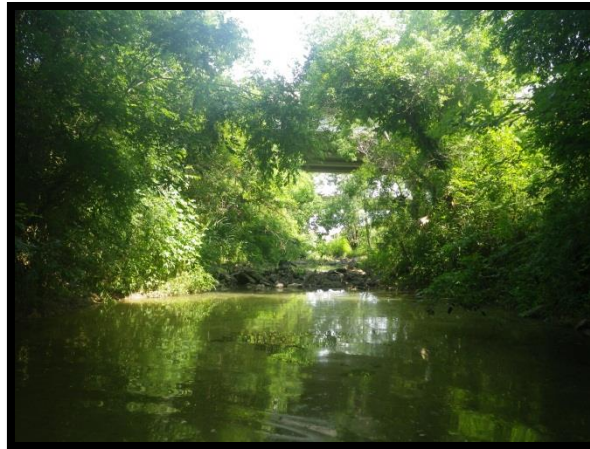
Right Bank

**CRITICAL**  
**Middle of Reach:**  
**TRANSECT**  
**3**

Left Bank

Downstream



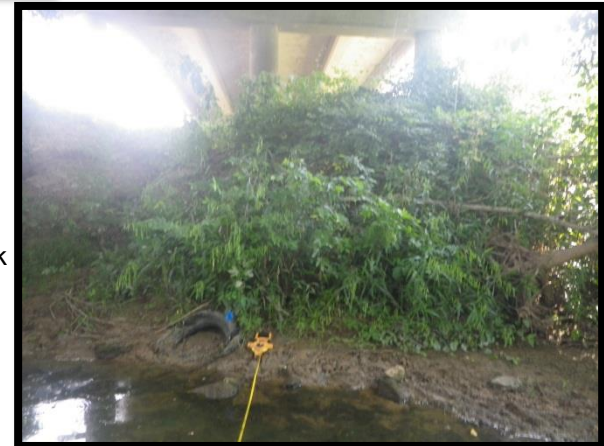


Upstream

**CRITICAL**  
**Near top of reach:**

Right Bank **TRANSECT** Left Bank  
**4**

Downstream







Upstream

**CRITICAL**  
**Top of reach:**  
**TRANSECT**  
**5**

Right Bank

Left Bank

Downstream



## Nekton Photographic Vouchers – Index Period



Figure 3 Alligator gar (*Atractosteus spatula*; 470mm) captured during seining in index sampling at site 11120.

## Nekton Photographic Vouchers – Critical Period

*\*\*No fish were photo vouchered during critical sampling\*\**