

# Cedar Bayou Above Tidal at FM 1942

## TCEQ ID – 11118



## 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.



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**Prepared by the Environmental Institute of Houston**

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## 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 11118 (Cedar Bayou Above Tidal at FM 1942).

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 I & II).

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 (9.4572 cfs) to critical (2.1703 cfs) sampling.

During index sampling, instantaneous water temperature was 23.10°C, while diel averaged 24.00°C (range: 21.78-25.64°C,  $n = 96$ ). Instantaneous specific conductance was 619  $\mu\text{S}/\text{cm}$ , while diel averaged 520  $\mu\text{S}/\text{cm}$  (range: 480-572  $\mu\text{S}/\text{cm}$ ,  $n = 96$ ). Instantaneous D.O. was 5.92 mg/L, while diel averaged 5.82 mg/L (range: 5.61-6.04 mg/L,  $n = 96$ ). Instantaneous pH was 7.52, while diel ranged from 7.36-7.49 ( $n = 96$ ).

During critical sampling, instantaneous water temperature was 27.96°C, while diel averaged 29.08°C (range: 26.85-30.94°C,  $n = 96$ ). Instantaneous specific conductance was 1492  $\mu\text{S}/\text{cm}$ , while diel averaged 1482  $\mu\text{S}/\text{cm}$  (range: 1342-1634  $\mu\text{S}/\text{cm}$ ,  $n = 96$ ). Instantaneous D.O. was 7.46 mg/L, while diel averaged 6.16 mg/L (range: 4.71-8.25 mg/L,  $n = 96$ ). Instantaneous pH was 8.11, while diel ranged from 8.04-8.32 ( $n = 96$ ).

Bacteria (*E. coli*) levels (156 MPN/100mL; 52 MPN/100mL), total nitrate-nitrite nitrogen (0.53 mg/L; 0.21 mg/L), total ammonia nitrogen (0.60 mg/L; <0.10 mg/L), and total suspended solids (50.0 mg/L; 34.4 mg/L) decreased from index to critical periods, respectively. Chloride (180

mg/L; 230 mg/L), orthophosphate phosphorus (0.62 mg/L; 1.42 mg/L), total phosphorus (0.76 mg/L; 1.85 mg/L), and sulfate (62.8 mg/L; 120.8 mg/L) increased from index to critical, respectively.

Nekton IBI scores averaged 44 indicating high ALU. Benthic macroinvertebrate IBI scores averaged 27, 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 averaged 19.5, and, when rounded up to 20, just met high ALU classification.

## **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 11118 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 physical habitat parameters (which only reached high ALU classification after rounding up the average score). Minima D.O. requirements averaged > 3.00 mg/L and do not appear to be a concern for this water body at this time.

# Aquatic Life Monitoring and Habitat Assessment Checklist

## Background Information

Name of Water Body: Cedar Bayou Above Tidal at FM 1942

Segment Number: 0902 Station ID: 11118 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: TX02089 – TX02093  
07/01/2013 sampling: TX02094 – TX02098

## Objective for Aquatic Life Use Assessment

Is this water body supporting its designated uses? Yes  No

Reason: The average nekton IBI score was high, supporting the previously designated ALU for nekton. Physical habitat IBI scores averaged 19.5 and, when rounded up, also met the high ALU classification. 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 average D.O. were measured as 5.82 mg/L for index and 6.16 mg/L for critical period. Absolute minima for D.O. were measured as 5.61 mg/L for index and 4.71 for critical period. In summary, this site does support its designated use, but there may be concern for benthic macroinvertebrates.

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 listed in the 2012 Texas Integrated Report 305(b) or the 303(d) lists.

Identify Sources of Pollution:

Point Source: Yes  No  Identify: Outfall from nearby plant downstream of FM 1942 bridge (just downstream of upstream most transect)

Nonpoint Source: Yes  No  Identify: Mowed power corridor between transects 2 and 3. FM 1942 bridge crossing drains runoff from FM 1942.

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>5.98</u> % of the <u>234</u> meters assessed	Flowing at <u>9,4572</u> cfs (measured)
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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 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 macroinvertebrate, and physical habitat sampling.

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

Dry	Pools covering <u>5.51</u> % of the <u>236</u> meters assessed	Flowing at <u>2,1703</u> cfs (measured)
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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

**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**

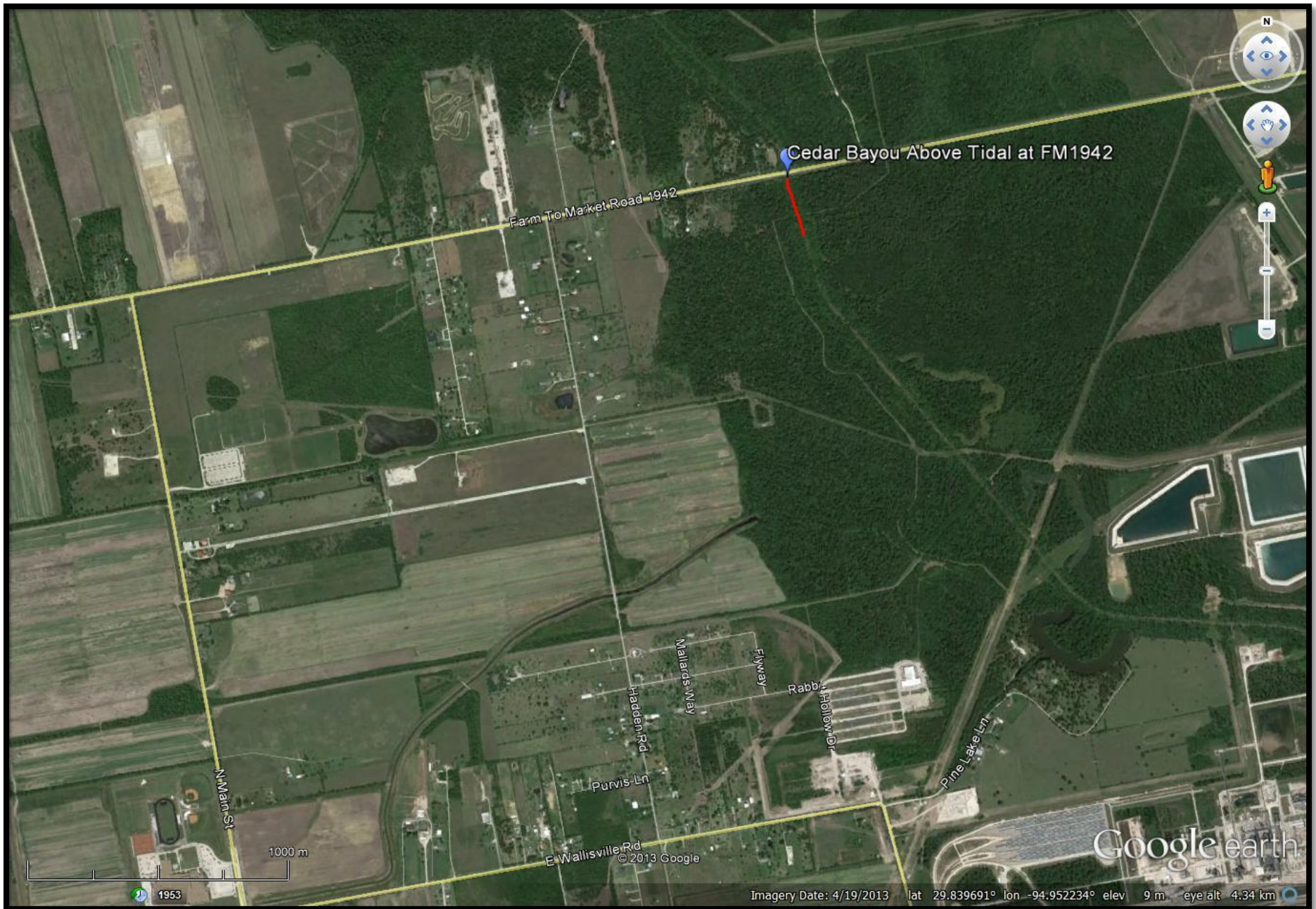
Exceptional  High  Intermediate  Limited

**Habitat index Event 1**

Exceptional  High  Intermediate  Limited

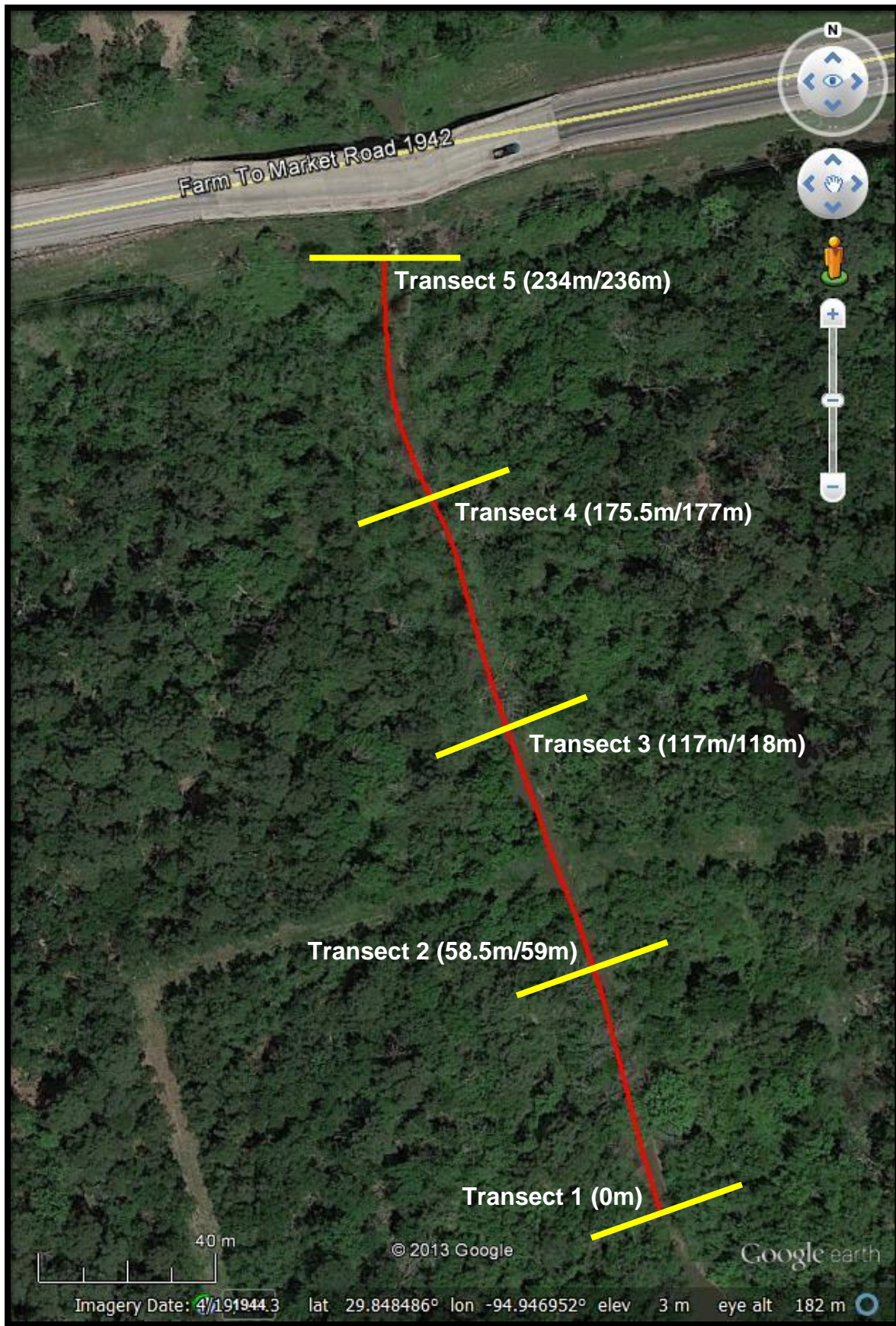
**Habitat index Event 2**

Exceptional  High  Intermediate  Limited



**Figure 1** Aerial map of overall sample area (site indicated at top-most transect of reach) including length of evaluated reach (234m and 236m during index and critical periods, respectively).





**Figure 2** Location of transects for index and critical sampling periods. Sample reaches differed by 2m between periods; locations of transects are approximate (distances from bottom of reach indicated in parentheses). Solid red line indicates curvature of Cedar Bayou.

<b>Ecoregion 34 Nekton IBI</b>			
<b>Date</b>	05/15/0213	<b>TCEQ ID</b>	11118
<b>Site</b>	Cedar Bayou Above Tidal at FM 1942		
<b>Metric</b>	<b>Value</b>	<b>Score</b>	
Total number fish species	17	5	
Number native cyprinid species	4	5	
Number benthic invertivore species	0	1	
Number sunfish species	5	5	
Number intolerant species	1	5	
Percent individuals as tolerant <sup>a</sup>	6.9	5	
Percent individuals as omnivores	3.4	5	
Percent individuals as invertivores	93.1	5	
Number individuals in sample	116	1	
Individuals per seine haul	10.4	1	
Individuals per min electrofishing	1.38	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>			
Intermediate	31 – 38	Exceptional	> 49
Limited	< 31	High	39 – 48

<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	955
Seining effort (number of hauls)	89947	9
Combined length of seine hauls (m)	89948	100
Seining effort (duration, minutes)	89949	4.37
Ecoregion	89961	34
Area seined (m <sup>2</sup> )	89976	457.2
Total fish species (n)	98003	17
Number of sunfish species (n)	98008	5
Total intolerant species (n)	98010	1
Omnivore individuals (%)	98017	3.4
Insectivore individuals (%)	98021	93.1
Piscivore individuals (%)	98022*	N/A
Total number of individuals (#)	98023	116
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	94
Total individuals electroshocking (n)	98040	22
Number of benthic invertivores (n)	98052	N/A
Total benthic species, fish	98053*	N/A
Individuals per seine haul (n)	98062	10.4
Individuals per minute electroshocking (n)	98069	1.38
Tolerant individuals (except <i>G. affinis</i> ) (%)	98070	6.9

\*Not calculated in ecoregion 34 IBI

**SPECIES LIST – NEKTON**

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

STORET	Collection Method (E = electro, S = seine)	Collection Effort (for E: sec; for S: meters)	Scientific Name	Common Name	S1	S2	S3	S4	S5	S6	S7	S8	S9	Seine Total #	E1	E2	E3	ES Total #
					#	#	#	#	#	#	#	#	#		#	#	#	
98564			<i>Ameiurus natalis</i>	Yellow bullhead										0			1	1
98344			<i>Atractosteus spatula</i>	Alligator gar										0	1			1
98487			<i>Cyprinella venusta</i>	Blacktail shiner	30	2	3	4	3	3	5	1	6	57				0
98429			<i>Dorosoma petenense</i>	Threadfin shad								1		1				0
98694			<i>Fundulus chrysotus</i>	Golden topminnow										0		1		1
98713			<i>Gambusia affinis</i>	Western mosquitofish			1	3		1		1	2	8	2	2	2	6
98734			<i>Labidesthes sicculus</i>	Brook silverside				2					1	3				0
99094			<i>Lepomis cyanellus</i>	Green sunfish										0			2	2
99095			<i>Lepomis gulosus</i>	Warmouth										0			1	1
99097			<i>Lepomis macrochirus</i>	Bluegill	1						1			2			1	1
99099			<i>Lepomis megalotis</i>	Longear sunfish				1			1			2	1		1	2
99101			<i>Lepomis miniatus</i>	Redspotted sunfish		1								1	2		4	6
98728			<i>Menidia beryllina</i>	Inland silverside		1	1		9			2	2	15				0
98793			<i>Mugil cephalus</i>	Striped mullet	1	1								2				0
98441			<i>Notemigonus crysoleucas</i>	Golden shiner							1			1				0
98452			<i>Opsopoeodus emiliae</i>	Pugnose minnow					1					1				0
98498			<i>Pimephales vigilax</i>	Bullhead minnow						1				1	1			1
<b>Total Collected</b>					32	5	5	10	13	5	8	5	11	94	7	3	12	22
<b>Total Taxa</b>					3	4	3	4	3	3	4	4	4	12	5	2	7	10

Ecoregion 34 IBI			
<b>Date</b>	07/01/2013	<b>TCEQ ID</b>	11118
<b>Site</b>	Cedar Bayou Above Tidal at FM 1942		
<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	0	1	
Number sunfish species	2	3	
Number intolerant species	0	1	
Percent individuals as tolerant <sup>a</sup>	6.7	5	
Percent individuals as omnivores	4.4	5	
Percent individuals as invertivores	85.6	5	
Number individuals in sample	90	1	
Individuals per seine haul	15.0	1	
Individuals per min electrofishing	0.00	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>41</b>	<b>High</b>	
<sup>a</sup> not including <i>G. affinis</i>			
Scoring Criteria			
Intermediate	31 – 38	Exceptional	> 49
Limited	< 31	High	39 – 48

Nekton Summary Data		
Description	STORET	Value
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	975
Seining effort (number of hauls)	89947	6
Combined length of seine hauls (m)	89948	165
Seining effort (duration, minutes)	89949	5.55
Ecoregion	89961	34
Area seined (m <sup>2</sup> )	89976	754.4
Total fish species (n)	98003	15
Number of sunfish species (n)	98008	2
Total intolerant species (n)	98010	0
Omnivore individuals (%)	98017	4.4
Insectivore individuals (%)	98021	85.6
Piscivore individuals (%)	98022*	N/A
Total number of individuals (#)	98023	90
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	90
Total individuals electroshocking (n)	98040	0
Number of benthic invertivores (n)	98052	0
Total benthic species, fish	98053*	N/A
Individuals per seine haul (n)	98062	15.0
Individuals per minute electroshocking (n)	98069	0
Tolerant individuals (except <i>G. affinis</i> ) (%)	98070	6.7

\*Not calculated in ecoregion 34 IBI

### SPECIES LIST - NEKTON

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

STORET	Collection Method Collection Effort Species Name	(E = electro, S = seine) (for E: sec; for S: meters) Common Name	S1	S2	S3	S4	S5	S6	Seine Total #	E1	E2	E3	ES Total #
			#	#	#	#	#	#		#	#	#	
98412	<i>Anchoa mitchilli</i>	Bay anchovy		3				2	5				0*
98487	<i>Cyprinella venusta</i>	Blacktail shiner	7	1	2	2		6	23				0*
98430	<i>Dorosoma cepedianum</i>	Gizzard shad		2					2				0*
98352	<i>Elops saurus</i>	Ladyfish		2				1	3				0*
98677	<i>Fundulus notatus</i>	Blackstripe topminnow	1	1					2				0*
98713	<i>Gambusia affinis</i>	Western mosquitofish			10	3	2		15				0*
98561	<i>Ictalurus punctatus</i>	Channel catfish	1						1				0*
99097	<i>Lepomis macrochirus</i>	Bluegill	1				2		3				0*
99099	<i>Lepomis megalotis</i>	Longear sunfish	4						4				0*
98728	<i>Menidia beryllina</i>	Inland silverside	2	4	2	6	1	1	16				0*
99090	<i>Micropterus salmoides</i>	Largemouth bass	3		1				4				0*
98793	<i>Mugil cephalus</i>	Striped mullet		1					1				0*
98452	<i>Opsopoeodus emiliae</i>	Pugnose minnow	2						6				0*
98498	<i>Pimephales vigilax</i>	Bullhead minnow	1	2					3				0*
98663	<i>Strongylura marina</i>	Atlantic needlefish		2					2				0*
<b>Total Collected</b>			22	18	18	12	13	7	90	0	0	0	0*
<b>Total Taxa</b>			9	9	4	3	5	3	15	0	0	0	0*

\*Note: no fish were collected during electroshocking for critical sampling.

<b>Qualitative Benthos IBI</b>			
<b>Date</b>	05/15/2013	<b>TCEQ ID</b>	11118
<b>Site</b>	Cedar Bayou Above Tidal at FM 1942		
<b>Metric</b>	<b>Value</b>	<b>Score</b>	
Taxa Richness	14	2	
EPT Taxa Abundance	5	2	
Biotic Index (HBI)	5.05	2	
% Chironomidae	10.62	2	
% Dominant Taxon	32.30	2	
% Dominant FFG	35.18	4	
% Predators	3.98	1	
Intolerant : Tolerant	0.86	1	
% Total Trichoptera as Hydropsychidae	76.92	1	
# of Non-Insect Taxa	5	3	
% Collector-Gatherers	35.18	2	
% of Total Number as Elmidae	13.27	3	
<b>AQUATIC LIFE USE SCORE</b>		<b>25</b>	
<b>AQUATIC LIFE USE RATING</b>		<b>Intermediate</b>	
<b>Scoring Criteria</b>			
Exceptional		>36	
High		29 - 36	
Intermediate		22 - 28	
Limited		<22	

**Benthos Summary Data**

**Date** 05/15/2013 **TCEQ ID** 11118  
**Site** Cedar Bayou Above Tidal at FM 1942

<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	12.6
Kicknet effort (min)	89904	5.1
Debris/shoreline effort, min picked (min)	89905	0.0
Total n for sample (n)	89906	226
Percent undercut bank at sample point (%)	89921	0
Percent overhanging brush at sample point (%)	89922	0
Gravel substrate (%)	89923	30
Percent sand substrate at sample point (%)	89924	35
Percent soft bottom at sample point (%)	89925	30
Macrophyte bed (%)	89926	0
Snags and brush (%)	89927	1
Bedrock (%)	89928	5
Net mesh size (cm)	89946	0.05
Benthic sampler	89950	3
Ecoregion	89961	34
Benthos sampled – no organisms present	90005	N/A
HBI	90007	5.05
EPT index (n)	90008	5
Dominant FFG (%)	90010	35.18
Collector-gatherers (%)	90025	35.18
Predators (%)	90036	3.98
Dominant taxon (%)	90042	32.30
Intolerant : Tolerant taxa	90050	0.86
Non-insect taxa (n)	90052	5
n as Elmidae (%)	90054	13.27
Taxa richness (n)	90055	14
Chironomidae (%)	90062	10.62
Trichoptera as Hydropsychidae (%)	90069	76.92

### SPECIES LIST - BENTHIC MACROINVERTEBRATES

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

STORET	Phylum	Class	Order	Family	Genus	Sample
90382	Annelida	Oligochaeta				6
91265	Arthropoda	Crustacea	Amphipoda	Gammaridae	<i>Gammarus</i>	73
91241	Arthropoda	Crustacea	Amphipoda	Taltridae	<i>Hyalella</i>	17
91370	Arthropoda	Crustacea	Mysidacea	Mysidae	<i>Taphromysis</i>	39
91056	Arthropoda	Crustacea	Ostracoda			1
92230	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Dubiraphia</i>	2
92253	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i>	28
92092	Arthropoda	Insecta	Coleoptera	Gyrinidae	<i>Gyretes</i>	1
92491	Arthropoda	Insecta	Diptera	Chironomidae		24
91651	Arthropoda	Insecta	Ephemeroptera	Baetidae	<i>Fallceon</i>	2
91600	Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i>	4
91619	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	<i>Stenacron</i>	3
92292	Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i>	20
92324	Arthropoda	Insecta	Trichoptera	Hydroptilidae	<i>Hydroptila</i>	6
<b>Total</b>						<b>226</b>



### Qualitative Benthos IBI

**Date** 07/01/2013 **TCEQ ID** 11118  
**Site** Cedar Bayou Above Tidal at FM 1942

Metric	Value	Score
Taxa Richness	19	3
EPT Taxa Abundance	6	2
Biotic Index (HBI)	5.53	1
% Chironomidae	15.51	2
% Dominant Taxon	47.78	1
% Dominant FFG	53.59	2
% Predators	6.75	4
Intolerant : Tolerant	0.44	1
% Total Trichoptera as Hydropsychidae	0.00	4
# of Non-Insect Taxa	5	3
% Collector-Gatherers	20.04	3
% of Total Number as Elmidae	13.92	3

**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	07/01/2013	TCEQ ID	11118
Site	Cedar Bayou Above Tidal at FM 1942		
Description	STORET	Value	
Stream order	84161	2	
Data reporting units	89899	1	
Kicknet effort (m <sup>2</sup> )	89903	25.0	
Kicknet effort (min)	89904	5.1	
Debris/shoreline effort, min picked (min)	89905	4.0	
Total n for sample (n)	89906	316	
Percent undercut bank at sample point (%)	89921	5	
Percent overhanging brush at sample point (%)	89922	0	
Gravel substrate (%)	89923	10	
Percent sand substrate at sample point (%)	89924	30	
Percent soft bottom at sample point (%)	89925	60	
Macrophyte bed (%)	89926	0	
Snags and brush (%)	89927	5	
Bedrock (%)	89928	0	
Net mesh size (cm)	89946	0.05	
Benthic sampler	89950	3	
Ecoregion	89961	34	
Benthos sampled – no organisms present	90005	N/A	
HBI	90007	5.53	
EPT index (n)	90008	6	
Dominant FFG (%)	90010	53.59	
Collector-gatherers (%)	90025	20.04	
Predators (%)	90036	6.75	
Dominant taxon (%)	90042	47.78	
Intolerant : Tolerant taxa	90050	0.44	
Non-insect taxa (n)	90052	5	
n as Elmidae (%)	90054	13.92	
Taxa richness (n)	90055	19	
Chironomidae (%)	90062	15.51	
Trichoptera as Hydropsychidae (%)	90069	0.00	

### SPECIES LIST - BENTHIC MACROINVERTEBRATES

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

STORET	Phylum	Class	Order	Family	Genus	Sample
90382	Annelida	Oligochaeta				1
91265	Arthropoda	Crustacea	Amphipoda	Gammaridae	<i>Gammarus</i>	17
91241	Arthropoda	Crustacea	Amphipoda	Taltridae	<i>Hyaella</i>	4
91370	Arthropoda	Crustacea	Mysidacea	Mysidae	<i>Taphromysis</i>	151
91056	Arthropoda	Crustacea	Ostracoda			3
92230	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Dubiraphia</i>	2
92253	Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i>	42
92090	Arthropoda	Insecta	Coleoptera	Gyrinidae	<i>Dineutus</i>	1
92477	Arthropoda	Insecta	Diptera	Ceratopogonidae	<i>Atrichopogon</i>	1
92491	Arthropoda	Insecta	Diptera	Chironomidae		49
91600	Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i>	6
91619	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	<i>Stenacron</i>	12
91594	Arthropoda	Insecta	Ephemeroptera	Tricorythidae	<i>Tricorythodes</i>	1
91944	Arthropoda	Insecta	Hemiptera	Gerridae	<i>Rheumatobates</i>	2
91683	Arthropoda	Insecta	Odonata	Coenagrionidae	<i>Argia</i>	1
91771	Arthropoda	Insecta	Odonata	Libellulidae		1
92324	Arthropoda	Insecta	Trichoptera	Hydroptilidae	<i>Hydroptila</i>	13
92330	Arthropoda	Insecta	Trichoptera	Hydroptilidae	<i>Neotrichia</i>	7
92320	Arthropoda	Insecta	Trichoptera	Polycentropodidae	<i>Cyrenellus</i>	2
<b>Total</b>						<b>316</b>

### Habitat Quality Index

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

Metric	Value	Score
Instream Cover, mean (%)	16.0	2
Riffles, number of	1	2
Pools, maximum depth (m)	1.04	4
<b>Bank Stability</b>	-	1.5
Slope component, mean angle (°)	60.3	-
Erosion component, mean (%)	12.0	-
Riparian Buffer Vegetation, mean width (m)	> 20	3
Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow)	3	2
Channel Sinuosity	-	1
Bottom Substrate, mean gravel or larger (%)	40.0	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 FM 1942  
**TCEQ ID** 11118

Description	STORET	Value
Instantaneous flow measurement (cfs)	00061	9.4572
Mean stream slope over evaluated reach (m/km)	72051	0.278
Mean instream cover (%)	84159	16.0
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	0
Moderately defined stream bends	89841	1
Poorly defined stream bends	89842	1
Number of riffles	89843	1
Dominant substrate (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock)	89844	1
Mean substrate gravel or larger (%)	89845	40
Mean bank erosion (%)	89846	12.0
Mean bank slope (°)	89847	60.3
Channel flow status (4=high, 3=moderate, 2=low, 1=no flow)	89848	3
Riparian vegetation	-	-
Trees (%)	89849	40.5
Shrubs (%)	89850	12.4
Grasses/forbes (%)	89851	85.6
Cultivated fields (%)	89852	0.0
Other (%)	89853	0.0
Mean tree canopy (%)	89854	75.88
Drainage area above location (km <sup>2</sup> )	89859	356.9
Length of segment evaluated (km)	89860	0.234
Mean stream width (m)	89861	5.64
Mean stream depth (m)	89862	0.435
Maximum pool width (m)	89864	9.10
Maximum pool depth (m)	89865	1.04
Mean width natural buffer vegetation (m)	89866	> 20
Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive)	89867	2
Maximum pool length (m)	89869	14
Percent pool coverage (%)	89870	5.98
Number of instream cover types	89929	4
Ecoregion	89961	34
Land development (1=unimpacted, 2=low, 3=moderate, 4=high)	89962	2
Primary contact, observed activity (# people observed)	89978	0
Evidence of primary contact recreation (1=observed, 2=not observed)	89979	0

### Habitat Transect Data

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

Description	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5
Stream type (RI=riffle, RU=run, G=glide, P=pool)	G	G	G	G	RI
Stream width (m)	7.3	4.8	6.0	5.7	4.4
Left bank slope (°)	25.0	52.5	90.0	55.0	25.0
Left bank erosion potential (%)	25	5	2	10	1
Left bank width of natural buffer vegetation (m)	> 20	> 20	> 20	> 20	> 20
Right bank slope (°)	90	85	60	85	35
Right bank erosion potential (%)	40	10	5	2	20
Right bank width of natural buffer vegetation (m)	> 20	> 20	> 20	> 20	> 20
Tree canopy (%)	92.6	70.6	73.5	97.1	45.6
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)	0.31	0.47	0.55	0.52	0.00
Stream depth at point 2 (m)	0.41	0.55	0.73	0.59	0.38
Stream depth at point 3 (m)	0.46	0.57	0.75	0.59	0.48
Stream depth at point 4 (m)	0.48	0.59	0.57	0.52	0.55
Stream depth at point 5 (m)	0.47	0.6	0.59	0.46	0.51
Stream depth at point 6 (m)	0.43	0.62	0.63	0.37	0.51
Stream depth at point 7 (m)	0.41	0.65	0.63	0.31	0.51
Stream depth at point 8 (m)	0.37	0.58	0.69	0.24	0.47
Stream depth at point 9 (m)	0.32	0.65	0.64	0.16	0.17
Stream depth at point 10 (m)	0.29	0.47	0.55	0.09	0.00
Stream depth at point 11 (m)	0.00	0.16	0.29	0.00	0.00
Substrate gravel or larger (%)	10	20	30	90	50
Instream cover (%)	2	8	20	10	40
Left bank trees (%)	35	70	43	45	30
Left bank shrubs (%)	5	0	2	5	30
Left bank grasses/forbes (%)	95	100	99	90	60
Left bank cultivated fields (%)	0	0	0	0	0
Left bank other (%)	0	0	0	0	0
Right bank trees (%)	35	30	60	40	20
Right bank shrubs (%)	10	0	1	1	70
Right bank grasses/forbes (%)	100	99	99	99	15
Right bank cultivated fields (%)	0	0	0	0	0
Right bank other (%)	0	0	0	0	0
Total length of reach (m)			234		

### Habitat Quality Index

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

Metric	Value	Score
Instream Cover, mean (%)	10.0	2
Riffles, number of	0	1
Pools, maximum depth (m)	1.145	4
<b>Bank Stability</b>	-	1.5
Slope component, mean angle (°)	64.7	-
Erosion component, mean (%)	16.2	-
Riparian Buffer Vegetation, mean width (m)	> 20	3
Channel Flow Status (4=High, 3=Moderate, 2=Low, 1=No flow)	3	2
Channel Sinuosity	-	1
Bottom Substrate, mean gravel or larger (%)	23.4	2
Aesthetics (1=Wilderness, 2=Natural, 3=Common, 4=Offensive)	2	2
<b>AQUATIC LIFE USE SCORE</b>	<b>18.5</b>	
<b>AQUATIC LIFE USE RATING</b>	<b>Intermediate</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 FM 1942  
**TCEQ ID** 11118

Description	STORET	Value
Instantaneous flow measurement (cfs)	00061	2.1703
Mean stream slope over evaluated reach (m/km)	72051	0.278
Mean instream cover (%)	84159	10.0
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	0
Moderately defined stream bends	89841	1
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	23.4
Mean bank erosion (%)	89846	16.2
Mean bank slope (°)	89847	64.7
Channel flow status (4=high, 3=moderate, 2=low, 1=no flow)	89848	3
Riparian vegetation	-	-
Trees (%)	89849	29.0
Shrubs (%)	89850	0.0
Grasses/forbes (%)	89851	67.3
Cultivated fields (%)	89852	0.0
Other (%)	89853	3.7
Mean tree canopy (%)	89854	87.94
Drainage area above location (km <sup>2</sup> )	89859	356.9
Length of segment evaluated (km)	89860	0.236
Mean stream width (m)	89861	5.50
Mean stream depth (m)	89862	0.197
Maximum pool width (m)	89864	8.5
Maximum pool depth (m)	89865	1.145
Mean width natural buffer vegetation (m)	89866	> 20
Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive)	89867	2
Maximum pool length (m)	89869	13
Percent pool coverage (%)	89870	5.51
Number of instream cover types	89929	3
Ecoregion	89961	34
Land development (1=unimpacted, 2=low, 3=moderate, 4=high)	89962	2
Primary contact, observed activity (# people observed)	89978	0
Evidence of primary contact recreation (1=observed, 2=not observed)	89979	0



### Habitat Transect Data

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

Description	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5
Stream type (RI=riffle, RU=run, G=glide, P=pool)	G	G	G	G	G
Stream width (m)	6.6	5.9	5.4	5.7	3.9
Left bank slope (°)	35	82	90	15	25
Left bank erosion (%)	30	2	10	40	5
Left bank width of natural buffer vegetation (m)	> 20	> 20	> 20	> 20	> 20
Right bank slope (°)	103	60	80	97.5	60
Right bank erosion (%)	35	10	10	10	10
Right bank width of natural buffer vegetation (m)	> 20	> 20	> 20	> 20	> 20
Tree canopy (%)	100.00	89.71	76.47	97.06	76.47
Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)	1	1	1	4	2
Stream depth at point 1 (m)	0.03	0	0	0	0
Stream depth at point 2 (m)	0.23	0.15	0.055	0.1	0.05
Stream depth at point 3 (m)	0.7	0.25	0.08	0.2	0.035
Stream depth at point 4 (m)	0.77	0.265	0.095	0.29	0.065
Stream depth at point 5 (m)	0.72	0.31	0.06	0.24	0.06
Stream depth at point 6 (m)	0.64	0.33	0.06	0.08	0
Stream depth at point 7 (m)	0.56	0.36	0.1	0.325	-
Stream depth at point 8 (m)	0.42	0.35	0.12	0.335	-
Stream depth at point 9 (m)	0.23	0.25	0.045	0.33	-
Stream depth at point 10 (m)	0.11	0.22	0.01	0.21	-
Stream depth at point 11 (m)	0	0	0	0	-
Substrate gravel or larger (%)	5	2	25	75	10
Instream cover (%)	5	10	15	10	10
Left bank trees (%)	35	20	30	40	25
Left bank shrubs (%)	0	0	0	0	0
Left bank grasses/forbes (%)	65	80	70	50	65
Left bank cultivated fields (%)	0	0	0	0	0
Left bank other (%)	0	0	0	10*	10*
Right bank trees (%)	20	20	40	20	40
Right bank shrubs (%)	0	0	0	0	0
Right bank grasses/forbes (%)	80	75	55	75	58
Right bank cultivated fields (%)	0	0	0	0	0
Right bank other (%)	0	5*	5*	5*	2*
Total length of reach (m)			236		

\*Other on right and left bank = exposed substrate

### Diel Measurement Summary

**Start Date** 05/14/2013    **Start Time** 07:00  
**End Date** 05/15/2013    **End Time** 06:45  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

Parameter	STORET	Value
Temp Mean	00209	24.00
Temp Maximum	00210	25.64
Temp Minimum	00211	21.78
Spec Cond Mean	00212	520
Spec Cond Maximum	00213	572
Spec Cond Minimum	00214	480
pH Maximum	00215	7.49
pH Minimum	00216	7.36
Salinity Maximum	00217	0.28
Salinity Mean	00218	0.25
Salinity Minimum	00219	0.23
# Salinity Measurements	00220	96
# Temp Measurements	00221	96
# Spec Cond Measurements	00222	96
# pH Measurements	00223	96
DO Minimum	89855	5.61
DO Maximum	89856	6.04
DO Mean	89857	5.82
# DO Measurements	89858	96

**Diel Data**

**Date** 05/15/2013 **TCEQ ID** 11118  
**Site Name** Cedar Bayou Above Tidal at FM 1942

<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)	<b>Salinity</b> (ppt)
5/14/2013	7:00:32	21.79	7.36	5.95	67.9	480	0.23
5/14/2013	7:15:32	21.78	7.36	5.95	67.9	481	0.23
5/14/2013	7:30:32	21.78	7.37	5.95	67.9	482	0.23
5/14/2013	7:45:32	21.78	7.37	5.95	67.8	485	0.23
5/14/2013	8:00:32	21.78	7.37	5.94	67.8	487	0.23
5/14/2013	8:15:31	21.79	7.37	5.95	67.8	489	0.24
5/14/2013	8:30:32	21.81	7.38	5.95	67.9	492	0.24
5/14/2013	8:45:32	21.83	7.38	5.95	68.0	495	0.24
5/14/2013	9:00:31	21.87	7.39	5.95	68.0	497	0.24
5/14/2013	9:15:31	21.91	7.39	5.96	68.1	499	0.24
5/14/2013	9:30:32	21.96	7.39	5.95	68.1	502	0.24
5/14/2013	9:45:32	22.03	7.40	5.95	68.2	505	0.24
5/14/2013	10:00:32	22.11	7.40	5.96	68.4	508	0.24
5/14/2013	10:15:31	22.20	7.41	5.96	68.5	509	0.25
5/14/2013	10:30:31	22.32	7.41	5.97	68.7	512	0.25
5/14/2013	10:45:32	22.44	7.42	5.98	69.0	514	0.25
5/14/2013	11:00:32	22.59	7.42	5.98	69.2	520	0.25
5/14/2013	11:15:32	22.74	7.43	5.99	69.6	522	0.25
5/14/2013	11:30:32	22.90	7.44	6.00	69.9	521	0.25
5/14/2013	11:45:32	23.11	7.44	6.02	70.4	523	0.25
5/14/2013	12:00:32	23.31	7.45	6.02	70.7	524	0.25
5/14/2013	12:15:32	23.52	7.46	6.03	71.1	526	0.25
5/14/2013	12:30:32	23.73	7.46	6.03	71.4	528	0.25
5/14/2013	12:45:31	23.94	7.47	6.03	71.6	529	0.25
5/14/2013	13:00:31	24.15	7.47	6.04	72.1	535	0.26
5/14/2013	13:15:32	24.34	7.47	6.04	72.3	533	0.26
5/14/2013	13:30:32	24.55	7.47	6.04	72.6	534	0.26
5/14/2013	13:45:31	24.71	7.48	6.03	72.7	536	0.26
5/14/2013	14:00:32	24.90	7.48	6.03	72.9	536	0.26
5/14/2013	14:15:32	25.03	7.48	6.02	73.0	538	0.26
5/14/2013	14:30:32	25.14	7.48	6.00	73.0	538	0.26
5/14/2013	14:45:32	25.27	7.47	6.01	73.1	539	0.26
5/14/2013	15:00:32	25.35	7.48	5.98	72.9	535	0.26
5/14/2013	15:15:32	25.45	7.47	5.96	72.8	535	0.26
5/14/2013	15:30:32	25.51	7.47	5.94	72.7	535	0.26
5/14/2013	15:45:32	25.57	7.46	5.92	72.4	533	0.26
5/14/2013	16:00:32	25.60	7.46	5.89	72.2	531	0.26
5/14/2013	16:15:32	25.62	7.45	5.88	72.1	530	0.25
5/14/2013	16:30:32	25.63	7.45	5.86	71.8	529	0.25
5/14/2013	16:45:32	25.64	7.44	5.84	71.6	528	0.25
5/14/2013	17:00:32	25.64	7.44	5.82	71.3	528	0.25
5/14/2013	17:15:32	25.63	7.43	5.81	71.2	527	0.25
5/14/2013	17:30:32	25.59	7.43	5.77	70.7	527	0.25
5/14/2013	17:45:32	25.56	7.43	5.76	70.5	526	0.25
5/14/2013	18:00:32	25.52	7.42	5.75	70.4	525	0.25
5/14/2013	18:15:32	25.48	7.42	5.73	70.0	523	0.25
5/14/2013	18:30:32	25.45	7.41	5.71	69.7	521	0.25

Date (mm/dd/yyyy)	Time (hh:mm:ss)	Temp (°C)	pH Std. Units	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)	Salinity (ppt)
5/14/2013	18:45:32	25.42	7.41	5.67	69.2	518	0.25
5/14/2013	19:00:32	25.38	7.40	5.63	68.7	516	0.25
5/14/2013	19:15:32	25.34	7.40	5.61	68.4	514	0.25
5/14/2013	19:30:32	25.27	7.40	5.61	68.3	512	0.25
5/14/2013	19:45:32	25.18	7.39	5.61	68.2	510	0.24
5/14/2013	20:00:32	25.08	7.39	5.63	68.3	508	0.24
5/14/2013	20:15:32	25.00	7.39	5.64	68.4	507	0.24
5/14/2013	20:30:32	24.96	7.40	5.66	68.6	506	0.24
5/14/2013	20:45:32	24.93	7.40	5.68	68.7	505	0.24
5/14/2013	21:00:32	24.92	7.41	5.68	68.7	504	0.24
5/14/2013	21:15:32	24.90	7.41	5.68	68.7	505	0.24
5/14/2013	21:30:32	24.87	7.41	5.67	68.5	505	0.24
5/14/2013	21:45:32	24.82	7.41	5.67	68.5	506	0.24
5/14/2013	22:00:32	24.76	7.42	5.68	68.5	508	0.24
5/14/2013	22:15:32	24.70	7.42	5.68	68.5	510	0.24
5/14/2013	22:30:32	24.64	7.42	5.68	68.3	511	0.25
5/14/2013	22:45:32	24.58	7.42	5.69	68.4	513	0.25
5/14/2013	23:00:32	24.52	7.41	5.67	68.1	509	0.24
5/14/2013	23:15:32	24.45	7.40	5.68	68.1	503	0.24
5/14/2013	23:30:32	24.39	7.40	5.66	67.9	503	0.24
5/14/2013	23:45:32	24.34	7.40	5.65	67.7	505	0.24
5/15/2013	0:00:32	24.29	7.40	5.66	67.7	506	0.24
5/15/2013	0:15:32	24.24	7.40	5.64	67.4	504	0.24
5/15/2013	0:30:32	24.19	7.41	5.68	67.8	508	0.24
5/15/2013	0:45:32	24.14	7.41	5.68	67.8	511	0.25
5/15/2013	1:00:32	24.10	7.42	5.69	67.9	513	0.25
5/15/2013	1:15:32	24.04	7.42	5.71	68.0	515	0.25
5/15/2013	1:30:32	24.00	7.41	5.71	67.9	513	0.25
5/15/2013	1:45:32	23.95	7.41	5.72	67.9	510	0.25
5/15/2013	2:00:32	23.90	7.41	5.72	67.9	512	0.25
5/15/2013	2:15:32	23.85	7.42	5.73	68.0	515	0.25
5/15/2013	2:30:32	23.80	7.42	5.74	68.0	519	0.25
5/15/2013	2:45:32	23.76	7.43	5.74	68.0	521	0.25
5/15/2013	3:00:32	23.72	7.43	5.75	68.0	523	0.25
5/15/2013	3:15:32	23.68	7.43	5.75	67.9	525	0.25
5/15/2013	3:30:32	23.65	7.44	5.76	68.0	526	0.25
5/15/2013	3:45:32	23.61	7.44	5.77	68.1	531	0.26
5/15/2013	4:00:32	23.57	7.44	5.77	68.1	533	0.26
5/15/2013	4:15:32	23.54	7.44	5.77	68.0	534	0.26
5/15/2013	4:30:32	23.50	7.45	5.78	68.1	537	0.26
5/15/2013	4:45:32	23.46	7.45	5.78	68.1	540	0.26
5/15/2013	5:00:32	23.43	7.45	5.79	68.1	540	0.26
5/15/2013	5:15:32	23.39	7.45	5.80	68.2	541	0.26
5/15/2013	5:30:32	23.35	7.46	5.80	68.2	547	0.26
5/15/2013	5:45:32	23.32	7.47	5.81	68.3	557	0.27
5/15/2013	6:00:32	23.28	7.49	5.82	68.3	566	0.27
5/15/2013	6:15:32	23.24	7.49	5.83	68.4	569	0.27
5/15/2013	6:30:32	23.21	7.49	5.84	68.4	570	0.28
5/15/2013	6:45:32	23.18	7.49	5.84	68.4	572	0.28

### Diel Measurement Summary

**Start Date** 06/30/2013    **Start Time** 12:00  
**End Date** 07/01/2013    **End Time** 11:45  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

Parameter	STORET	Value
Temp Mean	00209	29.08
Temp Maximum	00210	30.94
Temp Minimum	00211	26.85
Spec Cond Mean	00212	1482
Spec Cond Maximum	00213	1634
Spec Cond Minimum	00214	1342
pH Maximum	00215	8.32
pH Minimum	00216	8.04
Salinity Maximum	00217	0.82
Salinity Mean	00218	0.74
Salinity Minimum	00219	0.66
# Salinity Measurements	00220	96
# Temp Measurements	00221	96
# Spec Cond Measurements	00222	96
# pH Measurements	00223	96
DO Minimum	89855	4.71
DO Maximum	89856	8.25
DO Mean	89857	6.16
# DO Measurements	89858	96

**Diel Data**

**Date** 07/01/2013 **TCEQ ID** 11118

**Site Name** Cedar Bayou Above Tidal at FM 1942

<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)	<b>Salinity</b> (ppt)
6/30/2013	12:00:32	29.03	8.04	5.76	75.2	1344	0.67
6/30/2013	12:15:32	29.11	8.05	5.84	76.4	1343	0.67
6/30/2013	12:30:32	29.23	8.06	6.04	79.1	1342	0.66
6/30/2013	12:45:32	29.34	8.08	6.28	82.4	1342	0.66
6/30/2013	13:00:32	29.47	8.09	6.43	84.6	1343	0.66
6/30/2013	13:15:32	29.60	8.11	6.70	88.3	1343	0.66
6/30/2013	13:30:32	29.74	8.12	6.94	91.7	1345	0.67
6/30/2013	13:45:32	29.89	8.13	7.02	93.0	1347	0.67
6/30/2013	14:00:32	29.99	8.16	7.25	96.2	1349	0.67
6/30/2013	14:15:32	30.08	8.18	7.45	99.0	1351	0.67
6/30/2013	14:30:32	30.17	8.19	7.60	101.3	1352	0.67
6/30/2013	14:45:32	30.25	8.20	7.76	103.5	1355	0.67
6/30/2013	15:00:32	30.34	8.21	7.93	105.9	1357	0.67
6/30/2013	15:15:32	30.42	8.21	7.97	106.6	1359	0.67
6/30/2013	15:30:32	30.50	8.22	8.10	108.5	1361	0.67
6/30/2013	15:45:32	30.56	8.24	8.25	110.5	1363	0.67
6/30/2013	16:00:31	30.62	8.25	8.22	110.3	1365	0.68
6/30/2013	16:15:31	30.67	8.26	8.19	110.1	1367	0.68
6/30/2013	16:30:32	30.71	8.26	8.24	110.8	1369	0.68
6/30/2013	16:45:32	30.74	8.26	8.20	110.2	1372	0.68
6/30/2013	17:00:32	30.78	8.27	8.21	110.5	1374	0.68
6/30/2013	17:15:32	30.80	8.27	8.18	110.2	1377	0.68
6/30/2013	17:30:32	30.83	8.27	8.11	109.2	1381	0.68
6/30/2013	17:45:32	30.84	8.28	8.11	109.2	1385	0.69
6/30/2013	18:00:32	30.86	8.28	8.03	108.2	1389	0.69
6/30/2013	18:15:32	30.87	8.29	7.95	107.2	1395	0.69
6/30/2013	18:30:32	30.88	8.28	7.92	106.7	1401	0.69
6/30/2013	18:45:32	30.91	8.29	7.85	105.9	1409	0.70
6/30/2013	19:00:32	30.93	8.30	7.79	105.1	1418	0.70
6/30/2013	19:15:31	30.94	8.31	7.76	104.7	1428	0.71
6/30/2013	19:30:32	30.94	8.31	7.63	103.0	1437	0.71
6/30/2013	19:45:32	30.92	8.31	7.56	102.0	1447	0.72
6/30/2013	20:00:32	30.90	8.32	7.47	100.7	1456	0.72
6/30/2013	20:15:32	30.85	8.32	7.35	99.1	1465	0.73
6/30/2013	20:30:32	30.81	8.32	7.21	97.2	1476	0.73
6/30/2013	20:45:32	30.75	8.31	7.10	95.6	1486	0.74
6/30/2013	21:00:31	30.69	8.31	6.96	93.6	1496	0.74
6/30/2013	21:15:32	30.63	8.31	6.85	92.0	1505	0.75
6/30/2013	21:30:32	30.56	8.31	6.77	90.8	1516	0.75
6/30/2013	21:45:31	30.48	8.31	6.60	88.4	1526	0.76
6/30/2013	22:00:31	30.40	8.30	6.47	86.5	1536	0.76
6/30/2013	22:15:32	30.32	8.30	6.38	85.2	1545	0.77
6/30/2013	22:30:32	30.23	8.30	6.28	83.8	1555	0.77
6/30/2013	22:45:32	30.14	8.30	6.16	82.0	1565	0.78
6/30/2013	23:00:32	30.04	8.30	6.02	80.0	1574	0.78
6/30/2013	23:15:31	29.94	8.29	5.91	78.5	1583	0.79
6/30/2013	23:30:31	29.83	8.29	5.80	76.8	1592	0.79
6/30/2013	23:45:32	29.72	8.29	5.70	75.4	1600	0.80
7/1/2013	0:00:32	29.62	8.29	5.62	74.1	1607	0.80

Date (mm/dd/yyyy)	Time (hh:mm:ss)	Temp (°C)	pH Std. Units	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)	Salinity (ppt)
7/1/2013	0:15:32	29.51	8.29	5.52	72.8	1614	0.81
7/1/2013	0:30:32	29.41	8.29	5.43	71.5	1619	0.81
7/1/2013	0:45:32	29.31	8.29	5.37	70.5	1624	0.81
7/1/2013	1:00:32	29.21	8.28	5.28	69.3	1627	0.81
7/1/2013	1:15:32	29.11	8.28	5.25	68.7	1630	0.82
7/1/2013	1:30:32	29.02	8.28	5.17	67.6	1632	0.82
7/1/2013	1:45:32	28.92	8.28	5.13	66.9	1633	0.82
7/1/2013	2:00:32	28.82	8.28	5.10	66.5	1634	0.82
7/1/2013	2:15:32	28.73	8.27	5.06	65.7	1634	0.82
7/1/2013	2:30:32	28.64	8.27	5.04	65.5	1633	0.82
7/1/2013	2:45:32	28.54	8.27	5.01	64.9	1631	0.82
7/1/2013	3:00:32	28.45	8.26	5.00	64.7	1629	0.82
7/1/2013	3:15:32	28.36	8.26	4.98	64.3	1625	0.81
7/1/2013	3:30:32	28.27	8.25	4.97	64.1	1621	0.81
7/1/2013	3:45:32	28.18	8.25	4.97	64.0	1615	0.81
7/1/2013	4:00:32	28.09	8.24	4.90	63.0	1610	0.81
7/1/2013	4:15:32	28.00	8.23	4.93	63.2	1602	0.80
7/1/2013	4:30:32	27.92	8.23	4.91	62.9	1591	0.80
7/1/2013	4:45:32	27.85	8.22	4.87	62.3	1583	0.79
7/1/2013	5:00:32	27.76	8.21	4.88	62.4	1571	0.79
7/1/2013	5:15:32	27.68	8.20	4.85	61.8	1558	0.78
7/1/2013	5:30:32	27.61	8.19	4.85	61.8	1545	0.77
7/1/2013	5:45:32	27.53	8.18	4.88	62.1	1531	0.77
7/1/2013	6:00:32	27.45	8.18	4.86	61.7	1519	0.76
7/1/2013	6:15:32	27.37	8.17	4.86	61.6	1510	0.75
7/1/2013	6:30:32	27.31	8.16	4.83	61.2	1501	0.75
7/1/2013	6:45:32	27.25	8.15	4.84	61.2	1495	0.75
7/1/2013	7:00:32	27.19	8.14	4.76	60.2	1488	0.74
7/1/2013	7:15:32	27.14	8.12	4.72	59.6	1485	0.74
7/1/2013	7:30:32	27.06	8.13	4.71	59.4	1478	0.74
7/1/2013	7:45:32	27.00	8.13	4.83	60.9	1471	0.73
7/1/2013	8:00:32	26.96	8.13	4.88	61.4	1467	0.73
7/1/2013	8:15:32	26.91	8.13	4.94	62.2	1463	0.73
7/1/2013	8:30:32	26.89	8.13	4.95	62.2	1461	0.73
7/1/2013	8:45:32	26.86	8.13	5.01	63.0	1459	0.73
7/1/2013	9:00:32	26.85	8.13	5.07	63.7	1458	0.73
7/1/2013	9:15:32	26.85	8.13	5.09	64.0	1457	0.73
7/1/2013	9:30:32	26.85	8.13	5.11	64.2	1457	0.73
7/1/2013	9:45:32	26.87	8.13	5.17	64.9	1457	0.73
7/1/2013	10:00:32	26.90	8.13	5.24	65.9	1458	0.73
7/1/2013	10:15:32	26.93	8.13	5.34	67.2	1459	0.73
7/1/2013	10:30:32	26.97	8.13	5.40	68.0	1459	0.73
7/1/2013	10:45:32	27.04	8.14	5.51	69.5	1460	0.73
7/1/2013	11:00:32	27.12	8.14	5.66	71.5	1461	0.73
7/1/2013	11:15:32	27.20	8.14	5.78	73.1	1462	0.73
7/1/2013	11:30:32	27.27	8.15	5.85	74.1	1463	0.73
7/1/2013	11:45:32	27.39	8.16	6.06	76.9	1464	0.73

### Additional Parameter Data

**Date** 05/15/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

Description	STORET	Value/Split	
<i>E. coli</i> IDEXX Colilert (MPN/100 ml)	31699	156	
Enterococcus, IDEXX Enterolert (MPN/100ml)	31701	565	
Holding Time, <i>E. coli</i> IDEXX Colilert (hh:mm)	31704	4:03	
Sampling depth (m)	00068	0.30	0.30
TSS (mg/l)	00530	50.0	47.0
VSS (mg/l)	00535	N/A	
Ammonia-N, Total (mg/l)	00610	0.60	0.59
Total Kjeldahl Nitrogen (mg/l)	00625	1.5	1.7
Nitrate/Nitrite-N, Total (mg/l)	00630	0.53	0.54
Total Phosphorus-P (mg/l)	00665	0.76	0.76
Orthophosphate-P, field filtered (mg/l)	00671	0.62	0.64
TOC (mg/l)	00680	N/A	
Chloride (mg/l)	00940	180	160
Sulfate (mg/l)	00945	62.8	59.8
Chlorophyll-a, spectrophotometric method (ug/L)	32211	< 3.0	< 3.0
TDS, dried @ 180°C (mg/l)	70300	N/A	
Turbidity, lab nephelometric turbidity units (NTU)	82079	45.0	45.8
Hardness, total (mg/l as CaCO <sub>3</sub> )	82394	122	126
Temperature (°C)	00010	23.10	
Secchi Depth (m)	00078	0.187	
Specific Conductance (µS/cm)	00094	619	
DO (mg/L)	00300	5.92	
pH (standard units)	00400	7.52	
Salinity (ppt)	00480	0.30	
Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry)	01351	3	
Days Since Last Significant Rainfall (days)	72053	4	
Total Water Depth (m)	82903	0.750	
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	

\*Not included in 2013 A7 table, but included in previous studies



### Additional Parameter Data

**Date** 07/01/2013  
**Site** Cedar Bayou Above Tidal at FM 1942  
**TCEQ ID** 11118

Description	STORET	Value
<i>E. coli</i> IDEXX Colilert (MPN/100 ml)	31699	52
Enterococcus, IDEXX Enterolert (MPN/100ml)	31701	905
Holding Time, <i>E. coli</i> IDEXX Colilert (hh:mm)	31704	1:58
Sampling depth (m)	00068	0.08
TSS (mg/l)	00530	34.4
VSS (mg/l)	00535	6.4
Ammonia-N, Total (mg/l)	00610	< 0.10
Total Kjeldahl Nitrogen (mg/l)	00625	3.0
Nitrate/Nitrite-N, Total (mg/l)	00630	0.21
Total Phosphorus-P (mg/l)	00665	1.85
Orthophosphate-P, field filtered (mg/l)	00671	1.42
TOC (mg/l)	00680	9.6
Chloride (mg/l)	00940	230
Sulfate (mg/l)	00945	120.8
Chlorophyll-a, spectrophotometric method (ug/L)	32211	8.9
TDS, dried @ 180°C (mg/l)	70300	860
Turbidity, lab nephelometric turbidity units (NTU)	82079	19.5
Hardness, total (mg/l as CaCO <sub>3</sub> )	82394	220
Temperature (°C)	00010	27.96
Secchi Depth (m)	00078	0.270
Specific Conductance (µS/cm)	00094	1492
DO (mg/L)	00300	7.46
pH (standard units)	00400	8.11
Salinity (ppt)	00480	0.74
Flow Severity (1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry)	01351	2
Days Since Last Significant Rainfall (days)	72053	22
Total Water Depth (m)	82903	0.583
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*	3
Water Odor (1=sewage, 2=Chemical, 3=Rotten Egg, 4=Musky, 5=Fishy, 6=None, 7=Other)	89971*	6

\*Not included in 2013 A7 table, but included in previous studies



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

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

Right Bank **TRANSECT** Left Bank  
**1**

Downstream





Upstream

**CRITICAL**  
**Near bottom of Reach:**

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

Downstream







Upstream

**CRITICAL**  
**Middle of Reach:**

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

Downstream





Upstream

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

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

Downstream





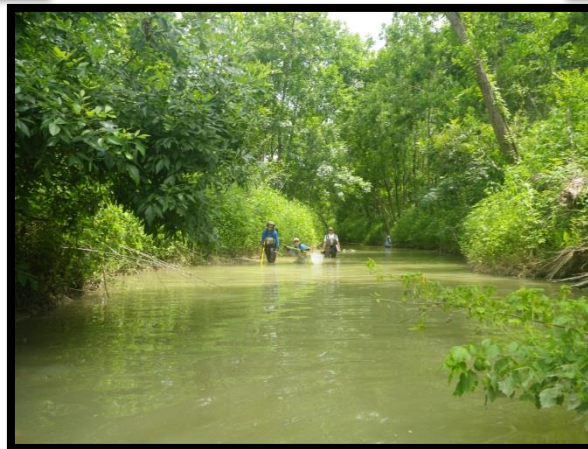
Right Bank

Upstream

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

Left Bank

Downstream



## Nekton Photographic Vouchers – Index Period



Figure 3 Alligator gar (*Atractosteus spatula*; 442mm) captured during electroshocking in index period at site 11118.

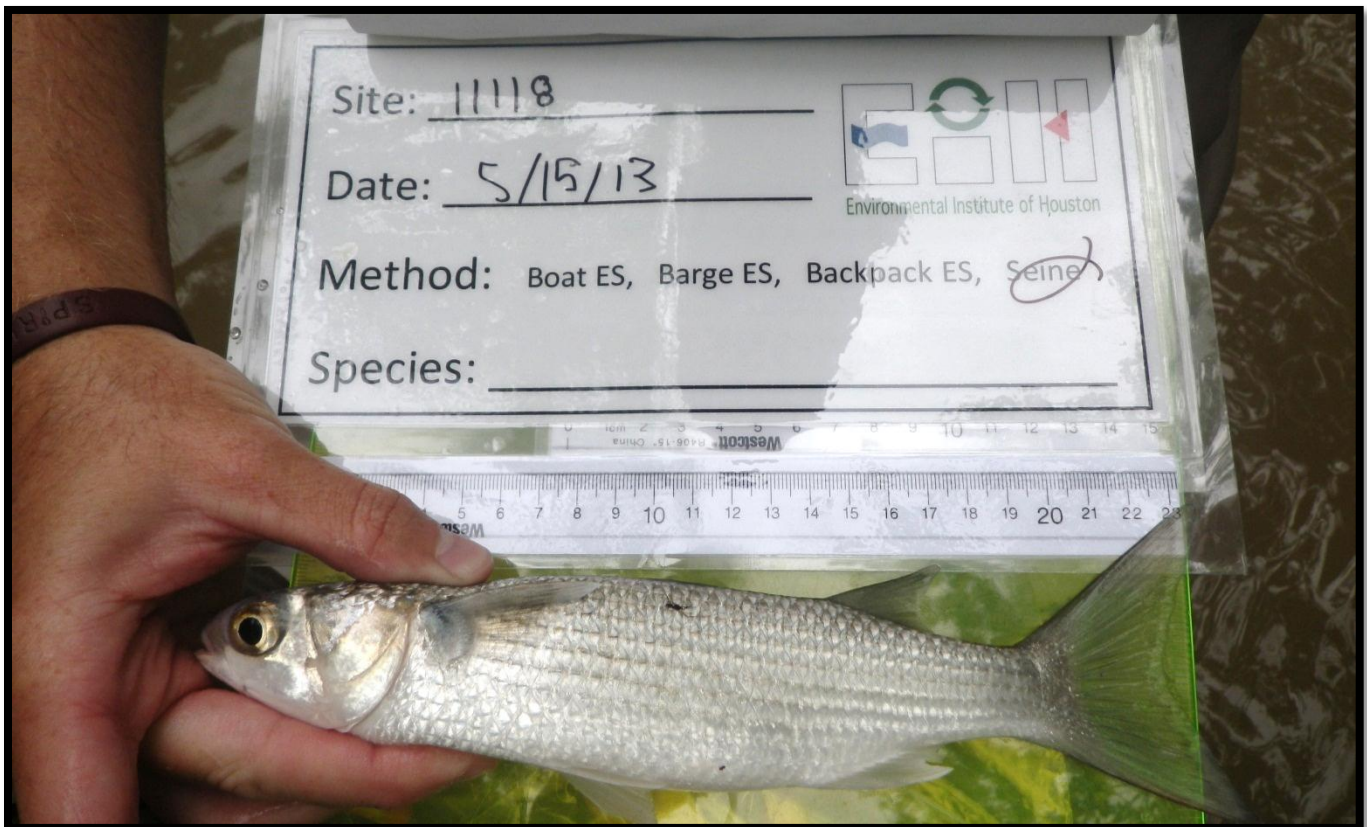


Figure 4 Striped mullet (*Mugil cephalus*; 199mm) captured during seining in index period at site 11118.

Nekton Photographic Vouchers – Critical Period



Figure 5 Channel catfish (*Ictalurus punctatus*; 150mm) captured during seining in critical period at site 11118.

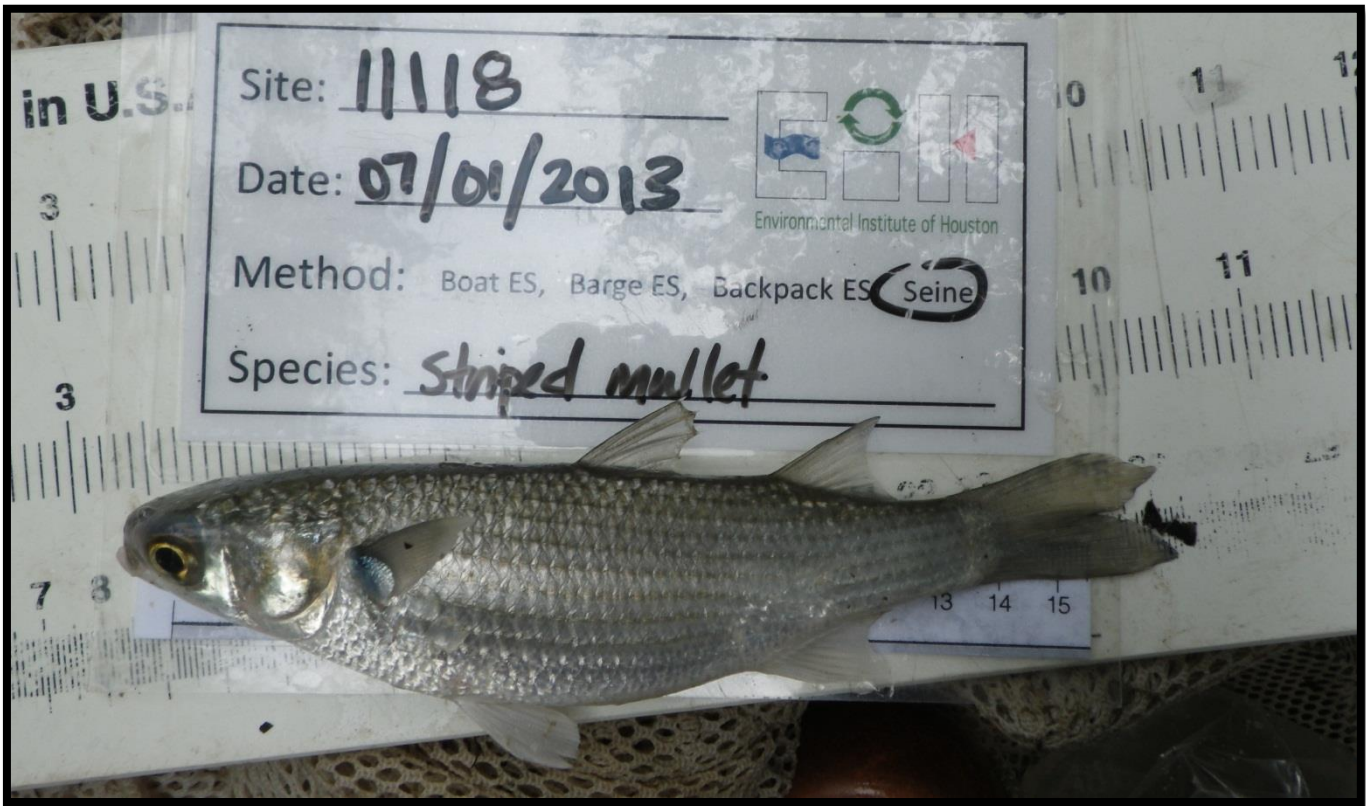


Figure 6 Striped mullet (*Mugil cephalus*; 136mm) captured during seining in critical period at site 11118.