Central and Southeast Texas Recreational Use Attainability Analyses Project
Upper Oyster Creek (Segment 1245) Comprehensive RUAA

Results Report

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Prepared by:
George Guillen, Jenny Wrast, and Alecya Gallaway
University of Houston-Clear Lake

Principal Investigator
George Guillen

Environmental Institute of Houston
University of Houston Clear Lake
2700 Bay Area Blvd
Houston, Texas 77058

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TCEQ Contact:
Amanda Ross
Total Maximum Daily Load Team
Texas Commission on Environmental Quality
P.O. BOX 13087
Austin, Texas 78711-3087
512-239-6646
aross@tceq.state.tx.us

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Introduction

Problem Statement

Upper Oyster Creek was first placed on the state's 303(d) list for violation of bacteria criteria associated with primary recreation uses in 1996. High levels of indicator bacteria had been noted for many years prior to this listing. A bacteria Total Maximum Daily Load (TMDL) for Upper Oyster Creek (UOC) Segment 1245 has already been adopted by the Texas Commission on Environmental Quality (TCEQ), but the appropriateness of its currently designated recreational use category needed to be determined (TCEQ 2007). Recreational Use Attainability Analyses (RUAA) are scientific assessments, that are used to determine existing and attainable recreational use for a water body, and if that use might be different than the presumed recreational use as specified in the Clean Water Act. In June, 2009 a Comprehensive RUAA was initiated on Upper Oyster Creek, segment 1245. This Comprehensive RUAA Report will provide TCEQ Standards Team with relevant information needed to determine the appropriate attainable use for Upper Oyster Creek (Segment 1245). The completion of this comprehensive RUAA consisted of several important interrelated components including 1) reconnaissance and site selection, 2) actual conducting the comprehensive RUAA and 3) public outreach. The actual objectives of each component are listed below.

Objectives

1. Reconnaissance and Site Selection

The site reconnaissance and selection (recon) phase is considered one of the first steps in a Comprehensive RUAA. The primary objective of this phase is to select survey sites that would be accessible to users and most likely characterize recreational uses in the watershed. This was

accomplished primary with the input of local, state and regional agency staff familiar with the watershed. This meeting occurred on July 15, 2009 at the University of Houston (UH) Sugar Land campus. Reconnaissance surveys were conducted on July 24 and 27, 2009 based on input from this meeting.

2. Comprehensive Recreational Use Attainability Analysis

The primary objective of the Upper Oyster Creek Comprehensive RUAA was to characterize the recreational use and potential impediments to use for this stream. A Basic RUAA Survey was conducted as part of the Comprehensive RUAA. The Basic RUAA survey was conducted on August 7, 8 and 14, 2009, to collect information on a water body and associated uses. During these dates field surveys were conducted at selected sites where there is a high probability of detecting recreation use. The objective is to document and characterize observed use, site conditions (hydrology, physical attributes), and weather during the survey. In addition to the field activities previously discussed in the Basic RUAA Survey section, a historical information review and interviews were also conducted for the Comprehensive RUAA. The objective of these reviews and interviews were to supplement the data obtained from the field surveys and increase the probability of detecting and characterizing recreational uses in the watershed if it exists.

3. Public Participation

The objective of the public participation phase of the Comprehensive RUAA is to solicit as much information from various watershed stakeholders including agency staff, citizens, recreational user groups and other interested parties on the historical and current recreational uses in the Upper Oyster Creek watershed. This included sending out email and phone messages to key

organizations and staff familiar with the watershed. This contact list is provided in Appendix 1. In addition, on July 15, 2009 a special technical working group meeting held at the UH Sugar Land campus to gather information on the watershed including likely recreational access points. Finally, a public meeting was advertised via public notice by TCEQ and held at the UH Sugar Land campus on August 24, 2009 to present the findings of this study and gather more information on potential observed or known recreational uses within the watershed from the attending public.

Study Area

Description of Water Body

Upper Oyster Creek is located within the Brazos River Basin, immediately southwest of Houston in northern Fort Bend County. Upper Oyster Creek watershed encompasses four incorporated towns and cities: Fulshear, Sugar Land, Stafford and Missouri City (Figure 1). Segment 1245 classified by the Texas Commission on Environmental Quality is approximately fifty-four miles of the watershed. Segment 1245, though named Upper Oyster Creek, also includes parts of Jones Creek, Oyster Creek, Flat Bank Creek, a diversion canal, and Steep Bank Creek. Segment 1245 begins at the Shannon Pump Station on the Brazos River and is impounded within the city of Sugar Land. The segment extends below this impoundment before ending at the confluence with the Brazos River. The assessment units sampled in this study are: 1) 1245_01 (From the confluence with the Brazos River upstream to Dam #3) 36.9 river miles. 2) 1245_02 (From Dam #3 upstream to Harmon St. Crossing in Sugar Land) 5.2 river miles. 3) 1245_3 (From Harmon St. crossing in Sugar Land upstream to the end of the segment) 13.4 river miles (Figure 1).

The dominant land use category in the watershed is pasture, which accounts for 56.1 percent of the total area. The urban areas (urban mixed and residential) occupy 24 percent of land cover within the watershed. Other land uses include rangeland at 9.5 percent, forest at 7.2 percent, and water at 3.2 percent (TCEQ, 2007).

Environmental Features and Population Characteristics

The climate in the Upper Oyster Creek watershed is classified as subtropical, which is defined as having hot, humid summers and dry winters. The Upper Oyster Creek watershed is within the upper portion of the Gulf Coast Prairies and Marshes ecoregion, an area characterized as containing nearly level, un-dissected plains with native vegetation types composed of tall grass prairie and post oak savanna. The elevation of the area is approximately 80 feet above mean sea level (TCEQ, 2007).

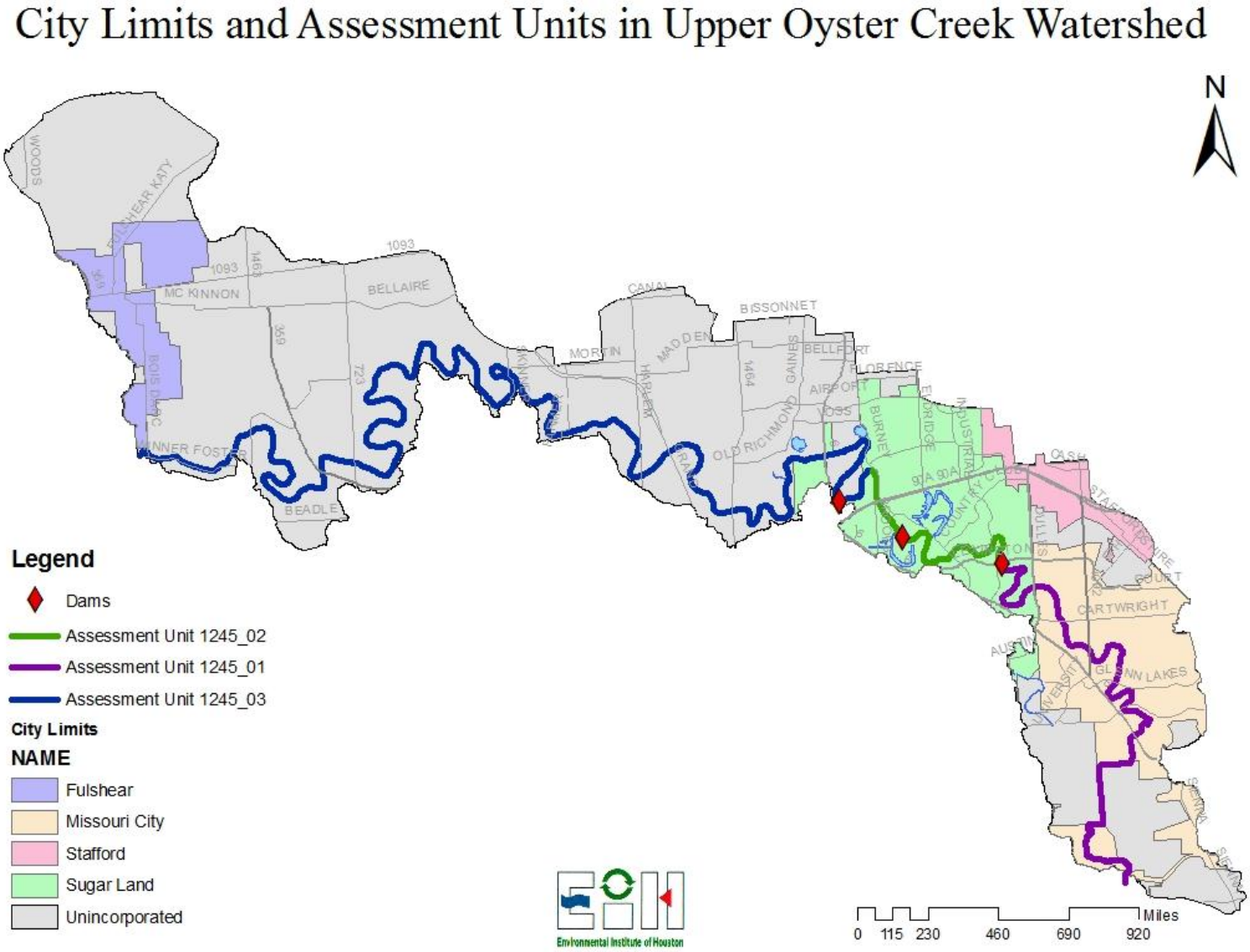

Figure 1 . City Limits and Assessment Units in Upper Oyster Creek Watershed (TCEQ Segment 1245) for Comprehensive Recreational Use Attainability Analysis Survey.

Upper Oyster Creek has been highly modified, and serves as a portion of water conveyance system for the Gulf Coast Water Authority (GCWA). Upper Oyster Creek is rapidly becoming urbanized. The population of the Upper Oyster Creek watershed in 2000 was estimated to be 96,273 people (31,573 households), with an overall average population density of 877 persons per square mile (U.S. Census Bureau, 2000). The population of Fort Bend County is estimated by the U.S. Census Bureau to have increased approximately 6 percent per year since the 2000 census, so the current watershed population may exceed 125,000 (TCEQ, 2007).

The population estimates for Sugar Land are held constant after the year 2010 because the city is expected to be completely built-out by this date. However, TWDB estimates may not account for future annexations that could occur. Annexations were used to drive the city's population growth in the 1990s. The 2000 census figures show a 158 percent increase in the population of Sugar Land since 1990 (TCEQ, 2007).

Watershed Characterization

Three small dams on Upper Oyster Creek are located on the watercourse around the City of Sugar Land. The dams form impoundments to maintain nearly constant water levels for industrial and recreational uses. These off-channel lakes create "lakefront" property with commensurate aesthetic and monetary value. There are two distinct hydrologic reaches within the Upper Oyster Creek segment. The upper reach extends from the GCWA Shannon Pump Station on the Brazos River to Dam #3 within the City of Sugar Land. The lower reach begins at Dam #3 and continues downstream through Steep Bank Creek to its confluence with the Brazos River.

The GCWA uses the reach above Dam #3 as a section of its Canal System A, which supplies water for irrigation, industrial, and public drinking supply to areas southeast of the watershed in

addition to uses in the vicinity of the City of Sugar Land (TCEQ, 2007). Dam #3 retains water for Alkire, Eldridge, and Horseshoe Lakes, and also serves to retain water for the GCWA Second Lift Station where water is pumped into the American Canal for transport to the Texas City area.

The hydrology of the reach below Dam #3 is highly influenced by the presence of the dam and the Second Lift Station. Small amounts of seepage do occur through Dam #3, and there is uncontrolled, excess rainfall runoff over the dam into the lower reach (TCEQ, 2007). The Second Lift Station, however, operates under most wet-weather conditions to capture portions of the rainfall runoff, which reduces the amount released below Dam #3. The lower reach contains no retention structures, and is characterized by reduced flow composed of small amounts of seepage from Dam #3, contributions from municipal dischargers, natural contributions from the drainage area below Dam #3, and excess rainfall runoff that is not diverted from the upper reach above Dam #3. The reach below Dam #3 is also hydrologically modified, though not for conveyance of water supplies and impoundment of water, but rather for flood prevention.

Permitted Discharges (Municipal, Industrial, Stormwater)

Upper Oyster Creek is affected by municipal and industrial wastewater discharges and by storm water runoff from agricultural, industrial, and urban areas (Figure 2). Under TPDES, the TCEQ has issued permits to discharge treated wastewater to 15 facilities within the watershed (TCEQ, 2007). All 15 are domestic wastewater (sewage) treatment facilities. Two additional facilities within the segment have been issued permits without provisions that allow discharge of wastewater—the Texas Department of Criminal Justice (TDCJ), for a confined animal feeding operation (CAFO) with land application of solid and liquid waste, and Bono Brothers Inc., for beneficial land application of sewage sludge and domestic septage. Finally, Hines Nurseries has a

permit for discharge of a small amount of domestic wastewater and a permit to discharge storm/irrigation waters.

From approximately 2000 to mid-2004, domestic wastewater facilities discharged a reported average of 11.9 million gallons per day (MGD) into Upper Oyster Creek, which is well below the total of 31.9 MGD allowed for all permitted discharges (TCEQ, 2007). A number of facilities have become operational since 2004; no monitored discharge information is provided for these facilities. Rapid urbanization of the watershed is correlated with a steadily increasing wastewater input into the segment, as indicated by increases in discharge limits for some municipal facilities within the segment and the addition of new discharge permits in recent years.

The City of Sugar Land and Fort Bend County Water Control and Improvement District (WCID) #2 permits allow the largest discharge of the wastewater facilities at over 5 MGD each (TCEQ 2007). The other wastewater facilities with permitted wastewater discharges of greater than 1 MGD are Quail Valley Utility District, Missouri City, and Fort Bend County Municipal Utility Districts (MUDs) #s 25, 118, and 142. Except for the City of Missouri City, the wastewater permits do not include specific limits or monitoring requirements for indicator bacteria concentrations in their effluents. (Missouri City's permit requires monitoring because the facility uses ultraviolet light disinfection rather than chlorination/dechlorination). With the exception of Hines Nurseries (which is permitted to discharge domestic-type waste, but does not actually do so based on self-reporting data), all permitted facilities are required to disinfect their treated effluent prior to discharge. Disinfection is designed to reduce or eliminate bacteria from the effluent.

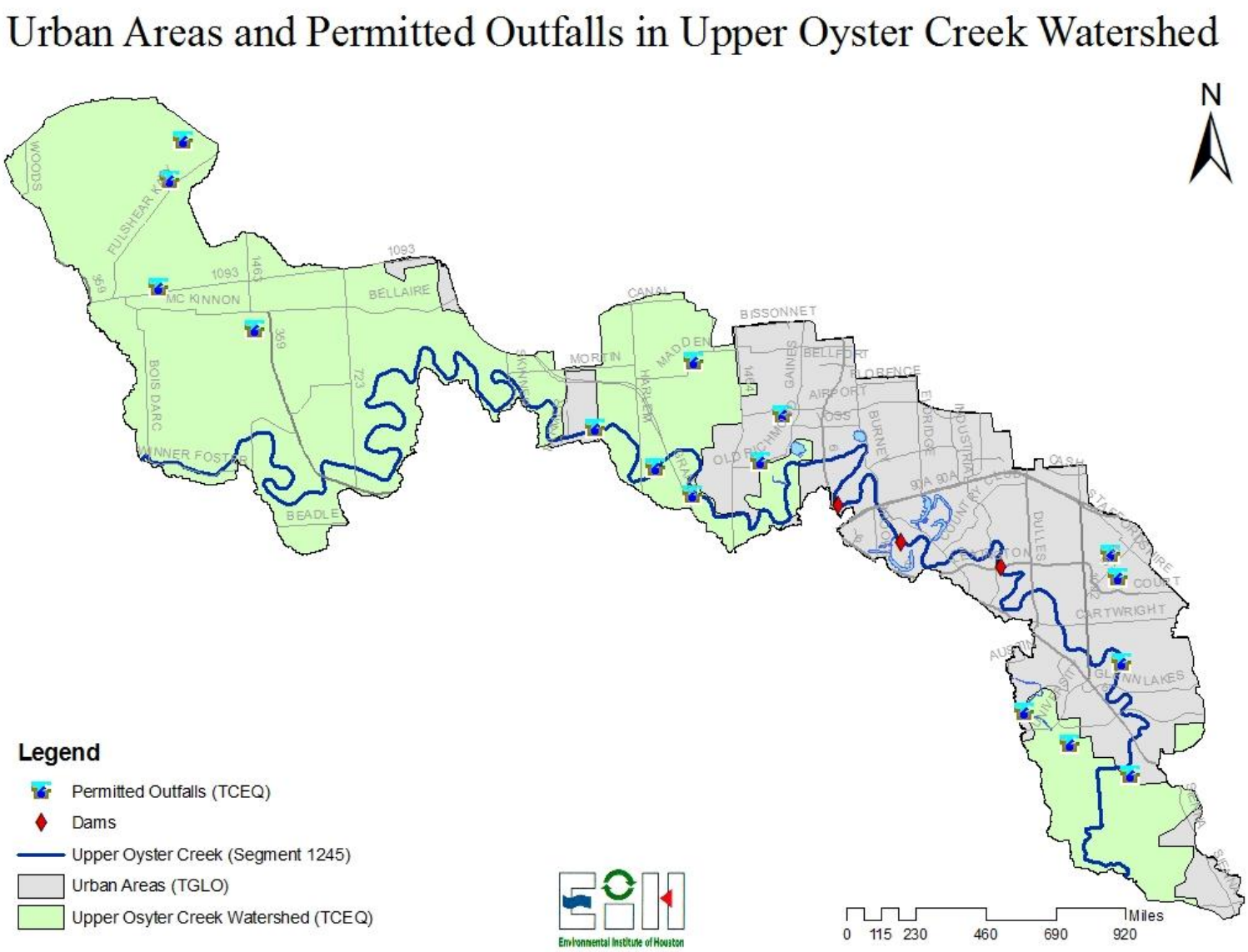

Figure 2. Urban Areas and Permitted Outfalls in Upper Oyster Creek Watershed (TCEQ Segment 1245) for Comprehensive Recreational Use Attainability Analysis Survey.

Potential Nonpoint Sources

For any urban collection and treatment system, sanitary sewer overflows and WWTF bypasses are possible sources of bacteria loadings to receiving waters. Concerns related to overflows and bypasses are heightened in areas with relatively high rainfall, such as the Upper Oyster Creek watershed. Because of the rapid and continuing population growth in the watershed, some of the supporting infrastructure has been built recently and has underutilized capacity, which reduces the likelihood of overflow and bypass events. Nonetheless, occurrences of such events and their subsequent impacts on bacteria loading must be recognized. Nonpoint sources and Bacterial Source tracking was further reported in TCEQ's *One Total Maximum Daily Load for Bacteria in Upper Oyster Creek, 2007*.

History of Recreational Use in Upper Oyster Creek

Historical Summary

Upper Oyster Creek has been a multi-use waterway since Stephen F. Austin's "Old Three hundred Families" began settling in the Brazos River Basin in 1821. The fertile land above the tidal waters along the upper reaches of the creek was where some of the most productive cotton and sugar plantations were established. Each plantation had a landing and the creek was busy with small boat traffic carrying cotton and sugarcane downstream to be shipped to Galveston and New Orleans (The Handbook of Texas, 2009)

Sugar mills were in production by the late 1820s and commercial and transportation activities along Upper Oyster Creek drove real estate and industrial development along the creek. By 1888 the San Antonio and Aransas Pass Railroad was given a right-of-way and towns and local industries built up along the rails near the creek. The historical accounts of the communities and towns that sprung up along the creek give several accounts of recreational use along the

creek. During the late 1800s, Upper Oyster Creek was the site of picnics, fishing, boating, swimming and many other types of social gatherings. Upper Oyster Creek has been historically important for agriculture production. By 1908 the American Canal System had been dredged to supply fresh water irrigation to rice farmers and by 1931 it had been expanded and in 1931 The Briscoe Canal System was constructed. These irrigation canals supplied water to miles of rice fields from Upper Oyster Creek to Galveston Bay. Upper Oyster Creek has been historically important for agriculture production (Timeline of the Brazos River Basin, 2009). Recent recreational activities are summarized as follows:

Boating

Boating has been one of the most constant uses of Upper Oyster Creek. It began as the transportation route for the earliest settlers and evolved to be one of the most popular kayaking and canoeing waterways in Fort Bend County. Members of the Houston Canoe Club, established in 1964, have been using the creek for outings since its organization. One of their access points is located on Oyster Creek just off Highway 6 in Sugar Land (Houston Canoe Club 2009) (Figure 3).

Figure 3. Houston Canoe Club trip of June 13, 2009. Access Point for this out and back trip is Oyster Creek Park, just off Highway 6 in Sugar Land (Houston Canoe Club 2009).

Today the Greater Houston Rowing Club established in 1988, has established its headquarters on Upper Oyster Creek and uses 3.5 miles of the waterway as its training grounds (Greater Houston Rowing Club 2009) (Figure 4).

Figure 4. Photo of sculling from the Greater Houston Rowing Club's website.

The Bayou Preservation Association (BPA) established in 1966, lists the creek as one of its choices for Houston paddlers and provides a paddling trail for this stream (BPA 2009). On their website they state "*Long known as a place to paddle, but always a mystery as where to paddle to. This guide will show several trips to and from "hidden" parks and even makes use of parts of the oxbow lakes. The new City of Houston Park, Joseph S. & Lucie H. Cullinan Park, is set right at the top of the floatable portion of the creek. Locations of the couple of dams and low water bridges are also given*". The go on to provide detailed directions of the three, 3-mile segments and where to launch and portages sites:

Segment 1: JosephS. & Lucie H. Cullinan Park to Lonnie Green Playground, three miles
KeyMap Locations: 567H, 567M, 568E, 568K

Quote: "Right at the entrance to the park is a small gravel road that leads down to the creek. This spot has long been used by fishermen"

Segment 2: Lonnie Green Playground to Sugarwood Community Park 3 miles
KeyMap: 568K, 568P, 568N, 568V

Lonnie Green Park is off 1st Street in Sugar Land. Sugarwood Communiy Park is on Old Bridge Road off Lexington Blvd.

Segment 3: Sugarwood Community Park to Oyster Creek Park. 3 miles
KeyMap: 568V, 569S, 569W, 609A

Texas Dragon Boat Association established in 2003 has found Upper Oyster Creek as the best place to hold its races in May 2009 (Figure 5).

Figure 5. Dragon Boat Races photo taken from the Texas Dragon Boat Association Website.

Fishing

Cane pole fishing has a long history on Upper Oyster Creek. It used to be popular to stop anywhere along the creek and throw a line in the water, but as this area of Fort Bend County built up it has become harder for fishermen to find good fishing spots without some type of small boat.

The 3.5 mile section between the upper dam just west of the SW freeway on the other side of the Flour building and the lower dam down by Lexington seems to be the area talked about by kayak fishermen. This is a popular section. The place that they park and launch is off of Lexington at the dead end barricade on Colonist Park. They also use the tiny dock on the creek

behind the tennis courts. One of the historical fishing spots discussed on the TexasKayakFisherman.com was off Hwy 6 along the tree lined bank at Flour Daniel. This area is used for line catfishing and bowfishing.

Swimming

Texas waters have always been accessible to the general public and this accessibility has instilled a feeling of public ownership. Intellectually, the public may know the dangers of body contact with waters that have been impaired by bacteria and pollution but the human desire to live beside and have contact with our waterways has often overpowered knowledge with desire. This has caused problems with banning swimming in these waterways, but throughout the parklands on Upper Oyster Creek there are posted bans on swimming. Based on our limited survey however, this has not stopped people from wading in shallow water.

Birding

According to Birds of the Upper Texas Coast, published by the Ornithology Group Houston Outdoor Nature Club, Houston, Texas 1993. "*In the spring and summer, just past the Sugar Land exit, exit onto the service road at William's Trace Blvd. Exit and pull off the road to the right at the bridge over Oyster Creek (just before Texas Highway 6). Cliff Swallows nest under the bridge in spring and summer and can be seen over the creek and flying in and out under the bridge. In migration check trees along the creek, both sides of US 59 for migrants…*" Birders are also using canoes and kayaks for birding trips in the creek.

Parks

Oyster Creek Park Trail. This three-mile hike and bike trail is accessible from Lexington Blvd., Dulles Ave., and Hwy 6. In addition to the Greenbelt trail, a water feature with rock lined falls and a pond is constructed near the Hwy 6 entrance, adjacent to Oyster Creek (Figure 6).

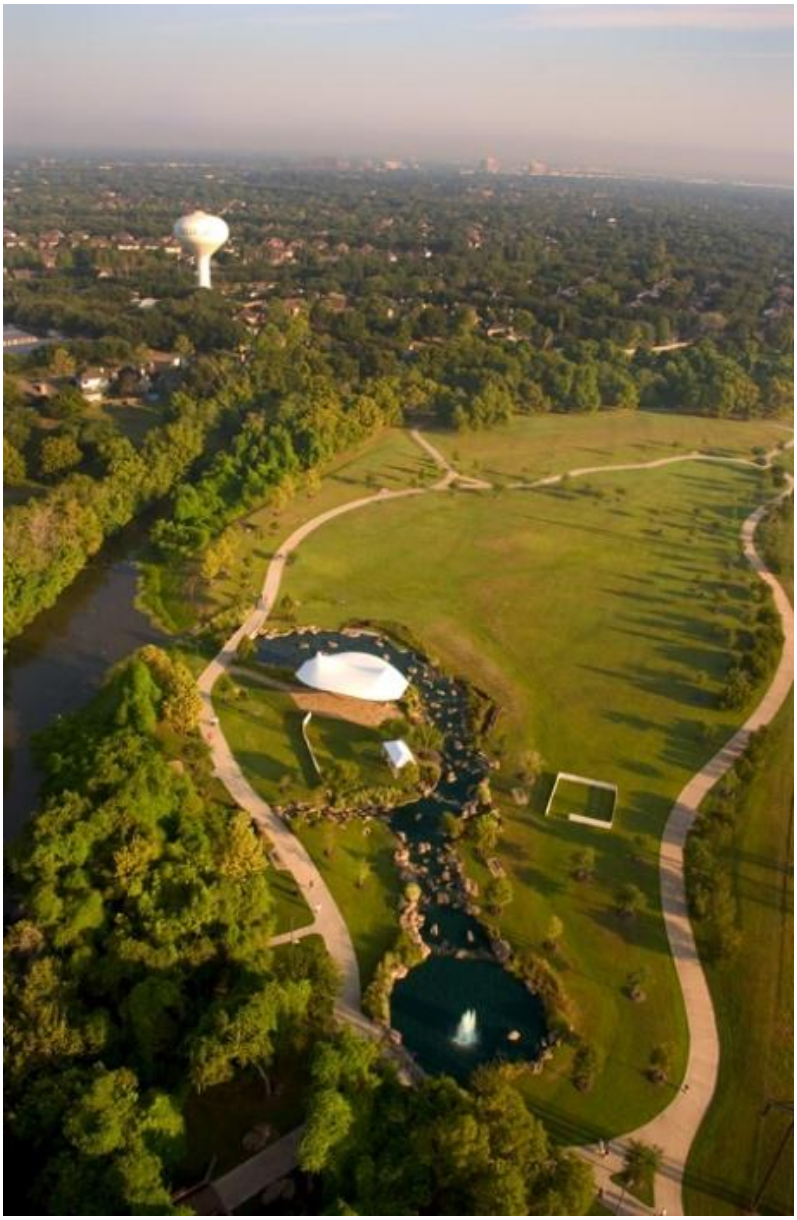

Figure 6. Aerial view of Oyster Creek Park showing the man-made water feature adjacent to Oyster Creek.

Today even as altered as it has become, Upper Oyster Creek is still a popular site for recreational use. There are many official reports about the quality of the water and the fisheries habitat in the upper creek through agencies such as: the Brazos River Authority, the Resource Protection Division Texas Parks and Wildlife Department, the Texas Commission of Environmental Quality, the Upper Oyster Creek Total Maximum Daily Load Steering Committee, and the Gulf Coast Water Authority. Although there is little official agency historical documentation of this recreational use we have provided documentation of published sources of data which, along with our Comprehensive RUAA surveys, should provide an overview of recent historical and present recreational use.

Site Reconnaissance Summary

Perspective sites were chosen based on public access and documented uses from the initial public working group meeting on July 15th, 2009. Initial reconnaissance surveys were conducted on July 24th and July 27th, 2009. A total of 23 perspective sites were visited, of these 19 were accessible enough to complete the reconnaissance (Table 1, Figure 7). Site suggestions were submitted to and approved by TCEQ on 7/29/2009.

Table 1. Site reconnaissance for comprehensive RUAA on Upper Oyster Creek Segment 1245.

Site	Description	Latitude	Longitude	Date of survey	Wadeable?	Public Access	Water Access	Recommendations
A	Pumping plant Rd @ Jones Creek	29.64171	-95.88530	7/24/2009	No	No public access, no trespassing signs	No access to water, very steep bank and heavy vegetation	Not Recommended Site
B	Winner-foster Rd @ Jones Creek	29.64802	-95.84694	7/24/2009	Yes	No parking, barbed wire down stream	Steep bank (3-4' drop off to water)	Full Assessment with Flow
C	723 @ Jones Creek	29.63781	-95.81202	7/24/2009	No	No Parking, must park on shoulder of road	Thick vegetation on banks, very fine sediment, sink into mud a couple of feet.	Full Assessment
D	Skinner lane @ Jones Creek	29.66062	-95.75688	7/24/2009	No	There is a small gravel spot to pull off the road on the bridge, there is No Tresspassing signs and barbed wire/chainlink fences.	Steep bank and overgrown vegetation	Full Assessment
E	Harlem @ Oyster Creek	29.63077	-95.71419	7/24/2009	No	No parking, can pull off on shoulder, near prison farms	~4' dropoff to water, well cut vegetation upto the bank. Very soft sediment, up to knees in mud	Not Recommended Site
F	Cullinan Park @ Oyster Creek	29.63383	-95.66382	7/24/2009	No	Park, with parking lot, but have to walk on dirt trail for ~ 1/3 mile to get to Oyster Creek	Steep Bank, Old Bridge, No Swimming or wading sign, Alligator Habitat signs	Full Assessment
G	Imperial St @ Oyster Creek (Dam 1)	29.62074	-95.64738	7/24/2009	No	Dirt Road, places to park "off road"	Small steep trail to water, not wadable due to dangers associated with dam and fast moving water	Full Assessment
H	Kempner @ Oyster Creek	29.62076	-95.63397	7/24/2009	No	No Parking, no shoulder on bridge	Metal Bulkhead	Not Recommended Site
I	Whimbrel @ Oyster Creek (Dam 2)	29.60911	-95.62617	7/24/2009	No	Easy Parking, in neighborhood	Small trail to water downstream of dam, floating docks on other side of water	Full Assessment
J	Houston Rowing Club Boat House @ Oyster Creek (Sugarland Cancer Center)	29.60452	-95.61898	7/24/2009	No	Park at the cancer center, walk across a field, boat-house hidden back in trees.	Dock on water, otherwise deep water and vegetation	Full Assessment
K	59 @ oyster Creek (Sugar Crossing Shopping Center)	29.60204	-95.61766	7/24/2009	No	No Fishing, Parking, Trespassing Sign!	No Fishing, Parking, Trespassing Sign!	Not Recommended Site
L	Colonist Creek @ Oyster Creek	29.60295	-95.60057	7/24/2009	No	Parking at Dead End street	Bench next to water, gentel slope into water, heavy emergent vegetation	Full Assessment
M	lexington @Oyster Creek (Dam 3)	29.60038	-95.59276	7/24/2009	No	No Public access, gates closed/locked (pic)	Private Property Gate	Not Recommended Site
N	Oyster Creek Park @ Oyster Creek (Upstream Site)	29.59372	-95.58841	7/24/2009	Yes	Park with parking, trails, restrooms, playground… trail goes along water, then bridge over water	easy water access (pic), Alligator signs, no swimming signs	Full Assessment with Flow
O	Oyster Creek Park @ Oyster Creek (Downstream Site)	29.58777	-95.59097	7/27/2009	Yes	Park, parking, trails, restrooms, water feature	easy water access (pic), Alligator signs, no swimming signs	Full Assessment
P	Cartwright and Oyster Creek	29.58159	-95.57269	7/27/2009	Yes	Parking and good trail along water	heavy vegetation and very little water	Full Assessment
Q	1092 @ Oyster Creek (Mosley Park)	29.57069	-95.56358	7/27/2009	Yes	Parking and good trail, also pic nic benches and grills at park	Vegetation on bank, and steep dropoff ~3' to water	Full Assessment
R	Glen Lakes @ Oyster Creek	29.56377	-95.55566	7/27/2009	No	No Parking… park on residential street down the road and walk back to bridge. Appears that others jump the curb and drive down to the water.	Ok, appears to be deep, but mowed up to bank	Full Assessment
S	Hwy 6 @ Oyster Creek	29.55046	-95.54756	7/27/2009	Yes	Parking in back on church parking lot… walk around chainlink fence in back of chruch complex	Solid bottom, ~ 4' drop to water on left bank… rt bank heavy vegetation	Not Recommended Site

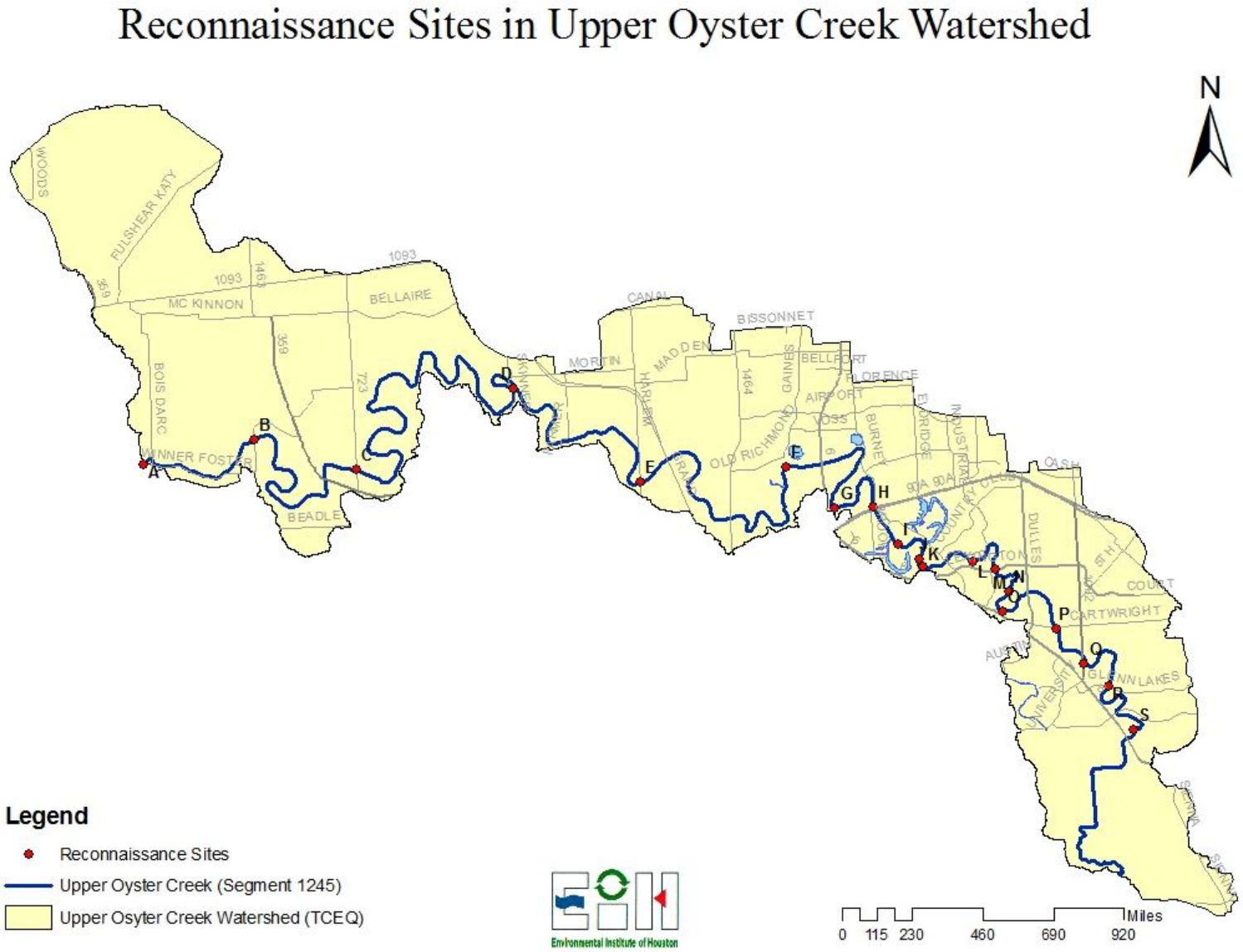

Figure 7. Reconnaissance sites for comprehensive RUAA in Upper Oyster Creek (Segment 1245)

Methodologies

RUAA Survey Site Selection and Descriptions

In general, the target density of survey sites should be approximately three (3) sites per every five (5) miles of stream (Texas Commission on Environmental Quality (TCEQ) 2009b). During our study survey sites were established in areas where the water body is accessible to the public and has the highest potential for recreational use (road crossings, public lands/parks located near the water body, and populated areas). A total of thirteen (13) survey sites were established (Table 2 & Figure 8). These sites were chosen based on public access potential with a highest potential for recreational use and also providing sufficient spatial coverage throughout each assessment unit.

Table 2. Survey sites for the Comprehensive RUAA Survey on Upper Oyster Creek, Segment 1245 (corresponding to Figure 3).

Site #	Site Description	Latitude	Longitude
1	Winner-Foster Rd @ Jones Creek	29.64802	-95.84694
2	723 @ jones Creek	29.63781	-95.81202
3	Skinner Lane @Jones Creek	29.66062	-95.75688
4	Cullinan Park @ Upper Oyster Creek	29.63383	-95.66382
5	Imperial St @ Oyster Creek (Dam 1)	29.62074	-95.64738
6	Whimbrel @ Oyster Creek (Dam 2)	29.60911	-95.62617
7	Houston Rowing Club Boat House @ Oyster Creek	29.60452	-95.61898
8	Colonist Creek @ Oyster Creek	29.60295	-95.60057
9	Lost Creek Park @ Oyster Creek	29.59372	-95.58841
10	Oyster Creek Park @ Oyster Creek	29.58777	-95.59097
11	Cartwright @ Oyster Creek	29.58159	-95.57269
12	1092 @ Oyster Creek (Mosley Park)	29.57069	-95.56358
13	Glen lakes @ Oyster Creek	29.56377	-95.55566

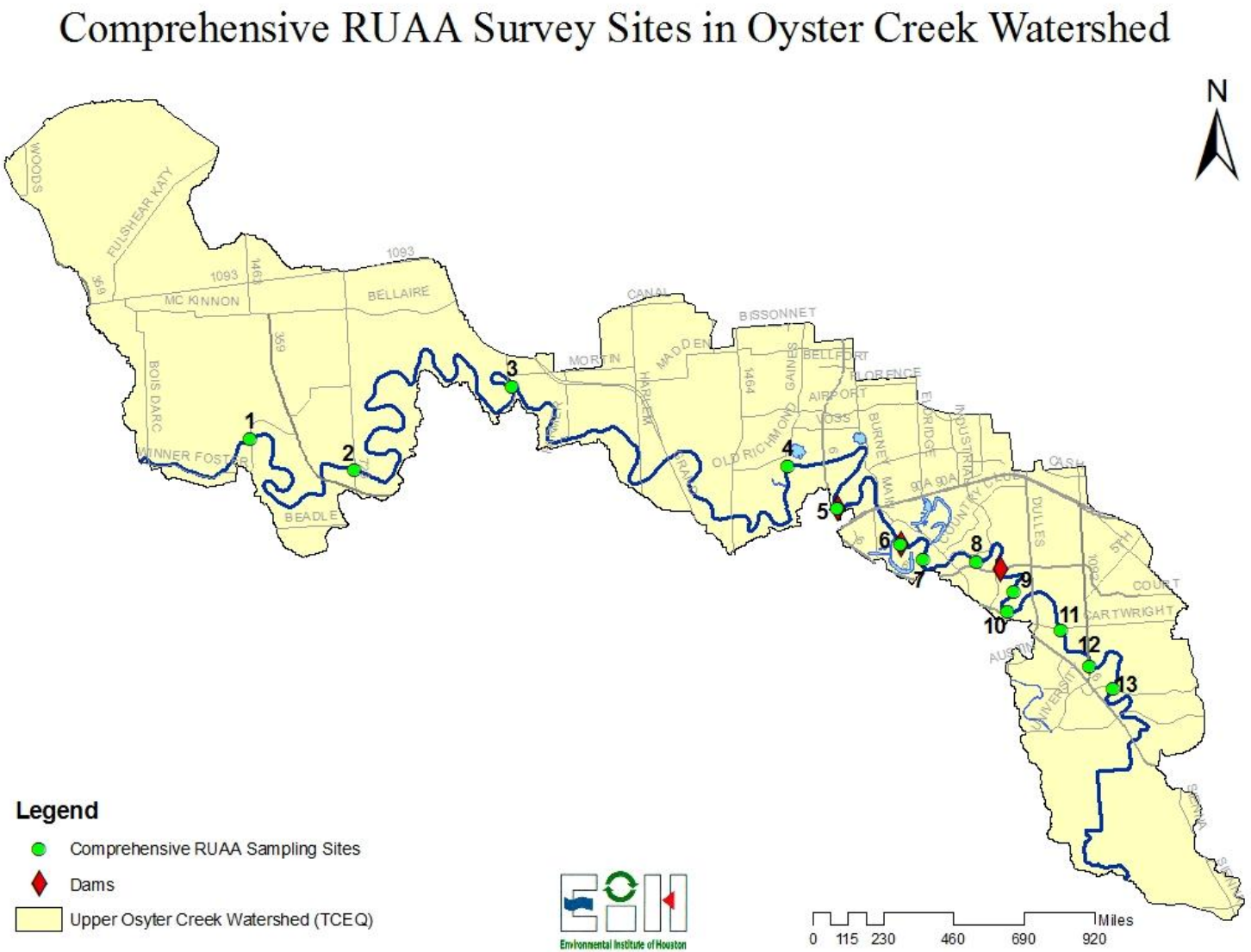

Figure 8. Comprehensive RUAA survey sites on Upper Oyster Creek, Segment 1245, selections based on river mile/assessment units, accessibility, and recreational features.

Sampling Methods

Recreational use attainability analyses (RUAAs) are used to identify and assign attainable uses and criteria to individual water bodies. Applicable uses and associated criteria are defined in the Texas Surface Water Quality Standards (TSWQS). Texas currently has two recreation use categories in the 2000 TSWQS: contact and noncontact recreation. Contact recreation consists of recreational activities involving a significant risk of ingestion of water including: wading by children, swimming, water skiing, diving, and surfing. Noncontact recreation is considered aquatic recreational pursuits not involving a significant risk of water ingestion: including fishing, commercial and recreational boating, and limited body contact incidental to shoreline activity.

Due to the fact that Upper Oyster Creek is a classified water body (Segment 1245) a comprehensive RUAA was conducted. RUAA Surveys should be conducted during a normal warm season and a period when people would be most likely to use the water body for contact recreational purposes. RUAA Surveys should also be conducted during optimal sampling conditions that are representative of the normal flow conditions of the stream and are not storm-influenced. RUAA field surveys for Upper Oyster Creek (Segment 11245) were conducted during August 7&8 2009 and August 14th, 2009. More specific procedures can be found in TCEQ's RUAA Procedures Document.

Field Survey Descriptions

A Comprehensive RUAA field survey begins with marking off a 300m reach of the waterway, flagging every 30 meters. Sites with public accessibility limitations may not be fully assessed in this way, in instances such as these a laser range finder was used to document the length of the stream reach that could be observed. A flow measurement (where possible) is then taken within the 300m stream reach. If the waterbody is wadeable, a depth measurement is taken

every 30m and width measurements are taken at the widest, narrowest, and average width points within the 300m reach. Pictures are taken to document the survey at 30, 150, and 300m facing upstream, right bank, downstream, and left bank. Air temperature and water temperature are also recorded at an easily accessible location. Finally the Comprehensive RUAA datasheets are completed to document any recreational uses, signs of recreational use, impeding conditions, or other field notes taken during the field survey.

A number of the field survey locations for the Comprehensive Recreational Use Attainability Analysis on Upper Oyster Creek were slightly abbreviated versions of the above methods due to access constraints. In any case where this was a factor, the limiting conditions were documented on the field data sheet and documenting pictures of these conditions were taken.

Interviews

When possible, interviews were conducted on field survey visits (Appendix 2). Targets for in person interviews were selected because of proximity to the waterbody and in some cases adjacent land/homeowners were solicited door to door. Other stakeholders were interviewed via telephone (Appendix 2). The Environmental Institute of Houston's Interview Protocol Guideline is attached as Appendix 7.

Results

Two field survey visits were completed on each of the 13 sample sites between in August, 2009 (Table 3). All field data sheets are attached (Appendix 3). The initial field surveys took place over the span of two days (8/7/2009 and 8/8/2009). Site # 7 (Houston Rowing Club Boat House @ Oyster Creek) was sampled three times, the second sampling occurred on the morning of 8/8/2009. This was an attempt to observe the Houston Rowing Club

practice that occurs on Saturday morning, and we were able to take pictures of the Club members rowing, and interview a handful of the rowers. The second site visits took place on 8/14/2009.

Table 3. Dates and times of field surveys conducted on Upper Oyster Creek (TCEQ Segment 1245) in completion of the Comprehensive Recreational Use Attainability Analysis Study.

Date of Survey	Site #	Site Description	Time of Field Survey
8/7/2009	1	Winner-Foster Rd @ Jones Creek	0930-1035
8/7/2009	2	723 @ jones Creek	1055-1117
8/7/2009	3	Skinner Lane @Jones Creek	1130-1150
8/7/2009	4	Cullinan Park @ Upper Oyster Creek	1220-1250
8/7/2009	5	Imperial St @ Oyster Creek (Dam 1)	1305-1330
8/7/2009	6	Whimbrel @ Oyster Creek (Dam 2)	1335-1350
8/7/2009	7	Houston Rowing Club Boat House @ Oyster Creek	1410-1430
8/7/2009	8	Colonist Creek @ Oyster Creek	1445-1500
8/8/2009	7	Houston Rowing Club Boat House @ Oyster Creek	0845-0930
8/8/2009	9	Lost Creek Park @ Oyster Creek	0950-1115
8/8/2009	10	Oyster Creek Park @ Oyster Creek	1130-1230
8/8/2009	11	Cartwright @ Oyster Creek	1245-1310
8/8/2009	12	1092 @ Oyster Creek (Mosley Park)	1320-1335
8/8/2009	13	Glen lakes @ Oyster Creek	1345-1405
8/14/2009	1	Winner-Foster Rd @ Jones Creek	0850-0915
8/14/2009	2	723 @ jones Creek	0925-0945
8/14/2009	3	Skinner Lane @Jones Creek	1005-1015
8/14/2009	4	Cullinan Park @ Upper Oyster Creek	1045-1105
8/14/2009	5	Imperial St @ Oyster Creek (Dam 1)	1125-1135
8/14/2009	6	Whimbrel @ Oyster Creek (Dam 2)	1145-1155
8/14/2009	7	Houston Rowing Club Boat House @ Oyster Creek	1200-1215
8/14/2009	8	Colonist Creek @ Oyster Creek	1230-1238
8/14/2009	9	Lost Creek Park @ Oyster Creek	1245-1300
8/14/2009	10	Oyster Creek Park @ Oyster Creek	1315-1350
8/14/2009	11	Cartwright @ Oyster Creek	1400-1410
8/14/2009	12	1092 @ Oyster Creek (Mosley Park)	1415-1445
8/14/2009	13	Glen lakes @ Oyster Creek	1500-1515

Physical Evaluation and Flow

Five of the sampled survey sites were located within parks and other recreational areas (Sites 4, 9, 10, 11, and 12). Five of the sampled survey sites were wadeable (sites 1, 9, 10, 11, and 12) and all but site 1, (Winner-Foster Rd @ Jones Creek) of the wadeable sites are located in

Assessment Unit 1245-01, below Dam 3. The depth measurements for the sites that were considered non-wadeable were taken from the bridge or from a dock at the deepest point accessible. Most physical parameters (depth and width) show similarities by assessment unit. The average air temperature (33.79 °C) and water temperature (32.2 °C) fell well within the range of acceptable temperatures for sampling described in the TCEQ procedures manual (Table 4).

Table 4. Average physical parameters from the two comprehensive recreational use attainability analysis field surveys conducted on August 7, 8 and 14, 2009, at Upper Oyster Creek (TCEQ Segment 1245)

Site #	Site Description	Avg. Depth (m)	Avg. Width (m)	Avg. Air Temp (C)	Avg. Water Temp (C)
1	Winner-Foster Rd @ Jones Creek	0.98	7.97	31.31	31.16
2	723 @ jones Creek	N/A	11.88	34.61	32.78
3	Skinner Lane @Jones Creek	N/A	19.51	33.68	N/A
4	Cullinan Park @ Upper Oyster Creek	N/A	20	32	31.5
5	Imperial St @ Oyster Creek (Dam 1)	1.22	58	34.11	32.25
6	Whimbrel @ Oyster Creek (Dam 2)	1.47	49.81	33.56	31.75
7	Houston Rowing Club @ Oyster Creek	1.99	38.5	34.78	36.67
8	Colonist Creek @ Oyster Creek	N/A	59.5	32.75	32.75
9	Lost Creek Park @ Oyster Creek	0.61	9.45	31.67	29.5
10	Oyster Creek Park @ Oyster Creek	0.67	10.7	34.22	31.75
11	Cartwright @ Oyster Creek	0.36	10.21	36.67	31.75
12	1092 @ Oyster Creek (Mosley Park)	0.67	6.25	35.34	33.25
13	Glen lakes @ Oyster Creek	1.83	11.75	34.61	31.25
	Overall Average	**1.09**	**24.12**	**33.79**	**32.2**

Upper Oyster Creek and its tributaries are generally located in either Forest or urban/suburban areas with portions also located in natural, agricultural, pastoral, commercial and industrial areas. The Upper portion of Upper Oyster Creek is dominated by forested riparian zones or riparian zones converted to regularly mowed corridors or managed shrub corridors, while the lower portion of Upper Oyster Creek is dominated by regularly mowed and maintained corridors and urban adjacent lands (Table 5). The dominant substrate along Upper Oyster Creek (Segment 1245) was generally composed of Mud/Clay, which made it difficult to navigate at

times. Investigators would often sink past their knees while attempting to wade across the waterway.

Based on data received from the Gulf Coast Water Authority (GCWA) the flow regime in Oyster Creek is quite variable and dependent in part to diversion pumping at various sites as water from the Brazos River as water is diverted downstream for irrigation and other uses. Flow data acquired from the GCWA compared to flow data gathered during our field surveys, were consistent showing the same temporal trends.

Table 5. Physical Characteristics of Riparian Zone and Dominant substrate of the field survey sites sampled on August 7, 8 and 14, 2009, during the Comprehensive Recreational Use Attainability Analysis on Upper Oyster Creek (TCEQ Segment 1245)

Site #	Site Description	Left Bank Riparian Zone	Right Bank Riparian Zone	Dominant Substrate
1	Winner-Foster Rd @ Jones Creek	Pasture	Mowed/maintained corridor	Mud/Clay
2	723 @ jones Creek	Mowed/maintained corridor	Mowed/maintained corridor	Mud/Clay
3	Skinner Lane @Jones Creek	Forest	Forest	Unknown
4	Cullinan Park @ Upper Oyster Creek	Forest	Forest	Mud/Clay
5	Imperial St @ Oyster Creek (Dam 1)	Forest	Forest	Silt
6	Whimbrel @ Oyster Creek (Dam 2)	Urban	Mowed/maintained corridor	Concrete
7	Houston Rowing Club Boat House @ Oyster Creek	Forest	Mowed/maintained corridor	Silt
8	Colonist Creek @ Oyster Creek	Urban	Urban	Mud/Clay
9	Lost Creek Park @ Oyster Creek	Forest	Forest	Silt
10	Oyster Creek Park @ Oyster Creek	Forest	Forest	Gravel
11	Cartwright @ Oyster Creek	Mowed/maintained corridor	Mowed/maintained corridor	Mud/Clay
12	1092 @ Oyster Creek (Mosley Park)	Urban	Mowed/maintained corridor	Mud/Clay
13	Glen lakes @ Oyster Creek	Urban	Mowed/maintained corridor	Mud/Clay

Recreational Uses

Uses observed from all combined site visits include: Bicycling, Fishing, Rowing, Kayaking, Wading-Adult, Sitting, Jogging/Running, Walking, ATV, and Standing (Table 6). The one instance of observing a wading-adult occurred when a kayaker walked his kayak out to mid-thigh deep water and then proceeded to board this kayak. This activity occurred at site #8 (Colonist Creek @ Oyster Creek).

Table 6. Recreational Uses observed during field surveys on Upper Oyster Creek (TCEQ Segment # 1245) for the Comprehensive Recreational Use Attainability Analysis.

Site #	Site Description	Activities Observed at Site	Number of Individuals Observed
1	Winner-Foster Rd @ Jones Creek	Bicycling	11-20
2	723 @ jones Creek	Mowers	1-10
3	Skinner Lane @Jones Creek	Fishing	1-10
4	Cullinan Park @ Upper Oyster Creek	None	None
5	Imperial St @ Oyster Creek (Dam 1)	None	None
6	Whimbrel @ Oyster Creek (Dam 2)	None	None
7	Houston Rowing Club @ Oyster Creek	Rowing	20-50
8	Colonist Creek @ Oyster Creek	Sitting, Kayaking, Wading-Adult	1-10
9	Lost Creek Park @ Oyster Creek	Jogging/Running, Sitting, Walking, Bicycling	greater than 50
10	Oyster Creek Park @ Oyster Creek	Jogging/Running, Sitting, Walking, Bicycling, Standing	20-50
11	Cartwright @ Oyster Creek	Jogging/Running, ATV	1-10
12	1092 @ Oyster Creek (Mosley Park)	None	None
13	Glen lakes @ Oyster Creek	Sitting, ATV	1-10

Interviews

A total of 69 individuals were contacted for an interview throughout the Comprehensive Recreational Use Attainability Analysis on Upper Oyster Creek (TCEQ Segment 1245), and a total of 46 of those individuals agreed to participate in the interview. Of the 45 total, 21 were interviewed in person and 25 by phone. A total of 41 out of the 46 interviewed answered yes to the question "Are you familiar with Upper Oyster Creek?" Of those, 25 had personally used the stream for recreation, 35 had observed recreation activities, and 25 had heard about recreation on Upper Oyster Creek. The total numbers of years that interviewees were familiar with the Upper Oyster Creek Watershed were over 619 man-years.

The types of recreational uses documented by interviews included a number of Primary Contact Recreations such as: Swimming, SCUBA Diving, Skin Diving, Wading-Adults, and Wading-Children (Table 7).

Table 7. Types of uses documented in interview responses conducted for the Comprehensive Recreational Use Attainability Analysis on Upper Oyster Creek (TCEQ Segment 1245). Primary Contact Recreation activities are highlighted in red.

Interview Responses		
Personal Recreation	**Observed Recreation**	**Recreation Heard About**
Swimming	Swimming	Swimming
SCUBA Diving	Wading-Adults	Rowing
Skin Diving	Wading-Children	Kayaking
Wading-Adults	Rowing	Boating
Wading-Children	Kayaking	Canoeing
Rowing	Boating	Fishing
Kayaking	Canoeing	Walking/Hiking
Rafting	Fishing	Bird Watching
Boating	Walking/Hiking	
Canoeing		
Fishing		
Walking/Hiking		

Summary

Based on our limited spatial and temporal field surveys we did not personally observe any primary contact (e.g. swimming) recreation activities. However, we did observe water related activities including wading-adults, rowing, kayaking, fishing, and other non-contact recreation activities. In addition, site access and conditions are sufficient at many locations to permit primary contact recreation. Other important documentation of primary contact recreation in Upper Oyster Creek was collected via interviews and includes swimming, SCUBA diving, skin diving, wading-children and wading-adults. These documented uses are discussed below.

Other Documented Uses

Some of the activities listed here have also been briefly mentioned under the historical uses section. This section provides more in depth information on recent recreational uses.

The Houston Rowing Club (Rowing/sculling as primary contact recreation)

Greater Houston Rowing Club (GHRC) promotes and provides competitive and recreational rowing for all ages in the community, fostering sportsmanship, teamwork, fitness and camaraderie. GHRC was founded in 1988 by 5 rowers, and continues to grow. They currently have 21 active members. The volunteer-based group offers clinics and instruction for beginning rowers, competitive opportunities for its members, and access to GHRC boats and equipment.

GHRC hosts a "Learn to Row" US Rowing national event in the community where anyone curious about the sport can come and give it a try. In addition, they participate in Keep Sugar Land Beautiful events by organizing creek clean-ups on Oyster Creek. They have also hosted workshops on boat rigging and led a charity mini-regatta benefiting a local shelter for families in crisis.

The GHRC has been based at a compound near the Sugar Land Cancer Center at the intersections of 59 and Oyster Creek. In 2006 the GHRC began the process of building a new boathouse upstream from the current location along Creekbend Drive. The boathouse is a result of collaboration between Planned Community Developers, First Colony Community Association and the Greater Houston Rowing Club. The 4,800 square foot building will house GHRC programs and equipment as well as First Colony Community Association sponsored water recreation programs, and will provide the GHRC the resources to accept a much higher volume of members.

Kerry Whitehead, the Houston Rowing Club President documented club use of Upper Oyster Creek for rowing occurred 7 days a week, year round. The Houston Rowing Club teaches around 100 people per year to row. He stated that tipping of boats and subsequent immersion in

water is very common event with beginner rowers. When tipping occurs it involves total submersion because the sculling boats tie in the rower at the shoe. Another probable pathway of exposure to high amounts of water is "back splashing". Back splashing is a rowing technique where you splash when rowing; the preferred amount of back splash determines how skilled of a rower you are. Kerry mentioned that when you row in a shell with multiple rowers you can get substantial splashing from the rower in front of you (especially if they are an inexperienced rower) and by the time the row is finished you can be drenched from head to toe.

On-line Texas Fishing Forum

The Texas Fishing Forum found at: http://texasfishingforum.com is a well used on-line chat browser self titled "The best place in Texas to talk fishing". Fishing forums can be easily searched by water body, type of fish, method of fishing, etc. Documented "secret fishing holes" are easy finds on these forums. Users must register, but there is no charge. A few of the favorite listed fishing spots for Upper Oyster Creek are: Alternate 90 and Hwy 6, and sites by the old Sugar Mill and Fluor Daniel. Types of fish targeted generally are: Gar, Catfish, Crappie, and largemouth bass.

Bayou Preservation Association Paddle Trail

The Bayou Preservation Association (BPA) documents that Upper Oyster Creek is long known as a place to paddle. The BPA website (www.bayoupreservation.org) describes and provides detailed maps of three segments of Upper Oyster Creek for paddle trails. Segment 1 put-in point is at the Joseph S. and Lucie H. Cullinan Park (EIH field survey site # 4). This segment is approximately 3 miles in length and the take-out point is at Lonnie Green Playground. Segment 2 starts at Lonnie Green Park and is approximately 3 miles in length and goes to Sugarwood Community Park. The third segment begins at Sugarwood Community Park and

runs 3 miles to Oyster Creek Park and Trail. The BPA advertises these segments as well used paddle trails in Upper Oyster Creek.

Dragon Boat Races

The Texas Dragon Boat Association hosts the annual Gulf Coast International Dragon Boat Regatta at Brooks Lake, in Sugar Land Texas. The 2009 Regatta is scheduled for the weekend of October 17th. The Dragon Boat Festivals in Houston and the surrounding area have grown to become a very large event hosted directly on our area waterways. The annual dragon boat festivals put hundreds of recreational boaters in large dragon boats in connected waters of Upper Oyster Creek watershed every year. More information on the dragon boat races can be found at the Texas Dragon Boat Association's website: www.texasdragonboat.com.

Summary

The physical characteristics of the waterbody are conducive to contact recreation and documented accounts of contact recreation were collected via interviews and background information including the large use of Upper Oyster Creek by Rowers/Scullers that employ rowing techniques such as backsplash which at times result in full body immersion. There is potential for rowing use activities to increase.

RUAA Summary Form

RUAA Summary

This form should be filled out after RUAA data collection is completed. Use the Contact Information Form, Field Data Sheets from all sites, Historical Information Review, and other relevant information to answer the following questions on the water body.

Name of water body: *Upper Oyster Creek*
Segment No. or Nearest Downstream Segment No.: *1245*
Classified?: *Yes*
County: *Fort Bend*

1. Observations on Use
   a. Do primary contact recreation activities occur on the water body?
      ☐ frequently ☐ seldom ☐ not observed or reported ☐ unknown

   b. Do secondary contact recreation 1 activities occur on the water body?
      ☐ frequently ☐ seldom ☐ not observed or reported ☐ unknown

   c. Do secondary contact recreation 2 activities occur on the water body?
      ☐ frequently ☐ seldom ☐ not observed or reported ☐ unknown

   d. Do noncontact recreation activities occur on the water body?
      ☐ frequently ☐ seldom ☐ not observed or reported ☐ unknown

2. Physical Characteristics of Water Body
   a. What is the average thalweg depth? *1.09* meters

   b. Are there substantial pools deeper than 1 meter? ☐ yes ☐ no N/A

   c. What is the general level of public access?
      ☐ easy ☐ moderate ☐ very limited

3. Hydrological Conditions (Based on Palmer Drought Severity Index)
☐ Mild-Extreme Drought ☐ Incipient dry spell ☐ Near Normal ☐ Incipient wet spell ☐ Mild-Extreme Wet

Literature Cited

BPA (Bayou Preservation Association). 2009. Oyster Creek Paddling Trail. Website http://www.bayoupreservation.org/default.aspx?act=documents2.aspx&category=Oyster+Creek. Accessed August 2009.

Brown, T.C., J.G. Taylor, and B. Shelby. 1991. Assessing the direct effects of streamflow on recreation: a literature review. Water Resources Bulletin 27(6): 979-989

Greater Houston Rowing Club (GHRC). 2009. Web resource: http://www.greaterhoustonrowingclub.com

Handbook of Texas Online. 2009. Texas State Historical Association (TSHA) web resource: http://www/tshaonline.org

Hintze, J.L. 1006. PASS USER'S Guide. Power Analysis and Sample Size for Windows. NCSS, Kaysville, Utah.

Houston Canoe Club. 2009. Trip Report: Oyster Creek. Houston Canoe Club Waterline. Volume: August 2009. http://www.houstoncanoeclub.org/waterline/2009/august/index.html.

Peterson, J.T., and P.B. Bayley. 2004. A Bayesian Approach to Estimating Presence When a Species is Undetected. Pages 173-188 *in* W. L. Thompson, editor. Sampling rare or elusive species: concepts, designs, and techniques for estimating population parameters. Island Press, Washington, D.C.

Pollock, K.H., C.M. Jones, and T.L. Brown. 1994. Angler survey methods and their applications in fisheries management. American Fisheries Society, Bethesda, Maryland.

Texas Commission on Environmental Quality (TCEQ). 2007. One Total Maximum Daily Load for Bacteria in Upper Oyster Creek, Segment 1245. TCEQ, Austin, Texas.

Texas Commission on Environmental Quality (TCEQ). 2008. Texas 303(d) list (March 19, 2008). TCEQ, Austin, Texas.

Texas Commission on Environmental Quality (TCEQ). 2009. Recreational Use-Attainability Analyses (RUAAs) Procedures for a Comprehensive RUAA and a Basic RUAA Survey. TCEQ, Austin, Texas.

Timeline of the Brazos River Basin. 2009. Brazos River Authority. Web resource: http://www.brazos.org

U.S. Census Bureau, 2000. web resource: http://www/census.gov