

**Central and Southeast Texas Recreational Use Attainability Analyses Project
Brushy Creek (Segment 1244) Comprehensive RUAA**

Results Report

Contract No. 582-9-90440
EIH Technical Report # 10-006

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September, 27 2010

PREPARED IN COOPERATION WITH THE
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

The preparation of the report was financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality

Federal Grant #07-09 106 Categorical Water Pollution Control 98665304 (State USAS Grant #998807)

Federal Grant #09-11 106 Categorical Water Pollution Control 98665305 (State USAS Grant #998810)

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Introduction

Problem Statement

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 September 2009, a Comprehensive RUAA was initiated on Brushy Creek, segment 1244. This Comprehensive RUAA Report will provide Texas Commission on Environmental Quality (TCEQ) Standards Group with relevant information needed to determine the appropriate attainable recreational use for Brushy Creek. The completion of this comprehensive RUAA consisted of several important interrelated components including 1) reconnaissance and site selection, 2) comprehensive RUAA and 3) public outreach. The objectives of each component are listed below.

Objectives

1. Reconnaissance and Site Selection

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 primarily with the input of local, state and regional agency staff familiar with the watershed, as well as aerial imagery. An initial stakeholder meeting occurred on February 16, 2010 at the Round Rock Public Library. Reconnaissance surveys were conducted on December 16, 2009 and were used as the basis for site recommendations discussed in this meeting. One additional field survey site was identified as a result of this meeting.

2. Comprehensive Recreational Use Attainability Analysis

The primary objective of the Brushy Creek Comprehensive RUAA was to characterize the recreational use and potential impediments to recreational use for this stream. Basic RUAA Field Surveys were conducted as part of the Comprehensive RUAA. The Basic RUAA field surveys were conducted on the weekend of May 7, 2010, to collect information on the water body and associated uses. During these dates field surveys were conducted at selected sites where there is a high probability of detecting recreational use. The objective was to document and characterize observed use, site conditions (hydrology and physical attributes), and weather during the survey. In addition to the field activities, a historical information review and interviews were also conducted for the Comprehensive RUAA. The objective of the historical review 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.

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 within Brushy Creek. This included sending out email and phone messages to key organizations and staff familiar with the watershed. The Brushy Creek Stakeholder contact list is provided in Appendix 1. In addition, on February 16, 2010 a stakeholder meeting was held at the Round Rock Public Library, Round Rock, TX to gather information on the watershed including likely recreational access points. A total of 14 stakeholders attended the meeting, and as a result of the meeting an additional field survey site was added. Finally, a public meeting was advertised via public notice by TCEQ and held at the Round Rock Public Library on August 13,

2010 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. A total of 10 stakeholders attended the final meeting (Appendix 7). It was confirmed at the meeting that the stakeholders agreed with the uses presented.

Study Area

Description of Water Body

Brushy Creek is located within the Brazos River Basin. Segment 1244 classified by the TCEQ is approximately seventy-five (75) miles in length. Segment 1244 begins from the confluence with the San Gabriel River in Milan County to the confluence of South Brushy Creek in Williamson County. The assessment units sampled in this study are: 1) 1244_01 (From the confluence with San Gabriel upstream to conf. with Mustang Creek) 27.4 river miles. 2) 1244_02 (From confluence with Mustang Creek, upstream to confluence with Cottonwood Branch) 22.1 river miles 3) 1244_3 (From confluence with Cottonwood Branch upstream to City of Round Rock WWTP outfall) 12.9 river miles 4) 1244_04 (From immediately upstream of City of Round Rock WWTP outfall upstream to the end of segment) 6.40 river miles (Figure 1). Brushy Creek (assessment units 1244_03 and 1244_04) are on the state's 303(d) list for exceeding levels of pathogen indicator bacteria.

Environmental Features and Population Characteristics

The climate in the Brushy Creek watershed is classified as having hot, humid summers and mild winters. The population of Williamson County is one of the fast growing in Texas (LCRA, 2002). Brushy Creek is disturbed by human activities that have altered both the land use and vegetation cover of the landscape. These activities include the construction of roads and

instream sewer lines, conversion of land for agriculture, and the building of commercial businesses and residential neighborhoods. Brushy Creek, assessment units 1244_03 and 1244_04 are largely adjacent to urban areas, while the downstream assessment units (1244_01 and 1244_02) are rural (Figure 1).

Watershed Characterization

The banks of the stream are heavily wooded for much of its length with mesquite and hardwood trees, and the creek flows through nearly level to gently rolling terrain surfaced by clayey and loamy soils used predominantly for agriculture (Handbook of Texas, 2010). The majority of the Creek is in the Edwards Backland Prairie Ecoregion, with a portion of the upstream creek in the Edwards Plateau Ecoregion.

Potential Nonpoint Sources

As of August 31, 1994 there were 15 permitted outfalls on Brushy Creek with an authorized discharge amount of 30.90 MGD (TPWD, 2000). Currently there are 18 permitted outfalls draining directly into segment 1244 (Table 1, Figure 1). The associated collection and treatment system, sanitary sewer overflows and WWTF bypasses are also possible sources of bacteria loadings to the receiving stream. Brushy Creek watershed, can be described as relatively rural with few permitted WWTF. This suggests that there are potentially a high number of on-site sewage facilities (OSSF) or septic systems) in use within the watershed. OSSF require routine repairs and maintenance. In general they should be replaced every 15 years to avoid failures causing potential leaks or overflows. Poorly maintained OSSF are a potential source of bacteria loadings into Brushy Creek.

Table 1. Permitted Outfalls (TCEQ) that discharge into Brushy Creek (Segment 1244) Status: C = Complete, P = Permitted

Permit Number	Permittee	Latitude	Longitude	Status
14499-001	COUPLAND WATER SUPPLY CORPORATION	30.46104	-97.38722	C
11459-001	ANDERSON MILL MUD	30.46437	-97.79668	C
12308-001	CITY OF CEDAR PARK	30.49437	-97.80612	C
13866-001	WINDMERE UTILITY CO INC	30.50881	-97.58389	C
14148-001	AQUA DEVELOPMENT INC	30.50881	-97.45333	C
04384-000	ACME BRICK CO	30.50940	-97.85189	C
04384-000	ACME BRICK CO	30.50970	-97.85099	C
04384-000	ACME BRICK CO	30.51020	-97.85079	C
04384-000	ACME BRICK CO	30.51040	-97.85089	C
04384-000	ACME BRICK CO	30.51050	-97.85119	C
10264-001	BRAZOS RIVER AUTHORITY & LCRA	30.51576	-97.66501	C
11865-001	BRUSHY CREEK MUD	30.52187	-97.73418	C
10264-002	BRAZOS RIVER AUTHORITY & LCRA	30.52664	-97.61702	C
11324-001	LOWER COLORADO RIVER AUTHORITY & BRAZOS RA	30.54025	-97.53960	C
10299-001	CITY OF TAYLOR	30.55770	-97.38861	C
14406-001	CITY OF ROUND ROCK	30.57300	-97.69949	P
12644-001	CITY OF LEANDER	30.58186	-97.83974	C
10302-001	CITY OF THORNDALE	30.60576	-97.20194	C

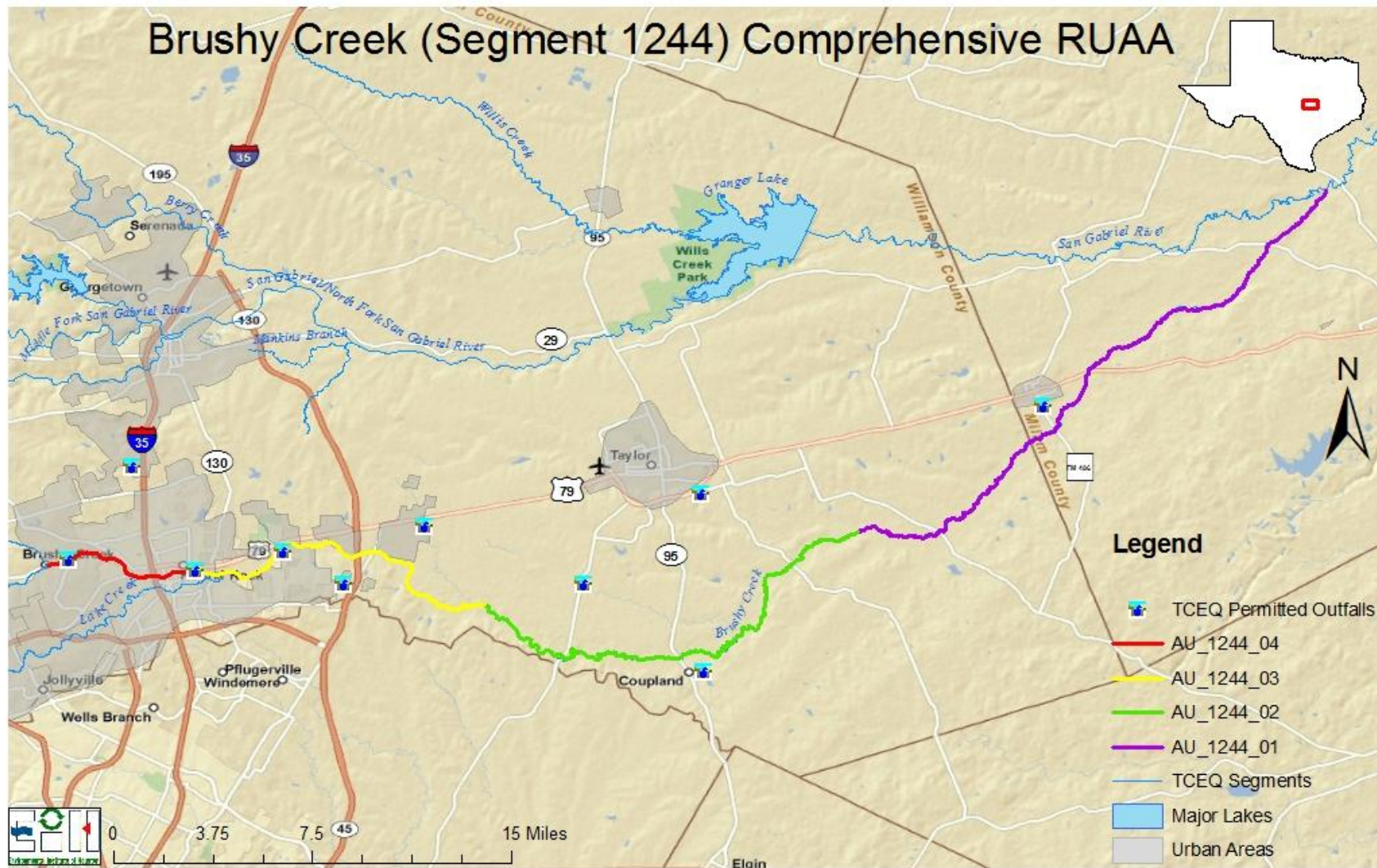


Figure 1. Assessment units, urban areas, and permitted outfalls (TCEQ) that discharge into Brushy Creek (Segment 1244).

Directly adjacent to Brushy Creek there are many agriculture grazing tracts. In particular at field survey sites 27 and 30 these tracts at times provide livestock with direct access to the Creek. Direct contact with cattle grazing can increase fecal bacteria in waterways. This is another potential source of bacteria loadings into the Brushy Creek watershed.

History of Recreational Use in Brushy Creek

Historical Summary

Brushy Creek was named Arroyo de las Animas Benditas (Creek of the Blessed Souls) by explorers Louis Juchereau de St. Denis and Domingo Ramon in 1716 and was known by variations of that name throughout the Spanish colonial periods. It was the site of several of the earliest communities in the county.

Boating

Boating in the form of kayaking and canoeing is one of the most common recreational uses of Brushy Creek. It is common (especially at time when the water levels are raised due to heavy rains) that kayakers use Brushy Creek (segment 1244) for recreation. According to the American Whitewater Paddling website (RiverFacts.com), Brushy Creek, Williamson County, Texas is considered a Class II+ whitewater kayaking, rafting, and paddling section. The website describes specific put-in and take-out locations. Below is a photo of Chris Lance taken by Earl (aka Squirrel) taken on 8/10/2005 from the AmericanWhitewater.org website (Figure 2). The exact location of these photos is unknown; however they are linked to a paddle trail that runs through Hutto, TX which is within the 1244 segment, specifically between field survey sites 11 and 13.



Figure 2 Photographs of Whitewater kayaking on Brushy Creek (Segment 1244) obtained from the website:

http://www.americanwhitewater.org/content/River_detail_id_4570#zzq2gsdh7qjpsuRiverMainGadget19

Fishing

Like boating, fishing is a popular form of recreation the Brushy Creek. Documentation of recreational fishing on Brushy Creek (segment 1244) is common on numerous on-line fishing and kayak fishing forums. Fishermen regularly blog about recent trips on the Brushy Creek, describing what they caught and how far they paddled or wade fished (Figure 3). Some widely visited websites are: AustinBassFishing.com, TexasFlyFisher.blogspot.com, and HookandBullet.com. Large expanses of private property in the downstream extent of the creek (assessment units 1244_01 and 1244_02) can restrict shoreline public fishing. Fishing from personal piers and private property throughout the segment is apparent through interviews with stakeholders and evidence of fishing paraphernalia found at field survey sites.



Figure 3. Photographs of fish caught on Brushy Creek (Segment 1244) posted on September 1, 2008 obtained from the website: <http://texasflyfisher.blogspot.com/2008/09/rio-fest-on-brushy-creek.html>

Swimming

Swimming and other primary contact recreational uses such as whitewater kayaking are well documented in Brushy Creek, however historically little documentation was found showing swimming in the 1244 segment. Interviews with stakeholders and property owners adjacent to the creek suggested that swimming in Brushy Creek is common in summer months, particularly near the historical round rock in Round Rock, Texas. While reviewing headline news articles that mention Brushy Creek, three historic drowning deaths were noted. One, published in August of 2005 was an account of a 31 year old man who drowned while fishing in lower Brushy Creek (Cameron Herald, 2010).

Parks

There are 6 parks directly adjacent to Brushy Creek (Table 2, Figure 4), 4 of which are publically accessible. These parks are all located within assessment units 1244_03 and 1244_04. Downstream of park #6, public access to the waterway is limited to bridge crossings.

Table 2. Parks located directly adjacent to Brushy Creek (Segment 1244)

Park #	Park Name	Latitude	Longitude
1	Creek Side Park	30.519569	-97.738067
2	Lions Park	30.519569	-97.068597
3	Veterans Park	30.514861	-97.675853
4	Rhaab House	30.514579	-97.652178
5	Sonoma HOA	30.514711	-97.630008
6	Brushy Creek HOA	30.523005	-97.560292

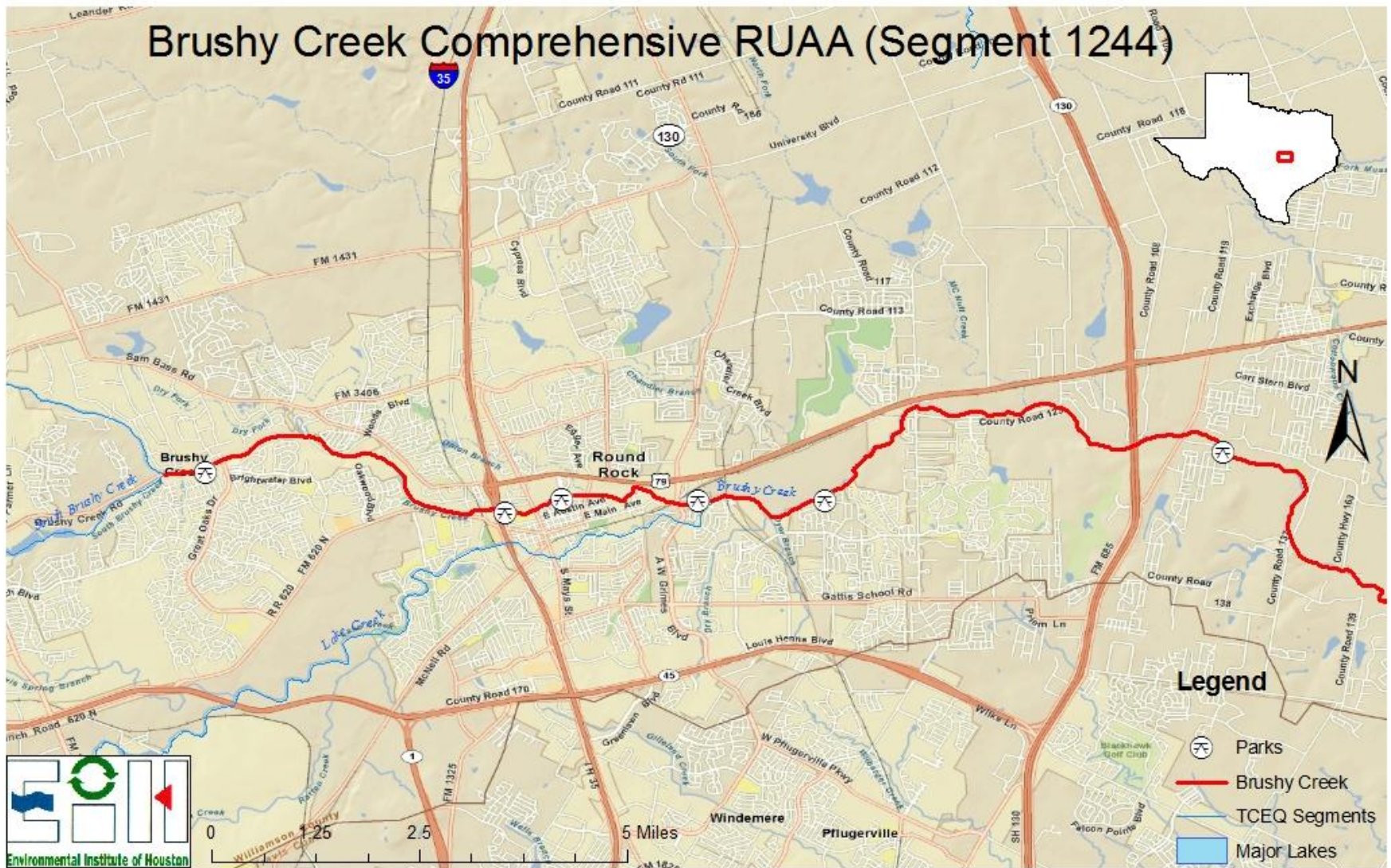


Figure 4. Parks located directly adjacent to Brushy Creek (Segment 1244). There were no documented parks in the downstream extent of the creek that is not shown in this map.

Site Reconnaissance Summary

Perspective sites were chosen based on public access and documented uses from the initial public working group meeting on 2/16/2010. Initial reconnaissance surveys were conducted on December 16 and 17, 2010. A total of 42 perspective sites were visited, of these 21 were accessible enough to complete the reconnaissance (Table 3, Figure 5). Site suggestions were submitted to and approved by TCEQ as part of the Monitoring Plan and QAP which was approved on April, 9 2010.

Methodologies

RUAA Survey Site Selection and Descriptions

The recommended target density of survey sites is approximately three (3) sites per every five (5) miles of stream (Texas Commission on Environmental Quality (TCEQ) 2009). 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 thirty (30) survey sites were established (Table 4 & Figure 5). These sites were chosen based on public access potential and also providing sufficient spatial coverage throughout each assessment unit (public and water access explained in Table 3). Brushy Creek is generally a rural area, lined by largely private properties. In portions where the recommended three (3) sites per every five (5) miles of stream was not possible, supplementary information was gathered through coordination with local authorities (Appendix 7), conducting interviews (Appendix 3), and using topographic maps and aerial photos to document any other potential private access points (reconnaissance sites). Land directly adjacent to the Brushy Creek were privately owned (gated, fenced, no trespassing signage), thus inaccessible for field surveys.

Extensive interviews were collected to help determine what kind of contact recreation occurred along the privately owned portions of the stream. These interviews resulted in additional background information which confirmed that recreation was most likely to occur at sites identified in this study, and also confirmed the many limitations to public access along the stream. Every effort was made for the interviewees to provide recreational use information about the entire length of the segment including areas other than the selected sites in this RUAA. Topographic maps were used to provide the needed geographic information about potential recreational opportunities and potential access points along Brushy Creek. The topographic map and aerial imagery review resulted in site selection for the reconnaissance site visits. The reconnaissance site visits confirmed the limited public access along the creek. Limited public access due to fences, gates, and no trespassing signage are common on assessment units 1244_01 and 1244_02 of Brushy Creek and resulted in less than three (3) sites for every five (5) miles of stream. Brushy Creek's physical characteristics can be generalized into two categories: assessment units 1244_03 and 1244_04 shallow, wide bedrock dominated creek (Figure 7) and assessment units 1244_01 and 1244_02 with more channelized and deeper creek (Figure 8).

Table 3. Site reconnaissance (recon) for comprehensive RUAA on Brushy Creek (Segment 1244). *Note: there is no site #11.

Date of Survey	Recon Site	Description	Latitude	Longitude	Public Access	Water Access	Recommended Site
12/16/09	1	Walsh Dr @ Brushy Creek	30.51922	-97.74505	Park on the side of the road in grass	Easy water access	Yes
	2	Great Oaks Dr @ Brushy Creek	30.52132	-97.73596	Gravel parking area on the side of the road	Easy water access	Yes
	3	Dry Fork @ Brushy Creek	30.52579	-97.72168	Gravel parking area on the side of the road	Easy water access	Yes
	4	Hairy Man Rd @ Brushy Creek	30.52275	-97.71548	Gravel parking area on the side of the road	Easy water access	Yes
	5	Pearl Cove @ Brushy Creek	N/A	N/A	No Public Access: Private Property	N/A	No
	6	CR 175 @ Brushy Creek	N/A	N/A	No Public Access: Private Property	N/A	No
	7	Chisholm Trail Rd @ Brushy Creek	30.51307	-97.68939	Parking at Public Park	Easy water access	Yes
	8	N Lee St @ Brushy Creek	30.51270	-97.68451	Parking at Public Park	Easy water access	N/A
	9	N Mays St @ Brushy Creek	30.51309	-97.68053	Combine with Recon site 10	Combine with Recon site 10	N/A
	10	Pecan Ave @ Brushy Creek	30.51459	-97.67580	Parking at Public Park	Easy water access	Yes
	12	Brushy Creek upstream of WWTP	N/A	N/A	No Public Access: Private Property	N/A	No
	13	Lance Ln @ Brushy Creek	30.51661	-97.66246	Small parking lot on left bank (apartment complex)	Easy water access	Yes
	14	Brushy Creek upstream of Railroad	N/A	N/A	No Public Access: Private Property	N/A	No
	15	Rabb House @ Brushy Creek	30.51453	-97.65237	Parking at Public Park	Access via man-made steps down into water	Yes
	16	Brushy Creek upstream of Lake Creek	N/A	N/A	Combine with Recon site 15	Combine with Recon site 15	N/A
	17	Brushy Creek downstream of Dry Branch	N/A	N/A	No Public Access: Private Property	N/A	No
	18	Ravenwood Dr @ Brushy Creek	N/A	N/A	Combine with Recon site 19	Combine with Recon site 19	N/A
	19	Paradise Ridge Dr @ Brushy Creek	30.51476	-97.63026	Posted: Lake Forest HOA residents only (access by foot or bike only)	Steep banks but manageable	Yes
	20	Brushy Creek upstream of Chandler Branch	N/A	N/A	Combine with Recon site 19	Combine with Recon site 19	N/A
	21	Red Bud Ln @ Brushy Creek	30.53082	-97.61374	Park on dirt/gravel under Red Bud Ln. bridge	Easy water access	Yes
	22	CR 123 @ Brushy Creek	30.53096	-97.59003	Park on the side of the road (low water bridge)	Easy water access	Yes
	23	Tollway 130 @ Brushy Creek	30.524047	-97.576277	Park on dirt path under bridge on left bank upstream	N/A	Yes
	24	FM 685 @ Brushy Creek	30.52606	-97.56706	Park on the side of the road	Easy water access	Yes
	25	Riverwalk Dr @ Brushy Creek	30.52287	-97.56084	Park just down the street at neighborhood park/pool and follow the sidewalk to the site	Poor water access: Steep and muddy, relatively sheer drop	Yes
	26	Old CR 137 @ Brushy Creek	N/A	N/A	Park on the side of the road	No access, very steep cliff-like banks	No
	27	CR 137 @ Brushy Creek	30.50686	-97.54869	Park on the side of the road gravel pull-off	Easy water access	Yes
	12/17/09	28	CR 129 @ Brushy Creek	30.48890	-97.49924	Park on the side of the road	Poor water access: very steep banks, 6-8 ft drop, can survey from bridge
29		FM 973 @ Brushy Creek	30.46887	-97.46365	Park on dirt path under bridge on left bank downstream	Poor water access, steep and slippery	Yes
30		CR 405 @ Brushy Creek	N/A	N/A	No Public Access: Private Property	N/A	No
31		CR 457 @ Brushy Creek	30.46890	-97.40557	Park at end of unmarked dirt road through a field	No water access, can get to bank but approximate 10 ft drop	Yes
32		SH 95 @ Brushy Creek	30.46844	-97.40118	Park on dirt path under bridge on right bank upstream	Poor water access, steep and slippery	Yes
33		CR 456 @ Brushy Creek	30.47001	-97.38160	Park on the side of the road	No water access, too steep	Yes
34		CR 455 @ Brushy Creek	30.51478	-97.35089	Park on the side of the road (Not quite wide enough to pull completely off of the road)	No water access, too steep	Yes
35		FM 619 @ Brushy Creek	30.51937	-97.33833	Park on the side of the road (Not quite wide enough to pull completely off of the road)	No water access, too steep	Yes
36		CR 450 @ Brushy Creek	N/A	N/A	No public access: fenced along all sides to bridge	N/A	No
37		FM 112 @ Brushy Creek	30.53732	-97.25908	Park on the side of the road	Poor water access, steep and large rocks	Yes
38		CR 434 @ Brushy Creek	30.55830	-97.23326	Park on the side of the road, worn pull-off right bank	Poor water access, steep sheer drop-off	Yes
39		CR 486 @ Brushy Creek	30.59410	-97.19521	Park on dirt path under bridge on right bank upstream	No water access, too steep	Yes
40		CR 440 @ Brushy Creek	30.60536	-97.18890	Park on the side of the road	Poor water access, too steep and vegetation	Yes
41		US 79 @ Brushy Creek	30.62346	-97.17701	Park on dirt path under bridge on right bank upstream	Poor water access, steep drop-off	Yes
42		CR 443 @ Brushy Creek	30.64413	-97.14510	Park on the side of the road (Not quite wide enough to pull completely off of the road)	Poor water access, too steep and vegetation	Yes
43		FM 908 @ Brushy Creek	30.69371	-97.07760	Park on the side of the road	Poor water access, too steep and vegetation	Yes

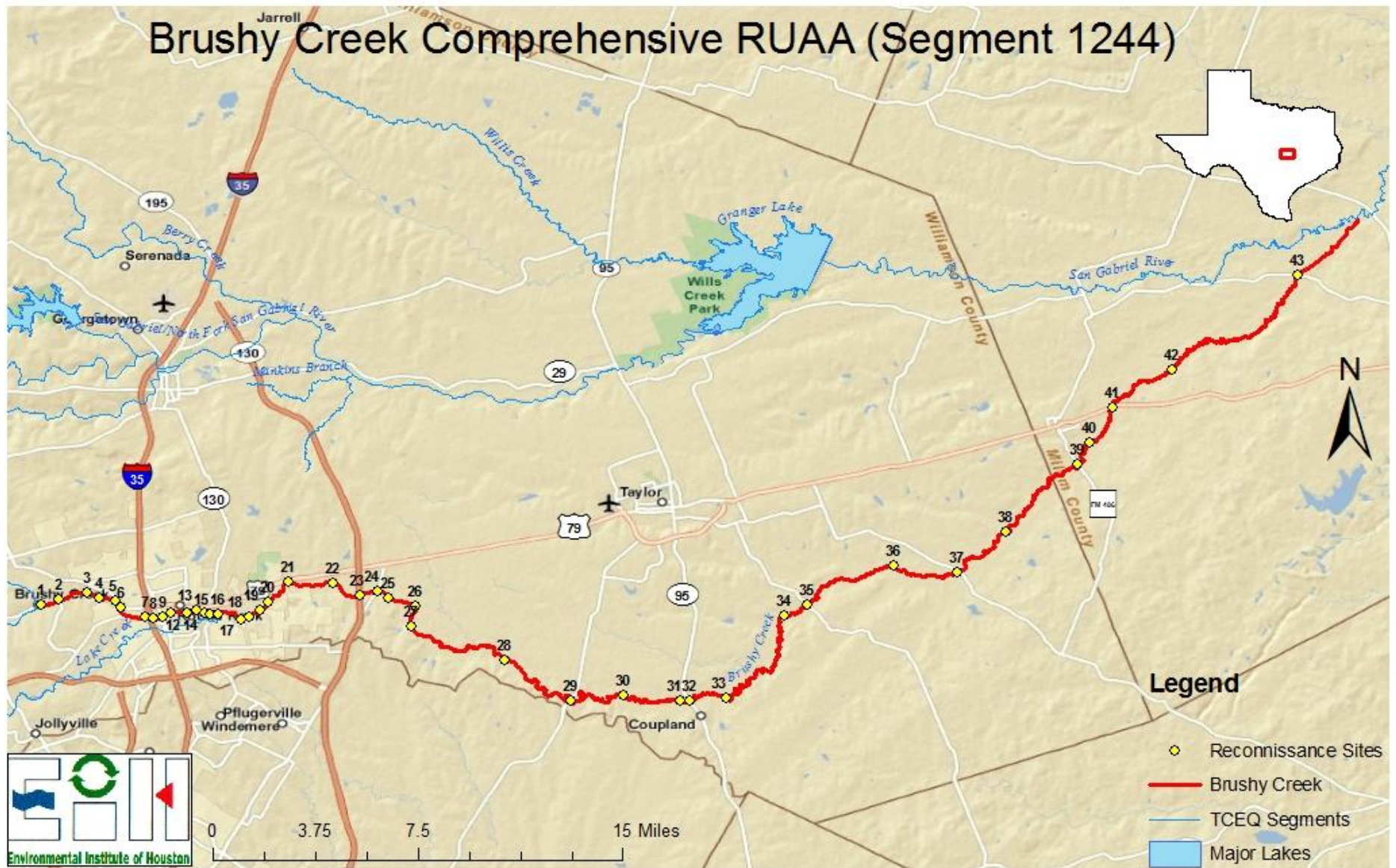


Figure 5. Reconnaissance sites for comprehensive RUAA in Brushy Creek (Segment 1244)

Table 4. Survey sites for the Comprehensive RUAA Survey on Brushy Creek (Segment 1244) (corresponding to Figure 6).

Recon Site	Field Survey Site	Description	Latitude	Longitude	Approx. River Mile	Photos
1	1	Walsh Dr @ Brushy Creek	30.519220	-97.745050	75.2	7
2	2	Great Oaks Dr @ Brushy Creek	30.521320	-97.735960	74.8	7
3	3	Dry Fork @ Brushy Creek	30.525790	-97.721680	73.7	12
4	4	Hairy Man Rd @ Brushy Creek	30.522750	-97.715480	73.2	7
7	5	Chisholm Trail Rd @ Brushy Creek	30.512575	-97.695352	71.5	0
8	6	N Lee St @ Brushy Creek	30.512700	-97.684510	70.7	6
10	7	Pecan Ave @ Brushy Creek	30.514590	-97.675800	70.0	5
13	8	Lance Ln @ Brushy Creek	30.516610	-97.662460	69.0	6
15	9	Rabb House @ Brushy Creek	30.514530	-97.652370	68.2	8
19	10	Paradise Ridge Dr @ Brushy Creek	30.514760	-97.630260	66.5	3
21	11	Red Bud Ln @ Brushy Creek	30.530820	-97.613740	64.8	7
22	12	CR 123 @ Brushy Creek	30.530960	-97.590030	63.0	5
23	13	SH 130 @ Brushy Creek	30.524047	-97.576277	61.8	0
24	14	FM 685 @ Brushy Creek	30.526060	-97.567060	61.2	12
25	15	Riverwalk Dr @ Brushy Creek	30.522870	-97.560840	60.6	7
27	16	CR 137 @ Brushy Creek	30.506860	-97.548690	58.7	8
28	17	CR 129 @ Brushy Creek	30.488900	-97.499240	54.1	6
29	18	FM 973 @ Brushy Creek	30.468870	-97.463650	49.5	10
31	19	CR 457 @ Brushy Creek	30.468900	-97.405570	43.2	9
32	20	SH 95 @ Brushy Creek	30.468440	-97.401180	42.9	7
33	21	CR 456 @ Brushy Creek	30.470010	-97.381600	41.1	7
34	22	CR 455 @ Brushy Creek	30.514780	-97.350890	33.8	6
35	23	FM 619 @ Brushy Creek	30.51937	-97.33833	32.8	4
37	24	FM 112 @ Brushy Creek	30.53732	-97.25908	26.0	6
38	25	CR 434 @ Brushy Creek	30.558300	-97.233260	23.1	6
39	26	CR 486 @ Brushy Creek	30.594100	-97.195210	18.3	7
40	27	CR 440 @ Brushy Creek	30.605360	-97.188900	17.0	4
41	28	US 79 @ Brushy Creek	30.623460	-97.177010	15.0	5
42	29	CR 443 @ Brushy Creek	30.644130	-97.145100	11.7	7
43	30	FM 908 @ Brushy Creek	30.693710	-97.077600	3.2	8

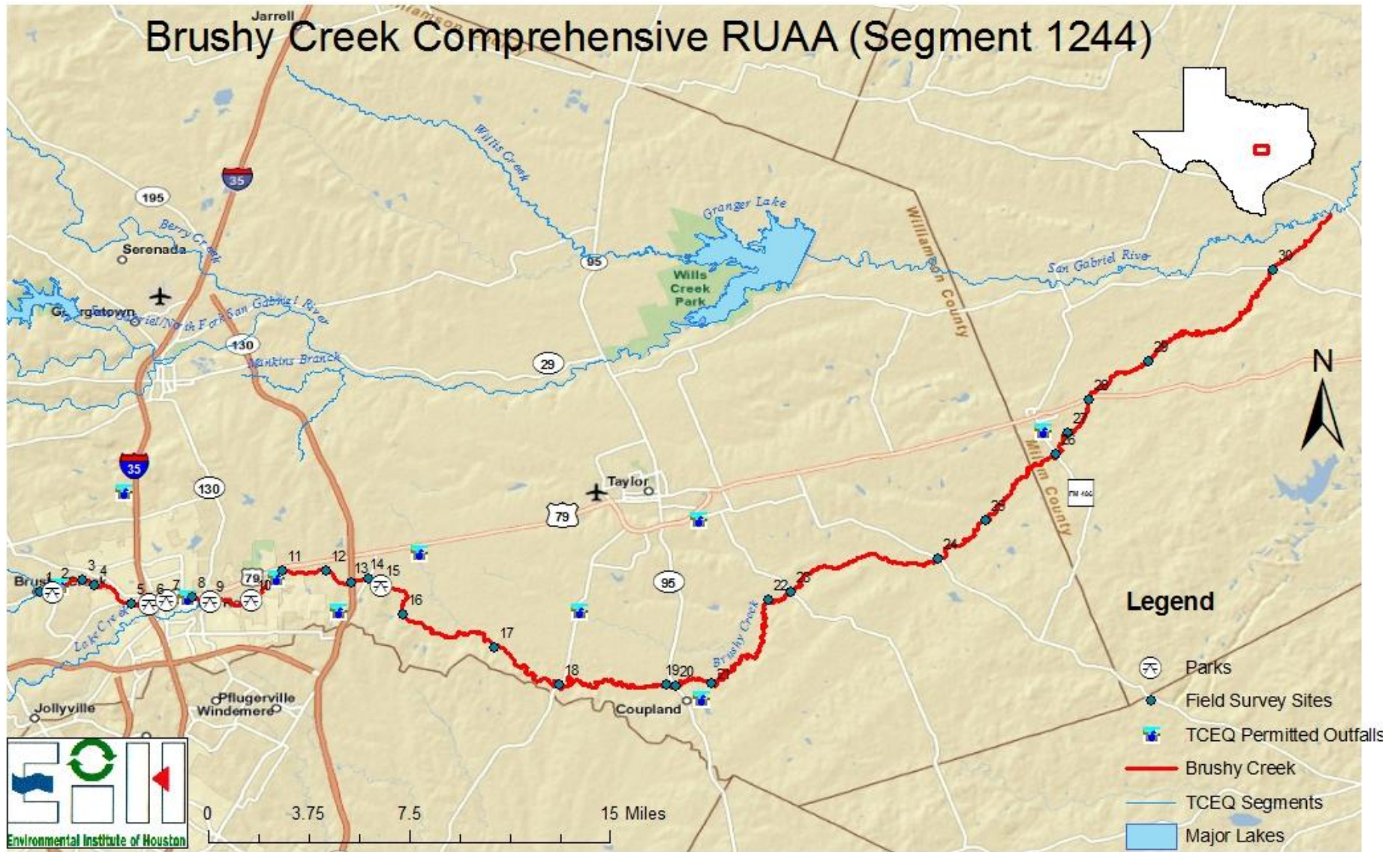


Figure 6. Comprehensive RUAA survey sites on Brushy Creek (Segment 1244) selections based on river mile/assessment units, accessibility, and recreational features.



Figure 7 Picture of field survey site 1, showing the general representation of the physical conditions seen on the Brushy Creek assessment units 1244_03 and 1244_04



Figure 8 Picture of field survey site 20, showing the general representation of the physical conditions seen on the Brushy Creek assessment units 1305_01 and 1305_02

Sampling Methods

Recreational use attainability analyses (RUAA) 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). Until recently, Texas had two recreation use categories in the 2000 TSWQS: contact and noncontact recreation. Recently these recreation use categories were expanded to include more categories: primary contact, and secondary contact recreation (1 &2). Primary contact recreation consists of recreational activities involving a significant risk of ingestion of water including: wading by children, swimming, water skiing, diving, and surfing. Secondary contact recreation 1 is considered water recreation activities not involving a significant risk of water ingestion: including fishing, commercial and recreational boating, and limited body contact incidental to shoreline activity. Secondary contact recreation 2 follows the same definition as secondary contact recreation 1 except that it occurs less frequently due to (1) physical characteristics of the water body and/or (2) limited public access.

According to TCEQ agency guidance, a comprehensive RUAA must be conducted on Brushy Creek since it is a classified water body (Segment 1244). RUAA Surveys must be conducted during the normal warm season and periods when people would be most likely use the water body for contact recreational purposes. RUAA surveys must also be conducted during optimal sampling conditions that are representative of the normal flow conditions of the stream and are not storm-influenced. Weather conditions summary can be found in Appendix 6. The RUAA field surveys for Brushy Creek (Segment 1244) were conducted during the weekend of May 7, 2010. While, normally two field survey site visits are necessary for a Comprehensive RUAA, due to the well documented primary contact recreation observed during the first field

survey, it was confirmed with the TCEQ that a second field survey site visit was not necessary, but that UHCL needed to continue to conduct interviews and collect historical information.

More specific information on procedures can be found in *TCEQ's RUAA Procedures Document, May 2009*.

Field Survey Descriptions

A Comprehensive RUAA field survey begins with marking off a 300 meter (m) reach of the waterway, flagging every 30m. 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) was then taken within the 300m stream reach. If the waterbody is wadeable, a depth measurement was 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 survey site conditions 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 Comprehensive RUAA datasheets were completed to document any recreational uses, signs of recreational use, impeding conditions, or other field notes taken during the field survey. Depth measurements for sites that were considered non-wadeable were taken from available bridges at the deepest point accessible.

Due to access constraints complete field surveys were not possible at a number of the field survey locations on Brushy Creek. Impediments to stream access, such as steep banks and water depth exceeding 1.5 meters, at times limited the field survey team's ability to survey the complete 300m stretch of stream. In each case where this was a factor, the impediments were documented on the field data sheet and documenting pictures of these conditions were taken.

Specific impediments causing access constraints for each site can be found in Appendices 2, 5, and 8.

Interviews

When possible, interviews were conducted on field survey visits (Appendix 3). In person interviews were performed with interviewees located in close proximity to the waterbody and in some cases adjacent land/homeowners. Other stakeholders were interviewed via telephone (Appendix 3). The Environmental Institute of Houston's Interview Protocol Guideline and University of Houston-Clear Lake's Informed Information Use document is attached as Appendix 4.

Results

The 75 miles of Brushy Creek was evaluated the weekend of May 7, 2010 with a total of 30 field surveys 29 sites were surveyed one time. Field survey site number nine was not surveyed because the park was closed at the time of the surveys. All field data sheets are attached (Appendix 2). The field surveys took place over the span of two days: 5/7/2010 and 5/8/2010.

Physical Evaluation and Flow

During the RUAA surveys the average air temperatures and water temperatures fell well within the range of acceptable temperatures for sampling described in the TCEQ procedures manual (Table 3). The average thalweg depth of Brushy Creek was 0.7m and the average width was 14.5m (Table 3). The average flow calculated during our survey of Brushy Creek was 48cfs. The stream type recorded throughout the segment was perennial.

Brushy Creek riparian zone can be generally broken down into two regions: (sites 1-15 were dominated by forested riparian zones, while sites 16-30 had a shrub dominated corridor (Table 4). The dominant substrate along Brushy Creek (Segment 1244) was generally composed of bedrock, cobble, and gravel in the upstream extent of the segment, and more mud/clay, sand and silt substrate in the downstream extent of the segment (Table 4).

Table 5. Physical parameters from the comprehensive recreational use attainability analysis field surveys conducted on, at Brushy Creek (Segment 1244) * = unable to take measurement due to physical parameters.

Field Survey		Air Temperature	Water	Average	Average	Stream	
Site	Site Description	(°C)	Temperature (°C)	Depth (m)	Width (m)	Flow (cfs)	Secchi (m)
1	Walsh Dr @ Brushy Creek	29.0	24.0	0.2	16.4	22.4	Clear to bottom
2	Great Oaks Dr @ Brushy Creek	30.0	25.5	0.3	11.6	21.8	Clear to bottom
3	Dry Fork @ Brushy Creek	30.0	25.0	0.4	9.5	19.3	Clear to bottom
4	Hairy Man Rd @ Brushy Creek	30.0	25.0	0.5	15.9	18.1	Clear to bottom
5	Chisholm Trail Rd @ Brushy Creek	32.0	25.0	0.6	19.8	32.9	Clear to bottom
6	N Lee St @ Brushy Creek	36.0	28.0	0.8	26.7	32.9	Clear to bottom
7	Pecan Ave @ Brushy Creek	31.0	25.0	>1.5	66.0	*	Clear to bottom
8	Lance Ln @ Brushy Creek	25.0	23.0	0.8	9.0	26.5	Clear to bottom
9	Rabb House @ Brushy Creek	No access for field survey: park closed					
10	Paradise Ridge Dr @ Brushy Creek	22.0	20.0	0.6	9.8	26.8	Clear to bottom
11	Red Bud Ln @ Brushy Creek	20.5	22.0	0.6	11.2	62.7	Clear to bottom
12	CR 123 @ Brushy Creek	25.0	22.0	0.9	19.5	64.5	Clear to bottom
13	Tollway 130 @ Brushy Creek	22.0	22.0	0.6	10.7	63.3	Clear to bottom
14	FM 685 @ Brushy Creek	24.0	22.0	0.5	14.5	44.1	Clear to bottom
15	Riverwalk Dr @ Brushy Creek	20.0	21.0	0.4	11.3	56.8	>1.20
16	CR 137 @ Brushy Creek	21.0	20.0	0.6	16.2	59.0	>1.20
17	CR 129 @ Brushy Creek	25.0	21.0	0.5	15.9	28.9	>1.20
18	FM 973 @ Brushy Creek	24.0	21.0	>1.5	9.6	48.4	0.66
19	CR 457 @ Brushy Creek	24.0	*	1.3	9.7	*	*
20	SH 95 @ Brushy Creek	21.0	22.0	1.0	8.0	63.6	0.472
21	CR 456 @ Brushy Creek	21.0	*	0.6	8.8	*	*
22	CR 455 @ Brushy Creek	16.0	22.0	0.8	7.5	72.1	0.38
23	FM 619 @ Brushy Creek	16.0	22.0	>1.5	9.0	75.3	0.27
24	FM 112 @ Brushy Creek	32.0	25.0	>1.5	6.3	*	0.31
25	CR 434 @ Brushy Creek	32.0	23.0	0.4	11.7	*	0.492
26	CR 486 @ Brushy Creek	30.0	22.5	1.2	10.4	61.5	0.32
27	CR 440 @ Brushy Creek	29.0	*	0.5	9.3	*	*
28	US 79 @ Brushy Creek	28.0	23.0	1.3	20.5	61.8	0.28
29	CR 443 @ Brushy Creek	29.0	23.0	1.0	8.7	*	*
30	FM 908 @ Brushy Creek	25.0	21.0	0.6	17.7	92.9	0.552
Total Average		25.8	22.9	0.7	14.5	48.0	

Table 6.Physical Characteristics of Riparian Zone and Dominant substrate of the field survey sites sampled, during the Comprehensive Recreational Use Attainability Analysis on Brushy Creek (Segment 1244)

Field Survey					Dominant Primary
Site	Site Description	Left Bank Riparian Zone	Right Bank Riparian Zone	Ease of Bank Access	Substrate
1	Walsh Dr @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Easy	Bedrock
2	Great Oaks Dr @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Easy	Bedrock
3	Dry Fork @ Brushy Creek	Forest	Forest	Easy	Cobble
4	Hairy Man Rd @ Brushy Creek	Denuded/Eroded bank	Forest	Easy	Bedrock
5	Chisholm Trail Rd @ Brushy Creek	Forest	Forest	Easy	Cobble
6	N Lee St @ Brushy Creek	Mowed/Maintained corridor	Mowed/Maintained corridor	Easy	Bedrock
7	Pecan Ave @ Brushy Creek	Forest	Mowed/Maintained corridor	Easy	Mud/Clay
8	Lance Ln @ Brushy Creek	Forest	Forest	Easy	Cobble
9	Rabb House @ Brushy Creek	No access for field survey: park closed			
10	Paradise Ridge Dr @ Brushy Creek	Forest	Forest	Difficult	Cobble
11	Red Bud Ln @ Brushy Creek	Forest	Forest	Easy	Cobble
12	CR 123 @ Brushy Creek	Forest	Forest	Easy	Cobble
13	Tollway 130 @ Brushy Creek	Forest	Forest	Moderately difficult	Bedrock
14	FM 685 @ Brushy Creek	Forest	Forest	Moderately easy	Bedrock
15	Riverwalk Dr @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately easy	Bedrock
16	CR 137 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately easy	Gravel
17	CR 129 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately easy	Gravel
18	FM 973 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately easy	Gravel
19	CR 457 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Difficult	Mud/Clay
20	SH 95 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately easy	Gravel
21	CR 456 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Difficult	Sand
22	CR 455 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately difficult	Sand
23	FM 619 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately difficult	Silt
24	FM 112 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately easy	Mud/Clay
25	CR 434 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately difficult	Sand
26	CR 486 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately difficult	Gravel
27	CR 440 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Difficult	Mud/Clay
28	US 79 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately easy	Sand
29	CR 443 @ Brushy Creek	Forest	Forest	Difficult	Sand
30	FM 908 @ Brushy Creek	Shrub dominated corridor	Shrub dominated corridor	Moderately easy	Mud/Clay

Surrounding Conditions that Impede Recreation and Channel Obstructions

Impediments and Channel Obstructions on Brushy Creek were recorded at the field survey site visits and include: private property, no trespassing signs, steep slopes, fences, log jams, dam, low water bridge, large rocks in water, fast flowing water, thick vegetation, and soft substrate. The downstream assessment units of Brushy Creek have very limited public access due to the large amount of privately owned land surrounding the river. A complete listing of the documented impediments and their locations can be found in Table 8, and Appendix 8.

Recreational Uses

Uses observed from all combined site visits include: children-wading, swimming, wading-adults, and fishing (Table 7). A total of 6 individuals were observed carrying out primary contact recreation activities on Brushy Creek (photo documentation of these observed uses are included in Appendix 5). Primary contact recreation occurred at sites 6 and 11. The observation of children-wading at site 6 consisted of two children walking barefoot in thigh deep water running and chasing fish with dip nets. When asked if they play in the water often, their response was “every afternoon”. The observation of children-wading and swimming at site 11 consisted of 6 children from approximate ages 2 to 16 wading and swimming in the Creek. The children swimming were seen wrestling in the water, dunking each other’s heads under water, swimming over distances underwater, and spitting site water out of their mouth upon surfacing. All observed instances of primary contact recreation occurred in assessment units 1244_03 and 1244_04. Four individuals were observed carrying out secondary contact recreation activities on Brushy Creek. Three of the individuals were observed fishing; one was a wading-adult. Various non-contact activities were recorded.

The most common evidence of recreational uses observed at the field survey sites were: children's toys, graffiti, gun shells, foot paths/prints, fishing tackle, and fire pit/ring (Table 8 and Appendix 8).

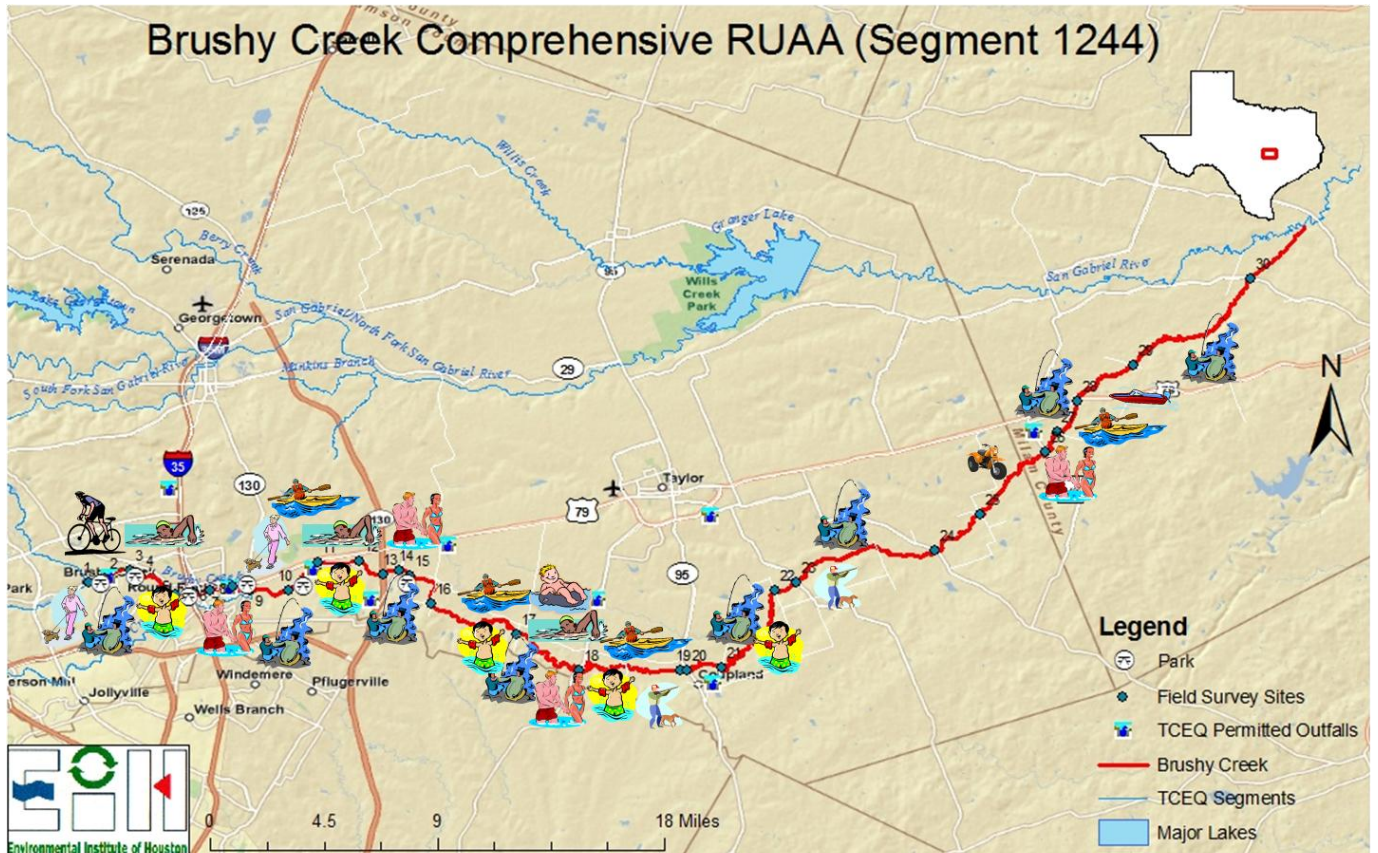
Interviews

A total of 121 individuals were contacted for an interview throughout the Comprehensive Recreational Use Attainability Analysis on Brushy Creek (TCEQ Segment 1244), and a total of 81 of those individuals agreed to participate in the interview. Of the 81 total, 13 were interviewed in person and 68 by phone. A total of 44 out of the 81 interviewed answered yes to the question "Are you familiar with Brushy Creek?" Of those, 26 had personally used the stream for recreation, 33 had observed recreation activities, and 19 had heard about recreation on Brushy Creek. The total numbers of man-years that interviewees were familiar with the Brushy Creek Watershed were over 1,300 man-years.

The types of recreational uses documented by interviews included a number of primary contact recreations such as: swimming and wading-children (Figure 9, Table 7). Secondary contact uses documented by interviews included: wading-adults, rafting, tubing, boating, kayaking, canoeing, and fishing. Non contact uses included: trapping, hunting, walking/hiking, jogging/running, bicycling, and playing on shoreline. Figure 9 does not include all recorded uses, and the locations are approximate. Please see Appendix 8, an electronic supplement for the complete depiction of the observed uses, evidence of uses, interviewed uses in the form of personal uses, witnessed use, and hear-say use, and impediments.

Table 7. Recreational uses observed and documented on Brushy Creek (Segment 1244) for the Comprehensive Recreational Use Attainability Analysis.

Types of Recreation	Field Survey	Interviews			Total	
	Observations	Personal Use	Witnessed	Hear-say		
1°	Drinking or water in mouth	1				1
	Skin Diving			1	1	2
	Swimming	1	8	15	8	32
	Wading -Children	2	8	14	6	30
	Water Skiing			1		1
2°	Wading -Adults	1	8	15	6	30
	Rafting			3	1	4
	Tubing		2	3	1	6
	Boating		3	3	2	8
	Kayaking		2	13	6	21
	Canoeing		6	8	6	20
	Fishing	2	17	31	27	77
non	Hunting		2	2	3	7
	Trapping		1			1
	Walking/Hiking	7	2	2	2	13
	Jogging/Running	3				3
	Bicycling	3	1			4
	Playing on shoreline	3				3
	Motorcycle/ATV	1				1
	Picnicking	3				3
	Wildlife watching	1				1
	Standing/Sitting	6				6



Recreation Symbols Key

- | | | | | | | | |
|--|-----------------|--|-------------|--|-------------------|--|-----------|
| | Swimming | | Tubing | | ATV/Motorcycle | | Hunting |
| | Wading-Children | | Kayak/Canoe | | Boating | | Bicycling |
| | Wading-Adult | | Fishing | | Wildlife Watching | | Walking |

Figure 9. Comprehensive RUAA survey sites on Brushy Creek (Segment 1244). Selections based on river mile/assessment units, accessibility, and recreational features (constructed from observations, interviews, and evidence). This map does not include all recorded uses and locations and Locations are approximate. See Appendix 8 for an interactive Google Earth map depicting exact locations of uses, impediments, and evidence.

Table 8. Impediments to, evidence of, and observed recreational uses documented during field surveys, interviewed personal uses, interviewed witnessed uses, and interviewed hear-say uses documented on Brushy Creek (Segment 1244) for the Comprehensive Recreational Use Attainability Analysis.

Field Survey Site	Site Description	Impediments	Evidence	Observed	Personal Use	Witnessed Use	Hear-say Use
1	Walsh Dr @ Brushy Creek	Low Water Bridge	Children's Toys	Bicycling, Jogging/Running, Walking/Hiking	Bicycling, Canoeing, Fishing, Kayaking, Wading-Adults, Wading-Children, Walking/Hiking	Canoeing, Fishing, Kayaking, Swimming, Tubing, Wading-Adults, Wading-Children	
2	Great Oaks Dr. @ Brushy Creek	Dam	Fishing Tackle, Foot Paths/Prints	Bicycling, Jogging/Running, Walking/Hiking	Bicycling, Walking/Hiking		
3	Dry Fork @ Brushy Creek	Log Jam	Children's Toys, Foot Paths/Prints	Standing, Sitting			
4	Hairy Man Rd @ Brushy Creek	Low Water Bridge	Fire Pit/Ring, Foot Paths/Prints	Standing, Sitting			
5	Chisholm Trail Rd. @ Brushy Creek	Dam, Large Rocks	Fishing Tackle, Foot Paths/Prints	Fishing, Walking/Hiking	Fishing, Swimming, Canoeing, Wading-Children	Fishing, Wading-Adults, Swimming, Wading-Children, Picnicking, Walking/Hiking	
6	N Lee St. @ Brushy Creek	Low Water Bridge	Fire Pit/Ring, Fishing Tackle, Foot Paths/Prints, Remnants of Kid's Play	Picnicking, Playing on Shoreline, Sitting, Standing, Wading-Adults, Wading-Children, Walking/Hiking, Wildlife Watching	Canoeing, Fishing, Swimming, Wading-Adults, Walking/Hiking	Canoeing, Fishing, Kayaking, Rafting, Swimming, Tubing, Wading-Adults, Wading-Children, Walking/Hiking, Picnicking	Fishing, Swimming, Wading-Children, Walking/Hiking
7	Pecan Ave @ Brushy Creek	Dam/Waterfall, Private Property, Soft Mud Substrate	Fishing Tackle, Foot Paths/Prints	Children in Playground, Fishing, Picnicking, Sitting, Standing	Boating, Canoeing, Fishing	Boating, Bicyling, Fishing, Picnicking, Swimming	Fishing, Swimming, Walking/Hiking
8	Lance Ln @ Brushy Creek	Culvert	Fire Pit/Ring, Fishing Tackle, Foot Paths/Prints, Blanket on Bank	Walking			
9	Rabb House @ Brushy Creek	Site Not Accessible: No Survey Conducted				Fishing	
10	Paradise Ridge Dr @ Brushy Creek	Steep Slopes	Children's Toys, Fire Pit/Ring, RV/ATV Tracks, Picnic Tables	Jogging/Running, Walking/Hiking			
11	Red Bud Ln @ Brushy Creek	Low Water Bridge	Foot Paths/Prints	Drinking or Water in Mouth, Picnicking, Playing on Shoreline, Sitting, Swimming, Wading-Children	Fishing, Canoeing, Swimming, Wading-Children		
12	CR 123 @ Brushy Creek	Low Water Bridge, No Trespassing Sign, Private Property	Children's Toys	Bicycling	Fishing, Hunting, Swimming, Trapping, Tubing, Wading-Adults, Wading-Children	Canoeing, Fishing, Rafting, Swimming, Tubing, Wading-Adults, Wading-Children	Fishing, Swimming
13	Tollway 130 @ Brushy Creek	Large Boulders, Steep Slopes	Foot Paths/Prints, Graffiti				
14	FM 685 @ Brushy Creek	Low Water Bridge	Foot Paths/Prints, Graffiti		Fishing	Fishing, Swimming, Kayaking, Canoeing, Wading-Children, Wading-Adults	Fishing, Swimming, Kayaking, Canoeing, Wading-Children, Wading-Adults
15	Riverwalk Dr @ Brushy Creek	Steep Slopes	Children's Toys	Walking	Swimming, Tubing, Fishing, Trapping, Hunting, Wading-Children, Wading-Adults	Swimming, Tubing, Fishing, Wading-Children, Wading-Adults, Rafting, Canoeing	Swimming, Fishing
16	CR 137 @ Brushy Creek	Steep Slopes	Graffiti		Swimming, Wading-Adults, Wading-Children, Tubing, Fishing, Trapping, Hunting	Canoeing, Kayaking, Swimming, Wading-Adults, Wading-Children, Tubing, Fishing, Rafting	Canoeing, Kayaking, Swimming, Wading-Adults, Wading-Children, Fishing
17	CR 129 @ Brushy Creek	Steep Slopes	RV/ATV Tracks		Boating, Canoeing, Fishing, Hunting, Swimming, Tubing, Wading-Adults, Wading-Children	Fishing, Hunting, Kayaking, Swimming, Wading-Adults, Wading-Children	Fishing, Canoeing, Swimming
18	FM 973 @ Brushy Creek	Log Jam	Foot Paths/Prints, Paddle on Bank, RV/ATV Tracks				
19	CR 457 @ Brushy Creek	Steep Slopes	Gun Shells				
20	SH 95 @ Brushy Creek	Log Jam, Steep Slopes	Gun Shells				
21	CR 456 @ Brushy Creek	Fence, Log Jam, Private Property, Steep Slopes					
22	CR 455 @ Brushy Creek	Log Jam, Steep Slopes					
23	FM 619 @ Brushy Creek	Steep Slopes	Fishing Tackle				
24	FM 112 @ Brushy Creek	Log Jam			Boating, Fishing		
25	CR 434 @ Brushy Creek	Fast Flowing Water, Log Jam, Steep Slopes				Fishing	Fishing
26	CR 486 @ Brushy Creek	Log Jam, Steep Slopes	RV/ATV Tracks		Canoeing, Fishing		Fishing
27	CR 440 @ Brushy Creek	Log Jam, Steep Slopes	Gun Shells	Motorcycle/ATV, Standing	Fishing	Fishing, Kayaking	
28	US 79 @ Brushy Creek	Soft Mud Substrate, Steep Slopes			Fishing		
29	CR 443 @ Brushy Creek	Log Jam, Steep Slopes			Fishing		
30	FM 908 @ Brushy Creek	Fence, Steep Slopes	Fishing Tackle		Fishing	Fishing	

Summary

Twenty nine (29) surveys on the Brushy Creek in the Brazos River Basin were completed in this RUAA to evaluate whether the existing and/or attainable recreational uses of segment 1244, might be different than the presumed recreational uses. Important data collected in this RUAA included general stream characteristics, observations and evidence of recreational use and surrounding conditions that promote recreation, as well as surrounding conditions that impede recreation (including channel obstructions).

Primary contact recreation was observed at two survey sites (children-wading and swimming), and 16 interviewees reported personally using the waterbody for primary contact recreation. Other important documentation of primary contact recreation in Brushy Creek was collected via interviews and includes swimming, water skiing, and wading-children. Observed secondary contact water related activities included adults-wading and fishing, as well as other non-contact recreation activities. There were six observed parks located throughout the segment providing public access to the water body. The average depth at the thalweg was 0.7m and the average flow throughout the segment was 48cfs. RUAA summary analysis indicates that primary contact, secondary contact (1 & 2), and non-contact recreation activities occur on Brushy Creek, Segment 1244.

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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: Brushy Creek
 Segment No. or Nearest Downstream Segment No.: 1244
 Classified?: Yes
 County: Williamson and Milam

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? 0.7 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