

**Comprehensive Recreational Use Attainability Analysis of Dickinson Bayou Above Tidal
(Segment 1104)**

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Introduction

Problem Statement

Dickinson Bayou Above Tidal is on the 2008 and draft 2010 Texas 303(d) list for non-attainment of bacteria criteria associated with primary recreation uses. High levels of indicator bacteria had been noted for many years prior to this listing. Bacteria from human and animal waste are associated with the presence of disease-causing microorganisms that may cause illness. Swimming and other forms of recreation that involve direct contact with the water are referred to as "contact recreation" in the state's standards for the quality of streams, lakes, and bays. The Texas Commission on Environmental Quality (TCEQ) has initiated a total maximum daily load (TMDL) project to characterize the sources of bacteria in the watershed of the bayou and develop a plan to improve water quality. In a parallel effort, the TCEQ partnered with the steering committee of the Dickinson Bayou Watershed Partnership and AgriLife Extension to develop a watershed protection plan (WPP) for Dickinson Bayou. In May 2009, the TCEQ accepted the Dickinson Bayou Watershed Partnership's WPP and submitted it to the EPA for approval. The EPA recommended several revisions to the plan, but gave preliminary approval to implement several major projects included in the plan.

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 Dickinson Bayou Above Tidal, Segment 1104, the results of which are included in this report. This Comprehensive RUAA Report will provide the TCEQ's Standards Group the relevant information needed to determine the appropriate attainable contact recreation use for Dickinson Bayou Above Tidal (Segment 1104). 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 specific objectives of each component are listed below.

Objectives

1. Reconnaissance and Site Selection

The site reconnaissance and selection 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 primarily with the input of local, state and regional agency staff familiar with the watershed. In cooperation with the TCEQ, UHCL conducted an initial stakeholder meeting on January 29th, 2010 at the Galveston County Consolidated Water Drainage District in Friendswood, TX. A reconnaissance survey was conducted previously, on November 19th 2009, and served to produce a list of candidate sites, which were discussed at the meeting.

2. Comprehensive Recreational Use Attainability Analysis

The primary objective of the Dickinson Bayou Above Tidal Comprehensive RUAA was to characterize the recreational use and potential impediments on the use of this stream. UHCL conducted a Basic RUAA Survey as part of the Comprehensive RUAA. The field surveys were conducted on March 19, April 16, May 22 and June 22, 2010, at selected sites where there is a high probability of detecting recreation use. The objective was to document and characterize observed use, site conditions (hydrology, physical attributes), and weather during the survey. In addition, UHCL conducted a historical information review and informant interviews for the Comprehensive RUAA. The objective of the review and interviews was to supplement the data obtained from the field surveys and increase the probability of detecting and adequately characterizing recreational uses in the watershed. In completing the Comprehensive RUAA for

Dickinson Bayou Above Tidal, UHCL followed the guidance found in the TCEQ document:

Recreational Use-Attainability Analyses (RUAAs) Procedures for a Comprehensive RUAA and Basic RUAA Survey, May 2009.

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 Dickinson Bayou Above Tidal. This included sending out email and phone messages to key organizations and staff familiar with the watershed. The final and complete stakeholder contact list is provided in Appendix 1. In addition, on January 29 2010, UHCL conducted an initial stakeholder group meeting at the Galveston County Consolidated Water Drainage District in Friendswood, TX to gather information on the watershed, including information on the likely recreational access points to Segment 1104. Finally, UHCL and TCEQ advertised a public meeting via public notice in the local newspaper and held the meeting, again at the Galveston County Consolidated Water Drainage District in Friendswood, TX on August 16, 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.

Study Area

Description of Water Body

Dickinson Bayou is located in the San Jacinto-Brazos Coastal Basin. It originates near the city of Alvin, south of Houston, and flows east through Dickinson before discharging into Dickinson Bay, a part of the Galveston Bay system. Dickinson Bayou is composed of two designated segments: the tidal portion, Segment 1103, and the portion above tidal influence,

Segment 1104. Dickinson Bayou Above Tidal is the subject of this Recreational Use Attainability Analysis. The Texas Surface Water Quality Standards describe Segment 1104 as flowing: “from a point 4.0 km (2.5 miles) downstream of FM 517 in Galveston County to FM 528 in Galveston County” (30 TAC §307, Appendix C). Segment 1104 encompasses two Assessment Units (AUs) 1104_01: from the lower segment boundary to FM 517 and 1104_02: from FM 517 upstream to FM 528. The Dickinson Bayou Above Tidal watershed is located in Galveston County (Figure 1). Segment 1104 is classified by the Texas Commission on Environmental Quality and is approximately 7 miles in length.

Environmental Features and Population Characteristics

The climate in the Dickinson Bayou watershed is classified as subtropical, which is defined as having hot, humid summers and dry winters. The Dickinson Bayou watershed is within the Gulf Coastal 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.

Dickinson Bayou Above Tidal is a small coastal prairie stream. Dickinson Bayou Above Tidal has been highly modified, and serves as a portion of water conveyance system for the Galveston County Consolidated Water Drainage District. Rice farming in the area created many diversion canals in the Above Tidal portion of the waterbody. The entire Dickinson Bayou watershed has been undergoing increased urbanization over the past 20 years.

Within this watershed the major land development is concentrated in and around the cities of Dickinson and League City and along Interstate 45 corridor. The natural Dickinson Bayou watershed includes the entire city of Dickinson, Algoa, and portions of the cities of Alvin, Friendswood, League City, Santa Fe, and Texas City. The remainder of the area is rural and undeveloped.

Dickinson Bayou Above Tidal (Segment 1104)

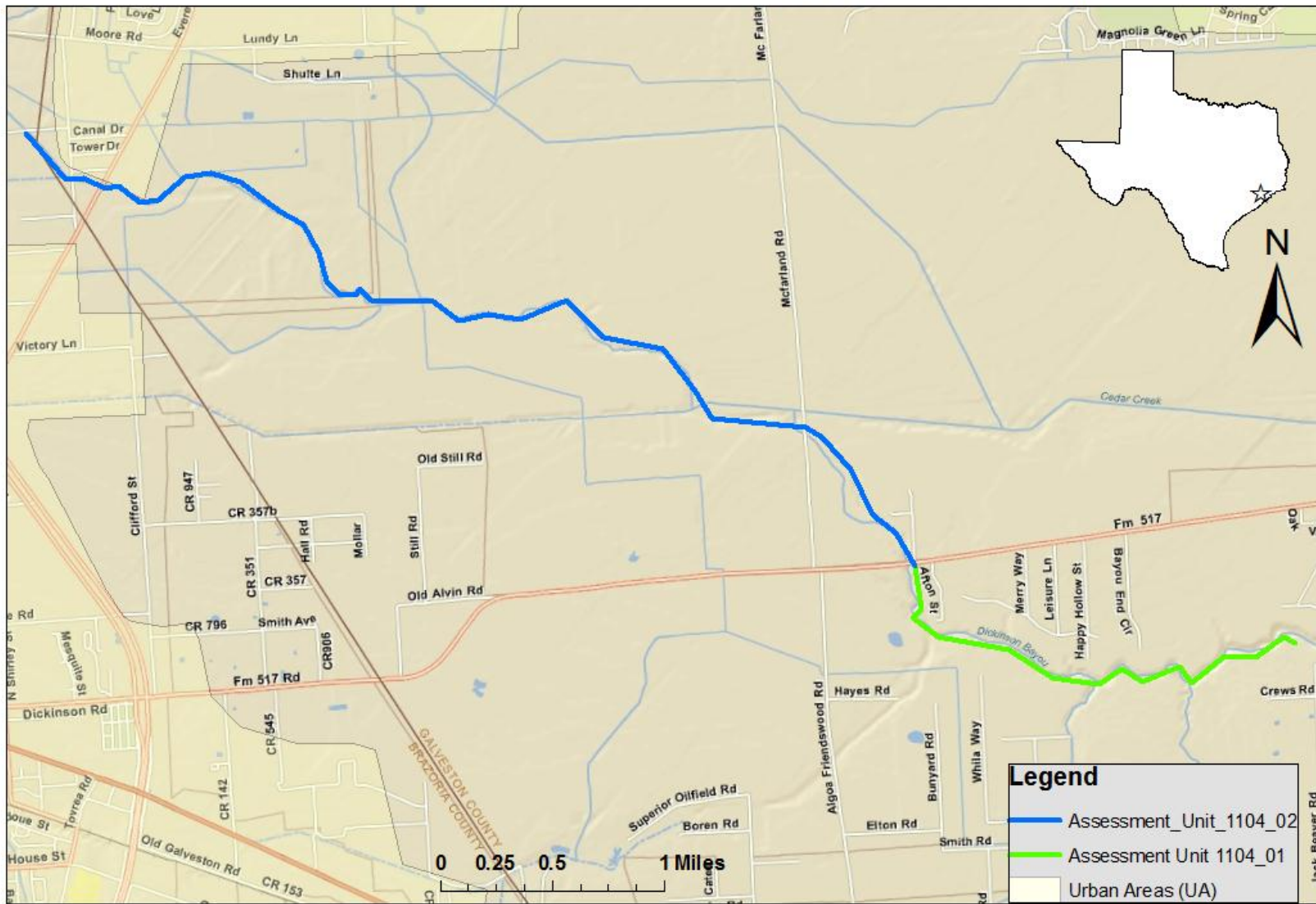


Figure 1. Urban Areas and Assessment Units in Dickinson Bayou Above Tidal (Segment 1104) watershed for comprehensive recreational use attainability analysis survey.

Commercial development is light to medium industrial and office warehouses along with retail merchandizing. The Dominant Land Use Classification for the Dickinson Bayou Watershed is Open Space/Agriculture (≤ 1 dwelling unit per 20 acres) (50% LU) (Dickinson Bayou Watershed Protection Plan, 2009).

Watershed Characterization

The Dickinson Bayou watershed is a natural basin of land that collects water and drains it into tributary streams, then into Dickinson Bayou, the main stream of the watershed. The bayou begins near the town of Alvin in Brazoria County as an intermittent stream and flows easterly through flat to rolling prairies in Galveston County approximately 24 river miles to Dickinson Bay. It is located within the San Jacinto-Brazos Coastal Basin, to the southeast of Houston and west of Galveston Bay. The entire Dickinson Bayou watershed covers a total of approximately 63,830 acres or 99.7 square miles and is elongated in shape, with a length of 22 miles from west to east. The maximum width of the watershed is approximately 7 miles. Rainfall falling within this area of Galveston and southern Brazoria counties drains into Dickinson Bayou. The water collected by the bayou flows into Dickinson Bay, a secondary bay of Galveston Bay, Cat's Point, April Fool Point, and Shell Island bound the roughly circular bay just over a mile across.

About 55% of the watershed is within the 100-year flood plain (the area of the flood plain which has a 1% chance of flooding in any given year). Adjoining watersheds include Clear Creek to the north, Mustang Bayou, Halls Bayou, Highland Bayou, and Moses Bayou to the south. Two major irrigation canals (the Gulf Coast Water Authority's American Canal and Galveston System) cross the watershed (Dickinson Bayou Watershed Partnership, 2010).

Permitted Discharges (Municipal, Industrial, Stormwater)

Dickinson Bayou Above Tidal is affected by municipal and industrial wastewater discharges and by storm water runoff from agricultural, industrial, and urban areas (Figure 2). Under the Texas Pollutant Discharge Elimination System TPDES, the TCEQ has issued permits to discharge treated wastewater to 4 facilities within the Above Tidal watershed (TCEQ, 2007). Three are classified as Domestic Wastewater facilities discharging <1.0 mgd. These wastewater facilities include: K.C. Utilities/Pine Colony WWTF, Meadowland Utility Corp., and R. West Development Co. Inc. One is a disposal facility without a specified flow limit permitted to Waste Management of Texas Inc. In 2007, the total average daily self reported domestic wastewater discharge to Dickinson Bayou was 2.29 MGD (Dickinson Bayou Watershed Protection Plan). Failing septic systems (on-site sewage facilities or OSSFs) has been identified as a potential major source of organic waste contributing to the depressed dissolved oxygen levels observed in Dickinson Bayou (USGS 1998, and TCEQ 2007).

Steadily increasing wastewater input into the segment is correlated with rapid urbanization of the watershed as indicated by increases in discharge limits for some municipal facilities within the segment and the addition of new discharge permit requests in recent years. All permitted facilities are required to disinfect their treated effluent prior to discharge. Disinfection is designed to reduce or eliminate bacteria from the effluent.

Potential Nonpoint Sources

For any urban collection and treatment system, sanitary sewer overflows and waste water treatment facilities (WWTF) bypasses are possible sources of bacteria loadings to receiving waters. Dickinson Bayou watershed is also home to numerous septic systems (Figure 2). Concerns related to overflows and bypasses are heightened in areas subject to occasional high rainfall events, such as the Dickinson Bayou 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 (Dickinson Bayou Watershed Protection Plan). Nonetheless, occurrences of such events and their subsequent impacts on bacteria loading must be recognized. Directly adjacent to the Dickinson Bayou Above Tidal are multiple active range lands occupied by cattle. In large segments of the bayou these cattle have direct access to the bayou. Also the Bayou Wildlife Park is located on the southwest side of Dickinson Bayou and FM 517. The park is located on 80 acres of prairie and woodlands. It is home to 50 species of animals and birds totaling 500 individuals. While there is not direct contact with the animals and the water body, it is possible that during rain events this is a potential nonpoint source for Dickinson Bayou Above Tidal. Additional detailed information on nonpoint sources and bacterial source tracking is described in TCEQ's *Total Maximum Daily Loads for Fecal Bacteria in the Dickinson Bayou Final Historical Data Review and Analysis Report Revision 1, 2007*.

History of Recreational Use in Dickinson Bayou Above Tidal

Historical Summary

The riparian corridor of Dickinson Bayou was aptly described by the Spanish with the name Arroyo de Cedros (River of Cedars). The watershed was part of the “Littorial Zone” of Texas, comprised of lands touched by the tides and ten leagues inland that were restricted from settlement by the Mexican Government. In 1828, this restriction was repealed and Stephen F. Austin was allowed to bring in colonists. Dickinson Bayou land was highly prized by Stephen F. Austin as cattle range and herds of wild Spanish cattle had been reported in the area by his surveyors. By 1860 the number of cattle ranging the watershed had grown to support a tannery and slaughterhouse. Historic Dickinson Bayou was known for its midden sites which are accumulations of rangia shells deposited by the Akokisa, a nomadic Atakapan speaking tribe, as they camped along the bayou, one of their staple foods, for thousands of years. In 1890, Fred McKinney Nichols, one of E.B. Nichol’s seven sons, bought the Nichols’ Dickinson estate and began investing in land on Dickinson Bayou. Fred Nichols designated forty acres on Dickinson Bayou as a public park called the “Dickinson Picnic Grounds”. A well dredged channel for boat traffic was constructed through the tidal portion of the waterbody in the mid 1900s. Historically there is little information on the Bayou above the tidal influence.

Boating

The Above Tidal portion of the bayou cannot physically support most motorized boats, and there is no historical record of boating in this portion of the bayou.

Fishing

Like boating, fishing has always been a popular form of recreation in Dickinson Bayou, however there is little historical evidence of fishing in the Above Tidal portions of the bayou. Historically, Dickinson Bayou was known for catfish and alligator gar fishing. Extensive private property, the lack of public parks and access points, and physical characteristics limit recreational fishing in the above tidal portion of the bayou.

Swimming

Historically, no documentation was found showing swimming in the Above Tidal Portion of Dickinson Bayou.

Parks

Dickinson Bayou Above Tidal has no adjacent public parks, however there are two semi-public parks that should be noted. The Bayou Wildlife Park which is located on the southwest corner of Dickinson Bayou and FM 517 is described as “an adventure-filled tram ride with experienced wildlife guides will take you over 80 acres of natural habitat. We have alligator ponds and three monkey islands. See and feed animals and birds from Africa, India, Asia, Australia, and North and South America.” The public is welcome for an admission charge. The second semi-public park located adjacent to Dickinson Bayou Above Tidal is Camp Wind-A-Mere. Camp Wind-A-Mere is a Girl Scout Camp described as a wooded, semi-primitive camp located in Alvin, Texas. The property offers many opportunities to campers including Lindsay Lodge, a multi-purpose building for activities, the Tejas teepee unit, the Caddo unit with platform tents, primitive camp grounds, Pine Meadows and the Chickasaw site, and several other

outdoor meeting areas. Campers can participate in traditional camp activities such as making crafts, going on hikes, cooking outdoors, and playing games. While the entire camp is located adjacent to Dickinson Bayou Above Tidal there are limited stream access opportunities due to steep, overgrown banks.

Site Reconnaissance Summary

Perspective sites were chosen based on public access and reported use information gathered from the initial public meeting held on January 29th 2010. Initial reconnaissance surveys were conducted on November 19th, 2009. A total of 12 perspective sites were visited, of these sites, 4 were determined publically accessible and suggested as field survey sites to TCEQ (Table 1, Figure 3). Site suggestions were submitted to and approved by TCEQ on 2/25/2010. Later, an amendment to the accepted QAP was made by the TCEQ to include two additional sites located on private property to augment the field surveys making a total of 6 field survey sites.

Table 1. Site reconnaissance for comprehensive RUAA on Dickinson Bayou Above Tidal (Segment 1104).

Recon Site	Description	Latitude	Longitude	Public Access	Water Access	Recommended Site
1	Hollier Rd @ Dickinson Bayou	29.466520	-95.233640	Can park at end of dead end road	Gentle slope into water, heavy vegetation	* No
2	Mandale Rd @ Dickinson Bayou	29.463370	-95.230450	Can pull off road N of site	Relatively steep banks, little vegetation, drainage ditches along rd	Yes
3	FM 528 @ Dickinson Bayou	29.462900	-95.228580	Can park on little turn-off on W side of bridge	Gently sloped banks, moderate vegetation	Combine with recon site 2
4	Farm Rd 1 @ Dickinson Bayou	29.461298	-95.216560	No public access, gated road, no trespassing sign	Not observed	No
5	Farm Rd 2 @ Dickinson Bayou	29.454610	-95.204594	No public access, gated road, no trespassing sign	Not observed	No
6	Farm Rd 3a @ Dickinson Bayou	29.451312	-95.191978	No public access, gated road, no trespassing sign	Not observed	No
7	Farm Rd 3b @ Dickinson Bayou	29.450013	-95.186659	No public access, gated road, no trespassing sign	Not observed	No
8	McFarland Rd @ Dickinson Bayou	29.444870	-95.177150	Can park at gate and walk in approx 200yds, landowners in area have access	Very steep on one side of water, traversable on other side	Yes
9	Unnamed Rd 2 @ Dickinson Bayou	29.441730	-95.173573	No public access, gated road, no trespassing sign	Not observed	No
10	FM 517 @ Dickinson Bayou	29.435950	-95.169980	No parking on side of rd, all drives close posted private property	Steep banks with a few gentle slopes	Yes
11	TCEQ station 11466: Dickinson Bayou at Happy Hollow	29.428550	-95.157020	Can drive/walk along ditch/waterway along private drive	Very steep banks and heavy vegetation around water	Yes
12	TCEQ station 11465: Dickinson Bayou at Jack Beaver	29.429575	-95.143747	No public access, locked and unlocked private rds/property	Not observed	No

*Site located directly adjacent to Recon Site #2... it was determined that site #2 had a higher probably of detecting recreational use due to higher accessibility.

Dickinson Bayou Above Tidal (Segment 1104)

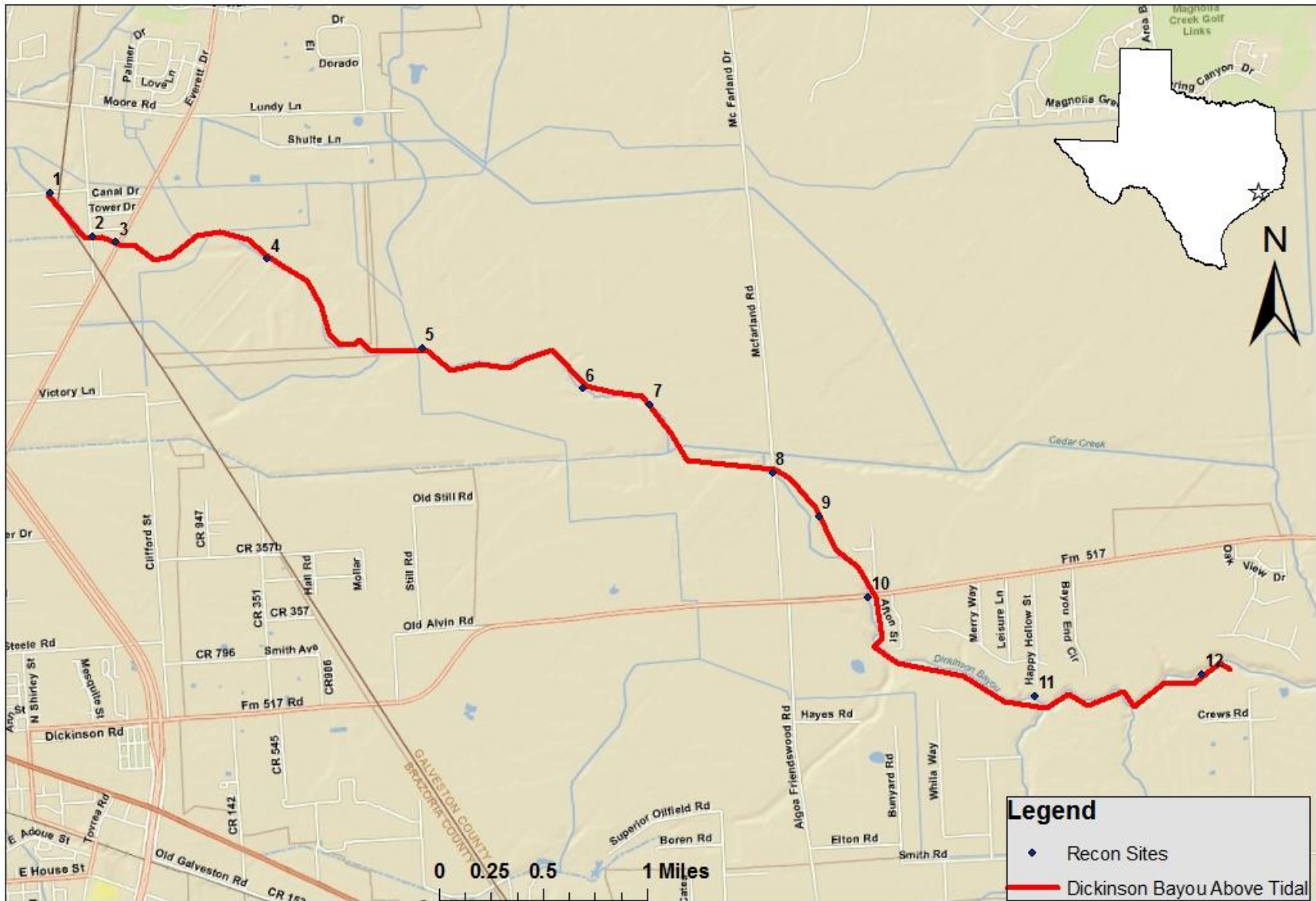


Figure 3. Reconnaissance sites for comprehensive RUAA in Dickinson Bayou Above Tidal (Segment 1104)

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). A total of six (6) survey sites were established (Table 2 & Figure 4). These sites were chosen based on public access potential, highest potential for recreational use (road crossings, public lands/parks located near the water body, and populated areas) and also locations providing sufficient spatial coverage and an even distribution throughout each assessment unit. More detail about the survey sites can be found in the project Quality Assurance Plan (QAP) (RUAA of Dickinson Bayou Above Tidal [Segment 1004] QAP).

Table 2. Field survey sites for the comprehensive RUAA survey on Dickinson Bayou Above Tidal (Segment 1104) (corresponding to Figure 4).

Recon Site	Field Survey Site	Description	Latitude	Longitude	Aprox. River Mile	Assessment Unit
2	1	Mandale Rd @ Dickinson Bayou	29.46337	-95.23045	7.0	02
5	2	Private Rd @ Dickinson Bayou #1	29.45915	-95.21304	5.8	02
6	3	Private Rd @ Dickinson Bayou #2	29.45406	-95.194757	4.6	02
8	4	McFarland Rd @ Dickinson Bayou	29.44487	-95.17715	3.1	02
10	5	FM 517 @ Dickinson Bayou	29.43595	-95.16998	2.3	01
11	6	Happy Hollow @ Dickinson Bayou	29.42855	-95.15702	1.2	01

Dickinson Bayou Above Tidal (Segment 1104)

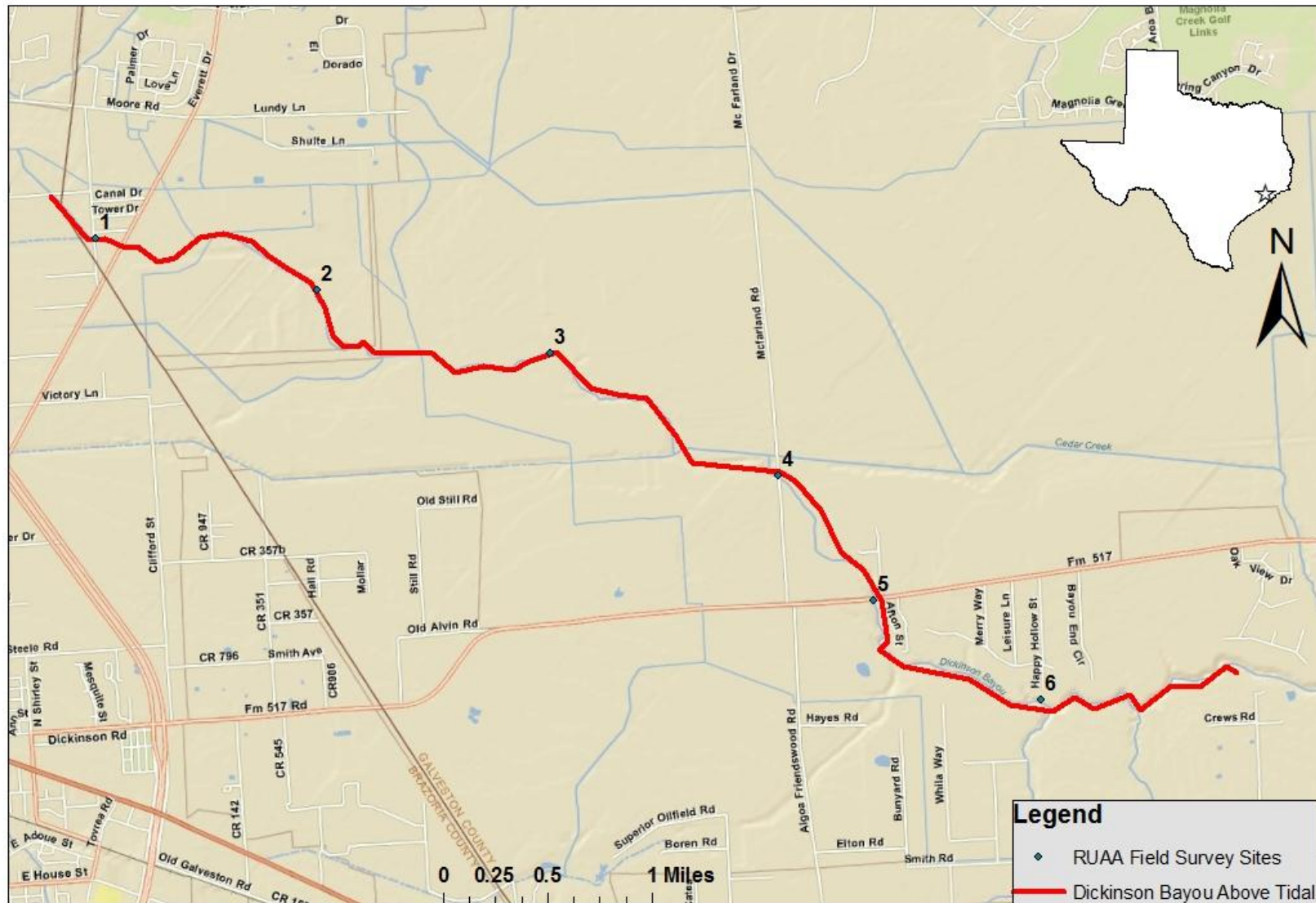


Figure 4. Comprehensive RUAA survey sites on Dickinson Bayou Above Tidal (Segment 1104) selections based on river mile/assessment units, accessibility, and recreational features.

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). 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 Dickinson Bayou Above Tidal since it is a classified water body (Segment 1104). RUAA Surveys are typically conducted during the normal warm season (March-October), a period when people are 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 have not been influenced by storms or drought. UHCL conducted RUAA field surveys for Dickinson Bayou Above Tidal (Segment 1104) during March 19th, April 16th, May 22nd and June 22nd, 2010. More specific Basic RUAA procedures can be found in TCEQ's *RUAA Procedures Document, May 2009*.

Field Survey Descriptions

An RUAA field survey begins by marking off a 300m reach of the waterway and flagging every 30 meters. Sites with public accessibility limitations may not be fully assessed in this way, in instances such as these; we used a laser range finder 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, water temperature, and secchi tube readings are also recorded at an easily accessible location. Finally the RUAA datasheets are completed to document any recreational uses, signs of recreational use, recreation impeding conditions, or other field notes taken during the field survey.

Interviews

When possible, interviews were conducted on field survey visits (Appendix 2). Subjects for in-person interviews were selected based on proximity to the water body and in some cases adjacent land/homeowners were solicited. Other stakeholders were interviewed via telephone (Appendix 2). The Environmental Institute of Houston's Interview Protocol Guideline is attached as Appendix 4 and the Informed Informational Document about Research is attached in Appendix 1.

Results

Two field survey visits were completed on each of the 6 sample sites between March and June, 2010. All field data sheets are attached (Appendix 3). The initial field surveys took place on one of two days (March 19, and April 16, 2010). The second site visit took place on May

22nd 2010, with the exception of site number two, which is closed on the weekends and was sampled later on June 22nd, 2010.

Physical Evaluation and Flow

All of the sampled survey sites were wadeable. Air temperature and water temperatures fell well within the range of acceptable temperatures for sampling described in the TCEQ procedures manual (Table 3). The average depth of Dickinson Bayou Above Tidal, as measured during the RUAA field surveys, was 0.35m and the average width was 3.45m. The average secchi tube reading taken during the field survey sites was 0.6m.

Table 3. Average physical parameters from the two comprehensive recreational use attainability analysis field surveys conducted on Dickinson Bayou Above Tidal (Segment 1104)

Field Survey		Air	Water	Average	Average	
Site	Site Description	Temperature	Temperature	Depth (m)	Width (m)	Secchi (m)
		(°C)	(°C)			
1	Mandale Rd @ Dickinson Bayou	25.00	21.50	0.27	6.31	0.48
2	Private Rd @ Dickinson Bayou #1	25.90	23.83	0.21	2.36	0.30
3	Private Rd @ Dickinson Bayou #2	25.25	24.25	0.32	1.83	0.34
4	McFarland Rd @ Dickinson Bayou	26.75	23.50	0.41	3.47	0.25
5	FM 517 @ Dickinson Bayou	23.60	22.25	0.37	3.93	0.34
6	Happy Hollow @ Dickinson Bayou	27.10	22.25	0.52	2.78	0.43
Overall Average:		25.60	22.93	0.35	3.45	0.36

Dickinson Bayou Above Tidal and its tributaries are generally located in either forested or urban/suburban areas with portions also located in natural, agricultural, pastoral, commercial and industrial areas. The Upper portion of Dickinson Bayou Above Tidal is dominated by urban and pasture riparian zones or riparian zones converted to regularly mowed corridors, while the lower portion of Dickinson Bayou Above Tidal is dominated by forest and regularly mowed and maintained corridors (Table 4). The dominant substrate along Dickinson Bayou Above Tidal (Segment 1104) was generally composed of mud/clay, which, at times, made it difficult to wade the length of the survey segment. UHCL investigators would often sink past their knees while

attempting to wade across the waterway. Also notable was underwater debris, such as branches and roots, which made navigation difficult at times.

Dickinson Bayou Above Tidal is an intermittent water body in AU 1104_02, with flow being absent after long periods of no rain, while AU1104_01 is often described as having perennial flow. The average flow including both site visits for sites 1-4 (AU 1104_02) was 0.7 cubic feet per second (cfs). The average flow for sites 5&6 (AU 1104_01) was 2.9 cfs.

Recreational Uses

UHCL investigators did not directly observe any contact recreational uses during the RUAA surveys on Segment 1104. Uses observed from all combined site visits include: bicycling and walking (Figure 5, Table 5). Observed evidence of recreational uses included: fishing tackle, foot paths/prints, children's toys, RV/ATV, camping sites, fire pit/rings, and gun shells (Table 6).

Interviews

UHCL investigators contacted a total of 76 individuals for interviews throughout the Comprehensive Recreational Use Attainability Analysis on Dickinson Bayou Above Tidal (TCEQ Segment 1104), and a total of 55 of those individuals agreed to participate in the interviews. Of the 55 total, 8 were interviewed in person, 8 by mail, and 39 by phone. A total of 36 individuals out of the 55 individuals interviewed answered yes to the question "Are you familiar with Dickinson Bayou Above Tidal?" Of those, 6 had personally used the stream for recreation, 7 had observed recreation activities, and 8 had heard about recreation on Dickinson Bayou Above Tidal. The total numbers of years that interviewees were familiar with the Dickinson Bayou Above Tidal watershed were over 244 man-years. The types of recreational uses documented by interviews included primary contact recreation such as: swimming and wading-children (Figure 5, Table 5 and Table 6).

Table 4. Physical Characteristics of Riparian Zone and Dominant substrate of the field survey sites sampled during the Comprehensive Recreational Use Attainability Analysis on Dickinson Bayou Above Tidal (Segment 1104)

Field Survey				Dominant Primary
Site	Site Description	Left Bank Riparian Zone	Right Bank Riparian Zone	Substrate
1	Mandale Rd @ Dickinson Bayou	Mowed/Maintained corridor	Mowed/Maintained corridor	Mud/Clay
2	Private Rd @ Dickinson Bayou #1	Pasture	Pasture	Mud/Clay
3	Private Rd @ Dickinson Bayou #2	Pasture	Pasture	Mud/Clay
4	McFarland Rd @ Dickinson Bayou	Forest	Forest	Mud/Clay
5	FM 517 @ Dickinson Bayou	Forest	Forest	Mud/Clay
6	Happy Hollow @ Dickinson Bayou	Shrub dominated corridor	Forest	Mud/Clay

Table 5. Recreational uses observed and documented on Dickinson Bayou Above Tidal (Segment 1104) for the Comprehensive Recreational Use Attainability Analysis.

Dickinson Bayou Above Tidal Comprehensive RUAA

Types of Recreation	Field Survey	Interviews			Total	
	Observations	Personal Use	Witnessed	Hearsay		
1°	Swimming		1		1	2
	Snorkeling					
	Water skiing					
	Wading -Children		1		1	2
2°	Wading -Adults		2			2
	Rafting					
	Tubing					
	Jet Skiing					
	Boating				1	1
	Kayaking		1	1	1	3
	Canoeing			1	2	3
	Tubing					
	Fishing		2	3	2	7
non	Hunting		1			1
	Trapping					
	Walking/Hiking	1		1		2
	Jogging/Running					
	Bicycling	1				1
	Camping			1		1
	Motorcycle/ATV					
	Wildlife watching					

Dickinson Bayou Above Tidal (Segment 1104) Comprehensive RUAA



Figure 5. Recreational uses visualization (constructed from observations, interviews, and evidence) for Dickinson Bayou Above Tidal (Segment 1104) Comprehensive RUAA. The bicycling at field site 1 and walking at field site 4 were the only two recreational uses that were observed by UHCL field staff. This map does not include all reported uses and locations are approximate. Please see Table 6 and Appendix 8 (Interactive Google Earth Map) for exact locations of uses, evidence, and impediments.

Table 6. Impediments, evidence of recreational uses, observed recreational uses, and interviewed documented uses by site on Dickinson Bayou Above Tidal (Segment 1104) for the Comprehensive Recreational Use Attainability Analysis by location.

Field Survey Site	Site Description	Impediments	Evidence	Observed Uses	Reported Uses		
					Personal Use	Witnessed Use	Here-say Use
1	Mandale Rd. at Dickinson Bayou	Curverts, Thick vegetation, Private property	Fishing tackle, Foot paths/prints	Bicycling			
2	Private Rd. at Dickinson Bayou (#1)	Fences, Private property, No public access					
3	Private Rd. at Dickinson Bayou (#2)	Culverts, Private property, No public access, Low bridges					
4	McFarland Rd. at Dickinson Bayou	Fences, Log jams, No public access, Private property, Steep slopes	Foot paths/prints, Children's toys	Walking	Swimming, Fishing, Hunting, Wading-Adults	Fishing, Camping	Fishing
5	FM 517 at Dickinson Bayou	Barbed wire, Log jams, Steep slopes			Wading-Adults, Wading-Children		
6	Happy Hollow St. at Dickinson Bayou	Log jams, No roads, Private property, Steep slopes, No public access	RV/ATV tracks, Foot paths/prints, Gun shells				Swimming, boating

Summary

We (UHCL investigators) conducted Basic Recreational Use Attainability Surveys at 6 sites in Dickinson Bayou Above Tidal (Segment 1104) and at a Girls Scout Camp located along Dickinson Bayou Above Tidal (Camp Wind-a-mere). While we did not personally observe any primary contact recreation activities (e.g. swimming, wading, etc.), we documented water related activities reported in the interviews, including reports of swimming, children wading, adults wading, canoeing, kayaking, fishing, hunting, and various non-contact recreation activities.

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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: Dickinson Bayou Above Tidal

Segment No. or Nearest Downstream Segment No.: 1104

Classified?: Yes

County: Galveston

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? 0.34 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