Recreational Use Attainability Analysis for Black Fork Creek (0606D) in the Neches River Basin

By Leah Taylor
Texas Institute for Applied Environmental Research
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P.O. Box 13087
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By:
Leah Taylor
Texas Institute for Applied Environmental Research
Tarleton State University
Stephenville, Texas

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For more information about this document or any other document TIAER produces, send email to tiaer@tarleton.edu

Author

Leah Taylor, senior project director, TIAER, ltaylor@tarleton.edu

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Chapter 1. Introduction

Problem Statement

Black Fork Creek (0606D) is an unclassified water body identified for assessment purposes by the Texas Commission on Environmental Quality (TCEQ). Black Fork Creek is approximately nine river miles long and is comprised of two assessment units (AU). The 2018 Texas Integrated Report of Surface Water Quality (TCEQ, 2018a) defines Black Fork Creek (0606D) as being located from the confluence with unnamed tributary at NHD RC 1202000100072 upstream to a point 0.4km downstream of FM14 in Tyler, at the confluence with Prairie Creek to a point 0.4 km downstream of FM14 in Tyler (Figure 1.1). While comprised of two AUs, only AU02 of Black Fork Creek is listed as impaired for bacteria on the 2018 Texas 303(d) list for bacteria. AU02 was first listed in 2012 and has continued to be listed as impaired for bacteria on the 2018 Texas 303(d) list. There are no additional impairments for Black Fork Creek. The Texas Integrated Report of Surface Water Quality (TCEQ, 2018a) includes the Texas 303(d) list of impaired water bodies and is available online dating back to 1992.

Black Fork Creek (0606D) has a presumed use of primary contact recreation based on the Texas Surface Water Quality Standards (TSWQS) (TCEQ, 2010). Prior to June 2010 only two categories of recreation use, contact and noncontact, existed in Texas. In June 2010, the TCEQ adopted revisions to the TSWQS that expanded the designation of contact recreation into three categories (primary contact recreation, secondary contact recreation 1, and secondary contact recreation 2) based on varying degrees of interaction with the water, while maintaining a fourth category of noncontact recreation. These revisions were codified in the Texas Administrative Code (TAC), Title 30 Chapter 307 and became effective as a state rule on July 22, 2010 (TCEQ, 2010). As a result of these revisions to the TSWQS, all water bodies listed as impaired based on bacteria for contact recreation are scheduled to undergo a standards review to determine if primary contact recreation is appropriate or if a revision to the use category for recreation should be considered.

Use attainability analyses (UAAs) are studies to evaluate the designated or presumed uses of a water body. In order to identify and assign attainable uses and criteria to individual water bodies, UAAs evaluate physical, chemical, biological, and economic factors affecting use attainment of a water body (40 Code of Federal Regulations §131.10(g)). A recreational use attainability analysis (RUAA) is a specific type of UAA focused on determining the appropriate recreational use category of a water body, the findings of which are presented within this report for Black Fork Creek (0606D).

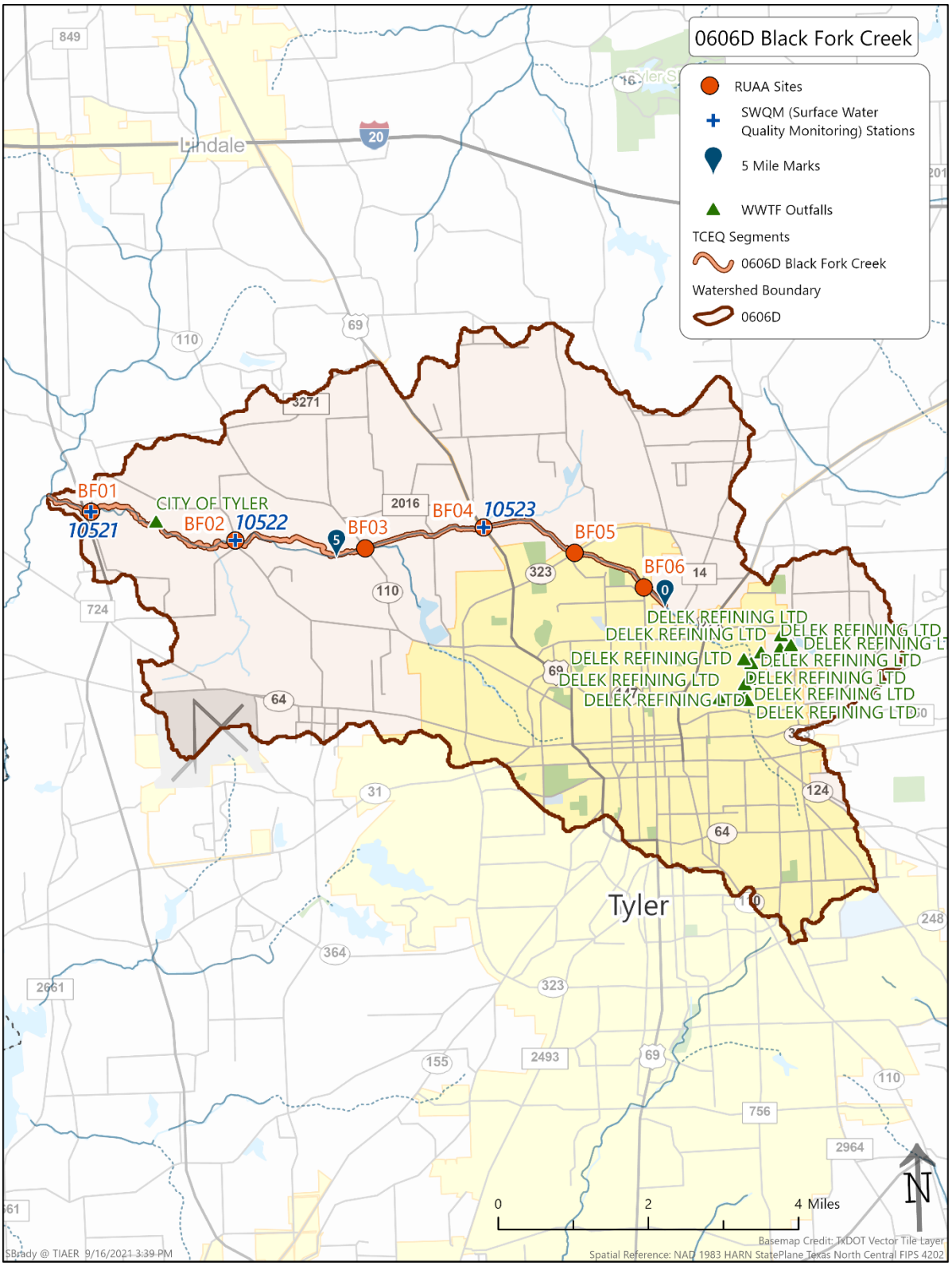

Figure 1.1 Watershed of Black Fork Creek (0606D)

There are two wastewater discharges, but no concentrated animal feeding operations are located in the Black Fork Creek watershed.

Objectives

The objective of this report is to present the findings of a Comprehensive RUAA for Black Fork Creek following the TCEQ March 2014 Procedures for a Comprehensive RUAA and a Basic RUAA Survey (TCEQ, 2014b). An RUAA consists of three parts: field surveys to document water body characteristics and signs of recreation, interviews with stakeholders regarding past and current use of the water body, and a historical review regarding recreational use of the water body. All components of this RUAA were performed by Texas Institute for Applied Environmental Research (TIAER), which is located on the campus of Tarleton State University in Stephenville, Texas. Field surveys and interviews for the RUAA were conducted under a Texas Commission on Environmental Quality (TCEQ) approved Quality Assurance Plan (QAP; TIAER, 2020).

Stakeholder and Agency Involvement

The TCEQ and its collaborating entities maintain an inclusive public participation process. From the inception of this project, the project team sought to ensure that stakeholders were informed and involved. TIAER provided coordination for public participation for this project.

Input from the TCEQ regional staff, United States Geological Survey regional staff, Texas Parks and Wildlife Department (TPWD) regional staff, and other local agencies was solicited as well as input from watershed stakeholders on the need for the RUAA (see Contact Information Form available on the project website noted below).

Meetings with state agencies, river authority representatives, local officials, and stakeholders were held to give an overview of water quality issues within Black Fork Creek watershed and to obtain comments on proposed survey sites prior to field data collection. Meetings targeted local and state agencies as well as stakeholders in an effort to inform them of the assessment of water quality within Black Fork Creek and the need for an RUAA.

A public meeting focusing specifically on the RUAA was held at the Rose Garden Center located in Tyler, Texas on March 2, 2020. At this meeting input was sought on the proposed sampling sites for the Black Fork Creek RUAA. Attendees provided information regarding activities that typically occur within the watershed and offered assistance in accessing the stream via privately owned property.

A final public meeting occurred virtually via ZOOM on December 16, 2021 to inform stakeholders of the findings of both field surveys. The next steps of the RUAA were discussed at this meeting and feedback from stakeholders was solicited. At the meeting, stakeholders were informed that the draft RUAA report was open for public review and comment. The draft report is available via the project website at https://www.tceq.texas.gov/waterquality/standards/ruaas/neches-ruaa-part3. Additionally, TIAER provided hard copies if desired by individuals.

Watershed stakeholders were invited to attend public meetings through mailed invitations, public announcements (TCEQ website), and individual phone calls. Information on past meetings for this RUAA, presentations, and other information, can be found on the project's website: https://www.tceq.texas.gov/waterquality/standards/ruaas/neches-ruaa-part3.

Chapter 2. Study Methodology

The process of developing a list of sites to be surveyed for the RUAA began with a reconnaissance of potential locations along each water body. A combination of Geographic Information System (GIS) data, review of historical information, and meetings, phone conversations with local entities and stakeholders were used to determine sites included in the RUAA field surveys.

Watershed Reconnaissance and Site Selection Strategy

Reconnaissance of each watershed was conducted to collect background information before selecting appropriate sites for each RUAA. To the degree possible, site reconnaissance was coordinated with watershed stakeholders in an effort to increase local landowner interest in water quality issues. The March 2014 RUAA procedures (TCEQ, 2014) recommends selecting three sites per every five miles of stream. Based on this recommendation, the preferred number of sites for Black Fork Creek was six.

The following information was compiled using Geographic Information System (GIS) based tools prior to, during, and immediately following the watershed reconnaissance:

- Location of areas along the water body that were accessible to the public and had the highest potential for recreational use, such as road crossings and parks;
- Location of permitted wastewater outfalls and other potential point sources;
- Hydrologic characteristics, such as stream type, streamflow, and hydrologic alterations; and
- Location of city boundaries or other designated population areas.

The site selection process considered locations that were accessible to the public, had the highest potential for recreational use, and that were established TCEQ monitoring stations where historical data may have been collected. The site selection process also considered parks and bridge crossings along the river, as well as access through private lands adjacent to the river.

Survey Methods

Field Survey Data Collection Activities

As specified in the procedures for a Comprehensive RUAA (TCEQ, 2014), two separate field surveys occurred at each selected survey site during the warm season (air temperature greater than or equal to 70 degrees Fahrenheit or 21 degrees Celsius) when human recreational activities were most likely to occur (May - September). Ideally, field surveys were to be conducted when stream flow conditions were normal. Rainfall data 30 days prior to each survey were also documented to provide antecedent conditions.

Data collection activities at each RUAA site for both field surveys included the following:

- Measurement of average depth at thalweg (deepest depth),

- Measurement of depths, lengths, and widths of substantial pools,
- Documentation of observational/anecdotal data required on the RUAA field data sheets,
- Photographs of any signs of recreation and
- Photographs of site conditions including upstream, downstream, left bank, and right bank photos at the 0-m, 150-m, and 300-m transects.

Average Depth at Thalweg and Substantial Pool Depths

Determination of thalweg and substantial pool depths is applicable to contact recreation use determination for intermittent and perennial freshwaters according to TCEQ (2014). The thalweg is defined as the deepest depth of a transect perpendicular to the stream channel. A substantial pool was defined as a pool greater than 1-m (3.28-ft) deep and 10-m (32.8-ft) long for the purposes of the RUAA survey (TCEQ, 2014).

As instructed in the RUAA procedures manual (TCEQ, 2014), a 300-m reach at each site was evaluated to determine average thalweg depth. Eleven transects at 30-m intervals were established along the reach. Transects were labeled upstream to downstream with the 300-m transect at the most upstream point of the survey and the 0-m transect being the most downstream. Thalweg was measured at each of the eleven transects. Where significant pools were encountered along the 300-m reach, depths, widths and lengths were measured and recorded. Depths, lengths and widths are presented in meters as per the RUAA procedures (TCEQ, 2014).

Observational /Anecdotal Data

Anecdotal information was recorded on field data sheets during all surveys using the field data sheets from the TCEQ-approved QAP (TIAER, 2020).

Types of observational and anecdotal records included, but were not limited to, the following:

- Channel flow status as indicated by flow severity
- Stream type (e.g., ephemeral, intermittent, etc.)
- Riparian zone characteristics (forest, pasture, eroded banks, etc.)
- Stream accessibility
- Substrate type
- Anecdotal information related to observed human contact activities

Photographs

TIAER staff created photographic records of each site during the site surveys. Photographs were intended to clearly depict the characteristics of the channel and any evidence of observed uses or indications of human use, hydrologic modifications, etc. Photographs were taken specifically at the 0-m, 150-m, and 300-m transects (as described in the Field Data Sheets). Any items of interest, e.g., obstructions, were also photographed. Photographs were used to document evidence of recreational use (e.g., fishing tackle) and actual recreation. Photographs were also used to document a lack

of use (e.g., dry creek beds) or impediments to recreational use. In addition, as part of the overall project, photographs were taken to indicate potential bacteria sources to the water body. All photographs were labeled in a manner that indicated the date, site location, orientation to the stream, and photo's subject. Selected photos representative of each RUAA field site are included with the survey results for each water body in this report.

Chapter 3. Study Area

Description of Black Fork Creek

Black Fork Creek is located in Smith County in the northeastern portion of Texas. Water body 0606D is within the Neches River Basin. The medium sized watershed is approximately 32,221 acres (roughly 50.35 square miles) with a population of 51,890 (USCB, 2010). The watershed overlaps the City of Tyler (population 97,173) (USCB, 2010).

Climatic Conditions

Annual precipitation for the Black Fork Creek watershed was based on data obtained from the National Oceanic and Atmospheric Administration's website (NOAA, 2015) for Tyler, Texas (Station USC00419207). It is important to note that this station is not within the Black Fork Creek watershed boundaries. However, it is the nearest station with climate data available for both precipitation and temperature. Normal precipitation (1981-2010) for Station USW00013966 averages 46.84 inches per year with a peak rainfall typically occurring in the months of June and October (Figure 3.1).

Average maximum temperatures for Station USC00419207 rise above 70˚F beginning in March and ending in October (Figure 3.1). March through October are the months known as generally suitable for assessing recreational use, but only if temperatures reach above 70˚F (TCEQ, 2014b).

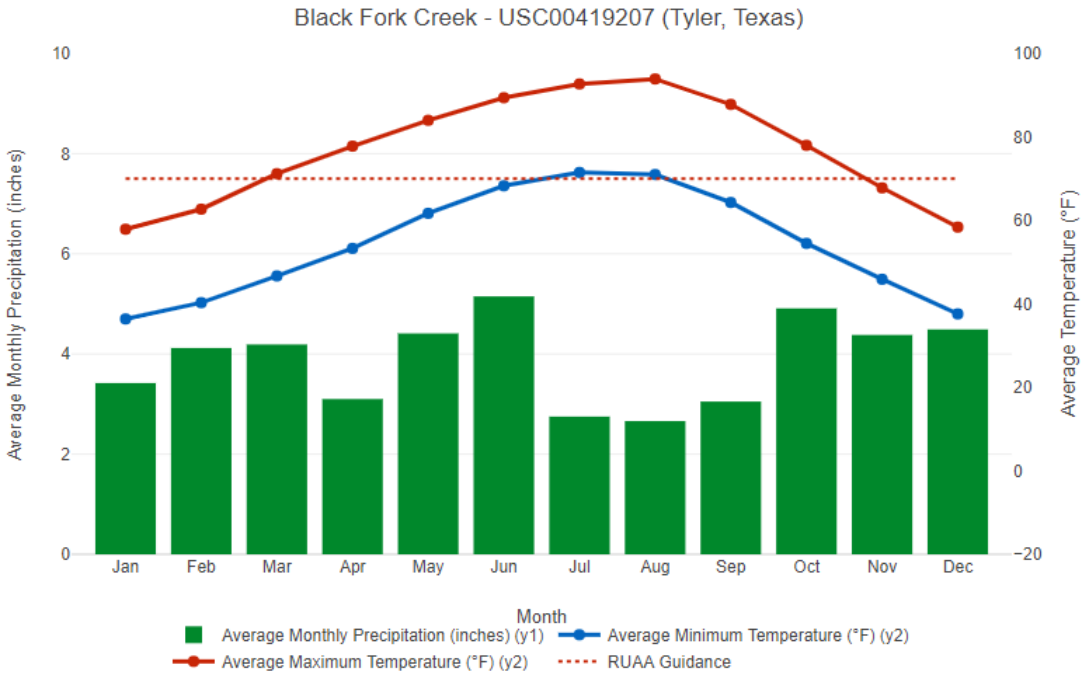

Figure 3.1 Monthly average precipitation for Tyler, Texas.

Source: NOAA (2015) based on data for 1974-2015.

Land Use and Land Cover

The Black Fork Creek watershed lies within the Post Oak Savanah ecoregion as defined in the publication Ecoregions of Texas (Griffith et al., 2007). The dominant land cover within the Black Fork Creek watershed is Developed Low Intensity at 29.26% and is present throughout the watershed (Table 3.1 and Figure 3.2). Pasture/Hay is the secondary land cover encompassing 19.73% of the Black Fork Creek watershed.

Table 3.1 Land use/land cover classes within the Black Fork Creek watershed.

Source: 2011 National Land Cover Database (USGS, 2016).

Class	Area (acres)	Percent (%)
Developed, Low Intensity	8,405	26.08%
Pasture/Hay	6,357	19.73%
Mixed Forest	4,708	14.61%
Developed, Medium Intensity	3,563	11.06%
Woody Wetlands	2,930	9.09%
Developed, Open Space	1,954	6.06%
Developed, High Intensity	1,776	5.51%
Evergreen Forest	971	3.01%
Grassland/Herbaceous	715	2.22%
Deciduous Forest	272	0.85%
Shrub/Scrub	220	0.68%
Open Water	188	0.58%
Emergent Herbaceous Wetlands	89	0.28%
Barren Land (Rock/Sand/Clay)	72	0.22%
Cultivated Crops	2	0.01%
TOTAL	32,225	100%

The land use/land cover for the watershed area was obtained from the National Land Cover Database (NLCD) maintained by the U.S. Geological Survey (USGS, 2016). The land use/land cover categories within the watershed are described as follows from the NLCD legend:

- Developed, Low Intensity – Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.
- Pasture/Hay – areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a

perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.

- Mixed Forest – areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.
- Developed, Medium Intensity – Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.
- Woody Wetlands – areas of forest of shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- Developed, Open Space – Areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot, single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
- Developed High Intensity – Highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses, and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.
- Evergreen Forest – areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
- Grassland/Herbaceous – Areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.
- Deciduous Forest – Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
- Shrub/Scrub – Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
- Open Water – Areas of open water, generally with less than 25% cover of vegetation or soil.

- Emergent Herbaceous Wetlands – Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

- Barren Land (Rock/Sand/Clay) – areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

- Cultivated Crops – Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.

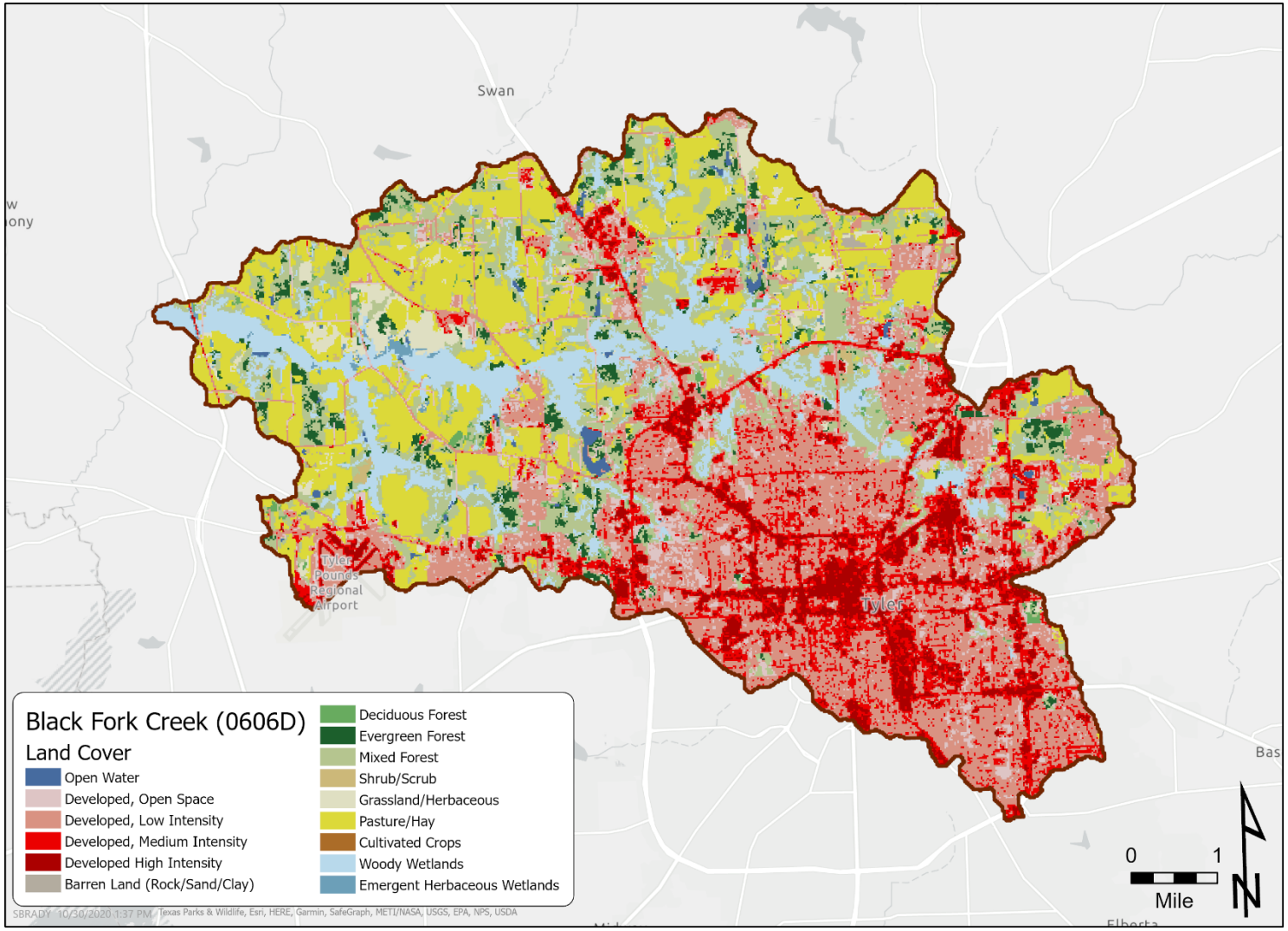

Figure 3.3 Land use and land cover of the Black Fork Creek watershed.

Source: 2016 National Land Cover Database (USGS, 2016).

Regulated Sources

Potential sources of fecal pollution, as measured by indicator bacteria Escherichia coli (*E. coli*), can be divided into two primary categories: regulated and unregulated. Pollution sources that are regulated have permits issued by TCEQ under the Texas Pollutant Discharge Elimination System (TPDES) and/or by the USEPA under the National Pollutant Discharge Elimination System (NPDES) and are generally point sources. Examples of regulated sources include domestic and industrial wastewater treatment facilities (WWTFs); stormwater from industries, construction, and municipal separate storm sewer systems (MS4s) of cities; and concentrated animal feeding operations (CAFOs). These various regulated sources are required to have either an individual permit that is specific for each facility or a general permit for operation.

Wastewater Discharge Facilities

There are two municipal wastewater treatment facilities (WWTF) within the Black Fork Creek watershed. More information regarding the City of Tyler and the city's Municipal Separate Storm Sewer (MS4) is below.

Regulated Stormwater

The TPDES and the NPDES Municipal Separate Storm Sewer (MS4) Phase I and II rules require municipalities and certain other entities in urban areas to obtain permits for their stormwater systems. Phase I permits are individual permits for large and medium sized communities with populations exceeding 100,000, whereas Phase II permits are for smaller communities that are located within an "Urbanized Area". An "Urbanized Area" is defined by the U.S. Census Bureau as an area with populations greater than 50,000 and with an overall population density of at least 1,000 people per square mile. Because the population of Tyler does meets this criteria, the municipality is required to obtain a stormwater permit. The City of Tyler's Stormwater Permit is TXR040041.

Concentrated Animal Feeding Operations

There are currently no permitted CAFOs located within the watershed of the Black Fork Creek watershed.

Potential Unregulated Sources

Unregulated sources are typically nonpoint source in nature, meaning the pollution originates from multiple diffuse locations and is usually carried to surface waters by rainfall runoff, and the sources are not regulated by permit under the TPDES and NPDES. Potential unregulated sources include wildlife (mammals and birds), large exotics, unmanaged feral animals (e.g., feral hogs), on-site sewage facilities (OSSFs), pets, and livestock.

Non-Permitted Agricultural Activities and Domesticated Animals

Activities such as livestock grazing close to water bodies and agricultural use of manure as fertilizer can contribute *E. coli* to nearby water bodies. Livestock statistics were obtained from United States Department of Agriculture (USDA) National

Agricultural Statistics Service website (USDA, 2017). While these are county level statistics and thus only a very rough estimate of livestock in the watershed (Table 3.2), these statistics indicate that cattle and calves, chickens, and horses and donkeys are the most common livestock found within the watershed.

Table 3.2 Estimated livestock numbers within the Black Fork Creek watershed based on statistics for Smith County and adjusted for the percent of the county represented by the watershed.

Source: USDA, 2012

100% of the Black Fork Creek watershed resides in Smith County.

County	Cattle & Calves (all beef)	All Goats	All Sheep	Horses & Donkeys	Hogs & Pigs	Chickens
Smith	87,748	3,516	2,510	6,828	1,118	29,040
Proportional Average for the Black Fork Creek Watershed	4,652	186	133	362	59	1,540

Domestic pets are another unregulated source of *E. coli* bacteria, particularly dogs, because storm runoff often carries these wastes into streams (USEPA, 2009). A rough estimate of the dog and cat population can be computed assuming there are 0.614 dogs and 0.457 cats per household (AVMA, 2018). According to the 2010 census there are 19,122 households within the Black Fork Creek watershed which indicates that there are potentially 11,741 dogs and 8,739 cats residing within the watershed.

Wildlife

E. coli bacteria are common inhabitants of the intestines of all warm-blooded animals, including wildlife such as mammals and birds. Wildlife are naturally attracted to riparian corridors of streams and rivers. With direct access to the stream channel, the deposition of wildlife waste can be a concentrated source of bacteria loading to a water body. Fecal bacteria from wildlife are also deposited onto land surfaces, where it may be washed into nearby streams by rainfall runoff.

Failing On-Site Sewage Facilities

Septic systems or on-site sewage facilities (OSSFs) are often used in rural areas that do not have the ability to connect to a central wastewater collection system. To estimate the number of potential OSSFs in the watershed, 911 address points outside of city boundaries and outside of any area municipal utility districts were used. Results indicate that 4,498 households in the watershed are outside municipal areas and likely on septic systems.

Historical Information on Recreational Use

A review of historical information was performed regarding recreational water uses for the Black Fork Creek. The review considered the time period of November 28, 1975 to

the present in accordance with 40 CFR Part 131 (EPA standards regulation). Government offices, libraries, and newspapers were searched and contacted in addition to generic internet searches. The following is a summary of the review and searches.

Government Sources

City of Tyler
City of Tyler Homepage[1]
Search retrieved one result:

> Article: City to Apply for Flood Infrastructure Grant from Texas Water Development Board
> Summary: The Tyler City Council unanimously voted to adopt a resolution authorizing the City to apply for funding from the Texas Water Development Board (TWDB) Flood Infrastructure Fund (FIF) program grant.
> Link: https://www.cityoftyler.org/Home/Components/News/News/1444/

Smith County
Smith County Homepage[2]
Search retrieved no results.

Library Sources

City of Tyler Public Library
City of Tyler Public Library Homepage[3]
Phone: (903) 593-7323
Searched online catalog. Search retrieved no results.

Newspaper Sources

Tyler Morning Telegraph
Tyler Morning Telegraph[4]
Phone: (940) 592-4431
Explored various links and online texts. Search retrieved no results.

Internet Searches

Google
Google.com – Search for Black Fork Creek[5]
Searched Google by creek name. Search retrieved no results of recreational contact.

The Handbook of Texas Online
The Handbook of Texas Online - Search for Black Fork Creek[6]
Searched the handbook by creek name. Search retrieved no results of recreational contact.

Chapter 4. Black Fork Creek (0606D)

Survey Site Descriptions

Black Fork Creek is 9 river miles long indicating a goal of 6 sites (3 sites per 5 miles of river) for the RUAA survey. With the help of cooperating stakeholders, TIAER was able to establish a total of 6 survey sites along Black Fork Creek (Figure 4.1 and Table 4.1). All 6 sites were located at public road crossings.

All 6 sites allowed for public access. There was no fencing upstream or downstream of the crossings. Access to the stream between road crossings was moderately difficult due to steep banks and dense vegetation. The average distance between survey sites was 1.67 river miles with the largest gap being 2.68 river miles between Site BF01 and BF02. Sites BF01, BF02, and BF04 are co-located with TCEQ sampling stations. RUAA surveys were performed August 3, 2020 and October 6, 2020 at all locations. Landowner permission was not required to access sites at any location. A brief description of each site follows.

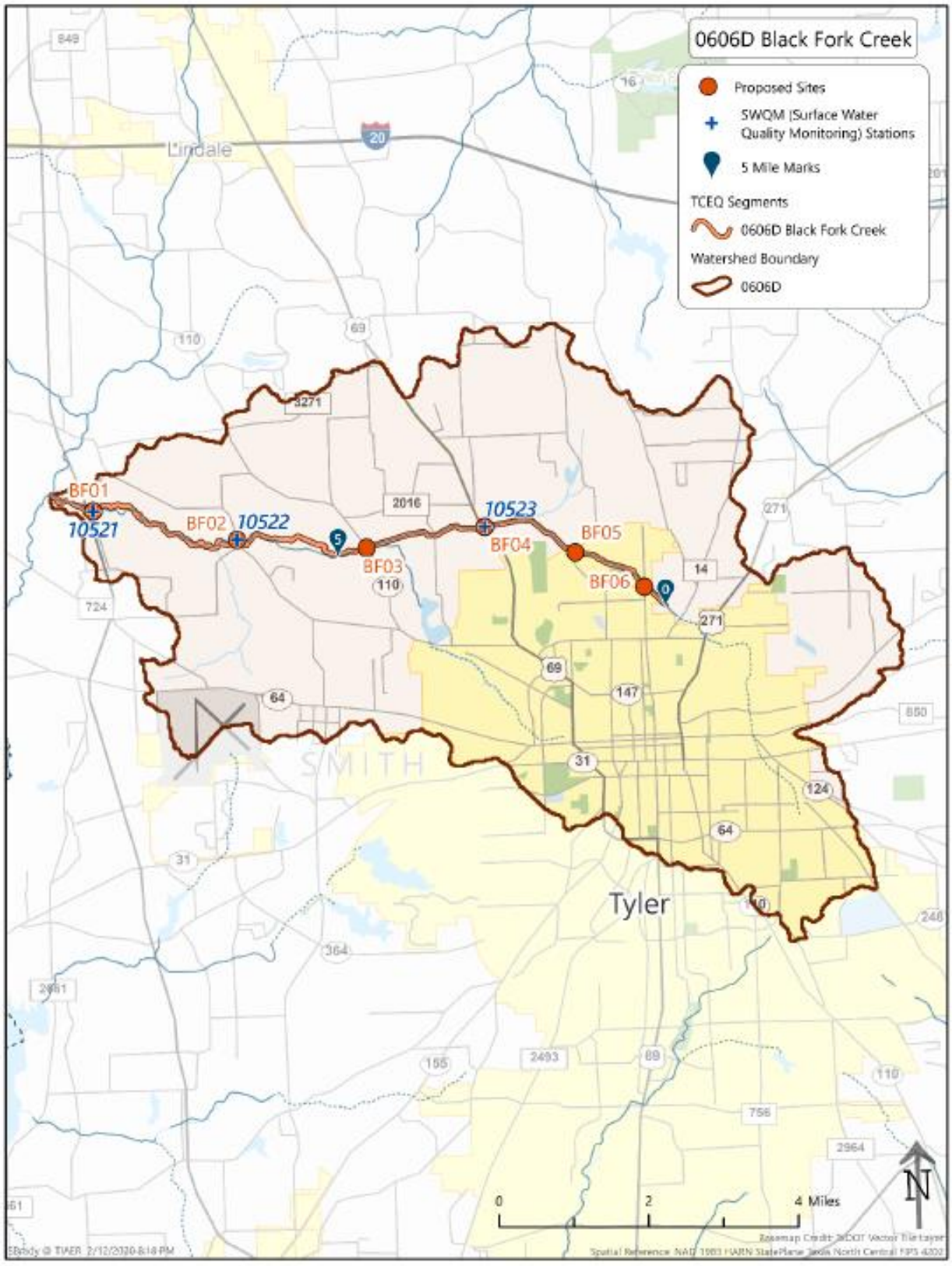

Figure 4.1 Watershed of Black Fork Creek (0606D)

Table 4.1 Description and location of RUAA field survey sites for Black Fork Creek, Water Body 0606D

Site ID	TCEQ ID	Site Description	Latitude	Longitude	Access
BF01	10521	Black Fork Creek at FM 1150 in Smith County	32.39814	-95.42737	Public
BF02	10522	Black Fork Creek at State Highway 46	32.39176	-95.39469	Public
BF03		Black Fork Creek at State Highway 110	32.3895	-95.36515	Public
BF04	10523	Black Fork Creek at State Highway 69	32.39286	-95.33804	Public
BF05		Black Fork Creek at Loop 323 in Tyler, Texas	32.38741	-95.31749	Public
BF06		Black Fork Creek at N Broadway Ave in Tyler, Texas (Woldert Park)	32.38033	-95.30198	Public

Site BF01 is the most downstream site located on Black Fork Creek. This site is publicly accessible from the bridge throughout the entire 300 m reach. Access to complete the surveys did not require land owner permission to enter the stream.

Site BF02 is located on Black Fork Creek about 2.68 miles from site BF01. This site is publicly accessible via the road crossing on State Highway 46 in Smith County. Due to very dense vegetation and steep banks, access into the stream was difficult/moderately difficult. Landowner permission to access the stream from the road crossing was not required to complete the surveys.

Site BF03 is located on Black Fork Creek about 2.07 miles from site BF02. This site was publicly accessible via the road crossing on State Highway 110 in Smith County. Access to the stream was difficult on the right bank and moderately difficult on the left bank due to steep banks and thick vegetation.

Site BF04 is located on Black Fork Creek about 1.70 miles from site BF03. This site was publicly accessible via the road crossing on State Highway 69 in Smith County north of the city of Tyler, Texas. Access to the stream was difficult due to steep banks and bank garbage.

Site BF05 is located on Black Fork Creek about 1.70 miles from site BF04. This site was publicly accessible via the road crossing on Loop 323 in Tyler, Texas. Access to the stream was difficult due to steep banks and thick vegetation.

Site BF06 is located on Black Fork Creek about 1.11 miles from site BF05. This site was publicly accessible via the road crossing at N Broadway Ave in the City of Tyler. Access to the stream was extremely difficult due to tree vegetation and very steep banks.

Field Survey Results and Discussions

General Description of RUAA Survey Sites and Conditions for Black Fork Creek 0606D

The Black Fork Creek RUAA surveys were conducted on August 3 and October 6, 2020 at all six sites. The surveys were performed on weekdays, weekends, or holidays at opportune times to observe recreational activities. Air temperatures prior to and during both the first and second surveys were above 21□C (70□F), indicated by the RUAA guidelines as warm enough to promote recreational activities (Tables 4.2 and 4.3). In the 30 days prior to the first survey, 4.61 inches of precipitation fell, while 3.65 inches fell 30 days prior to the second survey. These rainfall events did not cause a hindrance to accessing the stream. The Palmer Drought Severity Index (PDSI) indicated mid-range (index value: -1.99 to +1.99) conditions for East Texas during August and moderately moist conditions (+2.00 to +2.99) for October (TWDB, 2020).

A summary of the RUAA field survey results is presented in the following tables:

- Table 4.4 describes the stream channel and corridor characteristics at each site.
- Table 4.5 notes the average thalweg depth by site during each survey and the access to the stream, whether public or private, and the ease of bank access.
- Tables 4.6 and 4.7 document the maximum, minimum, and average stream widths at each site for each survey and observed flow conditions.
- Tables 4.8 and 4.9 note stream aesthetics, wildlife observations and tracks, and the presence of garbage by site observed during each survey.

Physical descriptions of each site follow these tables along with selected photos showing notable characteristics of each site. All sites were at public road crossings. Overall thalweg depth averaged 0.63 m for the first survey and 0.69 m for the second survey. Access to the stream was difficult or moderately difficult at all six sites due to steep, densely vegetated banks. The dominant substrate was mud and clay. The majority of the stream corridor was forest with several areas lined with shrubs and pasture. The maximum stream width encountered was 16 m at Site BF05 during the first survey. Typical stream widths were widest at Site BF03 (11 m) with typical narrow width of 4.5 m at BF02. Flow conditions appeared normal during both the first and second surveys. The water was clear in color at all sites during both surveys. The water surface at most sites was clear during the first survey, but had foam or scum apparent at Sites BF04 and BF06 during the second survey. Evidence of wildlife was rarely observed at sites, most commonly in the form of raccoon and hog tracks. Trash was rarely observed at most survey sites and when observed was typically plastics, aluminum cans, and bottles. No evidence of recreation was observed at any of the six survey sites.

Table 4.2 Rainfall records with maximum and minimum temperature for Tyler, Texas 30 days prior to the first RUAA survey initiated on August 3, 2020

Survey dates are highlighted in gray. Weather Data from Weather Underground; station KTXTYLER Station. (Weather Underground, 2020)

Date	Daily Precipitation (in)	High Temperature (˚F)	Low Temperature (˚F)
July 2	0	94	79
July 3	0	97	75
July 4	0.02	94	72
July 5	0	93	75
July 6	1.03	88	73
July 7	2.25	82	73
July 8	0.86	93	74
July 9	0	93	78
July 10	0	93	77
July 11	0	94	78
July 12	0	94	76
July 13	0	97	80
July 14	0	95	78
July 15	0	92	80
July 16	0	94	79
July 17	0	95	76
July 18	0	93	75
July 19	0	94	76
July 20	0	94	76
July 21	0	89	74
July 22	0.43	91	75
July 23	0	94	76
July 24	0	91	76
July 25	0	91	76
July 26	0	91	75
July 27	0	89	73
July 28	0	93	75
July 29	0	93	77
July 30	0	95	79
July 31	0.01	92	71
August 1	0.01	92	73
August 2	0	95	71
August 3	0	95	70

Table 4.3 Rainfall records with maximum and minimum temperature for Tyler, Texas 30 days prior to the second RUAA survey initiated on October 6, 2020

Survey dates are highlighted in gray. Weather Data from Weather Underground; station KTXTYLER Station. (Weather Underground, 2020)

Date	Daily Precipitation (in)	High Temperature (˚F)	Low Temperature (˚F)
September 5	0.11	88	73
September 6	0	91	72
September 7	0	92	72
September 8	0	88	73
September 9	0.38	91	75
September 10	0.67	78	69
September 11	0	85	66
September 12	0	89	70
September 13	0	91	73
September 14	0	87	73
September 15	0	90	73
September 16	0	90	72
September 17	0	84	73
September 18	0.49	85	69
September 19	0	80	63
September 20	0	84	57
September 21	0	73	66
September 22	1.00	69	66
September 23	0.60	71	65
September 24	0.01	73	64
September 25	0	78	61
September 26	0	82	64
September 27	0	88	68
September 28	0.39	77	58
September 29	0	79	50
September 30	0	86	54
October 1	0	81	57
October 2	0	76	53
October 3	0	80	54
October 4	0	76	58
October 5	0	77	55
October 6	0	83	56

Table 4.4 Stream channel and corridor appearance for each site sampled along Black Fork Creek (0606D)

Site Number	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings
BF01	Natural	Mud/Clay	Forest	Normal	No	Forest
BF02	Natural	Sand/Silt/Gravel	Forest	Normal	No	Forest
BF03	Natural	Sand	Forest	Normal	No	Forest
BF04	Natural	Sand	Forest	Normal	No	Forest
BF05	Natural	Mud/Clay	Forest	Normal	No	Forest
BF06	Natural	Mud/Clay	Forest/Rip rap	Normal	No	Forest/Rip Rap

Table 4.5 Thalweg depth, stream flow type, and site accessibility during the two surveys of Black Fork Creek (0606D)

Stream flow type represents observed stream characteristics on the date of the survey. Under general access, * indicates that the site was publicly accessible at a road crossing but that further access was limited by fencing of private property. For Bank Access, E = Easy, ME = Moderately Easy, MD = Moderately Difficult, D = Difficult.

Site	Reach length (m)	# of Transects	# of Recreational Areas at Site	Avg. Site Thalweg Depth (m) for Trip 1	Avg. Site Thalweg Depth (m) for Trip 2	Stream Flow Type Survey 1	Stream Flow Type Survey 2	General Access	Bank Access
BF01	300	11	0	.61	.59	Perennial	Perennial	Public/ limited	D
BF02	300	11	0	.41	.50	Perennial	Perennial	Public	MD/D
BF03	300	11	0	1.2	1.19	Perennial	Perennial	Public	MD/D
BF04	300	11	0	.43	.65	Perennial	Perennial	Public	D
BF05	300	11	0	.48	.56	Perennial	Perennial	Public/ Limited	D
BF06	300	11	0	.66	.66	Intermittent w/perennial pools	Intermittent w/perennial pools	Public	D

Table 4.6 Description of surveyed stream sites along Black Fork Creek during the first survey performed on August 3, 2020

Site Number	Maximum Width (m)	Minimum Width (m)	Typical Average Width (m)	Observed Flow
BF01	13	7	10	Normal
BF02	8.5	.75	4.5	Normal
BF03	13	9	11	Normal
BF04	11	2	7	Normal
BF05	16	.6	8	Normal
BF06	12	1	7	Normal

Table 4.7 Description of surveyed stream sites along Black Fork Creek during the second survey performed on October 6, 2020

Site Number	Maximum Width (m)	Minimum Width (m)	Typical Average Width (m)	Observed Flow
BF01	13.5	7	10	Normal
BF02	8.5	.75	4.5	Normal
BF03	13	9	11	Normal
BF04	11	2	7	Normal
BF05	12	.6	8	Normal
BF06	11	1	7	Normal

Table 4.8 Stream aesthetics along Black Fork Creek during the first survey performed August 3, 2020

From Field Data Sheet – Section F: A = absent, R = rare, C = common, Ab = abundant, N = none, NW = no water, SP = slight presence, MP = moderate presence, LP = large presence.

Site	Aquatic Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Evidence of wildlife	Large garbage in Channel	Small garbage in Channel	Bank garbage
BF01	R	R	C	Clear	Fine Sediments	Clear	SP	N	N	Tracks/Fecal Droppings	R	N	R
BF02	R	R	N	Clear	Fine Sediments	Clear	SP	N	N	Tracks/Fecal Droppings	N	R	R
BF03	R	R	N	Clear	Fine Sediments	Clear	N	SP	N	Fecal Droppings	R	R	R
BF04	R	R	N	Clear	Fine Sediments	Clear	N	N	N	Tracks/Fecal Droppings	C	C	C
BF05	R	R	N	Clear	Fine Sediments	Clear	N	SP	N	Tracks/Fecal Droppings	R	R	R
BF06	R	R	N	Clear	Fine Sediments	Clear	N	N	N	Tracks/Fecal Droppings	C	C	C

Table 4.9 Stream aesthetics along Black Fork Creek during the second survey performed October 6, 2020

From Field Data Sheet – Section F: A = absent, R = rare, C = common, Ab = abundant, N = none, NW = no water, SP = slight presence, MP = moderate presence, LP = large presence. NA indicates not applicable because conditions were dry.

Site	Aquatic Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Evidence of wildlife	Large garbage in Channel	Small garbage in Channel	Bank garbage
BF01	R	R	C	Clear	Fine Sediments	Clear	N	N	N	Tracks/Fecal Droppings	R	N	R
BF02	R	R	N	Clear	Fine Sediments	Clear	N	N	N	Tracks/Fecal Droppings	N	R	R
BF03	R	R	N	Clear	Fine Sediments	Clear	N	N	N	Tracks/Fecal Droppings	R	R	R
BF04	R	A	N	Clear	Fine Sediments	Clear/Scum @ pipeline	N	N	N	Tracks/Fecal Droppings	C	C	C
BF05	R	A	N	Clear	Fine Sediments	Clear	N	N	N	Tracks/Fecal Droppings	R	R	R
BF06	R	R	N	Clear	Fine Sediments	Clear/Scum @ log jams	N	N	N	Tracks/Fecal Droppings	C	C	C

Physical Description of BF01

Black Fork Creek site BF01 was visited on August 3 and October 6, 2020. This site was located at the bridge crossing on FM 1150 in Smith County. The site was only publicly accessible via the bridge crossing.

The creek at this site passes through a forest riparian zone that led directly up to the creek. Banks were steep and slippery and with thick vegetation. The general appearance of the creek at this location is shown in Figures 4.2 and 4.3.

Figure 4.2 Photograph of Black Fork Creek Site BF01 taken on August 3, 2020. The downstream view of the 0-m transect

Site BF01 was wadeable with average thalweg ranging from 0.59 m to 0.61 m between surveys. Figure 4.2 illustrates the typical observed width of the creek at this site, approximately 10 m. Widths ranged from 7 m to 13 m during the two surveys (Tables 4.6 and 4.7).

The stream flow type was observed as perennial at the time of both surveys (Table 4.5). Aquatic vegetation and algae cover was rare at this site for each surveys. The deepest thalweg depth measured during the first survey at the 0-m and 30-m transects was greater than 1.20 m and the shallowest was 0.13 m at the 180-m transect during the first survey. No pools were observed during either survey at this site.

Figure 4.3 Photograph of Black Fork Creek Site BF01 taken on October 6, 2020. The downstream view of the 300-m transect

No water dependent birds were observed during either survey (Tables 4.8 and 4.9), however, one small snake was spotted during the first survey. Raccoon tracks were noted during both surveys while an alligator slide with tracks were observed during the second survey. Aquatic vegetation and algae cover were rarely detected, while a chlorine odor was common throughout the reach during both surveys. Large garbage, a freezer, and television set was rare during both surveys and typical household garbage (plastics, glass, cans) observed in the stream and on the bank.

Physical Description of BF02

Black Fork Creek at Site BF02 was visited on August 3 and October 6, 2020. This site was located at the State Highway 46 bridge crossing. Access to this site was moderately difficult because the banks were steep with thick vegetation leading down to the water. The stream was only publicly accessible at the bridge crossing.

The riparian zone at Site BF02 was forest with thick vegetation on both the right and left banks (Table 4.4). When TIAER personnel arrived at the site during the second survey, a Smith County maintenance crew was present cutting the thick vegetation along the bridge. Banks were vegetated with larger trees and a larger shaded understory (Figures 4.4 and 4.5) throughout this site. The stream was wadeable during both surveys with average thalweg depths ranging from 0.41 m to 0.50 m. The stream was designated as perennial during both surveys (Table 4.5). Channel widths ranged

from 8.5 m to .75 m throughout the reach during both surveys with a typical observed width of 4.5 m (Tables 4.6 and 4.7).

Figure 4.4 Photograph of Black Fork Creek Site BF02 taken on August 3, 2020. Photograph shows the downstream view of the 150-m transect. TIAER personnel in photo.

Figure 4.5 Photograph of Black Fork Creek at Site BF02 taken on October 6, 2020. Photograph at the 300-m transect facing upstream.

No water dependent birds were observed at this site during either surveys (Tables 4.8 and 4.9). Bird droppings were observed in addition to raccoon tracks and a small snake. No evidence of wildlife was observed in either survey. Aquatic vegetation and algae were rare during both surveys. No odor was detected, water color was clear, and the surface clear during each survey. A fish trap and large tires were seen under the bridge during the first survey with no evidence of human recreation or large garbage observed during either survey.

Physical Description of BF03

Black Fork Creek at Site BF03 was visited on August 3 and October 6, 2020. This site was accessed via a bridge crossing at State Highway 110. Access to the stream passed the road crossing was by private property only. The riparian area was forest with thick vegetation and slippery slopes on both the right and left banks (Table 4.4). Access to the stream was difficult and moderately difficult due to private property and the dense forest riparian zones.

Site BF03 was only wadeable along the edges of the stream with thalwegs greater than 1.2 m during both surveys (Table 4.5). The stream flow type was characterized as perennial for this reach. Average stream width during both surveys was 11 m with maximum and minimum stream widths of 13 m and 9 m, respectively by survey (Tables 4.6 and 4.7).

The stream banks were densely vegetated (as seen in Figure 4.6) at BF03. Channel obstructions at this site included log jams and tree branches. Additionally, given the depth of the stream at this site, it was difficult to navigate, primarily wading along the edges. Aquatic vegetation and algae cover were rarely observed during each survey. The water was brown or tan in color with no surface scum observed.

Figure 4.6 Photograph of Black Fork Creek Site BF03 taken on August 3, 2021, the upstream view of the 150-m transect.

The only evidence of wildlife observed were deer, hog, and raccoon tracks during the second survey. Tires were observed during both surveys at the 300-m transect (under the bridge of State Highway 110). No other large garbage was encountered, but some small garbage, in the channel and along the banks was observed in the form of plastic bottles observed during both surveys (Tables 4.8 and 4.9). No evidence of human recreation was observed at this site.

Physical Description of BF04

Black Fork Creek site BF04 was visited on August 3 and October 6, 2020. This site was located at the State Highway 69 and stream crossing in Smith County northwest of Tyler, Texas. The site was publicly accessible via the bridge crossing only.

The riparian area was forest with thick vegetation and slippery slopes on both the right and left banks (Table 4.4). Areas of this site had large piles of debris, specifically under the bridge crossing (Figure 4.7). Banks were steep, slippery, and overgrown with vegetation.

Figure 4.7 Photograph of Black Fork Creek Site BF04 taken on August 3, 2020. The downstream view of the 150-m transect.

Site BF04 was wadeable with average thalweg ranging from 0.43 m to 0.65 m between surveys. Figure 4.8 illustrates the typical observed width of the creek at this site, approximately 7 m (TIAER personnel in photo). Widths ranged from 2 m to 11 m during each surveys (Tables 4.6 and 4.7) with a typical average of 7 m.

The stream flow type was observed as perennial at the time of both surveys (Table 4.5). Aquatic vegetation was rarely observed during both surveys, while algae cover was rare only during the first survey. No pools were observed during either survey at this site.

Figure 4.8 Photograph of Black Fork Creek Site BF04 taken on October 6, 2020. The downstream view of the 300-m transect.

No water dependent birds or reptiles were observed during either survey (Tables 4.8 and 4.9). Tracks and fecal droppings from hogs and raccoons were noted throughout the survey reach. Alligator tracks were also observed at this site (Figure 4.9). A small pipeline ran across the stream near the 150-m transect. Typical household garbage (plastics, glass, cans) was observed in the stream and on the bank during each survey.

Figure 4.9 Photograph of Alligator tracks taken on October 6, 2020 at BF04

Physical Description of BF05

Black Fork Creek at Site BF05 was visited on August 3 and October 6, 2020. This site was located at the Loop 323 bridge crossing in Tyler, Texas. Access to this site was difficult due to steep banks with thick vegetation leading down to the water. The stream was only publicly accessible at the bridge crossing.

The riparian zone at Site BF05 was forest with thick vegetation along both banks (Table 4.4). The stream was wadeable during both surveys with one pool present during the first survey (Figure 4.10). The pool that TIAER personnel encountered during the first survey was 107 m long and 13 m wide with a maximum depth of 0.90 m. Average thalweg depths were 0.48 m to 0.56 m between the first and second surveys respectively. The stream is observed as perennial (Table 4.5). Channel widths ranged from 0.6 m to 16 m throughout the reach during both surveys with a typical observed width of 8 m (Tables 4.6 and 4.7). Figure 4.11 depicts the typical channel width during each survey.

Figure 4.10 Photograph of pool at Black Fork Creek Site BF05 taken on August 3, 2020. Photograph shows the upstream view of the 150-m transect.

Figure 4.11 Photograph of Black Fork Creek at Site BF05 taken on October 6, 2020. Photograph at the 300-m transect facing upstream. TIAER personnel in photo.

A water dependent bird was only observed at this site during the first survey (Tables 4.8 and 4.9). Bird droppings were observed in addition to raccoon and hog tracks. A decent sized hog wallow, where evidence of rooting, was identified during each survey. Aquatic vegetation was rare during both surveys, while algae cover was absent. No odor was detected, water color was clear, and the surface was clear during the each surveys.

Physical Description of BF06

Black Fork Creek at Site BF06 was visited on August 3 and October 6, 2020. This site was accessed via a bridge crossing N Broadway Ave in Tyler, Texas. This site is located at Woldert Park. Access to the stream past the road crossing was by private property only. Access to the stream from the park was incredibly difficult due to the riparian area. The riparian area at this site was crowded with thick vegetation and slippery slopes along with rip rap on both the right and left banks (Table 4.4).

Site BF06 was wadeable with thalwegs ranging from 0.20 m to greater than 1.2 m during the first survey (Table 4.5) and 0.29 m to greater than 1.2 m during the second. The average thalweg was 0.66 m during both surveys. The stream flow type was characterized as perennial for this reach. The average stream width for each survey was 7 m. The maximum and minimum stream widths were 12 m for the first survey and 1 m for the second survey with a typical average width of 7 m (Tables 4.6 and 4.7).

The stream banks were densely vegetated (as seen in Figure 4.12) at BF06. The stream channel was relatively clear of downed logs and twig debris except the rare encounter during the second survey. Additionally, there was a pipeline running across the stream at this site. Aquatic vegetation and algae cover was observed during both the first and second surveys but was rare. The water was clear in color and surface during both surveys except for the rare scum encountered among the logjams during the second survey.

Figure 4.12 Photograph of Black Fork Creek Site BF06 taken on August 3, 2020, the downstream view of the 150-m transect.

The only evidence of wildlife observed were raccoon tracks during both surveys. ATV tracks were present during the first survey under the bridge crossing. Tires and a rolled carpet half under water was encountered during the first survey and other small channel and bank garbage (plastic bottles, cans) observed during each survey (Tables 4.8 and 4.9).

Observations and Interviews

Activities Observed

During each RUAA survey, field personnel visited sites during times of day and on days when recreational activities were most likely to be observed. All six sites were at public road crossings; however, private property boundaries limited public access to a small area around and underneath all bridge crossings. No form of recreation was directly observed by TIAER staff during either of the two surveys.

Activities Interviewed

A total of four interviews were collected from landowners along Black Fork Creek.

Three of the four interviewees stated they had not personally used, seen others use, or heard of others using the stream for any form of recreation. One interview indicated their family occasionally used the stream for fishing "years ago". Of the interviews that stated they had not personally recreated in Black Fork Creek, one gave the reason as not being deep enough while another stated it was dirty looking and dangerous (Table 4.10).

Activities listed in Table 4.10 indicate the number of times personal use, observed use, and/or heard of use was documented from interviews for a given location or in general along the assessment unit. Blank cells in Table 4.10 indicate no interviewed feedback for that location.

Table 4.10 Summary of recreational activities noted in interviews for Black Fork Creek

Site Name	Number of Interviews	Swimming	Adult Wading	Children Wading	Hunt	Fish	Boat, Canoe, Kayak
BF01							
BF02	1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
BF03							
BF04							
BF05							
BF06	1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
General AU	2	0,0,0	0,0,0	0,0,0	0,0,0	1,0,0	0,0,0
Totals	4	0,0,0	0,0,0	0,0,0	0,0,0	1,0,0	0,0,0

Summary

RUAA surveys were conducted at six sites along Black Fork Creek on August 3, 2020 and October 6, 2020. Temperatures were above 21ºC (70ºF) during the 30 days prior to each survey (Tables 4.2 and 4.3). Water existed and flowed in Black Fork Creek during both surveys. Stream flow was considered normal during both surveys based on information provided by local residents. The Palmer Drought Severity Index (PDSI) indicated mid-range conditions in August 2020 and moist conditions in October 2020 (TWDB, 2020).

No recreational activities were observed by TIAER field staff during either survey. Roughly 60% of the watershed through which Black Fork Creek falls into three types of land use. Low Intensity Developed land accounts for the majority at roughly 26%, while pasture/hay and mixed forest lands represent 20% and 14.6% of the watershed, respectively. Steep and slippery banks and overgrown banks with thick vegetation were present at all six sites indicating hazardous locations for recreation.

Interviews indicated only one occurrence of recreational activity, fishing, within the stream, many years ago (time is unknown). Public access to the stream is limited at all six sites primarily to the right-of-ways immediately surrounding bridge crossings or areas immediately up and down stream of culvert crossings.

Recreational activities observed and reported in interviews are summarized in Figure 4.13. Overall RUAA findings are summarized in the form below.

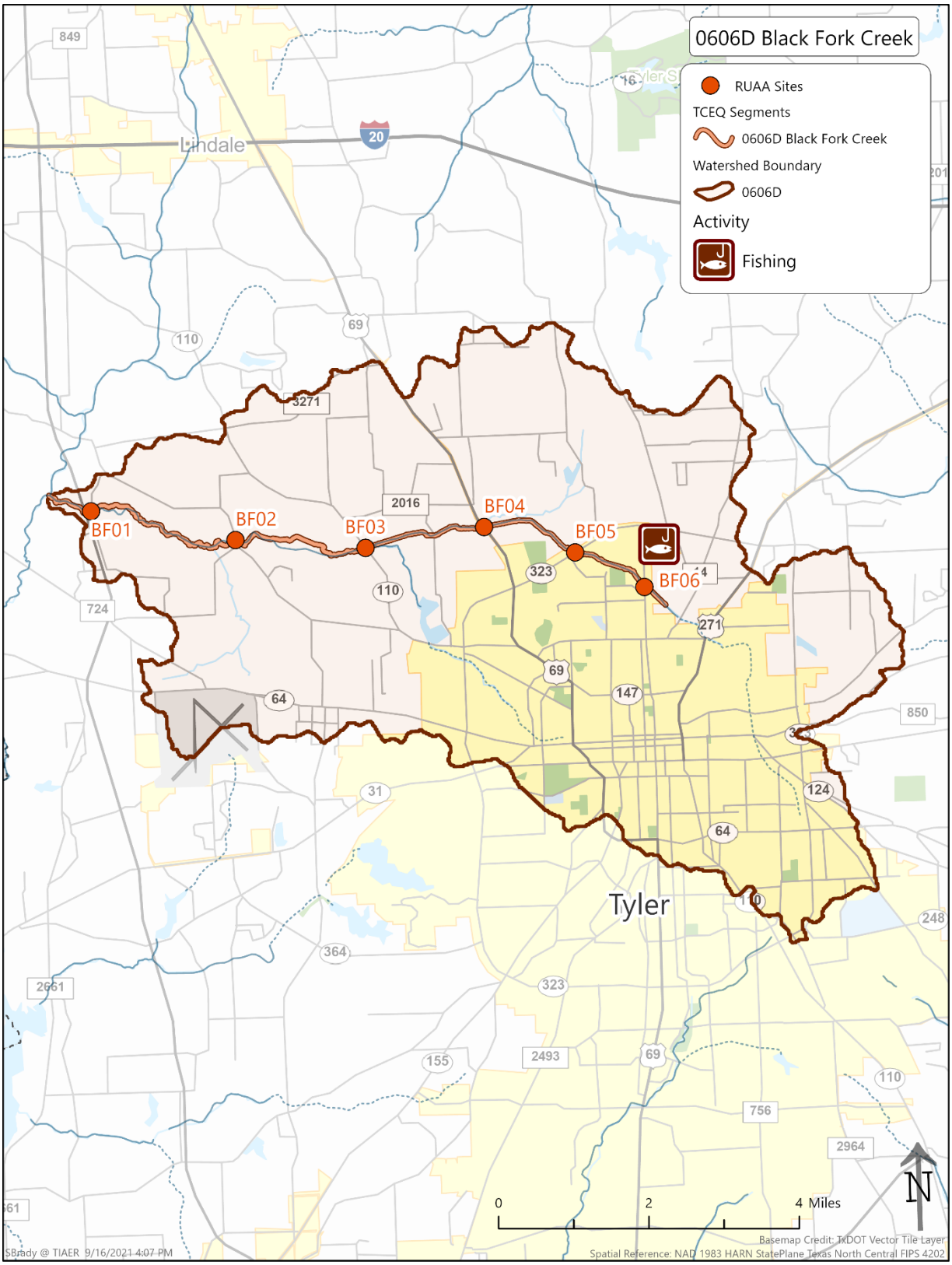

Figure 4.13 Summary of observed and interviewed human activities on Black Fork Creek

RUAA Summary

(Not part of the Field Data Sheet)

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: Black Fork Creek
Segment No. of Nearest Downstream Segment No.: 0606D
Classified?: No
County: Smith County

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? 0.66 meters
   b. Are there substantial pools deeper than 1 meter? ☒Yes ☐No
   c. What is the general level of public access?
   ☐easy ☐moderate ☒very limited

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

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