



# Attoyac Bayou Recreational Use Attainability Analysis

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**Attoyac Bayou  
Recreational Use Attainability Analysis**

*Prepared for:*

**Texas State Soil and Water Conservation Board  
Project # 09-10**

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**List of Acronyms and Abbreviations**

ANRA	Angelina & Neches River Authority
AU	Assessment Unit
BAEN	Department of Biological and Agricultural Engineering, Texas A&M University
CES	Castilaw Environmental Services, LLC.
FSC	Flood control structure
HUC	Hydrologic unit code
NHD	National Hydrography Dataset
NCR	Noncontact Recreation
NRCS	USDA Natural Resource Conservation Service
OSSF	On-site sewage facility
PCR	Primary contact recreation
QAPP	Quality assurance project plan
RUAA	Recreational use attainability analysis
RC&D	Resource conservation & development
SCR1	Secondary Contact Recreation 1
SCR2	Secondary Contact Recreation 2
SCSC	Department of Soil and Crop Sciences, Texas A&M University
SFASU	Stephen F. Austin State University
SMZ	Streamside management zone
SWQM	Surface water quality monitoring
TCEQ	Texas Commission on Environmental Quality
TSSWCB	Texas State Soil and Water Conservation Board
TSWQS	Texas Surface Water Quality Standards
TWDB	Texas Water Development Board
TWRI	Texas A&M AgriLife Research, Texas Water Resources Institute
UAA	Use attainability analysis
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WPP	Watershed Protection Plan
WWTF	Wastewater treatment facility



## Chapter 1 : Problem Statement

The Attoyac Bayou, Segment 0612, is one sub-watershed within the Upper Neches River Watershed that is experiencing changes in its hydrologic regime, and subsequent changes in water quality. Watershed dynamics have changed over time and environmental stressors have been exacerbated through expanded human influences and increasing demand for water resources, increasing pollutant load and the concentration of pollutant loads. These changes have resulted in the elevation of bacteria and nutrient levels relative to *Texas Surface Water Quality Standards* (TSWQS). The Bayou extends approximately 82 miles from its headwaters in Rusk County and flows through Nacogdoches, San Augustine and Shelby Counties before emptying into Sam Rayburn Reservoir. The watershed contains several named communities including Chireno, Attoyac, Martinsville, Grigsby, Garrison and others; however, these are small rural communities. Chireno and Garrison are the only two with Census Bureau estimated populations for 2007 of 419 and 858 respectively. The remainder of the area is predominantly managed for agricultural (cattle and poultry), silvicultural, recreational and wildlife uses and contains many rural residents and four known permitted wastewater discharges totaling a maximum of 338,000 gallons per day.

The Attoyac Bayou watershed is one of many rural watersheds that are included in the *Texas Water Quality Inventory and 303(d) List* as an impaired water body due to excessive *E. coli* levels, and currently does not support the primary contact recreation use as defined by TSWQS.

The TSWQS designates the Attoyac Bayou for primary contact recreation use (TCEQ 2010a). Amendments made to TSWQS in 2010 include the expansion of three use categories for contact recreation: Primary Contact Recreation (PCR), Secondary Contact Recreation 1 (SCR1), and Secondary Contact Recreation 2 (SCR2). Also included in TSWQS is the category of Noncontact Recreation (NCR). The Texas Commission on Environmental Quality (TCEQ), utilizes the use attainability analysis (UAA) process to identify and assign attainable uses and criteria to individual water bodies throughout the state taking into consideration the unique physical, chemical, biological, and economic factors affecting the attainment of the waterbody's use (40 Code of Federal Regulations §131.10(g)). A specific kind of UAA, the recreational use attainability analysis (RUAA), is employed when determining the appropriate recreational use of a waterbody, and was implemented in this study.

### Objectives

The objective of this project is to conduct a Comprehensive RUAA to assess the physical, chemical, biological, and economic factors affecting attainment of recreation use in the Attoyac Bayou (Segment 0612), Terrapin Creek (Segment 0612A), Waffelow Creek (Segment 0612B), Naconiche Creek, Big Iron Ore Creek and West Creek. Methods used shall be consistent with the TCEQ *Recreational Use-Attainability Analyses – Procedures for a Comprehensive Recreational UAA and a Basic UAA Survey* (TCEQ 2009).

## **Stakeholder and Agency Involvement**

Public participation and stakeholder involvement will be handled primarily by Castilaw Environmental Services, LLC (CES) who will serve as the Watershed Coordinator and will be assisted by ANRA, personnel from the Biological and Agricultural Engineering Department (BAEN) at Texas A&M University, Pineywoods Resource Conservation and Development (RC&D), personnel from the Soil and Crop Sciences Department (SCSC) at Texas A&M University, SFASU and TWRI. A diverse group of landowners, public officials, special interest groups and agencies have been identified as potential participants in a stakeholder group and will be asked to provide guidance for the direction of the project and development of a watershed protection plan (WPP) for the Attoyac Bayou as well as the RUAA. Input and cooperation from stakeholders is critical to the success of RUAA planning and implementation efforts, especially given the rural nature and private ownership of land in the watershed. Insight provided by the stakeholders will supply much needed information and greatly assist in identifying potential recreational uses and points of interest within the Attoyac Bayou watershed. Routine stakeholder meetings were held to provide information about the project objectives, results, updates and the final results of the project. Project information was made available through other avenues as well (ANRA CRP meetings, Regional Water Planning meetings, Special Interest Meetings, project website, etc.).

On Thursday, March 10, 2011, SFASU and TSSWCB gave separate presentations to stakeholders and involved agencies regarding the purpose and methodology of RUAs as well as their importance as a part of the WPP as a whole. The meeting was held at the Nacogdoches County Courthouse Annex.

A public meeting was held on Thursday, June 7, 2012, in which a representative from SFASU delivered a presentation to stakeholders and members of involved agencies regarding RUAA procedures, proposed dates, and locations of the survey. Questions and concerns from stakeholders were addressed by the representative and other agency personnel.

Information on past meetings for this RUAA including reports and other information can be found on the project website: <http://attoyac.tamu.edu/>.

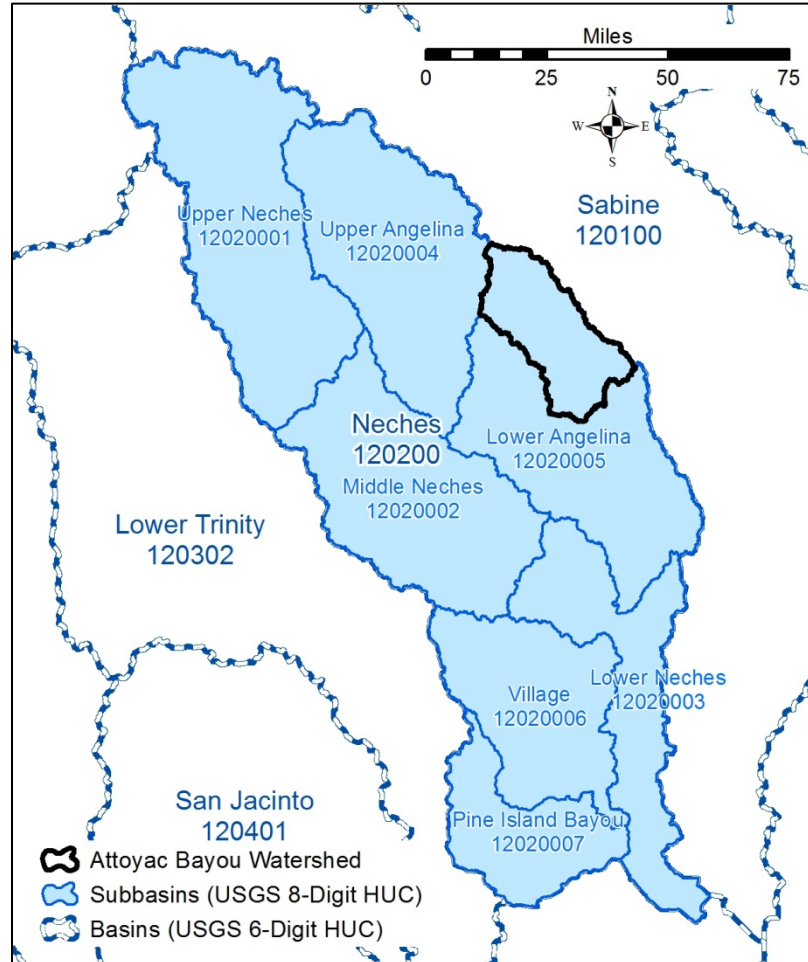
## Chapter 2 : Study Area

### Description of Attoyac Bayou

The Neches River Basin in East Texas originates in Van Zandt County southeast of Dallas and flows in a southeastern direction through the Pineywoods of East Texas to the Gulf of Mexico. The river basin has been divided into an upper and lower portion for management and monitoring purposes. ANRA is responsible for the Upper Neches River Basin (4,768,640 ac.) which extends from the headwaters of the Neches River downstream to its confluence with the Angelina River at B.A. Steinhagen Lake in Tyler and Jasper Counties. Within this upper portion of the Neches River basin, there are 10 classified segments, 13 monitored tributaries and 4 water supply reservoirs. The watershed is largely situated within the Southern Central Plains ecoregion and agricultural and silvicultural related industries and operations dominate the landscape and influence the watershed's hydrology and quality. Urban sprawl coupled with an increasing number of rural residents and land subdivision is also currently impacting the watershed and its hydrological processes.

The Attoyac Bayou Watershed is a predominantly rural watershed situated in deep East Texas. The watershed is located in portions of Nacogdoches, Rusk, San Augustine, and Shelby Counties. Local cities and communities within the watershed include Chireno, Garrison, Martinsville, and Stockmann. The Attoyac Bayou Watershed is situated approximately 180 miles southeast of Dallas, and approximately 150 miles northeast of Houston. Major roads accessing the watershed include US Highways 59 and 84 in the northern portion of the watershed, and State Highways 7 and 21 in the south.

The Attoyac Bayou Watershed has a drainage area of approximately 554 square miles, or 354,629 acres, and constitutes the northern extent of the Lower Angelina Sub-basin (8-Digit Hydrologic Unit Code (HUC): 12020005). The Lower Angelina Sub-basin is one of seven sub-basins that make up the Neches River Basin (6-Digit HUC: 120200). The headwaters of the Attoyac Bayou begin near the town of Mt. Enterprise in Rusk County. The watershed then extends south and east to the segment boundary near Sam Rayburn Reservoir. The Attoyac Bayou Watershed is further subdivided into 55 smaller sub-watersheds. Figure 2.1 depicts the location of the Attoyac Bayou Watershed within the Neches River Basin.



**Figure 2.1** Basins of East Texas and Sub-basins of the Neches River Basin.

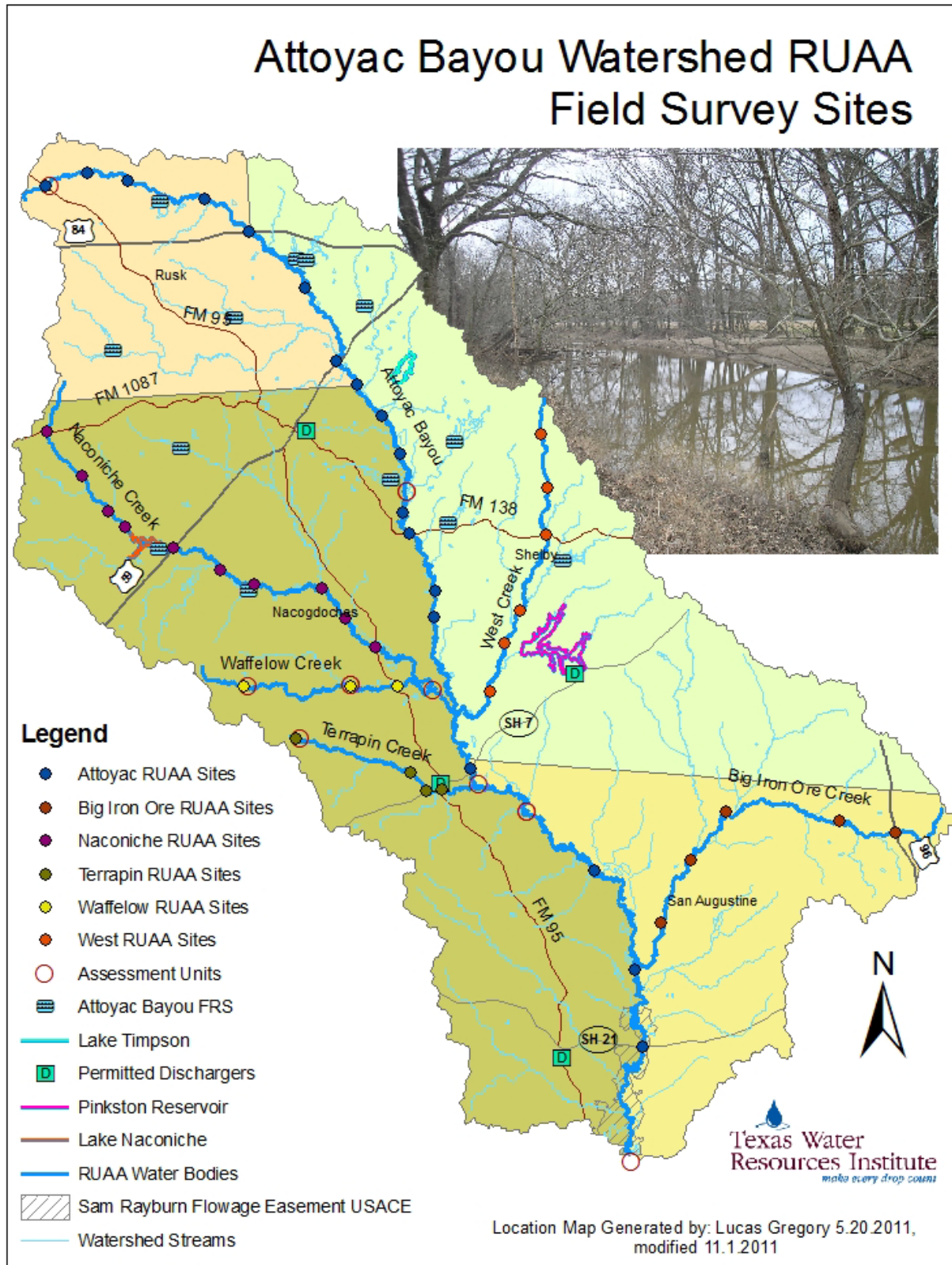
Source: TWDB

The flow type for Attoyac Bayou is described as perennial, meaning that it maintains flow throughout the year (TCEQ 2012c). The designated use for Attoyac Bayou is primary contact recreation, which includes any recreational activity that involves a significant risk of water ingestion. Surface water quality monitoring (SWQM) revealed that elevated levels of *E. coli* periodically exist in the watershed and as a result, the Attoyac Bayou does not currently support its contact recreational use.

In many cases the assessed data set includes a relatively small number of water quality samples collected over a 5 to 7 year period. Through the Texas Commission on Environmental Quality's (TCEQ) Clean Rivers Program (CRP), ANRA monitors the Attoyac Bayou at two sites on a quarterly basis. These sites are at the US 59 (Station 16076) and SH 7 (Station 15253) road crossings. Another water quality monitoring station is located at the SH 21 crossing (Station 10636) and is currently monitored quarterly by TCEQ. In this past, this station has been operated by ANRA and the U.S. Geological Survey (USGS). In the state's bi-annual water quality

assessment conducted in 2008, a review of the existing water quality data revealed that the geometric mean of assessed *E. coli* levels were above the state standard of 126 cfu/100ml at all three sites.

As a component of RUAA site evaluation and fieldwork, SFASU and CES field staff noted potential bacterial sources at each survey site. The most prevalent potential sources noted during the surveys included wildlife, feral hogs, on-site sewage facilities (OSSFs) and livestock. Permitted sources within the Attoyac Bayou Watershed include wastewater treatment facilities in the communities of Garrison, Chireno, and Martinsville Texas.



**Figure 2.2** Attoyac Bayou Watershed displaying dominant features and RUAA survey sites.

## Climatic Conditions

The climate within the watershed can be characterized as humid subtropical, with warm humid summers, and humid, mild winters. Average high temperatures during the summer months range from the low to mid 90's with average low temperatures ranging from the low to mid 70's. Average high temperatures during the winter months range from the mid to high 50's with low temperatures in the upper 30's (Southern Regional Climate Center 2012). Average rainfall within the watershed varies from 45 to 49 inches per year, with an average of 45 inches occurring in the western portion of the watershed and increasing to 49 inches per year in the eastern portion of the watershed. Rainfall is distributed fairly evenly throughout the cooler months of the year. The months of July and August generally receive the least amount of rain in a year. East Texas is characterized as a portion of Texas that experiences a summer drought climatic pattern, with peak precipitation occurring in the spring and fall months. When rainfall is below normal during the cooler months, especially during the peak rainfall periods before and after the typical summer drought conditions, significant drought periods can result (Carr 1967).

## Land Use/Land Cover

Castilaw Environmental Services, LLC (CES) classified the landuse and landcover (LULC) types within the Attoyac Bayou Watershed in 2009 – 2010. The watershed was divided into thirteen (13) LULC classes.

- Developed Open Space - Includes 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 Low Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49% of total cover. These areas most commonly include single-family housing units.
- Developed Medium Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79% of the total cover. These areas most commonly include single-family housing units.
- Developed High Intensity- Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80-100% of the total cover.
- Open Water - All areas of open water, generally with less than 25% cover of vegetation or soil.
- Barren Land - (Rock/Sand/Clay) - Barren 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 and includes transitional areas.

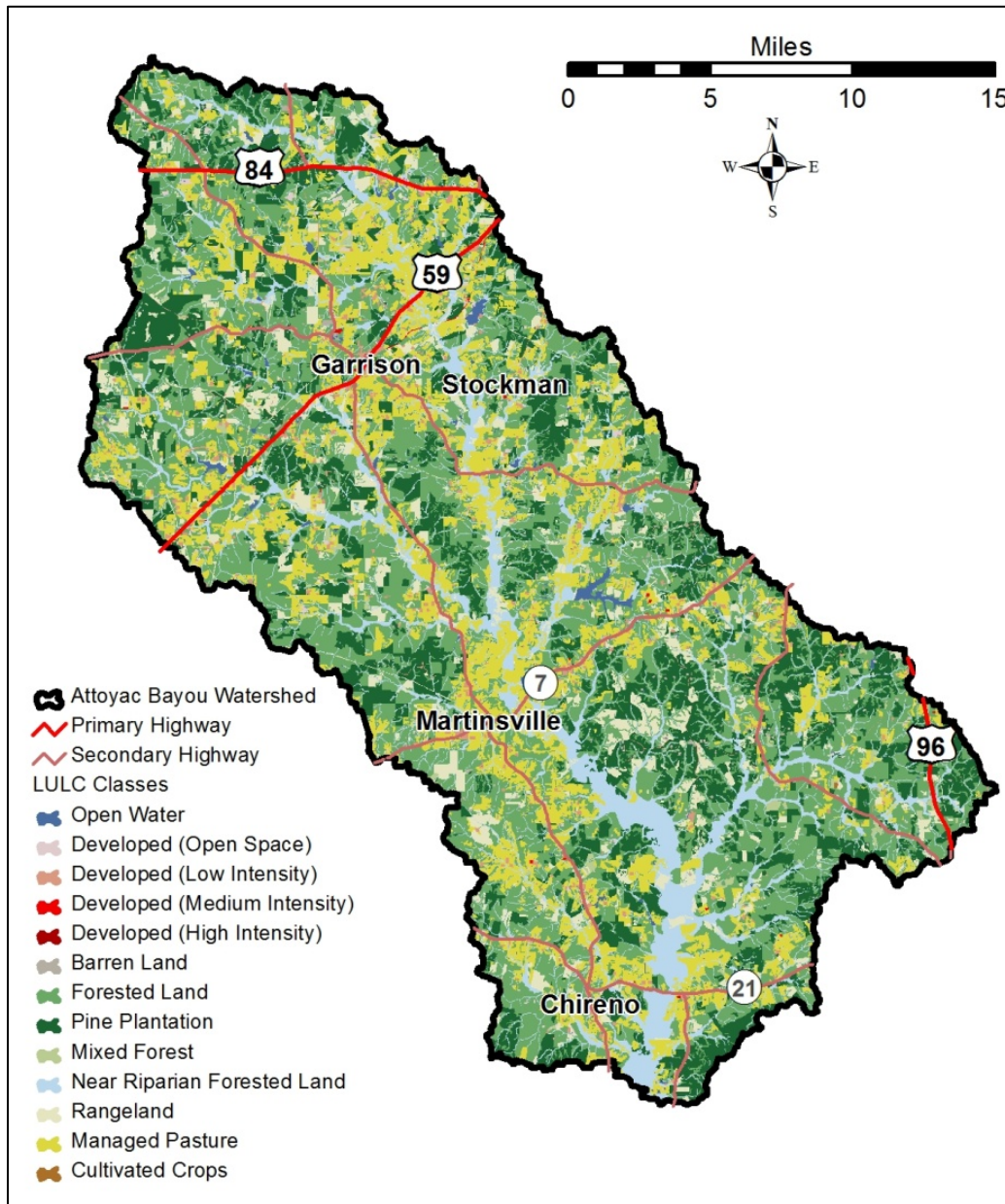
- Forested Land** – Areas dominated by trees generally greater than 5 meters tall, and greater than 50% of total vegetation cover.
- Near Riparian Forested Land** – Areas dominated by trees generally greater than 5 meters tall, and greater than 50% of total vegetation cover. These areas are found following in near proximity (within 60 ft) to streams, creeks and/or rivers.
- Mixed Forest** - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% but less than 50% of total vegetation cover.
- Rangeland** – Areas of unmanaged shrubs, grasses, or shrub-grass mixtures
- Managed Pasture** - 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.
- Cultivated Crops** - Areas used for the production of annual crops, such as corn, soybeans, vegetables, 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.
- Pine Plantation** – Areas of land dominated by pine trees that have been planted to artificially reforest an area for the purpose of timber production; trees are generally planted in an evenly spaced, systematic manner that is easily distinguishable from native tree stands.

CES utilized a variety of sources in order to delineate the individual LULC classes found throughout the watershed. The primary method used to delineate these classes was to hand digitize, often referred to as “heads-up digitizing”, individual areas within the watershed exhibiting a significantly different cover types or landuse from the surrounding areas. Each area was classified according to the different LULC classes presented in Table 2.1. Delineated areas were generally 2-acres in size and larger. Areas exhibiting a separate LULC class but smaller than 2-acres in size were considered a minor component to a larger LULC class and not delineated. Imagery used for the delineation of LULC classes consisted of 2008, leaf-off, 1-meter, National Agricultural Imagery Program (NAIP) county mosaics for each county within the watershed. In order to ensure the accuracy and completeness of the LULC data, CES personnel conducted initial field surveys to characterize dominant LULC types within the watershed and to relate on-the-ground observations with aerial photographic signatures associated with different LULC classes. These classifications were verified utilizing 2001 National Land Cover Dataset classifications and ground truthed data thus providing an accurate and up-to-date description of LULC in the watershed. Table 2.1 illustrates the acreages and percent of each LULC class within the Attoyac Bayou Watershed. As seen in Table 2.1, the Attoyac Bayou Watershed is a predominantly rural watershed with roughly 70% consisting of forested LULC classes, 26% consisting of managed pasture or rangeland, and only approximately 3% consisting of classes of developed land. The remaining classes consisted of open water, barren land, and cultivated crops.



**Table 2.1.** Land use/land cover of the Attoyac Bayou Watershed

<b>LULC Class</b>	<b>Acreage</b>	<b>Percent</b>
<b>Total Watershed</b>	<b>354,629</b>	
Forested Land	133,193	37.56%
Managed Pasture	69,662	19.64%
Pine Plantation	67,891	19.14%
Near Riparian Forested Land	43,193	12.18%
Rangeland	23,049	6.50%
Developed (Low Intensity)	6,618	1.87%
Developed (Open Space)	3,394	0.96%
Open Water	2,681	0.76%
Mixed Forest	2,561	0.72%
Barren Land	1,546	0.44%
Developed (Medium Intensity)	771	0.22%
Cultivated Crops	57	0.02%
Developed (High Intensity)	13	0.004%



**Figure 2.3** LULC classes within the Attoyac Bayou Watershed.  
Source: CES

### Potential Sources of Pollution

Potential sources contributing bacteria in the Attoyac Bayou Watershed were identified through a variety of avenues including stakeholder input, local experience in the watershed from project partners, and conducting watershed reconnaissance surveys.

**Table 2.2.** Summary of potential sources of bacteria occurring within the Attoyac Bayou Watershed.

<b>Category</b>	<b>Cause</b>	<b>Deposition Into Water Body</b>
Residential OSSFs	Improperly functioning or non-existent onsite septic systems releasing improperly treated wastewater into water bodies.	Direct and Indirect
Pets	Pets deposit fecal matter to the land surface which is washed into water bodies during runoff events.	Indirect
Livestock	Livestock manure directly deposited into water body and/or washed into water body during runoff events.	Direct and Indirect
Poultry	Poultry litter deposited on land application fields and washed into water body during runoff events.	Indirect
WWTFs	Potential maintenance issues and flow exceedances during runoff events causing improperly treated wastewater to be discharged into water body.	Direct
Oil and Gas OSSFs	Improperly functioning or non-existent onsite septic systems releasing improperly treated wastewater into water bodies. Potential for issues is generally most common during construction and drilling activities only.	Direct and Indirect
Wildlife and Feral Animals	Both wildlife and feral animals depositing fecal matter directly into water-bodies or washed into water body during runoff events.	Direct and Indirect
Illegal Dumping	Illegal dumping of household waste as well as animal carcasses releasing <i>E. coli</i> directly into water bodies, and washed into a water body during runoff events.	Direct and Indirect

### Wastewater Treatment Facilities

There are 3 wastewater treatment facilities within the Attoyac Bayou Watershed. These facilities and their associated permit requirements are outlined in Table 2.3.

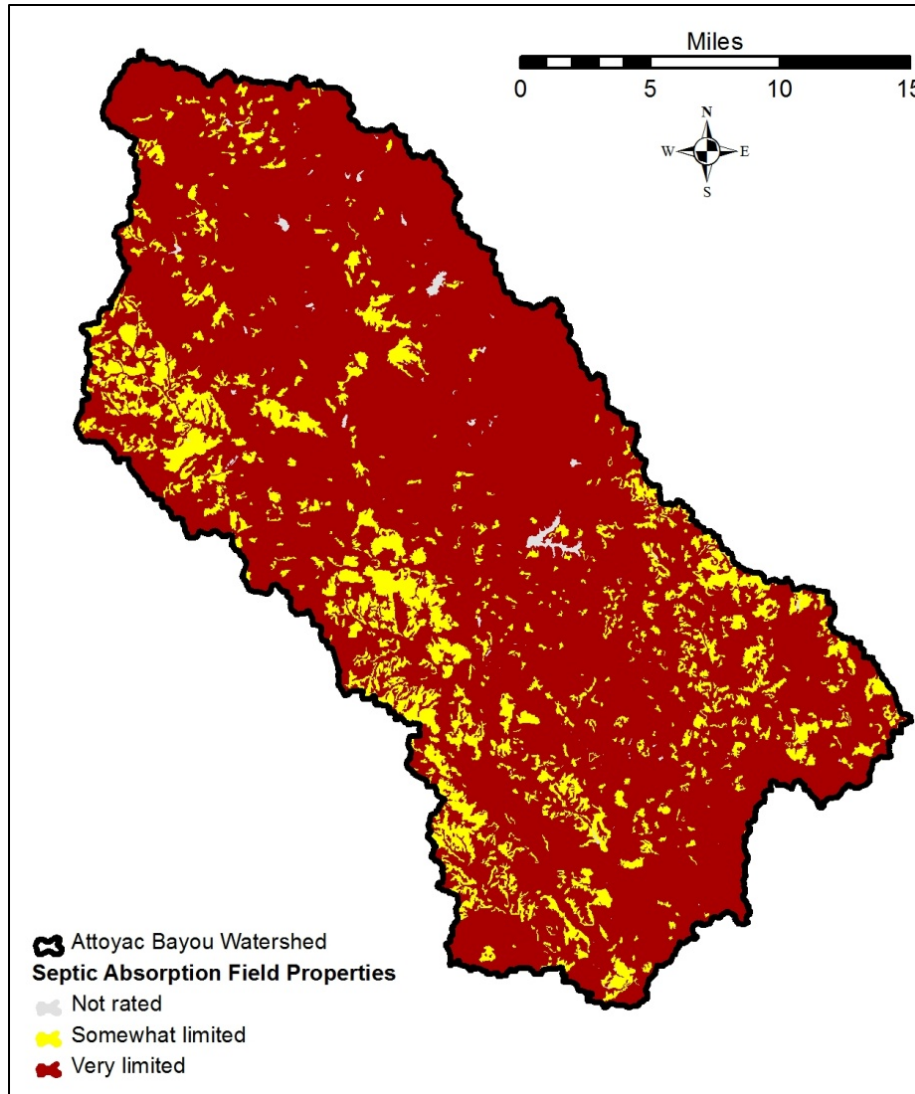
**Table 2.3** Permitted WWTFs within the Attoyac Bayou Watershed

<b>Facility Name</b>	<b>County</b>	<b>Receiving Station</b>	<b>Permitted Flow (MGD)</b>	<b>Bacteria Limitations (CFU or MPN/100 mL)</b>
ChirenoISD	Nacogdoches	Ditch to Attoyac Bayou	0.01	126 Daily Avg, or 394 Single Grab
City of Garrison	Nacogdoches	Tributary of Jenks Creek	0.12	N/A
Martinsville ISD	Nacogdoches	Tributary of Terrapin Creek	0.008	126 Daily Avg, or 394 Single Grab

Two types of WWTFs exist in the Attoyac Bayou watershed. The Garrison WWTF utilizes chlorination in order to reduce pathogens and bacteria concentrations to acceptable levels while the Chireno ISD and Martinsville ISD WWTFs utilize a 21 day residence time in their systems to achieve sufficient disinfection

### Residential On-Site Sewage Facilities

The Attoyac Bayou Watershed is a predominantly rural watershed. As a result, the majority of the residences present in the watershed utilize an OSSFs. Utilizing 911 address data, it is estimated that there are approximately 6,624 residences outside of the incorporated city of Garrison. The City of Garrison has a wastewater treatment facility (WWTF), and any residences within the city limits are assumed to be connected to the WWTF and therefore do not need an OSSF. The remaining residences within the watershed are assumed to utilize an OSSF. The majority of OSSFs utilize a septic tank and subsurface soil absorption to treat discharged wastewater. In these systems, wastewater is first passed through a septic tank. The septic tank is a buried, watertight container utilized to separate and accumulate solids and grease from wastewater. The effluent exiting the septic tank should be a clear liquid devoid of most solids and fats or greases. This effluent is then discharged into a soil absorption field where wastewater is further treated by percolating through the soil (EPA 1980). Many factors can affect the efficiency of these treatment systems including the soil properties of the soil absorption field. It is estimated that only 32% of the land area in the United States has soils suitable to adequately treat wastewater by percolation. As seen in Figure 2.4, much of the land area within the Attoyac Bayou Watershed is characterized as exhibiting very limited potential for use as a soil absorption field.



**Figure 2.4** Septic tank soil absorption field properties.  
Source: USDA NRCS

Lack of maintenance and malfunctioning or damaged OSSFs systems can also result in improperly treated wastewater being discharged to the environment. Sludge needs to be removed from the septic tank every 3 to 5 years and annual inspections should be conducted at a minimum. If this routine maintenance is neglected, the system may malfunction and discharge improperly treated wastewater. Leaking and ruptured pipes or septic tanks may also lead to these discharges. Many newer residences are now equipped with aerobic treatment systems largely due to the soil's inability to properly support a conventional soil absorption field. The majority of these systems utilize above-ground dispersion of treated wastewater effluent. The designs of these systems vary by manufacture and capacity of the system, but generally consist of a pretreatment area where large solids, oils and greases are removed from the wastewater. Following the pretreatment area, the wastewater flows to an aeration area, where oxygen levels are elevated, by pumping air into the chamber or by mechanical agitation, in order to aid aerobic bacteria growth to further digest the wastewater. The wastewater then goes through a settling

stage where any remaining solids are settled out. The resulting effluent is then disinfected, usually by chlorination, and dispersed above-ground by an irrigation system (EPA 1980).

Lack of maintenance is the major limiting factor in the efficiency in these aerobic treatment systems. If the effluent is not properly disinfected, it could result in improperly treated wastewater being applied to the land surface. Additionally, as in traditional septic systems, accumulated solids and oils and greases need to be periodically removed in order for the system to function properly. Of the estimated 6,624 OSSFs identified within the watershed, it was estimated that approximately 50 percent or 3,312 are not functioning properly. This was an estimate derived from stakeholder input. It was estimated that the majority of the homes in the watershed were built before Texas law required a permit to install a septic tank. As a result, most OSSFs in the watershed have not been documented and are older. Older septic systems can still function properly, however they do have a higher likely hood of malfunctioning.

### Pets

According to the American Veterinary Medical Association (AVMA) the average household in the U.S. is home to 1.7 dogs. Applying this average to the Attoyac Bayou Watershed, this results in 11,285 dogs spread across the watershed. These dogs are concentrated in areas of higher human population densities such as in Garrison, Martinsville, and Chireno. It is anticipated that the majority of dog owners do not collect their dog's waste in rural areas, and as a result represents a likely contributor to *E. coli* in the Attoyac Bayou Watershed. As with other animal waste, proximity to water bodies plays an important role on how much *E. coli* and other bacteria enter the water.

### Livestock

The grazing of livestock, primarily cattle and to a lesser extent horses occurs throughout the Attoyac Bayou Watershed. These animals deposit urine and fecal matter to the land surface as well as directly to water bodies if there is open access to surface waters. Exact numbers of these animals within the watershed are difficult to quantify at one time, however estimates were developed by the Attoyac Bayou Watershed Partnership. These estimates were based on a variety of information sources including county level population estimates available from the National Agriculture Statistics Service (NASS) and the application of recommended landuse-based stocking rates developed by the National Resource Conservation Service (NRCS).

Using these resources, as well as stakeholder input, it is estimated there are approximately 23,646 head of cattle, and 587 horses in the watershed. Populations of livestock are generally concentrated on managed pasture, with lesser densities occurring on rangeland. Based on the updated landuse/landcover dataset, 19.64%, or 69,662 acres, of the watershed consists of managed pasture, and 6.50%, or 23,049 acres, consists of rangeland. Horses were determined to be present in these same areas as well as developed open spaces.

## Poultry

Poultry operations are numerous throughout the Attoyac Bayou Watershed. Table 2.4 presents poultry numbers by county from the 2007 Census of Agriculture produced by NASS.

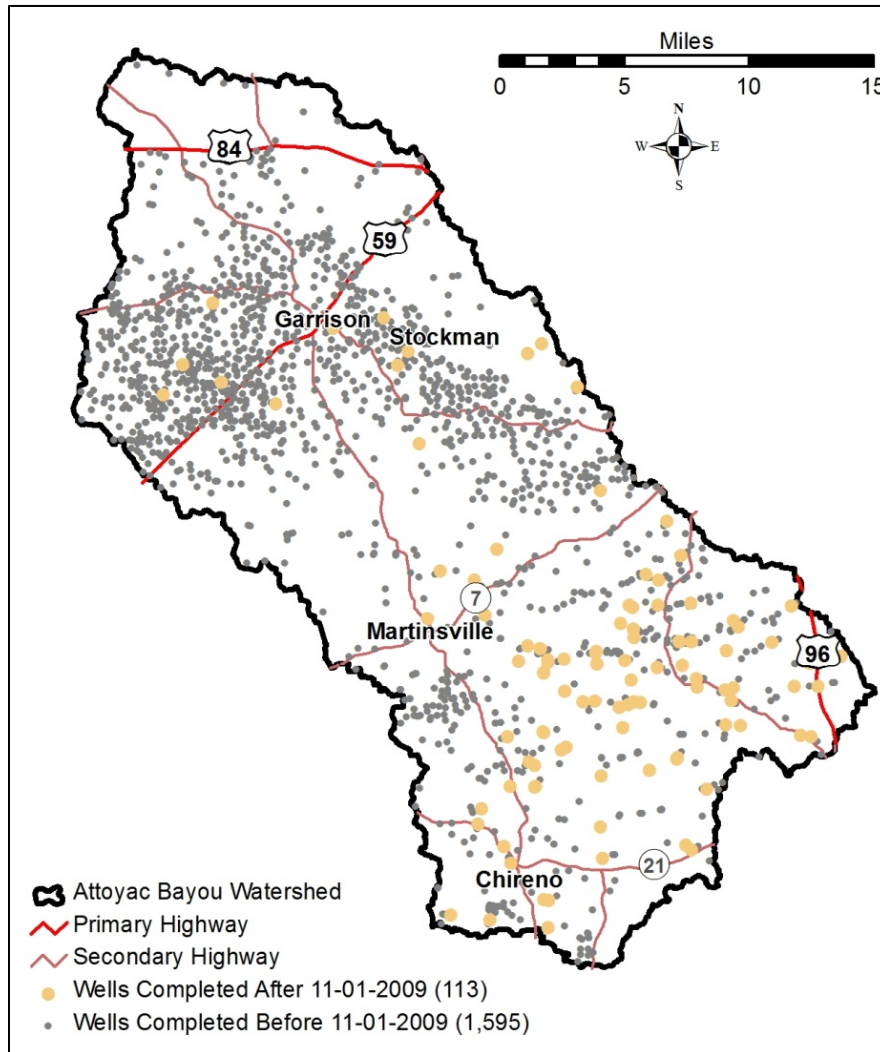
When litter is removed from a poultry house, it is typically land applied as a fertilizer. Guidance provided by TSSWCB on water quality management plan (WQMP) development states that land application fields must have the soils tested yearly to determine the appropriate application rate of manure. Additionally, land application fields should have a buffer of at least 100 ft of well vegetated ground between water bodies and applied manure. Litter should be stored in a roofed litter storage facility, but can be stored for up to 30 days outdoors if the litter is covered by an impermeable layer, protected from external rainwater or surrounded by an earthen berm to prevent runoff (TSSWCB 2010). Excessive nutrients and bacteria can enter into water bodies if proper land application techniques are not adhered to. Over application of manure can lead to excessive manure runoff which can cause excessive levels of *E. coli*, as well as nutrients, in nearby waterways. Not utilizing a proper buffer from applied manure and water bodies increases the likelihood of excessive bacteria and nutrient levels in runoff. Poultry numbers in the Attoyac Bayou Watershed were estimated to be approximately 12,235,140. This estimate was derived by the number of WQMPs within the watershed. All owners and operators of poultry facilities must implement and maintain a WQMP. The actual poultry numbers within the watershed may not characterize the amount of poultry litter being deposited in the watershed. As previously stated, when litter is removed from a poultry house, it is typically land applied as a fertilizer. This may occur outside of the poultry operation, or even outside of the watershed

**Table 2.4.** NASS Poultry Statistics from 2007 Census of Agriculture

<b>Bird Type</b>	<b>Count</b>	<b>State Rank</b>
<b><u>Nacogdoches County</u></b>		
Broilers	19,372,881	2
Layers	513,918	7
Pullets	522,052	4
<b>Total</b>	<b>20,408,851</b>	
<b><u>Rusk County</u></b>		
Broilers	1,537,072	16
Layers	-	33
Pullets	-	26
<b>Total</b>	<b>1,537,072</b>	
<b><u>San Augustine County</u></b>		
Broilers	5,710,598	7
Layers	217,840	13
Pullets	-	17
<b>Total</b>	<b>5,928,438</b>	
<b><u>Shelby County</u></b>		
Broilers	24,186,885	1
Layers	1,371,757	5
Pullets	650,639	3
<b>Total</b>	<b>26,209,281</b>	

Oil & Natural Gas Drilling

Oil & natural gas production activities were identified as a potential concern as a response to the increased drilling activities in the Haynesville Shale formation. During temporary construction of oil and natural gas infrastructure such as pipelines and well pad locations, workers utilize portable sewage disposal facilities, commonly referred to as portable toilets. Waste is discharged and held in the portable facilities and disposed of at an off-site location. During the drilling and fracturing processes, workers utilize temporary OSSFs for the disposal of waste. Even though multiple workers are present on a drilling location for a period of up to four months, if these onsite septic facilities are not working properly, these locations could cause increases in bacteria concentrations in nearby water bodies. Spatial data obtained from the Texas Rail Road Commission on July 7, 2011 indicate there are approximately 1,708 oil & natural gas wells within the watershed. Of these, approximately 201 wells have been plugged, and 113 have been drilled, primarily in the southern portion of the watershed, since this project began on September 1, 2009.



**Figure 2.5** Oil & gas wells within the Attoyac Bayou Watershed.  
Source: Railroad Commission of Texas



## Wildlife and Feral Animals

Numerous species of wildlife occur throughout the Attoyac Bayou watershed. In most watersheds wildlife and feral animals contribute a significant amount of bacteria to the watershed and in some cases wildlife alone can cause impairments to a water body (Gregory et al. 2012, Gregory et al. 2013a,b; Parsons 2006). Population estimates of individual wildlife species present in the watershed are not available, so the Attoyac Bayou Watershed Partnership focused on identifying the most significant potential sources.

### Deer

Whitetail deer are numerous in the watershed and represent a significant potential contributor of *E. coli* in the Attoyac Bayou. The Texas Parks and Wildlife Department (TPWD) conducts deer population surveys within the state of Texas at the Resource Management Unit (RMU) level. RMUs are developed based on similar ecological characteristics within a defined area. The Attoyac Bayou Watershed is situated in the southern portion of RMU 15. The estimated deer population within RMU 15 is 45.2 Acres/Deer. This population estimate was applied to every LULC classes within the watershed except for open water, barren land and developed land. When applied across the remaining landuse/landcover classes, it is estimated the Attoyac Bayou Watershed is home to 7,547 deer. Attoyac Bayou Watershed Partnership members concurred that this number is an appropriate estimate of the total deer population in the watershed.

### Feral Hogs

Hogs were introduced into the US by settlers as early as the 1500s for use as a food source due to their adaptability to a variety of environments and their prolific reproduction. Over time these hogs were released or escaped into the environment, which has led to the populations we now have today (Taylor 2003). In the Attoyac Bayou Watershed, as in most areas of the US, feral hog populations are growing and causing increasing amounts of damage to private property and to the native environment. A study conducted by Texas A&M University, concluded that average annual population growth of feral hogs in the state of Texas was 21%. Using a variety of information sources (Timmons et al. 2012; Wagner and Moench 2009) as well as stakeholder input, the Attoyac Bayou Watershed Partnership members determined that an appropriate feral hog population estimate for the watershed is 10,155 hogs. Distributing this number of hogs across suitable habitat in the watershed results in an estimated density of 33.4 acres per hog. This estimation is very similar to the 33.3 acres per hog reported in Wagner and Moench 2009.

### Waterfowl and Other Birds

Waterfowl and other birds were identified as a potential source for elevated levels of *E. coli* in the Attoyac Bayou Watershed, especially in areas of high population density. Areas of high bird population density can occur in or near large open water areas, in rookeries where large numbers of birds nest and roost, as well as under bridges where potentially large numbers of birds roost. According to data obtained from the Texas Natural Diversity Database (TXNDD), received on October 16, 2011, one rookery is noted in the watershed and is located approximately 3.5 miles north of Chireno in the southern portion of the watershed. The TXNDD data indicates this

rookery consisted of a nesting colony of little blue heron, and the last field observation was 1974. During the watershed reconnaissance surveys, CES personnel did not observe a rookery within this area. It is likely that this rookery has moved to another area of the watershed or out of the watershed completely. Data obtained from the US Department of Transportation (USDOT) for the National Bridge Inventory indicates there are 119 bridges in the watershed. Most of these consist of smaller bridges crossing minor stream channels; however some larger bridges are present within the watershed. During the watershed reconnaissance surveys, project partners did not observe any significant concentrations of nests under the larger bridges within the watershed.

### Illegal Dumping

Illegal dumping was identified as a potential source of *E. coli* in the watershed by stakeholders and project team members. Since this project began, numerous discarded deer carcasses have been reported near bridges and water quality monitoring stations during the fall and winter months. These carcasses can be a direct source of *E. coli* when improperly discarded in water bodies. Illegal dumping of residential waste can also represent a source of *E. coli* within the watershed. Residential waste can contain items such as used diapers that can contribute bacteria, as well as other pathogens, to a water body; however, none of these sites have been identified or documented in the watershed.

### **Historical Information on Recreational Use**

A thorough assessment of the historic recreational uses of the Attoyac Bayou Watershed was conducted. The review includes usage that took place from November 28, 1975 to the present day as outlined in TCEQ's *Recreational Use-Attainability Analyses: Procedures for a Comprehensive RUAA and a Basic RUAA Survey* (May 2009). Historical societies, community members, museums, government officials, newspapers, recreational service providers, as well as general internet searches regarding the watershed were utilized for the review. The following is a summary of the historical information and recreational use review.

### Personal Correspondence with Government Officials and Community Members

*James "Jim" McReynolds, State Representative*

Phone: (936) 275-5392

Representative McReynolds recounts that three to four times during the 1980s, he and several friends would float the Attoyac Bayou in a flat bottom boat during the summer. Due to log jams and shallow channels, the group had to portage the boat; often times wading in waste deep water. Representative McReynolds also said he knows Boy Scouts used the Attoyac Bayou to canoe from Hwy 7 (Attoyac 15) to Hwy 21 (Attoyac 18), but could not provide any specific information regarding names, troop leaders or frequency.

*Ron Collins, Naconiche District Chairman of the Boy Scouts*

Phone: (936) 552-3316

Mr. Collins conferred with troop leaders throughout the watershed and did not receive any confirmation that the Boy Scouts use the Attoyac Bayou or its tributaries for canoeing or recreational activities. The troops opt instead to use other local rivers such as the Sabine and Neches, stating they are much easier to navigate and maintain a more substantial flow than the

Attoyac Bayou. Mr. Collins, a lifelong resident of the Nacogdoches area, relates that he also does not recall using the Attoyac Bayou or its tributaries when he was a member of the Boy Scouts in his youth.

*Jerry Don Williamson, Nacogdoches County Commissioner, Precinct 1*

Phone: (936) 560-7709

Relates that the primary use of the watershed he is aware of is the watering of livestock; not aware of many people who fish or swim in it.

*Elton Milstead, Nacogdoches County Commissioner, Precinct 4*

Phone: (936) 560-7738

Mr. Milstead is a member of steering committee for Attoyac Bayou WPP. He grew up around Lake Sam Rayburn in southern Nacogdoches County and says he has never known the Attoyac to be used regularly for swimming or other primary contact recreation activities. Growing up and even currently, he is not familiar with any regular swimming holes along the Attoyac or within the watershed that the public uses, but notes that that doesn't preclude the possibility of people occasionally doing so, especially on private land. He notes that the primary recreation in the watershed that he is familiar with is fishing.

*Heath Bragg, Nacogdoches County Game Warden*

Phone: (936) 671-0437

Stated that the watershed is composed primarily of private land used for farming. The primary recreation activities that take place within the watershed are fishing and hunting; "hunting is king". When asked what type of hunting, Mr. Bragg said that deer is the primary game, but duck and squirrel hunting is also prevalent. Swimming does take place in the Attoyac Bayou, as does noodling. Locations where noodling has been observed are between Hwy 103 and Hwy 21(Attoyac 18) as well as Hwy 7 (Attoyac 15) and the Attoyac.

*Blaine Jernigan, Rusk County Extension Agent*

Phone: (903) 657-0376

Mr. Jernigan conveyed that he has personally never heard of anyone fishing in the Attoyac, but believes it may possibly be used for hunting deer, squirrel, and occasionally duck.

*Jerome Nickerson, San Augustine County Extension Agent*

Phone: (936) 275-3644

Believes the primary recreational uses of the Attoyac Bayou Watershed are fishing and hunting. He has seen cars parked at road crossings from which people access the river through the woods. Mr. Nickerson also notes that cattle owners who have land adjacent to the Attoyac use it as a water source for their livestock.

*Ed Wilson, San Augustine County Commissioner, Precinct 2*

Phone: (936) 275-6235

Mr. Wilson states that he doesn't know of anyone that swims in the watershed, nor has he heard of anyone doing so. He relates that residents primarily use the Attoyac Bayou for fishing.

*Rick Campbell, Shelby County Judge*

Phone: 936-598-3863

Judge Campbell noted that because the watershed is primarily composed of private property, there aren't any places other than public road crossings where the community can readily access the streams. He grew up in the area and only used the Attoyac Bayou once for frog gigging in 1976.

*Lane Dunn, Shelby County Extension Agent*

Phone: (936) 598-7744

Mr. Dunn referred to the Attoyac as a creek due to its size and flow, and said that it is basically used by landowners to water cattle. Mr. Dunn also relates that residents may occasionally fish and duck hunt along Attoyac, but he is not aware of people ever swimming in it.

*Michael Hanson, Shelby County Game Warden*

Phone: (936) 332-0819

Mr. Hanson stated that he has personally seen individuals swimming in the Attoyac Bayou within the past two years on a private hunting lease located 5-7 miles south of the Attoyac at Hwy 7 crossing (Attoyac 15). This area is known as the David Washole. He does note that swimming isn't observed regularly. According to Mr. Hanson, there is quite a bit of fishing in the watershed, especially at Hwy 59 (Attoyac 7), Hwy 7 (Attoyac 15) and a few county road crossings. Deer and squirrel hunting is more popular in the area than duck hunting. However, duck hunting does take place due to the prevalence of beaver dams and slough areas that provide ideal habitat.

*James Rodgers, Shelby County Commissioner, Precinct 3*

Number: 936-591-4311

Mr. Rodgers is a lifelong resident of Shelby County, but primarily recreated in Sabine River (what is now Toledo Bend Reservoir) during his youth. He believes the primary recreational activities within the watershed are fishing and deer hunting. Mr. Rodgers states that he has heard (within the past ten years) in passing that people do in fact swim in the Attoyac, but when asked about specific individuals or locations, he could not recall any details.

*Thomas Jenkins, Captain Game Warden, Region 3 District 2*

Captain Jenkins stated that the Attoyac Bayou is used more for fishing than hunting, and duck hunting does occasionally take place on the Attoyac. He also notes that swimming may occasionally take place in the Attoyac Bayou, especially considering the amount of private property and oil company sites in the area, but could provide no specific instances that he was aware of.

*Bobby Widner, Wildlife Technician, Texas Parks and Wildlife*

Mr. Widner notes that there is a crappie (white bass) run in the river in February and March due to spawning, and that people will fish often for them during that time. He also notes that duck hunting that takes place along the Attoyac, but was unable to provide any specific locations within the watershed.

*Grey Burton, Superintendent, Martinsville ISD*

Phone: 936-564-3455

Mr. Burton was contacted regarding the school district's nature trail that runs along Terrapin Creek. Mr. Burton states that students aren't allowed to access the water along the trail, and the Terrapin Nature Trail is primarily used for studying native plants of the area. When asked if any of the school district's science classes access the water as a part of their curriculum, he said no. He has also not heard of any students recreating in watershed, stating they instead primarily go to Lake Pinkston to fish.

*Roberta, Online blogger and Nacogdoches resident who wrote about canoeing the Attoyac*

<http://myadventuresinsanaugustine.blogspot.com/2010/09/canoeing-attoyac.html#comment-form>

Through correspondence via her blog, Roberta stated she and her husband have canoed the Attoyac Bayou twice, but did not swim because the water level was low and she is afraid of snakes. They also had to portage the canoe at certain points and could walk on dry ground in the channel. In her post, she mentions encountering fellow paddlers who warned them to be cautious of snakes and alligators in the Attoyac.

### **Recreational Service Providers**

*Terry Harshbarger of Terry's Marine, Nacogdoches, Texas*

Mr. Harshbarger related that if his customers do mention anything about the Attoyac, it is that they begin fishing in Lake Sam Rayburn and then follow a portion of the river channel near its confluence with Rayburn to bass fish. He states that he never hears any of his customers mention specifically fishing in the upper portion of the Attoyac (further away from Rayburn, north of Hwy 103).

### **Historical Data**

*San Augustine Historical Commission*

Al Broden, President

936-275-9434 ; 936-201-6336

Mr. Broden wasn't aware of any information related to recreational use of the watershed in their archives.

*Rusk County Depot Museum*

Jim White, assistant director of museum

Phone: 903.657.4303

Mr. White was unaware of any archives available which contain information or photos of recreation in Attoyac Bayou watershed. He did provide two documents which outline the water bodies in Rusk County, but there was no mention of recreation discussed in the portion regarding Attoyac Bayou.

*Shelby County Historical Commission*

Phone: 936-598-3613

Spoke over the phone with an employee. She was not aware of any records related to recreation, especially since the 1970s and onward.

*Stone Fort Museum*

*Stephen F. Austin State University, Nacogdoches, Texas*

Phone: (936) 468-2408

Archives include *The Chinquapin*, a publication created by Douglas High School students in the 1980s which contains interviews and stories from elderly residents of the area regarding culture, traditions, and growing up in East Texas. Stories mention swimming, fishing and baptism in Naconiche Creek as well as fishing in the Attoyac Bayou; however, these stories date back to pre-1975.

*East Texas Research Center – Ralph W. Steen Library*

*Stephen F. Austin State University, Nacogdoches, Texas*

Phone: (936) 468-4100

*Final Environmental Impact Statement: Attoyac Bayou Watershed, 1980*

Prepared by: United States Department of Agriculture Soil Conservation Service, Temple, Texas, 76501

- Call number TC425A48A81980X

“This document concerns the installation of remaining planned measures consisting of a multipurpose reservoir (flood prevention and recreational storage) and one floodwater retaining structure on the Naconiche Creek subwatershed within the Attoyac Bayou Watershed (p 1).”

“Recreational needs for the northern Nacogdoches County towns of Garrison, Cushing, and Appleby are not being met because of an uneven distribution of the surface water and water-based recreational facilities...(p 38).”

*The Handbook of Texas Online*

Searched handbook by bayou name as well as community. Nothing significant was found.

**Newspaper**

*Austin American-Statesman, July 18, 2010*

“Using the Old Noodle”

Summary: Outdoor writer Mike Leggett recounts his experience noodling (hand fishing) in Toledo Bend under the guidance of Ronald Murdock, or ‘Mud Duck’, a man who grew up fishing on the Attoyac.

*The Houston Chronicle, December 12, 1997*

“Tips on Finding Bass in the Cold”

Summary: Outdoor writer Shannon Tompkins writes about Jeff Buchanan, a Texas angler and participant in a BASS fishing tournament held on Lake Sam Rayburn traveled up the Attoyac Bayou to a spot "out in the middle of nowhere" to fish for bass. The article notes the ideal conditions on the Attoyac Bayou for bass fishing in the cold weather.

*The Houston Chronicle, March 6, 2008*

“Lone Star Anglers Can Cash in Big During the Spawning Season for White Bass”

Summary: Outdoor writer Shannon Tompkins notes when white bass begin spawning in East Texas Rivers, including the Attoyac.

### **Academia**

*An evaluation of the recreational potential of proposed Lake Naconiche in Nacogdoches County, Texas.* Van Dunk, Kris Allen. Stephen F. Austin State University, 1995

- “This study revealed that there was a need for a recreational facility in the northeast portion of the county and that the population living nearer to the proposed lake intended to utilize the facility at a greater level.” (Abstract)

**Table 2.5** Summary of recreational activities noted during historical information and recreational use research. Each instance of use is counted separately.

Site Name	Swimming	Wading		Bank activity (hiking, picnic)	Hunting	Fishing	Hand Fishing (Noodling)	Boating
		Adults	Children					
Attoyac1								
Attoyac 2								
Attoyac 3								
Attoyac 4								
Attoyac 5 (20842)								
Attoyac 6								
Attoyac 7						1		
Attoyac 8								
Attoyac 9								
Attoyac 10								
Attoyac 11								
Attoyac 12 (20841)								
Attoyac 13								
Attoyac 14								
Attoyac 15 (15253)						1	1	1
Attoyac 16								
Attoyac 17								
Attoyac 18 (10636)							1	1
Unspecified Location: Attoyac Bayou	3				8	10		2
Naconiche 1	1	1	1					



**Table 2.5** (Continued)

Site Name	Swimming	Wading		Bank activity (hiking, picnic)	Hunting	Fishing	Hand Fishing (Noodling)	Boating
		Adults	Children					
Naconiche 6								
Naconiche 7								
Naconiche 8								
Naconiche 9								
Naconiche 10								
Naconiche 11 (20843)								
Unspecified Location: Naconiche Creek								
West 1								
West 2								
West 3								
West 4	1							
West 5								
West 6 (20845)								
Unspecified Location: West Creek								
Terrapin 1								
Terrapin 2								
Terrapin 3								
Terrapin4 (16084)								
Unspecified Location: Terrapin Creek								

**Table 2.5** (Continued)

Site Name	Swimming	Wading		Bank activity (hiking, picnic)	Hunting	Fishing	Hand Fishing (Noodling)	Boating
		Adults	Children					
Waffelow 1								
Waffelow 2								
Waffelow 3 (16083)								
Unspecified Location: Waffelow Creek								
Big Iron Ore 1								
Big Iron Ore 2								
Big Iron Ore 3								
Big Iron Ore 4								
Big Iron Ore 5 (20844)								
Unspecified Location: Big Iron Ore Creek								
SUM	5	1	1		8	12	2	4

## Chapter 3 : Study Methodology

### Survey Methodology

The following section supplies the details of the comprehensive RUAA data collection activities conducted by SFASU and CES. The comprehensive RUAA of the Attoyac Bayou Watershed (segments 0612, 0612A, 0612B) can be divided into three primary field components:

- Site selection (2011)
- Site reconnaissance (June 2012)
- Field Surveys (Survey 1: July 20-22, 2012; Survey 2: August 24-25, 2012)

Site selection and site reconnaissance are not considered formal data collection activities, and thus did not require an approved quality assurance project plan (QAPP). These two elements, however, are critical to the success of data collection activities that take place during field surveys. Field surveys include multiple field activities such as stream flow measurement and data collections which are included in a TSSWCB approved QAPP.

### Site Selection and Site Reconnaissance

Survey areas were selected based on locations in which the waterbodies are accessible to the public and have the highest potential for recreational use, such as identified public road crossings. Other than public road crossings, there are no other publicly accessible areas, such as parklands operated by public or private entities, with the potential for recreational use directly along the six waterbodies of interest within the watershed. Although availability for public use was an important consideration in survey site selection, it was also imperative to include survey sites located on private property in order to assess private land owner use of the watershed.

The TCEQ guidelines (2009) for conducting a comprehensive RUAA state that “In general, choose three (3) sites per every five (5) miles of stream.” However, it was determined due to the rural nature and private ownership of the watershed, forty-four (44) sites would be sufficient in conducting the field surveys. Map reconnaissance, information provided by agency professionals familiar with the watershed, and stakeholder input regarding the study area were the primary impetus for specific site selections.

The RUAA survey station selection process incorporated the following strategies:

- Existing TCEQ monitoring stations were used
- Sites were selected using aerial maps and spaced appropriately to achieve as much spatial symmetry throughout the watershed as possible while taking into consideration the limited public access available at public road crossings.
- Stakeholder input was sought regarding proposed RUAA site selections in the watershed. Stakeholder contributions were garnered through meetings as well as personal correspondence with agency professionals.

- Landowner permission was obtained that permitted access to the 300 meter reach required for a survey site at public crossings as well as sites located within private property.

Geographic Information System (GIS) based programs were also used before, during, and after site selections were made. Using the National Hydrography Dataset (NHD) and available road layers, the following maps were produced:

- Figure 2.2: The location of areas along the segment that were accessible to the public and had the highest potential for recreational use.
- Figure 2.2: The location of sites for data collection following TCEQ guidance (2009)
- Figure 2.3: The land cover and land use characteristics of the watershed the hydrologic characteristics, such as stream type, stream flow and hydrologic alterations
- Figure 2.4: The location of wastewater treatment facility outfalls and other potential point sources.
- Figure 2.5: The location of oil and gas wells within the watershed as a potential source of contamination.
- Figures 6.1-6.5: RUAA summary of observed and interviewed recreation indicators within the watershed.

On March 10, 2011, a watershed partnership meeting was held in which landowners as well as state and local agencies were provided a detailed overview of UAA's and more specifically, RUAA procedures and requirements. Stakeholders were also presented with a map of proposed RUAA sites within the Attoyac Bayou Watershed.

On June 7, 2012, a presentation was given at a watershed partnership meeting in which RUAA procedures and requirements were once again elaborated upon by SFASU field staff. Following the presentation, a detailed, up to date map of proposed survey sites was presented to the stakeholders, allowing SFASU field staff to field questions and physically meet participating landowners. The final RUAA sites provided in Figure 2-2 and Table 3-1 reveal the results of input received during and following the meetings.

Site reconnaissance was conducted by SFASU field staff prior to field survey activities. The purpose of the site reconnaissance was to substantiate site choice, meet participating landowners at the survey sites on their property, collect information that would be pertinent to field surveys, and familiarize field staff leaders with the site's dynamics.

In June 2012, TSSWCB received confirmation that TCEQ staff agree that a suitable number and spatial density of sites was chosen to conform to RUAA guidelines.

**Table 3.1** Location and description of RUAA survey sites.

TCEQ ID	Map Legend	Site Description	Latitude	Longitude	Distance to Previous Station	Distance from Upper Segment Boundary	Distance from Lower Segment Boundary	Private or Public Access	Private Access Landowner approved
----	Attoyac1	Attoyac Bayou @FM 95 in Rusk Co. 3.3 mi N of FM 95-US 84 intersection	57'6.84"	37'50.88"	1.1	0.5	22.8	Public/Private	Yes- North West Bank
----	Attoyac 2	Attoyac Bayou @ Rusk Co. CR 3122 - FM 95 Intersection	57'28.44	36'20.88"	2.1	2.5	20.83	Public/Private	Yes – Left Bank
----	Attoyac3	Attoyac Bayou @ Rusk CR 3181, 2.8 mi WSW of CR 3181 - FM 1971 Intersection	57'10.44	34'51.12"	2.2	6.6	16.7	Public/Private	No- Channel only
----	Attoyac 4	Attoyac Bayou @ FM 1971, 1.35 mi N of FM 1971 Intersection in Caledonia	56'29.07"	32'13.21"	4.4	10.8	12.5	Public/Private	Yes- Downstream Bank
0612	Attoyac 5 (20842)	Attoyac Bayou @ US 84, 0.9 mi E of US 84 - FM 1971 Intersection in Caledonia	55'26.97	30'41.07"	2.8	13.5	9.8	Public/Private	No- Channel only
----	Attoyac 6	Attoyac Bayou @ Rusk CR 4760, 1.3 mi past end of FM 1970 and 4.2 mi W of US 59 - US 84 Intersection	53'38.76"	28'48.36"	5.7	18.8	4.5	Public/Private	No- Channel only
----	Attoyac 7	Attoyac Bayou @ US 59, 2.8 mi NE of US 95 Intersection in Garrison	51'24.14"	27'49.89"	4.7	23.3	0	Public/Private	Yes- Upstream
----	Attoyac 8	Attoyac Bayou @ Nacogdoches CR 294 2.5 ENE pf CR 294 - US 59 Intersection in Garrison	50'39.12"	27'8.28"	2	1.8	26.4	Private	Yes
----	Attoyac 9	Attoyac Bayou on Private Property 3 mi E of Garrison	49'40.79"	26'18.96"	2.8	4.1	24.1	Private	Yes
----	Attoyac 10	Attoyac Bayou @ Nacogdoches CR 290, 1.5 mi E of CR 290 - Irving Rd Intersection (0.3 mi N of FM 138 - Irving Rd Intersection)	48'31.68"	25'45.48"	2.4	6.5	21.7	Private	NO- Denied Access

**Table 3.1** Location and description of RUAA survey sites.

TCEQ ID	Map Legend	Site Description	Latitude	Longitude	Distance to Previous Station	Distance from Upper Segment Boundary	Distance from Lower Segment Boundary	Private or Public Access	Private Access Landowner approved
----	Attoyac 11	Attoyac Bayou on Private Property 4.8 mi SE of Garrison	46'44.04"	25'44.04"	3.9	10.2	18	Private	Yes- 2nd survey only
0612	Attoyac 12 (20841)	Attoyac Bayou @ FM 138, 6 mi SE of FM 138 - US 59 Intersection in Garrison	46'6.61"	25'34.5"	1.5	11.6	16.6	Public/Private	No- Channel only
----	Attoyac 13	Attoyac Bayou on Private Property 5.7 mi N of Martinsville	43'33.6"	24'50.76"	5.1	16.3	11.9	Private	Yes – All
----	Attoyac 14	Attoyac Bayou on Private Property 6.6 mi N of Martinsville	44'20.04"	24'45.36"	1.3	17.4	10.75	Private	Yes - All
15253	Attoyac 15 (15253)	Attoyac Bayou @ SH 7, 1.1 mi E of SH 7 - FM 95 Intersection in Martinsville	38'54.00"	23'50.00"	10.9	28.2	0	Private	No
----	Attoyac 16	Attoyac Bayou on Private Property 6.1 mi ESE of Martinsville	35'38.04	19'36.84"	13	12.7	13.7	Private	Yes-All
----	Attoyac 17	Attoyac Bayou @ Nacogdoches CR 392, 3.4 mi SE of FM 95	32'35.52"	18'23.4"	7.7	20.1	6.3	Public/Private	No
0612	Attoyac 18 (10636)	Attoyac Bayou @ 21, 3.1 mi E of FM 93 - SH 21 Intersection near Chireno	30'15.05"	18'13.99"	6.5	26.4	0	Public/Private	Yes-North Bank
----	Naconiche 1	Naconiche Creek @ FM 1087, 8 mi W of FM 1087, FM 95 Intersection	49'43.68"	38'12.12"	2	1.9	25.8	Public/Private	Yes- All banks
----	Naconiche 2	Naconiche Creek @ camp Tonkawa Rd in Nacogdoches Co, 2.1 mi S of Camp Tonkawa - FM 1087	48'19.8"	37'3.72"	2.2	3.9	23.8	Private	Yes- All
----	Naconiche 6	Naconiche Creek @ US 59, 8.3 mi NE of US 59 - US 259 Intersection	46'1.2"	33'55.08"	5	8.8	18.9	Public/Private	Yes- East Bank
----	Naconiche 7	Naconiche Creek @ Nacogdoches CR 271, 3 mi S of CR 271 - US 59 Intersection	45'17.64"	32'18.96"	2.9	11.6	16.1	Public/Private	Yes- All

**Table 3.1** Location and description of RUAA survey sites.

TCEQ ID	Map Legend	Site Description	Latitude	Longitude	Distance to Previous Station	Distance from Upper Segment Boundary	Distance from Lower Segment Boundary	Private or Public Access	Private Access Landowner approved
----	Naconiche 8	Naconiche Creek@ Cedar Bluff Rd in Nacogdoches Co, 2.7 mi s of Cedar Bluff - CM 2476 Intersection	44'46.98"	31'9.51"	2	13.4	14.3	Public/Private	Yes- West Bank
----	Naconiche 9	Naconiche Creek @ Nacogdoches CR 280, 0.6 mi SW of CR 280 - FM 95 Intersection	44'46.98"	28'44.76"	4.2	17.4	10.3	Public/Private	Yes- East Bank
----	Naconiche 10	Naconiche Creek on Private Property, 6.5 mi NNW of Martinsville in Nacogdoches Co	43'37.2"	27'59.04"	2.2	19.3	8.4	Private	Yes - all
0612	Naconiche 11 (20843)	Naconiche Creek @ FM 95, 5.6 mi N of FM 95 - SH 7 Intersection	42'43.80"	26'57.86"	2.2	21.3	6.4	Public/Private	Yes- North West Bank
----	West 1	West Creek @ Shelby CR 4054, 0.9 mi W of CR 4054 - FM 1645 Intersection	48'54.36"	20'42.72"	1.3	0.6	15.3	Public/Private	No
----	West 2	West Creek @ Shelby CR 4059, 0.3 mi W of CR 4059 - FM 1645 Intersection	47'15.36"	20'35.88"	2.1	2.6	13.4	Public/Private	Yes- East bank/West Bank
----	West 3	West Creek @ FM 138, 0.35 mi NW of FM 138 - FM 1645 Intersection	45'51.12"	20'44.52"	2.3	4.8	11.15	Public/Private	No
----	West 4	West Creek @ Shelby CR 1510, 2.9 mi S of CR 1510 - FM 138 Intersection	43'35.4"	21'47.52"	4.3	8.9	7.1	Public/Private	Yes-West Bank
----	West 5	West Creek @ Shelby CR 1546, 1 mi E of CR 1546 - CR 1520 Intersection	42'38.52"	22'24.24"	1.7	10.4	5.6	Private	Yes - All
20845	West 6 (20845)	West Creek @ FM 2913, 1.7 mi NW of FM 2913 - SH 7 Intersection	41'13.10"	23'0.09"	2.7	12.9	3.1	Public/Private	Yes-South Bank
----	Terrapin 1	Terrapin Creek @ Nacogdoches CR 234, 4.5 mi SW of CR 234 - FM 95 Intersection	40'4.43"	29'55.81"	0.3	0	8	Private	No

**Table 3.1** Location and description of RUAA survey sites.

TCEQ ID	Map Legend	Site Description	Latitude	Longitude	Distance to Previous Station	Distance from Upper Segment Boundary	Distance from Lower Segment Boundary	Private or Public Access	Private Access Landowner approved
----	Terrapin 2	Terrapin Creek on Private Property, 1.1 mi WNW of Martinsville in Nacogdoches Co	38'53.52"	25'55.56"	5.2	4.7	3.2	Private	Yes
----	Terrapin 3	Terrapin Creek @ SH 7, 0.6 mi WSW of SH 7 - FM 95 Intersection in Martinsville	38'19.68"	25'24.24"	1.2	5.5	2.5	Public/Private	Yes- SB
16084	Terrapin4 (16084)	Terrapin Creek @ 95, 0.3 mi s of FM 95 - SH 7 Intersection in Martinsville	38'20.01"	24'53.08"	0.7	6	1.99	Public/Private	Yes- WB
----	Waffelow 1	Waffelow Creek @ FM 1878, 1.5 mi NE of FM 1878 - 2112 Intersection	41'44.07"	32'42.09"	2.5	1.3	9.12	Public/Private	Yes-All
----	Waffelow 2	Waffelow Creek @ Nacogdoches CR 234, 1.6 mi WSW of CR 234 - FM 95 Intersection	41'34.08"	27'54.72"	5.3	6.5	4	Private	Yes- All
16083	Waffelow 3 (16083)	Waffelow Creek @ FM 95, 3.9 mi NNW of FM 95 - SH 21 Intersection in Martinsville	41'29.99"	26'16.00"	2.1	8.5	1.9	Public/Private	Yes- All
----	Big Iron Ore 1	Big Iron Ore Creek @ US 96, 5.2 mi N of US 96 - SH 21 Intersection	36'18"	8'54.6"	2.8	2.1	18	Public/Private	Yes- All
----	Big Iron Ore 2	Big Iron Ore Creek @ San Augustine CR 3017, 1.6 mi N of CR 3017 - FM 711 Intersection	36'46.8"	10'52.68"	2.7	4.6	15.4	Public/Private	Yes EB
----	Big Iron Ore 3	Big Iron Ore Creek @ FM 711, 10 mi NW of San Augustine	37'12"	14'52.08"	5.9	10.3	9.7	Public/Private	No
----	Big Iron Ore 4	Big Iron Ore Creek @ LR A, 3.4 mi NNE of LR A FM 354 Intersection	37'12.91"	14'52.08"	3.2	13.3	6.7	Private	Yes - All
20844	Big Iron Ore 5 (20844)	Big Iron Ore Creek @ FM 354, 6 mi N of FM 354 - SH 21 Intersection	33'57.43"	17'22.05"	3.8	17	3	Public/Private	Yes - All



### Survey Site Descriptions

Forty-four (44) sites were selected for the Attoyac Bayou comprehensive RUAA survey based on availability of public access as well as private landowner consent. The sites located on private property were barred from public access by use of barbed wire fencing and/or locked gates. Multiple private sites also required a hike through dense vegetation and forest cover to access the waterbody. Without the cooperation of these landowners, it would not have been possible for SFASU and CES to survey these sites. Beginning at the most northern point of the Attoyac Bayou, the sites selected are as follows:

#### Attoyac Bayou

Segment 0612 is the Attoyac Bayou defined as extending from the headwaters of the stream at FM 95 in Rusk County to the lower boundary of the reach located approximately at the confluence with Granberry Branch in Nacogdoches/Shelby counties. The NHD flowline does extend upstream of the FM 95 crossing approximately 1.1 miles. This segment is approximately 88.2 miles long and is divided into 3 AUs.

AU 01 is defined as the lower boundary approximately at the confluence with Granberry Branch upstream to the confluence with Polly Branch; there are 3 survey sites in this reach with 1 of those being on private property.

AU 02 is defined as beginning at a point immediately upstream of Polly Branch confluence upstream to confluence with Bear Bayou; this reach contains 5 survey sites with 3 of those being on private property.

AU 03 is defined as beginning at a point immediately upstream of Bear Bayou upstream to the boundary at FM 95 and contains 10 survey sites with 1 being on private land.

While landowner permission that was granted for project personnel to access some properties along the main stem of the Attoyac Bayou was limited, the access that was obtained provides a survey site at critical intervals where road crossings were not available for extended distances. This is a remote watershed that is dominated by forested riparian areas thus limiting access to the stream.

Lake Sam Rayburn is the receiving water body of the Attoyac Bayou. Log jams and sweepers (trees fallen into the stream) are common in this segment yet canoeing the lower half of the water body is common. The upper portion of the water body is often reduced to a mere trickle or is even dry during times of extreme or exceptional drought.

***Assessment Unit: 0612\_03: from a point immediately upstream of Bear Bayou upstream to the upper boundary at FM 95***

**Site: 1 - Attoyac @ FM 95: Attoyac Bayou @ FM 95 in Rusk Co. 3.3 mi N of FM 95 - US 84 Intersection**

*Approximate Distance to Upper Extent of NHD Flowline: 1.1 miles*

This site is located at the upper end of the segment boundary as defined in the 0612 segment description. This site was selected as access is available from the FM 95 right of way. Little or no flow often exists at this site during a typical summer. The riparian area at this site is moderately forested with deciduous and evergreen forest.

**Site: 2 - Attoyac @ Rusk CR 3122: Attoyac Bayou @ Rusk CR 3122, 1.6 mi N of CR 3122 - FM 95 Intersection**

*Approximate Distance to Upstream Site: 2.1 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded on the West by mixed pasture and forest and on the East by extensive deciduous evergreen forest. Little or no flow often exists at this site during a typical summer. Access is available from the right of way on Rusk CR 3122.

**Site: 3 - Attoyac @ Rusk CR 3181: Attoyac Bayou @ Rusk CR 3181, 2.8 mi WSW of CR 3181 - FM 1971 Intersection**

*Approximate Distance to Upstream Site: 2.2 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North and South by extensive deciduous and evergreen forest. Little or no flow often exists at this site during a typical summer. Access is available from the right of way on Rusk CR 3181.

**Site: 4 - Attoyac @ FM 1971: Attoyac Bayou @ FM 1971, 1.35 mi N of FM 1971 - US 84 Intersection in Caledonia**

*Approximate Distance to Upstream Site: 4.4 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the East and West by intermittent forest and pasture; the riparian area remains dominated by forested lands. Little or no flow often exists at this site during a typical summer. This site is located approximately 3.2 miles downstream of the confluence of Attoyac Bayou and the spillway of NRCS FCS 2. Access is available from the right of way on FM 1971.

**Site: 5 - Attoyac @ US 84: Attoyac Bayou @ US 84, 0.9 mi E of US 84 - FM 1971 Intersection in Caledonia; Site collocated with TCEQ SWQM Station: 20842**

*Approximate Distance to Upstream Site: 2.8 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North and South by intermittent forest and pasture; the riparian area remains dominated by forested lands. Little or no flow often exists at this site during a typical summer. This site has been pooled with no flow during much of the monitoring conducted through TSSWCB Project 09-10. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. Access is available from the right of way on US 84.

**Site: 6 - Attoyac @ Rusk CR 4760: Attoyac Bayou @ Rusk CR 4760, 1.3 mi past end of FM 1970 and 4.2 mi W of US 59 - US 84 Intersection**

*Approximate Distance to Upstream Site: 5.7 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North by intermittent forest and pasture and to the South by predominant pasture; the riparian area remains dominated by forested lands. This site still experiences low flow however the amount of the watershed above this site make year round flow more conducive. This site is located approximately 1.4 miles downstream of the confluence of the Attoyac Bayou and the spillways for NRCS flood control structures (FCS) 7 and 8. Access is available from the right of way on Rusk CR 4760.

**Site: 7 - Attoyac @ US 59: Attoyac Bayou @ US 59, 2.8 mi NE of US 59 - FM 95 Intersection in Garrison; Site collocated with TCEQ SWQM Station: 16076**

*Approximate Distance to Upstream Site: 4.7 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North and to the South by predominant pasture; the near riparian area remains dominated by forested lands. This site is approximately 0.4 miles downstream of the confluence of the Attoyac Bayou with Golondrina Creek. NRCS FCS 5 is located within the Golondrina Creek sub-watershed. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. Access is available from the right of way on US 59.

**Site: 8 – Attoyac @ CR 294: Attoyac Bayou @ Nacogdoches CR 294, 2.5 ENE of CR 294 - US 59 Intersection in Garrison**

*Approximate Distance to Upstream Site: 2.0 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North and to the South by predominant pasture; the near riparian area remains dominated by forested lands. There is a train track crossing at this site. Access is available from the right of way on Nacogdoches CR 294.

**Site: 9 – Attoyac Private 1: Attoyac Bayou on Private Property 3 mi E of Garrison**

*Approximate Distance to Upstream Site: 2.8 miles*

This site was selected as landowner permission was granted for project personnel to access this site. This site is surrounded by dense bottomland hardwood forest and is located approximately 0.45 miles downstream of the confluence of the Attoyac Bayou and Blackwater Creek. Lake Timpson impounds Blackwater Creek approximately 1.5 miles upstream of its confluence with the Attoyac Bayou and is a publicly accessible lake that covers an approximate 223 acres. Access to this site is available by landowner permission. No public access exists here.

**Site: 10 – Attoyac @ CR 290: Attoyac Bayou @ Nacogdoches CR 290, 1.5 mi E of CR 290- Irving Rd Intersection (0.3 mi N of FM 138 - Irving Rd Intersection)**

*Approximate Distance to Upstream Site: 2.4 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is surrounded by dense bottomland hardwood forest. This site is located roughly 1.6 miles

downstream of the confluence of Jenks Creek and the Attoyac Bayou. Jenks Creek transmits the City of Garrison WWTF effluent to the Attoyac Bayou. The City is permitted to discharge up to 120,000 gallons per day of treated wastewater effluent through TPDES Permit WQ0011304001. Access to this site is available from the right of way on Nacogdoches CR 290.

***Assessment Unit: 0612\_02: from a point immediately upstream of Polly Branch confluence upstream to the confluence with Bear Branch***

**Site: 11 – Attoyac Private 2: Attoyac Bayou on Private Property 4.8 mi SE of Garrison**

*Approximate Distance to Upstream Site: 3.9 miles*

This site was selected as landowner permission was granted for project personnel to access this site. This site is surrounded immediately by mixed forest and pasture and upstream by dense bottomland hardwood forest. The site is located approximately 1 mile downstream of the confluence of the Attoyac Bayou and Bear Bayou which is also the upper limit AU 0612\_02; Bear Bayou is also impounded by NRCS FCS 11 approximately 3.5 miles upstream of its confluence with the Attoyac Bayou. The site is located approximately 1.4 miles downstream of the Attoyac Bayou and Lick Creek confluence. NRCS FCS 18a impounds Lick Creek roughly 0.4 miles upstream of its confluence with the Attoyac Bayou. Access to this site is available by landowner permission. No public access exists here.

**Site: 12 – Attoyac @ FM 138: Attoyac Bayou @ FM 138, 6 mi SE of FM 138 - US 59**

**Intersection in Garrison; Site collocated with TCEQ SWQM Station 20841**

*Approximate Distance to Upstream Site: 1.5 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North and to the South by mixed pasture and forest; the near riparian area remains dominated by forested lands. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. Access is available from the right of way on FM 138.

**Site: 13 – Attoyac Private 3: Attoyac Bayou on Private Property 6.6 mi N of Martinsville**

*Approximate Distance to Upstream Site: 5.1 miles*

This site was selected as landowner permission was granted for project personnel to access this site. This site is surrounded by mixed forest. The site is located approximately 2.3 miles downstream of the confluence of the Attoyac Bayou and Stockman Creek. Stockman Creek is impounded by NRCS FCS 12 approximately 2 miles upstream of its confluence with the Attoyac Bayou. Access to this site is available by landowner permission. No public access exists here.

**Site: 14 – Attoyac Private 4: Attoyac Bayou on Private Property 5.7 mi N of Martinsville**

*Approximate Distance to Upstream Site: 1.3 miles*

This site was selected as landowner permission was granted for project personnel to access this site. This site is surrounded by mixed forest. The site is not directly influenced by any significant upstream tributaries, NRCS FCS's or WWTFs. Access to this site is available by landowner permission. No public access exists here.

**Site: 15 – Attoyac @ SH 7: Attoyac Bayou @ SH 7, 1.1 mi E of SH 7 - FM 95 Intersection in Martinsville; Site collocated with TCEQ SWQM Station 15253**

*Approximate Distance to Upstream Site: 10.9 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North and to the South by mixed pasture and forest; the near riparian area remains dominated by bottomland hardwoods forest. All NRCS FCSs are upstream of this sampling site. This site is located approximately 4 miles downstream of the confluences of the Attoyac Bayou, Naconiche and West Creeks. These two creeks contain NRCS FCSs 15 and 21 as well as the recently impounded Lake Naconiche and Pinkston Reservoir. Additionally, Pinkston Reservoir is the receiving water body for the City of Center's potable water treatment facility filter backwash. A maximum of 200,000 gallons per day of filter back wash is permitted through TPDES Permit WQ0014352001. This site is also located approximately 5.4 miles upstream of the lower boundary of AU 0612\_02. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. Access to this site is available from the right of way on SH 7.

***Assessment Unit: 0612\_01: from the lower boundary approximately at the confluence with Granberry Branch upstream to the confluence with Polly Branch***

**Site: 16 – Attoyac Private 5: Attoyac Bayou on Private Property 6.1 mi ESE of Martinsville**

*Approximate Distance to Upstream Site: 13.0*

This site was selected as landowner permission was granted for project personnel to access this site. This site is immediately surrounded by bottomland hardwoods forest. The site is approximately 6.8 miles downstream of the upper boundary of AU 0612\_01 and is about 11.1 miles downstream of the confluence of Terrapin Creek. Terrapin Creek is the receiving waterbody for the Martinsville ISD WWTF. This is a wetland facility permitted to discharge up to 8,000 gallons of effluent daily by TPDES Permit WQ0014027001. Access to this site is available by landowner permission. No public access exists here.

**Site: 17 – Attoyac @ CR 392: Attoyac Bayou @ Nacogdoches CR 392, 3.4 mi SE of FM 95**

*Approximate Distance to Upstream Site: 7.7 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North by bottomland hardwoods forest and pine plantation and to the South by mixed pasture and forest; the near riparian area remains dominated by bottomland hardwoods forest. This site is less than 0.1 miles downstream of the confluence of Big Iron Ore Creek. Access to this site is available from the right of way on Nacogdoches CR 392.

**Site: 18 – Attoyac @ SH 21: Attoyac Bayou @ SH 21, 3.1 mi E of FM 95 - SH 21 Intersection near Chireno; Site collocated with TCEQ SWQM Station 10636**

*Approximate Distance to Upstream Site: 6.5 miles*

This site was selected as it is the next downstream road crossing on the Attoyac Bayou. This site is bounded to the North and South by bottomland hardwoods forest. The site is located within the designated Lake Sam Rayburn flowage easement maintained by the USACE. This site is located approximately 4.8 miles upstream of the confluence of Polysot Creek. Polysot Creek delivers Chireno ISD WWTF effluent to the Attoyac when effluent is discharged. The facility is

permitted to discharge up to 10,000 gallons per day by TPDES Permit WQ0013917001. Contact with the WWTF operator and site visits have verified that the WWTF does not discharge year round. This site is approximately 9.3 miles upstream of the lower boundary of AU 0612\_01. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. Access to this site is available from the right of way on SH 21.

### Big Iron Ore Creek

Big Iron Ore Creek is a sizeable tributary in the lower third of the Attoyac Bayou watershed. This creek lies entirely within the confines of San Augustine County; however, a portion of its watershed lies in Shelby County. The creek's headwaters begin East of US 96 approximately 6 miles North of the City of San Augustine. The confluence of Big Iron Ore Creek with the Attoyac Bayou is located less than 0.1 miles upstream of Site 17 – Attoyac @ CR 392. This segment is approximately 22.2 miles long and is not subdivided into any AUs. RUAA survey site assessments will be conducted at 5 locations on Big Iron Ore Creek. All 5 sites are located at road crossings. No landowners agreed to grant access to project team members for survey site assessments. A total of 7 private landowners were contacted along the creek. The Big Iron Ore Creek watershed is dominated by forested lands including native hardwoods, evergreens and pine plantations. The Attoyac Bayou, Segment 0612, is the receiving water body of Big Iron Ore Creek.

#### **Site: 1 – Big Iron Ore @ US 96: Big Iron Ore Creek @ US 96, 5.2 mi N of US 96 - SH 21 Intersection**

*Approximate Distance to Upper Extent of NHD Flowline: 2.8 miles*

This site is located at the upper most public road crossing on Big Iron Ore Creek. This site was selected as access is available from the US 96 right of way. The riparian area at this site is moderately forested with deciduous and evergreen forest; the surrounding watershed area is dominated by mixed deciduous and evergreen forest as well as pine plantations.

#### **Site: 2 – Big Iron Ore @ FM 3017: Big Iron Ore Creek @ San Augustine CR 3017, 1.6 mi N of CR 3017 - FM 711 Intersection**

*Approximate Distance to Upstream Site: 2.7 miles*

This site was selected as it is the next downstream road crossing on Big Iron Ore Creek. This site is largely surrounded by mixed deciduous and evergreen forest as well as pine plantations. Some pasture land does exist to the South of this site. Access is available from the right of way on San Augustine CR 3017.

#### **Site: 3 – Big Iron Ore @ FM 711: Big Iron Ore Creek @ FM 711, 10 mi NW of San Augustine**

*Approximate Distance to Upstream Site: 5.9 miles*

This site was selected as it is the next downstream road crossing on Big Iron Ore Creek. This site is largely surrounded by mixed deciduous and evergreen forest as well as pine plantations. Some pasture land does exist to the South of this site. Access is available from the right of way on FM 711.

**Site: 4 – Big Iron Ore @ LR A: Big Iron Ore Creek @ Logging Road (LR) A, 3.4 mi NNE of LR A- FM 354 Intersection**

*Approximate Distance to Upstream Site: 3.2 miles*

This site was selected as it is the next downstream road crossing on Big Iron Ore Creek. This site is largely surrounded by mixed deciduous and evergreen forest as well as pine plantations. Access is available from LR A.

**Site: 5 – Big Iron Ore @ FM 354: Big Iron Ore Creek @ FM 354, 6 mi N of FM 354 - SH 21 Intersection; Site collocated with TCEQ SWQM Station 20844**

*Approximate Distance to Upstream Site: 3.8 miles*

This site was selected as it is the next downstream road crossing on Big Iron Ore Creek. This site is largely surrounded by mixed deciduous and evergreen forest as well as pine plantations. A small amount of pasture does exist upstream of the site. Access is available from FM 354. This site is monitored through TSSWCB project 09-10 and is visited every two weeks and is instrumented with automated storm sampling equipment through TSSWCB Project 09-10.

#### Naconiche Creek

Naconiche Creek is the largest tributary of the Attoyac Bayou. Its confluence with the Attoyac Bayou is in the center of the Attoyac Bayou watershed. This creek lies predominantly in Nacogdoches County with the upper 0.75 miles of the stream in Rusk County. This segment is approximately 29.8 miles long and is not subdivided into any AUs. Naconiche Creek is impounded to form Lake Naconiche. This is a multipurpose reservoir and is included as a NRCS FCS (#23A) as well as a recreational reservoir. Construction of the dam began and was completed in 2006; however, the reservoir has not been allowed to fill to capacity due to construction activities in the park. According to news releases, the lake is actively filling now and once full, the reservoir will cover an anticipated 692 acres. The flood pool for the reservoir is project to be 1,003 acres. RUAA survey site assessments will be conducted at 10 locations on Naconiche Creek. All but 2 of the sites are located at road crossings. 1 landowner agreed to grant access to project team members for a survey site assessment. A site was planned for Lake Naconiche; however, it has been removed as this lake will have a swimming area. 5 additional private landowners were contacted along the creek in attempts to obtain more sampling sites. The Naconiche Creek watershed consists of a mix of pastures and forested lands including native hardwoods, evergreens and pine plantations. The Attoyac Bayou, Segment 0612, is the receiving water body of Naconiche Creek.

**Site: 1 – Naconiche @ FM 1087: Naconiche Creek @ FM 1087, 8 mi W of FM 1087, FM 95 Intersection**

*Approximate Distance to Upper Extent of NHD Flowline: 2.0 miles*

This site is located at the upper most public road crossing on Naconiche Creek. This site was selected as access is available from the FM 1087 right of way. The riparian area at this site is heavily forested with deciduous and evergreen forest; the surrounding watershed area is dominated by mixed deciduous and evergreen forest as well as pine plantations and scattered pastures. This site is approximately 2.1 miles below the headwaters of the creek.

**Site: 2 – Naconiche @ Camp Tonkawa: Naconiche Creek @ Camp Tonkawa Rd in Nacogdoches Co., 2.1 mi S of Camp Tonkawa - FM 1087 Intersection**

*Approximate Distance to Upstream Site: 2.2 miles*

This site was selected as it is the next downstream road crossing on Naconiche Creek. This site is largely surrounded by mixed deciduous and evergreen forest as well as pine plantations. Some pasture land does exist adjacent to and to the South of this site. Access is available from the right of way on Camp Tonawa Rd.

**Site: 3 – Naconiche @ CR 155: Naconiche Creek @ Nacogdoches CR 155, 0.7 mi N of CR 155 -FM 2435 Intersection**

This site was evaluated as it was the next downstream road crossing on Naconiche Creek. This site is now inundated by the recent impoundment of Lake Naconiche. This site will not be evaluated; however it is still illustrated on the included RUA site survey map.

**Site: 4 – Naconiche @ FM 2435: Naconiche Creek @ FM 2435, 2.1 mi NW of FM 2435 - US 59 Intersection**

This site was evaluated as it was the next downstream road crossing on Naconiche Creek. This site is now inundated by the recent impoundment of Lake Naconiche. This site will not be evaluated; however it is still illustrated on the included map.

**Site: 5 – Naconiche @ Holly Springs: Lake Naconiche @ Holly Springs Rd in Nacogdoches Co, 1.3 mi N of Holly Springs - US 59 Intersection**

This site was evaluated as it was the next downstream road crossing on Naconiche Creek. This site is now inundated by the recent impoundment of Lake Naconiche. This site will not be evaluated; however it is still illustrated on the included map.

**Site: 6 – Naconiche @ US 59: Naconiche Creek @ US 59, 8.3 mi NE of US 59 - US 259 Intersection**

*Approximate Distance to Upstream Site: 4.7 miles*

This site was chosen as it is the next major road crossing downstream from the Lake Naconiche dam. The FM 2435 crossing below the dam is located less than 0.1 miles upstream from this site but was passed over due to the close proximity to this larger crossing. This site is largely surrounded by mixed deciduous and evergreen forest as well as pine plantations. Sparse pasture land does exist around this site. The Lake Naconiche dam is approximate 0.6 miles upstream of this site and the reservoir's emergency spillway is less than 0.2 miles upstream.

Access is available from the right of way on US 59.

**Site: 7 – Naconiche @ CR 271: Naconiche Creek @ Nacogdoches CR 271, 3 mi S of CR 271 US 59 Intersection**

*Approximate Distance to Upstream Site: 2.9 miles*

This site was selected as it is the next downstream road crossing on Naconiche Creek. This site is largely surrounded by mixed deciduous and evergreen forest as well as pine plantations. Sparse pasture land does exist around this site. This site is accessible from the right of way on Nacogdoches CR 271.



**Site: 8 – Naconiche @ Cedar Bluff: Naconiche Creek @ Cedar Bluff Rd in Nacogdoches Co, 2.7 mi S of Cedar Bluff - FM 2476 Intersection**

*Approximate Distance to Upstream Site: 2.0 miles*

This site was selected as it is the next downstream road crossing on Naconiche Creek. This site is surrounded by pastures, mixed deciduous and evergreen forest as well as pine plantations. This site is less than 0.03 miles downstream of the confluence of the spillway from NRCS FCS 21 located on Browns Creek. This site is accessible from the right of way on Cedar Bluff road in Nacogdoches County.

**Site: 9 – Naconiche @ CR 280: Naconiche Creek @ Nacogdoches CR 280, 0.6 mi SW of CR 280 - FM 95 Intersection**

*Approximate Distance to Upstream Site: 4.2 miles*

This site was selected as it is the next downstream road crossing on Naconiche Creek. This site is surrounded by pastures, mixed deciduous and evergreen forest as well as pine plantations. This site is accessible from the right of way on Nacogdoches CR 280.

**Site: 10 – Naconiche Private 1: Naconiche Creek on Private Property, 6.5 mi NNW of Martinsville in Nacogdoches Co**

*Approximate Distance to Upstream Site: 2.2 miles*

This site was selected as landowner permission was granted for project personnel to access this site. This site is surrounded by mixed pastures and deciduous forest. Access to this site is available by landowner permission. No public access exists here.

**Site: 11 – Naconiche @ FM 95: Naconiche Creek @ FM 95, 5.6 mi N of FM 95 - SH 7 Intersection; Site collocated with TCEQ SQWM Station 20843**

*Approximate Distance to Upstream Site: 2.2 miles*

This site was selected as it is the lower most downstream road crossing on Naconiche Creek. This site is surrounded by pastures, mixed deciduous and evergreen forest as well as pine plantations. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. This site is accessible from the right of way on FM 95.

**Terrapin Creek – Unclassified Segment 0612A**

Unclassified segment 0612A is Terrapin Creek. AU 0612A\_01 is utilized for Terrapin Creek and is defined as the entire water body. This segment is approximately 9.4 miles long and the watershed is largely forested in its upper half and transitions to mostly pastures in the lower portion of the watershed. 4 survey sites will be used to assess Terrapin Creek due to its remote nature and limited public road crossings. 1 private landowner did grant the project team permission to access their property for survey purposes. Two additional private landowners were contacted seeking access to survey their properties but the request was denied. Terrapin Creek does flow near the town of Martinsville. Terrapin receives effluent from the Martinsville ISD WWTF. This is a wetland facility permitted to discharge up to 8,000 gallons of effluent daily by TPDES Permit WQ0014027001. From here, the creek flows to the Attoyac Bayou.

***Assessment Unit: 0612A\_01: entire segment*****Site: 1 – Terrapin @ CR 234: Terrapin Creek @ Nacogdoches CR 234, 4.5 mi SW of CR 234 -FM 95 Intersection**

*Approximate Distance to Upper Extent of NHD Flowline: 0.3 miles*

This site is located at the upper end of the boundary of Terrapin Creek. This site was selected as access is available from the CR 234 right of way. Little or no flow often exists at this site during a typical summer as the site is approximately 0.3 miles from the stream's headwaters. The riparian area and watershed at this site is heavily forested with evergreen forest.

**Site: 2 – Terrapin Private 1: Terrapin Creek on Private Property, 1.1 mi WNW of Martinsville in Nacogdoches Co**

*Approximate Distance to Upstream Site: 5.2 miles*

This site was selected as landowner permission was granted for project personnel to access this site. This site is surrounded by mixed pastures, deciduous and evergreen forests. Access to this site is available by landowner permission. No public access exists here.

**Site: 3 – Terrapin @ SH 7: Terrapin Creek @ SH 7, 0.6 mi WSW of SH 7 - FM 95 Intersection in Martinsville; Site collocated with TCEQ SWQM Station: 16084**

*Approximate Distance to Upstream Site: 1.2 miles*

This site was selected as it is the next downstream road crossing on Terrapin Creek. This site is bounded to the North and South by mixed pastures, deciduous and evergreen forests. Access is available from the right of way on SH 7.

**Site: 4- Terrapin @ FM 95: Terrapin Creek @ FM 95, 0.3 mi S of FM 95 - SH 7 Intersection in Martinsville; Site collocated with TCEQ SWQM Station: 16084**

*Approximate Distance to Upstream Site: 0.7 miles*

This site was selected as it is the next downstream road crossing on Terrapin Creek. This site is bounded to the North and South by mixed pastures, deciduous and evergreen forests. This site also is upstream of the Martinsville ISD WWTF outfall. This is a wetland facility permitted to discharge up to 8,000 gallons of effluent daily by TPDES Permit WQ0014027001. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. Access is available from the right of way on FM 95.

**Waffelow Creek – Unclassified Segment 0612B**

Unclassified segment 0612B is Terrapin Creek which is subdivide into 2 AUs: 0612B\_01 and 0612B\_02. This segment is approximately 12.0 miles long and the watershed is largely forested in its middle portion and pastures in the upper and lower portions. AU 0612B\_01 is defined as being from the confluence of Naconiche Creek North of Martinsville in Nacogdoches County upstream to the confluence with an unnamed tributary about 0.27 km west of CR 234; 2 survey sites are located in this AU. AU 0612B\_02 is defined as being from a point immediately upstream of confluence with unnamed tributary about 0.27 km west of CR 234 upstream to headwaters; 1 survey site is located in this AU. 3 survey sites will be used to assess Waffelow

Creek due to its remote nature and limited public road crossings. No private landowners granted the project team permission to access their property for survey purposes. 3 private landowners were contacted seeking access to survey their properties but the request was denied.

***Assessment Unit: 0612B\_02: upstream of confluence with unnamed tributary about 0.27 km west of CR 234 upstream to headwaters***

**Site: 1 – Waffelow @ FM 1878: Waffelow Creek @ FM 1878, 1.5 mi NE of FM 1878 - FM 2112 Intersection**

*Approximate Distance to Upper Extent of NHD Flowline: 2.5 miles*

This site was selected as it is the upstream most road crossing on Waffelow Creek. This site was selected as access is available from the FM 1878 right of way. The site is located approximately 2.5 miles from the stream's headwaters. The riparian area and watershed at this site is in this area are surrounded by mixed forests and pasture.

**Site: 2 – Waffelow @ CR 234: Waffelow Creek @ Nacogdoches CR 234, 1.6 mi WSW of CR 234 - FM 95 Intersection**

*Approximate Distance to Upstream Site: 5.3 miles*

This site was selected it is the next downstream road crossing on Waffelow Creek. The watershed near this site is dominated by mixed forested lands upstream and a mix of forest and pasture downstream. Access to this site is available from the right of way on Nacogdoches CR 234.

**Site: 3 – Waffelow @ FM 95: Waffelow Creek @ FM 95, 3.9 mi NNW of FM 95 - SH 21 Intersection in Martinsville; Site collocated with TCEQ SWQM Station: 16083**

*Approximate Distance to Upstream Site: 2.1 miles*

This site was selected as it is the most downstream road crossing on Waffelow Creek. This site is surrounded immediately by forested lands with pastures in the watershed nearby. It is also located approximately 1.9 miles upstream of the lower boundary of the assessment unit. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. Access to the site is available from the right of way on FM 95.

### West Creek

West Creek is largest tributary of the Attoyac Bayou in that lies wholly within Shelby County. This segment is approximately 18.0 miles long and is not subdivided into any AUs. The watershed is intermittently populated with forested largely forested in its middle portion and pastures in the upper and lower portions. Six survey sites will be used to assess West Creek. Each of these sites is located on a public road crossing. No private landowners granted the project team permission to access their property for survey purposes. 3 private landowners were contacted seeking access to survey their properties but the request was denied.

West Creek is not impounded in any location; however 2 impoundments do exist in the watershed. Pinkston Reservoir impounds Sandy Creek upstream of its confluence with West Creek approximately 2.4 miles. Pinkston Reservoir is a publicly available recreation area with public boat ramps. No designated public swimming areas exist; however, numerous lake lots adjoin the lake. Pinkston Reservoir is also the receiving water body for the City of Center's

potable water treatment facility filter backwash. A maximum of 200,000 gallons per day of filter back wash is permitted through TPDES Permit WQ0014352001. NRCS FCS 15 is also located in the West Creek watershed and impounds Powdrill Creek approximately 3.2 miles upstream of its confluence with West Creek.

**Site: 1 – West @ CR 4054: West Creek @ Shelby CR 4054, 0.9 mi W of CR 4054 - FM 1645 Intersection**

*Approximate Distance to Upper Extent of NHD Flowline: 1.3 miles*

This site was selected as it is the upstream most road crossing on West Creek. Access is available from the Shelby CR 4054 right of way. The site is located approximately 1.3 miles from the stream's headwaters. The riparian area and watershed at this site is in this area are surrounded by mixed forests and pasture.

**Site: 2 – West @ CR 4059: West Creek @ Shelby CR 4059, 0.3 mi W of CR 4059 - FM 1645 Intersection**

*Approximate Distance to Upstream Site: 2.1 miles*

This site was selected it is the next downstream road crossing on West Creek. The watershed near this site is dominated by mixed forested lands and pine plantation upstream and a mix of forest and pasture downstream. Access to this site is available from the right of way on Shelby CR 4059.

**Site: 3 – West @ FM 138: West Creek @ FM 138, 0.35 mi NW of FM 138 - FM 1645 Intersection**

*Approximate Distance to Upstream Site: 2.3 miles*

This site was selected as it is the next downstream road crossing on West Creek. This site is surrounded immediately by forested lands with pastures in the downstream portion of the watershed. Access to the site is available from the right of way on FM 138.

**Site: 4– West @ CR 1510: West Creek @ Shelby CR 1510, 2.9 mi S of CR 1510 - FM 138 Intersection**

*Approximate Distance to Upstream Site: 4.3 miles*

This site was selected as it is the next downstream road crossing on West Creek. This site is surrounded by pastures in the nearby watershed; the riparian area remains forested. Powdrill Creek adjoins West Creek approximately 0.8 miles upstream of this site. NRCS FCS 15 is located on Powdrill Creek about 3.2 miles upstream of this confluence. Access to the site is available from the right of way on CR 1510.

**Site: 5– West @ 1546: West Creek @ Shelby CR 1546, 1 mi E of CR 1546 - CR 1520 Intersection**

*Approximate Distance to Upstream Site: 1.7 miles*

This site was selected as it is the next downstream road crossing on West Creek. This site is surrounded by pastures in the nearby watershed; the riparian area remains forested. Access to the site is available from the right of way on CR 1546.

**Site: 6– West @ FM 2913: West Creek @ FM 2913, 1.7 mi NW of FM 2913 - SH 7  
Intersection; Site collocated with TCEQ SWQM Station: 20845**

*Approximate Distance to Upstream Site: 2.7 miles*

This site was selected as it is the last downstream road crossing on West Creek prior to its confluence with the Attoyac Bayou. This site is surrounded by mixed pastures and forested lands. Sandy Creek adjoins West Creek approximately 1.5 miles upstream of this site. Pinkston Reservoir is located on Sandy Creek about 2.4 miles upstream of this confluence. This site is monitored through TSSWCB project 09-10 and is visited every two weeks. Access to the site is available from the right of way on FM 2913.

### **Field Survey Data Collection Activities**

In accordance with the procedures for a Comprehensive RUAA (TCEQ, 2009), two separate field surveys were conducted at each of the 44 sites on different weekends in the course of the warm season (temperature  $\geq 70^{\circ}$  F) when recreational activities were most likely to occur (March – October). One RUAA survey date was postponed due to heavy rainfall events which occurred during the week prior that greatly altered base flow conditions required for RUAA field surveys. The following dates (survey one: July 20-22; survey two: August 24-25) in which the surveys were conducted provide a relatively representative example of the waterbody's base flow conditions.

Data collection activities for both field surveys included the following:

- Instantaneous streamflow
- Average depth at thalweg
- Substantial pool (pools  $\geq 10'$  length) depths, lengths, and widths
- Air and water temperatures
- Observational/anecdotal data
- Photographic record

#### Instantaneous Streamflow

At each survey site, an instantaneous water velocity measurement was taken. Employees of SFASU and CES collected velocity measurements at wadeable streams using a Marsh McBirney Velocimeter. The velocity measurements followed protocols defined by the TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment and Tissue* (2008).

#### Average Depth at Thalweg and Substantial Pool Depths

As instructed by TCEQ (2009) RUAA procedures, the average depths of thalweg, as well as the depths of substantial pools were taken at each survey site. The thalweg is defined as the deepest point of a transect perpendicular to the stream channel, while substantial pools are defined as pools greater than or equal to ( $\geq$ ) 10 feet in length (TCEQ, 2009).

Within the 300 meter reach of stream channel evaluated at each survey site, eleven transects at 30 meter intervals were established. At each 30 meter station, the depth at thalweg was taken as directed in the RUAA procedure guidelines, Section E (TCEQ, 2009).

For wadeable streams, a two-meter measuring rod was used to determine depth at thalweg. In the case of non-wadeable streams, a depth of greater than (>) the deepest measurable depth was documented.

#### Observational/Anecdotal Data

All observational and anecdotal information was documented using field data sheets from the TSSWCB-approved QAPP.

The material documented included but was not limited to:

- Stream flow status
- Stream type
- Substrate type
- Accessibility
- Signs of recreational use

#### Air and Water Temperature Measurements

Water temperature was measured in degrees Celsius using a 600 XLM YSI multiprobe. Air temperature was measured in the field using a Kestrel digital thermometer.

#### Photographic Record

A photographic record of each site was made during both RUAA site surveys. The photographs taken include the required upstream, downstream, left bank, right bank views at 30, 150, and 300 meters as mandated by RUAA procedure guidelines, Section E (TCEQ, 2009), as well as any signs of human or wildlife use, obstructions, potential bacterial sources, etc. Photographs were used not only document signs of use (such as litter, fishing equipment), but used to document lack of use (dry stream channels) and features that impede recreational use (log jams, heavy vegetation).

All photographs were identified by site location, date, view orientation, and subject of photograph. Photographs which best represent each survey site are included in chapters 4 and 5.

## Chapter 4 : Physical Survey Results

### General Description of Stream and Survey Sites

RUAA surveys were conducted on July 20-22 and August 24-25, 2012. Surveys were performed during base flow conditions on weekends during the warm season at auspicious times to observe recreational activities in the Attoyac Bayou Watershed. At each survey site, eleven transects were assessed along a 300-m reach. Each transect was measured off at 30 meter increments.

Transects of certain stream channels were inaccessible due to excessive depth, thus rendering the stream unwadable (> 1 meter in depth). Surveyors were unable to obtain the depth at thalweg at these sites and thusly noted the reason on the applicable portions TCEQ RUAA surveys (Section E). It was not feasible to launch a boat at these sites due to the characteristics of the stream banks and channels (steep banks, large woody debris).

Table 4-1 illustrates rainfall data for the 30-days prior to each RUAA survey, which were performed July 20-22 and August 24-25, 2012.

Table 4-2 illustrates the various air and water temperatures present on the days of the surveys, all of which are amply warm enough to sustain water based recreational activities.

Table 4-3 depicts the stream channel and riparian corridor appearance at survey sites.

Table 4-4 documents the average depths at thalweg for each site for both RUAA surveys. If the actual thalweg was not found due to excessive depth, the deepest measurement recorded was used to calculate the average thalweg depth for the site. In the case of stream channels composed of pools, the average depth at thalweg was calculated by averaging the depth of thalweg of each substantial pool. Table 4-4 also documents whether each survey site has public or private access as well as ease of access to the stream channel.

Table 4-5 documents the maximum, minimum and average widths of the stream channel at each site for both surveys. Observed flow and total discharge (cfs) is also listed in this table for each site per survey.

Table 4-6 documents the aesthetics of the stream channel and riparian zone, including litter, along with wildlife and livestock observations. Tracks from raccoon, livestock, and feral hogs were the most common signs of wildlife use during both surveys. In many cases, livestock fecal matter was directly observed in the stream channel. Bank and stream channel litter was primarily composed of plastics (bottles, bags), aluminum cans and glass bottles. There were concentrations of illegal dumping at multiple survey sites. Objects observed include tires, garbage bags full of household refuse, appliances, clothing items, and pieces of scrap metal. Litter (bank and channel) was rare at all of the privately owned survey sites, and what few pieces were observed appears to

have washed in from upstream. A description of each site is presented along with select photos taken during the surveys. All photos are available electronically as an appendix to this report.

**Table 4.1** Rainfall records for the months prior to RUAA surveys. Data obtained from the National Weather Service Station in Nacogdoches, Texas. (RUAA surveys were conducted July 20-22, 2012 and August 24-25, 2012. Dates of surveys are highlighted in gray.)

<b>RUAA Trip 1 July 20-22</b>		<b>RUAA Trip 2 August 24-25</b>	
<b>Date</b>	<b>Rainfall (in)</b>	<b>Date</b>	<b>Rainfall (in)</b>
<i>June 2012</i>		<i>July 2012</i>	
20	0.02	23	0.00
21	0.00	24	0.03
22	0.01	25	0.00
23	0.00	26	0.00
24	0.00	27	0.00
25	0.00	28	0.00
26	0.00	29	0.00
27	0.00	30	0.00
28	0.00	31	0.00
29	0.00	<i>August 2012</i>	
30	0.00	1	0.00
<i>July 2012</i>		2	0.00
1	0.00	3	0.00
2	0.06	4	0.00
3	0.00	5	0.00
4	0.00	6	0.02
5	0.00	7	0.02
6	0.00	8	1.70
7	0.10	9	0.05
8	0.00	10	0.00
9	0.42	11	0.00
10	0.13	12	0.00
11	0.05	13	0.00
12	0.54	14	0.00
13	0.35	15	0.00
14	0.03	16	0.00
15	1.34	17	0.00
16	1.37	18	0.05
17	0.02	19	0.00
18	0.00	20	0.02
19	0.00	21	0.00
20	0.00	22	0.02
21	0.00	23	0.00
22	0.09	24	0.00



**Table 4.2** Air and water temperatures present during surveys.

Assessment Unit	Station Number	July 20-22,2012		August 24-25,2012	
		Air Temp (°C)	Water Temp (°C)	Air Temp (°C)	Water Temp (°C)
612	Attoyac 1	22.22	N/A	31.67	N/A
612	Attoyac 2	23.89	N/A	31.67	N/A
612	Attoyac 3	23.89	24.13	23.33	N/A
612	Attoyac 4	26.11	N/A	23.33	23.23
612	Attoyac 5	27.78	25.5	23.33	22.85
612	Attoyac 6	31.67	24.43	25	22.87
612	Attoyac 7	32.78	26.42	26.67	23.94
612	Attoyac 8	32.22	27.79	26.67	23.45
612	Attoyac 9	35	28.03	30.56	25
612	Attoyac 10	Landowner permission to access site retracted			
612	Attoyac 11	Landowner permission to access not obtain by survey date		25.38	22.05
612	Attoyac 12	22.22	25.53	23.89	22.06
612	Attoyac 13	22.78	25.13	32.78	24.84
612	Attoyac 14	24.44	25.35	32.22	23.92
612	Attoyac 15	33.89	27.56	27.44	24.65
612	Attoyac 16	32.78	28.39	31.5	25.67
612	Attoyac 17	26.11	27.15	29.6	25.89
612	Attoyac 18	32.75	28.39	31.5	25.57
612	Naconiche 1	35	24.58	32.22	22.36
612	Naconiche 2	33.89	26.46	30.56	23.37
612	Naconiche 6	32.22	30.26	29.44	26.76
612	Naconiche 7	32.22	25.82	28.89	22.66
612	Naconiche 8	31.67	25.97	27.22	22.43
612	Naconiche 9	33.89	25.32	26.67	22.47
612	Naconiche 10	34.01	25.64	23.28	22.76
612	Naconiche 20843	36.4	25.57	23.44	22.62
612	West 1	21.67	23.9	23.28	23.54
612	West 2	22.78	24.12	23.44	N/A
612	West 3	23.89	25.96	23.44	23.9
612	West 4	24.44	25.35	25.38	23.6
612	West 5	24.44	26.67	25.33	24.05
612	West 6	23.89	25.84	25.33	23.82
612	Big Iron Ore 1	23.89	26.94	25.8	N/A
612	Big Iron Ore 2	23.89	26.01	24.6	23.64

**Table 4.2** Continued

Assessment Unit	Station Number	July 20-22, 2012		August 24-25	
		Air Temp (°C)	Water Temp (°C)	Air Temp (°C)	Water Temp (°C)
612	Big Iron Ore 3	35	26.12	24.2	24.03
612	Big Iron Ore 4	31.11	26.07	26.5	24.36
612	Big Iron Ore 20844	26.67	26.39	27.6	25
612A	Terrapin 1	Survey site dry and overgrown with vegetation			
612A	Terrapin 2	28.33	25.81	30.78	24.79
612A	Terrapin 3	29.44	25.75	30.78	25.9
612A	Terrapin 16084	30.56	25.81	30.78	24.56
612B	Waffelow 1	26.67	26.06	32.78	N/A
612B	Waffelow 2	34.44	25.13	28.33	23.06
612B	Waffelow 16083	33.89	28.75	28.33	25.49

**Table 4.3** Stream channel and riparian corridor appearance of each survey site.

Assessment Unit	Site Number	Stream Bank	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings	Channel Obstruction
0612	Attoyac 1	Right	Natural/ Dry	Sand	Forest	Large	No	Maintained/Natural	None/ Dry
		Left			Forest	Large		Maintained/Natural	
0612	Attoyac 2	Right	Natural/Dry	Sand/ Mud/Clay	Forest	None	No	No SMZ	None/ Dry
		Left			Forest	None		No SMZ	
0612	Attoyac 3	Right	Natural	Sand/ Mud/Clay	Forest	Large	No	Native	Overgrown bank/ large woody debris
		Left			Forest	Large		Native	
0612	Attoyac 4	Right	Natural/Dry	Mud/Clay	Forest	Large	No	Maintained / Native	Large Beaver dam
		Left			Forest	Large		Maintained/Native	
0612	Attoyac 5 (20842)	Right	Natural	Mud/Clay	Forest	Large	No	Native	Large Woody Debris/ Fenced up stream with sediment mesh
		Left			Forest	Large		Native	
0612	Attoyac 6	Right	Natural	Silt/Mud/Clay	Forest/Pasture	Large	No	Native/Pasture	Large woody debris
		Left			Forest	Large		Native	
0612	Attoyac 7 (16076)	Right	Natural	Mud/Clay	Forest	Large	No	Native	Large Beaver dam
		Left			Forest/Pasture	Large		Native/Pasture	
0612	Attoyac 8	Right	Natural	Sand/Mud/Clay	Forest	Large	No	Native	Large log jam
		Left			Forest/Pasture	Large		Native/Pasture	
0612	Attoyac 9	Right	Natural	Mud/Clay	Forest	Large	No	Native	Woody debris
		Left			Forest	Large		Native	

**Table 4.3** Continued

Assessment Unit	Site Number	Stream Bank	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings	Channel Obstruction
0612	Attoyac 10	Right Left	Landowner permission to access site retracted						
0612	Attoyac 11	Right Left	Natural	Sand/Mud/Clay/Slit	Forest Pasture	Large Small	No	Native Pasture	Log Jams/thick vegetation
0612	Attoyac 12 (20841)	Right Left	Natural	Sand/Mud/Clay	Forest Forest/Pasture	Large Large	No	Native Native/Pasture	Large woody debris/ fence downstream
0612	Attoyac 13	Right Left	Natural	Sand/Mud/Clay	Forest Forest	Large Large	No	Maintained Native	None
0612	Attoyac 14	Right Left	Natural	Sand/ Mud/Clay	Forest Forest	Large Large	No	Maintained Native	Woody debris
0612	Attoyac 15 (15253)	Right Left	Natural	Mud/Clay	Forest Forest/Pasture	Large Medium	No	Native Native/Pasture	Woody debris
0612	Attoyac 16	Right Left	Natural	Slit/Sand	Forest Forest	Large Large	No	Native Native	Woody debris
0612	Attoyac 17	Right Left	Natural	Mud/Clay	Forest Forest	Large Large	No	Native Native	None
0612	Attoyac 18 (10636)	Right Left	Natural	Mud/Clay	Forest Forest	Large Large	No	Native Native	Log jams
0612	Naconiche 1	Right Left	Natural	Sand	Forest Forest	Large Large	No	Native Native	None
0612	Naconiche 2	Right Left	Natural	Sand	Forest Forest	Large Large	No	Native Native	Logs

**Table 4.3** Continued

Assessment Unit	Site Number	Stream Bank	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings	Channel Obstruction
0612	Naconiche 6	Right	Natural	Silt/Mud/Clay	Forest	Large	No	Maintained	None
		Left			Forest	Large		Maintained	
0612	Naconiche 7	Right	Natural	Silt/Gravel	Forest	Large	No	Native	Down tress/ Over growth
		Left			Forest	Large		Native	
0612	Naconiche 8	Right	Natural	Mud/Clay	Forest	Large	No	Native	Large Woody Debris
		Left			Forest/Pasture	Large		Native/Pasture	
0612	Naconiche 9	Right	Natural	Mud/Clay	Forest	Large	No	Native	Woody debris
		Left			Forest	Large		Native	
0612	Naconiche 10	Right	Natural	Sand/Mud/Clay	Pasture	Large	No	Pasture	Woody debris
		Left			Forest	Large		Native	
0612	Naconiche 11 (20843)	Right	Natural	Silt/Mud/Clay	Shrub dominated corridor	Large	No	Pasture	Woody debris
		Left			Pasture	large		Native	
0612	West 1	Right	Natural	Mud/Clay	Forest/Pasture	Small	No	Native/Pasture	Fence/Log Jam
		Left			Forest/Pasture	Small		Native/Pasture	
0612	West 2	Right	Natural	Mud/Clay	Forest	Large	No	Native	Log Jams
		Left			Forest	Large		Native	
0612	West 3	Right	Natural	Mud/Clay	Forest/Shrub dominated	Large	No	Native	Log Jams/thick vegetation
		Left			Forest/Shrub dominated	Large		Native	
0612	West 4	Right	Natural	Sand	Forest/Pasture	Medium	No	Native/Pasture	Log Jam, Fences
		Left			Forest/Pasture	Medium		Native/Pasture	

**Table 4.3** Continued

Assessment Unit	Site Number	Stream Bank	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings	Channel Obstruction
0612	West 5	Right	Natural	Mud/Clay	Forest/Pasture	Medium	No	Native/Pasture	Woody debris
		Left			Forest/Pasture	Medium		Native/Pasture	
0612	West 6 (20845)	Right	Natural	Mud/Clay	Forest	Large	No	Native	Log jam, Narrow channel
		Left			Forest	Medium		Native	
0612A	Terrapin 1	Right	Natural	N/A	Forest	Large	No	Native	Dry and completely overgrown
		Left			Forest	Large		Native	
0612A	Terrapin 2	Right	Natural	Sand/Mud/Clay	Forest/Pasture	Medium	No	Native/Pasture	Log Jams
		Left			Forest	Large		Native	
0612A	Terrapin 3	Right	Natural	Mud/Clay	Forest	Large	No	Native	Beaver dams, thick vegetation, Fenced across stream
		Left			Forest	Large		Native	
0612A	Terrapin 4 (16084)	Right	Natural	Mud/Clay	Forest	Large	No	Native	sediment deposits
		Left			Forest	Large		Native	
0612B	Waffelow 1	Right	Natural	Mud/Clay	Mowed Maintained/Pasture	Large	No	Maintained/ Pasture	Fences
		Left			Pasture/ Shrub/Mowed	Large		Pasture/Native/Mowed	
0612B	Waffelow 2	Right	Natural	Mud/Clay	Forest	Large	No	Native	sediment deposits
		Left			Forest	Small		Native	
0612B	Waffelow 3 (16083)	Right	Natural	Mud/Clay	Forest/Pasture	Medium	No	Native/Pasture	Beaver dams, thick vegetation, Fenced across stream
		Left			Forest	Large		Native	
0612	Big Iron Ore 1	Right	Natural	Mud/Clay	Forest	Large	No	Native	Large Beaver dam
		Left			Forest	Large		Native	
0612A	Big Iron Ore 2	Right	Natural	Mud/Clay	Forest	Large	No	Native	Beaver Dams
		Left			Forest	Large		Native	

**Table 4.3** Continued

Assessment Unit	Site Number	Stream Bank	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings	Channel Obstruction
0612	Big Iron Ore 3	Right	Natural	Gravel/Sand	Forest	Large	No	Native	Log Jams
		Left			Forest	Large		Native	
0612	Big Iron Ore 4	Right	Natural	Sand	Forest	Large	No	Native	None
		Left			Forest	Large		Native	
0612	Big Iron Ore 5 (20844)	Right	Natural	Sand	Forest	Large	No	Native	None
		Left			Forest	Large		Native	

**Table 4.4** Thalweg depth, stream flow type, and site accessibility of each site.  
 (Bank Access References: E: Easy; D: Difficult; MD: Moderately difficult; ME: Moderately easy)

Assessment Unit (AU)	Segment Length (miles)	Number of sites	Number of Recreation Areas in AU	Avg. Thalweg Depth (m)		Stream Flow Type	General Access	Bank Access
				July 20-22, 2012	August 24-26, 2012			
6012,0612A,0612B		44	0			Perennial	Private	MD
Site	Reach length (meters)	Number of Transects	Number of Recreational Areas at Site	Avg. Thalweg Depth (m)		Stream Flow Type	General Access	Bank Access
				July 20-22, 2012	August 24-26, 2012			
Attoyac 1	300	11	0	0	0	Ephemeral	Private	MD
Attoyac 2	300	11	0	0	0	Intermittent	Private	ME
Attoyac 3	300	11	0	0.367	0	Intermittent	Private	D
Attoyac 4	300	11	0	0.175	0.25	Intermittent/ Perennial Pool	Private	ME
Attoyac 5 (20842)	300	11	0	0.55	0.15	Perennial/ Intermittent Perennial Pools	Private	D
Attoyac 6	300	11	0	0.535	0.483	Perennial	Private	MD
Attoyac 7 (16076)	300	11	0	>1.5	>1.5	Perennial	Private	ME
Attoyac 8	300	11	0	0.55	0.625	Perennial/ Intermittent Perennial Pools	Private	D
Attoyac 9	300	11	0	0.455	0.267	Perennial/ Intermittent Perennial Pools	Private	D
Attoyac 10	300	11	Landowner permission to access site retracted					
Attoyac 11	300	11	0	N/A	1.025	Perennial/ Intermittent Perennial Pools	Private	D



**Table 4.4** Continued (Bank Access Reference: E: Easy; D: Difficult; MD: Moderately difficult; ME: Moderately easy)

Assessment Unit (AU)	Segment Length	Number of sites	Number of Recreation	Avg. Thalweg Depth (m)		Stream Flow Type	General Access	Bank Access
Attoyac 12 (20841)	300	11	0	0.81	0.5	Perennial/ Intermittent Perennial Pools	Private	D
Attoyac 13	300	11	0	0.5	0.217	Perennial/ Intermittent Perennial Pools	Private	ME
Attoyac 14	300	11	0	N/A	N/A	Perennial/ Intermittent Perennial Pools	Private	D
Attoyac 15 (15253)	300	11	0	0.668	0.434	Perennial	Private	ME
Attoyac 16	300	11	0	0.983	0.698	Perennial	Private	D
Attoyac 17	300	11	0	0.991	0.877	Perennial	Private	D
Attoyac 18 (10636)	300	11	0	0.8	0.55	Perennial	Private	D
Attoyac Total				0.592	0.474			
Naconiche 1	300	11	0	0.225	0.19	Perennial	Private	ME
Naconiche 2	300	11	0	0.385	0.275	Perennial	Private	D
Naconiche 6	300	11	0	0.345	0.68	Perennial	Private	MD
Naconiche 7	300	11	0	0.414	0.525	Perennial	Private	MD
Naconiche 8	300	11	0	0.48	0.475	Perennial	Private	MD
Naconiche 9	300	11	0	0.82	0.45	Perennial	Private	ME
Naconiche 10	300	11	0	0.645	0.54	Perennial	Private	D
Naconiche 11 (20843)	300	11	0	0.59	0.43	Perennial	Private	E
Naconiche Crk. Total				0.488	0.446			
West 1	300	11	0	0.09	0.235	Intermittent/Perennial Pools	Private	D
West 2	300	11	0	0.25	0	Intermittent/Perennial Pools	Private	MD

**Table 4.4** Continued (Bank Access Reference: E: Easy; D: Difficult; MD: Moderately difficult; ME: Moderately easy)

Assessment Unit (AU)	Segment Length	Number of sites	Number of Recreation	Avg. Thalweg Depth (m)		Stream Flow Type	General Access	Bank Access
West 3	300	11	0	0.2	0.31	Perennial/ Intermittent Perennial Pools	Private	D
West 4	300	11	0	0.565	0.438	Perennial	Private	D
West 5	300	11	0	0.368	0.303	Perennial	Private	ME
West 6 (20845)	300	11	0	0.426	0.237	Perennial	Private	D
West Crk. Total				0.317	0.254			
Terrapin 1	300	11	0	0	0	Ephemeral	Private	E
Terrapin 2	300	11	0	0.525	0.4	Perennial	Private	ME
Terrapin 3	300	11	0	>1.5	>1.5	Perennial	Private	MD
Terrapin 4 (16084)	300	11	0	0.515	0.563	Perennial	Private	D
Terrapin Crk .Total				0.635	0.615			
Waffelow 1	300	11	0	0.07	0	Intermittent/ Perennial Pool	Private	MD
Waffelow 2	300	11	0	0.315	0	Intermittent/ Perennial Pool	Private	ME
Waffelow 3 (16083)	300	11	0	>1.5	>1.5	Perennial	Private	MD
Waffelow Crk. Total				0.628	0.5			
Big Iron Ore 1	300	11	0	0.59	>1.5	Perennial	Private	E
Big Iron Ore 2	300	11	0	0.787	0.655	Perennial	Private	D
Big Iron Ore 3	300	11	0	0.698	0.632	Perennial	Private	ME
Big Iron Ore 4	300	11	0	0.561	0.64	Perennial	Private	MD
Big Iron Ore 5 (20844)	300	11	0	0.376	0.298	Perennial	Private	E
Big Iron Ore Crk. Total				0.602	0.556			

**Table 4.5** Stream segment width and flow of survey sites.  
 (Data recorded as N/A connotes dry stream bed or inability to obtain data throughout total transect due to extenuating circumstance)

Assessment Unit	Date	Site Number	Maximum width (m)	Minimum width (m)	Average width (m)	Total Discharge (cfs)	Observed Flow	Wadeable	
0612	July 20-22, 2012	Attoyac 1	N/A	N/A	N/A	N/A	No Flow	None	
0612		Attoyac 2	4	2.5	2.85	N/A	No Flow	None	
0612		Attoyac 3	5	3	4.5	0.2	Low Flow	Yes-low	
0612		Attoyac 4	7	5	6	N/A	No Flow	Yes-Pools	
0612		Attoyac 5 (20842)	6	1.5	2.5	N/A	No Flow/ Stagnant	Yes	
0612		Attoyac 6	6	0.5	4	0.18	Low Flow	Yes-low	
0612		Attoyac 7 (16076)	15	8	10	N/A	Too Deep to Wade	No-high	
0612		Attoyac 8	4.5	1	3	1.38	Normal	Yes	
0612		Attoyac 9	10	1.5	4.5	N/A	No Flow	Yes	
0612		Attoyac 10	Landowner permission to access site retracted						
0612		Attoyac 11	Landowner permission to access site not received by survey date						
0612		Attoyac 12 (20841)	6.5	0.5	5	1.18	Normal	Yes-low	
0612		Attoyac 13	5.5	0.4	4	1.976	Normal	Yes	
0612		Attoyac 14	12	5.5	6	1.35	Normal	Yes	
0612		Attoyac 15 (15253)	10.4	6.3	8.73	8.61	Normal	Yes	
0612		Attoyac 16	13	6.5	9.75	11.01	Normal	Yes	
0612		Attoyac 17	12	6	9	17.7	Normal	Yes	
0612		Attoyac 18 (10636)	12.5	7	9.75	21.39	Normal	Yes	
0612		Naconiche 1	2.5	0.3	2	0.5563	Normal	Yes-low	
0612		Naconiche 2	4.5	2	2.5	2.093	Normal	Yes	
0612	Naconiche 6	4.5	2	3	2.51	Normal	Yes		
0612	Naconiche 7	6	0.5	3	2.92	Normal	Yes		
0612	Naconiche 8	8	1	3.5	4.102	Normal	Yes		
0612	Naconiche 9	6.5	1.75	3	1.8544	Normal	Yes		
0612	Naconiche 10	5	1.5	2	3.84	Normal	Yes		

**Table 4.5** Continued

Assessment Unit	Date	Site Number	Maximum width (m)	Minimum width (m)	Average width (m)	Total Discharge (cfs)	Observed Flow	Wadeable
0612	July 20-22, 2012	Naconiche 11 (20843)	4.5	2	3	3.32	Normal	Yes
0612		West 1	3	0.3	1.65	0.0041	Low Flow	Yes
0612		West 2	1.8	0.6	1.2	N/A	No Flow	Yes-Pools
0612		West 3	N/A	N/A	N/A	0.16	Low Flow	Yes-in some parts
0612		West 4	8.5	3	5	1.68	Low Flow	Yes
0612		West 5	4.05	2.1	3.075	0.79	Low Flow	Yes
0612		West 6 (20845)	7.1	2.25	4.675	0.915	Normal	Yes
0612A		Terrapin 1	N/A	N/A	N/A	N/A	Dry	Yes
0612A		Terrapin 2	4.8	1.3	3.05	0.43	Normal	Yes
0612A		Terrapin 3	5	2.5	4.5	N/A	Low flow	No- flooded from beaver dams
0612A		Terrapin 4 (16084)	9.25	1.5	5.375	0.47	Low Flow	Yes
0612B		Waffelow 1	2.5	1	1.8	N/A	No flow	Yes-pools
0612B		Waffelow 2	6.5	0.4	3.45	N/A	No flow	Yes- low
0612B		Waffelow 3 (16083)	5.5	2.3	3.5	N/A	No flow	No- flooded from beaver dams
0612		Big Iron Ore 1	N/A	N/A	N/A	0.23	Low Flow	No- flooded from beaver dams
0612		Big Iron Ore 2	8	2.5	5.25	1	Low Flow	Yes
0612		Big Iron Ore 3	5	3.5	4.25	2.88	Low Flow	Yes
0612		Big Iron Ore 4	9.5	4	6.75	4.03	Low Flow	Yes
0612		Big Iron Ore 5 (20844)	8.5	4	6.25	4.72	Low Flow	Yes

**Table 4.5** Continued

Assessment Unit	Date	Site Number	Maximum width (m)	Minimum width (m)	Average width (m)	Total Discharge (cfs)	Observed Flow	Wadeable	
0612	August 24-25, 2012	Attoyac 1	N/A	N/A	N/A	N/A	Dry	Yes-Dry	
0612		Attoyac 2	5	2.5	4	N/A	Dry	Yes-Dry	
0612		Attoyac 3	6	2	4.5	N/A	Dry	Yes-Dry	
0612		Attoyac 4	9	0	8	N/A	No Flow	Yes- Pools	
0612		Attoyac 5 (20842)	5	0	4	N/A	No Flow	Yes-Pools	
0612		Attoyac 6	5	0	4.5	N/A	No Flow	Yes-Pools	
0612		Attoyac 7 (16076)	15	9.5	10	N/A	Low Flow	No- Too deep to wade	
0612		Attoyac 8	5	0	4.75	N/A	No Flow	Yes-Pools	
0612		Attoyac 9	6	0	4.5	N/A	No Flow	Yes-Pools	
0612		Attoyac 10	Landowner permission to access site retracted						
0612		Attoyac 11	6.5	0	6	N/A	No Flow	Yes-Pools	
0612		Attoyac 12 (20841)	6	0	3	N/A	No Flow	Yes- Pools	
0612		Attoyac 13	3	0	2.66	N/A	No Flow	Yes-Pools	
0612		Attoyac 14	3.5	0	3	N/A	No Flow	Yes-Pools	
0612		Attoyac 15 (15253)	17	3.5	10.2	0.4879	Low Flow	Yes	
0612		Attoyac 16	14	1.5	8	1.6086	Low Flow	Yes	
0612		Attoyac 17	14	8	11	2.8374	Low Flow	Yes	
0612		Attoyac 18 (10636)	11.5	1.5	6.5	2.7614	Low Flow	Yes	
0612		Naconiche 1	4	0.5	2.5	0.8673	Low Flow	Yes	
0612		Naconiche 2	5	1	2.5	1.623	Normal	Yes	
0612		Naconiche 6	3.5	2	3	0.474	Normal	Yes	
0612		Naconiche 7	4	1	3	1.075	Low Flow	Yes	
0612		Naconiche 8	6.5	0.5	3.5	1.488	Low Flow	Yes	
0612		Naconiche 9	8	1.5	3	0.763	Low Flow	Yes	

**Table 4.5** Continued

Assessment Unit	August 24-25, 2012	Site Number	Maximum width (m)	Minimum width (m)	Average width (m)	Total Discharge (cfs)	Observed Flow	Wadeable
0612		Naoniche 10	5.5	2	3.5	0.902	Low Flow	Yes
0612		Naoniche 11 (20843)	6	2	3	0.539	Low Flow	Yes
0612		West 1	4.2	0	1.5	N/A	No Flow	Yes-Pools
0612		West 2	N/A	N/A	N/A	N/A	No Flow	Yes-Dry
0612		West 3	3.2	0	2.9	N/A	No Flow	Yes-Pools
0612		West 4	7.5	1.5	4.5	0.22595	Low Flow	Yes
0612		West 5	5.5	0.9	3.1	0.11408	Low Flow	Yes
0612		West 6 (20845)	8	1.5	4.75	0.73413	Low Flow	Yes
0612A		Terrapin 1	N/A	N/A	N/A	N/A	Dry	Yes-Dry
0612A		Terrapin 2	4.5	0.4	2.65	0.0488	Low Flow	Yes
0612A		Terrapin 3	N/A	N/A	N/A	N/A	Flooded-Beaver dam	No-Flooded Beaver Dam
0612A		Terrapin 4 (16084)	9.5	0.3	5	0.053378	Low Flow	Yes
0612B		Waffelow 1	N/A	N/A	N/A	N/A	Dry	Yes-Dry
0612B		Waffelow 2	N/A	N/A	N/A	N/A	Dry	Yes-Dry
0612B		Waffelow 3 (16083)	N/A	N/A	N/A	N/A	Flooded-Beaver dam	No-Flooded
0612		Big Iron Ore 1	N/A	N/A	N/A	N/A	Flooded-Beaver dam	No-Flooded
0612		Big Iron Ore 2	7.5	2.5	5	0.896135	Low Flow	Yes
0612		Big Iron Ore 3	8	4.5	6.25	2.91678	Low Flow	Yes
0612		Big Iron Ore 4	12	3	7.5	0.9258	Low Flow	Yes
0612	Big Iron Ore 5 (20844)	7	3	5	0.97346	Low Flow	Yes	

**Table 4.6** Stream aesthetics and wildlife observations at each survey site. (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations						Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank	
Attoyac 1	July 21,2012	A	N	N	N	Sand	N	N	N	N	N/A	N	N	N		
	August 24,2012	A	N	N	N	Sand	N	N	N	N	N/A	N	N	N		
Attoyac 2	July 21,2012	A	N	N	N	Fine Sediments	N	Slight Snakes	N	Moderate Feral Hogs	N	Tracks/ Wallow	AB	AB	R	
	August 24,2012	A	N	N	N	Fine Sediments	N	N	N	N	N	N/A	AB	AB	N	
Attoyac 3	July 21,2012	A	A	R	Brown	Solid/ Fine Sediments	Scum/ debris	Slight Snakes	N	N	N	N/A	R	N	N	
	August 25,2012	A	N	N	N	Solid/ Fine Sediments	N/A	N	N	Slight Raccoon	N	Tracks	AB	AB	C	
Attoyac 4	July 21,2012	A	A	C	Brown	Sludge	Scum-pools	AB-Snakes	Slight	Moderate Hogs/other	N	Tracks	N	N	N	
	August 25,2012	A	A	C	Brown	Sludge	Scum	N	N	Slight Feral Hogs	N	Tracks	N	R	R	
Attoyac 5 (20842)	July 21,2012	A	A	AB	Black/Brown	Sludge/ Fine Sediments	Scum/ debris	N	N	N	N	N/A	N	R	R	
	August 25,2012	A	A	N	Brown	Sludge	Scum	N	N	N	N	N/A	N	N	N	

**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations					Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
Attoyac 6	July 21,2012	R	A	AB	Black/Brown	Fine Sediments	Scum/ debris	N	N	Moderate Livestock	N	Tracks	C	R	N
	August 25,2012	A	A	C	Brown	Sludge	Scum/ debris	N	N	Large Livestock	N	Tracks/Fecal	R	R	R
Attoyac 7 (16076)	July 21,2012	A	A	N	Brown	Unknown	Clear	N	N	Large Livestock	Slight	Tracks/Observed/ Known	N	N	A B
	August 25,2012	C	A	N	Brown	Unknown	Clear/Debris	N	N	Large Livestock	Slight	Observed/ Tracks/ Known	N	R	A B
Attoyac 8	July 21,2012	A	A	R	Brown	Sludge/ Fine Sediments	Clear/ Scum/Debris	N	N	Slight Livestock	N	Tracks	N	R	N
	August 25,2012	A	A	N	Brown	Sludge	Clear/Scum/Debris	N	N	Slight Wildlife, Feral Hogs, Livestock	N	Tracks	N	N	N
Attoyac 9	July 21,2012	A	A	C	Brown	Sludge/ Fine Sediments	Debris	N	Slight	Large Feral Hogs	N	Tracks	N	R	N
	August 25,2012	A	A	N	Brown	Sludge	Scum/Debris	N	Slight	Slight Wildlife, Large Feral Hogs	N	Tracks	N	R	N



**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics					Wildlife Observations					Stream Garbage			
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
Attoyac 10	July 2012	Landowner permission to access site retracted													
	August 2012														
Attoyac 11	July 2012	Landowner permission to access site not received by survey date													
	August 24, 2012														A
Attoyac 12 (20841)	July 22,2012	A	A	N	Brown	Fine Sediments	Debris	N	N	N	N	N/A	C	R	R
	August 24, 2012	A	A	C	Brown	Fine Sediments	Clear/Scum/Debris	N	N	N	N	N/A	AB	C	R
Attoyac 13	July 22,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	N	Moderate	N/A	N	N	N
	August 25,2012	A	A	N	Brown	Fine Sediments	Clear/Debris	N	N	Moderate Feral Hogs	Moderate	Tracks/Known	N	R	N

**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations					Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
Attoyac 14	July 22,2012	A	A	N	Brown	Fine Sediments	Debris	N	N	N	Moderate	Known	N	N	N
	August 25,2012	A	A	N	Brown	Fine Sediments	Clear/Debris	N	N	Moderate Feral Hogs	Moderate	Tracks/ Known	N	R	N
Attoyac 15 (15253)	July 20,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Moderate Feral Hogs, Livestock	N	Tracks Fecal Known	N	N	N
	August 24,2012	A	R	N	Brown	Fine Sediments	Clear	N	N	Moderate Wildlife, Livestock, Feral Hogs	N	Tracks/Fecal	N	N	N
Attoyac 16	July 21,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Slight Wildlife, Beavers	Moderate	Tracks/ Beavers on trees	N	R	R
	August 25,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Slight Wildlife	Moderate	Tracks	N	R	R
Attoyac 17	July 21,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	N	N	Tracks close to stream	N	N	N
	August 25,2012	A	A	N	Brown	Fine Sediments	Clear	N	Slight	Slight Wildlife	N	Tracks	N	N	N

**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations					Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
Attoyac 18 (10636)	July 21,2012	A	A	N	Brown	Fine Sediments	Clear	Slight Snakes	N	Large Wildlife/ Moderate Feral Hog	Slight	Tracks/Fecal	N	N	R
	August 25,2012	A	A	N	Brown	Fine Sediments	Clear	Slight Snakes	N	Large Wildlife/ Moderate Feral Hog	Moderate	Tracks/Fecal	N	N	R
Naconiche 1	July 20,2012	C	A	N	Clear	Fine Sediments	Clear/ Foam	N	N	N	N	N/A	N	N	R
	August 24, 2012	C	R	N	Clear	Fine Sediments	Clear/ Foam	N	N	Slight Wildlife	N	Tracks	N	N	N
Naconiche 2	July 20,2012	R	R	R	Brown	Solid/ Fine Sediments	Clear	N	N	Slight	N	Tracks	N	N	N
	August 24, 2012	A	A	N	Clear	Fine Sediments	Clear/ Debris	N	N	Slight Deer	N	Track	N	N	C
Naconiche 6	July 20,2012	A	A	N	Brown	Fine Sediments	Clear	Slight Snakes	N	Moderate Raccoon/ Feral Hogs	N	Tracks	R	R	R
	August 24, 2012	A	R	C	Brown	Fine Sediments	Clear/Debris	N	N	Slight Wildlife/ Moderate Feral Hogs	N	Tracks	N	N	R

**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations					Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
Naoniche 7	July 20,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Slight Raccoon	N	Tracks	C	C	C
	August 24, 2012	A	A	R	Brown	Fine Sediments	Clear/ Scum/ Debris	N	N	N	N	N/A	C	C	R
Naoniche 8	July 20,2012	A	A	N	Brown	Solid/ Fine Sediments	Clear	Slight Snakes	N	N	N	Tracks	C	R	R
	August 24, 2012	A	A	N	Brown	Sludge/ Fine Sediments	Clear/ Debris	N	N	N	N	N/A	R	R	R
Naoniche 9	July 20,2012	A	A	R	Brown	Solid/ Fine Sediments	Clear	Slight Snakes	N	Slight Raccoon	N	Tracks	C	R	C
	August 24, 2012	A	A	N	Brown	Sludge/ Fine Sediments	Clear/Debris	N	N	Large Feral Hogs	N	Tracks	AB	C	R
Naoniche 10	July 20,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Large Livestock	N	Tracks/Fecal	N	R	N
	August 24, 2012	A	A	N	Brown	Fine Sediments	Clear/Scum/ Debris	N	N	Slight Feral Hogs/ Moderate Domestic Pet/Large Livestock	N	Tracks	N	N	N

**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations					Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
Naconiche 11 (20843)	July 20,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Slight	N	Tracks	R	N	C
	August 24, 2012	A	A	R	Brown	Solid/ Fine Sediments	Clear/ Scum/Debris	N	N	Slight Domestic Pet /Large Livestock	N	Tracks	R	R	R
West 1	July 22,2012	R	A	N	Clear/ Brown	Fine Sediments	Clear	N	N	Moderate Wildlife, Livestock, Feral Hogs	N	Tracks/Fecal	C	C	N
	August 24,2012	A	A	N	Brown	Solid/ Fine Sediments	Clear	N	N	Moderate Wildlife/ Slight Feral Hogs/ Large Livestock	N	Tracks/Fecal	R	C	N
West 2	July 22,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Slight Wildlife, Feral Hogs	N	Tracks	C	N	N
	August 24,2012	N / A	N / A	N / A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N / A	N / A	N / A

**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations					Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
West 3	July 22,2012	A	C	N	Brown	Fine Sediments	Oil sheen	N	N	Slight Wildlife, Feral Hogs	N	Tracks	AB	AB	R
	August 24,2012	A	C	N	Brown	Fine Sediments	Oil	N	N	Slight Wildlife , Feral Hogs	N	Tracks	AB	AB	R
West 4	July 22,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Slight Wildlife, Moderate Livestock	N	Tracks/Fecal	R	N	N
	August 24,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Slight Wildlife/ Moderate Livestock	N	Tracks/Fecal	R	N	N
West 5	July 20,2012	A	A	N	Clear	Fine Sediments	Debris	Mod-erate Snakes	Slight Egrets	Slight Domestic, Feral Hogs/ Large Livestock	N	Tacks Fecal	N	R	N
	August 24,2012	A	A	N	Clear	Fine Sediments	Debris	Mod-erate Snakes	Slight	Slight Domestic Pets, Feral Hogs/ Large Livestock	N	Tracks/Fecal	N	R	N

**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations					Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
West 6 (20845)	July 20,2012	A	A	N	Brown	Fine Sediments	Clear	N	N	Slight Feral Hogs	N	Tracks	N	R	N
	August 24,2012	A	A	N	Brown	Fine Sediments	Clear	Slight Snakes	N	Slight Wildlife, Feral Hogs/ Large Livestock	N	Tracks/Fecal	N	R	N
Terrapin 1	July 20,2012	N / A	N / A	N / A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N / A	N / A	N / A
	August 24,2012	N / A	N / A	N / A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N / A	N / A	N / A
Terrapin 2	July 20,2012	A	A	N	Brown	Fine Sediments	Clear	Slight Snakes	N	Moderate Livestock/ Slight feral Hogs	N	Tracks/ Fecal	N	N	N
	August 24,2012	A	A	N	Brown	Fine Sediments	Clear	Slight Snakes	N	Moderate Livestock/ Slight feral Hogs	N	Tracks/Fecal	N	N	N
Terrapin 3	July 20,2012	A	A	N	Brown	Fine Sediments	Clear	N	Slight wood ducks	Large Beavers Feral Hogs	N	Tacks/ Dams	N	N	N

**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics					Wildlife Observations					Stream Garbage			
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
	August 24,2012	Site Flooded From Large Presence of Beavers													
Terrapin 4 (16084)	July 20,2012	A	A	N	Brown	Fine Sediments	Oil sheen under bridge	N	Moderate	N	N	Tracks/ Feathers	N	N	N
	August 24,2012	A	A	N	Brown	Fine Sediments	Clear / Oil sheen under bridge	N	Moderate	N	N	N/A	N	N	N
Waffelow 1	July 22,2012	A	A	N	Brown	Fine Sediments	Clear	Slight Snakes	N	Large Livestock	N	Tracks/ Observed	AB	R	R
	August 24, 2012	A	A	N	N/A	Fine Sediments	N/a	N	N	N	N	N/A	N	N	N
Waffelow 2	July 20,2012	A	A	N	Green/ Brown	Fine Sediments	Scum	N	N	Slight Feral Hogs	N	Tracks/ Fecal	N	N	N
	August 24,2012	A	A	N	Green/Brown	Fine Sediments	N/A	N	N	Slight Feral Hogs	N	Tracks/Fecal	N	N	N
Waffelow 3 (16083)	July 20,2012	R	R	N	Green/Brown	Fine Sediments	Scum	N	N	Moderate Beavers, Livestock, Feral Hogs	Slight	Known	C	C	N
	August 24,2012	Site Flooded From Large Presence of Beavers & Alligator at the start point													
Big Iron Ore 1	July 21,2012	R	A	N	Brown	Fine Sediments	Clear	N	Slight	Large Beavers/ Moderate Feral Hogs		Tracks/Fecal/ Dam	N	N	N
	August 25,2012	Site Flooded From Large Presence of Beavers													



**Table 4.6** Continued (Abbreviation Key: A: Absent; AB: Abundant; N: None; R: Rare; C: Common)

Site	Survey Date	Water Aesthetics						Wildlife Observations					Stream Garbage		
		Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Alligators	Evidence	Large in Channel	Small in Channel	Bank
Big Iron Ore 2	July 21,2012	R	A	N	Brown	Fine Sediments	Clear	N	N	Moderate Raccoon/ Feral Hogs/ Beavers	N	Tracks	N	N	N
	August 25,2012	R	A	N	Brown	Fine Sediments	Clear	N	N	Moderate Wildlife/ Feral Hogs	N	Tracks	N	N	N
Big Iron Ore 3	July 21,2012	A	A	N	Clear	Fine Sediments	Clear	N	Moderate	Moderate Wildlife	N	Tracks/Fecal	N	N	N
	August 25,2012	A	A	N	Clear	Fine Sediments	Clear	N	Moderate	Moderate Wildlife	N	Tracks/Fecal	N	N	N
Big Iron Ore 4	July 21,2012	A	A	N	Clear	Fine Sediments	Clear	N	N	Slight Wildlife, Feral Hogs	Slight	Tracks/Fecal	N	N	N
	August 25,2012	A	A	N	Clear	Fine Sediments	Clear	N	N	Slight Wildlife, Feral Hogs	Slight	Tracks/Fecal	N	N	N
Big Iron Ore 5 (20844)	July 21,2012	A	A	N	Clear	Fine Sediments	Clear	N	Slight	Moderate Wildlife, Feral Hogs	N	Tracks/ Fecal	N	N	N
	August 25,2012	A	A	N	Clear	Fine Sediments	Clear	N	Slight	Moderate Wildlife, Feral Hogs	N	Tracks/Fecal	N	N	N

## Chapter 4 : Physical Description of Sites

### *Attoyac Bayou (Segment 0612)*

#### **Physical Description of Site Attoyac 1**

Attoyac Bayou at site Attoyac 1 was surveyed on July 21 and August 24, 2012. The site is accessible from the Farm to Market (FM) 95 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned. Stream channel access is moderately difficult due to the steep access points from FM 95. During both surveys, the stream channel was completely dry, providing no opportunity for recreational activities. Staff from SFASU and CES were unable to access a 300 meter reach of the stream channel due to excessively dense vegetation which covered the dry stream bed. Photogroup 4-1 illustrates the appearance of the stream at site Attoyac 1.

#### **Physical Description of Site Attoyac 2**

Attoyac Bayou at site Attoyac 2 was surveyed on July 21 and August 24, 2012. This site is accessible from the County Road (CR) 3122 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned. Stream channel access was moderately easy due to a gently sloping area near the CR crossing, despite thick ground vegetation. During Survey 1, substantial pools were present within the stream channel. Portions of dry, exposed stream bed were visible, and no flow was present. Survey 2 found the stream channel completely dry. The banks along the stream channel were relatively steep and denuded with large tree roots exposed, as illustrated by photographs in Photogroup 4-2. During Survey 1, SFASU and CES staff observed a slight presence of snakes (water moccasins) and a moderate presence of feral hogs in the form of wallows and tracks in the stream channel, as described in Table 4-6.

This sight is used for illegal dumping as the stream channel is riddled with bags of household garbage, appliances, tires, and a variety of other items. A selection of these illegally discarded items is displayed in Photogroup 4-2. These items were abundant throughout the 300 meter reach of the survey.

The left bank of the stream had recently been harvested for timber, leaving no streamside management zone (SMZ). Large branches and several trees were found across the stream channel.

No signs of recreational use or further access points were evident within the 300 meter reach of the survey. Even if stream flow were present, it is doubtful that individuals would use the site for primary contact recreation or secondary contact recreation 1 as a result of the privately owned banks and illegal dumping in the channel.

#### **Physical Description of Site Attoyac 3**

Attoyac Bayou at site Attoyac 3 was surveyed on July 21 and August 25, 2012. This site is accessible from the County Road (CR) 3181 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned. Stream channel access was difficult due to the steep, eroded bank adjacent to the CR crossing and the poison ivy which covered the bank.

Litter in the form of bottles, appliances, and general household refuse was abundant in the stream channel during survey 2. It is possible that a portion of the litter was submerged during Survey 1, while some had been deposited since the initial survey. During Survey 1, the 300 meter reach was wadeable, although quite low with an average depth at thalweg of 0.37 m and a total discharge of 0.2 cfs. During Survey 2, the stream was dry with no substantial pools. Large woody debris and thick vegetation was prevalent in the stream channel and along the adjacent banks, making it difficult for anyone to access from the adjacent privately owned lands.

No signs of recreational use were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel, potential bank access, and water surface characteristics of site Attoyac 3 is illustrated in Photogroup 4-3.

#### **Physical Description of Site Attoyac 4**

Attoyac Bayou at site Attoyac 4 was surveyed on July 21 and August 25, 2012. This site is accessible from the Farm to Market (FM) 1971 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned.

Stream channel access was moderately easy due to the gently sloping bank that extends from the FM 1971 crossing to the stream channel. A substantial pool was located directly under the FM 1971 bridge, and another was located approximately 30 meters upstream. Large portions of dry stream bed were exposed, and no flow was present. The bottom deposits of the pools were sludge, and odor was common. A beaver dam which retained a large pool of stagnant water was also present at approximately 40 meters upstream. Staff from CES and SFASU made the decision not to traverse the entire 300 meters due safety concerns. Multiple water moccasins were seen in the stream channel and within the debris of the beaver dam.

A crocheted blanket which was not present during Survey 1 was spread out on the stream bank next to the County Road (CR) 1971 bridge crossing with an animal carcass lying on top of it during Survey 2 in August 2012. Photogroup 5-7 documents these indications of possible recreational activity.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 4 is illustrated in Photogroup 4-4.

#### **Physical Description of Site Attoyac 5**

Attoyac Bayou at site Attoyac 5 was surveyed on July 21 and August 25, 2012. This site is accessible from the US Highway 84 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned.

Stream channel access was difficult due to extremely dense vegetation lining both left and right banks at the downstream access point. Further downstream, vegetation was less thick in certain areas, and gently sloping banks provided relatively easy access to the stream channel. Woody debris (large and small) was prevalent under the water surface as well as on the surface of the stream channel. The amount of woody debris under the water surface made walking the required 300 meter survey length difficult. Dense layers of organic material from the canopy along the water's edge also made walking difficult as surveyors commonly sunk up to their knees in debris. Furthermore, the upstream portion of the stream channel accessible from US Highway 84 is fenced with high irrigation fencing, preventing anyone from venturing upstream. No flow was present during either survey in July or August. Despite the lack of flow, the stream was wadeable and there was enough water present to support primary contact recreation during both surveys.

No signs of recreational use or further access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 5 is illustrated in Photogroup 4-5.

#### **Physical Description of Site Attoyac 6**

Attoyac Bayou at site Attoyac 6 was surveyed on July 21 and August 25, 2012. This site is accessible from the County Road (CR) 4760 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned.

Access to the stream channel was moderately difficult due to the steep, eroded nature of the upstream left and right banks adjacent to the CR crossing. In many areas, the banks were gently sloping but covered by dense vegetation or woody debris, making potential channel access difficult. Woody debris under the water surface and in the stream channel was prevalent. Near the 300 meter point of the study area, the right bank opens up to pastureland, and portions of the bank are eroded due to heavy cattle use. The access point used by livestock is illustrated in photogroup 4-6. Total discharge during Survey 1 was 0.18 cfs, and no flow was present during Survey 2. The stream channel was composed of three substantial pools and large portions of dry, exposed stream bed during Survey 2. During both surveys, the stream channel was wadeable and there was sufficient water to support contact recreation.

There were no signs of recreational use or further human access within the 300 meter reach of the survey area.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 6 is illustrated in Photogroup 4-6.

**Physical Description of Site Attoyac 7**

Attoyac Bayou at site Attoyac 7 was surveyed on July 21 and August 25, 2012. This site is accessible from the US Highway 59 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned.

Access to the stream bank is moderately easy due to the gently sloping nature of the bank which leads to the stream channel and the availability of a small, unmarked road directly off of Hwy 59 which individuals use to access the stream bank.

The reach of the survey area was unwadeable due to excessive depth of well over 1 meter. In accordance with RUAA procedure regarding unwadeable streams, average widths of the stream channel were taken at 30 meter transects over the 300 meter survey reach. The widths are documented in Table 4-5. Flow was also unmeasurable due to excessive depth.

It is obvious that individuals access this site. The stream bank is littered with food wrappers as well as beer/soda bottles. Signs of fishing in the form of old fishing lines, fish carcasses, and fish bait containers are present. Also present is a well-established foot path that leads from the Hwy 59 crossing to further upstream along the stream bank. Several areas along this path contain concentrations of indicators of human use in the form of litter. Photogroup 5-8 documents these indications of recreational activity.

The stream channel banks are very steep in most areas along the foot path, making it difficult to physically access the stream; however, in at least one spot, the bank gently slopes in a manner which makes physical access to the water much easier.

At approximately 150 meters, the foot path ends at a deep secondary channel which branches off the primary channel of the Attoyac. Across the ravine, the bank opens into pastureland; heavy livestock use is evident. Staff from SFASU and CES walked along the ravine in an attempt to find an accessible point at which to cross, but were unable to do so as the ravine banks were very steep. Cattle have access to the channel and fecal matter was present along the stream bank.

Hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 7 is illustrated in Photogroup 4-7.

**Physical Description of Site Attoyac 8**

Attoyac Bayou at site Attoyac 8 was surveyed on July 21 and August 25, 2012. This site is not publicly accessible as County Road 294 is now defunct, and what was once a public road is now fenced and gated. In order to access the Attoyac Bayou stream channel, SFASU and CES staff obtained landowner permission and passed through three separate gates. The land surrounding the access point is fenced and privately managed for livestock grazing. An accessible public road is no longer maintained by the county.

The banks of the stream channel were very steep and covered with thick vegetation throughout the survey reach. The total discharge during Survey 1 was 1.38 cfs, and there was no measurable

flow during Survey 2. During Survey 2, the stream channel was composed of substantial pools with portions of dry streambed exposed. Woody debris was present under the surface of the water as well as across the stream channel. The stretch of the survey area was wadeable and maintained sufficient water to support primary contact recreation.

At approximately 150 meters, the stream bank opens up to pastureland and a camp house is present on the bank. The house appears to be used only seasonally, and is not for year round residence. Despite the presence of the camp house and pastureland, there was no evidence of human or livestock use in the actual stream channel, most likely due to the steep nature of the banks which inhibit access.

Near the 300 meter point of the survey area, CES and SFASU staff encountered an extensive log jam which prohibited further safe access downstream. Due to the steep nature of the left bank, the densely vegetated nature of the right bank, and safety concerns regarding traversing the extensive log jam, the survey crew made the decision to end the stream survey at that point. Photos of the log jam are presented in Photogroup 4-8.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 8 is illustrated in Photogroup 4-8.

#### **Physical Description of Site Attoyac 9**

Attoyac Bayou at site Attoyac 9 was surveyed on July 21 and August 25, 2012. This site is not publicly accessible, and requires a 15-20 minute hike through densely wooded, gated, private property to access the Attoyac Bayou stream channel.

The channel banks range from very steep to gently sloping, with a heavily forested riparian zone on both banks throughout the survey area. The stream is wadeable throughout the 300 meter reach. The total discharge during Survey 1 was too insignificant to register data using the Marsh McBirney flow meter. During Survey 2, there were substantial pools present with no flow and portions of dry stream bed exposed. Large woody debris are present throughout the stream channel as are signs of feral hog use in the form of tracks and wallows.

No signs of recreational use or access points were present within the 300 meter survey reach.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 9 is illustrated in Photogroup 4-9.

#### **Physical Description of Site Attoyac 10**

Staff of SFASU and CES were unable to conduct a RUAA survey at Attoyac Bayou site 10. The landowner who owns all adjacent banks withdrew previously granted permission and expressed the desire to not have the survey conducted near his property.

As a result, Photogroup 4-10 was not developed.

### **Physical Description of Site Attoyac 11**

Attoyac Bayou at site Attoyac 11 was surveyed on August 24, 2012. Staff from SFASU and CES were unable to obtain permission from the landowner prior to the initial survey in July. This site is not publicly accessible, and is located on gated and fenced property that is managed for grazing livestock. To access the survey site, staff from CES and SFASU crossed through a locked gate and drove approximately .5 miles through open pastureland to reach the stream. Once at the streamside, staff had to cross through a barbed wire fence constructed by the landowner in order to prevent cattle from degrading the stream bank.

The survey reach was wadeable due to its composition of substantial pools; no flow was present.

The banks within the survey reach are densely vegetated and range from steep to a gently sloping incline. The banks at the water's edge are extremely difficult to walk along due to the primary substrate of organic matter that is sludge-like. A foul odor was common throughout the survey. There is a heavy presence of large woody debris across and within the stream channel as well as along the stream banks. In one area of the survey stretch, a large amount of small litter had collected at a log jam. Two large items of litter (a TV and a bucket) were also present in the channel. It appears that much of the litter likely washed in from upstream.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 11 is illustrated in Photogroup 4-11.

### **Physical Description of Site Attoyac 12**

Attoyac Bayou at site Attoyac 12 was surveyed on July 22 and August 24, 2012. This site is accessible from the Farm to Market (FM) 138 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned.

Bank access is difficult due to the steep nature of the banks at the access point. The stream banks within the survey reach are densely vegetated and range from steep to gently sloping in nature. Thick layers of organic matter from the canopy composed the substrate along the water's edge, making it difficult to walk and producing a foul odor. A few large items (tire, kitchen sink) have been dumped from the FM 138 bridge crossing. Large woody debris in the stream channel is common. During Survey 1, the total discharge was 1.18 cfs. During Survey 2, the stream channel was composed of substantial perennial pools with dry portions of the stream bed exposed.

One set of human footprints were found on the right bank under the FM 138 bridge crossing during Survey 2. Graffiti was also present under the bridge. These items are depicted in Photogroup 4-12. There did not appear to be any additional human access points past the FM 138 crossing. Human foot prints were observed along the stream bank underneath the highway bridge crossing. Photogroup 5-9 documents these indications of potential recreational activity.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 12 is illustrated in Photogroup 4-12.

### **Physical Description of Site Attoyac 13**

Attoyac Bayou at site Attoyac 13 was surveyed on July 22 and August 25, 2012. This site is not publicly accessible, and is located on gated and fenced property. Access to the stream is over 1.0 mile away from the primary gated access point.

Access to the stream channel is moderately easy as there is a mowed corridor used by the landowners near the stream and a portion of the bank which slopes gently to the stream bed. Within the survey range, the stream banks range from gently sloping to very steep. Large woody debris across and within the stream channel is common. Major portions of the channel within the stream reach are composed of denuded banks and exposed tree roots. During Survey 1, the stream was wadeable and contained at least one substantially deep pool within the contiguous stream; the total discharge was 1.98 cfs. During Survey 2, the stream was wadeable but composed of substantial pools with no flow and portions of exposed stream bed were present. During Survey 2, signs of feral hog use within the stream channel were also more prevalent.

No other access points were present within the 300 meter reach. According to the landowner, he and his two children occasionally walk or wade down the streambed, but they do not swim or immerse their bodies in the water.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 13 is illustrated in Photogroup 4-13.

### **Physical Description of Site Attoyac 14**

Attoyac Bayou at site Attoyac 14 was surveyed on July 22 and August 25, 2012. This site is not publicly accessible, and is located on gated and fenced property. Access to the stream is over 1.0 miles away from the primary gated access point.

Access to the stream channel is difficult due to the dense vegetation and steep banks. Furthermore, CES and SFASU staff made the decision to not physically access the stream channel due to the known presence of an alligator within the survey reach. Photos of said alligator taken by the landowner are provided in Photogroup 4-13.

During Survey 1, no exact stream depth measurements were taken, but the stream did contain enough water to support primary contact recreation and appeared wadeable in most portions of the survey reach. The total discharge was 1.35 cfs. Stream width measurements were estimated at each 30 meter transect of the 300 meter reach. During Survey 2, the stream channel was composed of substantial perennial pools with no flow. A film was present on the water surface. Large woody debris within the stream channel was prevalent during both surveys.



There was no evidence of recreational use or human access points present during either survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 14 is illustrated in Photogroup 4-14.

#### **Physical Description of Site Attoyac 15**

Attoyac Bayou at site Attoyac 15 was surveyed on July 20 and August 24, 2012. This site is accessible from the Texas State Highway 7 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned.

Access to the stream channel is moderately easy from the public road crossing. Banks range from gently sloping and heavily vegetated at the access point to steep and denuded featuring exposed tree roots further downstream. Total discharge during Survey 1 was 8.61 cfs, and the total discharge during Survey 2 was 0.49 cfs. Large woody debris across and within the stream channel are common. The stream is perennial and maintained wadeability and sufficient water for primary contact recreation during both surveys.

Human foot prints were observed along the bank underneath the highway bridge crossing. Photogroup 5-10 documents these indications of possible recreational activity. survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 15 is illustrated in Photogroup 4-15.

#### **Physical Description of Site Attoyac 16**

Attoyac Bayou at site Attoyac 16 was surveyed on July 21 and August 24, 2012. This site is not publicly accessible, and is located on fenced property at the end point of a very poorly maintained county road that is rarely used according to the landowner.

Access to the stream channel is difficult due to the steep banks at the access point as well as its location at the end of the poorly maintained county road. Banks within the survey reach range from gently sloping and heavily vegetated to steep and denuded featuring exposed tree roots. Woody debris was present in the stream channel, although the water surface remained relatively clear throughout the survey reach. The total discharge during Survey 1 was 11.01 cfs, and the total discharge during Survey 2 was 1.61 cfs. The perennial stream maintained wadeability and sufficient water for primary contact recreation during both surveys.

In a separate interview, the landowner confirms that fishing from a small boat or from the bank does occasionally take place. There appeared to be no regularly used human access points within the 300 meter survey reach.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 16 is illustrated in Photogroup 4-16.

#### **Physical Description of Site Attoyac 17**

Attoyac Bayou at site Attoyac 17 was surveyed on July 21 and August 25, 2012. This site is accessible from the County Road (CR) 392 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned.

Access to the stream channel is difficult due to the steep nature of the bank at the access point. Banks within the survey reach remain steep and heavily vegetated throughout the 300 meter reach. Woody debris across and within the stream channel was common. Total discharge during Survey 1 was 17.7 cfs, while the total discharge during Survey 2 was 2.84 cfs. The perennial stream maintained wadeability and sufficient water for primary contact recreation during both surveys.

Evidence of recreational use was found in the form of a discarded trot line/set hook attached to a tree on the right bank. There appeared to be no other human access points other than the CR 392 crossing within the 300 meter survey reach. Photogroup 5-11 documents these indications of recreational activity.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 17 is illustrated in Photogroup 4-17.

#### **Physical Description of Site Attoyac 18**

Attoyac Bayou at site Attoyac 18 was surveyed on July 21 and August 25, 2012. This site is accessible from the Texas State Hwy 21 public road crossing of the Attoyac Bayou; both adjacent stream banks are privately owned.

A small, unmarked road branches off of Hwy 21 and leads to the left bank of the stream where a small, rudimentary boat launch is available. Access to the stream channel itself is difficult due to the steep, heavily vegetated nature of the banks at the access point.

Evidence of human bank use is present in the form of litter (beer cans, soda bottles) as well as graffiti throughout the underside of the left bank portion of the Highway 21 bridge crossing.

Banks remain relatively steep and heavily vegetated throughout the 300 meter survey reach, although certain portions of both left and right bank slope more gently in some areas. During Survey 1, the total discharge was 21.39 cfs, while during Survey 2 the total discharge was 2.76 cfs. The perennial stream maintained wadeability and sufficient water for primary contact recreation during both surveys.

There appeared to be no other human access points other than the Hwy 21 crossing within the 300 meter survey reach.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Attoyac 18 is illustrated in Photogroup 4-18.



**Photogroup 4-1** Attoyac 1 depicting general appearance of the site from public access point, FM 95. Top left: 0-m transect, downstream view, stream channel with dense vegetation, July 2012; Top center: 0-m transect, downstream view, August 2012; Top right: 0-m transect, downstream view July 2012.



**Photogroup 4-2** Attoyac 2 depicting general appearance of the site. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, July 2012; Top center: 30-m downstream, July 2012; Top right: 90-m transect, downstream, July 2012; Middle left: 300-m transect, upstream, July 2012; Middle right: large woody debris, July 2012; Bottom left: large channel litter, July 2012; Bottom right: 300-m transect, upstream, August 2012.



**Photogroup 4-2** Attoyac 2 depicting general bank appearance and stream access point. All individuals featured are SFASU and CES staff. Top left: 0-m transect, downstream bank, July 2012; Top center: 150-m transect, downstream, July 2012; Top right: 150-m transect, upstream, August 2012. Bottom left: Stream access point from CR 3122, July 2012; Bottom right: 30-m transect, downstream, August 2012.



**Photogroup 4-2** Attoyac 2 depicting potential sources of contamination. Top left: Livestock fecal, August 2012. Top right: Livestock tracks in channel, August 2012; Bottom: Feral hog wallow, July 2012.



**Photogroup 4-3** Attoyac 3 depicting general stream appearance. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top center: 150-m transect, upstream, August 2012; Top right: 30-m transect, July 2012; Bottom Left: 150-m transect, downstream, July 2012. Bottom right: 300-m transect, upstream, July 2012.



**Photogroup 4-3** Attoyac 3 depicting bank access and general bank appearance. All individuals featured are SFASU and CES staff. Top left: Large channel litter against left bank, August 2012; Top center: 150-m transect, left bank, July 2012; Top right: 30-m transect, downstream, August 2012; Bottom left: 150-m transect, upstream, July 2012; Bottom right: Stream access point from CR 3181.





**Photogroup 4-3** Attoyac 3 Depicting water surface characteristics further stream features. Top left Raccoon tracks, August 2012; Top right: Large litter in channel (tire), July 2012; Middle left: 300-m transect, upstream, August 2012; Middle right: 300-m transect, downstream, July 2012; Bottom: Water Moccasin in channel, July 2012.



**Photogroup 4-4** Attoyac 4 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: Pool at access point, July 2012; Middle right: Beaver dam, upstream, July 2012. Bottom: Water Moccasin in pool, July 2012.



**Photogroup 4-4** Attoyac 4 depicting access point and general bank appearance. Top left: 0-m transect, left bank, July 2012; Top right: 30-m transect, right bank, August 2012; Bottom left: Fence on Right bank, August 2012; Bottom Right: Stream access point from FM 1971, July 2012.



**Photogroup 4-5** Attoyac 5 (20842) depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right, Large woody debris, July 2012; Bottom left: 30-m transect, downstream, August 2012; Bottom center: 150-m transect, upstream, August 2012; Bottom right: 150-m transect, downstream, July 2012.



**Photogroup 4-5** Attoyac 5 (20842) depicting stream banka access and general bank appearance. Top left: Upstream channel fenced, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: 300-m transect, rightbank, August 2012; Middle right: 30-m transect, rightbank; Bottom: 0-m transect, stream access from Hwy 84; August 2012.



**Photogroup 4-5** Attoyac 5 (20842) depicting stream surface characteristics. All individuals featured are SFASU and CES staff. Top left: 150-m, downstream, August 2012; Top center: 300-m, upstream, July 2012; Top right: Large woody debris, July 2012; Bottom left: 300-m, downstream, August 2012; Bottom right: Large woody debris, July 2012.



**Photogroup 4-6** Attoyac 6 depicting general stream characteristics. Top left: 30-m, downstream, July 2012; Top right: 150-m, upstream, July 2012; Middle left: 300-m, upstream, August 2012; Middle right: 30-m, downstream, August 2012; Bottom left: 30-m, upstream, August 2012; Bottom right: 300-m downstream, August 2012.



**Photogroup 4-6** Attoyac 6 depicting bank access and general bank appearance. All individuals featured are SFASU and CES staff. Top left: 150-m, downstream, July 2012; Top right: 300-m, right bank, August 2012; Middle: 30-m, left bank, August 2012; Bottom left: CR 4760 crossing, August 2012; Bottom right: 0-m, Bank access from CR 4760 crossing, July 2012.





**Photogroup 4-6** Attoyac 6 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: Large woody debris in channel, July 2012; Top right: Woody debris and aquatic vegetation, July 2012; Middle left: 150-m transect, downstream, July 2012; Middle right: Large woody debris, July 2012; Bottom: Large channel litter (tires), July 2012.



**Photogroup 4-6** Attoyac 6 depicting potential contamination sources. Top left: Livestock access bank access, July 2012; Top right: Livestock fecal, August 2012; Bottom left: Livestock fecal, August 2012; Bottom right: 0-m transect, animal carcass, August 2012.



**Photogroup 4-7** Attoyac 7 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 150-m, downstream, July 2012; Top center: 30-m downstream, July 2012; Top right: 150-m, downstream, August 2012; Middle: 150-m, upstream, August 2012; Bottom left: 150-m, upstream, July 2012; Bottom right: Establish trail along left bank, August 2012.



**Photogroup 4-7** Attoyac 7 depicting bank access and general bank appearance. All individuals featured are SFASU and CES staff. Top left: Stream access point from Hwy 59, July 2012; Top right: 30-m, right bank, July 2012; Middle left: 150-m, right bank, August 2012; Middle right: 30-m, upstream, August 2012; Bottom: 30-m, upstream, July 2012.



**Photogroup 4-7** Attoyac 4-7 depicting water surface characteristics and potential sources of contamination. Top left: Large woody debris, August 2012; Top right: Aquatic vegetation, August 2012; Middle left: Livestock use, left bank, July 2012; Middle right: Livestock use, left bank, July 2012; Bottom left: Livestock fecal, July 2012; Bottom right: Livestock fecal and tracks, July 2012.



**Photogroup 4-8** Attoyac 8 depicting general stream characteristics. Top left: 150-m, upstream, July 2012; Top center: 300-m, downstream, August 2012; Top right: 30-m, downstream, July 2012; Middle left: Dry stream channel, August 2012; Middle right: Upstream from major logjam; July 2012; Bottom: 30-m, upstream, August 2012.



**Photogroup 4-8** Attoyac 8 depicting bank access and general bank appearance. Top left: 150-m, leftbank, August 2012; Top right: 150-m; right bank, July 2012; Middle left: Large woody debris, July 2012; Middle right: Camp house on left bank, July 2012; Bottom: Defunct CR 294.



**Photogroup 4-8** Attoyac 8 depicting stream surface characteristics and potential sources of contamination. Top left: Pool with scum, August 2012; Top right: Feral hog use, August 2012; Middle left: 150-m, downstream, July 2012; Middle right: Channel litter, July 2012; Bottom: Downstream logjam, July 2012.





**Photogroup 4-9** Attoyac 9 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m, left bank, July 2012; Top right: 150-m, downstream, July 2012; Middle left: 30-m, downstream, July 2012; Middle center: 150-m, upstream, July 2012; Middle right: 300-m, downstream, July 2012; Bottom: Large woody debris, July 2012.



**Photogroup 4-9** Attoyac 9 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: 300-m, left bank, July 2012; Top right: Large woody debris, July 2012; Middle left: 30-m, upstream, August 2012; Middle right: 150-m, right bank, July 2012; Bottom: 300-m, upstream, July 2012.



**Photogroup 4-9** Attoyac 9 depicting general water surface appearance and potential sources of contamination. All individuals featured are SFASU and CES staff. Top left: Large woody debris, August 2012; Top right: 150-m, downstream, August 2012; Middle left: Feral hog track, August 2012; Middle right: Feral hog use; Bottom left: Feral hog wallow, August 2012; Bottom right: Feral hog tracks, August 2012.



**Photogroup 4-10** Attoyac 11 depicting general stream appearance. All individuals featured are SFASU and CES staff. Top left: 150-m, downstream, August 2012; Top right: 30-m, downstream, August 2012; Middle left: 150-m, upstream, August 2012; Middle right: 30-m, upstream, August 2012; Bottom left: 300-m, upstream, August 2012; Bottom right: 300-m, downstream, August 2012.



**Photogroup 4-10** Attoyac 11 depicting general bank access and water surface appearance. All individuals featured are SFASU and CES staff. Top left: Large woody debris, August 2012; Top right: 150-m, right bank, August 2012; Middle left: Woody debris in channel, August 2012; Middle right: Aquatic vegetation, August 2012; Bottom left: Gated site access, August 2012; Bottom right: Fenced stream bank, August 2012.



**Photogroup 4-11** Attoyac 12 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m, downstream, July 2012; Top right: 150-m, downstream, July 2012; Middle left: 300-m, upstream, July 2012; Middle right: 300-m, upstream, August 2012; Bottom: 30-m, downstream, August 2012.



**Photogroup 4-11** Attoyac 12 depicting general bank access and bank appearance. Top left: FM 138 stream crossing, August 2012; Top right: Stream channel access with visible use, July 2012; Middle left: Large channel litter (tire and metal objects) under FM 138 crossing, July 2012; Middle right: 300-m, right bank, August 2012; Bottom left: 150-m, left bank, July 2012; Bottom right: 150-m, right bank, August 2012.



**Photogroup 4-11** Attoyac 12 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: Large woody debris, August 2012; Top right: Dense organic material as substrate, July 2012; Bottom left: 300-m downstream with scum, August 2012; Bottom right: Channel litter (bathroom sink), August 2012.





**Photogroup 4-12** Attoyac 13 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m, downstream, July 2012; Top middle: 150-m, upstream, July 2012; Top right: 30-m, downstream, August 2012; Bottom left: 300-m, downstream, July 2012; Bottom right: 300-m, downstream, August 2012.



**Photogroup 4-12** Attoyac 13 depicting general bank appearance. Top left: 150-m, upstream, August 2012; Top right: 30-m, left bank, August 2012; Bottom left: 300-m, left bank, July 2012; Bottom right: 150-m, left bank, July 2012.



**Photogroup 4-12** Attoyac 13 depicting water surface appearance and potential sources of contamination. Top left: Large woody debris, July 2012; Top right: 300-m, upstream, July 2012; Middle left: 300-m, upstream, August 2012; Middle right: Woody debris, August 2012; Bottom left: Feral hog use, August 2012; Bottom right: Feral hog use, August 2012.



**Photogroup 4-13** Attoyac 14 depicting general stream characteristics. Top left: 30-m transect, downstream, August 2012; Top right: 300-m transect, downstream, August 2012; Middle left: 30-m transect, July 2012; Middle right: 30-m transect, downstream, July 2012; Bottom: 150-m transect, downstream, July 2012.



**Photogroup 4-13** Attoyac 14 depicting general bank appearance. Top left: 300-m transect; upstream, July 2012; Top center: Woody debris along banks; Top right: 300-m transect, left bank, July 2012; Bottom left: 150-m transect, upstream, August 2012; Bottom right: 150-m transect, left bank, August 2012.



**Photogroup 4-13** Attoyac 14 depicting water surface characteristics. Top left: Log jam, August 2012; Top right: 30-m transect, upstream, July 2012; Bottom left: 300-m transect; downstream, August 2012, Bottom right: Photograph of alligator within survey area provided by landowner, taken 2011.



**Photogroup 4-14** Attoyac 15 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: 150-m transect, downstream, July 2012; Middle right: 300-m transect, upstream, July 2012; Bottom: 150-m transect, downstream, August 2012.



**Photogroup 4-14** Attoyac 15 depicting general bank appearance. Top left: 30-m transect, downstream, August 2012; Top right: 150-m transect, right bank, August 2012; Middle left: 300-m transect, left bank, August 2012; Middle right: 300-m, downstream, August 2012; Bottom left: 150-m transect, left bank, August 2012; Bottom right: 30-m transect, right bank, August 2012.





**Photogroup 4-14** Attoyac 15 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: 300-m transect, upstream, August 2012; Top right: 300-m, downstream, July 2012; Middle left: Stream width measurement, July 2012; Middle right: 150-m transect, upstream, July 2012; Bottom: Channel litter (tire), August 2012.



**Photogroup 4-15** Attoyac 16 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: 30-m transect, downstream, August 2012; Middle right: 150-m transect, upstream, July 2012; Bottom left: 30-m transect, upstream, August 2012; Bottom right: 150-m transect, downstream, August 2012.



**Photogroup 4-15** Attoyac 16 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: 150-m transect, left bank, August 2012; Top right: 150-m transect, right bank, August 2012; Middle left: 300-m transect, left bank, August 2012; Middle right: 150-m transect, left bank, July 2012; Bottom left: 300-m transect, downstream, July 2012; Bottom right: 300-m transect, upstream, August 2012.



**Photogroup 4-15** Attoyac 16 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: Adolescent Alligator, July 2012; Top right: 150-m transect, downstream, July 2012; Bottom left: 300-m transect, upstream, July 2012; Bottom right: Raccoon prints, August 2012.



**Photogroup 4-16** Attoyac 17 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 150-m transect, downstream, July 2012; Middle left: 150-m transect, upstream, July 2012; Middle right: 30-m transect, downstream, August 2012; Bottom left: 300-m transect, upstream, August 2012; Bottom right: 30-m transect, upstream, August 2012.



**Photogroup 4-16** Attoyac 17 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, July 2012; Top right: 30-m transect, left bank, July 2012; Middle left: 150-m transect, right bank, July 2012; Middle right: 300-m transect, left bank, July 2012; Bottom left: 30-m transect, right bank, August 2012; Bottom right: 30-m transect, left bank, August 2012.



**Photogroup 4-16** Attoyac 17 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: Large woody debris, August 2012; Top right: 300-m transect, left bank, August 2012; Middle left: 150-m transect, right bank, August 2012; Middle right: 300-m transect, downstream, July 2012; Bottom: 300-m transect, upstream, July 2012.



**Photogroup 4-17** Attoyac 18 depicting general stream appearance. All individuals featured are SFASU and CES staff. Top Left: 30-m transect, upstream, July 2012; Top right: 150-m transect, upstream, July 2012; Middle left: 300-m transect, upstream, July 2012; Middle right: 150-m transect, upstream, August 2012; Bottom left: 300-m transect, downstream, July 2012; Bottom right: 30-m transect, upstream, August 2012.





**Photogroup 4-17** Attoyac 18 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, left bank, July 2012; Middle left: 300-m transect, right bank, August 2012; Middle right: 150-m transect, left bank, August 2012; Bottom: 150-m transect, left bank, July 2012.



**Photogroup 4-17** Attoyac 18 depicting water surface appearance. Top left: 150-m transect, downstream, August 2012; Top right: 300-m transect, downstream, August 2012; Bottom left: 300-m, upstream, August 2012; Bottom right: 30-m, downstream, August 2012.

### **Physical Description of Site Big Iron Ore 1**

Big Iron Ore at site Big Iron Ore 1 was surveyed on July 21 and August 25, 2012. This site is accessible from the US Highway 21 public road crossing of the Big Iron Ore Creek; both adjacent stream banks are privately owned.

Access to the stream channel is easy due to the low, gently sloping nature of the banks at the access point. Bank vegetation is present but not an impediment to stream access. Banks within the survey reach remain low and moderately vegetated throughout the 300 meter reach. Woody debris across and within the stream channel was common. Total discharge during Survey 1 was 0.23 cfs, there was no flow present during Survey 2. During Survey 2, staff from SFASU and CES made the decision to not traverse the entire 300 meter stretch due to the stagnant nature of the water, presence of snakes at the access point, and flooded conditions at the site due to a downstream beaver dam. The perennial stream maintained wadeability and sufficient water for primary contact recreation during both surveys. At approximately 275 meters, a substantial beaver dam is present within the stream channel allowing only a small amount of water to flow through. Upstream from the dam, the creek is transformed into a pond due to the flow impediment, as illustrated in Photogroup 4-18.

Woody debris was prevalent in the stream channel and along the adjacent banks. No signs of recreational use or human access points other than the Hwy 96 crossing were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Big Iron Ore 1 is illustrated in Photogroup 4-18.

### **Physical Description of Site Big Iron Ore 2**

Big Iron Ore at site Big Iron Ore 2 was surveyed on July 21 and August 25, 2012. This site is accessible from the Farm to Market (FM) 3017 public road crossing of the Big Iron Ore Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately easy due to the low, gently sloping nature of the banks at the access point, however dense vegetation along both banks serves as a slight impediment to stream access. Banks within the survey range from low and gently sloping to moderately high and steep. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also common, making it difficult to traverse the channel at certain points. Total discharge during Survey 1 was 1.0 cfs while during Survey 2 the total discharge was 0.90 cfs. The perennial stream maintained wadeability and sufficient water for primary contact recreation during both surveys.

No signs of recreational use or human access points other than the FM 3017 crossing were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6,

correspondingly. The general appearance of the stream channel of site Big Iron Ore 2 is illustrated in Photogroup 4-19.

### **Physical Description of Site Big Iron Ore 3**

Big Iron Ore at site Big Iron Ore 3 was surveyed on July 21 and August 25, 2012. This site is accessible from the Farm to Market (FM) 711 public road crossing of the Big Iron Ore Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately easy due to the gently sloping nature of the banks at the access point, however dense vegetation along both banks serves as a slight impediment to stream access. Banks within the survey range from low and gently sloping to moderately high and steep. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also common. Total discharge during Survey 1 was 2.88 cfs while during Survey 2 the total discharge was 2.92 cfs. The perennial stream maintained wadeability and sufficient water for primary contact recreation during both surveys.

Boot prints were observed along the stream bank. Photogroup 5-12 documents these indications of recreational activity.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Big Iron Ore 3 is illustrated in Photogroup 4-20.

### **Physical Description of Site Big Iron Ore 4**

Big Iron Ore at site Big Iron Ore 4 was surveyed on July 21 and August 25, 2012. This site is not publicly accessible as it is located over 1 mile off of a county road on a separate logging road behind a fence and locked gate. Landowner permission was obtained in order to access the stream. The land surrounding the stream is leased for hunting.

Access to the stream channel is moderately difficult due to its location on private property and the moderately steep nature of the banks at the access point. Banks within the survey range from low and gently sloping to high and steep. Within the survey reach are several areas of wide, sandy banks that are prime areas for recreation; however, the dense vegetation which surrounds them on the property prevents access. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also common. Total discharge during Survey 1 was 4.03 cfs while during Survey 2 the total discharge was 0.93 cfs. The perennial stream maintained wadeability and sufficient water for primary contact recreation during both surveys.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Big Iron Ore 4 is illustrated in Photogroup 4-21.

**Physical Description of Site Big Iron Ore 5**

Big Iron Ore at site Big Iron Ore 5 was surveyed on July 21 and August 25, 2012. This site is accessible from the Farm to Market (FM) 354 public road crossing of the Big Iron Ore Creek; both adjacent stream banks are privately owned

Access to the stream channel is easy due to the gently sloping nature of the banks at the access point. Banks within the survey range from low and gently sloping to high, steep, and denuded. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also common. Total discharge during Survey 1 was 4.72 cfs while during Survey 2 the total discharge was 0.97 cfs. The perennial stream maintained wadeability and sufficient water for primary contact recreation during both surveys.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Big Iron Ore 5 is illustrated in Photogroup 4-22.



**Photogroup 4-18** Big Iron Ore 1 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, July 2012; Top right: 150-m transect, downstream, July 2012; Middle left: 150-m transect, upstream, July 2012; Middle right: 300-m transect, upstream, July 2012; Bottom: 300-m transect, left bank, July 2012.



**Photogroup 4-18** Big Iron Ore 1 depicting general bank appearance and water surface characteristics. 0-m transect, Highway 96 access point; Top right: 0-m transect, left bank, August 2012; Middle left: 150-m transect, left bank, July 2012; Middle right: 300-m transect, right bank, July 2012; Bottom left: Beaver dam; Bottom right: Woody debris.



**Photogroup 4-19** Big Iron Ore 2 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, July 2012; Top right: 150-m transect, upstream, July 2012; Middle left: 300-m, upstream, July 2012; Middle right: 150-m transect, downstream, August 2012; Bottom: 300-m transect, downstream, August 2012.

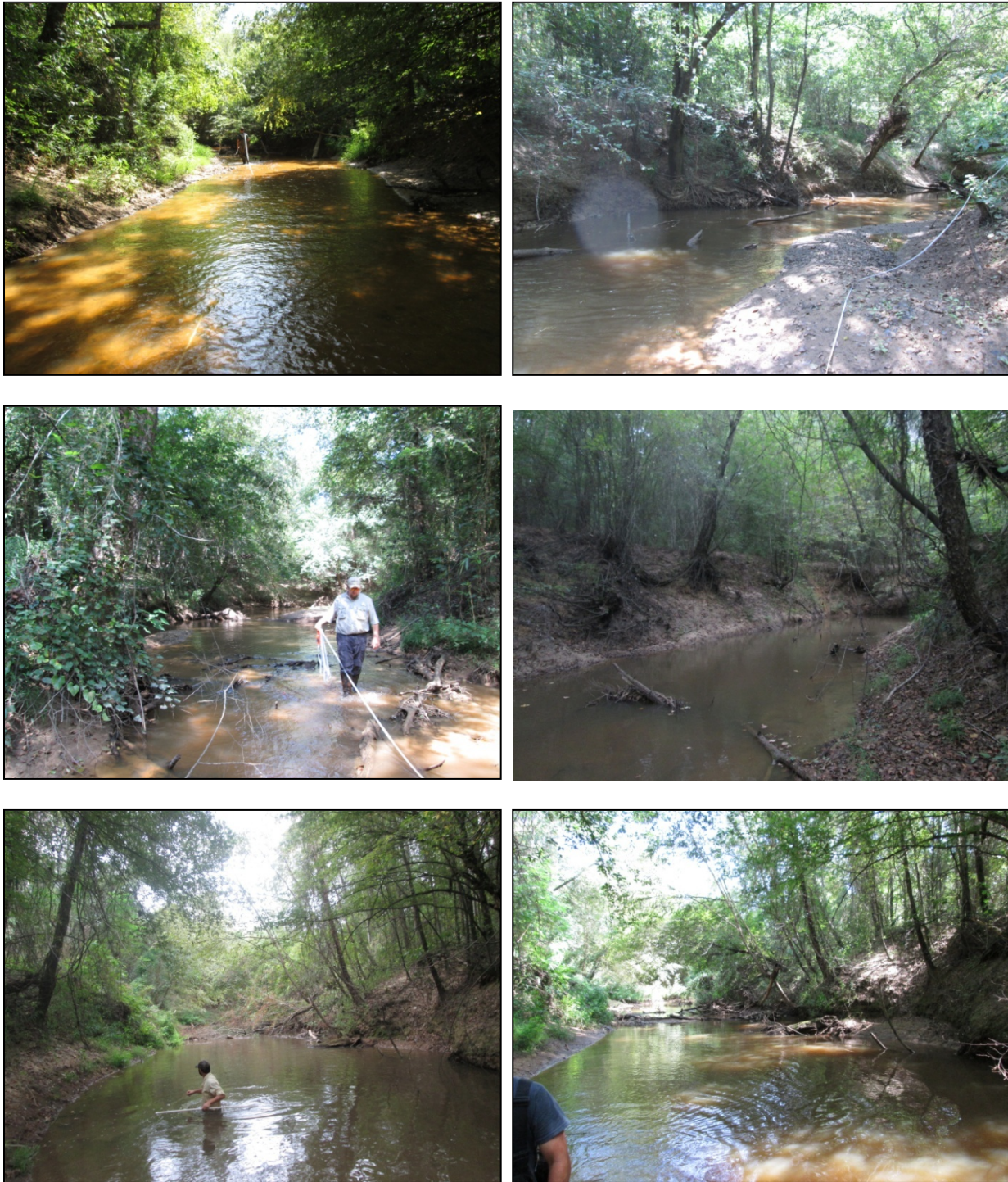




**Photogroup 4-19** Big Iron Ore 2 depicting general bank appearance. Top left: 30-m transect, right bank, July 2012; Top right: 30-m transect, downstream, August 2012; Middle left: 150-m transect, left bank, August 2012; Middle right: 30-m transect, left bank, August 2012; Bottom: 30-m transect, left bank, July 2012.



**Photogroup 4-19** Big Iron Ore 2 depicting water surface characteristics. Top left: Beaver dam; Top right: 30-m transect, downstream, July 2012; Bottom: 150-m transect, downstream, July 2012.



**Photogroup 4-20** Big Iron Ore 3 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 150-m transect, downstream, July 2012; Middle left: 150-m transect, upstream, July 2012; Middle right: 300-m transect, upstream, August 2012; Bottom left: 300-m transect, downstream, August 2012; Bottom right: 300-m transect, downstream, July 2012.



**Photogroup 4-20** Big Iron Ore 3 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, July 2012; Top right: 30-m transect, right bank, July 2012; Middle left: 150-m transect, right bank, July 2012; Middle right: 300-m transect, left bank, July 2012; Bottom left: 30-m transect, left bank, August 2012; Bottom right: 300-m transect, left bank, August 2012.



**Photogroup 4-20** Big Iron Ore 3 depicting water surface characteristics. Left: 150-m transect, upstream, August 2012; Right: Woody debris with foam.



**Photogroup 4-21** Big Iron Ore 4 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: 150-m transect, upstream, July 2012; Middle right: 30-m transect, downstream, August 2012; Bottom left: 150-m transect, downstream, August 2012; Bottom right: 300-m transect, upstream, July 2012.



**Photogroup 4-21** Big Iron Ore 4 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: 150-m transect, downstream, July 2012; Top right: 30-m transect, left bank, July 2012; Middle left: 30-m transect, left bank, August 2012; Middle right: 30-m transect, right bank, August 2012; Bottom: 300-m transect, downstream, July 2012.



**Photogroup 4-21** Big Iron Ore 4 depicting water surface characteristics. Top left: 150-m transect, upstream, August 2012; Top right: 300-m transect, downstream, August 2012; Middle left: 300-m transect, upstream, August 2012; Middle right: Log jam with small channel litter; Bottom: Coyote tracks along stream bank.





**Photogroup 4-22** Big Iron Ore 5 depicting general stream characteristics. All individuals featured are SFASU and CES staff. 30-m transect, downstream, July 2012; Top right: 150-m transect, downstream, July 2012; Middle left: 150-m transect, upstream, July 2012; Middle right: 300-m transect, downstream, July 2012; Bottom left: 30-m transect, downstream, August 2012; Bottom right: 150-m transect, upstream, August 2012.



**Photogroup 4-22** Big Iron Ore 5 depicting general bank appearance. Top left: 150-m transect, left bank, August 2012; Top right: 30-m transect, right bank, August 2012; Middle left: 150-m transect, right bank, July 2012; Middle right: 300-m transect, upstream, July 2012; Bottom: 300-m transect, right bank, July 2012.



**Photogroup 4-22** Big Iron Ore 5 depicting water surface characteristics and potential source of contamination. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, August 2012, Top right: 150-m transect, downstream, August 2012; Bottom left: 300-m transect, upstream, August 2012; Bottom right: Feral hog tracks.

### **Physical Description of Site Naconiche 1**

Naconiche Creek at site Naconiche 1 was surveyed on July 20 and August 24, 2012. This site is accessible from the Farm to Market (FM) 1087 public road crossing of Naconiche Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately easy due to the gently sloping nature of the banks at the access point. Banks within the survey area remain low and gently sloping. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also common. At certain points within the survey reach, tree roots branched across the stream, making it difficult to cross. Total discharge during Survey 1 was 0.56cfs while during Survey 2 the total discharge was 0.87cfs. The perennial stream maintained wadeability, and despite the stream being very shallow (average thalweg Survey 1: 0.225 m; Survey 2: 0.19 m) there was sufficient water for primary contact recreation during both surveys. In the case of this shallow stream, primary contact recreation may be limited to children.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Naconiche 1 is illustrated in Photogroup 4-23.

### **Physical Description of Site Naconiche 2**

Naconiche Creek at site Naconiche 2 was surveyed on July 20 and August 24, 2012. This site is accessible from the Camp Tonkawa (FM 155) public road crossing of Naconiche Creek; both adjacent stream banks are privately owned.

Access to the stream channel is difficult due to the dense vegetation and relatively steep nature of the banks at the access point. Banks within the survey area range from low and gently sloping to steeper with denuded embankments. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also common. Total discharge during Survey 1 was 2.10cfs while during Survey 2 the total discharge was 1.62cfs. The perennial stream maintained wadeability, and despite the stream being very shallow (average thalweg Survey 1: 0.385 m; Survey 2: 0.275 m) there was sufficient water for primary contact recreation during both surveys. In the case of this shallow stream, primary contact recreation may be limited to children.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey. There was a moderate amount of litter in the form of beer cans and bottles at the edge of the wooded area near the access point, but they appear to have washed in from the roadside ditches during previous rains.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6,

correspondingly. The general appearance of the stream channel of site Naconiche 2 is illustrated in Photogroup 4-24.

### **Physical Description of Site Naconiche 6**

Naconiche Creek at site Naconiche 6 was surveyed on July 20 and August 24, 2012. This site is accessible from the US Highway 59 road crossing of Naconiche Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately difficult due to the consistently high level of traffic at the access point. Anyone who desired to access the Naconiche would have to park along the shoulder of the hectic highway which is a primary corridor for cars, trucks, and 18-wheelers. Furthermore, the banks leading to the stream channel are relatively steep. Banks within the survey area remain low and gently sloping. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also present. The stream bottom substrate was composed of fine sediments and organic debris which made it difficult to walk; staff from SFASU and CES often sank up their thighs while traversing the survey reach. Total discharge during Survey 1 was 2.51cfs while during Survey 2 the total discharge was 0.47cfs. The perennial stream maintained wadeability, and there was sufficient water for primary contact recreation during both surveys.

At approximately 180 m, the stream passes under the Farm to Market (FM) 2435 crossing. Under the FM crossing, ATV tracks were present during both surveys as well as evidence of heavy feral hog use. The ATV most likely accessed the stream bank via the maintained power line corridors along the left and right banks adjacent to the FM 2435 crossing. There were no well-established trails along these corridors to suggest persistent human use. Photogroup 5-13 documents these indications of recreational activity.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Naconiche 6 is illustrated in Photogroup 4-25.

### **Physical Description of Site Naconiche 7**

Naconiche Creek at site Naconiche 7 was surveyed on July 20 and August 24, 2012. This site is accessible from the County Road (CR) 271 crossing of Naconiche Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately difficult due to vegetation and denuded nature of the banks at the access point. Banks within the survey area largely remain low and gently sloping, however there are also steep portions along both left and right banks. Dense vegetation and woody debris are very prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also extremely common. At certain points within the survey reach, woody debris within the channel made it difficult to traverse the 300 meters. Total discharge during Survey 1 was 2.92cfs while during Survey 2 the total discharge was 1.08cfs. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation during both surveys.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey. There is evidence of illegal dumping within the stream channel in the form of tires, buckets, extension cords, etc.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Naconiche 7 is illustrated in Photogroup 4-26.

### **Physical Description of Site Naconiche 8**

Naconiche Creek at site Naconiche 8 was surveyed on July 20 and August 24, 2012. This site is accessible from the Cedar Bluff (CR 273) public road crossing of Naconiche Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately difficult due to the steep nature of the banks at the access point. Banks within the survey area remain relatively steep. Some areas along both left and right banks are composed of denuded embankments with exposed tree roots. Woody debris within the stream channel was common. Total discharge during Survey 1 was 4.10cfs while during Survey 2 the total discharge was 1.49cfs. The perennial stream maintained wadeability, and there was sufficient water for primary contact recreation during both surveys.

An ATV trail/access point was present on the right bank adjacent to the Cedar Bluff Road. No further signs of human access points were evident within the 300 meter reach of the survey. A portion of the upstream, left bank is fenced at the road crossing to prevent public access. Signs of recreation were also present in the form of a fish bait container. A portion of the container was found on the bank next to the road crossing while the bottom of the container was found in the stream channel. A tire, bucket, and old drink can were also present in the stream channel. Photogroup 5-14 documents these indications of recreational activity.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Naconiche 8 is illustrated in Photogroup 4-27.

### **Physical Description of Site Naconiche 9**

Naconiche Creek at site Naconiche 9 was surveyed on July 20 and August 24, 2012. This site is accessible from the County Road (CR) 280 public road crossing of Naconiche Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately easy due to the gently sloping nature of the banks at the access point. Banks within the survey area range from low and gently sloping to steep and denuded with exposed tree roots. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris within the stream channel was also common. Total discharge during Survey 1 was 1.85cfs while during Survey 2 the total discharge was 0.76cfs. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation during both surveys.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey. Illegal dumping in the form of tires, a mattress, and an unidentified piece of electronic equipment was present under and adjacent to the CR crossing. On the downstream side of the CR crossing, the right bank was fenced to prevent public access.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Naconiche 9 is illustrated in Photogroup 4-28.

#### **Physical Description of Site Naconiche 10**

Naconiche Creek at site Naconiche 10 was surveyed on July 20 and August 24, 2012. The site is located on private property and is not accessible to the public. In order to access stream within the property, SFASU and CES staff were required to walk approximately 0.5 miles through a wooded trail with no public accessibility.

Access to the stream channel is difficult due to the steep, heavily vegetated nature of the banks at the access point. Banks within the survey area remain steep and heavily vegetated throughout the 300 meter reach. Dense vegetation and woody debris are also prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also common. Total discharge during Survey 1 was 3.84cfs while during Survey 2 the total discharge was 0.90cfs. The perennial stream maintained wadeability, and there was sufficient water for primary contact recreation during both surveys.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey. The landowner notes that during the 1970s-1990s, he, friends and family swam on many occasions in the stream located within the property. The left bank is composed of pastureland and there are signs of heavy cattle use and fecal matter along the bank. These cattle access points are illustrated in Photogroup 4-29.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Naconiche 10 is illustrated in Photogroup 4-29.

#### **Physical Description of Site Naconiche 11**

Naconiche Creek at site Naconiche 11 was surveyed on July 20 and August 24, 2012. This site is accessible from the Farm to Market (FM) 95 public road crossing of Naconiche Creek; both adjacent stream banks are privately owned.

Access to the stream channel is easy due to the gently sloping nature of the banks at the access point. Banks within the survey range from steep to gently sloping on the left bank where cattle access the stream. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also common. Total discharge during Survey 1 was 3.32cfs, while during Survey 2 the total discharge was 0.54cfs. The perennial stream maintained wadeability, and there was sufficient water for primary contact recreation during both surveys.

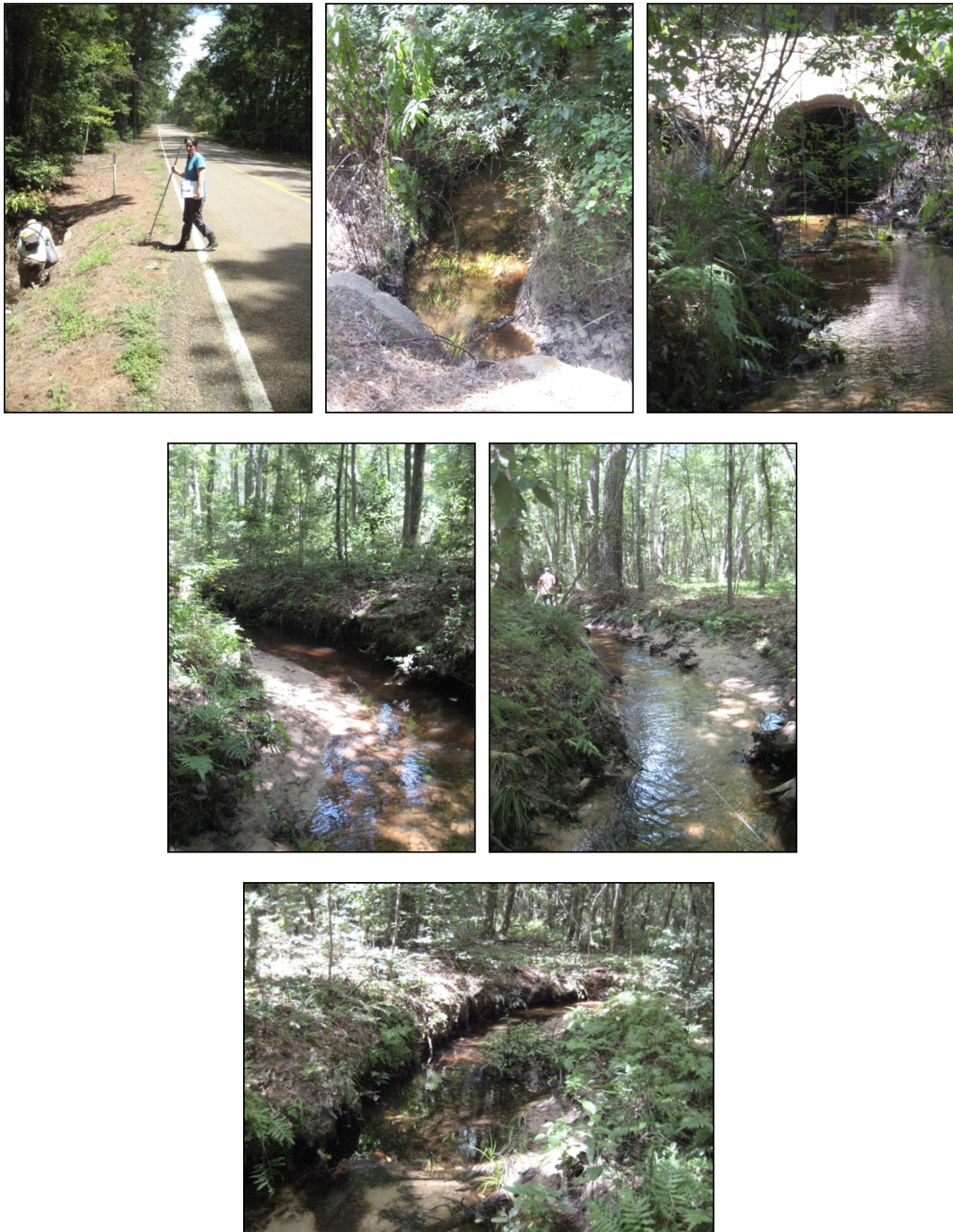
No signs of recreational use or human access points were evident within the 300 meter reach of the survey. The left bank of the stream is composed of pastureland, and at certain points there is heavy cattle use as illustrated by Photogroup 4-30. Litter in the form of tires and boards with protruding nails are also present in the stream channel.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Naconiche 11 is illustrated in Photogroup 4-30.





**Photogroup 4-23** Naconiche 1 depicting general stream characteristics. Top left: 30-m transect, downstream, July 2012; Top middle: 30-m transect, upstream, July 2012; Top right: 150-m transect, upstream, July 2012; Middle left: 300-m transect, upstream, July 2012; Middle right: 300-m transect, downstream, August 2012; Bottom: 30-m transect, downstream, August 2012.



Photogroup 4-23 Naconiche 1 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: Access point at FM 1087 crossing, August 2012; Top center: 0-m transect, upstream access point, July 2012; Top right: View of culvert at FM 1087 access point from stream channel, downstream, July 2012; Middle left: 30-m transect, downstream, July 2012; Middle right: 30-m transect, upstream, July 2012; Bottom: 30-m transect, upstream, August 2012.



**Photogroup 4-23** Naconiche 1 depicting water surface characteristics. Top left: 300-m transect, downstream, July 2012; Top center: 300-m transect, upstream, August 2012; Top right: Dense bank vegetation, August 2012; Middle left: Woody debris across channel, August 2012; Middle right: 150-m transect, downstream, August 2012; Bottom: Woody debris with foam, July 2012.



**Photogroup 4-24** Naconiche 2 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 150-m transect, downstream, July 2012; Top center: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: 300-m transect, downstream, August 2012; Middle right: 150-m transect, downstream, August 2012; Bottom: 150-m transect, upstream, July 2012.



**Photogroup 4-24** Naconiche 2 depicting general bank appearance. Top left 300-m transect, right bank, August 2012; Top right: 150-m transect, left bank, August 2012; Middle left: 30-m transect, right bank, August 2012; Middle right: 30-m transect, left bank, July 2012; Bottom: County road 155 crossing at access point, August 2012.



**Photogroup 4-24** Naconiche 2 depicting water surface characteristics. Top left: 300-m transect, downstream, July 2012; Top middle: 300-m transect, upstream, July 2012; Middle left: 300-m transect, upstream, August 2012; Middle right: Woody debris across/within channel, July 2012; Bottom: Woody debris across/within channel, July 2012.



**Photogroup 4-25** Naconiche 6 depicting general stream characteristics. Top left: 300-m transect, upstream, July 2012; Top right: 150-m transect, upstream, July 2012; Middle left: 30-m transect, upstream, July 2012; Middle right: 150-m transect, downstream, July 2012; Bottom: CR 2435 crossing, upstream, July 2012.



**Photogroup 4-25** Naconiche 6 depicting general bank appearance. Top left: 30-m transect, left bank, July 2012; Top right: 150-m transect, right bank, July 2012; Middle left: 300-m transect, right bank, July 2012; Middle right: 30-m transect, left bank, August 2012; Bottom: 30-m transect, downstream, July 2012.





**Photogroup 4-25** Naconiche 6 depicting water surface characteristics and possible source of contamination. All individuals featured are SFASU and CES staff. Top left: 300-m transect, downstream, July 2012; Top right: 30-m transect, upstream, August 2012; Bottom left: Feral hog tracks/heavy use under CR 2435 crossing, July 2012; Bottom right: 150-m transect, downstream, August 2012.



**Photogroup 4-26** Naconiche 7 depicting general stream characteristics. Top left: 150-m transect, downstream, July 2012; Top right: 300-m transect, upstream, July 2012; Middle left: 150-m transect, upstream, August 2012; Middle right: 30-m transect, downstream, July 2012; Bottom: 300-m transect, upstream, August 2012.



**Photogroup 4-26** Naconiche 7 depicting bank access and general bank appearance. All individuals featured SFASU and CES staff. Top left: CR 271 crossing/access point, July 2012; Top right: 300-m transect, left bank, August 2012; Middle left: 30-m transect, left bank, August 2012; Middle right: 300-m transect, right bank, July 2012; Bottom left: 150-m transect, right bank, July 2012; Bottom right: 30-m transect, right bank, July 2012.



**Photogroup 4-26** Naconiche 7 depicting water surface characteristics. All individuals featured SFASU and CES staff. Top left: Large woody debris across/within channel, July 2012; Top right: Large woody debris across/within channel, July 2012; Middle left: Large woody debris in channel, July 2012; Middle right: Large woody debris and littler within channel, July 2012; Bottom: Large woody debris and small litter within channel, July 2012.



**Photogroup 4-27** Naconiche 8 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 150-m transect, upstream, July 2012; Top right: 150-m transect, downstream, July 2012; Middle left: 300-m transect, upstream, July 2012; Middle right: 300-m transect, downstream, July 2012; Bottom left: 30-m transect, downstream, August 2012; Bottom right: 300-m transect, downstream, August 2012.



**Photogroup 4-27** Naconiche 8 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: Cedar Bluff Road (CR 273) crossing, July 2012; Top right: 150-m transect, left bank, July 2012; Middle left: Fenced bank upstream adjacent to road crossing, July 2012; Middle right: 300-m transect, right bank, July 2012; Bottom left: 30-m transect, right bank, August 2012; Bottom right: Possible ATV trail entrance adjacent to stream crossing, August 2012.



**Photogroup 4-27** Naconiche 8 depicting stream surface characteristics. Top left: Large woody debris within channel, August 2012; Top right: Large woody debris across/within channel, August 2012; Bottom left: Large channel litter (bucket), August 2012; Bottom right: Large woody debris across channel, August 2012.



**Photogroup 4-28** Naconiche 9 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: 300-m transect, downstream, July 2012; Middle right: 150-m transect, upstream, August 2012; Bottom: 300-m transect, upstream, August 2012.





**Photogroup 4-28** Naconiche 9 depicting bank access and general bank appearance. All individuals featured are SFASU and CES staff. Top left: CR 280 crossing/channel access point, July 2012; Top right: 150-m transect, downstream, August 2012; Middle left: 30-m transect, right bank, July 2012; Middle right: Fenced downstream bank, July 2012; Bottom left: 30-m transect, right bank, August 2012; Bottom right: 30-m transect, upstream, August 2012.



**Photogroup 4-28** Naconiche 9 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: Large woody debris, July 2012; Top right: Large channel litter (electronic metal object) under CR 280 crossing July 2012; Middle left: Large channel litter (tire) adjacent to CR 280 crossing, July 2012; Middle right: Large channel litter (metal object) adjacent to CR 280 crossing; Bottom left: Large channel litter (mattress) under CR 280 crossing, July 2012; Bottom right: Organic debris on water surface, August 2012.



**Photogroup 4-29** Naconiche 10 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: Deep pool in channel (>2m deep), July 2012; Middle right: 300-m transect, upstream, July 2012; Bottom : 300-m transect, downstream, July 2012.



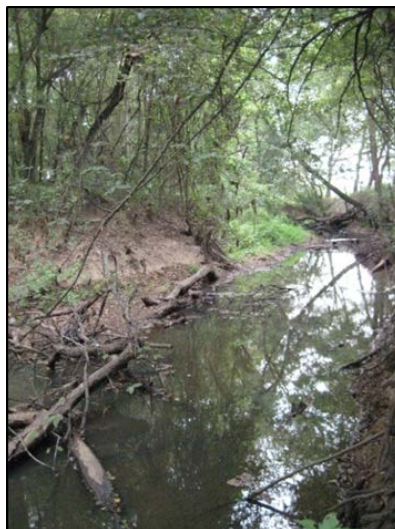
**Photogroup 4-29** Naconiche 10 depicting general bank appearance. Top left: 300-m transect, left bank, August 2012; Top right: 300-m transect, left bank, July 2012; Middle left: Downstream view with cattle access along bank, August 2012; Middle right: Livestock access along bank, August 2012; Bottom left: Heavy cattle use along right bank; August 2012; Bottom right: 150-m transect, right bank, August 2012.



**Photogroup 4-29** Naconiche 10 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: Large woody debris, August 2012, Top right: Large woody debris in channel, August 2012; Middle left: Large woody debris across/within channel, August 2012; Middle right: Large woody debris in channel with slight foam, July 2012; Bottom: Large woody debris in channel, August 2012.



**Photogroup 4-29** Naconiche 10 depicting livestock access and potential sources of contamination. Top left: Heavy livestock use along stream bank, July 2012; Top right: Heavy livestock use with fecal matter along stream bank, July 2012; Bottom left: Livestock fecal, August 2012; Bottom right: Livestock fecal, August 2012.



**Photogroup 4-30** Naconiche 11 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, July 2012; Top right: 30-m transect, downstream, July 2012; Middle left: 300-m transect, upstream, July 2012; Middle right: 150-m transect, upstream, August 2012; Bottom: 300-m transect, upstream, August 2012.



**Photogroup 4-30** Naconiche 11 depicting bank access and general bank appearance with livestock access. All individuals featured are SFASU and CES staff. Top left: 30-m transect, left bank, July 2012; Top right: 0-m transect, FM 95 crossing/access point, July 2012; Middle left: 300-m transect, left bank, July 2012; Middle right: Livestock and livestock bank use, July 2012; Bottom: Livestock use, July 2012.





**Photogroup 4-30** Naconiche 11 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: 150-m transect, downstream, August 2012; Top right: Large woody debris across/within channel, August 2012; Middle left: Large woody debris, July 2012; Middle right: Large woody debris, July 2012; Bottom left: Large channel litter (various metal objects), August 2012; Bottom right: Large channel litter (tire with metal rim), August 2012.

### **Physical Description of Site Terrapin 1**

Terrapin Creek at Terrapin 1 was surveyed on July 20 and August 24, 2012. This site is accessible from the County Road (CR) 234 public road crossing of Terrapin Creek; both adjacent stream banks are privately owned.

Access to the stream channel is easy due to the shallow nature of the stream channel. Terrapin 1 is an ephemeral stream that is designated by a small culvert that transects CR 234. During the surveys, the stream bed was completely dry and covered with thick vegetation. Flow was not measured during either survey as no water was present. Staff from CES and SFASU made the decision not to traverse the 300 meter survey reach due to the thick, overgrown nature of the stream channel which made walking extremely difficult. Photogroup 4-20 illustrates the overgrown nature of the channel.

No signs of recreational use or human access points were evident at the stream access point, and lack of water during both surveys precludes any aquatic activities from taking place.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Terrapin 1 is illustrated in Photogroup 4-31.

### **Physical Description of Site Terrapin 2**

Terrapin Creek at Terrapin 2 was surveyed on July 20 and August 24, 2012. This site is located on private property with no public access points. Landowner permission was granted before accessing the site.

Access to the stream channel is moderately easy due to the gently sloping nature of the banks at the access point. Banks within the survey area range from low, open, and gently sloping, to steep and densely vegetated. Vegetation and woody debris are common along both left and right banks throughout the 300 meter reach. Woody debris across and within the stream channel was also present. Total discharge during Survey 1 was 0.43 cfs, while during Survey 2 the total discharge was 0.05 cfs. The perennial stream maintained wadeability, and there was sufficient water for primary contact recreation during both surveys.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Terrapin 2 is illustrated in Photogroup 4-32.

### **Physical Description of Site Terrapin 3**

Terrapin Creek at Terrapin 3 was surveyed on July 20 and August 24, 2012. This site is accessible from the State Highway 7 road crossing of Terrapin Creek. Adjacent stream banks are privately owned.

Access to the stream channel is moderately difficult due to the dense vegetation at the access point as well as the flooded nature of the stream. A beaver dam was present downstream which caused the stream to overrun its banks. Upstream, a fenced channel prevented staff from traversing the 300 meter survey length. CES and SFASU staff were unable to measure flow due to the flooded nature of the stream. Furthermore, CES and SFASU staff made the decision not to traverse downstream due to the deep, flooded nature of the stream as well as dense vegetation which lined the banks and congested channel. The perennial stream maintained wadeability, although due to the beaver dam, the stream bordered on non-wadeable. There was sufficient water for primary contact recreation during both surveys.

Evidence of possible recreation was observed at site Terrapin 3 during Survey 1. An animal trap was present on the left bank, and further downstream a defunct wooden bridge was found across the stream. Photogroup 5-15 documents these indications of recreational activity.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Terrapin 3 is illustrated in Photogroup 4-33.

#### **Physical Description of Site Terrapin 4**

Terrapin Creek at Terrapin 4 was surveyed on July 20 and August 24, 2012. This site is accessible from the County Road (CR) 280 public road crossing of Naconiche Creek; both adjacent stream banks are privately owned.

Access to the stream channel is difficult due to the steep nature of the banks at the access point as well as the dense vegetation and woody debris along the left and right banks. Banks within the survey area range from low and gently sloping to steep and denuded with exposed tree roots. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris within the stream channel was also common. Total discharge during Survey 1 was 0.47 cfs while during Survey 2 the total discharge was 0.05 cfs. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation during both surveys.

Evidence of possible recreation was observed at site Terrapin 4 during Survey 2. Along the right stream bank, approximately 5 m downstream, field staff observed a beech tree in which initials had been carved into the bark. Photogroup 5-16 documents these indications of bank-side recreational activity.

No available human access points were evident within the 300 meter reach of the survey other than the public county road crossing.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Terrapin 4 is illustrated in Photogroup 4-34.



**Photogroup 4-31** Terrapin 1 depicting general stream characteristics. Top left: 0-m transect, downstream, July 2012; Top right: 0-m transect, upstream, July 2012; Bottom left: Downstream, dry stream channel, August 2012; Bottom center: Downstream, dense vegetation covering channel, August 2012; Bottom right: 0-m transect, downstream, view from CR 234 crossing, July 2012.



**Photogroup 4-32** Terrapin 2 depicting general stream characteristics. Top left: 30-m transect, downstream, July 2012; Top right: 150-m transect, upstream, July 2012; Middle left: 300-m transect, downstream, July 2012; Middle right: 30-m transect, downstream, August 2012; Bottom: 30-m transect, upstream, August 2012.



**Photogroup 4-32** Terrapin 2 depicting general bank appearance. Top left: 300-m transect, downstream, August 2012; Top center: 300-m transect, left bank, August 2012; Top right: 30-m transect, left bank, July 2012; Bottom left: 30-m transect, right bank, July 2012; Bottom right: Fenced pastureland, left bank, July 2012.



**Photogroup 4-32** Terrapin 2 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: Logjam with foam, July 2012; Top right: Logjam within channel, July 2012; Middle left: 150-m transect, upstream, August 2012; Middle right: 150-m transect, downstream, July 2012; Bottom: 300-m transect, upstream, July 2012.



**Photogroup 4-33** Terrapin 3 depicting general stream characteristics. Top left: 30-m transect, upstream, July 2012; Top center: 150-m transect, downstream, July 2012; Top right: 300-m transect, downstream, July 2012; Bottom left: 30-m transect, downstream, July 2012; Bottom right: 300-m transect, upstream, July 2012.





**Photogroup 4-33** Terrapin 3 depicting general bank appearance. Top left: 0-m transect, Highway 7 crossing, flooded banks, August 2012; Top right: 0-m transect, Bank access from Hwy 7, flooded banks, August 2012; Middle: Fenced channel, upstream, August 2012; Bottom left: 300-m transect, left bank, July 2012; Bottom right: 300-m transect, Right bank, July 2012.



**Photogroup 4-33** Terrapin 3 depicting water surface characteristics. Left: 150-m transect, right bank, July 2012; Center: Large channel litter (cooler), July 2012; Right: 150-m transect, upstream, July 2012.



**Photogroup 4-34** Terrapin 4 depicting general stream characteristics. Top left: 300-m transect, downstream, August 2012; Top right: 150-m transect, downstream, July 2012; Bottom left: 300-m transect, downstream, July 2012; Bottom center: 150-m transect, downstream, August 2012; Bottom right: 150-m transect, upstream, August 2012.



**Photogroup 4-34** Terrapin 4 depicting general bank appearance. Top left: 30-m transect, right bank, July 2012; Top right: 150-m transect, upstream, July 2012; Bottom left: 150-m transect, right bank, July 2012; Bottom right: 300-m transect, upstream, August 2012.



**Photogroup 4-34** Terrapin 4 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: Woody debris within channel, July 2012; Top right: Log jam, July 2012; Middle left: 30-m transect, downstream, July 2012; Middle right: 30-m transect, upstream, July 2012; Bottom left: Log under water surface with woody debris, July 2012; Bottom right: Large woody debris within channel (above and under water surface); July 2012.

**Physical Description of Site Waffelow 1**

Waffelow Creek at site Waffelow 1 was surveyed on July 22 and August 24, 2012. This site is accessible from the Farm to Market (FM) 1878 public road crossing of Waffelow Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately difficult due to the sloping nature of the banks at the access point. Both upstream and downstream portions of the channel are fenced to prevent public access. The stream is best classified as intermittent with perennial pools. The riparian zone within the 300 meter reach is composed of mowed maintained corridor, shrub/trees, and pastureland on both left and right banks. Banks within the survey area range from low and gently sloping to steep and densely vegetated. No flow measurements were available during either survey. The intermittent pool maintained wadeability only through pools during the first survey, and did not maintain wadeability during Survey 2, as the stream bed was dry.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey; however a house was present within visual range of the stream. Illegal dumping in the form of tires, appliances, and various other items were present along the banks and stream channel. Photos of the refuse are provided in Photogroup 4-35.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Waffelow 1 is illustrated in Photogroup 4-35.

**Physical Description of Site Waffelow 2**

Waffelow Creek at site Waffelow 2 was surveyed on July 20 and August 24, 2012. This site is accessible from the County Road (CR) 234 public road crossing of Waffelow Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately easy due to the gently sloping nature of the banks at the access point. Banks within the survey area range from low and gently sloping to steep and slightly denuded with exposed tree roots. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Woody debris within the stream channel was also common. The stream is best classified as perennial with intermittent pools. There was no flow measurable during Survey 1, and during Survey 2 the stream channel was dry. The perennial stream maintained wadeability during Survey 1.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Waffelow 2 is illustrated in Photogroup 4-36.

**Physical Description of Site Waffelow 3**

Waffelow Creek at site Waffelow 3 was surveyed on July 20 and August 24, 2012. This site is accessible from the Farm to Market (FM) public road crossing of Waffelow Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately difficult due to the steep nature of the banks at the access point. Banks within the survey area remain low, gently sloping, and heavily vegetated. Dense vegetation and woody debris are prevalent along both left and right banks throughout the survey reach. Staff from CES and SFASU were unable to survey the entire 300 meter reach due to the dense overgrowth along both banks which impeded their ability to walk. Woody debris within the stream channel was also common. There was no measurable flow during either survey; the site has heavy beaver activity and a dam is present downstream. The perennial stream was not wadeable due to excessive depth.

No signs of recreational use or human access points were evident within the 150 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site Waffelow 3 is illustrated in Photogroup 4-37.



**Photogroup 4-35** Waffelow 1 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top center: 30-m transect, upstream, July 2012; Top right: 150-m transect, upstream, July 2012; Bottom left: 300-m transect, upstream, July 2012; Bottom right: 300-m transect, downstream, July 2012.





**Photogroup 4-35** Waffelow 1 depicting bank appearance. All individuals featured are SFASU and CES staff. Top left: FM 1878 crossing/access point, July 2012; Top right: 0-m transect, July 2012; Middle: 0-m transect, fenced stream channel, July 2012; Bottom left: 30-m transect, left bank, July 2012; Bottom right: 30-m transect, right bank, July 2012.



**Photogroup 4-35** Waffelow 1 depicting water surface characteristics and potential sources of contamination. Top left: Livestock access point, July 2012; Top right: Livestock fecal in portion of dry stream channel, July 2012; Middle left: Livestock fecal on bank, July 2012; Middle right: Water snake at CR 1878 access point, July 2012; Bottom left: Livestock bank use, July 2012; Bottom right: Large bank litter (refrigerator), July 2012.



**Photogroup 4-36** Waffelow 2 depicting general stream characteristics. Top left: 30-m transect, upstream, July 2012; Top right: 30-m transect, downstream, July 2012; Middle left: 300-m transect, downstream, August 2012; Middle right: 150-m transect, downstream, August 2012. Bottom left: 300-m transect, upstream, July 2012; Bottom right: 150-m transect, downstream, July 2012.



**Photogroup 4-36** Waffelow 2 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: 150-m transect, upstream, July 2012; Top right: 30-m transect, upstream, July 2012; Bottom left: 300-m transect, upstream, August 2012; Bottom right: 300-m transect, downstream, July 2012.



**Photogroup 4-36** Waffelow 2 depicting water surface characteristics. All individuals featured are SFASU and CES staff. Top left: 300-m transect, downstream, July 2012; Top right: Large woody debris along bank/within channel, July 2012; Middle left: 150-m transect, upstream, August 2012; Middle right: 30-m transect, upstream, August 2012; Bottom: Small channel litter (glass bottle and wire), August 2012.



**Photogroup 4-37** Waffelow3 depicting general stream characteristics. Top left: 30-m transect, downstream, July 2012; Top right: 150-m transect, downstream, July 2012; Bottom left: 0-m transect, upstream, August 2012; Bottom right: 30-m transect, upstream, July 2012.



**Photogroup 4-37** Waffelow3 depicting general bank appearance. Top: 0-m transect, Juvenile alligator at FM 95 crossing access point, August 2012; Middle left: 0-m transect, FM 95 crossing, downstream, August 2012; Middle right: Dense bank vegetation; Bottom left: 150-m transect, right bank, July 2012; Bottom right: 30-m transect, left bank, July 2012.

**Physical Description of Site West 1**

West Creek at site West 1 was surveyed on July 22 and August 24, 2012. This site is accessible from the County Road (CR) 4054 public road crossing of West Creek; both adjacent stream banks are privately owned.

Access to the stream channel is difficult due to the steep nature of the banks at the access point. Banks within the survey area remain steep throughout. Dense vegetation and woody debris are prevalent along both left and right banks throughout the 300 meter reach. Large woody debris within the stream channel was also common. Total discharge during Survey 1 was 0.004cfs, while during Survey 2 no flow measurements were available due to intermittent pools with no contiguous flow. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation during both surveys. During Survey 2 the wadeability reserved to perennial pools. Cow fecal matter was present in the stream channel during Survey 2, as was a bag of garbage. Documentation of these possible contamination sources is available in Photogroup 4-38.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site West 1 is illustrated in Photogroup 4-38.

**Physical Description of Site West 2**

West Creek at site West 2 was surveyed on July 22 and August 24, 2012. This site is accessible from the County Road (CR) 4059 public road crossing of West Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately difficult due to the steep, vegetated nature of the banks at the access point. Banks within the survey area remain steep throughout. Dense vegetation and woody debris are prevalent along both left and right banks throughout the span of the survey reach. CES and SFASU staff were able to safely traverse only 30 meters of the full 300 meter survey due to a large logjam which encompassed the stream channel. Flow measurements were unable to be taken due to intermittent pools with no contiguous flow during Survey 1 and the presence of a dry stream bed during Survey 2. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation in shallow pools during Survey 1. During Survey 2 the streambed was completely dry.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site West 2 is illustrated in Photogroup 4-39.



**Physical Description of Site West 3**

West Creek at site West 3 was surveyed on July 22 and August 24, 2012. This site is accessible from the Farm to Market (FM) 138 public road crossing of West Creek; both adjacent stream banks are privately owned.

Access to the stream channel is difficult due to the steep, heavily vegetated nature of the banks at the access point. Banks within the survey area remain steep and densely vegetated throughout. Dense vegetation and woody debris are prevalent along both left and right banks throughout the survey reach. Large woody debris within the stream channel was also common. Total discharge during Survey 1 was 0.16 cfs, while during Survey 2 no flow measurements were available due to intermittent pools with no contiguous flow. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation during both surveys. During Survey 2 the wadeability and opportunity for contact recreation was reserved to perennial pools. An animal carcass was present in the stream channel during Survey 1. Also present was illegal dumping in the form of tires and other unidentifiable items. Documentation of these possible contamination sources and litter is available in Photogroup 4-40.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site West 3 is illustrated in Photogroup 4-40.

**Physical Description of Site West 4**

West Creek at site West 4 was surveyed on July 22 and August 24, 2012. This site is accessible from the County Road (CR) 1510 public road crossing of West Creek; both adjacent stream banks are privately owned.

Access to the stream channel is difficult due to the steep, vegetated nature of the banks at the access point. Banks within the survey area remain relatively steep throughout, although some areas along the left bank have a less severe slope. Dense vegetation and woody debris are prevalent along both left and right banks throughout the span of the survey reach. Total discharge during Survey 1 was 1.68 cfs, and the total discharge during Survey 2 was 0.22595 cfs. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation during both surveys. Livestock access points to the stream channel were present on both the left and right banks. Cow fecal matter was present in the stream channel during Survey 2, as was litter in the form of a tire. Documentation of this possible contamination source is available in Photogroup 4-41.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site West 4 is illustrated in Photogroup 4-41.

**Physical Description of Site West 5**

West Creek at site West 4 was surveyed on July 20 and August 24, 2012. This site is accessible from the County Road (CR) 1546 public road crossing of West Creek; both adjacent stream banks are privately owned.

Access to the stream channel is moderately easy due to the gently sloping nature of the banks at the access point. Banks within the survey range from steep to gently sloping. Dense vegetation and woody debris are prevalent along both left and right banks throughout the span of the survey reach. The riparian zone of the left bank was comprised primarily of pastureland in which there was a heavy livestock presence. No direct livestock access points to the stream channel were evident. During Survey 1, the total discharge was 0.79 cfs, while during Survey 2 the total discharge was 0.12 cfs. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation during both surveys.

No signs of recreational use or human access points were evident within the 300 meter reach of the survey.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site West 5 is illustrated in Photogroup 4-42.

**Physical Description of Site West 6**

West Creek at site West 5 was surveyed on July 20 and August 24, 2012. This site is accessible from the Farm to Markey (FM) 2913 public road crossing of West Creek; both adjacent stream banks are privately owned.

Access to the stream channel is difficult due to the steep nature of the banks at the access point. Banks within the survey area range from steep and denuded with exposed tree roots to gently sloping. Dense vegetation and woody debris are prevalent along both left and right banks throughout the span of the survey reach. During Survey 1, the total discharge was 0.92 cfs, while during Survey 2 the total discharge was 0.73 cfs. The perennial stream maintained wadeability and there was sufficient water for primary contact recreation during both surveys.

Evidence of recreation was observed at site West 6 during Survey 1 in July. A hammock was observed attached to a tree located along the stream bank. Photogroup 5-17 documents these indications of recreational activity.

Average thalweg depth, hydrographic parameters, appearance of the water, as well as wildlife observations for the site during each survey are documented in Tables 4-4, 4-5, and 4-6, correspondingly. The general appearance of the stream channel of site West 6 is illustrated in Photogroup 4-43.



**Photogroup 4-38** West 1 depicting general stream characteristics. Top left: 300-m transect, downstream, July 2012; Top right: 300-m transect, upstream, July 2012; Middle left: 300-m transect, downstream, August 2012; Middle right: 300-m transect, upstream, August 2012; Bottom: 30-m transect, downstream, July 2012.



**Photogroup 4-38** West 1 depicting bank appearance, water surface characteristics and potential sources of contamination. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, August 2012; Top right: 30-m transect, upstream, July 2012; Middle left: Logjam, July 2012; Middle right: Channel litter (household garbage), August 2012; Bottom left: Livestock fecal, August 2012; Bottom right: Dog track or coyote track, August 2012.



**Photogroup 4-39** West 2 depicting general stream characteristics and bank appearance. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: 30-m transect, downstream, August 2012; Middle right: 30-m transect, upstream, August 2012; Bottom left: 30-m transect, left bank, August 2012; Bottom right: 30-m transect, right bank, August 2012.



**Photogroup 4-39** West 2 depicting water surface characteristics. Top left: Channel litter (tire), August 2012; Top right: Logjam, July 2012.



**Photogroup 4-40** West 3 depicting general stream characteristics. Top left: 30-m transect, downstream, July 2012; Top right: 30-m transect, upstream, July 2012; Middle left: 150-m transect, upstream, July 2012; Middle right: 150-m transect, upstream, August 2012; Bottom: Large channel litter (Tire), August 2012.



**Photogroup 4-40** West 3 depicting general bank appearance. Top left: 30-m transect, upstream, August 2012; Top right: 150-m transect, downstream, August 2012; Middle left: 150-m transect, downstream, July 2012; Middle right: 150-m transect, right bank, August 2012; Bottom: 300-m transect, left bank, July 2012.





**Photogroup 4-40** West 3 depicting water surface characteristics. Top left: Large channel litter (tire), July 2012; Top right: Animal carcass within stream channel (photo strap also appears in photo), July 2012; Bottom left: Small channel litter (unidentified object), July 2012; Bottom right: Raccoon prints in channel, August 2012.



**Photogroup 4-41** West 4 depicting general stream characteristics and water surface appearance. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, August 2012; Top right: 30-m transect, downstream, August 2012; Middle left: 30-m transect, upstream, July 2012; Middle center: 150-m transect, downstream, July 2012; Middle right: 300-m transect, upstream, July 2012; Bottom: 150-m transect, downstream, August 2012.



**Photogroup 4-41** West 4 depicting general bank appearance and potential sources of contamination. Top left: 300-m transect, upstream, August 2012; Top right: 300-m transect, downstream, August 2012; Middle left: 150-m transect, upstream, August 2012; Middle right: Large channel litter (tire), August 2012; Bottom left: 30-m transect, right bank, Cattle access point, August 2012; Bottom right: Livestock fecal, August 2012.



**Photogroup 4-42** West 5 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, upstream, July 2012; Top center: 300-m transect, downstream, July 2012; Top right: 300-m transect, upstream, July 2012; Bottom left: 300-m transect, upstream, August 2012; Bottom right: 150- m transect, upstream, August 2012.



**Photogroup 4-42** West 5 depicting general bank appearance. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, July 2012; Top center: 30-m transect, right bank, July 2012; Top right: 150-m transect, right bank, July 2012; Bottom left: 30-m transect, downstream, August 2012; Bottom right: 150-m transect, downstream, August 2012.



**Photogroup 4-42** West 5 depicting water surface characteristics. Top left: 300-m transect, downstream, August 2012; Top right: 150-m transect, downstream, July 2012; Bottom left: 150-m transect, upstream, July 2012; Bottom right: Water moccasin, July 2012.



**Photogroup 4-43** West 6 depicting general stream characteristics. All individuals featured are SFASU and CES staff. Top left: 30-m transect, downstream, August 2012; Top center: 30-m transect, upstream, August 2012; Top right: 300-m transect, upstream, July 2012; Middle left: 300-m transect, downstream, August 2012; Middle right: 150-m transect, downstream, August 2012; Bottom: 300-m transect, upstream, August 2012.



**Photogroup 4-43** West 6 depicting general bank appearance. Top left: 150-m transect, left bank, August 2012; Top right: 150-m transect, right bank, August 2012; Bottom left: 150-m transect, upstream, August 2012; Bottom right: 300-m transect, left bank, August 2012.





**Photogroup 4-43** West 6 depicting water surface characteristics. Top left: Large woody debris, July 2012; Top right: Log jam under FM 2913 crossing/access point, July 2012; Bottom: 300-m transect, downstream, July 2012.

## Chapter 5 : Observations and Interviews

### Activities Observed

During each RUAA field survey, sites were visited during times of the day and on days of the week when recreational activities were most likely to be observed. Of the forty-four (44) RUAA survey sites, thirty-six (36) were at locations which supplied public access. The remaining eight (8) sites were located on private property. SFASU and CES staff was granted permission from these landowners to access their property in order to conduct the RUAA surveys.

During field surveys, no contact (primary or secondary) or noncontact recreational activities were directly observed at any of the 44 sites by SFASU and CES staff. During both field surveys, signs of recreation were present at multiple sites.

### Recreational Indicators Observed During Field Surveys

Evidence of intentional dumping was observed at site Attoyac 4 during Survey 2. A crocheted blanket which was not present during Survey 1 was spread out on the stream bank next to the County Road (CR) 1971 bridge crossing with an animal carcass lying on top of it during Survey 2 in August 2012. Photogroup 5-1 documents these indications of possible recreational activity.

Evidence of fishing as well as general loitering was observed at site Attoyac 7 during both June and August 2012 surveys in the form of bait containers, discarded fishing line, beer bottles/cans, soda cans, and plastic bags full of refuse. Also observed on the bank during Survey 2 was the carcass of an alligator gar on a fish stringer as well as hot dog wieners in a zip-lock bag. Hot dog wieners are commonly used as fishing bait. Photogroup 5-2 documents these indications of recreational activity.

Evidence of possible recreation was observed at site Attoyac 12 during Survey 2. Human foot prints were observed along the stream bank underneath the highway bridge crossing. Also present under the highway bridge crossing was graffiti. Photogroup 5-3 documents these indications of recreational activity.

Evidence of possible recreation was observed at site Attoyac 15 during Survey 2. Human foot prints were observed along the bank underneath the highway bridge crossing. Photogroup 5-4 documents these indications of possible recreational activity.

Evidence of possible recreation was observed at site Attoyac 17 during Survey 1. A trot line attached to a tree and stretched across the stream channel was present. Photogroup 5-5 documents these indications of recreational activity.

Evidence of possible recreation was observed at site Big Iron Ore 3 during Survey 2. Boot prints were observed along the stream bank. Photogroup 5-6 documents these indications of recreational activity.

Evidence of recreation was observed at site Naconiche 6 during Survey 1 and 2. ATV tracks were present during both surveys underneath Farm to Market (FM) 2435 road crossing. Photogroup 5-7 documents these indications of recreational activity.

Evidence of possible recreation was observed at site Naconiche 8 during Survey 1 and Survey 2. During Survey 1, a bait net was present in the stream channel, and further downstream a defunct trotline/set hook was attached to a tree and hanging in the stream. A live bait container was present on the bank next to the public Cedar Bluff Road bridge crossing during Survey 2 in August. Photogroup 5-8 documents these indications of recreational activity.

Evidence of possible recreation was observed at site Terrapin 3 during Survey 1. An animal trap was present on the left bank, and further downstream a defunct wooden bridge was found across the stream. Photogroup 5-9 documents these indications of recreational activity.

Evidence of possible recreation was observed at site Terrapin 4 during Survey 2. Along the right stream bank, approximately 5m downstream, field staff observed a beech tree in which initials had been carved into the bark. Photogroup 5-10 documents these indications of bank-side recreational activity.

Evidence of recreation was observed at site West 6 during Survey 1 in July. A hammock was observed attached to a tree located along the stream bank. Photogroup 5-11 documents these indications of recreational activity.

### Activities Interviewed

Interviews were conducted with multiple landowners and stakeholders within the Attoyac Bayou Watershed. Because of the lack of human presence during surveys conducted in July and August, no in field interviews were conducted.

In order to efficiently reach a large number of stakeholders, a total of 112 interviews were distributed through the mail to individuals who had at one point attended an Attoyac WPP meeting and indicated they were a landowner within the watershed. The interviews were accompanied by a self addressed, stamped return envelope in order to increase the chance of response. Of the total distributed, only 7 surveys were returned. Interviews were also conducted with stakeholders by phone. A total of 35 formal interviews were conducted, not including the personal correspondence with government officials and community members as a part of the Historical Information and Recreational Use portion of the RUAA document.

The most commonly identified recreational uses of the Attoyac Bayou Watershed were fishing and hunting. Furthermore, the Attoyac and its tributaries are widely known to be used by ranchers to water livestock. It appears that the watershed was used much more for primary contact recreation pre-1970. One landowner who has lived along the Attoyac Bayou for approximately 60 years relates that, "It's not like it used to be," and "It used to flow more, and it was beautiful." This landowner and his family also stopped fishing in the Attoyac Bayou around 2000-2001 when he learned of the bacterial impairment of the watershed. A separate landowner

(site Attoyac 8) also related that the Attoyac Bayou flows at a much slower rate and contains far more log jams and large woody debris than it did pre-1970s.

The landowner at Attoyac 7 states that she and her family regularly fished in the Attoyac Bayou when they first moved onto the property in 1982, but haven't done so regularly since they built a pond on their property. She also relates that cars often park near the Highway 59 crossing (Attoyac 7) of the Attoyac in the spring and summer, and she believes they are fishing. She also states that her neighbors use the Attoyac Bayou to water their cattle.

At Attoyac 8, the landowner states that he and his family regularly hunted deer and fished along the Attoyac Bayou within his property from the 1970s through the 1990s. He relates that the stream is too full of logs for boating. He still hears neighbors occasionally talk of hunting and fishing along the bayou primarily on private property rather than at public access points such as county road or highway crossings.

The landowner at Attoyac 9 states that he has never personally used the stream for recreation, but leases the tract out to hunters in the fall. When asked if there was a particular reason why he never used the stream for recreation, the owner replied that no, there was no particular reason. Furthermore, the landowner states that he has seen evidence of fishing on his property in the form of litter and fishing poles. Because the landowner does not live in the area, he has not heard of any community members using the Attoyac or any of its tributaries.

According to the landowner at Attoyac 13, he and his two children occasionally walk or wade down the streambed, but they do not swim or immerse their bodies in the water. No other access points were present within the 300 meter reach.

The landowner at Attoyac 16 states that she and her family have used the Attoyac Bayou for fishing in the past, but have not done so regularly since feral hogs became common on their property 8-10 years ago. The landowner currently leases their property for hunting, and has also seen signs of fishing on their property in the form of discarded fishing line, fishing poles, and a flat bottom boat that was located on the bank near their property boundary. Following this dialogue, the landowner's son was interviewed. He relates that he fishes on the Attoyac approximately one to two times a year in the spring or summer. He also states that in the 1980s, he did a bit of duck hunting on their property. The landowner's son confirms that he has also seen the flat bottom boat located on the shore adjacent to their property. Despite visiting their property 12-15 times a year, he has never directly viewed anyone using the Attoyac recreationally. Furthermore, the interviewee relates that while growing up he often heard about fishing and hunting taking place along the Attoyac Bayou, but could not recall any specific location mentioned.

In a separate interview, the landowner confirms that fishing from a small boat or from the bank does occasionally take place. There appeared to be no regularly used human access points within the 300 meter survey reach.

One landowner stated that he occasionally sees a boat being launched at the Highway 21 crossing (Attoyac 18) of the Attoyac, but acknowledges that this does not occur very often. He as

well as his family regularly fish in the summer and hunt in the fall along the portion of the Attoyac Bayou located within his property (Attoyac 18). Furthermore, the landowner has also heard others within the community talk of hunting and fishing along the Attoyac Bayou, but he could not recall any specific locations.

At Terrapin 2, the landowner states that she and her family fished in the creek regularly during the 1970s, but has not done so regularly since then. Although the landowner does not currently use the land along Terrapin Creek for recreation, others do so illegally. The landowner expresses frustration with the number of instances in which individuals have trespassed onto her property to hunt, primarily for deer.

The landowner at site West 4 states that he and his family used the stream for swimming as well as fishing in the past, but have not done so for the past 25-30 years. He further states that he has seen as well as heard individuals talk about fishing in West Creek, but could not recall any specific locations in which the activity took place.

The owner of a tract adjacent to site West 5 confirmed that his son hunts regularly along the creek during the fall, and he regularly sees individuals fishing from the County Road 2913 crossing (West 6) of West Creek during the spring.

At Naconiche 11, the landowner states that he has not personally used the stream for recreation since the 1970s, and notes that during the 1950s when he was growing up, the whole community used the site as a swimming hole. He further states that he has not seen anyone use the area recreationally since then, nor has he heard of anyone doing so. The landowner also expressed great disdain for government interference within the watershed, primarily the building of the dam on Naconiche Creek which he asserts “messed everything up” (referring to stream flow and characteristics of Naconiche.)

The landowner at Naconiche 10 confirms that he, his family, as well as friends (children and adults) frequently swam and waded at Naconiche 10 from 1982-1999. The landowner held many swim parties for family and friends, and personally maintained a tradition for seven years of swimming in the creek on New Year’s Day. In 1998, he discovered an 8 foot alligator in a neighboring swamp and became fearful for his and his loved one’s safety while in the creek. He states that he possibly swam once in 1999, but has not done so since then.

The owner of a tract adjacent to Naconiche 7 states that he swam in the Naconiche frequently as a child, and also heard community members speaking in generalities about fishing in the stream. However, both instances of recreation he mentioned pre-date the 1975 established RUAA standard of relevance. He noted specifically the Naconiche flows significantly less now than it did when he was growing up.

The owner of a tract adjacent to Waffelow 1 relates the portion of stream that flows through his property is best described as ephemeral. In 1938, neighboring landowners dammed up the creek to make a lake on their property, and now the creek only flows through his property during a major rain or flood event. Neither he nor his family has used the portion of stream on their property recreationally due to its limited flow. However, his nephew has fished along West

Creek in other locations, but he was unsure of a specific site. Furthermore, he has seen members of a hunting club located “down the road” use West Creek for hunting and fishing.

The landowner at Waffelow 3 states that he has never used the portion of creek located on his property due to the difficult and inaccessible nature of the stream banks. The landowner also confirms that he has observed individuals during the past 3-5 years fishing off of the FM 95 crossing (Waffelow 3) of Waffelow Creek during the summer.

The owner of land adjacent to Big Iron Ore 1 conveys that he and his family picnic, hike, and hunt regularly along the portion of Big Iron Ore Creek that flows through his property. His land is bordered by two hunting leases, and he is aware of hunting that frequently takes place along Big Iron Ore.

The landowner at Big Iron Ore 2 relates that he and his family fished in the stream 6-7 years ago but did not catch anything. His neighbor’s son occasionally fishes at the FM 3017 crossing (Big Iron Ore 2), and he has also heard of others fishing in the area, although he could not name a specific site. At the end of the interview, the landowner noted that the creek has greatly changed over time due to the drilling and timber industry which has caused erosion and the silting in of the stream. Feral hogs are also a major issue in the area and frequently wallow in the stream.

A landowner who lives in the southern portion of the watershed states that he has swum, waded, and canoed the Attoyac Bayou within the past 10 years. He has often seen individuals fishing from the Highway 21 crossing (Attoyac 18) of Attoyac Bayou during the summer, and also states that from the 1970s-1990s, he was aware of a popular swimming hole located on the Attoyac near the community of Blackjack.

A landowner who owns land along the Attoyac Bayou states that he and his family regularly fish, boat, hunt and wade (adults) in the stream. He also confirms that he has heard of and seen others fish, boat, and hunt along the stream as well.

Another stakeholder who grew up in Nacogdoches County and owned property along the Attoyac Bayou states that he and his family held yearly July 4 picnics and swam at the Ironosa swimming hole located on Big Iron Ore Creek during the 1950s-1960s. He also recounts hunting and fishing in Attoyac Bayou while growing up, but hasn’t done so since the 1960s. Furthermore, he notes that the County Road 392 crossing (Attoyac 17) of Attoyac Bayou was a popular location for swimming during the 1960. Currently, he occasionally sees individuals fishing at road crossings within the watershed, and believes people infrequently launch boats at the Highway 7 crossing (Attoyac 15) of the Attoyac to set trot lines.

Efforts to contact further landowners at West 2, West 4, West6, Naconiche 7, Naconiche 8, Waffelow 2, and Attoyac 4 were unsuccessful.

Interviews conducted with other stakeholders who own property within the watershed also reveal a common recreational theme of fishing and hunting. Only one landowner cited the watershed’s bacterial impairment as a reason for no longer utilizing the watershed recreationally. Throughout the course of the interviews, if reasons were given for not recreating within the streams, they

most often implicated difficulty of access to the stream and large woody debris in the stream channel.

**Table 5.1** Activities reported in landowner interviews at sites along Attoyac Bayou. Activities include personal use, observed use, and use indicated during interviews. Each instance of use is counted separately.

Site Name	Swimming	Wading		Bank activity (hiking, picnic)	Hunting	Fishing	Boating
		Adults	Children				
Attoyac1							
Attoyac 2							
Attoyac 3							
Attoyac 4							
Attoyac 5 (20842)							
Attoyac 6							
Attoyac 7						2	
Attoyac 8					1	1	
Attoyac 9					1	1	
Attoyac 10							
Attoyac 11							
Attoyac 12 (20841)							
Attoyac 13		1	1				
Attoyac 14							
Attoyac 15 (15253)						1	1
Attoyac 16					2	2	1
Attoyac 17							
Attoyac 18 (10636)					1	2	1
Unspecified Location: Attoyac Bayou	2	2			4	5	2
Naconiche 1							



**Table 5.1** Continued

Site Name	Swimming	Wading		Bank activity (hiking, picnic)	Hunting	Fishing	Boating
		Adults	Children				
Naconiche 2							
Naconiche 6							
Naconiche 7							
Naconiche 8							
Naconiche 9							
Naconiche 10	1	1	1				
Naconiche 11 (20843)							
Unspecified Location: Naconiche Creek							
West 1							
West 2							
West 3							
West 4							
West 5					1		
West 6 (20845)						1	
Unspecified Location: West Creek					1	3	
Terrapin 1							
Terrapin 2					1	1	
Terrapin 3							
Terrapin4 (16084)							
Unspecified Location: Terrapin Creek							

**Table 5.1** Continued

Site Name	Swimming	Wading		Bank activity (hiking, picnic)	Hunting	Fishing	Boating
		Adults	Children				
Waffelow 1							
Waffelow 2							
Waffelow 3 (16083)						1	
Unspecified Location: Waffelow Creek							
Big Iron Ore 1				1	1		
Big Iron Ore 2						2	
Big Iron Ore 3							
Big Iron Ore 4							
Big Iron Ore 5 (20844)							
Unspecified Location: Big Iron Ore Creek					1	1	
SUM	3	4	2	1	14	23	5

**Observed Signs of Recreation Documented During Surveys**



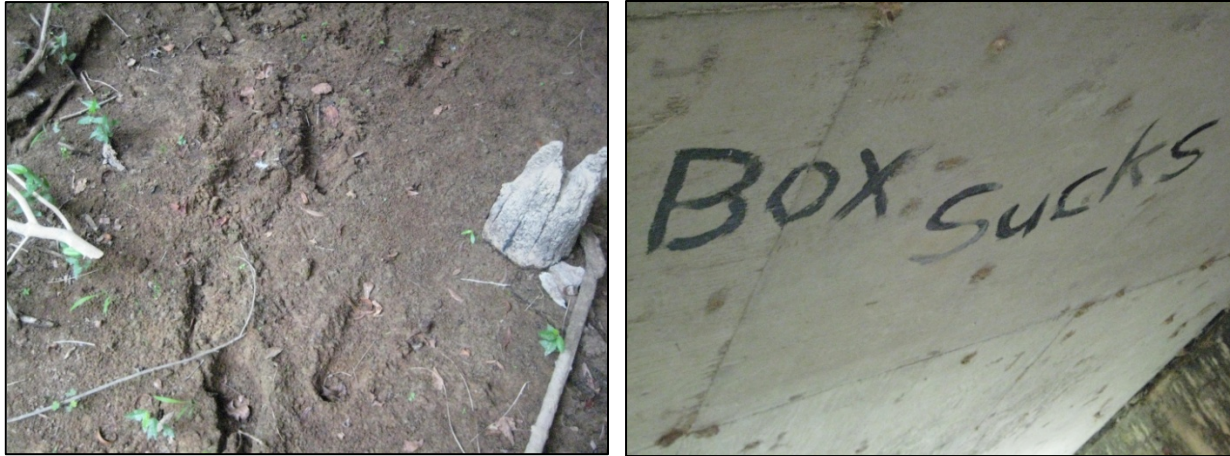
**Photogroup 5-1** Attoyac 4 depicting crocheted afghan with unidentified animal carcass lying along the stream bank next to FM 1971 bridge crossing.



**Photogroup 5-2** Attoyac 7 depicting signs of recreational use along stream bank.



**Photogroup 5-2 cont.** Attoyac 7 depicting signs of recreational use along stream bank.



**Photogroup 5-3** Attoyac 12 depicting footprints along the stream bank as well as graffiti under the FM 138 bridge crossing.



**Photogroup 5-4** Attoyac 15 depicting footprints along the stream bank near the Hwy 7 bridge crossing.



**Photogroup 5-5** Attoyac 17 depicting secondary contact recreation in the form of a trot line attached to a bank-side tree.



**Photogroup 5-6** Big Iron Ore 3 depicting potential recreation with a boot print located along the stream bank. Print is located on the right side of photo; corresponding foot is used to establish scale.



**Photogroup 5-7** Naconiche 6 depicting ATV use along stream bank.





**Photogroup 5-8** Naconiche 8 depicting the lid of a live bait container on the bank near stream access point, a fish trap located within the stream, and a set hook that is no longer used attached to a limb that overhangs the stream channel.



**Photogroup 5-9** Terrapin 3 depicting an animal trap located along the stream bank and a defunct bridge across the stream channel.



**Photogroup 5-10** West 6 depicting a hammock attached to a stream-side tree.



**Photogroup 5-11** Terrapin 4 depicting initials appearing to read “CR” carved into a beech tree located along stream bank. Photo enlarged to show detail.

## Chapter 6 : Organization of Electronic Files and RUAA Summary

### Organization of Electronic Files

Copies of field data sheets, stakeholder interviews, contact information form, RUAA summary form, as well as RUAA survey photos are furnished electronically as an appendix to this report.

Electronic files are organized by survey and the file organization illustrated below:

```

RUAA2012_Attoyac_Bayou
    RUAA_Information
        Stakeholder_Interviews
RUAA_Survey1_July2012
    Field_Data_Sheets
    Survey_Photos
        Stream_Segment
            Stream_Name
            Site_ID
                SiteID_Date_Orientation_Transect
RUAA_Survey2_August2012
    Field_Data_Sheets
    Survey_Photos
        Stream_Segment
            Stream_Name
            Site_ID
                SiteID_Date_Orientation_Transect
  
```

Each site ID folder contains sub-folders labeled as transect number and when necessary, other, rec\_signs, and source\_signs. Photos within these sub-folders are labeled as follows:

SiteID\_Date(yyyymmdd)\_Orientation\_TransectNumber. Example:

Attoyac1\_20120721\_DS\_30M. This label designates the photo as being taken at survey site Attoyac1 on July 21, 2012, at the 30 meter transect facing downstream. For the remaining orientations, LB denotes left bank; RB denotes right bank; US denotes upstream.

### Summary

RUAA surveys were conducted at forty-three (43) sites within the Attoyac Bayou watershed on July 20-22 and August 24-25. No recreational activities were observed by CES and SFASU field staff during either survey despite there being sufficient water or pools available. Recreational activities recounted during stakeholder interviews are summarized in Figure 6.1. Based upon interview findings, primary contact recreation was reported to occur infrequently within the Attoyac Bayou Watershed while secondary and non-contact recreation such as fishing and hunting are noted to occur more often. Public access to water bodies is limited to public road crossings, as the majority of the land within the watershed is privately owned. Based on interviews and signs observed during field surveys, Attoyac 18, Attoyac 15, and Attoyac 7 road crossings of the Attoyac Bayou appear to be the most publically accessed sites.

Evidence of recreation was observed at ten (10) of the forty-three (43) survey sites, as summarized in the Recreational Indicators Observed During Field Surveys portion of Chapter 5. All of the evidence was indicative of secondary contact recreation in the form of fishing or bank-based activities. The most prevalent items found include fishing tackle, discarded fishing line, live bait containers, discarded set hooks, as well as beer cans, drink bottles and food wrappers.

Two landowners state they have swum in the Attoyac Bayou and Naconiche Creek respectively within the past 10-15 years. These two responses were collected through anonymous surveys distributed through the mail. Respondents did not indicate whether they swim in the streams regularly, or if the recreation they indicated was a rare event. Several individuals, among them State Game Wardens, confirmed that swimming does occasionally occur within the watershed, primarily within the Attoyac Bayou. The State Game Wardens also confirm that noodling, a fishing technique in which anglers submerge themselves in bodies of water to capture fish by hand occurs periodically; primarily in the area of the Attoyac Bayou between Attoyac 18 and Attoyac 15. Signs of human use in the form of illegal dumping are common throughout the watershed. Sites Attoyac 2 and Attoyac 3 appear to be the most heavily used for illegal dumping of large household appliances and garbage.

A small, unmarked, unmaintained area at Attoyac 15 appears to be used as a boat or canoe launch promotes recreation, but no other characteristics such as parks, playgrounds, public trails or campgrounds which would further promote recreation were observed. The rural nature and predominantly private ownership of land within the watershed serves as an impediment to recreation, as does the prevalence of woody debris and log jams within the streams. Also, alligators were present during surveys at sites Attoyac 16 and Waffelow 3. Alligators have also been documented during water quality collection activities at Attoyac 15, as well as by the landowner of Attoyac 14. Water Moccasins were also observed at many of the sampling sites.. Furthermore, during both surveys, the stream channels of Attoyac 1, Attoyac 2, and Terrapin 1 were completely dry. During the field survey conducted in August, much of the upper portion of the Attoyac had no flow, was composed of stagnant pools, and while maintaining sufficient water for recreation, was very unappealing in appearance and odor.

For individuals to access streams at public road crossings, vehicles must be parked on the shoulder of the road, as there are no designated parking areas. Furthermore, the land adjacent to these public road crossings is all privately owned, often times gated or fenced.

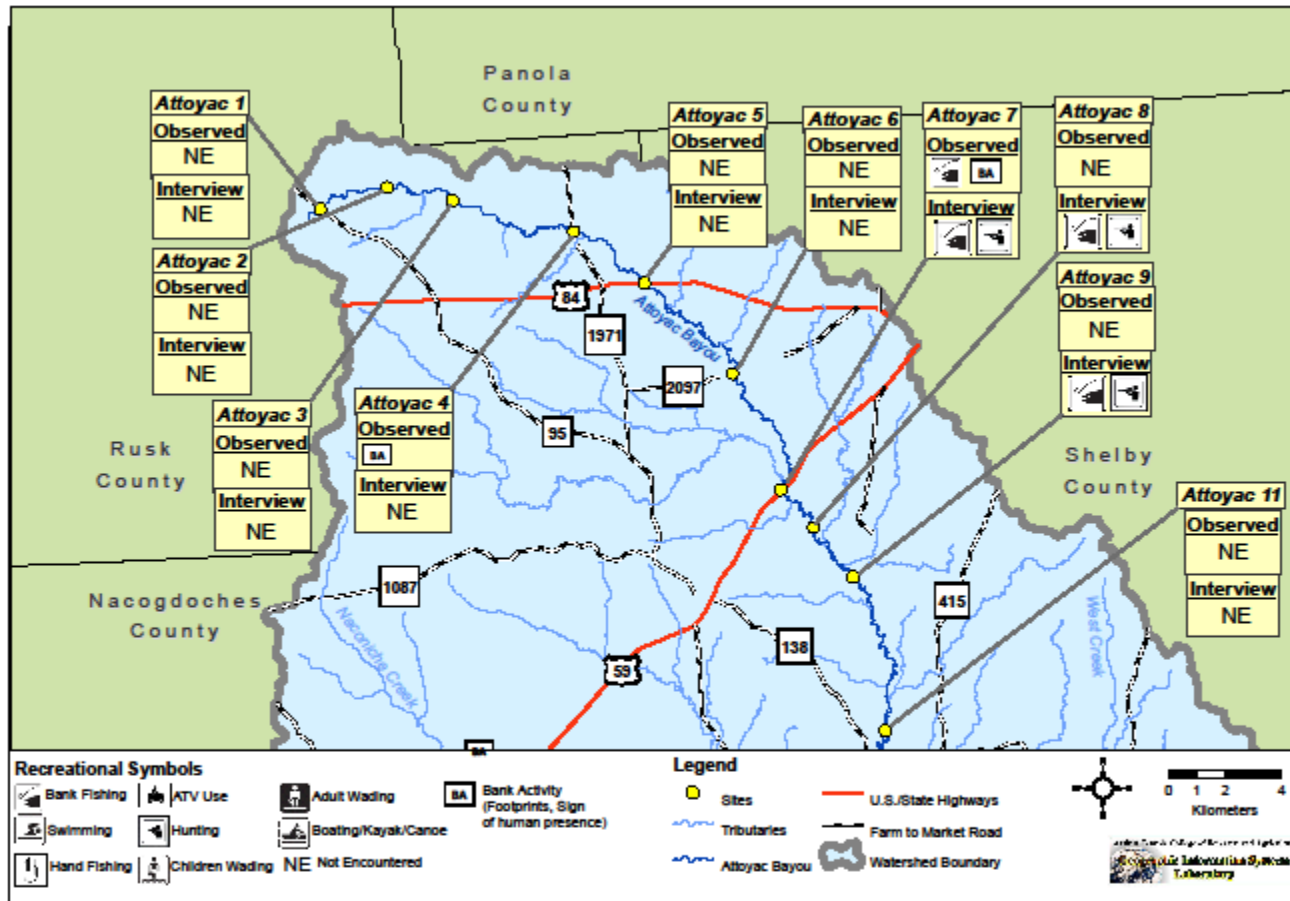
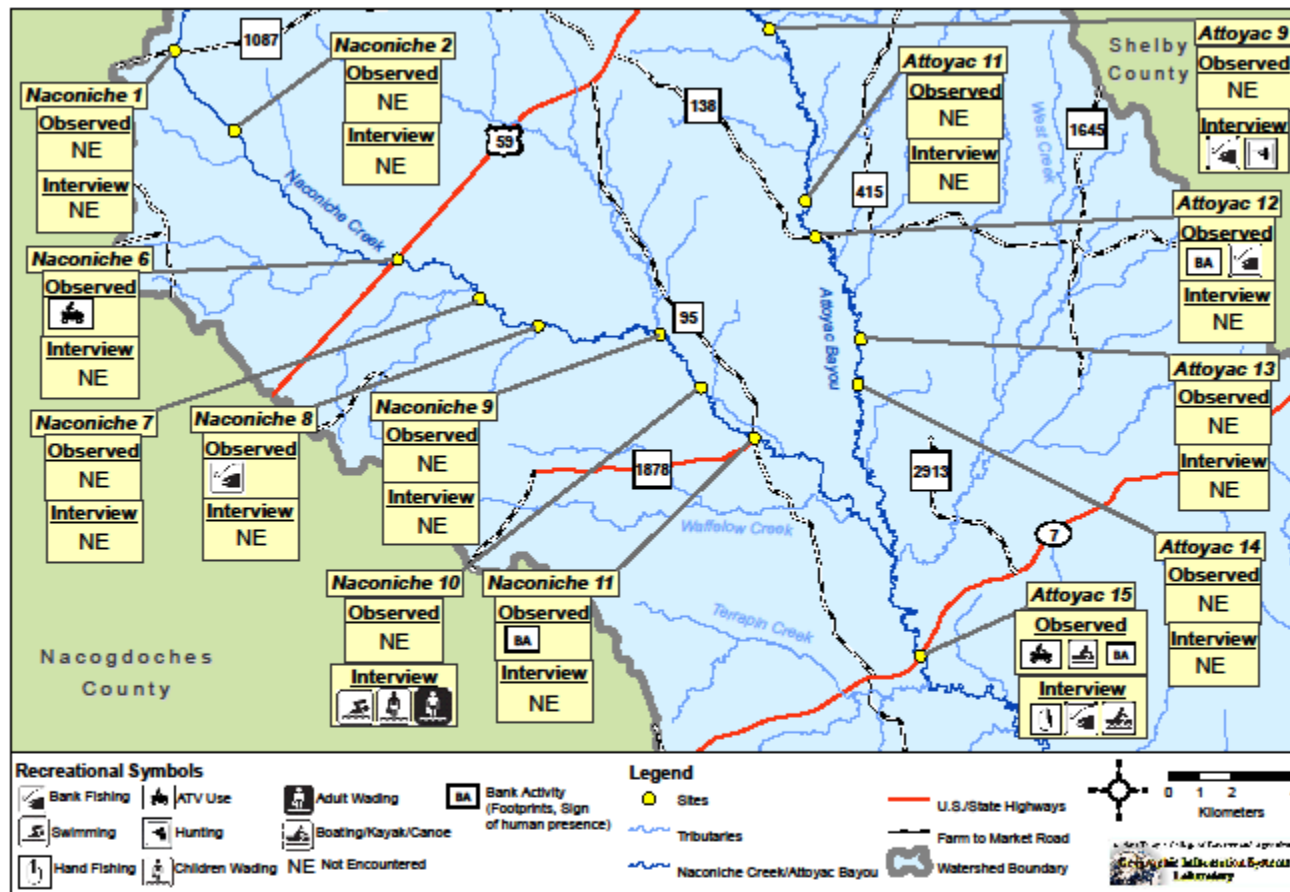
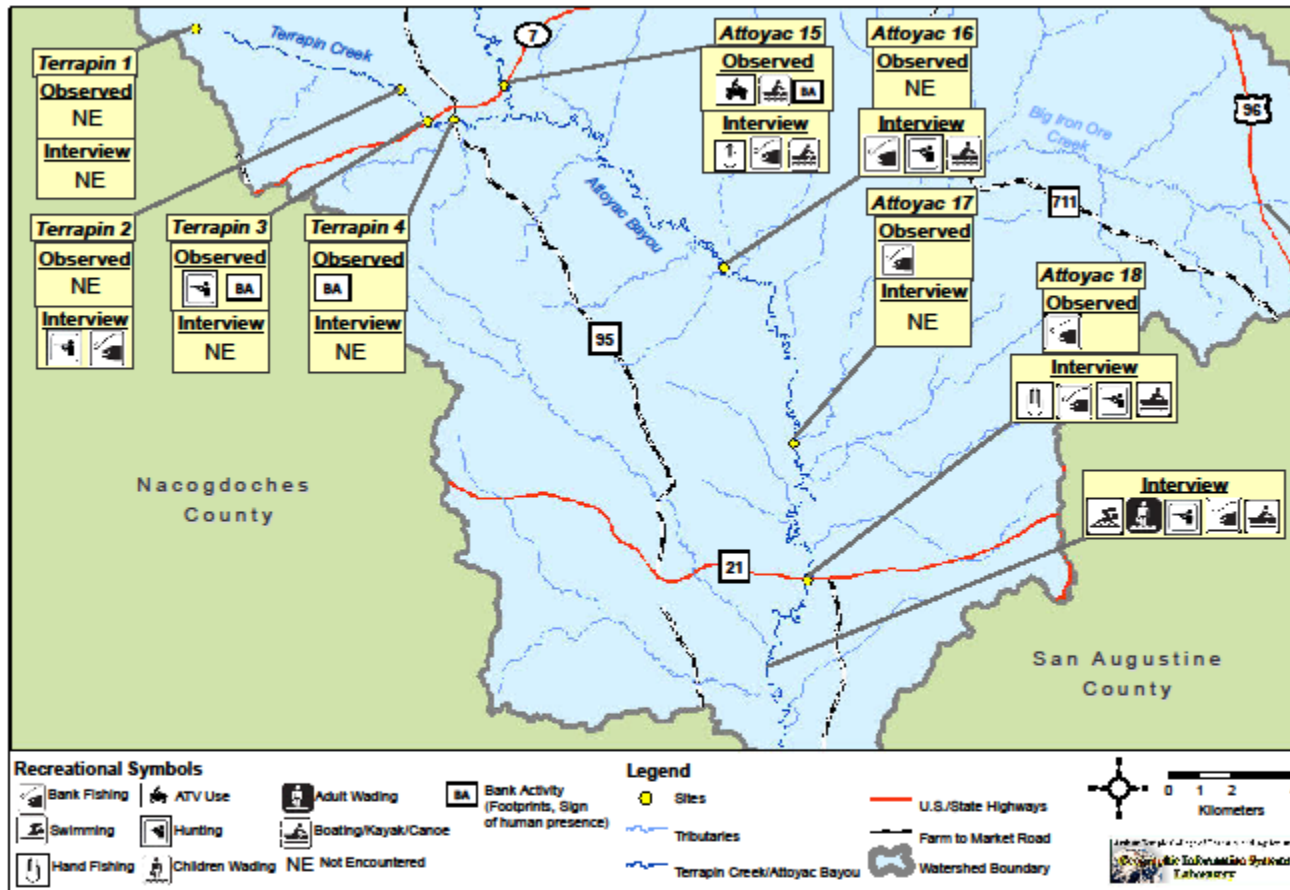


Figure 6.1 Summary of observed and interviewed human activities along Attoyac Bayou (Segment 0612).

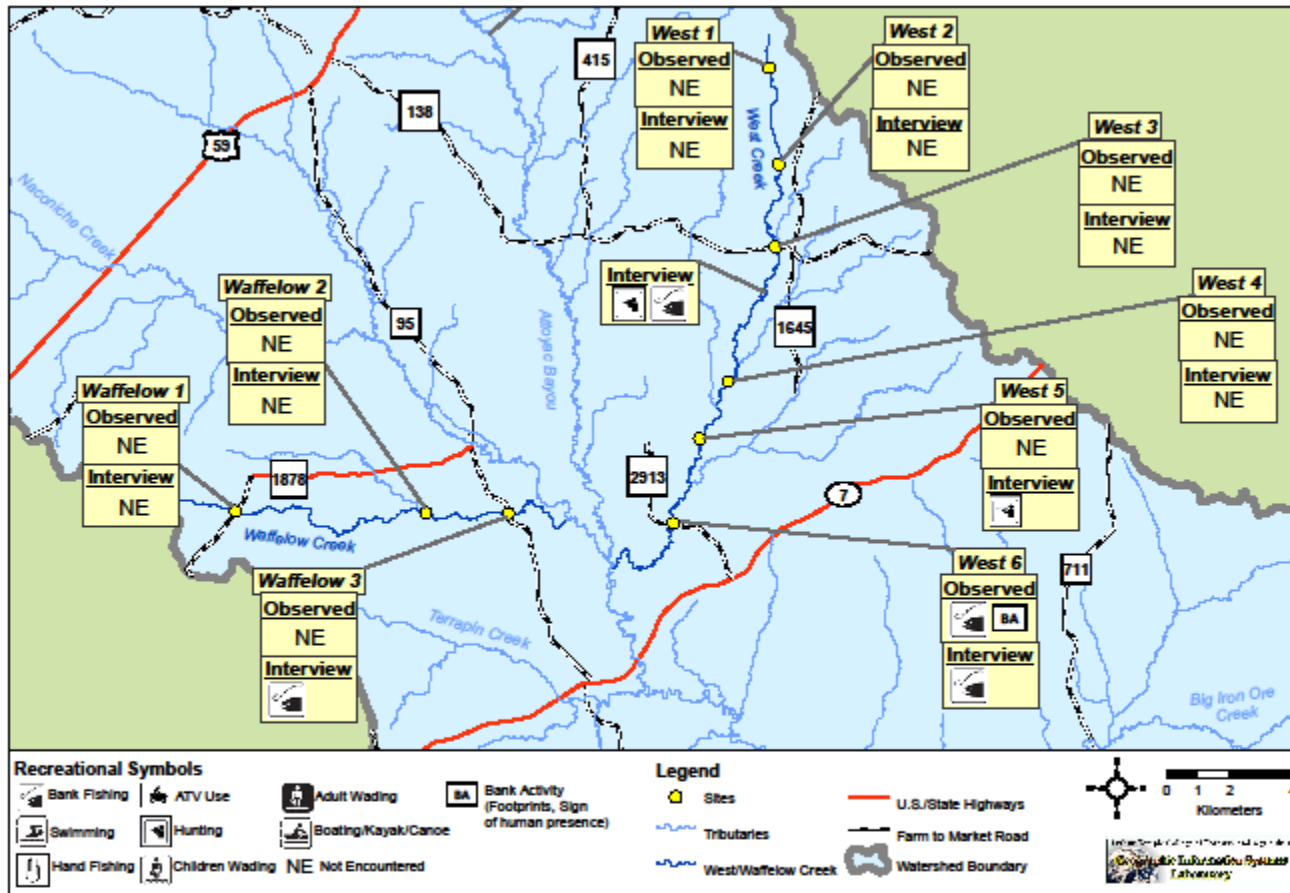


**Figure 6.2** Summary of observed and interviewed human activities along Attoyac Bayou (Segment 0612) and Naconiche Creek (Segment 0612).

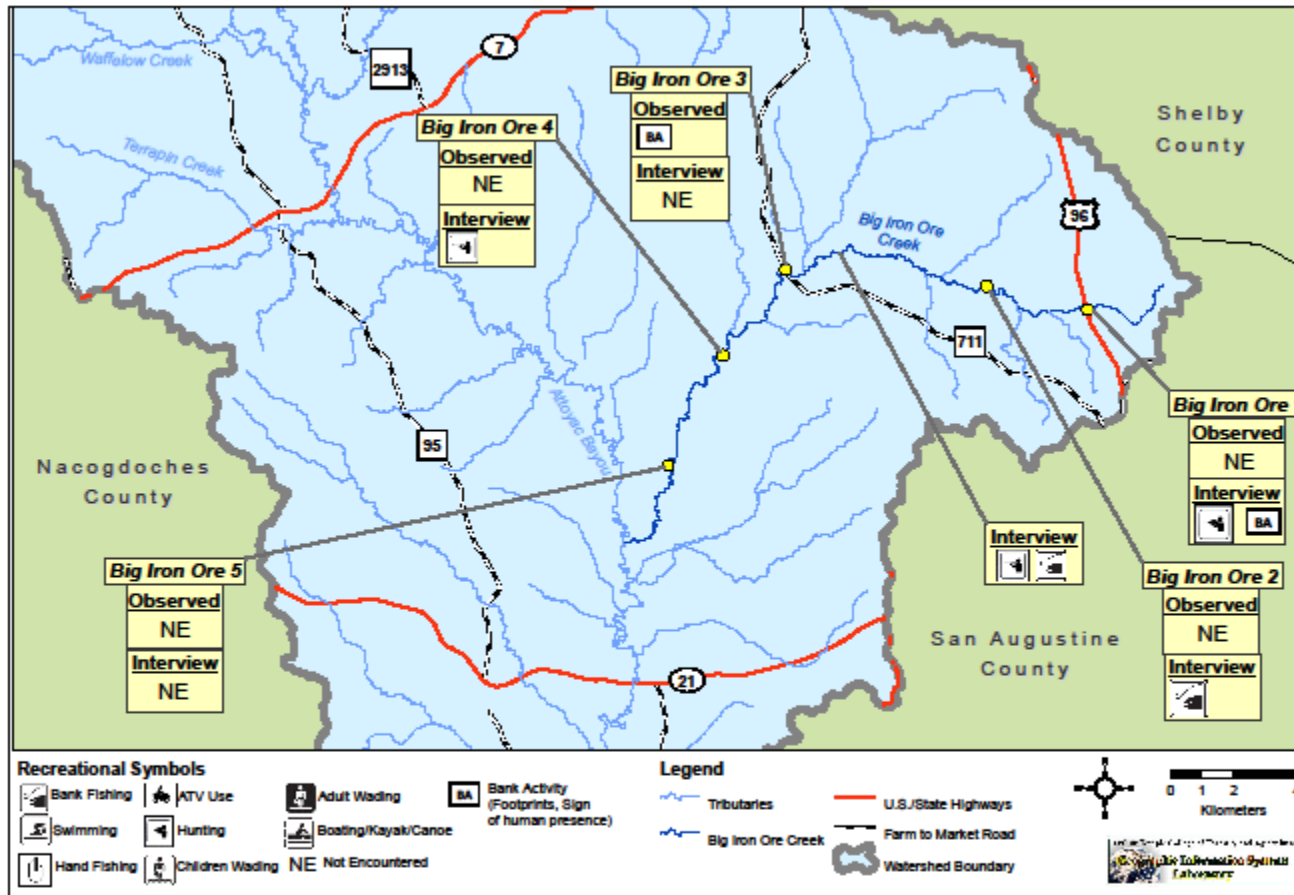


**Figure 6.3** Summary of observed and interviewed human activities along Attoyac Bayou (Segment 0612) and Terrapin Creek (Segment 0612A). Of note, four landowners and multiple state officials note activities of swimming, wading adults, hunting, fishing, and boating within the Attoyac Bayou, but did not provide precise locations.





**Figure 6.4** Summary of observed and interviewed human activities along Waffelow Creek (Segment 0612B) and West Creek (Segment 0612). Of note, two landowners indicated hunting and/or fishing along West Creek but were unable to provide precise locations.



**Figure 6.5** Summary of observed and interviewed human activities along Big Iron Ore Creek (Segment 0612). Of note, two landowners indicated fishing and/or hunting along Big Iron Ore Creek, but did not provide precise locations.

## Chapter 7 : REFERENCES

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**Appendix A**

**Letter Accompanying Standard RUAA Interview Form Distributed Through Mail**

**Stephen F. Austin State University**  
**Arthur Temple College of Forestry and Agriculture**  
P. O. Box 6109 SFA Station • Nacogdoches, TX 75962-6109  
Phone (936) 468-3301 • Fax (936) 468-2489

Dear Attoyac Bayou Watershed Stakeholder,

We need your help. As a part of the ongoing Attoyac Bayou Watershed Protection Plan, a Recreational Use and Attainability Analysis (RUAA) is being conducted to determine what types of recreational activities take place within the Attoyac Bayou Watershed. As a stakeholder, you have firsthand knowledge of the recreational use of the watershed, and we would greatly appreciate your assistance in documenting this information. In addition, the information you provide will greatly assist me in the completion of my graduate research thesis at the Stephen F. Austin Arthur Temple College of Forestry and Agriculture.

To complete the survey, simply have someone in your household 18 years of age or older answer the questionnaire. The entire survey will only take about 5-10 minutes to complete. There are no right or wrong answers, and the opinions and information you provide will remain anonymous.

Please answer the questions regarding the stream within the watershed that you are most familiar with, noting its name at the top of the survey. To return the survey, please enclose it in the self addressed, stamped envelope included, and mail it back to the university by Monday, October 1, 2012.

We greatly appreciate your assistance in our research. Enclosed you will find the survey form as well as a fact sheet regarding the watershed protection plan. If you have any questions regarding the Attoyac Bayou Watershed Protection Plan, the RUAA, or upcoming stakeholder meetings, please contact Sarah Fuller, Graduate Research Assistant at Stephen F. Austin Arthur Temple College of Forestry and Agriculture at (936) 468-2412 or [fullersa@titan.sfasu.edu](mailto:fullersa@titan.sfasu.edu), or Dr. Pat Stephens Williams at (936) 468-2196 or [stephensp@sfasu.edu](mailto:stephensp@sfasu.edu).

Thank you once again for your assistance,

Sarah Fuller