## Attoyac Bayou Watershed Protection Plan and Monitoring Implementation Effectiveness Final Report

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Texas State Soil and Water Conservation Board Project #16-12

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## Contents

Acronym List	
Map of the Attoyac Bayou Watershed4	
Project History	
WPP implementation	
Stakeholder engagement6	
OSSF remediation	
Water quality management plans7	
Feral hog management	
Water Quality Monitoring	
Future plans for the watershed13	



Attoyac Bayou Watershed. Photo by Ed Rhodes, TWRI.

## Acronym List

ANRA	Angelina & Neches River Authority
AU	Assessment Unit
CRP	Clean Rivers Program
CEU	Continuing Education Unit
CFU	Colony-forming units
DO	Dissolved oxygen
EPA	United States Environmental Protection Agent
L	Liter
mg	Milligrams
mL	Milliliters
MPN	Most Probable Number
N	Nitrogen
OSSF	On-site sewage facility
SWCD	Soil & water conservation district
TCEQ	Texas Commission on Environmental Quality
TSSWCB	Texas State Soil and Water Conservation Board
TWRI	Texas Water Resources Institute
WPP	Watershed Protection Plan
WQMP	Water quality management plan



## Map of the Attoyac Bayou Watershed

## **Project History**

The Attoyac Bayou is an 82-mile-long water body in the northeast portion of the Neches River Watershed. It is identified as segment 0612 in the Texas Surface Water Quality Standards and is considered impaired due to excessive levels of monitored fecal indicator bacteria. The Bayou has 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. The majority of the watershed 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.

In 2009, the Attoyac Bayou Watershed Partnership was formed to address the noted bacteria impairment. Using technical support from the Angelina & Neches River Authority (ANRA), Stephen F. Austin State University, Castilaw Environmental Services, Texas A&M University and the Texas Water Resources Institute (TWRI) as well as funding from the Texas State Soil and Water Conservation Board

(TSSWCB) through project #09-10 entitled "Development of a Watershed Protection Plan for Attoyac Bayou," the Attoyac Bayou Watershed Protection Plan (WPP) was completed. This plan outlines an appropriate strategy to address bacteria source contributions in this rural watershed and describes practices that when implemented, will reduce loading contributions to the watershed. EPA accepted the WPP in the spring of 2015.

Project #16-12, "Attoyac Bayou Watershed Protection Plan and Monitoring Implementation Effectiveness," has been implementing the WPP since October 2016. Over the last three years, the project partners have hosted a variety of education and outreach programs and developed a related on-site sewage facility (OSSF) rehabilitation program through the Texas Commission on Environmental Quality



Figure 1 - Water quality monitoring sites within the watershed.

(TCEQ). The 2016 Integrated Report of Surface Water Quality delisted the most downstream assessment unit (0612\_01) of the Attoyac Bayou. As efforts continue in this area with future WPP implementation programs, we hope to see more success in the reduction of bacteria levels in the area.

### WPP implementation

#### Stakeholder engagement

Several educational programs and meetings were hosted and coordinated by the WPP project team. A homeowner OSSF training was held in Nacogdoches in September 2017 with 28 attendees. In November 2017, a Texas Watershed Stewards Program was held in the watershed with 35 attendees. Project #16-12 also provided an 8-hour continuing education unit (CEU) course for OSSF professionals in Lufkin in May 2019.

The project team attended relevant local meetings that were not hosted by the WPP project in order to participate in greater community efforts. Presentations and updates about the implementation efforts of Project #16-12 were given at each annual Clean Rivers Program (CRP) meeting held during the project performance period: July 2017, May 2018 and June 2019. An overview of the project was delivered at the Pineywoods Resource Conservation and Development annual board meeting in Nacogdoches in November 2018, at the Texas Watershed Stewards Meeting in May 2019 in Lufkin, and at the OSSF CEU course held in May 2019 in Lufkin. The project team also participated in the Texas Well Owner Network event hosted by Healthy Texas in Lufkin in November 2017.

The Attoyac Bayou WPP project was highlighted each year in ANRA's annual Basin Highlights Report through the CRP. Additionally, the project team reaches stakeholders more frequently through social media engagement, news releases, handing out educational materials like our homeowner OSSF maintenance guides and keeping the watershed website and email subscribers updated with events and relevant news.

#### **OSSF** remediation

The Attoyac Bayou WPP identified failing or nonexistent OSSFs as one of the leading contributors to lower water quality in the Attoyac Bayou watershed, and the project team applied for and received a Clean Water Act §319(h) Nonpoint Source Grant from the TCEQ and EPA to identify, repair and replace failing OSSF systems. This project, "Attoyac Bayou Watershed Protection Plan Implementation – On Site Sewage Facility (OSSF) Remediation," builds upon the similar previous efforts by ANRA. TWRI, Pineywoods Resource Conservation and Development and ANRA used this grant funding from TCEQ as well as Supplemental Environmental Project funds to assist low income families within the watershed that have failing systems (or no system) and to educate residents on best practices related to owning and maintaining OSSFs. TWRI and ANRA are also continuing to explore development of a watershed OSSF database to better monitor the age and health of OSSFs in the watershed. At this point, developing a database is not feasible, but efforts have begun to standardize data collection and documentation across the watershed counties.

This project began in March, 2017 and was originally intended to replace or repair approximately 13 OSSFs.



Figure 2 - Local partners installing a new system at a watershed residence. Photo by KTRE 9 News.



**Figure 3** - Local partners installing a new system at a watershed residence. Photo by KTRE 9 News.

Response to the program was very positive, and additional funds were secured to provide an additional 10 repairs/replacements, for a total of 23 OSSFs repaired, replaced or installed through this project. A follow-on project, also funded through a Clean Water Act §319(h) Nonpoint Source Grant by TCEQ and the EPA, has been approved with enough funding to repair or replace 15 additional systems and the project team has begun accepting applications from watershed residents.

#### Water quality management plans

One of the goals the stakeholders had when developing the WPP was to encourage residents to implement water quality management plans (WQMPs) on farms, forestry and ranching operations. WQMPs are developed between landowners and the local soil & water conservation districts (SWCDs)

and are property specific. During the project performance period, the Attoyac Bayou technician wrote plans for eight sites over 1,967 acres. The practices implemented included livestock pipeline, watering facilities, cross fences and prescribed grazing.



**Figure 4** - Livestock water pipeline and cross fences installed in the watershed as part of a WQMP. Photo by Chris Crenshaw, Nacogdoches SWCD 319 technician during the project period.

#### Feral hog management

While the WPP indicated feral hogs to be one of the largest contributors of bacteria in the watershed, management of feral hogs has proven to be a difficult goal to monitor. The WPP implementation team encourages local residents to implement exclusionary management practices related to their deer feeders and to install traps that will directly lead to removal of the hogs from the watershed. The watershed coordinator for the Attoyac Bayou has noted that because there is no limit in Texas on how many feral hogs can be killed, very few processors and hunters (if any) are keeping records. Although there are no numbers to report for this management measure, education and assistance related to feral hog management continues to be given to stakeholders upon request.

## Water Quality Monitoring

Five of the impaired stream segments were monitored in the Attoyac Basin monthly between March 2017 and August 2019 for a total of 31 monitoring events. These sites were the Attoyac Bayou at FM 138 (Station ID# 20841), Naconiche Creek at FM 95 (ID# 20843), Waffelow Creek at FM 95 (ID# 16083), Terrapin Creek at FM 95 (ID# 16084) and Big Iron Ore Creek at FM 354 (ID# 20844). Water quality parameters measured in-situ included stream discharge (when possible), dissolved oxygen, pH, temperature and specific conductance. Grab samples were transported to the ANRA laboratory for

analysis of *E. coli*, nitrate-nitrogen (N), nitrite-N, ammonia-N, total phosphorus, sulfate, chloride, total dissolved solids, and total suspended solids. The goal of this monitoring was to continue baseline water quality data collection and to begin collecting data in areas where WPP implementation activities are being implemented. Over time, this data will allow the Attoyac Bayou Partnership to determine the extent to which WPP implementation activities have affected instream water quality.



#### Figure 5 - E. coli concentrations geometric means by monitoring site from March 2017 through August 2019.

Based on preliminary analyses, geometric mean *E. coli* remains elevated above the primary contact recreation standard of 126 colony-forming units (CFU) per 100 milliliters (mL) at all five sites in the watershed. The lowest mean for the study period was at the Terrapin Creek station with 287 most probably number (MPN)/100 mL. Higher concentrations were measured during times of greater streamflow at all sites. Most of the samples taken at each site were higher than this standard. For the Attoyac segment, geometric mean *E. coli* concentrations have increased during the last nine years of monitoring, from 225 MPN/100 mL in the 2010-2012 period, to 281 MPN/100 mL for the 2014-15 cycle, and 418 MPN/100 mL from 2017-2019. However, mean concentrations are strongly affected by large flow events with concentrations greater than 2,400 MPN/100 mL during these times. Additional monitoring for bacteria is warranted based on these data, and as more data is collected with future monitoring efforts, more extensive statistical investigations will be completed.

For nitrate-nitrogen, mean concentrations were well below the threshold value of 1.95 milligrams (mg)/liter(L) across all sites during the monitoring period. No concentrations above 1.95 were measured during the period, indicating that nitrogen levels are not likely to be a significant concern. For ammonia

9

nitrogen, means were well below the screening criteria of 0.33 mg/L with no observations above this concentration during the period. Total phosphorus concentrations were similarly below screening values and once again, the maximum value measured during the period was 0.44 mg/L, well below the screening criteria of 0.69 mg/L. None of the nutrient concentrations measured during this study period would support the conclusion that excess nutrients from nonpoint pollution sources are negatively impacting these streams.



*Figure 6* - Total nitrate as N averages by monitoring site from March 2017 through August 2019.



*Figure 7* - Total ammonia as N averages by monitoring site from March 2017 through August 2019.

Annual mean dissolved oxygen (DO) concentrations were above 5.0 mg/L, the water quality standard for DO, for all monitoring locations during the study period. Summer is the season when the lowest DO values are typically observed, especially on smaller stream systems when discharge is minimal. Mean summer DO concentrations were above 5.0 mg/L for the Big Iron Ore (7.6 mg/L), Naconiche (6.4 mg/L) and Terrapin (6.2 mg/L) stations. Mean summer DO was 4.2 mg/L for the Waffelow monitoring site and 4.8 mg/L for Attoyac site. About 31% of the samples measured at the Waffelow sampling location were below 5.0 mg/L, with almost all of these lower readings being observed during summer months. Stream discharge was minimal during these periods with DO measurements being made in a pool upstream of the SH 95 bridge. These relatively lower DO concentrations at the Waffelow Creek in summer are likely not a significant concern since they probably reflect the stream geomorphology and fluvial status rather than potential nonpoint sources of pollution. The relatively low levels of nitrogen and phosphorus measured at the Waffelow sampling site also reinforce this conclusion.



Figure 8 - Total phosphorus by monitoring site from March 2017 through August 2019.



Figure 9 - Dissolved oxygen averages by monitoring site from March 2017 through August 2019.



Figure 10 – Mean pH by site from March 2017 through August 2019.

## Future plans for the watershed

At the conclusion of Project #16-12, the same project team will continue implementing the Attoyac Bayou WPP with funding from the TSSWCB via Project #19-53, "Attoyac Bayou Watershed Protection Plan Implementation Effectiveness Monitoring and Facilitation Continuation." The first watershed newsletter has been published and will continue to be produced annually. Copies of the newsletter can be found under the stakeholder resources list on the Attoyac Bayou Watershed website, <u>http://attoyac.tamu.edu/</u>. A stakeholder meeting is scheduled for December 10, 2019, with other educational programming to be announced as well. Water quality monitoring will continue through the WPP implementation projects and CRP, and the WPP implementation team will continue to work with and educate residents, working together toward the delisting of the Attoyac Bayou.



Figure 11 – Water quality monitoring in the Attoyac Bayou. Photo by Ed Rhodes, TWRI.

13