

# Attoyac Bayou Watershed Protection Plan Implementation Effectiveness Monitoring and Facilitation Continuation

Texas Water Resources Institute TR-532  
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# Attoyac Bayou Watershed Protection Plan Implementation Effectiveness Monitoring and Facilitation Continuation

## Final Report

Texas State Soil and Water Conservation Board Project #19-53

Prepared by:

Emily Monroe<sup>1</sup>, Dr. Lucas Gregory<sup>1</sup>, Dr. Matthew McBroom<sup>2</sup>, Carla Ethridge<sup>3</sup>, and  
Jeremiah Poling<sup>3</sup>

<sup>1</sup>Texas A&M AgriLife Research, Texas Water Resources Institute

<sup>2</sup>Stephen F. Austin State University, Arthur Temple College of Forestry

<sup>3</sup>Angelina & Neches River Authority

Texas A&M AgriLife Research, Texas Water Resources Institute

578 John Kimbrough Blvd., 2260 TAMU

College Station, Texas 77843-2260

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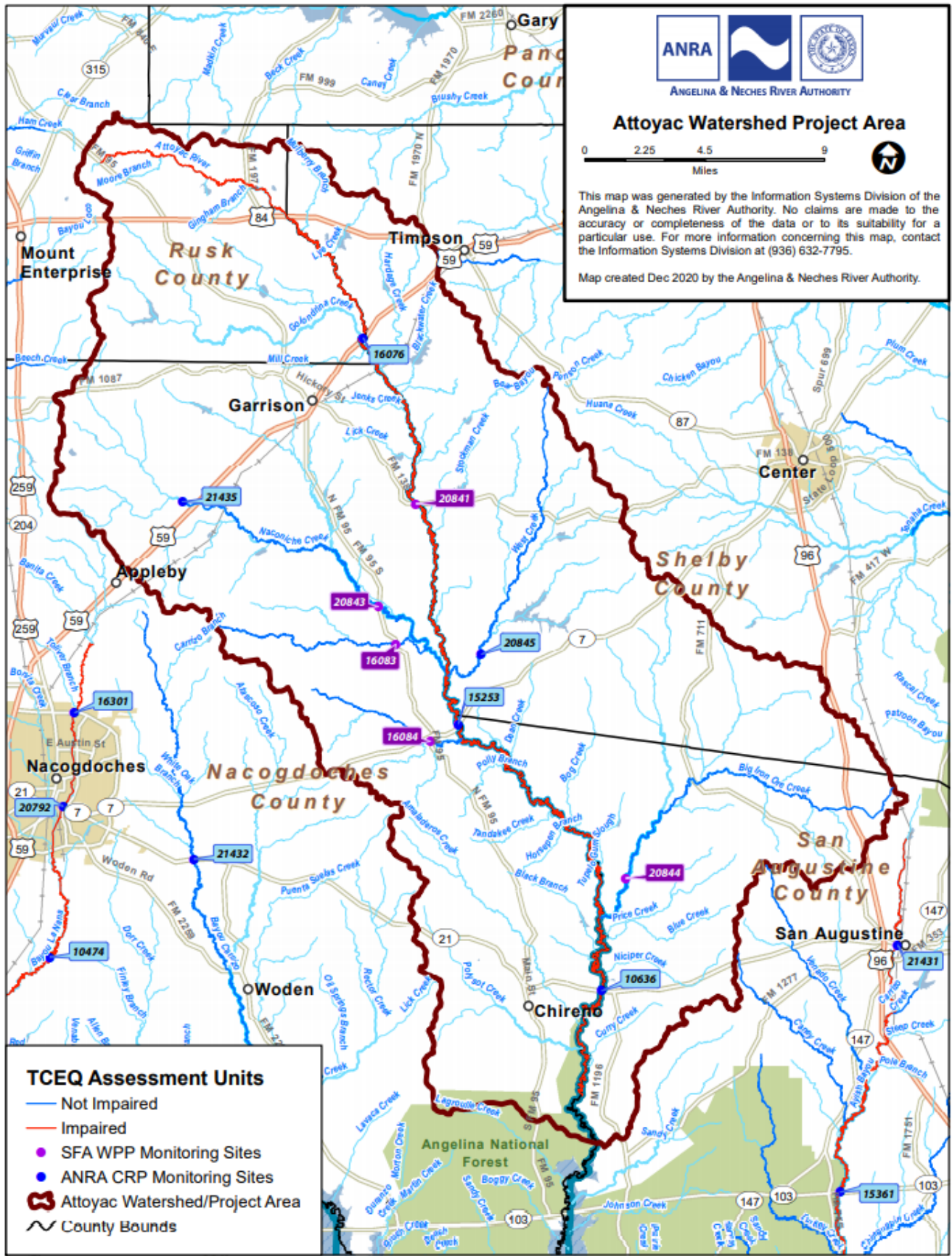
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## Acronym List

ANRA	Angelina & Neches River Authority
AU	Assessment Unit
CEU	Continuing Education Unit
CFU	Colony-forming units
DO	Dissolved oxygen
EPA	United States Environmental Protection Agency
MPN	Most Probable Number
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
WQS	Water quality standard

Map of the Attoyac Bayou





Attoyac Bayou tributary. Photo by Chantal Cough-Schulze.

### Attoyac Bayou Project History

The Attoyac Bayou Watershed Protection Plan Implementation Effectiveness Monitoring and Facilitation Continuation, or the Texas State Soil and Water Conservation Board's (TSSWCB) Project #19-53, is the third project in the TSSWCB's Attoyac Bayou watershed-based planning project series being implemented by the Texas Water Resources Institute (TWRI), the Angelina & Neches River Authority (ANRA), and Stephen F. Austin State University (SFA). The first project, #09-10, "Development of a Watershed Protection Plan for Attoyac Bayou", established the Attoyac Bayou Watershed Partnership and began the process of developing the watershed protection plan (WPP) to address elevated bacteria. The Attoyac Bayou WPP covers the bayou's 82-mile-long main waterbody and its tributaries in the northeast portion of the Neches River Watershed. The headwaters for the bayou are in Rusk County, and it flows through Nacogdoches, San Augustine, and Shelby Counties before joining the Sam Rayburn Reservoir. After the United States Environmental Protection Agency (EPA) accepted the WPP in 2015, the Partnership started implementing it with Project #16-12, "Attoyac Bayou Watershed Protection Plan and Monitoring Implementation Effectiveness."

Over the three years covered by #16-12, the project partners hosted multiple education and outreach programs and created an on-going On-Site Sewage Facility (OSSF) remediation program with the Texas Commission on Environmental Quality (TCEQ), which has repaired or replaced 57 septic systems in the watershed to date. Project #19-53 continued the implementation of the Attoyac Bayou WPP from May 2019 through May 2021. The COVID-19 global health pandemic hindered hosting in-person education and outreach programs, causing educators to switch to online platforms. However, the project team was able to continue monthly water quality monitoring, the OSSF remediation program, and be featured in multiple local news stories.



Attoyac Bayou tributary. Photo by Chantal Cough-Schulze.

## Project Implementation

### Outreach & Education

Throughout the project, the Attoyac Bayou Watershed subscriber list with 169 contacts was used to communicate project updates, upcoming events, as well as emergency preparedness information. In September 2019, the annual newsletter was sent to stakeholders, as well as another e-mail inviting watershed residents to an Abandoned Well Workshop in which attendees were educated on how to properly decommission wells on their property. An invitation to the December 2019 stakeholder meeting was sent one month prior in November. In August 2020, ahead of Hurricane Laura that was anticipated to reach the watershed, a special update letter went to subscribers to educate them on how to protect their water well system, and what to do in the event their well is contaminated by flood water. Another newsletter was released in October 2020, providing project updates as well as advertising for the online Landowner Riparian and Stream Ecosystems workshop being hosted for the watershed.

#### *Messages Sent to Attoyac Bayou Mailing List Subscribers*

- [September 2019 Newsletter](#)
- [September 2019 Abandoned Well Workshop](#)
- [December 2019 Stakeholder Meeting invitation](#)
- [December 2019 Stakeholder Meeting reminder](#)
- [August 2020 Hurricane Laura Special Update](#)
- [October 2020 Newsletter and Riparian Education workshop invitation](#)

Due to the COVID-19 global health pandemic, only two programs were hosted during this project cycle. A stakeholder meeting was hosted by the Attoyac Bayou Watershed Partnership on December 10, 2019, with 13 attendees. The meeting included project updates from TWRI, water quality monitoring updates given by ANRA, and an educational presentation about best management practices in Forestry and their impact on water quality, presented by Donna Work, Biologist from Texas A&M Forest Service. The second program was an online Landowner Riparian and Stream Ecosystems workshop on October 19, 2020, with 34 attendees. The program agenda included watershed project and water quality updates, riparian principles, watershed processes, basic hydrology, erosion/deposition principles, riparian



vegetation, and potential causes of degradation, as well as information on technical and financial assistance.

The Attoyac Bayou Watershed projects were also highlighted several times in the local news, as well as highlighted in TWRI's own publications and ANRA's 2020 Upper Neches Basin Summary Report.

#### *The Attoyac Bayou in the News*

- [Improving water quality with septic system repair, replacement in Attoyac Bayou](#) - January 2020
- [Partnership coordinates septic system repair, replacement](#) - February 2020
- [TWRI program spotlight: Attoyac Bayou watershed](#) - February 2020
- [Protecting our water: Institute works with partners to improve water quality in East Texas](#) - March 2020
- [TWRI 2019 Annual Report](#) – May 2020
- [2020 Upper Neches Basin Summary Report](#) – Summer 2020
- [Got a crappy septic system? Grant program brings relief](#) - July 2020 (Daily Sentinel subscription required)
- [Texas water quality and septic systems](#) – August 2020
- [Training held to improve water quality for Attoyac Bayou Watershed](#) – October 2020

#### On-Site Sewage Facility Remediation

Failing OSSFs is one of the leading contributors to the bacteria impairments in the Attoyac Bayou. ANRA originally began an OSSF repair and replacement program with TCEQ that provided assistance to 26 homeowners in the area. In 2017, TWRI, Pineywoods RC&D, and ANRA applied for and received a grant to continue these efforts, as well as develop recommendations for area Designated Representatives to standardize OSSF data collection. Originally, the project intended to replace 13 septic systems, but received funding to replace an additional 24 systems. The total estimated *E. coli* load reduction for the 24 systems installed was 1.245E+14 colony-forming units (cfu) per 100 milliliters (mL)<sup>1</sup>. Another continuation of the program to fund the repair or replacement of 15 systems was applied for in 2018 and began in fall 2019. To date, the current project has completed the replacement of seven systems, with three more to be done by the end of June 2021, and the final five to be completed by September 2021.

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<sup>1</sup> [https://twri.tamu.edu/media/4990/tr\\_522.pdf](https://twri.tamu.edu/media/4990/tr_522.pdf)

## Water Quality Management Plans

The Nacogdoches Soil and Water Conservation District (SWCD) 319 Conservation Technician has been working with producers in the watershed to continue implementing Water Quality Management Plans (WQMPs). One producer has completed a plan for a cross fence and brush management. Additional plans that are being developed include brush management, net wire cross fence, and livestock watering options.

BMPs Implemented or Planned	Coverage
Wire exclusion fences to keep cattle from pond and creek	526 feet
Brush management spray for dewberry/blackberry	9 acres
Wire cross fences for rotational grazing	12,250 feet
Pipeline and troughs to be able to better implement rotational grazing	1,600 feet
Brush management spray for invasive McCartney Rose	268 acres



Cattle near Attoyac Bayou tributary. Photo by Ed Rhodes.

## Water Quality Monitoring

Five of the impaired stream segments were monitored in the Attoyac Basin monthly between September 2019 and May 2021 for a total of 21 monitoring events. These sites include 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-N, nitrite-N, ammonia-N, total phosphorus, sulfate, chloride, 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.



Flow measurement being taken at monitoring site.  
Photo by Ed Rhodes.

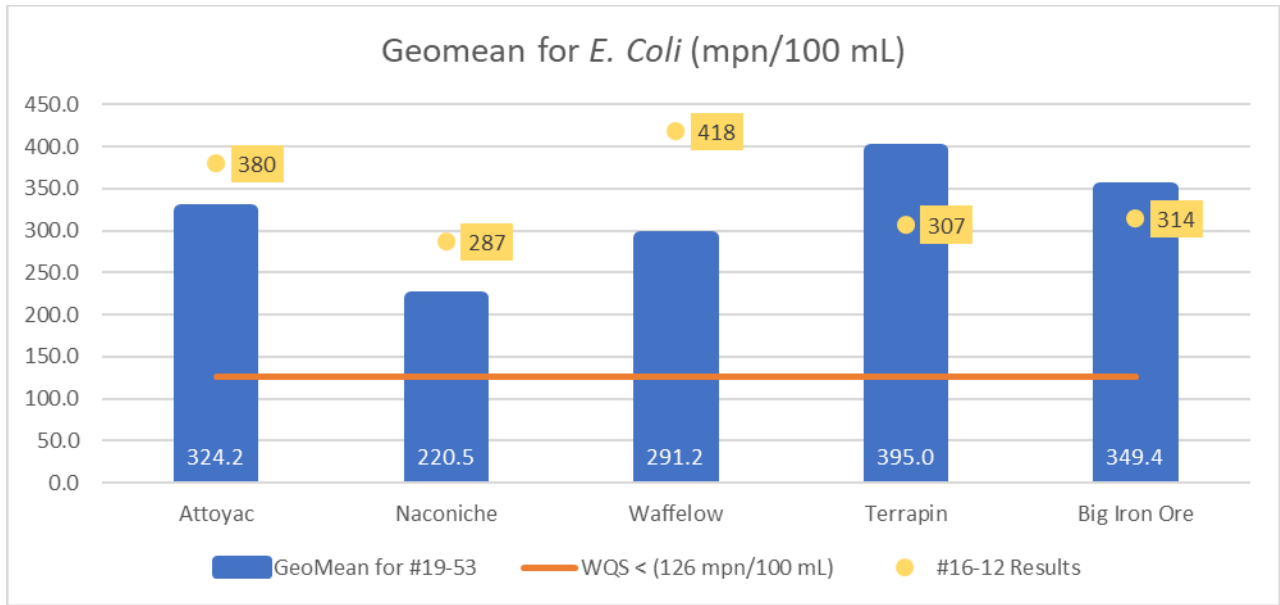


Figure 1: Geometric means of E. coli (mpn/100 mL) by site.

The geometric mean for E. coli remains elevated above the water quality standard (WQS) for primary contact recreation (126 most probable number (mpn) / 100 mL), but three of the stations saw some improvement at the Attoyac, Naconiche, and Waffelow Creek stations. The yellow markers in Figure 1 indicate the geomean for each site from the monitoring efforts during previous WPP implementation project, #16-12. Almost all observations were higher than the WQS, as seen in Figure 2.

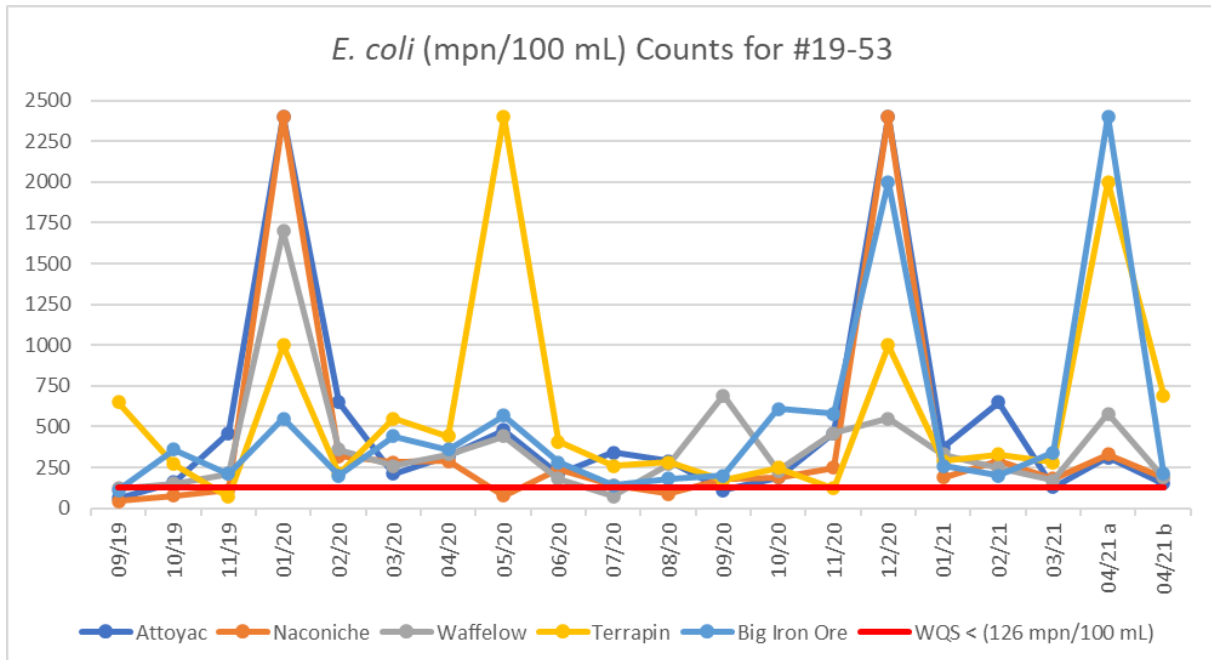


Figure 2: E. coli mpn/100 mL by site per monitoring event.

The following charts show the average concentration of each of the nutrient parameters and in situ observations during the project period, as well as the water quality criteria set for each parameter in the Attoyac Bayou when applicable. The averages for each of the nutrient parameters fell below the relevant criteria, and only sulfate had observances that were higher than the criteria, as seen in Figure 4. This could indicate that excess nutrients are not a major concern for these portions of the Attoyac Bayou, apart from sulfate, potentially.

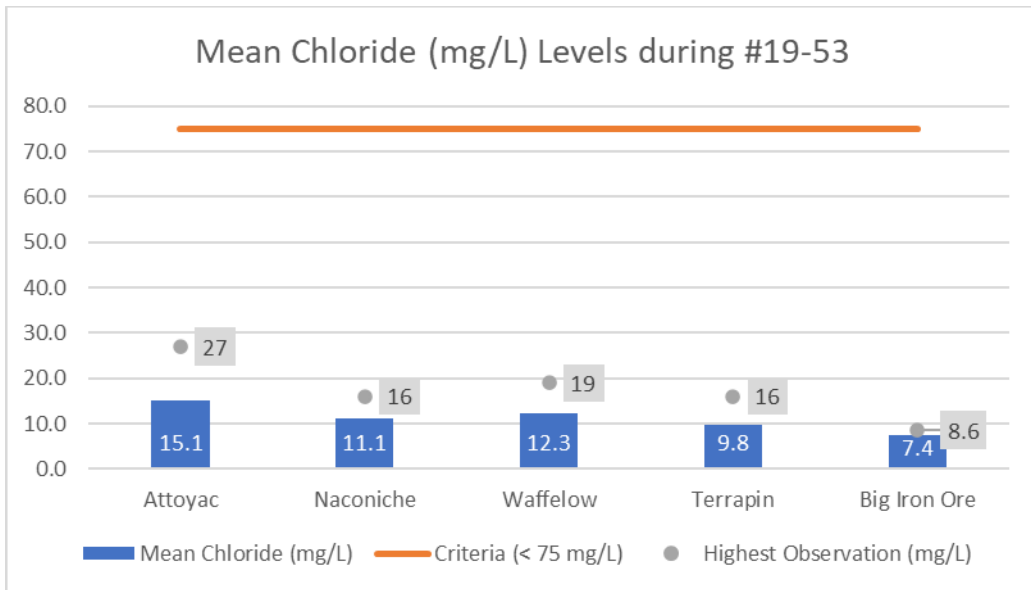


Figure 3: Mean Chloride (mg/L) by monitoring site.

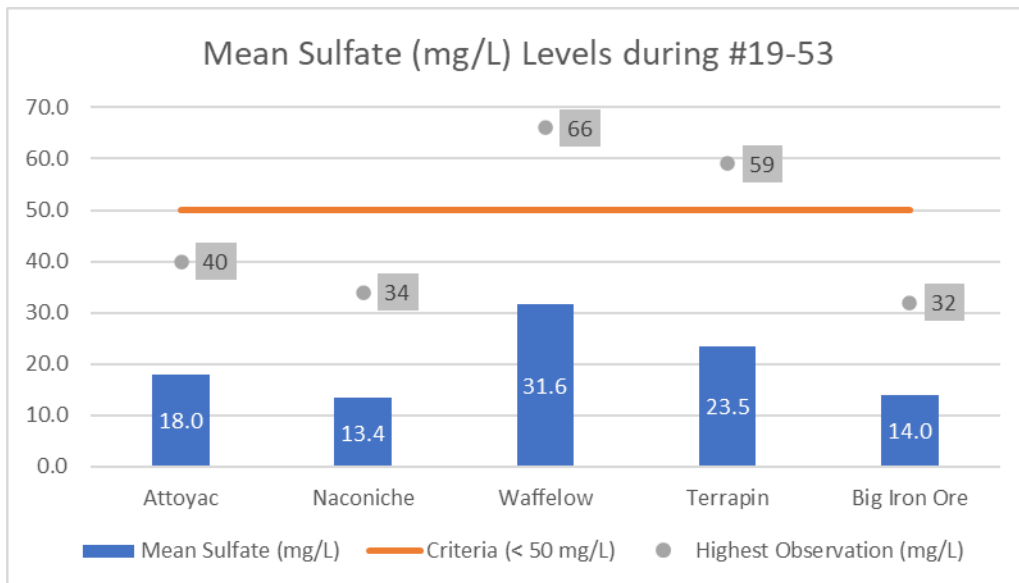


Figure 4: Mean Sulfate (mg/L) by monitoring site.

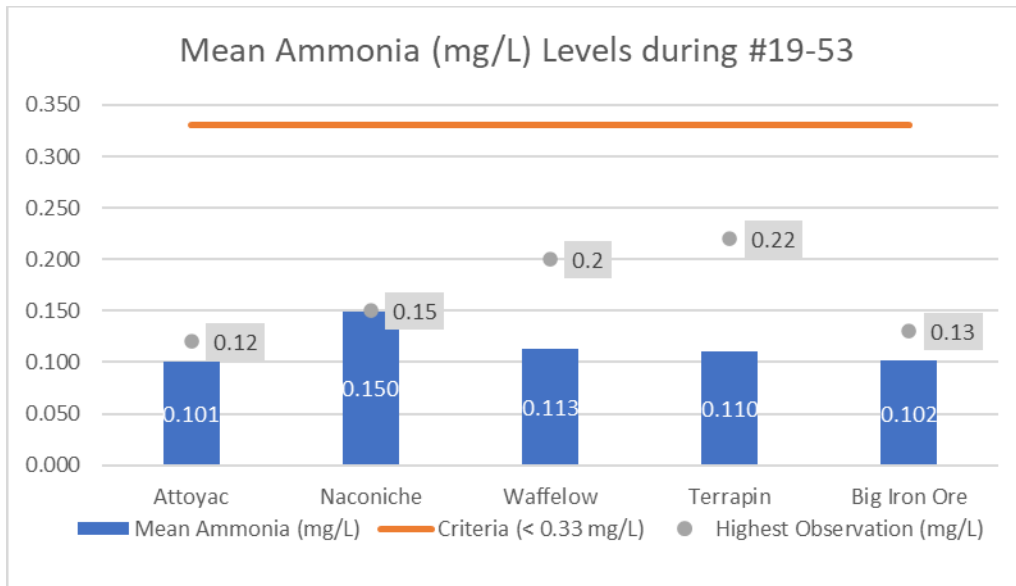


Figure 5: Mean Ammonia (mg/L) by monitoring site.

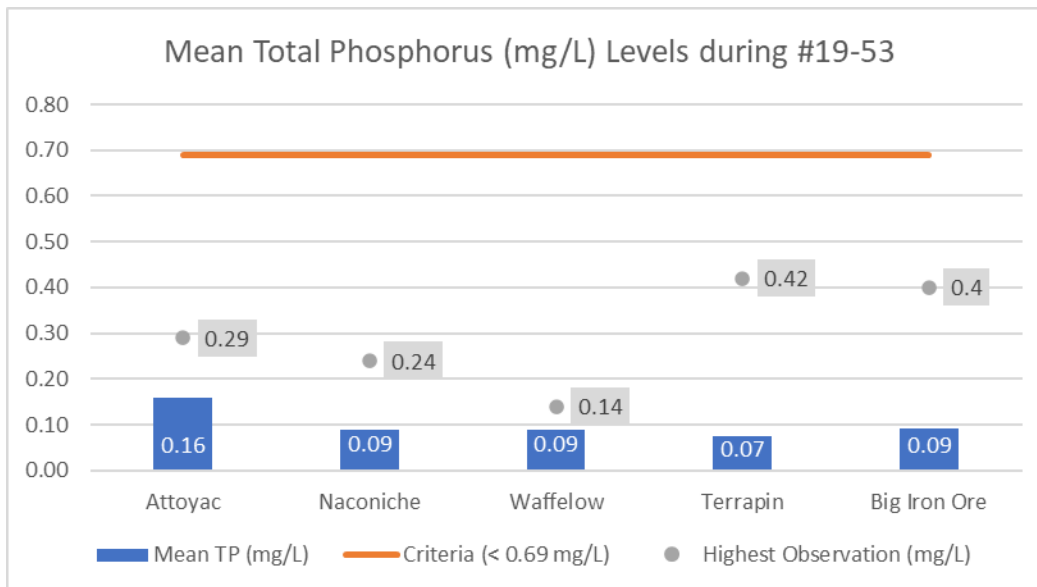


Figure 6: Mean Total Phosphorus (mg/L) by monitoring site.

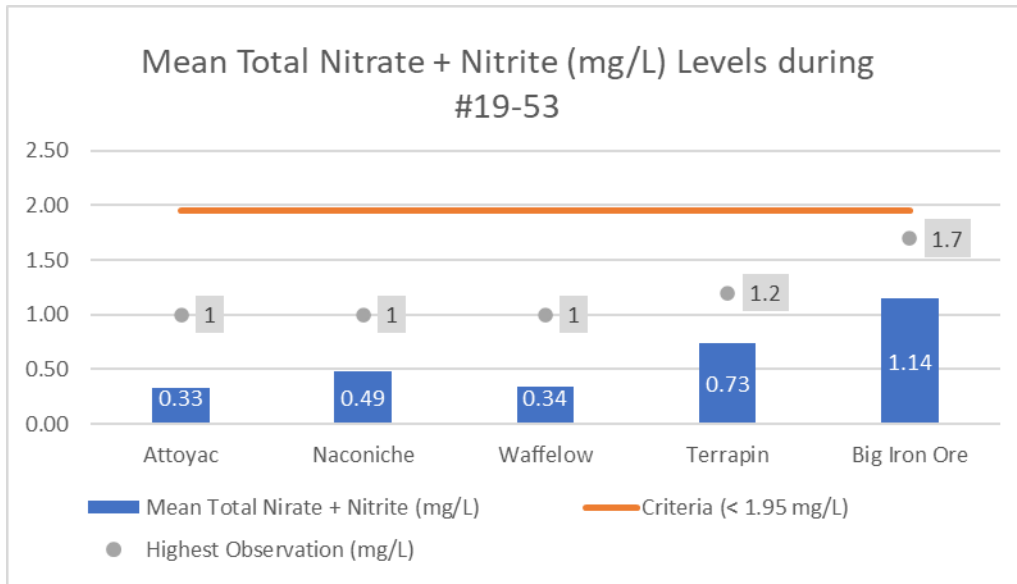


Figure 7: Mean Total Nitrate + Nitrite (mg/L) by monitoring site.

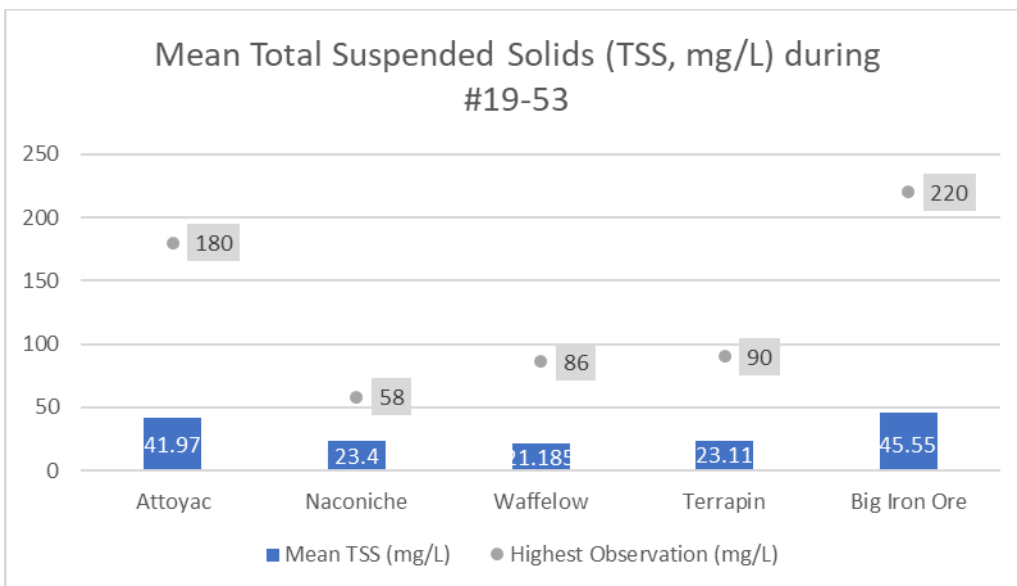


Figure 8: Mean Total Suspended Solids (mg/L) by monitoring site.

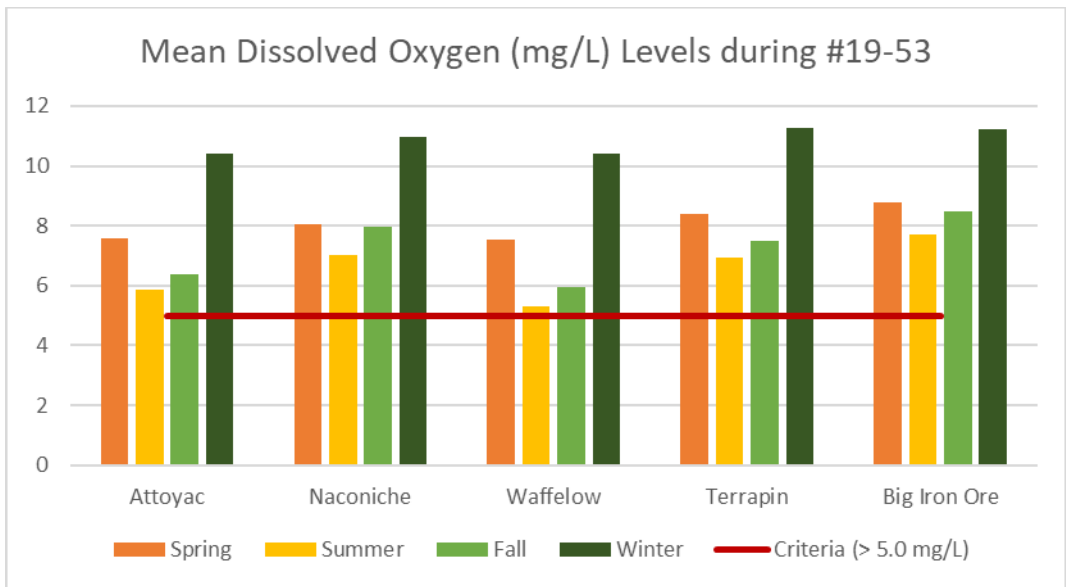


Figure 9: Seasonal mean Dissolved Oxygen (mg/L) by monitoring site.

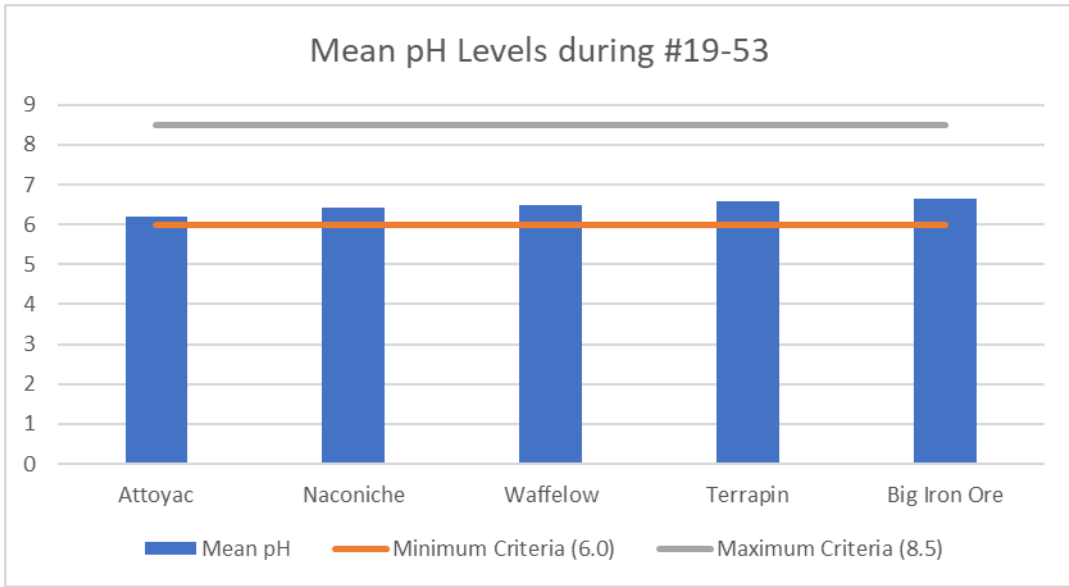


Figure 10: Mean pH by monitoring site.





Attoyac Bayou tributary. Photo by Ed Rhodes.

## Conclusion

Beginning in fall 2021, the project team will continue implementing the Attoyac Bayou WPP with TSSWCB, as well as the OSSF remediation program with TCEQ. We look forward to continuing to work in the watershed, especially in person as COVID-19 related restrictions are lifted. The implementation of the watershed protection plan would not be the success that it is without the residents of the Attoyac Bayou Watershed and these state and community partners:

- Angelina & Neches River Authority
- Castilaw Environmental Services
- Nacogdoches County
- Nacogdoches County Environmental Health and Safety Department
- Pineywoods Resource Conservation & Development, Inc.
- Rusk County
- San Augustine County
- Shelby County
- Stephen F. Austin State University WET Center
- Texas A&M AgriLife Extension Service
- Texas A&M Forest Service
- Texas A&M Healthy Texas Initiative
- Texas Commission on Environmental Quality
- Texas Forestry Association
- Texas Soil and Water Conservation Districts of Rusk, San Augustine, Shelby, and Nacogdoches Counties
- Texas State Soil & Water Conservation Board
- Texas Water Resources Institute
- USDA Natural Resource Conservation Service
- US Environmental Protection Agency