BASIN HIGHLIGHTS REPORT

2023

For the Upper& Middle Portions of the Neches River Basin

Angelina & Neches River Authority

ANRA

Angelina & Neches River Authority

Cover Photos:
Front: Riverine portion of Sam Rayburn Reservoir/Angelina River, Aug 2019
Back: La Nana Bayou CR 526, June 2018

ANGELINA & NECHES RIVER AUTHORITY

2023 Basin Highlights Report for the Upper and Middle Portions of the Neches River Basin

THE TEXAS CLEAN RIVERS PROGRAM

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

TABLE OF CONTENTS

GLOSSARY

ALU – Aquatic Life Use

ANRA – Angelina & Neches River Authority

AU – Assessment Unit

BMP – Best Management Practice

CFS – Cubic Feet Per Second

CR – County Road

CRP – Clean Rivers Program

CWA – Clean Water Act

DEM – Digital Elevation Model

DO – Dissolved Oxygen

DSHS – Department of State Health Services

EROM – Extended Unit Runoff Method

FM – Farm-to-Market

FY – Fiscal Year

HWY – Highway

I/I – Inflow and Infiltration

LNVA – Lower Neches Valley Authority

mg/L – Milligrams Per Liter

MGD – Million Gallons per Day

NHDPlus – National Hydrography Dataset Plus

NOAA – National Oceanic and Atmospheric Administration

NLCD – National Land Cover Data

NPDES – National Pollution Discharge Elimination System

NPS – Non-point Source

OSSF – On-site Sewage Facility

RUAA – Recreational Use Attainability Analysis

SFASU (SFA) – Stephen F. Austin State University

SU – Standard Units

SWQM – Surface Water Quality Monitoring

SQ. MI – Square Miles

TCEQ – Texas Commission on Environmental Quality

TFS – Texas A & M Forest Services

TIAER – Texas Institute for Applied Environmental Research

TIR – Texas Integrated Report

TKN – Total Kjeldhal Nitrogen

TMDL – Total Maximum Daily Load

TPDES – Texas Pollutant Discharge Elimination System

TPWD – Texas Parks and Wildlife Department

TSI – Trophic Status Index

TSSWCB – Texas State Soil and Water Conservation Board

TSWQS – Texas Surface Water Quality Standards

TWRI – Texas Water Resources Institute

USGS – United States Geologic Survey

UAA – Use-Attainability Analysis

WPP – Watershed Protection Plan

WWTF – Wastewater Treatment Facility

WWTP – Wastewater Treatment Plant

INTRODUCTION

ABOUT THE CLEAN RIVERS PROGRAM

History

The Texas Clean Rivers Act, enacted in 1991 by the Texas legislature, requires that each Texas River Basin conduct ongoing water quality assessments, integrating water quality issues using a watershed management approach. The Clean Rivers Program (CRP) implements the Clean Rivers Act through water quality monitoring assessment and public outreach.

Today

Currently, monitoring in the state of Texas includes over 1,800 sites and regional water quality assessments within the 23 major river and coastal basins and the sub-watersheds. The mission of the CRP is to maintain and improve the quality of water within each river basin in Texas through an ongoing partnership involving the Texas Commission on Environmental Quality (TCEQ), river authorities, other agencies, regional entities, local governments, industry, and citizens. The program's watershed management approach is designed to identify and evaluate water quality issues, establish priorities for corrective action, work to implement those actions, and adapt to changing priorities.

ABOUT THE ANGELINA & NECHES RIVER AUTHORITY

History

The Angelina & Neches River Authority (ANRA) originally named the Sabine-Neches Conservation District was created in 1935 by the Texas legislature as a conservation and reclamation district. The legislature divided the territory of the Sabine & Neches Conservation District into the Sabine River Authority and the Neches River Conservation District in 1949. It was not until 1971 that the Neches River Conservation District was activated and began operating as a water resource agency. In 1977, Senate Bill 125 changed the name of the Neches River Conservation District to the Angelina & Neches River Authority.

Today

ANRA's office is located in Lufkin, Texas. ANRA's territorial jurisdiction consists of 8,500 square miles that lie wholly or in a part of the following counties: Van Zandt, Smith, Henderson, Newton, Cherokee, Anderson, Rusk, Houston, Nacogdoches, San Augustine, Shelby, Angelina, Trinity, Sabine, Polk, Jasper, and Orange.

The Angelina & Neches River Authority is responsible for monitoring, protecting, and enhancing water resources in the Neches River Basin. ANRA's functions in the basin include water quality monitoring, drinking water and wastewater analysis, on-site sewage facility permitting and complaint investigations, water and wastewater utilities, water resource development, regional wastewater/composting facilities, and other regional planning efforts.

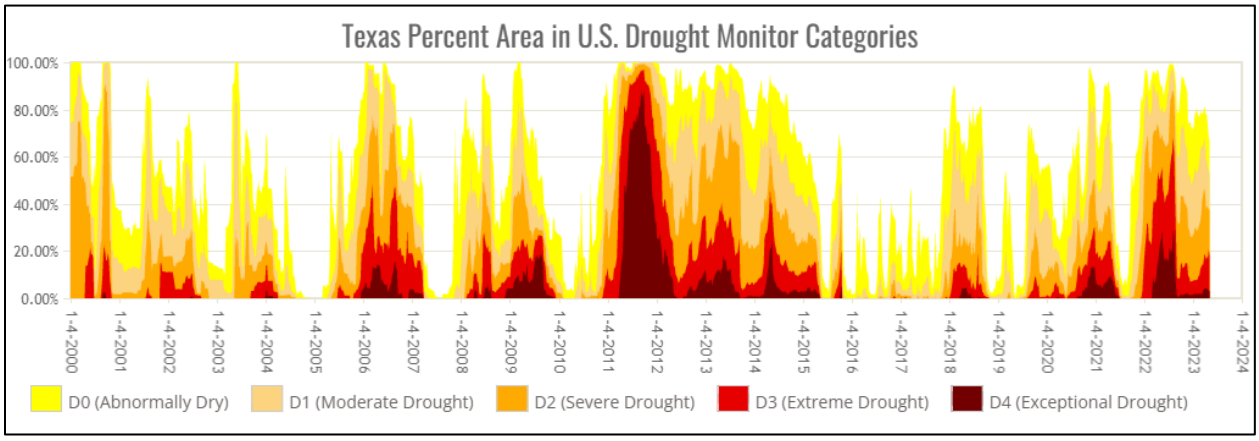
THIS YEAR'S HIGHLIGHTS

DROUGHT CONDITIONS

Throughout the past year, large portions of East Texas, including the Neches River basin, experienced extreme drought conditions. In 2022, the statewide drought was one of the worst in Texas history, coming close to rivaling those experienced by the state back in 2011. For the most part, drought conditions in the Neches River Basin were noticeable starting in May and ending in November.

LA NANA BAYOU AT NORTH LOOP 224 IN NACGDOCHES, 2022

According to the U.S. Drought Monitor, between August 9th and August 15th of 2022, about 68% of Texas was in extreme drought conditions and nearly 30% was in exceptional drought conditions.



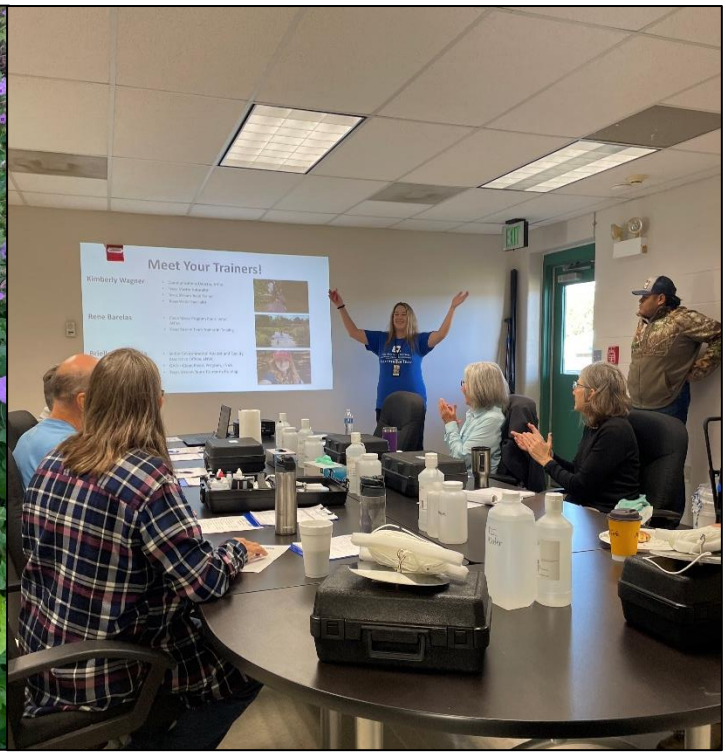
The ongoing drought caused several streams that ANRA monitors to shrink to the level of small pools, but thus far has not produced a significant impact on the water quality measured.

ADDRESSING BACTERIA IMPAIRMENTS IN AYISH BAYOU AND WEST MUD CREEK

In 2022, ANRA partnered with TWRI and the TCEQ TMDL team to begin laying the groundwork for a water quality improvement project or projects to address bacterial impairments in the Ayish Bayou and the West Mud Creek watersheds. The first year of the project was focused on gathering existing data and meeting with key stakeholders in the Ayish Watershed to bring them up to speed on the issues and solicit input about options for addressing those issues. For 2023, the collection of additional targeted water quality samples is underway in the Ayish Watershed, and data gathering along with planning for introductory meetings for the efforts in West Mud Creek is underway. For more details about this project, see the full project description in the Restoring Impaired Waterbodies section of this report.

EDUCATION AND OUTREACH ACTIVITIES

Throughout 2022, ANRA embarked on several new and exciting education and outreach projects, as well as continued to experience success in existing programs that began in 2021. One new program is Texas Stream Team. Although ANRA has been a long-time program partner and supporter, there has not been a consistently active trainer or volunteer presence in the Neches River Basin. Since June 2022, two ANRA employees achieved trainer status and 34 volunteers were certified as water quality monitors. Another new program is the Stash Your Trash litter bag campaign. In late spring 2022, ANRA partnered with three area Keep Texas Beautiful affiliates to develop a plan to distribute 10,000 litter bags throughout the basin in an effort to empower the public to take personal responsibility and reduce the amount of litter in our waterways. With the help of these program partners, ANRA distributed 3,000 litter bags in 2022. Both of these programs are highlighted in the third new endeavor ANRA took on in 2022, which is the update and redesign of ANRA's website to include digital education and outreach resources.



ANRA also experienced success and growth in existing programs that began in 2021, which include hosting and participating in stream cleanup events and fishing tournaments, distribution of coloring and activity books, and providing water quality presentations to schools and civic organizations.

LABORATORY UPDATE

For the past several years, ANRA's Environmental Laboratory has been steadily working towards bringing all CRP-related analyses in house rather than shipping some of them out to partner labs. Performing all CRP analyses in house has several advantages; eliminating shipping fees, avoiding shipping error or delays, improving turnaround time, and standardizing the quality assurance that goes into analyzing water quality samples for CRP. In February of 2021, the lab was able to bring Chlorophyll-a and Pheophytin analyses in house, and as of Q3 of 2023, with the addition of Total Kjeldhal Nitrogen, the ANRA lab is now the principal lab for all CRP analyses that we routinely collect.

2022 INTEGRATED REPORT

On July 7, 2022 the EPA approved the 2022 Texas Integrated Report of Surface Water Quality (IR). The IR is published every other year and uses data from the preceding seven years to evaluate how well surface waters of Texas are meeting water quality standards. Waterbodies that do not meet the designated uses assigned in the water quality standards are considered impaired, and are listed on the 303(d) List. All data collected within the 2024 IR period of record has been submitted, and the TCEQ is currently developing the 2024 IR.

In the 2022 IR, no waterbodies within the Neches River Basin were removed from the 303(d) List, and five impairments for waterbodies were added.

RESERVOIR NUTRIENT ASSESSMENT CHANGES – THE 5N IMPAIRMENT CATEGORY

Since 2001, the TCEQ has been working on a long-term goal to develop nutrient criteria to add to the Texas Surface Water Quality Standards (TSWQS). In 2010, the TCEQ adopted numerical chlorophyll-a criteria for 75 reservoirs, and in 2013 the EPA approved the chlorophyll-a criteria for 39 of the 75 reservoirs. Sam Rayburn Reservoir and the Tyler lakes were among those with EPA approved criteria in 2013.

When assessing reservoirs for nutrient issues, chlorophyll-a criteria and nutrient thresholds are applicable to the monitoring site indicated in Appendix F of 30 TAC Chapter 307 TSWQS and *Guidance for Assessing and Reporting Surface Water Quality in Texas*. These sites were chosen as representative samples for the entirety of their respective reservoirs. Typically, these are sites near the dam of a reservoir, which is the case for Lake Tyler East and Sam Rayburn Reservoir. Parameters for reservoir nutrient assessments include chlorophyll-a, 10-year change in Trophic Status Index (TSI), Secchi depth, total nitrogen, total phosphorus, and outcome of dissolved oxygen assessments.

Beginning with the 2016 IR, the TCEQ updated their assessment guidance to incorporate the nutrient criteria for reservoirs as part of a line-of-evidence framework. For the reservoirs with EPA approved nutrient criteria, the TCEQ assesses standards attainment using the newly adopted chlorophyll-a criteria (2022 TCEQ Guidance Figure F.1). When assessing reservoirs without approved chlorophyll-a criteria, an alternate framework is used (2022 TCEQ Guidance Figure F.2).

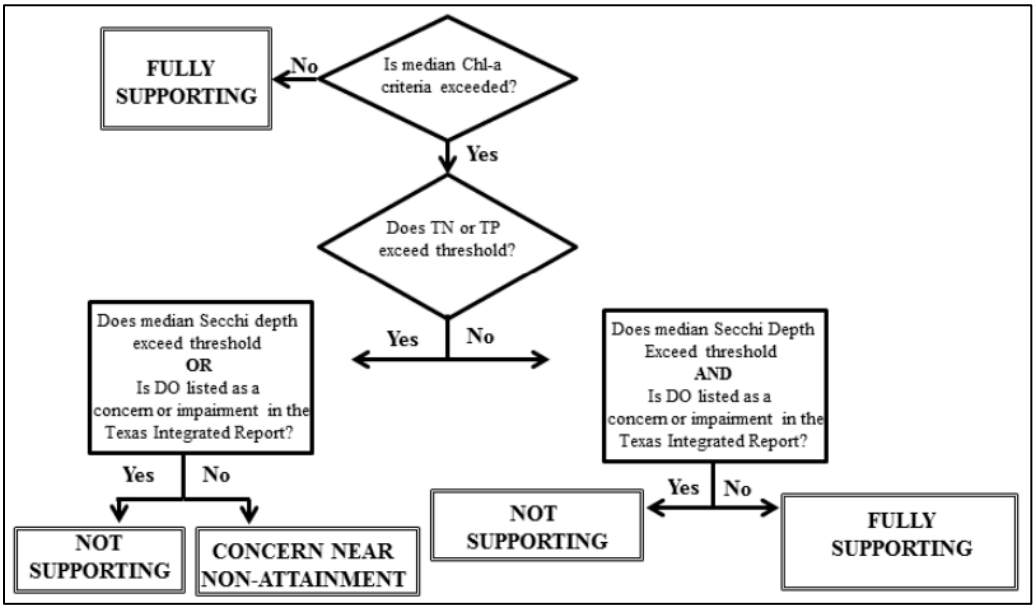
For the 2022 IR, a new impairment category has been added specifically for reservoirs with nutrient impairments. This new category is labeled “5n” and is described in the assessment guidance as follows:

> *“This category is established to focus management actions that address nutrients in reservoirs with numeric Chl a criteria. Sub-category 5n will be assigned when the water body does not meet its applicable Chl a criterion, and additional information from causal nutrient parameters or impacts to response variables corroborates the exceedance of Chl a. However, additional nutrient-specific data and information is needed before a management strategy, such as a TMDL or watershed protection plan, is initiated. Reservoirs in 5n will be prioritized for additional studies and management efforts, including enhanced monitoring, nutrient-evaluation studies, and/or characterization of the contributing watershed. Information developed while assigned to sub-category 5n can be used to provide the basis for traditional restoration efforts such as TMDLs and watershed protection plans. Due to the complexity of nutrient dynamics in reservoirs, addressing internal cycling of nutrients, as well as other site-specific factors, may also need to be considered to appropriately manage nutrients and excessive algae. Information developed may also demonstrate that exceedances of Chl a are not caused by a pollutant, and a TMDL is not required.”*

With the addition of this new category, the flow chart for assessing reservoirs with EPA approved chlorophyll-a criterion is different from previous assessments. Waterbodies that would previously have been categorized as a “concern for near non-attainment”, are placed in category 5c (impaired, further data needed) now, and waterbodies that would have previously been category 5 are now assigned as category 5n (impaired for nutrients, additional nutrient data is needed for future management strategies).

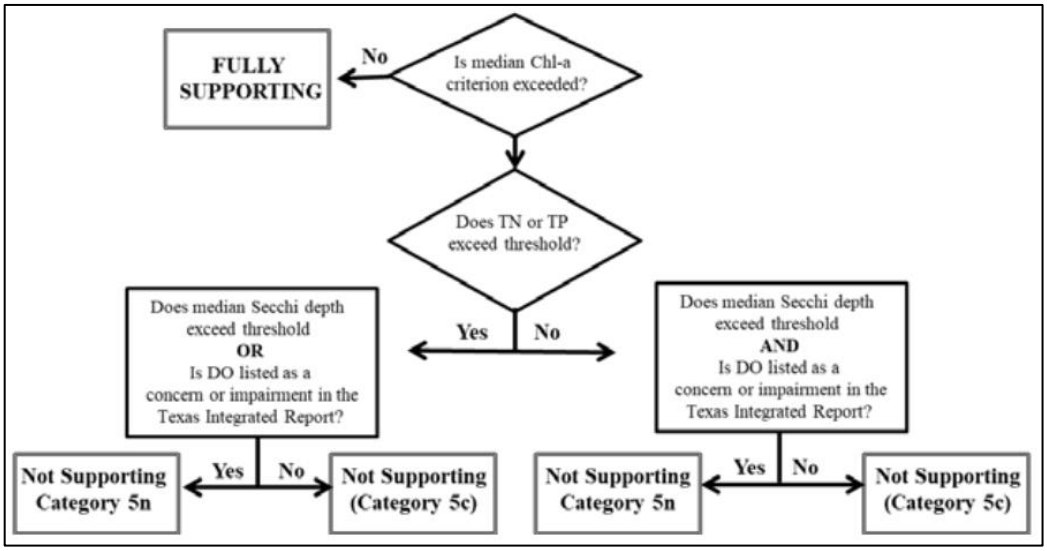
2020 ASSESMENT FLOWCHART FOR RESERVOIRS WITH CHL-A CRITERIA

The previous assessment method allowed for reservoirs to be considered fully supporting even if their median chlorophyll-a criteria was exceeded. Additionally, a reservoir also could be identified as concern for near non-attainment if chlorophyll-a and a nutrient exceed their thresholds, but dissolved oxygen and Secchi depth did not.



2022 ASSESMENT FLOWCHART FOR RESERVOIRS WITH CHL-A CRITERIA

With the new assessment method, 2022 TCEQ Guidance Figure F.1, if a reservoir exceeds its chlorophyll-a criteria, regardless of other parameters, it will be considered impaired. The 5n category allows for more precise assessments of reservoirs to determine if the reservoir is impaired in general, or if it is specifically a nutrient issue.



A NOTE ABOUT STATISTICAL SIGNIFICANCE

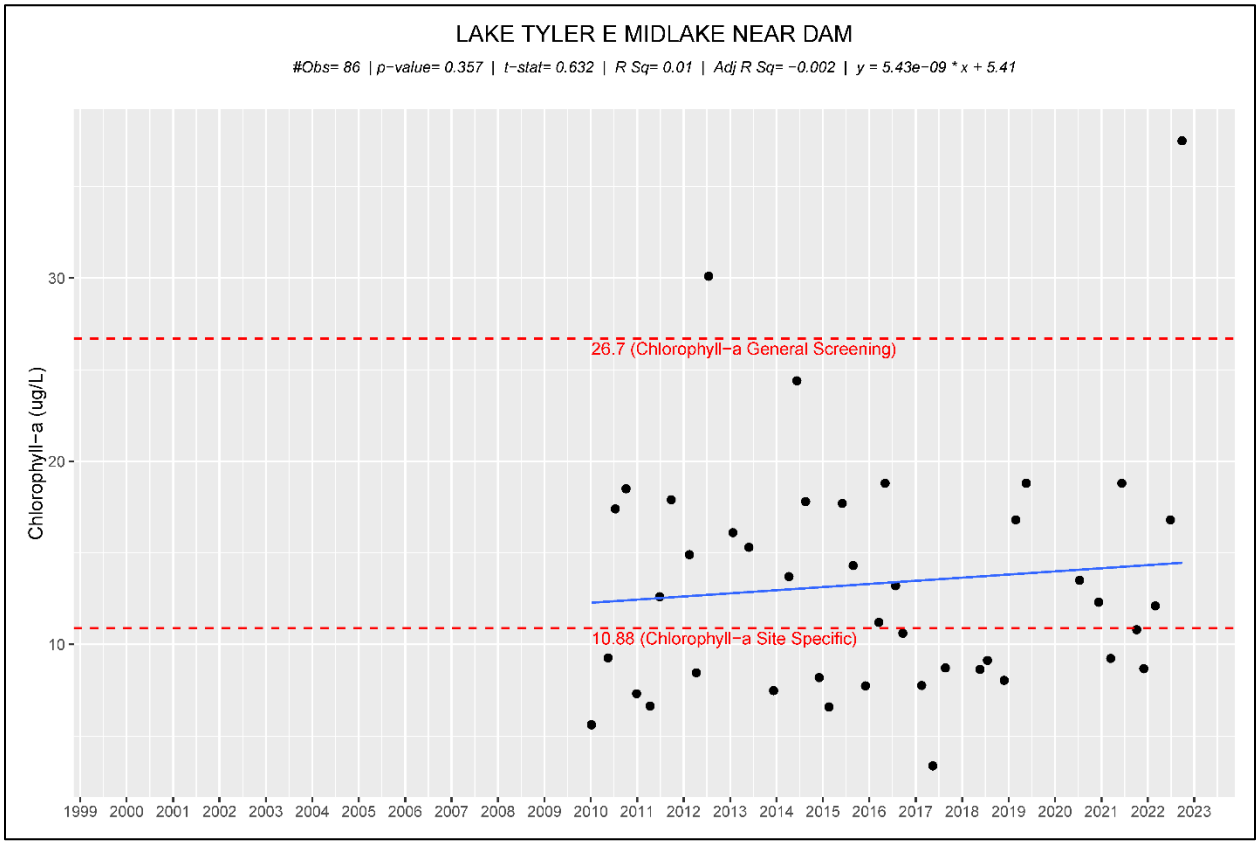
The following sections will contain datasets that have undergone statistical analyses. There are certain criteria that must be met in order for this data to be considered of statistical significance. Those criteria are: a p-value of < 0.1, and a t-stat of $\geq |2|$.

LAKE TYLER EAST AND SAM RAYBURN RESERVOIR – EXCESSIVE ALGAL GROWTH

Lake Tyler East and Sam Rayburn Reservoir were both newly-listed for Excessive Algal growth. These are not entirely new issues and are in-part, driven by the nutrient related changes to the 2022 assessment guidance discussed in the previous two pages.

LAKE TYLER EAST CHLOROPHYLL-A DATA

The chlorophyll-a data from sampling on Lake Tyler East shows a slight upward trend since 2010, but the trend does not meet our thresholds for statistical significance. There is data prior to 2010, but including that data is counterproductive because a large portion of it had much higher detection limits, and it artificially skews that time period upward on the graph.



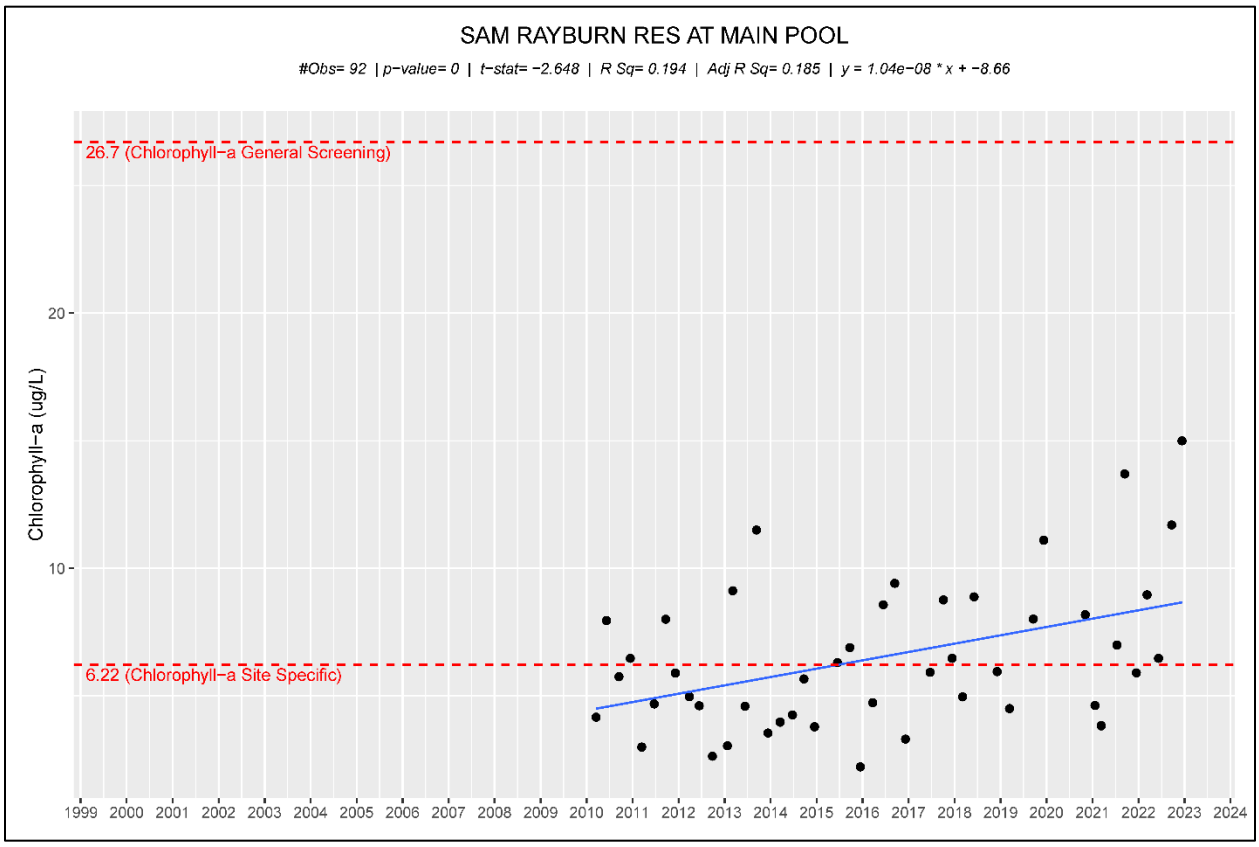
LAKE TYLER EAST ESTABLISHED NUTRIENT CRITERIA VS ASSESSED VALUES FROM 2016 - 2022

The assessed data over time shows consistent values, and even some improvements over time. However, the nutrient assessment methodology change has resulted in this waterbody being pushed onto the impaired list for the 2022 IR. Monitoring will continue, but there is a possibility this this one will come off the 303(d) List with no additional action if the gradual improvements seen in the assessment data continue.

PARAMETER	CRITERIA	2016 ASSESSED VALUES	2018 ASSESSED VALUES	2020 ASSESSED VALUES	2022 ASSESSED VALUES
CHLOROPHYLL	10.88	12.60	13.45	10.90	10.90
TSI	10.00	NA	NA	NA	53.34
SECCHI DEPTH	1.06	1.20	1.35	1.50	1.50
TOTAL NITROGEN	0.80	0.57	0.58	0.58	0.57
TOTAL PHOSPHOROUS	0.03	0.03	0.02	0.02	0.02

SAM RAYBURN RESERVOIR CHLOROPHYLL-A DATA

The chlorophyll-a data from Sam Rayburn Reservoir dam site also shows an obvious upward trend since 2010, but unlike the graph for Lake Tyler East, this trend meets our thresholds for statistical significance. As with Lake Tyler East, there is data prior to 2010, but including that data is counterproductive because a large portion of it had much higher detection limits which artificially skews that time period upward on the graph.



SAM RAYBURN RESERVOIR ESTABLISHED NUTRIENT CRITERIA VS ASSESSED VALUES FROM 2016 - 2022

As with the graph, in the table below we can see a distinct upward trend in the assessed values over time for Sam Rayburn. In contrast to Lake Tyler East, the assessment methodology change is not the only thing driving the listing for this waterbody. The 2022 assessment was the first where the assessed chlorophyll-a value exceeded the established criteria. However, even though the chlorophyll-a value is rising, with the previous assessment methodology, the reservoir would have been classified as "Fully Supporting" because the corroborating nutrient measurements for nitrogen and phosphorus are not exceeding their thresholds. More investigation is needed to determine the cause of the increasing chlorophyll-a values at this site.

PARAMETER	CRITERIA	2016 ASSESSED VALUES	2018 ASSESSED VALUES	2020 ASSESSED VALUES	2022 ASSESSED VALUES
CHLOROPHYLL	6.22	4.97	4.85	6.15	7.49
TSI	10.00	NA	NA	NA	48.66
SECCHI DEPTH	1.82	1.55	1.90	1.25	1.1
TOTAL NITROGEN	0.80	0.44	0.44	0.51	0.48
TOTAL PHOSPHOROUS	0.03	0.03	0.01	0.03	0.03

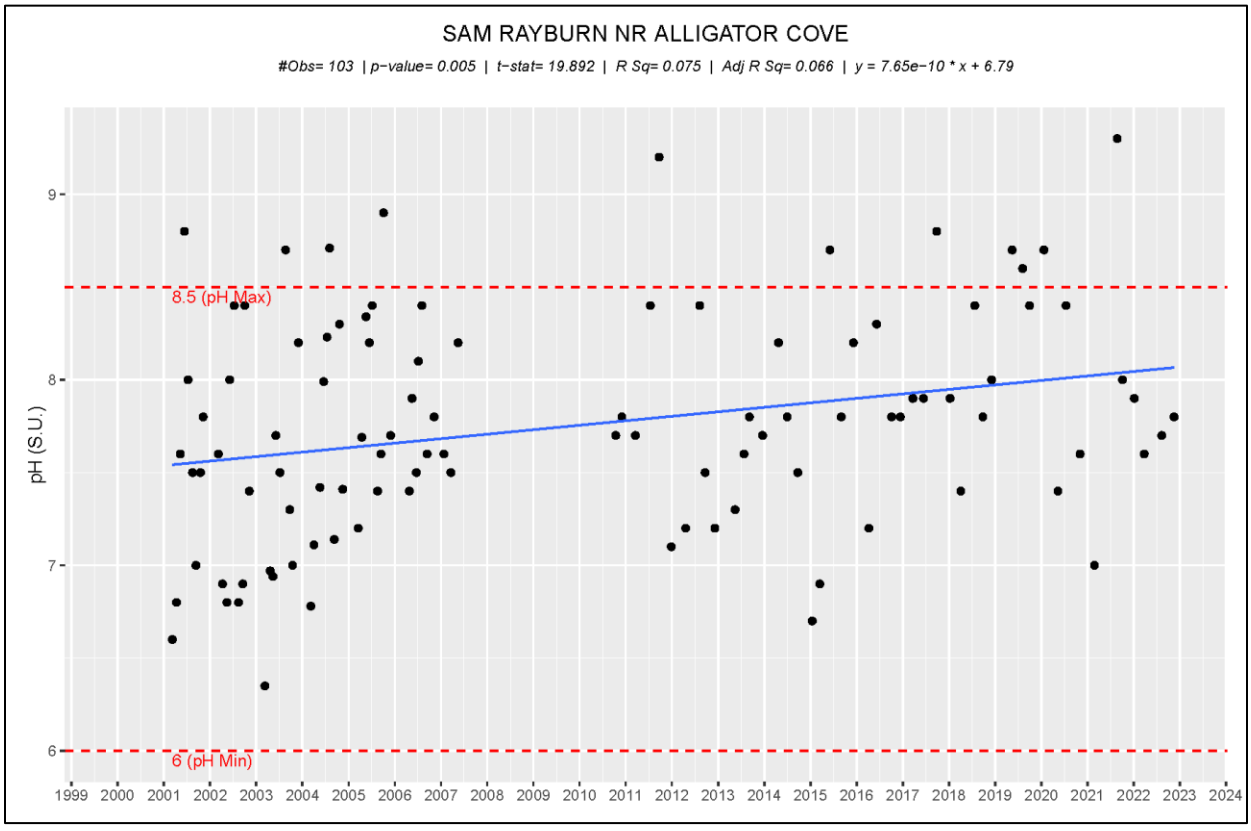
SAM RAYBURN – ELEVATED pH

Assessment unit 05 - the Attoyac Bayou Arm of Sam Rayburn - has been listed for elevated pH. This can be observed in the twenty-year dataset seen below. Also note the general upward trend in pH. This dataset meets requirements to be considered statistically significant. Most waterbodies in this region of Texas tend to have a slightly acidic to neutral pH (6.5-7), the Attoyac Bayou Arm is seeing measurements ranging from 7 to 9.4 in recent years. A similar situation at Lake O' the Pines led to a special study which attributed high pH to increased phytoplankton production. That study found strong correlation between high dissolved oxygen percent saturation and high pH, which appears to be similar to what is happening in the Attoyac Arm of the reservoir.

However, several factors can cause variation in pH. These can range from soils, geology, decaying organic matter, algal production, acid rain, alkalinity, etc. Among the ten CRP sites on Sam Rayburn, there is a lot of variability in relevant parameters such as DO, chlorophyll, nutrients, and pH itself. Further studies are required to narrow down the reason behind this pH increase, such as 24-hour pH studies or soil tests.

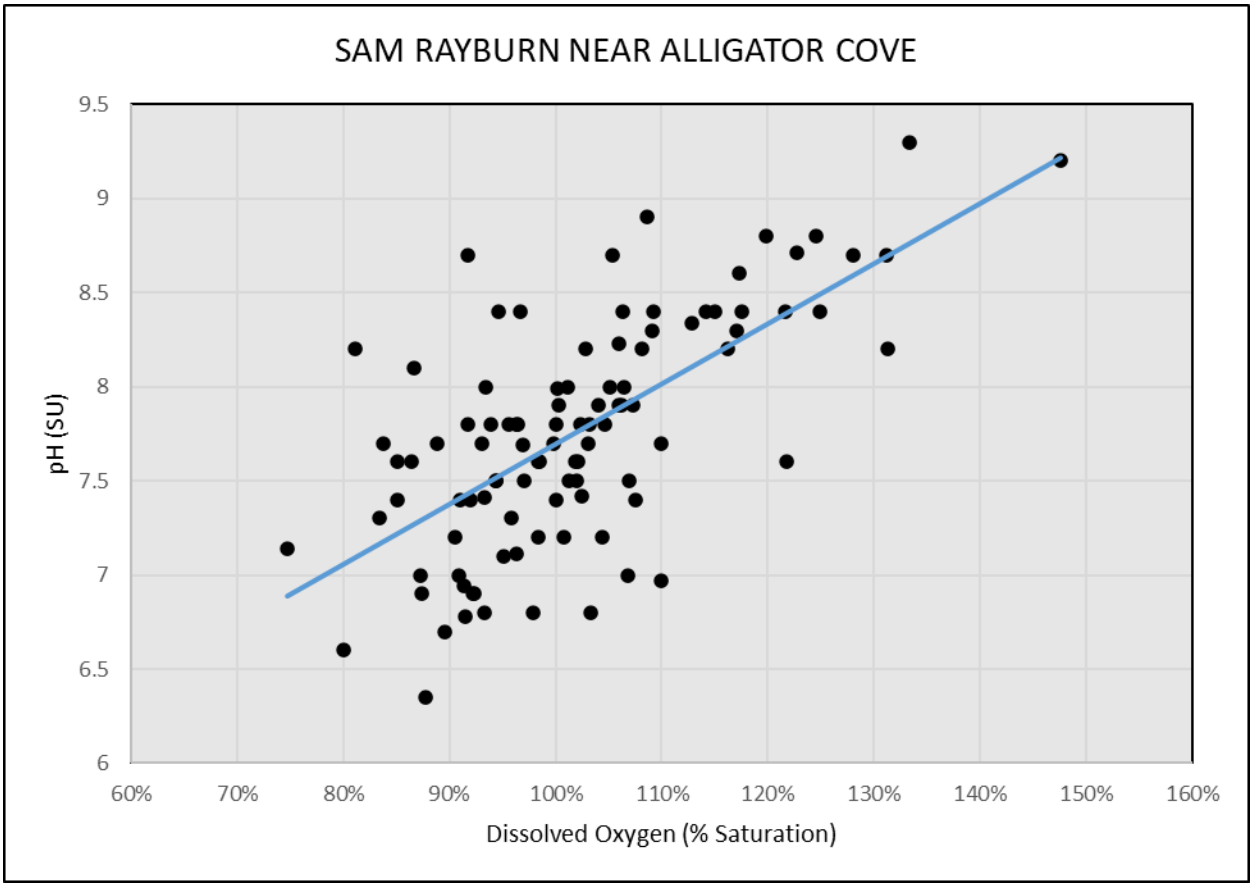
SAM RAYBURN pH DATA OVER TIME

This data is considered statistically significant, and shows an upward trend in pH, even with the gap in data from 2007-2010. This site is near the convergence of the Attoyac Bayou and Angelina Arms of the reservoir. Half of the datasets for various locations on Sam Rayburn reservoir show similar upward trends.



SAM RAYBURN pH VS. DISSOLVED OXYGEN % SATURATION

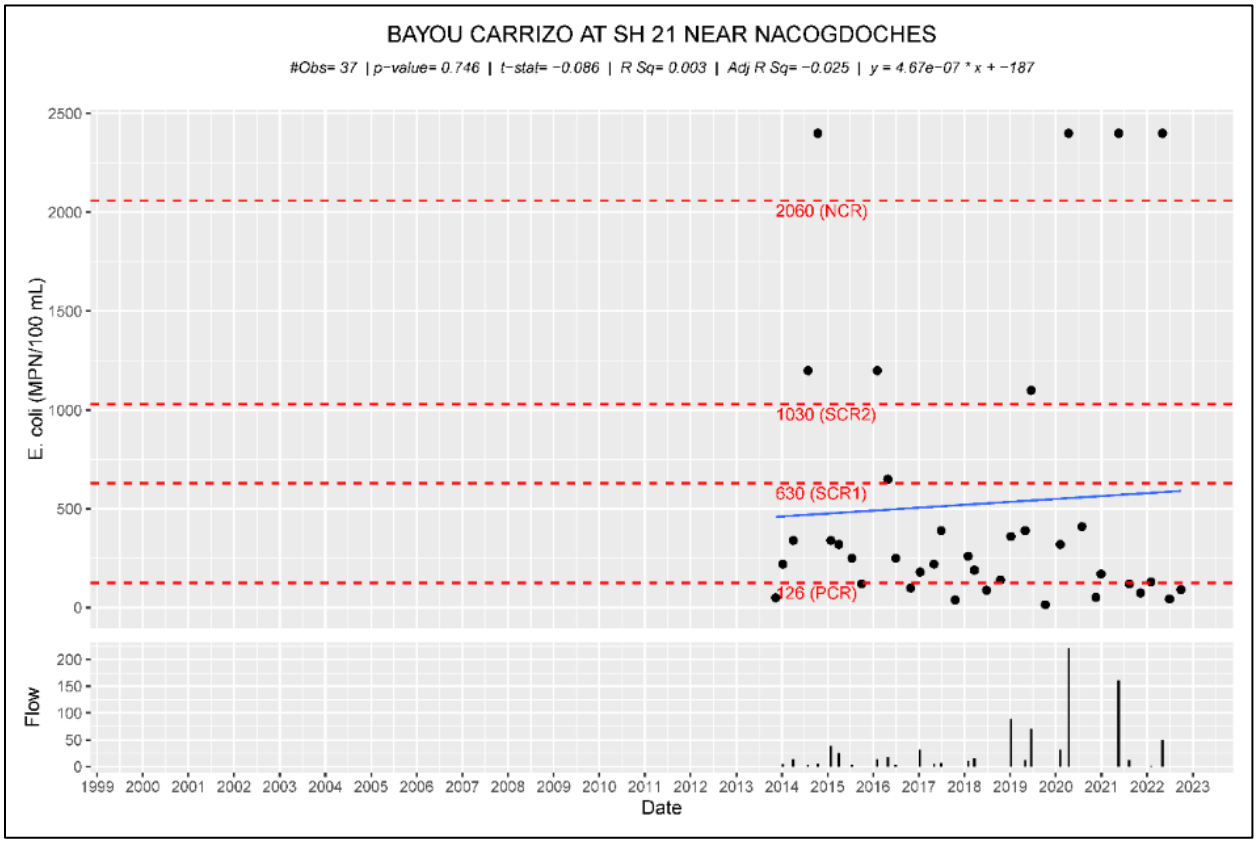
This graph shows the correlation between pH and dissolved oxygen percent saturation. While this data is not yet statistically significant, it shows the same correlation seen in the Lake O' the Pines study previously mentioned.



BAYOU CARRIZO – ELEVATED BACTERIA

Bayou Carrizo, a waterbody east of Nacogdoches, Texas, was newly listed for elevated bacteria in the 2022 IR. This is most likely an existing problem for which data is only now available. For assessment of a waterbody, a seven-year window of data is needed. Data collection on this segment began in late 2013, which means only recently has there been enough data for an assessment. Bayou Carrizo continues to be monitored quarterly as part of ANRA's routine CRP sampling. More data is needed before any further action will be considered for this water body.

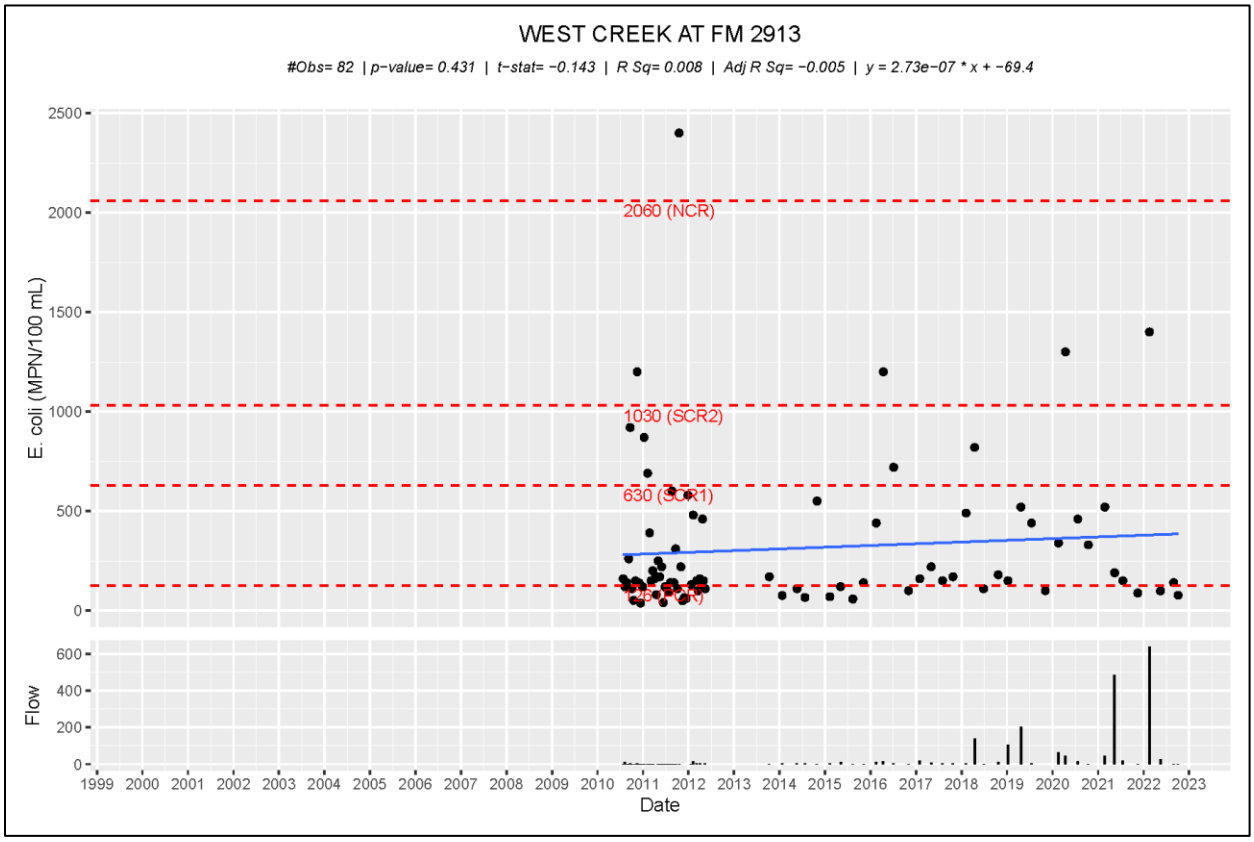
BAYOU CARRIZO BACTERIA DATA



WEST CREEK – ELEVATED BACTERIA

West Creek is also newly listed for elevated bacteria in the 2022 IR. Though some data was collected as early as 2010 for this site during the development of the Attoyac Bayou WPP, routine monitoring began around the same time as Carrizo Bayou. As such, this listing is likely also primarily related to data availability rather than a change in water quality. West Creek is within the Attoyac Bayou Watershed, and the Attoyac Watershed Protection Plan Partners are already working with local stakeholders to address bacteria impairments watershed-wide.

WEST CREEK BACTERIA DATA



WATER QUALITY MONITORING

Multiple organizations and agencies work together to collect and analyze water quality data in the Neches River Basin. As a part of the Clean Rivers Program, ANRA performs routine surface water quality monitoring at 37 stations per quarter and 24-hour dissolved oxygen monitoring at two additional sites five times per year. Also, a special project on the Ayish Bayou consists of eight sites monitored monthly for FY 2023. Six of the Ayish sites are dedicated specifically for the project, while the remaining two were preexisting CRP routine sites. Routine water quality monitoring includes analysis of field parameters, conventional parameters, bacteria, and flow. 24-hour D.O. monitoring includes the collection of field parameters over a 24-hour period.

The table below lists the entities monitoring in the Neches Basin and the number of sites that they monitor.

COUNT OF CURRENT MONITORING SITES FOR THE ENTIRE NECHES RIVER BASIN

Monitoring Entity	Field	Conventional	Bacteria	Flow	Notes
ANRA	43	43	43	35	For FY 2023 ANRA is monitoring 37 sites routinely for CRP, and 8 sites are being monitored for a special project on Ayish Bayou. Two of the eight sites are joint CRP/project sites and the remainder are dedicated project sites. 24 hr. D.O. is also being collected at 2 sites.
TCEQ Region 5 (Tyler)	20	20	20	9	Metals in fish tissue collected at 2 additional sites
TCEQ Region 10 (Beaumont)	20	20	20	5	Metals in Sediment at 6 of these sites
LNVA	23	23	23	20	24 hr. D.O. at 3 of these sites
SFASU	5	5	5	5	
TIAER	9	9	9	9	24 hr. D.O. at 3 of these sites. Sampling for Kickapoo WPP. Sampling completed in February of 2023
Tarrant Regional Water District	1	1	1	-	TRA out of basin site Intake for Lake Palestine water supply. Metals in Water also collected at this site.

WATER QUALITY MONITORING PARAMETERS

As a part of ANRA's Routine Quarterly Monitoring, ANRA collects and analyzes field parameters conventional parameters, bacteriological parameters, and flow. Other agencies may monitor for different parameters depending on their data needs or objectives. ANRA collects and performs the following analyses:

Field Parameters are collected on-site by direct monitoring in the water body using field instrumentation, multiprobe sondes, and doppler surveying equipment.

- Dissolved Oxygen
- pH
- Specific Conductance
- Water Temperature
- Total Water Depth
- Secchi Depth
- Flow Severity
- Present Weather
- Days Since Last Significant Rainfall
- Instantaneous Stream Flow*

**Instantaneous stream flow is only measured at sites with flowing/moving water. For example, lakes are not measured for instantaneous stream flow.*

Conventional Parameters are analyzed for water samples collected during routine water quality monitoring events. These parameters include nutrients, minerals, and particulates. ANRA's Environmental Laboratory conducts all analyses of conventional parameters, with the exception of Nitrate-plus-Nitrite which is only analyzed as a fallback parameter in instances where the individual Nitrate and Nitrite analyses cannot be performed for some reason.

- Chloride
- Sulfate
- Total Phosphorus
- Ammonia-N
- Nitrate-N
- Nitrite-N
- Total Kjeldhal Nitrogen (TKN)
- Chlorophyll-a
- Pheophytin-a
- Total Suspended Solids
- Total Dissolved Solids

Bacteriological Parameters are also collected for laboratory analysis during routine water quality monitoring events to determine if the water is contaminated with fecal material. In freshwater systems, *Escherichia Coli* (*E. Coli*) is the organism used to assess the level of fecal contamination.

For more information regarding current monitoring sites and water quality data, please visit:
https://www.anra.org/conservation-recreation/water-quality-activities/monitoring-sites-water-quality-data/

BASINWIDE MONITORING SITES FOR FY 2023

MAP OF MONITORING SITES IN THE NECHES RIVER BASIN

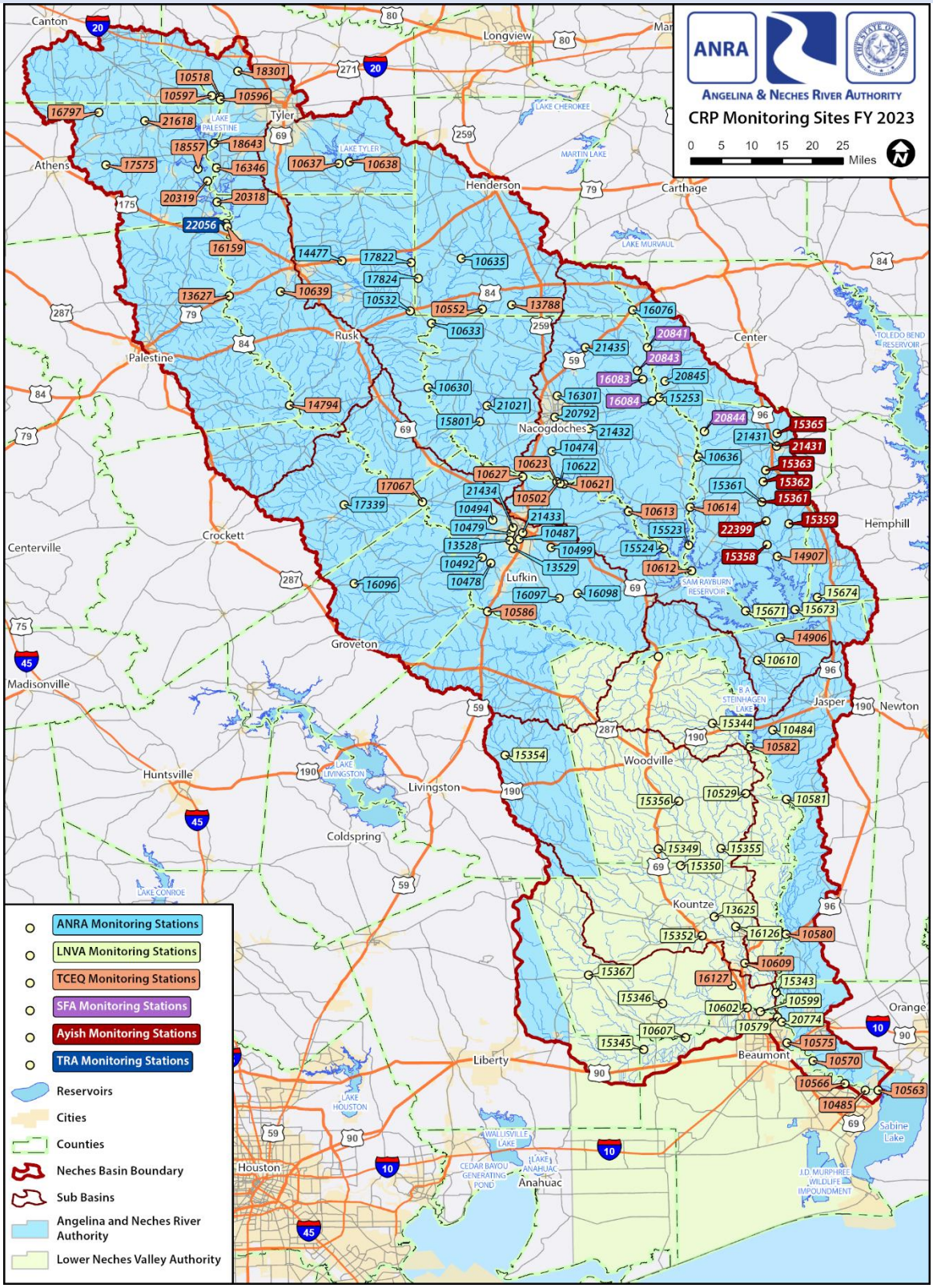


TABLE OF MONITORING SITES IN THE UPPER AND MIDDLE NECHES RIVER BASIN

ID	SEG.	DESCRIPTION	COLLECTED BY	NOTES
10585	0604	NECHES RIVER AT US 69	ANRA	
10586	0604	NECHES RIVER AT US 59	TCEQ	
13627	0604	NECHES RIVER AT US 79	TCEQ	
14794	0604	NECHES RIVER AT SH 294	TCEQ	
17067	0604	NECHES RIVER AT SH 7	TCEQ	
10478	0604A	CEDAR CREEK AT FM 2497	ANRA	
10479	0604A	CEDAR CREEK AT LOOP 287	ANRA	
13528	0604A	CEDAR CREEK AT FM 1336	ANRA	
21434	0604A	CEDAR CREEK AT ELLIS AVE	ANRA	
10487	0604B	HURRICANE CREEK AT LOOP 287	ANRA	
13529	0604B	HURRICANE CREEK AT FM 324	ANRA	
21433	0604B	HURRICANE CREEK AT KIWANIS PARK	ANRA	
10492	0604C	JACK CREEK AT FM 2497	ANRA	
10494	0604C	JACK CREEK AT FM 3150	ANRA	
16096	0604D	PINEY CREEK AT FM 358	ANRA	
10499	0604M	BILOXI CREEK AT CR 216	ANRA	
16097	0604M	BILOXI CREEK AT FM 1818	ANRA	
16098	0604N	BUCK CREEK AT FM 1818	ANRA	
17339	0604T	LAKE RATCLIFF	ANRA	
16159	0605	LAKE PALESTINE AT DAM	TCEQ	
16346	0605	LAKE PALESTINE AT RAW WATER INTAKE	TCEQ	
18557	0605	LAKE PALESTINE IN FLAT BAY	TCEQ	
18643	0605	LAKE PALESTINE UPPER LAKE EAST SHORE	TCEQ	
20318	0605	LAKE PALESTINE MIDLAKE NEAR LEDBETTER BAY	TCEQ	
20319	0605	LAKE PALESTINE NEAR CAPE TRANQUILITY DRIVE	TCEQ	
22056	0605	LAKE PALESTINE IN BLACKBURN BAY	TRA	Water Intake
10517	0605A	KICKAPOO CREEK AT FM 314	TIAER	TSSWCB Project
16796	0605A	KICKAPOO CREEK AT FM1803	TIAER	TSSWCB Project
16797	0605A	KICKAPOO CREEK AT FM 773	TCEQ & TIAER	TSSWCB Project
21618	0605A	KICKAPOO CREEK AT CR 3514	TCEQ & TIAER	TSSWCB Project
22163	0605A	KICKAPOO CREEK UPSTREAM OF CR 3520	TIAER	TSSWCB Project
22164	0605A	KICKAPOO CREEK AT CR 3806	TIAER	TSSWCB Project
22165	0605A	KICKAPOO CREEK AT FM 1861	TIAER	TSSWCB Project
22166	0605A	KICKAPOO CREEK AT CR 4206	TIAER	TSSWCB Project
22167	0605A	KICKAPOO CREEK AT FM 858	TIAER	TSSWCB Project
17575	0605F	LAKE ATHENS	TCEQ	
10596	0606	NECHES RIVER AT FM 279	TCEQ	
10597	0606	NECHES RIVER UPSTREAM LAKE PALESTINE AT SH 64	TCEQ	
10518	0606A	PRAIRIE CREEK AT SH 64	TCEQ	
18301	0606A	PRAIRIE CREEK AT SH 110	TCEQ	
10610	0609	ANGELINA RIVER AT SH 63	LNVA	
10612	0610	SAM RAYBURN RESERVOIR AT SH 147	TCEQ	
10613	0610	SAM RAYBURN RESERVOIR AT SH 103	TCEQ	
10614	0610	SAM RAYBURN RESERVOIR WEST SHORE AT SH 103	TCEQ	
14906	0610	SAM RAYBURN RESERVOIR AT MAIN POOL	TCEQ	
14907	0610	SAM RAYBURN RESERVOIR AT FM 83	TCEQ	
15523	0610	SAM RAYBURN RESERVOIR ALLIGATOR COVE	ANRA	
15524	0610	SAM RAYBURN RESERVOIR NEAR SHIRLEY CREEK	ANRA	
15671	0610	SAM RAYBURN RESERVOIR USGS SITE FC	LNVA	
15673	0610	SAM RAYBURN RESERVOIR USGS SITE AC	LNVA	
15674	0610	SAM RAYBURN RESERVOIR USGS SITE LC	LNVA	
15361	0610A	AYISH BAYOU AT SH 103	ANRA	CRP RT, Ayish project site
15365	0610A	AYISH BAYOU AT FM 3230	ANRA	Ayish project site
21431	0610A	AYISH BAYOU AT WEST COLUMBIA	ANRA	CRP RT, Ayish project site
22399	0610A	AYISH BAYOU AT SAN AUGUSTINE CR 313	ANRA	Ayish project site

15362	0610G	CANEY CREEK AT SH 147	ANRA	Ayish project site
15359	0610I	CHIAMON BAYOU AT FM 1751	ANRA	Ayish project site
15358	0610K	SANDY CREEK AT FM 705	ANRA	Ayish project site
15363	0610M	VENADO CREEK AT SH 147	ANRA	Ayish project site
21432	0610P	BAYOU CARRIZO AT SH 21	ANRA	
10623	0611	ANGELINA RIVER 1.16 KM UPSTREAM OF PAPER MILL CREEK	TCEQ	
10627	0611	ANGELINA RIVER AT US 59	TCEQ	
10630	0611	ANGELINA RIVER AT SH 21	ANRA	
10633	0611	ANGELINA RIVER UPSTREAM OF SH 204	ANRA	
10635	0611	ANGELINA RIVER ABOVE SAM RAYBURN AT FM 1798	ANRA	
10552	0611A	EAST FORK ANGELINA RIVER AT FM 225	TCEQ	
13788	0611A	EAST FORK ANGELINA RIVER AT CR 3218	TCEQ	
10474	0611B	LA NANA BAYOU AT CR 526	ANRA	
16301	0611B	LA NANA BAYOU AT LOOP 224	ANRA	
20792	0611B	LA NANA BAYOU AT EAST MAIN	ANRA	
10532	0611C	MUD CREEK AT US 84	ANRA	
14477	0611C	MUD CREEK AT US 79	ANRA	
15801	0611Q	LAKE NACOGDOCHES IN MAIN POOL	ANRA	
21021	0611Q	LAKE NACOGDOCHES UPPER LAKE	ANRA	
17822	0611R	LAKE STRIKER UPPER LAKE	ANRA	
17824	0611R	LAKE STRIKER NEAR DAM	ANRA	
10636	0612	ATTOYAC BAYOU AT SH 21	ANRA	
15253	0612	ATTOYAC BAYOU AT SH 7	ANRA	
16076	0612	ATTOYAC BAYOU AT US 59	ANRA	
20841	0612	ATTOYAC BAYOU AT FM 138	SFA	TSSWCB Project
16084	0612A	TERRAPIN CREEK AT SH 95	SFA	TSSWCB Project
16083	0612B	WAFFELOW CREEK AT FM 95	SFA	TSSWCB Project
20843	0612D	NACONICHE CREEK AT FM 95	SFA	TSSWCB Project
20844	0612E	BIG IRON ORE CREEK AT FM 354	SFA	TSSWCB Project
20845	0612F	WEST CREEK AT FM 2913	ANRA	
21435	0612G	NACONICHE LAKE NEAR DAM	ANRA	
10637	0613	LAKE TYLER MIDLAKE AT DAM	TCEQ	
10638	0613	LAKE TYLER EAST AT DAM	TCEQ	
10639	0614	SOUTHWEST CORNER OF LAKE JACKSONVILLE	TCEQ	
10621	0615	SAM RAYBURN BELOW PAPER MILL CREEK LOWER CHANNEL	TCEQ	
10502	0615A	PAPER MILL CREEK UPPER BIFURCATION CHANNEL	TCEQ	

WHAT DO WE DO WITH THE DATA WE COLLECT?

After samples and measurements are collected from their respective sites, they are processed in various ways. Field data sheets are transcribed onto the computer, archived, and the appropriate databases are updated. Physical samples (water, soil, and biological) are processed in laboratories, with the vast majority of the water quality analyses for samples ANRA collects processed in-house by ANRA's Environmental Laboratory. Results from the labs are archived and added to appropriate databases. The data and databases ANRA manages are then utilized by agencies such as the TCEQ and the EPA.

TYPES OF WATER BODY STATUSES IN THE TEXAS INTEGRATED REPORT

The Texas Integrated Report for Surface Water Quality, which TCEQ produces bi-annually in even-numbered years, summarizes the quality of the state's surface waters. There are three main statuses under which a water body will be defined as:

- Meets or Supports – Sufficient data are available to assess. The water body meets all applicable surface water quality standards and fully supports its designated uses.
- Concern – Sufficient data is not available to perform a full assessment and the limited data indicate surface water quality standards are not being met or surface water quality standards have not yet been established. If water quality data indicates a concern, resources are allocated to collect more data and verify the concern.
- Impaired – Sufficient data is available and shows that the water body does not meet surface water quality standards. TCEQ publishes a list of impaired water bodies. If monitoring data indicate a water body does not support one or more of its designated uses, then it is said to be impaired. Details of the impairment are published in the TCEQ Integrated Report and 303(d) List.

The full report is available here: https://www.tceq.texas.gov/waterquality/assessment/22twqi/22txir

This Basin Highlights Report summarizes the results of the 2022 Integrated Report for the upper and middle Neches River Basin. The 2022 Integrated Report evaluated 90 water bodies in the upper and middle Neches River Basin and of those, 33 had enough data to assess. Water quality data collected from December 2013 through November 2020 were assessed for the 2022 Integrated Report. Several agencies and organizations, including ANRA, collect and analyze data to send to the TCEQ to add to their databases and Integrated Reports.

COMMON IMPAIRMENTS IN THE NECHES RIVER BASIN

Bacteria impairments are the most common reason for water bodies in the upper and middle portions of the Neches River Basin to be listed on the state's list of impaired water bodies (303(d)) List). Three classified segments (Neches River Above Lake Palestine, Angelina River Above Sam Rayburn Reservoir, and Attoyac Bayou) have a bacterial impairment listed in the 2022 Texas Integrated Report. Additionally, fifteen unclassified segments have impairments or concerns for *E. Coli* bacteria. When it comes to water quality, most organizations test specifically for *E. Coli* in water samples. *E. Coli* is essentially a 'baseline' bacteria strain. If there are elevated levels of *E. Coli* in a sample, then there are likely other harmful bacteria present as well. Water bodies in Texas are assigned recreation uses, which come with a set of standards based on how much *E. Coli* is acceptable/safe for each type of recreation. More information about the different types of recreational uses can be found in the "Designated Uses" section.

Depressed Dissolved Oxygen levels are present in two of the classified segments and five of the unclassified segments in the Basin. These impairments and concerns are most likely due to a combination of low flows and elevated nutrient levels. Dissolved oxygen monitoring is important for two main reasons: dissolved oxygen is essential to aquatic life such as fish and it is also an indicator of a serious ecologic issue known as eutrophication. Eutrophication is an ecological chain reaction when a water body receives too many nutrients. With a large input of nutrients, algae grows and spreads incredibly fast across a body of water. Initially, this will lead to a spike in dissolved oxygen, as algae generates oxygen through photosynthesis. Eventually, the algae will begin to die, forming large mats. These mats of dead algae block light to other plants, cutting off a significant amount of dissolved oxygen production. The levels of dissolved oxygen will plummet leading to fish and other plants dying.

Nutrients are a concern for multiple segments, particularly ammonia, nitrate, and total phosphorus. Classified segments have concerns for chlorophyll-a, nitrates, and total phosphorus. Nutrients play a major role in eutrophication, so they are important to monitor. When nutrients are naturally occurring, their prescence in waters are generally not harmful. However, most nutrient problems we see in Texas water bodies come from agricultural runoff containing fertilizer, which is incredibly dense with nutrients. Chlorophyll-a is an indicator of algae levels in water, and in turn an indicator of eutrophication.

Mercury and Dioxins in Edible Fish Tissue: Fish consumption advisories issued by the Texas Department of State Health Services (DSHS) cover several water bodies in the Neches Basin. Lake Ratcliff has a fish consumption advisory issued in 2012 due to mercury found in fish tissue. An advisory for mercury and dioxin in fish tissue, issued in 2014, covers the Neches River Below Lake Palestine, Sam Rayburn Reservoir, and B.A. Steinhagen Lake. Mercury ends up in fish tissue through a process called bioaccumulation. This is where increasing amounts of mercury are consumed during each step up in the food chain, accumulating in the tissues of organisms. This results in the larger predator fish such as largemouth bass having elevated levels of mercury. This mercury can be passed onto humans if consumed. Dioxins are a group of toxic chemical compounds that also accumulate in fish similar to mercury. Both mercury and dioxins are toxic to humans.

WHAT ARE DESIGNATED USES

Designated uses are specific uses assigned to water bodies by the TCEQ. Water bodies with designated uses are often held to higher standards than those without due to safety reasons. Designated uses include things like recreation, fish consumption, aquatic life, domestic water supply, and general. Most of these uses involve consuming water or consuming things from the water, which is why standards for water bodies with designated uses are generally higher than normal.

General

General use is for waterbodies that have or are intended to have more than one use associated with them, for example aquatic life, recreation, domestic water supply, etc. As such, there are multiple water quality parameters involved with general use, which are water temperature, pH, chloride, sulfate, TDS, and chlorophyll-a. Criteria for these parameters are assessed for the general use category.

Recreation

Recreation involves many of the typical things one would think of when going in the water, such as swimming, wading, or boating. There are multiple classes of recreation which are based on how much contact a person will have with waterbodies. These are the definitions for each class of recreation outlined in the TSWQS:

- Primary Contact Recreation 1 (PCR 1): Water recreation activities, such as wading by children, swimming, water skiing, diving, tubing, surfing, and whitewater kayaking, canoeing, and rafting, involving a significant risk of ingestion of water.
- Primary Contact Recreation 2 (PCR 2): Water recreation activities that involve a significant risk of ingestion of water occur, but less frequently than for primary contact recreation 1. Will be designated where recreation occurs less frequently due to physical characteristics of the water body or limited public access.
- Secondary Contact Recreation 1 (SCR 1): Water recreation activities, such as fishing, commercial and recreational boating, and limited body contact incidental to shoreline activity, not involving a significant risk of water ingestion and that commonly occur.
- Secondary Contact Recreation 2 (SCR 2): Water recreation activities, such as fishing, commercial and recreational boating, and limited body contact incidental to shoreline activity, not involving a significant risk of water ingestion but that occur less frequently than for secondary contact recreation 1 due to (1) physical characteristics of the water body and/or (2) limited public access.
- Noncontact Recreation (NCR): Activities, such as ship and barge traffic, birding, and using hike and bike trails near a water body, not involving a significant risk of water ingestion, and where primary and secondary contact recreation should not occur because of unsafe conditions. The recreation use for these water bodies is protected by the same criteria and indicators assigned to contact recreation waters— *E. Coli*, and *Enterococci*.

Aquatic Life

Aquatic life use is based on the habitat the water body provides and the amount of ecologic diversity it has. This use is broken down into multiple categories in the TSWQS:

- Exceptional: A water body that has an average dissolved oxygen content of 6 mg/L, has outstanding natural variability habitat characteristics, exceptional or unusual species assemblages, abundant sensitive species, exceptionally high diversity and species richness, and a balanced trophic structure
- High: A water body that has an average dissolved oxygen content range of 5 mg/L to 5.5 mg/L, has highly diverse habitat characteristics, the usual association of regionally expected species assemblages, present sensitive species, high diversity and species richness, and a balanced to slightly unbalanced trophic structure
- Intermediate: A water body that has an average dissolved oxygen content range of 4 mg/L to 5 mg/L, has moderately diverse habitat characteristics, some expected species assemblages, low amounts of sensitive species, moderate diversity and species richness, and a moderately imbalanced trophic structure
- Limited: A water body that has an average dissolved oxygen content range of 3 mg/L to 4 mg/L, has uniform habitat characteristics, most expected species assemblages absent, no sensitive species, low diversity and species richness, and a severely imbalanced trophic structure
- Minimal: A water body that has an average dissolved oxygen content of 2 mg/L

Fish Consumption

Fish consumption is exactly as it sounds. This use is for water bodies commonly associated with catching and consuming fish. Standards are put in place to ensure mercury and dioxin levels are low enough for the safe consumption of fish.

Domestic Water Supply

Domestic water supply use is for municipalities or other entities to take water from water bodies to use for things like drinking water or irrigation.

DESCRIPTIONS OF CLASSIFIED SEGMENTS AND ASSOCIATED UNCLASSIFIED SEGMENTS

This section highlights the ten major classified segments and their associated unclassified segments in the Upper Neches River Basin, with emphasis on major water bodies, impairments, and efforts to bring water bodies into compliance with Texas Surface Water Quality Standards.

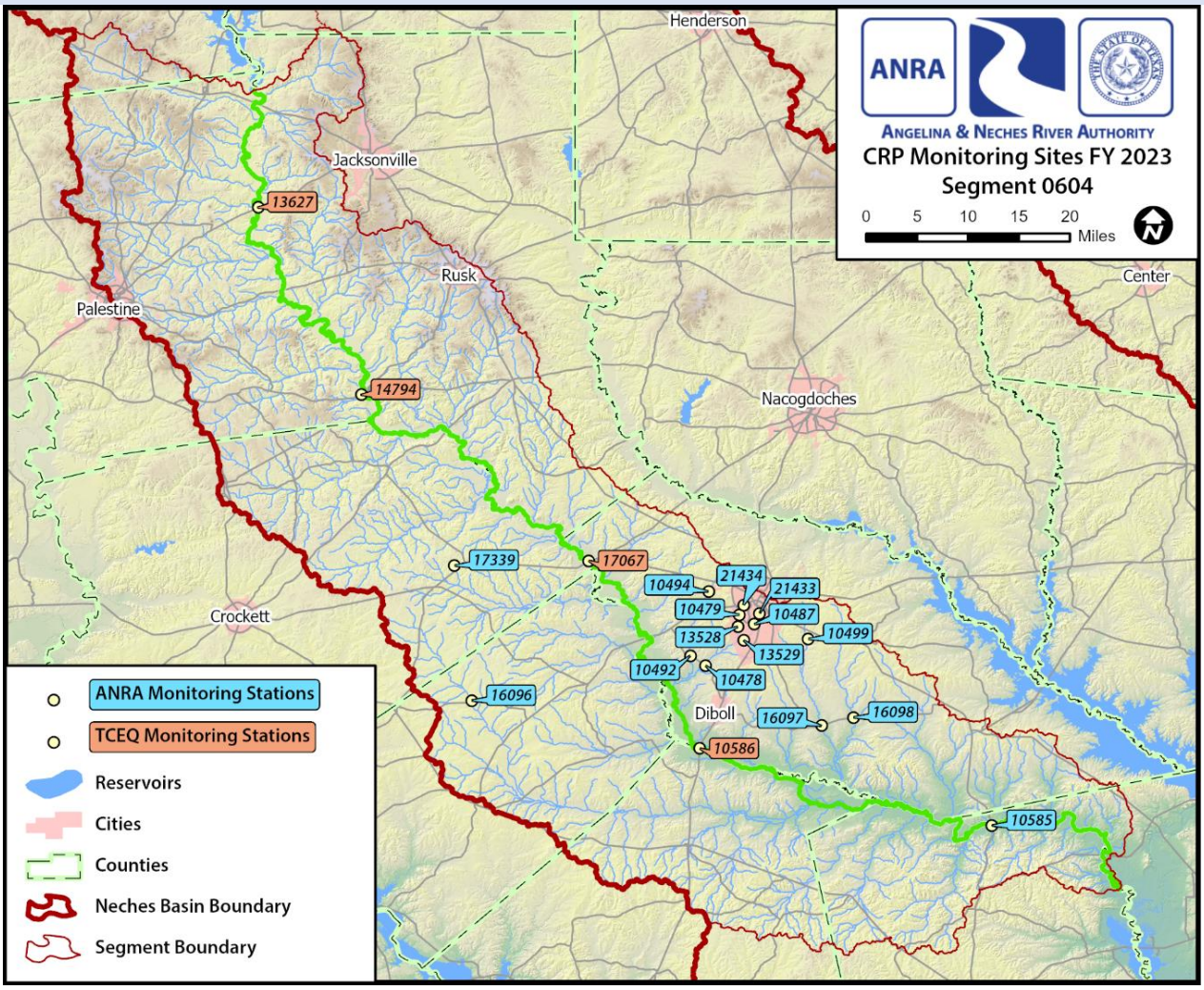
WHAT ARE CLASSIFIED, UNCLASSIFIED, AND ASSESSMENT UNITS

For the purpose of managing Water Quality Standards, water bodies in the state are divided into classified and unclassified segments. A classified segment is a water body or portion of a water body that is individually defined in the Texas Surface Water Quality Standards. A segment is intended to have relatively homogeneous chemical, physical, and hydrological characteristics. A segment provides a basic unit for assigning site-specific standards and for applying water quality management programs of the agency. Classified segments may include streams, rivers, bays, estuaries, wetlands, lakes, or reservoirs. The classified segments are assigned four-digit numbers. The first two digits correspond to the major basin in which they are located. The last two digits distinguish individual segments within the particular basin.

Because of the great extent of waters of the state, not all bodies of water are classified in the standards. For example, when managing a classified segment of the Neches River, it may be necessary to examine water quality in the tributaries that flow into that segment. Some of these tributaries may not be part of the classified segment system. When that happens, for management purposes, the tributary is assigned a unique tracking number that is referred to as an unclassified segment. This unclassified tributary will be designated with the number of the classified segment in the watershed in which it is located, along with a letter. For instance, tributaries of Segment 0604 would be 0604A, 0604B, and so on. The same numbering system applies to unclassified lakes. In management activities, both classified and unclassified segments are referred to generically as water bodies.

Segments are further divided into Assessment Units (AUs) to provide a more detailed picture of water quality when examining collected data for assessment purposes. A segment may be represented by one or more Assessment Units. For example, Sam Rayburn Reservoir (Segment 0610) is broken down into 10 separate Assessment Units.

SEGMENT 0604 – NECHES RIVER BELOW LAKE PALESTINE

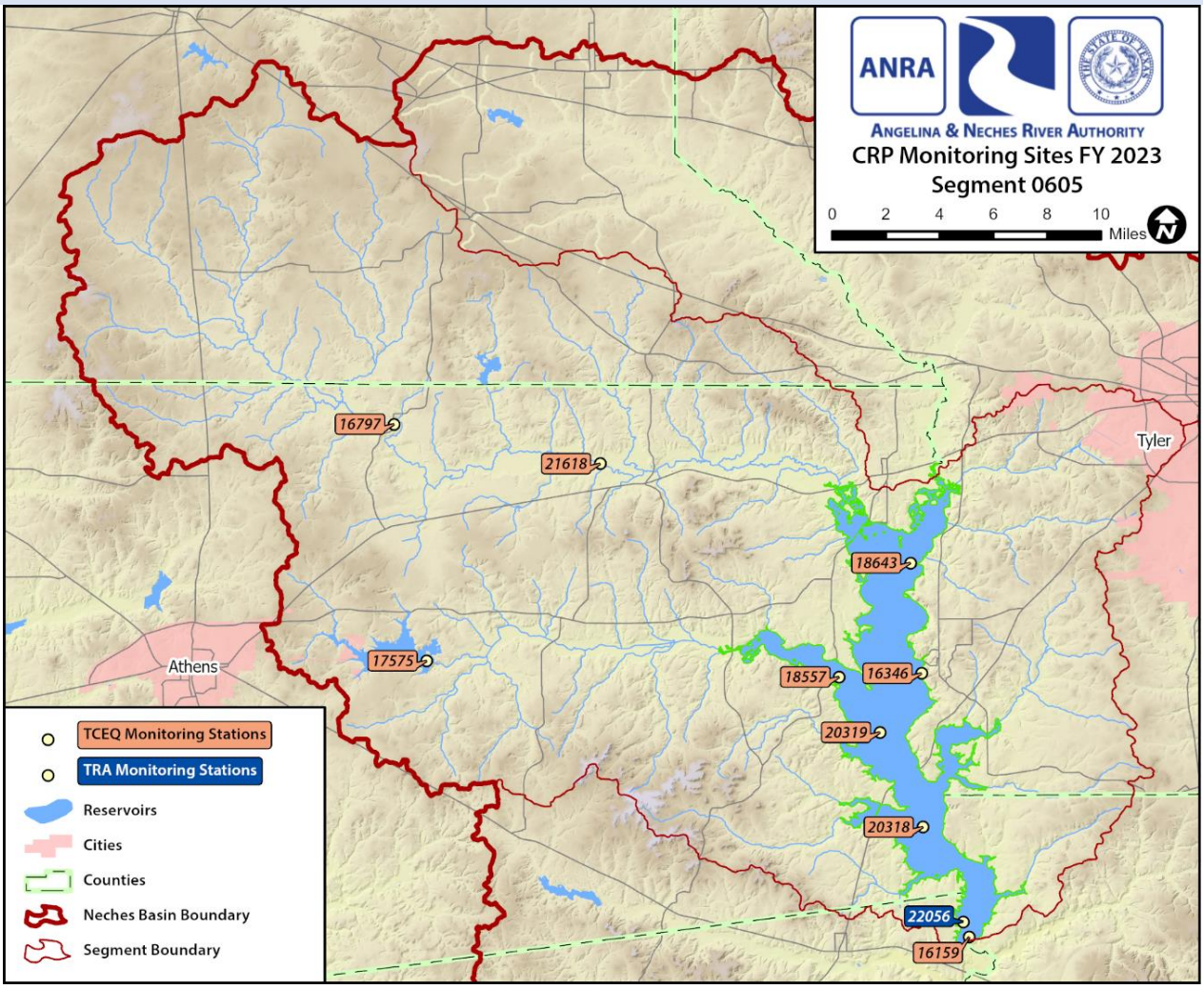


Segment 0604 is a 231-mile-long freshwater stream portion that extends from a point immediately upstream of the confluence of Hopson Mill Creek in Jasper/Tyler County to Blackburn Crossing Dam in Anderson/Cherokee County. Designated uses for this segment are general, primary contact recreation 1, aquatic life (high), domestic water supply, and fish consumption.

According to the 2022 IR, three Assessment Units on the Neches River (0604) have impairments for mercury and dioxin in edible tissue. Several unclassified stream segments are associated with segment 0604, and six of them currently have impairments:

- 0604A – Cedar Creek - Impaired for bacteria and depressed dissolved oxygen in water.
- 0604B – Hurricane Creek: bacteria in water.
- 0604C – Jack Creek: bacteria in water.
- 0604D – Piney Creek: bacteria and depressed dissolved oxygen in water.
- 0604M – Biloxi Creek: bacteria and depressed dissolved oxygen in water.
- 0604T – Lake Ratcliff: mercury in edible tissue.

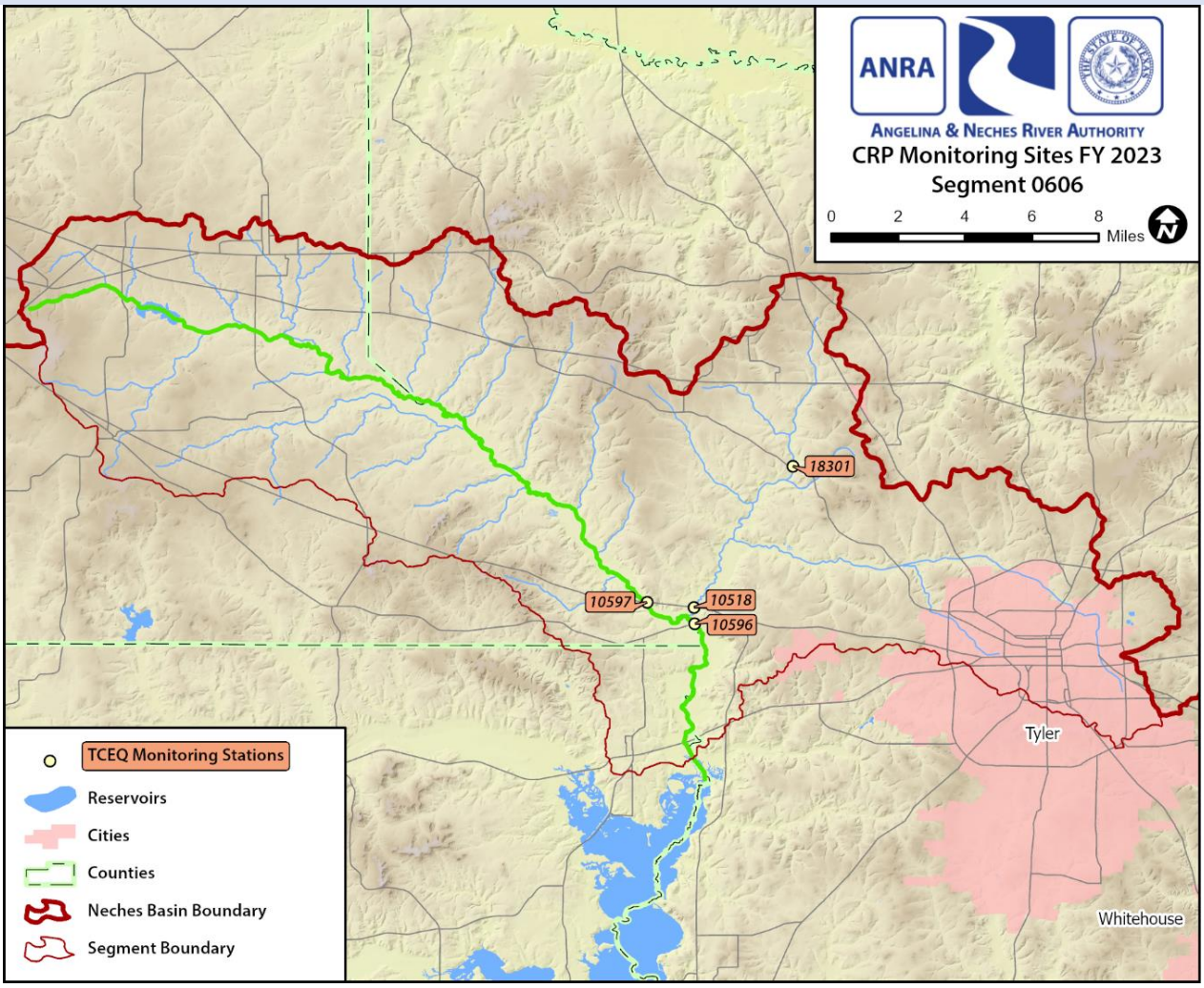
SEGMENT 0605 – LAKE PALESTINE



Segment 0605 is a 23,500-acre reservoir, an impoundment of the Neches River, from the Blackburn Crossing Dam in Anderson/Cherokee County to a point 6.7 km (4.2 miles) downstream of FM 279 in Henderson/Smith County, up to normal pool elevation of 345 feet. It was impounded in 1962. Designated uses for this segment are general, primary contact recreation 1, aquatic life (high), and domestic water supply.

According to the 2022 IR, five AUs on Lake Palestine (0605) have impairments for pH. Multiple unclassified stream segments are associated with Segment 0605. Only 0605A (Kickapoo Creek in Henderson County) is currently impaired due to bacteria in the water and depressed dissolved oxygen in the water.

SEGMENT 0606 – NECHES RIVER ABOVE LAKE PALESTINE

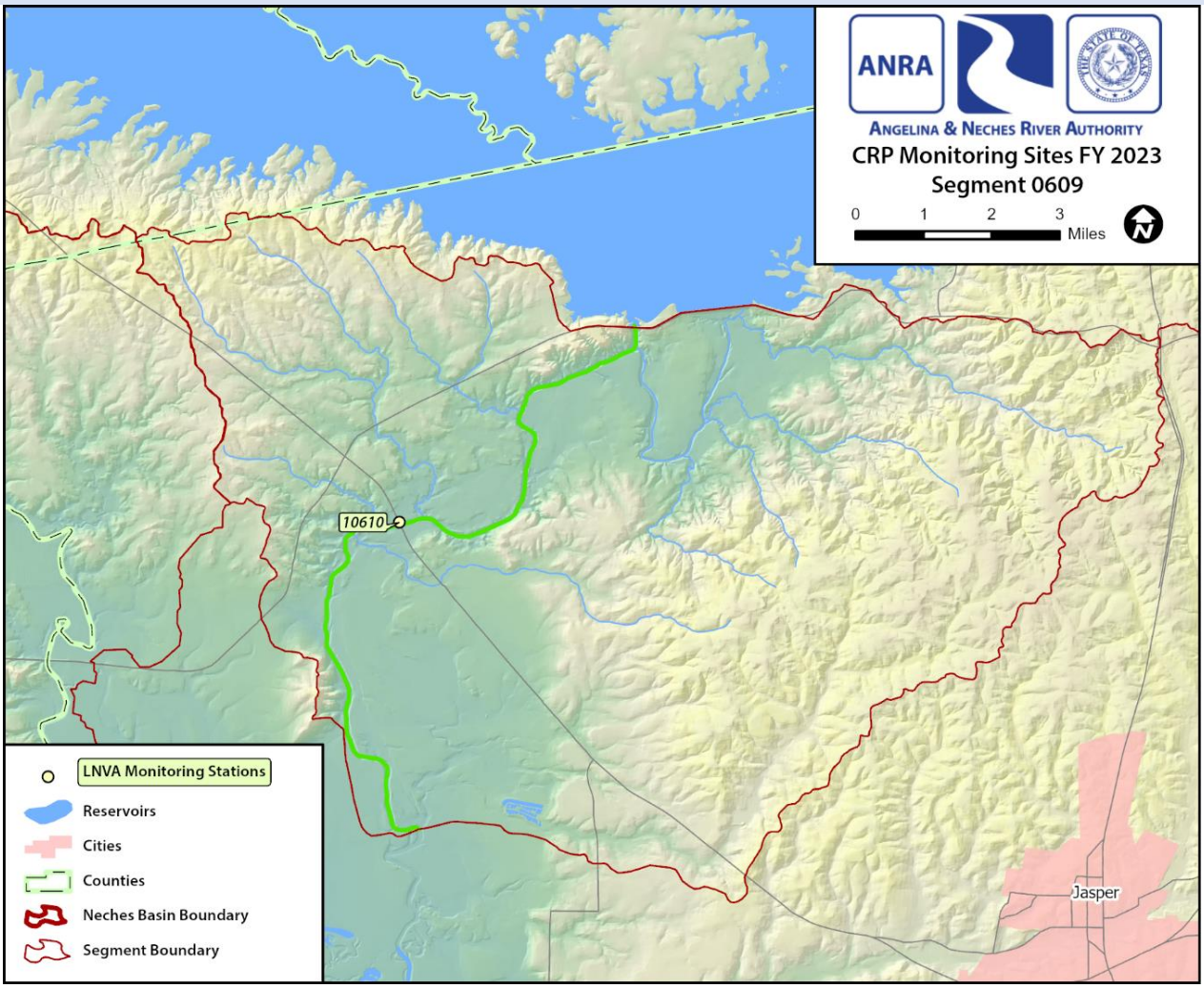


Segment 0606 is a 27 mile stretch of freshwater stream between a point 6.7 km (4.2 miles) downstream of FM 279 in Henderson/Smith County to Rhines Lake Dam in Van Zandt County. Designated uses for this segment are general, primary contact recreation 1, aquatic life (intermediate), and domestic water supply.

According to the 2022 IR, two AUs on the Neches River Above Lake Palestine (0606) have impairments for bacteria in the water and depressed dissolved oxygen in the water. Three unclassified stream segments are associated with Segment 0606. Two of them currently have impairments:

- 0606A – Prairie Creek: bacteria in water
- 0606D – Black Fork Creek: bacteria in water

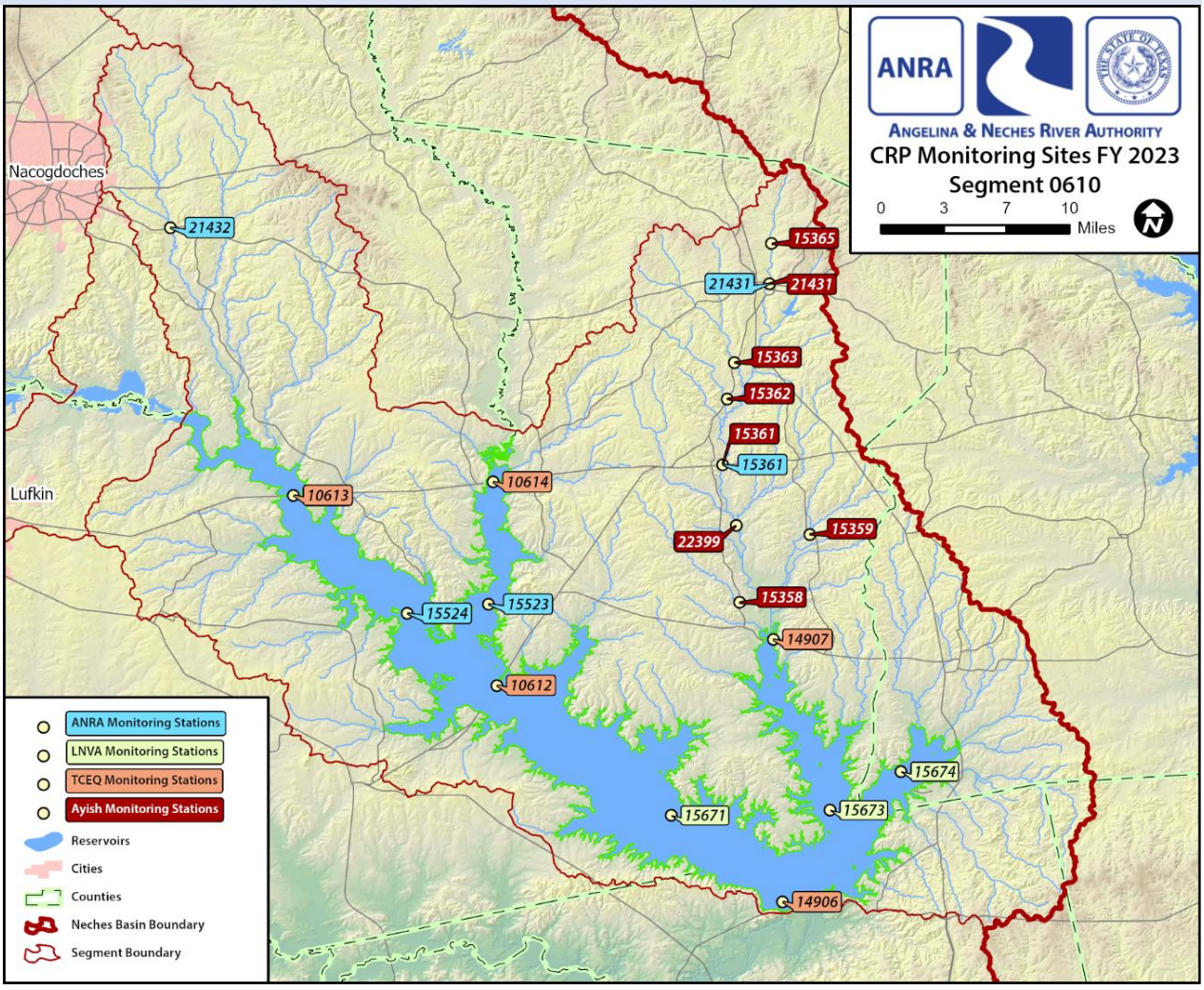
SEGMENT 0609 – ANGELINA RIVER BELOW SAM RAYBURN RESERVOIR



Segment 0609 is an 18-mile section of freshwater stream between the Sam Rayburn Reservoir dam in Jasper County and a point immediately upstream of the confluence of Indian Creek in Jasper County. Designated uses for this segment are general, primary contact recreation 1, aquatic life (high), domestic water supply, and fish consumption.

According to the 2022 IR, one AU on the Angelina River Below Sam Rayburn Reservoir (0609) has impairments for dioxin and mercury in edible tissue. There are no unclassified stream segments are associated with Segment 0609.

SEGMENT 0610 – SAM RAYBURN RESERVOIR



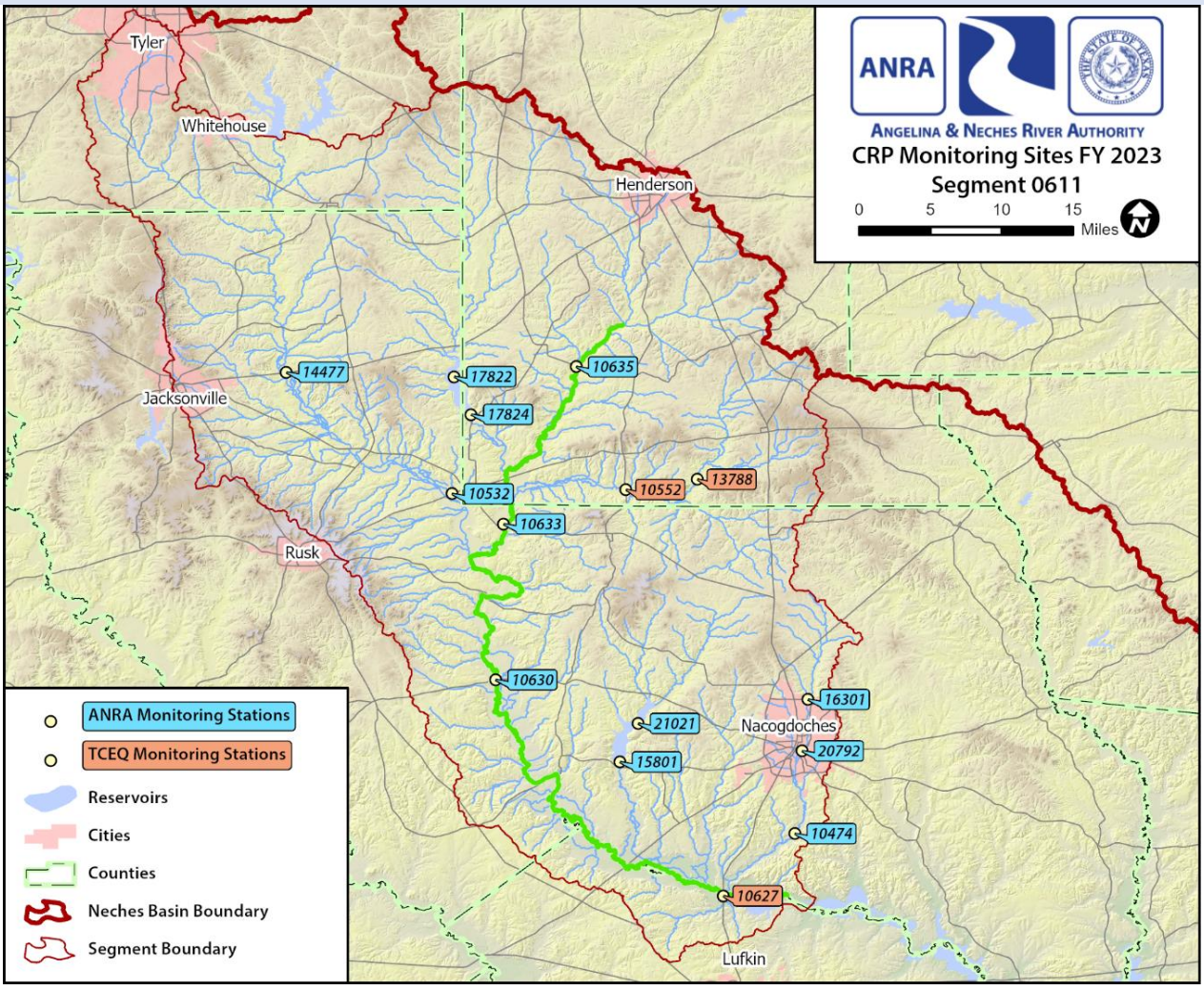
Segment 0610, which is Sam Rayburn Reservoir, includes 106,666 acres from Sam Rayburn Dam in Jasper County to a point 5.6 kilometers (3.5 miles) upstream of Marion's Ferry on the Angelina River Arm in Angelina/Nacogdoches County and to a point 3.9 km (2.4 miles) downstream of Curry Creek on the Attoyac Bayou Arm in Nacogdoches. Designated uses are general, primary contact recreation 1, aquatic life (high), domestic water supply, and fish consumption. Various contact recreational areas including trails, campgrounds, boating ramps, marinas, designated swimming areas, and group areas are located around Sam Rayburn Reservoir.

According to the 2022 IR, all ten AUs at Sam Rayburn (Segment 0610) are impaired for dioxin and mercury in edible tissue and excessive algal growth in water, additionally AU 05 is also impaired for high pH. Also, there are several unclassified stream segments that are associated with Sam Rayburn due to their direct discharge into the reservoir. Two of them are currently impaired:

- 0610A – Ayish Bayou: bacteria in water.
- 0610P – Bayou Carrizo: bacteria in water.

ANRA is currently working with TWRI on a TMDL project to address bacteriological impairments in the Ayish Bayou. The current project is set to be completed on August 31, 2023, however, the project will potentially be extended.

SEGMENT 0611 – ANGELINA RIVER ABOVE SAM RAYBURN RESERVOIR



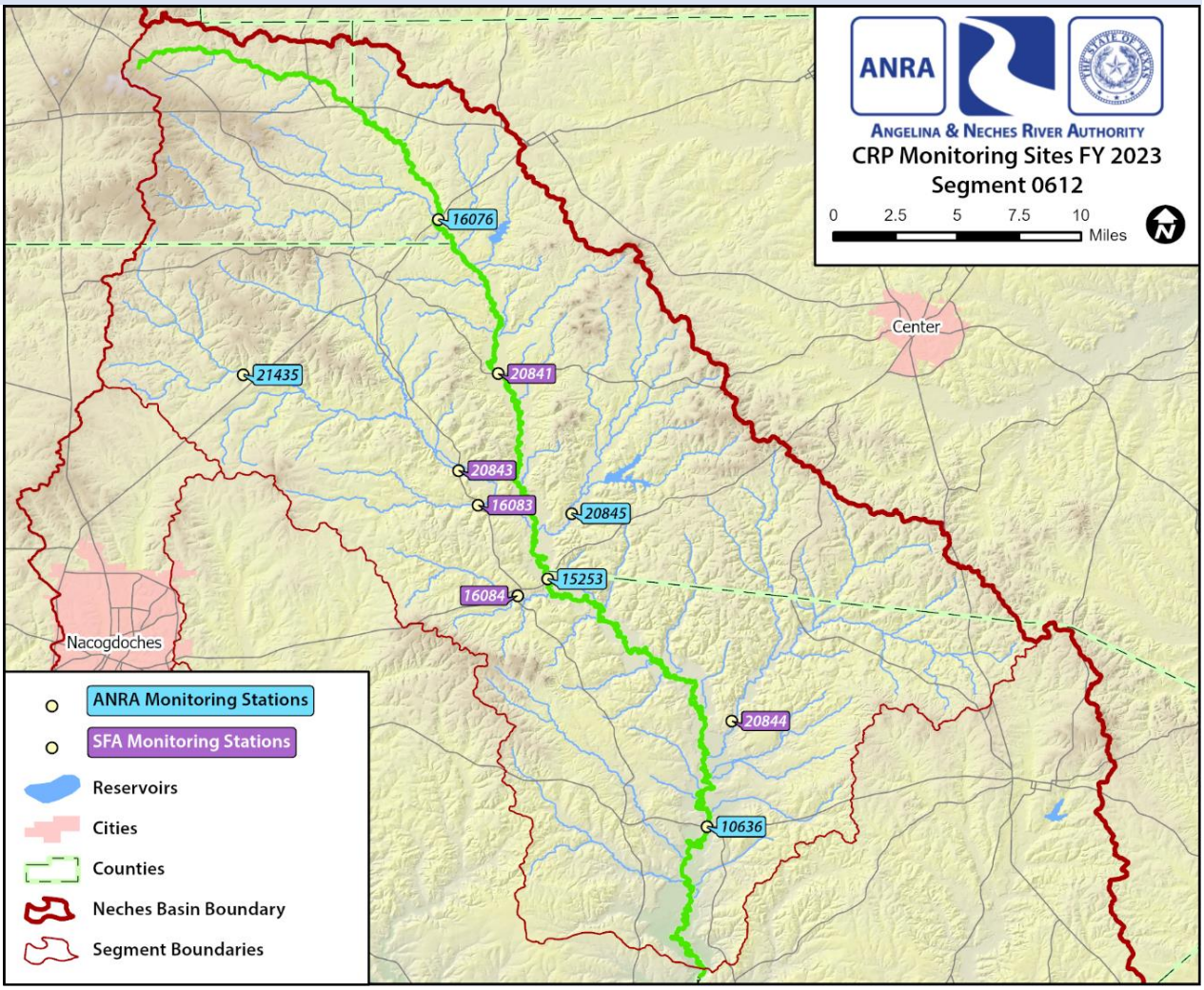
Segment 0611 is a 104-mile freshwater stream from the aqueduct crossing 0.6 miles upstream of the confluence of Paper Mill Creek in Angelina/Nacogdoches County to the confluence of Barnhardt Creek and Mill Creek at FM 225 in Rusk County. Designated uses for this segment are general, primary contact recreation 1, aquatic life (high), and domestic water supply.

According to the 2022 IR, all three Segment 0611 AUs have impairments of bacteria in water. Additionally, there are multiple unclassified segments associated with this section of the Angelina River, four of which have impairments:

- 0611A – East Fork Angelina River: bacteria in water
- 0611B – La Nana Bayou: bacteria in water.
- 0611C – Mud Creek: bacteria in water.
- 0611D – West Mud Creek: bacteria in water

ANRA is currently working with TWRI on a WPP project to address bacteriological impairments in the Ayish Bayou. The current project was completed on January 31, 2023.

SEGMENT 0612 – ATTOYAC BAYOU

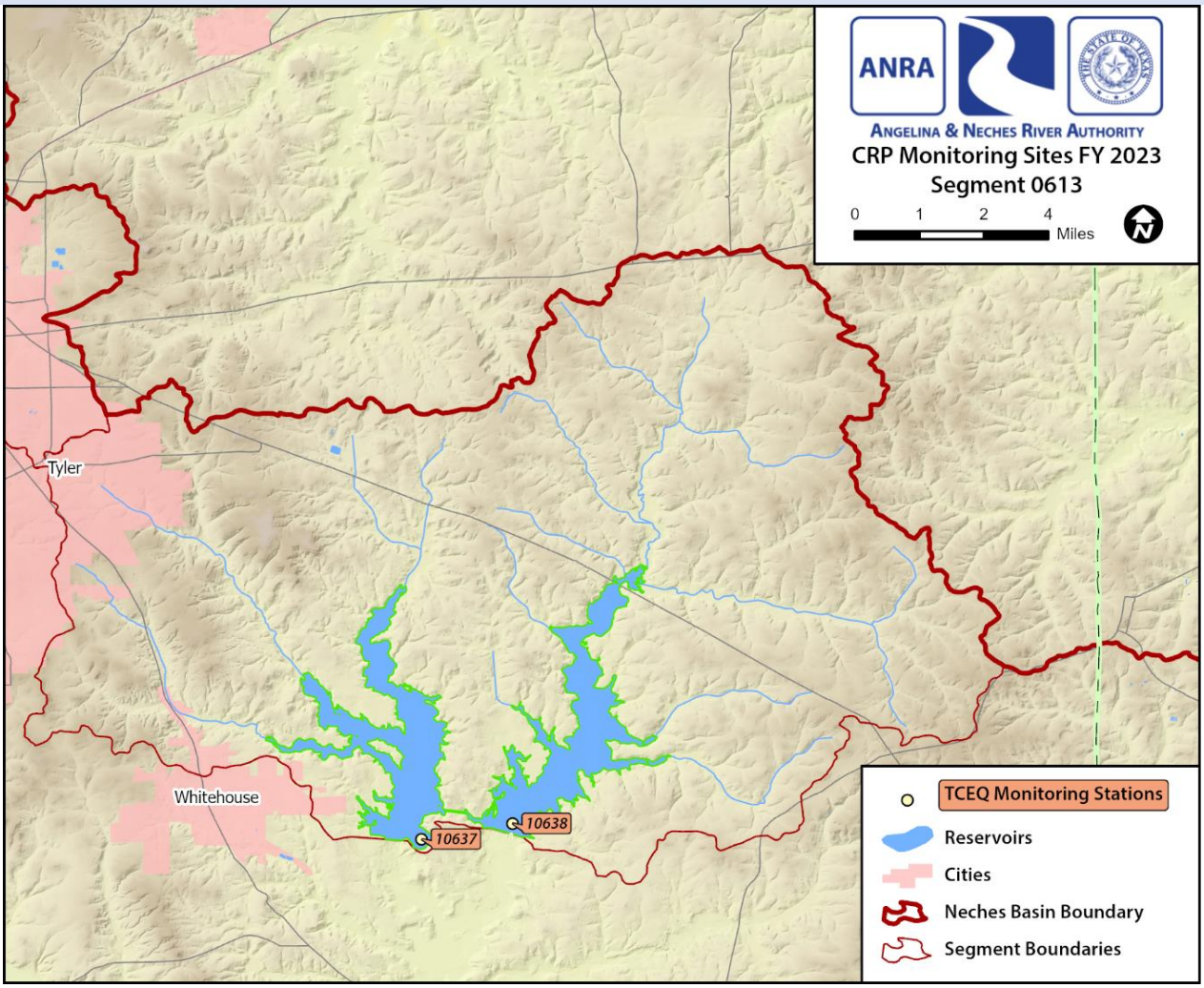


Segment 0612 is a section of freshwater stream measuring 81.7 miles in length from a point 3.9 km (2.4 miles) downstream of Curry Creek in Nacogdoches/San Augustine County to FM 95 in Rusk County. Designated uses for this segment are general, primary contact recreation 1, aquatic life (high), and domestic water supply. The area surrounding the watershed is managed for agricultural (cattle and poultry), silvicultural, recreational, and wildlife uses.

According to the 2022 IR, all three AUs of Segment 0612 are impaired for bacteria. There are multiple unclassified segments associated with 0612, but only 0612F (West Creek) is currently impaired due to bacteria in the water.

There are two WPP projects on the Attoyac Bayou to address bacteriological impairments - an ongoing OSSF project and a current implementation project.

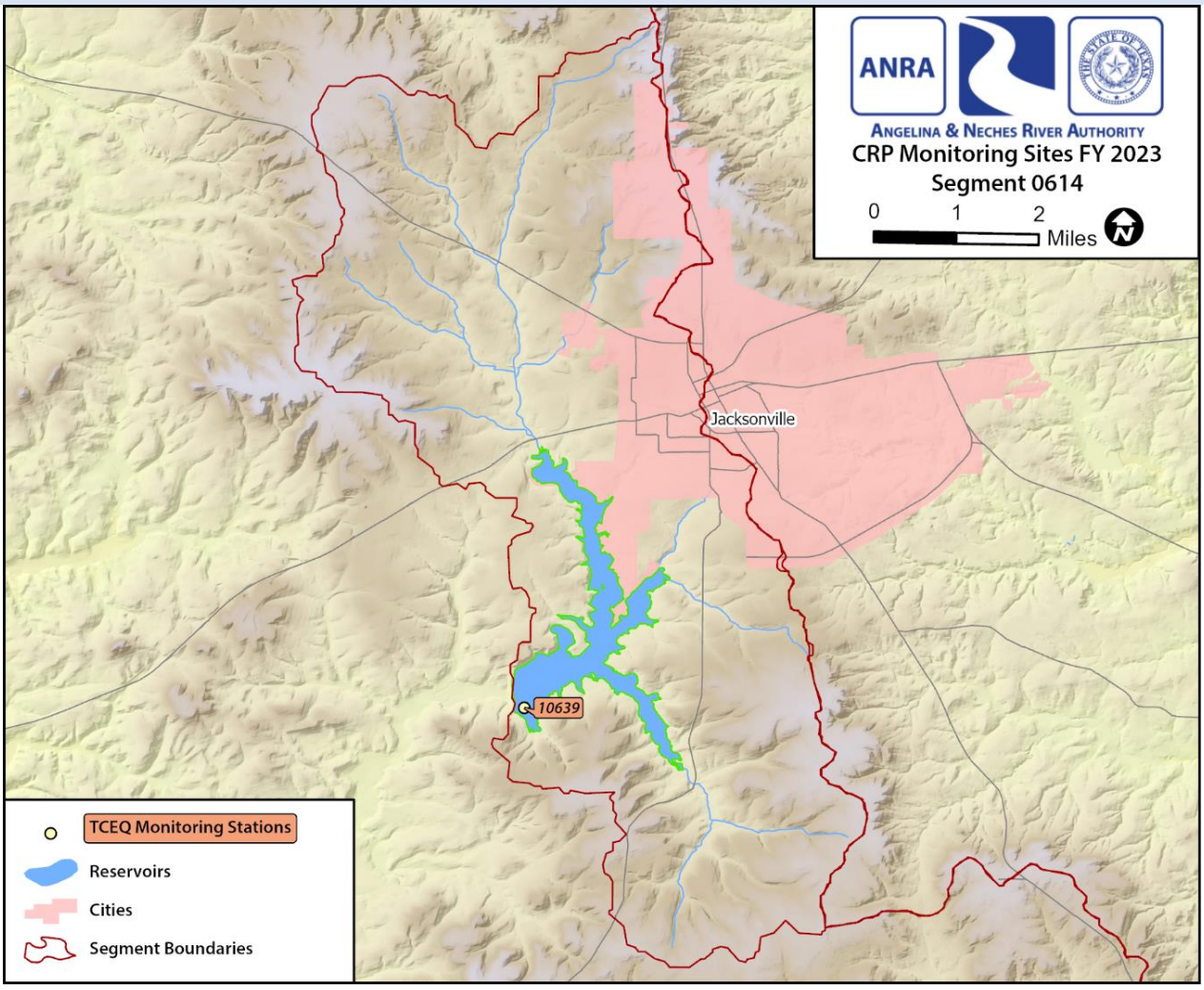
SEGMENT 0613 – LAKE TYLER/LAKE TYLER EAST



Segment 0613 extends from Whitehouse Dam and Mud Creek Dam in Smith County up to the normal pool elevation of 375.38 feet. The reservoir impounds both Prairie Creek and Mud Creek. Lake Tyler West and East include a total of 4,880 acres. Designated uses for this segment are general, primary contact recreation 1, aquatic life (high), and domestic water supply. Lake Tyler West and East were impounded in 1949 and 1966, respectively. The reservoir serves as a major source of water for local municipalities and recreational uses. There are several park areas adjacent to both lakes. The lakes have a storage capacity of 15 billion gallons of water within the watershed.

According to the 2022 IR, two AUs on Lake Tyler/Lake Tyler East (0613) have impairments for excessive algal growth in water. There are no unclassified segments associated with 0613.

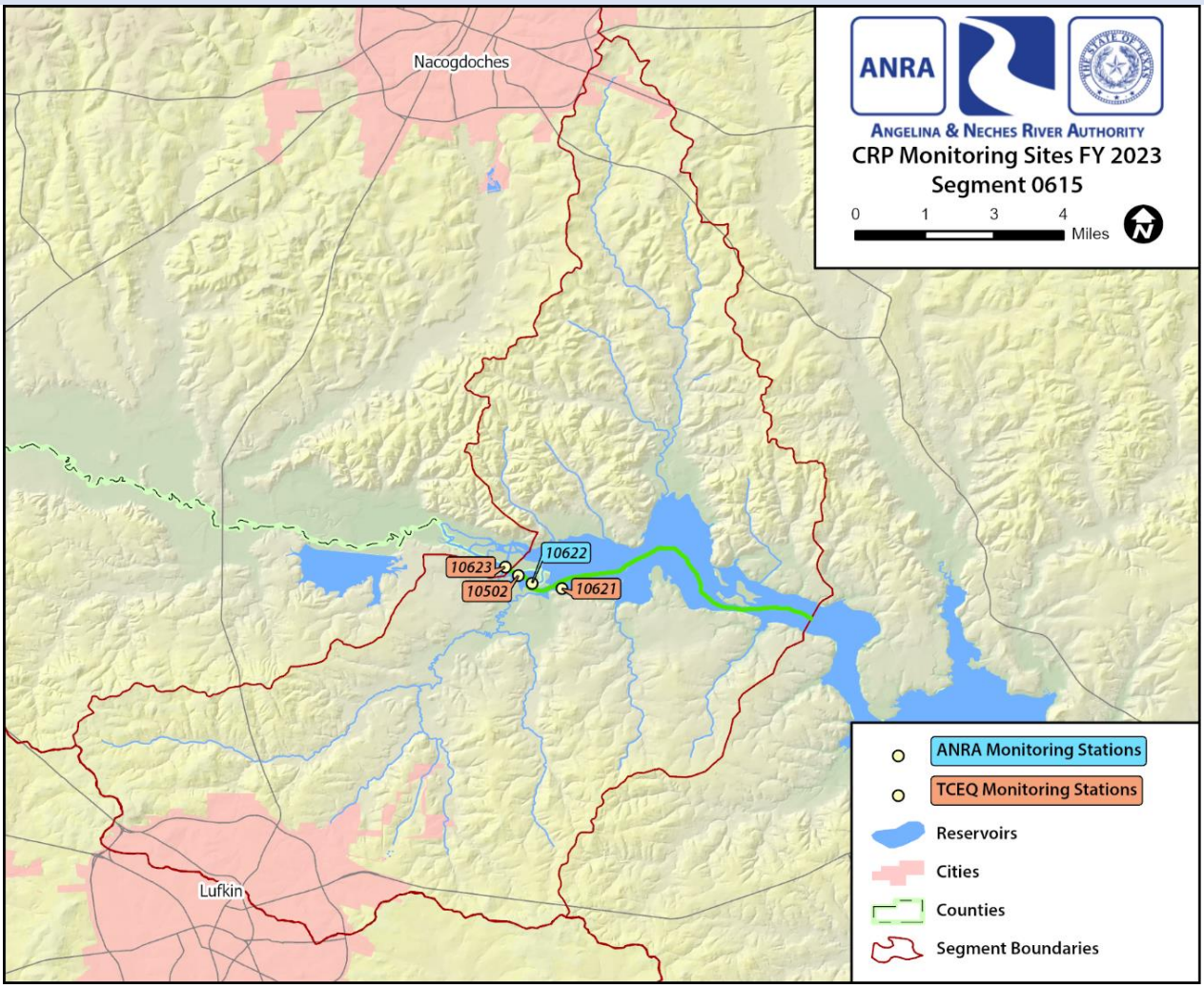
SEGMENT 0614 – LAKE JACKSONVILLE



Segment 0614 is designated as a classified reservoir - Lake Jacksonville. The description of this lake includes an area from Buckner Dam in Cherokee County up to a normal pool elevation of 422 feet (impounds Gum Creek). Designated uses for this segment are general, primary contact recreation 1, aquatic life (high), and domestic water supply.

According to the 2022 IR, Lake Jacksonville currently meets all standards for designated uses.

SEGMENT 0615 – ANGELINA RIVER/SAM RAYBURN RESERVOIR



Segment 0615, known as the riverine portion of Sam Rayburn Reservoir, extends from a point 5.6 kilometers (3.5 miles) upstream of Marion's Ferry to a point 2.75 kilometers (1.71 miles) upstream of the confluence of Paper Mill Creek. The segment includes 5,068 acres. Designated uses for this segment are general, primary contact recreation 1, aquatic life (high), domestic water supply, and fish consumption.

According to the 2022 IR, one AU is impaired for depressed oxygen levels, as well as dioxin and mercury in edible tissue. Three unclassified segments are associated with 0615, but only one of them (0615A, Paper Mill Creek) is impaired due to bacteria in the water.

IMPAIRMENTS AND CONCERNS IN THE NECHES RIVER BASIN FROM THE 2022 IR

IMPAIRMENTS

SEGMENT ID	SEGMENT NAME	IMPAIRMENTS	CATEGORY (AU ID)
0604	Neches River Below Lake Palestine	Dioxin in edible tissue Mercury in edible tissue	5a (02) 5c (03)
0604A	Cedar Creek	Bacteria in water (Recreation Use) Depressed dissolved oxygen in water	5a (02), 5c (03) 5c (03)
0604B	Hurricane Creek	Bacteria in water (Recreation Use)	5a (01)
0604C	Jack Creek	Bacteria in water (Recreation Use)	5a (01)
0604D	Piney Creek	Bacteria in water (Recreation Use) Depressed dissolved oxygen in water	5b (02) 5b (01)
0604M	Biloxi Creek	Bacteria in water (Recreation Use) Depressed dissolved oxygen in water	5a (03) 5c (03)
0604T	Lake Ratcliff	Mercury in edible tissue	5c (01)
0605	Lake Palestine	pH	5b (02, 03, 09, 10), 5c (01)
0605A	Kickapoo Creek in Henderson County	Bacteria in water (Recreation Use) Depressed dissolved oxygen in water	5c (01, 02) 5c (01)
0606	Neches River Above Lake Palestine	Bacteria in water (Recreation Use) Depressed dissolved oxygen in water	5c (01, 02) 5b (02)
0606A	Prairie Creek	Bacteria in water (Recreation Use)	5b (01, 03)
0606D	Black Fork Creek	Bacteria in water (Recreation Use)	5b (02)
0609	Angelina River Below Sam Rayburn Reservoir	Dioxin in edible tissue Mercury in edible tissue	5a (01) 5c (01)
0610	Sam Rayburn Reservoir	Dioxin in edible tissue Excessive algal growth in water Mercury in edible tissue pH	5a (01 - 10) 5c (01 - 10) 5c (01 - 10) 5c (05)
0610A	Ayish Bayou	Bacteria in water (Recreation Use)	5c (01, 02)
0610P	Bayou Carrizo	Bacteria in water (Recreation Use)	5c (01)
0611	Angelina River Above Sam Rayburn Reservoir	Bacteria in water (Recreation Use)	5c (01, 03, 04)
0611A	East Fork Angelina River	Bacteria in water (Recreation Use)	5c (01, 02)
0611B	La Nana Bayou	Bacteria in water (Recreation Use)	5b (01, 02, 03)
0611C	Mud Creek	Bacteria in water (Recreation Use)	5b (01, 02)
0611D	West Mud Creek	Bacteria in water (Recreation Use)	5c (01)
0612	Attoyac Bayou	Bacteria in water (Recreation Use)	5c (01, 02, 03)
0612F	West Creek	Bacteria in water (Recreation Use)	5c (01)
0613	Lake Tyler/Lake Tyler East	Excessive algal growth in water	5c (03, 04)

CATEGORIES OF IMPAIRMENTS

CATEGORY	DESCRIPTION
1	Attaining all water quality standards and no use is threatened.
2	Attaining some water quality standards and no use is threatened; and insufficient data and information are available to determine if the remaining uses are attained or threatened.
3	Insufficient data and information are available to determine if any water quality standard is attained.
4	Water quality standard is not supported or is threatened for one or more designated uses but does not require the development of a TMDL.
4A	TMDL has been completed and approved by EPA.
4B	Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.
4C	Nonsupport of the water quality standard is not caused by a pollutant.
5	The water body does not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants.
5A	A TMDL is underway, scheduled, or will be scheduled.
5B	A review of the water quality standards for the water body will be conducted before a TMDL is scheduled.
5C	Additional data and information will be collected before a TMDL is scheduled.
5N	Water body does not meet its applicable Chl a criterion, but additional study is needed to verify whether exceedance is associated with causal nutrient parameters or impacts to response variables.

CONCERNS

SEGMENT ID	SEGMENT NAME	CONCERNS	LEVEL OF CONCERN
0604	Neches River Below Lake Palestine	Nutrients	CS
0604A	Cedar Creek	Nutrients	CS
		Dissolved Oxygen	CS
0604B	Hurricane Creek	Bacteria	CN
0604D	Piney Creek	Nutrients	CS
		Dissolved Oxygen	CS
0604M	Biloxi Creek	Bacteria	CN
0604N	Buck Creek	Bacteria	CN
0605	Lake Palestine	Nutrients	CS
		Manganese in Sediment	CS
0605A	Kickapoo Creek	Nutrients	CS
		Dissolved Oxygen	CN
0606	Neches River Above Lake Palestine	Nutrients	CS
		Dissolved Oxygen	CN
		Zinc in Water	CN
0606A	Prairie Creek	Nutrients	CS
0610	Sam Rayburn Reservoir	Mercury in Edible Tissue	CS
		Manganese in Sediment	CS
		Iron in Sediment	CS
0610A	Ayish Bayou	Dissolved Oxygen	CS
0611	Angelina River Above Sam Rayburn Reservoir	Nutrients	CS
0611B	La Nana Bayou	Nutrients	CS
0611D	West Mud Creek	Nutrients	CS
0611V	Bowles Creek	Dissolved Oxygen	CS
0615	Angelina River/Sam Rayburn Reservoir	Bacteria	CN

LEVELS OF CONCERN

LEVEL OF CONCERN	DESCRIPTION
CN	Concern for near non-attainment of the T based on numeric criteria.
CS	Concern for water quality based on screening levels.

RESTORING IMPAIRED WATER BODIES

Although not funded by the Clean Rivers Program, ANRA is actively involved with multiple special projects in the basin that are also related to surface water quality. These special projects are often funded in part by Clean Water Act funds from the EPA, as well as funds from the TCEQ and the TSSWCB. The focus of these special projects is to bring stakeholders in diverse watersheds together to address water quality issues. Project tasks can include things like: data collection and interpretation, education and outreach, implementation of best management practices, assistance for low-income households, and more.

Examples of these type of projects can include:

Watershed Characterization - Project goals involve the investigation of current water quality in a specific watershed through an assessment of existing water quality data, collection of additional data, and the analysis of that water quality data.

Watershed Protection Plan (WPP) – WPPs are holistic, stakeholder-driven plans that address water quality in a specific watershed. These plans identify pollutants and their potential sources and provide a framework for coordinated implementation of protection and restoration activities. All impairments are taken into consideration when developing a watershed protection plan.

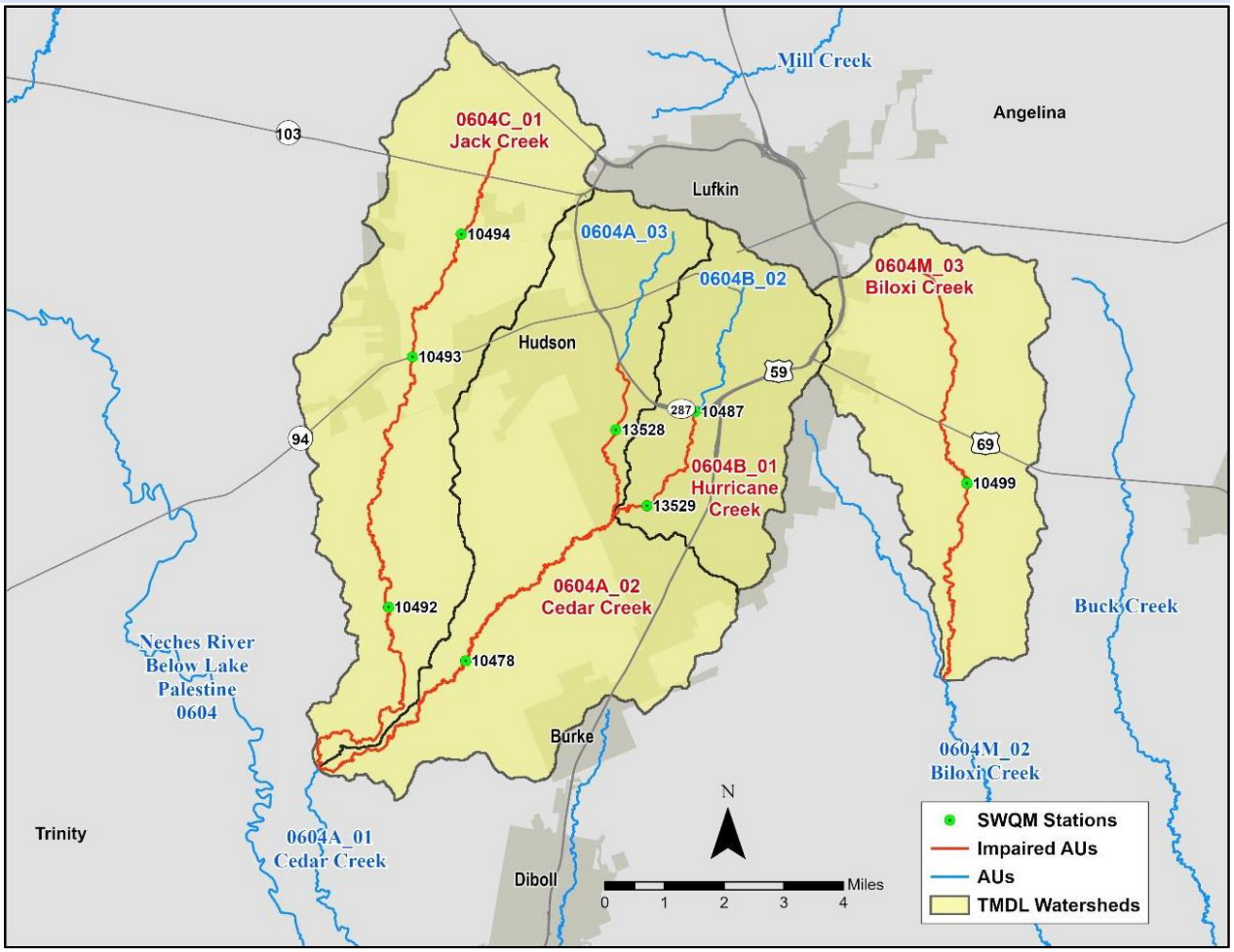
Total Maximum Daily Load (TMDL) - These projects are agency-driven, but are still highly stakeholder dependent. The goal of a TMDL is to identify pollutants and their potential sources and allocation loads. Implementation plans are then developed to outline the steps needed for reducing the loading of the specific pollutant identify management measures and actions that can be taken by stakeholders.

Use Attainability Analysis (UAA) – These analyses evaluate designated or presumed uses if there is reason to believe the standards for a water body are inappropriate due to local conditions. A UAA is a scientific assessment of the physical, chemical, and biological characteristics of a water body.

Recreational Use Attainability Analysis (RUAA) – An RUAA is a specific type of UAA that is conducted to evaluate and determine what category of recreational use is appropriate for a particular water body. RUAAs are typically site-specific studies that assess reasonably attainable recreational uses based on the physical and flow characteristics of a stream—such as water depth and persistence of flow. Supporting information, including surveys of individuals and organizations with firsthand knowledge of a water body, is also collected to assess historical and existing patterns of recreational use.

The following pages present an overview of surface water quality projects that are active in the Neches River Basin at the time of this writing.

MIDDLE NECHES TMDL AND I-PLAN



In portions of four stream segments in the Lufkin area, bacteria concentrations are sometimes higher than the criteria set to protect the safety of recreation. High concentrations of bacteria, which are found in both human and animal waste, may indicate a health risk to people who swim or wade in the water body, which are "contact recreation" activities, according to the state's standards for water quality.

The goal of this project is to improve water quality to protect recreational uses. To achieve that goal, the TCEQ, TWRI, and ANRA have been working with local stakeholders over the past several years to develop a TMDL and associated I-Plan for Jack, Cedar, Hurricane, and Biloxi Creeks near Lufkin.

The developed TMDL was accepted by the commission in October of 2022, and the draft I-Plan was presented for public comment in February of 2023.

For further information about this project, contact:
Mr. Andrew Henry at ANRA (ahenry@anra.org)
Ms. Luna Yang at TWRI (Luna.Yang@ag.tamu.edu)
Project Website: https://www.tceq.texas.gov/waterquality/tmdl/nav/118-lufkinwatersheds-bacteria

ATTOYAC BAYOU WPP IMPLEMENTATION – BMP EFFECTIVNESS MONITORING

The TSSWCB, TWRI, SFA, and ANRA are working together to perform monthly routine monitoring in the Attoyac Bayou Watershed and increase public education and outreach efforts. This series of projects initially began in 2013 as an implementation of some of the recommendations of the then recently completed Attoyac Bayou Watershed Protection Plan. Water quality samples will be collected through August 2024 for this iteration of the project.

SFA is collecting monthly samples at five sites within the watershed. ANRA's Environmental Laboratory analyzes the samples and sends the results to TWRI and TCEQ to determine the effectiveness of BMPs that have been put in place, under the guidance of the Attoyac WPP. They also assess water quality for the Integrated Report. Multiple educational events have been held in the area over the course of the project, and more are being planned.

This project is funded by the TSSWCB through a CWA Section 139(h) grant from the EPA.

For further information about this project, contact:
Mr. Andrew Henry at ANRA (ahenry@anra.org)
Ms. Emily Monroe at TWRI (Emily.Monroe@ag.tamu.edu)

Project website: https://attoyac.tamu.edu/

ATTOYAC BAYOU WPP IMPLEMENTATION – OSSF REMEDIATION

In partnership with the TCEQ, TWRI, Pineywoods Resources Conservation & Development (RC&D), SFA, and ANRA, the Attoyac OSSF Remediation Project was created to replace/repair failing On-Site Sewage Facilities (OSSFs) within the Attoyac Bayou Watershed. In addition, outreach and education initiatives were created to educate residents on best practices related to owning and maintaining OSSFs. The Attoyac Bayou WPP identified failing or non-existent OSSFs as one of the leading contributors to lower water quality in the Attoyac Bayou Watershed.

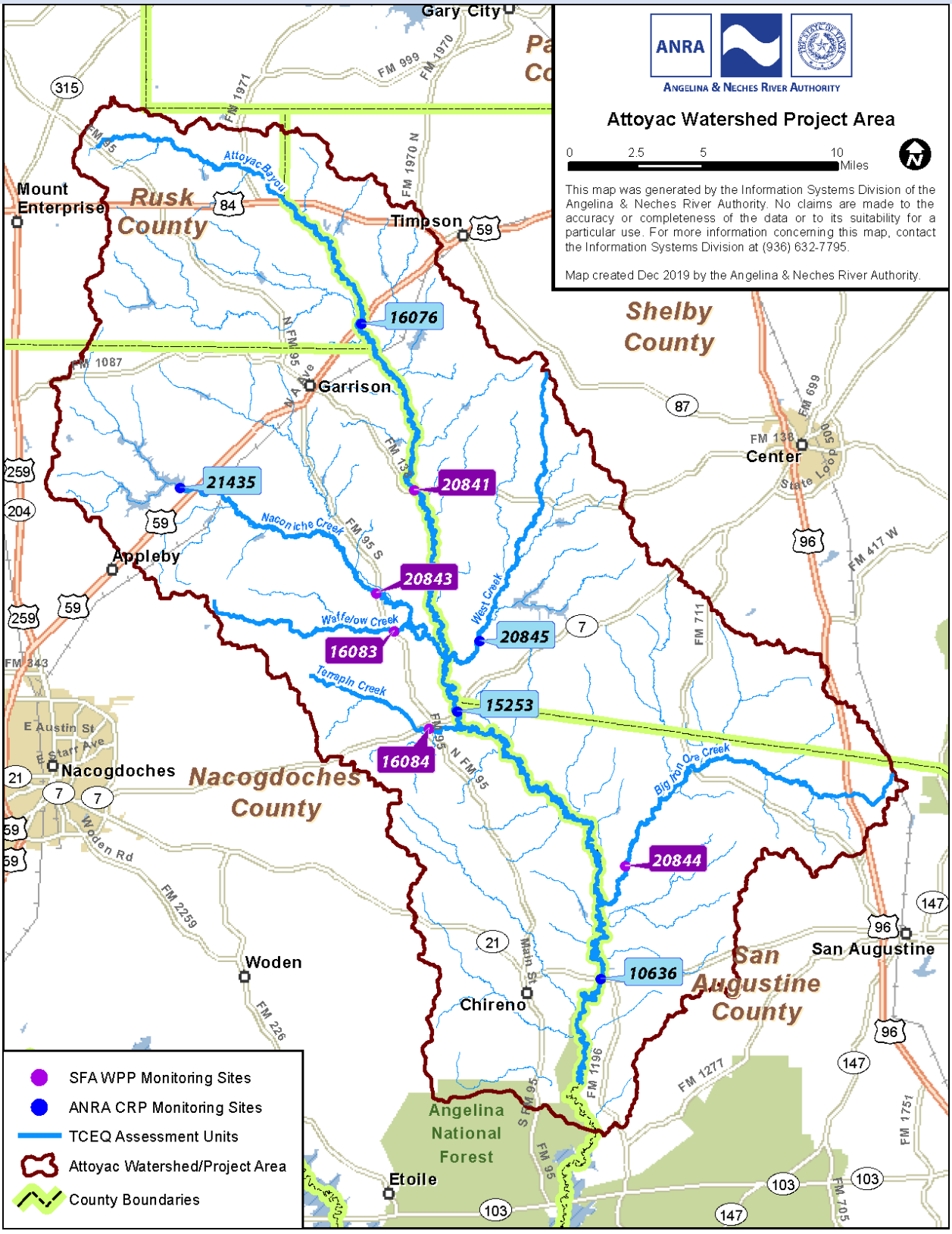
Like the Attoyac BMP Effectiveness Project discussed previously, this series of projects began in 2013. To date, more than 60 OSSFs have been repaired or replaced. The current project began in September of 2021, and is expected to replace or repair approximately 21 additional OSSFs.

This project is funded by TCEQ through a CWA Section 319(h) grant.

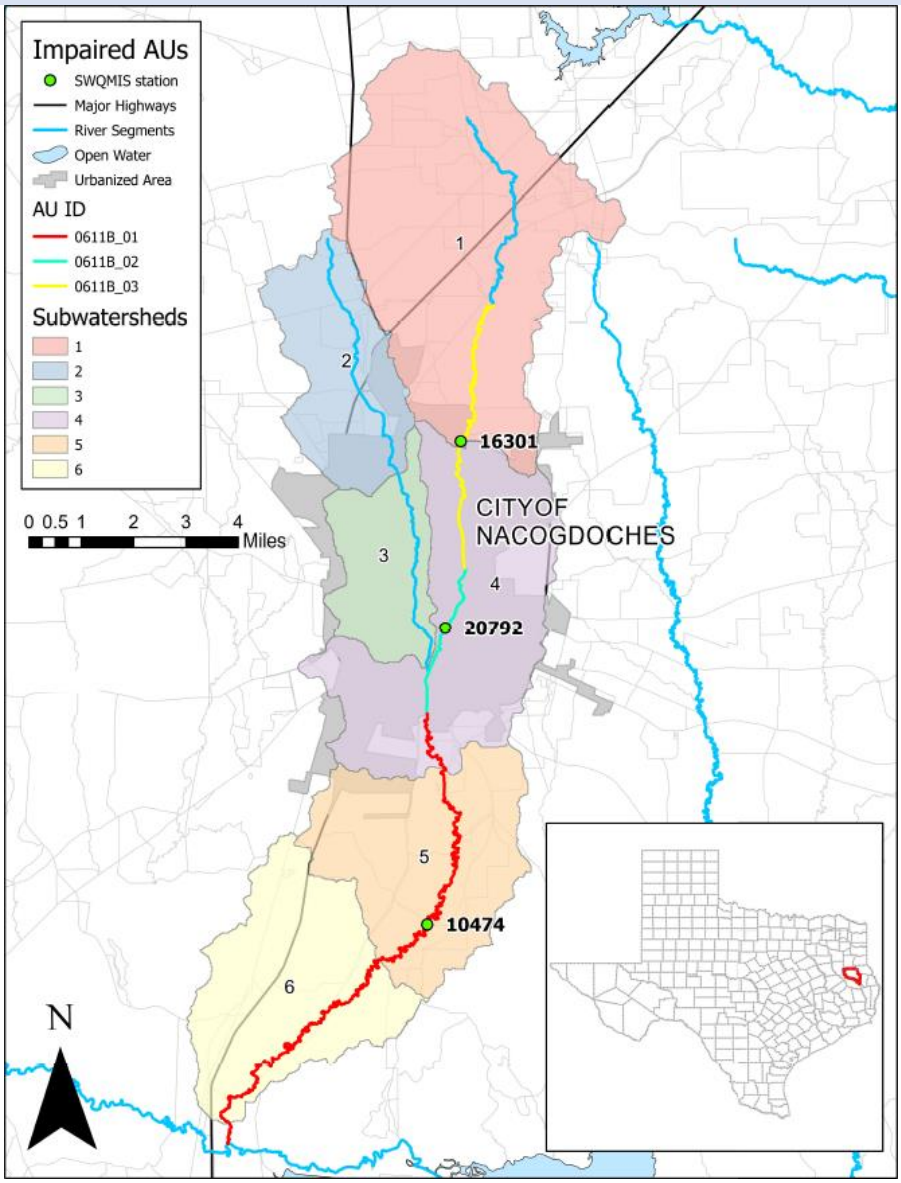
For further information about this project, contact:
Mr. Andrew Henry at ANRA (ahenry@anra.org)
Ms. Emily Monroe at TWRI (Emily.Monroe@ag.tamu.edu)

Project website: https://attoyac.tamu.edu/

ATTOYAC BAYOU WPP MAP



LA NANA BAYOU WPP MAP



LA NANA BAYOU WATERSHED PROTECTION PLAN DEVELOPMENT AND IMPLEMENTATION

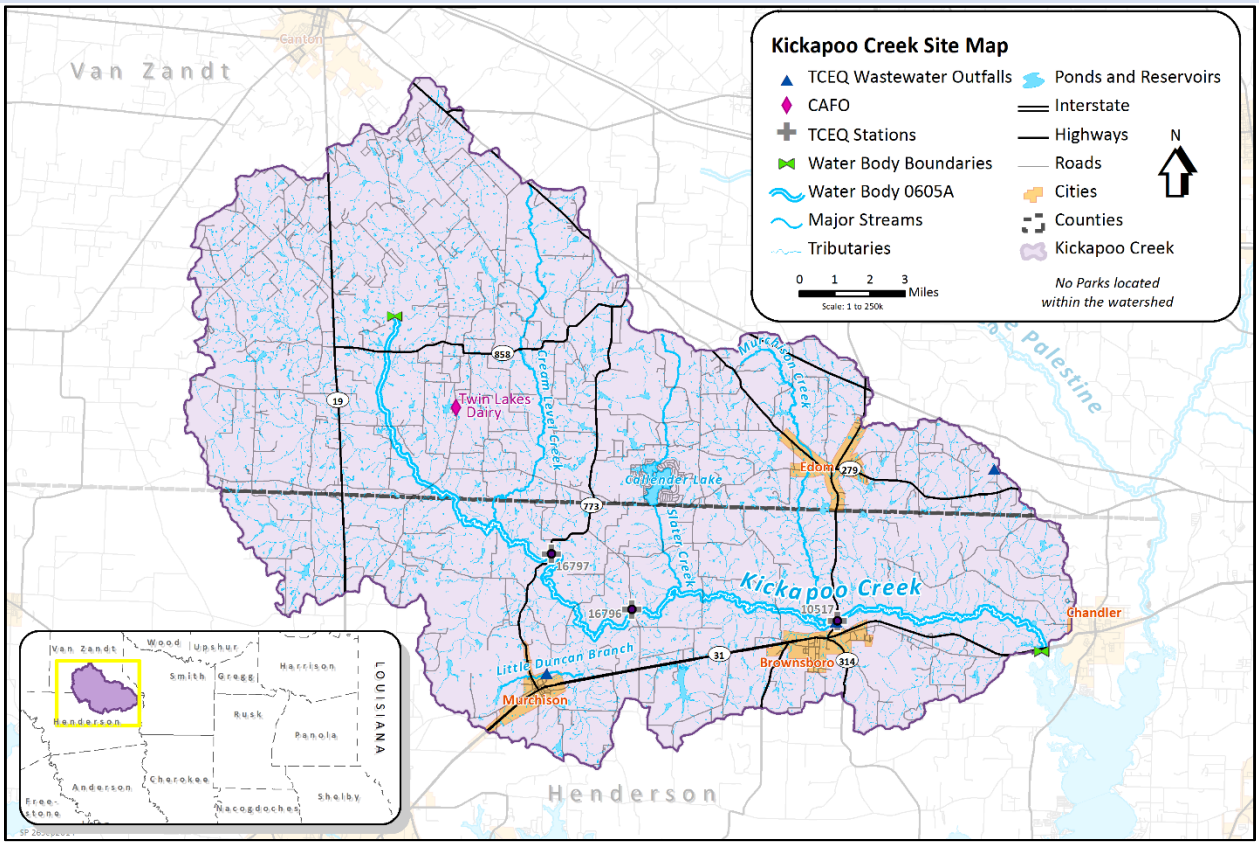
Since 2018 TCEQ, TWRI, and ANRA have been working with local stakeholders including SFA and the City of Nacogdoches to characterize the watershed, and subsequently to develop a Watershed Protection Plan to address elevated bacteria levels in La Nana Bayou.

Numerous public meetings and educational events were held and the developed WPP was accepted by the EPA in May 2023. Projects to implement the WPP are in development and could begin as soon as September 2023.

This project is funded by the TCEQ through a CWA, Section 319(h) grant from the EPA.

For further information about this project, contact:
Mr. Andrew Henry at ANRA (ahenry@anra.org)
Ms. Emily Monroe at TWRI (Emily.Monroe@ag.tamu.edu)
Project Website: https://lanana.twri.tamu.edu/

KICKAPOO CREEK WATERSHED PROTECTION PLAN DEVELOPMENT



This project is a partnership between the Texas Institute for Applied Environmental Research (TIAER), TSSWCB, and ANRA to coordinate with local stakeholders to develop a WPP to achieve the needed pollutant load reductions in order for the creek to begin meeting state surface water quality standards. Routine monthly monitoring was performed to further assess local water quality above Lake Palestine within the Kickapoo Creek (Segment 0605A). And several stakeholder meetings have taken place to educate and assist stakeholders about how to develop the WPP. The project began in March 2021. Water quality sampling was completed in February 2023. A draft of the complete WPP was distributed for public comment on May 4, 2023, and is available on the project website.

Project goals include providing stakeholders and agencies with the information needed to address the bacteria and dissolved oxygen impairments within Kickapoo Creek and to develop a database of existing water quality and land-use information to evaluate and characterize causes and sources of pollution for the segment.

This work is being funded via state funds provided by a State Nonpoint Source grant from TSSWCB.

For more information about this project, contact:
Mr. Andrew Henry (ahenry@anra.org) or
Ms. Leah Taylor at TIAER (ltaylor@tarleton.edu).
Project website: https://www.tarleton.edu/tiaer/kickapoo-creek-wpp/

ADDRESSING INDICATOR BACTERIA IMPAIRMENT IN THE AYISH BAYOU AND WEST MUD CREEK WATERSHEDS

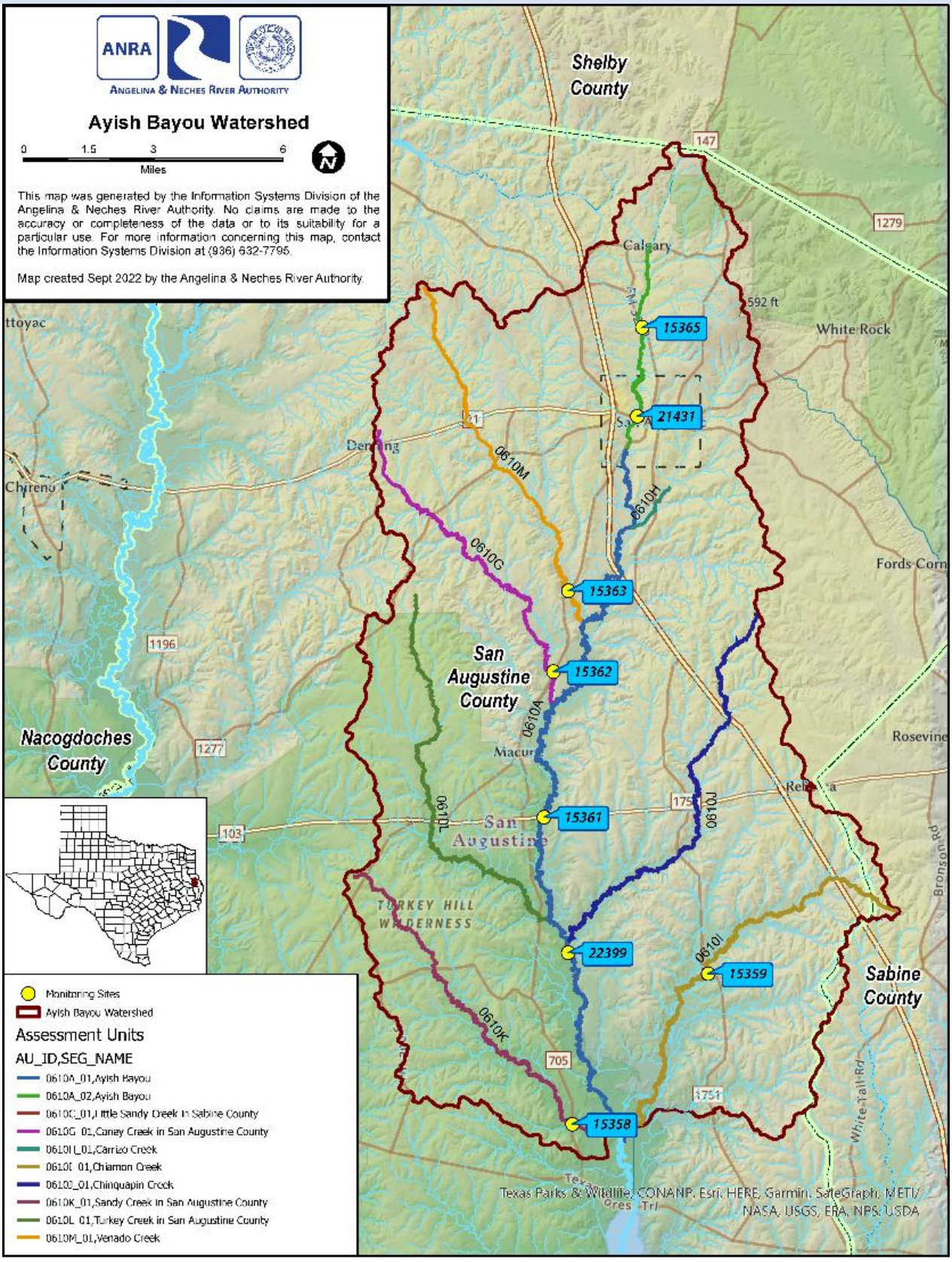
In September 2021, TCEQ, TWRI, and ANRA, began work on a series of projects to address bacteria impairments in the Ayish Bayou and West Mud Creek. The first-year goals were to collect and review existing data, evaluate data gaps that need to be filled, and begin contacting stakeholders to develop a plan to address water quality impairments in the Ayish Bayou. The goals of the second year were to begin collecting additional water quality samples throughout the Ayish Bayou Watershed and to continue stakeholder engagement and education in both watersheds. In year three the project should continue to collect data to fill gaps, and begin presenting that data to stakeholders to facilitate choosing a path forward.

This project is funded by the TCEQ through the TMDL program.

For more information about this project, contact:
Mr. Andrew Henry (ahenry@anra.org)
Mr. Duncan Kikoyo Ahimbisibwe at TWRI (duncan.kikoyo@ag.tamu.edu)
Project website: https://www.ayish.twri.tamu.edu/

AYISH BAYOU AT FM 3230 NORTH OF THE CITY OF SAN AUGUSTINE, FEB 2023

AYISH BAYOU WATERSHED MAP



STAKEHOLDER PARTICIPATION AND OUTREACH

Through dedicated and improved public awareness and education efforts, in 2022, ANRA participated in a number of outreach activities, focused on the Clean Rivers Program and Clean Water Activities.

CLEAN RIVERS PROGRAM STEERING COMMITTEE

Through the Clean Rivers Program, ANRA has established a steering committee of stakeholders to guide us in our monitoring activities. The steering committee's role is advisory in nature and involves assistance with the review of local issues as well as the creation of priorities for the Upper Neches River Basin. Committee members assist with the review and development of work plans, reports, basin monitoring plans, allocation of resources, and basin action plans. CRP steering committee meetings are held annually, typically in the spring. The committee is made up of a diverse group of stakeholders, including:

- Private Citizens
- Fee-payers (Identified in Texas Water Code TWC 26.0135(H))
- Political Subdivisions (Including local, regional, and state officials)
- Texas State Soil and Water Conservation Board
- Other appropriate state agencies including the Texas Parks and Wildlife Department, Texas Water Development Board, Texas General Land Office, Texas Department of State Health Services, Texas Department of Agriculture, Texas Railroad Commission, and Texas Department of Transportation
- Other entities interested in water quality matters, including Texas Commission on Environmental Quality regional staff, business and industry, agriculture, environmental, and other public interest groups

One of the objectives of the CRP long-term plan is to engage and inform stakeholders. The steering committee process gives stakeholders an opportunity to contribute their ideas and concerns through steering committee meetings, public meetings, and other forums. The process also allows for the communication of issues related to water quality so that priorities may be set which consider local, regional, state, and federal needs. The steering committee aids in increasing opportunities for citizens to identify pressing issues and concerns, contribute ideas to the CRP process, and functions to expand the public's role in water quality management issues.

ANRA's Clean Rivers Program Steering Committee last met on July 13, 2022, at the Log Cabin Civic Center in San Augustine, Texas. The meeting had an excellent turnout, with representatives from ANRA, Texas Commission on Environmental Quality (TCEQ), Texas Institute for Applied Environmental Research (TIAER), Texas Water Resources Institute (TWRI), Stephen F. Austin State University (SFASU), the Texas A&M Forest Service (TFS), and private citizens. An overview of the Clean Rivers Program and project updates to ANRA's water quality monitoring was presented by Mr. Rene Barelas. In addition, TMDL and CWA project updates were presented by project partners. A representative from SFASU gave a special presentation on the repatriation of illegally harvested alligator snapping turtles into native Texas waters.

A recording of the meeting, as well as copies of the presentations, are available on the ANRA website:
https://www.anra.org/conservation-recreation/water-quality-activities/clean-rivers-program/meetings-events/

ANRA ATTENDS AND HOSTS TEXAS STREAM TEAM TRAININGS

Through Texas Stream Team, citizen scientists are trained to collect and submit surface water and environmental quality data that can then be used to promote and protect Texas waterways. Throughout 2022, ANRA staff made extensive efforts to be trained and certified in multiple programs, such as Standard Core Water Quality and *E. Coli* Bacteria Monitoring.

ANRA staff traveled to San Marcos on April 24, 2022, to attend Standard Core Water Quality Monitoring training, hosted by the San Marcos River Rangers. This session was part of a three-phase training program required to become a Texas Stream Team Certified Trainer. As a certified trainer, ANRA staff can train teachers, students, and community members to conduct water quality testing using the Standard Core Monitoring kits. Kimberly Wagner, ANRA's executive manager of communications, achieved the final phase of her training in May 2022, by hosting a training in Port Arthur for members of the Community in Power and Development Association. Mrs. Wagner successfully became Texas Stream Team trainer-certified and in the fall of 2022, oversaw the training certifications of two trainers-in-training, including ANRA's CRP Coordinator and the Lower Neches Valley Authority's CRP Coordinator, in addition to hosting four standard core monitoring trainings.

These trainings took place on August 5, October 12, October 15, and October 25, 2022. At the time of this report, ANRA has trained 34 private citizens and approximately half are actively volunteer monitoring in the Neches River Basin.

In addition to Standard Core training, Ms. Wagner completed training for *E. Coli* Bacteria Monitoring on September 18, 2022.

ANRA ATTENDS AND HOSTS SCHOOL PRESENTATIONS

On March 8 and 9, 2022, ANRA staff hosted presentations at Fred Douglas Elementary School. This event allowed ANRA staff to share their expertise with students. The students were eager to ask questions and learn all about the efforts of the Clean Rivers Program to keep Texas' waters healthy and clean. In addition, seven other water quality presentations were made to students, civic organizations, and the general public. ANRA hosted a group of students from St. Cyprian's Episcopal School at ANRA's Central Office, participated in Career Day at Diboll Elementary, and made presentations to the Nacogdoches Fredonia Rotary Club, the Keep Nacogdoches Beautiful Board of Directors, and the Longleaf Ridge Chapter of the Texas Master Naturalists.

ANRA HOSTED STREAM CLEANUPS

On May 11, 2022, ANRA partnered with Keep Jasper Beautiful (KJB) to host a stream clean-up at Boykin Springs Recreation Area in Zavalla, Texas. Half a dozen volunteers gathered at Boykin Springs and cleaned up a large portion of the recreation area and roadway. Trash included plastics, glass, and other non-decomposable materials. ANRA plans to participate in and host a stream cleanup event quarterly. ANRA also partnered with Keep Nacogdoches Beautiful to participate in two waterway/roadway cleanups on September 24, 2022, and February 19, 2023. ANRA has two additional stream cleanups planned for 2023. In 2023, ANRA will partner with the Huntington All Around 4-H club to clean up a waterway in the Huntington or Lake Sam Rayburn area and a Battle of the Banks event is planned for October 2023, which will involve both Keep Nacogdoches Beautiful and Angelina Beautiful/Clean. In addition, ANRA also sponsored an Adopt-A-Spot with Angelina Beautiful/Clean and has committed to keeping the Outdoor Water Classroom, located behind Morris Frank Park, in Lufkin, clean and litter-free.

ANRA KICKS OFF STASH YOUR TRASH CAMPAIGN

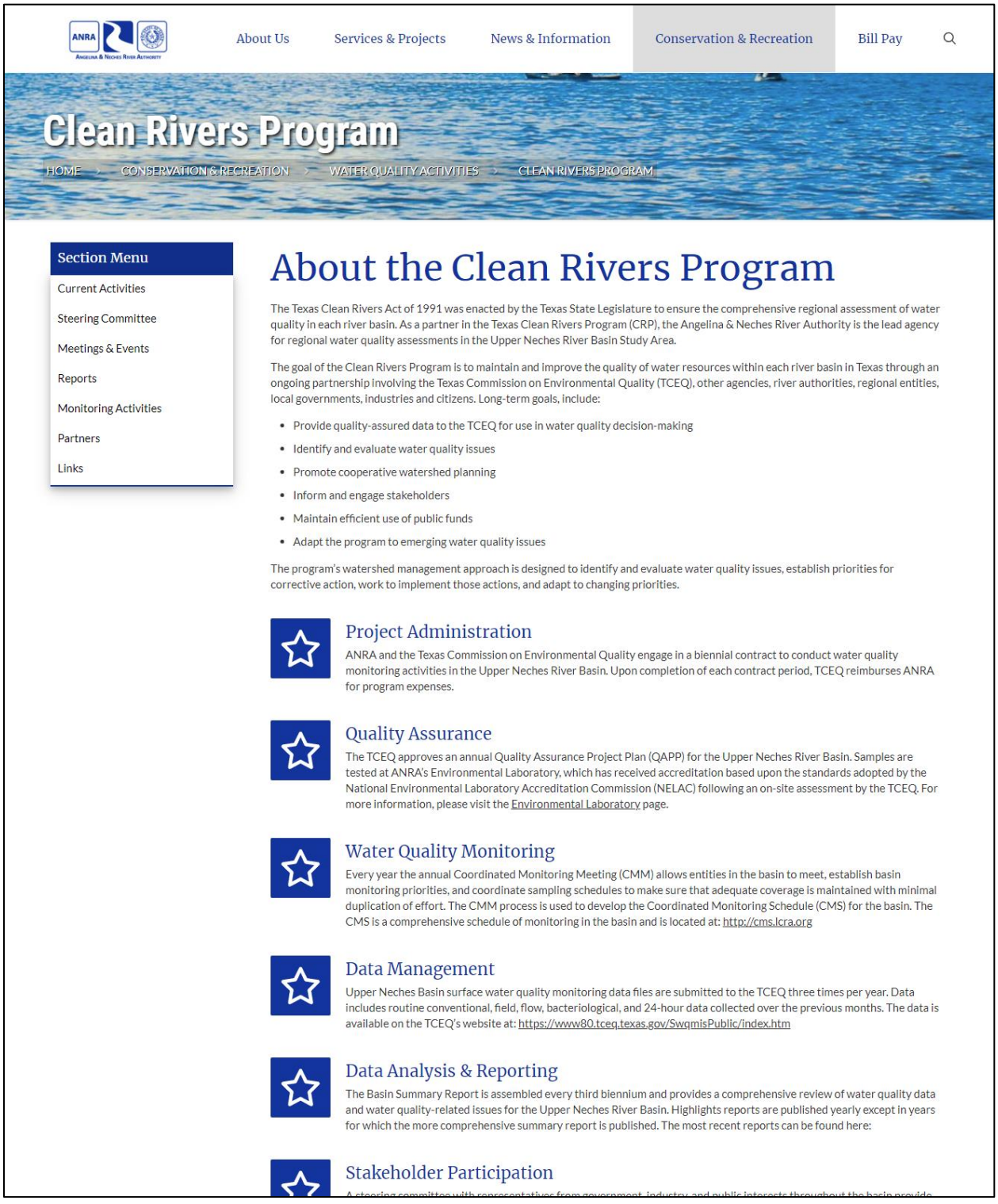
In late spring 2022, ANRA partnered with three area Keep Texas Beautiful (KTB) affiliates for a Stash Your Trash litter campaign. Mesh litter bags, made of recycled material and imprinted with ANRA and KTB affiliate logos have been distributed to 5,000 individuals, organizations, businesses, and events. ANRA's goal to distribute half of the original 10,000 bags by the end of the calendar year 2023 has already been met! ANRA also sponsored two fishing tournaments in the Neches River Basin on April 22, 2022, and May 8, 2022, and promoted the Stash Your Trash project. In 2023, ANRA will once again sponsor the Stash Your Trash competition at both of these tournaments.

ANRA TO UPDATE & EXPAND COLORING & ACTIVITY BOOKS PROGRAM

In 2022, ANRA distributed 500 coloring books, geared toward 3rd-5th graders as well as 250 activity books, geared toward middle school-aged children. Although the coloring and activity books, originally designed in 2021 have been well-received, ANRA has partnered with Keep Nacogdoches Beautiful and Angelina Beautiful/Clean to redesign the activity books for distribution in 2024. This partnership will provide an updated and more detailed curriculum, the inclusion of a teacher resource guide, and assistance with distribution, cost, and promotion.

ANRA UPDATES WEBSITE

ANRA has completely redesigned our website in order to improve how we're able to communicate with our stakeholders and the public. The new site launched in the fall of 2022. It is more engaging, more mobile-friendly, and more frequently updated. New education and outreach data has been added, and more is planned for the next several years. Check it out and let us know what you think! www.anra.org



ADDITIONAL INFORMATION

CONTACT INFORMATION

Andrew Henry,
Clean Rivers Program Coordinator
Email: ahenry@anra.org
Phone: (936) 633-7527

Melissa Garcia,
Laboratory Services Director
Email: mgarcia@anra.org
Phone: (936) 633-7552

Jeremiah Poling,
Deputy General Manager
Email: jpoling@anra.org
Phone: (936) 633-7551

Kimberly Wagner,
Executive Manager - Communications
Email: kwagner@anra.org
Phone: (936) 633-7507

ANRA OPERATIONS

The Angelina & Neches River Authority promotes public involvement in the Upper Neches Basin through numerous operations and departments. In addition to monitoring water quality through the Clean Rivers Program, ANRA operates and maintains numerous public drinking water and municipal wastewater facilities, maintains the on-site septic system program for Sam Rayburn Reservoir, San Augustine County, and Angelina County, and operates an Environmental Laboratory offering services to the public. Additionally, ANRA produces and sells biosolids compost through our Neches Compost Facility.

INFORMATIONAL LITERATURE

Numerous pamphlets, brochures, and other educational and informational literature on such topics as water quality, conservation, and on-site septic facilities are available to the public at ANRA's offices. ANRA supports the TPWD invasive species awareness campaign "Hello Giant Salvinia, Goodbye Texas Lakes" by making informational pamphlets available to the public.

ANRA PUBLICATIONS

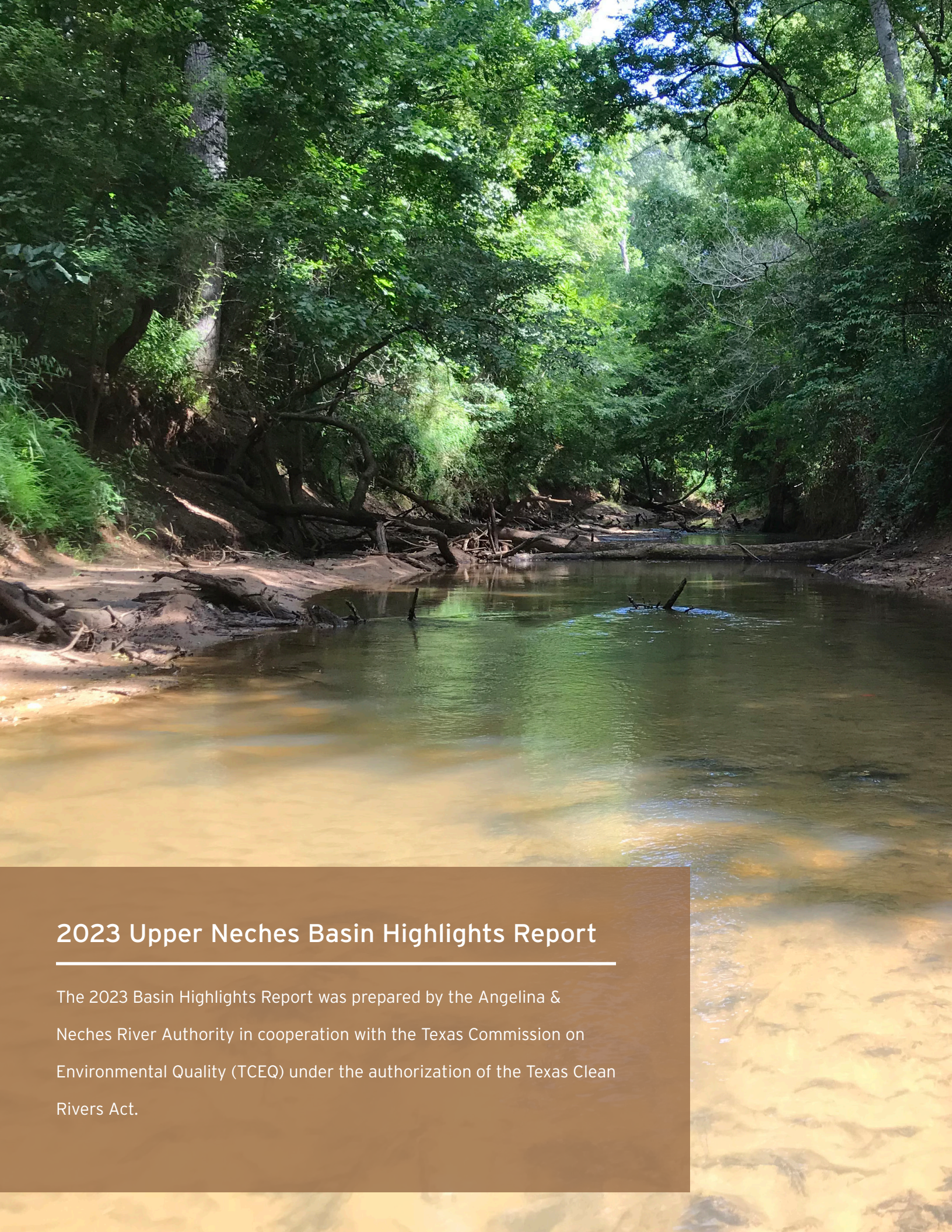
Every year, ANRA's Clean Rivers Program produces either a Basin Highlights Report or Basin Summary Report (every third biennium) that discusses water quality in the Neches River Basin. These reports are distributed to our Steering Committee members, interested stakeholders, and other interested parties.

ANRA WEBSITE

The Angelina & Neches River Authority provides the public with information concerning water quality issues on our website, which is updated frequently. The ANRA website provides public access to information on the Clean Rivers Program, current and historical Basin Summary and Basin Highlights reports, meeting agendas and minutes, maps, and water quality data.

Please visit us online at http://www.anra.org.

The 2023 Basin Highlights Report was prepared by the Angelina & Neches River Authority in cooperation with the Texas Commission on Environmental Quality under the authorization of the Texas Clean Rivers Act.



2023 Upper Neches Basin Highlights Report

The 2023 Basin Highlights Report was prepared by the Angelina & Neches River Authority in cooperation with the Texas Commission on Environmental Quality (TCEQ) under the authorization of the Texas Clean Rivers Act.