Sabine River Basin Summary Report 2024

Prepared in Cooperation with the Texas Commission on Environmental Quality under the Authorization of the Texas Clean River Act

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Executive Summary for the 2024 Sabine River Basin Summary Report

The Sabine River Authority of Texas (SRA-TX) Basin Summary Report allows stakeholders and interested parties to have greater understanding of water quality throughout the basin by providing an overview of water quality data collected under the Texas Clean Rivers Program (CRP). SRA-TX's comprehensive water quality monitoring program includes the collection, management, and analysis of water quality data collected in the basin.

The SRA-TX has fostered lasting positive relationships with water supply corporations, permitted dischargers, Texas Department of Agriculture, Texas Parks and Wildlife, TCEQ, SRA-TX Board members, industry representatives, Texas Railroad Commission, Sabine River Compact Commissioner, universities, consulting firms, and city and county officials. These working relationships drive the future of resource management and regulation. All these individuals had the opportunity to attend the steering committee meetings. This year, there was representation from Texas Parks and Wildlife, TCEQ, North Texas Municipal Water District, and the city of Dallas. Attendance was sparse this year at both meetings and there was little input. Going forward, we need to improve our strategy for engaging more stakeholders and facilitating larger meetings where more stakeholders will be represented.

Basin Wide Water Quality Overview

The majority of water quality data continues to meet TSWQS and screening criteria. Low DO and bacteria are the most exceeded parameters throughout the basin. There was one segment (0510) removed and no segments added to the 2022 Texas Integrated Report 303(d) List.

The most frequently exceeded TSWQS parameter within the basin was bacteria (*Enterococcus* or *E. coli*). During periods of significant rainfall and increased stream turbidity, elevated levels of bacteria continued to be measured. Elevated levels of bacteria are attributed primarily to wildlife and non-point sources, but additional sources may include industrial and municipal point source discharges, on-site treatment systems, sanitary sewer overflow discharges, and package plant or other permitted small flow discharges.

Low DO was the second most exceeded TSWQS parameter throughout the basin. Low dissolved oxygen levels are a common occurrence in small, forested, intermittent, low gradient streams. Forested creeks that flow seasonally through low gradient terrain often experience long periods of little to no velocity and become a series of small, isolated pools of water. Since much of the Sabine Basin is heavily forested, these pools of water are seasonally loaded with leaf litter. The predominately humid sub-tropical climate throughout the basin facilitates the rapid decomposition of organic matter in the water, which in turn, lowers the DO. During hot, dry periods, isolated pools can become nearly anoxic. When a large runoff event occurs, these pools of extremely low DO water are flushed down the watershed, resulting in short-lived isolated sections of low DO water moving through larger stream systems. Nonpoint source runoff is a probable contributor to the concern for screening level assessment for chlorophyl-a, nitrate, and nitrite. Upstream wastewater discharges may also be contributing factors in these water quality issues.

The top and bottom of the basin is where most of the low DO and bacteria problems occur. Bacteria problems and some nutrient concerns also occurred in the more populated urban watersheds. Water quality is poorest during runoff events following significant rain events. Most parameters experience elevated levels for 48 to 72 hours depending on the intensity of the rain.

Across the big picture, water quality in the Sabine Basin has remained stable and consistent. The SRA water quality

monitoring program has been in place for over 50 years. This has advanced our understanding of water quality by allowing researchers and interested parties to access continuous water quality data to find long term trends and short term problems that need to be addressed. The mostly forested watershed has not experienced population growth at the rates of many cities across the state. Thanks to silviculture, cattle farming, agriculture, and the Sabine National Forest and Texas Parks and Wildlife Department properties, the majority of the Sabine basin is natural landscaped pastures and forests. With the exception of the Orange/Bridge City area in the lower basin and the Longview/Gladewater area in the upper basin, the Sabine watershed is sparsely populated.

Moving forward, SRA plans to continue investing in relationships with our stakeholders to ensure well- informed and proper management decisions are made that protect the integrity of the Sabine River. We will continue to maintain our water quality monitoring program through CRP and support our customers and stakeholders in any way possible to maintain the water quality that we are blessed to have in the Sabine Basin.

Watershed Summaries:

Segment 0501 - Sabine River Tidal:

- Impairment for bacteria in water
- Impairment for polychlorinated biphenyls (PCBs) in edible tissue.
- Little Cypress Bayou (0501B), an unclassified water body in a densely populated region, has an impairment for bacteria, depressed dissolved oxygen and toxicity.

Point and non-point discharge are likely sources of elevated bacteria levels. A recreation use attainability analysis (RUAA) has been completed on Little Cypress Bayou. No recommendation has been made at this time. Seasonal depressed DO is a naturally occurring phenomenon in low gradient swampy regions like Segment 0501.

Segment 0502 - Sabine River Above Tidal:

- No impairments to the main classified water body of the Sabine River
- Nichols Creek has a impairment for bacteria and DO.
- Caney Creek has a impairment for bacteria.
- Cypress Creek has a impairment for DO, and concerns for habitat and microbenthic community.
- Trend analysis indicated decreases in chloride and TDS and increases in pH and phosphorous over time.

The SRA-TX currently monitors Nichols and Caney Creek through the TMDL program and will continue water quality monitoring at the representative routine sites in this segment. A RUAA supports the revision of Nichols Creek from primary contact recreation (PCR) to secondary contact recreation 1 (SCR1). A completed RUAA confirmed that primary contact recreation is appropriate for Cypress Creek.

Segment 0503 - Sabine River above Caney Creek:

- No impairment or concerns
- Trend analysis indicated a decrease in TDS and chloride over time.

This is a sparsely populated, mostly forested watershed. The SRA-TX will continue water quality monitoring at the representative routine sites in this segment.

Segment 0504 - Toledo Bend Reservoir:

- Impairment for Mercury in edible tissue for reservoir sites.
- A fish consumption advisory, first issued in 1998 by TDSH for largemouth bass and freshwater drum for mercury, remains in place
- Clear Lake also has a fish consumption advisory for mercury that has been in place since 2006

The SRA-TX will continue water quality monitoring at the representative routine sites in this segment.

Segment 0505 - Sabine River above Toledo Bend Reservoir:

- The Sabine River from Hatley Creek upstream to Grace Creek remains on the 303(d) List for bacteria
- Grace Creek remains on the 303(d) List for bacteria.
- A completed RUAA supports the revision of Grace Creek from primary contact recreation to secondary contact recreation.
- Wards Creek remains on the 303(d) List for DO and has a concern for impaired habitat
- Hills Lake remains on the 303(d) List due to a fish consumption advisory for mercury in largemouth bass and freshwater drum
- Rabbit Creek has a concern for bacteria

This is the most populated segment in the basin. The SRA-TX will coordinate and cooperate with stakeholders and provide education through public outreach activities explaining the proper handling of wastewater and best management practices in agriculture. Water quality monitoring will continue at representative routine sites in this segment.

Segment 0506 - Sabine River Below Lake Tawakoni:

- Harris Creek remains on the 303(d) List for DO and has a concern for bacteria
- Wiggins Creek has a concern for ammonia and DO
- Trend analysis indicated pH and total phosphorus are increasing over time and nitrate is increasing

The SRA-TX will coordinate and cooperate with stakeholders and provide education through public outreach activities. Best management practices aimed at reducing agricultural runoff can be encouraged through public outreach. Water quality monitoring will continue at representative routine sites in this segment.

Segment 0507 - Lake Tawakoni Reservoir:

- No impairments of concerns in the reservoir
- South Fork of the Sabine River remains on the 303(d) List for bacteria. A completed RUAA supports the revision from primary contact recreation to secondary contact recreation.
- Cowleech Fork of the Sabine River has a concern for nitrate, DO and Chorophyl-*a*
- Long Branch has a concern for nitrate
- Caddo Creek has a concern for DO

Elevated bacteria and nutrient numbers coincide with sampling events that occurred during runoff events immediately following significant rain events. The *E. coli* impairment is currently classified as 5b, meaning a review of the standards for this segment will be conducted before a management strategy is selected. A completed recreation use attainability assessment (RUAA) supports the revision of this segment from primary contact recreation (PCR) to secondary contact recreation 1 (SCR1).

Segment 0508 - Adams Bayou Tidal:

- Adams Bayou in tidal influence has a concern for DO
- Adams Bayou above tidal influence is impaired for DO
- Gum Gully and Hudson Gully: impairment for DO and bacteria
- Trend analysis indicated total phosphorus and Total Kjeldahl nitrogen (TKN) are decreasing over time

Segment 0508 is included in the OCTMDL project, initiated in 2002, to address these impairments. Low DO and bacteria are naturally occurring in these slow moving flat bayou regions and not necessarily an indicator of human related impacts on water quality. Low DO occurs seasonally during the hot growing season.

Segment 0509-Murvaul Lake:

- Concern for excessive algal growth

Runoff from fertilized lawns and older septic systems are a likely source of enriched water introduced into the lake, leading to increased algal blooms and growth.

Segment 0510-Lake Cherokee:

- Removed from 303(d) List for low pH in 2022
- Screening level concern for low DO
- Trend analysis indicated decreases over time for sulfate and chloride

The City of Longview will continue to monitor Lake Cherokee under SRA-TX's CRP contract.

Segment 0511 - Cow Bayou Tidal:

- Cow Bayou tidally influenced: Impairment for DO, bacteria and low pH, concern for DO.
- Cow Bayou above tidal influence: impaired for DO
- Coon Bayou: impaired for DO and bacteria
- Cole Creek: impaired for DO
- Terry Gully: impaired for bacteria, concern for DO
- Trend analysis indicated a decrease in TKN over time

Segment 0511 is included in the OCTMDL project, initiated in 2002, to address these impairments. TCEQ adopted the original TMDL for indicator bacteria, DO and pH for Cow Bayou and its tributaries on June 13, 2007. The Implementation Plan (I- Plan) was adopted eight years later on August 5, 2015. Since the adoption of the I-Plan, SRA-TX has conducted routine water quality monitoring at one station within the Cow Bayou watershed under CRP.

Segment 0512-Lake Fork Reservoir:

- No impairments of concerns on reservoir
- Running Creek and Elm Creek both remain on the 303(d) List for bacteria
- A completed RUAA supports the revision from primary contact recreation to secondary contact recreation for both creeks
- Running Creek has a concern for ammonia, nitrate and DO
- Elm Creek has a concern for ammonia and DO
- Trend analysis indicated TDS, sulfate and chloride are decreasing over time and chlorophyll-*a* is increasing over time.

A RUAA to address bacteria listings has been completed on each of these creeks and TCEQ is awaiting EPA approval of recreation use changes for these water bodies. Lower lake levels and lack of fresh inflow during drought conditions appear to be correlated to increased TDS, chloride, and sulfate values. Runoff from agricultural fields around the lake can bring in an influx of nutrients causing explosions of algal blooms. These algal blooms bring large amounts of chlorophyll-*a*.

Segment 0513-Big Cow Creek:

- Impairment for bacteria
- Concern for lead
- Trend analysis indicated *E. coli*, TDS and chloride are decreasing over time

The SRA-TX will continue water quality monitoring at the representative routine sites in this segment. At this time, the source and cause of the lead is unknown, and SRA-TX will continue monitoring future trends. Although lead levels remain relatively low, SRA will continue to stay informed of watershed activities and keep an eye on increasing lead in the water system.

Segment 0514-Big Sandy Creek:

- Big Sandy Creek remains on the 303(d) List for bacteria and low pH
- Trend analysis indicated pH is increasing and sulfate and total phosphorous are decreasing over time.

Given the low population density of the segment, agricultural runoff from chicken house and cattle operations is the likely source of bacteria. The upper AU, 0514_02, also showed levels of high pH. The high pH could possibly be caused by runoff from chicken house facilities. The SRA-TX will continue water quality monitoring at the representative routine sites in this segment and remain alert on high amounts of runoff from agriculture that may be contributing to the pH and bacteria impairments.

Segment 0515-Lake Fork Creek:

- No impairments of concerns
- Trend analysis indicated chloride is decreasing over time

The SRA-TX routinely monitors one site monthly and the TCEQ monitors one site quarterly in this segment.

Introduction

The Sabine River Authority of Texas (SRA-TX) Basin Summary Report allows stakeholders and interested parties to have greater understanding of water quality throughout the basin by providing an overview of water quality data collected under the Texas Clean Rivers Program (CRP). SRA-TX's comprehensive water quality monitoring program includes the collection, management, and analysis of water quality data collected in the basin.

SRA-TX has taken an active role in water quality matters since initial operational activities began in 1954 and has grown and evolved to meet increasing needs throughout the Sabine River Basin. The SRA-TX water quality monitoring program was established in 1972 and reinforced by the CRP in 1991. The SRA-TX collects water quality data in the Sabine River Basin to identify and track trends, prioritize water quality concerns, and ensure the protection of the resource while supporting the mission of the river authority. The Texas Commission on Environmental Quality (TCEQ) partners with regional water authorities to coordinate and conduct water quality monitoring, assessment, and stakeholder participation in the river and coastal basins of Texas in order to improve surface water quality across the state of Texas. Water quality information obtained through the CRP is collected under a TCEQ-approved quality assurance project plan (QAPP) and is suitable for evaluation using the Texas Surface Water Quality Standards (TSWQS). Water quality is determined using data analyses developed from the Guidance for Screening and Assessing Texas Surface Water Quality Data developed by the TCEQ. SRA-TX is responsible for analyzing the data to identify and prioritize water quality concerns and causes of pollution and is the planning agency for all CRP activities in the Sabine River Basin.

SRA biologist conducting routine water quality monitoring on Lake Tawakoni.

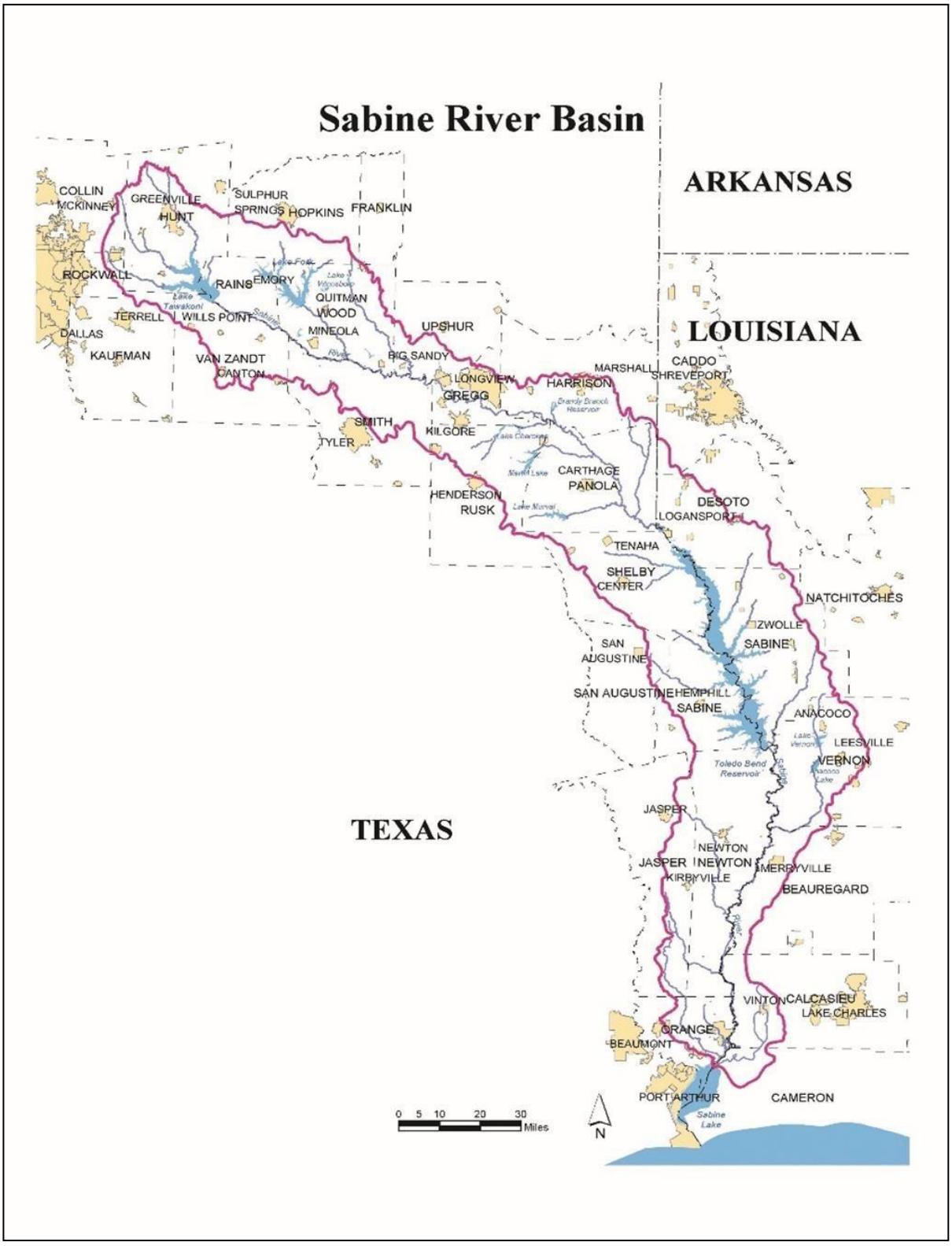


Figure 1. General map showing the Sabine River Basin.

The Sabine River originates in Hunt County, near Celeste, TX, and empties into Sabine Lake near Bridge City in Orange County. The crescent shaped basin drains approximately 10,000 square miles of watershed, is approximately 300 miles long and 48 miles wide, and encompasses three major reservoirs: Lake Tawakoni, Lake Fork, and Toledo Bend. The Sabine River serves as the state line between Texas and Louisiana near the headwaters of Toledo Bend Reservoir down to the mouth of the river. The state of Texas has jurisdiction to the midstream boundary for the state line reach of the Sabine River. Three quarters of the basin area is located within the state of Texas with a quarter in the state of Louisiana. In Texas, the basin includes all or part of 21 counties (Figure 1). Major tributaries of the Sabine River in Texas include Lake Fork Creek, Big Sandy Creek, Big Cow Creek, Adams Bayou, and Cow Bayou. Major tributaries in the state of Louisiana are Bayou Toro and Bayou Anacoco. The Texas Water Development Board [1] lists the Carrizo-Wilcox (outcrop), Carrizo-Wilcox (subcrop), and Gulf Coast as major aquifers within the basin. Minor aquifers include Nacatoch, Sparta (outcrop), Sparta (subcrop), and Queen City (outcrop). The Sabine River flows through four major ecoregions which include the Texas Blackland Prairies, East Central Texas Plains, South Central Plains, and Western Gulf Coastal Plains (Figure 2).

The upper portions of Lake Tawakoni and Lake Fork Creek watersheds are in the Texas Blackland Prairies ecoregion. The soils of this area are composed of calcareous clays which erode readily and tend to remain suspended in the water. Higher values for pH, conductivity, alkalinity, and total dissolved solids (TDS) are found in this region. Most of the Sabine Basin is in the East Central Texas and South Central Plains ecoregions. These ecoregions contain sand and clay loam soils and have surface waters with comparatively lower pH, TDS, conductivity, and alkalinity values. Lake Fork and Toledo Bend Reservoirs are in these ecoregions. The tidal portion of the Sabine Basin is in the Western Gulf Coastal Plains ecoregion and has soil that is comprised of calcareous clays and clay loams. The TDS, salinity, and conductivity values in this ecoregion are variable based on tide, wind, and rainfall.

Average annual rainfall ranges from 40 inches near the Sabine River headwaters to 60 inches at the mouth of the Sabine River[2]. Land surface elevations across the basin vary from a few feet above sea level in the tidal region to approximately 700 feet above mean sea level (AMSL) at the headwaters. General topography varies from moderate to gently sloping hills. Major land uses in the basin include mineral production, silviculture, agriculture, manufacturing, shipping, recreation, and tourism. Much of the population is in the upper basin above the headwaters of Toledo Bend Reservoir.

[1] https://www.twdb.texas.gov/groundwater/aquifer/index.asp
[2] AHPS Precipitation Analysis (weather.gov)

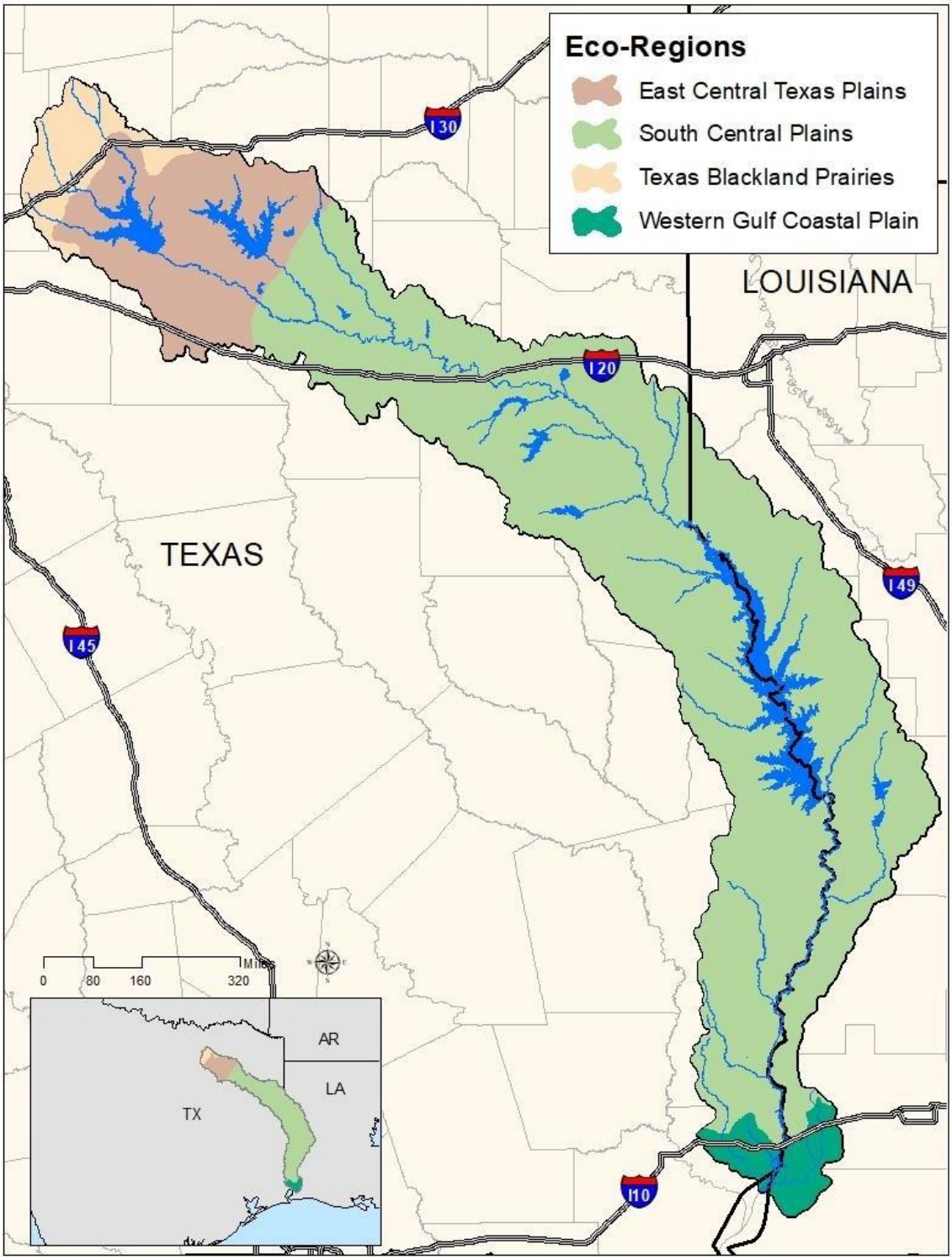


Figure 2. Sabine River Basin Ecoregions.

The CRP and SRA-TX Objectives

- Identify and evaluate water quality issues.
- Provide quality-assured data to the TCEQ for use in decision-making.
- Maintain efficient use of public funds and promote cooperative watershed planning.
- Recommend water quality management strategies.
- Inform and engage stakeholders about local water quality.

Public Involvement

Sabine Basin Steering Committee meetings engage stakeholders and inform them of water quality within the basin. A stakeholder is defined as any individual or entity that has a vested interest in the basins' waters, and includes the general public, institutions, government, industry, fee payers, and other interested parties. In each stage of planning and implementing watershed activities, it is important to get support from relevant stakeholders: those who help make decisions, and those who will be affected by them. Stakeholder knowledge of local conditions provides additional information that can be valuable when used in conjunction with scientific efforts and helps to define what is desirable and achievable. It is also important to make sure that the contributions of stakeholders are both recognized and used in some manner to reach the goals of the CRP. The coordinated monitoring meeting (CMM) brings together SRA-TX, TCEQ, other state agencies, and entities with interests in the Sabine Basin to help reduce sampling duplication and maximize resources to assess water quality of the entire basin. Stakeholders are invited to participate in the CMM. Participants that contribute water quality data through the CRP for the Sabine Basin include the City of Longview and SRA-TX. All stakeholders collecting water quality data in the Sabine Basin for the CRP are encouraged to coordinate their efforts with SRA-TX and participate under the SRA-TX QAPP. Collection of water quality data in accordance with a QAPP allows the data to be used by the TCEQ for assessments based on TSWQS, updating wastewater permits, and various other purposes. The SRA-TX has fostered lasting positive relationships with water supply corporations, permitted dischargers, Texas Department of Agriculture, Texas Parks and Wildlife, TCEQ, SRA-TX Board members, industry representatives, Texas Railroad Commission, Sabine River Compact Commissioner, universities, consulting firms, and city and county officials. These working relationships drive the future of resource management and regulation. All these individuals have the opportunity to attend the steering committee meetings. This year, there was representation from Texas Parks and Wildlife, TCEQ, North Texas Municipal Water District, and the city of Dallas. Attendance was sparse this year at both meetings and there was little input. Going forward, we need to improve our strategy for engaging more stakeholders and facilitating larger meetings where more stakeholders will be represented. For more information about participating in the Sabine Basin Steering Committee meetings, please contact Luke Sanders at (903) 878-2262 or lsanders@sratx.org.

The Orange County Total Maximum Daily Load Project (OCTMDL) includes the Adams Bayou and the Cow Bayou watersheds located in the southern section of the Sabine Basin in Orange County. Impairments in these water bodies were first identified in Adams Bayou Tidal (0508) in 1992 and Cow Bayou Tidal (0511) in 1994. TCEQ adopted the original total maximum daily loads (TMDL) for indicator bacteria, dissolved oxygen (DO), and pH for both bayous and their tributaries on June 13, 2007. The implementation plan (I-Plan) was adopted eight years later, on August 5, 2015. Since the adoption of the I-Plan, SRA-TX has conducted routine water quality monitoring at two stations within the impaired watersheds under the CRP. Beginning in FY2021, SRA-

TX began collecting water quality data from several of the other original OCTMDL sampling stations under the TMDL Program. These stations have not been monitored since the original OCTMDL sampling program was completed. This additional data will be used to assess the status of impairments to the primary contact recreation, aquatic life, and general uses in these waterbodies.

SRA-TX Water Quality Reports provide current and historical monitoring data to the public and monthly water quality updates of SRA-TX's routine monitoring activities. The SRA-TX's website provides access to information related to water resource issues within the Sabine River Basin. Available documents include Monthly Water Quality Monitoring Reports, Sabine Basin Highlights Reports, and Summary Reports. The SRA-TX supports education and public outreach as critical components of water conservation. SRA-TX uses various programs to inform and solicit input from the public such as: Major Rivers Water Education Program, Texas Stream Team Volunteer Monitoring, Alligator Snapping Turtle Public Outreach, Invasive Species Control and Public Awareness Campaign, Rains County Eagle Fest, as well as providing presentations at area schools, civic groups, environmental events and providing tours of SRA-TX facilities. Additional examples include Sabine County Ag Day, March for Parks, Career Dat at Stephen F. Austin State University and the City of Longview's East Texas Outdoor Expo.

Water Quality Review

The SRA-TX evaluates water quality in accordance with a TCEQ-approved QAPP and maintains Texas laboratory accreditation from The National Environmental Laboratories Accreditation Conference (NELAC) Institute (TNI). The purpose of the SRA-TX CRP QAPP is to clearly delineate data quality objectives, quality assurance specifications, and the data management structure which will be used to validate that data collected, ensure it is of known and documented quality, and is deemed acceptable for its intended use. Data collected under a TCEQ-approved QAPP can be used for water quality assessments, TMDL development, establishing water quality standards, making permit decisions, and other programs deemed appropriate by TCEQ. Field sampling is conducted in accordance with the latest versions of the TCEQ Surface Water Quality Monitoring Procedures.

Water Quality Terminology

The definition of water quality parameters and how they relate to maintaining water quality standards can be found in Tables 1 and 2.

Table 1. Water Quality Parameter Definitions

Parameter	Definition
Temperature	Temperature is the most common physical measurement of water quality. Variations in temperature can have various effects on water quality and aquatic life by affecting the amount of dissolved oxygen in the water and increasing solubility of metals and other toxins in the water.

pH	A measurement of hydrogen ion concentration used to describe the acidity or alkalinity of a solution. The pH scale is from 0 to 14, with the neutral point at 7.0. Values lower than 7 indicate acidic conditions which can obtain heavy metals and become more toxic. Values below 4 or above 12 are lethal to some fish species.
Dissolved Oxygen	The amount of oxygen gas dissolved in a given quantity of water at a given temperature and atmospheric pressure. Dissolved oxygen is one of the most important parameters in aquatic systems largely affecting survival of fishes and other aquatic organisms.
Total Dissolved Solids (TDS)	The amount of inorganic and organic material dissolved in water measured by laboratory analysis or estimated using specific conductance multiplied by a conversion factor, typically 0.65. High levels of TDS can affect aquatic organisms by stunting growth or even cause death.
Enterococcus and *Escherichia coli (E. coli)*	These bacteria groups are used as indicators of possible contamination by the fecal material of warm-blooded animals. Although generally not harmful themselves, they indicate the possible presence of pathogenic (disease-causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. *Enterococcus* testing is used in tidal and high saline waters. *Escherichia coli* testing is used in freshwater areas.
Sulfate	Sulfates are salts of sulfuric acid that occur naturally and are often the result of the breakdown of leaves that fall into a stream, water passing through rock or soil containing gypsum and other common minerals, or from atmospheric deposition. Sulfates can also come from agricultural runoff and municipal or industrial discharges.
Chlorophyll-a	Chlorophyll-a is a green pigment found in most plants, algae, and cyanobacteria. Excessive amounts of chlorophyll-a can indicate algal blooms, which can cause dissolved oxygen levels to fluctuate and deteriorate to harmful levels.
Chloride	Chloride is the ionic form of chlorine usually in the form of salts. Some common chlorides include sodium chloride and magnesium chloride. High chloride concentrations can affect osmoregulation and treatability of water.
Secchi Disk Depth	Secchi depth is a measure of the depth to which light is transmitted through the water column.
Turbidity	Turbidity is a measure of the water clarity or light transmitting properties. It may be caused by naturally occurring suspended material or plankton and other microscopic organisms.
Ammonia Nitrogen	Ammonia is excreted by animals and is produced during the decomposition of plants and animals. It is also present in sewage, storm water run-off, and industrial wastewaters.
Nitrate Nitrogen	Nitrate-nitrogen containing compounds act as nutrients in streams, rivers, and reservoirs. These nutrients can be found in wastewater treatment plant effluent, fertilizers, and agricultural runoff.
Total Phosphorus	Total phosphorus is an essential nutrient required for growth of organisms. Excessive amounts of total phosphorus increase primary productivity and algal growth.

Table 2. Water Quality Term Definitions

Water Quality Term	Definitions
Assessment Units (AU)	the smallest geographic area of use support reported in the assessment
Concern (CN)	Concern for near-nonattainment of the TSWQS based on numeric criteria.
Coordinated Monitoring Site	A site that is sampled by an entity, other than the SRA-TX, with a TCEQ approved QAPP in the CRP
Designated Use	A use that is assigned to a specific water body in Appendix A, Appendix D or Appendix G in the TSWQS. Typical uses that may be assigned for specific water bodies include domestic water supply, categories of aquatic-life use, recreational categories, and aquifer protection.
Impairment	When a water body fails to support its designated use based on TSWQS numeric criteria.
Non-Point Source	A pollution source that is diffuse and does not have a single point of origin or is not introduced into a receiving stream from a specific outfall. The pollutants are generally carried off the land by storm water runoff. Commonly used categories are agricultural, forestry, urban, mining, construction, dams and channels, land disposal, and saltwater intrusion.
Noncontact Recreation	Aquatic recreational pursuits not involving a significant risk of water ingestion and limited body contact incidental to shoreline activity, including birding, hiking, fishing, biking, and commercial and recreational boating. Can also be assigned in areas where unsafe conditions occur due to ship or barge traffic.
Outfall	A designated point of effluent discharge.
Point Source	Any discernable, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, item of rolling stock, concentrated animal feeding operation, or vessel, or floating craft, from which pollutants or wastes are or may be discharged into or adjacent to any water in the state.
Primary Contact Recreation 1 (PCR1)	Activities involving a significant risk of ingestion of water, including wading by children, swimming, water skiing, diving, surfing, kayaking, canoeing, and rafting.
Primary Contact Recreation 2 (PCR2)	Activities involving a significant risk of ingestion of water, including wading by children, swimming, water skiing, diving, surfing, kayaking, canoeing, and rafting but occur less frequently than primary contact recreation 1 due to physical characteristics of a water body or limited public access. Presumed risk occurs less frequently than PCR1.
Recreational Use Attainability Analysis (RUAA)	A RUAA is a specific type of use attainability analysis (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.
Runoff	The part of precipitation or irrigation water that runs off land into streams and other surface water.
Screening Level	Criteria used to evaluate parameters without defined standards
Screening Level Concern	Criteria is not considered impaired, however, data indicate that pollutant levels are elevated or exceed specific screening thresholds

Water Quality Term	Definitions
Secondary Contact Recreation 1 (SCR1)	Activities that have limited body contact, including fishing, canoeing, kayaking, rafting, and motor boating. Presumed less risk than PCR1 or 2 and more than SCR2.
Secondary Contact Recreation 2 (SCR2)	Activities that have limited body contact, including fishing, canoeing, kayaking, rafting, and motor boating. Presumed less risk than SCR1 due to physical characteristics of a water body or limited public access.
Segment	A water body or portion of a water body that is individually defined and classified in Appendix A of the TSWQS. 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. Segments may include streams, rivers, bays, estuaries, wetlands, lakes, or reservoirs.
Surface Water Quality Standards	The designation of water bodies for desirable uses and the narrative and numerical criteria deemed necessary to protect those uses.
Total Maximum Daily Load (TMDL)	The total amount of a substance that a water body can assimilate and still meet the TSWQS.
Unclassified Water Bodies	Water bodies that are not classified in Appendix A of the TSWQS. Each unclassified water body is given a number which associates it to the classified segment with a letter designation.
Watershed	The area of land from which precipitation drains to a single point. Watersheds are sometimes referred as drainage basins of drainage areas.
WQM	Water quality monitoring

Data Review Methodology

With the use of geographic information systems (GIS), spatial analyses were conducted at the TCEQ-designated segment level throughout the Sabine Basin to provide information on the factors that influence water quality, such as point source locations, land use, and watershed characteristics. Relatively recent (2019) United States Geological Survey (USGS) National Land Cover Data (NLCD) was used to determine land cover percent usages including:

- *Highways*
- *Hydrology*
- *Current and Historical Land Use*
- *Historical Monitoring Stations*
- *Population (Census 2020 block data)*
- *Permitted Discharges (TCEQ Data)*
- *Landfills (TCEQ Data)*
- *Superfund Sites (TCEQ Data)*
- *Permitted Industrial Hazardous Waste Sites*

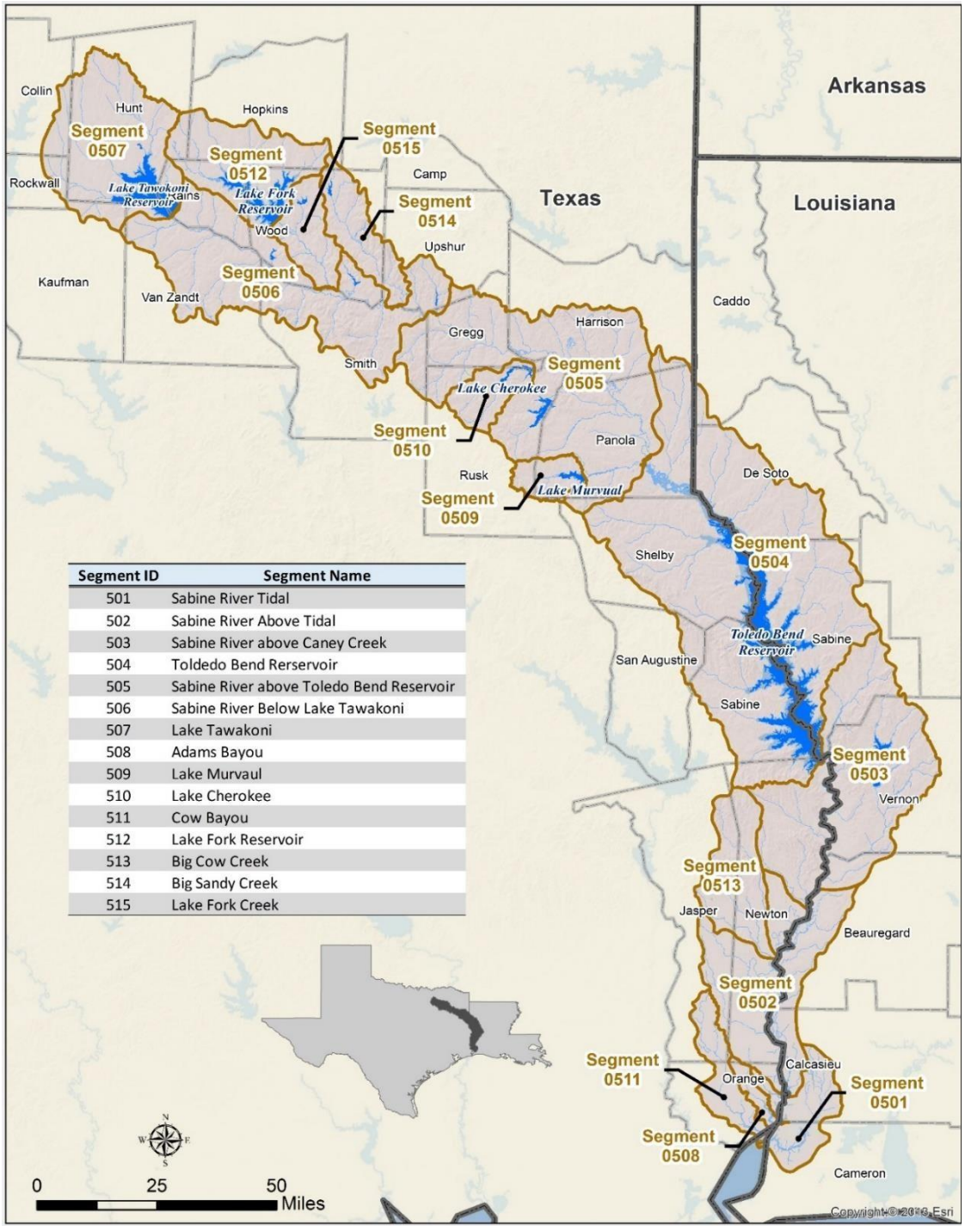
Trend analyses were conducted on various parameters at the sites where the most data was available in each segment. The period of record used for the trend analyses was from September 2013 through August 2023. The number of records per parameter varied between 62 and 119, depending on whether the site was sampled quarterly or monthly. A regression analysis was used to determine significance of change in a parameter over time (p value < 0.10). Although trend analyses are useful tools for interpreting data, they do not take into consideration all the variables that could affect the measurement of a particular parameter. The data produced from the trend analyses was compared with the TSWQS and 2022 Integrated Report for Clean Water Act Sections 305(b) and 303(d). The Integrated Report is a comprehensive assessment of each river basin across the state. This report is produced by TCEQ every two years. Each basin is delineated to assessment units (AU). Water quality data from each AU is assessed against criteria for the designated use of that particular AU. Through this assessment, water quality impairments and concerns are identified. A list of SRA-TX current fixed monitoring stations is listed below (Table 3).

Current Fixed Monitoring Stations

Table 3. List of current SRA-TX Water Quality Monitoring Stations. The FY24 CMS can be found at: https://cms.lcra.org/schedule.aspx?basin=5&FY=2024

Segment	Station TCEQ ID (SRA-TX ID)	Location
0501	10391 (SRT1)	SABINE RIVER AT CHANNEL CAN 3
0501	10394 (SRT2)	SABINE RIVER AT IH 10
0501	10395 (SR1)	SABINE RIVER 12.00 KM UPSTREAM OF IH 10
0501	15653 (ICW1)	INTERCOASTAL WATERWAY AT PERRY RIDGE
0501	15654 (BB1)	BLACK BAYOU IN CAMERON PARISH
0502	10397 (SR2)	SABINE RIVER AT SH 12 NORTH OF DEWEYVILLE TX.
0503	10340 (BA4)	ANACOCO BAYOU AT LOUISIANA HWY 111 CROSSING SOUTHWEST OF KNIGHT LA.
0503	10398 (SR3)	SABINE RIVER AT US 190 EAST OF BON WIER TX.
0503	10399 (SR5)	SABINE RIVER AT SH 63 EAST OF BURKEVILLE TX.
0503	10401 (TB6S)	SABINE RIVER BELOW TOLEDO BEND RESERVOIR AT RIGHT ABUTMENT OF SPILLWAY FOR DAM
0503	15660 (BT1)	BAYOU TORO AT LA SH 392 IN SABINE PARISH SW OF HORNBECK LA.
0504	10402 (TB6H)	TOLEDO BEND RESERVOIR AT SH 21 NORTHEAST OF MILAM
0504	10404 (TB6A)	TOLEDO BEND RESERVOIR MAIN LAKE ABOVE THE DAM AT THE OLD RIVER CHANNEL
0504	10406 (TB6C)	TOLEDO BEND RESERVOIR IN SIX MILE BOAT LANE 0.8KM EAST OF SH 87
0504	10411 (TB6F)	TOLEDO BEND RESERVOIR IN SUNSHINE BAY NEAR FM 3121 BRIDGE
0504	15655 (TB6J)	TOLEDO BEND RESERVOIR PATROON BAYOU BRANCH AT FM 276
0504	15659 (TB6K)	TOLEDO BEND RESERVOIR IN LANANA BAYOU AT LOUISIANA SH 191 IN SABINE PARISH LOUISIANA WEST OF MANY

0504	18052 (TB6R)	TOLEDO BEND RESERVOIR AT RAGTOWN
0504	10402 (TB6H)	TOLEDO BEND RESERVOIR AT SH 21 NORTHEAST OF MILAM
0504	15659 (TB6K)	TOLEDO BEND RESERVOIR IN LANANA BAYOU AT LOUISIANA SH 191 IN SABINE PARISH LOUISIANA WEST OF MANY
0504	15655 (TB6J)	TOLEDO BEND RESERVOIR PATROON BAYOU BRANCH AT FM 276
0504	18053 (TB6LN)	TOLEDO BEND RESERVOIR SAN MIGUEL ARM BOAT LANE
0504	18052 (TB6R)	TOLEDO BEND RESERVOIR AT RAGTOWN
0505	10415 (SR10)	SABINE RIVER AT FM 2517
0505	13628 (SR11)	SABINE RIVER AT US 59
0505	10427 (SR16)	SABINE RIVER AT SH 42
0505	10423 (SR14)	SABINE RIVER AT SH 149 SOUTH OF LONGVIEW TX
0506	10428 (SR17)	SABINE RIVER AT US 271
0506	10429 (SR19)	SABINE RIVER AT SH 14 S. OF HAWKINS
0506	10430 (SR21)	SABINE RIVER AT US 69
0514	10468 (BS1)	BIG SANDY CREEK AT SH 155
0515	10469 (LF20)	LAKE FORK CREEK AT US 80
0512	10458 (LF2)	LAKE FORK RESERVOIR NEAR DAM IN CREEK CHANNEL
0512	10462 (LF4)	LAKE FORK RESERVOIR MID-COVE IN LAKE FORK CREEK ARM AT FM 515
0512	10461 (LF3)	LAKE FORK RESERVOIR MID-ARM IN CANEY CREEK ARM AT FM 515
0507	10434 (LT23A)	LAKE TAWAKONI IN THE MAIN LAKE NEAR THE DAM
0507	21173 (LT23DN)	LAKE TAWAKONI IN WACO BAY EQUIDISTANT FROM FINGER AND SPRING POINTS 1.17KM BEARING 18.61 DEGREES FROM IRON BRIDGE PUMPING STATION
0507	10437 (LT23B)	LAKE TAWAKONI AT SH 276



Segment ID	Segment Name
501	Sabine River Tidal
502	Sabine River Above Tidal
503	Sabine River above Caney Creek
504	Toldedo Bend Rerservoir
505	Sabine River above Toledo Bend Reservoir
506	Sabine River Below Lake Tawakoni
507	Lake Tawakoni
508	Adams Bayou
509	Lake Murvaul
510	Lake Cherokee
511	Cow Bayou
512	Lake Fork Reservoir
513	Big Cow Creek
514	Big Sandy Creek
515	Lake Fork Creek

Figure 3. Sabine Basin Map with Classified Segments.

Watershed Summaries

Segment 0501 - Sabine River Tidal-- From the confluence with Sabine Lake in Orange County to Morgans Bluff in Orange County.

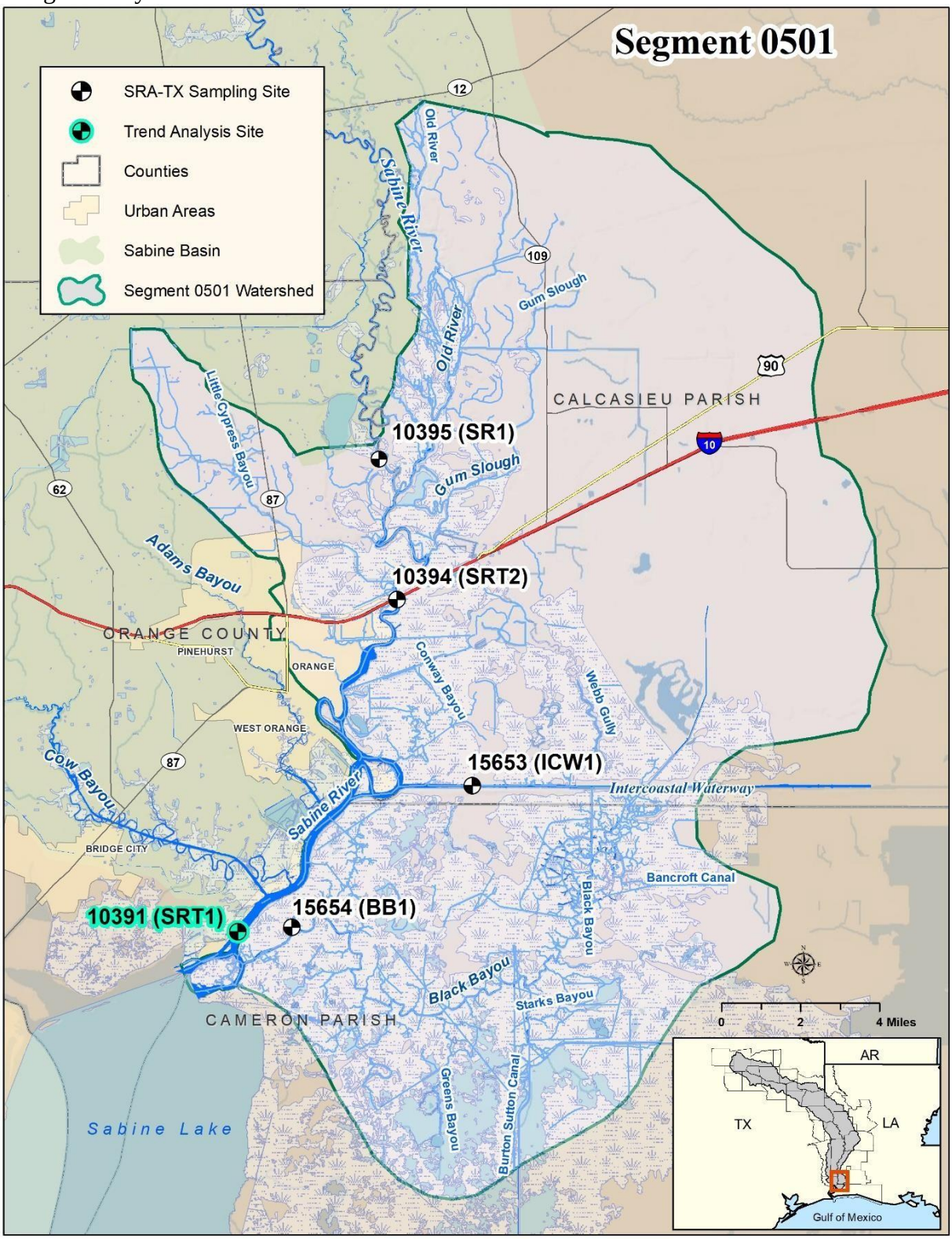


Figure 4. Segment 0501 Sabine River Tidal.

The Sabine River Tidal Watershed, with a drainage area of 251 square miles, is located in the Western Gulf Coastal Plains Ecoregion, an area characterized by relatively flat terrain with emergent herbaceous wetlands, hay pasture and woody wetlands (Table 4). Although some areas are quite rural with sections of open water, Segment 0501 includes the City of Orange. It is one of the three highest population concentrations in the Sabine Basin, with a population of around 19,000.

USGS maintains gaging stations at three locations within the Sabine River Tidal Watershed: Sabine River (at Navy Pier) at Orange, TX; Sabine River at IH-10 near Orange, TX; and Sabine River at International Paper near Orange, TX. SRA-TX routinely samples at five sites monthly for the CRP.

Segment 0508 (Adams Bayou Tidal) and Segment 0511 (Cow Bayou Tidal) are tributaries to this watershed.

Spatial Analysis of Land Use

Table 4. Segment 0501 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	12.3
Developed, Open Space	2.5
Developed, Low Intensity	2.3
Developed, Medium Intensity	2.6
Developed, High Intensity	1.2
Barren Land	< 1
Herbaceous	1.0
Evergreen Forest	5.1
Mixed Forest	1.3
Scrub/Shrub	0.7
Woody Wetlands	12.0
Hay Pasture	13.2
Cultivated Crops	5.9
Deciduous Forest	< 1
Emergent Herbaceous Wetlands	39.8

*USGS - NLCD 2019

Table 5. Segment 0501 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
12	181,227	5	0	0	72

Table 6. Segment 0501 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10391 (SRT1)	SABINE RIVER AT CHANNEL CAN 3	SRA-TX
15654 (BB1)	BLACK BAYOU IN CAMERON PARISH	SRA-TX
15653 (ICW1)	INTERCOASTAL WATERWAY AT PERRY RIDGE	SRA-TX
10394 (SRT2)	SABINE RIVER AT IH 10	SRA-TX
10395 (SR1)	SABINE RIVER 12.00 KM UPSTREAM OF IH 10	SRA-TX

Water Quality Conditions

The 2022 TCEQ Integrated Report listed an impairment in Segment 0501 for bacteria in water (recreation use) and polychlorinated biphenyls (PCBs) in edible tissue. PCBs are contained in the waste from manufacturing processes. Improper disposal of waste, spills and leaks can introduce PCBs into the water body. PCBs accumulate in fatty tissues and bio-magnify higher up in the food chain. Little Cypress Bayou (0501B), an unclassified water body, indicated an impairment for bacteria in water (recreation use), depressed dissolved oxygen and toxicity. Little Cypress runs through a heavily populated region of Orange where multiple manufacturing companies operate. The flat topography of the region does not facilitate regular flushes of the water system to help mitigate pollutants introduced into Little Cypress Bayou.

The Texas Department of State Health Services (TDSHS) issued a fish consumption advisory in December 2011 for the Gafftopsail Catfish (*Bagre marinus*) (PCBs in edible tissue) for all Texas waters of Sabine Lake and all contiguous Texas waters. Additional information regarding fish consumption advisories can be found at http://www.dshs.texas.gov/seafood/advisories-bans.aspx.

Regression analyses at station 10391 (SRT1) indicated no parameters were significantly related to time.

Recommendations

Point and non-point discharge from failed wastewater storage and agricultural operations along with naturally occurring bacterial waste from wildlife are likely sources of elevated bacteria levels. Seasonal depressed DO is a naturally occurring phenomenon in low gradient swampy regions like Segment 0501. The SRA-TX will continue water quality monitoring at the representative routine sites in this segment.

Segment 0502 - Sabine River Above Tidal--From Morgans Bluff in Orange County to the confluence with Caney Creek in Newton

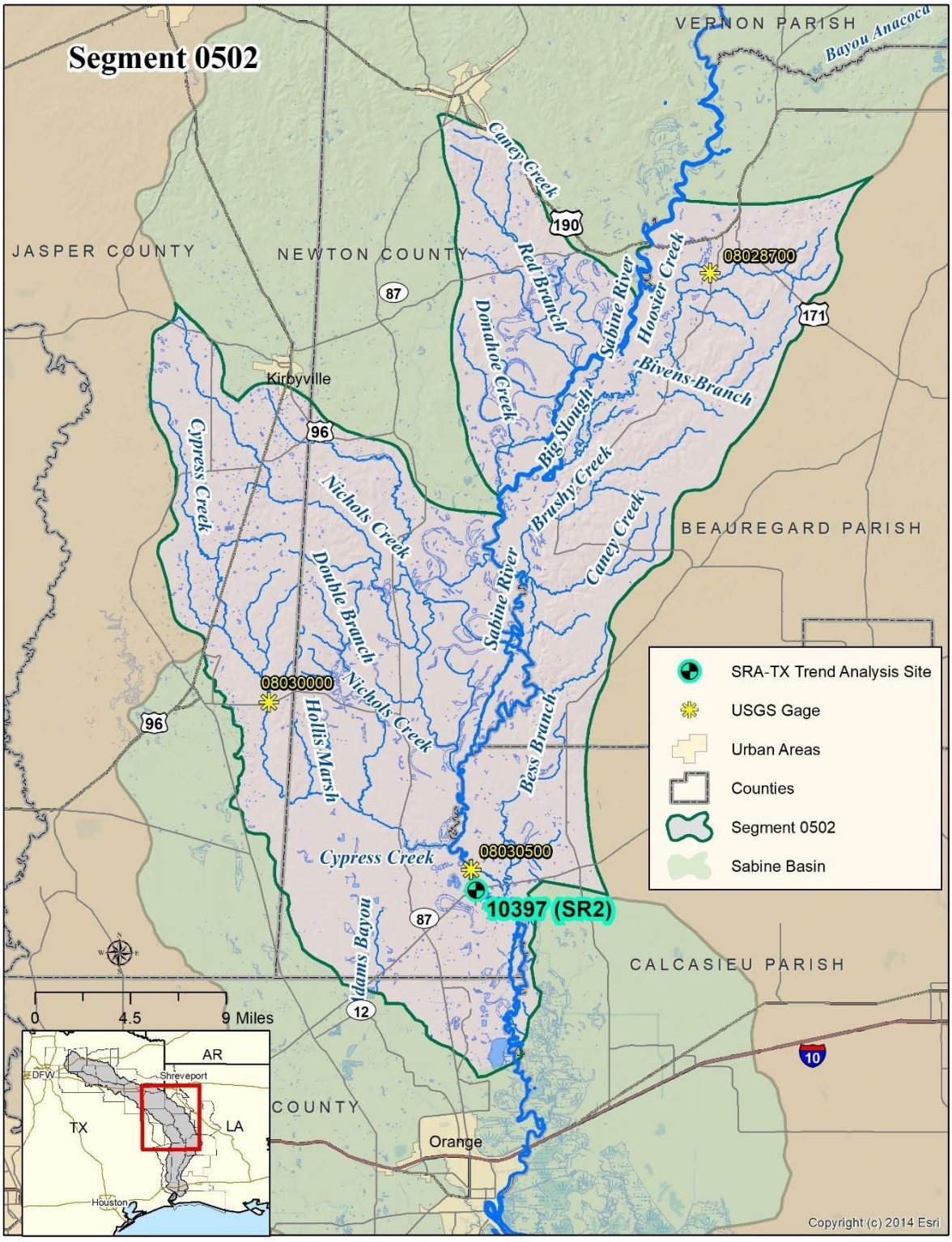


Figure 5. Map of Segment 0502 Sabine River Above Tidal.

The Sabine River Above Tidal watershed, with a drainage area of 739 square miles, is located in the Western Gulf Coastal Plains Ecoregion. This region is characterized by rolling hills to the north and is relatively flat to the south. Segment 0502 is largely a rural area with woody wetlands, evergreen and mixed forest with no major industries or cities (Table 7).

USGS maintains one gaging station in Segment 0502 located on the Sabine River at SH12 near Ruliff, Texas. SRA-TX routinely samples at this site monthly for the CRP.

Segment 0513 (Big Cow Creek) is a tributary to this watershed. Other tributaries to segment 0502 include: Nichols Creek, Caney Creek, Sabine River Authority Canal, Dempsey Creek, Cypress Creek, and an unnamed Tributary of Dempsey Creek.

Spatial Analysis of Land Use

Table 7. Segment 0502 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	1.0
Developed, Open Space	8.0
Developed, Low Intensity	5.7
Developed, Medium Intensity	1.3
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	7.8
Evergreen Forest	12.8
Mixed Forest	10.6
Scrub/Shrub	6.2
Woody Wetlands	31.4
Hay Pasture	9.4
Cultivated Crops	1.8
Deciduous Forest	< 1
Emergent Herbaceous Wetlands	3.5

*USGS - NLCD 2019

Table 8. Segment 0502 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
12	16,122	4	1	0	22

Table 9. Segment 0502 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10397 (SR2)	SABINE RIVER AT SH 12 NORTH OF DEWEYVILLE TX.	SRA-TX

Water Quality Conditions

The 2022 TCEQ Integrated Report indicated no impairments to the main classified water body of the Sabine River in Segment 0502.

Nichols Creek (0502A_01), an unclassified intermittent stream with pools, is impaired for bacteria and dissolved oxygen. A RUAA has been completed on this creek to address these impairments. The RUAA findings support the revision of Nichols Creek from primary contact recreation (PCR) to secondary contact recreation 1 (SCR1). The Environmental Protection Agency (EPA) approved the recreation use change in November 2018.

Caney Creek (0502B_02), an unclassified perennial stream, has an impairment for bacteria. A RUAA has been completed on this creek to address this impairment. The RUAA identified the presumed use of PCR for Caney Creek is appropriate.

Cypress Creek (0502E_01), an unclassified water body, has impairments for dissolved oxygen and concerns for impaired habitat and impaired microbenthic community.

Regression analysis at station 10397 (SR2) indicated the following were significantly related to time: pH with a p value of 0.09, TDS with a p value of 0.02, phosphorus with a p value of 0.0005, and chloride with a p value of 0.005. All parameters were graphed against flow to determine if flow could explain any anomalies in the data collected. Extremely acidic (low pH) or basic (high pH) values can be lethal to most fish species. Although the trend at 10397 is increasing, it falls well within the TSWQS criteria. High levels of phosphorus in a water body can cause large amounts of growth in plants and algae creating low dissolved oxygen levels and potential problems for aquatic species. An increasing trend in phosphorus was observed at 10397 but falls below the TCEQ screening level of 0.69 mg/L. Chloride and TDS showed decreasing trends at 10397. These parameters greatly affect the growth and nutrient intake of aquatic organisms under high values and can be toxic. Drought conditions in the basin may be associated with the parameter trends in this segment but the exact causes of these trends are unknown.

The pH values ranged from 5.5 units to 7.8 units with a median of 6.8 units, which is between the TSWQS criteria of 6.0 – 8.5 units. Three single grab exceedances were documented from FY 2013 to FY 2023 (Figure 6).

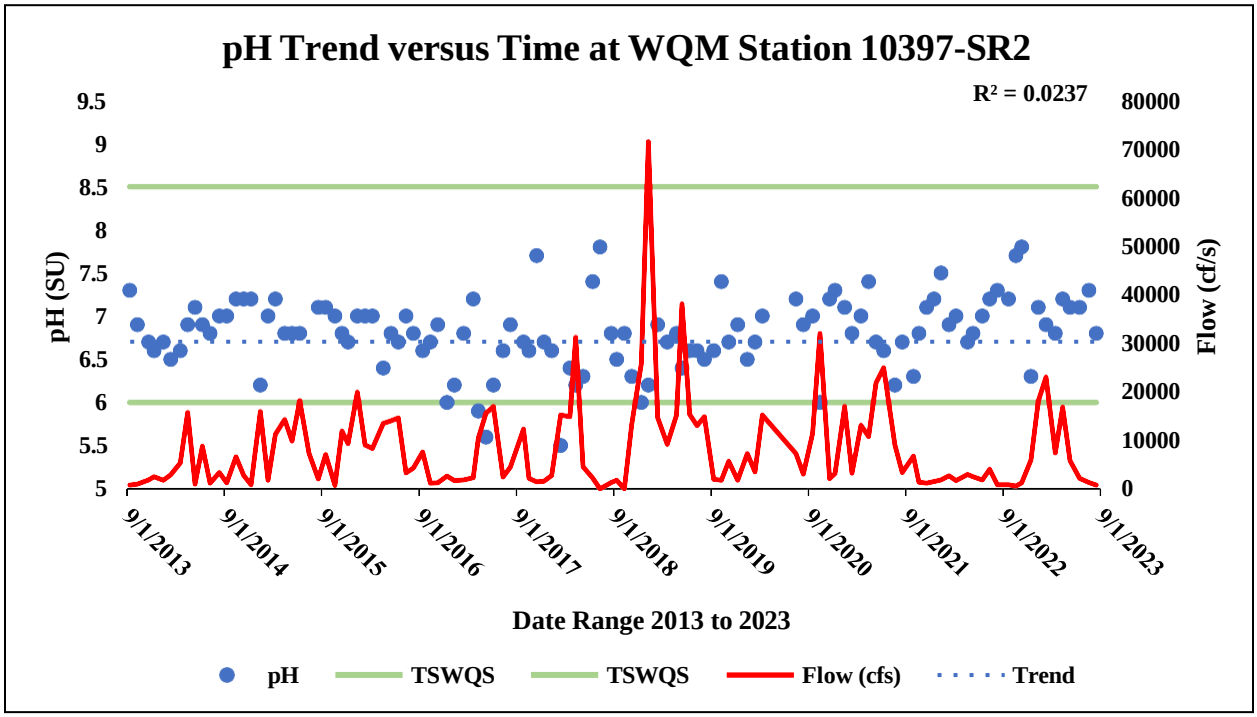


Figure 6. pH trend over time at 10397-SR2 from September 2013 to August 2023.

The TDS values ranged from 19.5 mg/L to 176.8 mg/L with a mean of 85.4 mg/L, which is below the TSWQS of 200 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 7).

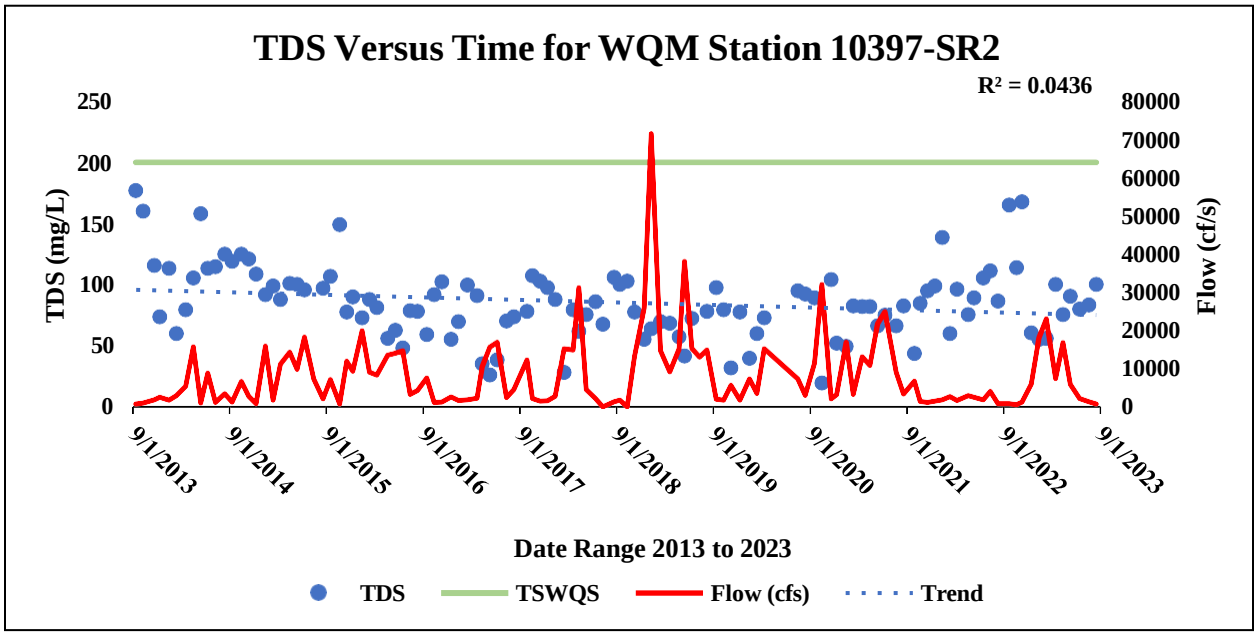


Figure 7. TDS trend over time at 10397-SR2 from September 2013 to August 2023.

The phosphorus values ranged from 0.03 mg/L to 0.18 mg/L with a mean of 0.06 mg/L, which is less than the TCEQ screening levels for nutrients in freshwater streams of 0.69 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 8).

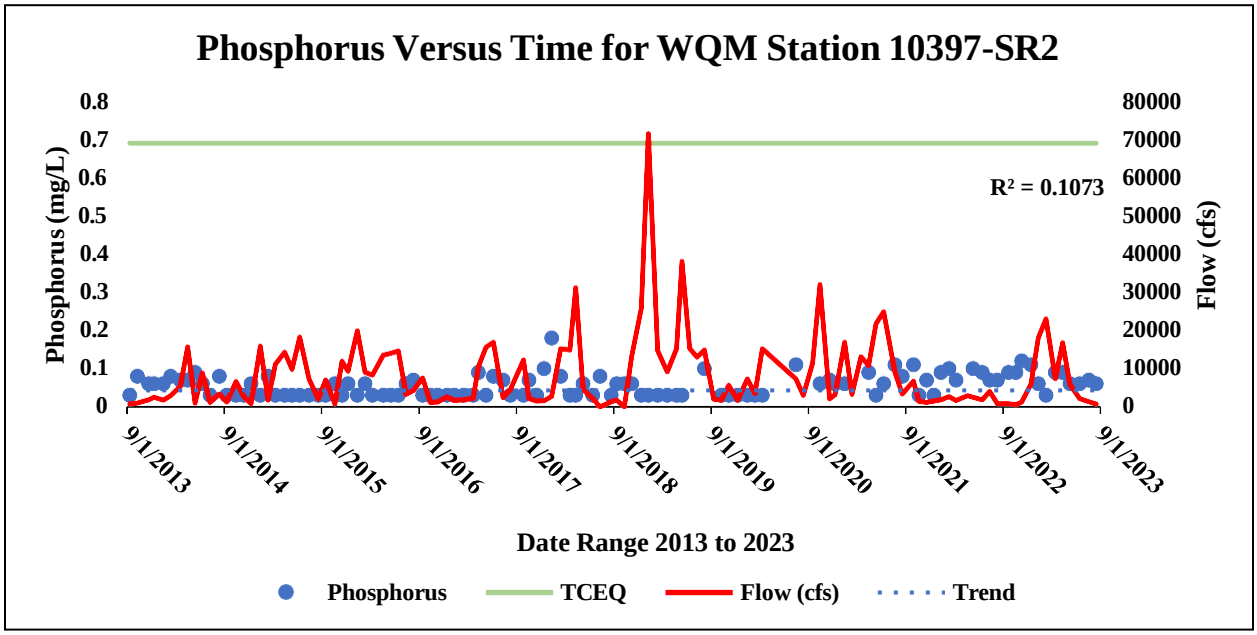


Figure 8. Phosphorus trend over time at 10397-SR2 from September 2013 to August 2023.

The chloride values ranged from 2.5 mg/L to 19 mg/L with a mean of 10.1 mg/L, which is below the TSWQS of 50 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 9).

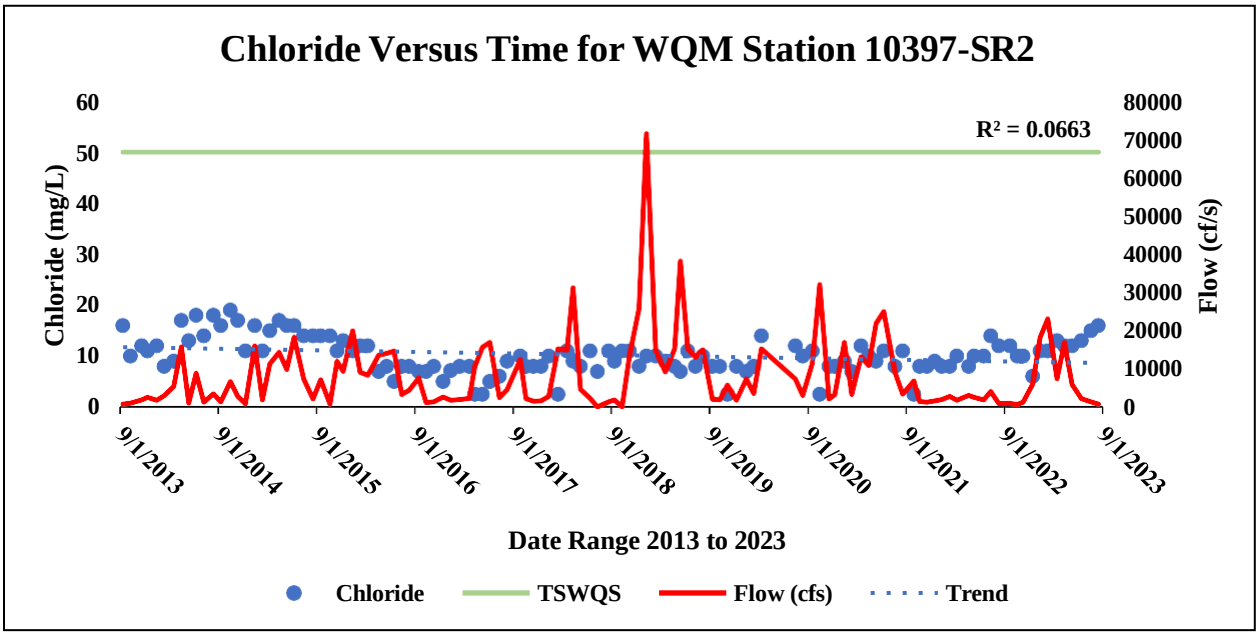


Figure 9. Chloride trend over time at 10397-SR2 from September 2013 to August 2023.

Recommendations

Nichols and Caney Creek are both very rural, forested stream systems. The elevated bacteria levels and depressed DO are likely due to naturally occurring sources such as wildlife. The SRA-TX currently monitors Nichols and Caney Creek through the TMDL program and will continue water quality monitoring at the representative routine sites in this segment.

Sabine River Upstream of SH 12

Segment 0503 - Sabine River above Caney Creek--From a point immediately upstream of the confluence with Caney Creek in Newton County up to Toledo Bend Dam in Newton County.

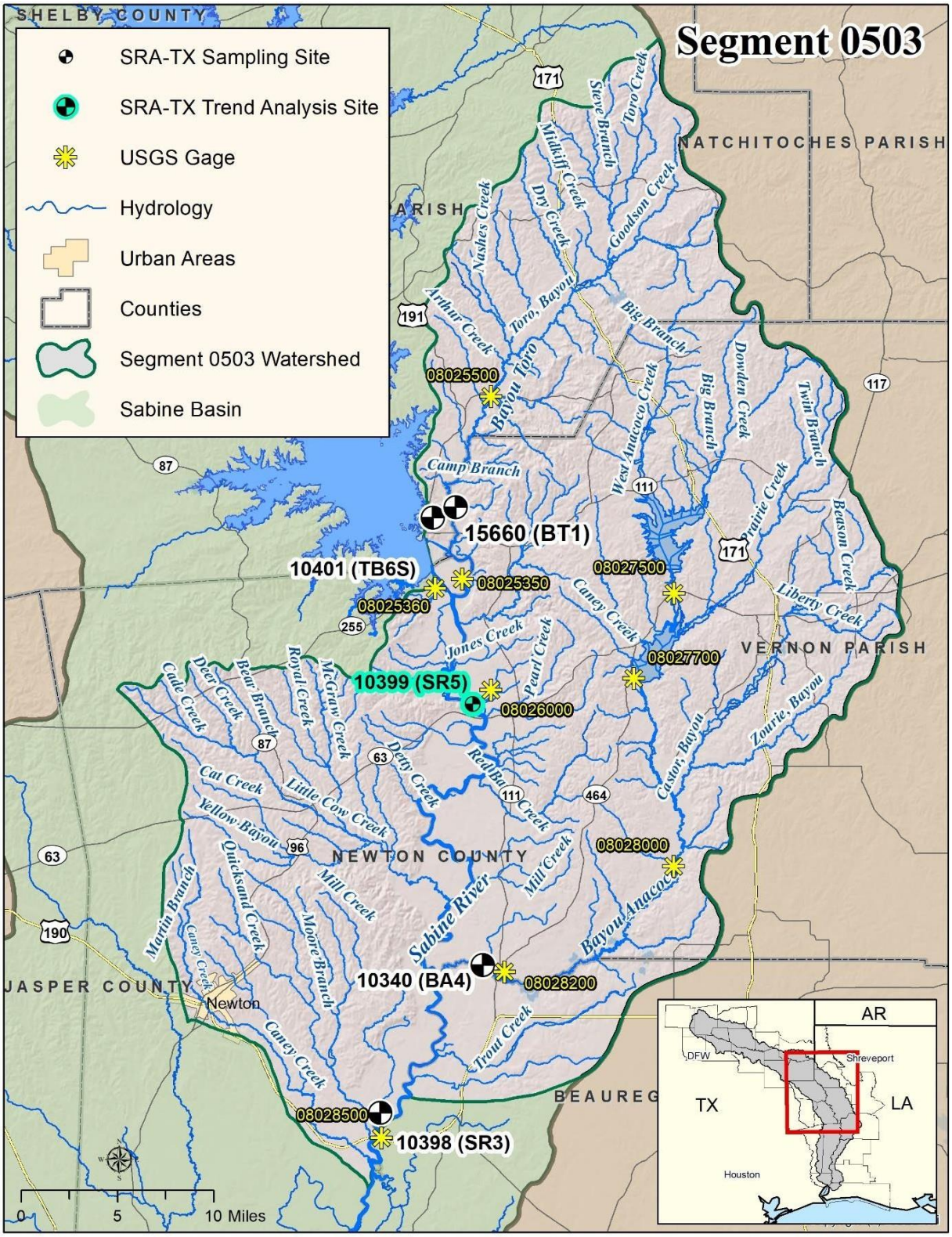


Figure 10. Map of Segment 0503 Sabine River above Caney Creek.

The Sabine River Above Caney Creek, with a drainage area of 1,176 square miles, is located in the South Central Plains ecoregion. This region is locally termed the “piney woods”. Vegetation mostly consists of evergreen forest and scrub. This region of mostly irregular plains represents the western edge of the southern coniferous forest belt (Table 10).

Timber is the main industry in Segment 0503, which is largely rural with no city having a population greater than 5,000 (Table 11).

The USGS maintains three gaging stations in Segment 0503: the Sabine River at SH190 near Bon Wier, TX; Sabine River at CR 2082 near Burkeville, TX; and Sabine River at Toledo Bend Reservoir near Burkeville, TX. SRA-TX routinely samples at five sites monthly for the CRP.

Spatial Analysis of Land Use

Table 10. Segment 0503 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	1.5
Developed, Open Space	4.3
Developed, Low Intensity	2.8
Developed, Medium Intensity	< 1
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	9.1
Evergreen Forest	38.5
Mixed Forest	5.1
Scrub/Shrub	13.8
Woody Wetlands	21.0
Hay Pasture	2.5
Cultivated Crops	< 1
Deciduous Forest	< 1
Emergent Herbaceous Wetlands	< 1

*USGS - NLCD 2019

Table 11. Segment 0503 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
15	46,304	2	0	0	39

Table 12. Segment 0503 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10398 (SR3)	SABINE RIVER AT US 190 EAST OF BON WIER TX.	SRA-TX
10340 (BA4)	ANACOCO BAYOU AT LOUISIANA HWY 111 CROSSING SOUTHWEST OF KNIGHT LA	SRA-TX
10399 (SR5)	SABINE RIVER AT SH 63 EAST OF BURKEVILLE TX.	SRA-TX
10401 (TB6S)	SABINE RIVER BELOW TOLEDO BEND RESERVOIR AT RIGHT ABUTMENT OF SPILLWAY FOR DAM	SRA-TX
15660 (BT1)	BAYOU TORO AT LA SH 392 IN SABINE PARISH SW OF HORNBECK LA	SRA-TX

Water Quality Conditions

The 2022 TCEQ Integrated Report indicated no impairments to the main classified water body of the Sabine River in Segment 0503. All water quality parameters meet TSWQS and fully support this segment’s designated uses.

Regression analysis at station 10399 (SR5) indicated TDS, with a p value of 0.005, and chloride, with a p value of 0.04, were significantly related to time. TDS is used as an indicator of the accumulation of contaminants in the water and can cause water hardness as well as reduce water clarity. Elevated chloride can be toxic to some aquatic life. Decreasing trends of TDS and chloride at 10399 are indicators of improved water quality. All data collected at 10399 showed values below the TSWQS. All parameters were graphed against flow to determine if flow could explain any anomalies in the data collected. The cause of these trends is currently unknown.

The TDS values ranged from 29.2 mg/L to 119.6 mg/L with a mean of 81.5 mg/L, which is below the TSWQS of 200 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 11).

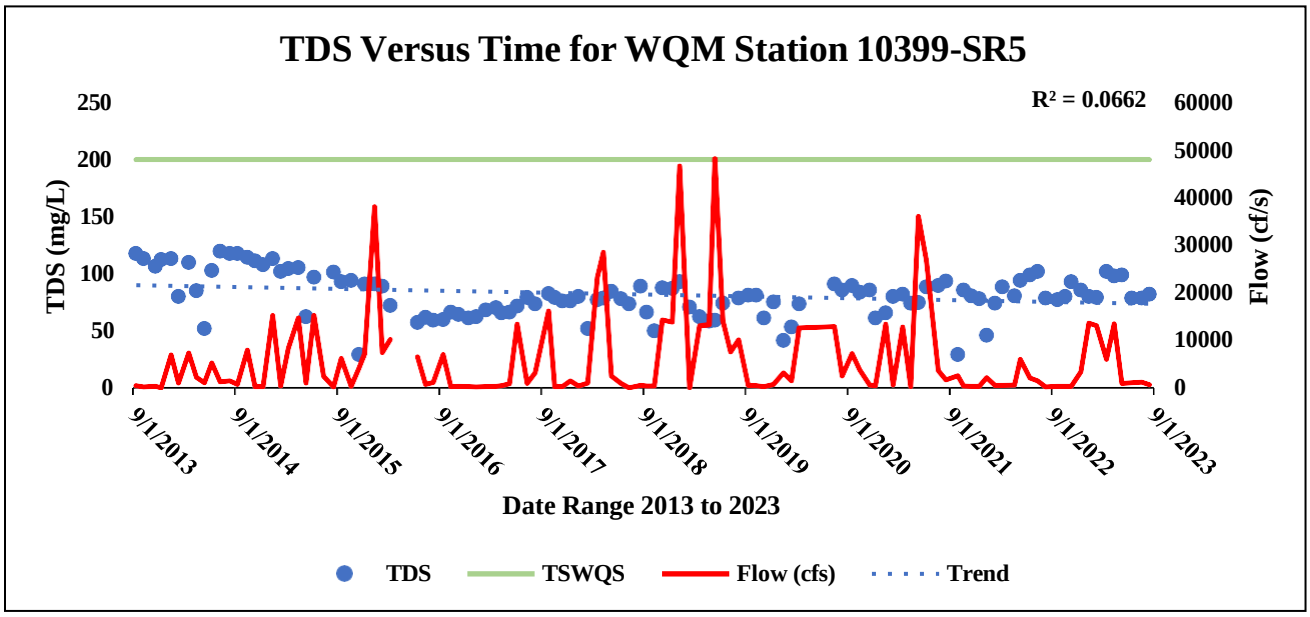


Figure 11. TDS trend over time at station 10399-SR5 from September 2013 to August 2023.

The chloride values ranged from 2.5 mg/L to 21 mg/L, with a mean of 12.4 mg/L which is below the TSWQS of 50 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 12).

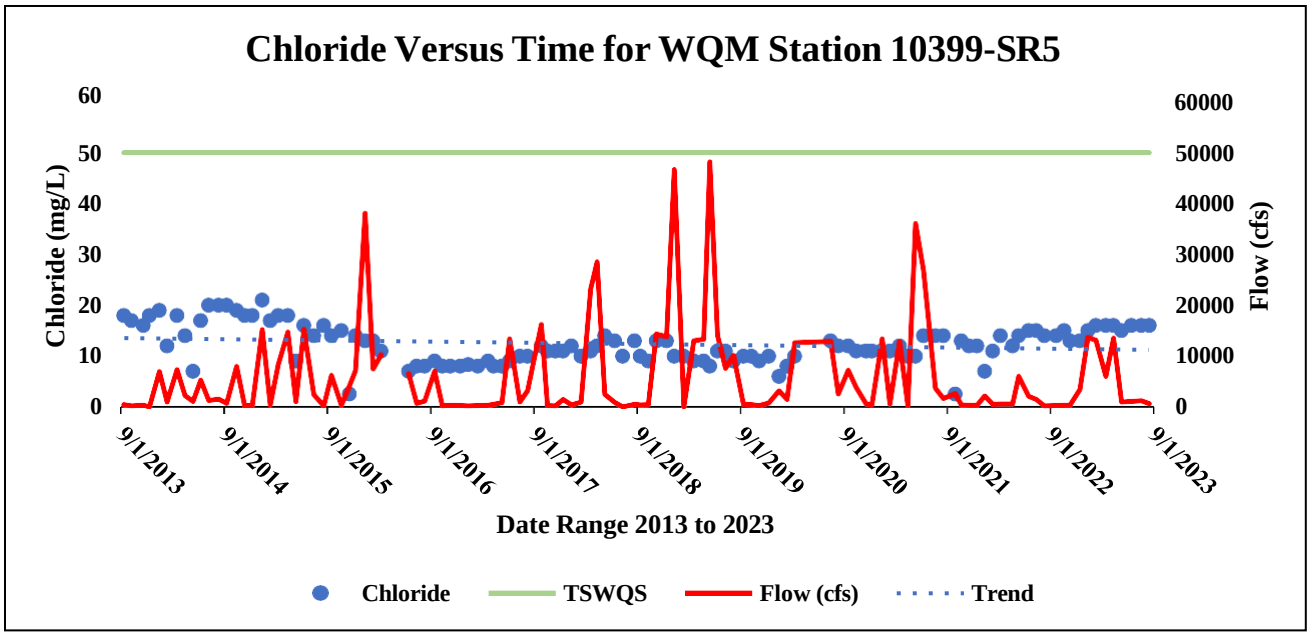


Figure 12. Chloride trend over time at station 10399-SR5 from September 2013 to August 2023.

Recommendations

The SRA-TX will continue water quality monitoring at the representative routine sites in this segment.

Sabine River in Segment 0503

Segment 0504 - Toledo Bend Reservoir--From Toledo Bend Dam in Newton County to a point immediately upstream of the confluence of Murvaul Creek in Panola County, up to the normal pool elevation of 172 feet (impounds Sabine River).

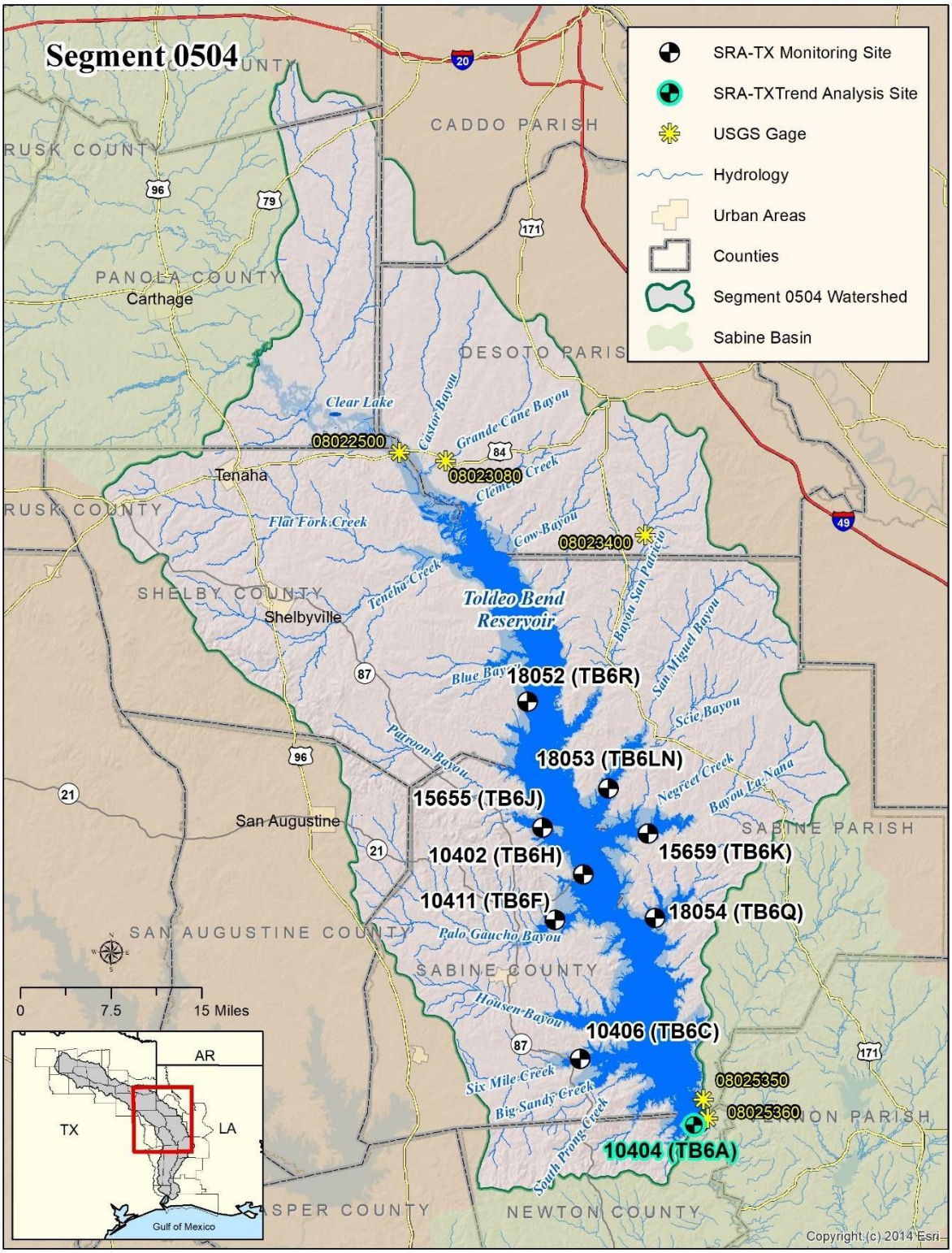


Figure 13. Map of Segment 0504 Toledo Bend Reservoir.

The Toledo Bend Reservoir watershed, with a drainage area of 2,396 square miles, is located in the South Central Plains ecoregion. This region is also called “piney woods”. Land use mostly consists of evergreen forest and woody wetlands. This region of mostly irregular plains represents the western edge of the southern coniferous forest belt (Table 13).

Segment 0504 includes one city of over 5,000 in population, the City of Center, but the segment is mostly rural (Table 14).

The USGS maintains three gaging stations in Segment 0504. They are located on the Sabine River at Logansport, LA, Sabine River at Toledo Bend Spillway near Burkeville, TX and Sabine River at Toledo Bend Reservoir near Burkeville, TX. SRA-TX routinely samples at nine sites monthly for the CRP.

Spatial Analysis of Land Use

Table 13. Segment 0504 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	8.6
Developed, Open Space	2.1
Developed, Low Intensity	2.1
Developed, Medium Intensity	< 1
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	7.1
Evergreen Forest	29.6
Mixed Forest	6.3
Scrub/Shrub	6.6
Woody Wetlands	17.5
Hay Pasture	7.2
Cultivated Crops	< 1
Deciduous Forest	11.1
Emergent Herbaceous Wetlands	1.5

*USGS - NLCD 2019

Table 14. Segment 0504 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
34	77,422	19	2	0	32

Table 15. Segment 0504 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10404 (TB6A)	TOLEDO BEND RESERVOIR MAIN LAKE ABOVE THE DAM AT THE OLD RIVER CHANNEL	SRA-TX
10406 (TB6C)	TOLEDO BEND RESERVOIR IN SIX MILE BOAT LANE 0.8 KM EAST OF SH87	SRA-TX
10411 (TB6F)	TOLEDO BEND RESERVOIR IN SUNSHINE BAY NEAR FM3121 BRIDGE	SRA-TX
18054 (TB6Q)	TOLEDO BEND RESERVOIR IN NEGREET BAYOU	SRA-TX
10402 (TB6H)	TOLEDO BEND RESERVOIR AT SH 21 NORTHEAST OF MILAM	SRA-TX
15659 (TB6K)	TOLEDO BEND RESERVOIR IN LANANA BAYOU AT LOUISIANA SH 191 IN SABINE PARISH LOUISIANA WEST OF MANY	SRA-TX
15655 (TB6J)	TOLEDO BEND RESERVOIR PATROON BAYOU BRANCH AT FM 276	SRA-TX
18053 (TB6LN)	TOLEDO BEND RESERVOIR SAN MIGUEL ARM BOAT LANE	SRA-TX
18052 (TB6R)	TOLEDO BEND RESERVOIR AT RAGTOWN	SRA-TX

Water Quality Conditions

The 2022 TCEQ Integrated Report indicated an impairment for mercury in edible tissue in edible tissue for nine out of the thirteen AUs of Toledo Bend Reservoir. Although the source of the mercury cannot be confirmed, possibilities include local power plants or naturally occurring geological formations around the reservoir.

The TDSHS issued a fish consumption advisory for Toledo Bend Reservoir since 1998 for largemouth bass (*Micropterus salmoides*) and freshwater drum (*Aplodinotus grunniens*) due to elevated levels of mercury in fish tissue. Additional information regarding fish consumption advisories can be found at http://www.dshs.texas.gov/seafood/advisories-bans.aspx.

Clear Lake (0504E_01), an unclassified water body, has an impairment of mercury in edible tissue. Again, the source of the mercury cannot be confirmed, but possible sources include local power plants or naturally occurring geological formations around the reservoir.

Regression analysis of station 10404 (TB6A) indicated TDS and chloride were significantly related to time. At 10404, both TDS and chloride showed decreasing trends with p values of 0.0003 and 0.03 respectively. It appears that elevated TDS and chloride values are correlated to drought conditions. Values dropped when the drought conditions subsided in 2016.

The TDS values ranged from 58.5 mg/L to 119.6 mg/L with a mean of 87.6 mg/L, which is below the TSWQS of 240 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 14).

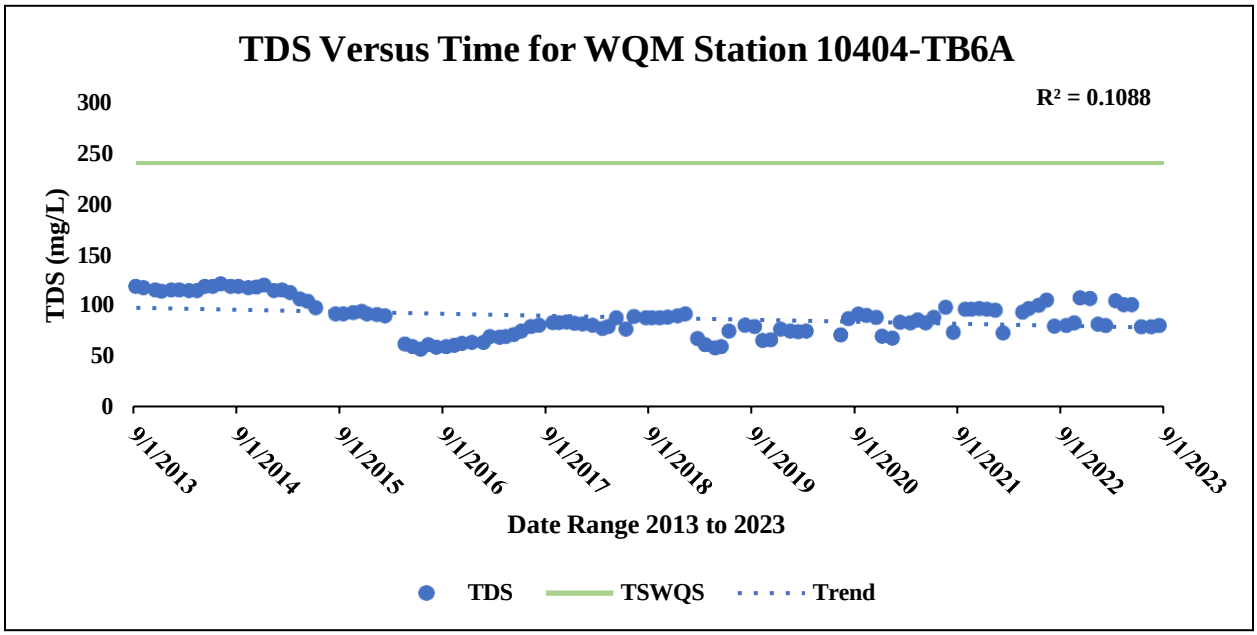


Figure 14. TDS trend over time at station 10404-TB6A from September 2013 to August 2023.

The chloride values ranged from 7 mg/L to 20 mg/L with a mean of 13.5 mg/L, which is below the TSWQS of 70 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 15).

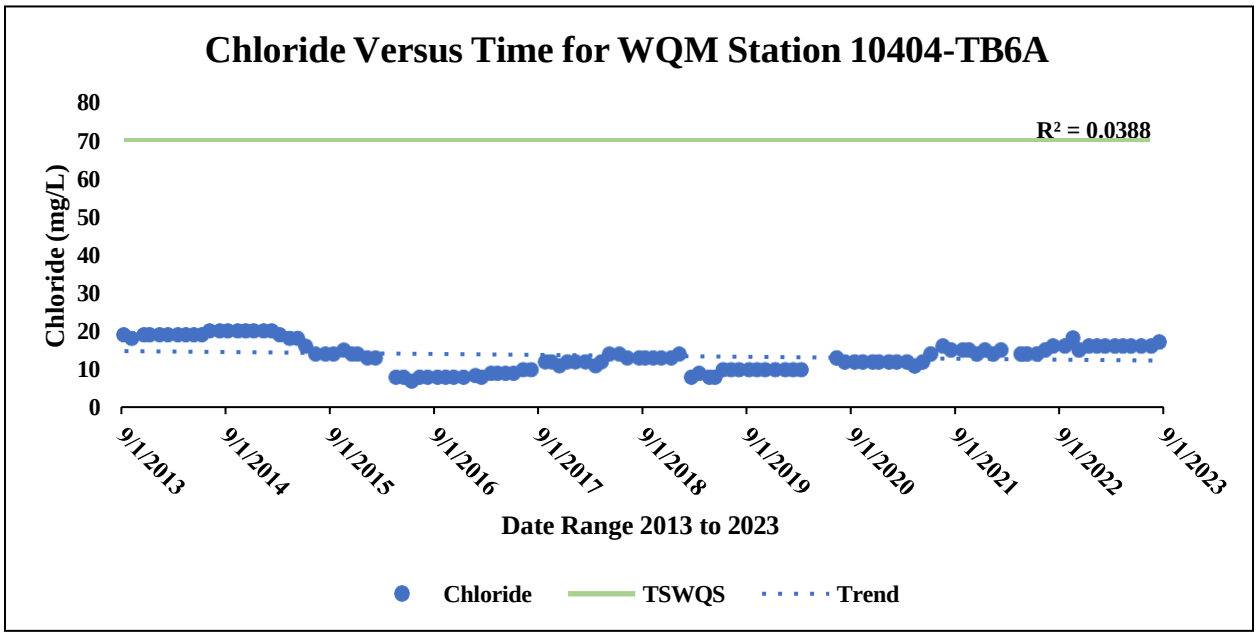


Figure 15. Chloride trend over time at station 10404-TB6A from September 2013 to August 2023.

Recommendations

The SRA-TX will continue water quality monitoring at the representative routine sites in this segment.

Toledo Bend Reservoir

Segment 0505 - Sabine River above Toledo Bend Reservoir--From a point immediately upstream of Murvaul Creek in Panola County to a point 100 meters (110 yards) downstream of US 271 in Gregg County.

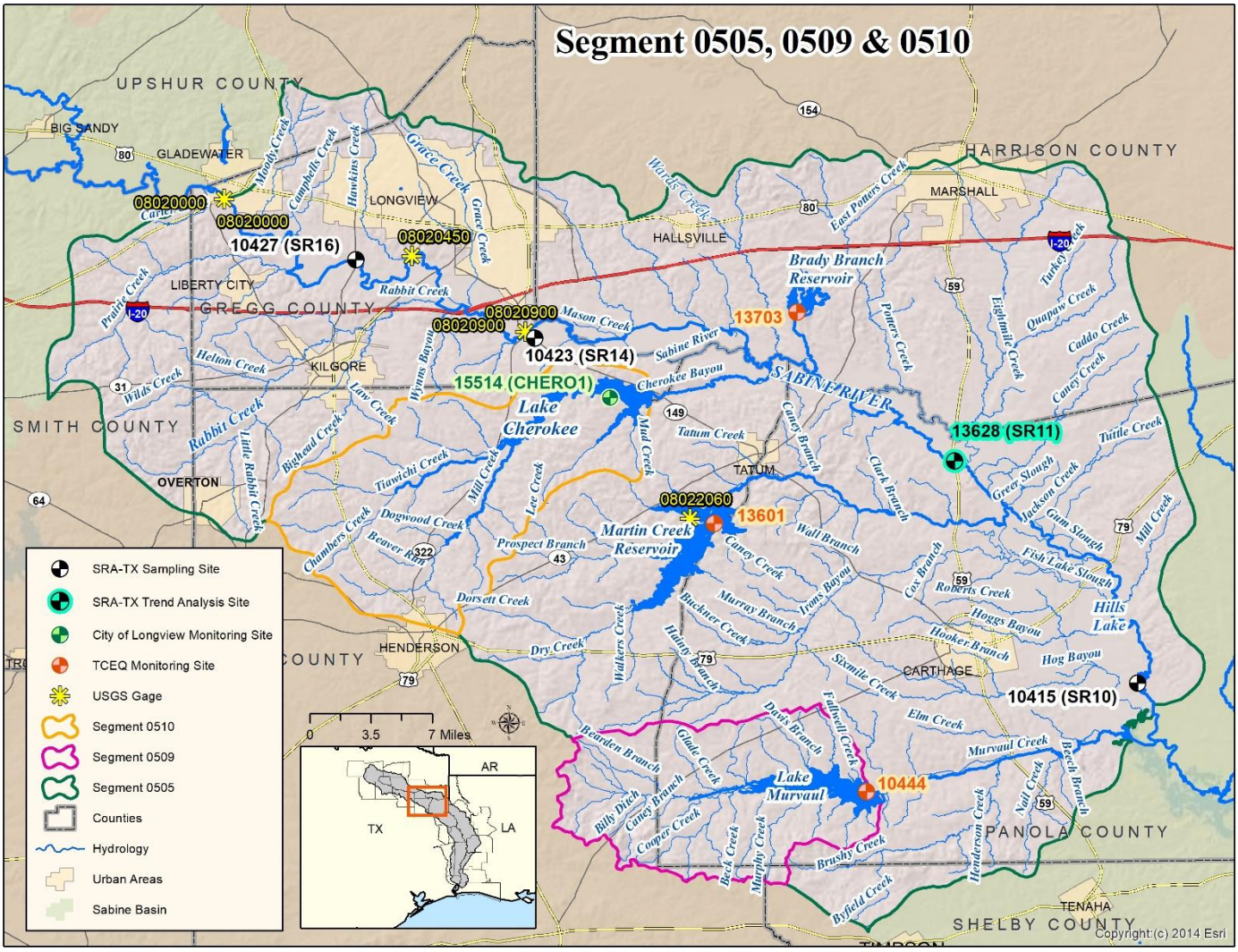


Figure 16. Map of Segment 0505 Sabine River above Toledo Bend Reservoir

Segment 0505, with a drainage area of 1,698 square miles, is in the South Central Plains ecoregion and is characterized by evergreen and mixed forest and hay pasture (Table 16).

This segment includes numerous industries, oilfields, and all or part of six cities (Carthage, Marshall, Kilgore, Longview, White Oak, and Gladewater) with populations greater than 5,000, the highest concentration of population in the Sabine Basin (Table 17).

Tributary watersheds within this segment include Segment 0509 (Murvaul Lake) and Segment 0510 (Lake Cherokee). Both reservoirs help control and regulate the release of flood waters to reduce negative impacts to the environment. Unclassified water bodies in this segment include Grace Creek, Rabbit Creek, Brady Branch Reservoir, Martin Creek Reservoir, Wards Creek, and Hills Lake. The SRA-TX routinely monitors four sites monthly and the TCEQ monitors two sites quarterly in segment 0505 (Table 18).

The USGS maintains gaging stations at the following locations along the Sabine River: Sabine River near Carthage, TX; the Sabine River near Beckville, TX; the Sabine River below Longview, TX; the Sabine River above Longview, TX; and Rabbit Creek at Kilgore, TX.

Spatial Analysis of Land Use

Table 16. Segment 0505 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	1.9
Developed, Open Space	3.2
Developed, Low Intensity	7.4
Developed, Medium Intensity	2.4
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	< 1
Evergreen Forest	18.7
Mixed Forest	12.7
Scrub/Shrub	11.0
Woody Wetlands	12.1
Hay Pasture	18.4
Cultivated Crops	< 1
Deciduous Forest	11.7
Emergent Herbaceous Wetlands	< 1

*USGS - NLCD 2019

Table 17. Segment 0505 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
13	212,041	61	2	3	124

Table 18. Segment 0505 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10415 (SR10)	SABINE RIVER AT FM 2517 WEST OF DEADWOOD TX	SRA-TX
13628 (SR11)	SABINE RIVER AT US 59 8.4 MI NE OF BECKVILLE 0.9 MI UPSTREAM FROM EIGHTMILE CREEK	SRA-TX
10423 (SR14)	SABINE RIVER AT SH 149	SRA-TX
10427 (SR16)	SABINE RIVER AT SH 42 NEAR KILGORE RK 283.9	SRA-TX
13703	BRANDY BRANCH RESERVOIR AT MID LAKE NEAR DAM APPROXIMATELY 6MI SOUTHEAST OF HALLSVILLE	TCEQ
13601	MARTIN CREEK RESERVOIR HISTORICAL AREA 2 OF SE MONITORING PROGRAM AREA SOUTH AND WEST FROM AREA 1 TO 1ST BRIDGE OF WEIR CREEK	TCEQ

Water Quality Conditions

Sabine River Segment 0505_04, first listed in 2002, was included on the 2022 TCEQ Integrated Report 303(d) List for bacteria. The geometric mean for data collected from December 1, 2013, to November 30, 2020 was 143.15 MPN/100ml, which exceeds the TSWQS criteria of 126 MPN/100ml. Elevated bacteria levels are likely caused by human activity such as improper permitted discharge, failed septic systems, and municipal and household waste.

Grace Creek (Segment 0505B), first listed in 2002, is included on the 2022 Integrated Report 303(d) List with an impairment for bacteria. Elevated bacteria levels are likely caused by human activity such as improper permitted discharge, failed septic systems, and municipal and household waste.

Rabbit Creek (0505D) has a concern for bacteria. This is the most populated segment in the Sabine basin. Elevated bacteria levels are likely caused by human activity such as improper permitted discharge, failed septic systems, and municipal and household waste.

Wards Creek (Segment 0505G), first listed in 2000, is included on the 2022 Integrated Report 303(d) List for depressed dissolved oxygen. It also has a concern for impaired habitat in water. This concern for depressed dissolved oxygen is possibly due to natural occurrences in streams.

Hills Lake (Segment 0505O), an oxbow lake 13 miles east of Carthage, was first listed in 2006 and remains on the 2022 Integrated Report 303(d) List due to a TDSHS fish consumption advisory for mercury in edible tissue. Although the actual cause is unknown, a possible source of mercury in this water body could be from the numerous permitted discharges and superfund sites.

Regression analysis at station 13628 (SR11) indicated no parameters were significantly related to time.

Recommendations

The SRA-TX will coordinate and cooperate with stakeholders and provide education through public outreach activities explaining the proper handling of wastewater and best management practices in agriculture. Water quality monitoring will continue at representative routine sites in this segment.

Sabine River at US 59

Segment 0506 - Sabine River Below Lake Tawakoni--From a point 100 meters (110 yards) downstream of US 271 in Gregg County to Iron Bridge Dam in Rains County.

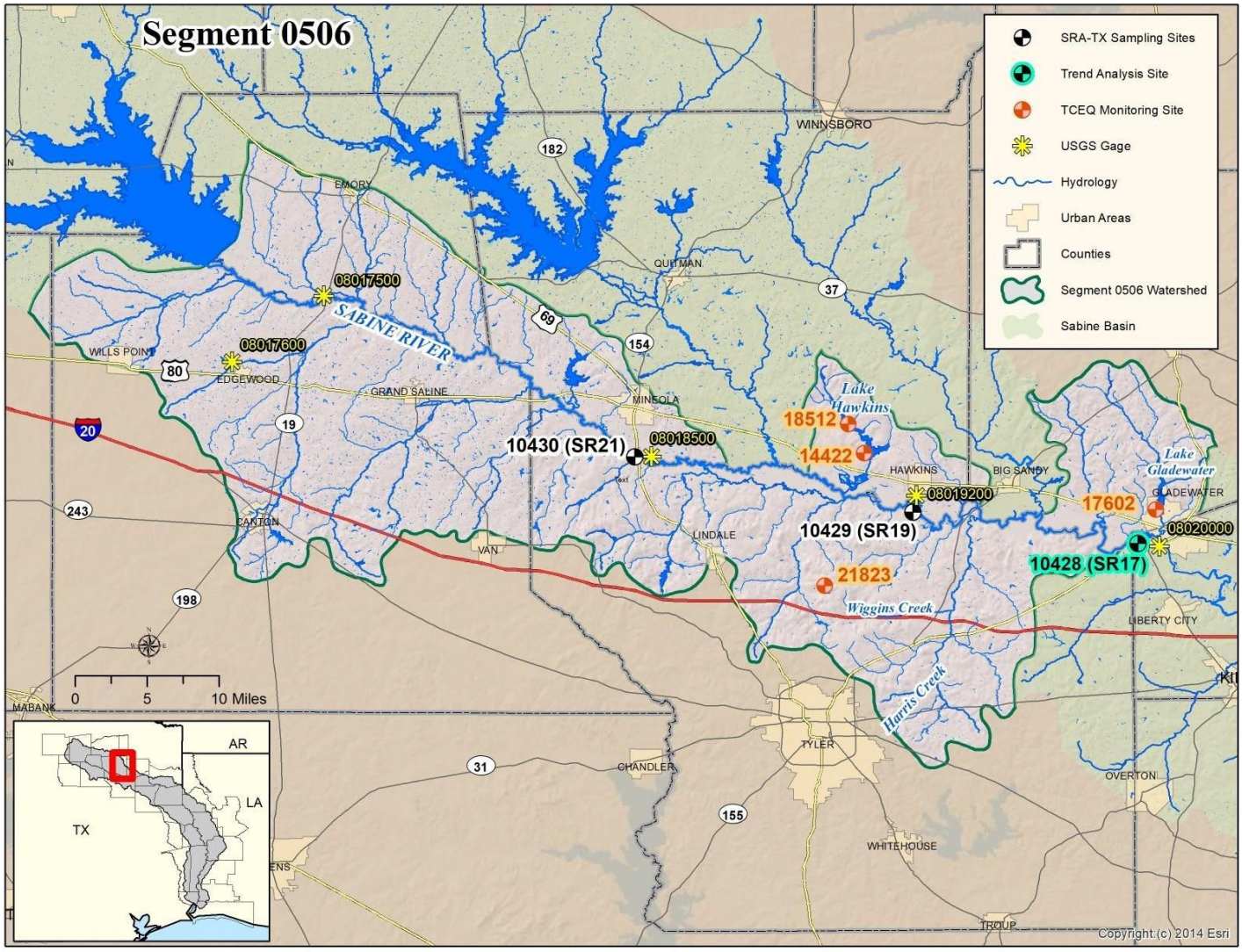


Figure 17. Map of Segment 0506 Sabine River below Lake Tawakoni.

The Segment 0506 watershed has a drainage area of 1,091 mi^2. Much of this watershed lies with the East Central Texas Plains Ecoregion with portions in the South Central Plains ecoregion. This segment is characterized by low rolling hills with hay pasture and deciduous forest (Tables 19–20).

Tributaries to Segment 0506 include: Segment 0512 (Lake Fork Reservoir), Segment 0514 (Big Sandy Creek), and Segment 0515 (Lake Fork Creek). Unclassified water bodies include Harris Creek, Wiggins Creek, Lake Gladewater, Lake Hawkins, Lake Holbrook, and Tyler State Park Lake. The SRA-TX routinely monitors three sites monthly and the TCEQ monitors four sites quarterly in the segment (Table 21).

The USGS maintains gaging stations located on the Sabine River near Gladewater, TX; the Sabine River near Hawkins, TX; and the Sabine River near Mineola, TX.

Spatial Analysis of Land Use

Table 19. Segment 0506 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	1.8
Developed, Open Space	1.4
Developed, Low Intensity	6.5
Developed, Medium Intensity	< 1
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	< 1
Evergreen Forest	4.1
Mixed Forest	< 1
Scrub/Shrub	8.3
Woody Wetlands	13.8
Hay Pasture	36.5
Cultivated Crops	3.5
Deciduous Forest	23.3
Emergent Herbaceous Wetland	< 1

*USGS - NLCD 2019

Table 20. Segment 0506 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
46	92,321	28	1	1	84

Table 21. Segment 0506 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10428 (SR17)	SABINE RIVER AT US 271 AT GLADEWATER	SRA-TX
10429 (SR19)	SABINE RIVER IMMEDIATELY DOWNSTREAM OF FM 14 4.17 KM SOUTH OF HAWKINS TX	SRA-TX
10430 (SR21)	SABINE RIVER AT US 69 NORTHWEST OF LINDALE/5.6 KM SOUTH OF MINEOLA WOOD COUNTY	SRA-TX
17062	LAKE GLADEWATER AT RAW WATER INTAKE STRUCTURE FOR THE CITY OF GLADEWATER APPROX 2.5KM NW OF THE INTERSECTION OF US271 AND US80	TCEQ
14422	LAKE HAWKINS 34M UPSTREAM FROM DAM AND 233M EAST OF WEST BANK	TCEQ
18512	LAKE HAWKINS 435 M S AND 165 M E OF FM 2869 BRIDGE AT WOOD CR 4320	TCEQ
21823	TYLER STATE PARK LAKE 125 METERS EAST OF THE CENTER OF THE DAM AND APPROXIMATELY 1.2 KILOMETERS NORTH AND 2.5 KILOMETERS WEST OF THE INTERESECTION OF INTERSTATE 20 AND STATE HIGHWAY 14 IN SMITH COUNTY	TCEQ

Water Quality Conditions

There are no impairments or concerns on the mainstem of the river in segment 0506. Harris Creek (Segment 0506A), first listed in 2000, was included in the 2022 Integrated Report 303(d) List for depressed dissolved oxygen. The low dissolved oxygen in this segment may have resulted from agricultural usage in the watershed or possible drought conditions. Harris Creek also has a concern for bacteria. Wiggins Creek (0506C) has concerns for depressed dissolved oxygen and ammonia.

Regression analyses at station 10428 (SR17) indicated pH with a p value of 0.03, phosphorus with a p value of 0.007, and nitrate with a p value of 0.07, were significantly related to time. Increasing trends for each parameter were observed. Increasing phosphorous and nitrite can accelerate eutrophication, causing dramatic increases in aquatic plant growth and changes in the flora and fauna of the water body. Runoff from fertilized soil, wastewater, landfills, urban runoff, and animal feedlots often introduce nitrate and phosphorous into the water body. With the pH values remaining between 6 and 8, the increasing pH trend is not a concern currently.

The pH values ranged from 6.3 to 7.7 units with a median of 7.1 units, which falls between the TSWQS of 6 to 8.5 units. No single grab exceedances were documented from FY2013 to FY2023 (Figure 18).

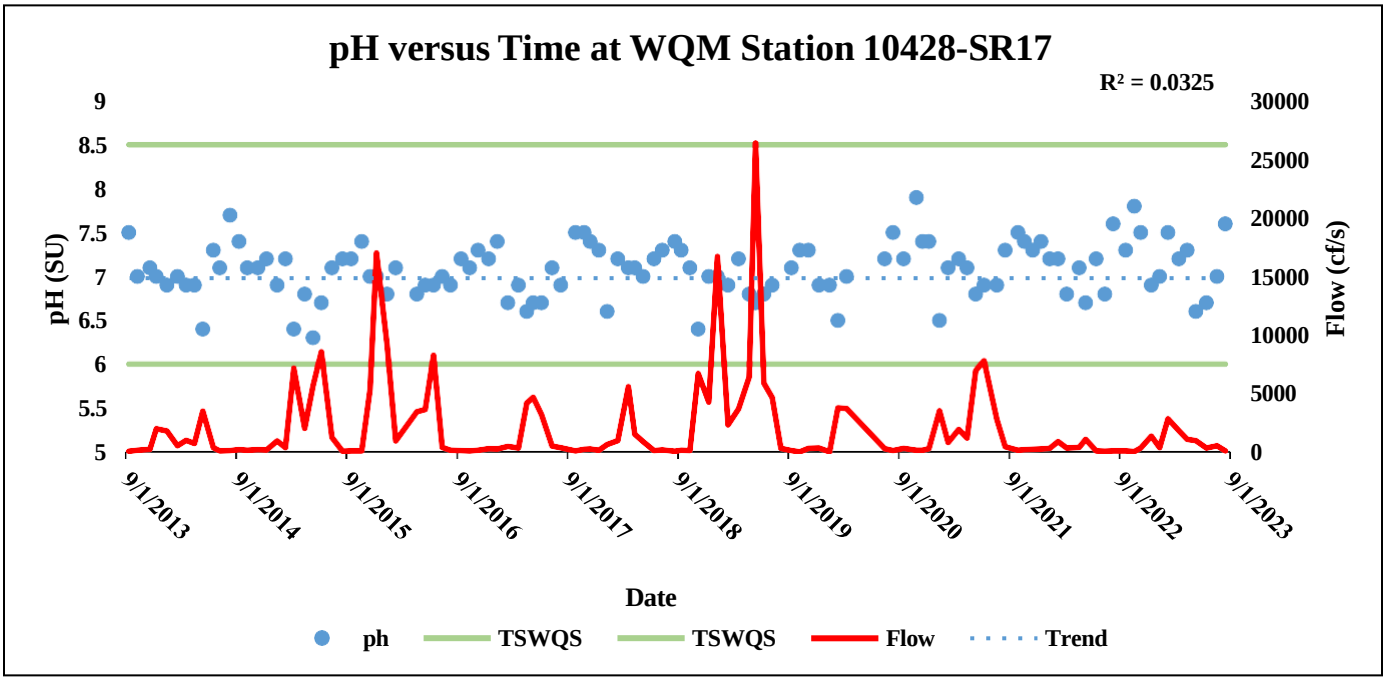


Figure 18. pH trend over time at station 10428-SR 17 as related to flow from September 2013 to August 2023.

The total phosphorus (TP) values ranged from 0.03 to 0.31 mg/L with a mean of 0.12 mg/L, which is less than the TCEQ screening level for TP in freshwater streams of 0.69 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 19).

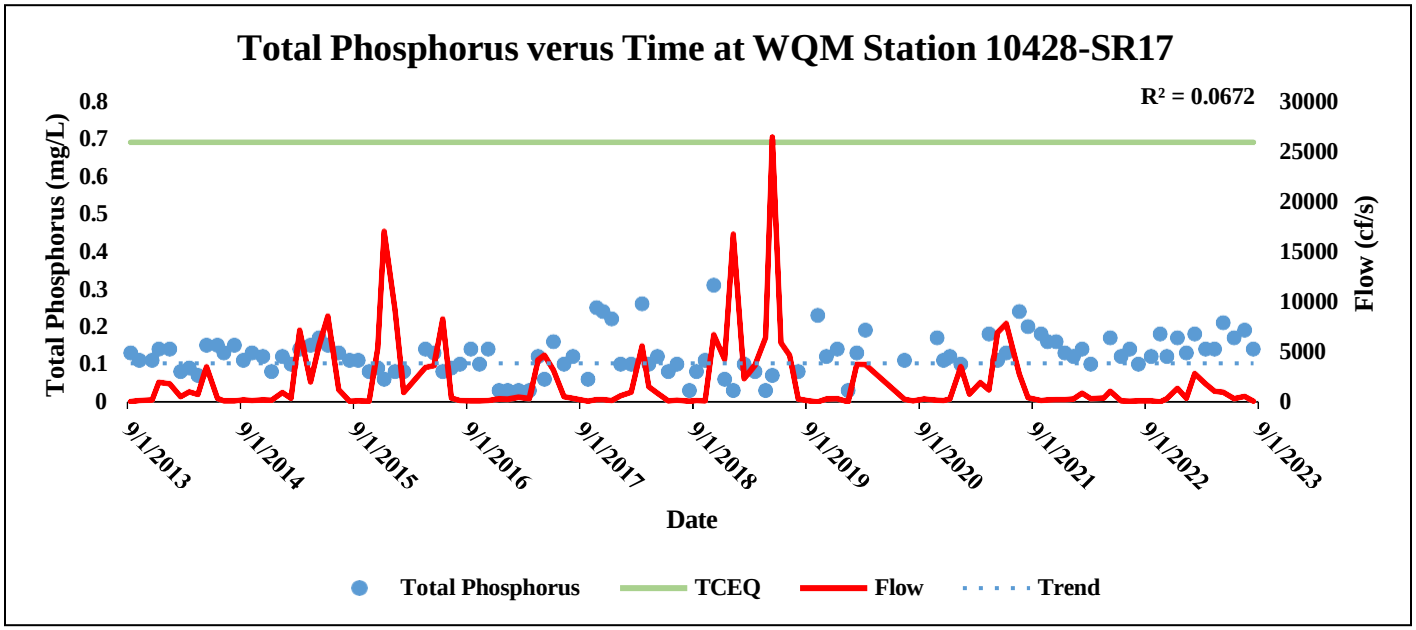


Figure 19. Total Phosphorus trend over time at station 10428-SR 17 as related to flow from September 2013 to August 2023.

Nitrate values at 10428 ranged from 0.025 to 0.87 mg/L with a mean of 0.18 mg/L, which is less than the TCEQ screening level for nitrate in freshwater streams of 1.95 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 20).

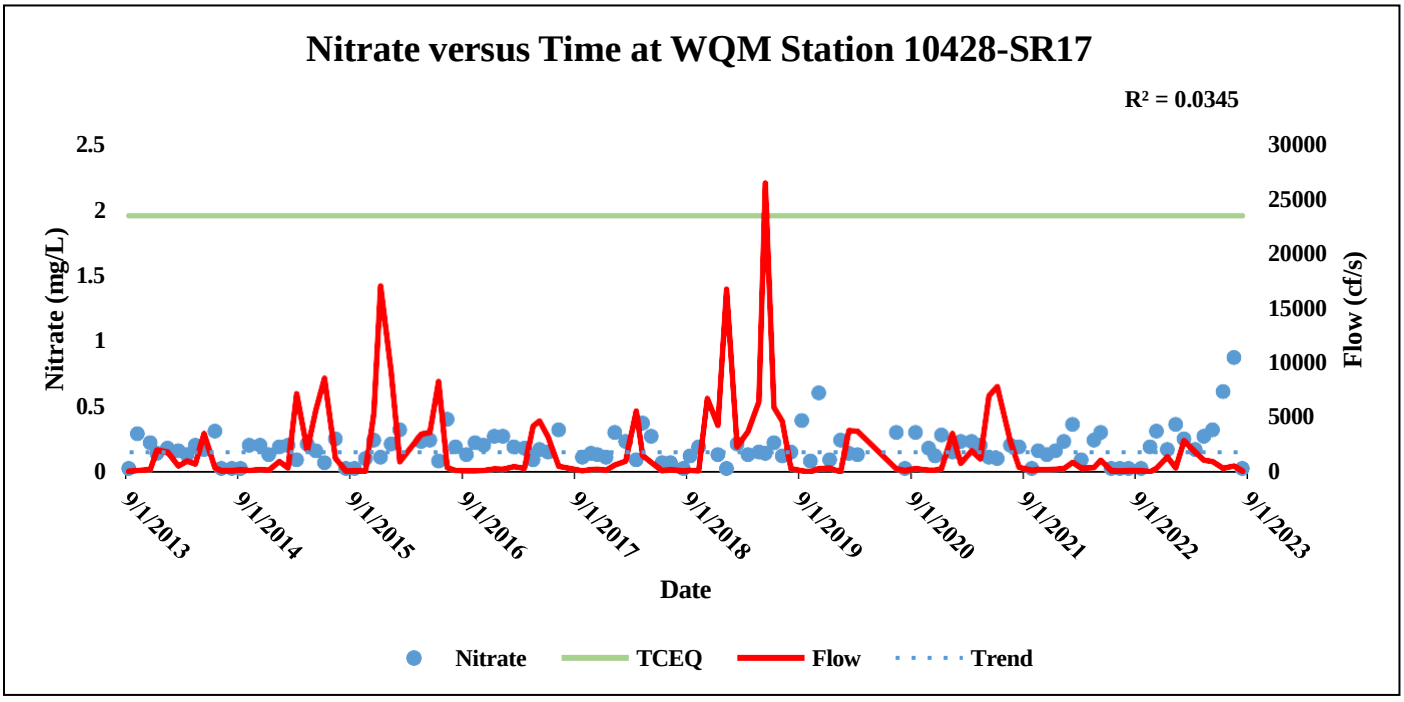


Figure 20. Nitrate trend over time at station 10428-SR 17 as related to flow from September 2013 to August 2023.

Recommendations

The SRA-TX will coordinate and cooperate with stakeholders and provide education through public outreach activities. Best management practices aimed at reducing agricultural runoff can be encouraged through public outreach. Water quality monitoring will continue at representative routine sites in this segment.

Sabine River Upstream of SH 19

Segment 0507 - Lake Tawakoni Reservoir--From Iron Bridge Dam in Rains County up to normal pool elevation of 437.5 feet AMSL (impounds Sabine River).

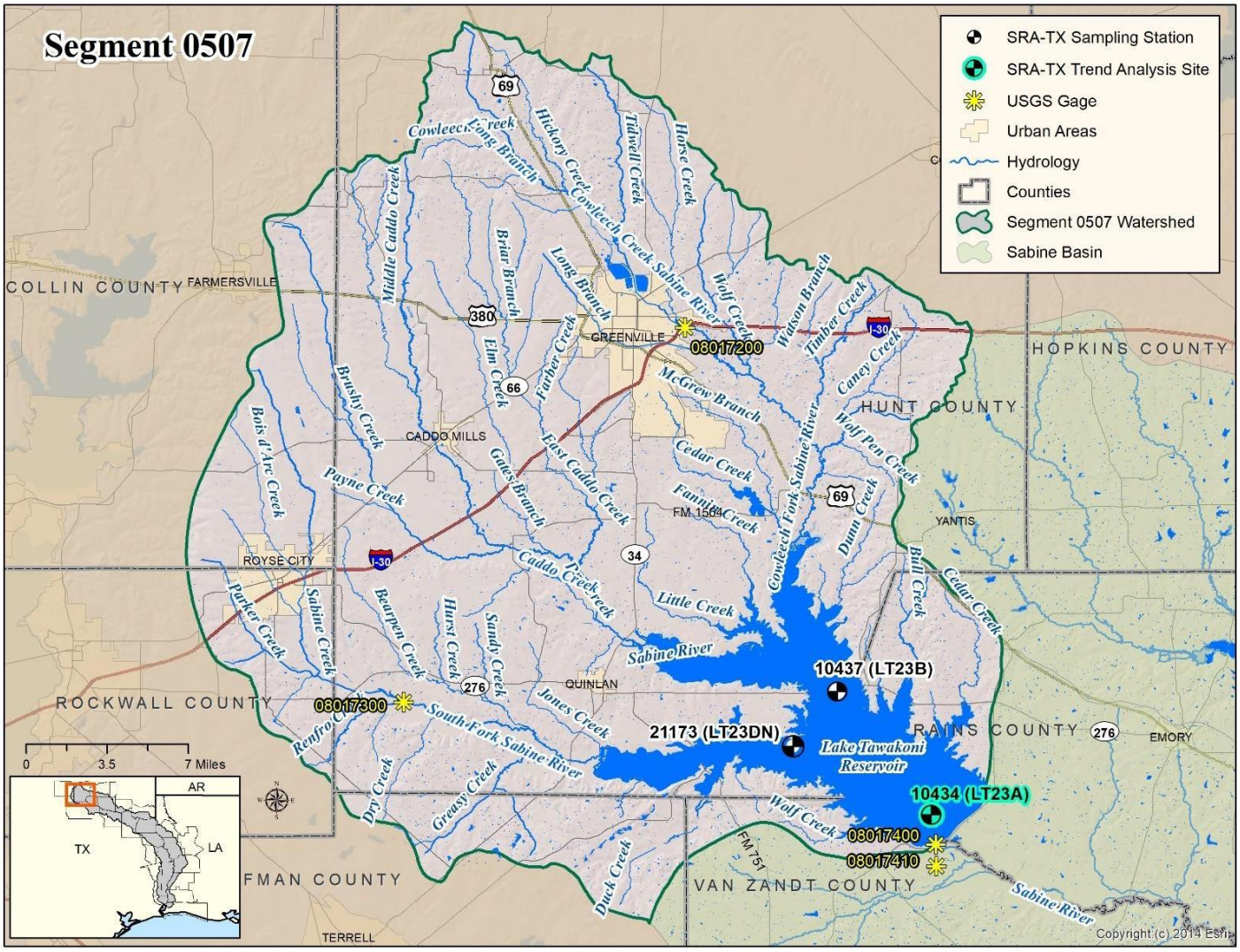


Figure 21. Map of Segment 0507 Lake Tawakoni Reservoir

Lake Tawakoni Reservoir, which has a drainage area of 710 square miles, lies within the Blackland Prairie eco-region, which is characterized by low rolling hills with black, calcareous, alkaline, heavy clay soils that support areas of post oaks, elms, and pines. Cattle farming and agriculture are the primary land uses in Segment 0507 with approximately half of the watershed occupied by hay pasture and grasslands (Table 22). The two largest cities in the watershed are Greenville and Royse City making up 23 and 12 percent of the total population respectively (Table 23).

The USGS maintains gaging stations at three locations within the Lake Tawakoni Watershed: Cowleech Fork of the Sabine River near Greenville, TX; South Fork Sabine River near Quinlan, TX; and the Sabine River near Wills Point, TX. The SRA-TX routinely monitors three sites monthly for the CRP.

Spatial Analysis of Land Use

Table 22. Segment 0507 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	7.1
Developed, Open Space	5.9
Developed, Low Intensity	2.9
Developed, Medium Intensity	< 1
Developed, High Intensity	< 1
Barren Land	1.0
Herbaceous	26.3
Evergreen Forest	< 1
Mixed Forest	< 1
Scrub/Shrub	2.3
Woody Wetlands	2.4
Hay Pasture	23.8
Cultivated Crops	12.9
Deciduous Forest	14.4
Emergent Herbaceous Wetlands	< 1

*USGS - NLCD 2019

Table 23. Segment 0507 Spatial Data

Historical Monitoring Stations	Population	Permitted Discharges	Raw Water Intakes	Superfund Sites	Population Per Sq. Mile
37	125,243	33	14	1	162

Table 24. Segment 0507 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10434 (LT23A)	LAKE TAWAKONI MID LAKE 2.13 KM NORTH AND 180 M WEST OF CENTER OF THE DAM SPILLWAY APPROXIMATELY 15.6 KM SOUTHWEST OF EMORY TEXAS	SRA-TX
10437 (LT23B)	LAKE TAWAKONI 20 M DOWNSTREAM FROM SH 276 1638 M FROM WEST BANK	SRA-TX
21173 (LT23DN)	LAKE TAWAKONI IN WACO BAY EQUIDISTANT FROM FINGER POINT AND SPRING POINTS 1.17 KM BEARING 18.61 DEGREES FROM IRON BRIDGE PUMPING STATION	SRA-TX

Water Quality Conditions

The 2022 TCEQ Integrated Report lists South Fork Sabine River (AU 0507G_01) as impaired for bacteria. A completed RUAA supports the revision of this water body from PCR to SCR1 and TCEQ is awaiting approval from the
U.S. Environmental Protection Agency (EPA) of recreation use changes. Nonpoint source runoff from both natural and urban areas is a probable source of bacterial impairment in the South Fork. Nonpoint bacteria sources within this watershed include agriculture practices such as livestock grazing, the use of chicken litter and cow manure to fertilize hay pastures, wildlife including feral hogs, beaver, otter, and deer, and private septic systems. Elevated bacteria levels in surface water often occur with significant rainfall events that produce surface runoff. As runoff subsides and river levels return to base flows, bacteria levels decrease. Another possible source of bacterial impairment for this stream segment may come from two upstream wastewater discharges near Royse City.

The 2022 TCEQ Integrated Report indicated concerns in four assessment units of the Segment 0507 watershed: Cowleech Fork Sabine River (0507A_01, 0507A_02), Long Branch (0507B_01), and Caddo Creek (0507H_01). Cowleech Fork has a concern for chlorophyll-a, depressed dissolved oxygen, and nitrate. Long Branch has a concern for nitrate and Caddo Creek has concerns for depressed DO. Cowleech, Long Branch, South Fork, and Caddo Creek are all unclassified waterbodies.

Regression analyses at station 10434 (LT23A) indicated no parameters were significantly related to time.

Recommendations

The SRA-TX will coordinate and cooperate with stakeholders and provide education through public outreach activities and will continue water quality monitoring at the representative routine sites in this segment. These drainage systems flow through generally flat terrain with clay and sandy loam soils. The streams typically have low baseflows with short-lived spikes in flow following major rain events. Elevated bacteria and nutrient numbers coincide with sampling events that occurred during runoff events immediately following significant rain events. The *E. coli* impairment is currently classified as 5b, meaning a review of the standards for this segment will be conducted before a management strategy is selected. A completed recreation use attainability assessment (RUAA) supports the revision of this segment from primary contact recreation (PCR) to secondary contact recreation 1 (SCR1).

Lake Tawakoni

Segment 0508 - Adams Bayou Tidal--From the confluence with the Sabine River in Orange County to a point 1.1 kilometers (0.7 miles) upstream of IH 10 in Orange County.

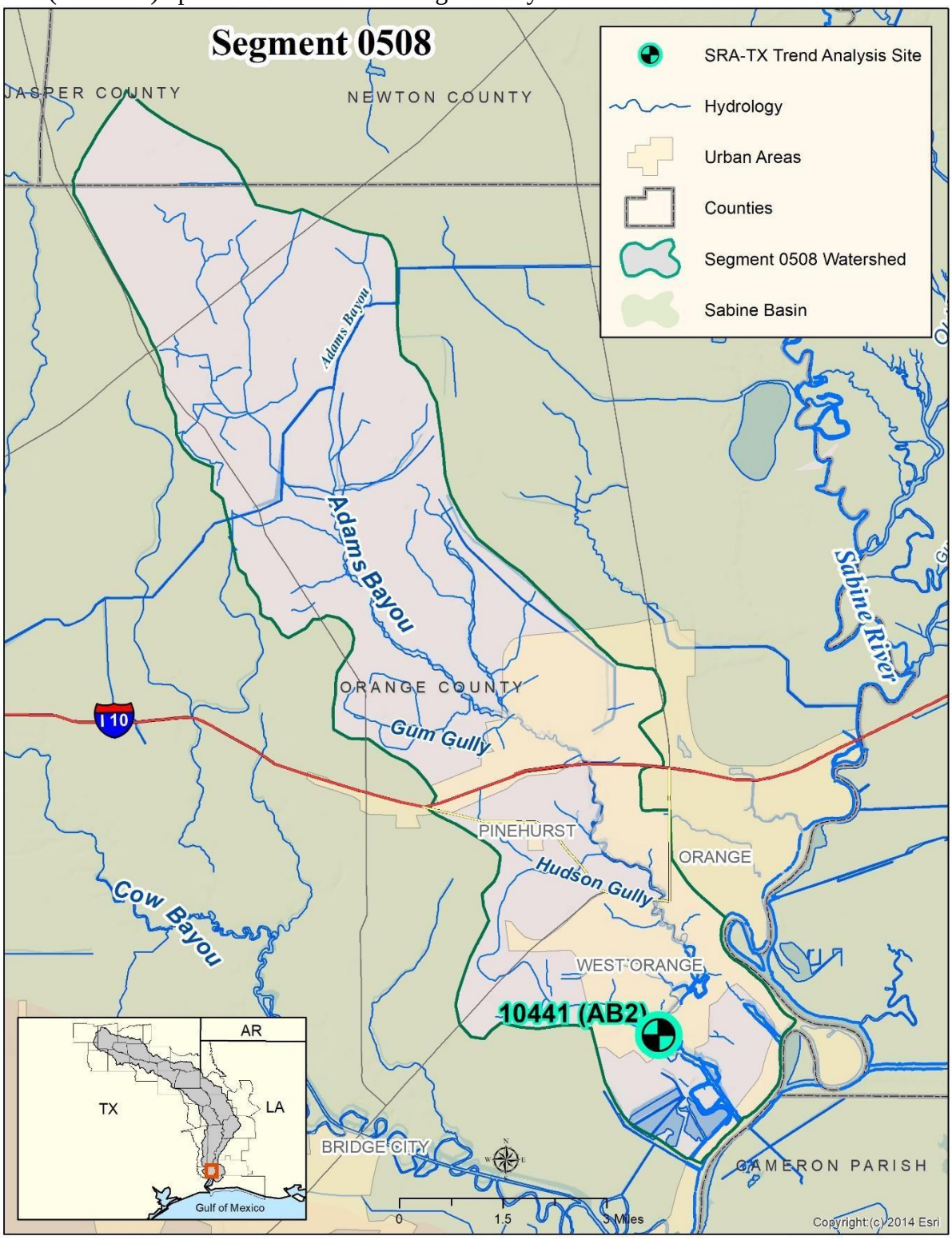


Figure 22. Map of Segment 0508 Adams Bayou Tidal

The Adams Bayou Tidal watershed, with a drainage area of 51 square miles, is located in the Western Gulf Coastal Plains ecoregion. This area is characterized by hay pastures, woody wetlands, and relatively flat terrain (Table 25). Unclassified water bodies include Gum Gully and Hudson Gully.

USGS maintains two gaging stations in Segment 0508 located on Adams Bayou at SH87 near Orange, TX and Adams Bayou at FM 3247 near Orange, TX. SRA-TX routinely samples at one site monthly for the CRP.

The watershed includes part of the City of Orange and has a significant rural population.

Adams Bayou Tidal is a tributary to the Sabine River Tidal (Segment 0501) watershed.

Spatial Analysis of Land Use

Table 25. Segment 0508 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	2.8
Developed, Open Space	13.1
Developed, Low Intensity	13.8
Developed, Medium Intensity	4.3
Developed, High Intensity	2.9
Barren Land	< 1
Herbaceous	2.8
Evergreen Forest	5.0
Mixed Forest	4.8
Scrub/Shrub	3.7
Woody Wetlands	19.6
Hay Pasture	21.0
Cultivated Crops	1.3
Deciduous Forest	< 1
Emergent Herbaceous Wetlands	4.8

*USGS - NLCD 2019

Table 26. Segment 0508 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
23	23,116	5	0	1	454

Table 27. Segment 0508 CRP Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10441 (AB2)	ADAMS BAYOU AT FM 1006	SRA-TX

Water Quality Conditions

The 2022 TCEQ Integrated Report indicates impairments for dissolved oxygen and bacteria in 0508. Segment 0508 is included in the OCTMDL project, initiated in 2002, to address these impairments. TCEQ adopted the original TMDL for indicator bacteria, DO and pH for Adams Bayou and its tributaries on June 13, 2007. The Implementation Plan (I-Plan) was adopted eight years later on August 5, 2015. Since the adoption of the I-Plan, SRA-TX has conducted routine water quality monitoring at one station within the Adams Bayou watershed under CRP. Beginning in FY2021, SRA-TX began collecting water quality data from several of the other original OCTMDL sampling stations under the TMDL Program. These stations have not been monitored since the original OCTMDL sampling program was completed. This additional data will be used to assess the current status of impairments to the primary contact recreation, aquatic life, and general uses in these waterbodies. An additional component of the project involving monthly grab sample collections to determine the tidal influence in Adams Bayou Above Tidal (0508A) and Gum Gully (0508B) took place during FY2021 and FY2022. In FY2024 two sites were added along the Sabine River: one site upstream of Adams Bayou and one downstream. These sites will be used by TCEQ in future modeling efforts.

Low DO and bacteria are naturally occurring in these slow moving flat bayou regions and not necessarily an indicator of human related impacts on water quality. Low DO occurs seasonally during the hot growing season, where some sections of the water system become isolated and stagnate, leading to pockets of near anoxic water. Following runoff producing rain events, these isolated pools of water are flushed through the bayou system. Slugs of low DO water moving through the bayou can cause stress to aquatic life.

Adams Bayou Tidal (0508) also has screening level concerns for DO in all assessment units and a concern for low pH in 0508_04.

Adams Bayou Above Tidal (0508A_01) is impaired for DO.

Gum Gully (0508B_01) is impaired for DO and bacteria.

Hudson Gully (0508C_01) is also impaired for DO and bacteria.

Regression analysis at station 10441 (AB2) indicated total phosphorus with a p value of 0.03 and total Kjeldahl nitrogen (TKN) with a p value of 0.006, were significantly related to time. Decreasing TP and TKN indicate that less nutrified runoff is reaching the water body. Less nutrified runoff and decreasing nutrient levels are positive trends for water quality and provide a more stable environment for aquatic life.

The TP values ranged from 0.03 mg/L to 0.35 mg/L with a mean of 0.17 mg/L, which is less than the TCEQ screening level for TP in tidal streams of 0.66 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 23).

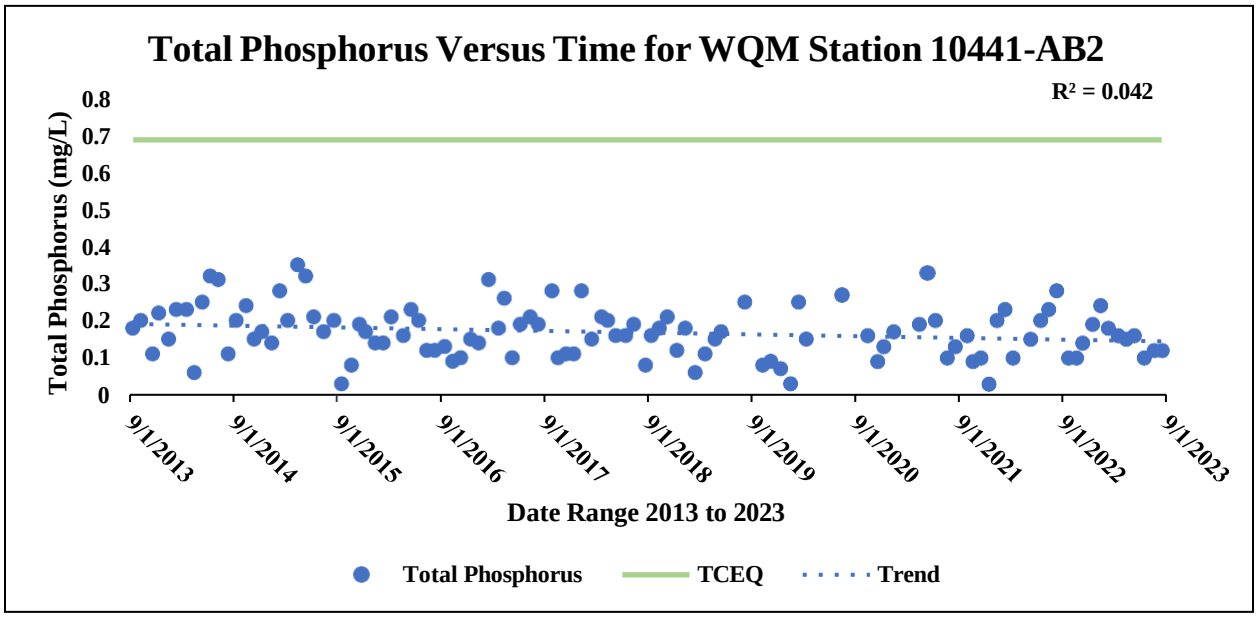


Figure 23. Phosphorus trend over time for station 10441-AB2 from September 2013 to August 2023.

The TKN values ranged from 0.1 mg/L to 2 mg/L with a mean of 0.99 mg/L (Figure 24).

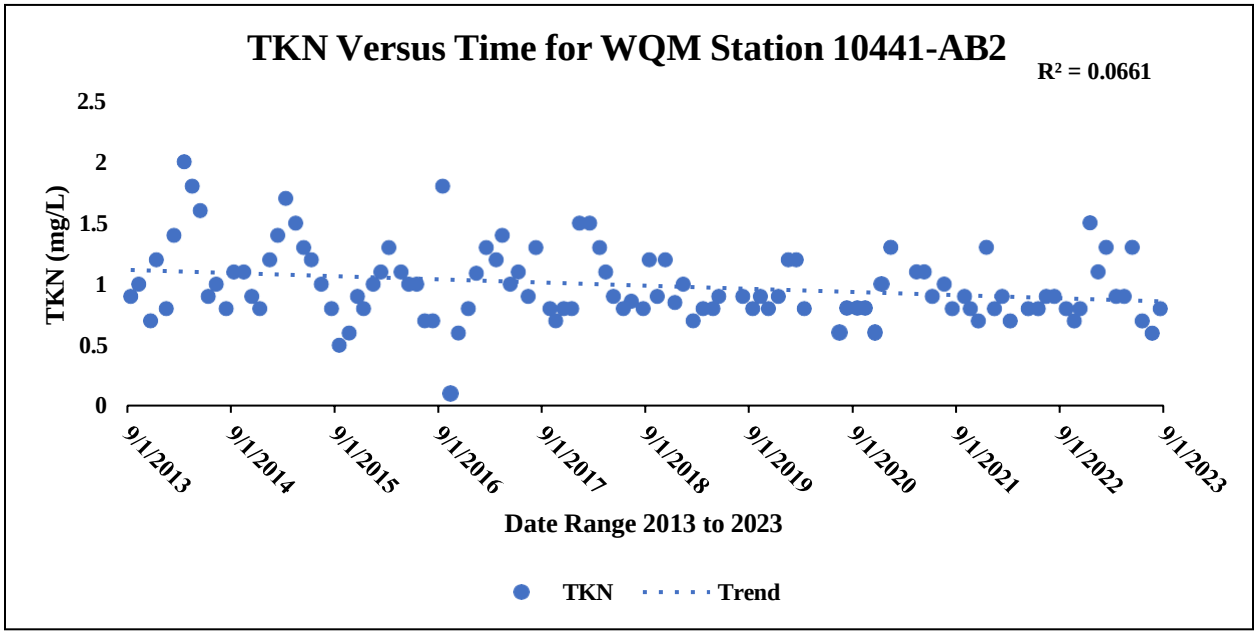


Figure 24. TKN trend over time for station 10441-AB2 from September 2013 to August 2023.

Recommendations

The SRA-TX will continue water quality monitoring at one site in this segment through CRP, along with other sites along Adams Bayou and its tributaries through TMDL to assess the current status of impairments in these waterbodies.

Adams Bayou south of Western Avenue

Segment 0509-Murvaul Lake--From Murvaul Dam in Panola County up to the normal pool elevation of 233.6 feet AMSL (impounds Murvaul Bayou).

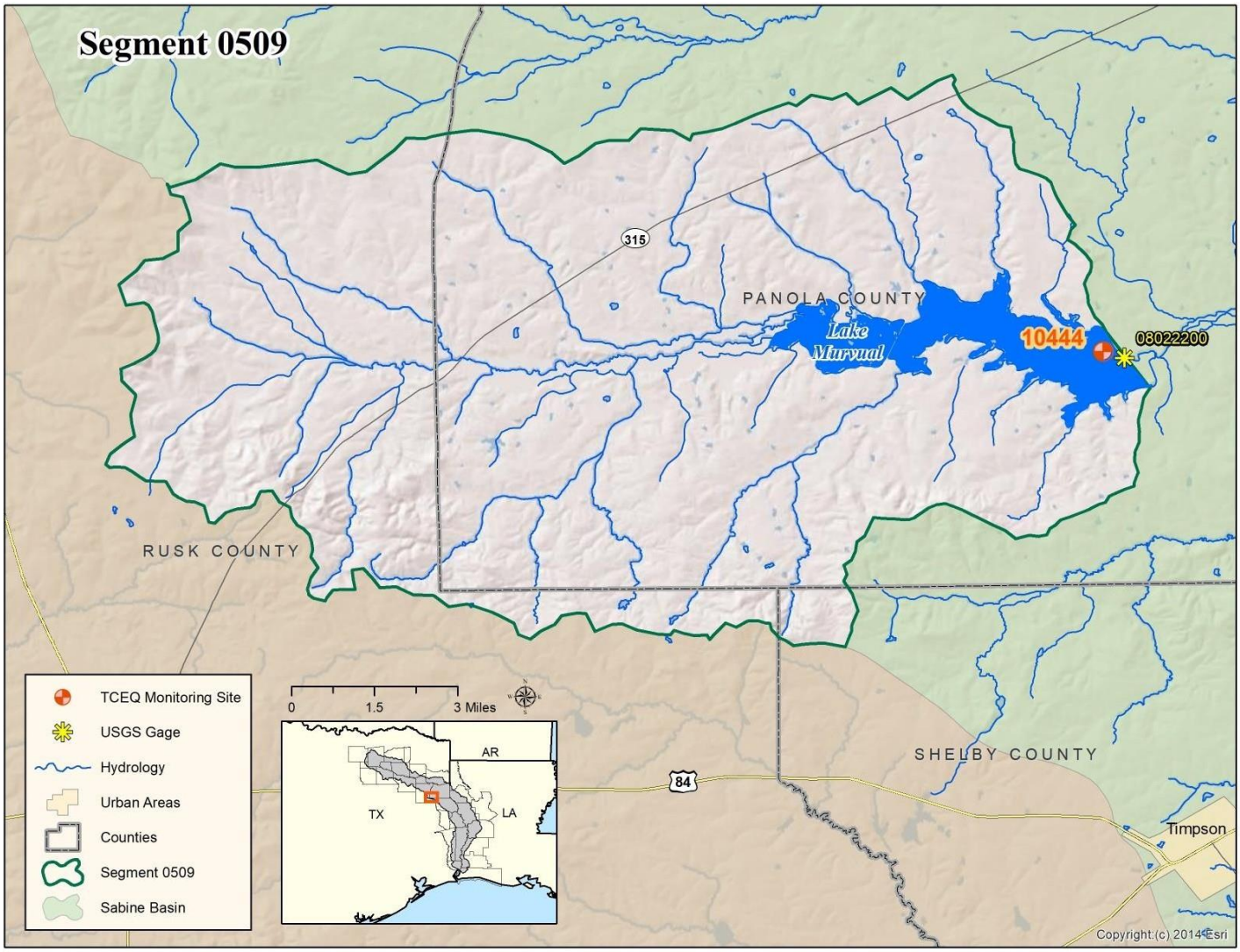


Figure 25. Map of Segment 0509 Murvaul Lake.

The Lake Murvaul watershed, with a drainage area of 201 square miles, is located in the South Central Plains ecoregion and is characterized by low rolling hills with hay pasture and mixed forest (Tables 28–29). The reservoir controlling authority is the Panola County Freshwater District. Water quality influences include residential, agricultural, and oil field activities. Lake Murvual, which is an old lake with a heavily populated shoreline, has a concern for excessive algal growth. Runoff from fertilized lawns and older septic systems are a likely source of enriched water introduced into the lake, leading to increased algal blooms and growth. These algal blooms can significantly reduce water clarity and potentially cause a decrease in DO levels as the algae dies off.

TCEQ monitors one site quarterly (Table 30).

Spatial Analysis of Land Use

Table 28. Segment 0509 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	4
Developed, Open Space	2.1
Developed, Low Intensity	1.9
Developed, Medium Intensity	<1
Developed, High Intensity	<1
Barren Land	<1
Herbaceous	1.1
Evergreen Forest	19.6
Mixed Forest	20.7
Scrub/Shrub	8.9
Woody Wetlands	3.6
Hay Pasture	22.6
Cultivated Crops	<1
Woody Wetlands	4.4
Deciduous Forest	10.8
Emergent Herbaceous Wetlands	<1

*USGS - NLCD 2019

Table 29. Segment 0509 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
3	2,499	0	0	0	21

Table 30. Segment 0509 TCEQ Monitoring Station.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10444	LAKE MURVAUL 40 M UPSTREAM OF CENTER DAM	TCEQ

Lake Murvaul at FM 1791

Segment 0510-Lake Cherokee—From Cherokee Dam in Gregg/Rusk County up to normal pool elevation of 280 feet AMSL (impounds Cherokee Bayou).

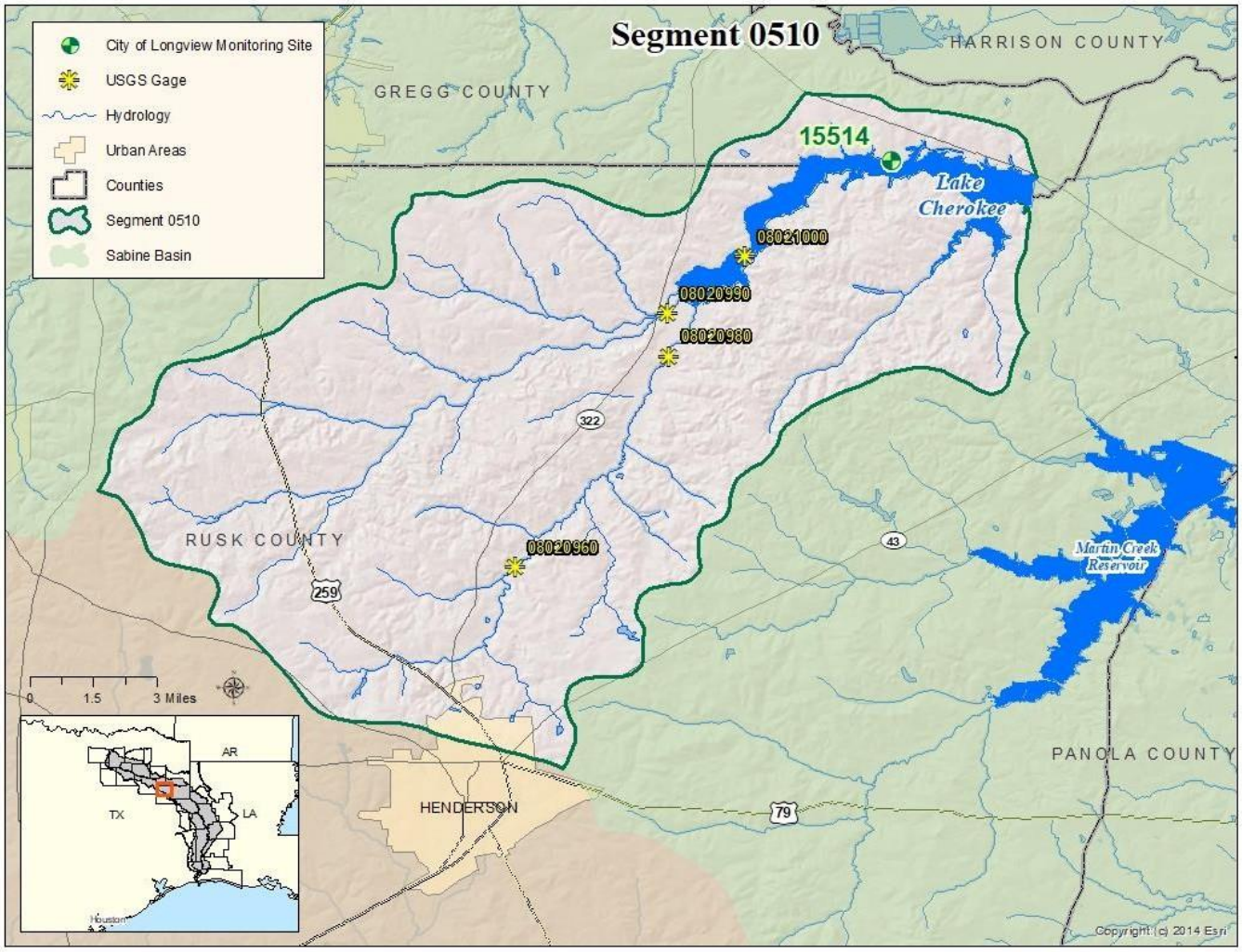


Figure 26. Map of Segment 0510 Lake Cherokee.

The Lake Cherokee watershed, with a drainage area of 201 square miles, is in the South Central Plains ecoregion and is characterized by low rolling hills with hay pastures and evergreen forests (Tables 31–32).

With a surface area of 3,987 acres, Lake Cherokee is owned and operated by the Cherokee Water Company to supply water for municipal, industrial, and recreational purposes. The City of Longview monitors one site nine times per year in this segment (Table 33). Significant water quality influences include industry (mining) and oil field activities.

Spatial Analysis of Land Use

Table 31. Segment 0510 Spatial Analysis

Delineated Land Use*	% Watershed Coverage
Open Water	4.2
Developed, Open Space	3.4
Developed, Low Intensity	5.1
Developed, Medium Intensity	<1
Developed, High Intensity	<1
Barren Land	1.1
Herbaceous	2.7
Evergreen Forest	19.3
Mixed Forest	7.1
Scrub/Shrub	11.4
Woody Wetlands	9.1
Hay Pasture	26
Cultivated Crops	<1
Woody Wetlands	9.7
Deciduous Forest	<1
Emergent Herbaceous Wetlands	4.2

*USGS - NLCD 2019

Table 32. Segment 0510 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
9	12,421	1	0	0	80

Table 33. Segment 0510 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
15514 (CHERO1)	LAKE CHEROKEE CITY OF LONGVIEW WATER INTAKE 2.51 MILES EAST OF FM 2963	LONGVIEW

Water Quality Conditions

The TCEQ 2022 Integrated Report indicated no impairments for Lake Cherokee (Segment 0510). There is one screening level concern for DO in 0510_02. This segment was removed from the 303(d) List for low pH in 2022.

Regression analyses at station 15514 (CHERO1) indicated sulfate and chloride were significantly related to time with p values of 0.03 and 0.0001 respectively. Decreasing trends were observed at each parameter. These decreasing trends indicate improved water quality most likely from decreased urban runoff or urban runoff that is less enriched. Elevated sulfate levels typically occur with lower lake levels during drought conditions.

Sulfate values ranged from 10 mg/L to 54 mg/L with a mean of 22.9 mg/L, which is less than the TSWQS of 50 mg/L. Five single grab exceedances were observed from FY 2013 to FY 2023 (Figure 27).

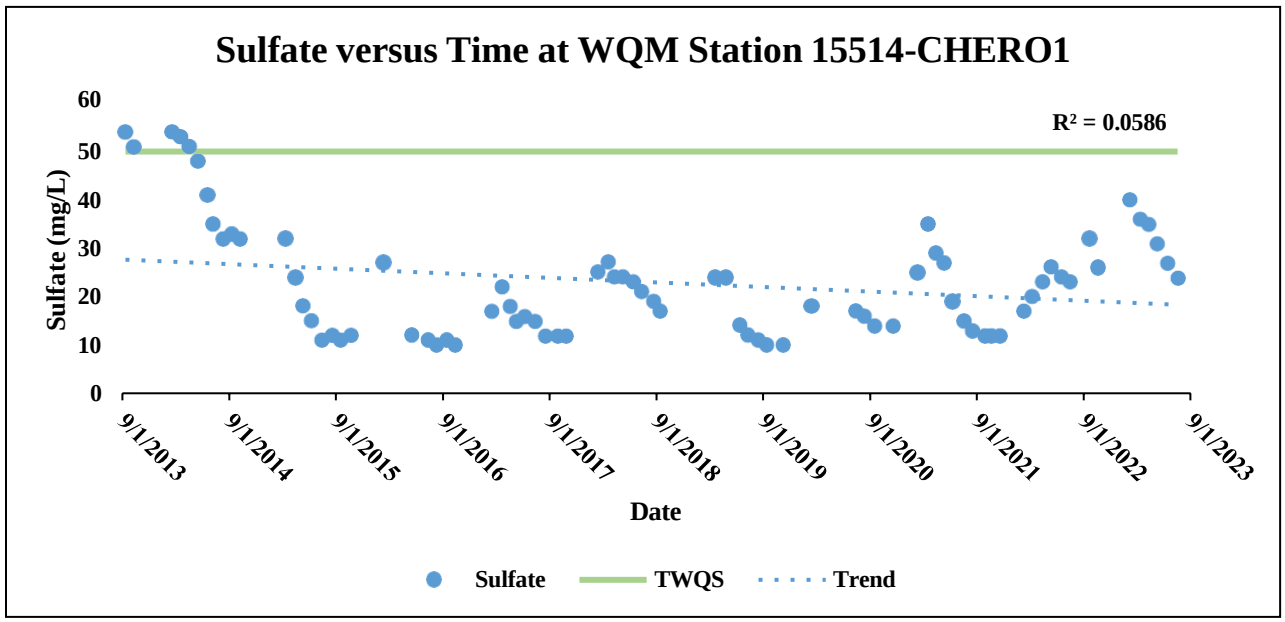


Figure 27. Sulfate trend over time at station 15514-CHERO1 from September 2013 to August 2023.

Chloride values ranged from 2.5 mg/L to 24 mg/L with a mean of 11.3 mg/L, which is less than the TSWQS of 75 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 28).

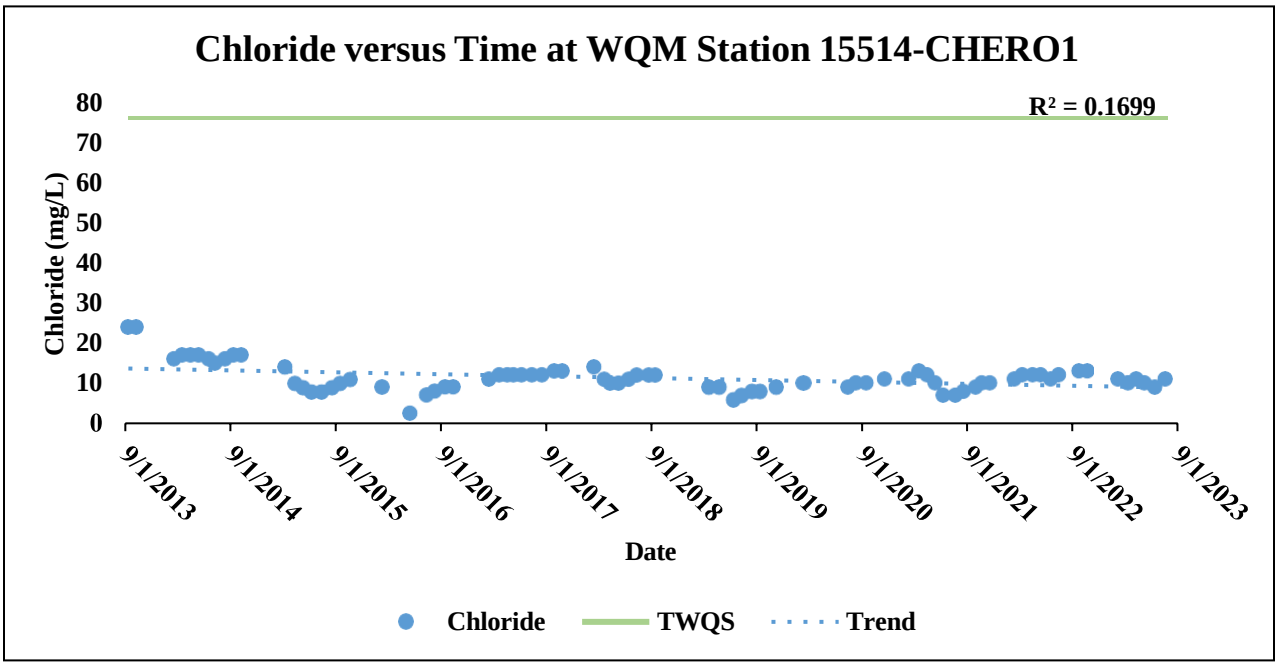


Figure 28. Chloride trend over time at station 15514-CHERO1 from September 2013 to August 2023.

Recommendations

The City of Longview will continue water quality monitoring at the representative routine site in this segment.

Segment 0511 - Cow Bayou Tidal--From the confluence with the Sabine River in Orange County to a point 4.8 kilometers (3.0 miles) upstream of IH 10 in Orange County.

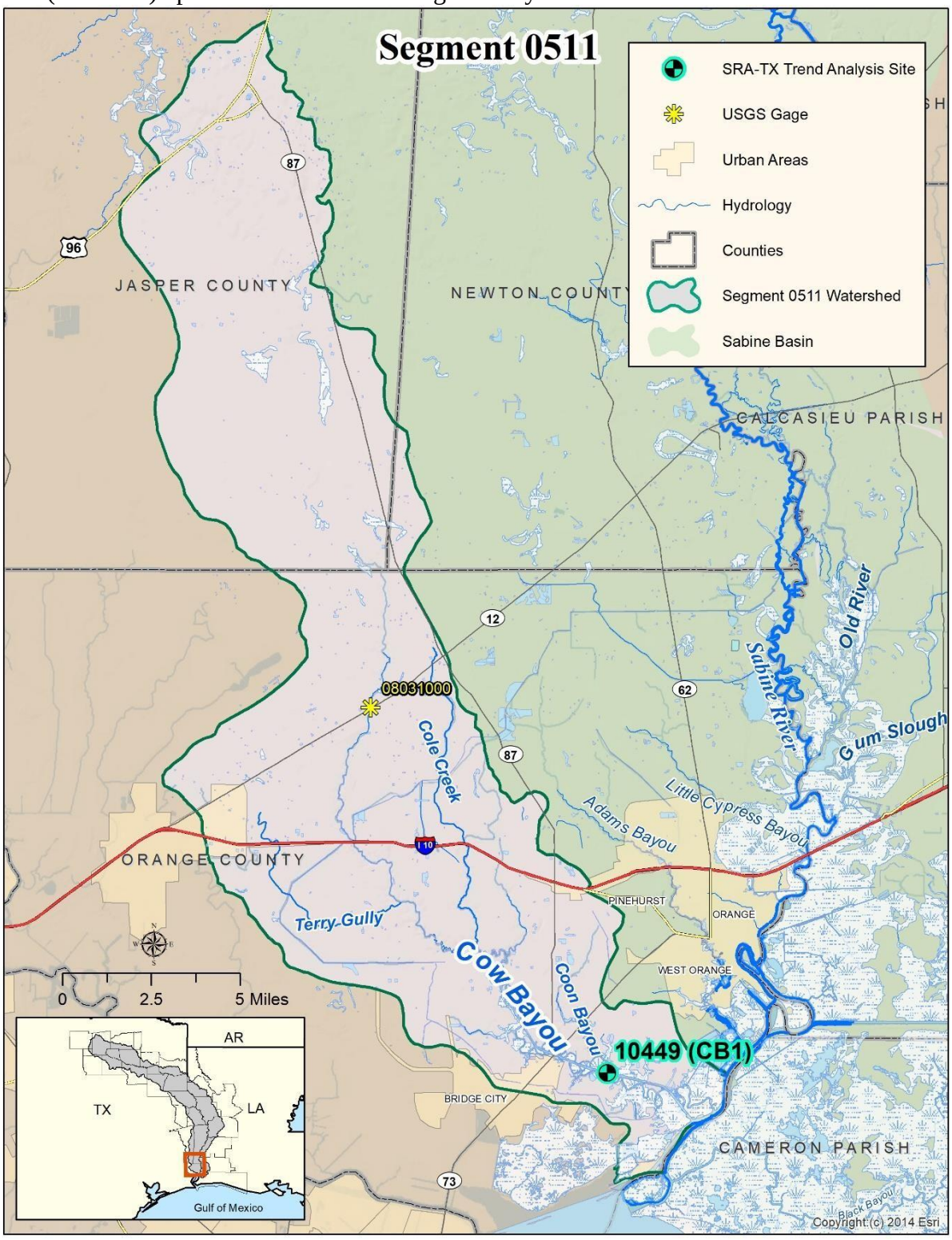


Figure 29. Map of Segment 0511 Cow Bayou Tidal.

The Cow Bayou Tidal watershed, with a drainage area of 193 square miles, is located in the Western Gulf Coastal Plains ecoregion. This rural area is characterized by woody wetlands, mixed forest, and relatively flat terrain (Tables 34–35). Unclassified water bodies include Coon Bayou, Cole Creek, and Terry Gully.

The USGS maintains five gaging stations in Segment 0511: Cow Bayou at SH 87 near Bridge City, TX; Cow Bayou at FM 1442 near Orangefield, TX; Cole Creek at IH 10 near Orange, TX; Cow Bayou at IH 10 near Vidor, TX; and Cow Bayou near Mauriceville, TX. SRA-TX routinely samples at one site monthly for the CRP (Table 36).

The watershed includes Bridge City and a large rural population.

Cow Bayou Tidal is included in the Sabine River Tidal (Segment 0501) watershed.

Spatial Analysis of Land Use

Table 34. Segment 0511 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	1.3
Developed, Open Space	9.4
Developed, Low Intensity	4.6
Developed, Medium Intensity	1.1
Developed, High Intensity	1.2
Barren Land	< 1
Herbaceous	7.7
Evergreen Forest	12.3
Mixed Forest	10.9
Scrub/Shrub	6.3
Woody Wetlands	32.3
Hay Pasture	7.9
Cultivated Crops	1.4
Deciduous Forest	<1
Emergent Herbaceous Wetlands	3.3

*USGS - NLCD 2019

Table 35. Segment 0511 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
47	26,084	21	0	1	135

Table 36. Segment 0511 CRP Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10449 (CB1)	COW BAYOU AT ROUNDBUNCH ROAD	SRA-TX

Water Quality Conditions

The 2022 TCEQ Integrated Report indicates concerns and impairments in five portions of the Segment 0511 watershed: Cow Bayou Tidal (0511), Cow Bayou above Tidal (0511A_02), Coon Bayou (0511B_01), Cole Creek (0511C_01), and Terry Gully (0511E_01). Cow Bayou Tidal (0511) has a screening level concern for DO, as well as impairments in bacteria, DO, and low pH. Cow Bayou Above Tidal (0511A_02) is impaired for DO. Coon Bayou (0511B_01) is impaired for DO and bacteria. Cole Creek (0511C_01) is impaired for DO. Terry Gully (0511E_01) is impaired for bacteria and has concerns for DO. Segment 0511 is included in the OCTMDL project, initiated in 2002, to address these impairments. TCEQ adopted the original TMDL for indicator bacteria, DO and pH for Cow Bayou and its tributaries on June 13, 2007. The Implementation Plan (I-Plan) was adopted eight years later on August 5, 2015. Since the adoption of the I-Plan, SRA-TX has conducted routine water quality monitoring at one station within the Cow Bayou watershed under CRP. Beginning in FY2021, SRA-TX began collecting water quality data from several of the other original OCTMDL sampling stations under the TMDL Program. These stations have not been monitored since the original OCTMDL sampling program was completed. This additional data will be used to assess the current status of impairments to the primary contact recreation, aquatic life, and general uses in these waterbodies. In FY2024 two sites were added along the Sabine River. One site upstream of Cow Bayou and one downstream. These sites will be used by TCEQ in future modeling efforts. Like Adams Bayou, this flat slow moving bayou system experiences naturally low DO during the summer months. The humid subtropical climate encourages robust plant life, and the increased plant biomass is a significant source of organic loading to the bayou system. As the organic load is broken down, the DO demand increases. This organic loading, combined with the increased temperature during the hot summer months leads to periods of seasonally low DO.

Regression analysis at station 10449 (CB1) indicated TKN, with a p value of 0.04, was significantly related to time. A decreasing trend of TKN indicates that less nutrified runoff is reaching the water body. Less nutrified runoff and decreasing nutrient levels are positive trends for water quality and provide a more stable environment for aquatic life.

The TKN values ranged from 0.1 mg/L to 2 mg/L with a mean of 0.99 mg/L (Figure 30).

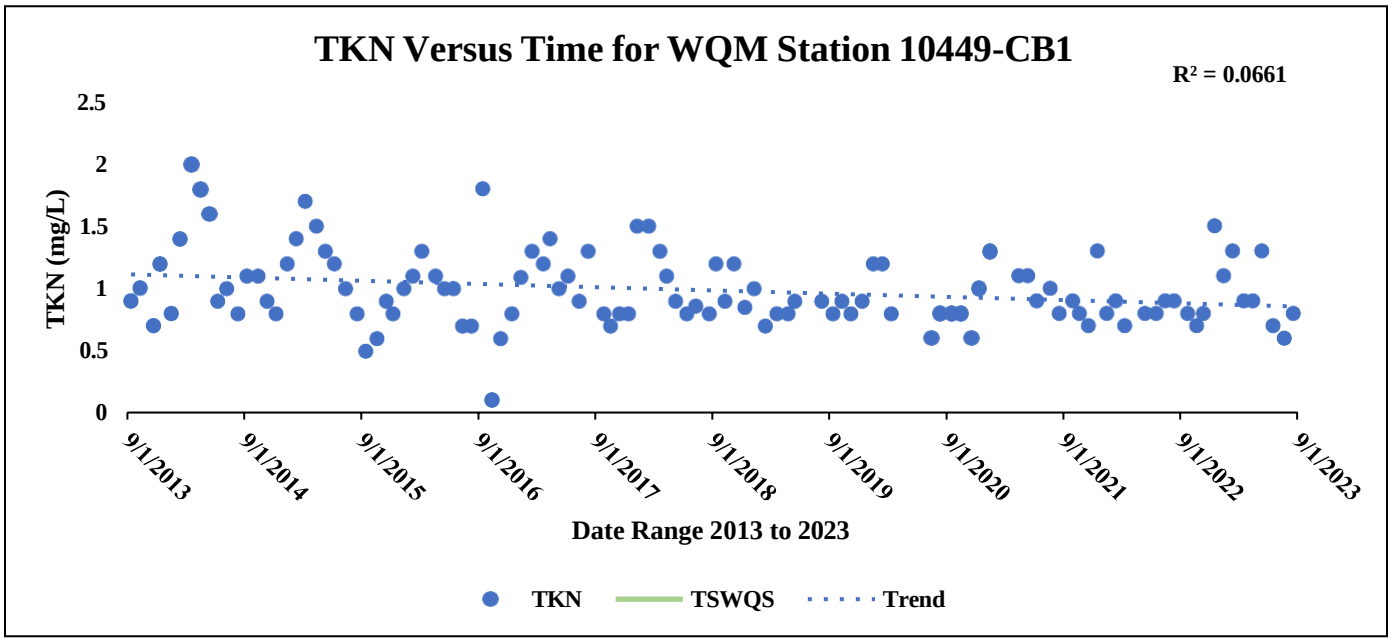


Figure 30. TKN trend over time at station 10449-CB1 from September 2013 to August 2023.

Recommendations

The SRA-TX will continue water quality monitoring at one site in this segment through CRP, along with other sites along Cow Bayou and its tributaries through TMDL to assess the current status of impairments in these waterbodies.

Cow Bayou at FM 1006

Segment 0512-Lake Fork Reservoir—From Lake Fork Dam in Wood County up to normal pool elevation of 403 feet AMSL (Impounds Lake Fork Creek).

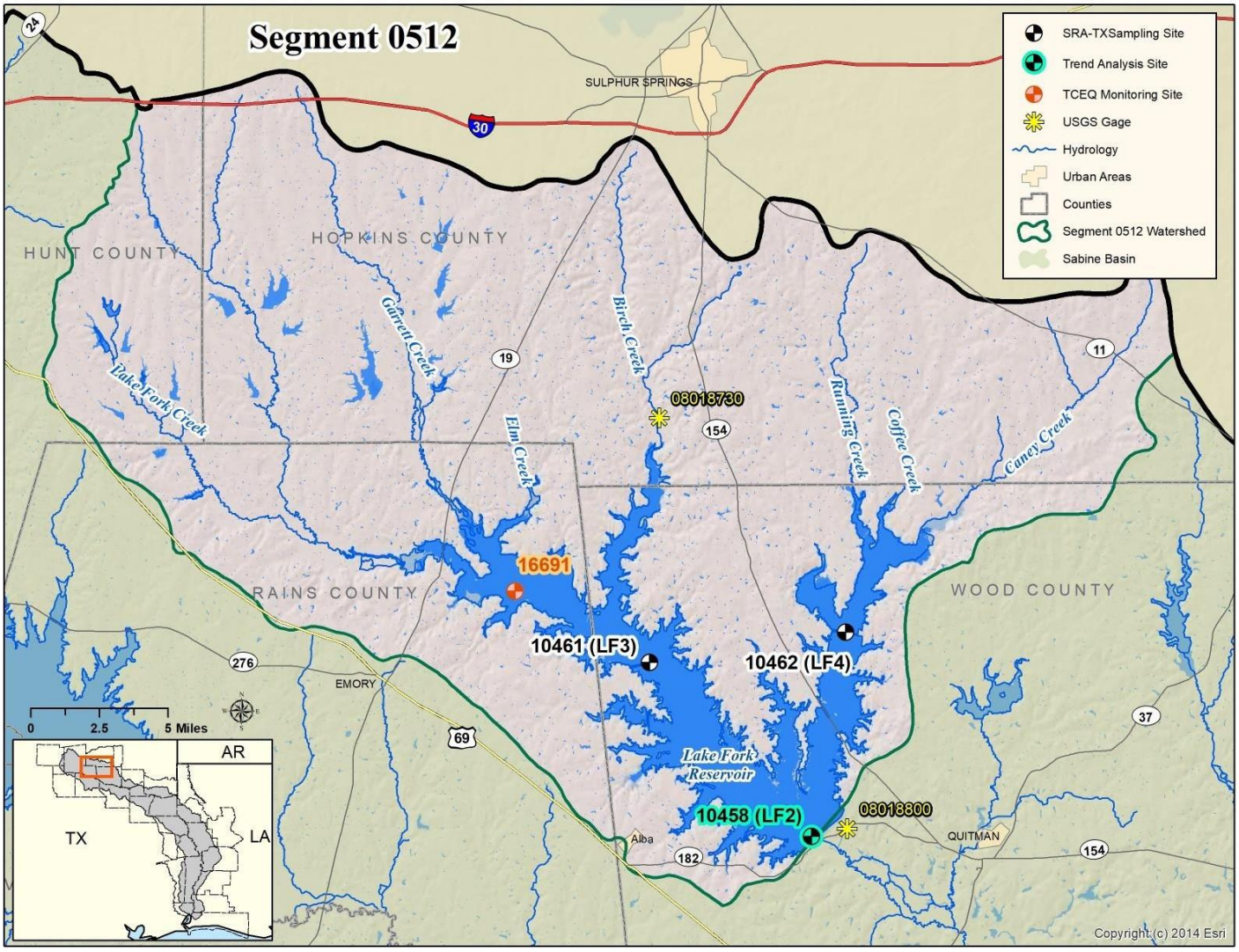


Figure 31. Map of Segment 0512 Lake Fork Reservoir.

Lake Fork Reservoir has 315 miles of shoreline and a surface area of 27,690 acres at a conservation pool elevation of 403 feet AMSL. Lake Fork, Garrett, Elm (0512B), Birch, Running (0512A), Coffee, Glade, Little Caney, and Caney Creeks are the major tributaries that contribute to the 438 square miles of the Lake Fork Reservoir drainage area.

Lake Fork Reservoir is located in the East Central Texas Plains and South Central Plains ecoregions. This segment is characterized by low rolling hills with pastures, wetlands, and deciduous forests (Tables 37–38). This area is largely rural with numerous dairies.

The SRA-TX routinely monitors three sites monthly and the TCEQ monitors one site quarterly in this segment (Table 39).

Table 37. Segment 0515 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	< 1
Developed, Open Space	3.5
Developed, Low Intensity	2.1
Developed, Medium Intensity	< 1
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	12.1
Evergreen Forest	34.7
Mixed Forest	2.6
Scrub/Shrub	11.2
Woody Wetlands	30.1
Hay Pasture	3.2
Cultivated Crops	< 1
Deciduous Forest	<1
Emergent Herbaceous Wetlands	< 1

*USGS - NLCD 2019

Table 38. Segment 0512 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
45	20,018	2	0	0	45

Table 39. Segment 0512 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10458 (LF2)	LAKE FORK RESERVOIR NEAR DAM IN CREEK CHANNEL	SRA-TX
10461 (LF3)	LAKE FORK RESERVOIR MID-ARM IN CANEY CREEK ARM AT FM 515	SRA-TX
10462 (LF4)	LAKE FORK RESERVOIR MID COVE IN LAKE FORK CREEK ARM AT FM 515	SRA-TX
16691	LAKE FORK RESERVOIR 3.7 KM UPSTREAM OF FM 2946 AT BUOY 63 NEAR THE OLD LAKE FORK CREEK CHANNEL	TCEQ

Water Quality Conditions

The 2022 TCEQ Integrated Report indicated no impairments to the main classified water body of Lake Fork Reservoir in Segment 0512.

Running Creek (0512A_01), an unclassified perennial stream, and Elm Creek (0512B_01), an unclassified intermittent stream with pools, are listed as impaired for bacteria. There are a large number of dairy farms in this region that are a likely source of bacteria. A RUAA to address bacteria listings has been completed on each of these creeks and TCEQ is awaiting EPA approval of recreation use changes for these water bodies. More information on the RUAA can be found at the TCEQ Recreational Use Attainability Analyses website[3]. In addition to the bacteria impairment, Running Creek has concerns for DO, nitrate, and ammonia. Elm Creek has concerns for DO and ammonia.

Regression analyses at station 10458 (LF2) indicated TDS, sulfate, chloride, and chlorophyll *a* were significantly related to time with p values of 0.001, 0.0001, 0.000002, and 0.001 respectively. Trend analyses showed decreasing trends for TDS, chloride, and sulfate and an increasing trend for chlorophyll *a*. Lower lake levels and lack of fresh inflow during drought conditions typically correspond to increased TDS, chloride, and sulfate values. Runoff from agricultural fields around the lake can bring in an influx of nutrients causing explosions of

[3] https://www.tceq.texas.gov/waterquality/standards/ruaas/multisabine05, accessed 3/7/2019

algal blooms. These algal blooms bring large amounts of chlorophyll *a*. This increase of algae and other aquatic plants can cause decreasing levels of dissolved oxygen hindering aquatic life in the area.

TDS values ranged from 64.35 mg/L to 170.95 mg/L with a mean of 101.32 mg/L, which is below the TSWQS of 200 mg/L. No single grab exceedances were observed from FY 2013 to FY2023 (Figure 32).

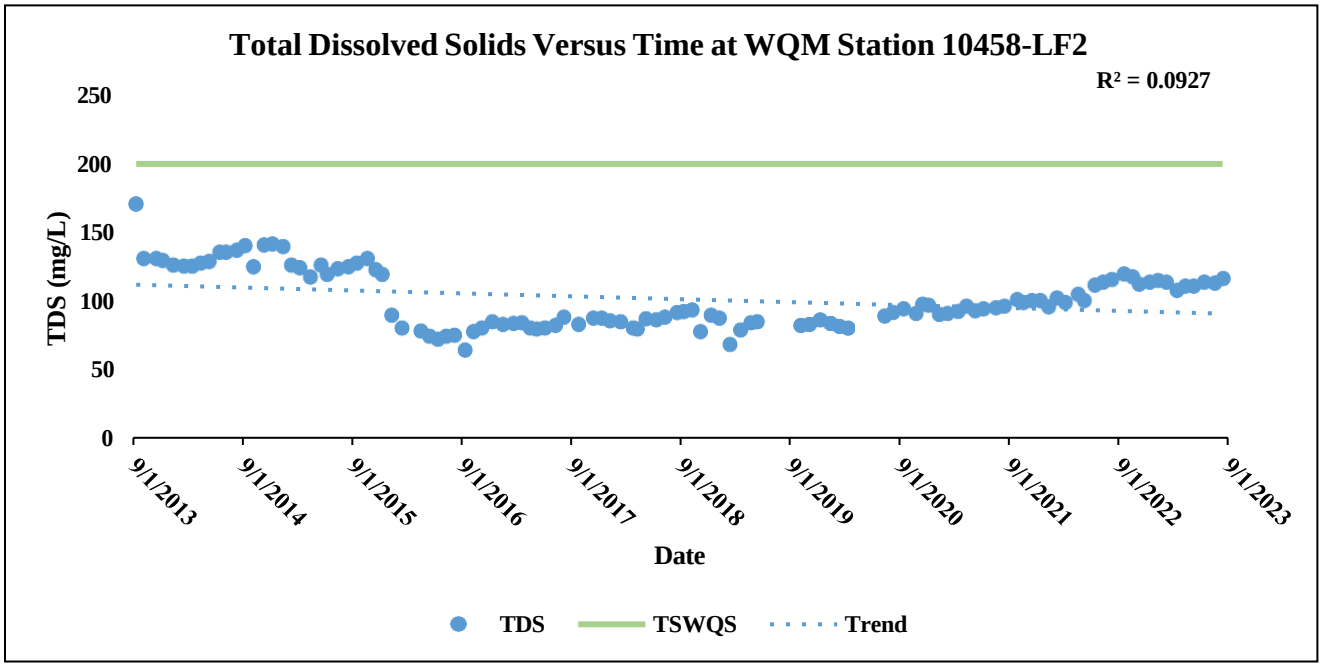


Figure 32. TDS trend over time at station 10458-LF2 from September 2013 to August 2023.

Sulfate values ranged from 9 mg/L to 27 mg/L with a mean of 16.6 mg/L, which is below the TSWQS of 50 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 33).

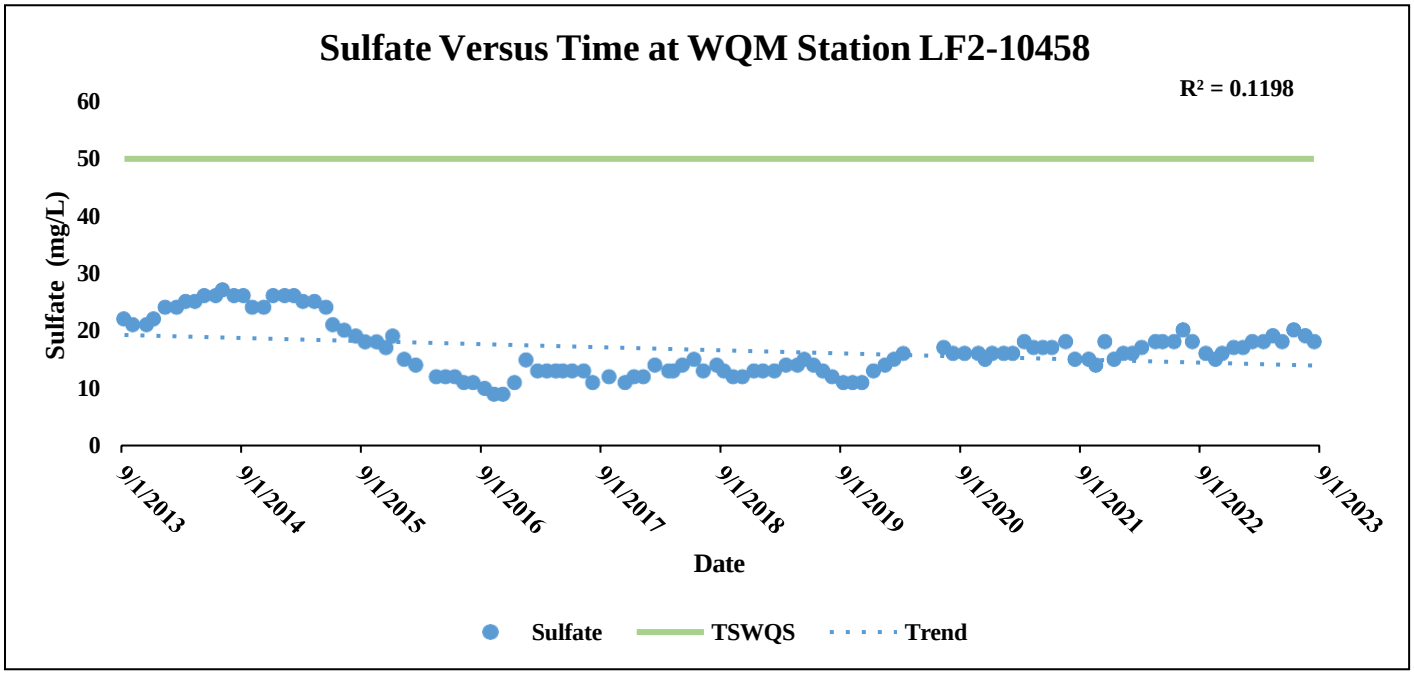


Figure 33. Sulfate trend over time at station 10458-LF2 from September 2013 to August 2023.

Chloride values ranged from 8 mg/L to 21 mg/L with a mean of 12.8 mg/L, which is below the TSWQS of 50 mg/L. No single grab exceedances were observed from FY 2013 to FY2023 (Figure 34).

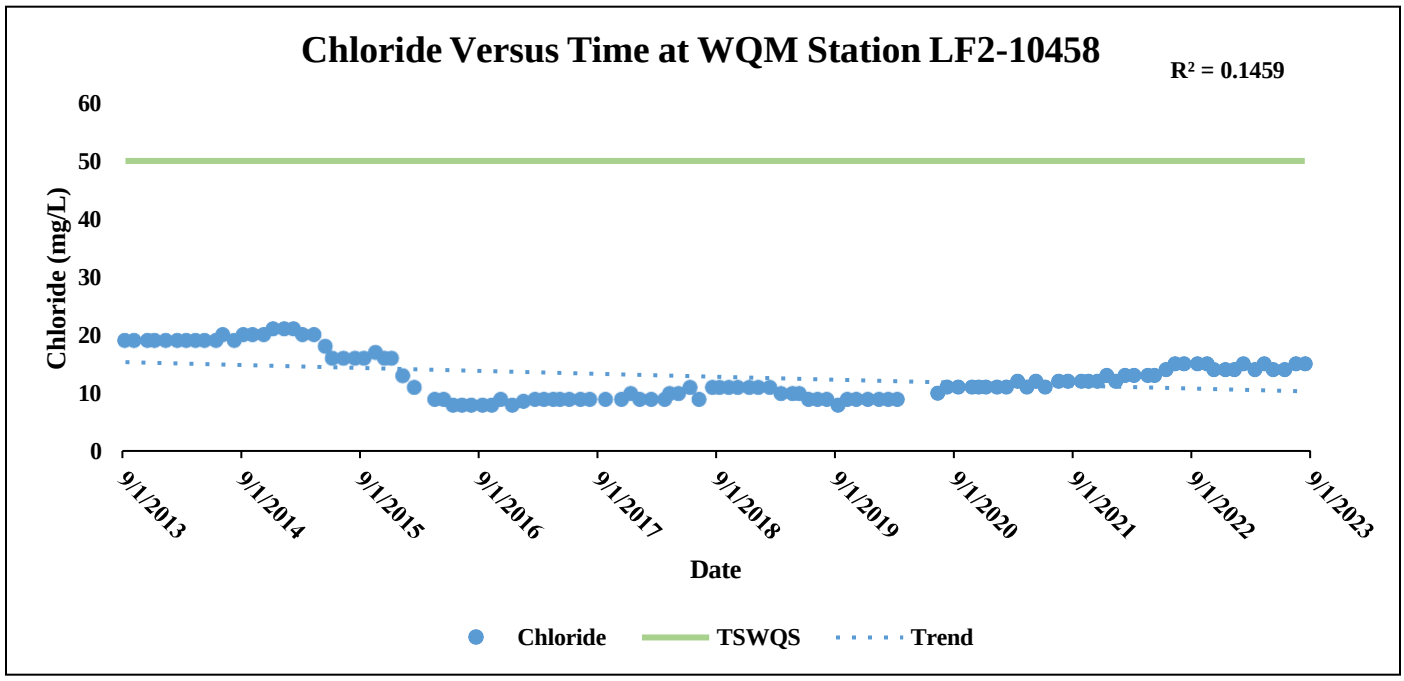


Figure 34. Chloride trend over time at station 10458-LF2 from September 2013 to August 2023.

Chlorophyll *a* values ranged from 3 µg/L to 45 µg/L with a mean of 15 µg/L, which is below the TCEQ screening levels for chlorophyll *a* in reservoirs of 26.7 µg/L. Thirteen single grab exceedances were observed from FY 2013 to FY 2023 (Figure 35).

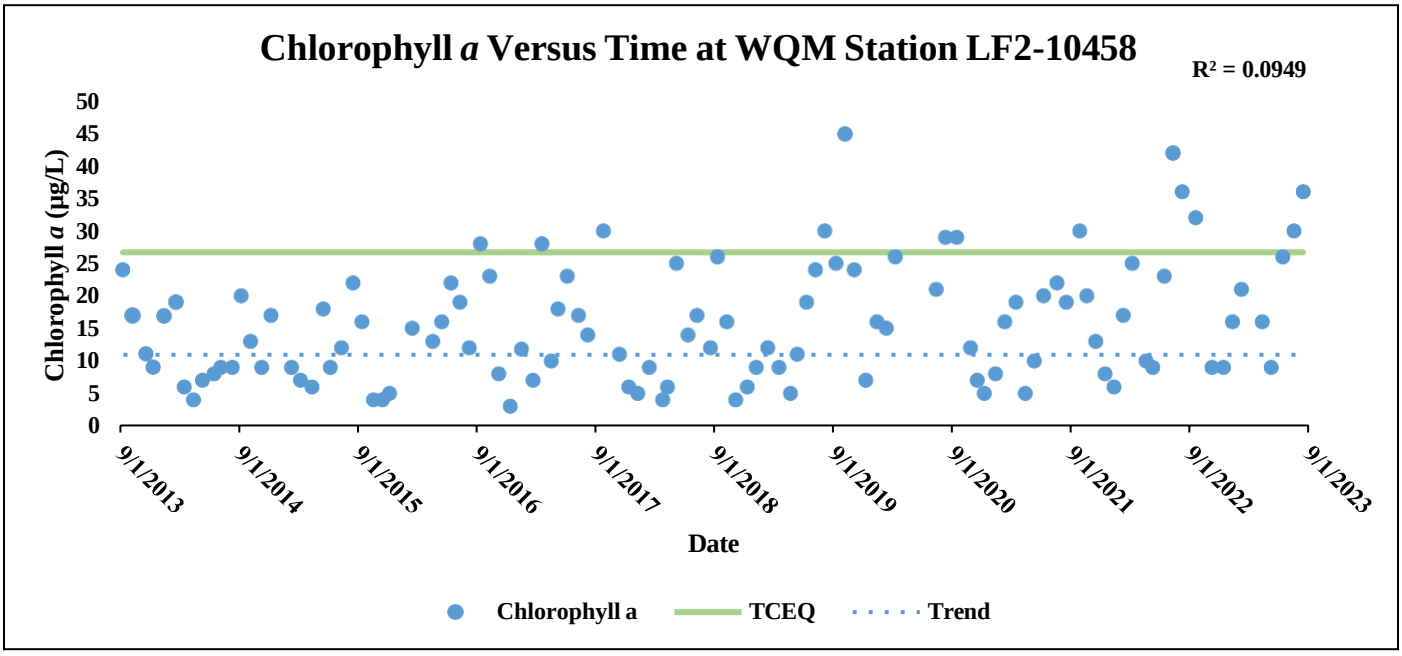


Figure 35. Chlorophyll *a* trend over time at station 10458-LF2 from September 2013 to August 2023.

Recommendations

The SRA-TX will continue water quality monitoring at routine sites in this segment. SRA continues to respond to any issues that occur on the dairy farm operations in this area. Responding to issues, such as a failed settling pond dam, provides an opportunity to work with the dairy farm operators to improve management practices and provide education about improved dairy farm operations that can decrease enriched runoff.

Lake Fork Reservoir

Segment 0513-Big Cow Creek--From the confluence with the Sabine River in Newton County to a point 4.6 kilometers (2.9 miles) upstream of CR 255 in Newton County.

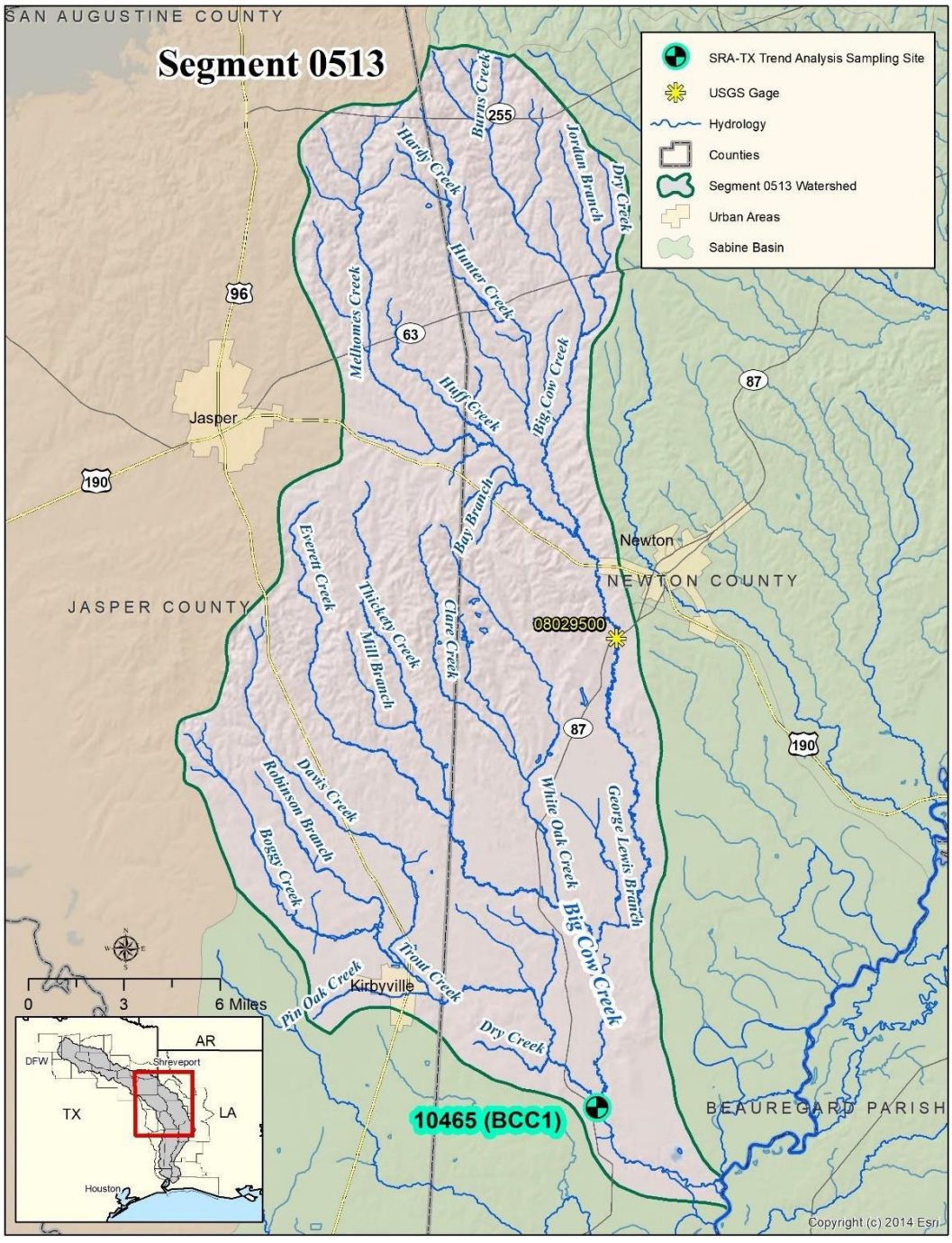


Figure 36. Map of Segment 0513 Big Cow Creek.

The Big Cow Creek watershed, with a drainage area of 349 square miles, is located in the Western Gulf Coastal Plains ecoregion. This region is characterized by evergreen forest, woody wetlands, and small rolling hills to the north and flatlands to the south. Segment 0513 is largely rural with no major industries or cities (Tables 40–41).

The USGS maintains two gaging stations on Big Cow Creek at FM 1416 near Call, TX and Big Cow Creek near Newton, TX. SRA-TX routinely samples at one site monthly for the CRP (Table 42).

This segment is a tributary of the Sabine River above Tidal (Segment 0502).

Spatial Analysis of Land Use

Table 40. Segment 0513 Spatial Analysis

Delineated Land Use*	% Watershed Coverage
Open Water	< 1
Developed, Open Space	3.5
Developed, Low Intensity	2.1
Developed, Medium Intensity	< 1
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	12.1
Evergreen Forest	34.7
Mixed Forest	2.6
Scrub/Shrub	11.2
Woody Wetlands	30.1
Hay Pasture	3.2
Cultivated Crops	< 1
Deciduous Forest	<1
Emergent Herbaceous Wetlands	< 1

*USGS - NLCD 2019

Table 41. Segment 0513 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
4	8,561	2	0	1	24

Table 42. Segment 0513 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10465 (BCC1)	BIG COW CREEK AT FM 1416 SOUTH OF BON WIER	SRA-TX

Water Quality Conditions

The 2022 TCEQ Integrated Report indicated an impairment for bacteria in water and a use concern of lead in water.

Regression analysis at station 10465 (BCC1) indicated TDS, *E. coli* and chloride were significantly related to time. The p values of TDS, E. coli, and chloride were 0.003, 0.02, and 0.09 respectively. This decreasing *E. coli* trend could point to a positive change as septic systems are updated and permitted discharges are more consistently meeting required criteria.

The TDS values ranged from 13.6 mg/L to 42.9 mg/L with a mean of 25.3 mg/L, which is below the TSWQS of 300 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 37).

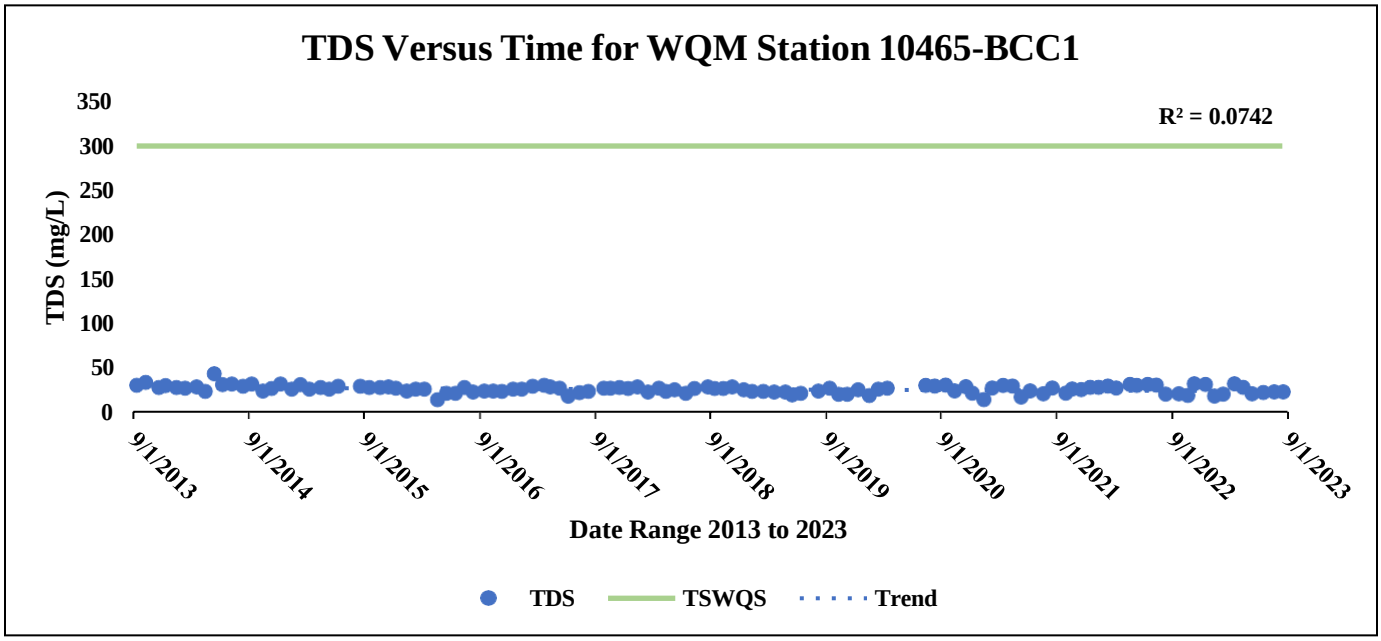


Figure 37. TDS trend over time at station 10465-BCC1 from September 2013 to August 2023.

The *E. coli* values ranged from 16 MPN/100 mL to >2400 MPN/100 mL with a geomean of 146.2 MPN/100mL, which exceeds the TSWQS geomean exceedance of 126 MPN/100 mL. Twenty-seven single grab exceedances were observed FY 2013 to FY 2023 (Figure 38).

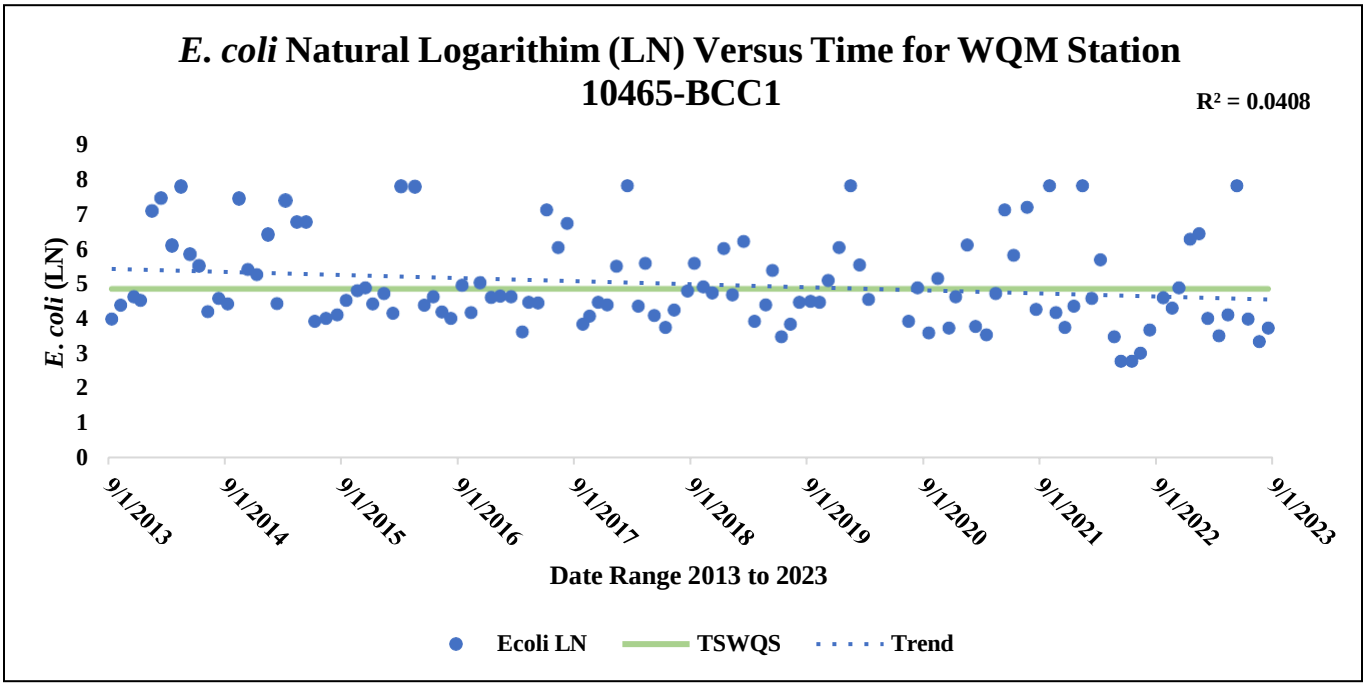


Figure 38. *E. coli* LN trend over time at station 10465-BCC1 from September 2013 to August 2023.

The chloride values ranged from 2.5 mg/L to 66 mg/L with a mean of 5.6 mg/L, which is below the TSWQS of 75 mg/L. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 39).

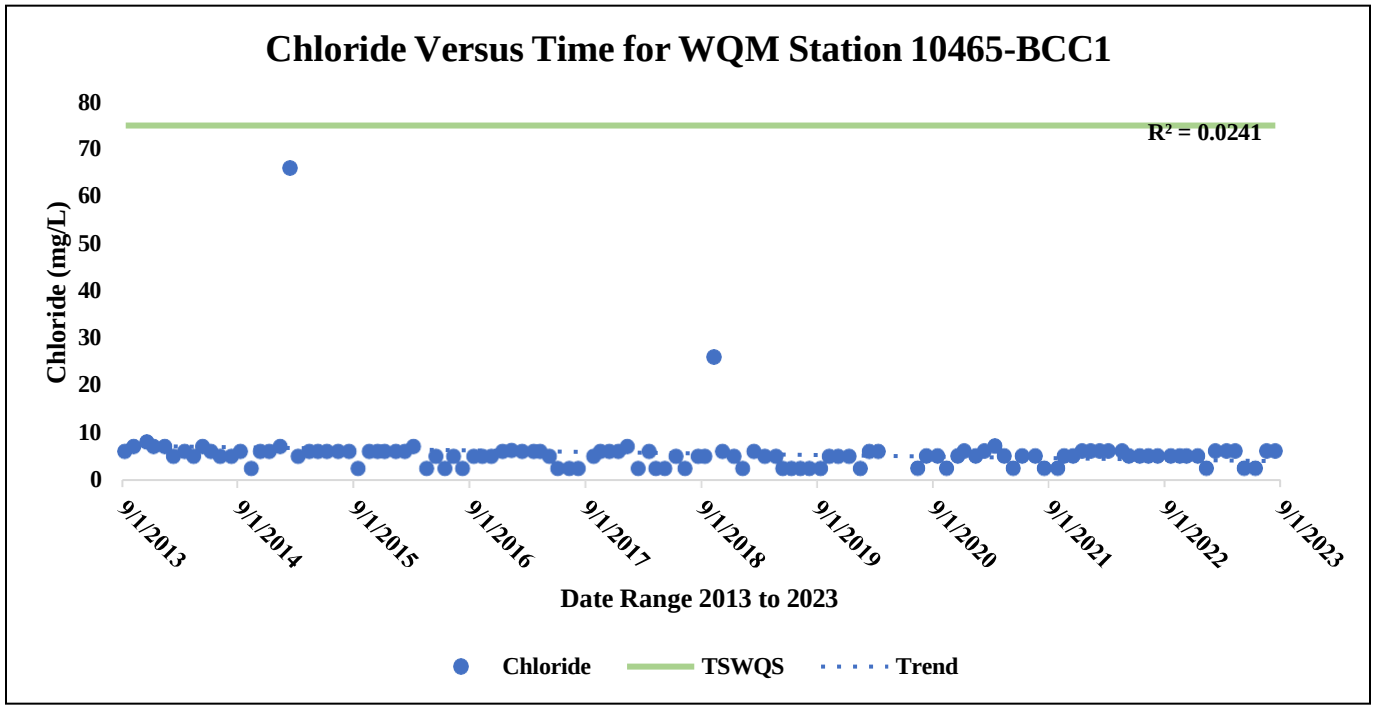


Figure 39. Chloride trend over time at station 10465-BCC1 from September 2013 to August 2023.

Recommendations

The SRA-TX will continue water quality monitoring at the representative routine sites in this segment. At this time, the source and cause of the lead is unknown, and SRA-TX will continue monitoring future trends. Although lead levels remain relatively low, SRA will continue to stay informed of watershed activities and keep an eye on increasing lead in the water system.

Big Cow Creek at FM 1416

Segment 0514-Big Sandy Creek—From the confluence with the Sabine River in Upshur County to a point 206 kilometers (1.6 miles) upstream of SH 11 in Hopkins County.

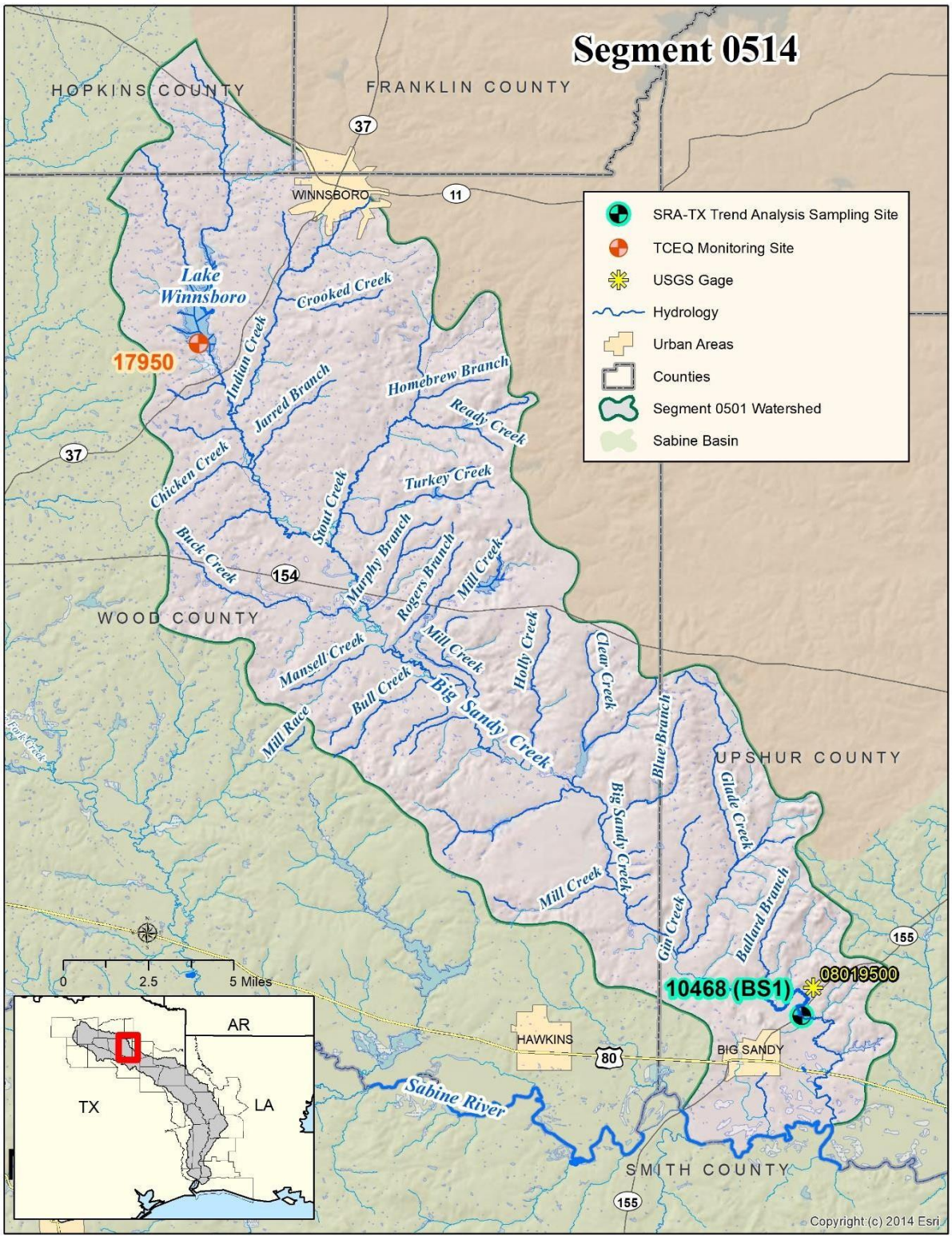


Figure 40. Map of Segment 0514 Big Sandy Creek.

The Big Sandy Creek watershed is 58 miles long, has an approximate drainage area of 245 square miles, and is in the South Central Plains ecoregion. This watershed is characterized by low rolling hills, deciduous forest, hay pastures, woody wetlands, and is predominately rural (Table 43). The cities of Big Sandy, Winnsboro, and the community of Holly Lake are located within this watershed, and all have a population of less than 5,000 (Table 44).

The USGS maintains one flow monitoring station on Big Sandy Creek located on SH 155 north of Big Sandy, TX. The SRA-TX routinely samples one site monthly and TCEQ samples one site quarterly in this segment (Table 45).

Spatial Analysis of Land Use

Table 43. Segment 0514 Spatial Analysis

Delineated Land Use*	% Watershed Coverage
Open Water	1.2
Developed, Open Space	1.4
Developed, Low Intensity	6.2
Developed, Medium Intensity	< 1
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	<1
Evergreen Forest	8.9
Mixed Forest	< 1
Scrub/Shrub	10.3
Woody Wetlands	12.9
Hay Pasture	25.2
Cultivated Crops	2.4
Deciduous Forest	30.6
Emergent Herbaceous Wetlands	< 1

*USGS - NLCD 2019

Table 44. Segment 0514 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
7	15,937	5	0	0	65

Table 45. Segment 0514 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10468 (BS1)	BIG SANDY CREEK 70M DOWNSTREAM FROM SH 155 NORTHWEST OF BIG SANDY TX	SRA-TX
17950	LAKE WINNSBORO IN MAIN POOL 0.4 KM NORTH NORTHWEST OF CENTER OF DAM STRUCTURE 9.7 KM SOUTHWEST OF WINNSBORO	TCEQ

Water Quality Conditions

First listed in 2006, this segment remains on the 2022 TCEQ Integrated Report for a bacteria impairment. Elevated bacteria levels are consistently observed at this site during periods of increased flows and turbidity from rainfall runoff. Given the low population density of the segment, agricultural runoff from chicken house and cattle operations is the likely source of bacteria. The upper AU, 0514_02, also showed levels of high pH. The high pH could possibly be caused by runoff from chicken house facilities.

Regression analyses at station 10468 (BS1) indicated pH, TP, and sulfate were significantly related to time. An increasing trend was observed for pH and decreasing trends were observed for TP and sulfate. Extremely acidic (low pH) or basic (high pH) values can be lethal to most fish species. Although the trend of pH at 10468 is increasing, it falls well within the TSWQS criteria. High levels of phosphorus in a water body can cause large amounts of growth in plants and algae creating low dissolved oxygen levels and potential problems for aquatic species. These parameters greatly affect the growth and nutrient intake of aquatic organisms under high values and can ultimately lead to death. The current cause of these trends is unknown, but the decreasing trend of TP and sulfate indicate water quality is improving over time.

The pH values ranged from 6.0 to 7.8 units with a median of 6.8 units. No single grab exceedances were observed from FY 2013 to FY 2023 (Figure 41).

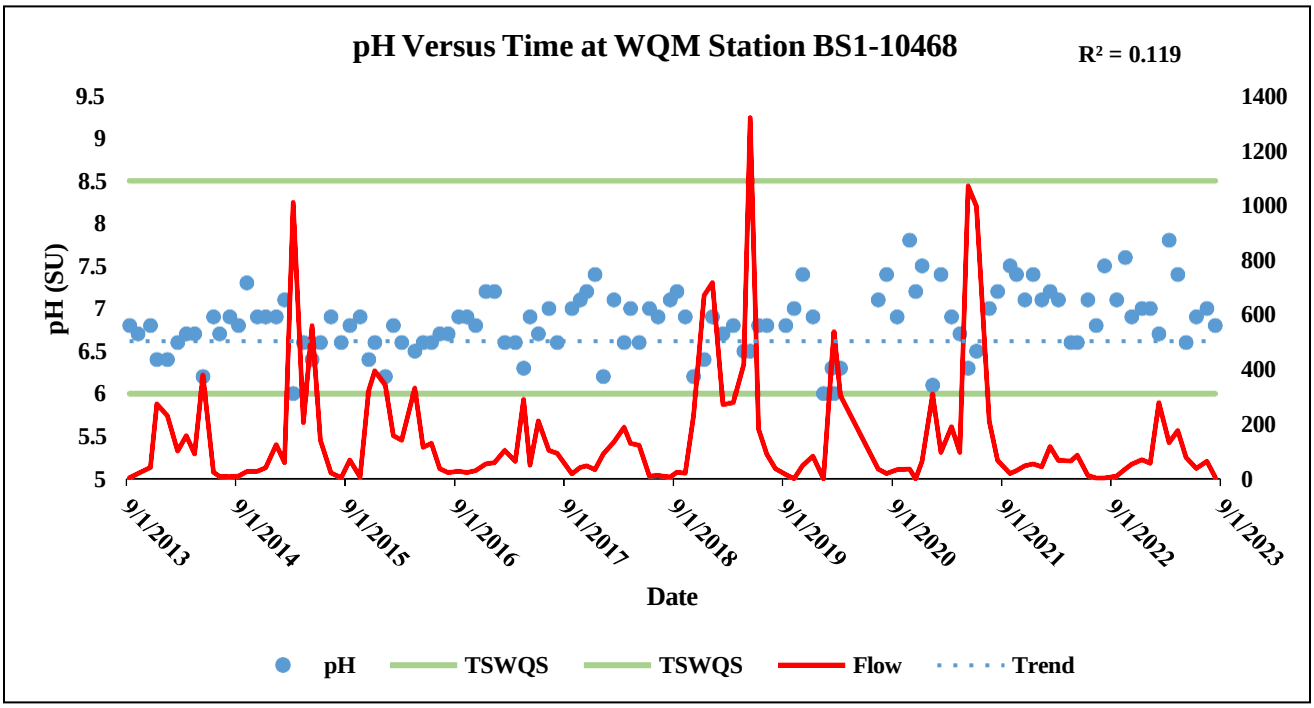


Figure 41. pH trend over time at station 10468-BS1 from September 2013 to August 2023.

The TP values ranged from 0.03 mg/L to 0.69 mg/L with a mean of 0.09 mg/L, which is below the TCEQ screening levels for nutrients in freshwater streams of 0.69 mg/L. No single grab exceedances were documented from FY 2013 to FY 2023 (Figure 42).

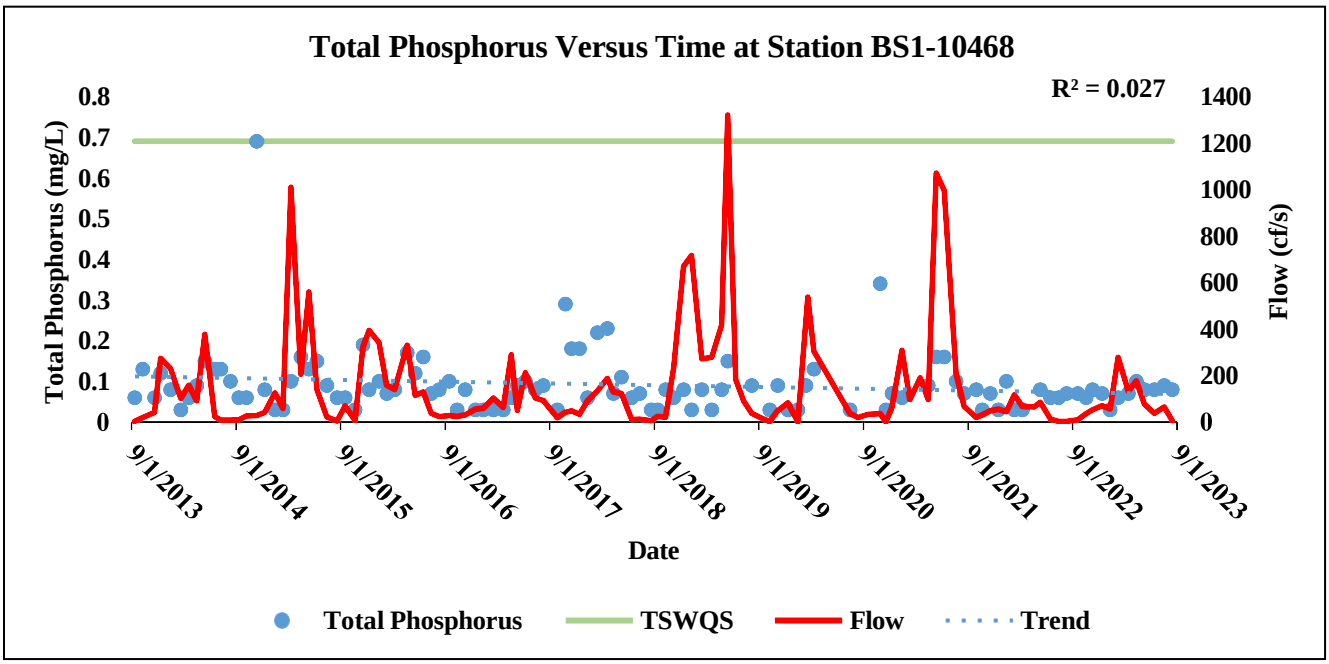


Figure 42. Total phosphorus trend over time at station 10468-BS1 from September 2013 to August 2023.

The sulfate values ranged from 2.5 mg/L to 55 mg/L with a mean of 12.17 mg/L, which is below the TSWQS of 50 mg/L. One single grab exceedance was observed from FY 2013 to FY 2023 (Figure 43).

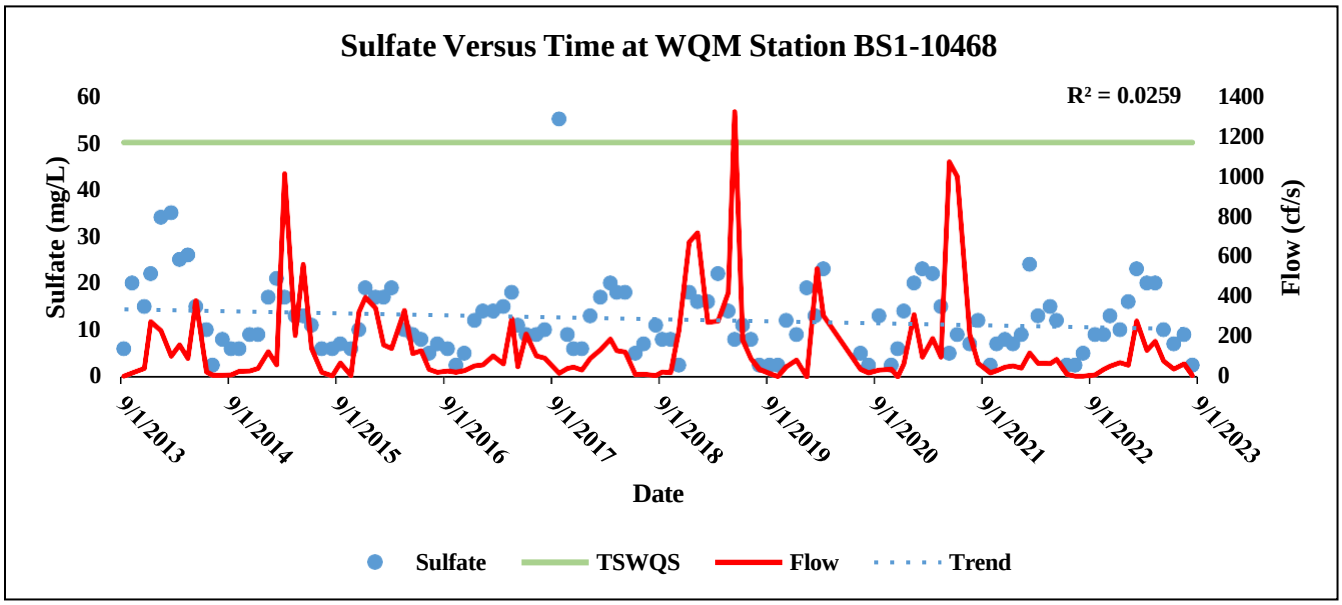


Figure 43. Sulfate trend over time at station 10468-BS1 from September 2013 to August 2023.

Recommendations

The SRA-TX will continue water quality monitoring at the representative routine sites in this segment and remain alert on high amounts of runoff from agriculture that may be contributing to the pH and bacteria impairments.

Big Sandy Creek at SH 155

Segment 0515-Lake Fork Creek—From the confluence with the Sabine River in Wood County up to the Lake Fork Dam in Wood County.

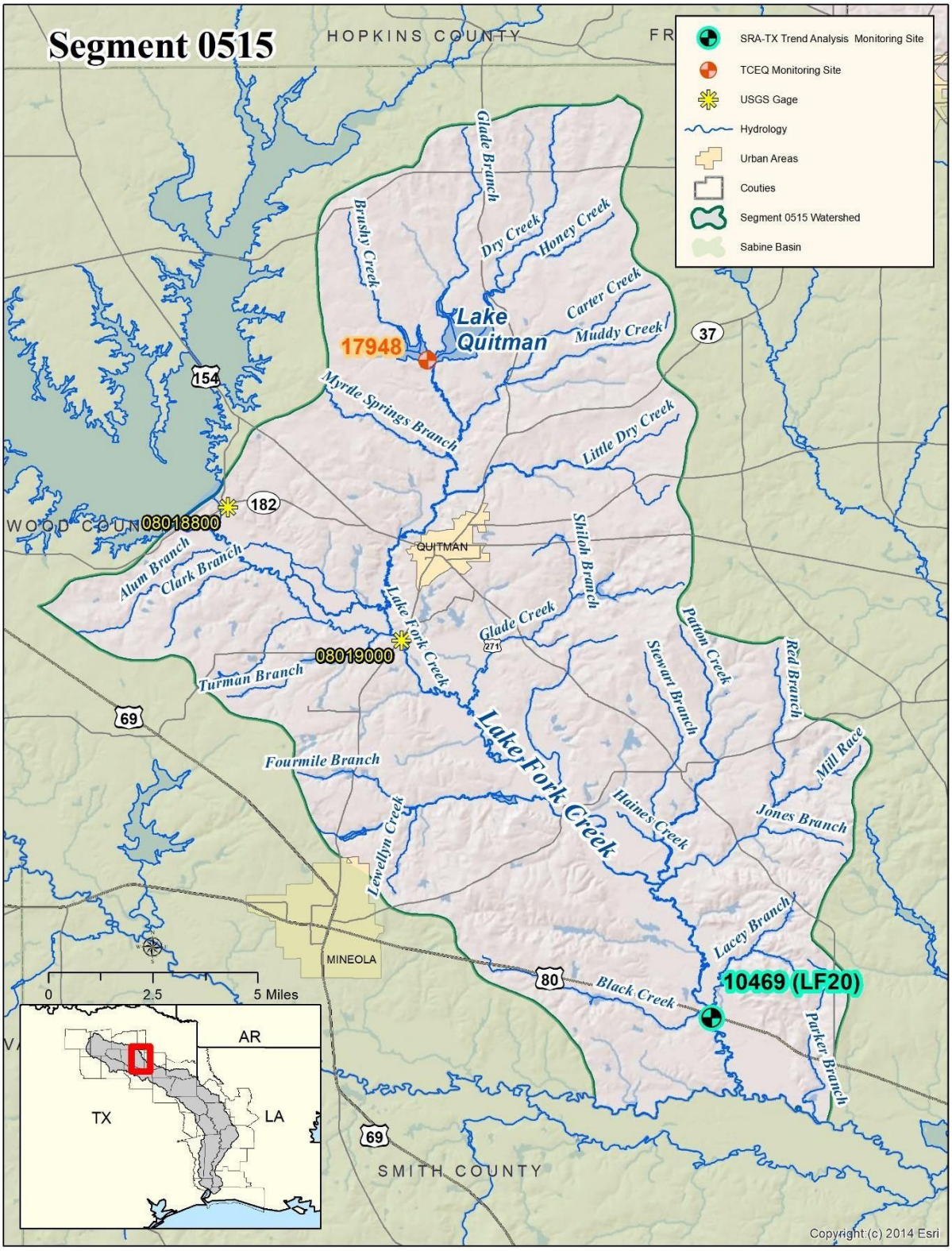


Figure 44. Map of Segment 0515 Lake Fork Creek.

The Lake Fork Creek watershed, with a drainage area of approximately 201 square miles, is located in the East Central Texas Plains and in the South Central Plains ecoregion and is characterized by hay pasture and herbaceous vegetation with low rolling hills. Lake Quitman Reservoir is located on Dry Creek, a major tributary to Lake Fork Creek (Tables 46–47).

The USGS maintains one flow monitoring station on Lake Fork Creek located on SH 37 south of Quitman, Texas.

The SRA-TX routinely monitors one site monthly and the TCEQ monitors one site quarterly in this segment (Table 48).

Spatial Analysis of Land Use

Table 46. Segment 0515 Spatial Analysis.

Delineated Land Use*	% Watershed Coverage
Open Water	1.9
Developed, Open Space	3.2
Developed, Low Intensity	7.4
Developed, Medium Intensity	2.4
Developed, High Intensity	< 1
Barren Land	< 1
Herbaceous	< 1
Evergreen Forest	18.7
Mixed Forest	12.7
Scrub/Shrub	11.0
Woody Wetlands	12.1
Hay Pasture	18.4
Cultivated Crops	< 1
Deciduous Forest	11.7
Emergent Herbaceous Wetlands	< 1

*USGS - NLCD 2019

Table 47. Segment 0515 Spatial Data.

Historical Monitoring Stations	Population	Permitted Discharges	Landfills	Superfund Sites	Population Per Sq. Mile
5	10,119	2	0	0	50

Table 48. Segment 0515 Active Monitoring Stations.

Station TCEQ ID (SRA-TX ID)	Location	Sampling Entity
10469 (LF20)	LAKE FORK CREEK AT US 80 12 KM EAST OF MINEOLA TX	SRA-TX
17948	LAKE QUITMAN IN MAIN POOL 0.4 KM NORTH NORTHWEST OF CENTER OF DAM STRUCTURE 8 KM NORTH OF QUITMAN TX	TCEQ

Water Quality Conditions

The 2022 Texas Integrated Report indicated no impairments or concerns on Lake Fork Creek (Segment 0515_01) or Lake Quitman (0515A_01). All measured water quality parameters meet TSWQS and fully support this segment's designated uses.

Regression analyses at station 10469 (LF20) indicated chloride data was significantly related to time with a decreasing trend observed, which indicates improved watershed management practices that have reduced enriched runoff.

Chloride values at 10469 ranged from 10 mg/L to 100 mg/L with a mean of 23.45mg/L, which is less than the TSWQS of 100 mg/L (Figure 45). One single grab of 100mg/L was observed.

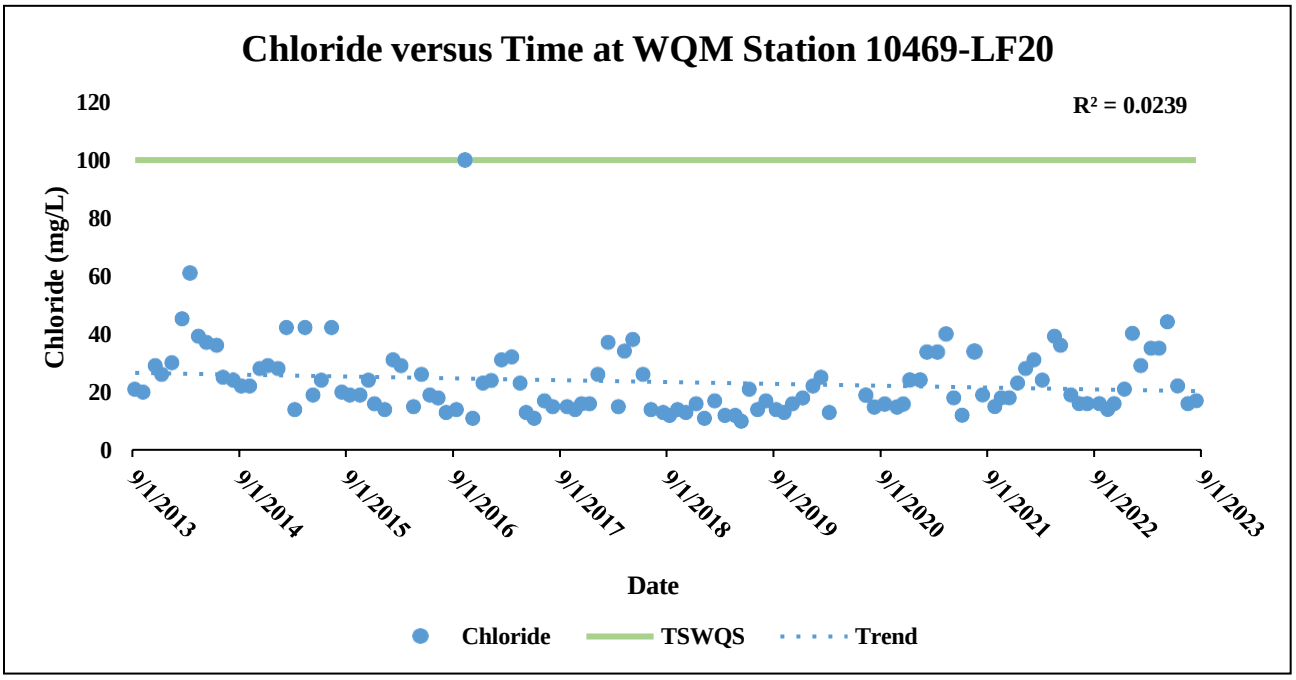


Figure 45. Chloride trend over time at station 10469-LF20 from September 2013 to August 2023.

Conclusions

The majority of water quality data continues to meet TSWQS and screening criteria. Low DO and bacteria are the most exceeded parameters throughout the basin. There was one segment (0510) removed and no segments added to the 2022 Texas Integrated Report 303(d) List.

The most frequently exceeded TSWQS parameter within the basin was bacteria (*Enterococcus* or *E. coli*). During periods of significant rainfall and increased stream turbidity, elevated levels of bacteria continued to be measured. Elevated levels of bacteria are attributed primarily to wildlife and non-point sources, but additional sources may include industrial and municipal point source discharges, on-site treatment systems, sanitary sewer overflow discharges, and package plant or other permitted small flow discharges.

Low DO was the second most exceeded TSWQS parameter throughout the basin. Low dissolved oxygen levels are a common occurrence in small, forested, intermittent, low gradient streams. Forested creeks that flow seasonally through low gradient terrain often experience long periods of little to no velocity and become a series of small, isolated pools of water. Since much of the Sabine Basin is heavily forested, these pools of water are seasonally loaded with leaf litter. The predominately humid sub-tropical climate throughout the basin facilitates the rapid decomposition of organic matter in the water, which in turn, lowers the DO. During hot, dry periods, isolated pools can become nearly anoxic. When a large runoff event occurs, these pools of extremely low DO water are flushed down the watershed, resulting in short-lived isolated sections of low DO water moving through larger stream systems. Nonpoint source runoff is a probable contributor to the concern for screening level assessment for chlorophyl-a, nitrate, and nitrite. Upstream wastewater discharges may also be contributing factors in these water quality issues.

The top and bottom of the basin is where most of the low DO and bacteria problems occur. Bacteria problems and some nutrient concerns also occurred in the more populated urban watersheds. Looking at parameter values against flow for this data record, water quality is typically negatively impacted during runoff events following significant rain events. Most parameters experience elevated levels for 48 to 72 hours depending on the intensity of the rain.

Across the big picture, water quality in the Sabine Basin has remained stable and consistent. The SRA water quality monitoring program has been in place for over 50 years. This has advanced our understanding of water quality by allowing researchers and interested parties to access continuous water quality data to find long term trends and short term problems that need to be addressed. The mostly forested watershed has not experienced population growth at the rates of many cities across the state. Thanks to silviculture, cattle farming, agriculture, and the Sabine National Forest and Texas Parks and Wildlife Department properties, most of the Sabine basin is natural landscaped pastures and forests. Apart from the Orange/Bridge City area in the lower basin and the Longview/Gladewater area in the upper basin, the Sabine watershed is sparsely populated.

Moving forward, SRA plans to continue investing in relationships with our stakeholders to ensure well-informed and proper management decisions are made that protect the integrity of the Sabine River. We will continue to maintain our water quality monitoring program through CRP and support our customers and stakeholders in any way possible to maintain the water quality that we are blessed to have in the Sabine Basin.

Recommendations

The SRA-TX will continue to advance the knowledge and understanding of water quality in the Sabine Basin through:

- Involvement in the Texas Stream Team, public presentations, and facility tours.
- Participation in the TCEQ-facilitated Surface Water Quality Standards Workgroup, which provides input into nutrient and toxic criteria, recreational indicators and uses, and site-specific criteria changes.
- Continue to provide sampling in areas to support effective permit requirements, as well as provide input to assist the TCEQ in the development of attainable water quality standards.
- Providing web-based monthly SRA-TX Water Quality Monitoring Reports, which benefit stakeholders.
- Coordination and support of the CRP activities within the Sabine Basin with other agencies and interested entities to identify and prioritize water quality concerns.
- Hosting the CRP Basin Steering Committee and Coordinated Monitoring meetings to promote and engage public involvement.