2020 BASIN SUMMARY REPORT
TRINITY RIVER AUTHORITY CLEAN RIVERS PROGRAM



Acknowledgements

The preparation of this report was financed through funding from the Texas Commission on Environmental Quality under Agreement No. 582-18-80164. Within Basin Participating Agencies provided additional water quality monitoring data. These include the cities of Dallas, Fort Worth, Grand Prairie, Arlington, and Irving, as well as Tarrant Regional Water District, TRA Lake Livingston Project, Dallas/Fort Worth International Airport Environmental Affairs Department, and North Texas Municipal Water District. Guidance was provided by the members of the Trinity River Authority's Clean Rivers Program Steering Committee.

Cover photo: Lower Trinity River, September 2015

Acronyms

CFS – Cubic feet per second

CN – Use Concern

CRP – Clean Rivers Program

CS – Screening Level Concern

DWS – Domestic Water Supply

ECHO – Enforcement and Compliance History Online

eDNA – Environmental DNA

EPA – Environmental Protection Agency

FS – Fully Supporting

HH – Human Health

HUC – Hydrologic Unit Code

JPLWPP – Joe Pool Lake Watershed Protection Plan

mg/L – milligrams/Liter

MPN/100 mL – Most Probable Number per 100 Milliliters

NA – Not Assessed

NC – No Concern

NELAP – National Environmental Laboratory Accreditation Program

NS – Not Supporting

PCB – Polychlorinated Biphenyl

RCRA – Resource Conservation and Recovery Act

SAS – Statistical and Qualitative Data Analysis Software

SWQM – Surface Water Quality Monitoring

SWQMIS – Surface Water Quality Monitoring Information System

TCEQ – Texas Commission on Environmental Quality

TMDL – Total Maximum Daily Load

TRA – Trinity River Authority

µg/L – micrograms/Liter

µS/cm – microsiemens/centimeter

USGS – United States Geological Survey

VCLAWPP – Village Creek Lake Arlington Watershed Protection Plan

WPP – Watershed Protection Plan

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Foreword



Figure 1: West Fork Trinity River downstream of Precinct Line Road in Fort Worth

Executive Summary

Trinity River Authority (TRA) operates and administers the Texas Clean Rivers Program (CRP) through a biennial contract with the Texas Commission on Environmental Quality (TCEQ). The primary goal for the CRP is to acquire water quality data that is both accurate and of a comparable, known quality. Therefore, all Clean Rivers Program partners throughout Texas sample and handle data under similar Quality Assurance Project Plans. Additionally, data provided to TCEQ by the Clean Rivers Program is used in the Texas Integrated Report of Surface Water Quality.

CRP programs statewide are involved in other activities such as public outreach, special projects, and data analysis and reporting. Every third biennium, a comprehensive Basin Summary Report is prepared for each river basin that is designed to examine the water quality of the basin. The Trinity River Authority Clean Rivers Program 2020 Basin Summary Report reviews the most recent TCEQ water quality assessment, the TCEQ 2020 Texas Integrated Report, and analyzes trends for the most recent fifteen years.

The Trinity River Basin extends approximately 715 river miles and drains about 18,000 square miles before emptying into Trinity Bay near Anahuac. The basin transitions from sandy soils and rangeland in the northwest, to Blackland prairies and row crop agriculture around the Dallas-Fort Worth Metroplex, to piney forest along the middle portions of the basin, and finally to the coastal prairies near the mouth of the river. Additionally, the Trinity River supports the water needs of two major population centers; the Dallas-Fort Worth Metroplex in the upper reaches and the City of Houston in the south.

Generally, water quality in the Trinity River Basin is of high quality. Dissolved oxygen levels in the river have increased over the years with the introduction of wastewater treatment facilities and subsequent advancements in treatment technology. These wastewater treatment facilities provide baseline flow of known quantity and quality to the river which has been beneficial to aquatic life. Detailed discussions of water quality for each subwatershed are found in the body of the full report. The major issues prevalent basin-wide are listings for bacteria (Contact Recreation Use), concerns for chlorophyll-a and nutrients (General Use), low dissolved oxygen in several of the smaller tributaries (Aquatic Life Use), and fish consumption advisories (Fish Consumption Use).

Bacteria impairments are prevalent throughout much of the basin. In the TCEQ 2020 Texas Integrated Report, 159 assessment units were assessed for contact recreation. Of these, 69 were found to have concerns or to be not supporting the contact recreation use. Furthermore, 55 of these findings were on unclassified segments which are generally small streams that flow into classified segments; many of which are intermittent urban streams in the Dallas-Fort Worth Metroplex. High levels of bacteria can indicate improperly treated wastewater or illicit dischargers. However, a 2006 Texas Institute for Applied Environmental Research report, Monitoring Report for Bacterial Source Tracking Segments 0806, 0841, and 0805 of the Trinity River Bacteria TMDL, indicates that 63% of the bacteria is related to birds, mammalian wildlife, and other unknown sources while the remaining 37% is related to humans, pets, and livestock.

A Total Maximum Daily Load (TMDL) Implementation Plan for bacteria is underway in the Dallas-Fort Worth area. While implementing a bacteria TMDL in this area will be difficult at best, the plan presents an iterative approach where implementation activities will be periodically evaluated and adjusted. The hope is that the activities outlined in the Implementation Plan will eventually reduce the bacteria loading into these streams.

Based upon the findings of this basin summary report, nutrients are not causing widespread problems in the Trinity River Basin and correlation analysis shows little relationship between nutrients and harmful algal blooms that can cause widespread fish kills. In the naturally turbid waters of the Trinity River Basin, the greatest limiting factor for algal growth is likely light penetration into the water column, which limits the depth of the photic zone; therefore, limiting available resources for algal populations. As of the 2018 Texas Surface Water Quality Standards, numeric standards for chlorophyll-*a* have been developed and approved by EPA for 38 reservoirs in Texas; four of which are in the Trinity River Basin. Reservoirs without approved numeric standards are assessed against a narrative criteria which takes into account factors such as algal growth, nutrient and chlorophyll-*a* concentrations, dissolved oxygen, and trophic status of the reservoir. There are ten reservoirs in the Trinity River Basin that are assessed against the narrative criteria. Water quality is assessed by comparisons to nutrient and chlorophyll-*a* screening levels in the remaining nine reservoirs where numeric standards have not been developed. Similarly, streams and rivers are assessed by comparison to screening levels as development of numeric criteria in these waterbodies has not begun.

Dissolved oxygen in water is imperative for aquatic species to survive. Low dissolved oxygen can be caused by algal activity, sanitary sewer overflows, rapid temperature swings, or a host of other natural and anthropogenic factors. The default standard for dissolved oxygen is 5 mg/L. Many of the listings for low dissolved oxygen are on low order intermittent streams with seasonal flows and the default standard may be inappropriate. Additionally, some of the higher order streams that show low dissolved oxygen measurements are not experiencing fish kills and biological indicators show that the environment is healthy; there is some evidence that communities in these streams may be adapted to lower dissolved oxygen environments. Dissolved oxygen is an important parameter and should continue to be closely monitored. Toward this end, TRA Clean Rivers Program staff have been monitoring diurnal dissolved oxygen at several locations in the basin in order to address the findings of the Integrated Report.

Legacy pollutants continue to be a problem in the basin; specifically PCBs and dioxins which have been found in the edible portions of fish tissue. In December 2015, the Texas Department of State Health Services extended the fish consumption advisory on the Trinity River from US 287 downstream to US 90. Advisories are now present from the West Fork Trinity River below Lake Worth and the Clear Fork Trinity River below Benbrook Lake in Fort Worth to Liberty in the lower basin. Included in these advisories are several small lakes in Fort Worth, Lake Worth, and Lake Livingston. There are no realistic solutions for remediation of these pollutants. These chemicals have been banned for decades, but continue to persist in the sediments. Nationwide, efforts to remove contaminated sediments have resulted in exacerbating problems downstream. Unfortunately, consumption bans will remain in effect for the foreseeable future.

As shown in Figure 2, the most common issues identified in the TCEQ 2020 Texas Integrated Report were for General Use (nutrients, chlorophyll-*a*, pH, sulfate, and total dissolved solids),

Fish Consumption Use, and Recreation Use (bacteria). A majority of the Aquatic Life Use concerns were for low dissolved oxygen levels. Importantly, there were no listings for Public Water Supply. Overall, TRA's trend analysis found that there were more improving water quality trends than degrading trends as shown in Figure 3. Conventionals are a broad group of parameters that include chlorophyll-*a*, total dissolved solids, total suspended solids, chloride, hardness, sulfate, and metals. Field parameters include dissolved oxygen, pH, specific conductance, water temperature, and flow. Nutrients include the various nitrogen and phosphorus parameters. Bacteria include *E. coli* and *Enterococcus*. Metals include various dissolved and total metals. As populations continue to increase, water quality will become more important. It is imperative that planning agencies monitor water quality and focus on making monitoring programs as efficient and pertinent as possible. TRA currently partners with ten other entities within the basin to leverage funds and maximize data collection. TRA is also in the process of developing relationships with other entities in the basin where water quality data is sparse at best with the goal of further expanding the current monitoring network.

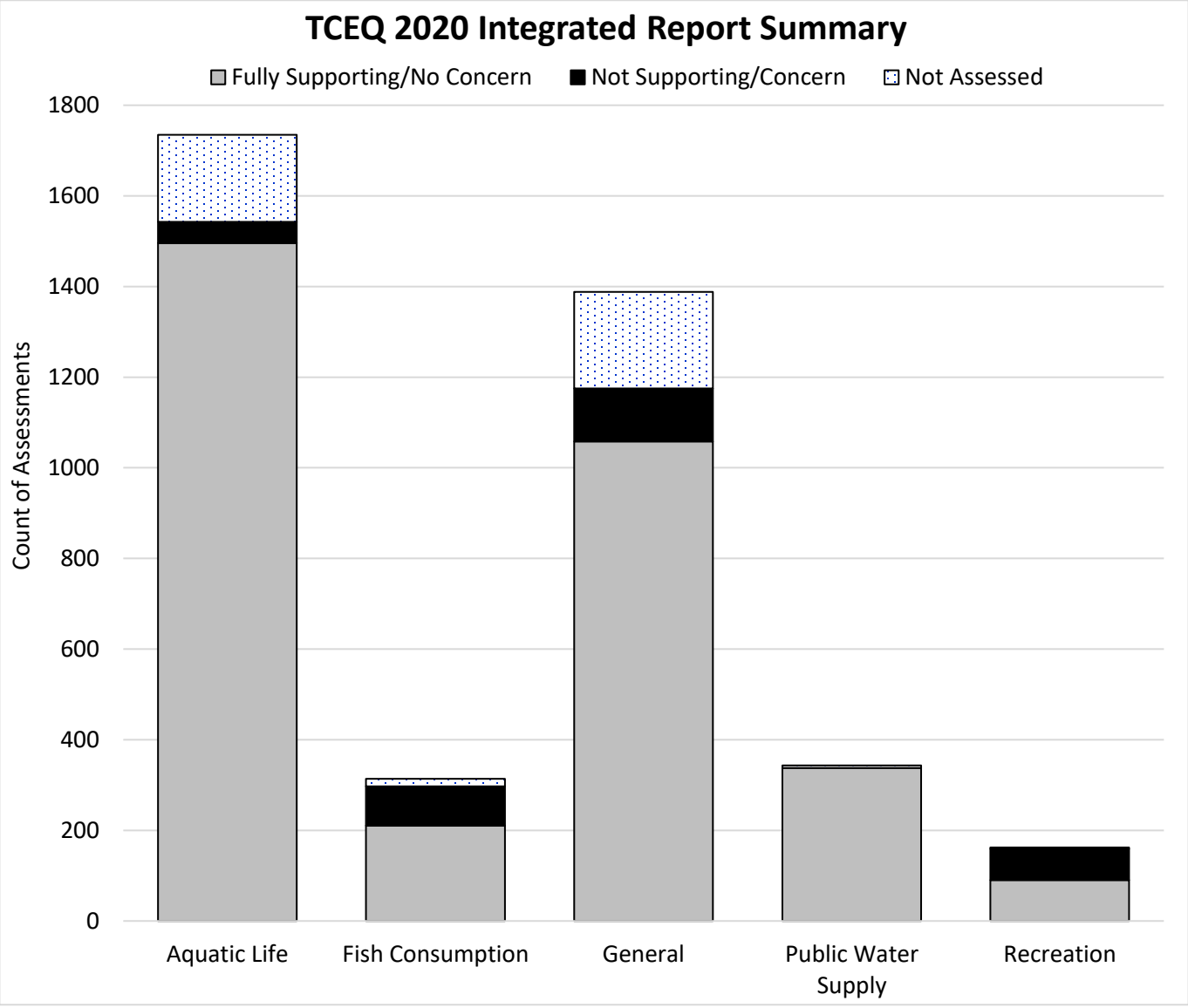


Figure 2: TCEQ 2020 Texas Integrated Report Summary

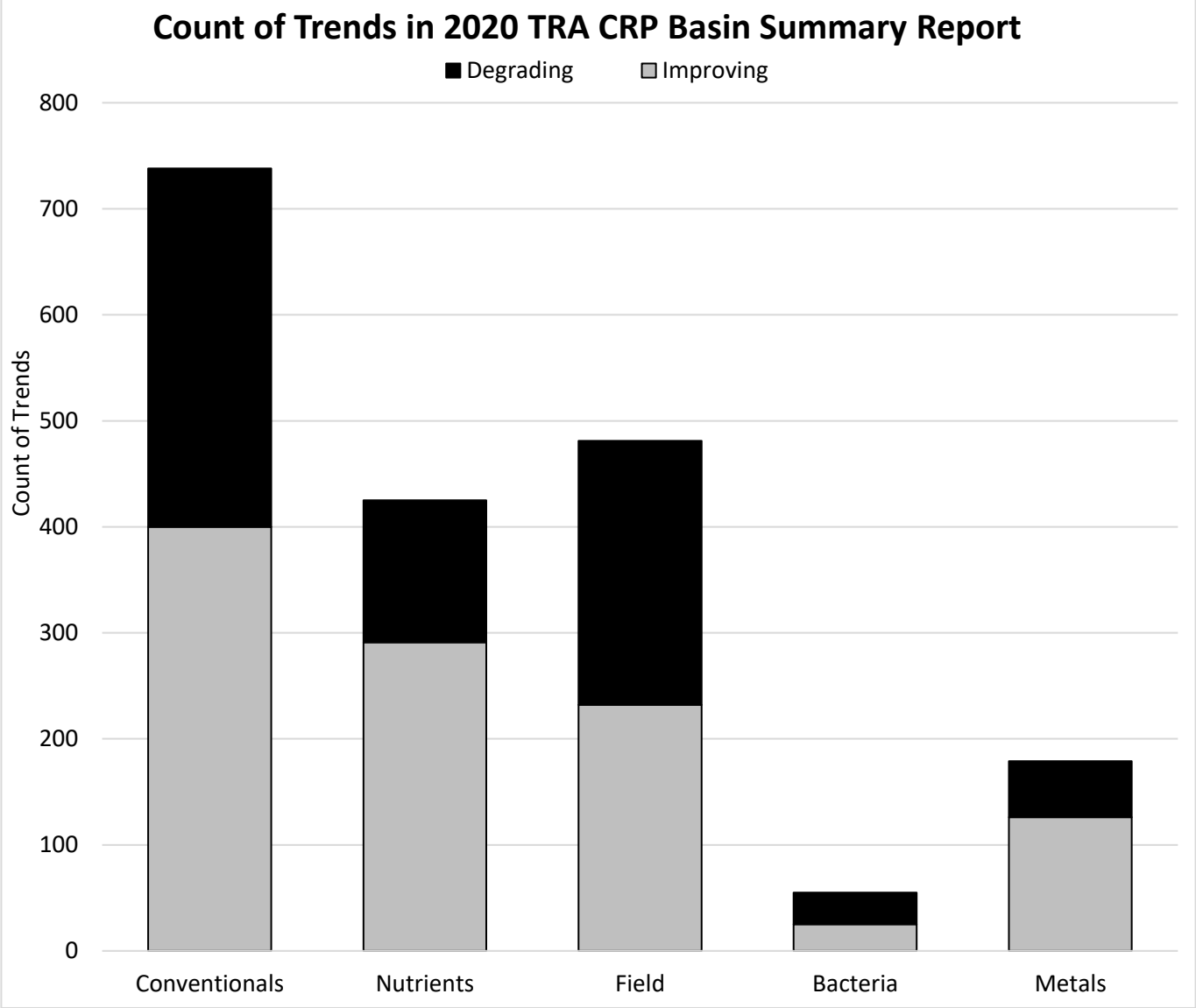


Figure 3: Count of Trends in 2020 TRA CRP Basin Summary Report

Conclusions and Recommendations

Conclusions

Water quality in the Trinity River Basin will continue to be a challenge as the pressures of population growth continue. The Trinity River Basin provides drinking water to over 50% of the residents of Texas and the demands on these finite resources will only increase as populations in both the DFW and Houston areas swell. Addressing the concerns of rural and large urban populations will be paramount in the decades to come.

The major water quality issues in the Trinity River Basin are legacy pollutants affecting fish consumption use, bacteria impairments, and nutrient concerns. A more recent concern is the potential impact of zebra mussels in the reservoirs of the basin.

Legacy pollutants have caused extensive fish consumption advisories across much of the basin; from Lake Worth to Highway 90 near Liberty, including Lake Livingston. These advisories range from limiting consumption to completely advising against the consumption of certain species of fish that are contaminated by polychlorinated biphenyls (PCBs), dioxins, and furans. PCBs have been banned for decades. However, as byproducts of some industrial products, dioxins and furans have current active sources. These chemicals tend to collect in sediments where they can bioaccumulate and biomagnify up the food chain. There are no satisfactory solutions for in-situ remediation of these pollutants and on-site treatment or removal of contaminated sediments resuspends the contaminants. In the case of removal, disposal of the material may be difficult and simply moves the problem to another location. Capping of the contaminated materials is not feasible in rivers like the Trinity which is subject to frequent flooding and scouring events. It is likely that these issues will remain for decades to come unless or until technology is developed that will remove these contaminants without exacerbating the problem.

Bacteria impairments are fairly widespread. Sources of bacteria can be natural and anthropogenic. Sources related to wildlife and birds will be difficult to resolve and these species depend on nearby waterbodies for survival. Anthropogenic sources include livestock entering waterbodies to drink, run-off from livestock pastures, broken sewage lines, improperly functioning septic systems, and run-off from yards with pet waste. Standards revisions that are being evaluated may remove some of these impairments. However, the remainder will require interventions such as regular inspection and repair of wastewater infrastructure, landowner and homeowner education, and various best management practices to reduce the amount of bacteria reaching waterbodies.

Nutrient enrichment in the waterbodies of the basin is caused by both point and non-point sources. Point sources such as wastewater treatment facilities are known to release high levels of nutrients. Many of these facilities do not currently have advanced nutrient removal systems. This technology is still developing and is expensive but will very likely be more accessible in the future. Non-point sources include nutrients from human waste leaking from failing infrastructure, run-off containing animal waste, and residential or agricultural fertilizers. These sources could be reduced by homeowner and landowner education and various best management practices.

Generally, nutrients are not causing algal blooms in much of the basin. It is believed that the turbidity of the waterbodies in the basin is the limiting factor to algal growth. However, the threat of zebra mussel infestation could drastically alter this limitation and result in algal blooms. Large zebra mussel populations filter a tremendous amount of water per day and have been seen to rather quickly increase the clarity of infested waterbodies. The increased clarity increases the depth of the photic zone which allows algal populations to move into those deeper areas and utilize the nutrients there to reproduce. Compounding this potential, zebra mussels selectively reject blue-green algae while consuming other species of algae, thereby removing the competition for resources among algae and potentially leading to harmful algal blooms.

Overall, the current water quality in the Trinity River basin is quite good and there is a competitive market for wastewater effluent reuse due to the high degree of treatment. The challenges ahead in tackling water quality issues are many, and there are no easy fixes. The Trinity River Authority's Clean Rivers Program will continue to work to find solutions through data collection, watershed surveys, special projects, and public outreach programs.

Recommendations

From the beginning of the Texas Clean Rivers Program, there has been an emphasis on the collection and submittal of data to TCEQ. However, limited resources and continued water quality listings have necessitated a change in the routine monitoring program to begin addressing monitoring needs in other portions of the basin. Priority has been given to those sites where flow can be collected as this information is necessary to confirm the flow status of streams, calculate loads, and create accurate water quality models. Resources were shifted away from sites that were in close proximity to other routine sites or that showed little change in water quality over the years. Those resources were reallocated to areas where impairments have been identified but remained unaddressed. Targeted monitoring is conducted for a period of time necessary to obtain enough data for the Integrated Report. Those resources are then allocated to other areas as needed.

Over the years, the TRA Clean Rivers Program has partnered with several entities in order to leverage available funding for water quality monitoring. This partner network has provided for much greater basin coverage than would be possible with in-house resources. In the current biennium, TRA CRP staff are focusing on further increasing this coverage by approaching new cities and agencies that may be conducting water quality monitoring in under-represented areas of the basin and bringing them under the CRP umbrella, thus allowing TRA to focus resources in other areas where monitoring may be needed. Overall, routine sampling should be reassessed on a regular basis to determine where limited resources are best spent. This basin summary report identifies several areas where monitoring or the collection of additional parameters are needed.

TRA has been conducting biological monitoring for several years at a limited number of stations each year. This monitoring is conducted in accordance with the Aquatic Life Monitoring protocols defined in the Surface Water Quality Monitoring Procedures. Data analysis and current water quality issues are used to identify the areas of interest for each monitoring event. This monitoring program should be expanded in the future as resources allow. Additionally, long

term biological monitoring should be considered at locations where water quality changes are identified in order to determine if these changes are impacting aquatic life.

TRA has begun developing watershed protection plans with grant funds provided by the EPA through the TCEQ. These projects identify potential sources of pollution and recommend solutions for these issues in a stakeholder driven process. Grant funding for implementation of solutions – best management practices – can be applied for after completion of a watershed protection plan document. These solutions can range from education and outreach activities, to low impact development, to construction of detention ponds. Landowner and homeowner education initiatives are the “low hanging fruit” of best management practices. These activities can cost little money and have great benefits. Some examples include education on the proper use of residential fertilizers, the necessity of picking up and properly disposing of pet waste, and the benefits of allowing the growth of riparian buffer strips in parks and on private lands. Grants for projects that can benefit water quality are frequently made available on the state and federal levels. TRA can apply for, or assist cities and other entities in applying for, these grants.

As noted previously, zebra mussels are a growing threat in the Trinity River Basin. Many of the reservoirs of the basin have been identified in the TCEQ Trophic Classification of Texas Reservoirs as mesotrophic or eutrophic. These reservoirs, as well as many of the streams and rivers, in the basin have elevated nutrient levels. However, many of these waterbodies do not have excessive algal growth due to the limited photic zone caused by the turbidity of the water. If zebra mussels infest these waterbodies, their populations can quickly increase the clarity of the water and the depth of the photic zone leading to potential algal blooms. This could hinder the use of reservoirs as domestic water supplies due to compounds such as geosmin, which is released by decaying algae and can affect the taste and odor of finished drinking water. Zebra mussels also form thick mats of individuals that can clog intake pipes for drinking water facilities and cooling water for industrial facilities. These mats of sharp zebra mussel shells can create a hazard for recreational activities such as wading and swimming. Other recreational activities, such as sport fishing, can be impacted as well because zebra mussel infestations can cause a collapse of the food web as huge quantities of algae are consumed; ultimately removing the lowest level of productivity in affected reservoirs. Therefore, it is important that proactive and ongoing zebra mussel monitoring be conducted in the reservoirs of the basin. Early detection may help abatement efforts and limit their spread to other waterbodies.

Background



Figure 4: White Rock Creek in Dallas, July 2017

Introduction

The Texas Clean Rivers Program

In 1991, Texas Senate Bill 818 created the Clean Rivers Program (CRP). This program is administered by the Texas Commission on Environmental Quality (TCEQ) and is conducted in each of the major river basins by local planning agencies like the Trinity River Authority. The CRP is funded, in part, by fees assessed to water right and wastewater permit holders. The goals of the program are to protect the water resources of the state and to maintain and improve water quality.

Annual Reports

Each year, the local planning agencies produce a Basin Highlights Report which summarizes the CRP activities in their basin. This report includes information on events affecting water quality, a summary of water quality data, and an overview of public outreach activities and special projects. Every third biennium, a greatly expanded Basin Summary Report provides a detailed analysis of water quality data and potential sources, as well as offering recommendations for future basin activities. All past reports are available on TRA's Reports webpage.

Goals and Objectives of the TRA CRP

The TRA CRP focuses on three main aspects of the program: water quality monitoring, special projects, and public outreach. Routine water quality monitoring data are vital to the success of the CRP. Data are used for regulatory purposes such as setting water quality standards, constructing models for permit limits, and evaluating the health of waterbodies. In the Trinity River Basin, monitoring is leveraged with the existing programs of several municipalities and other entities. This partnership has allowed TRA to provide much more information to the TCEQ than would be possible with in-house resources.

Special projects are typically short-term sampling activities focused on answering a specific water quality question. Other projects that do not generate water quality data may include in-depth analyses of existing data for various purposes and compilation of historic data sources.

Public outreach and stakeholder engagement involves annual updates to the Steering Committee which helps guide the activities of the TRA CRP. Other outreach activities include sponsorship of trash clean-ups and public education events. Education on the importance and protection of Trinity River Basin water resources is accomplished via participation in organized public and school events.

Trinity Basin and Water Quality Characteristics

The Trinity River extends approximately 715 miles and drains about 18,000 square miles of the state before ending at Trinity Bay near Anahuac. A majority of the basin topography is flat to gently rolling. A large portion of the watershed flows through the Blackland Prairies which lends the river its characteristic muddy brown color. This ecoregion is made up of soil types that, while excellent for row crop agriculture, are highly erodible. Ecoregions are areas that have similar ecosystems – geology, vegetation, climate, etc. These ecosystem components can influence water quality in various ways. Geology can affect levels of dissolved solids, chlorides, and sulfates. Areas with soils and climate amenable to agriculture can have elevated levels of nutrients from fertilizers used on crops and suspended sediments due to erosion. Watersheds dominated by pine wood forests may have tea colored, low pH waters due to humic acids from the breakdown of pine needles in waterbodies. The Ecoregions of Texas report by EPA provides a detailed description of the ecoregions referenced in this basin summary report.

The northern portion of the basin is dominated by the Dallas-Fort Worth Metroplex. Legacy pollutants, which are banned chemicals that are persistent in the environment, are a concern. Other results of urban life include storm water run-off that is polluted by oil and grease, pesticides, fertilizers, and animal waste. During the summer months, the native flow of the river in this area is reduced to a trickle, generally made up of groundwater seeps and occasional rainfall events. The larger fraction of summer flow is made up of high-quality effluent from wastewater dischargers, which allows the river to maintain a habitat far greater in flow with better water quality than historical levels.

The far northern and middle reaches of the basin are characterized by agriculture. These activities can result in elevated nutrient levels from fertilizer use, bacteria from livestock waste, and soil erosion. Many areas of the basin are still experiencing high levels of oil and gas drilling activities which can have negative impacts on water quality. These impacts can include increased salinity due to run-off containing salts from clay stabilizers in fracking fluid and the co-produced brine water that often results from oil and gas recovery, increased suspended solids due to run-off containing disturbed soils from drilling sites, and the presence of drilling fluid and wastewater due to accidental spills and leakage. According to the Railroad Commission of Texas, from 2018 to 2019, a total of 940 drilling permits were approved and 617 wells were spudded in the counties of the Trinity River Basin. During this same period, over 32 million barrels of oil and almost 2.6 trillion cubic feet of gas were produced.

Public Involvement

The TRA CRP participates in several public involvement activities which range from trash clean-ups to public education events. Public interest in the welfare of local waterbodies is vital to improving water quality in the Trinity Basin.

The TRA Clean Rivers Program Steering Committee is made up of basin stakeholders and other interested parties, including city officials and the general public. The steering committee provides input and information that is used to guide the program. Annual public meetings are held to update committee members on the activities of the program and to provide a forum to share ideas. If you are interested in participating in the Steering Committee, contact the TRA CRP at tra@trinityra.org.

Trash clean-ups are public events that are organized by cities and counties. The TRA CRP helps fund these events, which include Trash Bash, Navarro County Clean-Up Day, and Walker County Proud. Volunteers at these events remove many tons of debris from waterbodies and waterways. In addition to the immediate benefit of the waste removal, volunteers become more aware of their impact on local waterbodies.

The Texas Stream Team utilizes a network of trained volunteers to monitor the quality of waterbodies in Texas. The Meadows Center at Texas State University administers this program in cooperation with the Texas Commission on Environmental Quality (TCEQ) and the Environmental Protection Agency (EPA). The TRA CRP supports this program through funding for replacement supplies for existing TRA kits. For more information about this program, visit the Texas Stream Team website hosted by the Texas State University Meadows Center for Water and the Environment.

In addition to the activities discussed above, the TRA CRP participates in several organized public outreach and education events each year. These range from local Earth Day events to educational field trips for large school groups. At these events, information is presented on the Trinity River Basin as well as the Trinity River Authority. Educational materials are supplied in order to teach the public about how they can take a personal role in reducing and preventing water pollution.

DRAFT

Special Projects

Special projects are typically studies or activities that look at a specific issues in great detail. These are either federally or locally funded and can range from short-term to long-term, depending on the needs of the project.

Federal Programs

There are several projects occurring in the Trinity River Basin that are part of federal programs such as the EPA's Superfund, Brownfield, Resource Conservation and Recovery Act, and Enforcement and Compliance History Online programs.

Superfund sites are those abandoned sites and facilities that are determined to be contaminated and in need of cleanup. Funding for cleanup activities was established by the Comprehensive Environmental Response, Compensation and Liability Act in 1980 and the Superfund Amendments and Reauthorization Act in 1986. The EPA can either cleanup a site, or identify those responsible for the contamination. In cases where contamination can be tied to an individual, entity, or company, the EPA may require those responsible to clean the site or pay the EPA for their cleanup activities. This process of identifying sites through the end goal of cleanup or remediation can take many years or decades.

Brownfield sites are industrial or commercial facilities that are either abandoned or underutilized and which may have low level contamination. These sites are generally less contaminated that Superfund sites. Commonly, brownfields are sites which can benefit the community, economy, and environment through their cleanup and redevelopment. Depending on the type and extent of contamination, as well as state laws, brownfields are redeveloped for a wide variety of purposes ranging from residential and commercial to recreational. In addition, Brownfield redevelopment eases the pressure to destroy natural spaces for new development activities.

The Resource Conservation and Recovery Act (RCRA) of 1976 governs the disposal of solid and hazardous waste. In addition, the Act governs the tracking of hazardous waste from its creation to disposal, commonly known as the "cradle to grave" program. Other goals of the Act are to protect human and environmental health from improper waste disposal and waste reduction. Information provided by the RCRA program is available online.

The Enforcement and Compliance History Online (ECHO) database provides the public with information on facilities regulated by EPA. This includes information on inspections, violations, and enforcement actions. All facilities regulated by the Clean Air Act Stationary Source Program, Clean Water Act National Pollutant Elimination Discharge System, and RCRA are included in the ECHO database.

State Level Basin Programs

There are many state-wide and basin-wide special projects that are administered by TCEQ and other state agencies such as the Texas State Soil and Water Conservation Board.

Many of these projects are related to Total Maximum Daily Load (TMDL) activities. A TMDL determines the maximum amount of a pollutant that can be allowed to enter a waterbody while still meeting applicable standards. Therefore, it identifies the amount of pollutant reduction necessary to restore water quality to acceptable levels. A TMDL is scheduled when a waterbody exceeds a standard and requires further action. After TMDL levels are determined for each pollutant and waterbody, implementation plans are developed which outline the steps necessary to reduce pollutant levels. Several of the current TMDL projects in the Trinity River Basin are for elevated bacteria levels in the water column and legacy pollutants such as PCBs.

TRA Projects

The Trinity River Authority Clean Rivers Program either participates in, or administers several special projects during the course of its biennial contracts with TCEQ. Final reports for past special projects are available on the TRA CRP Reports webpage. The following sections discuss recent and upcoming special projects conducted by TRA CRP staff.

Biological Monitoring

Since 2013, TRA has conducted Aquatic Life Monitoring in one or more streams each summer. This monitoring consists of an assessment of the benthic macroinvertebrate and fish populations, as well as the available habitat in and around the stream for up to a 500-meter reach in wadeable streams (see Figure 5). This information is used to determine if aquatic life uses are being supported in those streams.

Aquatic Life Monitoring takes place during the index and critical periods of a single year (see Figure 6). The index period is from March 15 to October 15 with the critical period being from July 1 to September 30. These periods represent the warmer times of the year and the portion of the summer where the lowest stream flows, highest temperatures, and lowest dissolved oxygen levels are expected to occur. These times are targeted because it is assumed that if aquatic life uses are being met under these conditions, then they are also being met during the remainder of the year.

The data that are collected are summarized into a score that represents an aquatic life use level of Exceptional, High, Intermediate, or Limited. See Table 1 for details of the metrics for Exceptional and Limits use scores.



Figure 5: Measuring width and depth at a habitat transect on the Clear Fork Trinity River during an Aquatic Life Monitoring event

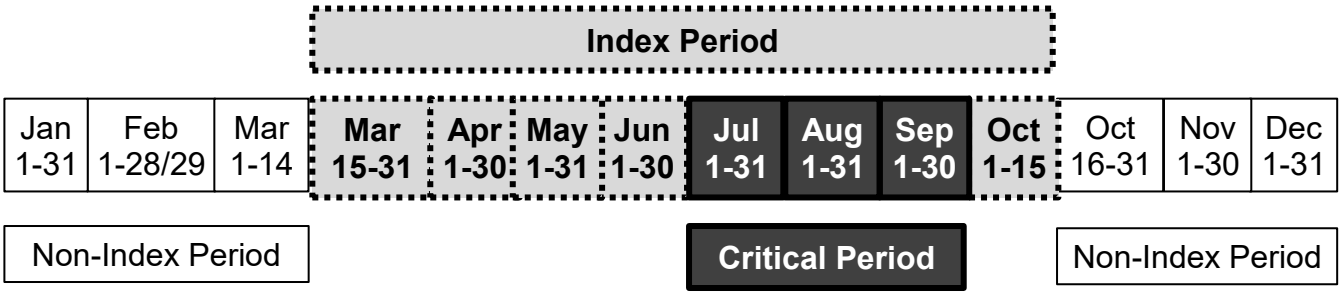


Figure 6: Critical and Index Periods (from TCEQ Surface Water Quality Monitoring Procedures, Volume 1)

Table 1: Scoring Metric Summary for Aquatic Life Monitoring

Exceptional	Limited
Fish Metrics	
1. Large number of species relative to basin size	1. Small number of species relative to basin size
2. Large number of native cyprinid species	2. Few native cyprinid species
3. Larger number of benthic invertivore species	3. No benthic invertivore species
4. Large number of native sunfish species	4. Few native sunfish species
5. Lower percentage of individuals as tolerant species	5. Higher percentage of individuals as tolerant species
6. Lower percentage of individuals as omnivores	6. Higher percentage of individuals as omnivores
7. Higher percentage of individuals as invertivores	7. Lower percentage of individuals as invertivores
8. Higher percentage of individuals as piscivores	8. Lower percentage of individuals as piscivores
9. Higher number of individuals per seine haul	9. Lower number of individuals per seine haul
10. Higher number of individuals per minute of electrofishing	10. Lower number of individuals per minute of electrofishing
11. Lower percentage of individuals as non-native species	11. Higher percentage of individuals as non-native species
12. Lower percentage of individuals with disease or other anomaly	12. Higher percentage of individuals with disease or other anomaly
Benthic Macroinvertebrate Metrics	
1. Large number of species overall	1. Small number of species overall
2. Large number of species within the orders Ephemeroptera, Plecoptera, and Tricoptera	2. Few species within the orders Ephemeroptera, Plecoptera, and Tricoptera
3. Lower Hilsenhoff Biotic Integrity score (higher relative abundance of intolerant taxa)	3. Higher Hilsenhoff Biotic Integrity score (higher relative abundance of tolerant taxa)
4. Lower percentage of individuals as Chironomidae	4. Higher percentage (or extremely low percentage) of individuals as Chironomidae
5. Lower ratio of individuals in the dominant taxon to the total number of individuals	5. Higher ratio of individuals in the dominant taxon to the total number of individuals
6. Lower ratio of individuals in the dominant functional feeding group to the total number of individuals	6. Higher ratio of individuals in the dominant functional feeding group to the total number of individuals
7. Lower ratio of predator individuals to the total number of individuals	7. Higher ratio (or extremely low ratio) of predator individuals to the total number of individuals
8. Higher ratio of individuals in intolerant taxa to those in tolerant taxa	8. Lower ratio of individuals in intolerant taxa to those in tolerant taxa
9. Lower percentage of total Tricoptera individuals as Hydropsychidae	9. Higher percentage of total Tricoptera individuals as Hydropsychidae (or no Trichoptera individuals)
10. Higher number of non-insect taxa	10. Lower number of non-insect taxa
11. Lower ratio of collector-gatherer individuals to the total number of individuals	11. Higher ratio (or extremely low ratio) of collector-gatherer individuals to the total number of individuals
12. Lower ratio of Elmidae individuals to the total number of individuals	12. Higher ratio (or extremely low ratio) of Elmidae individuals to the total number of individuals
Habitat Metrics	
1. Large amount and many types of substrate that provides instream cover or habitat	1. Low amount or very few types of substrate that provides instream cover or habitat
2. Higher substrate stability (dominant substrate is gravel or larger)	2. Low substrate stability (dominant substrate sand/silt/clay or bedrock)
3. Higher number of riffles	3. Lower number of riffles
4. Higher dimensions for largest pool	4. Lower dimensions for largest pool
5. Higher water level within the channel	5. Lower water level within the channel
6. Highly stable banks	6. Unstable banks
7. Higher channel sinuosity	7. Lower channel sinuosity
8. Wide natural riparian buffer strips	8. Narrow natural riparian buffer strips
9. Undeveloped surrounding area	9. Highly developed surrounding area

Aquatic Life Monitoring scores are shown in Table 2. Details of the recent samples will be discussed in the appropriate Subwatershed Summary later in this report.

Table 2: Results of TRA Aquatic Life Monitoring

Station	Description	Assessment Unit	Stream Type	Aquatic Life Use Designation	Date	Period	Fish *	Benthics *	Habitat *
10868	Bear Creek at Valley View Lane	0841B_01	Intermittent with perennial pools	Limited	6/27-28/2013	Index	**I**	**L**	**I**
					8/22-23/2013	Critical	**H**	**I**	**I**
16414	Clear Fork Trinity River at Kelly Road	0831_01	Perennial	High	6/27-28/2013	Index	**I**	**I**	**H**
					8/22-23/2013	Critical	**H**	**I**	**I/H**
21286	Red Oak Creek downstream of ROCRWS	0805A_01	Perennial	High	6/20/2014 Habitat, 7/9/2014 Fish/Benthics	Index	**H**	**H**	**H**
					9/2-3-2014	Critical	**H**	**I**	**H**
No Aquatic Life Monitoring in 2015 due to flooding									
10784	Village Creek upstream of Shelby Road	0828A_01	Intermittent with perennial pools	Limited	8/9-10/2016	Critical	**E**	**I**	**I**
					10/3-4/2016	Index	**E**	**H**	**H**
21990	Walnut Creek at Katherine Rose Park	0838C_01	Intermittent with perennial pools	Limited	5/31/2017	Index	**H**	**I**	**H**
					8/1/2017	Critical	**I**	**H**	**H**
15294	Fish Creek at Great Southwest Parkway	0841K_01	Perennial	High	6/15/2018	Index	**H**	**I**	**I**
					7/23/2018	Critical	**H**	**I**	**I**
10972	West Fork Trinity River at SH 59	0812_01	Intermittent with perennial pools	Intermediate	6/21/2018	Index	**E**	**L**	**I**
					8/1/2018	Critical	**E**	**I**	**I**
18517	White Rock Creek upstream of Greenville Avenue	0827A_01	Perennial	Intermediate	6/20/2018	Index	**E**	**I**	**H**
					7/24/2018	Critical	**E**	**I**	**I**
20440	Cedar Creek in Moore Park	0805	Assumed Perennial	Assumed High	8/29/2019	Critical	Pending		
					10/1/2019	Index	Pending		
22097	Clear Fork Trinity River at Fort Worth Branch Trinity Trails	0829_03	Perennial	High	8/30/2019	Critical	Pending		
					10/2/2019	Index	Pending		

* E = Exceptional; H = High; I = Intermediate; L = Limited

PCBs, Dioxins, and Furans in Sediments

Polychlorinated biphenyls (PCBs) are a class of chemicals that were manufactured from about 1929 to 1979 when they were banned. There are 209 congeners which are two connected benzene rings with between one and ten chlorine atoms attached around the outside of the rings. They were commonly sold as mixes called Aroclors. These chemicals were viscous, not water soluble (hydrophobic), very stable, and had high flash points which made them ideal for use in many products including caulking, plasticizers, heat transfer fluids in transformers and capacitors, and carbonless copy paper. However, because of their stability, they are persistent in the environment and do not easily degrade although they can break down from more heavily chlorinated congeners to less chlorinated congeners over time. Items manufactured before 1977 may still contain PCBs. Current sources could include old landfills, auto salvage yards, and old electrical transformers that may still be in place in some areas.

Polychlorinated dibenzo-p-dioxins (dioxins) and polychlorinated dibenzofurans (furans) are a somewhat similar class of hydrophobic chemicals to PCBs. Dioxins are two benzene rings connected by two oxygen bridges and furans are two benzene rings connected by one oxygen bridge. There are several hundred congeners with between one and ten chlorine atoms attached around the rings. There are 17 congeners which are considered the most toxic and are the most commonly analyzed and studied. Unlike PCBs, dioxins and furans are not intentionally manufactured. They are byproduct contaminants of other processes such as wood burning, waste incineration, paper pulp bleaching, and production of other chemicals. Therefore, these chemicals are still being produced and released into the environment.

As hydrophobic molecules, PCBs, dioxins, and furans are not usually observed at high concentrations in the water column. They tend to bind to sediment particles and bioaccumulate in sediment dwelling organisms. Predators then eat these organisms and concentrations biomagnify up the food chain where they build up in the fatty tissues of animals. This has led to the fish consumption advisories that are currently in place along much of the Trinity River from upstream of Fort Worth to downstream of Lake Livingston. In 2017, TRA began a study to measure concentrations of these chemicals in the sediments in the advisory area to identify potential sources of these contaminants.

In the summer of 2017, sampling was conducted at 26 stations along the Trinity River, its tributaries, and in Benbrook Lake and Lake Livingston (see Figure 7). Based on the results of this sampling effort, it was determined that there are potential sources of these contaminants in three areas; along the Clear Fork Trinity River in Fort Worth, along the main stem Trinity River in Dallas between the confluence with the Elm Fork Trinity River and Cedar Crest Boulevard, and upstream of the White Rock Creek cove of Lake Livingston. Additional monitoring is planned for these areas in 2020. The goal of this monitoring is to identify an area that may be contributing these contaminants to the river and provide that information to the proper agency for investigation and enforcement.

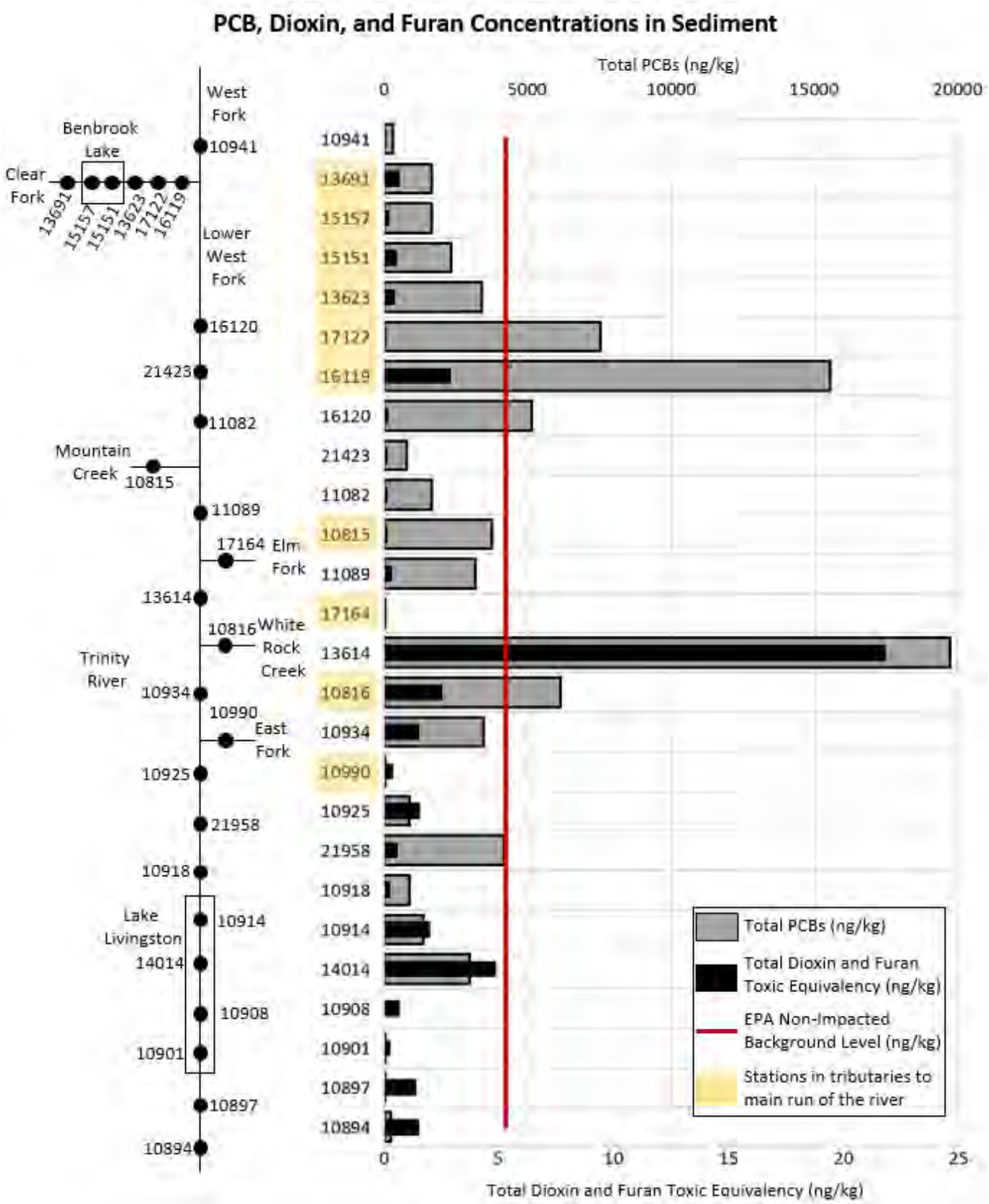


Figure 7: PCB, Dioxin, and Furan Concentrations in Sediment

E. coli in Sediment

Over the past two decades, fecal bacteria, or *E. coli*, has become a concern for many stakeholders in the Trinity River basin, and throughout the state of Texas. According to the 2020 Texas Integrated Report 303(d) List, there are currently more than 320 waterbody assessment units in Texas listed as impaired for recreational use due to elevated levels of fecal bacteria. These impairments can sometimes be attributed to point sources of bacteria, such as malfunctioning human sewage infrastructure, but commonly, bacteria impairments arise from nonpoint source pollution that is delivered to the stream as runoff during storm events. However, streams may retain elevated levels of bacteria well after disturbances from storm events have taken place. Current scientific literature indicates that shallow bed sediments can be a significant reservoir of bacteria when resuspended by a disturbance event such as incoming stormwater runoff, floodwater erosion, or other in-stream physical agitation (wildlife, livestock, or human activity). However, the majority of these studies focus on coastal tidal zones, or along beaches of reservoirs or lakes. These are areas where flow velocity slows, sediment conditions are more likely to be accretive, and unconsolidated bed sediments are common. A literature review suggests that very little is known about this phenomenon in inland, eroding systems where particle sizes, sediment consolidation conditions, and fluvial geomorphology may differ from those conditions evaluated in preceding studies.

Furthermore, there is indirect acknowledgement that sediments can affect water quality; the TCEQ Surface Water Quality Monitoring Procedures provides guidance that seeks to minimize sediment disturbance when taking water quality samples. However, studies to evaluate sediment influence on water quality are limited.

To further explore the impacts of sediment bacteria on water quality and the bacterial impairment issues in the streams of the Trinity basin, a study was undertaken to identify the extent to which bacteria in sediments may affect water column concentrations. Samples were collected in 2018 and 2019 from seven stations on Village Creek (0828A), Mountain Creek (0838A), and Walnut Creek (0838C) as shown in Figure 8. Water column *E. coli* samples were collected upon arrival at each site. Sediment samples were then collected for *E. coli*, total organic carbon, percent solids, and sediment particle size. Following sediment collection, the bottom of the stream was disturbed across the full width of the channel and another water column *E. coli* sample was collected just downstream of the disturbed area. This data was used to determine if sediment disturbances significantly changed the concentration of *E. coli* in the water column.

Results of data analysis found that artificial disturbance events led to significant increases in *E. coli* counts. There were mean increases of anywhere between 38% to >5300% at each station with a maximum increase of nearly 26,000% for one sample at site 13261 (see Table 3). There were some exceptions, particularly at the Mountain Creek sites, where substrates were notably different due to the higher presence of compacted clays. At these sites, there were several instances of no increase or even decreases with the post-disturbance samples. Additional monitoring is scheduled for 2020 and 2021 to collect enough data to determine if there are any correlations between sediment E. coli and sediment particle sizes.

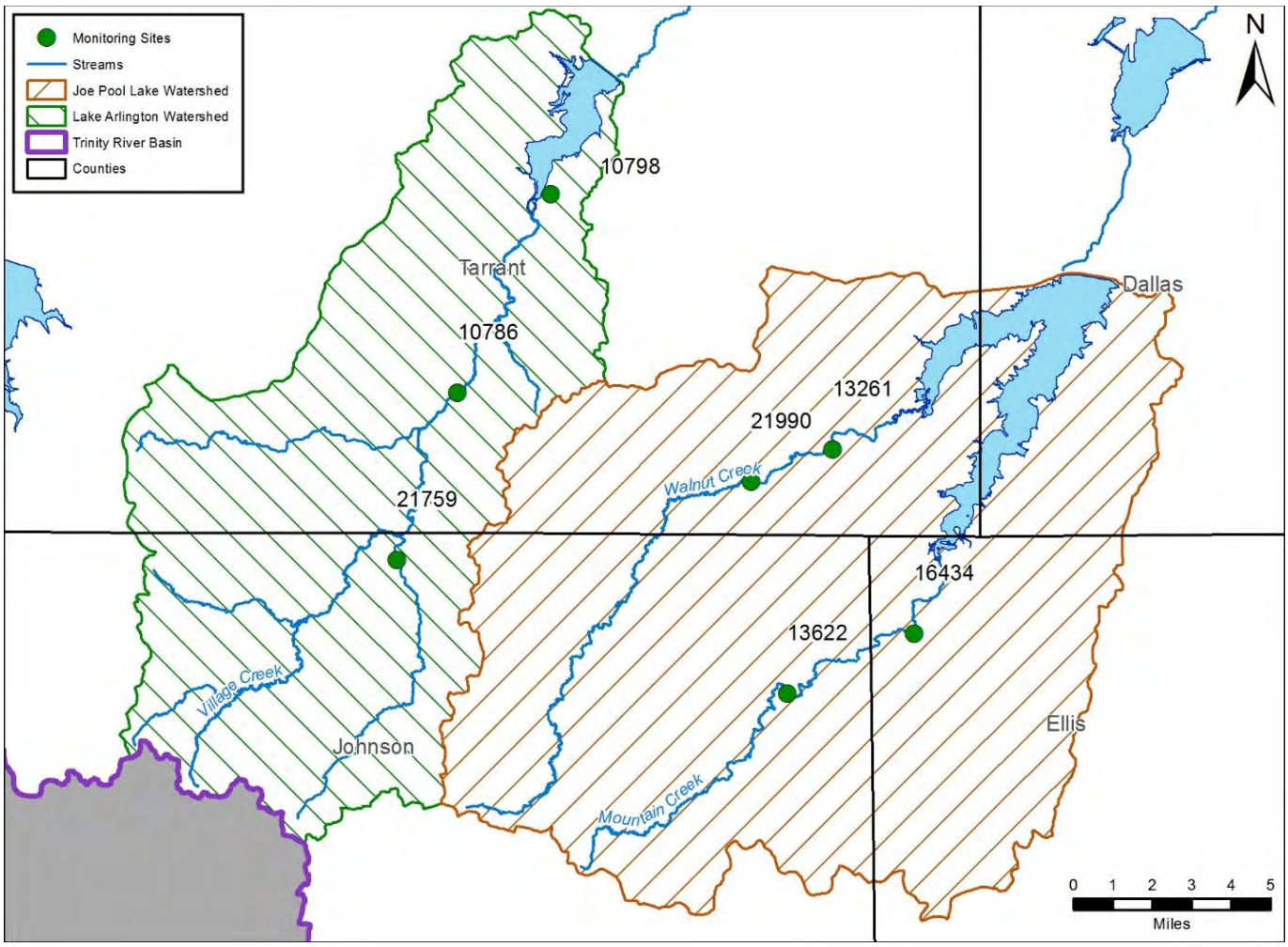


Figure 8: Sediment E. coli sampling stations

Table 3: Observations of changes in water column E. coli counts after artificial disturbance events

Station	Site	% Change in Water Column *E. coli* Count (MPN/100 mL)		
		Max	Min	Mean
13622	Mountain Creek at FM 157	153.05	-52.94	37.97
16434	Mountain Creek at US 287	1414.73	-25.00	461.12
21759	Quil Miller at CR 532	1018.77	11.76	323.58
10798	Unnamed Tributary of Lake Arlington	8658.57	228.81	3031.84
10786	Village Creek at Rendon Road	531.71	0.00	204.89
13621	Walnut Creek at Matlock Road	25925.00	142.71	5362.71
21990	Walnut Creek at Katherine Rose Park	2106.76	5.08	522.71

White Rock Creek *E. coli* Source Identification

Since the TCEQ 2016 Texas Integrated Report, segment 0827A, White Rock Creek above White Rock Lake, has been identified as not supporting the recreation use due to elevated levels of *E. coli*. As discussed in the 2018 TRA Basin Highlights Report, *E. coli* is not well correlated to flow in this segment (correlation coefficient = -0.04). This indicates that there may be a regular source of bacteria into the stream. In order to identify potential sources of bacteria, a study was conducted along the stream from the headwaters near Frisco to I-635 near Richardson. Samples were collected at 23 bridges in this reach during both dry and wet weather. The results of these sample events were used to determine smaller, more focused reaches for additional sampling. Any reach between two consecutive bridges with an order of magnitude increase and values above the *E. coli* standard of 126 MPN/100 mL was selected for fine scale sampling. TRA staff walked these reaches, to the extent possible, making observations about conditions in and around the stream that may have contributed bacteria in the stream. Samples were collected in several areas including near confluences, storm drains, or run-off rills.

After dry weather sampling in 2019, two reaches were identified for focused sampling; SH 121 to McDermott Road and Tennyson Parkway to West Spring Creek Parkway. Fine scale sampling showed a large increase in *E. coli* levels near a run-off rill upstream of McDermott Road. Sampling upstream of West Spring Creek Parkway showed an increase in a small area immediately upstream of the bridge.

Wet weather sampling was conducted in 2020 and identified four reaches for fine scale sampling; Ohio Drive to Preston Road, Keller Springs Road to Arapaho Road, Arapaho Road to Beltline Road, and Spring Valley Road to Alpha Road. The results of the fine scale wet weather sampling are still being analyzed, but all reported very high levels of *E. coli* between 442 and >12,098 MPN/100 mL.

Additional surveys of these reaches may be necessary to further refine the areas where bacteria may be entering the stream. Once an area or source is identified that is anthropogenic in nature, the information will be given to the proper entity for investigation and enforcement.

Lake Arlington Zebra Mussel Monitoring

The zebra mussel, *Dreissena polymorpha,* is an invasive species that was first discovered in Texas waters in 2009 and the Trinity River Basin in 2012 at Lake Ray Roberts. Zebra mussels establish themselves by clinging to stationary objects with strong fibers they excrete called byssal threads, and can form large, jagged clusters that can damage underwater infrastructure, make swimming areas dangerous, and cause changes to the tropic structure of waterbodies.

Lake Arlington is a major water supply reservoir in the Dallas/Fort Worth Metroplex that provides drinking water for more than half a million people. Yields of the reservoir are supplemented by water pumped in from the Cedar Creek and Richland Chambers reservoirs. Of particular concern, Richland Chambers Reservoir has a confirmed presence of adult zebra mussels.

Starting in June of 2019, the USGS has performed five sampling efforts at four monitoring stations in Lake Arlington to determine the presence or absence of environmental DNA (eDNA), larva (veligers), or adult/juvenile zebra mussels (see

Table 4 and Figure 9). To date, no adults, juveniles, or veligers have been located, though there have been two positive samples for environmental DNA (eDNA). Early detection of zebra mussels in Lake Arlington could help slow the spread of zebra mussels to other reservoirs. Additionally, early detection could increase the potential success of eradication measures taken before the reservoir becomes fully infested, thereby protecting the public water supply and recreational uses of this reservoir. This study was conducted by the USGS in cooperation with the Trinity River Authority (TRA) and the Texas Commission on Environmental Quality (TCEQ) and was financed through funding from the TCEQ.

Table 4: Lake Arlington zebra mussel monitoring results

Event	Date	Juveniles/Adults	Veligers	eDNA
1	6/6/2018	Negative	Negative	**Positive**
2	6/28/2018	Negative	Negative	Negative
3	10/22/2018	Negative	Negative	**Positive**
4	5/6/2019	Unable to Sample	Negative	Negative
5	10/8/2019	Negative	Negative	Negative

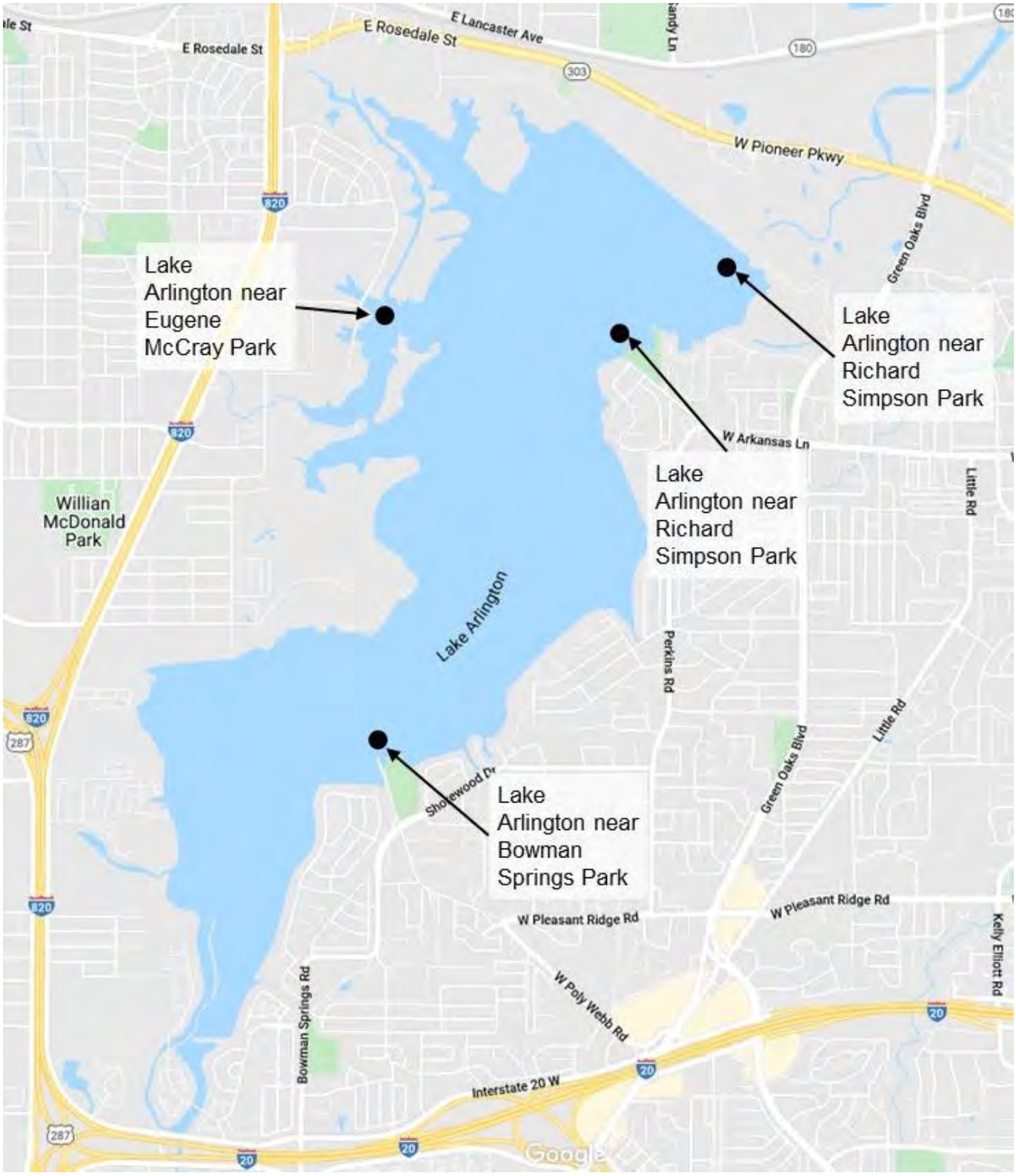


Figure 9: Lake Arlington zebra mussel monitoring sites

Watershed Protection Plans

Watershed Protection Plans (WPPs) are broad, stakeholder driven, voluntary programs designed to address both water quality impairments and other water quality concerns deemed important by local stakeholders, e.g. stream bank erosion, nutrient loadings, public education, etc. In the Trinity River Basin, there are currently five WPPs underway or completed. TRA has been the contractor for two of the projects, the Village Creek/Lake Arlington WPP (VCLAWPP) and the Joe Pool Lake WPP (JPLWPP).

Village Creek is currently listed as an impaired waterbody, which indicates that it is not meeting the designated contact recreation use due to elevated levels of bacteria. Village Creek flows into Lake Arlington (see Figure 10), a major water supply reservoir for the Dallas-Fort Worth area, and has a Concern for nitrate and chlorophyll-*a*. The WPP was created by the Village Creek–Lake Arlington Watershed Partnership, the City of Arlington, and the Trinity River Authority to restore water quality in Village Creek, and protect Lake Arlington's water quality. After three years of work, the U.S. Environmental Protection Agency approved the VCLAWPP in 2019. TRA is actively seeking funding to implement elements of the plan.



Figure 10: Cove of Lake Arlington near Eugene McCray Park

Joe Pool Lake and its associated park facilities are a popular recreational destination for many Dallas-Fort Worth area residents and water from the reservoir is currently being withdrawn by the City of Midlothian as part of its municipal water supply. This water withdrawal is used to

supply the communities of Venus, Rockett, Mountain Peak, Sardis, and parts of southern Grand Prairie during times of peak demand. Walnut Creek, one of Joe Pool's two main tributaries, was listed on the TCEQ 2016 Texas Water Quality Inventory and 303(d) List due to elevated levels of *E. coli*. Additionally, the Mountain Creek arm of Joe Pool Lake showed a Concern on the TCEQ 2014 Texas Water Quality Inventory due to elevated levels of nitrate.

To address these concerns in a holistic manner, the surrounding cities of Cedar Hill, Grand Prairie, Mansfield, Midlothian, and TRA (Partnership Group, collectively) came together to create the JPLWPP. On behalf of the Partnership Group, TRA submitted a grant application and was approved for the project. TRA was awarded a total of $358,817, 60% of total project cost, in grant funding with the Partnership Group agreeing to provide the $239,211, 40% required local match. The final WPP is due in 2022, and upon EPA approval of the plan, the implementation phase will begin (see Figure 11 and Figure 12). If you would like to be involved with the JPLWPP, please reach out to TRA's Technical Services and Basin Planning group at 817-467-4343. For more information, please visit the TRA VCLAWPP website.

Grant funding for both WPPs was provided by the Texas Commission on Environmental Quality through a Clean Water Act § 319(h) grant from the U.S. Environmental Protection Agency.



Figure 11: Stream hydrology demonstration trailer as an example of an implementation option for public education

Compost your pet's waste



To go through a composting process, organic waste requires the right level of heat, water, and oxygen. In a pile of organic waste, there are millions of tiny microbes that consume the waste, transforming the organic materials into compost.

In order to claim that a product is fully compostable, the product has to meet all the requirements in the US Standard ASTM D6400. These specifications require that biodegradable/compostable products completely decompose in a composting setting in a specific time frame, leaving no harmful residues behind.

DIY Pet Waste Composter



1. Select container based on number of animals and pet size. Drill a dozen or so holes in the sides all around the container no more than 2/3 of the way up, to prevent odor issues.

2. Cut into the bottom of the container 1 inch from the rim. This will maintain the structural integrity of the container.

3. Dig a hole in a rarely used area of the yard. Possibly in a far corner.
Warning: Pet waste compost should NOT be applied to gardens. DO NOT place composter in gardens.

4. Toss some rocks or gravel in the hole for drainage 10" below the container. Position the container so it's a little above ground level.

5. Place the lid on top.

6. Start scooping.

Within 48 hours, the septic-tank starter (which is non-caustic and promotes natural bacterial growth) will have begun it s work. There will be no smell if the pet waste composter is installed correctly. You can then begin to add it daily. This waste biodegrades and flows into the subsoil.

Prefabricated pet waste composter options can be found online for purchase as well.

Figure 12: Excerpt from a brochure for a best management practice implementation option for pet waste

Water Quality Review



Figure 13: Trinity River flooding, June 2015

Data Review Methodology

Data Collection

A large portion of the data used in this report was collected by TRA CRP Within Basin Participating Agencies. Current partners include the cities of Fort Worth, Grand Prairie, Arlington, Irving, and two groups within the City of Dallas, as well as Tarrant Regional Water District, North Texas Municipal Water District, Dallas-Fort Worth International Airport Environmental Affairs Department, and the TRA Lake Livingston Project. These partner entities have monitoring programs that have been in place for many years for reasons such as storm water permitting and water supply protection. These entities have agreed to provide their data to the CRP on a voluntary basis. In return, TRA CRP staff provide the partner entities with data quality assurance and data analysis, some sampling supplies and equipment, funding for analytical costs of parameters requested by TRA, and additional manpower on an as-needed and negotiated basis. This voluntary partner network has allowed the TRA CRP to leverage funding for more than a four to one return on the dollar. The result has been the ability to collect a large amount of data covering a large portion of the basin which would be impossible using only in-house resources. In fact, from 2009 to 2018, 73% of the data for the Trinity River Basin in the TCEQ Surface Water Quality Monitoring Information System (SWQMIS) database were collected by members of the TRA partner network. Data are collected in compliance with both the biennial quality assurance project plans and the TCEQ Surface Water Quality Monitoring Procedures Manuals.

TCEQ Assessments

The date range for the TCEQ 2020 Texas Integrated Report includes the seven-year period from December 1, 2011 to November 30, 2018. Where needed, data from an additional three years starting from December 1, 2008 were used. The methods used for the Integrated Report are described in the TCEQ document titled "2020 Guidance for Assessing and Reporting Surface Water Quality in Texas."

Findings of the Integrated Report are classified as Fully Supporting, No Concern, Use Concern, Screening Level Concern, and Not Supporting. Use Concern findings are given for assessments against designated use standards such as dissolved oxygen and *E. coli*. Use Concerns can apply to data sets with limited data where the threshold number of exceedances are met or to data sets with adequate data where there are less than the threshold number of exceedances required for a Not Supporting finding. Screening Level Concerns apply to General Use nutrients and chlorophyll-*a* as well as a few other parameters for other designated uses. These parameters have screening levels rather than standards.

TRA Basin Summary Report Trend Analysis

Trend analyses were conducted by TRA on all data sets determined to be normally distributed. Those data sets with trends that passed significance testing were determined to have trends that warranted further discussion and investigation. The methodology used for data preparation and trend analysis is discussed below and in Appendix C. It is important to note that TCEQ assessments are based on "assessment units", which are sub-sections of a classified or unclassified segment and may include one or more monitoring stations. For the purposes of this report, trend analyses were conducted for individual stations rather than assessment units because localized conditions may affect water quality between stations and these conditions could be missed if trends were analyzed on the larger scale of the assessment unit.

In order to create a robust dataset, data from both the SWQMIS database and TRA's in-house database were compiled to analyze trends for this report. Additionally, data collected by the cities of Fort Worth and Dallas (collecting entity DA) but analyzed at labs that were not accredited by the National Environmental Laboratory Accreditation Program (NELAP) were included for trend analysis. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS. Data for the period December 1, 2003 to November 30, 2018 were selected in order to better identify long-term trends. To standardize the trend analysis, only routine surface samples were included to prevent biasing the data set to conditions such as flow, weather, and depth.

Additional steps were taken to process greater than and less than values and to combine similar parameters. Trend analyses were conducted for the full data sets and for summer and winter seasons. The seasonal trends were based on splitting the year into two seasons – May through October as the summer and November through April as the winter. Expanded detail of how data were processed prior to trend analysis can be found in the Data Preparation section of Appendix C.

Most water quality data are inherently non-normal, while most statistics are based on the assumption of normality. This can make the results of statistical analyses performed on water quality data less reliable. To increase the reliability of trend analyses, only data sets that fell within predefined boundaries of adequate normality were used. Detailed discussion of trend analyses can be found in the Trend Analysis Procedure and Deviations from TCEQ Data Analysis Guidance sections of Appendix C.

Due to the data preparation and trend analysis procedures used in this report, as well as the deviations from TCEQ guidance, all significant trends identified during TRA data analysis may not represent true changes in water quality. Trend analysis summaries are presented in tables in each segment chapter. During further data analysis, some of the identified significant trends were determined to be false trends and have been discussed throughout this report. If there are questions about any of the trends that have not been specifically discussed, please contact Angela Kilpatrick at kilpatricka@trinityra.org.

General Water Quality Issues in the Trinity River Basin

Nutrients

Based upon the findings of this basin summary report, nutrients are not causing widespread problems in the Trinity River Basin and correlation analysis shows little relationship between nutrients and harmful algal blooms that can cause widespread fish kills. In the naturally turbid waters of the Trinity River Basin, the greatest limiting factor for algal growth is likely light penetration into the water column, which limits the depth of the photic zone; therefore, limiting available resources for algal populations. In an effort to maintain the existing levels of use attainment in reservoirs, standards have been derived from existing main body chlorophyll-*a* data for some reservoirs. As of the 2018 Texas Surface Water Quality Standards, numeric standards for chlorophyll-*a* have been developed and approved by EPA for 38 reservoirs in Texas; four of which are in the Trinity River Basin. Reservoirs without approved numeric standards are assessed against a narrative criteria which takes into account factors such as algal growth, nutrient and chlorophyll-*a* concentrations, dissolved oxygen, and the trophic status of the reservoir. There are ten reservoirs in the Trinity River Basin that are assessed against the narrative criteria. Water quality is assessed by comparisons to nutrient and chlorophyll-*a* screening levels in the remaining nine reservoirs where numeric standards have not been developed. Similarly, streams and rivers are assessed against screening levels as development of numeric criteria in these waterbodies has not begun.

It is very difficult to obtain meaningful correlations between any single constituent and phytoplankton. The data (15-year period of record averages for chlorophyll-*a*, total phosphorus, and Secchi depth) from Lake Livingston are a good example of the difficulty of teasing out these relationships (Figure 14).

As expected, due to inflows from the river being quite turbid and nutrient laden, the total phosphorus value was high and the chlorophyll-*a* and secchi depth values were low in the riverine portion (10917) of the lake. However, the upper reaches (10913) of Lake Livingston and Kickapoo Creek cove (21562) showed the highest chlorophyll-*a* values, yet total phosphorus decreased somewhat and the secchi depth was still quite low at 10913, which should have significantly limited phytoplankton production. Perhaps, phytoplankton are being washed in from White Rock Creek cove just north of 10913 and from Kickapoo Creek upstream of 21562. Unexpectedly, in the middle section (21563), both chlorophyll-*a* values and total phosphorus values decreased as secchi depth increased. Near the dam (10899), chlorophyll-*a* should, in theory, be the highest due to the very high secchi depth. However, chlorophyll-*a* was far lower than the middle portion of the lake.

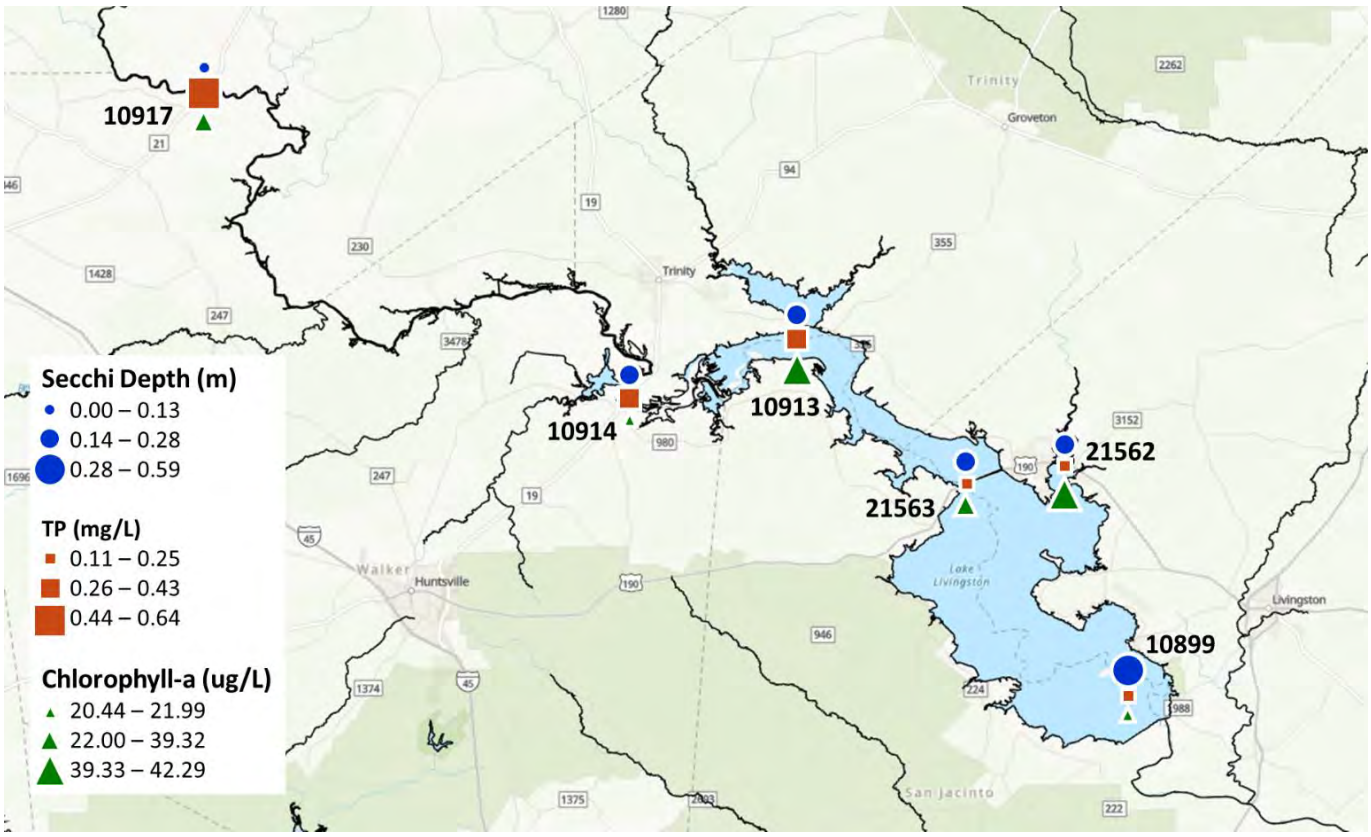


Figure 14: Lake Livingston 15-Year Averages

Nutrients are essential for the productivity of aquatic ecosystems. Without the building blocks, or "food", that drives the system, there would be no plant and animal life. Conversely, an overabundance of nutrients within riverine and reservoir ecosystems may have detrimental effects in some instances. Clear reservoirs are more susceptible to nutrient enrichment than sediment-laden rivers and lakes. Algae require nutrients and light to grow; Trinity River Basin waterbodies are generally turbid and, as a result, light can be more of a limiting factor than nutrients. The Trinity River Basin's two fairly clear reservoirs, Bridgeport and Amon G. Carter, should be more susceptible to algal growth due to nutrient enrichment, but this was not demonstrated. Much of the published work demonstrating nutrient correlations with excessive phytoplankton production were performed in very clear, temperate or boreal lakes, temperate streams, and coastal areas and may not apply to Texas reservoirs. Every two years, TCEQ produces a Trophic Classification of Texas Reservoirs report. This report ranks reservoirs based on Carlson's Trophic State Index calculations using chlorophyll-*a*, total phosphorus, and secchi depth measurements collected within the reservoirs. Reservoir results are categorized as oligotrophic, mesotrophic, eutrophic, hypereutrophic. Oligotrophic reservoirs are generally clear with low nutrient and algal content while hypereutrophic reservoirs are murky with high nutrient and algal levels. All Trinity Basin reservoirs for which there are current scores have been categorized as either mesotrophic or eutrophic.

Especially during dry weather, point sources dischargers can have local effects on nutrient concentrations in streams and rivers. However, reservoir nutrient loadings are typically

dominated by storm water run-off, which is difficult to control. Many Trinity River Basin waterbodies are nutrient saturated and exponential decreases in nutrients would be needed to have any meaningful decrease in phytoplankton growth. This lends support to the statement above – nutrients are generally not causing problematic algal blooms. There are other factors, such as light penetration, limiting algal growth even in the presence of excess nutrients. However, under the current threat of zebra mussel infestation in the reservoirs of the Trinity River Basin, it is necessary to be proactive. Large populations of zebra mussels have been known to rather quickly increase the clarity of reservoirs. Once light is able to penetrate deeper into reservoirs, a much larger area with more resources is available for algal blooms to occur. Watershed Protection Programs, extensive use of best management practices, and a cultural shift in both rural and urban communities are needed to measurably decrease nutrients in the Trinity River Basin.

Chlorophyll-*a*

Chlorophyll-***a*** is commonly used throughout the state as a surrogate for algal biomass. It is the pigment responsible for the green color of many algal species and is vital for photosynthesis. High levels of chlorophyll-***a*** may indicate algal blooms have occurred or are occurring as shown in Figure 15. Typically, nutrients, such as nitrogen and phosphorous species, are the limiting factors for algal growth. The most common limiting nutrients are the phosphates. Nutrients can enter waterbodies via run-off containing residential and agricultural fertilizers, as well as animal waste, atmospheric deposition, effluent from wastewater treatment plants, and sanitary sewer overflows.

In the Trinity River Basin, nutrients are not always the limiting factor for algal growth. In the naturally turbid waters of the river, light availability is commonly the limiting factor. High suspended sediment loads decrease light penetration into the water column. Therefore, algal productivity is limited to a narrow band at the surface of the water which can range from just a few inches to several feet depending on turbidity. In reservoirs, light can be the limiting factor in the turbid upper reaches and coves where sediments are still in suspension. As sediments settle out nearer to the main body of the reservoirs, nutrients can become the limiting factors.

Algal growth can affect levels of dissolved oxygen and pH. As algae cycle through photosynthesis and respiration during a 24-hour period, dissolved oxygen and pH levels rise and fall in response. Because chlorophyll-***a*** is used as a surrogate for algal biomass, data analysis can show a strong correlation between chlorophyll-***a***, dissolved oxygen, and pH. The strength and direction of the correlation depends on the extent of the algal bloom and the time of day, as well as the time required for dissolved oxygen and pH levels to recover.



Figure 15: Algal bloom upstream of Lake Livingston

During sunny daylight hours, algae photosynthesize and respire. The process of photosynthesis uses light, carbon dioxide, and water to produce carbohydrates and oxygen. Therefore, oxygen and pH levels can increase.

At night or during cloudy weather, algal photosynthesis stops while respiration continues. Cellular respiration uses carbohydrates and oxygen to produce carbon dioxide and water. Carbon dioxide in the presence of water forms carbonic acid which reduces the pH of the water. Therefore, oxygen and pH levels can decrease when algal mass is high but light is low.

During an algal bloom, it is not uncommon for the water to become supersaturated with dissolved oxygen during the day. At night or during cloudy weather, dissolved oxygen and pH can drop to very low levels, occasionally causing fish kills. This rise and fall in dissolved oxygen and pH during a 24-hour period is called a diurnal swing. The severity of the diurnal swing and the resultant minimum and maximum dissolved oxygen and pH levels depend of the extent of the algal bloom.

Bacteria

Enterococcus and *Escherichia coli* (*E. coli*) are bacteria commonly found in the intestines of animals and humans. These bacteria live in the waste products of these animals and can be washed into surface and ground water during rain events. High measurements of these bacteria can indicate improperly treated wastewater, illicit discharges, livestock and wildlife presence, and a host of other sources. Any warm-blooded animal can be a source. Some of these bacteria produce powerful toxins and can cause severe illness if ingested. To protect public safety, CRP partners sample for bacteria throughout the basin. These samples are compared to a surface water quality standard determined by the Texas Commission on Environmental Quality and approved by the U.S. Environmental Protection Agency.

E. coli (freshwater) and *Enterococcus* (saltwater) are the two parameters used in assessing waterbodies against the Contact Recreation use standard. This standard is based on the geometric mean of the sample set. In the TCEQ 2020 Texas Integrated Report, 162 assessment units in the Trinity River Basin were assessed for contact recreation. Of these, 69 were found to have concerns or to be not supporting the contact recreation use. Furthermore, 55 of these findings were on unclassified segments which are generally small streams that flow into classified segments, roughly half of which are intermittently-flowing urban streams in the Dallas-Fort Worth Metroplex.

The Clean Water Act requires that states perform a Total Maximum Daily Load (TMDL) for waterbodies not meeting the water quality standards. TMDLs establish an allowable loading of a particular pollutant and allots a certain percentage to each source. There is currently a TMDL Implementation Plan in place for much of the Dallas-Fort Worth Metroplex. While implementing a bacteria TMDL in this area will be difficult at best, the plan presents an iterative approach where implementation activities will be periodically evaluated and adjusted. The hope is that the activities outlined in the Implementation Plan will eventually reduce the bacteria loading into these streams.

Potential issues associated with this Implementation Plan are that sources are frequently difficult to identify and nearly impossible to control. This is especially true for sources attributed to wildlife. In a 2006 Texas Institute for Applied Environmental Research report, Monitoring Report for Bacterial Source Tracking Segments 0806, 0841, and 0805 of the Trinity River Bacteria TMDL, researchers attempted to identify the sources of *E. coli* in the Upper Trinity River region. In general, they found that the *E. coli* sources were:

- 27.3% Avian;
- 18.5% Human;
- 18% Mammalian Wildlife;
- 17.6% Unknown;
- 12.5% Pet; and
- 6.2% Livestock.

During wet-weather sampling, *E. coli* values tend to spike at the beginning of the rain event, or first flush, and then taper off as the rain event progresses. In smaller streams, such as those

found in the Upper Trinity River Basin, this is compounded by the fact that many of these streams are commonly low flow systems. Bacteria levels can increase in these systems because it is not washed out or assimilated.

Many of the current large-scale projects in the Upper Trinity River Basin such as the Panther Island Central City Flood Project in Fort Worth and the Trinity River Corridor Project in Dallas have components that are designed to increase riparian buffer zones and create additional opportunities for the public to enjoy recreating in and around the Trinity River. It is possible that these projects, which are designed to re-create the natural riparian vegetation and habitat, may actually increase the *E. coli* values by introducing additional wildlife and avian sources.

There are no accounts of sickness resulting from elevated *E. coli* values in the Trinity River Basin. Water quality is monitored regularly in all flow conditions and there are no known illnesses in sampling personnel attributed to bacteria ingestion or contact during sample collection.

Resolution of the *E. coli* listings will continue to be addressed in the future. The 2018 Texas Surface Water Quality Standards have proposed an update to the *E. coli* standard for some segments from Primary Contact Recreation to Secondary Contact Recreation 1. This indicates that contact recreation activities are generally those that pose less risk for water ingestion as compared to primary contact activities such as swimming. Secondary contact recreation activities may include fishing and boating. TCEQ has applied the secondary contact recreation standard of 630 MPN/100 mL to three unclassified segments in the West Fork Trinity River. These include Big Sandy Creek (segment 0810A), Garrett Creek (0810B), and Salt Creek (0810D). It is important to note that EPA has not yet approved the standard revision. The Primary Contact Recreation standard remains in place until EPA approves the change.

Flooding

The Trinity River Basin is a transition zone between arid West Texas and sub-tropical, humid East Texas. The precipitation gradient from west to east ranges from approximately 29 inches in the northwest to the over 60 inches in the southeast. Average rainfall increases approximately 1 inch/year for every 10 miles of longitude, moving west to east. As such, the Trinity River Basin experiences high variability in rainfall year-to-year and decade to decade. Looking at rainfall data from the Dallas/Fort Worth Airport for the last ten years, two distinct periods stand out. 2010-14 is a half-decade of drought, while 2015-19 show extremely high rainfall totals, especially in the wet spring and fall months (see Figure 16).

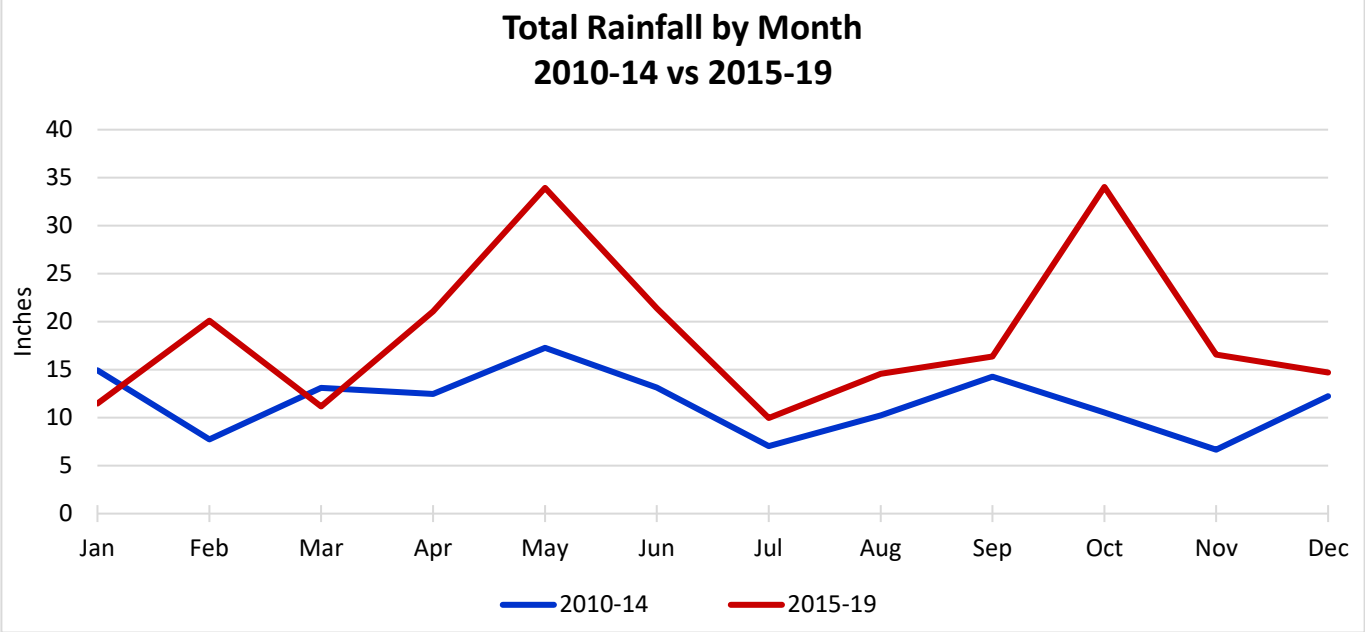


Figure 16: Total Rainfall by Month 2010-14 vs 2015-19 as measured at DFW International Airport

When looking at streamflow for the same time period at the USGS gage at Rosser, the same pattern emerges (see Figure 17). There are some important things to note about this gage record. Between 2010 and 2014, there were only a few days at or above the River Forecast Center's Moderate Flood Stage. During the later time period, there were multiple exceedance events and extended days above this threshold. Interestingly, there was an extended "flash drought" during the summer and fall of 2015, but because the United States Army Corps of Engineers flood control reservoirs were releasing stored water, the flow remained high for the majority of the time between the spring of 2015 and fall of 2016. Figure 18 shows the mean annual flow for each year (period of record - 95 years, 1924-2019). It is interesting to note that the two highest years in the period of record were 2015 and 2016.

Two major Hurricanes struck the lower basin, Harvey in 2017 and Imelda in 2019. According to the National Oceanic and Atmospheric Administration, Harvey set the rainfall record dropping over 60.58 inches of rain over 3.5 days (see Figure 19) and, two years later, Imelda produced 44.29 inches of rain in less than 24 hours, making them the first and fifth wettest hurricanes on record in the Lower 48 states, respectively. Flooding from Imelda was worse than Harvey in many parts of the Trinity River Basin due to the intensity of the rainfall. During Imelda, towns near the coast like Liberty and Dayton were heavily affected, but just 45 miles to the northwest, Lake Livingston received less than 1 inch of rainfall.

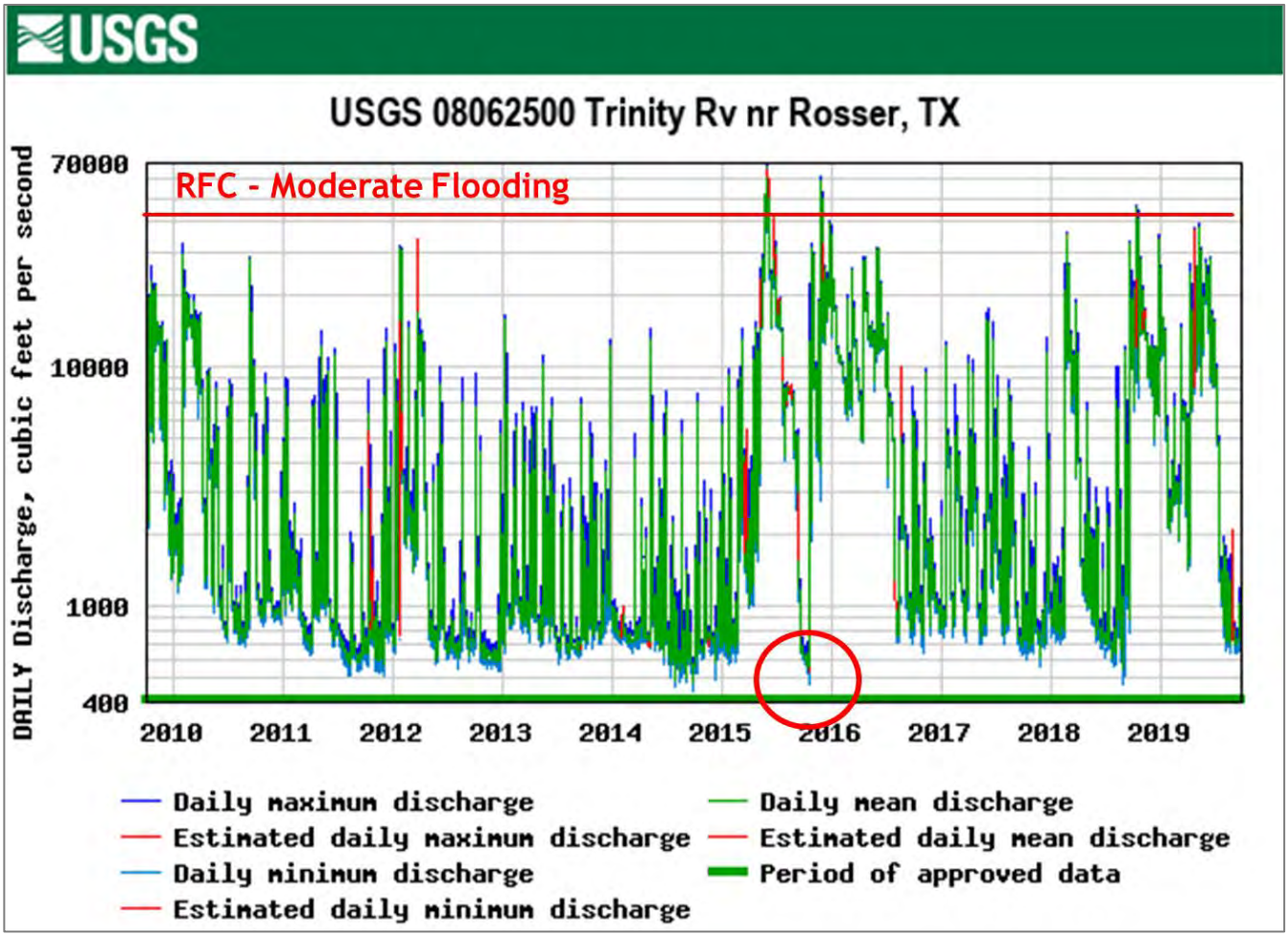


Figure 17: USGS 08062500 Trinity River Near Rosser daily flow

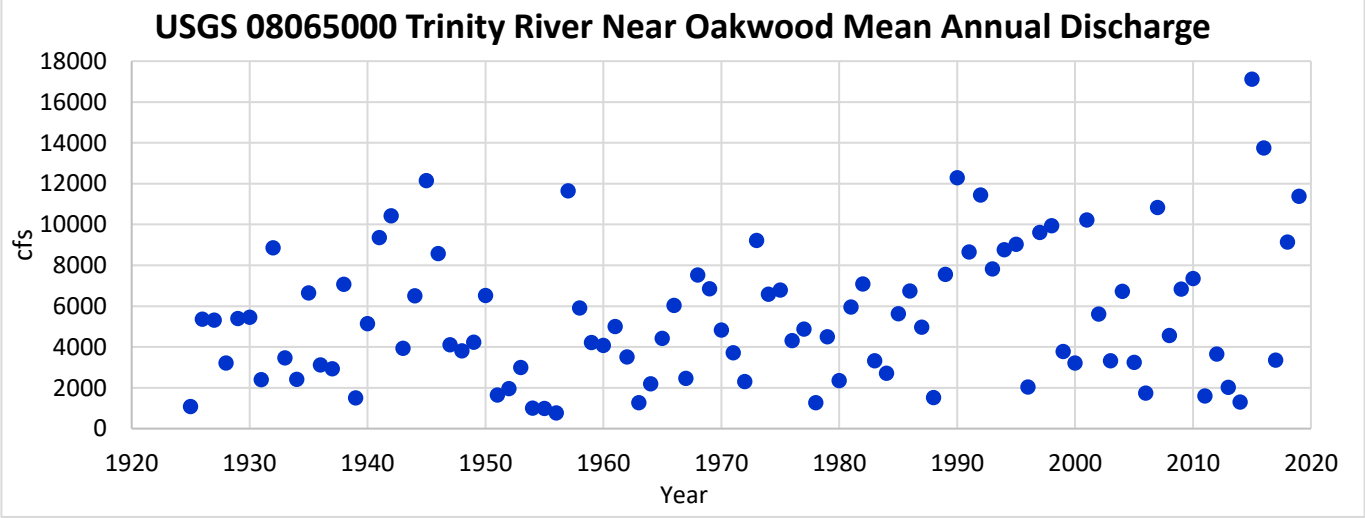


Figure 18: USGS 08065000 Trinity River Near Oakwood Mean Annual Discharge



Figure 19: Hurricane Harvey flooding

Subwatershed Summaries



Figure 20: Common Snapping Turtle found in Fish Creek in Grand Prairie, June 2018

Hydrographs

A hydrograph is a time-series graph of the flow in a stream measured at a specific location. Anything that adds or subtracts water to a stream will alter the flow. Daily fluctuations are seen downstream of wastewater treatment facility outfalls as the amount of effluent leaving the facility responds to water usage throughout the day. The portion of the hydrograph representing increasing flow is referred to as the rising limb while the portion representing decreasing flow is the falling limb. Large increases above baseline flows are usually caused by run-off from precipitation events. This run-off can also wash pollutants such as bacteria, salts, and solids into the stream. When this occurs, there is a direct relationship between flow and pollutant concentrations. A basic assumption would be that concentrations of a pollutant would increase as flow increases and that is true to a point. At some point during a sufficiently long precipitation event, all of the pollutant that was on the ground will have been washed into a stream. At that time, pollutant concentrations begin to decrease. Given this sufficiently long precipitation event, the peak pollutant concentration will occur before the peak flow. Figure 21 shows an idealized hydrograph and pollutant concentration graph. If a sample were collected at 4:00 am, the flow and pollutant concentration would be approximately 240 cfs and 32 mg/L, respectively. This sample would have been collected on the rising limb of the hydrograph. If another sample were collected the next time the flow was at 240 cfs on the falling limb of the hydrograph, the pollutant concentration would be approximately 1.5 mg/L.

There is usually no indication in data sets of the timing of the sample in relation to the hydrograph, unless samples are collected in close proximity to a streamflow gage. Due to the cost of installation and maintenance, these gages are limited. On most streams, flow records are limited to only those measurements made at the time a water quality sample is collected. When graphing pollutant concentrations against these discrete flow measurements, samples collected on the falling limb of the hydrograph can complicate the ability to make conclusions about the data set, reducing the strength of the correlations between flow and pollutants.

During data analysis, it is important to consider these complicating factors and to measure flow when collecting samples because it aids in data analysis and future uses of the data such as loading calculations and modeling. Alternative parameters can sometimes be used to tease out run-off related causes for elevated pollutant concentrations with varying levels of success. These can include flow severity, days since precipitation, or radar interpolated rainfall data, if it is available.

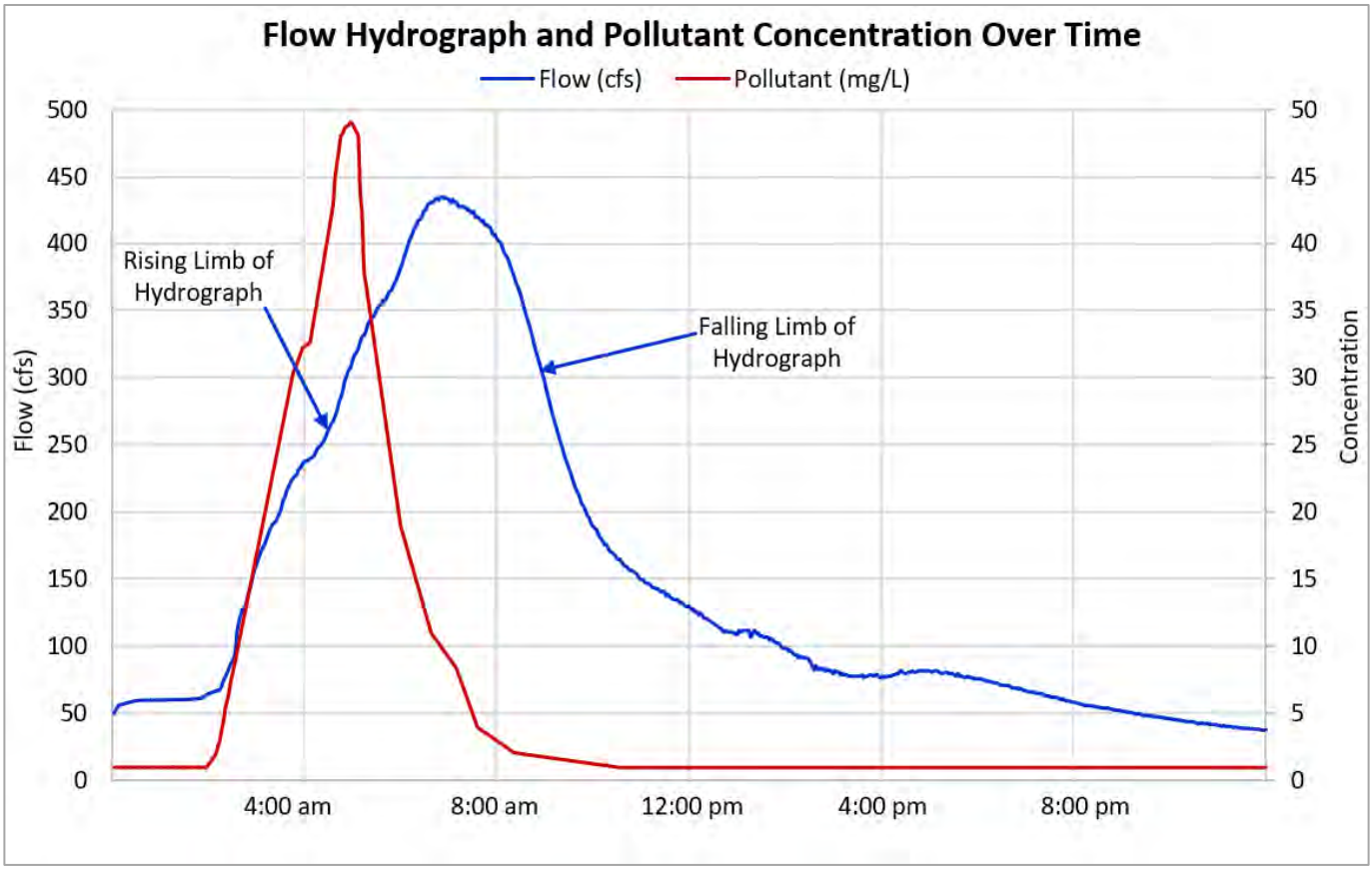


Figure 21: Flow Hydrograph and Pollutant Concentration Over Time

Drought and Hydrologic Unit Codes

Many of the graphs in the following segment discussions include drought data. An example of this data is shown in Figure 22. Drought data can be useful in interpreting water quality data because parameters such as total dissolved solids and salts can increase during periods of drought due to evaporation concentrating these parameters; especially in reservoirs. Increases in nutrient level concentrations can be seen in effluent dominated streams due to the lack of inflows from precipitation. Nutrient levels in streams that are not effluent dominated can increase during drought recovery periods due to run-off washing nitrogen and phosphorus from fertilizers and animal waste into the stream.

The drought data shown in the graphs of this report are based on data reported on the United States Drought Monitor website. Data have been organized by hydrologic unit codes (HUC). HUCs are subdivisions of watersheds; the more digits in the HUC, the smaller the watershed. The codes are classified by the number of digits; HUC 2, HUC 4, HUC 6, HUC 8, et cetera. Data from the Drought Monitor website are available for HUC 2 to HUC 8. The United States is divided into 21 regions. The Trinity River Basin lies within the Texas Gulf Region 12; a HUC 2 code. The next levels are the river basins; HUC 4. The Trinity River Basin is 1203. The HUC 6 level further subdivides the river basins. 120301 is the Upper Trinity and 120302 is the Lower Trinity. The HUC 8 level divides these portions into smaller drainage areas such as 12030101-Upper West Fork Trinity, 12030102-Lower West Fork Trinity, and 12030103-Elm Fork Trinity.

Individual stations in this report were matched to the appropriate HUC 8. The Drought Monitor data is subdivided by the intensity of drought conditions from abnormally dry to exceptional drought. For the purposes of this report, there has been no distinction made between the drought intensity categories. The data in the graphs shows the percentage of the HUC that is in any level of drought intensity.

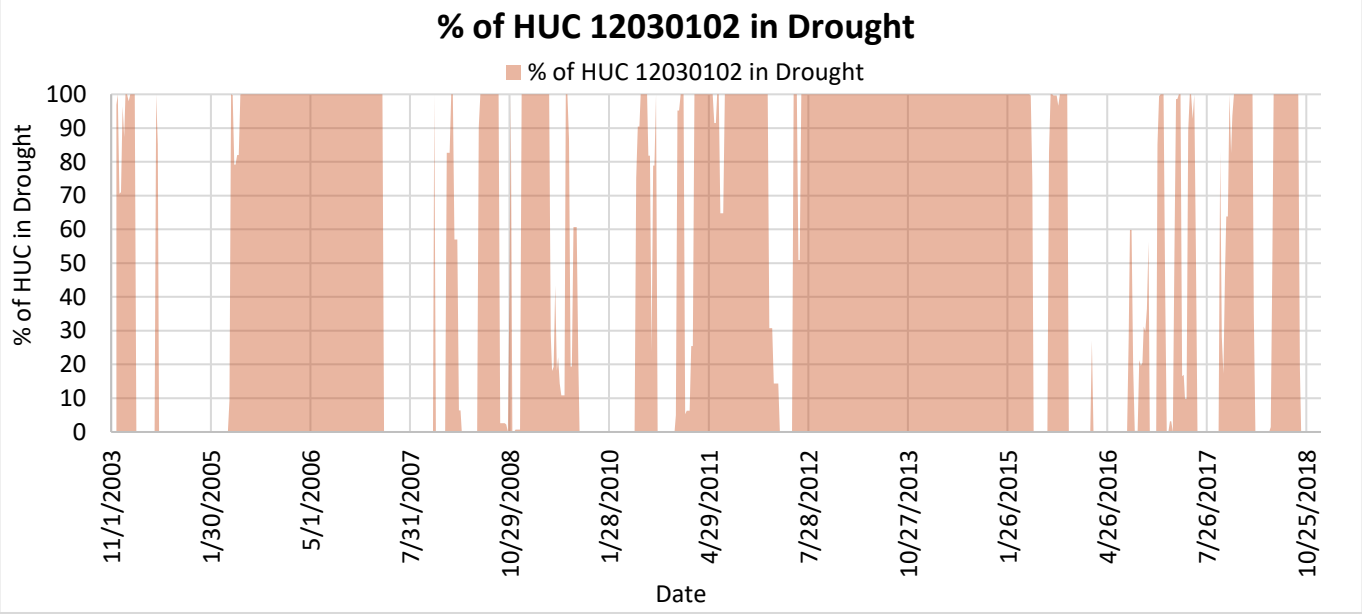


Figure 22: % of HUC 12030102 in Drought, example graph

TCEQ 2020 Texas Integrated Report Summary

The TCEQ assesses the waterbodies of the state every two years. The most recent assessment is the 2020 Texas Integrated Report. All details of how the assessment is conducted can be found in TCEQ document titled "2020 Guidance for Assessing and Reporting Surface Water Quality in Texas."

Assessments are conducted for several parameters that are grouped together in the following five designated use categories.

- Aquatic Life Use – "Assessment of dissolved oxygen criteria, toxic substances in water criteria, ambient water and sediment toxicity test results, and indices for habitat, benthic macroinvertebrate and fish community" to protect the health of aquatic life.
- General Use – Assessment of water temperature, pH, chloride, sulfate, TDS, chlorophyll-a, and nutrients to "safeguard general water quality, rather than for protection of one specific use." Fish kill reports are assessed under this category as well.
- Recreation Use – Assessment of *E. coli* in fresh water or *Entercoccus* in tidal waters to protect the health of humans recreating in waterbodies.
- Fish Consumption Use – Assessment of several toxic substances in fish tissue to protect human health. Sampling is conducted by the Texas Department of State Health Services.
- Domestic Water Supply Use – Assessment of several metals, organic compounds, fluoride, and nitrate in waterbodies designated as domestic water supplies to protect human health.

There are six possible findings of the assessments as listed below.

- Not Assessed – An assessment is not conducted due to lack of data.
- Fully Supporting – Data are assessed against water quality standards. There are adequate data and the number of exceedances is less than the number required for a non-support or use concern finding.
- Not Supporting – Data are assessed against water quality standards. There are adequate data (or the listing is carried forward from previous assessments) and at least the required number of exceedances.
- Use Concern – Data are assessed against water quality standards. There are adequate or limited data and the number of exceedances is just less than the number required for a non-support finding.
- Screening Level Concern – There are no water quality standards. Data is assessed against a screening level. There are adequate or limited data and at least the required number of exceedances.
- No Concern – There are limited data that are assessed against a water quality standard or there are adequate data assessed against a screening level and the number of exceedances is less than the number required for a concern or non-support finding.

The following maps represent a coarse summary of the TCEQ 2020 Texas Integrated Report. The results of the Integrated Report have been summarized down to the best or worst finding for each designated use. For example, for Aquatic Life Use, if a segment had a No Concern finding for some parameters and a Fully Supporting finding for other parameters, then the segment has been color-coded green for Fully Supporting. If a segment had Use Concern or Screening Level Concern findings for some parameters and a Not Supporting finding for other parameters, then the segment has been color-coded red for Not Supporting. If the highest level of finding was Use Concern or Screening Level Concern, then the segment has been color-coded orange. Segments that were not assessed, or for which there were no records in the Integrated Report, are color-coded gray.

Additionally, the results of the Integrated Report were summarized for classified and unclassified segments. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. For the classified segments, all assessment units in that segment were summarized down to the best or worst finding in that segment. All unclassified segments associated with a classified segment were summarized down to the best or worst finding for those unclassified segments. For example, there are four unclassified segments associated with segment 0823. If one of those unclassified segments had a Use Concern finding and other unclassified segment had a Not Supporting finding, then the segment was color-coded red for Not Supporting.

These maps are presented to provide an overview of the findings of the Integrated Report. Detailed discussions for each classified and unclassified segment are found in the remainder of this basin summary report.

Aquatic Life Use Classified Segments

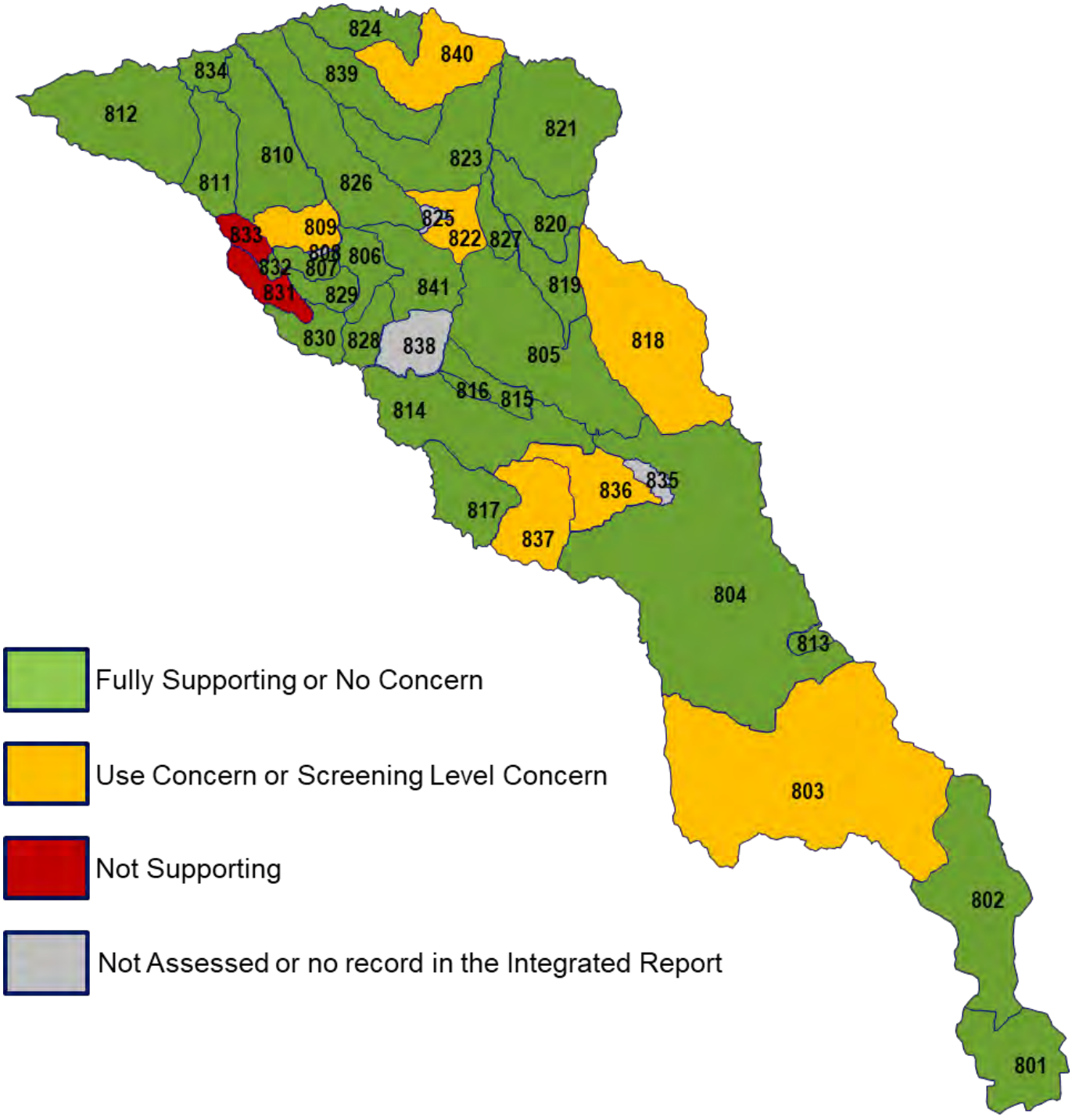


Figure 23: TCEQ 2020 Texas Integrated Report Summary - Aquatic Life Use Classified Segments

Aquatic Life Use Unclassified Segments

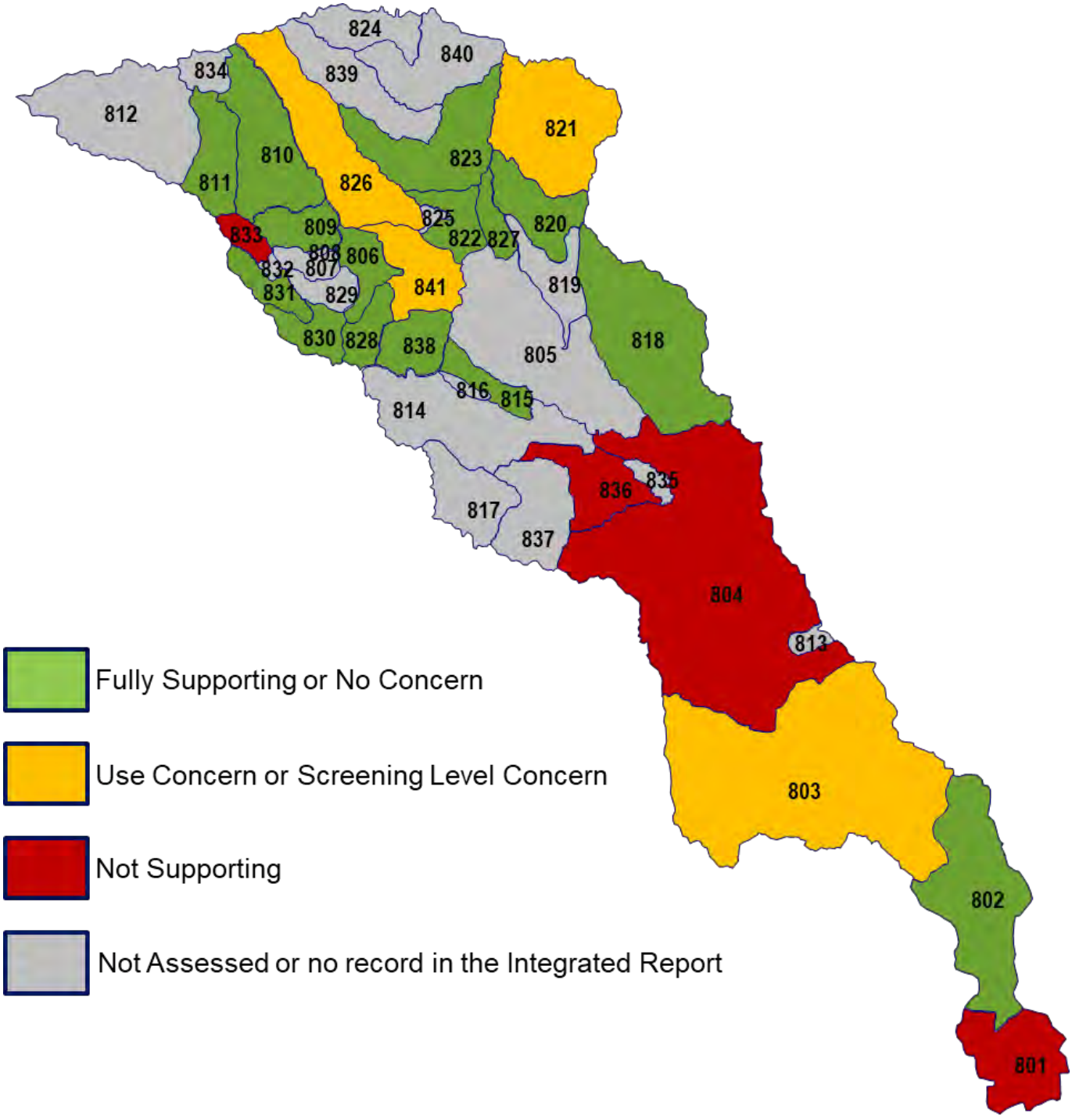


Figure 24: TCEQ 2020 Texas Integrated Report Summary - Aquatic Life Use Unclassified Segments

General Use Classified Segments

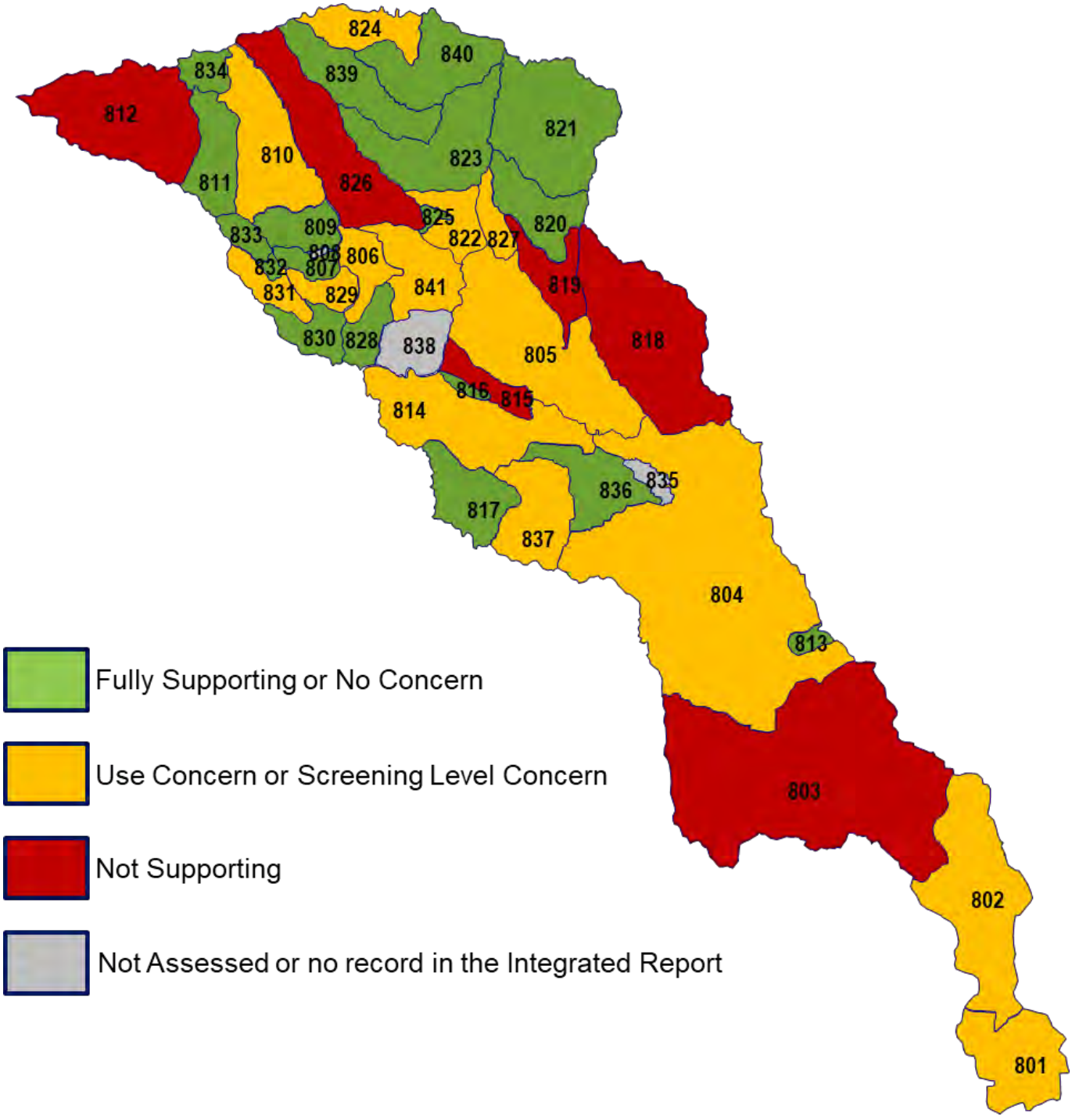


Figure 25: TCEQ 2020 Texas Integrated Report Summary - General Use Classified Segments

General Use Unclassified Segments

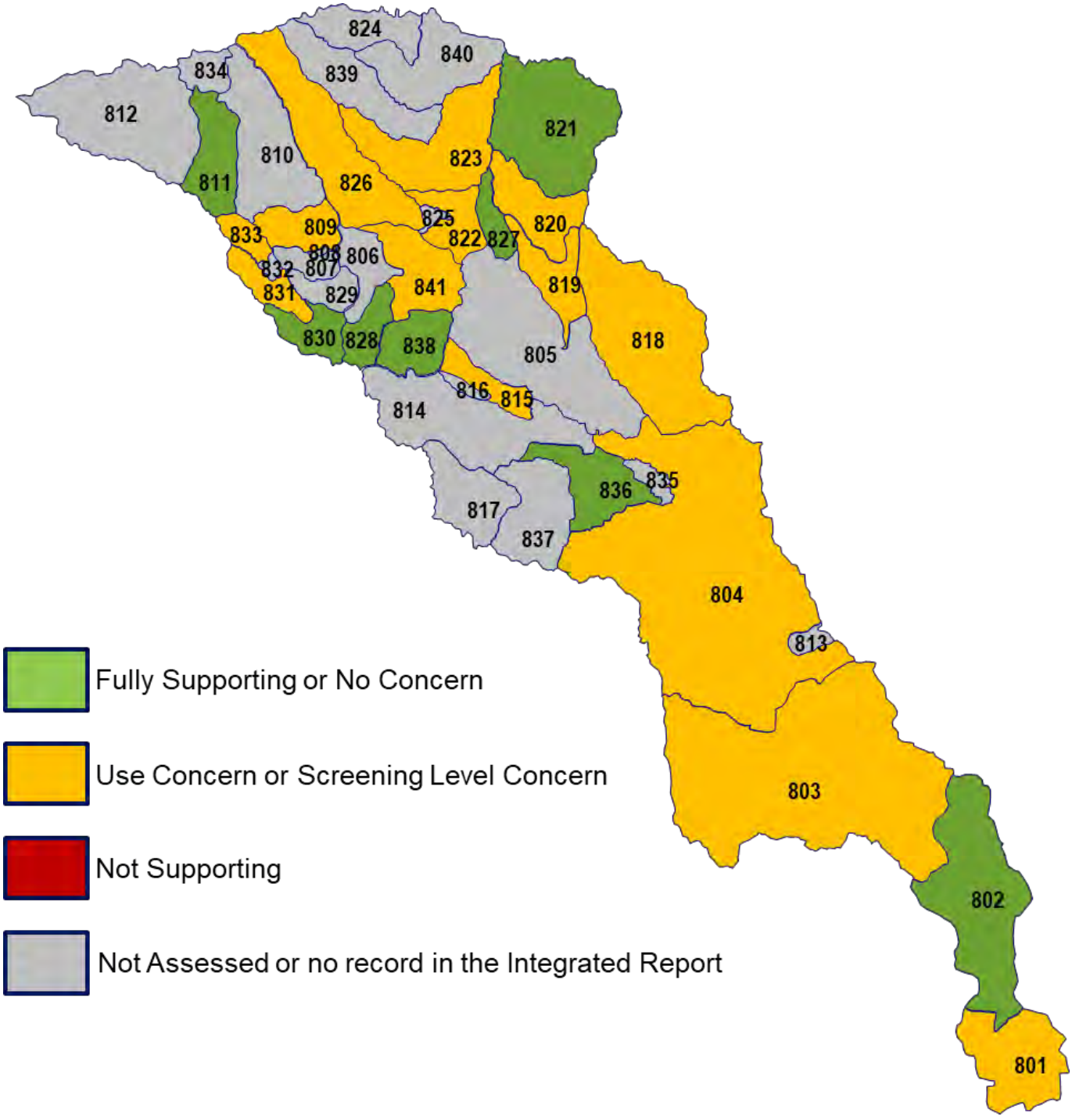


Figure 26: TCEQ 2020 Texas Integrated Report Summary - General Use Unclassified Segments

Recreation Use Classified Segments

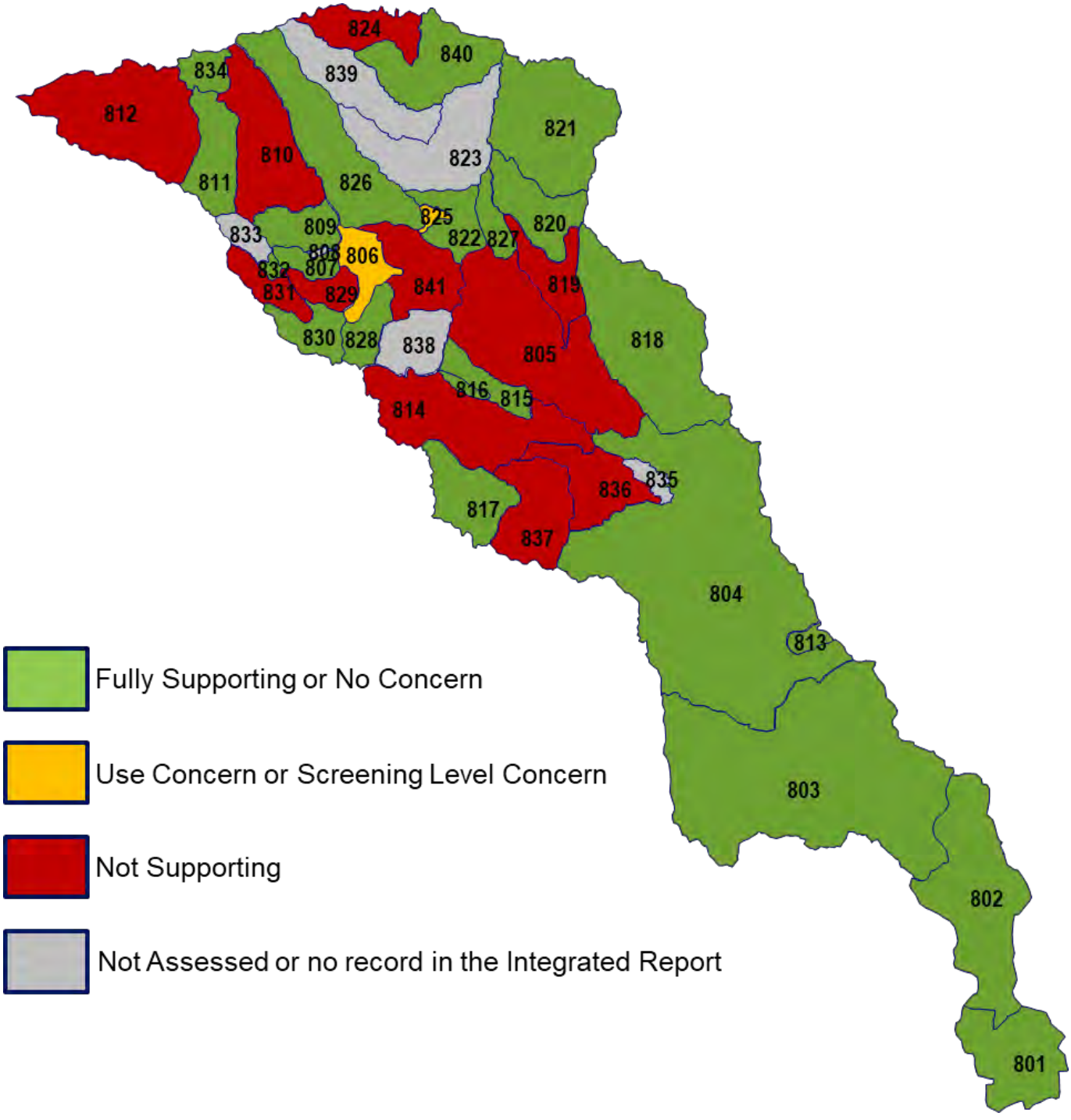


Figure 27: TCEQ 2020 Texas Integrated Report Summary - Recreation Use Classified Segments

Recreation Use Unclassified Segments

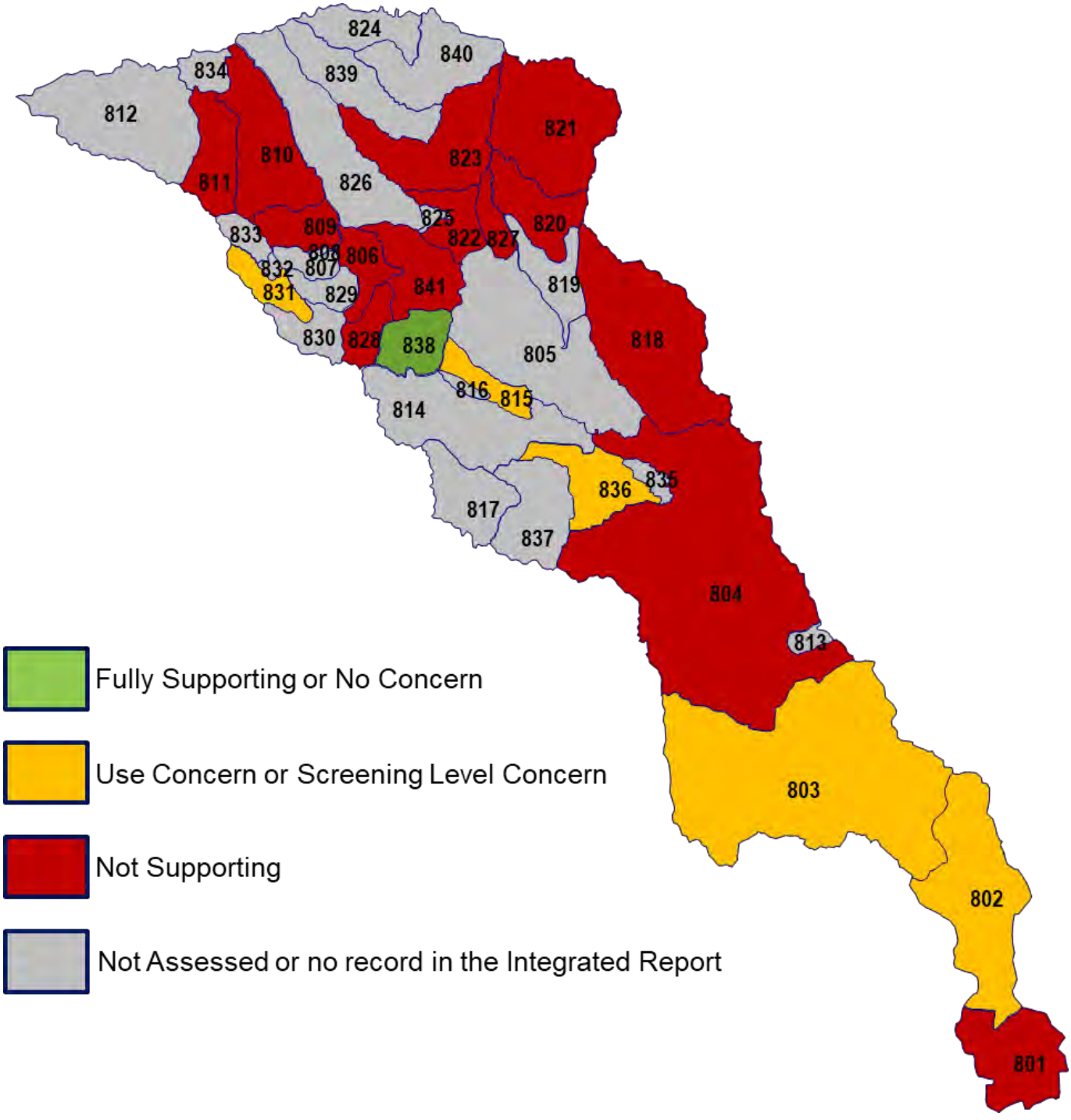


Figure 28: TCEQ 2020 Texas Integrated Report Summary - Recreation Use Unclassified Segments

Fish Consumption Use Classified Segments

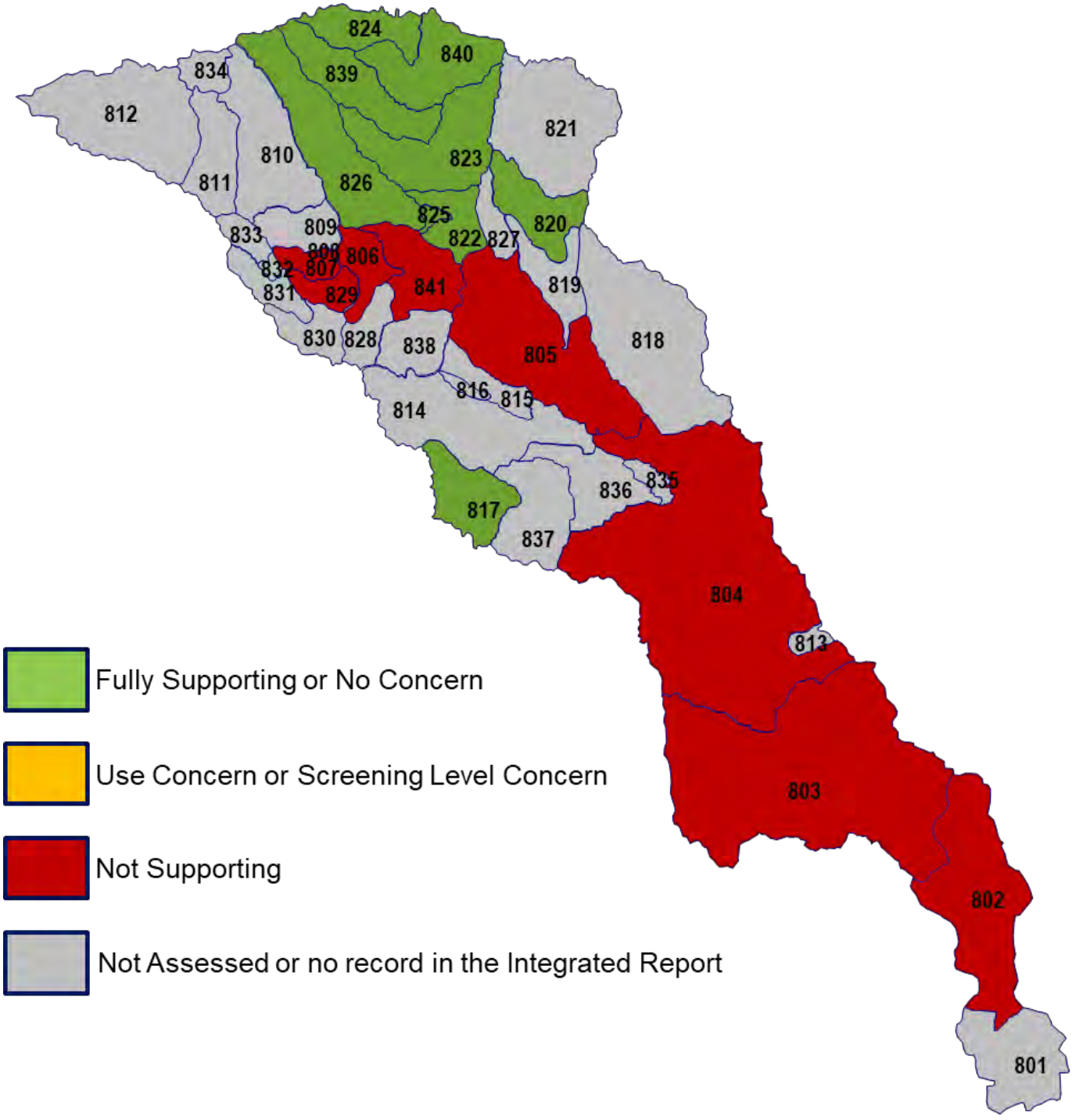


Figure 29: TCEQ 2020 Texas Integrated Report Summary - Fish Consumption Use Classified Segments

Fish Consumption Use Unclassified Segments

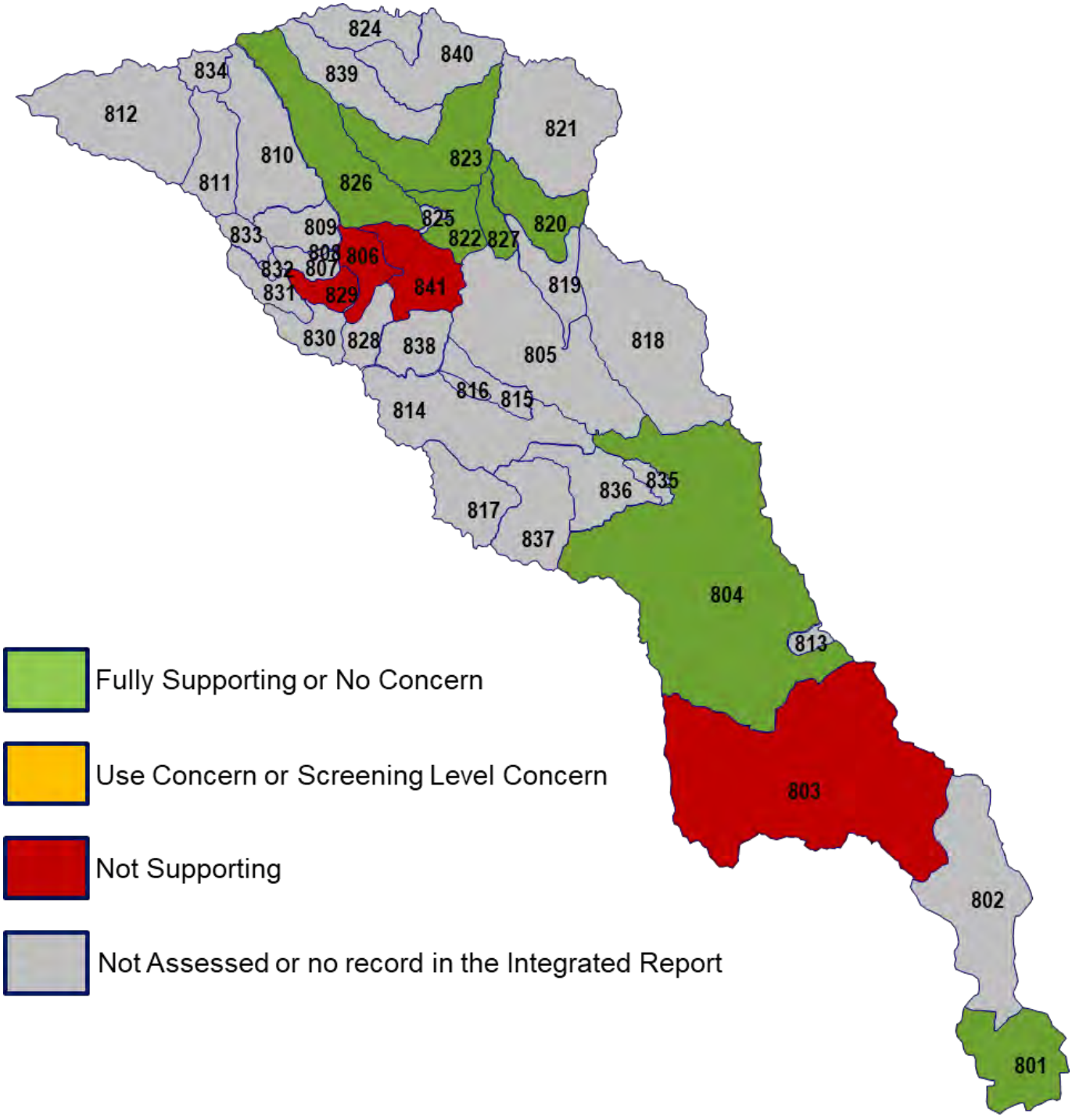


Figure 30: TCEQ 2020 Texas Integrated Report Summary - Fish Consumption Use Unclassified Segments

Domestic Water Supply Use Classified Segments

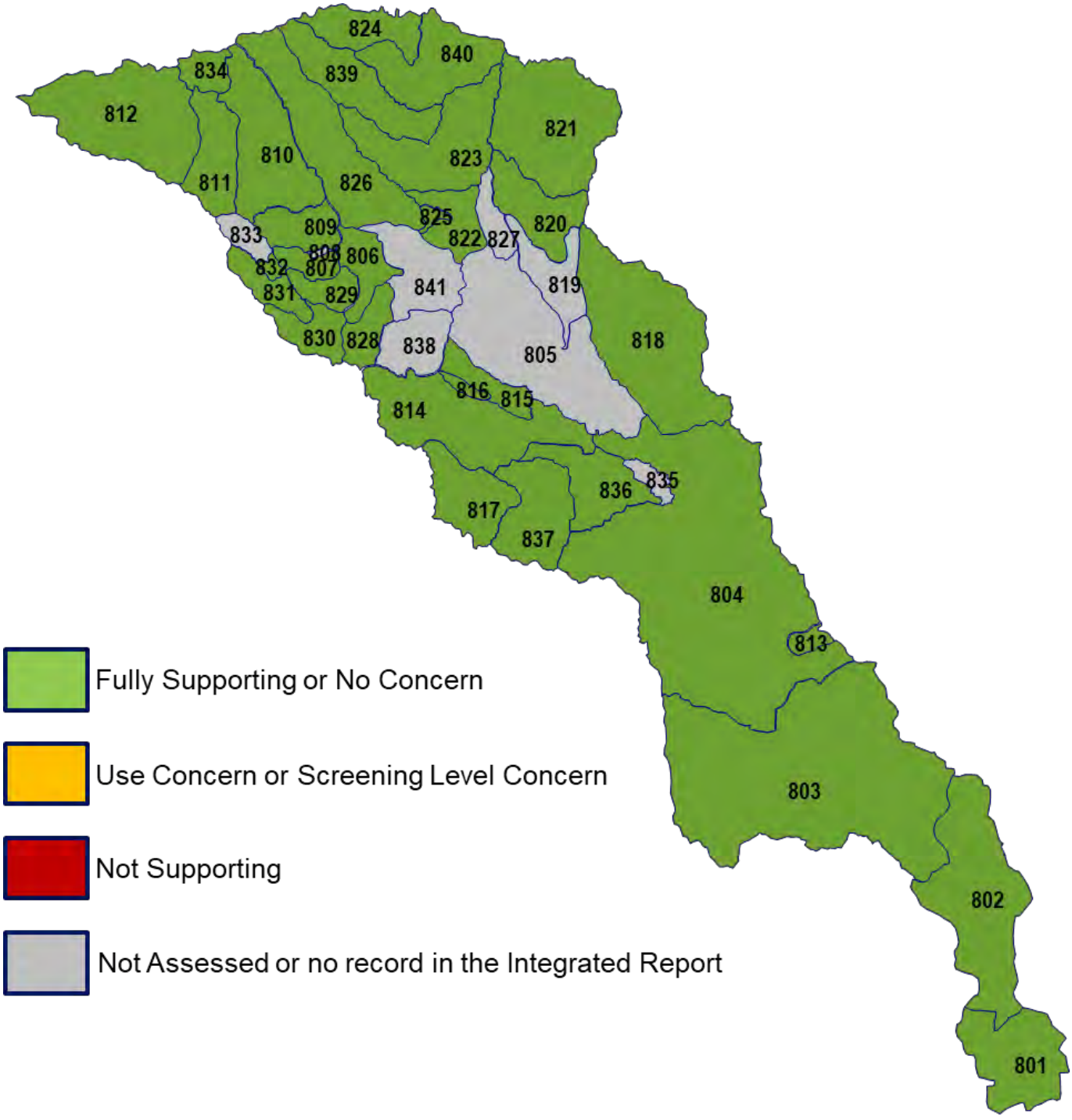


Figure 31: TCEQ 2020 Texas Integrated Report Summary - Domestic Water Supply Use Classified Segments

Domestic Water Supply Use Unclassified Segments

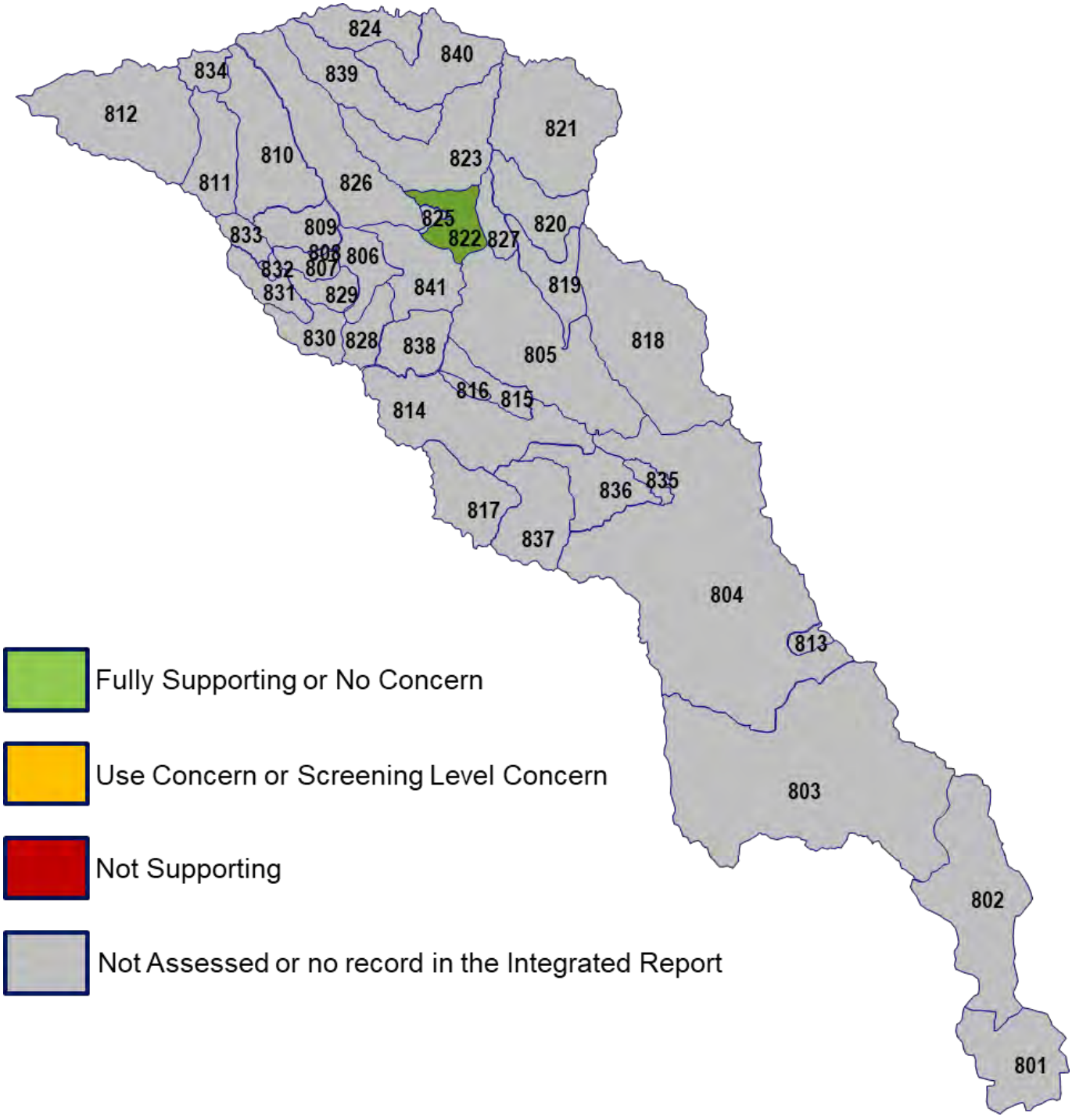


Figure 32: TCEQ 2020 Texas Integrated Report Summary - Domestic Water Supply Use Unclassified Segments

West Fork Trinity River

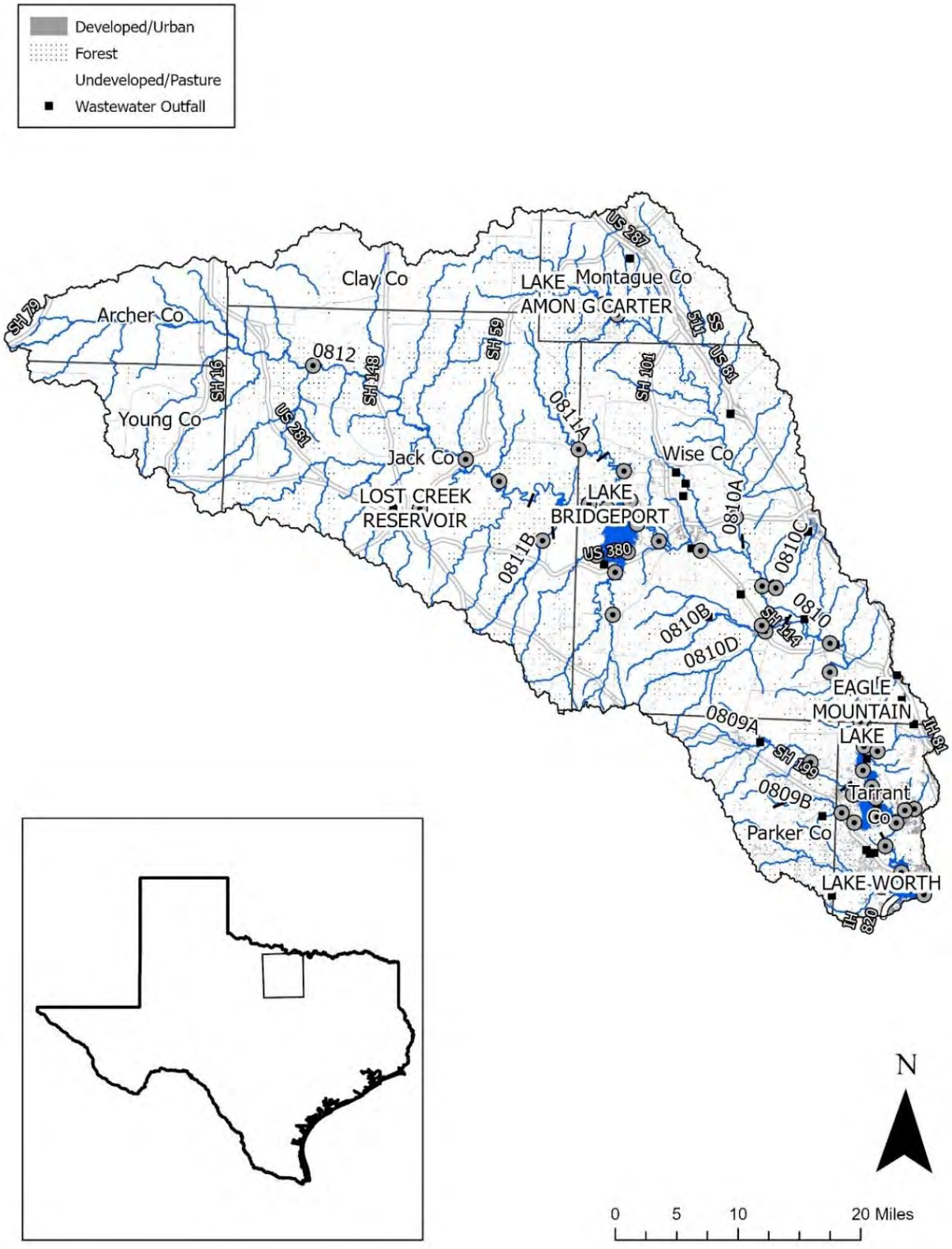


Figure 33: West Fork Trinity River Overview Map

The West Fork subwatershed extends approximately 150 river miles from the headwaters in Archer County to the Lake Worth Dam in Tarrant County (see Figure 33). It flows through the Broken Red Plains, Western Cross Timbers, and Grand Prairies and receives between 29 and 38 inches of precipitation annually. A majority of the subwatershed is rural with pastureland and row crop agriculture, however, the most downstream portion of the subwatershed becomes more urbanized. Major population centers include Bridgeport, Jacksboro, Bowie, Decatur, and Reno as well as the northwest communities of the Dallas-Fort Worth Metroplex. Bridgeport Reservoir, Eagle Mountain Reservoir, Lake Worth, and Lake Amon G. Carter are located in this subwatershed. Water rights permits for both Bridgeport and Eagle Mountain reservoirs are held by Tarrant Regional Water District while those for lakes Worth and Amon G. Carter are held by the cities of Fort Worth and Bowie, respectively.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0812 – West Fork Trinity River above Bridgeport
- 0811 – Bridgeport Reservoir
- 0811A – Big Creek
- 0811B – Beans Creek
- 0810 – West Fork Trinity River below Bridgeport
- 0810A – Big Sandy Creek
- 0810B – Garrett Creek
- 0810C – Martin Branch
- 0810D – Salt Creek
- 0809 – Eagle Mountain Reservoir
- 0809A – Walnut Creek
- 0809B – Ash Creek
- 0809C – Dosier Creek
- 0809D – Derrett Creek
- 0808 – West Fork Trinity River below Eagle Mountain Reservoir
- 0807 – Lake Worth
- 0834 – Lake Amon G. Carter

0812 – West Fork Trinity River above Bridgeport

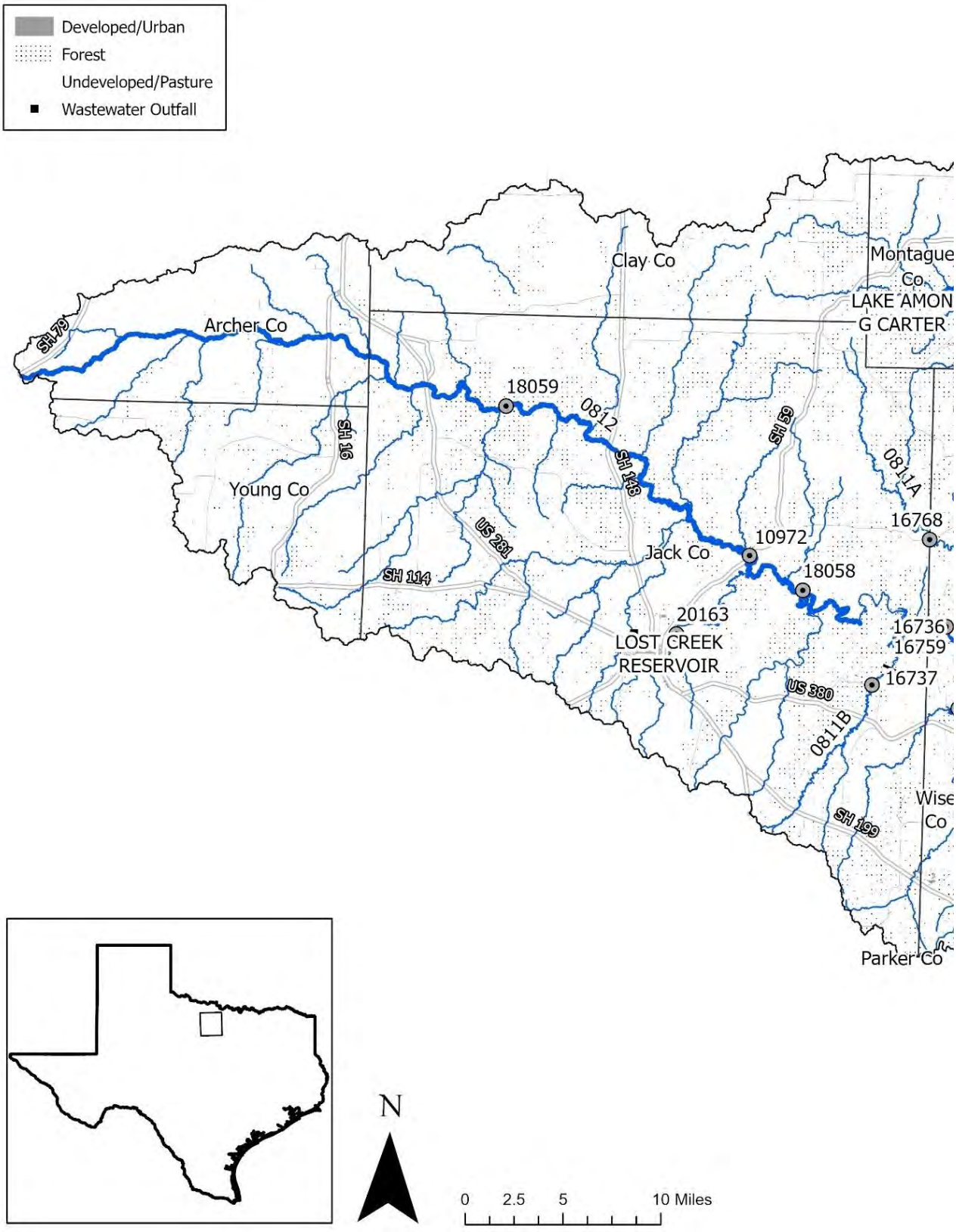


Figure 34: Segment 0812 Map

This 97-mile segment begins immediately upstream of the confluence of Bear Hollow in Jack County and continues to State Highway 79 in Archer County (see Figure 34). Segment 0812 has its headwaters in the Broken Red Plains and flows into the Western Cross Timbers. The vast majority of this segment is rural with the predominant land use being grassland.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 5. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 5: Segment 0812 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0812_01	WEST FORK TRINITY RIVER DOWNSTREAM OF SH 59	10972	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 6. Results of TRA trend analyses are shown in Table 7.

Table 6: TCEQ 2020 Texas Integrated Report Summary for Segment 0812

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0812_01 Lower 25 mi of segment	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0812_01 Lower 25 mi of segment	Aquatic Life Use	Fish Community		FS
0812_01 Lower 25 mi of segment	Aquatic Life Use	Macrobenthic Community		FS
0812_01 Lower 25 mi of segment	Aquatic Life Use	Habitat		NC
0812_01 Lower 25 mi of segment	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0812_01 Lower 25 mi of segment	General Use	Ammonia	0.33 mg/L	NC
0812_01 Lower 25 mi of segment	General Use	Nitrate	1.95 mg/L	NC
0812_01 Lower 25 mi of segment	General Use	Total Phosphorus	0.69 mg/L	NC
0812_01 Lower 25 mi of segment	General Use	pH	6.5 - 9 S.U.	FS
0812_01 Lower 25 mi of segment	General Use	Chloride	100 mg/L	FS
0812_02 Upper 60 mi of segment	General Use	Chloride	100 mg/L	FS
0812_01 Lower 25 mi of segment	General Use	Total Dissolved Solids	500 mg/L	NS
0812_02 Upper 60 mi of segment	General Use	Total Dissolved Solids	500 mg/L	NS
0812_01 Lower 25 mi of segment	General Use	Water temperature	31.1 °F	FS
0812_01 Lower 25 mi of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment unit 0812_02 for the period of record for this basin summary report.

Table 7: Significant Trends for Segment 0812 (P-value<0.1)

Segment & Assessment Unit		0812_01
Site		10972
Total Suspended Solids	All	No Trend
	Summer	Not Significant
	Winter	↓
Ammonia	All	No Trend
	Summer	↓
	Winter	↓
Total Kjeldahl Nitrogen	All	No Trend
	Summer	No Trend
	Winter	↓
Total Phosphorus	All	↓
	Summer	↓
	Winter	↓
Total Organic Carbon	All	↓
	Summer	↓
	Winter	↓
Chloride	All	Not Significant
	Summer	No Trend
	Winter	↑
Total Dissolved Solids	All	Not Significant
	Summer	Not Significant
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

The TCEQ 2020 Texas Integrated Report found that assessment unit 0812_01 was not supporting the Contact Recreation Use due to elevated levels of *E. coli*. As shown in Figure 35, *E. coli* levels consistently exceeded the standard of 126 MPN/100 mL. *E. coli* levels were not strongly correlated to flow (correlation coefficient = 0.31). This indicates that the impairment may not be related to run-off washing bacteria in from the watershed. The watershed upstream of the monitoring station in this assessment unit is mostly rangeland with sparsely wooded riparian zones (see Figure 36). Based on site visits by TRA staff from 2016 to 2018, this portion of the segment was intermittent with perennial pools and exhibited evidence of wildlife and livestock activity in and around the stream. Therefore, it is assumed that elevated bacteria levels were a result of direct deposition by animals visiting the stream for watering.

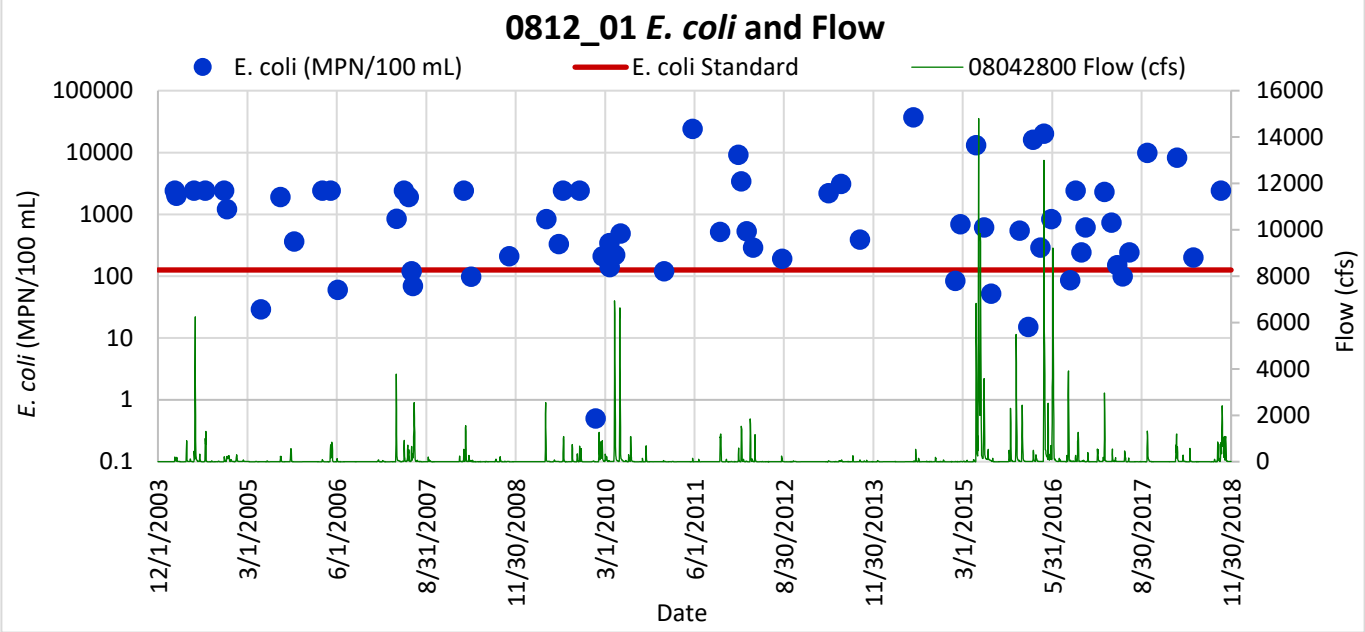


Figure 35: 0812_01 E. coli and Flow



Figure 36: West Fork Trinity River Upstream of SR 59 near Jacksboro

Decreasing trends were seen for total suspended solids, ammonia, total kjeldahl nitrogen, total phosphorus, and total organic carbon in assessment unit 0812_01 as shown in Table 7. Each of these parameters showed a pattern of higher concentrations generally occurring during higher flows, however, the correlations were not strong. For example, the correlation coefficient for total phosphorus and flow was -0.08. This may have been due to the timing of sampling in relation to the hydrograph. Typically, contaminants are found at higher concentrations when samples are collected during the rising limb of the hydrograph when precipitation washes these contaminants off the watershed and into the waterbody. This is known as the first flush. Samples collected on the falling limb of the hydrograph will generally have lower contaminant concentrations because the contaminants have been cleared off the surface and washed downstream. Therefore, samples collected at a given flow are generally seen to be higher on the rising limb of the hydrograph than on the falling limb. Based on this and the lack of point source dischargers in the watershed, it is believed that elevated total phosphorus levels are due to use of agricultural fertilizers or animal waste as discussed above for *E. coli*. As illustrated by total phosphorus in Figure 37, the decreasing trends for these parameters appeared to be related to the prolonged drought of 2011 to 2015. During periods of drought, contaminants from the watershed are not being washed in to waterbodies due to the lack of rain. This supports the assumption that the source of these contaminants is run-off from the use of agricultural fertilizers and/or animal wastes. Landowner education and best management practices would be required to address these issues.

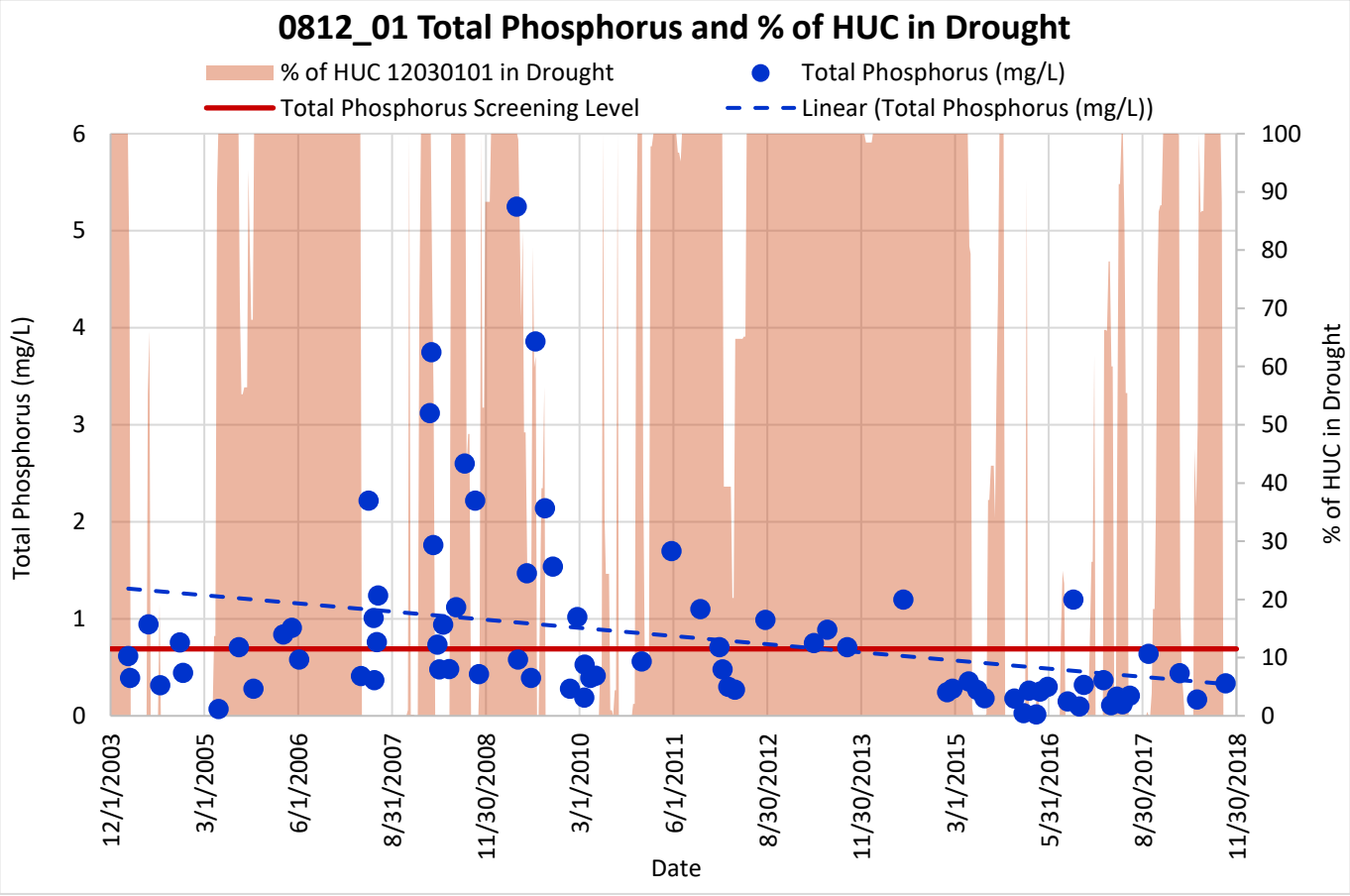


Figure 37: 0812_01 Total Phosphorus and % of HUC in Drought

Increasing winter trends for chloride and total dissolved solids were also found during data analysis (see Table 7). An impairment for total dissolved solids was identified in the TCEQ 2020 Texas Integrated Report (see Table 6). As shown in Figure 38 for chloride and Figure 39 for total dissolved solids, these trends and the total dissolved solids impairment appear to be caused by the drought recovery period in 2016 and 2017 when high levels of these parameters were measured. This was likely due to run-off from the watershed during precipitation events. When water from irrigation and precipitation evaporates, the salts and dissolved solids are left behind on the surface. Subsequent irrigation and non-run-off producing precipitation events will continue to build up the salts and solids. Precipitation events of sufficient quantity to produce run-off can carry these salts and dissolved solids into nearby waterbodies and increase the concentrations in the water column. Best management practices such as drip irrigation systems may help reduce the quantity of salts and dissolved salts that build up on the land.

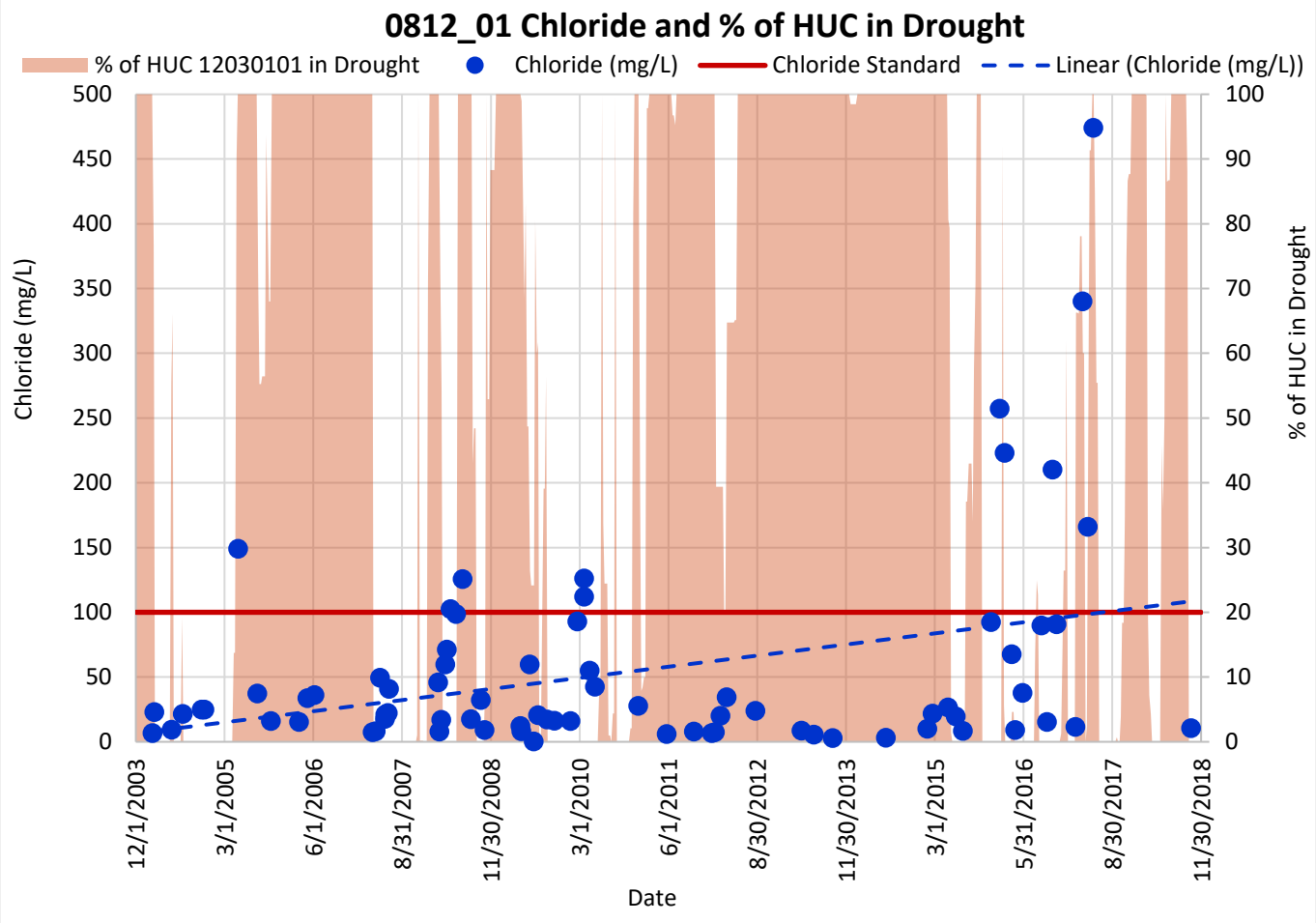


Figure 38: 0812_01 Chloride and % of HUC in Drought

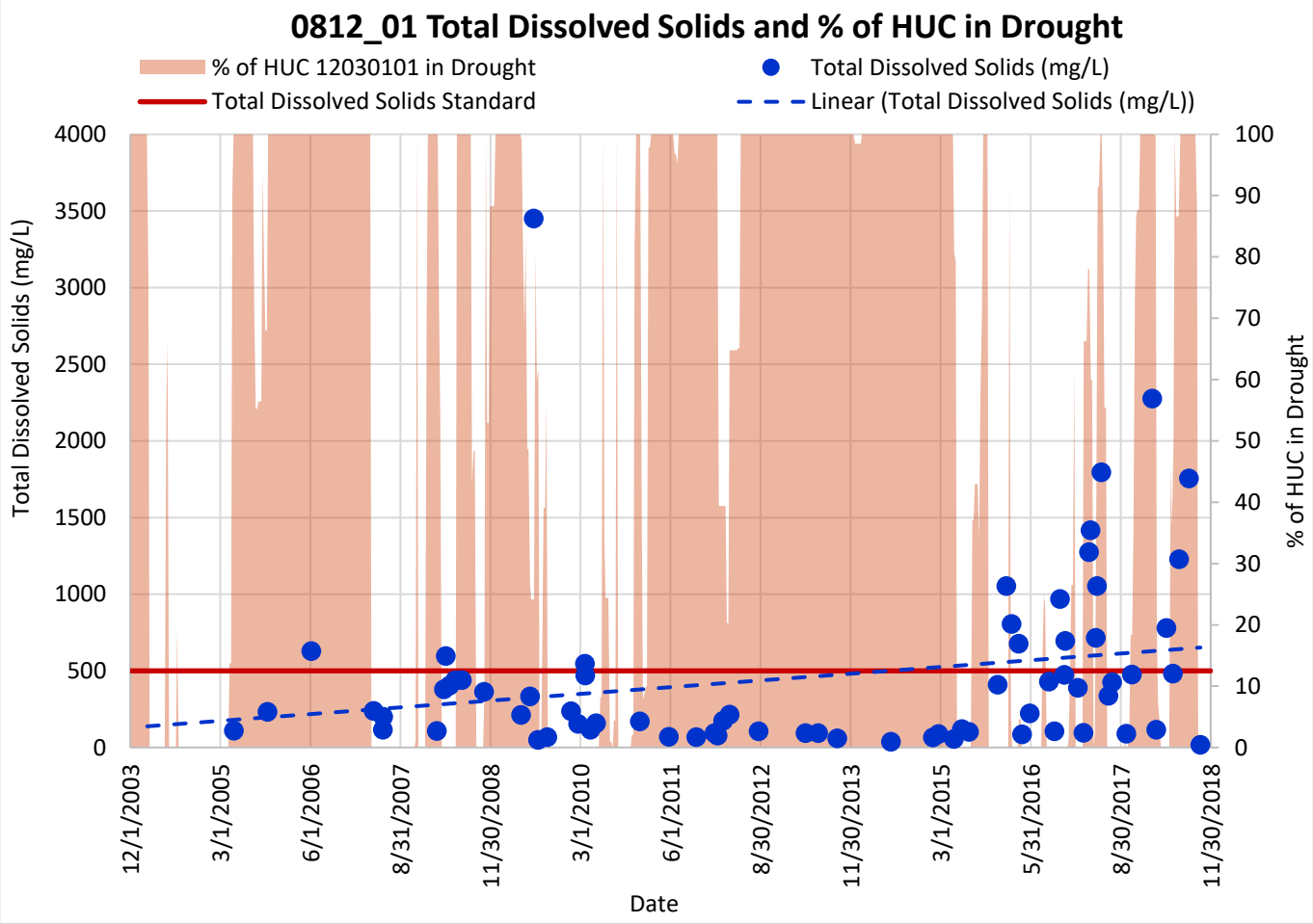


Figure 39: 0812_01 Total Dissolved Solids and % of HUC in Drought

This segment has been characterized as intermittent with perennial pools and has an intermediate aquatic life use designation. In 2018, TRA staff conducted biological monitoring in assessment unit 0812_01. This site was selected because TRA staff were conducting diurnal monitoring in this segment and were interested in determining the level of aquatic life the perennial pools could support. During both the index and critical period sampling events, the river was in a pooled condition. The index period is defined by TCEQ as the warmer portion of the year between March 15th and October 15th. Within this timeframe is the critical period which is from July 1st to September 30th. This period represents the time of the year when maximum water temperatures in conjunction with the lowest flows and dissolved oxygen concentrations are expected.

The index period event was conducted in June 2018. During this event there were some small pools and one long pool with some deep sections. This large pool was greater than 230 meters long and was 9.1 meters wide and 0.98 meters deep at its largest point. The critical period event took place in August 2018. During this event, the small pools were gone and the long pool was slightly shorter and shallower than during the previous event measuring 225 meters long and 8.6 meters wide by 0.73 meters deep at its largest point. Both events scored exceptional for fish communities (see Figure 40, Figure 41, and Figure 42) and intermediate for habitat quality.



Figure 40: Channel catfish caught during index period event in assessment unit 0812_01



Figure 41: Longnose gar caught during index period event in assessment unit 0812_01



Figure 42: Bluntnose darter caught during critical period event in assessment unit 0812_01

The benthic macroinvertebrate community was scored as limited during the index period event but intermediate during the critical period event (see Figure 43 and Figure 44). It is presumed that this increase in score was due to the differences in location of benthic sampling. The pool that was sampled during the index period event was dry during the critical period event. The critical period sample was collected at the downstream end of the single remaining pool and was just upstream of the location that was sampled during the index period. Because of the size of this pool, it is believed that it was able to support a larger and more diverse benthic macroinvertebrate population.



Figure 43: Benthic macroinvertebrates collected during index period in assessment unit 0812_01



Figure 44: Benthic macroinvertebrates collected during critical period in assessment unit 0812_01

0811 – Bridgeport Reservoir

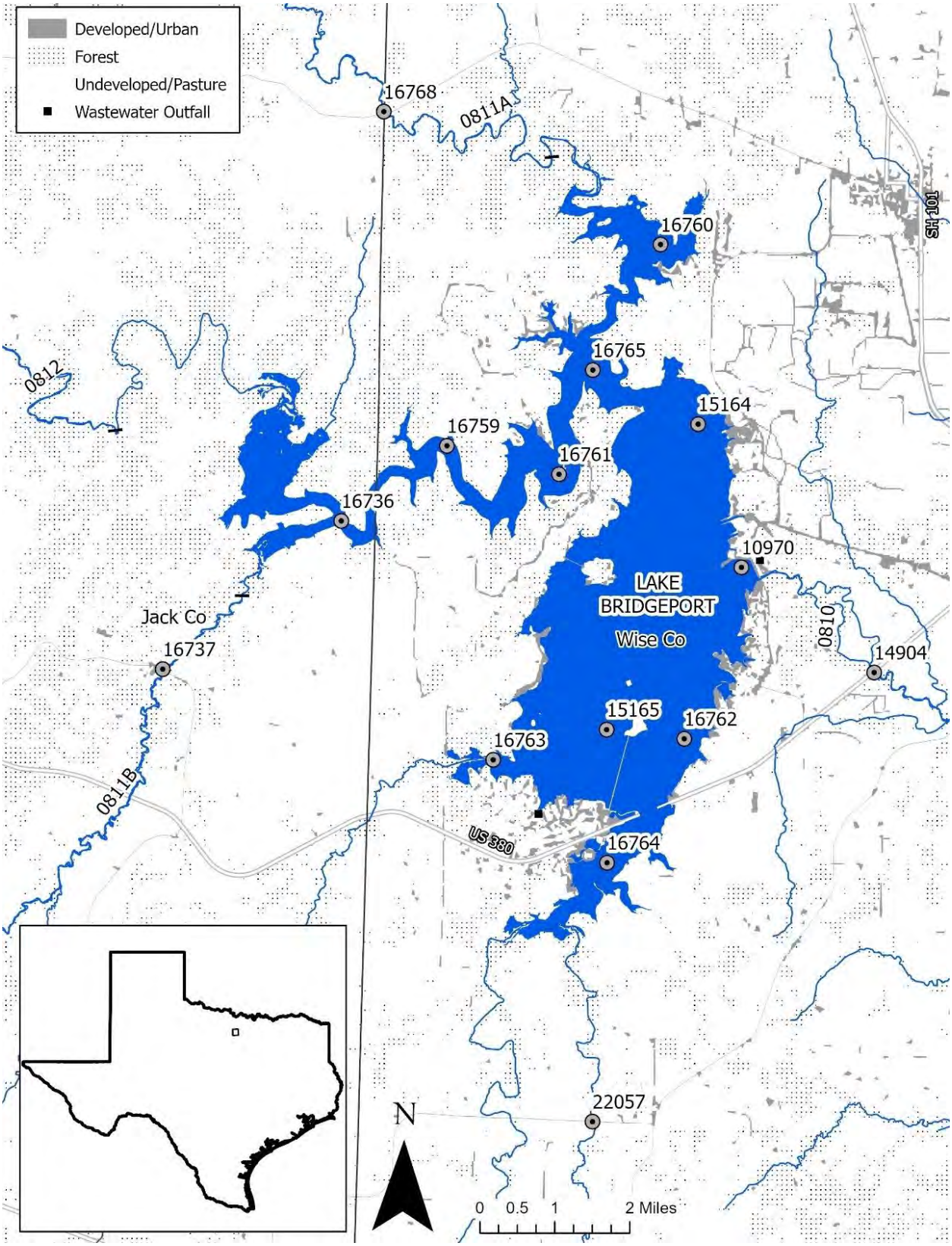


Figure 45: Segment 0811 Map

This 10,784-acre segment impounds the West Fork Trinity River from the Bridgeport Dam in Wise County to the confluence of Bear Hollow in Jack County, up to a normal pool elevation of 836 feet (see Figure 45). Bridgeport Reservoir lies within the Western Cross Timbers ecoregion. The majority of the land directly around the reservoir is rural with grassland being the predominant land use. There are some areas of development directly adjacent to the reservoir especially along the eastern and southern shores. Bridgeport Reservoir has been noted as being mesotrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at four sites within this segment as shown in Table 8. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 8: Segment 0811 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0811_03	LAKE BRIDGEPORT NEAR DAM	10970	Tarrant Regional Water District
0811_04	LAKE BRIDGEPORT NORTH END MAIN BODY OF RESERVOIR	15164	Tarrant Regional Water District
0811_01	LAKE BRIDGEPORT EAST OF RATTLESNAKE ISLAND	16762	Tarrant Regional Water District
0811	WILLOW CREEK AT CR 2210	22057	Tarrant Regional Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 9. Results of TRA trend analyses are shown in Table 10.

Table 9: TCEQ 2020 Texas Integrated Report Summary for Segment 0811

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0811_01 Southeast portion of main body of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0811_03 Central portion of main body of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0811_04 Northern portion of main body of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0811_01 Southeast portion of main body of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0811_03 Central portion of main body of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0811_04 Northern portion of main body of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0811_01 Southeast portion of main body of reservoir	General Use	Nutrient Reservoir Criteria		FS
0811_02 Southwest portion of main body of reservoir	General Use	Nutrient Reservoir Criteria		FS
0811_03 Central portion of main body of reservoir	General Use	Nutrient Reservoir Criteria		FS
0811_04 Northern portion of main body of reservoir	General Use	Nutrient Reservoir Criteria		FS
0811_05 Remainder of reservoir	General Use	Nutrient Reservoir Criteria		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0811_01 Southeast portion of main body of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0811_03 Central portion of main body of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0811_04 Northern portion of main body of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0811_01 Southeast portion of main body of reservoir	General Use	Chloride	75 mg/L	FS
0811_02 Southwest portion of main body of reservoir	General Use	Chloride	75 mg/L	FS
0811_03 Central portion of main body of reservoir	General Use	Chloride	75 mg/L	FS
0811_04 Northern portion of main body of reservoir	General Use	Chloride	75 mg/L	FS
0811_05 Remainder of reservoir	General Use	Chloride	75 mg/L	FS
0811_01 Southeast portion of main body of reservoir	General Use	Sulfate	75 mg/L	FS
0811_02 Southwest portion of main body of reservoir	General Use	Sulfate	75 mg/L	FS
0811_03 Central portion of main body of reservoir	General Use	Sulfate	75 mg/L	FS
0811_04 Northern portion of main body of reservoir	General Use	Sulfate	75 mg/L	FS
0811_05 Remainder of reservoir	General Use	Sulfate	75 mg/L	FS
0811_01 Southeast portion of main body of reservoir	General Use	Total Dissolved Solids	300 mg/L	FS
0811_02 Southwest portion of main body of reservoir	General Use	Total Dissolved Solids	300 mg/L	FS
0811_03 Central portion of main body of reservoir	General Use	Total Dissolved Solids	300 mg/L	FS
0811_04 Northern portion of main body of reservoir	General Use	Total Dissolved Solids	300 mg/L	FS
0811_05 Remainder of reservoir	General Use	Total Dissolved Solids	300 mg/L	FS
0811_01 Southeast portion of main body of reservoir	General Use	Water temperature	32.2 °F	FS
0811_03 Central portion of main body of reservoir	General Use	Water temperature	32.2 °F	FS
0811_04 Northern portion of main body of reservoir	General Use	Water temperature	32.2 °F	FS
0811_01 Southeast portion of main body of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0811_03 Central portion of main body of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0811_04 Northern portion of main body of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting

Data for assessment units 0811_02 and 0811_05 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 10: Significant Trends for Segment 0811 (P-value<0.1)

Segment & Assessment Unit		0811_01	0811_03	0811_04
Site		16762	10970	15164
Specific Conductance	All	↓	No Trend	↓
	Summer	↓	No Trend	No Trend
	Winter	↓	↓	↓
Alkalinity	All	↓	↓	No Trend
	Summer	↓	↓	Not Significant
	Winter	↓	↓	↓
Total Phosphorus	All	No Trend	↓	No Trend
	Summer	↓	↓	↓
	Winter	↓	↓	↓
Total Organic Carbon	All	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	↑
	Winter	Not Significant	Not Significant	Not Significant
Dissolved Organic Carbon	All	Not Significant	No Trend	No Trend
	Summer	Not Significant	Not Significant	No Trend
	Winter	↑	↑	↑
Hardness	All	Insufficient Data	↓	Insufficient Data
	Summer	Insufficient Data	↓	Insufficient Data
	Winter	Insufficient Data	↓	Insufficient Data
Total Calcium	All	Insufficient Data	↓	Insufficient Data
	Summer	Insufficient Data	↓	Insufficient Data
	Winter	Insufficient Data	↓	Insufficient Data
Total Magnesium	All	Insufficient Data	↓	Insufficient Data
	Summer	Insufficient Data	Not Significant	Insufficient Data
	Winter	Insufficient Data	↓	Insufficient Data
Total Sodium	All	Insufficient Data	Not Significant	Insufficient Data
	Summer	Insufficient Data	Not Significant	Insufficient Data
	Winter	Insufficient Data	↓	Insufficient Data
Chloride	All	↓	Not Significant	↓
	Summer	↓	Not Significant	↓
	Winter	Not Significant	Not Significant	Not Significant
Sulfate	All	Insufficient Data	No Trend	Insufficient Data
	Summer	Insufficient Data	No Trend	Insufficient Data
	Winter	Insufficient Data	↓	Insufficient Data
Total Arsenic	All	Insufficient Data	↑	Insufficient Data
	Summer	Insufficient Data	↑	Insufficient Data
	Winter	Insufficient Data	↑	Insufficient Data
Total Manganese	All	Insufficient Data	↑	Insufficient Data
	Summer	Insufficient Data	↑	Insufficient Data
	Winter	Insufficient Data	Not Significant	Insufficient Data
Bromide	All	Insufficient Data	No Trend	Insufficient Data
	Summer	Insufficient Data	↑	Insufficient Data
	Winter	Insufficient Data	No Trend	Insufficient Data

Segment & Assessment Unit		0811_01	0811_03	0811_04
Site		16762	10970	15164
Phytoplankton	All	Insufficient Data	↑	Insufficient Data
	Summer	Insufficient Data	↑	Insufficient Data
	Winter	Insufficient Data	↑	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend

Many of the decreasing trends appear to have been a result of decreasing reservoir elevations observed during the drought of 2011 to 2015 and the recovery starting in 2015. This is best shown by total phosphorus and chloride in Figure 46 and Figure 47. Total phosphorus appears to have been trending downward as a result of reduced inflows to the reservoir that would have otherwise washed in additional nutrients followed by a dilution of in situ concentrations during the drought recovery period. Chloride concentrations were trending upward during the drought; however, the decreasing trend appears to be weighted by the drop in concentrations during the drought recovery.

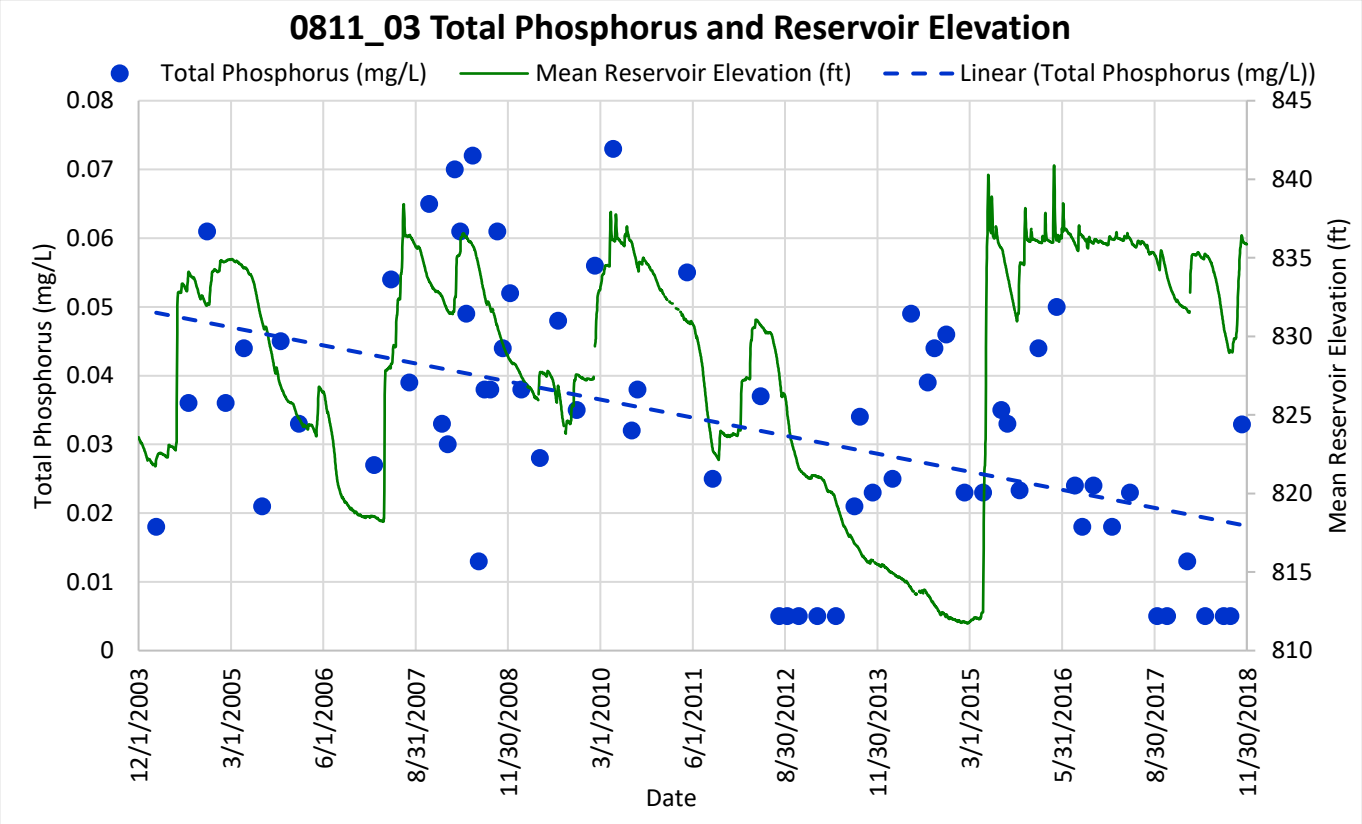


Figure 46: 0811_03 Total Phosphorus and Reservoir Elevation

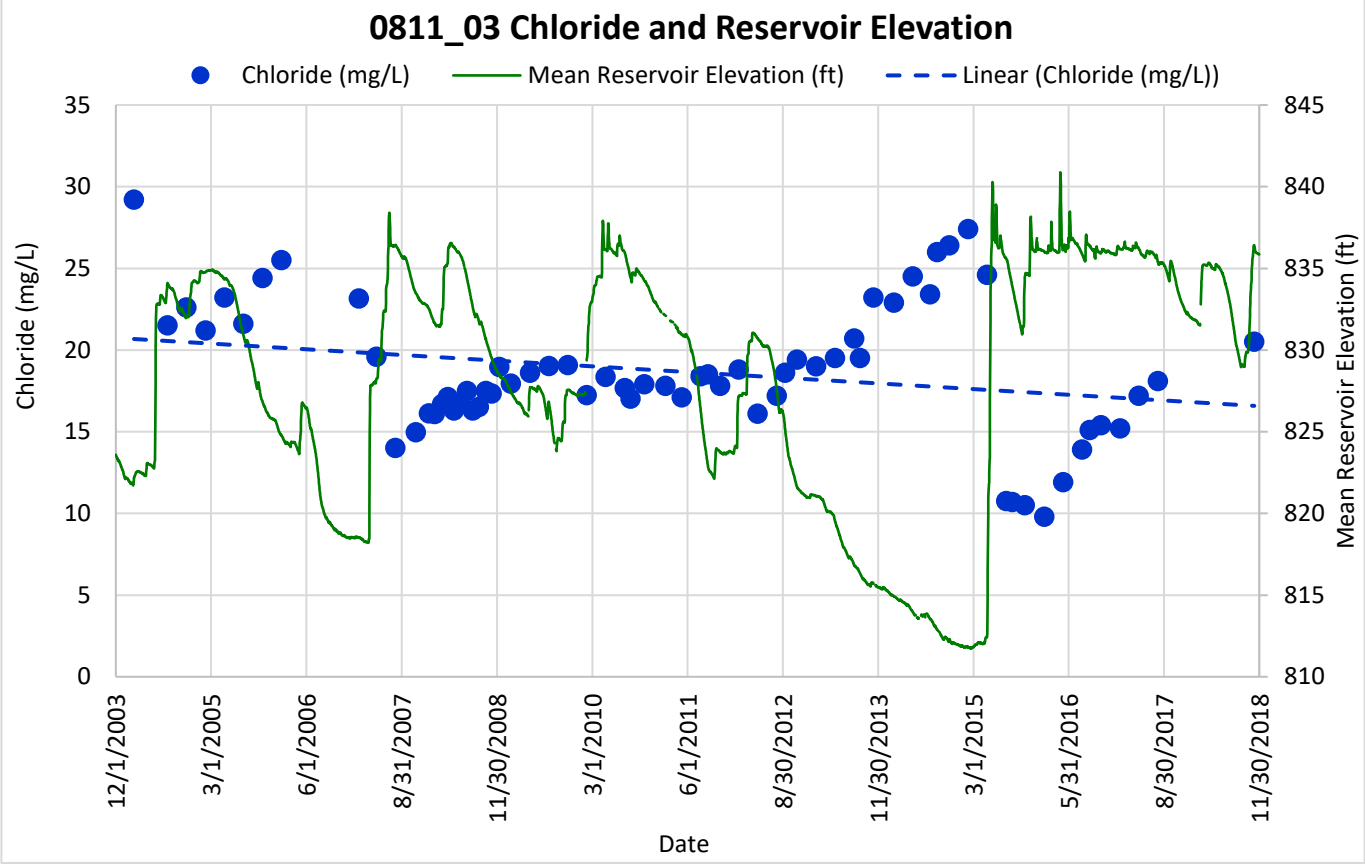


Figure 47: 0811_03 Chloride and Reservoir Elevation

The increasing trends for total arsenic, total manganese, and bromide appear to false trends caused by a reduction in the detection limit over the years. As discussed previously in this report, all non-detect data were censored to one half of the lowest detection limit in the database. This can cause the appearance of false trends because, as detection limits decrease over time, more data are reported at values above the detection limit which results in increasing trends that are not a result of actual changes in water quality. This is well illustrated for total arsenic in Figure 48. The detection limit for samples collected in assessment unit 0811_03 ranged from 5 µg/L early in the period of record to 1 µg/L toward the end. The lowest detection limit in the database from which this data was pulled was 0.5 µg/L resulting in a censored value of 0.25 µg/L for all total arsenic non-detect data. All data used for this analysis were reported at levels below 5 µg/L.

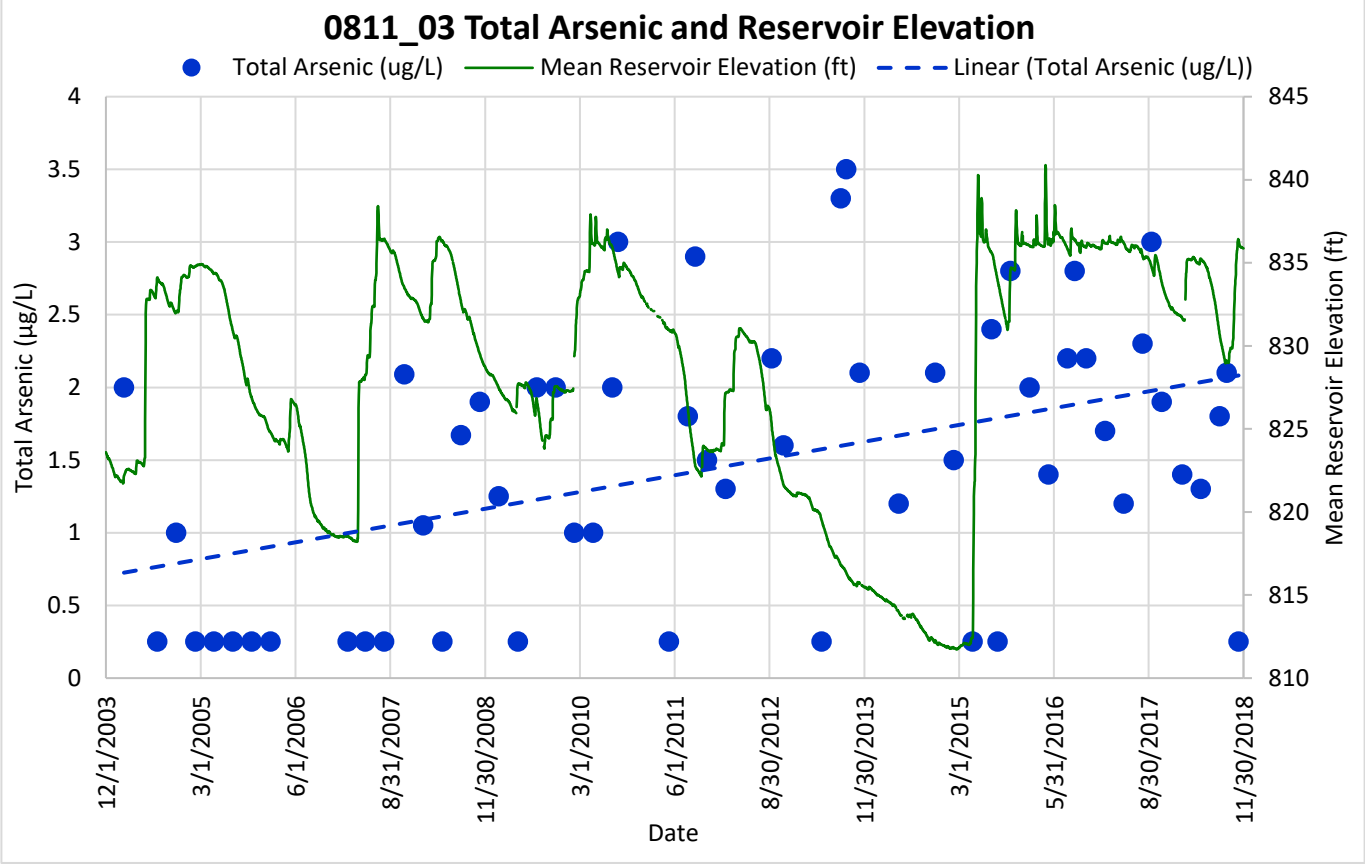


Figure 48: 0811_03 Total Arsenic and Reservoir Elevation

0811A – Big Creek

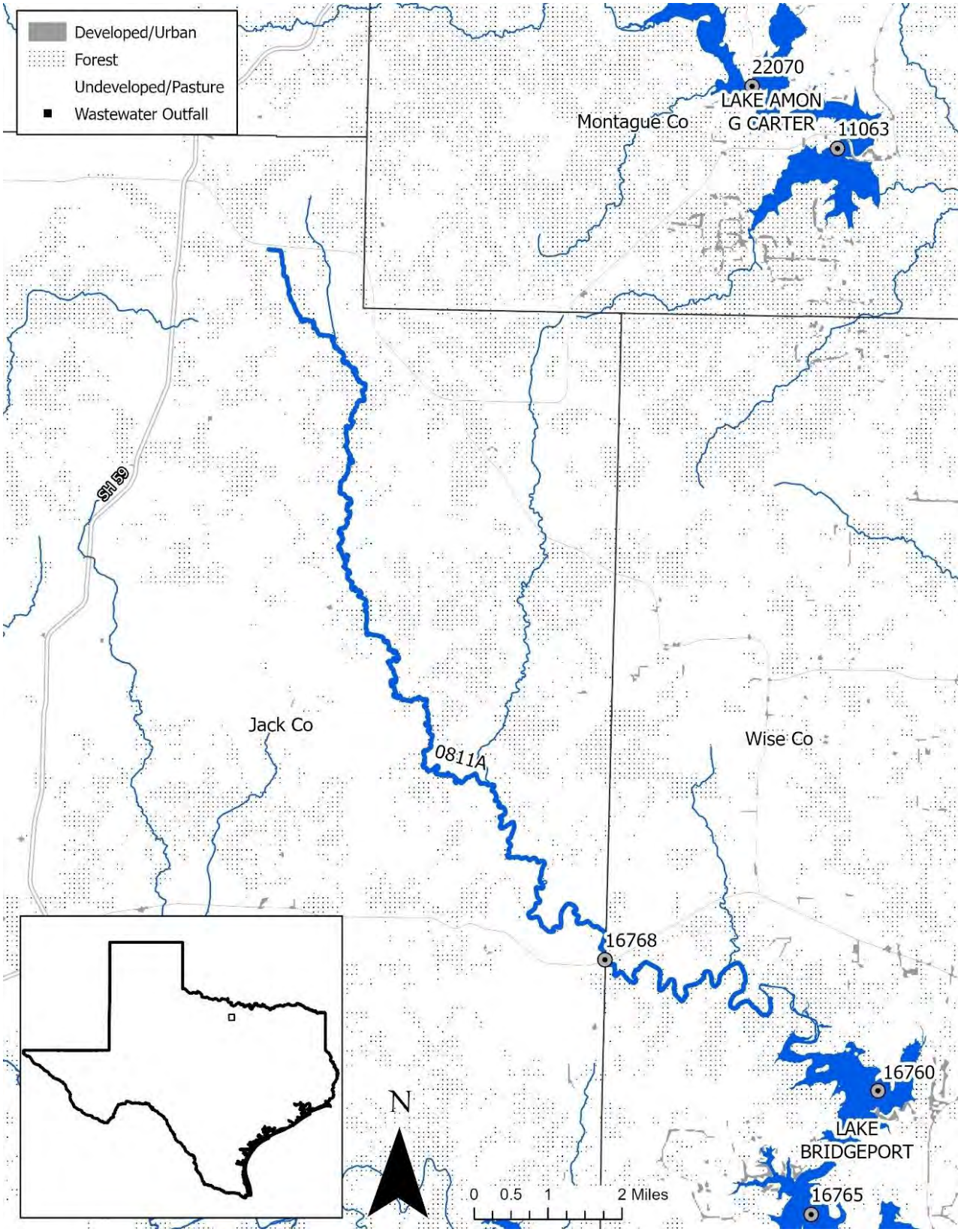


Figure 49: Segment 0811A Map

This unclassified segment runs approximately 23 miles from the headwaters adjacent to FM 2127 in Jack County to the confluence with Bridgeport Reservoir at normal pool elevation (see Figure 49). It lies within the Western Cross Timbers ecoregion. The watershed around this stream is predominately rural with grassland and forested areas being the major land uses.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 11. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 11: Segment 0811A FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0811A_01	BIG CREEK AT FM 1810	16768	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 12. Results of TRA trend analyses are shown in

Table 13.

Table 12: TCEQ 2020 Texas Integrated Report Summary for Segment 0811A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0811A_01 From confluence with Bridgeport Reservoir normal pool to headwaters near FM 2127, Jack Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0811A_01 From confluence with Bridgeport Reservoir normal pool to headwaters near FM 2127, Jack Co.	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0811A_01 From confluence with Bridgeport Reservoir normal pool to headwaters near FM 2127, Jack Co.	General Use	Ammonia	0.33 mg/L	NC
0811A_01 From confluence with Bridgeport Reservoir normal pool to headwaters near FM 2127, Jack Co.	General Use	Nitrate	1.95 mg/L	NC
0811A_01 From confluence with Bridgeport Reservoir normal pool to headwaters near FM 2127, Jack Co.	General Use	Total Phosphorus	0.69 mg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

Table 13: Significant Trends for Segment 0811A (P-value<0.1)

Segment & Assessment Unit		0811A_01
Site		16768
pH	All	↑
	Summer	Not Significant
	Winter	Not Significant
Total Kjeldahl Nitrogen	All	Not Significant
	Summer	Not Significant
	Winter	↓
Total Phosphorus	All	↓
	Summer	↓
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

The concern for *E. coli* in this segment appears to be related to run-off. Due to the land use in the watershed, wildlife and livestock are the likely sources of bacteria in this stream. Measured stream flows were not available, however, elevated bacteria levels tended to occur when precipitation events immediately preceded sample collection as shown in Figure 50.

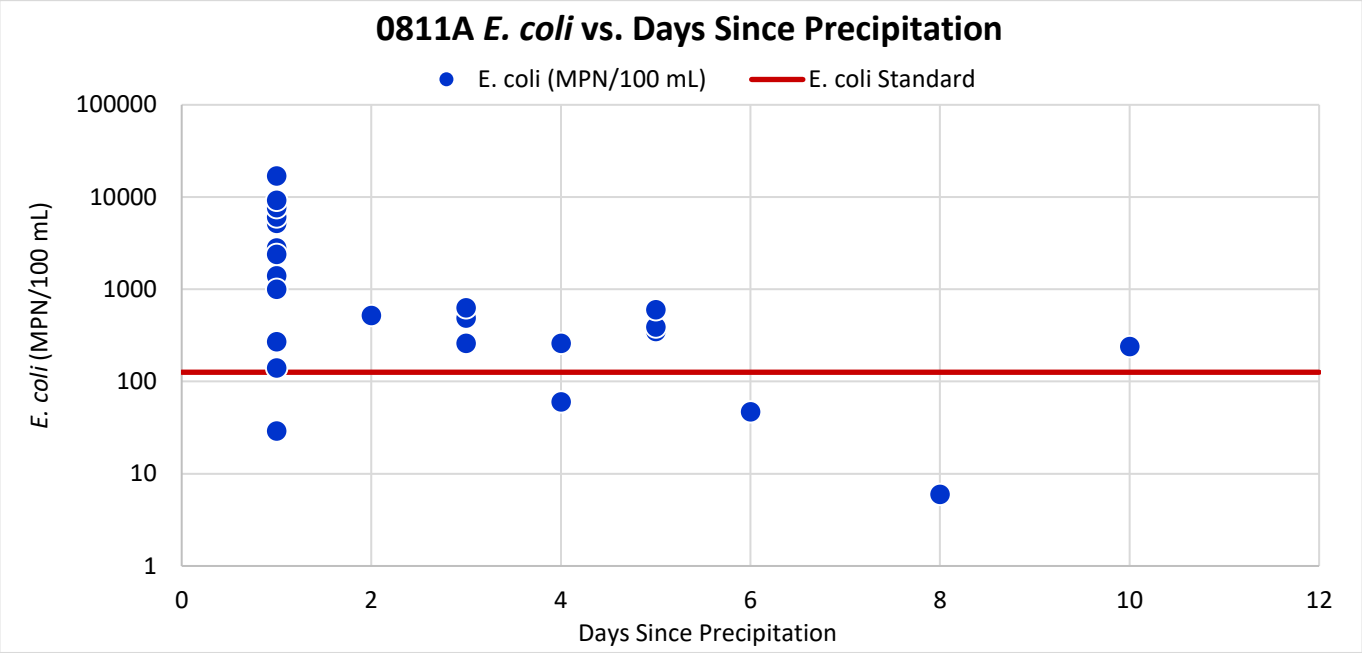


Figure 50: 0811A E. coli vs. Days Since Precipitation

There is not enough information to address the increasing trend for pH. However, as there are several long pools upstream of the sampling station at CR 1810, it is presumed that algal photosynthesis is the likely cause (see Figure 51). It is important to note that although there is an increasing trend, all pH values were between 7.1 and 8.2; well within the pH standard range of 6.5 to 9 S.U. for this segment. It is recommended that chlorophyll-*a* be collected in order to further assess this trend.

Decreasing trends for total kjeldahl nitrogen and total phosphorus appear to be weighted by a few abnormally high values throughout the data set as shown in Figure 52. The three highest total kjeldahl nitrogen values occurred on 8/19/2008, 4/30/2009, and 9/28/2017. Concentrations of many other parameters collected on these days were also high. This leads to the presumption that flows may have been elevated due to precipitation on the days that sampling was conducted. As stated above, flow was not measured during sampling events in this segment. However, based on information from the National Weather Service Advanced Hydrologic Prediction Service, 24-hour accumulation in the upstream watershed for each of the dates listed above were greater than 2 inches for the samples in 2008 and 2009 and between 0.5 and 1.5 inches for the sample in 2017. Therefore, it is believed that nutrients are being washed into the stream during precipitation events as there are no permitted discharges in the watershed above the sampling station.



Figure 51: Pools upstream of station 16768 in segment 0811A

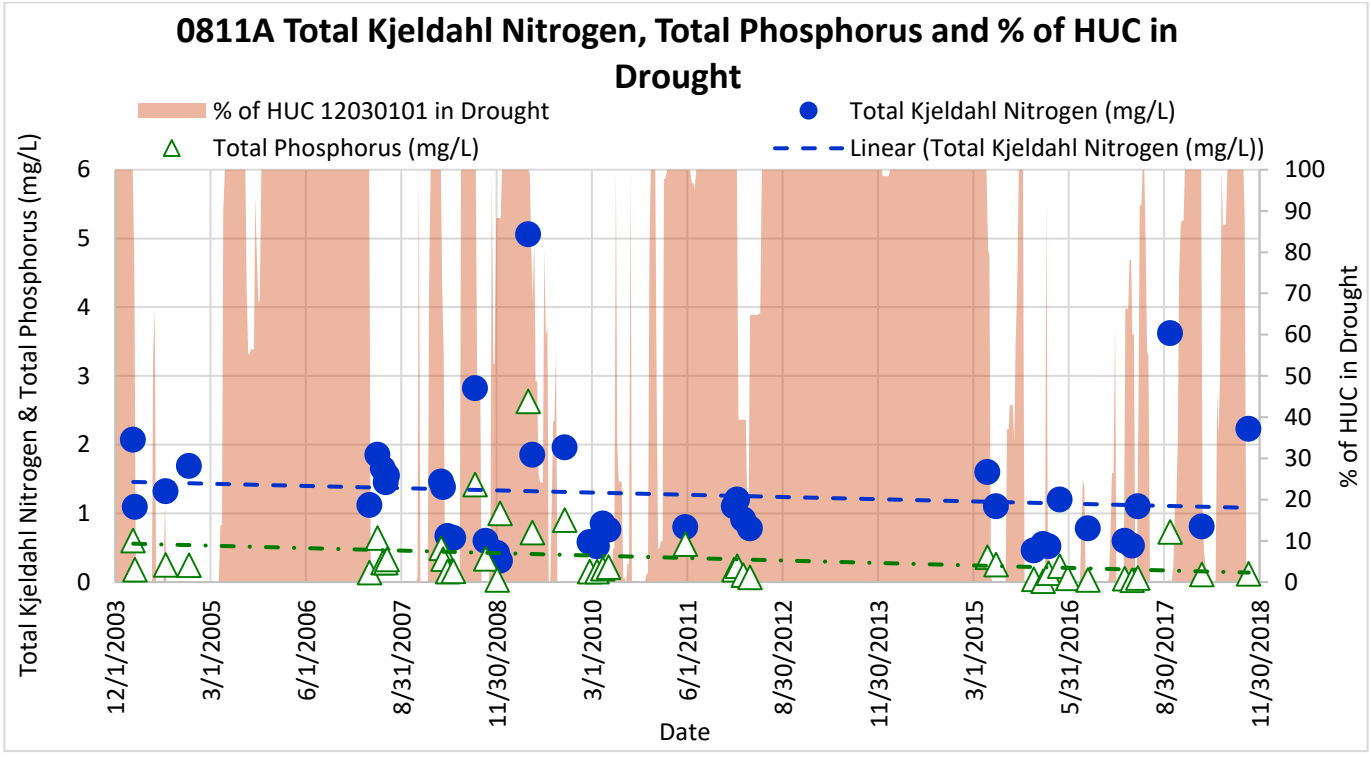


Figure 52: 0811A Total Kjeldahl Nitrogen, Total Phosphorus, and % of HUC in Drought

0811B – Beans Creek

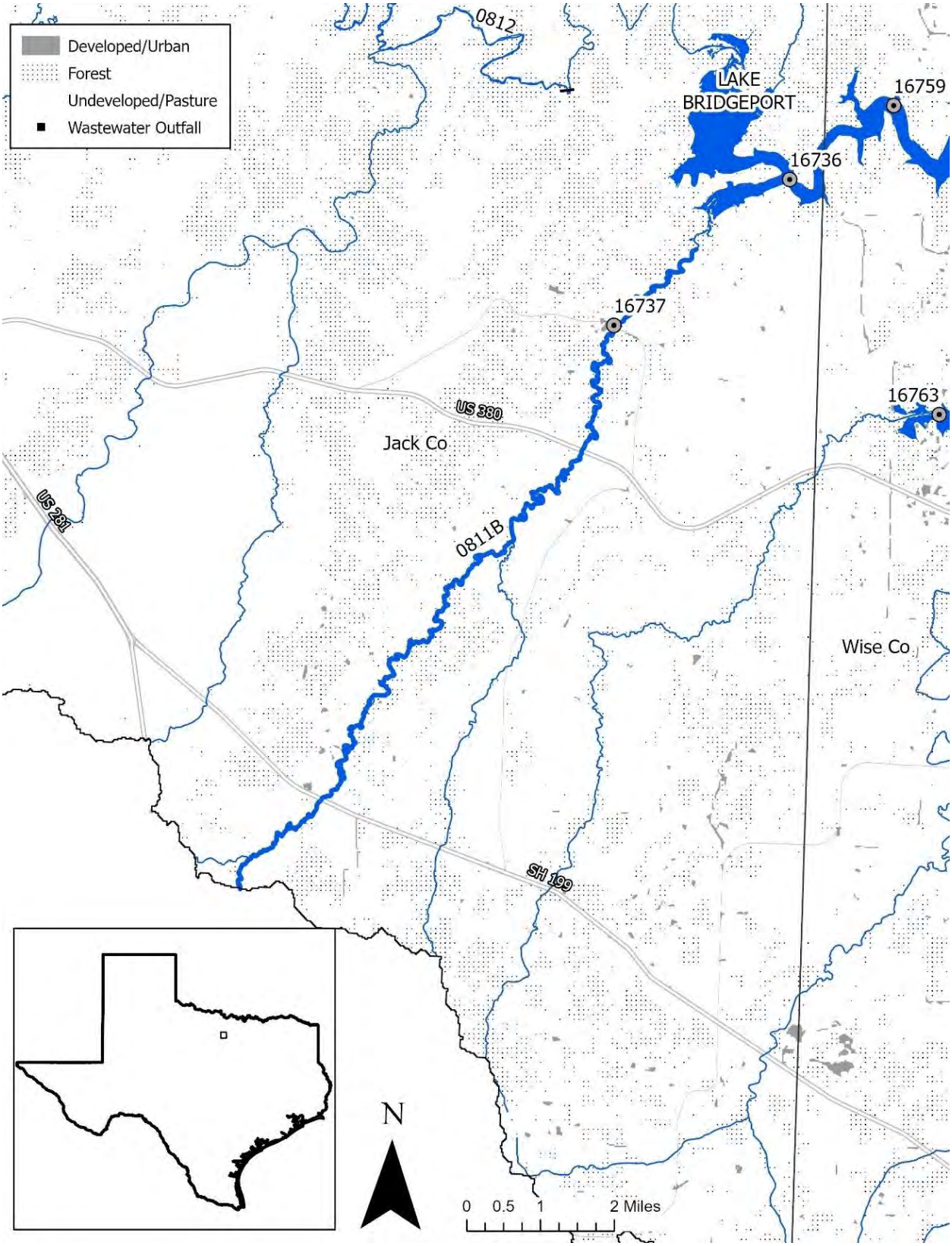


Figure 53: Segment 0811B Map

Beans Creek is a perennial stream that runs approximately 19 miles from the headwaters approximately 4.4 km north of Perrin in Jack County to the confluence with Bridgeport Reservoir at normal pool elevation (see Figure 53). It lies within the Western Cross Timbers ecoregion. The watershed is largely rural with the predominate land uses being grassland and forested areas. There are some areas of cultivated crops adjacent to the intersection of the stream and SH114.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 14. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 14: Segment 0811B FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0811B_01	BEANS CREEK AT FM 1156	16737	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 15. Results of TRA trend analyses are shown in Table 16.

Table 15: TCEQ 2020 Texas Integrated Report Summary for Segment 0811B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0811B_01 From confluence with Bridgeport Reservoir up to headwaters approx. 4.4 km north of Perrin	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0811B_01 From confluence with Bridgeport Reservoir up to headwaters approx. 4.4 km north of Perrin	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0811B_01 From confluence with Bridgeport Reservoir up to headwaters approx. 4.4 km north of Perrin	General Use	Ammonia	0.33 mg/L	NC
0811B_01 From confluence with Bridgeport Reservoir up to headwaters approx. 4.4 km north of Perrin	General Use	Nitrate	1.95 mg/L	NC
0811B_01 From confluence with Bridgeport Reservoir up to headwaters approx. 4.4 km north of Perrin	General Use	Total Phosphorus	0.69 mg/L	NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 16: Significant Trends for Segment 0811B (P-value<0.1)

Segment & Assessment Unit		0811B_01
Site		16737
Ammonia	All	↓
	Summer	Not Significant
	Winter	No Trend
Total Kjeldahl Nitrogen	All	↓
	Summer	↓
	Winter	↓
Total Phosphorus	All	↓
	Summer	↓
	Winter	↓

Segment & Assessment Unit		0811B_01
Site		16737
Orthophosphate	All	↓
	Summer	Not Significant
	Winter	Not Significant
Total Organic Carbon	All	↓
	Summer	↓
	Winter	↓
Flow Severity	All	No Trend
	Summer	↓
	Winter	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend

The impairment for *E. coli* in this segment does not appear to be strictly related to run-off. As shown in Figure 54, bacteria levels were elevated when sampling immediately followed a precipitation event. However, levels remained elevated even when precipitation occurred many days before sampling. Therefore, it is presumed that there are direct sources of bacteria into the stream in addition to run-off related sources. As much of the watershed is rural, wildlife and livestock are likely the primary sources of bacteria under both run-off producing and low flow conditions. Animals visiting the stream for watering may be directly depositing bacteria into the stream. Additionally, there is a small community directly adjacent to the sampling station. Improperly functioning septic systems can introduce bacteria into waterbodies. It is recommended that optical brightener testing be conducted in order to better evaluate the potential source of bacteria in this segment. Optical brighteners are pigments that are added to detergents to make clothing appear brighter and whiter and are therefore commonly found in wastewater. These pigments can be detected visually, especially in low flow systems where dilution of optical brighteners is not an issue. Sampling for optical brighteners involves the saturation of an unbleached cotton media with ambient water. The media is then viewed under an ultraviolet lamp. If the media has a purple-blue fluorescence, optical brighteners may be present in the water and can indicate that human waste may be entering the waterbody.

The segment 0811 tributaries have been noted as being flashy and typically are not flowing unless there has been a recent precipitation event. Therefore, it is not unexpected to have elevated bacteria levels even at what appears to be lower flows since any flow in tributaries would likely be a result of run-off.

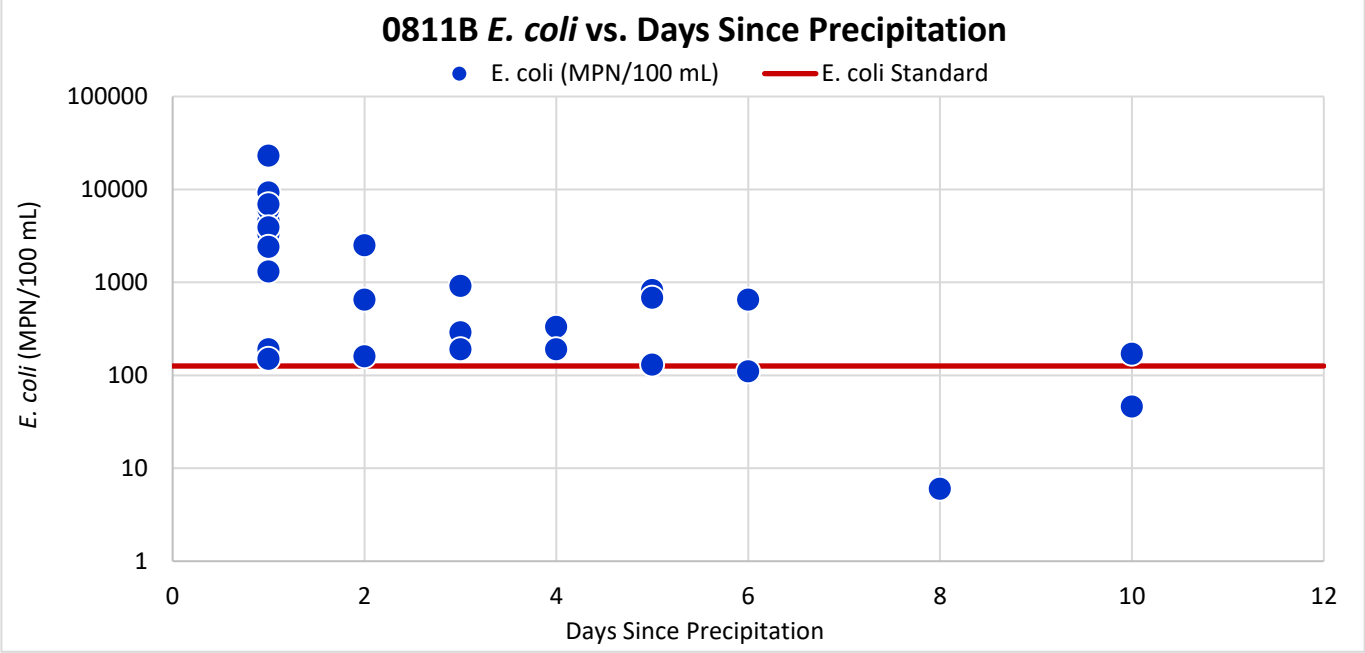


Figure 54: 0811B E. coli vs. Days Since Precipitation

Similar to the decreasing trends discussed in segment 0811A, the decreasing trends for nitrogen, phosphorus, and total organic carbon in 0811B appear to be weighted by samples collected in conjunction with large precipitation events. This is best illustrated by total phosphorus as shown in Figure 55. The three highest values were collected on days that had more than one inch of 24-hour precipitation accumulations as reported by the National Weather Service Advanced Hydrologic Prediction Service. Precipitation data was used as there was no flow data available to assess these trends.

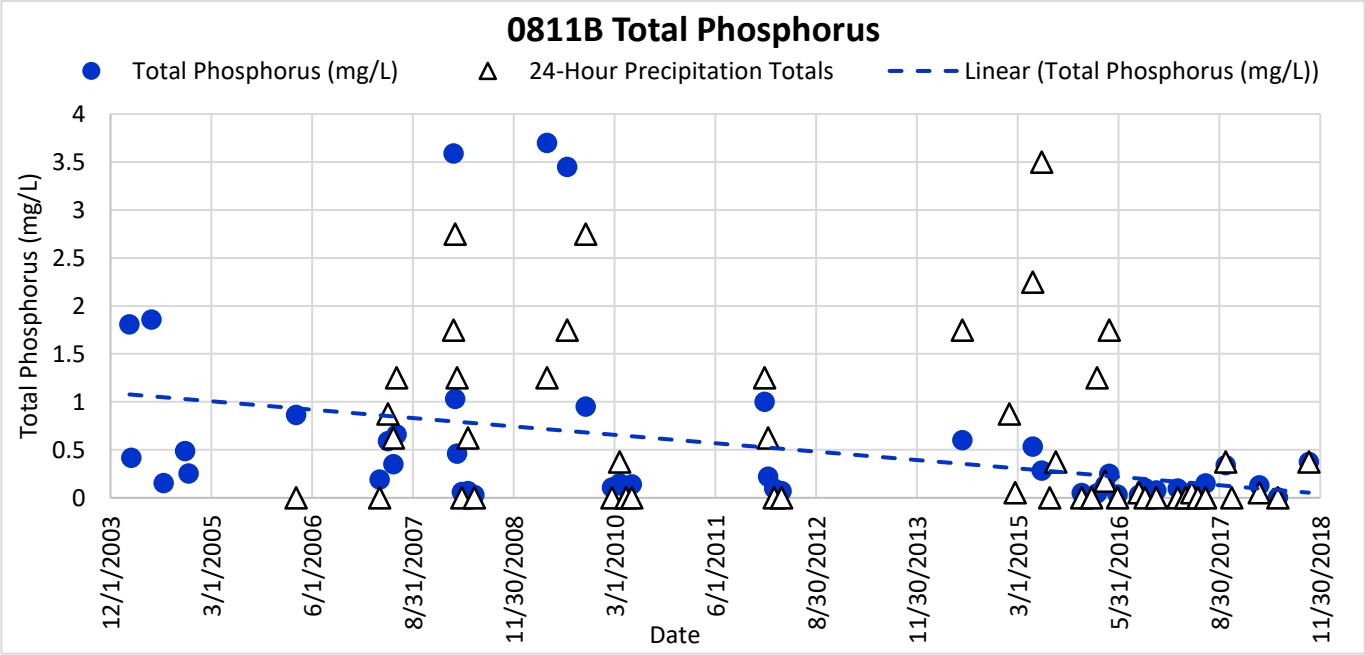


Figure 55: 0811B Total Phosphorus

0810 – West Fork Trinity River below Bridgeport

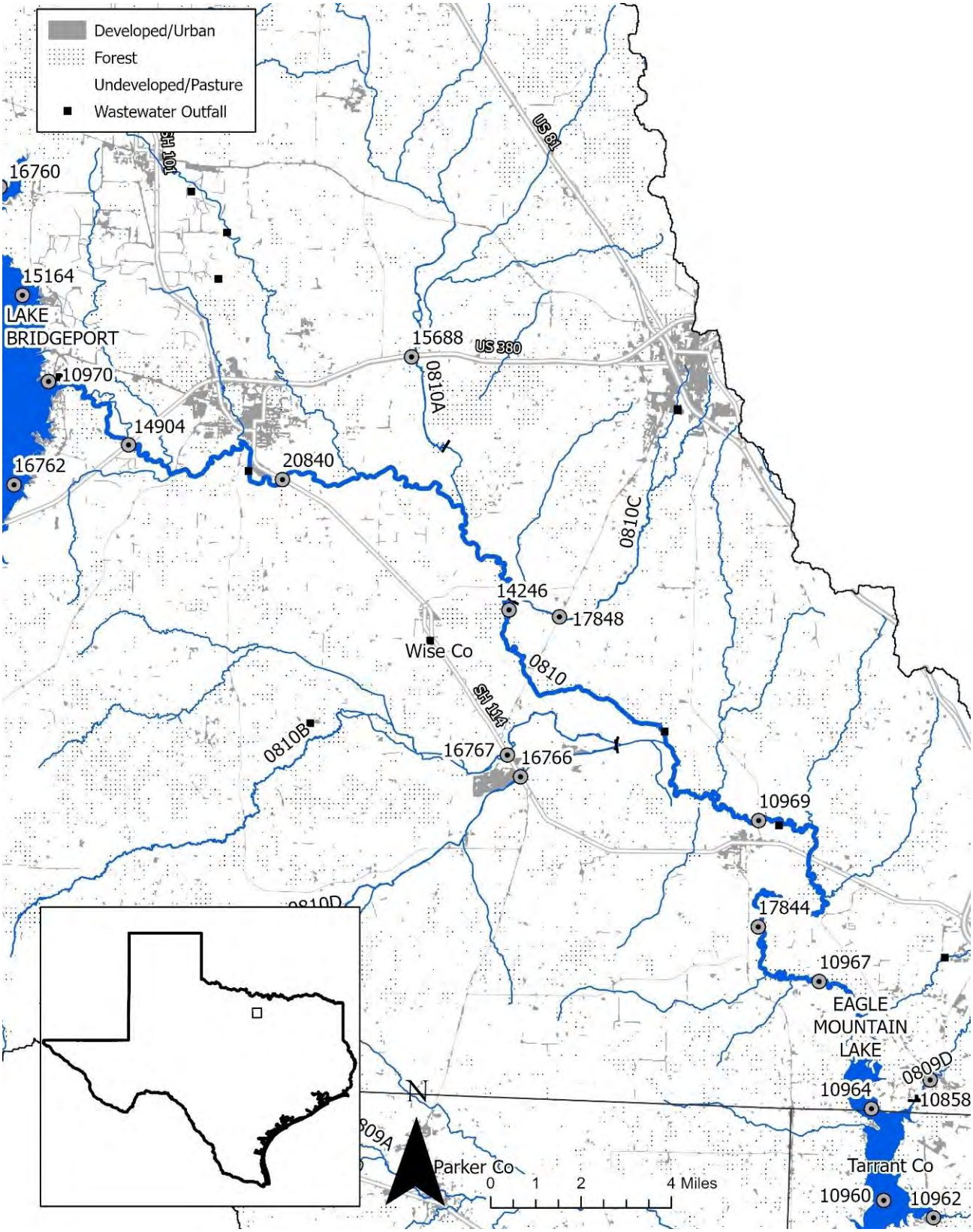


Figure 56: Segment 0810 Map

This 43-mile segment begins at Bridgeport Dam in Wise County and continues to 0.4 miles downstream of the confluence of Oates Branch in Wise County (see Figure 56). It flows through the Western Cross Timbers ecoregion. Land use in this segment is a mixture of pasture, hay, and crop lands with smaller areas of grasslands and forest. Developed areas in the watershed are centered mainly around the cities of Chico, Bridgeport, Decatur, Boyd, and Rhome.

Clean Rivers Program water quality monitoring is being conducted at six sites within this segment as shown in Table 17. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 17: Segment 0810 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0810_01	WEST FORK TRINITY RIVER AT VAN METER BRIDGE	10967	Tarrant Regional Water District
0810_01	WEST FORK TRINITY RIVER DOWNSTREAM OF FM 730	10969	Tarrant Regional Water District
0810_01	WEST FORK TRINITY RIVER DOWNSTREAM OF MARTIN BRANCH	14246	Tarrant Regional Water District
0810_01	WEST FORK TRINITY RIVER AT BOBO BRIDGE	17844	Tarrant Regional Water District
0810_02	WEST FORT TRINITY RIVER DOWNSTREAM OF US 380	14904	Tarrant Regional Water District
0810_02	WEST FORK TRINITY RIVER AT SH 114	20840	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 18. Results of TRA trend analyses are shown in Table 19.

Table 18: TCEQ 2020 Texas Integrated Report Summary for Segment 0810

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0810_01 Lower 25 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0810_02 Upper 11 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0810_01 Lower 25 mi of segment	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0810_02 Upper 11 mi of segment	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0810_01 Lower 25 mi of segment	General Use	Ammonia	0.33 mg/L	NC
0810_01 Lower 25 mi of segment	General Use	Nitrate	1.95 mg/L	NC
0810_01 Lower 25 mi of segment	General Use	Total Phosphorus	0.69 mg/L	NC
0810_01 Lower 25 mi of segment	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0810_01 Lower 25 mi of segment	General Use	pH	6.5 - 9 S.U.	FS
0810_02 Upper 11 mi of segment	General Use	pH	6.5 - 9 S.U.	FS
0810_01 Lower 25 mi of segment	General Use	Chloride	100 mg/L	FS
0810_02 Upper 11 mi of segment	General Use	Chloride	100 mg/L	FS
0810_01 Lower 25 mi of segment	General Use	Total Dissolved Solids	500 mg/L	FS
0810_02 Upper 11 mi of segment	General Use	Total Dissolved Solids	500 mg/L	FS
0810_01 Lower 25 mi of segment	General Use	Water temperature	32.2 °F	FS
0810_02 Upper 11 mi of segment	General Use	Water temperature	32.2 °F	FS
0810_01 Lower 25 mi of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 19: Significant Trends for Segment 0810 (P-value<0.1)

Segment & Assessment Unit		0810_01	0810_02
Site		10969	14904
Secchi Depth	All	Not Significant	Insufficient Data
	Summer	↑*	Insufficient Data
	Winter	Not Significant	Insufficient Data
pH	All	No Trend	Not Significant
	Summer	↓	Not Significant
	Winter	No Trend	Not Significant
Fluoride	All	↓*	Insufficient Data
	Summer	↓*	Insufficient Data
	Winter	↓*	Insufficient Data
E. coli	All	No Trend	Not Significant
	Summer	No Trend	↓
	Winter	No Trend	Not Significant
Days Since Precipitation	All	Not Significant	Not Significant
	Summer	Not Significant	↑
	Winter	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The *E. coli* impairment in assessment unit 0810_01 does not appear to be well correlated to any particular flow as shown for station 10969 in Figure 57. Rather, bacteria levels are elevated at both low and high flows. The riparian areas of this portion of the segment are forested and much of the remainder of the watershed is grassland and pasture or hay fields. It is likely that both wildlife and livestock are the primary source of bacteria in this portion of the river with loads being introduced via run-off and direct deposition when animals visit the river for water. However, the watershed is also a rather densely populated rural area with few permitted discharges. Therefore, failing septic systems may also be contributing bacteria. A bacterial source tracking study would be required to identify the predominate source of bacteria in this segment so that the appropriate best management practices could be implemented to address the impairment.

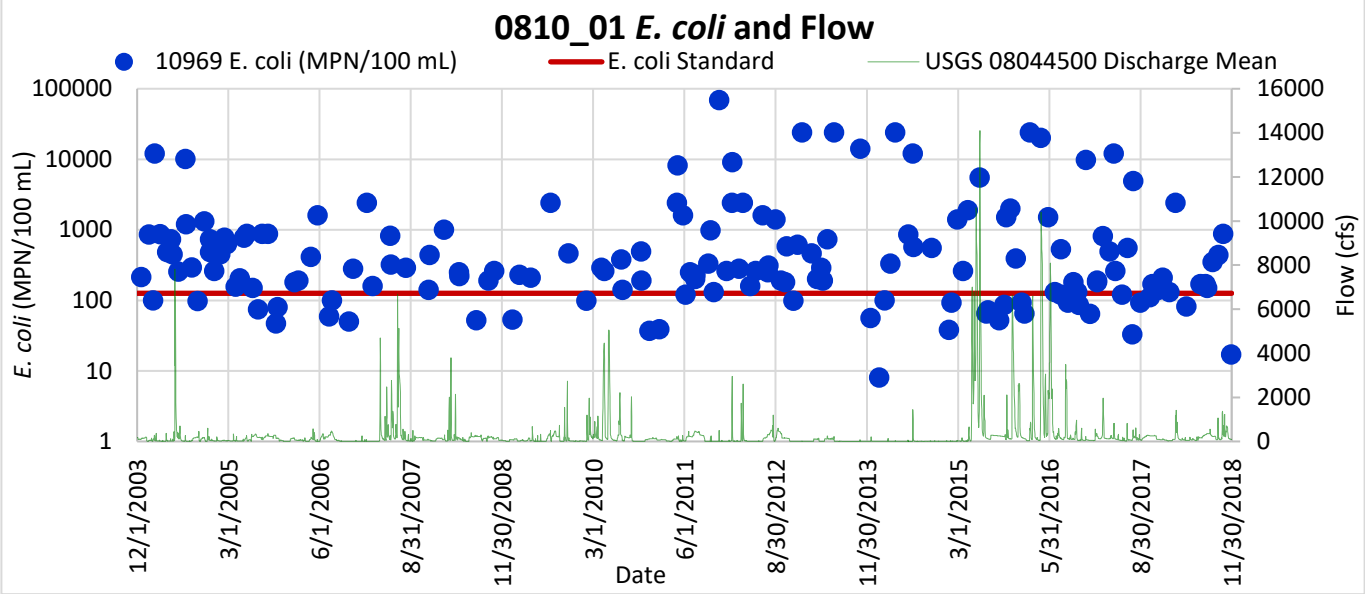


Figure 57: 0810_01 E. coli and Flow

The concern for chlorophyll-*a* was carried forward from previous assessments as there was no data available for assessment collected during the period of record used for the TCEQ 2020 Texas Integrated Report. It is recommended that chlorophyll-*a* be collected in order to determine if this concern still exists. Additionally, chlorophyll-*a* data would be beneficial in determining if the decreasing pH trend as shown in Figure 58 is related to potentially ongoing chlorophyll-*a* concerns.

The decreasing trends for fluoride were false trends introduced by the censoring of non-detect data to one half of the lowest non-detect value in the database. There does not appear to be any change in water quality in 0810_01 in regard to fluoride.

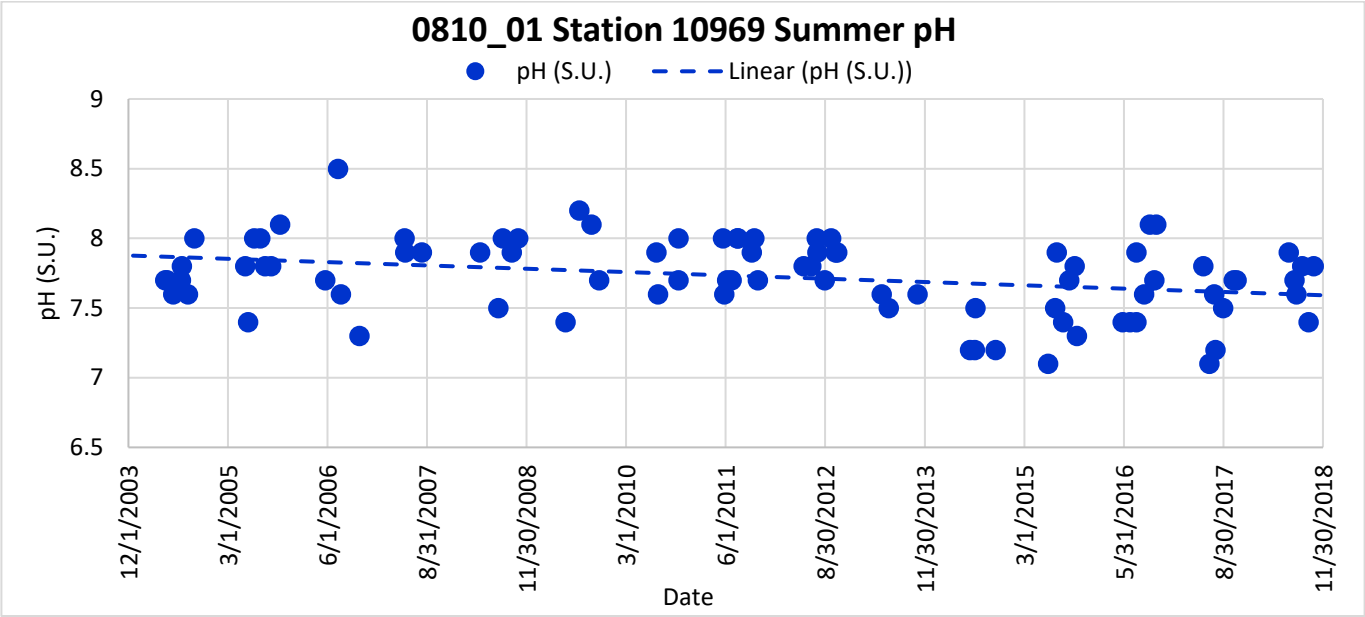


Figure 58: 0810_01 Station 10969 Summer pH

0810A – Big Sandy Creek

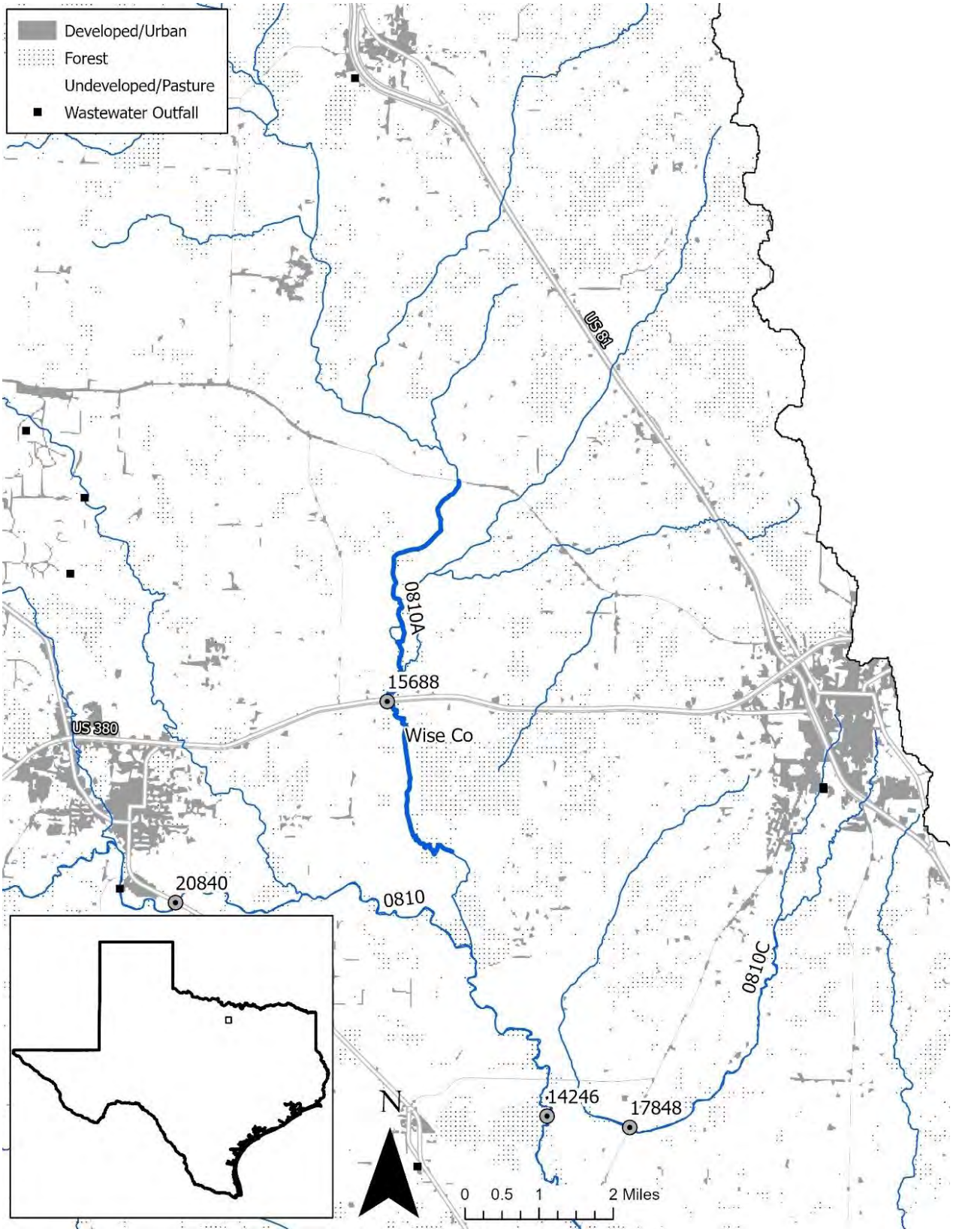


Figure 59: Segment 0810A Map

This unclassified segment runs approximately 7 miles from FM 1810 west of Decatur to the confluence with Waggoner Branch (see Figure 59). It lies within the Western Cross Timbers ecoregion and is surrounded mainly by pasture, hay, and crop land.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 20. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 20: Segment 0810 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0810A_01	BIG SANDY CREEK DOWNSTREAM OF US 380	15688	Tarrant Regional Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 21. No significant trends were identified during TRA data analysis.

Table 21: TCEQ 2020 Texas Integrated Report Summary for Segment 0810A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0810A_01 Big Sandy Creek from confluence with Waggoner Branch up to FM 1810 west of Decatur	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0810A_01 Big Sandy Creek from confluence with Waggoner Branch up to FM 1810 west of Decatur	Recreation Use	*E. coli*	630 MPN/100 mL	FS

FS = Fully Supporting

0810B – Garrett Creek

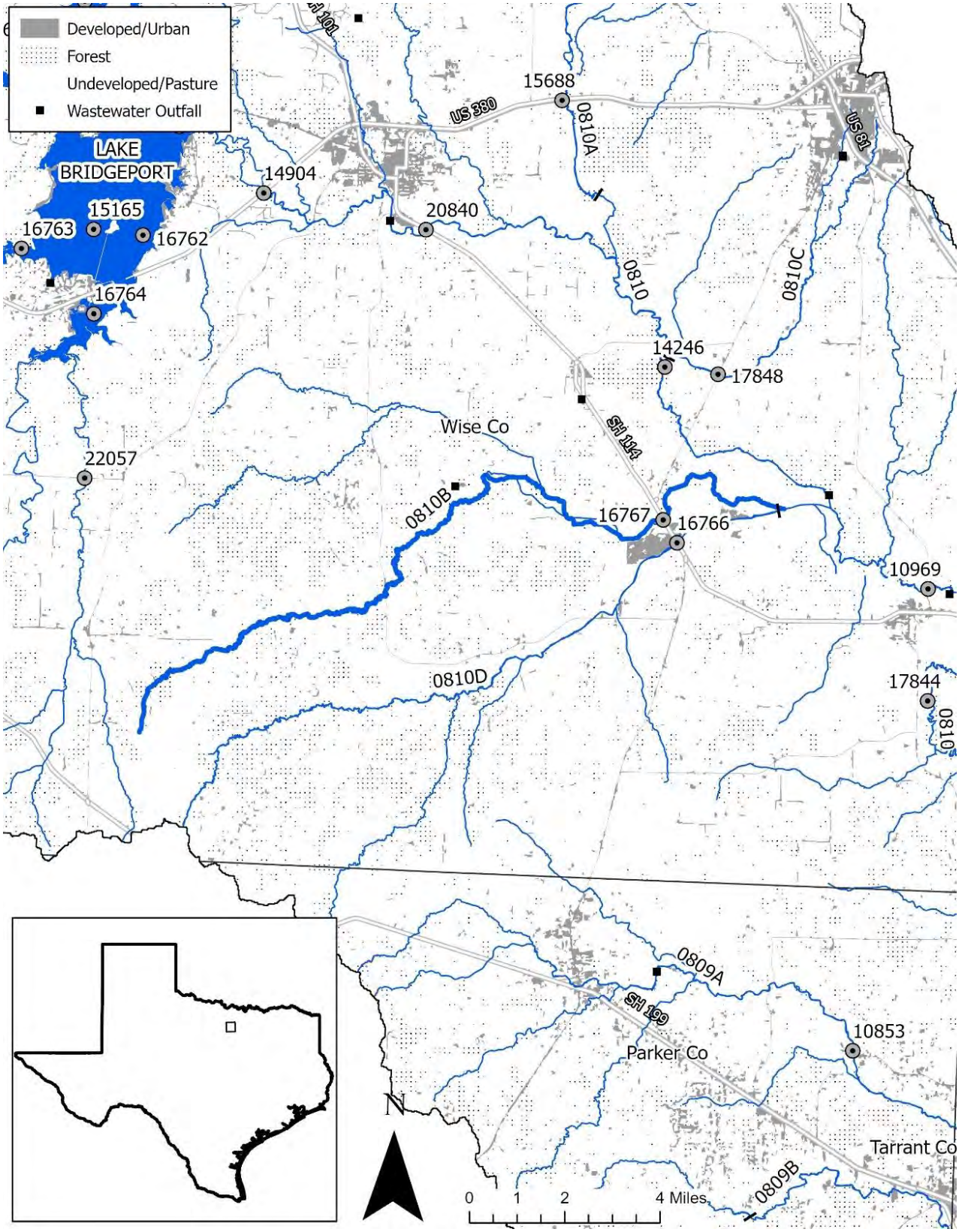


Figure 60: Segment 0810B Map

This 18-mile unclassified segment runs from Wise County Road approximately 14 miles upstream of SH114 in Wise County to the confluence with Salt Creek (see Figure 60). It lies within the Western Cross Timbers ecoregion. Land use in this watershed is predominantly rural with pasture, hay, and crop land with some forested areas throughout.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 22. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 22: Segment 0810B FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0810B_01	GARRETT/RUSH CREEK AT SH 114	16767	Tarrant Regional Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 23. Results of TRA trend analyses are shown in Table 24.

Table 23: TCEQ 2020 Texas Integrated Report Summary for Segment 0810B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0810B_01 18 mi stretch from confluence with Salt Creek to Wise CR approx. 14 mi upstream of SH114	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0810B_01 18 mi stretch from confluence with Salt Creek to Wise CR approx. 14 mi upstream of SH114	Recreation Use	*E. coli*	630 MPN/100 mL	NC

FS = Fully Supporting NC = No Concern

Table 24: Significant Trends for Segment 0810B (P-value<0.1)

Segment & Assessment Unit		0810B_01
Site		16767
Days Since Precipitation	All	Not Significant
	Summer	↑
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

The only trend identified in this segment was an increasing trend for days since precipitation in the summer. This is not unexpected for the summer months but may also be related to a change in the way this data has been reported over the years. For many years, the maximum reported value for this parameter was seven days and anything above this was censored to “>7”. Several years ago, in response to prolonged drought conditions, the reporting methodology was changed to allow for the actual number of days since precipitation to be reporting.

0810C – Martin Branch

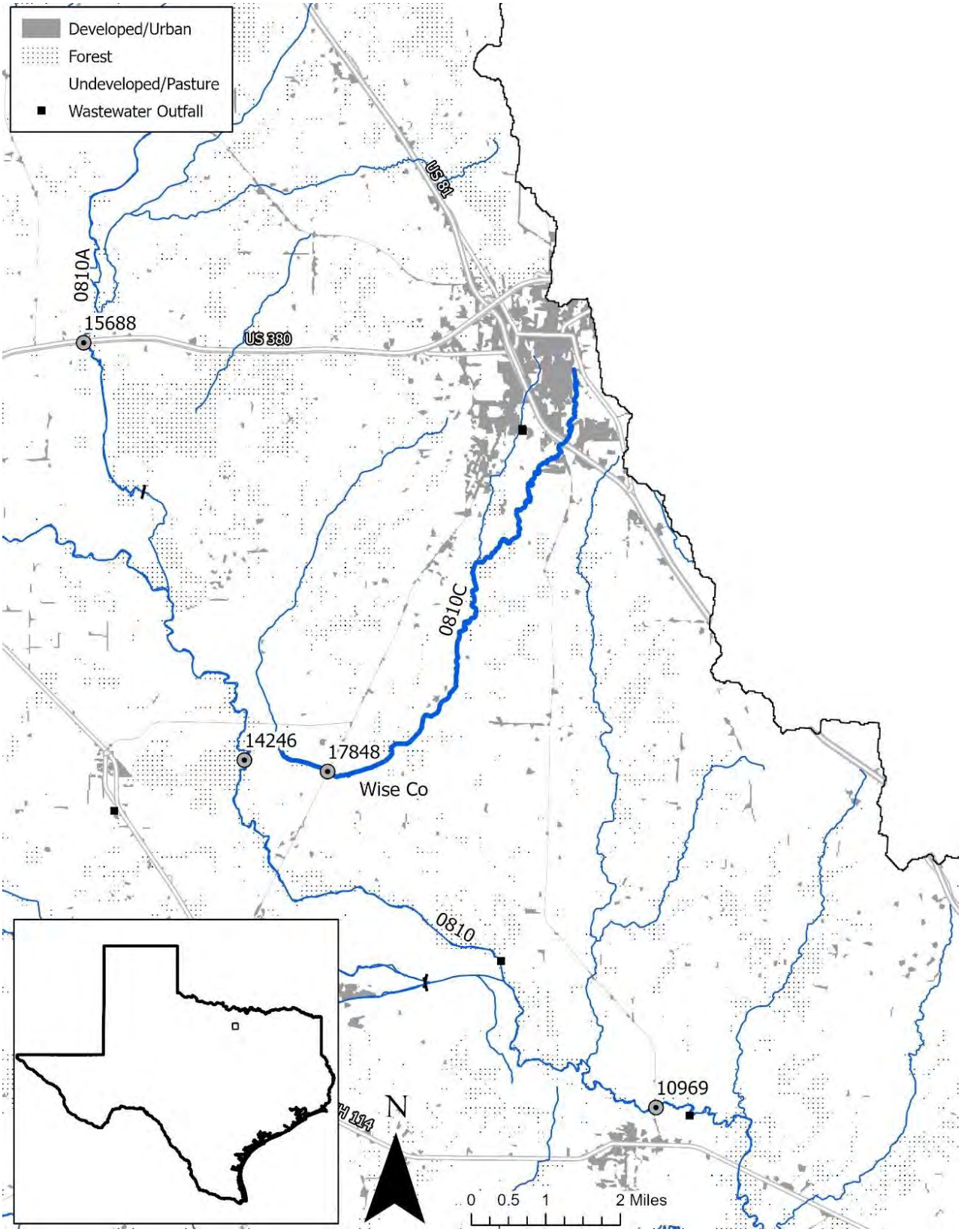


Figure 61: Segment 0810C Map

This eight-mile unclassified segment runs from FM 730 south of Decatur in Wise County to the confluence with Center Creek (see Figure 61). The headwaters lie in the Grand Prairie ecoregion and flows into the Western Cross Timbers. The stream begins in the City of Decatur and then travels through rural areas consisting largely of pasture, hay, and crop lands before joining the West Fork Trinity River.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 25. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 25: Segment 0810C FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0810C_01	MARTIN BRANCH CENTER CREEK AT FM 51	17848	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 26. Results of TRA trend analyses are shown in Table 27.

Table 26: TCEQ 2020 Texas Integrated Report Summary for Segment 0810C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0810C_01 Eight mi stretch of Martin Branch from confluence with Center Creek to FM 730 south of Decatur	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0810C_01 Eight mi stretch of Martin Branch from confluence with Center Creek to FM 730 south of Decatur	Recreation Use	*E. coli*	126 MPN/100 mL	NS

FS = Fully Supporting NS = Not Supporting

Table 27: Significant Trends for Segment 0810C (P-value<0.1)

Segment & Assessment Unit		0810C_01
Site		17848
Days Since Precipitation	All	Not Significant
	Summer	↑
	Winter	Not Significant
E. coli	All	↓
	Summer	↓
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

E. coli in this segment are regularly elevated. As expected, the highest values occurred after recent precipitation and higher flow severities. However, levels were still high even under low flow severities. Based on the land use in the watershed, it is likely that livestock are the source of bacteria in this segment. It is interesting to note that there is evidence of repeated visitation by livestock to the stream directly upstream of the sampling station in this segment. There are livestock trails visible in Google Earth imagery on both sides of the stream just upstream from station 17848 as shown in Figure 62.



Figure 62: Livestock trails upstream of sampling station in 0810C

0810D – Salt Creek

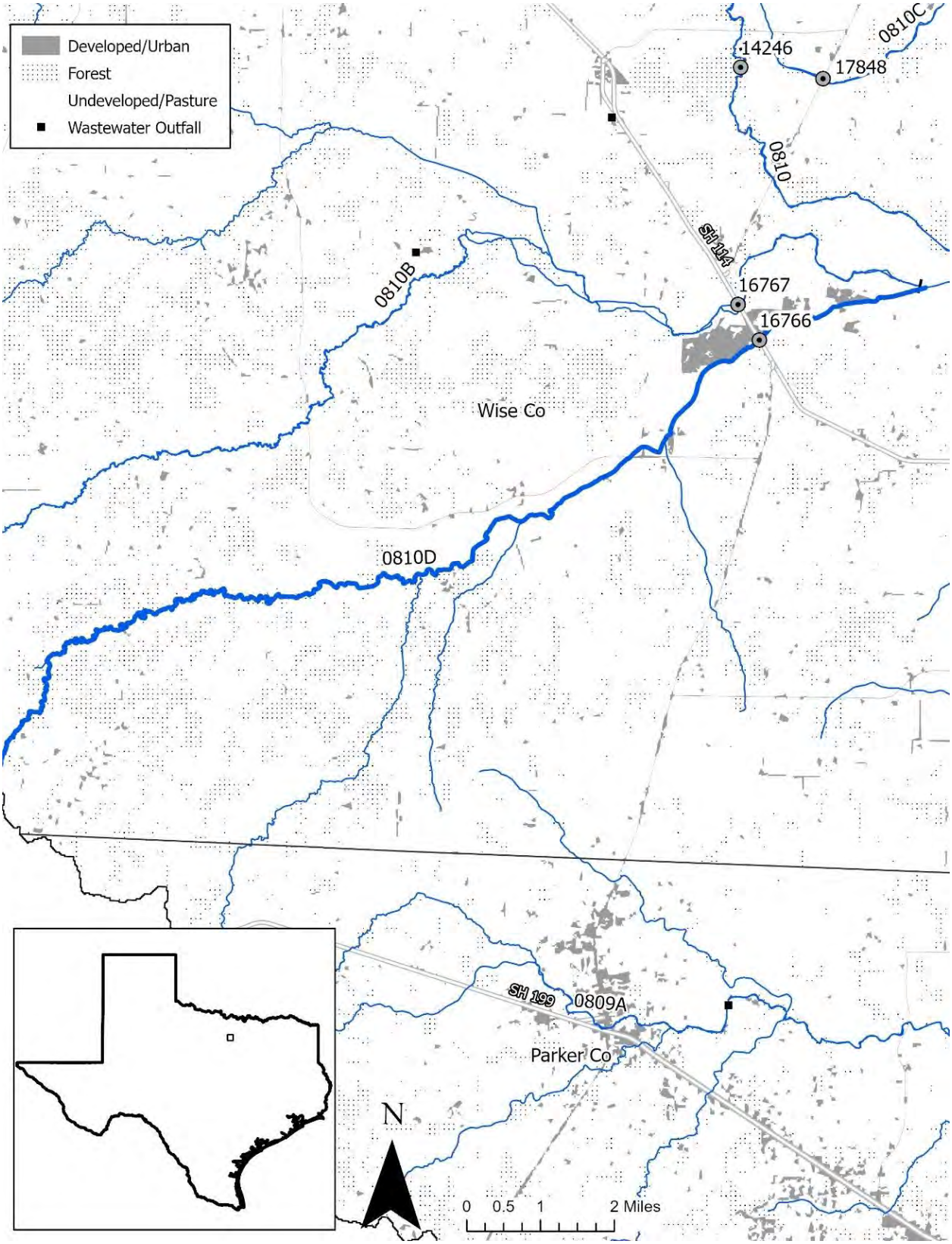


Figure 63: Segment 0810D Map

This 11-mile unclassified segment runs from near SH199 northeast of Poolville to the confluence with Garrett Creek in Wise County (see Figure 63). It lies within the Western Cross Timbers ecoregion. Land use in this watershed is predominantly rural with pasture, hay, and crop land with some forested areas throughout.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 28. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 28: Segment 0810D FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0810D_01	SALT CREEK AT SH 114	16766	Tarrant Regional Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 29. No significant trends were identified during TRA data analysis.

Table 29: TCEQ 2020 Texas Integrated Report Summary for Segment 0810D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0810D_01 11 mile stretch of Salt Creek running upstream from confluence with Garrett Creek Wise Co.	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0810D_01 11 mile stretch of Salt Creek running upstream from confluence with Garrett Creek Wise Co.	Recreation Use	*E. coli*	630 MPN/100 mL	NA

FS = Fully Supporting NA = Not Assessed

0809 – Eagle Mountain Reservoir

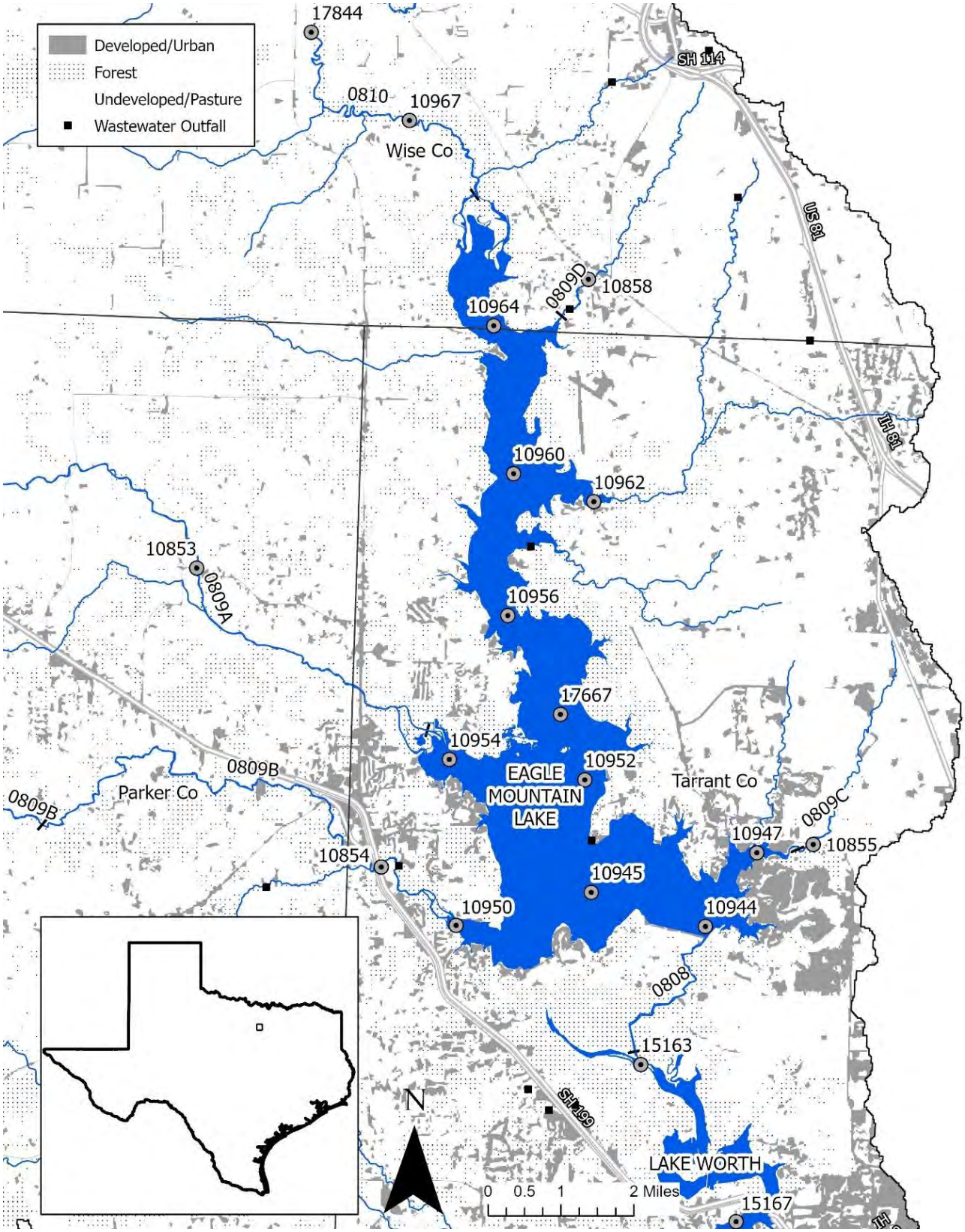


Figure 64: Segment 0809 Map

This segment covers 8,974 acres and stretches from Eagle Mountain Dam in Tarrant County to a point 0.4 miles downstream of the confluence of Oates Branch in Wise County, up to a normal pool elevation of 649.1 feet (see Figure 64). The western portion of the watershed for Eagle Mountain Reservoir lies in the Western Cross Timbers ecoregion and the eastern portion lies in the Grand Prairie ecoregion. Large sections of land around the lake are classified as developed and the remainder is grassland and pasture. Eagle Mountain Reservoir has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at five sites within this segment as shown in Table 30. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 30: Segment 0809 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0809_01	EAGLE MOUNTAIN RESERVOIR EAST EDGE OF DAM	10944	Tarrant Regional Water District
0809_05	EAGLE MOUNTAIN RESERVOIR NEAR TEXAS ELECTRIC	10952	Tarrant Regional Water District
0809_08	EAGLE MOUNTAIN RESERVOIR NEAR COLE SUBDIVISION	10956	Tarrant Regional Water District
0809_10	EAGLE MOUNTAIN RESERVOIR NEAR INDIAN CREEK COVE	10960	Tarrant Regional Water District
0809_12	EAGLE MOUNTAIN RESERVOIR NEAR NEWARK BEACH	10964	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 31. Results of TRA trend analyses are shown in Table 32.

Table 31: TCEQ 2020 Texas Integrated Report Summary for Segment 0809

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0809_01 Lowermost portion of reservoir near east end of dam	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0809_05 Lower portion of reservoir east of Walnut Creek cove	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0809_08 Middle portion of reservoir near Cole subdivision	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0809_10 Upper portion of reservoir near Indian Creek cove	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0809_12 Upper portion of reservoir near Newark Beach	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0809_01 Lowermost portion of reservoir near east end of dam	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0809_05 Lower portion of reservoir east of Walnut Creek cove	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0809_08 Middle portion of reservoir near Cole subdivision	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0809_10 Upper portion of reservoir near Indian Creek cove	Recreation Use	*E. coli*	126 MPN/100 mL	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0809_12 Upper portion of reservoir near Newark Beach	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0809_01 Lowermost portion of reservoir near east end of dam	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_02 Dosier Slough cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_03 Ash Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_04 Lowermost portion of reservoir near west end of dam	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_05 Lower portion of reservoir east of Walnut Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_06 Walnut Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_07 Old Ranch cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_08 Middle portion of reservoir near Cole subdivision	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_09 Indian Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_10 Upper portion of reservoir near Indian Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_11 Darrett Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_12 Upper portion of reservoir near Newark Beach	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_14 Mid-Lake, from just above Walnut Cr. Cove to Oakwood Rd. peninsula	General Use	Nutrient Reservoir Narrative Criteria		NC
0809_01 Lowermost portion of reservoir near east end of dam	General Use	pH	6.5 - 9 S.U.	FS
0809_05 Lower portion of reservoir east of Walnut Creek cove	General Use	pH	6.5 - 9 S.U.	FS
0809_08 Middle portion of reservoir near Cole subdivision	General Use	pH	6.5 - 9 S.U.	FS
0809_10 Upper portion of reservoir near Indian Creek cove	General Use	pH	6.5 - 9 S.U.	FS
0809_12 Upper portion of reservoir near Newark Beach	General Use	pH	6.5 - 9 S.U.	FS
0809_01 Lowermost portion of reservoir near east end of dam	General Use	Chloride	75 mg/L	FS
0809_02 Dosier Slough cove	General Use	Chloride	75 mg/L	FS
0809_03 Ash Creek cove	General Use	Chloride	75 mg/L	FS
0809_04 Lowermost portion of reservoir near west end of dam	General Use	Chloride	75 mg/L	FS
0809_05 Lower portion of reservoir east of Walnut Creek cove	General Use	Chloride	75 mg/L	FS
0809_06 Walnut Creek cove	General Use	Chloride	75 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0809_07 Old Ranch cove	General Use	Chloride	75 mg/L	FS
0809_08 Middle portion of reservoir near Cole subdivision	General Use	Chloride	75 mg/L	FS
0809_09 Indian Creek cove	General Use	Chloride	75 mg/L	FS
0809_10 Upper portion of reservoir near Indian Creek cove	General Use	Chloride	75 mg/L	FS
0809_11 Darrett Creek cove	General Use	Chloride	75 mg/L	FS
0809_12 Upper portion of reservoir near Newark Beach	General Use	Chloride	75 mg/L	FS
0809_14 Mid-Lake, from just above Walnut Cr. Cove to Oakwood Rd. peninsula	General Use	Chloride	75 mg/L	FS
0809_01 Lowermost portion of reservoir near east end of dam	General Use	Sulfate	75 mg/L	FS
0809_02 Dosier Slough cove	General Use	Sulfate	75 mg/L	FS
0809_03 Ash Creek cove	General Use	Sulfate	75 mg/L	FS
0809_04 Lowermost portion of reservoir near west end of dam	General Use	Sulfate	75 mg/L	FS
0809_05 Lower portion of reservoir east of Walnut Creek cove	General Use	Sulfate	75 mg/L	FS
0809_06 Walnut Creek cove	General Use	Sulfate	75 mg/L	FS
0809_07 Old Ranch cove	General Use	Sulfate	75 mg/L	FS
0809_08 Middle portion of reservoir near Cole subdivision	General Use	Sulfate	75 mg/L	FS
0809_09 Indian Creek cove	General Use	Sulfate	75 mg/L	FS
0809_10 Upper portion of reservoir near Indian Creek cove	General Use	Sulfate	75 mg/L	FS
0809_11 Darrett Creek cove	General Use	Sulfate	75 mg/L	FS
0809_12 Upper portion of reservoir near Newark Beach	General Use	Sulfate	75 mg/L	FS
0809_14 Mid-Lake, from just above Walnut Cr. Cove to Oakwood Rd. peninsula	General Use	Sulfate	75 mg/L	FS
0809_01 Lowermost portion of reservoir near east end of dam	General Use	Total Dissolved Solids	300 mg/L	FS
0809_02 Dosier Slough cove	General Use	Total Dissolved Solids	300 mg/L	FS
0809_03 Ash Creek cove	General Use	Total Dissolved Solids	300 mg/L	FS
0809_04 Lowermost portion of reservoir near west end of dam	General Use	Total Dissolved Solids	300 mg/L	FS
0809_05 Lower portion of reservoir east of Walnut Creek cove	General Use	Total Dissolved Solids	300 mg/L	FS
0809_06 Walnut Creek cove	General Use	Total Dissolved Solids	300 mg/L	FS
0809_07 Old Ranch cove	General Use	Total Dissolved Solids	300 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0809_08 Middle portion of reservoir near Cole subdivision	General Use	Total Dissolved Solids	300 mg/L	FS
0809_09 Indian Creek cove	General Use	Total Dissolved Solids	300 mg/L	FS
0809_10 Upper portion of reservoir near Indian Creek cove	General Use	Total Dissolved Solids	300 mg/L	FS
0809_11 Darrett Creek cove	General Use	Total Dissolved Solids	300 mg/L	FS
0809_12 Upper portion of reservoir near Newark Beach	General Use	Total Dissolved Solids	300 mg/L	FS
0809_14 Mid-Lake, from just above Walnut Cr. Cove to Oakwood Rd. peninsula	General Use	Total Dissolved Solids	300 mg/L	FS
0809_01 Lowermost portion of reservoir near east end of dam	General Use	Water temperature	34.4 °F	FS
0809_05 Lower portion of reservoir east of Walnut Creek cove	General Use	Water temperature	34.4 °F	FS
0809_08 Middle portion of reservoir near Cole subdivision	General Use	Water temperature	34.4 °F	FS
0809_10 Upper portion of reservoir near Indian Creek cove	General Use	Water temperature	34.4 °F	FS
0809_12 Upper portion of reservoir near Newark Beach	General Use	Water temperature	34.4 °F	FS
0809_01 Lowermost portion of reservoir near east end of dam	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0809_05 Lower portion of reservoir east of Walnut Creek cove	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0809_08 Middle portion of reservoir near Cole subdivision	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0809_10 Upper portion of reservoir near Indian Creek cove	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0809_12 Upper portion of reservoir near Newark Beach	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern

There were no data available in assessment units 0809_07 and 0809_11 for the period of record for this basin summary report. Data for assessment units 0809_02, 0809_03, 0809_04, 0809_06, 0809_09, and 0809_14 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 32: Significant Trends for Segment 0809 (P-value<0.1)

Segment & Assessment Unit		0809_01	0809_05	0809_08	0809_10	0809_12
Site		10944	10952	10956	10960	10964
Secchi Depth	All	No Trend	↓	↓	↓	↓
	Summer	No Trend	↓	↓	↓	↓
	Winter	No Trend	↓	↓	↓	↓
Alkalinity	All	Not Significant	No Trend	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	No Trend	Not Significant	Not Significant	Not Significant
	Winter	↓	Not Significant	↓	Not Significant	Not Significant
Ammonia	All	No Trend	No Trend	No Trend	No Trend	Insufficient Data
	Summer	No Trend	No Trend	No Trend	No Trend	Insufficient Data
	Winter	↓	Not Significant	No Trend	No Trend	Insufficient Data
Nitrate	All	Not Significant	Not Significant	Not Significant	↑	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	↑	Not Significant
	Winter	No Trend	No Trend	↑	↑	↑
Total Kjeldahl Nitrogen	All	↓	No Trend	No Trend	↓	Insufficient Data
	Summer	Not Significant	No Trend	No Trend	Not Significant	Insufficient Data
	Winter	↓	↓	↓	↓	Insufficient Data
Total Phosphorus	All	No Trend	No Trend	No Trend	No Trend	No Trend
	Summer	No Trend	↓	Not Significant	↓	No Trend
	Winter	Not Significant	Not Significant	↓	No Trend	↓
Total Organic Carbon	All	No Trend	No Trend	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	No Trend	No Trend	Not Significant	Not Significant	No Trend
Total Dissolved Solids	All	Not Significant	Not Significant	No Trend	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	↓
	Winter	Not Significant	Not Significant	No Trend	Not Significant	Not Significant
Total Suspended Solids	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	No Trend
	Winter	Not Significant	Not Significant	No Trend	Not Significant	Not Significant
Chloride	All	↓	↓	↓	↓	↓
	Summer	↓	↓	↓	↓	↓
	Winter	Not Significant	↓	Not Significant	Not Significant	Not Significant
Sulfate	All	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Arsenic	All	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Iron	All	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data

Segment & Assessment Unit		0809_01	0809_05	0809_08	0809_10	0809_12
Site		10944	10952	10956	10960	10964
Total Magnesium	All	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Manganese	All	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Chlorophyll-*a*	All	No Trend	No Trend	↓	No Trend	↓
	Summer	↓	↓	↓	↓	↓
	Winter	Not Significant	↓	↓	↓	↓
Phytoplankton Density	All	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend

The concern for dissolved oxygen in assessment unit 0809_01 appears to be related to drought conditions. As shown in Figure 65, many of the dissolved oxygen values reported below the grab sample screening level of 5 mg/L occurred during periods of low reservoir elevation; especially during the prolonged drought of 2011 to 2015. This assumption is supported by the fact that dissolved oxygen was not well correlated to chlorophyll-*a* (correlation coefficient = -0.157) indicating that algal populations were not excessively influencing dissolved oxygen concentrations. As expected, each of the dissolved oxygen values below the screening level occurred during the summer months which further supports the drought related concern; the correlation coefficient between water temperature and dissolved oxygen was -0.713.

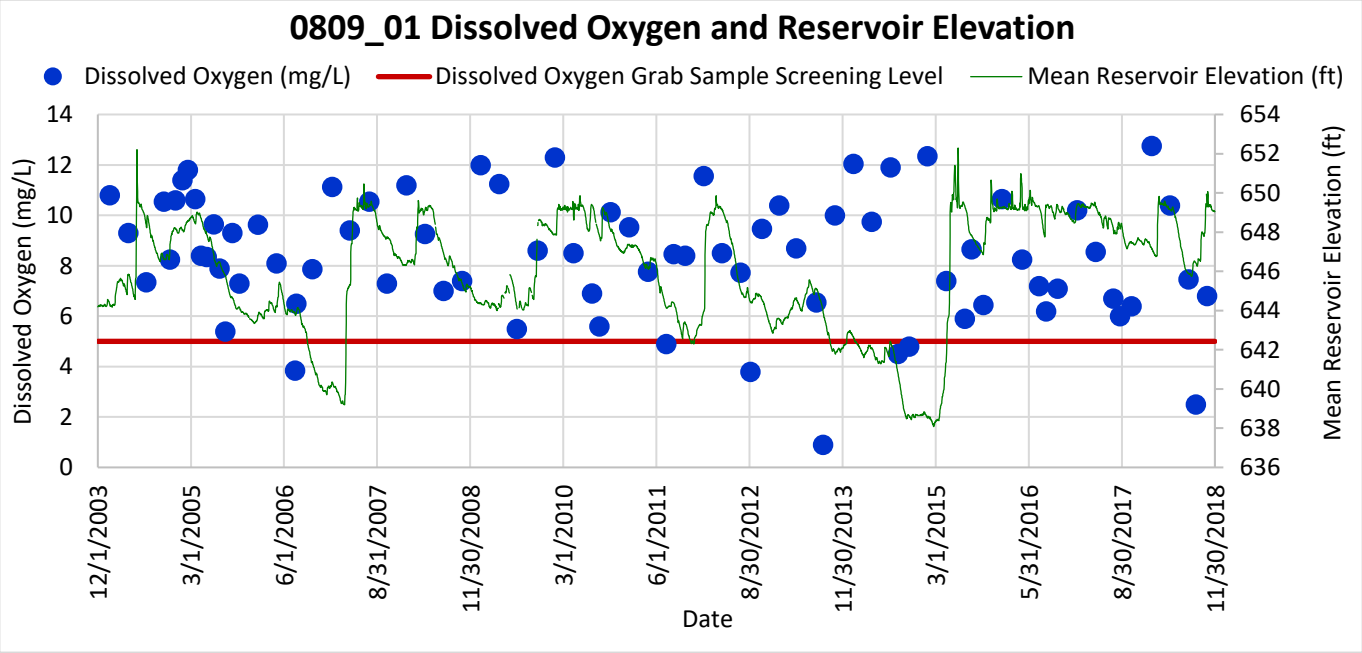


Figure 65: 0809_01 Dissolved Oxygen and Reservoir Elevation

The decreasing trends for secchi depth tracked very well with reservoir elevation as shown in Figure 66 for assessment unit 0809_05. As reservoir elevations drop throughout a drought, evaporation can concentrate the solids remaining in the reservoir. This would result in a decrease in reservoir clarity.

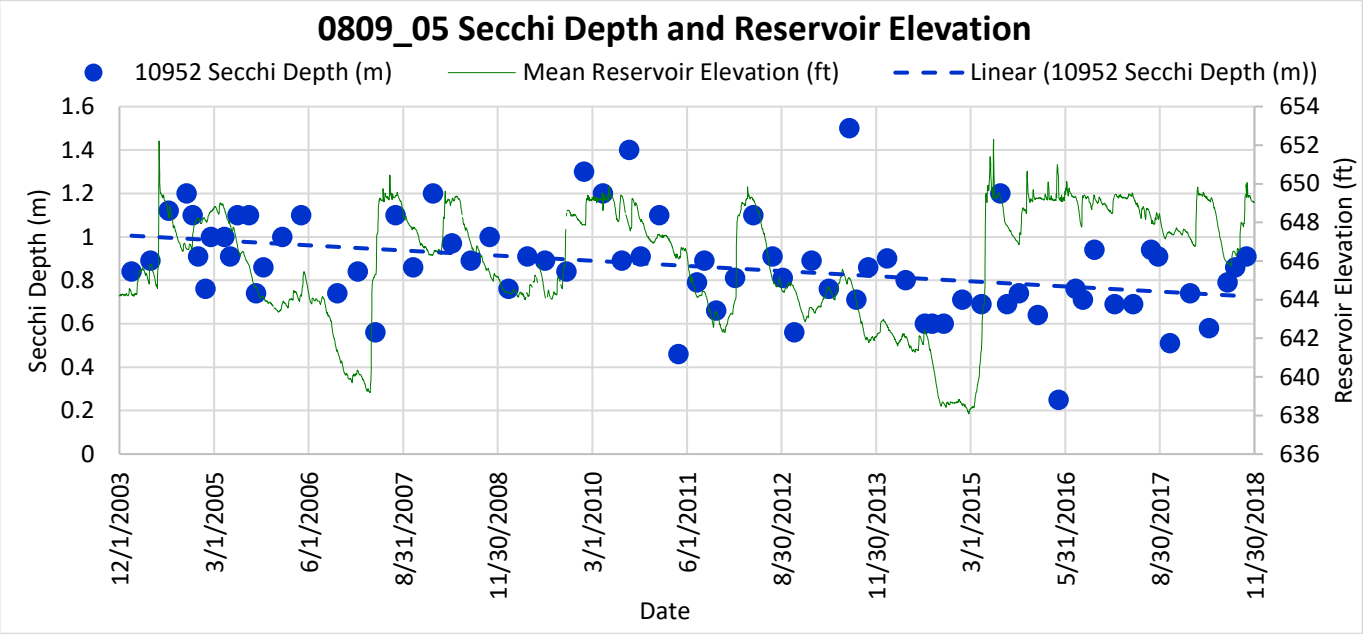


Figure 66: 0809_05 Secchi Depth and Reservoir Elevation

The increasing trend for nitrate appears to have been an artifact of censoring non-detect data as discussed in previous segments. As shown in Figure 67, in the absence of the non-detect data, there does not appear to be a true change in water quality in this assessment unit.

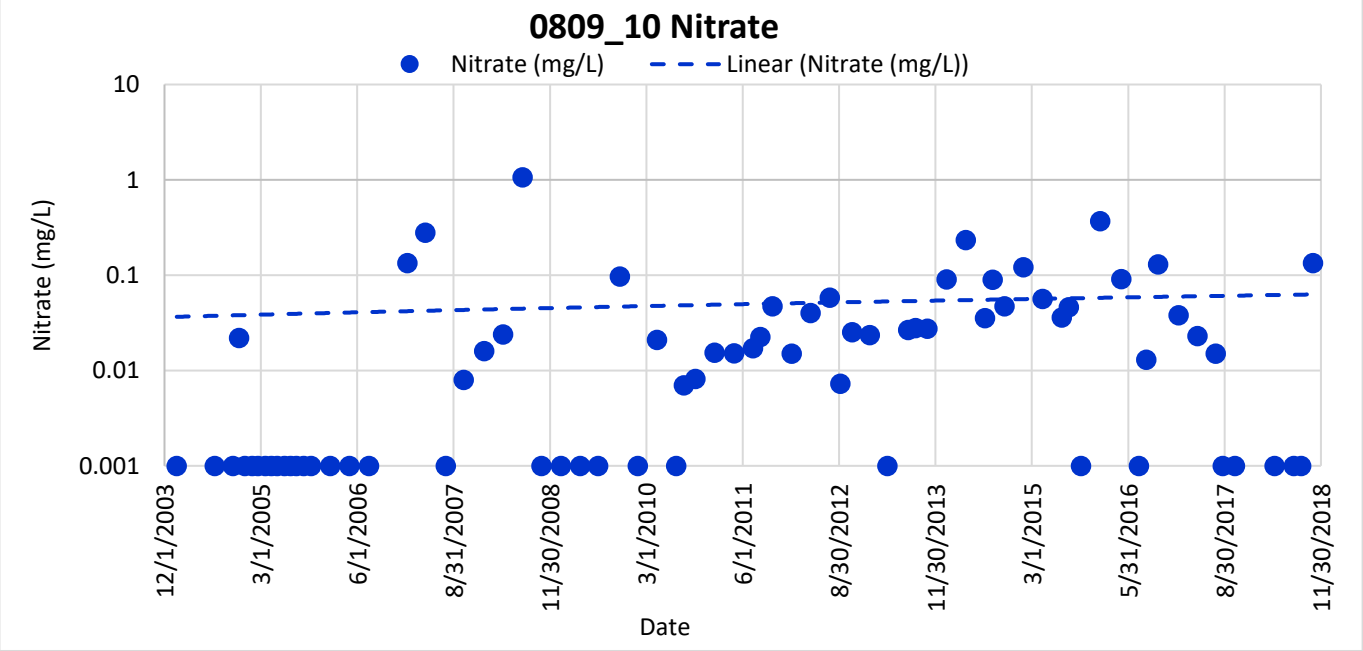


Figure 67: 0809_10 Nitrate

0809A – Walnut Creek

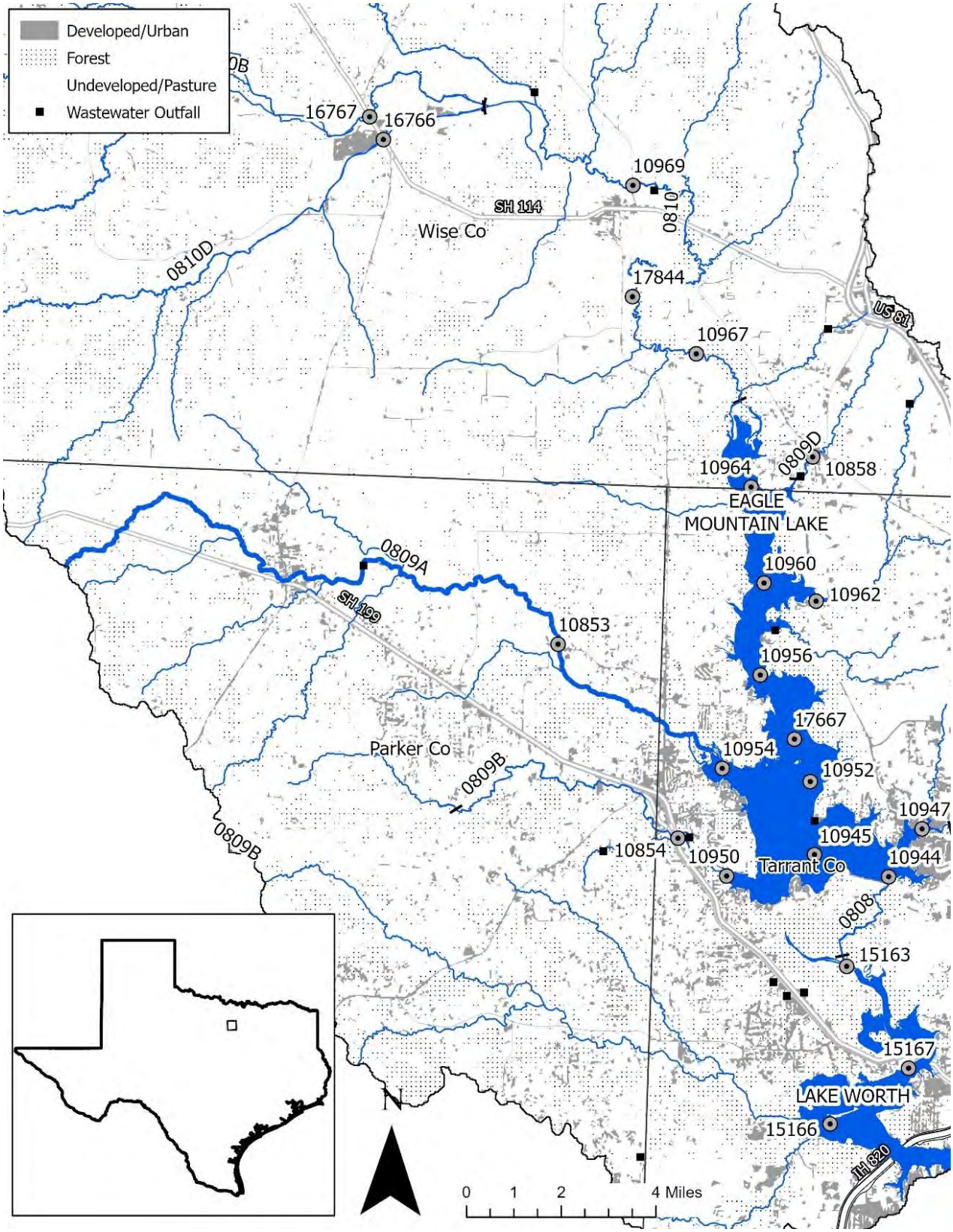


Figure 68: Segment 0809A Map

This unclassified segment runs 20 miles from the headwaters approximately 2.1 mi upstream of State Highway 199 in Parker County to the normal pool elevation of Eagle Mountain Reservoir (see Figure 68). It lies within the Western Cross Timbers ecoregion. The majority of the watershed is rural with pasture, hay, and crop land directly adjacent to the stream. However, the upper portion of the stream flows through the City of Springtown.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 33. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 33: Segment 0809A FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0809A_01	WALNUT CREEK AT FM 1542	10853	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 34. No significant trends were identified during TRA data analysis.

Table 34: TCEQ 2020 Texas Integrated Report Summary for Segment 0809A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0809A_01 From Eagle Mountain Reservoir up to headwaters approx, 2.1 mi upstream of SH 199 in Parker Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0809A_01 From Eagle Mountain Reservoir up to headwaters approx, 2.1 mi upstream of SH 199 in Parker Co.	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0809A_01 From Eagle Mountain Reservoir up to headwaters approx, 2.1 mi upstream of SH 199 in Parker Co.	General Use	Ammonia	0.33 mg/L	NC
0809A_01 From Eagle Mountain Reservoir up to headwaters approx, 2.1 mi upstream of SH 199 in Parker Co.	General Use	Nitrate	1.95 mg/L	NC
0809A_01 From Eagle Mountain Reservoir up to headwaters approx, 2.1 mi upstream of SH 199 in Parker Co.	General Use	Total Phosphorus	0.69 mg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

E. coli in this segment is fairly well correlated to flow (correlation coefficient = 0.604) as shown in Figure 69. This indicates that much of the bacteria concern in this segment is related to run-off. This watershed is fairly rural and the riparian corridor is not as extensive as some other segments. Therefore, livestock are likely to be the predominate source of bacteria in this segment. There are several occurrences of elevated bacteria levels even at lower flows which may also be explained by livestock visiting the stream for watering. There is evidence of livestock trails entering the stream as seen in Google Earth imagery. Additionally, there are several communities directly adjacent to the stream and only one permitted discharge. Failing septic systems may be contributing to the bacteria load in this stream. It is recommended that optical brightener testing be conducted to help determine if septic systems may be contributing to this concern. Optical brighteners are pigments that are added to detergents to make clothing appear brighter and whiter and are therefore commonly found in wastewater. These pigments can be detected visually, especially in low flow systems where dilution of optical brighteners is not an issue. Sampling for optical brighteners involves the saturation of an unbleached cotton

media with ambient water. The media is then viewed under an ultraviolet lamp. If the media has a purple-blue fluorescence, optical brighteners may be present in the water and can indicate that human waste may be entering the waterbody. Landowner education and implementation of livestock best management practices may help reduce bacteria loading in this segment.

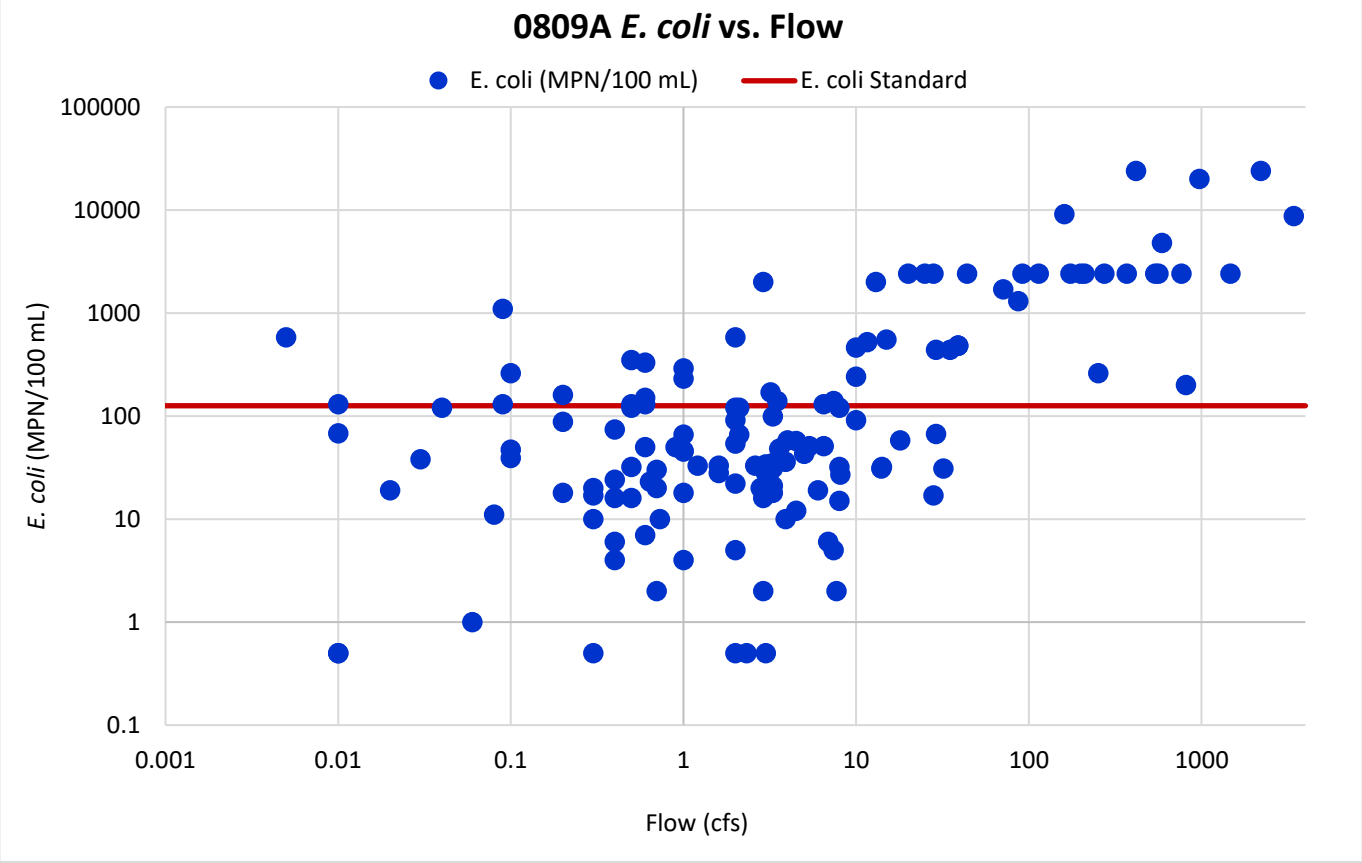


Figure 69: 0809A E. coli vs. Flow

0809B – Ash Creek

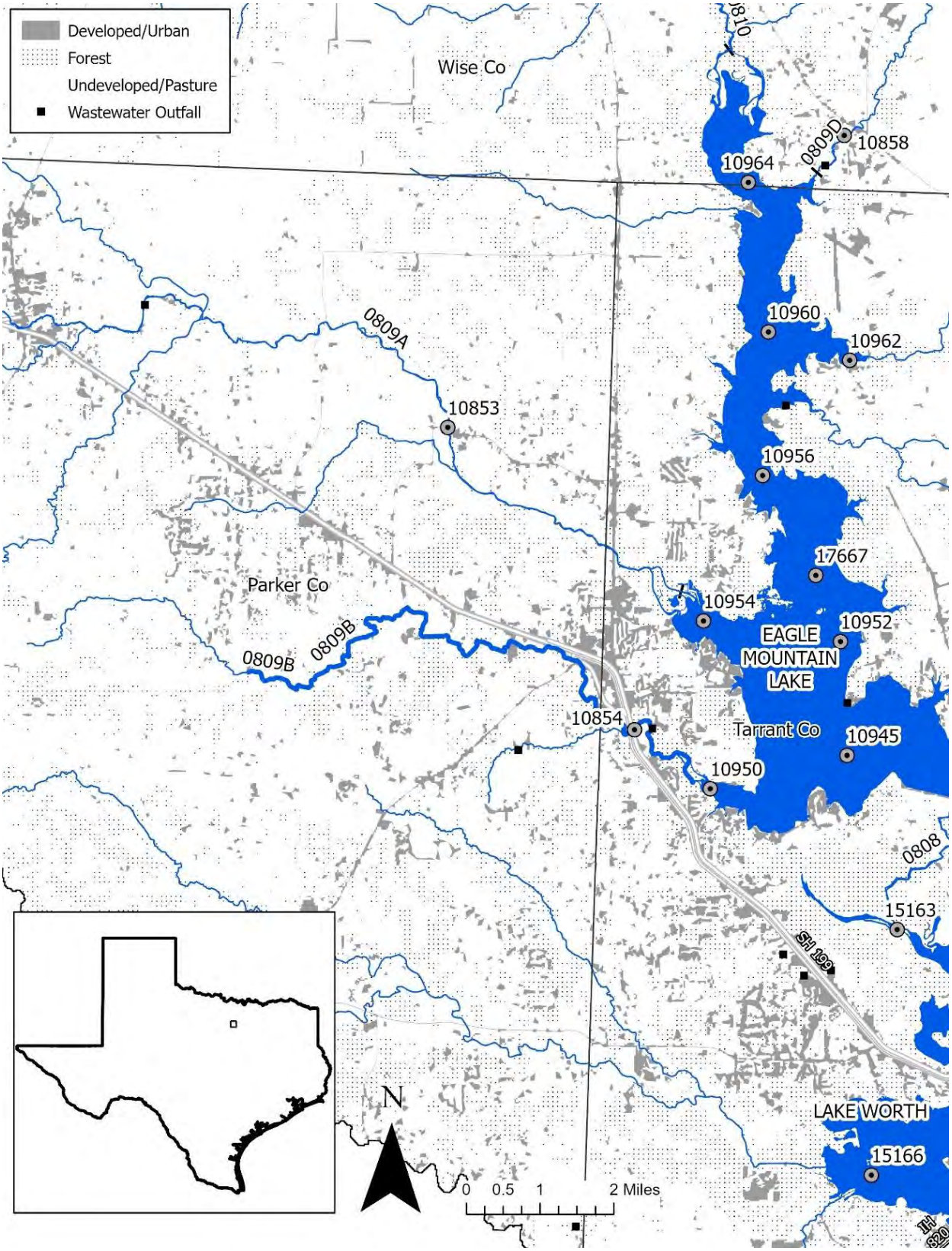


Figure 70: Segment 0809B Map

This 10-mile unclassified segment runs from the confluence with Mill Branch in Parker County to normal pool elevation of Eagle Mountain Reservoir in Tarrant County (see Figure 70). The downstream end flows through the City of Azle but the remainder of the stream flows through grassland and forested areas.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 35. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 35: Segment 0809B FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0809B_01	ASH CREEK DOWNSTREAM OF SH 199	10854	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 36. Results of TRA trend analyses are shown in Table 37.

Table 36: TCEQ 2020 Texas Integrated Report Summary for Segment 0809B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0809B_01 From Eagle Mountain Lake in Tarrant Co. upstream to confluence with Mill Branch in Parker Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0809B_01 From Eagle Mountain Lake in Tarrant Co. upstream to confluence with Mill Branch in Parker Co.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0809B_01 From Eagle Mountain Lake in Tarrant Co. upstream to confluence with Mill Branch in Parker Co.	General Use	Ammonia	0.33 mg/L	NC
0809B_01 From Eagle Mountain Lake in Tarrant Co. upstream to confluence with Mill Branch in Parker Co.	General Use	Nitrate	1.95 mg/L	CS
0809B_01 From Eagle Mountain Lake in Tarrant Co. upstream to confluence with Mill Branch in Parker Co.	General Use	Total Phosphorus	0.69 mg/L	NC

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 37: Significant Trends for Segment 0809B (P-value<0.1)

Segment & Assessment Unit		0809B_01
Site		10854
Total Suspended Solids	All	Not Significant
	Summer	↓
	Winter	Not Significant
Ammonia	All	No Trend
	Summer	↓
	Winter	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend

As shown in Figure 71, *E. coli* in this segment is not well correlated to flow (correlation coefficient = 0.319). *E. coli* levels were generally above the standard of 126 MPN/100 mL regardless of flow. This indicates that there may be constant sources of bacteria into the stream

as well as contributions from run-off during high flow conditions. As much of this segment upstream of Azle is rural, livestock, wildlife, and failing septic systems may be contributing. However, there appears to be a stable immediately upstream of the sampling station in this segment (station 10854). It is recommended that *E. coli* samples be collected upstream and downstream of the stable to determine if this is the source of the elevated bacteria levels observed at station 10854.

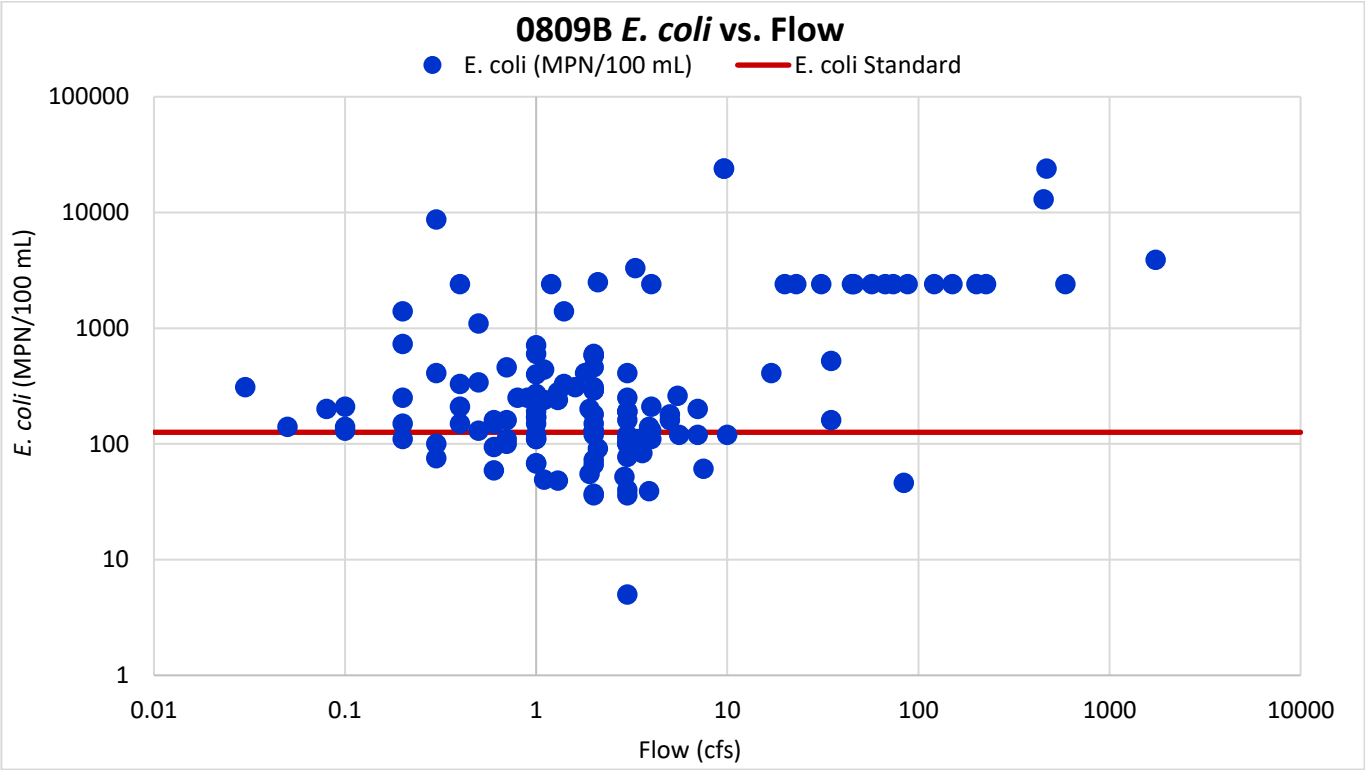


Figure 71: 0809B E. coli vs. Flow

The concern for nitrate appears to be related to drought conditions as shown in Figure 72. The City of Azle wastewater treatment facility is located downstream of the sampling station in this segment so it is unlikely that it is the source of elevated nitrate seen at station 10854. Evaporation during drought conditions could have concentrated the nitrate that existed within the stream, increasing the observed levels. Additionally, run-off from over-irrigation during the drought could have washed nitrate into the stream from animal waste or agricultural or residential fertilizer use.

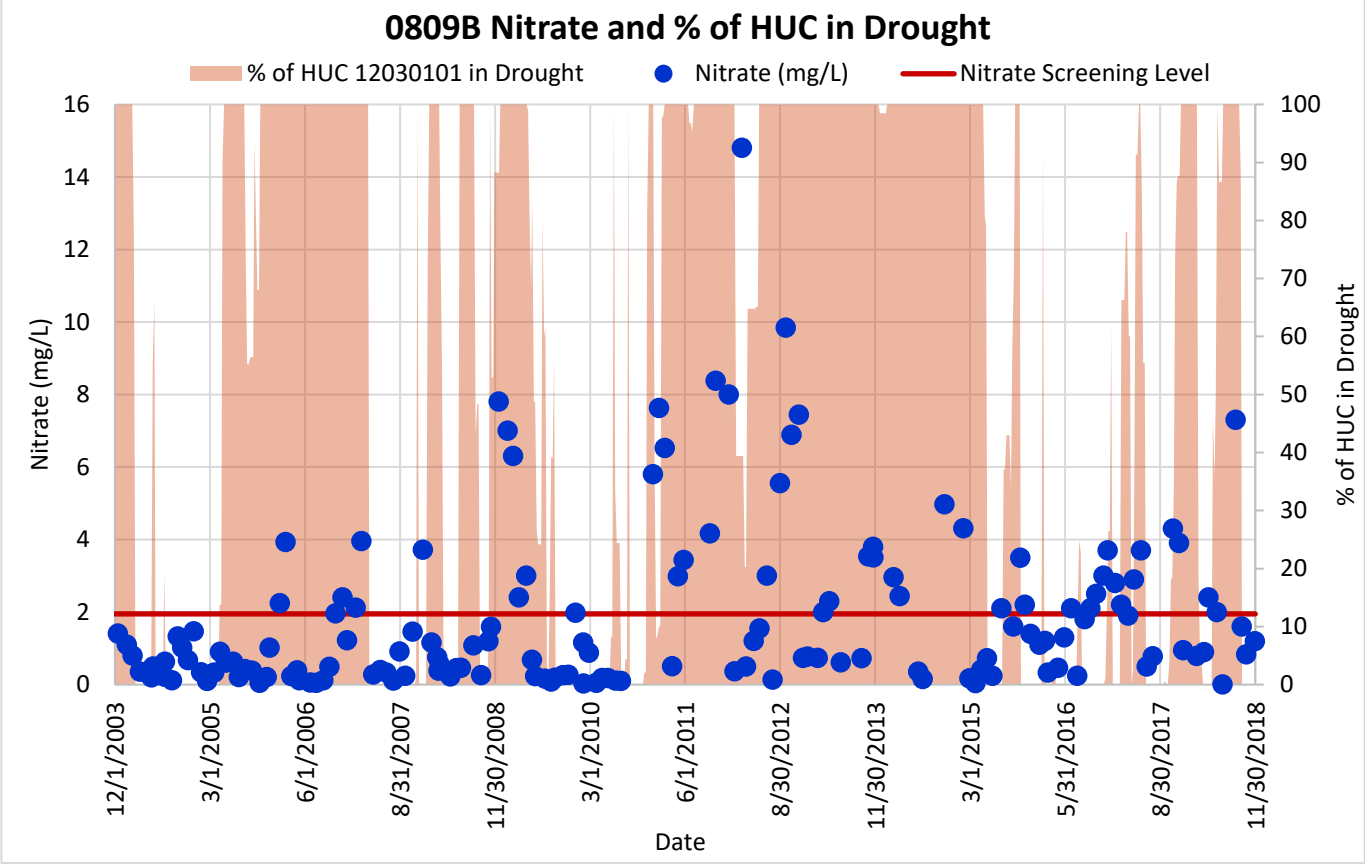


Figure 72: 0809B Nitrate and % of HUC in Drought

0809C – Dosier Creek

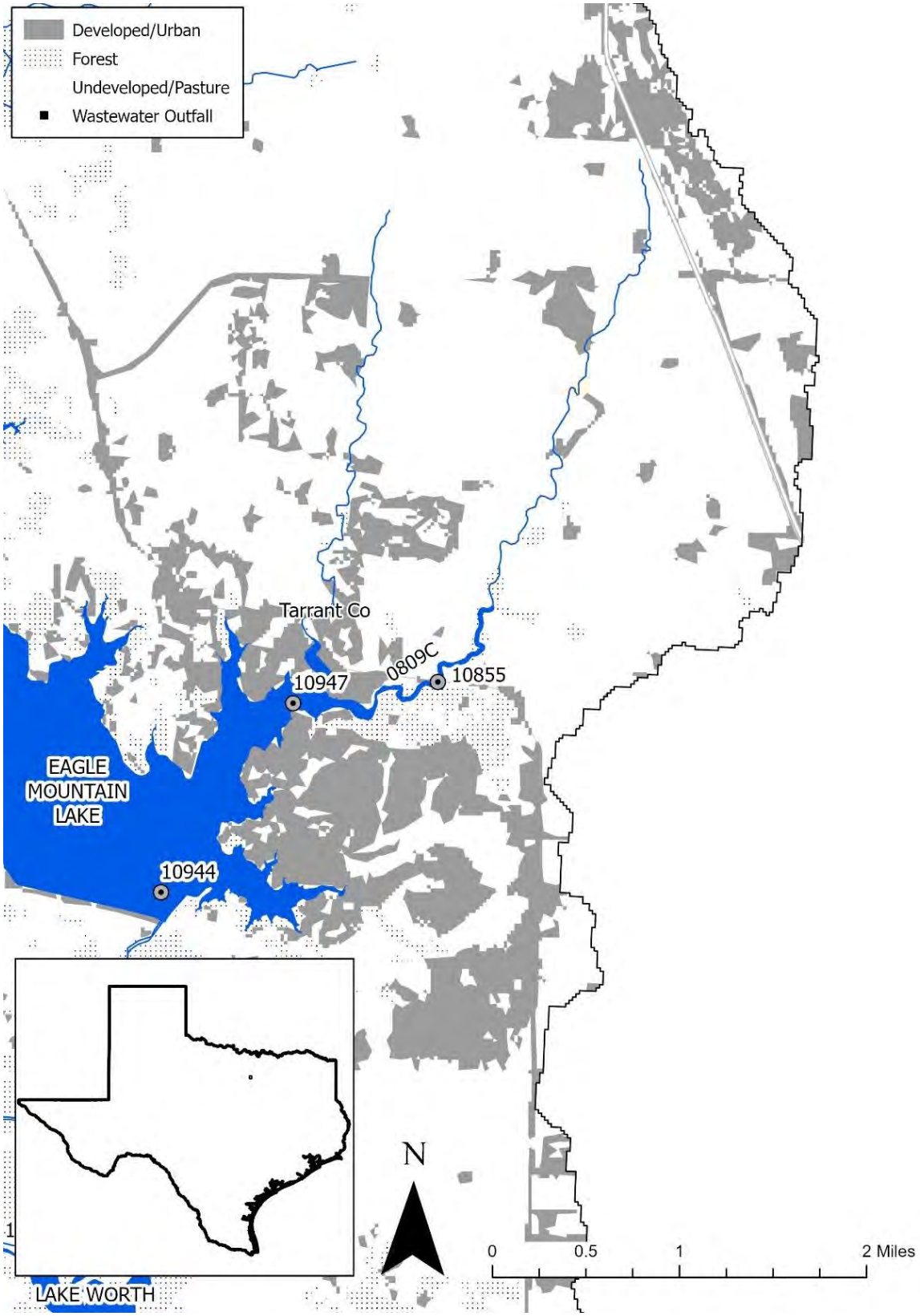


Figure 73: Segment 0809C Map

This unclassified segment runs approximately 1 mile from the confluence with an intermittent stream 1 km upstream of Boat Club Road to the confluence of Dosier Slough cove (see Figure 73). It lies within the Grand Prairie ecoregion and is largely grassland with some pasture and crop land directly adjacent to the stream before it enters Dosier Slough near the south end of Eagle Mountain Reservoir.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 38. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 38: Segment 0809C FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0809C_01	DOSIER CREEK AT FM 1220	10855	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 39. Results of TRA trend analyses are shown in Table 40.

Table 39: TCEQ 2020 Texas Integrated Report Summary for Segment 0809C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0809C_01 From confluence of Dosier Slough cove to confluence with stream 1 km upstream of Boat Club Road	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0809C_01 From confluence of Dosier Slough cove to confluence with stream 1 km upstream of Boat Club Road	Recreation Use	*E. coli*	126 MPN/100 mL	**NS**
0809C_01 From confluence of Dosier Slough cove to confluence with stream 1 km upstream of Boat Club Road	General Use	Ammonia	0.33 mg/L	NC
0809C_01 From confluence of Dosier Slough cove to confluence with stream 1 km upstream of Boat Club Road	General Use	Nitrate	1.95 mg/L	NC
0809C_01 From confluence of Dosier Slough cove to confluence with stream 1 km upstream of Boat Club Road	General Use	Total Phosphorus	0.69 mg/L	NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 40: Significant Trends for Segment 0809C (P-value<0.1)

Segment & Assessment Unit		0809C_01
Site		10855
Days Since Precipitation	All	Not Significant
	Summer	↑
	Winter	Not Significant
Flow Severity	All	No Trend
	Summer	↓
	Winter	No Trend
Total Kjeldahl Nitrogen	All	No Trend
	Summer	↓
	Winter	No Trend
Total Organic Carbon	All	Not Significant
	Summer	↓
	Winter	Not Significant

Segment & Assessment Unit		0809C_01
Site		10855
Total Suspended Solids	All	Not Significant
	Summer	↓
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

E. coli in this segment is very well correlated to flow (correlation coefficient = 0.898) as shown in Figure 74. This indicates that much of the bacteria concern in this segment is related to run-off. Based on the land use in the watershed, it is likely that livestock and, to a lesser extent, wildlife are the source of bacteria in this segment. Google Earth imagery supports this assumption as there is evidence of livestock trails in the pastures surrounding and entering the stream (see Figure 75). Landowner education and livestock best management practices may be beneficial in reducing bacterial loads in this segment.

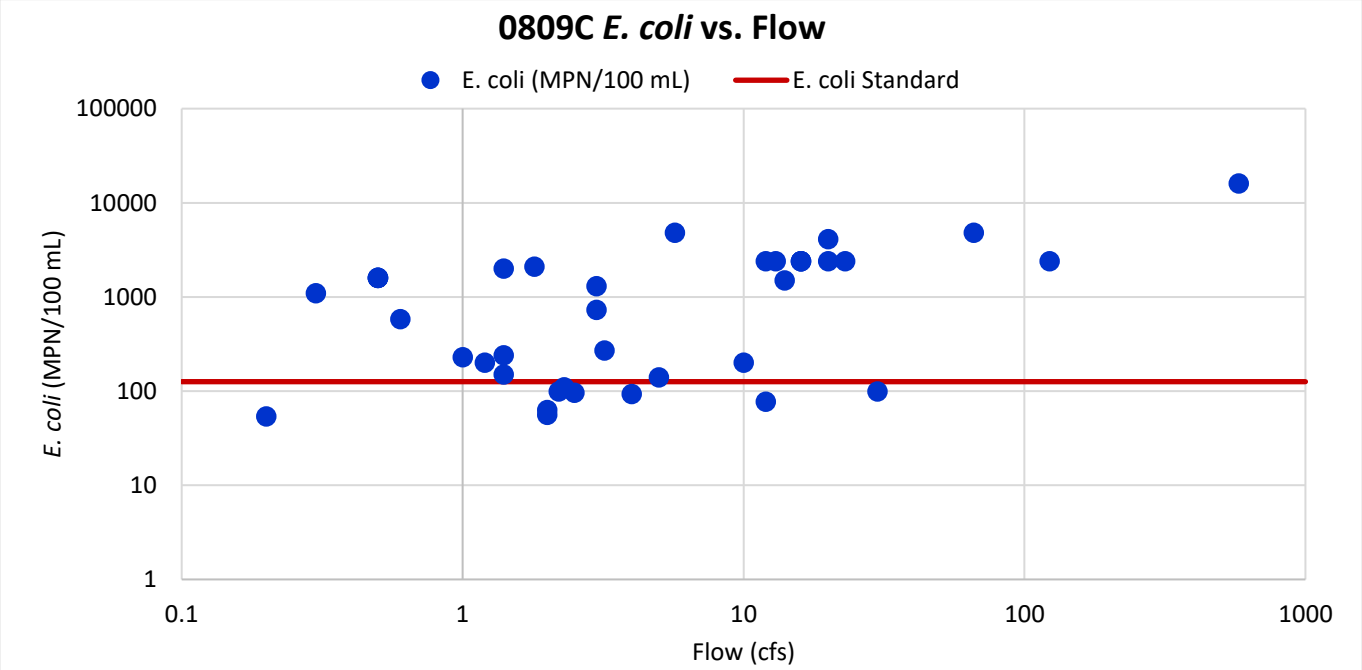


Figure 74: 0809C E. coli vs. Flow



Figure 75: Livestock trails in segment 0809C

0809D – Derrett Creek

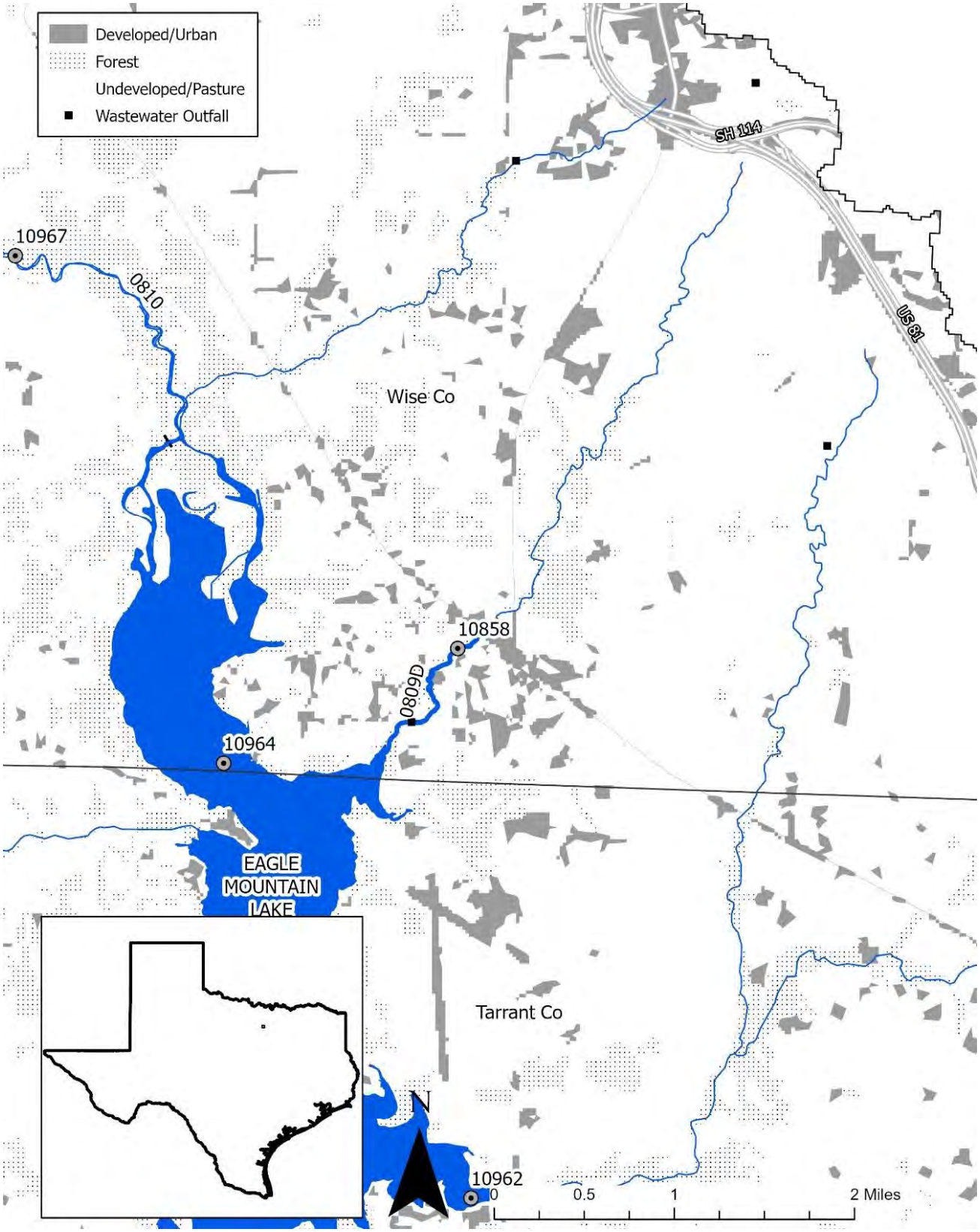


Figure 76: Segment 0809D Map

This 1.2-mile unclassified segment runs from an intermittent stream just upstream of FM 718 in the City of Newark to the confluence with Derrett Creek cove (see Figure 76). The upper portion of the watershed flows through the Grand Prairie ecoregion into the Western Cross Timbers just before entering the northern Eagle Mountain Reservoir.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 41. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 41: Segment 0809D FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0809D_01	DERRETT CREEK AT CENTRAL AVENUE	10858	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 42. Results of TRA trend analyses are shown in Table 43.

Table 42: TCEQ 2020 Texas Integrated Report Summary for Segment 0809D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0809D_01 From confluence with Derrett Creek cove to 0.22 km upstream of FM 718	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0809D_01 From confluence with Derrett Creek cove to 0.22 km upstream of FM 718	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0809D_01 From confluence with Derrett Creek cove to 0.22 km upstream of FM 718	General Use	Ammonia	0.33 mg/L	NC
0809D_01 From confluence with Derrett Creek cove to 0.22 km upstream of FM 718	General Use	Nitrate	1.95 mg/L	NC
0809D_01 From confluence with Derrett Creek cove to 0.22 km upstream of FM 718	General Use	Total Phosphorus	0.69 mg/L	NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 43: Significant Trends for Segment 0809D (P-value<0.1)

Segment & Assessment Unit		0809D_01
Site		10858
Dissolved Oxygen	All	Not Significant
	Summer	↓
	Winter	Not Significant
pH	All	Not Significant
	Summer	↓
	Winter	Not Significant
Flow Severity	All	↓
	Summer	↓
	Winter	↓
Days Since Precipitation	All	Not Significant
	Summer	↑
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

The *E. coli* impairment in this segment appears to be related to run-off as shown in Figure 77. There was not enough flow data to adequately analyze the relationship between flow and other parameters in this data set, however a majority of elevated *E. coli* values were reported during sampling events that occurred during or immediately followed a precipitation event. There are several large pastures upstream of the sampling station in this segment so livestock are the likely source of bacteria. Landowner education and livestock best management practices may be beneficial in reducing bacterial loads in this segment.

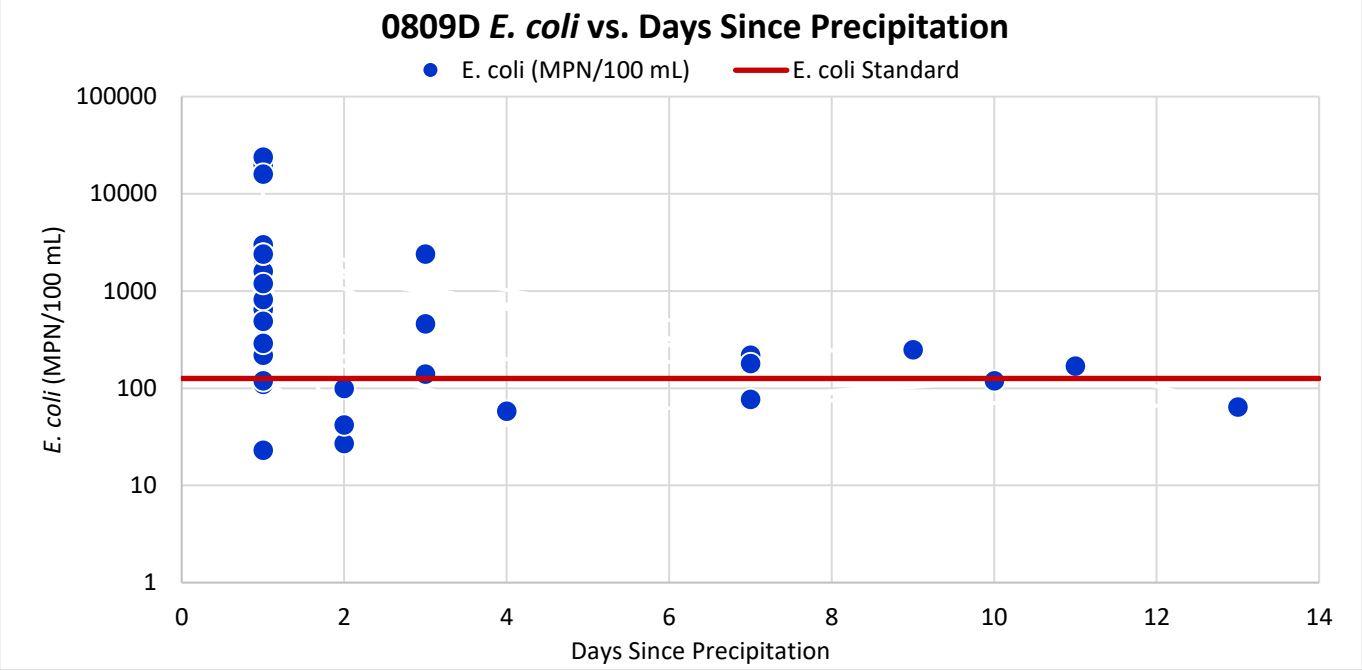


Figure 77: 0809D E. coli vs. Days Since Precipitation

The decreasing trends for dissolved oxygen and pH in the summer are difficult to assess with the available data. Because both dissolved oxygen and pH have decreasing summer trends, algal populations could be influencing these parameters through photosynthesis and respiration cycles. However, there are no chlorophyll-*a* data available to confirm this assumption. Alternatively, decreasing dissolved oxygen trends could be related to low flows. The correlation coefficients for flow and flow severity were 0.423 and 0.630, respectively. However, this does not account for the decreasing pH trend. It is recommended that chlorophyll-*a* be collected in this segment to further analyze the trends in this segment.

0808 – West Fork Trinity River below Eagle Mountain Reservoir

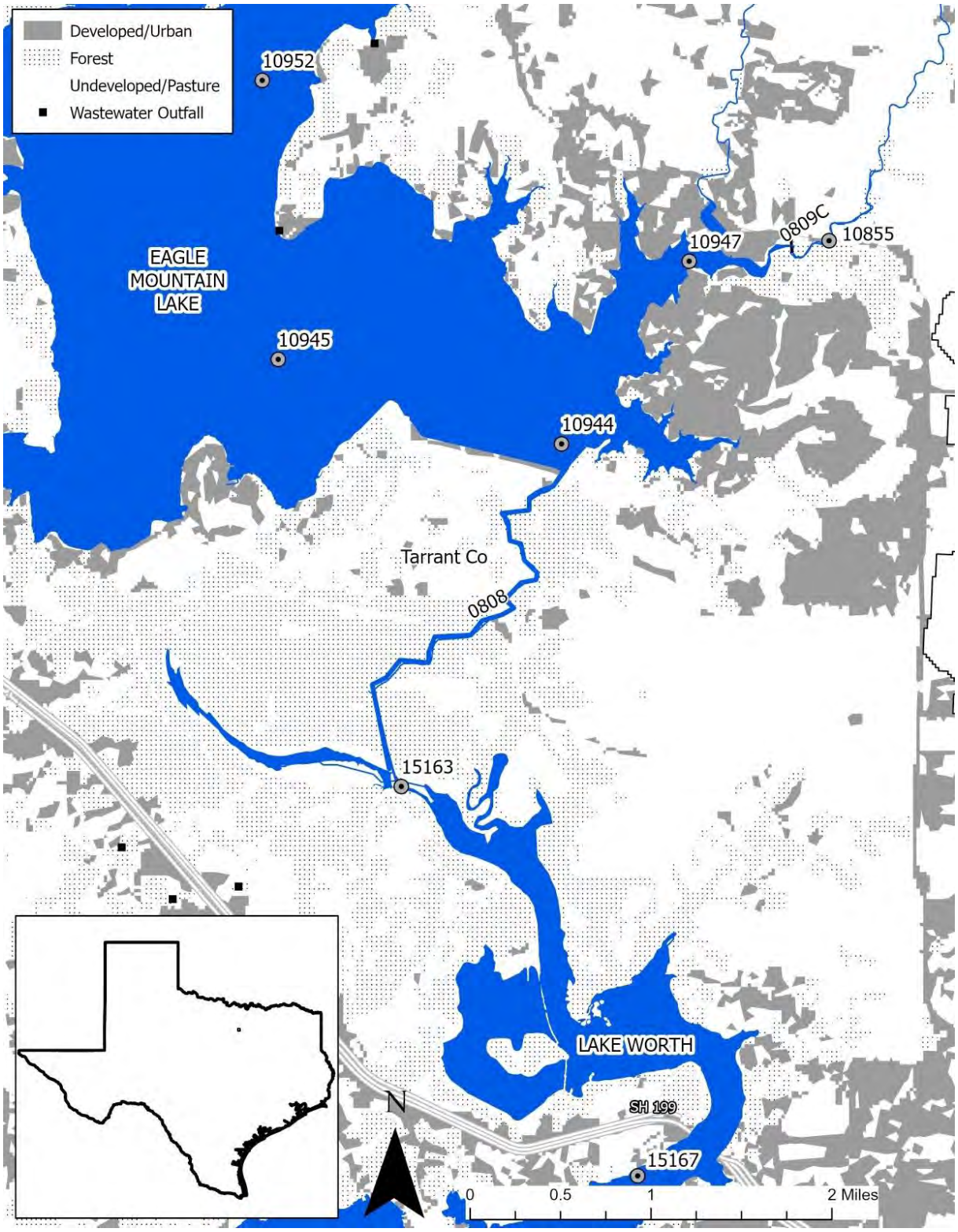


Figure 78: Segment 0808 Map

This 2.5-mile segment runs from Eagle Mountain dam downstream to the headwaters of Lake Worth in Tarrant County (see Figure 78). Land use in this watershed is split between forest and grassland with some pastures. The main channel of this segment lies within the Western Cross Timbers ecoregion but drains the Grand Prairie ecoregion to the east. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 44.

Table 44: TCEQ 2020 Texas Integrated Report Summary for Segment 0808

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0808_01 From 4.0 km downstream of Eagle Mountain Dam, Tarrant Co. to Eagle Mountain Dam, Tarrant Co.	Fish Consumption Use	PCBs in edible tissue		NS

NS = Not Supporting

There were no data available in assessment unit 0808_01 for the period of record for this basin summary report.

The impairment for fish consumption use is based on unsafe levels of PCBs in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 60) to limit the consumption of several species of fish. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

0807 – Lake Worth

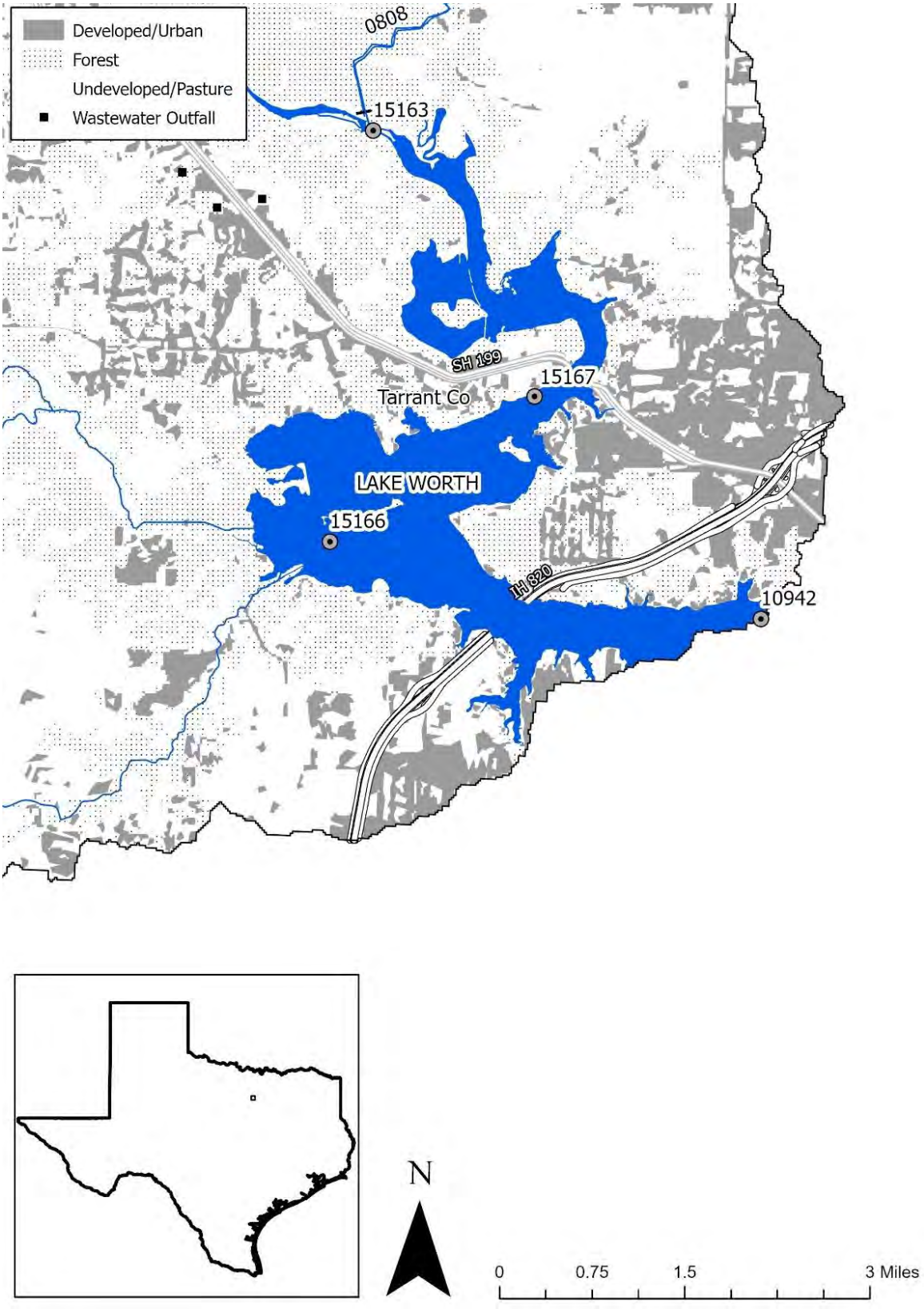


Figure 79: Segment 0807 Map

This segment covers 3,614 acres from Lake Worth Dam in Tarrant County to a point 2.5 miles downstream of Eagle Mountain Dam in Tarrant County up to a normal pool elevation of 594.3 feet (see Figure 79). The watershed for Lake Worth is highly urbanized to the south and east with the remainder being mostly forested areas with some grassland and pastures. The majority of the watershed and reservoir is located in the Grand Prairie ecoregion with the west side of the watershed draining the Western Cross Timbers. Lake Worth has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at four sites within this segment as shown in Table 45. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 45: Segment 0807 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0807_01	LAKE WORTH MID LAKE NEAR DAM	10942	Tarrant Regional Water District
0807_01	LAKE WORTH MID CHANNEL DOWNSTREAM OF MOUTH OF WEST FORK TRINITY RIVER	15163	Tarrant Regional Water District
0807_01	LAKE WORTH AT MOUTH OF SILVER CREEK	15166	Tarrant Regional Water District
0807_01	LAKE WORTH MID CHANNEL SOUTH OF SH 199	15167	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 46. Results of TRA trend analyses are shown in Table 47.

Table 46: TCEQ 2020 Texas Integrated Report Summary for Segment 0807

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	General Use	Nutrient Reservoir Narrative Criteria		NC
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	General Use	pH	6.5 - 9 S.U.	FS
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	General Use	Chloride	100 mg/L	FS
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	General Use	Sulfate	100 mg/L	FS
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	General Use	Total Dissolved Solids	500 mg/L	FS
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	General Use	Water temperature	32.8 °F	FS
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0807_01 From Lake Worth Dam, Tarrant Co. to 4.0 km downstream of Eagle Mountain Dam, Tarrant Co.	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 47: Significant Trends for Segment 0807 (P-value<0.1)

Segment & Assessment Unit		0807_01	0807_01	0807_01	0807_01
Site		10942	15163	15166	15167
Secchi Depth	All	↓	No Trend	Not Significant	Not Significant
	Summer	↓	No Trend	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant
Total Suspended Solids	All	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	↓	↓	Not Significant
Nitrate	All	Not Significant	Not Significant	↑	↑
	Summer	Not Significant	Not Significant	↑	↑
	Winter	↑	Not Significant	↑	↑
Total Kjeldahl Nitrogen	All	No Trend	Not Significant	No Trend	Not Significant
	Summer	No Trend	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	↓	↓	No Trend
Total Phosphorus	All	↓	No Trend	Not Significant	Not Significant
	Summer	↓	↓	No Trend	↓
	Winter	↓	No Trend	Not Significant	No Trend
Orthophosphate	All	Not Significant	Not Significant	Not Significant	↓
	Summer	Not Significant	No Trend	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	↓
Total Magnesium	All	↓	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↓	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data	Insufficient Data
Chloride	All	↓	↓	↓	↓
	Summer	↓	↓	Not Significant	↓
	Winter	↓	↓	↓	↓
Sulfate	All	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data	Insufficient Data
Total Arsenic	All	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↑	Insufficient Data	Insufficient Data	Insufficient Data
E. coli	All	No Trend	Not Significant	Not Significant	No Trend
	Summer	No Trend	↓	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant

Segment & Assessment Unit		0807_01	0807_01	0807_01	0807_01
Site		10942	15163	15166	15167
Chlorophyll-*a*	All	No Trend	No Trend	No Trend	No Trend
	Summer	No Trend	↓	↓	Not Significant
	Winter	No Trend	↓	No Trend	Not Significant
Bromide	All	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data
Phytoplankton	All	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↑	Insufficient Data	Insufficient Data	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend

The impairment for fish consumption use is based on unsafe levels of PCBs in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 60) to limit the consumption of several species of fish. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

Decreasing trends observed in this reservoir appear to be related to reservoir elevations. Several of the parameters such as secchi depth, total suspended solids, total kjeldahl nitrogen, and total phosphorus follow the pattern shown in Figure 80 for total phosphorus at station 10942 where values track fairly well with reservoir elevations; possibly due to inflows or lack thereof carrying these constituents. The trends for these parameters appear to have been an artifact of the length of the drought toward the end of the period of record for this report. Other parameters such as total magnesium, sulfate, chloride, and chlorophyll-*a* followed the pattern shown in Figure 81 for chloride at station 10942. Again, the observed values track fairly well with reservoir elevations followed by a sharp decrease in concentrations when reservoir elevations recover in 2015. The sharp decrease was likely due to a dilution of the in-reservoir concentrations when prolonged precipitation allowed the reservoir to recover.

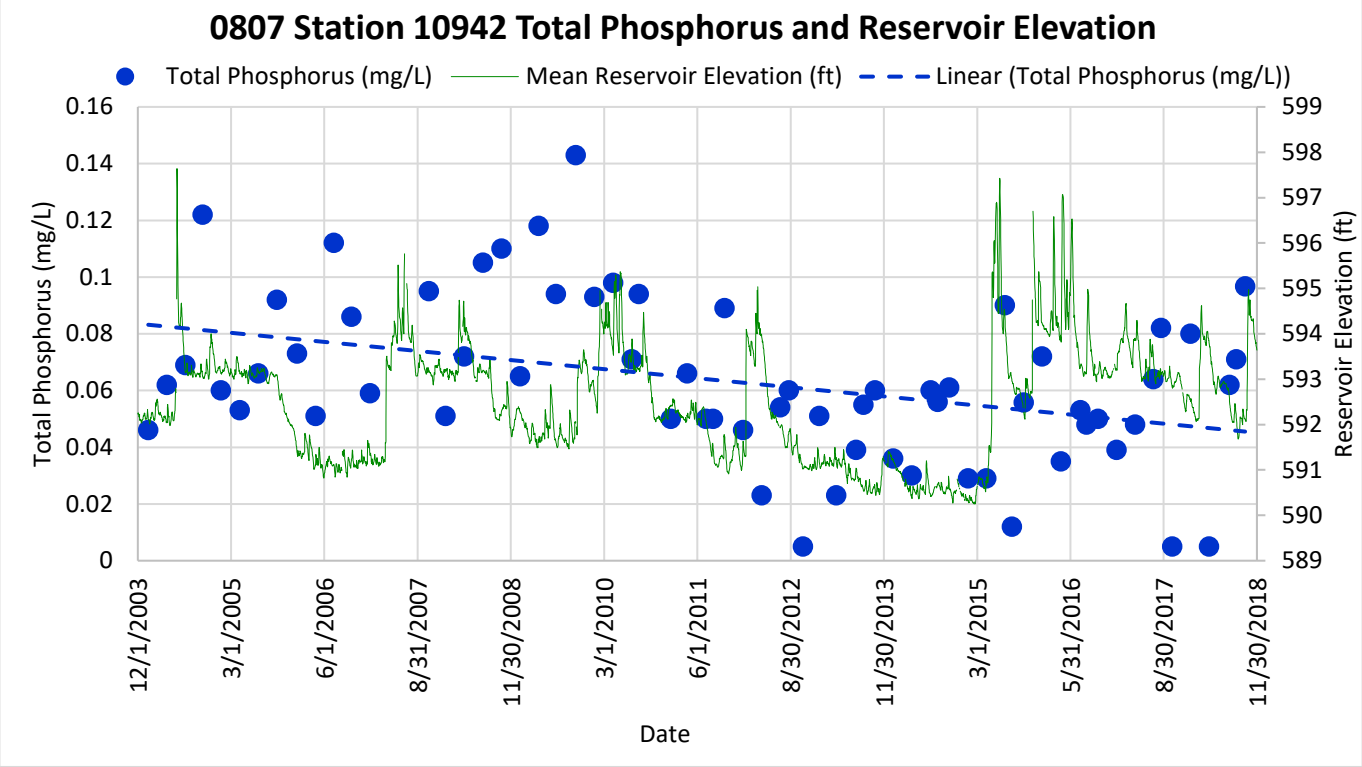


Figure 80: 0807 Station 10942 Total Phosphorus and Reservoir Elevation

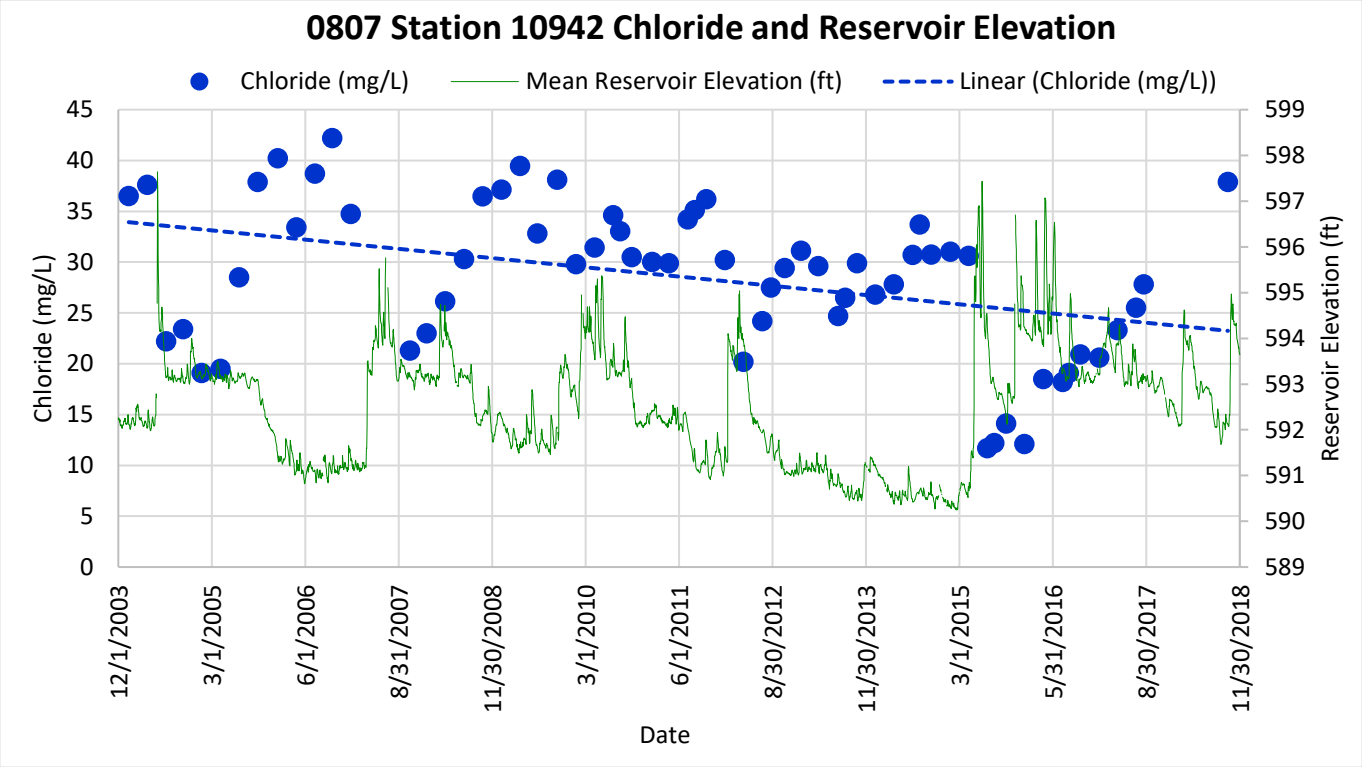


Figure 81: 0807 Station 10942 Chloride and Reservoir Elevation

Increasing trends for nitrate seem to be a combination of censored non-detect data at the beginning of the period of record and an increase of nitrate concentrations during the drought of 2011 to 2015 (see Figure 82). The increase during the drought period could have been due to either evaporation causing concentration of nitrate levels or run-off from over-irrigation washing in nutrients from animal waste or agricultural and residential fertilizers

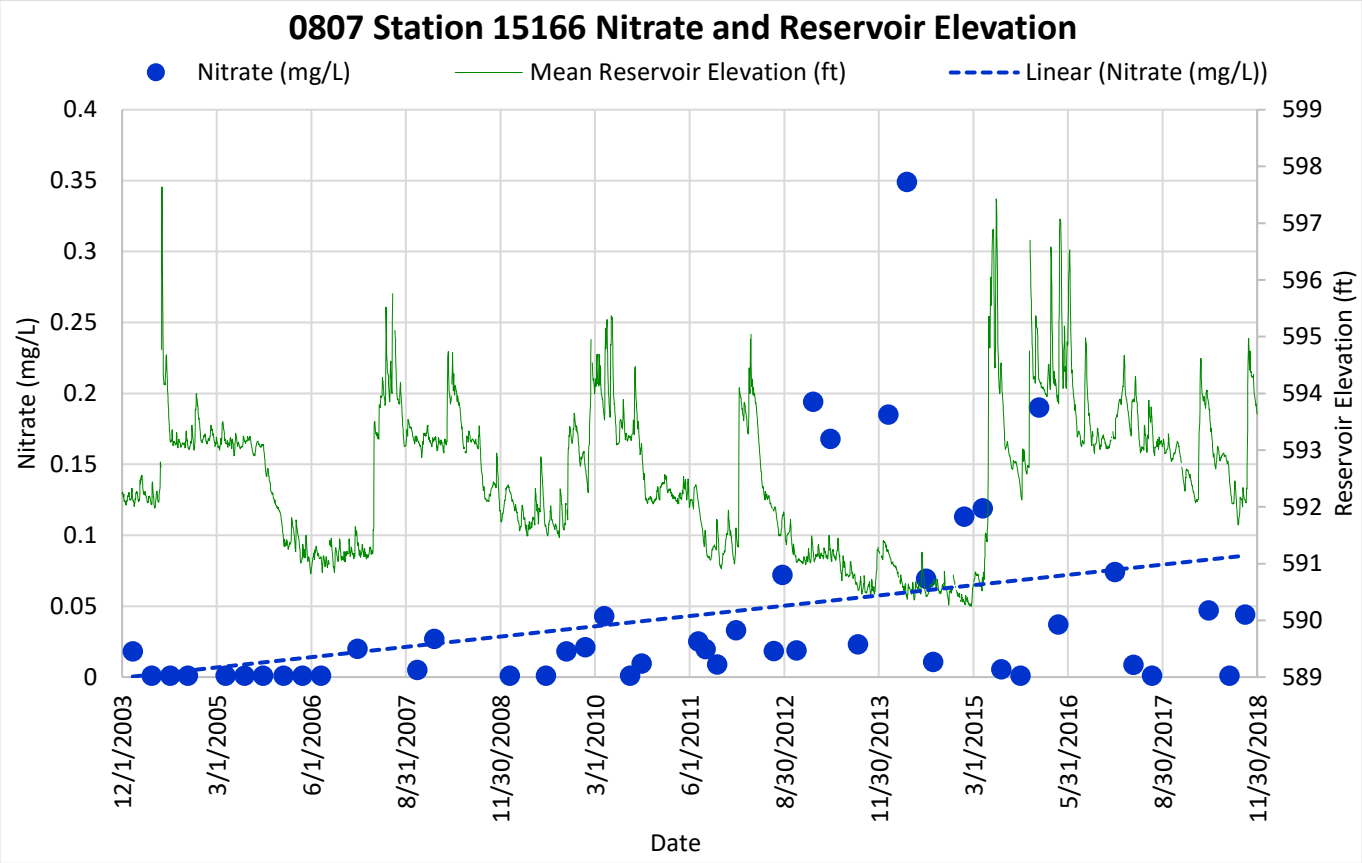


Figure 82: 0807 Station 15166 Nitrate and Reservoir Elevation

Increasing trends for total arsenic and bromide appear to be false trends caused by censoring of non-detect data. These do not appear to represent a true change in water quality.

0834 – Lake Amon G. Carter

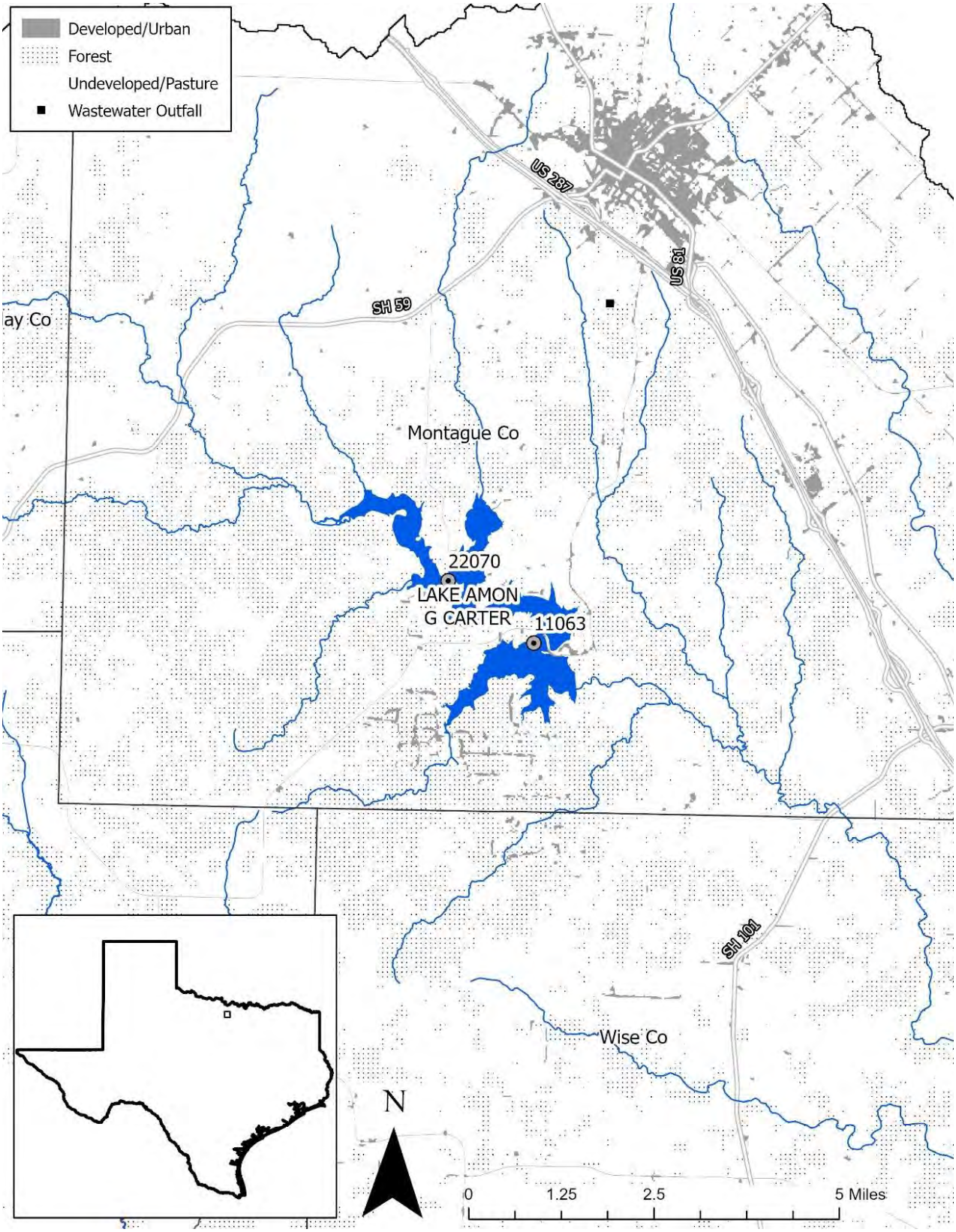


Figure 83: Segment 0834 Map

This 1,614-acre segment impounds Big Sandy Creek from Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet (see Figure 83). Much of the watershed is rural with grassland and forested areas but there is some residential development directly adjacent to the reservoir. This reservoir lies within the Western Cross Timbers ecoregion. Lake Amon G. Carter has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 48. Monitoring is being conducted by TCEQ Region 3. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 48: Segment 0834 FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0834_01	LAKE AMON G. CARTER MID LAKE NEAR DAM	11063	TCEQ Region 3
0834_01	LAKE AMON G CARTER MIDLAKE	22070	TCEQ Region 3

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 49. Results of TRA trend analyses are shown in Table 50.

Table 49: TCEQ 2020 Texas Integrated Report Summary for Segment 0834

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	Ammonia	0.11 mg/L	NA
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	Nitrate	0.37 mg/L	NA
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	Total Phosphorus	0.2 mg/L	NA
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	pH	6.5 - 9 S.U.	FS
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	Chloride	150 mg/L	FS
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	Sulfate	150 mg/L	FS
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	Total Dissolved Solids	400 mg/L	FS
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	General Use	Water temperature	33.9 °F	FS
0834_01 From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting NA = Not Assessed NC = No Concern

Table 50: Significant Trends for Segment 0834 (P-value<0.1)

Segment & Assessment Unit		0834_01
Site		11063
Secchi Depth	All	↓
	Summer	↓
	Winter	↓
Dissolved Oxygen	All	↑
	Summer	↑
	Winter	↑
Total Organic Carbon	All	↑
	Summer	↑
	Winter	Not Significant
Sulfate	All	↓
	Summer	↓
	Winter	↓
Fluoride	All	↓
	Summer	Not Significant
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

Decreasing trends for secchi depth in this reservoir track well with reservoir elevation until the reservoir recovers after the drought (see Figure 84). Concentration of solids in the reservoir due to evaporation could reduce secchi depths. However, it is unknown why secchi depths did not begin to increase when reservoir elevations began to increase after the drought.

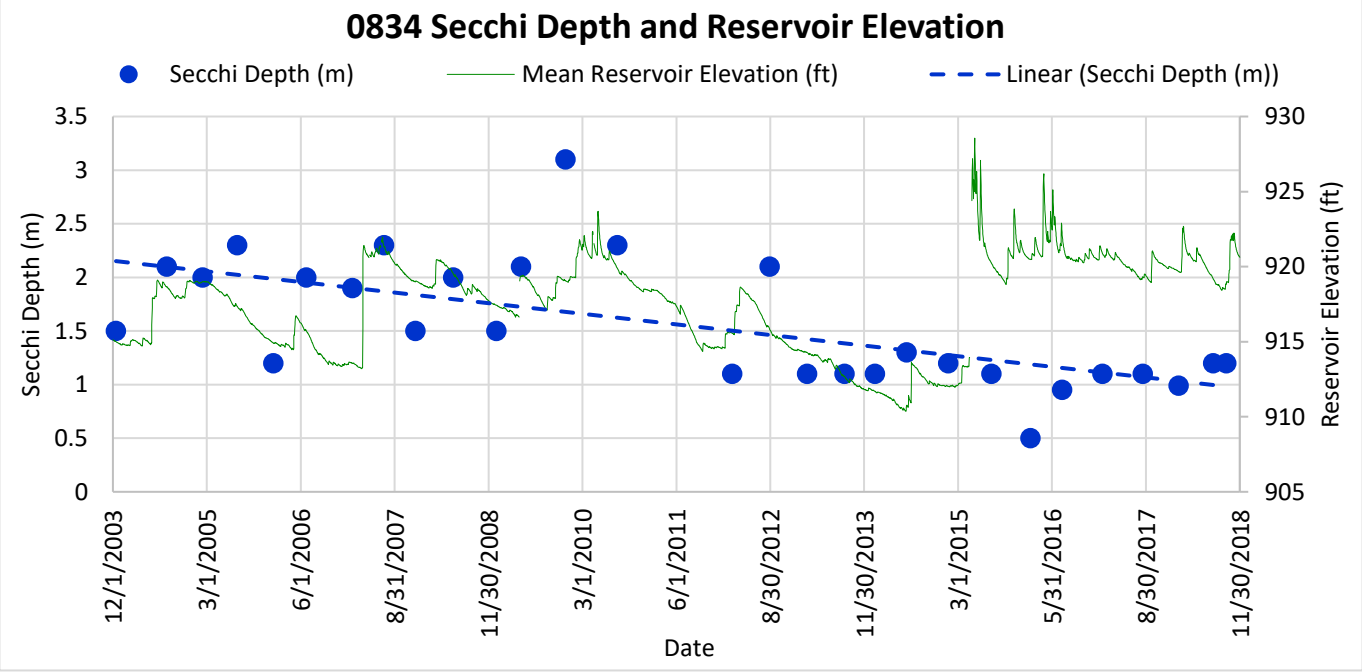


Figure 84: 0834 Secchi Depth and Reservoir Elevation

Total organic carbon also appeared to track fairly well with reservoir elevations prior to the drought of 2011 to 2015 as shown in Figure 85. During this period, the increase was likely caused by concentration of total organic carbon levels due to evaporation. Total organic carbon increases after the reservoir began to recover from the drought were likely caused by contaminants being washed in to the reservoir during precipitation events.

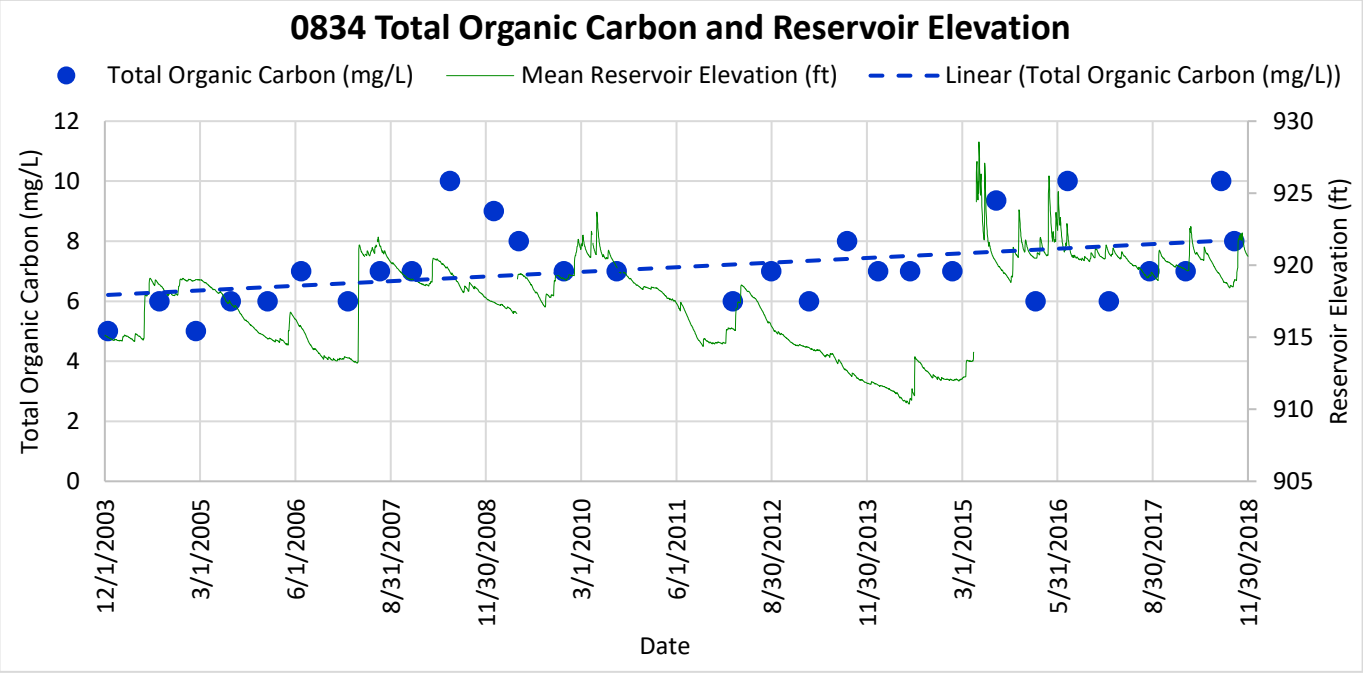


Figure 85: 0834 Total Organic Carbon and Reservoir Elevation

Clear Fork Trinity River

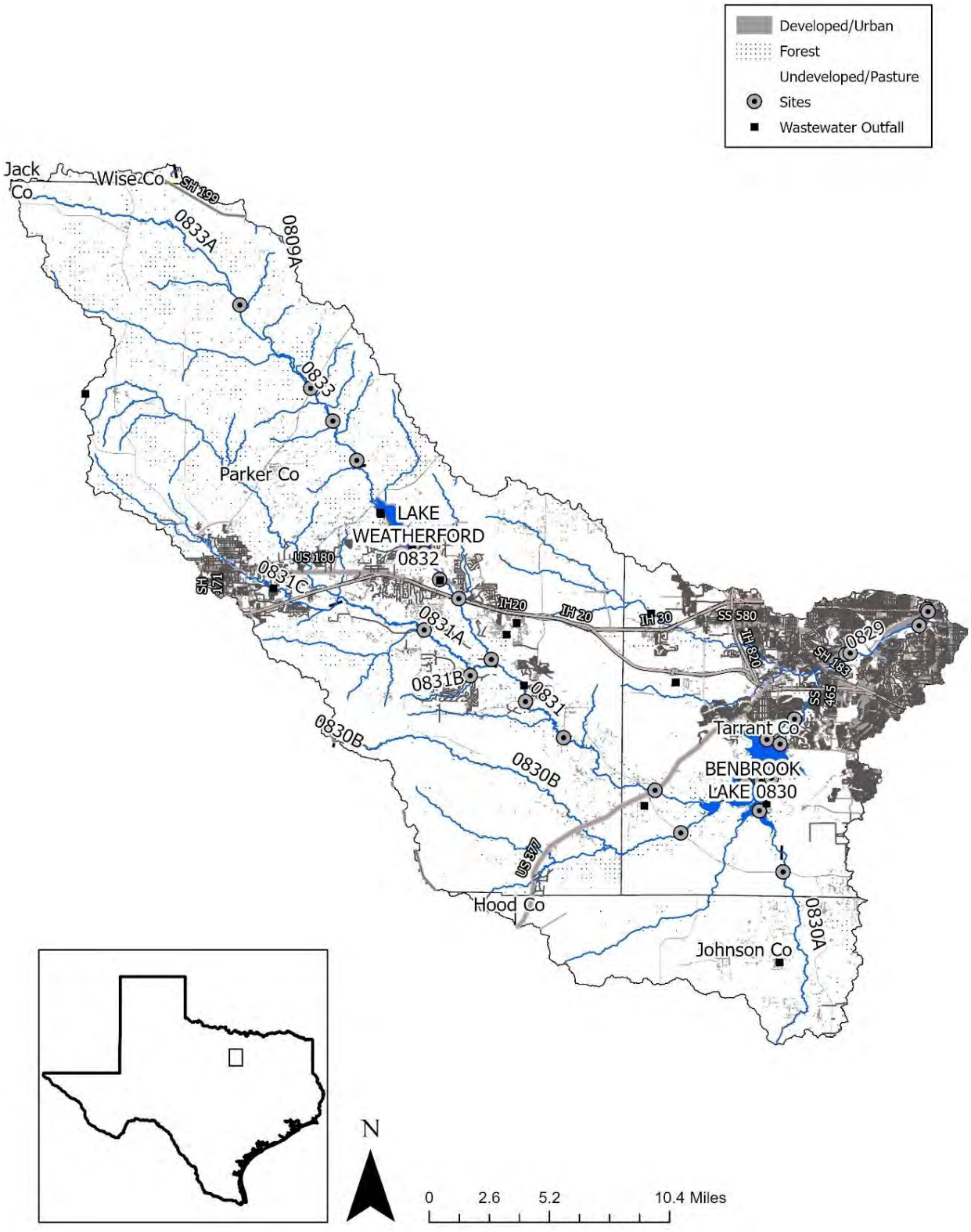


Figure 86: Clear Fork Trinity River Overview Map

The Clear Fork subwatershed extends approximately 65 river miles from Parker County to the confluence with the Lower West Fork in Tarrant County (see Figure 86). Although a majority of the subwatershed is sparsely populated and rural, major population centers include Weatherford, Benbrook, and the communities of the southwest Dallas-Fort Worth Metroplex. Lake Weatherford and Benbrook Lake are located in this subwatershed. Water right permit holders for Lake Weatherford and Benbrook Lake are the City of Weatherford and TRWD, respectively.

The subwatershed generally receives between 34 and 36 inches of precipitation annually. The terrain consists of flat land and rolling prairies which are mostly used for cattle grazing. The downstream reaches of the subwatershed become more urbanized as they approach the Metroplex.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0833A – Clear Fork Trinity River Above Strickland Creek
- 0833 – Clear Fork Trinity River Above Lake Weatherford
- 0832 – Lake Weatherford
- 0831 – Clear Fork Trinity River Below Lake Weatherford
- 0831C – Town Creek
- 0831A – South Fork Trinity River
- 0831B – Unnamed Tributary of South Fork Trinity River
- 0830 – Benbrook Lake
- 0830A – Rock Creek
- 0830B – Bear Creek
- 0829 – Clear Fork Trinity River Below Benbrook Lake
- 0829A – Lake Como

0833A – Clear Fork Trinity River Above Strickland Creek

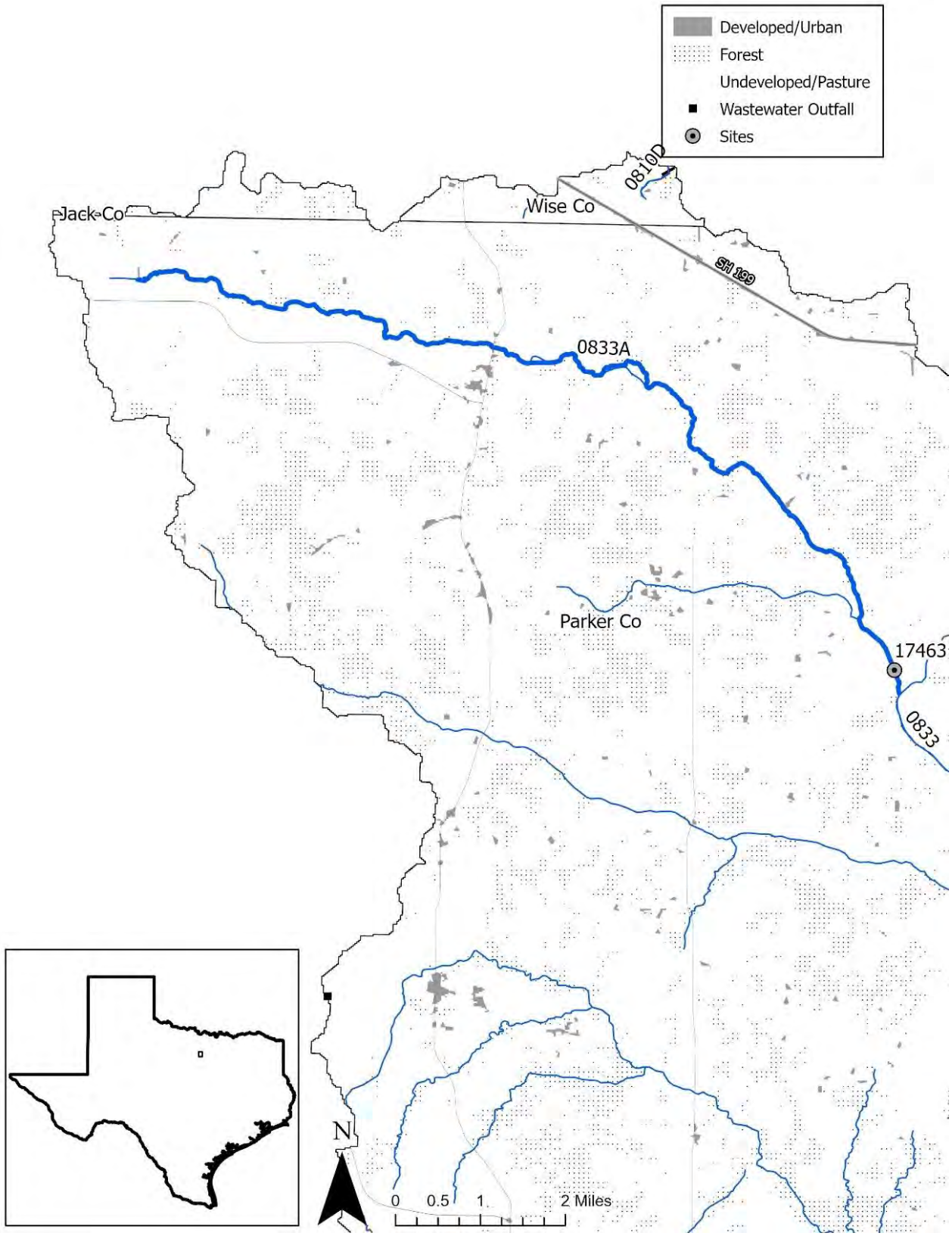


Figure 87: Segment 0833A Map

This 11.8-mile unclassified segment runs from Turpin Lake Road in Parker County to the confluence with Strickland Creek (see Figure 87). Much of the watershed is grassland with pasture and hay fields adjacent to the stream. Crop lands are found at the headwaters of this segment. It lies within the Western Cross Timbers ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 51.

Table 51: TCEQ 2020 Texas Integrated Report Summary for Segment 0833A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0833A_01 From the confluence with Strickland Creek up to Turpin Lake Road in Parker County.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NS
0833A_01 From the confluence with Strickland Creek up to Turpin Lake Road in Parker County.	General Use	Chlorophyll-*a*	14.1 µg/L	CS

CS = Screening Level Concern NS = Not Supporting

Data for assessment unit 0833A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

Segment 0833A is a newer unclassified segment that was designated in the TCEQ 2014 Integrated Report. The impairment and concern for this segment were carried forward from when this portion of the stream was identified as assessment unit 0833_02. There is no recent data available to analyze the findings of the integrated report, therefore it is recommended that monitoring be added in this segment.

0833 – Clear Fork Trinity River Above Lake Weatherford

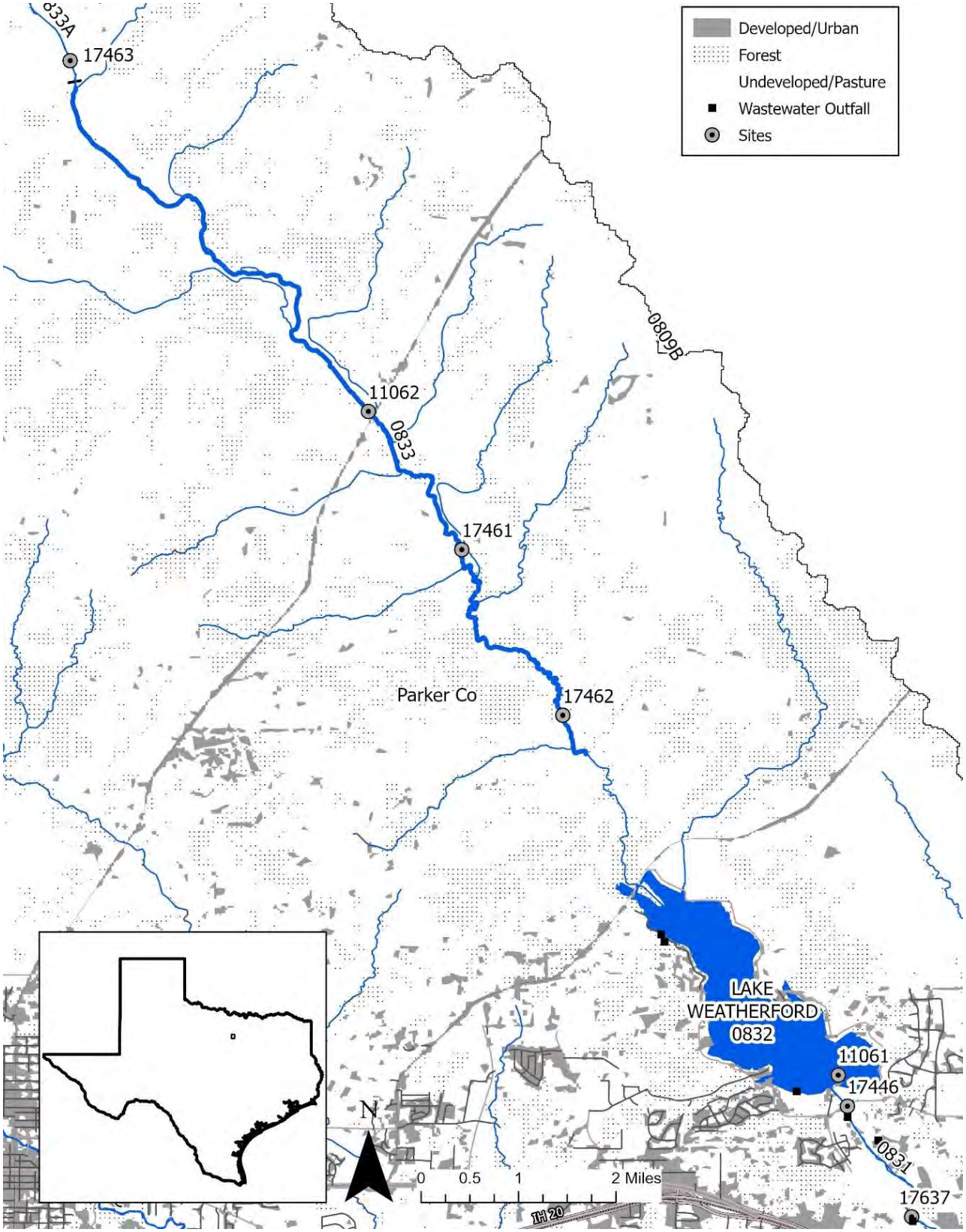


Figure 88: Segment 0833 Map

This 10.5-mile segment runs from the confluence with Strickland Creek in Parker County to 1.9 miles upstream of FM 1707 in Parker County (see Figure 88). Much of the watershed is grassland with pasture and hay fields adjacent to the stream. Most of the segment lies within the Western Cross Timbers with a small portion flowing through the Grand Prairie ecoregion just before entering Lake Weatherford. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 52.

Table 52: TCEQ 2020 Texas Integrated Report Summary for Segment 0833

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0833_03 From confluence of McKnight Branch to confluence of Strickland Creek	Aquatic Life Use	Dissolved Oxygen	2 mg/L	NS
0833_04 From the confluence with Dobbs Branch to confluence with McKnight Branch	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NS
0833_05 From the confluence of Dobbs Branch to the lower end of segment	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0833_03 From confluence of McKnight Branch to confluence of Strickland Creek	General Use	Total Dissolved Solids	750 mg/L	FS
0833_04 From the confluence with Dobbs Branch to confluence with McKnight Branch	General Use	Total Dissolved Solids	750 mg/L	FS
0833_05 From the confluence of Dobbs Branch to the lower end of segment	General Use	Total Dissolved Solids	750 mg/L	FS

FS = Fully Supporting NS = Not Supporting

Data for assessment units 0833_03, 0833_04, and 0833_05 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Three stations in this segment were monitored for 24-hour dissolved oxygen in fiscal years 2015 and 2016. The station in assessment unit 0833_04 was consistently dry during each site visit. For assessment unit 0833_03, one minimum dissolved oxygen and one average dissolved oxygen value out of ten total values for each was reported below the respective 2 mg/L and 4 mg/L standards. For 0833_05, all minimum and average dissolved oxygen values were reported above the respective standards of 2 mg/L and 4 mg/L. It is recommended that an aquatic life use attainability analysis study be conducted to determine if the standards are appropriate for this segment as it has been observed to be a very low flow system and has been intermittent even after recent precipitation.

0832 – Lake Weatherford

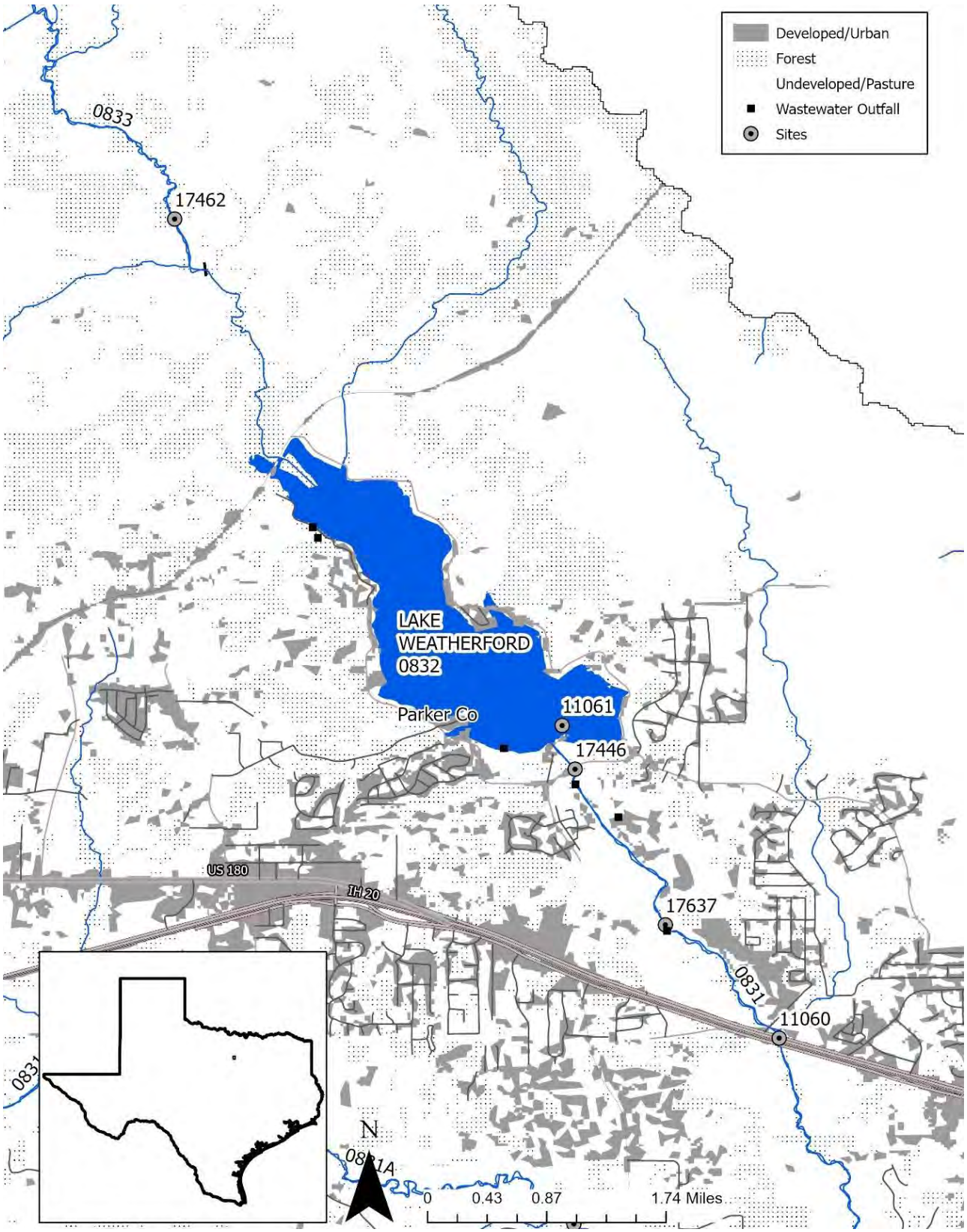


Figure 89: Segment 0832 Map

This 1,133-acre segment impounds the Clear Fork Trinity River from the Lake Weatherford dam in Parker County to a point 1.9 miles upstream of FM 1707 in Parker County, up to a normal pool elevation of 896 feet (see Figure 89). The watershed is mostly grassland and forest on the eastern side of the reservoir with some residential development on the southeastern shores. The western side of the watershed is more developed with the cities of Weatherford and Hudson Oaks to the southwest of the reservoir. The remainder of the western side of the watershed is grassland, pasture, and hay. The watershed to the west of Lake Weatherford is in the Western Cross Timbers ecoregion while the east side is in the Grand Prairie ecoregion. Lake Weatherford has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 53. Monitoring is being conducted by TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 53: Segment 0832 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0832_01	LAKE WEATHERFORD MID LAKE NEAR DAM 310 METERS NORTH & 98 M EAST OF INTERSECTION OF E LAKE DRIVE & WEST SHORE DRIVE	11061	TCEQ Region 4

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 54. Results of TRA trend analyses are shown in Table 55.

Table 54: TCEQ 2020 Texas Integrated Report Summary for Segment 0832

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	Ammonia	0.11 mg/L	NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	Nitrate	0.37 mg/L	NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	Total Phosphorus	0.2 mg/L	NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	pH	6.5 - 9 S.U.	FS
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	Chloride	100 mg/L	FS
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	Sulfate	100 mg/L	FS
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	Total Dissolved Solids	500 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	General Use	Water temperature	33.9 °F	FS
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Fish Consumption Use	Bioaccumulative Toxics in fish tissue		NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Fish Consumption Use	Bioaccumulative Toxics in fish tissue		NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Fish Consumption Use	Bioaccumulative Toxics in fish tissue		NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Fish Consumption Use	Bioaccumulative Toxics in fish tissue		NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Fish Consumption Use	Bioaccumulative Toxics in fish tissue		NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Fish Consumption Use	Bioaccumulative Toxics in fish tissue		NA
0832_01 From Weatherford Dam in Parker Co. to 3.1 km upstream of FM 730 in Parker Co.	Fish Consumption Use	Bioaccumulative Toxics in fish tissue		NA

FS = Fully Supporting NA = Not Assessed

Table 55: Significant Trends for Segment 0832 (P-value<0.1)

Segment & Assessment Unit		0832_01
Site		11061
Dissolved Oxygen	All	Not Significant
	Summer	↑
	Winter	No Trend
Volatile Suspended Solids	All	↑
	Summer	↑
	Winter	Not Significant
Total Kjeldahl Nitrogen	All	↑
	Summer	Not Significant
	Winter	↑
Total Phosphorus	All	↑
	Summer	↑
	Winter	Not Significant
Total Organic Carbon	All	No Trend
	Summer	↑
	Winter	↑
Chlorophyll-a	All	↑
	Summer	↑
	Winter	Not Significant
Days Since Precipitation	All	No Trend
	Summer	No Trend
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

As noted above, Lake Weatherford has been identified as being eutrophic based on the Carlson's trophic status index for chlorophyll-*a*. This score has increased from 56.02 in 2006 to 64.22 in the 2020 report referenced above. This confirms the increasing trend for chlorophyll-*a* identified during TRA data analysis as shown in Figure 90. Increasing trends for total organic carbon and volatile suspended solids are likely related to the chlorophyll-*a* trend as algal cells make up a portion of the measured total organic carbon and volatile suspended solids. Similarly, the increasing trend for dissolved oxygen may be influenced by increasing algal populations as measured by chlorophyll-*a*. Increasing trends were also identified for total kjeldahl nitrogen and total phosphorus as shown in Figure 91 for total kjeldahl nitrogen. It is interesting to note that the values did not track well with reservoir elevation. The City of Weatherford wastewater treatment facility discharges to this reservoir. Therefore, this may be the source of nutrients into the reservoir and the ultimate cause of its increasing level of eutrophication.

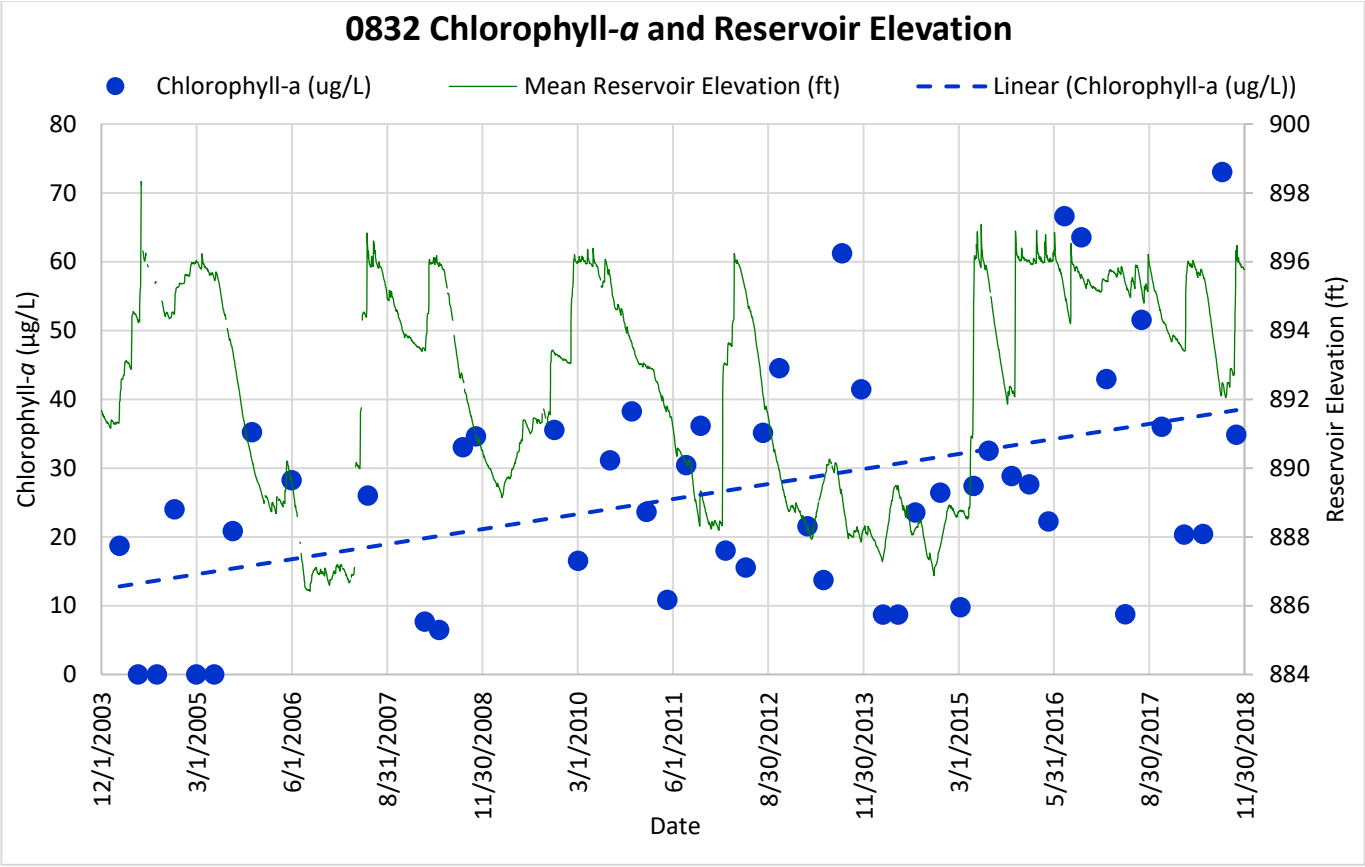


Figure 90: 0832 Chlorophyll-a and Reservoir Elevation

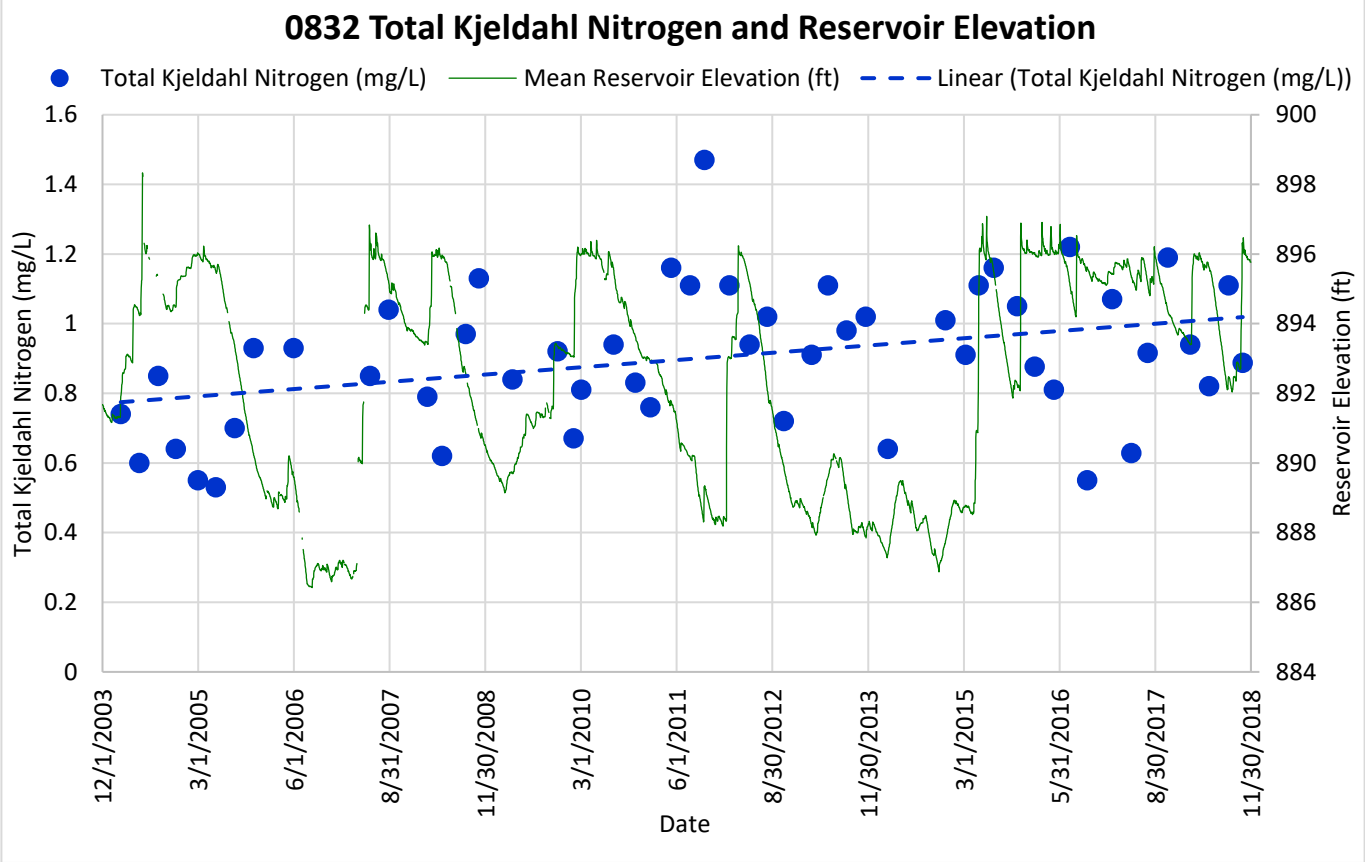


Figure 91: 0832 Total Kjeldahl Nitrogen and Reservoir Elevation

0831 – Clear Fork Trinity River Below Lake Weatherford

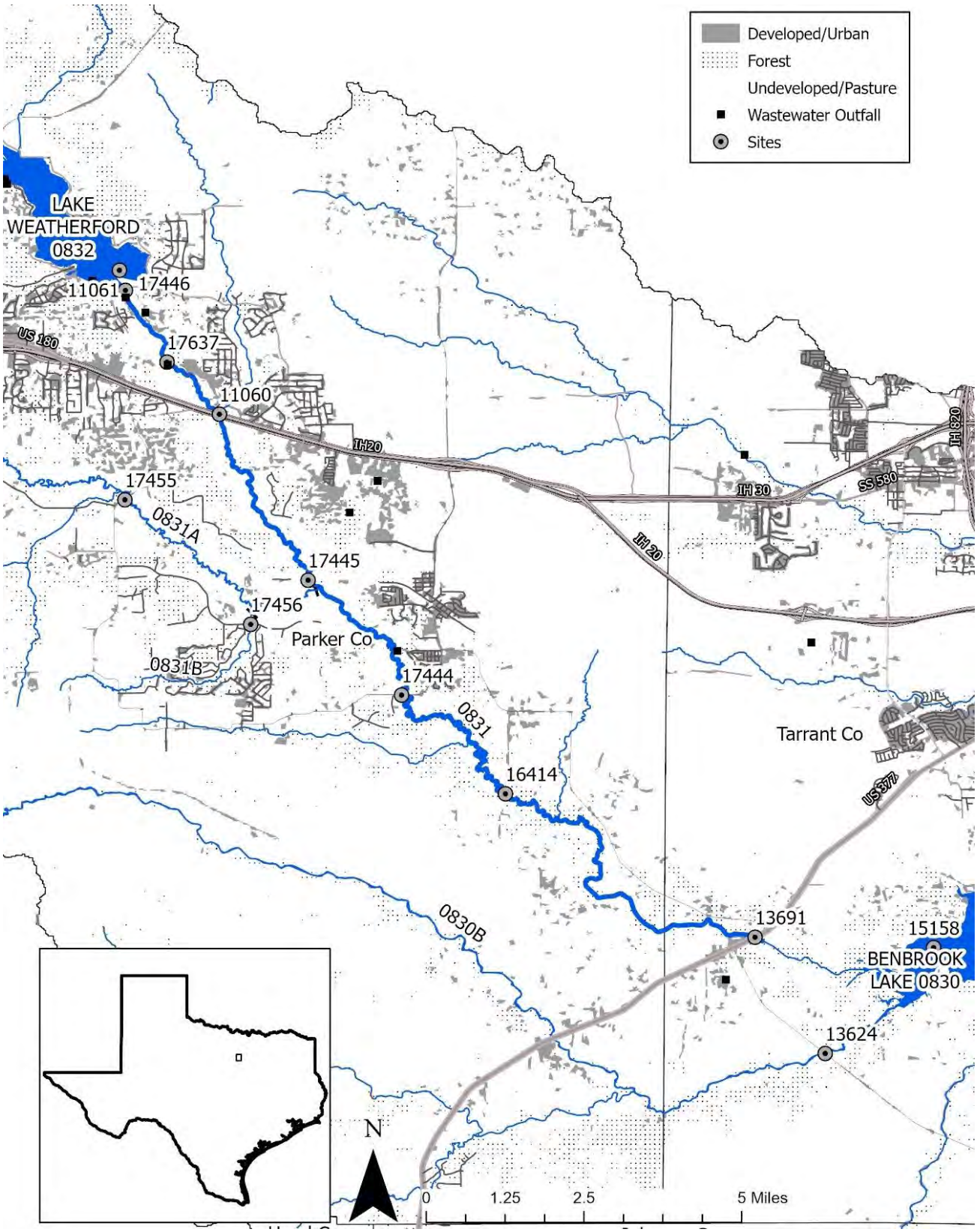


Figure 92: Segment 0831 Map

This 20-mile segment runs from the Lake Weatherford dam in Parker County to 220 yards downstream of US 377 in Tarrant County (see Figure 92). The majority of the land use in 0831 is grassland and pasture especially along the lower half of the segment. The upper half of the segment has some development along the IH-20 corridor, including the cities of Hudson Oaks, Willow Park, and Aledo. This river flows through the Western Cross Timbers ecoregion but the surrounding watershed drains the Grand Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 56. Monitoring is being conducted by Tarrant Regional Water District and TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 56: Segment 0831 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0831_01	CLEAR FORK TRINITY RIVER AT KELLY ROAD 8.7KM UPSTREAM OF US 377 SOUTH OF ALEDO	16414	Tarrant Regional Water District
0831_01	CLEAR FORK TRINITY RIVER AT FM 5 3.2 KM DOWNSTREAM OF CONFLUENCE OF CLEAR FORK AND SOUTH FORK SOUTH OF ALEDO	17444	TCEQ Region 4

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 57. Results of TRA trend analyses are shown in Table 58.

Table 57: TCEQ 2020 Texas Integrated Report Summary for Segment 0831

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0831_04 2 mi upstream of South Fork Trinity River confluence to Squaw Creek Confluence	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NS
0831_05 From the confluence of Squaw Creek to Lake Weatherford Dam	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	Aquatic Life Use	Fish Community		FS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	Aquatic Life Use	Macrobenthic Community		FS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	Aquatic Life Use	Habitat		NC
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	Ammonia	0.33 mg/L	NC
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	Nitrate	1.95 mg/L	CS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	Total Phosphorus	0.69 mg/L	CS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	Chlorophyll-*a*	14.1 µg/L	NC

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	pH	6.5 - 9 S.U.	FS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	Chloride	100 mg/L	FS
0831_03 From the confluence with South Fork of Trinity River to a point 2 mi upstream	General Use	Chloride	100 mg/L	FS
0831_04 2 mi upstream of South Fork Trinity River confluence to Squaw Creek Confluence	General Use	Chloride	100 mg/L	FS
0831_05 From the confluence of Squaw Creek to Lake Weatherford Dam	General Use	Chloride	100 mg/L	FS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	Sulfate	100 mg/L	FS
0831_03 From the confluence with South Fork of Trinity River to a point 2 mi upstream	General Use	Sulfate	100 mg/L	FS
0831_04 2 mi upstream of South Fork Trinity River confluence to Squaw Creek Confluence	General Use	Sulfate	100 mg/L	FS
0831_05 From the confluence of Squaw Creek to Lake Weatherford Dam	General Use	Sulfate	100 mg/L	FS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	Total Dissolved Solids	500 mg/L	FS
0831_03 From the confluence with South Fork of Trinity River to a point 2 mi upstream	General Use	Total Dissolved Solids	500 mg/L	FS
0831_04 2 mi upstream of South Fork Trinity River confluence to Squaw Creek Confluence	General Use	Total Dissolved Solids	500 mg/L	FS
0831_05 From the confluence of Squaw Creek to Lake Weatherford Dam	General Use	Total Dissolved Solids	500 mg/L	FS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	General Use	Water temperature	32.2 °F	FS
0831_01 Lower 12.75 mi, downstream from South Fork Trinity River confluence	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Data for assessment unit 0831_05 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit. No significant trends were identified in assessment unit 0831_03.

Table 58: Significant Trends for Segment 0831 (P-value<0.1)

Segment & Assessment Unit		0831_01	0831_01	0831_01	0831_04
Site		13691	16414	17444	11060
Flow	All	No Trend	No Trend	↑	Insufficient Data
	Summer	Not Significant	No Trend	↑	Insufficient Data
	Winter	Not Significant	Not Significant	Not Significant	Insufficient Data
Dissolved Oxygen	All	Not Significant	Not Significant	Not Significant	Insufficient Data
	Summer	Not Significant	↑*	No Trend	Insufficient Data
	Winter	Not Significant	Not Significant	Not Significant	Insufficient Data

Segment & Assessment Unit		0831_01	0831_01	0831_01	0831_04
Site		13691	16414	17444	11060
Ammonia	All	Not Significant	No Trend	↓	Insufficient Data
	Summer	No Trend	No Trend	Not Significant	Insufficient Data
	Winter	Not Significant	No Trend	↓	Insufficient Data
Total Phosphorus	All	Not Significant	No Trend	No Trend	Insufficient Data
	Summer	Not Significant	↓*	No Trend	Insufficient Data
	Winter	Not Significant	No Trend	↓	Insufficient Data
Total Organic Carbon	All	No Trend	No Trend	No Trend	Insufficient Data
	Summer	No Trend	Not Significant	No Trend	Insufficient Data
	Winter	No Trend	↓*	Not Significant	Insufficient Data
Chloride	All	Not Significant	Not Significant	Not Significant	Insufficient Data
	Summer	Not Significant	↓*	Not Significant	Insufficient Data
	Winter	Not Significant	Not Significant	Not Significant	Insufficient Data
Fluoride	All	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↓	Insufficient Data
Days Since Precipitation	All	No Trend	No Trend	Not Significant	Not Significant
	Summer	↓	Not Significant	Not Significant	↓*
	Winter	Not Significant	Not Significant	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Two stations in this segment were monitored for 24-hour dissolved oxygen in fiscal years 2015 and 2016. For assessment unit 0831_04, two out of ten average dissolved oxygen values were reported below the 24-hour average standard of 5 mg/L. For 0831_05, one average dissolved oxygen value was reported below the dissolved oxygen grab sample screening level of 5 mg/L. It is recommended that an aquatic life use attainability analysis study be conducted to determine if the standards are appropriate for this segment as it has been observed to be a very low flow system.

The *E. coli* impairment in assessment unit 0831_01 does not appear to be completely run-off related as shown in Figure 93. *E. coli* levels did track with flows in some portions of the data set but there are also portions where increased flows coincided with decreased bacteria levels. It is interesting to note that most of the data in the latter half of the data set are reported above the standard. The consistently high values seem to indicate that there were continuous sources of bacteria into the river. The City of Aledo wastewater treatment facility is located less than 2 km upstream of the sampling station at CR 5. Livestock may also be contributing to the *E. coli* impairment via run-off and direct deposition as there are several pastures upstream of the sampling station with evidence of livestock trails in the pasture and leading into the river. It is recommended that either optical brightener testing be conducted or that samples be collected both upstream and downstream from the wastewater treatment facility to determine how bacteria concentrations vary along the segment. Optical brighteners are pigments that are added to detergents to make clothing appear brighter and whiter and are therefore commonly found in wastewater. These pigments can be detected visually, especially in low flow systems where dilution of optical brighteners is not an issue. Sampling for optical brighteners involves the saturation of an unbleached cotton media with ambient water. The media is then viewed under

an ultraviolet lamp. If the media has a purple-blue fluorescence, optical brighteners may be present in the water and can indicate that human waste may be entering the waterbody.

Concerns for total phosphorus and nitrate in assessment unit 0831_01 appear to be associated with drought-related low flows as shown for total phosphorus in Figure 94. There are several wastewater treatment facilities in this assessment unit. Most facilities do not currently have advanced nutrient removal and therefore can contribute nutrients to their receiving waterbodies. During periods of drought, the river exhibited higher levels of nutrients as it became more effluent-dominated. However, it does not appear as though this affected algal populations as measured by chlorophyll-*a*. The correlation coefficient between chlorophyll-*a* and nitrate and total phosphorus was -0.243 and -0.303, respectively. Further, as discussed previously, low dissolved oxygen in this stream is believed to have been related to low flows rather than excessive algal growth. This is supported by the low correlation between dissolved oxygen and chlorophyll-*a* at 0.137.

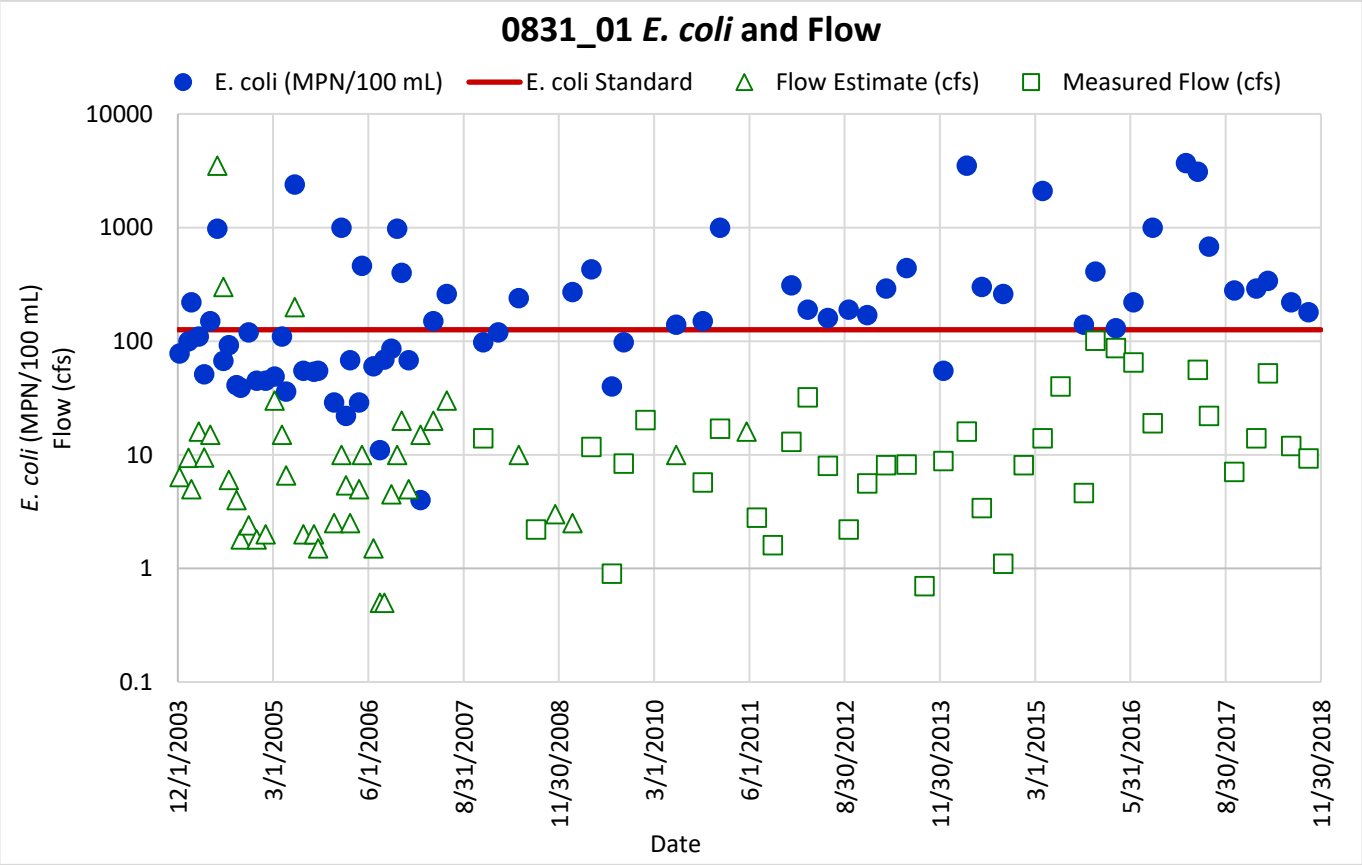


Figure 93: 0831_01 E. coli and Flow

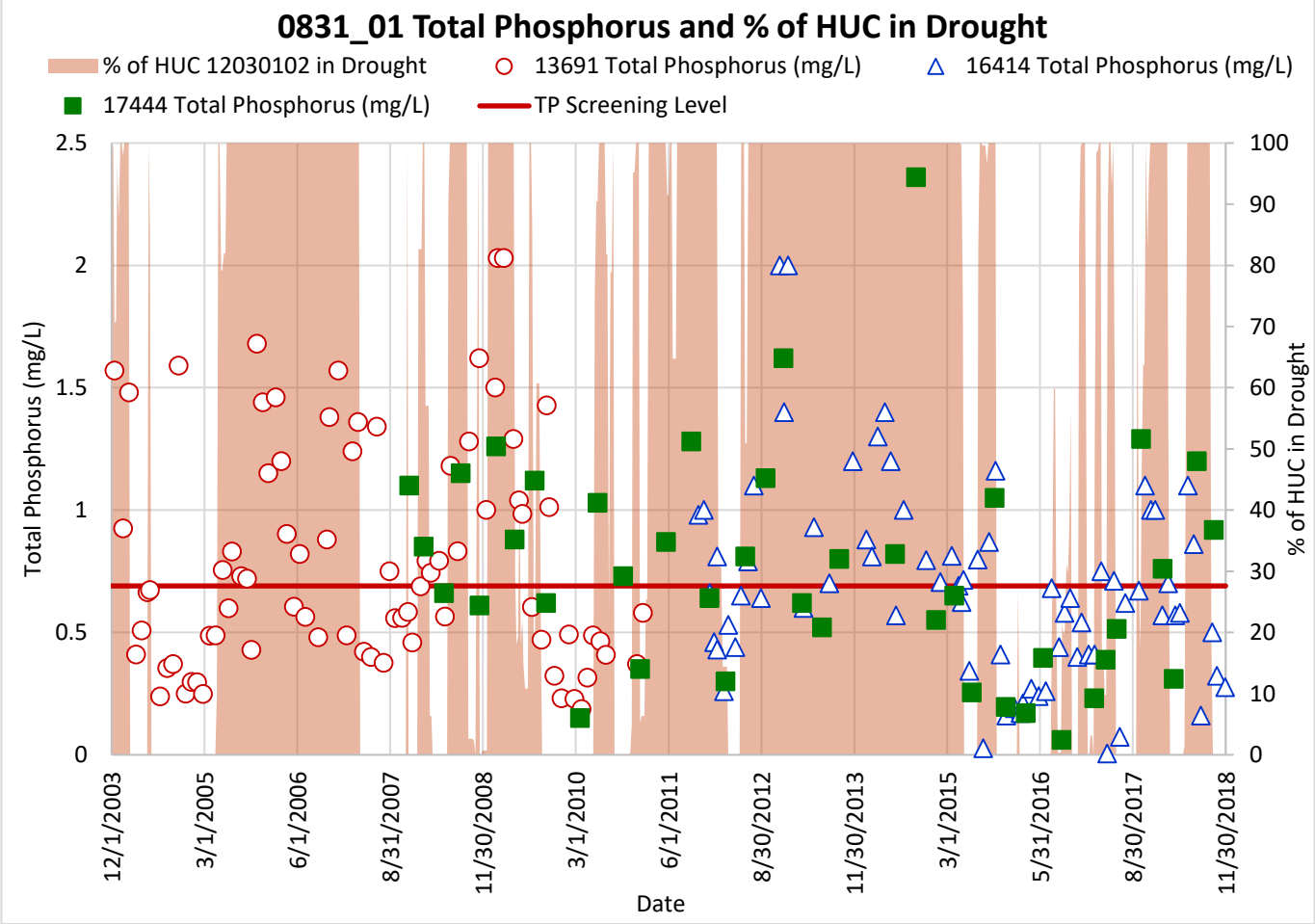


Figure 94: 0831_01 Total Phosphorus and % of HUC in Drought

0831C – Town Creek

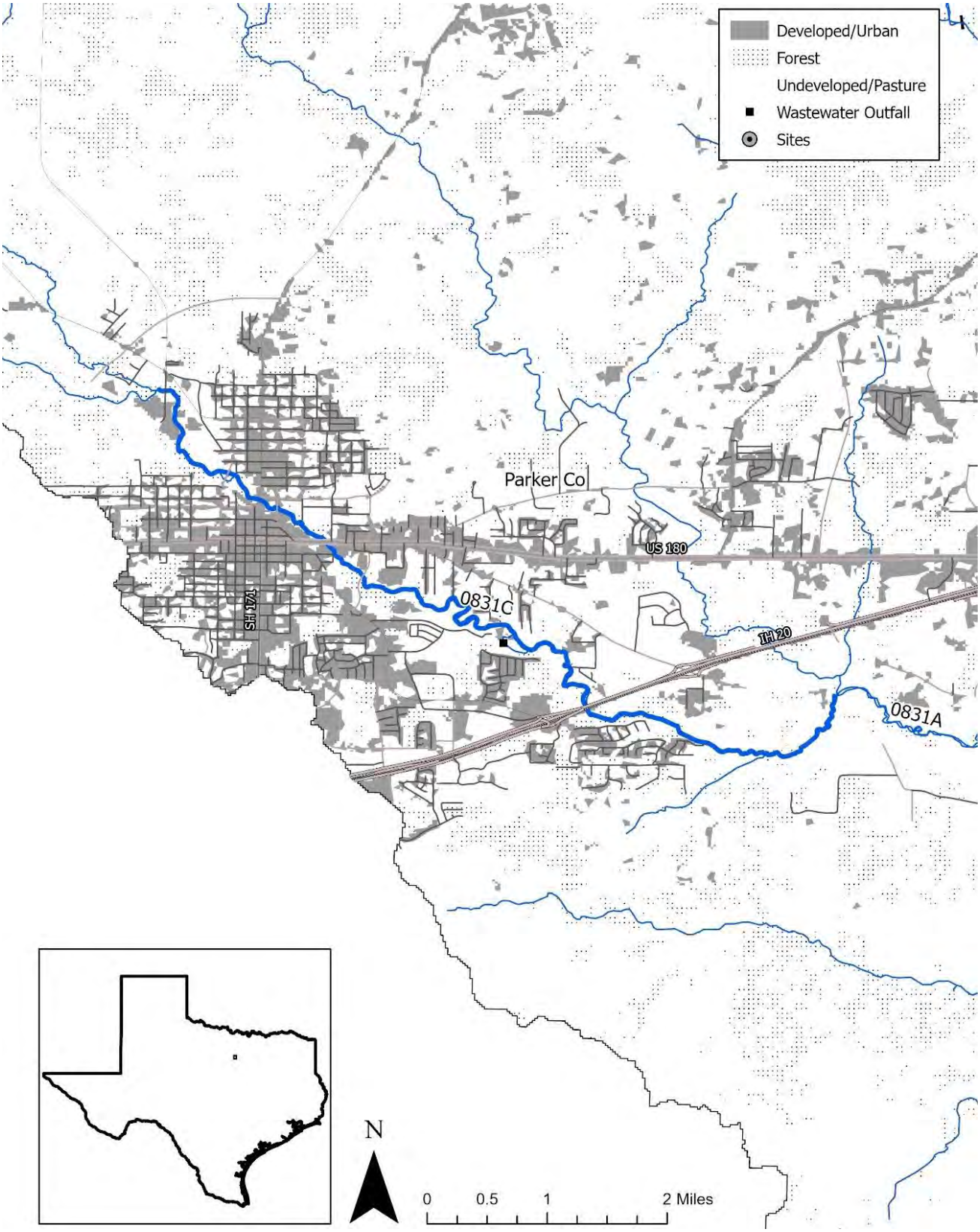


Figure 95: Segment 0831C Map

This 19.5-mile unclassified segment runs from the upper end of the creek upstream of Weatherford to the confluence with the South Fork of the Trinity River (see Figure 95). The extreme upper and lower ends of the segment drain rural areas with grassland and pasture. The remainder of the segment drains the City of Weatherford and surrounding developed areas. The stream flows through the Western Cross Timbers but there is a small portion of the Grand Prairie ecoregion to the west of the stream. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0831C_01 for the period of record for this basin summary report.

0831A – South Fork Trinity River

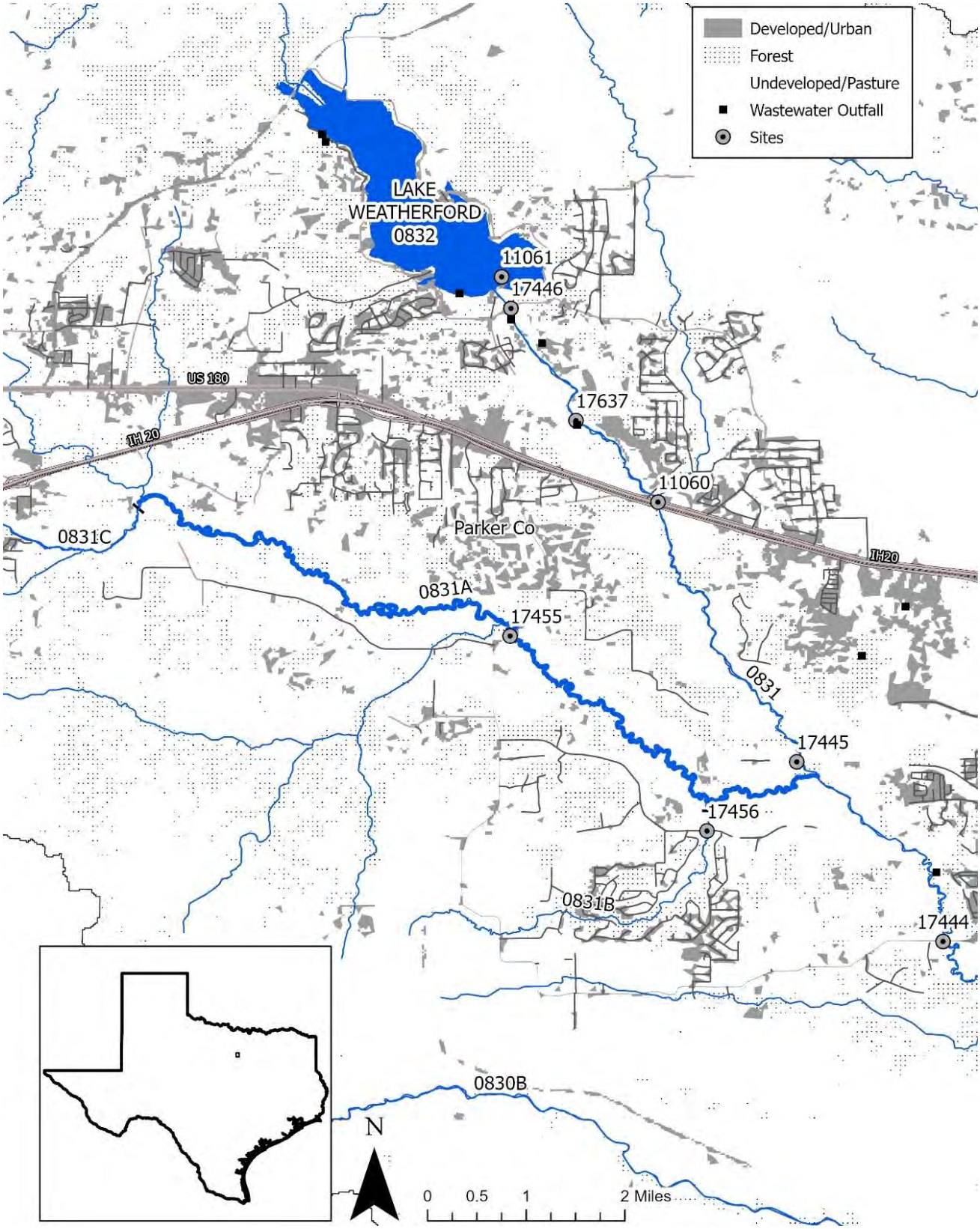


Figure 96: Segment 0831A Map

This 12-mile stretch of the South Fork Trinity River runs from the confluence with Willow Creek in Parker County to the confluence with the Clear Fork Trinity River (see Figure 96). Much of the watershed is rural with grassland and pasture being the predominant land use. There are some forested areas spread throughout the watershed and some development along the IH-20 corridor on the north side of the river. The river flows through the Western Cross Timbers with a small portion of the Grand Prairie ecoregion along the southwestern edge of the watershed. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 59.

Table 59: TCEQ 2020 Texas Integrated Report Summary for Segment 0831A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0831A_01 11 mi stretch from confluence with Clear Fork Trinity to confluence with Willow Creek Parker Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0831A_01 11 mi stretch from confluence with Clear Fork Trinity to confluence with Willow Creek Parker Co.	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0831A_01 11 mi stretch from confluence with Clear Fork Trinity to confluence with Willow Creek Parker Co.	General Use	Ammonia	0.33 mg/L	NC
0831A_01 11 mi stretch from confluence with Clear Fork Trinity to confluence with Willow Creek Parker Co.	General Use	Nitrate	1.95 mg/L	CS
0831A_01 11 mi stretch from confluence with Clear Fork Trinity to confluence with Willow Creek Parker Co.	General Use	Total Phosphorus	0.69 mg/L	CS
0831A_01 11 mi stretch from confluence with Clear Fork Trinity to confluence with Willow Creek Parker Co.	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CN = Use Concern CS = Screening Level Concern FS = Fully Supporting NC = No Concern

Data for assessment unit 0831A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

TRA staff monitored this segment in fiscal years 2017 and 2018. As shown in Figure 97, concerns for *E. coli* and nutrients are both related to flows in the segment. *E. coli* levels increased as flow increased indicating that run-off may have been influencing bacteria levels in this stream. There are several pastures with evidence of livestock trails in the watershed upstream of the sampling station, therefore, livestock are most likely the predominant source of bacteria in this segment. There is also a small forested area surround the stream immediately upstream of the sampling station so wildlife may be contributing bacteria as well. Bacterial source tracking would be necessary to determine the extent to which livestock or wildlife were influencing bacteria in this segment and what best management practices might be able to reduce loadings.

Nutrients were seen to be decreasing as flow increased as shown for nitrate in Figure 97. As discussed previously, this is commonly seen in streams receiving effluent from wastewater treatment facilities. It does not appear that the elevated nutrient levels were influencing algal populations as most of the observed values for chlorophyll-*a* were non-detects. Additionally, dissolved oxygen levels were all measured above 6 mg/L so it does not appear that nutrient enrichment is a concern at this time.

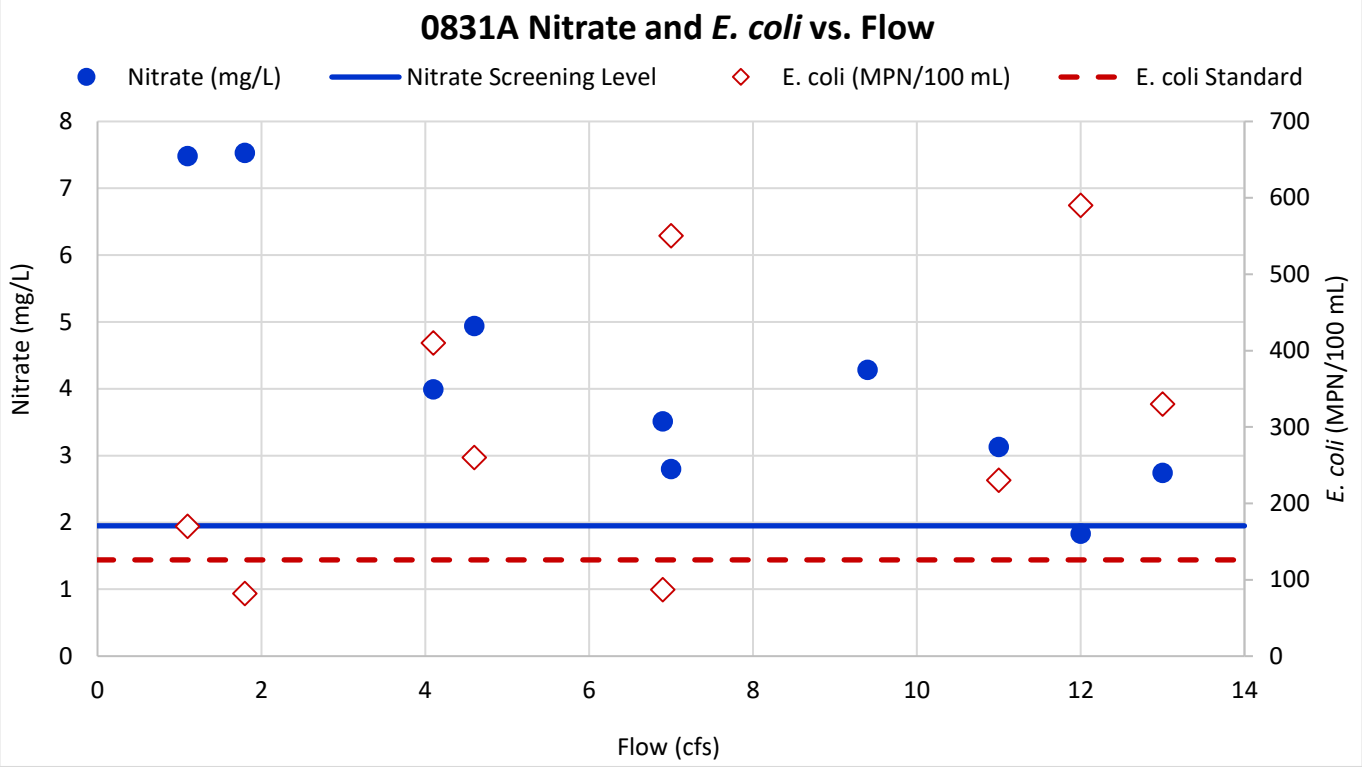


Figure 97: 0831A Nitrate and E. coli vs. Flow

0831B – Unnamed Tributary of South Fork Trinity River

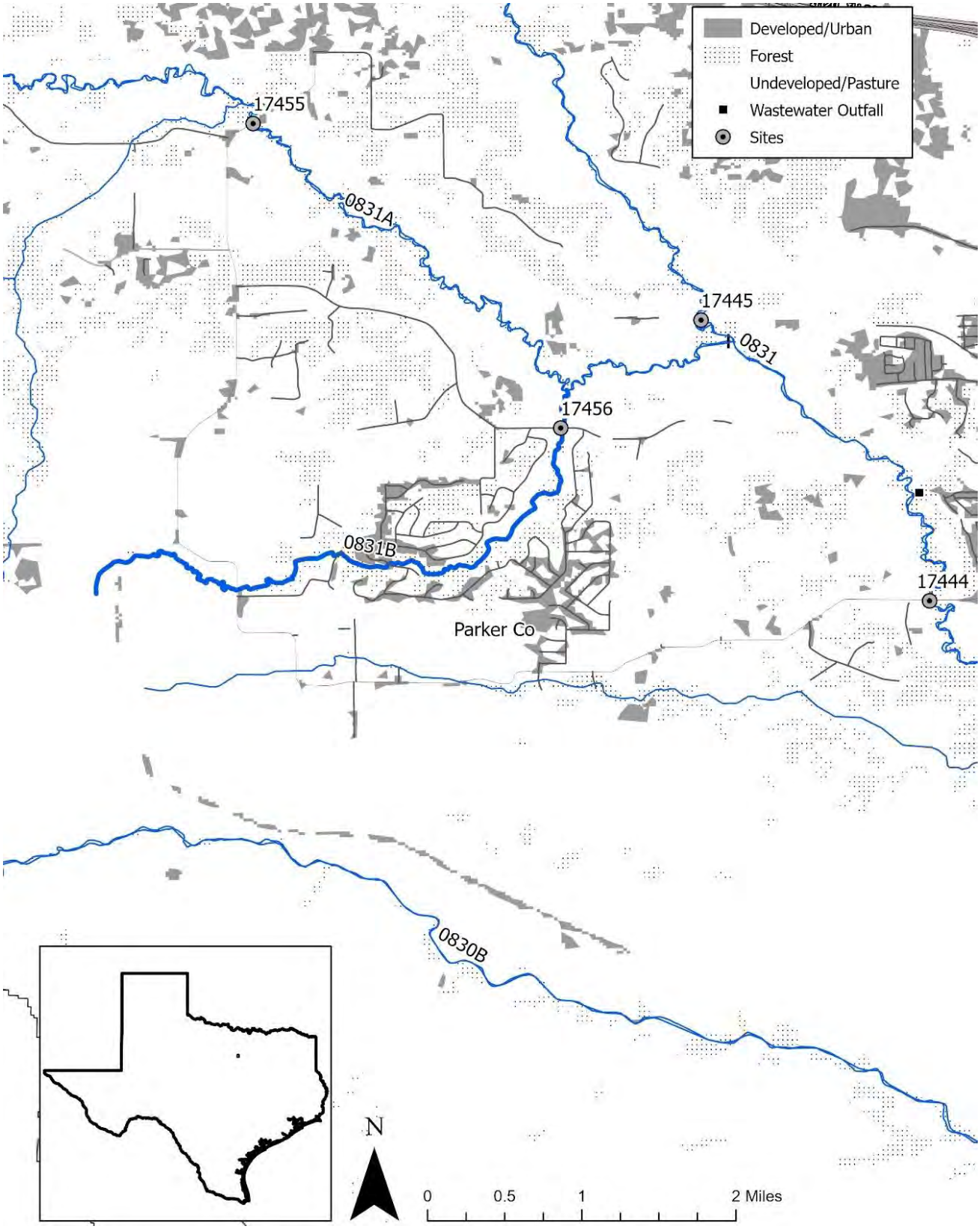


Figure 98: Segment 0831B Map

This 4.4-mile unclassified segment runs from the upper end of the creek upstream of Savage Lane near Annetta to the confluence with the South Fork Trinity River (see Figure 98). The watershed is mostly grassland with some forested areas and pasture adjacent to the stream and residential developments outside of Annetta. The upper portion of the segment flows through the Grand Prairie ecoregion before entering the Western Cross Timbers. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments for this segment. Data for assessment unit 0831B_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0830 – Benbrook Lake

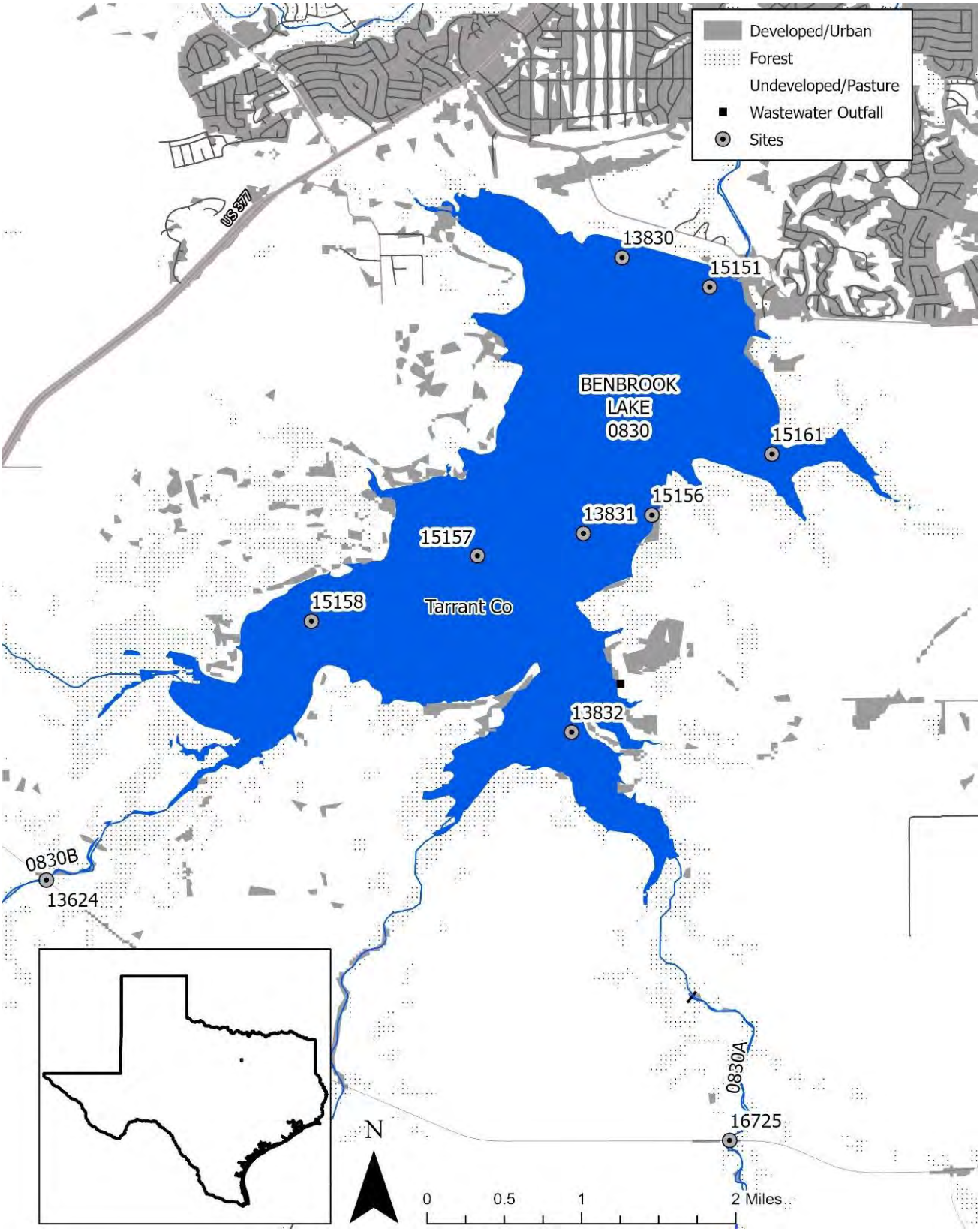


Figure 99: Segment 0830 Map

This 3,671-acre segment impounds the Clear Fork Trinity River from the Benbrook Lake dam in Tarrant County to 220 yards downstream of US 377 in Tarrant County, up to a normal pool elevation of 694 feet (see Figure 99). The majority of the watershed is grassland with some smaller areas of forest, pasture, and crop land. There is significant urban development on the north side of the lake. The entire segment is located within the Grand Prairie ecoregion. Benbrook Lake has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at four sites within this segment as shown in Table 60. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 60: Segment 0830 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0830_01	BENBROOK LAKE EAST END OF DAM 285 METERS SOUTH AND 332 METERS WEST OF INTERSECTION OF PECAN VALLEY DRIVE AND LAKESIDE DRIVE	15151	Tarrant Regional Water District
0830_02	BENBROOK LAKE 1.36 KM NORTH AND 223 METERS WEST OF INTERSECTION OF ST FRANCIS VILLAGE RD AND ST ANTHONY DR EAST SIDE IN MAIN CHANNEL	15156	Tarrant Regional Water District
0830_03	BENBROOK LAKE EAST OF BOAT RAMP AT HOLIDAY PARK IN MAIN CHANNEL 1.21 KM N AND 58 M E OF INTERSECTION OF PENINSULA RD AND BEAR CREEK DR	15158	Tarrant Regional Water District
0830_05	BENBROOK LAKE USGS SITE CR 92 METERS NORTH AND 1.27 KM EAST OF INTERSECTION OF PENINSULA ROAD AND PLOVER ROAD	13832	Tarrant Regional Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 61. Results of TRA trend analyses are shown in Table 62.

Table 61: TCEQ 2020 Texas Integrated Report Summary for Segment 0830

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0830_01 Lower portion of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0830_02 Middle portion of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0830_03 Upper portion of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0830_01 Lower portion of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0830_02 Middle portion of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0830_03 Upper portion of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0830_01 Lower portion of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NC
0830_02 Middle portion of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NC
0830_03 Upper portion of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NC
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	General Use	Nutrient Reservoir Narrative Criteria		NC
0830_01 Lower portion of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0830_02 Middle portion of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0830_03 Upper portion of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	General Use	pH	6.5 - 9 S.U.	FS
0830_01 Lower portion of reservoir	General Use	Chloride	75 mg/L	FS
0830_02 Middle portion of reservoir	General Use	Chloride	75 mg/L	FS
0830_03 Upper portion of reservoir	General Use	Chloride	75 mg/L	FS
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	General Use	Chloride	75 mg/L	FS
0830_01 Lower portion of reservoir	General Use	Sulfate	75 mg/L	FS
0830_02 Middle portion of reservoir	General Use	Sulfate	75 mg/L	FS
0830_03 Upper portion of reservoir	General Use	Sulfate	75 mg/L	FS
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	General Use	Sulfate	75 mg/L	FS
0830_01 Lower portion of reservoir	General Use	Total Dissolved Solids	300 mg/L	FS
0830_02 Middle portion of reservoir	General Use	Total Dissolved Solids	300 mg/L	FS
0830_03 Upper portion of reservoir	General Use	Total Dissolved Solids	300 mg/L	FS
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	General Use	Total Dissolved Solids	300 mg/L	FS
0830_01 Lower portion of reservoir	General Use	Water temperature	33.9 °F	FS
0830_02 Middle portion of reservoir	General Use	Water temperature	33.9 °F	FS
0830_03 Upper portion of reservoir	General Use	Water temperature	33.9 °F	FS
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	General Use	Water temperature	33.9 °F	FS
0830_01 Lower portion of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0830_02 Middle portion of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0830_03 Upper portion of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0830_05 Rock/Mustang Creek arm of Benbrook Lake.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting NC = No Concern

Table 62: Significant Trends for Segment 0830 (P-value<0.1)

Segment & Assessment Unit		0830_01	0830_02	0830_03	0830_05
Site		15151	15156	15158	13832
Water Temperature	All	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	↑	No Trend	No Trend	No Trend
	Winter	Not Significant	Not Significant	Not Significant	Not Significant
Secchi Depth	All	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	↓	↓	Not Significant
	Winter	↓	No Trend	Not Significant	Not Significant
Total Suspended Solids	All	Not Significant	No Trend	Not Significant	↓
	Summer	Not Significant	No Trend	Not Significant	↓
	Winter	Not Significant	No Trend	Not Significant	↓
Nitrate	All	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	↑	↑	↑	↑
Total Kjeldahl Nitrogen	All	No Trend	↓	↓	No Trend
	Summer	No Trend	↓	↓	↓
	Winter	No Trend	↓	↓	No Trend
Total Phosphorus	All	↓	No Trend	No Trend	No Trend
	Summer	↓	↓	No Trend	No Trend
	Winter	↓	No Trend	↓	No Trend
Orthophosphate	All	No Trend	No Trend	Not Significant	No Trend
	Summer	No Trend	No Trend	No Trend	No Trend
	Winter	Not Significant	Not Significant	Not Significant	↓
Total Organic Carbon	All	No Trend	↓	↓	No Trend
	Summer	↓	↓	↓	Not Significant
	Winter	Not Significant	↓	↓	No Trend
Dissolved Organic Carbon	All	Not Significant	No Trend	No Trend	Not Significant
	Summer	↓	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	No Trend	No Trend	Not Significant
Chloride	All	Not Significant	Not Significant	Not Significant	↓
	Summer	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant
Total Manganese	All	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data
Chlorophyll-*a*	All	No Trend	No Trend	↓	↓
	Summer	↓	↓	↓	↓
	Winter	No Trend	No Trend	↓	↓
Phytoplankton	All	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	No Trend	Insufficient Data	Insufficient Data	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend

Increasing trends for total manganese appear to be false trends and do not represent a change in water quality. As shown in Figure 100, the data set is weighted by several non-detects at the beginning of the period of record. For the purposes of this report, all non-detect data were censored to one half of the lowest non-detect value in the database for each parameter. While this can introduce false trends, it does make it more obvious that those trends do not represent any real change in water quality.

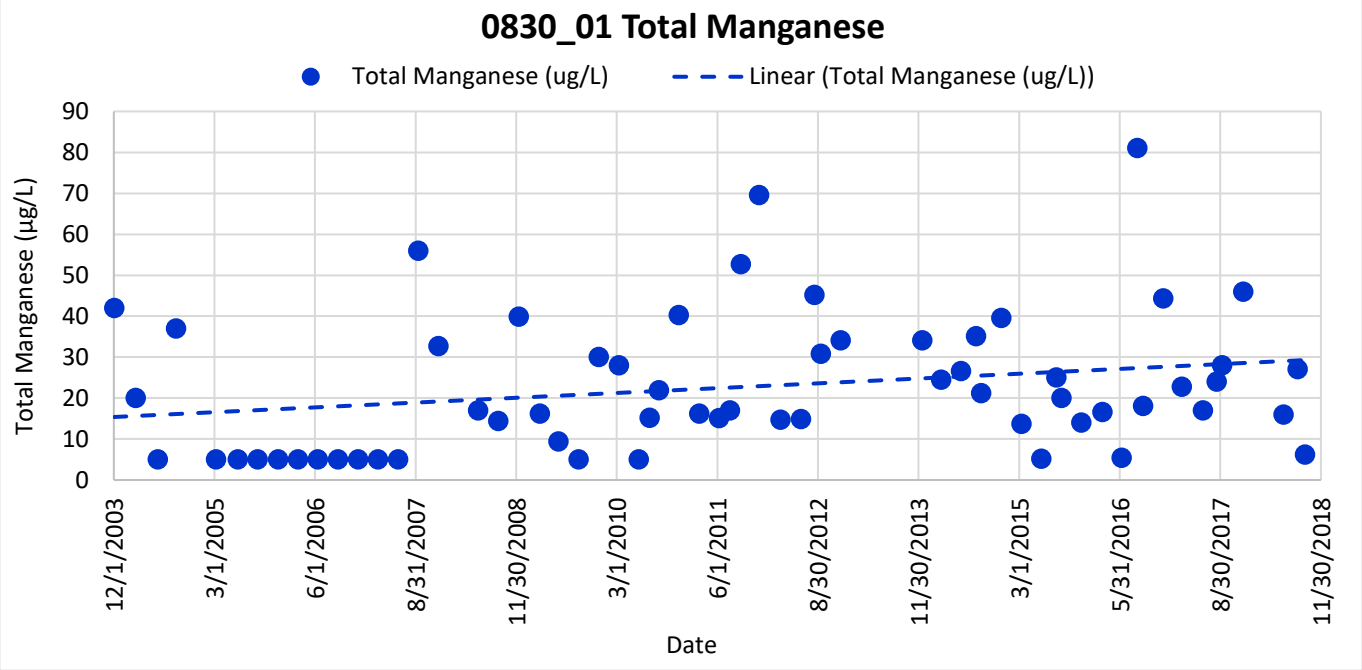


Figure 100: 0830_01 Total Manganese

Increasing trends for nitrate in the winter months appear to be related to drought conditions as shown in Figure 101 for assessment unit 0830_01. Nitrate increased during both major drought periods from 2005 to 2006 and from 2011 to 2015. However, nitrate levels did not return to pre-drought levels after the drought ended in late 2015. Regardless, winter nitrate levels are relatively low with the highest value reported being 0.4 mg/L; slightly above the screening levels for reservoirs of 0.37 mg/L. Monitoring is ongoing in this reservoir and additional review of the resultant data in the future will help determine if this increasing trend needs further analysis as the drought of 2011 to 2015 becomes less predominant in the data set.

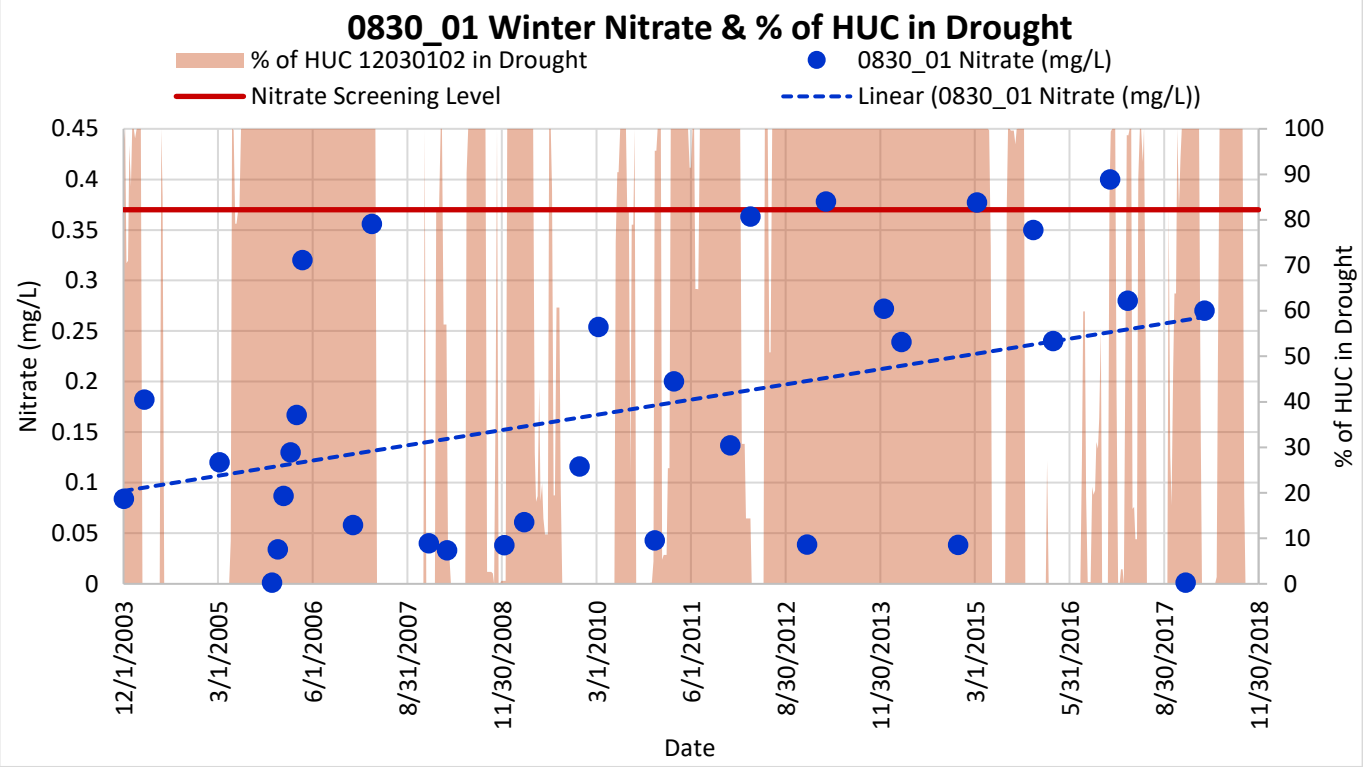


Figure 101: 0830_01 Winter Nitrate & % of HUC in Drought

0830A – Rock Creek

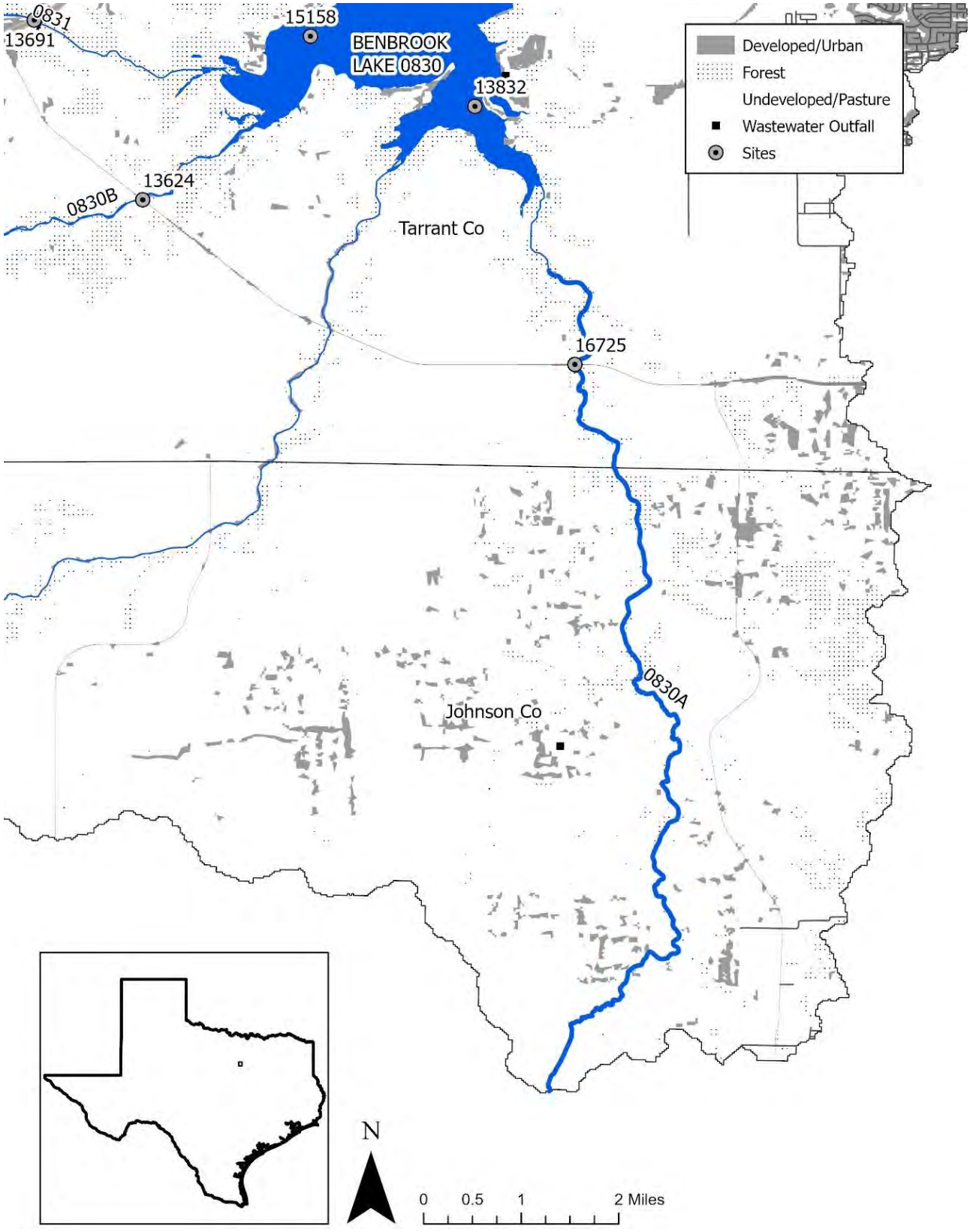


Figure 102: Segment 0830A Map

This 11-mile unclassified segment is an intermittent stream with perennial pools that runs from the headwaters near FM 917 near Burleson in Johnson County to the confluence with Benbrook Lake at normal pool elevation upstream (see Figure 102). The watershed is mostly grassland interspersed with pasture and hay fields. There is some residential development in the southern portion of the watershed. It lies within the Grand Prairie ecoregion but drains the Eastern Cross Timbers in the southeastern portion of the watershed.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 63. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 63: Segment 0830A FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0830A_01	ROCK CREEK AT FM 1187 3.7KM UPSTREAM OF BENBROOK LAKE	16725	Tarrant Regional Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 64. Results of TRA trend analyses are shown in Table 65.

Table 64: TCEQ 2020 Texas Integrated Report Summary for Segment 0830A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0830A_01 From confluence with Benbrook Lake at normal pool elevation up to headwaters near FM 917	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0830A_01 From confluence with Benbrook Lake at normal pool elevation up to headwaters near FM 917	General Use	Ammonia	0.33 mg/L	NC
0830A_01 From confluence with Benbrook Lake at normal pool elevation up to headwaters near FM 917	General Use	Nitrate	1.95 mg/L	NC
0830A_01 From confluence with Benbrook Lake at normal pool elevation up to headwaters near FM 917	General Use	Total Phosphorus	0.69 mg/L	NC

FS = Fully Supporting NC = No Concern

Table 65: Significant Trends for Segment 0830A (P-value<0.1)

Segment & Assessment Unit		0830A_01
Site		16725
Flow	All	No Trend
	Summer	↓
	Winter	Not Significant
Total Phosphorus	All	Not Significant
	Summer	Not Significant
	Winter	↓
Flow Severity	All	No Trend
	Summer	↓
	Winter	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend

The decreasing winter trend for total phosphorus appears to have been related to the drought conditions as shown in Figure 103. Overall, both full year total phosphorus and winter total phosphorus were somewhat correlated to flow; correlation coefficients were 0.439 and 0.466, respectively. This indicates that total phosphorus is being washed into the stream during precipitation events. As less precipitation occurs during drought years, less total phosphorus washed in during those periods of time. Based on land use in the segment, waste from livestock or use of fertilizers could be the source of total phosphorus in this segment. However, there are no bacteria data available to further analyze this presumption. It is recommended that *E. coli* be collected in order to help determine if the source of total phosphorus is from livestock waste or fertilizer use.

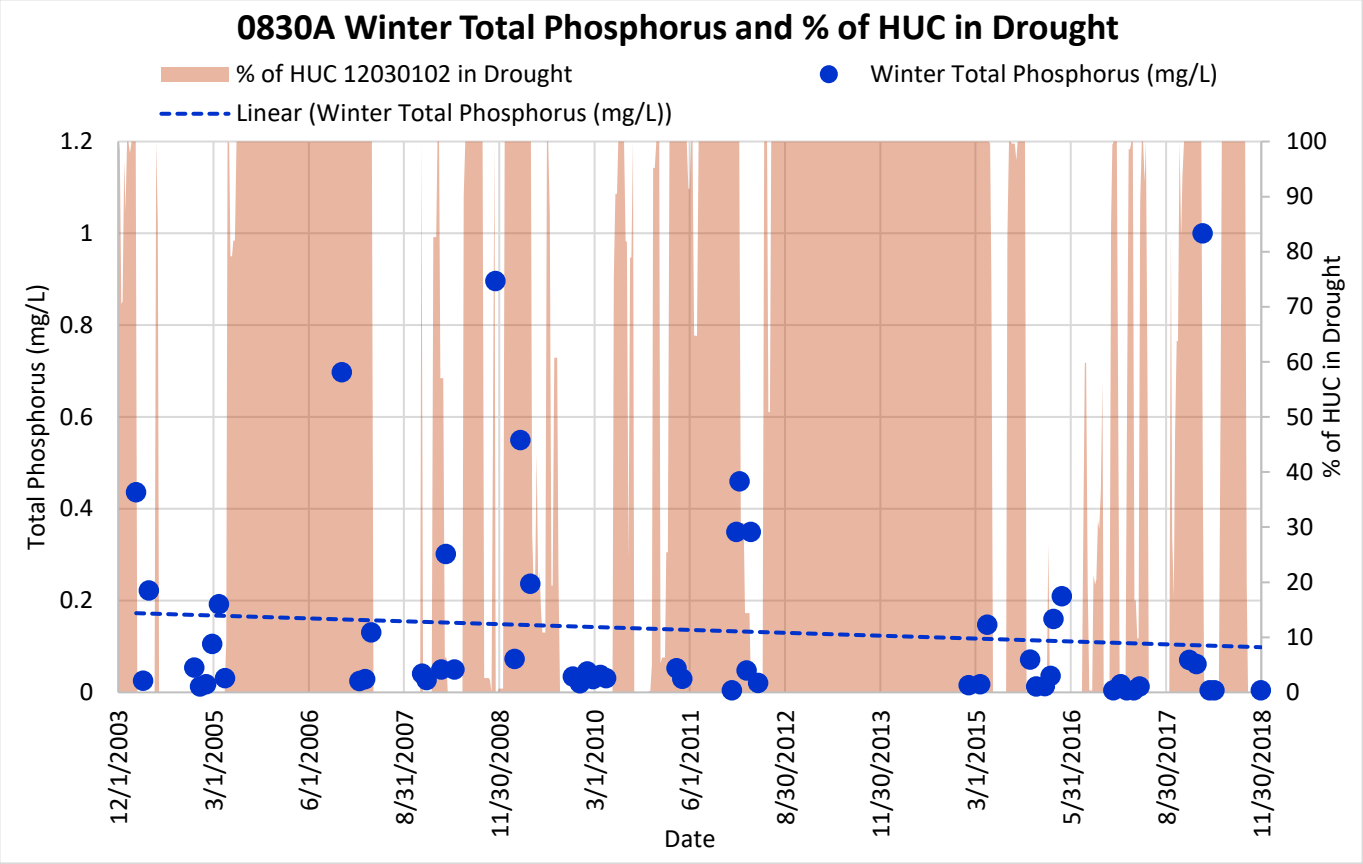


Figure 103: 0830A Winter Total Phosphorus and % of HUC in Drought

0830B – Bear Creek

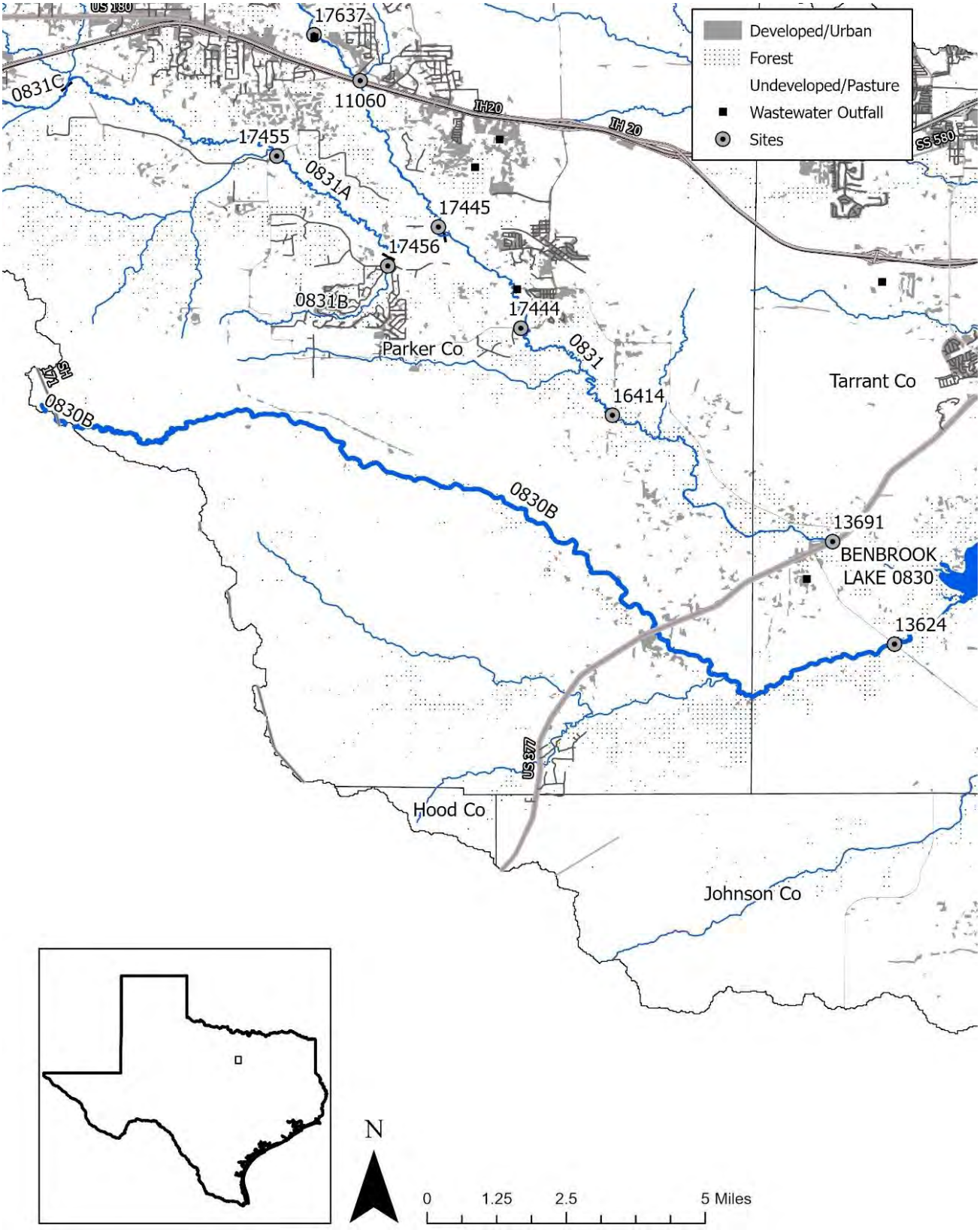


Figure 104: Segment 0830B Map

This 20-mile unclassified segment is an intermittent stream with perennial pools that runs from the headwaters adjacent to SH 171 southeast of Weatherford in Parker County to the confluence with Benbrook Lake at normal pool elevation upstream (see Figure 104). The watershed is mostly grassland with some pasture and hay fields adjacent to the stream. There is some residential and industrial development along the US 377 corridor. This segment lies within the Grand Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 66. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 66: Segment 0830B FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0830B_01	BEAR CREEK AT FM 1187 NEAR BENBROOK	13624	Tarrant Regional Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 67. Results of TRA trend analyses are shown in Table 68.

Table 67: TCEQ 2020 Texas Integrated Report Summary for Segment 0830B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0830B_01 From confluence with Benbrook Lake at normal pool elevation up to headwaters near SH 171	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0830B_01 From confluence with Benbrook Lake at normal pool elevation up to headwaters near SH 171	General Use	Ammonia	0.33 mg/L	NC
0830B_01 From confluence with Benbrook Lake at normal pool elevation up to headwaters near SH 171	General Use	Nitrate	1.95 mg/L	NC
0830B_01 From confluence with Benbrook Lake at normal pool elevation up to headwaters near SH 171	General Use	Total Phosphorus	0.69 mg/L	NC

FS = Fully Supporting NC = No Concern

Table 68: Significant Trends for Segment 0830B (P-value<0.1)

Segment & Assessment Unit		0830B_01
Site		13624
Total Phosphorus	All	↓
	Summer	↓
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

Similar to the decreasing total phosphorus trend in segment 0830A, decreasing total phosphorus trends in 0830B appear to have been related to drought conditions. The land use in this watershed is also similar to that of segment 0830A, therefore it is presumed that total phosphorus sources may include livestock or fertilizers. However, there are no bacteria data available to further analyze this presumption. It is recommended that *E. coli* be collected in order to help determine if the source of total phosphorus is from livestock waste or fertilizer use.

0829 – Clear Fork Trinity River Below Benbrook Lake

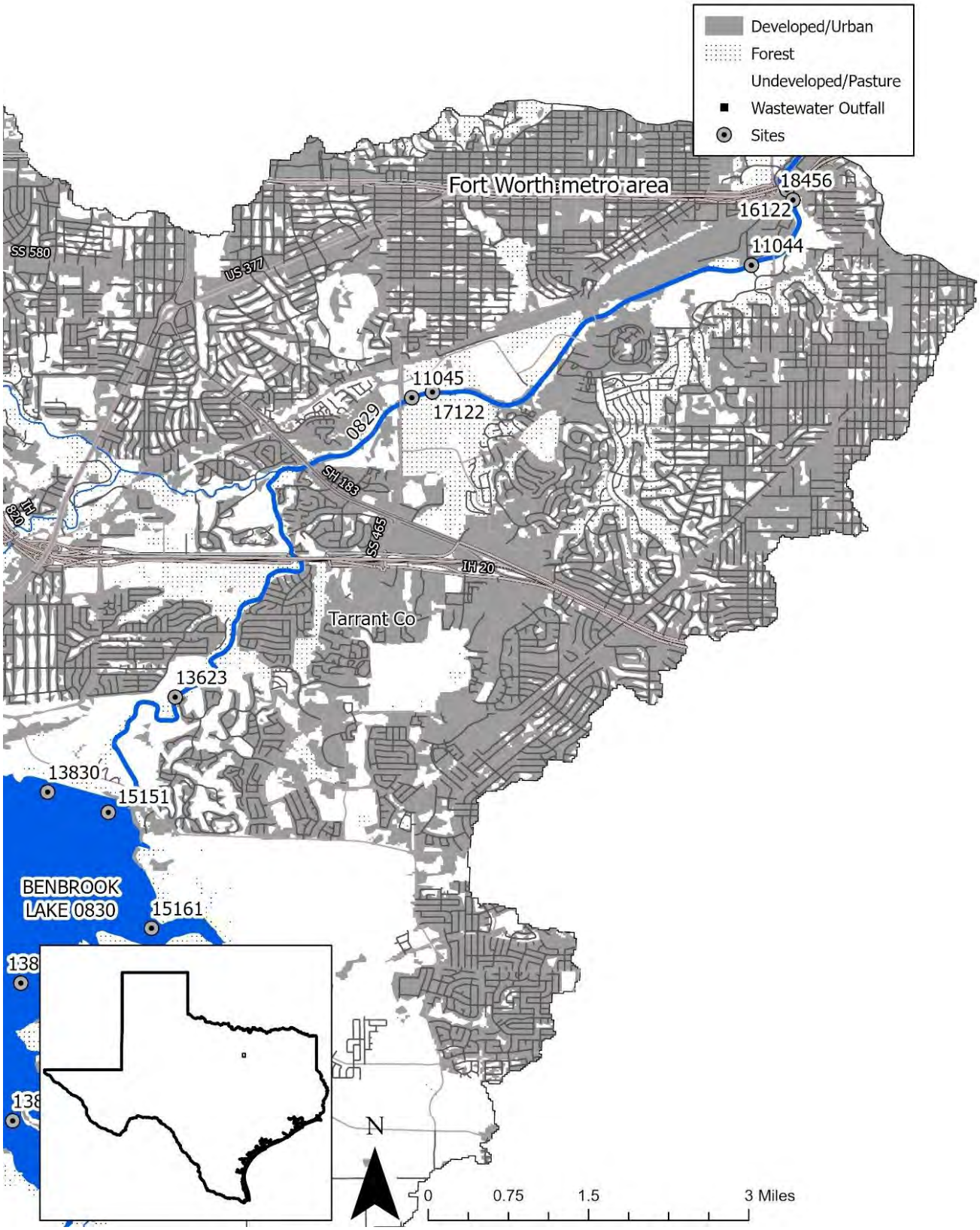


Figure 105: Segment 0829 Map

This 12.5-mile segment runs from the Benbrook Lake dam in Tarrant County to the confluence of the West Fork Trinity River in Tarrant County (see Figure 105). The watershed is heavily developed as it flows from the City of Benbrook and into the City of Fort Worth. It lies within the Grand Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 69. Monitoring is being conducted by TCEQ Region 4 and the City of Fort Worth. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 69: Segment 0829 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0829_02	CLEAR FORK TRINITY RIVER 161 METERS DOWNSTREAM OF BRYANT-IRVIN STREET IN FORT WORTH	11045	TCEQ Region 4
0829_02	CLEAR FORK TRINITY RIVER MID CHANNEL 85 M UPSTREAM OF SPILLWAY AND IMMEDIATELY UPSTREAM OF WEST ROSEDALE STREET IN FORT WORTH	18456	City of Fort Worth

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 70. Results of TRA trend analyses are shown in Table 71. Data used for these trend analyses includes data that was collected by the City of Fort Worth but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 70: TCEQ 2020 Texas Integrated Report Summary for Segment 0829

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	Ammonia	0.33 mg/L	NC
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	Nitrate	1.95 mg/L	NC
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	Total Phosphorus	0.69 mg/L	NC
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	pH	6.5 - 9 S.U.	FS
0829_01 From the confluence with West Fork Trinity River to 1 mi upstream	General Use	Chloride	100 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	Chloride	100 mg/L	FS
0829_03 From the confluence with Mary's Creek up to Benbrook Dam in Tarrant County, TX	General Use	Chloride	100 mg/L	FS
0829_01 From the confluence with West Fork Trinity River to 1 mi upstream	General Use	Sulfate	100 mg/L	FS
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	Sulfate	100 mg/L	FS
0829_03 From the confluence with Mary's Creek up to Benbrook Dam in Tarrant County, TX	General Use	Sulfate	100 mg/L	FS
0829_01 From the confluence with West Fork Trinity River to 1 mi upstream	General Use	Total Dissolved Solids	500 mg/L	FS
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	Total Dissolved Solids	500 mg/L	FS
0829_03 From the confluence with Mary's Creek up to Benbrook Dam in Tarrant County, TX	General Use	Total Dissolved Solids	500 mg/L	FS
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	General Use	Water temperature	33.9 °F	FS
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0829_01 From the confluence with West Fork Trinity River to 1 mi upstream	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0829_02 From 1 mi upstream of confluence with West Fork Trinity River to confluence with Mary's Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0829_03 From the confluence with Mary's Creek up to Benbrook Dam in Tarrant County, TX	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Data for assessment units 0829_01 and 0829_03 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 71: Significant Trends for Segment 0829 (P-value<0.1)

Segment & Assessment Unit		0829_02	0829_02
Site		11045	18456
Water Temperature	All	Not Significant	Not Significant
	Summer	Not Significant	Not Significant
	Winter	↑	Not Significant
Specific Conductance	All	Not Significant	↑
	Summer	Not Significant	↑
	Winter	Not Significant	↑

Segment & Assessment Unit		0829_02	0829_02
Site		11045	18456
Dissolved Oxygen	All	Not Significant	Not Significant
	Summer	↑	↓
	Winter	Not Significant	Not Significant
pH	All	Not Significant	Not Significant
	Summer	Not Significant	Not Significant
	Winter	Not Significant	↑
Ammonia	All	Not Significant	Insufficient Data
	Summer	↓	Insufficient Data
	Winter	No Trend	Insufficient Data
Total Organic Carbon	All	↑	Insufficient Data
	Summer	↑	Insufficient Data
	Winter	Not Significant	Insufficient Data
Flow Severity	All	↓	Not Significant
	Summer	↓	Not Significant
	Winter	Not Significant	Not Significant
E. coli	All	Not Significant	No Trend
	Summer	Not Significant	No Trend
	Winter	↑	No Trend
Total Dissolved Solids	All	Not Significant	↑
	Summer	No Trend	↑
	Winter	Not Significant	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

The impairment for fish consumption use is based on unsafe levels of PCBs and dioxins. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 43) to advise against the consumption of any species of fish in this segment. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

An impairment due to elevated levels of *E. coli* was identified in assessment unit 0829_02. As shown in Figure 106 for the upstream station 11045, *E. coli* were regularly reported above the standard of 126 MPN/100 mL. *E. coli* values were not well correlated to flow for this station (correlation coefficient = 0.035). This may have been due to the timing of sampling in relation to the hydrograph. As discussed previously, samples taken on the rising limb of the hydrograph typically have higher concentrations of contaminants than samples taken at the same flow on the falling limb of the hydrograph after contaminants have been washed off the land and moved downstream. Alternatively, this could indicate that there are both run-off related and constant sources of bacteria in this segment. This segment is highly developed and there are golf courses and dense residential areas upstream of both stations. Run-off containing waste from pets and wildlife could be introducing bacteria to the river. Additionally, failing infrastructure such

as broken sewage lines could be sources of bacteria. Bacterial source tracking would be required to fully assess this impairment and determine what best management practices would reduce bacterial loadings. Walking inspections of the segment may also be useful in identifying potential sources of bacteria into the stream.

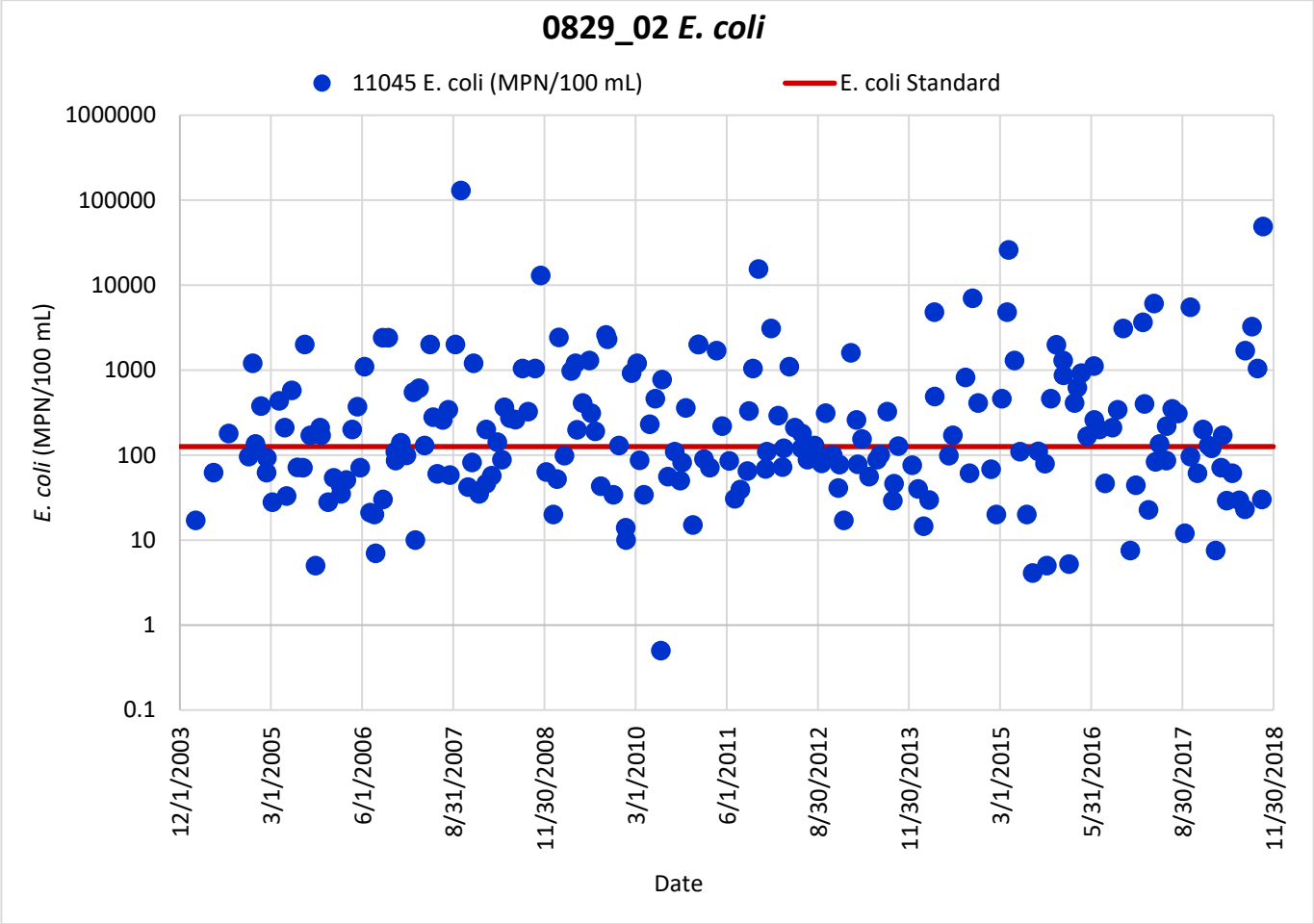


Figure 106: 0829_02 E. coli

Concerns for chlorophyll-*a* in assessment unit 0829_02 appear to have been related to drought conditions (see Figure 107). During drought periods, flows are generally low and many portions of a stream or river may be confined to pools. The river upstream of this site was observed to have very large deep pools during aquatic life monitoring in the summer of 2019 (Figure 108). Low flows and long residence times in large pools create the ideal conditions for algal growth. It does not seem that algal populations are negatively affecting dissolved oxygen levels at station 11045. Out of 216 values, only six were reported be low 5 mg/L. Data for the aquatic life monitoring event is still being processed and will be presented in the FY 2021 Basin Highlights Report.

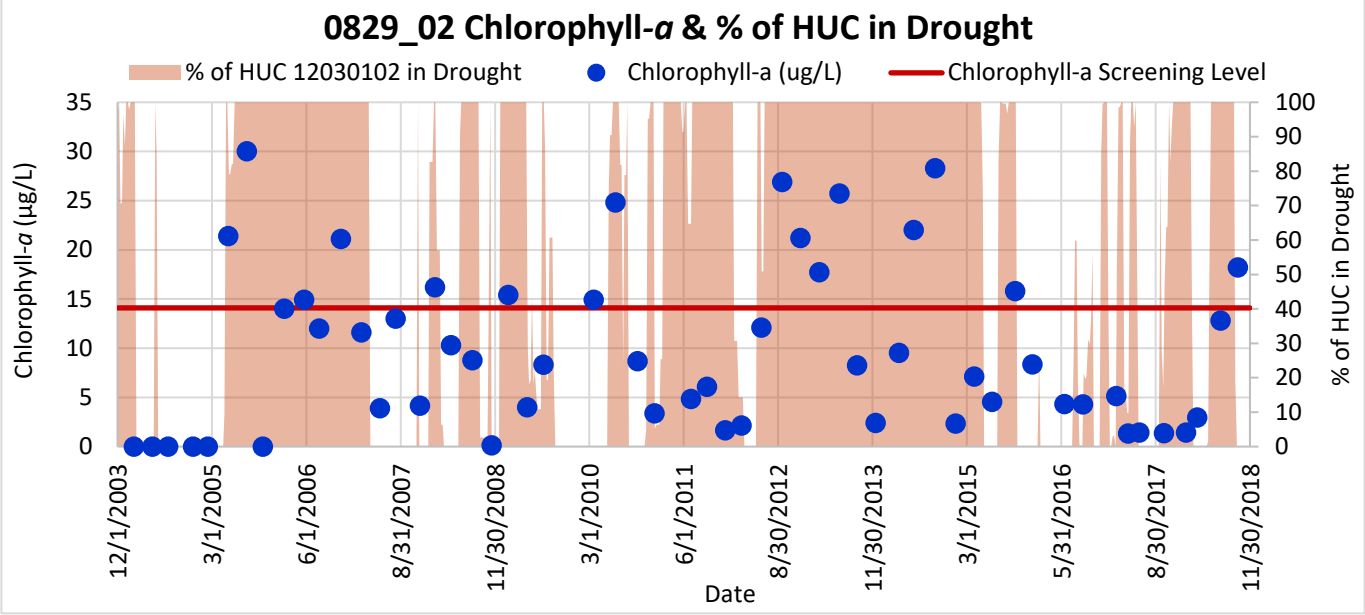


Figure 107: 0829_02 Chlorophyll-a & % of HUC in Drought



Figure 108: Large pool on Clear Fork – 48 feet wide and 6.5 feet deep

Increasing trends for specific conductance at station 18456 may be related to drought recovery periods. Increasing trends for total dissolved solids may be false trends as there were no actual total dissolved solids samples collected at this station. All total dissolved solids values at this station were calculated from specific conductance. As shown in Figure 109, specific conductance decreased during drought periods and increased immediately after the droughts ended. This is likely due to irrigation of the golf courses and yards in the residential areas upstream. During irrigation, water will evaporate and leave behind salts and other dissolved solids. Subsequent irrigation will increase the build-up of these salts and dissolved solids on the land. Precipitation events of sufficient quantity to create run-off then washed those salts and dissolved solids off of the land and into nearby waterbodies, creating a spike in measured concentrations immediately following a drought period.

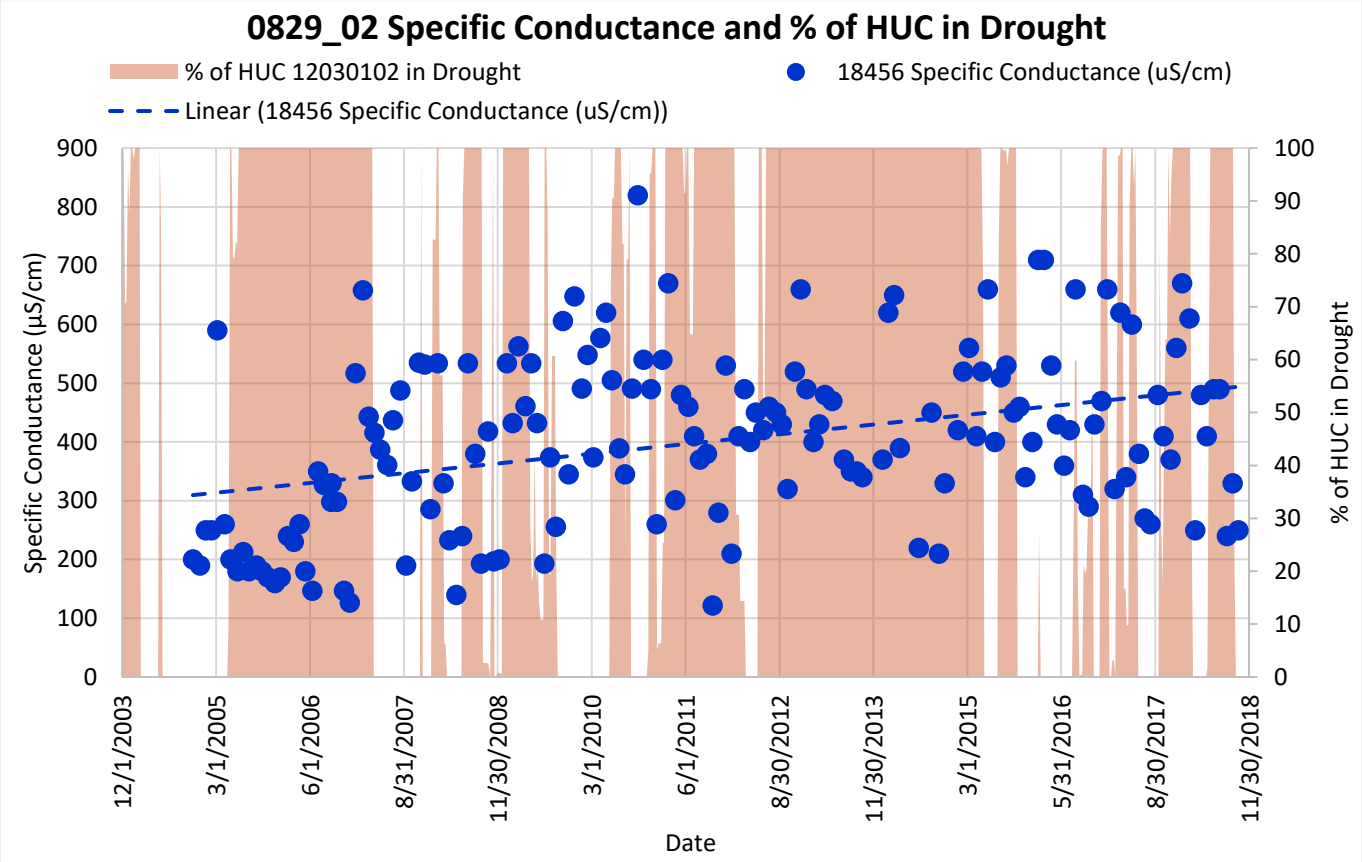


Figure 109: 0829_02 Specific Conductance and % of HUC in Drought

0829A – Lake Como

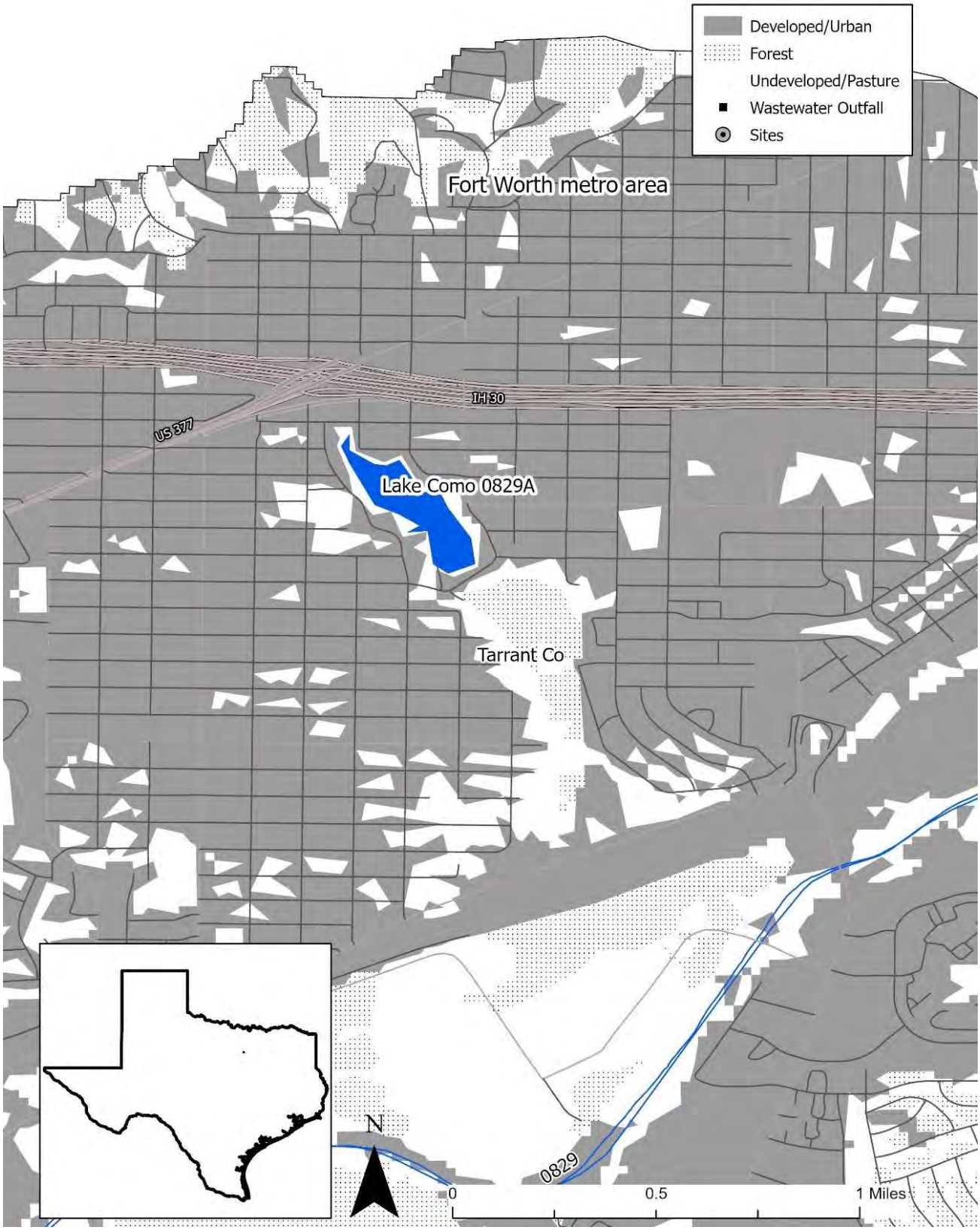


Figure 110: Segment 0829A Map

This 11-acre unclassified segment runs from Lake Como Dam to the reservoir headwaters in Lake Como Park in Tarrant County (see Figure 110). It is surrounded by the developed suburbs of Fort Worth and lies within the Grand Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 72.

Table 72: TCEQ 2020 Texas Integrated Report Summary for Segment 0829A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0829A_01 From Lake Como Dam to the reservoir headwaters in Lake Como Park in Tarrant County	Fish Consumption Use	PCBs, Dioxin, Dieldrin in edible tissue		NS
0829A_01 From Lake Como Dam to the reservoir headwaters in Lake Como Park in Tarrant County	Fish Consumption Use	Bioaccumulative Toxics in fish tissue - Arsenic	0.04 ng/kg	CS

CS = Screening Level Concern NS = Not Supporting

There were no data available in assessment unit 0829A_01 for the period of record for this basin summary report.

The impairment for fish consumption use is based on unsafe levels of PCBs, dioxins, and dieldrin in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 57) to advise against the consumption of common carp. The concern for arsenic in fish tissue was carried forward from previous integrated reports. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

Elm Fork Trinity River

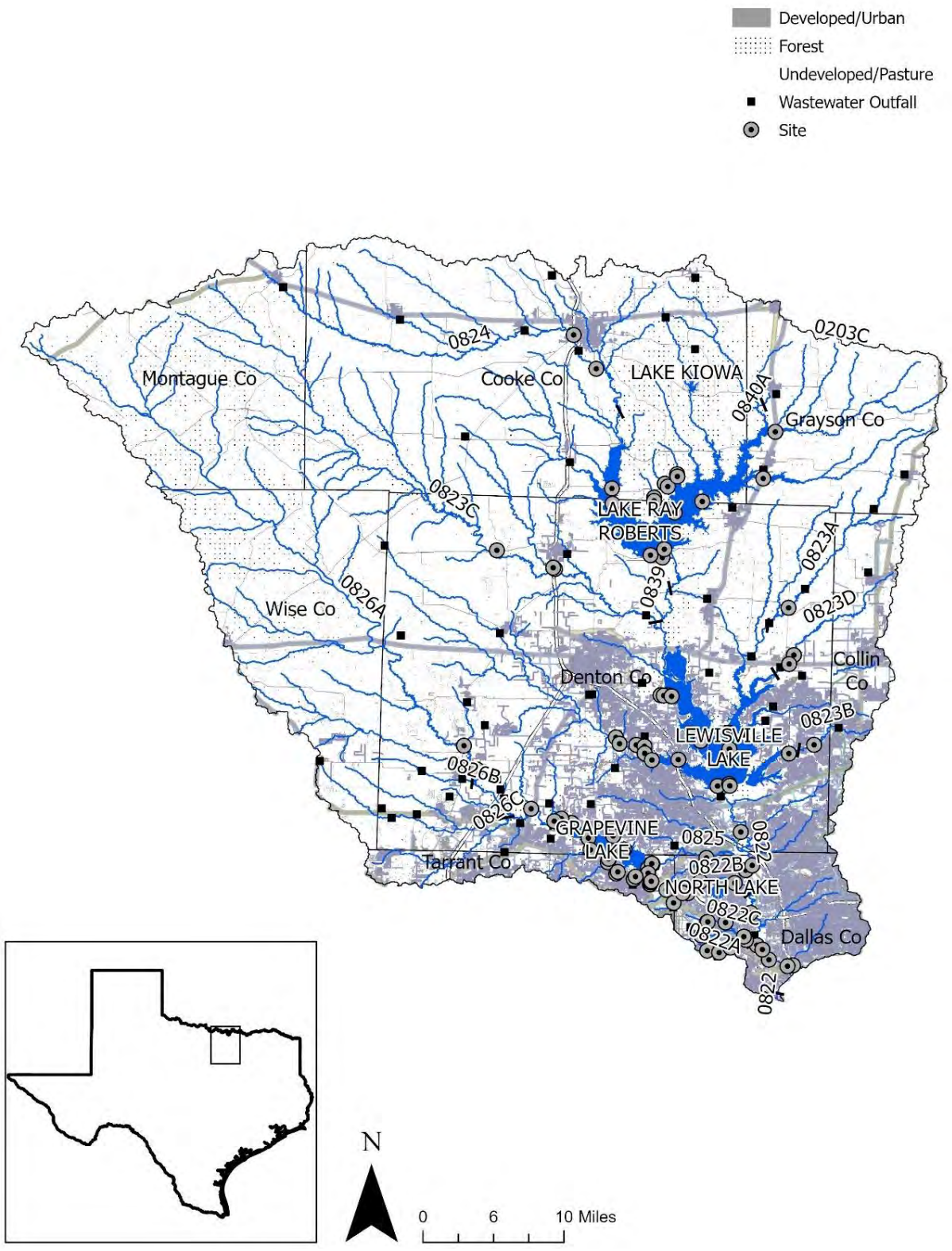


Figure 111: Elm Fork Trinity River Overview Map

The Elm Fork subwatershed is the northernmost watershed in the basin stretching to within a few miles of the Oklahoma Border (see Figure 111). The headwaters of the Elm Fork begin in Montague County and extend approximately 118 miles to the confluence with the Main Stem in Dallas County. The majority of the subwatershed is rural and becomes more urbanized as it approaches the Dallas-Fort Worth Metroplex, around the City of Denton and the shores of Lake Lewisville. The rural northern portion of the subwatershed includes row crop agriculture, cattle grazing, and dairy industry. This watershed receives between 35 and 41 inches of precipitation annually.

Ray Roberts Lake, Lake Lewisville, and Lake Grapevine are located in this subwatershed. Water rights permits for Ray Roberts Lake and Lake Lewisville are held by the cities of Dallas and Denton. Water rights permits for Lake Grapevine are held by the Park Cities Municipal Utility District, as well as, the cities of Dallas and Grapevine.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0824 – Elm Fork Trinity River Above Ray Roberts Lake
- 0840 – Ray Roberts Lake
- 0840A – Unnamed Tributary of Jordan Creek
- 0839 – Elm Fork Trinity River Below Ray Roberts Lake
- 0823 – Lewisville Lake
- 0823C – Clear Creek
- 0823A – Little Elm Creek
- 0823D – Doe Branch
- 0823B – Stewart Creek
- 0822 – Elm Fork Trinity River Below Lewisville Lake
- 0826A – Denton Creek
- 0826B – Trail Creek
- 0826C – Henrietta Creek
- 0826 – Grapevine Lake
- 0825 – Denton Creek
- 0822B – Grapevine Creek
- 0822C – Hackberry Creek
- 0822A – Cottonwood Branch
- 0822D – Ski Lake

0824 – Elm Fork Trinity River Above Ray Roberts Lake

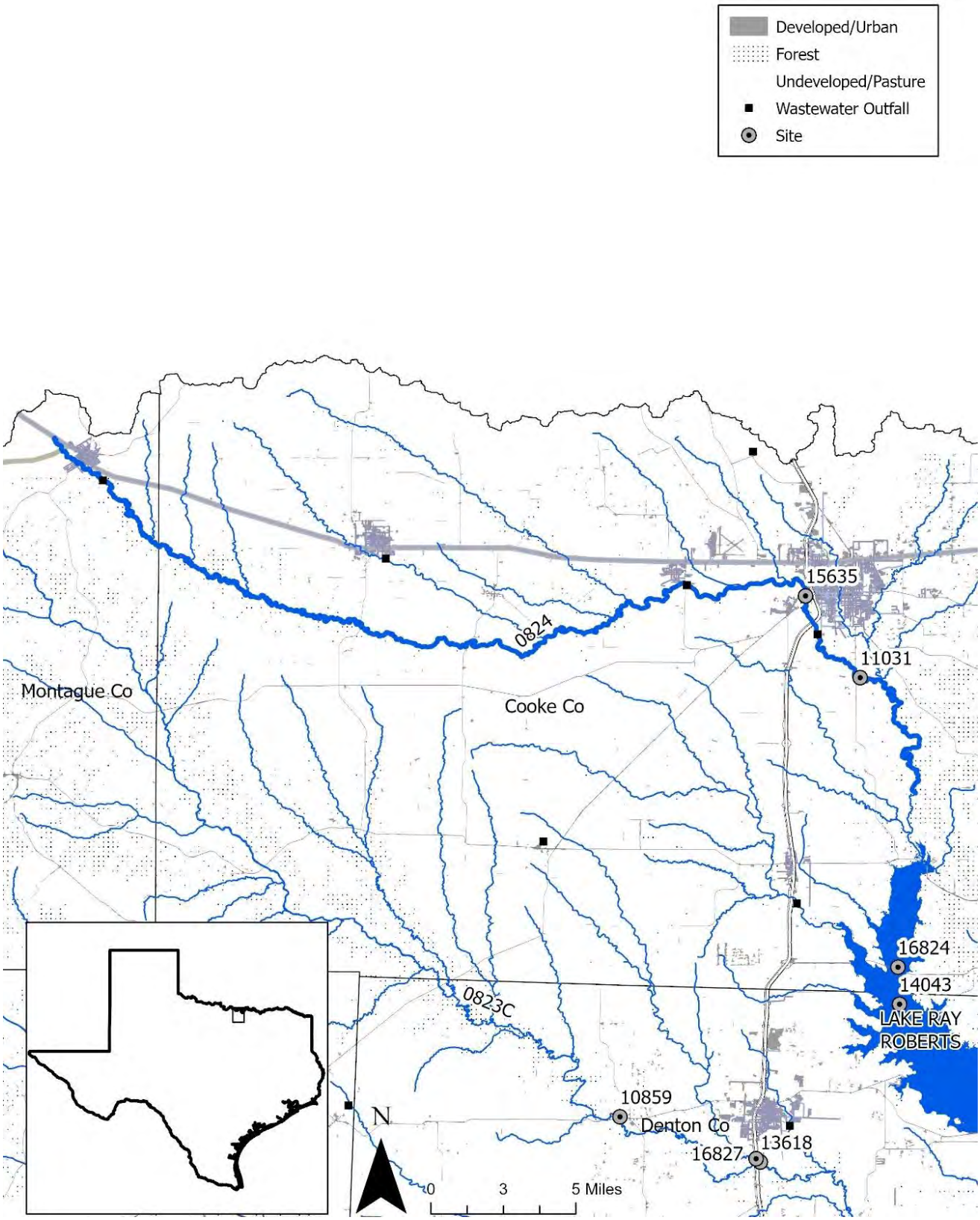


Figure 112: Segment 0824 Map

This 51-mile segment runs from US 82 in Montague County to 5.9 miles downstream of the confluence of Pecan Creek in Cooke County (see Figure 112). The entire segment runs through the Grand Prairie ecoregion with almost all land use classified as pasture and crop land with more grassland in the upstream portion of the segment. Oil production has been heavy in the area over the last century and natural gas drilling has increased tremendously in the last 20 years.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 73. Monitoring is being conducted by TCEQ Region 4 and the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 73: Segment 0824 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0824_01	ELM FORK TRINITY RIVER IMMEDIATELY DOWNSTREAM OF FM 2071 SOUTH OF GAINESVILLE (R1)	11031	City of Dallas (collecting entity DA)
0824_03	ELM FORK TRINITY RIVER 59 METERS DOWNSTREAM OF FM 51 IN GAINESVILLE	15635	TCEQ Region 4

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 74. Results of TRA trend analyses are shown in Table 75. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 74: TCEQ 2020 Texas Integrated Report Summary for Segment 0824

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0824_01 Lower 7.5 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0824_03 3.5 mi reach near SH 51	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0824_01 Lower 7.5 mi of segment	Aquatic Life Use	Acute Toxic Substances in water		FS
0824_01 Lower 7.5 mi of segment	Aquatic Life Use	Chronic Toxic Substances in water		FS
0824_03 3.5 mi reach near SH 51	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0824_03 3.5 mi reach near SH 51	General Use	Ammonia	0.33 mg/L	NC
0824_01 Lower 7.5 mi of segment	General Use	Nitrate	1.95 mg/L	CS
0824_02 2 mi reach near unmarked county road, 1.4 km downstream Gainesville WWTP	General Use	Nitrate	1.95 mg/L	CS
0824_03 3.5 mi reach near SH 51	General Use	Nitrate	1.95 mg/L	NC
0824_03 3.5 mi reach near SH 51	General Use	Total Phosphorus	0.69 mg/L	NC
0824_01 Lower 7.5 mi of segment	General Use	Chlorophyll-*a*	14.1 µg/L	CS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0824_03 3.5 mi reach near SH 51	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0824_01 Lower 7.5 mi of segment	General Use	pH	6.5 - 9 S.U.	FS
0824_03 3.5 mi reach near SH 51	General Use	pH	6.5 - 9 S.U.	FS
0824_01 Lower 7.5 mi of segment	General Use	Chloride	110 mg/L	FS
0824_02 2 mi reach near unmarked county road, 1.4 km downstream Gainesville WWTP	General Use	Chloride	110 mg/L	FS
0824_03 3.5 mi reach near SH 51	General Use	Chloride	110 mg/L	FS
0824_04 25 mi reach near FM 3108	General Use	Chloride	110 mg/L	FS
0824_05 Upper 48 mi of segment	General Use	Chloride	110 mg/L	FS
0824_01 Lower 7.5 mi of segment	General Use	Sulfate	90 mg/L	FS
0824_02 2 mi reach near unmarked county road, 1.4 km downstream Gainesville WWTP	General Use	Sulfate	90 mg/L	FS
0824_03 3.5 mi reach near SH 51	General Use	Sulfate	90 mg/L	FS
0824_04 25 mi reach near FM 3108	General Use	Sulfate	90 mg/L	FS
0824_05 Upper 48 mi of segment	General Use	Sulfate	90 mg/L	FS
0824_01 Lower 7.5 mi of segment	General Use	Total Dissolved Solids	700 mg/L	FS
0824_02 2 mi reach near unmarked county road, 1.4 km downstream Gainesville WWTP	General Use	Total Dissolved Solids	700 mg/L	FS
0824_03 3.5 mi reach near SH 51	General Use	Total Dissolved Solids	700 mg/L	FS
0824_04 25 mi reach near FM 3108	General Use	Total Dissolved Solids	700 mg/L	FS
0824_05 Upper 48 mi of segment	General Use	Total Dissolved Solids	700 mg/L	FS
0824_01 Lower 7.5 mi of segment	General Use	Water temperature	32.2 °F	FS
0824_03 3.5 mi reach near SH 51	General Use	Water temperature	32.2 °F	FS
0824_01 Lower 7.5 mi of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0824_02 2 mi reach near unmarked county road, 1.4 km downstream Gainesville WWTP	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0824_03 3.5 mi reach near SH 51	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0824_04 25 mi reach near FM 3108	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0824_05 Upper 48 mi of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0824_01 Lower 7.5 mi of segment	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0824_02 2 mi reach near unmarked county road, 1.4 km downstream Gainesville WWTP	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0824_03 3.5 mi reach near SH 51	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0824_04 25 mi reach near FM 3108	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0824_05 Upper 48 mi of segment	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment units 0824_02, 0824_04, and 0824_05 for the period of record for this basin summary report.

Table 75: Significant Trends for Segment 0824 (P-value<0.1)

Segment & Assessment Unit		0824_01	0824_03
Site		11031	15635
Air Temperature	All	Not Significant	Insufficient Data
	Summer	↓	Insufficient Data
	Winter	Not Significant	Insufficient Data
Specific Conductance	All	Not Significant	Not Significant
	Summer	No Trend	Not Significant
	Winter	↓	Not Significant
Orthophosphate	All	No Trend	Not Significant
	Summer	No Trend	Not Significant
	Winter	No Trend	↓*
Hardness	All	Not Significant	Insufficient Data
	Summer	Not Significant	Insufficient Data
	Winter	↑	Insufficient Data
Chloride	All	Not Significant	Not Significant
	Summer	Not Significant	Not Significant
	Winter	↓	Not Significant
Dissolved Copper	All	Not Significant	Insufficient Data
	Summer	↓	Insufficient Data
	Winter	Not Significant	Insufficient Data
Dissolved Nickel	All	↓	Insufficient Data
	Summer	No Trend	Insufficient Data
	Winter	Not Significant	Insufficient Data
Flow Severity	All	Not Significant	Insufficient Data
	Summer	Not Significant	Insufficient Data
	Winter	↑	Insufficient Data
E. coli	All	No Trend	Not Significant
	Summer	No Trend	Not Significant
	Winter	No Trend	↑

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The *E. coli* impairment in assessment unit 0824_03 appears to be largely run-off related. As shown in Figure 113, *E. coli* levels generally increased during increased flows although this correlation was very weak (correlation coefficient = 0.157). This indicates that bacteria may be entering the stream via both run-off during precipitation events and direct deposition by livestock. There are several pastures upstream of the monitoring station in this assessment unit with evidence of livestock trails. Additionally, livestock have been seen entering the stream for

watering during sampling in this segment. Landowner education and livestock best management practices may help reduce bacteria levels in this segment.

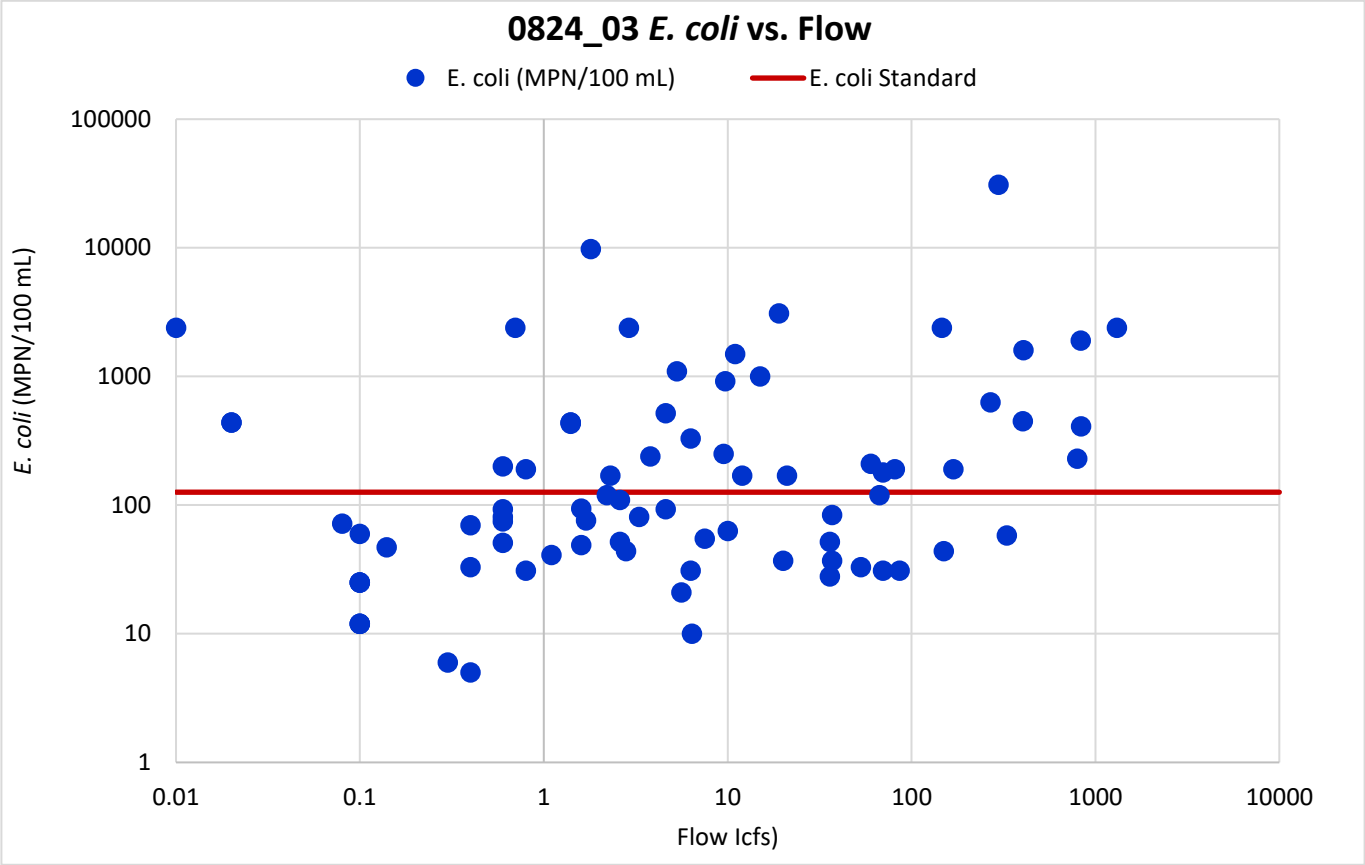


Figure 113: 0824_03 E. coli vs. Flow

Concerns for nitrate in assessment unit 0824_02 and for chlorophyll-*a* in assessment unit 0824_01 were carried forward from previous assessments. Based on data collected in assessment unit 0824_01, nitrate concerns may be due to wastewater treatment facilities in the watershed. As shown in Figure 114, nitrate levels increased during drought periods when flows decrease. In streams with wastewater treatment facility dischargers, downstream monitoring stations experience increasing levels of nutrients as the stream becomes effluent-dominated. This nutrient enrichment appears to be affecting chlorophyll-*a* levels as shown in Figure 115 for assessment unit 0824_03. Low flows increase residence times in the stream. This could allow algal populations time to utilize elevated nutrient levels and increase their populations.

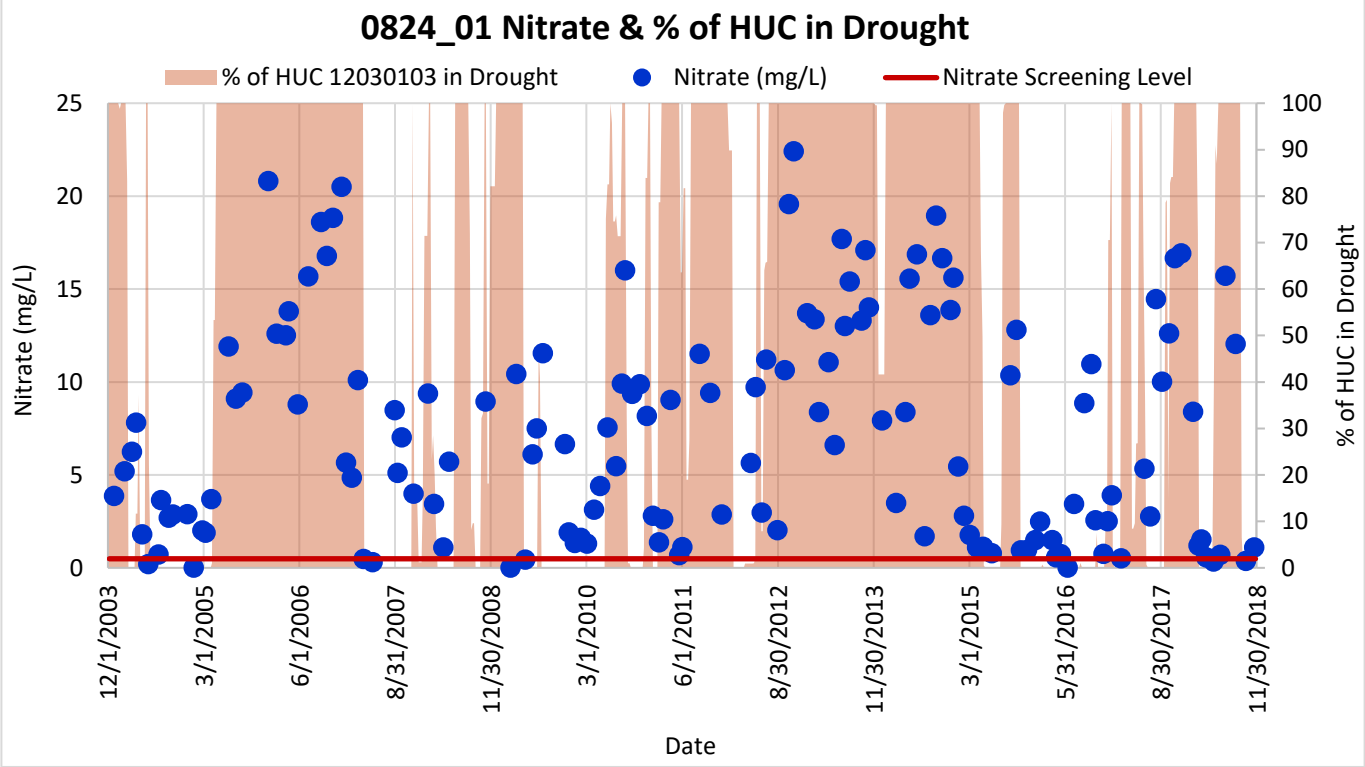


Figure 114: 0824_01 Nitrate & % of HUC in Drought

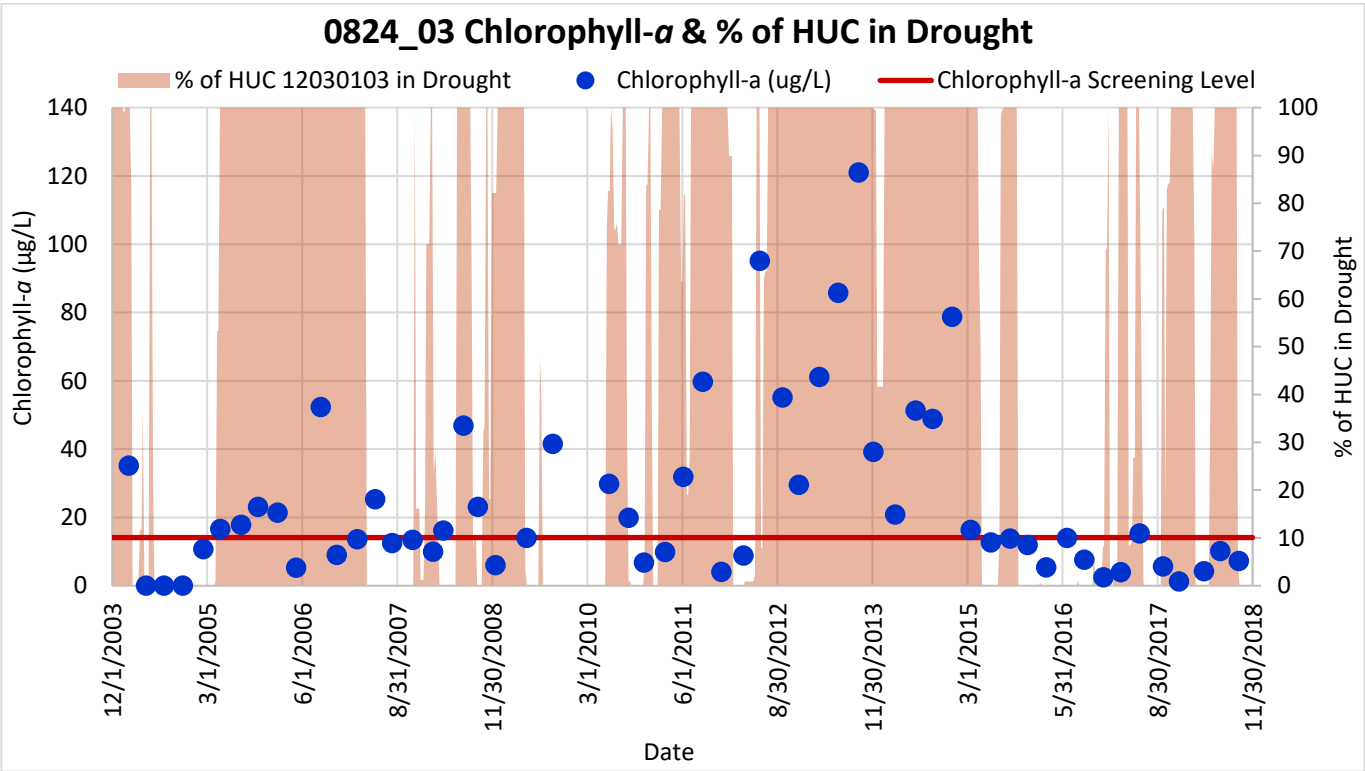


Figure 115: 0824_03 Chlorophyll-a & % of HUC in Drought

Increasing winter trends for hardness appear to be related to periods of drought recovery as shown in Figure 116. It is presumed that the mechanism for this trend has to do with decreased inflows from the watershed during periods of drought. Calcium and magnesium from the geology of the watershed are then carried into waterbodies during precipitation events.

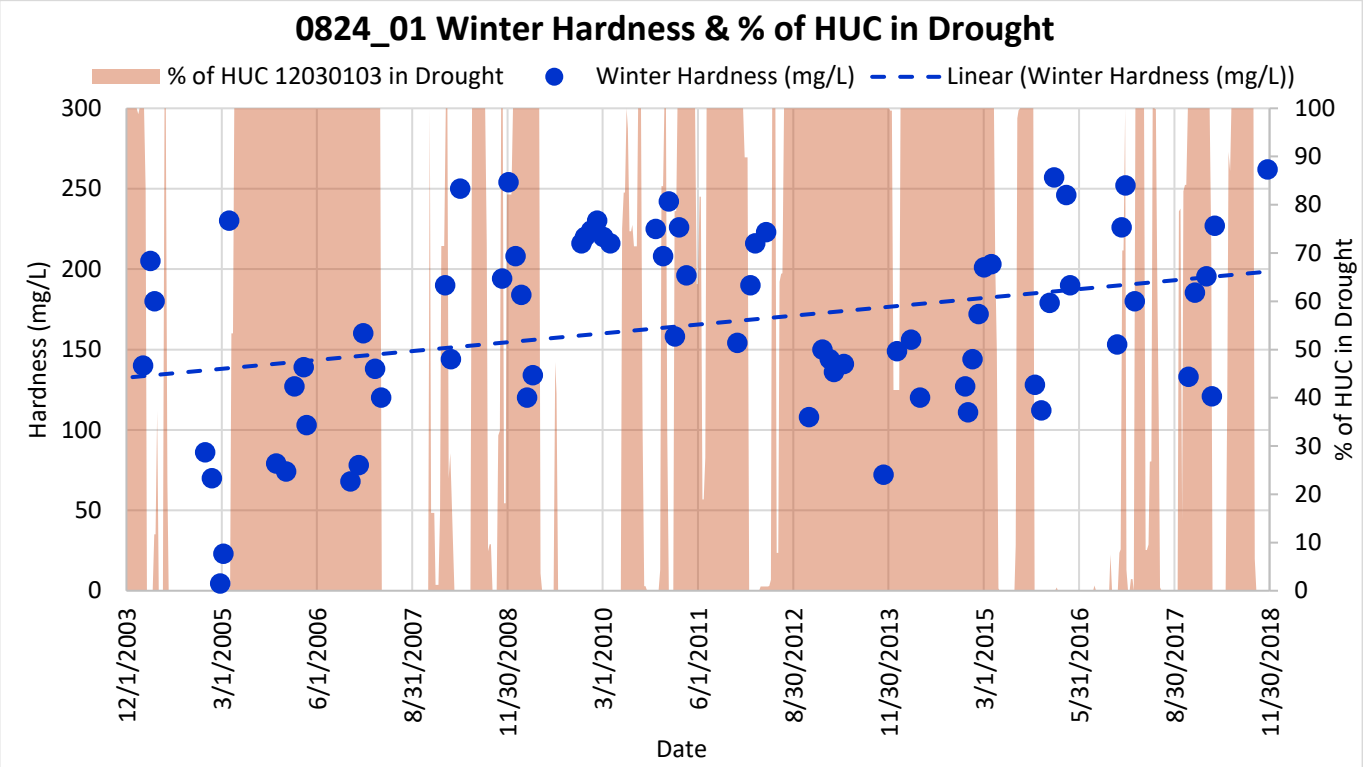


Figure 116: 0824_01 Winter Hardness & % of HUC in Drought

0840 – Ray Roberts Lake

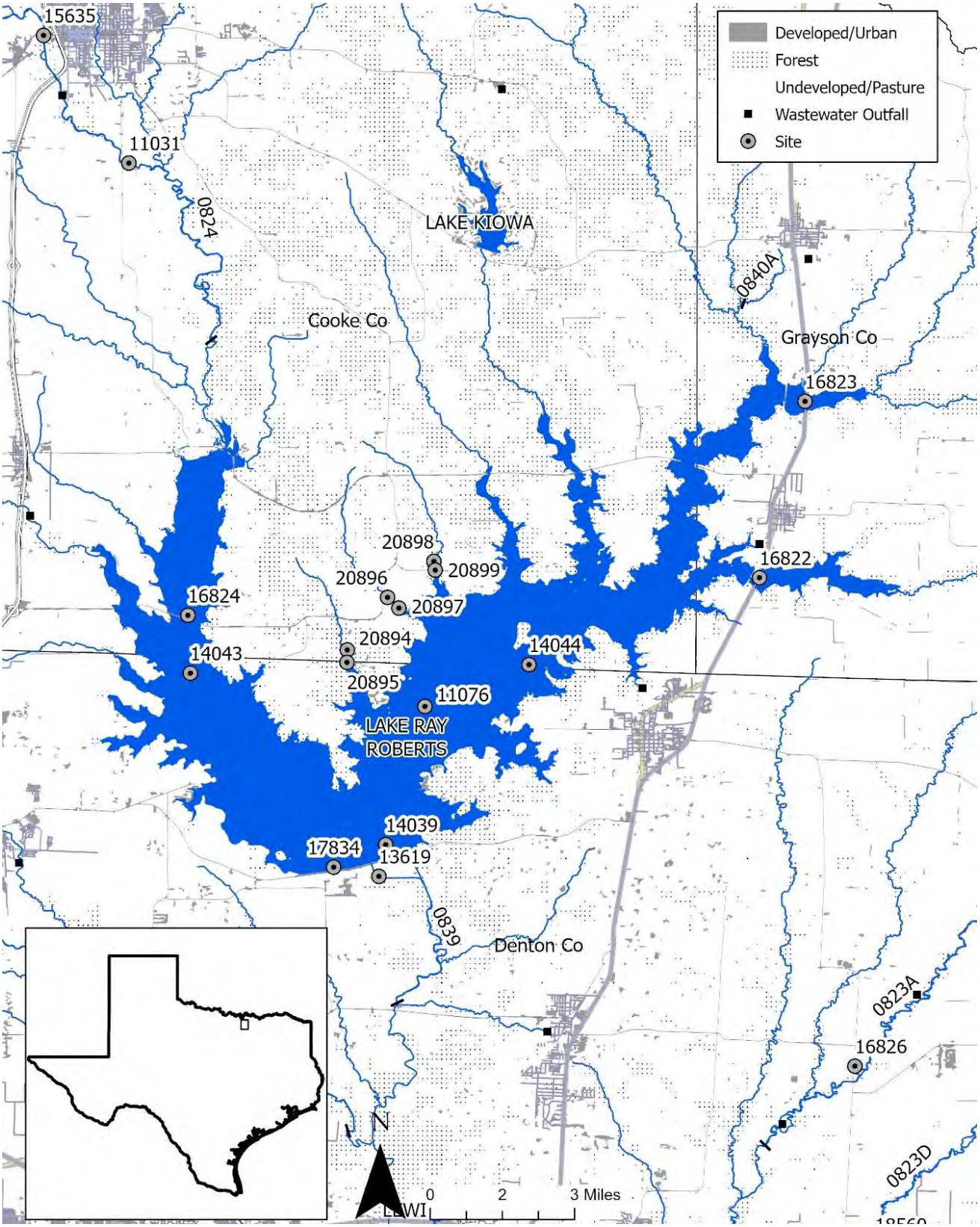


Figure 117: Segment 0840 Map

This 28,374-acre reservoir impounds the Elm Fork Trinity River from Ray Roberts Dam in Denton County to a point 5.9 miles upstream of the confluence of Pecan Creek in Cooke County up to the normal pool elevation of 632.5 feet (see Figure 117). Land use in this segment is nearly all classified as pasture and crop land. The watershed between the two arms of the reservoir has some wooded areas. The eastern portion of the watershed is in the Eastern Cross Timbers ecoregion and the western portion is in the Grand Prairie ecoregion. Ray Roberts Lake has been noted as being mesotrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at eight sites within this segment as shown in Table 76. Monitoring is being conducted by TCEQ Region 4 and the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 76: Segment 0840 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0840_01	RAY ROBERTS LAKE USGS SITE AC 98 METERS NORTH AND 1.26 KM WEST OF INTERSECTION OF FM 455 AND LAKE RAY ROBERTS ROAD	14039	TCEQ Region 4
0840_01	RAY ROBERTS LAKE AT DALLAS WATER UTILITIES INTAKE W SIDE OF DAM 1.02 KM N AND 232 METERS E OF INTERSECTION OF BURGER RD AND FM 2153 (R6)	17834	City of Dallas (collecting entity DA)
0840_02	RAY ROBERTS LAKE ISLE DU BOIS CREEK ARM WEST OF JORDAN PARK 2.84 KM N AND 599 M W OF INTERSECTION OF ISLE DU BOIS PARK RD AND QUAIL RUN (R5)	11076	City of Dallas (collecting entity DA)
0840_02	RAY ROBERTS LAKE USGS SITE EC 399 METERS NORTH AND 2.61 KM WEST OF INTERSECTION OF JACK GRAY ROAD AND ALEXANDER ROAD	14044	TCEQ Region 4
0840_03	RAY ROBERTS LAKE IN RANGE CREEK COVE AT US 377 BRIDGE 600 M SOUTH AND 57 M WEST OF INTERSECTION OF PATTON RD AND US 377 SW OF SHERMAN (R2)	16823	City of Dallas (collecting entity DA)
0840_04	RAY ROBERTS LAKE BUCK CREEK COVE AT US377 BRIDGE 1.06 KM N AND 428 M E OF INTERSECTION OF US 377 AND EMBERSON CHAPEL RD SW OF SHERMAN (R3)	16822	City of Dallas (collecting entity DA)
0840_06	RAY ROBERTS LAKE USGS SITE DC 778 METERS NORTH AND 2.42 KM WEST OF INTERSECTION OF TYSON LANE AND HEMMING ROAD	14043	TCEQ Region 4
0840_07	RAY ROBERTS LAKE AT FM 3002 377 METERS NORTH AND 1.25 KM EAST OF INTERSECTION OF FM 3002 AND MANN ROAD 13 MI SOUTH OF GAINESVILLE (R4)	16824	City of Dallas (collecting entity DA)

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 77. Results of TRA trend analyses are shown in Table 78. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and

documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 77: TCEQ 2020Texas Integrated Report Summary for Segment 0840

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0840_01 Lowermost portion of reservoir adjacent to dam	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0840_03 Upper portion of Jordan Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0840_04 Buck Creek cove	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0840_06 Middle portion of Elm Fork arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0840_07 Upper portion of Elm Fork arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0840_08 Remainder of reservoir	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0840_01 Lowermost portion of reservoir adjacent to dam	Aquatic Life Use	Acute Toxic Substances in water		FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	Aquatic Life Use	Acute Toxic Substances in water		FS
0840_03 Upper portion of Jordan Creek arm	Aquatic Life Use	Acute Toxic Substances in water		FS
0840_04 Buck Creek cove	Aquatic Life Use	Acute Toxic Substances in water		FS
0840_07 Upper portion of Elm Fork arm	Aquatic Life Use	Acute Toxic Substances in water		FS
0840_01 Lowermost portion of reservoir adjacent to dam	Aquatic Life Use	Chronic Toxic Substances in water		FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	Aquatic Life Use	Chronic Toxic Substances in water		FS
0840_03 Upper portion of Jordan Creek arm	Aquatic Life Use	Chronic Toxic Substances in water		FS
0840_04 Buck Creek cove	Aquatic Life Use	Chronic Toxic Substances in water		FS
0840_07 Upper portion of Elm Fork arm	Aquatic Life Use	Chronic Toxic Substances in water		FS
0840_01 Lowermost portion of reservoir adjacent to dam	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0840_06 Middle portion of Elm Fork arm	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	Ammonia	0.11 mg/L	NA
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	Ammonia	0.11 mg/L	NA
0840_06 Middle portion of Elm Fork arm	General Use	Ammonia	0.11 mg/L	NA
0840_07 Upper portion of Elm Fork arm	General Use	Ammonia	0.11 mg/L	NA

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	Nitrate	0.37 mg/L	NA
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	Nitrate	0.37 mg/L	NA
0840_06 Middle portion of Elm Fork arm	General Use	Nitrate	0.37 mg/L	NA
0840_07 Upper portion of Elm Fork arm	General Use	Nitrate	0.37 mg/L	NA
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	Total Phosphorus	0.2 mg/L	NA
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	Total Phosphorus	0.2 mg/L	NA
0840_06 Middle portion of Elm Fork arm	General Use	Total Phosphorus	0.2 mg/L	NA
0840_07 Upper portion of Elm Fork arm	General Use	Total Phosphorus	0.2 mg/L	NA
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0840_06 Middle portion of Elm Fork arm	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0840_07 Upper portion of Elm Fork arm	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	pH	6.5 - 9 S.U.	FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	pH	6.5 - 9 S.U.	FS
0840_03 Upper portion of Jordan Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0840_04 Buck Creek cove	General Use	pH	6.5 - 9 S.U.	FS
0840_06 Middle portion of Elm Fork arm	General Use	pH	6.5 - 9 S.U.	FS
0840_07 Upper portion of Elm Fork arm	General Use	pH	6.5 - 9 S.U.	FS
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	Chloride	80 mg/L	FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	Chloride	80 mg/L	FS
0840_03 Upper portion of Jordan Creek arm	General Use	Chloride	80 mg/L	FS
0840_04 Buck Creek cove	General Use	Chloride	80 mg/L	FS
0840_05 Lower portion of Elm Fork arm	General Use	Chloride	80 mg/L	FS
0840_06 Middle portion of Elm Fork arm	General Use	Chloride	80 mg/L	FS
0840_07 Upper portion of Elm Fork arm	General Use	Chloride	80 mg/L	FS
0840_08 Remainder of reservoir	General Use	Chloride	80 mg/L	FS
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	Sulfate	60 mg/L	FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	Sulfate	60 mg/L	FS
0840_03 Upper portion of Jordan Creek arm	General Use	Sulfate	60 mg/L	FS
0840_04 Buck Creek cove	General Use	Sulfate	60 mg/L	FS
0840_05 Lower portion of Elm Fork arm	General Use	Sulfate	60 mg/L	FS
0840_06 Middle portion of Elm Fork arm	General Use	Sulfate	60 mg/L	FS
0840_07 Upper portion of Elm Fork arm	General Use	Sulfate	60 mg/L	FS
0840_08 Remainder of reservoir	General Use	Sulfate	60 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	Total Dissolved Solids	500 mg/L	FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	Total Dissolved Solids	500 mg/L	FS
0840_03 Upper portion of Jordan Creek arm	General Use	Total Dissolved Solids	500 mg/L	FS
0840_04 Buck Creek cove	General Use	Total Dissolved Solids	500 mg/L	FS
0840_05 Lower portion of Elm Fork arm	General Use	Total Dissolved Solids	500 mg/L	FS
0840_06 Middle portion of Elm Fork arm	General Use	Total Dissolved Solids	500 mg/L	FS
0840_07 Upper portion of Elm Fork arm	General Use	Total Dissolved Solids	500 mg/L	FS
0840_08 Remainder of reservoir	General Use	Total Dissolved Solids	500 mg/L	FS
0840_01 Lowermost portion of reservoir adjacent to dam	General Use	Water temperature	32.2 °F	FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	General Use	Water temperature	32.2 °F	FS
0840_03 Upper portion of Jordan Creek arm	General Use	Water temperature	32.2 °F	FS
0840_04 Buck Creek cove	General Use	Water temperature	32.2 °F	FS
0840_06 Middle portion of Elm Fork arm	General Use	Water temperature	32.2 °F	FS
0840_07 Upper portion of Elm Fork arm	General Use	Water temperature	32.2 °F	FS
0840_01 Lowermost portion of reservoir adjacent to dam	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0840_03 Upper portion of Jordan Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0840_04 Buck Creek cove	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0840_06 Middle portion of Elm Fork arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0840_07 Upper portion of Elm Fork arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0840_01 Lowermost portion of reservoir adjacent to dam	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0840_02 Lower portion of Jordan Creek arm west of Pilot Point	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0840_03 Upper portion of Jordan Creek arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0840_04 Buck Creek cove	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0840_05 Lower portion of Elm Fork arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0840_06 Middle portion of Elm Fork arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0840_07 Upper portion of Elm Fork arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0840_08 Remainder of reservoir	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NA = Not Assessed

There were no data available in assessment unit 0840_05 for the period of record for this basin summary report. Data for assessment unit 0840_08 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 78: Significant Trends for Segment 0840 (P-value<0.1)

Segment & Assessment Unit		0840_01	0840_01	0840_02	0840_02	0840_03	0840_04	0840_06	0840_07
Site		14039	17834	11076	14044	16823	16822	14043	16824
Water Temperature	All	Not Significant	No Trend	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	No Trend
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant
	Winter	↑	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑	Not Significant
Air Temperature	All	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend	No Trend	Insufficient Data	Not Significant
	Summer	Insufficient Data	Not Significant	Not Significant	Insufficient Data	↓	Not Significant	Insufficient Data	Not Significant
	Winter	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Not Significant
Secchi Depth	All	↑	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	↑	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	↑	Insufficient Data
	Winter	↑	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	↑	Insufficient Data
Specific Conductance	All	↓	No Trend	No Trend	↓	No Trend	No Trend	↓	No Trend
	Summer	No Trend	Not Significant	↓	Not Significant	Not Significant	No Trend	↓	Not Significant
	Winter	↓	No Trend	↓	↓	↓	Not Significant	↓	No Trend
BOD	All	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend
	Summer	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend	Not Significant	Insufficient Data	↑
	Winter	Insufficient Data	No Trend	No Trend	Insufficient Data	Not Significant	No Trend	Insufficient Data	No Trend
Alkalinity	All	↓	No Trend	No Trend	Not Significant	No Trend	No Trend	↓	No Trend
	Summer	Not Significant	No Trend	No Trend	Not Significant	No Trend	Not Significant	Not Significant	No Trend
	Winter	↓	No Trend	Not Significant	↓	Not Significant	No Trend	↓	No Trend
Ammonia	All	No Trend	No Trend	Not Significant	No Trend	No Trend	Not Significant	No Trend	No Trend
	Summer	No Trend	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	No Trend	Not Significant
	Winter	No Trend	Not Significant	↑	No Trend	Not Significant	Not Significant	No Trend	Not Significant
Total Kjeldahl Nitrogen	All	Not Significant	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	↓	Insufficient Data
	Summer	Not Significant	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
	Winter	Not Significant	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
Total Phosphorus	All	Not Significant	Not Significant	No Trend	Insufficient Data	No Trend	No Trend	Insufficient Data	↓
	Summer	Not Significant	↓	No Trend	Insufficient Data	No Trend	↓	Insufficient Data	↓
	Winter	Not Significant	Not Significant	↓	Insufficient Data	No Trend	No Trend	Insufficient Data	↓
Ortho-phosphate	All	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend
	Summer	Insufficient Data	No Trend	No Trend	Insufficient Data	↓	No Trend	Insufficient Data	No Trend
	Winter	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend	Not Significant	Insufficient Data	No Trend
Total Organic Carbon	All	No Trend	No Trend	No Trend	Not Significant	No Trend	No Trend	↑	No Trend
	Summer	No Trend	No Trend	No Trend	Not Significant	No Trend	No Trend	↑	No Trend
	Winter	Not Significant	No Trend	No Trend	↑	Not Significant	Not Significant	↑	No Trend

Segment & Assessment Unit		0840_01	0840_01	0840_02	0840_02	0840_03	0840_04	0840_06	0840_07
Site		14039	17834	11076	14044	16823	16822	14043	16824
Hardness	All	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend
	Summer	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend	↓	Insufficient Data	No Trend
	Winter	Insufficient Data	↓	↓	Insufficient Data	No Trend	No Trend	Insufficient Data	No Trend
Chloride	All	↓	No Trend	↓	↓	No Trend	No Trend	↓	No Trend
	Summer	↓	No Trend	↓	↓	↓	↓	↓	No Trend
	Winter	Not Significant	↓	↓	↓	No Trend	↓	↓	No Trend
Sulfate	All	↓	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	↓	Insufficient Data
	Summer	↓	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	↓	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	↓	Insufficient Data
Dissolved Barium	All	Insufficient Data	↓		Insufficient Data	↓		Insufficient Data	↓
	Summer	Insufficient Data	↓	↓	Insufficient Data	↓		Insufficient Data	↓
	Winter	Insufficient Data	↓		Insufficient Data			Insufficient Data	↓
Dissolved Nickel	All	Insufficient Data	↓	↓	Insufficient Data	↓	↓	Insufficient Data	↓
	Summer	Insufficient Data	↓	↓	Insufficient Data			Insufficient Data	↓
	Winter	Insufficient Data	↓		Insufficient Data	↓	↓	Insufficient Data	↓
Total Dissolved Solids	All	↓	No Trend	No Trend	↓	No Trend	No Trend	↓	No Trend
	Summer	↓	No Trend	No Trend	Not Significant	No Trend	No Trend	Not Significant	No Trend
	Winter	↓	No Trend	No Trend	↓	No Trend	No Trend	↓	No Trend
Geosmin	All	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	No Trend
	Summer	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Not Significant
	Winter	Insufficient Data	↑	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

The concern for dissolved oxygen in assessment unit 0840_08 was carried forward from previous assessments. There is no current monitoring in this assessment unit. As the concern is based on the dissolved oxygen grab screening level, it is recommended that grab sample monitoring be conducted in this assessment unit to determine if the concern still exists.

Decreasing trends for alkalinity at station 14039 in assessment unit 0840_01 and for 14043 in 0840_06 appear to be due to the drought recovery in 2015 and 2016 as shown in Figure 118. Freshwater inflows likely diluted alkalinity concentrations within the reservoir.

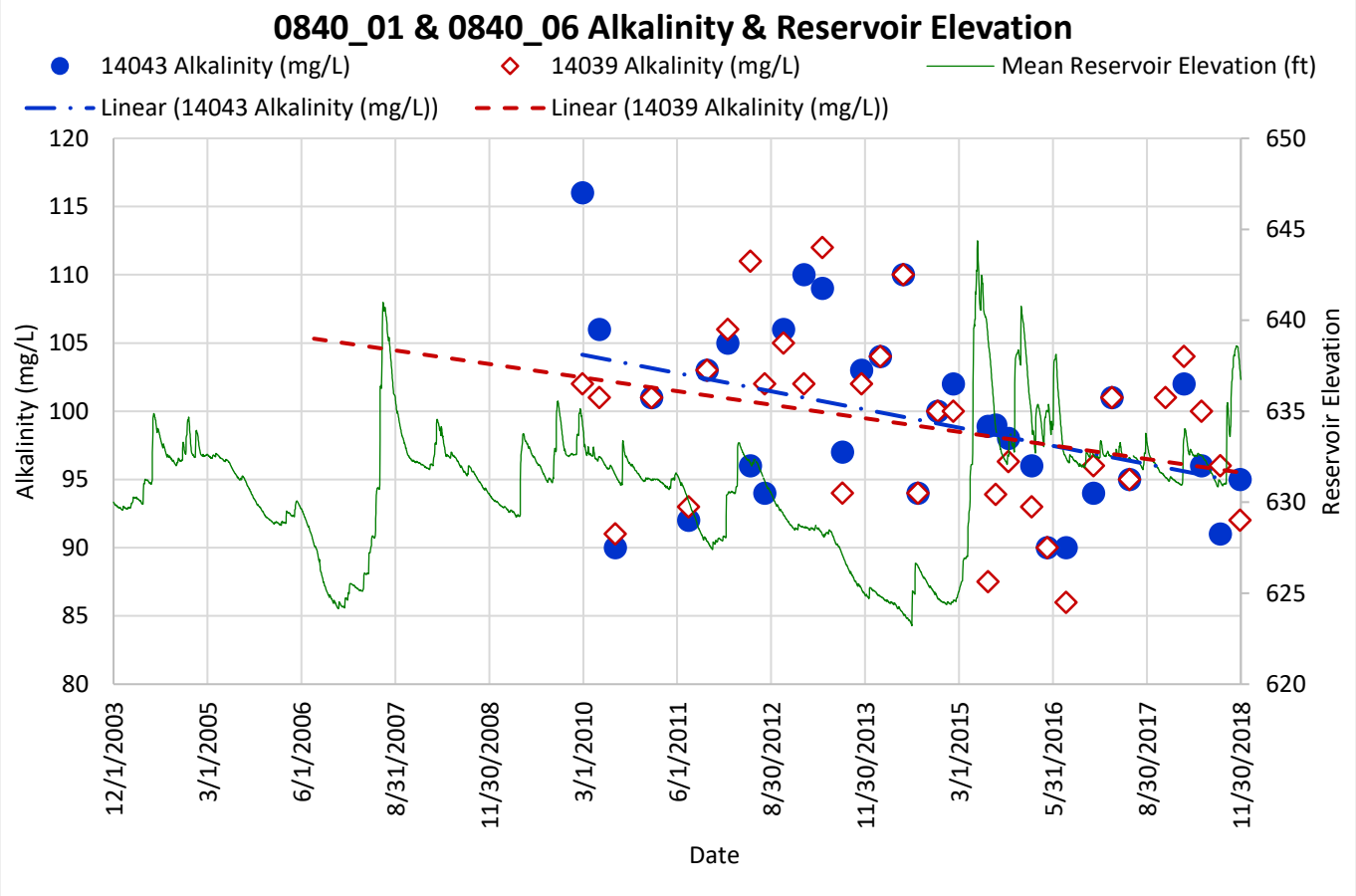


Figure 118: 0840_01 & 0840_06 Alkalinity & Reservoir Elevation

Increasing trends for total organic carbon in assessment unit 0840_06 are shown in Figure 119. Increased levels of total organic carbon are reported at the end of the data set and coincide with an increase in reservoir elevation. This is likely due to organic debris being washed into the reservoir. Review of future data will be necessary to determine if this is a true trend or an anomaly.

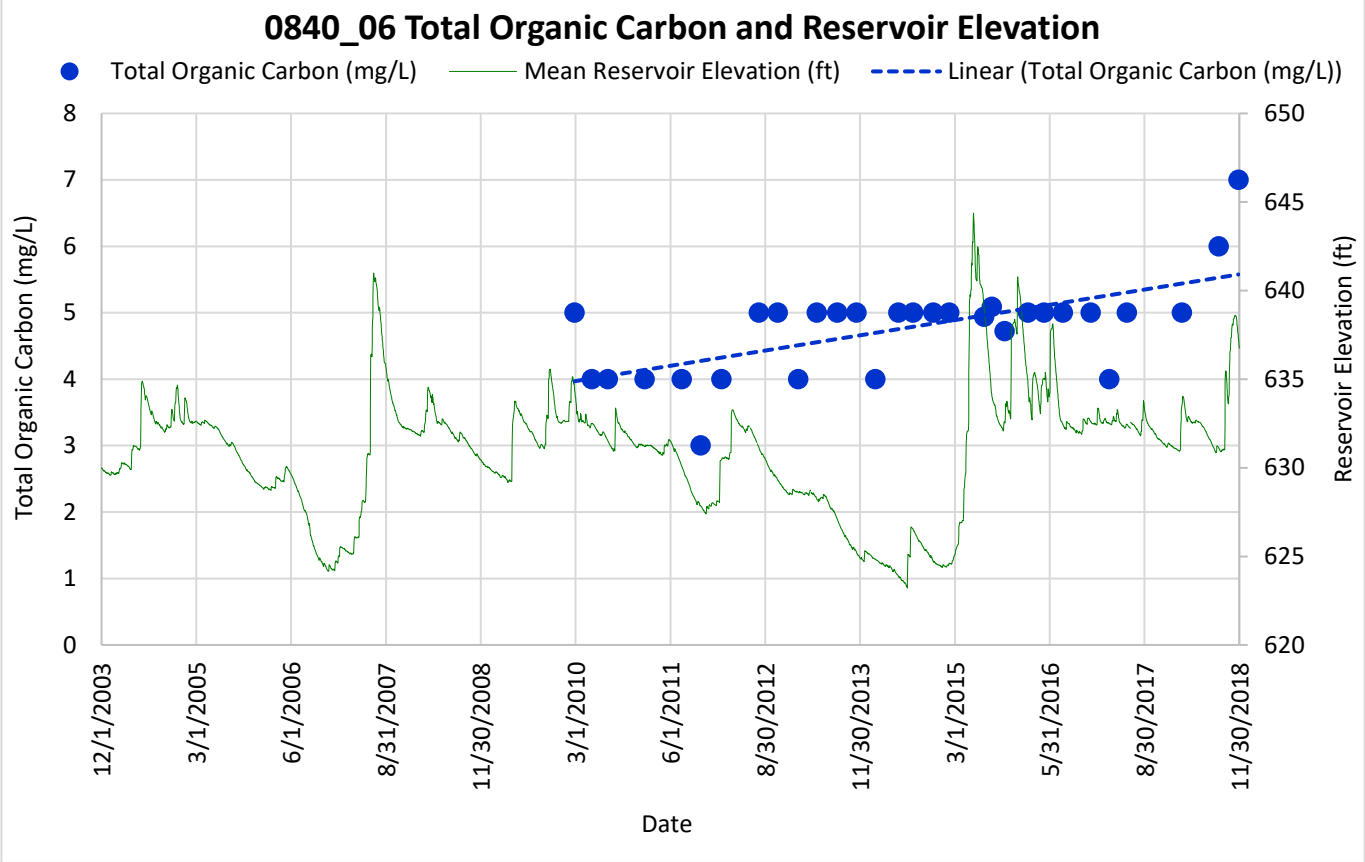


Figure 119: 0840_06 Total Organic Carbon and Reservoir Elevation

0840A – Unnamed Tributary of Jordan Creek

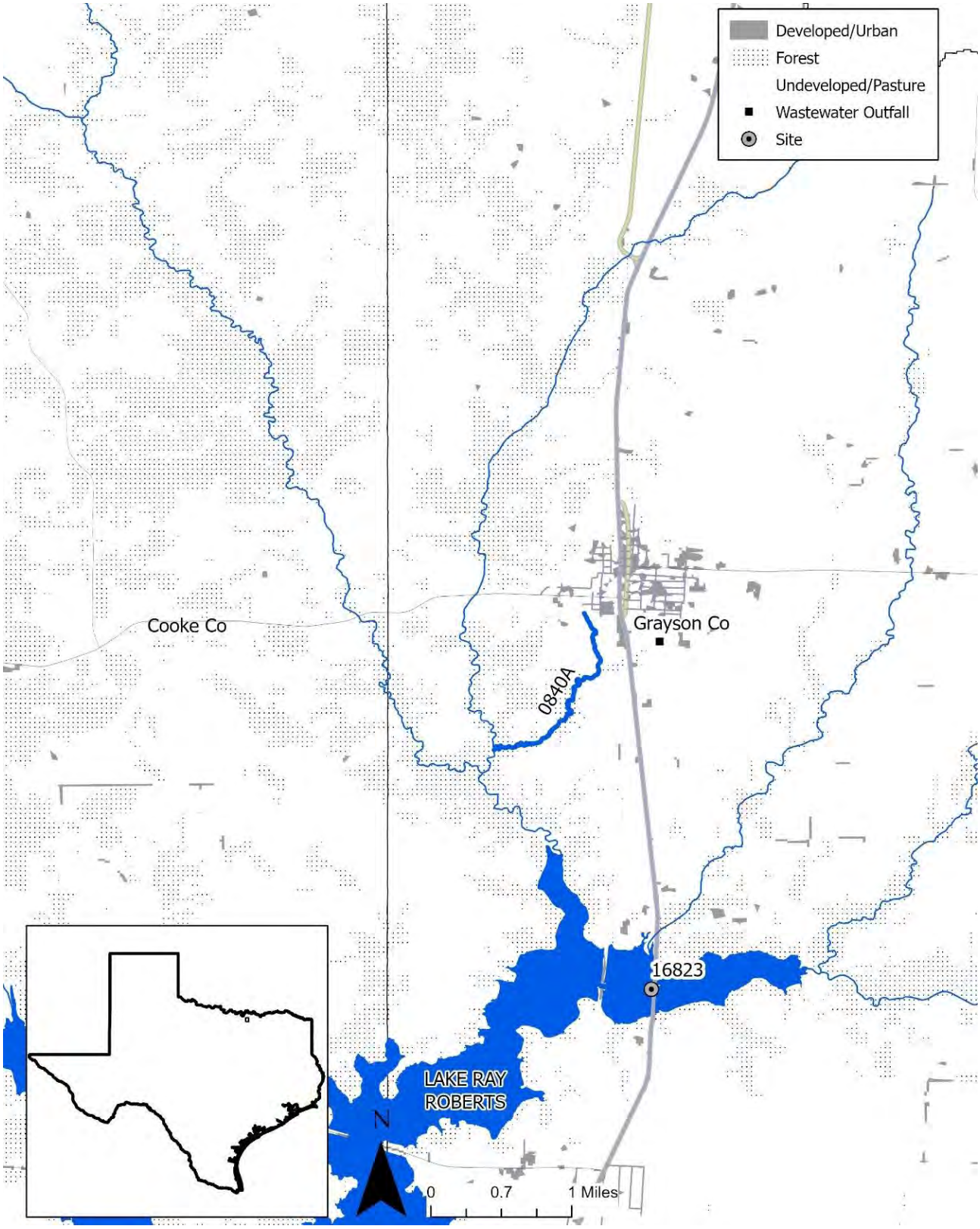


Figure 120: Segment 0840A Map

This 2.2-mile unclassified segment runs from the headwaters near South Neathery Street in Collinsville in Grayson County to the confluence with Jordan Creek south of CR 226 (see Figure 120). Land use on the northwest side of the creek is forested and pasture or hay and on the southeast side is cropland and pasture or hay. The segment flows from the Northern Blackland Prairie ecoregion and into the Eastern Cross Timbers. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0840A_01 for the period of record for this basin summary report.

0839 – Elm Fork Trinity River Below Ray Roberts Lake

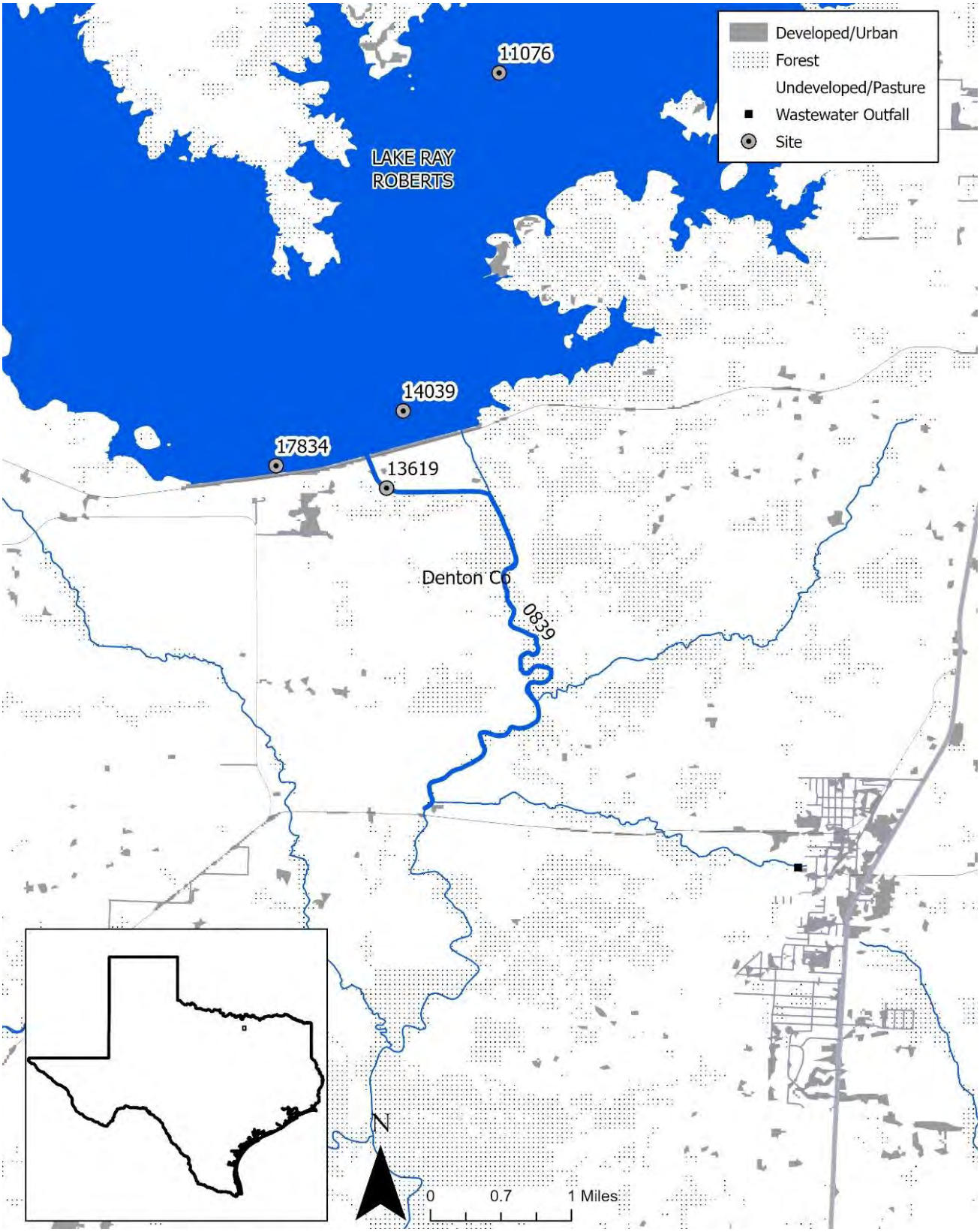


Figure 121: Segment 0839 Map

This 5.5-mile segment stretches from Ray Roberts Dam in Denton County to 110 yards upstream of US 380 in Denton County (see Figure 121). Land use in this segment is largely pasture and hay. The river flows through the Eastern Cross Timbers but drains the Grand Prairie ecoregion to the west.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 79. Monitoring is being conducted by the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 79: Segment 0839 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0839_01	ELM FORK TRINITY RIVER 336 METERS DOWNSTREAM OF RAY ROBERTS DAM 5.7 MI SW OF PILOT POINT 3.3 MI UPSTREAM FROM BRAY BRANCH (L2)	13619	City of Dallas (collecting entity DA)

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 80. Results of TRA trend analyses are shown in Table 81. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 80: TCEQ 2020 Texas Integrated Report Summary for Segment 0839

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0839_01 From a point 100 meters upstream of US 380 in Denton Co. to Ray Roberts Dam in Denton Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0839_01 From a point 100 meters upstream of US 380 in Denton Co. to Ray Roberts Dam in Denton Co.	Aquatic Life Use	Acute Toxic Substances in water		FS
0839_01 From a point 100 meters upstream of US 380 in Denton Co. to Ray Roberts Dam in Denton Co.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0839_01 From a point 100 meters upstream of US 380 in Denton Co. to Ray Roberts Dam in Denton Co.	General Use	pH	6.5 - 9 S.U.	FS
0839_01 From a point 100 meters upstream of US 380 in Denton Co. to Ray Roberts Dam in Denton Co.	General Use	Total Dissolved Solids	500 mg/L	FS
0839_01 From a point 100 meters upstream of US 380 in Denton Co. to Ray Roberts Dam in Denton Co.	General Use	Water temperature	32.2 °F	FS
0839_01 From a point 100 meters upstream of US 380 in Denton Co. to Ray Roberts Dam in Denton Co.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0839_01 From a point 100 meters upstream of US 380 in Denton Co. to Ray Roberts Dam in Denton Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting

Table 81: Significant Trends for Segment 0839 (P-value<0.1)

Segment & Assessment Unit		0839_01
Site		13619
Specific Conductance	All	No Trend
	Summer	No Trend
	Winter	↓
Total Phosphorus	All	↓
	Summer	↓
	Winter	↓
Hardness	All	↓
	Summer	Not Significant
	Winter	↓
Chloride	All	No Trend
	Summer	No Trend
	Winter	↓
Dissolved Barium	All	↓
	Summer	↓
	Winter	↓
Dissolved Nickel	All	↓
	Summer	↓
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

The monitoring station in 0839 is located just downstream from the Ray Roberts Dam. It is expected that water quality at this station would be dominated by releases from Lake Ray Roberts. During drought conditions, releases from the reservoir would decrease and therefore concentrations of many parameters downstream might also be expected to decrease. This is best illustrated by hardness as shown in Figure 122. Hardness is generally contributed by calcium and magnesium containing geology in the watershed. As reservoir levels decreased, hardness levels downstream of the dam also decreased as there was less release from the reservoir. Hardness levels began to increase toward the end of the data set as reservoir elevations began to increase after the drought of 2011 to 2015 ended.

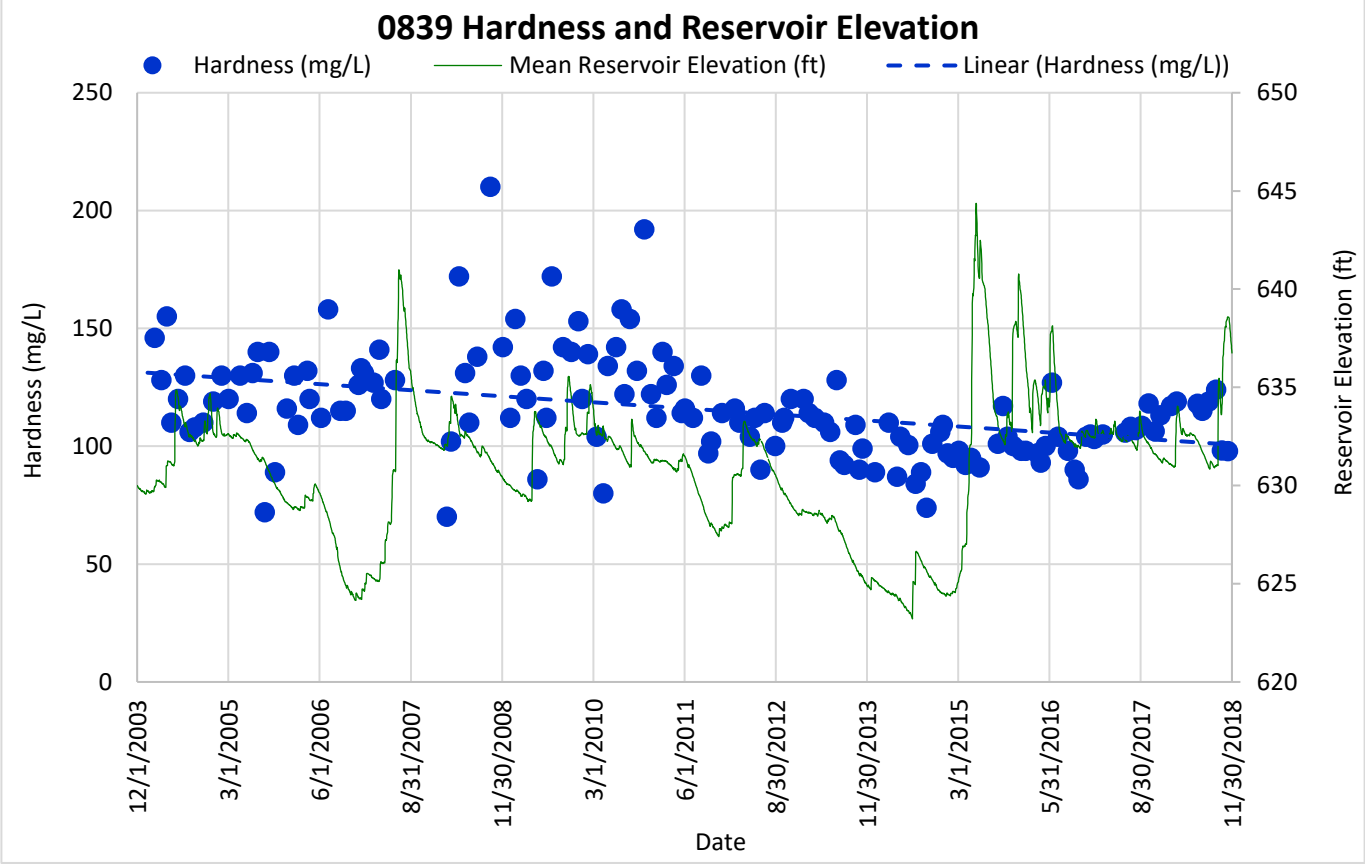


Figure 122: 0839 Hardness and Reservoir Elevation

0823 – Lewisville Lake

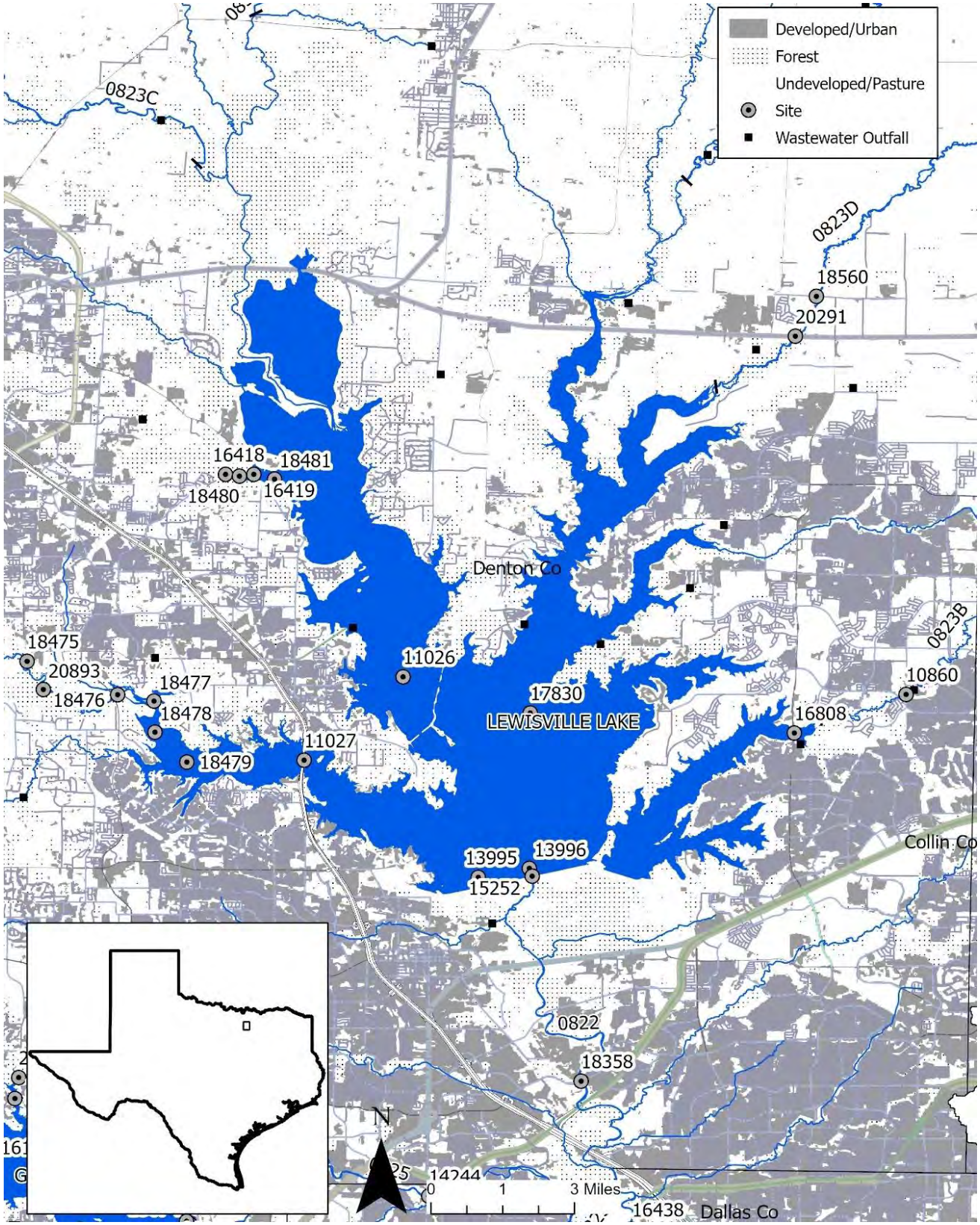


Figure 123: Segment 0823 Map

This 26,654-acre reservoir impounds the Elm Fork Trinity River from Lewisville Dam in Denton County to a point 110 yards upstream of US 380 in Denton County up to normal pool elevation of 515 feet (see Figure 123). Land use is heavily developed around most of the reservoir by the cities of Denton, Little Elm, Frisco, The Colony, and Lewisville. Between the Elm Fork and Little Elm Creek arms, land use is mostly pasture and hay land with some smaller areas of development. There is a large area of crop land to the east along the Little Elm Creek and Doe Branch drainages. The watershed drains portions of the Grand Prairie, Eastern Cross Timbers, and Northern Blackland Prairie ecoregions.

Clean Rivers Program water quality monitoring is being conducted at four sites within this segment as shown in Table 82. Monitoring is being conducted by the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 82: Segment 0823 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0823_02	LAKE LEWISVILLE IN STEWART CREEK ARM AT FM 423 BRIDGE 389 METERS NORTH OF INTERSECTION OF OVERLAKE DRIVE AND FM 423/MAIN STREET (L4)	16808	City of Dallas (collecting entity DA)
0823_03	LEWISVILLE LAKE AT I 35E IN THE HICKORY CREEK ARM 681 METERS NORTH OF INTERSECTION OF I 35E AND COPPERAS BRANCH ROAD (L7)	11027	City of Dallas (collecting entity DA)
0823_04	LEWISVILLE LAKE NEAR LITTLE ELM CREEK ARM 1.82 KM SOUTH AND 2.85 KM WEST OF INTERSECTION OF HIDDEN COVE AND HACKBERRY CREEK PARK (L6)	17830	City of Dallas (collecting entity DA)
0823_05	LEWISVILLE LAKE ELM FORK ARM 170 METERS NORTH AND 1.58 KM EAST OF INTERSECTION OF HUNDLEY AND MARINA DRIVE (L5)	11026	City of Dallas (collecting entity DA)

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 83. Results of TRA trend analyses are shown in Table 84. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 83: TCEQ 2020 Texas Integrated Report Summary for Segment 0823

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0823_02 Stewart Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0823_03 Hickory Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0823_04 Little Elm Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0823_05 Middle portion of reservoir east of Lake Dallas	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0823_02 Stewart Creek arm	Aquatic Life Use	Acute Toxic Substances in water		FS
0823_03 Hickory Creek arm	Aquatic Life Use	Acute Toxic Substances in water		FS
0823_04 Little Elm Creek arm	Aquatic Life Use	Acute Toxic Substances in water		FS
0823_05 Middle portion of reservoir east of Lake Dallas	Aquatic Life Use	Acute Toxic Substances in water		FS
0823_02 Stewart Creek arm	Aquatic Life Use	Chronic Toxic Substances in water		FS
0823_03 Hickory Creek arm	Aquatic Life Use	Chronic Toxic Substances in water		FS
0823_04 Little Elm Creek arm	Aquatic Life Use	Chronic Toxic Substances in water		FS
0823_05 Middle portion of reservoir east of Lake Dallas	Aquatic Life Use	Chronic Toxic Substances in water		FS
0823_01 Lowermost portion of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NA
0823_02 Stewart Creek arm	General Use	Nutrient Reservoir Narrative Criteria		NA
0823_03 Hickory Creek arm	General Use	Nutrient Reservoir Narrative Criteria		NA
0823_04 Little Elm Creek arm	General Use	Nutrient Reservoir Narrative Criteria		NA
0823_05 Middle portion of reservoir east of Lake Dallas	General Use	Nutrient Reservoir Narrative Criteria		NA
0823_06 Remainder of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NA
0823_02 Stewart Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0823_03 Hickory Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0823_04 Little Elm Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0823_05 Middle portion of reservoir east of Lake Dallas	General Use	pH	6.5 - 9 S.U.	FS
0823_01 Lowermost portion of reservoir	General Use	Total Dissolved Solids	500 mg/L	FS
0823_02 Stewart Creek arm	General Use	Total Dissolved Solids	500 mg/L	FS
0823_03 Hickory Creek arm	General Use	Total Dissolved Solids	500 mg/L	FS
0823_04 Little Elm Creek arm	General Use	Total Dissolved Solids	500 mg/L	FS
0823_05 Middle portion of reservoir east of Lake Dallas	General Use	Total Dissolved Solids	500 mg/L	FS
0823_06 Remainder of reservoir	General Use	Total Dissolved Solids	500 mg/L	FS
0823_02 Stewart Creek arm	General Use	Water temperature	32.2 °F	FS
0823_03 Hickory Creek arm	General Use	Water temperature	32.2 °F	FS
0823_04 Little Elm Creek arm	General Use	Water temperature	32.2 °F	FS
0823_05 Middle portion of reservoir east of Lake Dallas	General Use	Water temperature	32.2 °F	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0823_02 Stewart Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0823_03 Hickory Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0823_04 Little Elm Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0823_05 Middle portion of reservoir east of Lake Dallas	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0823_01 Lowermost portion of reservoir	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0823_02 Stewart Creek arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0823_03 Hickory Creek arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0823_04 Little Elm Creek arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0823_05 Middle portion of reservoir east of Lake Dallas	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0823_06 Remainder of reservoir	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NA = Not Assessed

Data for assessment units 0823_01 and 0823_06 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 84: Significant Trends for Segment 0823 (P-value<0.1)

Segment & Assessment Unit		0823_02	0823_03	0823_04	0823_05
Site		16808	11027	17830	11026
Biochemical Oxygen Demand	All	No Trend	No Trend	No Trend	No Trend
	Summer	No Trend	↑	Not Significant	Not Significant
	Winter	No Trend	No Trend	No Trend	Not Significant
Ammonia	All	↓	No Trend	No Trend	Not Significant
	Summer	No Trend	Not Significant	Not Significant	Not Significant
	Winter	↓	Not Significant	Not Significant	No Trend
Total Phosphorus	All	No Trend	↓	↓	No Trend
	Summer	Not Significant	↓	↓	No Trend
	Winter	↓	Not Significant	↓	No Trend
Hardness	All	Not Significant	No Trend	No Trend	No Trend
	Summer	No Trend	No Trend	Not Significant	↓
	Winter	Not Significant	No Trend	No Trend	No Trend
Chloride	All	No Trend	Not Significant	No Trend	Not Significant
	Summer	Not Significant	↓	Not Significant	↓
	Winter	Not Significant	Not Significant	No Trend	Not Significant
Dissolved Barium	All	↑	Not Significant	Not Significant	Not Significant

Segment & Assessment Unit		0823_02	0823_03	0823_04	0823_05
Site		16808	11027	17830	11026
	Summer	↑	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant
Dissolved Nickel	All	↓	No Trend	↓	↓
	Summer	Not Significant	↓	↓	↓
	Winter	↓	No Trend	↓	↓
Dissolved Zinc	All	↓	No Trend	No Trend	No Trend
	Summer	Not Significant	Not Significant	Not Significant	No Trend
	Winter	Not Significant	Not Significant	No Trend	Not Significant
E. coli	All	No Trend	Insufficient Data	Insufficient Data	↑
	Summer	Not Significant	Insufficient Data	Insufficient Data	Not Significant
	Winter	Not Significant	Insufficient Data	Insufficient Data	↑
Geosmin	All	Insufficient Data	↑	↑	Not Significant
	Summer	Insufficient Data	No Trend	Not Significant	↑
	Winter	Insufficient Data	↑	↑	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

The increasing trend for biochemical oxygen demand in assessment unit appears to be as a result of the drought of 2011 to 2015 as shown in Figure 124. Biochemical oxygen demand levels increased during the drought and began to return to pre-drought levels in late 2015. The increases may have been due to either concentration of organic materials due to evaporation or from the reservoir becoming more dominated by wastewater effluent as the amount of diluting precipitation decreased over the drought years.

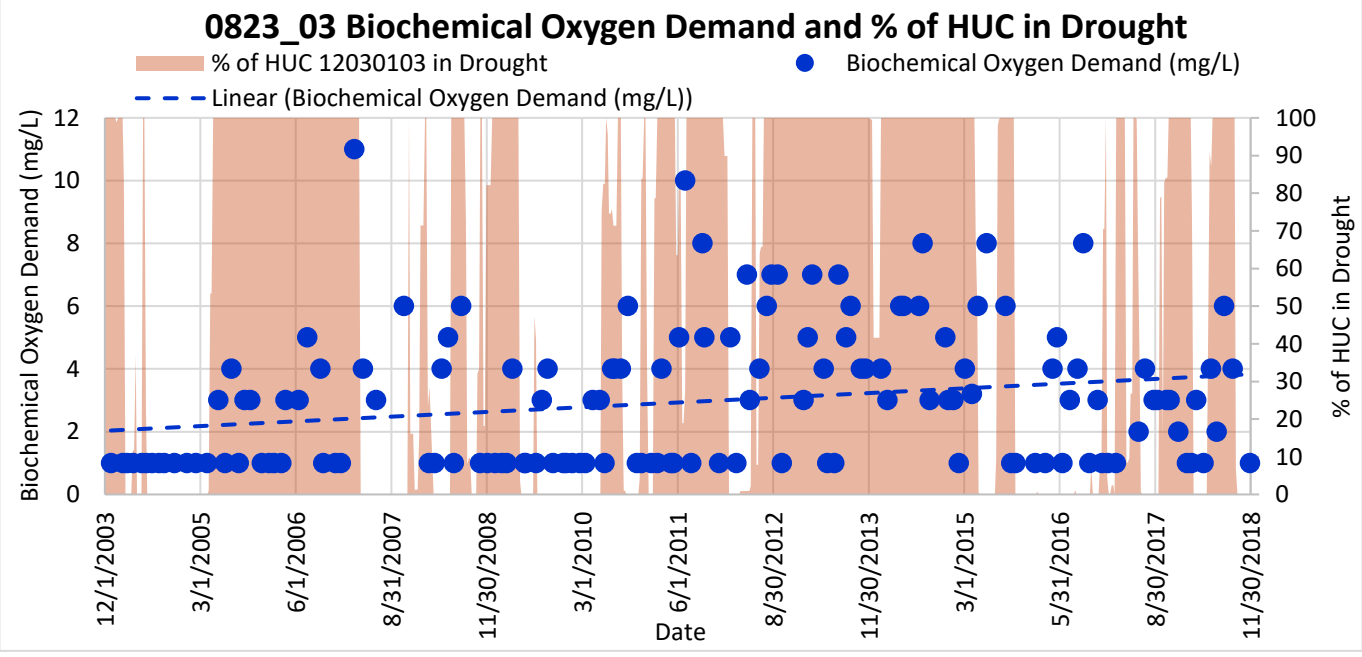


Figure 124: 0823_03 Biochemical Oxygen Demand and % of HUC in Drought

Dissolved barium in assessment unit 0823_02 tracked well with reservoir elevation (see Figure 125). This indicates that there is a source in the watershed that may be contributing barium to the reservoir. As the monitoring station in this portion of the reservoir is high in the Stewart Creek arm, it is presumed that the source is located in the Stewart Creek watershed. Sources of barium can include mineral deposits, natural gas drilling, and some industrial processes. As the Stewart Creek watershed is mostly residential, sources of barium are not immediately obvious. There is an industrial facility near the stream south of Frisco. It is recommended that sampling be conducted upstream and downstream of this facility and along the stream to determine if it is the source of barium or if it is naturally occurring in the geology of the watershed.

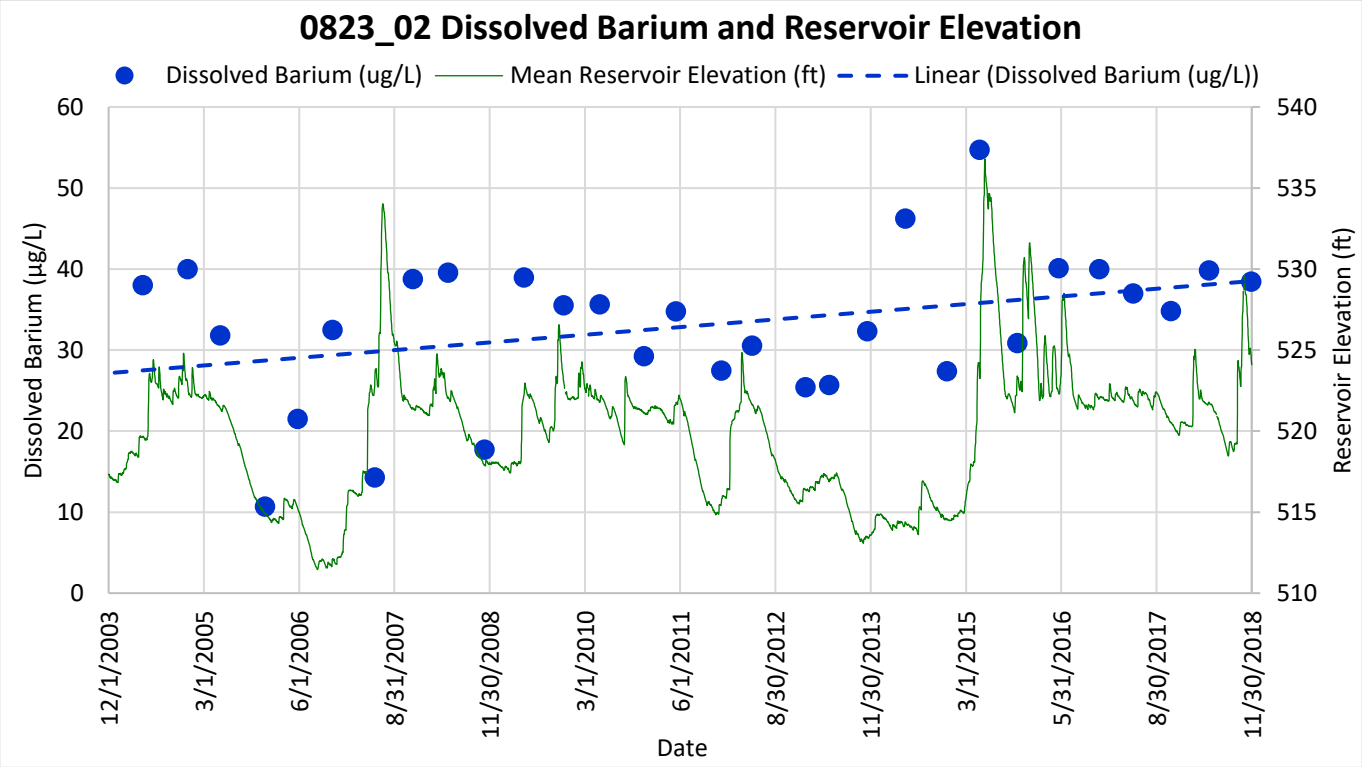


Figure 125: 0823_02 Dissolved Barium and Reservoir Elevation

Increasing trends for geosmin – a compound released during the decay of some algal species that causes taste and odor issues in drinking water – were found in several portions of the reservoir. These trends coincided with non-significant trends in phytoplankton density and with drought periods. This indicates that these trends were being influenced by algal blooms that occurred during these periods when freshwater inflows were low and concentrations of nutrients were elevated.

Increasing trends for *E. coli* were identified in assessment unit 0823_05. The sampling station for this assessment unit is located in middle of the lake toward the lower end of the assessment unit. Although very low, it is concerning that *E. coli* levels began increasing during the drought of 2011 to 2015 and generally remained elevated after the drought ended as shown in Figure 126. This indicates that there may have been some infrastructure failure that occurred during the drought that continued after reservoir elevations recovered. Infrastructure failures have been

observed in other areas during drought periods when ground shifting is common. This could include things like broken sewer lines and damaged or leaking septic systems. It is recommended that bacteria sampling be conducted in near shore areas and coves around this assessment unit to determine if sources of bacteria remain and can be identified.

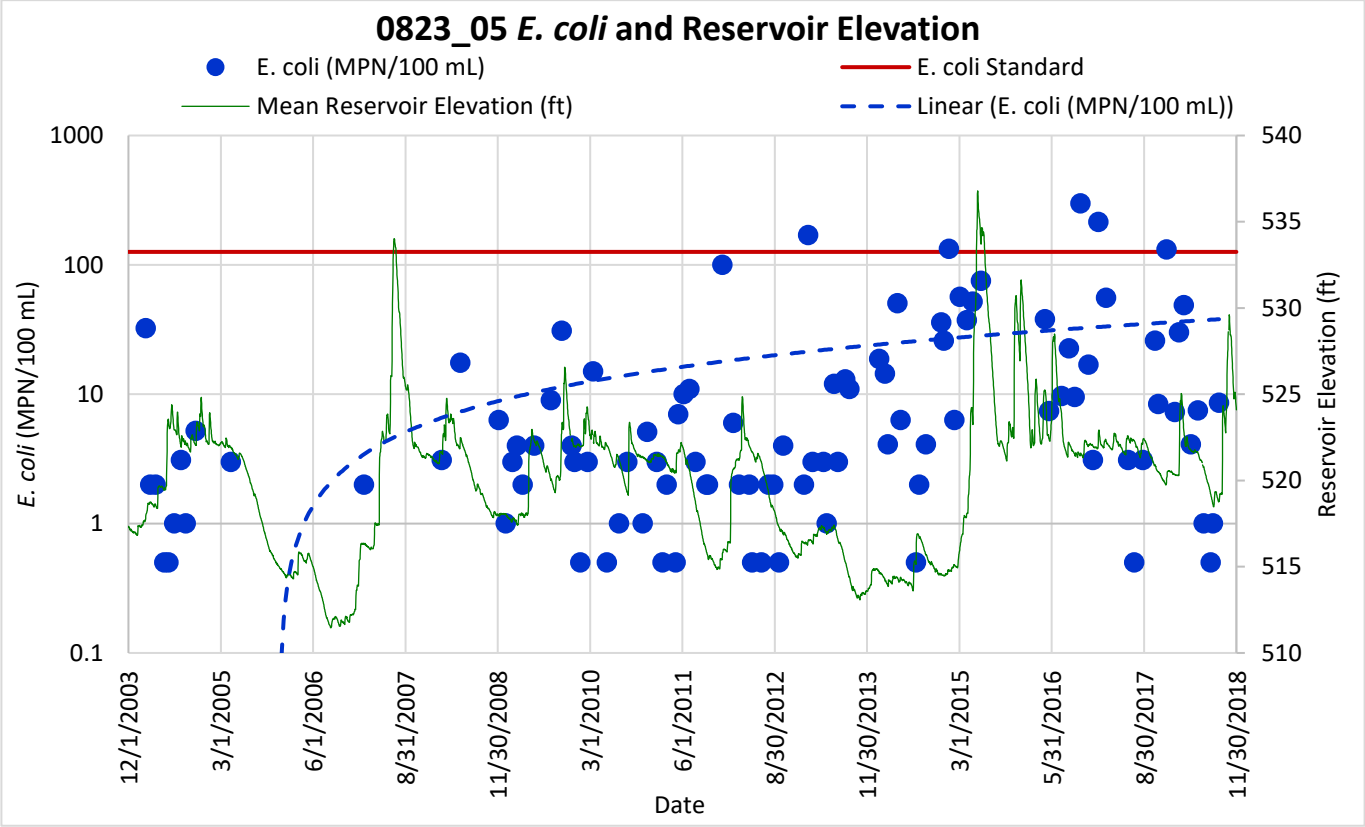


Figure 126: 0823_05 E. coli and Reservoir Elevation

0823C – Clear Creek

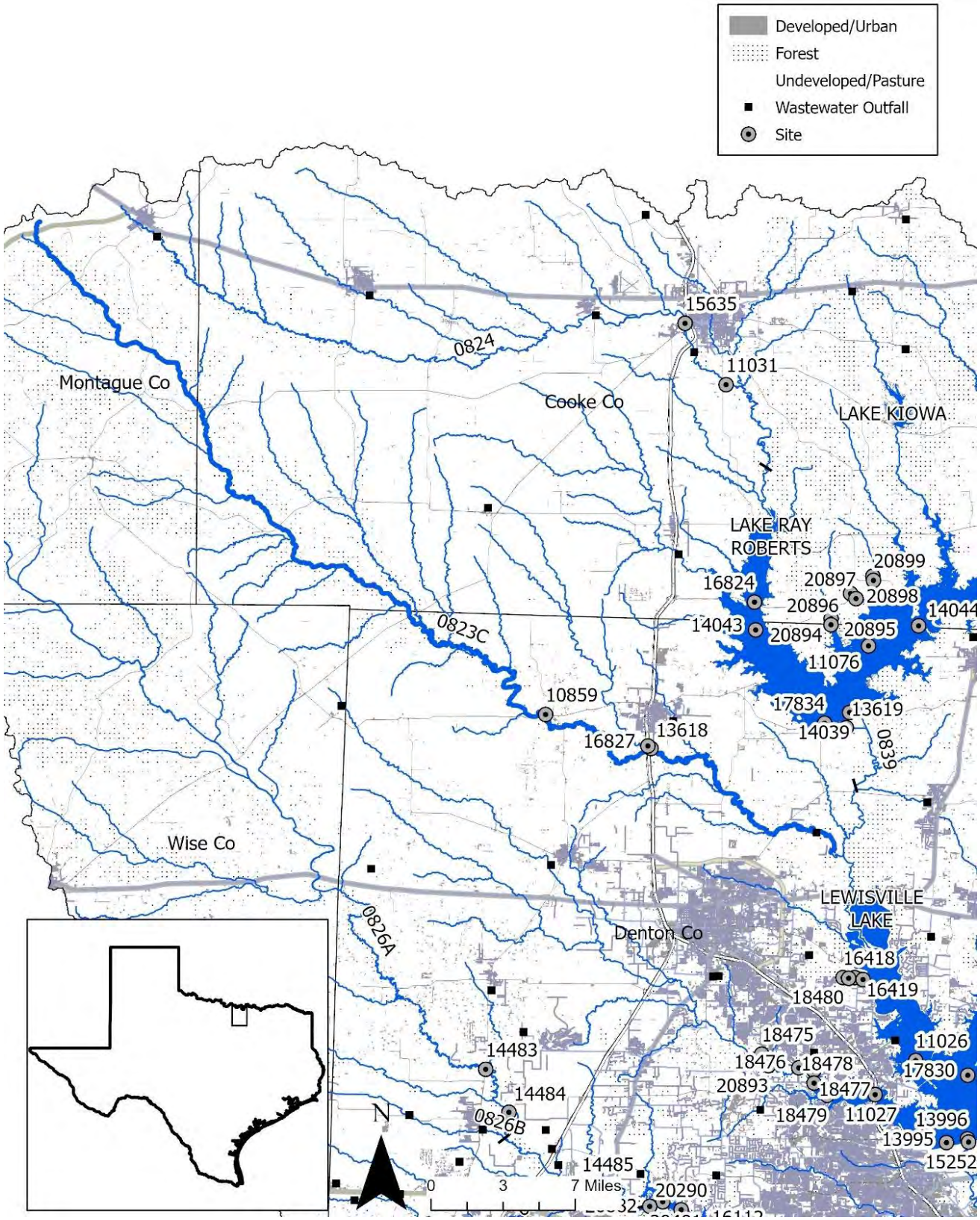


Figure 127: Segment 0823C Map

This 68.4-mile unclassified segment runs from the headwaters west of Montague in Montague County to the confluence with Lake Lewisville in Denton County (see Figure 127). Much of this watershed is grassland. There are pockets of pasture and hay and crop lands directly adjacent to the stream. The upper half of the segment flows through the Western Cross Timbers while the lower half flows through the Grand Prairie ecoregion. A small stretch of the creek flows through the Eastern Cross Timbers before entering Lewisville Lake.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 85. Monitoring is being conducted by TCEQ Region 4 and the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 85: Segment 0823C FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0823C_01	CLEAR CREEK 80 METERS UPSTREAM OF FM 455 WEST OF SANGER	10859	TCEQ Region 4
0823C_01	CLEAR CREEK AT I 35 WEST OF US 377 APPROX 24.7 KM UPSTREAM OF LEWISVILLE LAKE SOUTH OF SANGER (L1)	16827	City of Dallas (collecting entity DA)

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 86. Results of TRA trend analyses are shown in Table 87. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 86: TCEQ 2020 Texas Integrated Report Summary for Segment 0823C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0823C_01 Lower 25 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0823C_01 Lower 25 mi of segment	Aquatic Life Use	Acute Toxic Substances in water		FS
0823C_01 Lower 25 mi of segment	Aquatic Life Use	Chronic Toxic Substances in water		FS
0823C_01 Lower 25 mi of segment	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0823C_01 Lower 25 mi of segment	General Use	Ammonia	0.33 mg/L	NC
0823C_01 Lower 25 mi of segment	General Use	Nitrate	1.95 mg/L	NC
0823C_01 Lower 25 mi of segment	General Use	Total Phosphorus	0.69 mg/L	NC
0823C_01 Lower 25 mi of segment	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0823C_01 Lower 25 mi of segment	Fish Consumption Use	HH Bioaccumulative Toxics in water		NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment unit 0823C_02 for the period of record for this basin summary report.

Table 87: Significant Trends for Segment 0823C (P-value<0.1)

Segment & Assessment Unit		0823C_01	0823C_01	0823C_01
Site		10859	13618	16827
Flow	All	No Trend	Not Significant	Insufficient Data
	Summer	No Trend	Not Significant	Insufficient Data
	Winter	No Trend	↑*	Insufficient Data
Secchi Depth	All	Not Significant	Insufficient Data	Insufficient Data
	Summer	↓	Insufficient Data	Insufficient Data
	Winter	Not Significant	Insufficient Data	Insufficient Data
Alkalinity	All		Insufficient Data	No Trend
	Summer		Insufficient Data	↑
	Winter	Not Significant	Insufficient Data	No Trend
Total Phosphorus	All	↑	Insufficient Data	Not Significant
	Summer	↑	Insufficient Data	↓
	Winter	↑	Insufficient Data	Not Significant
Total Organic Carbon	All	Not Significant	Insufficient Data	Not Significant
	Summer	↑	Insufficient Data	Not Significant
	Winter	Not Significant	Insufficient Data	Not Significant
Dissolved Nickel	All	Insufficient Data	Insufficient Data	↓
	Summer	Insufficient Data	Insufficient Data	↓
	Winter	Insufficient Data	Insufficient Data	↓
Total Dissolved Solids	All	No Trend	Insufficient Data	No Trend
	Summer	↓	Insufficient Data	No Trend
	Winter	Not Significant	Insufficient Data	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The impairment for *E. coli* in this segment appears to have been related to run-off. *E. coli* levels are fairly well correlated to flow with the correlation coefficient at the upstream station 10859 being 0.689 and 0.477 at the downstream station 16827. As shown in Figure 128, *E. coli* levels at the downstream station 16827 were slightly higher that at the upstream station 10859. There are several pastures and areas with evidence of livestock trails upstream of these stations. There are also several forested areas adjacent to the stream. Therefore, livestock and wildlife are the most likely sources of bacteria in this segment. Landowner education and livestock best management practices may help reduce *E. coli* levels.

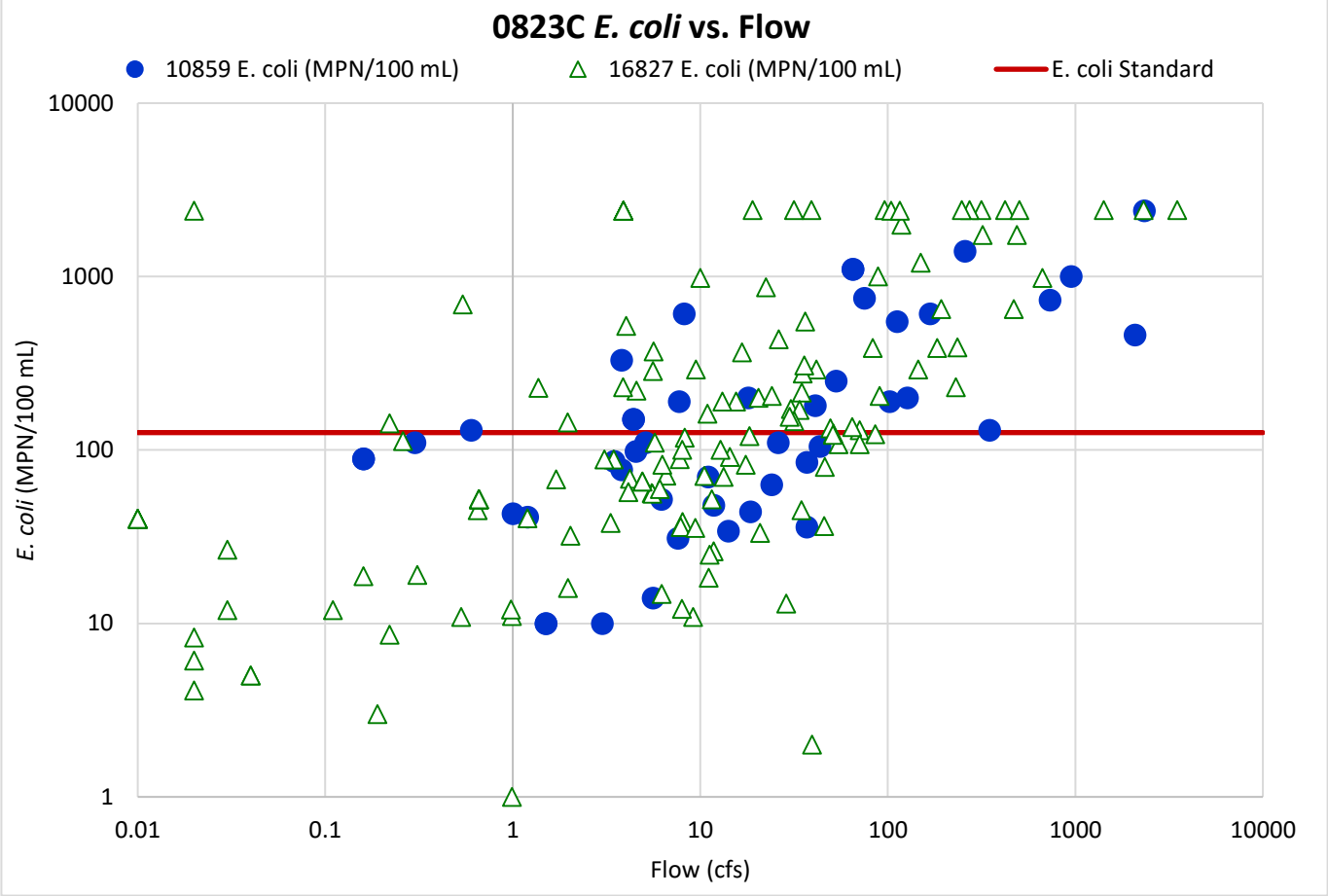


Figure 128: 0823C E. coli vs. Flow

Increasing trends for total phosphorus at station 10859 appear to be false trends introduced by censoring of non-detect data rather than actual changes in water quality. As previously discussed, non-detect data were censored to one half of the lowest non-detect value in the database for each parameter. While this can introduce false trends, it also makes false trends easier to see when graphing the data. For this station, the detection limit changed from 0.06 mg/L to 0.02 mg/L over the course of the period of record. Out of 49 data points, 18 values were reported at levels above 0.06 mg/L, eight were reported between 0.02 and 0.06 mg/L, and the remaining 21 were reported at either <0.02 or <0.06 mg/L.

The increasing summer trend for total organic carbon at station 10859 may have been due to both flow and algal growth. Summer total organic carbon values were fairly well correlated to flow (correlation coefficient = 0.574) which indicates that organic debris or other organic constituents are being washed into the stream during summer storms. However, as shown in Figure 129, higher total organic carbon concentrations were being reported during drought conditions which indicates that run-off may not have been the only factor influencing the trend. It is likely that algal populations may have been contributing to this trend as the correlation coefficient between total organic carbon and chlorophyll-*a* was 0.607. It does not appear that algal populations were negatively affecting water quality; only two dissolved oxygen readings at this station were reported below 5 mg/L and none were reported below 3 mg/L.

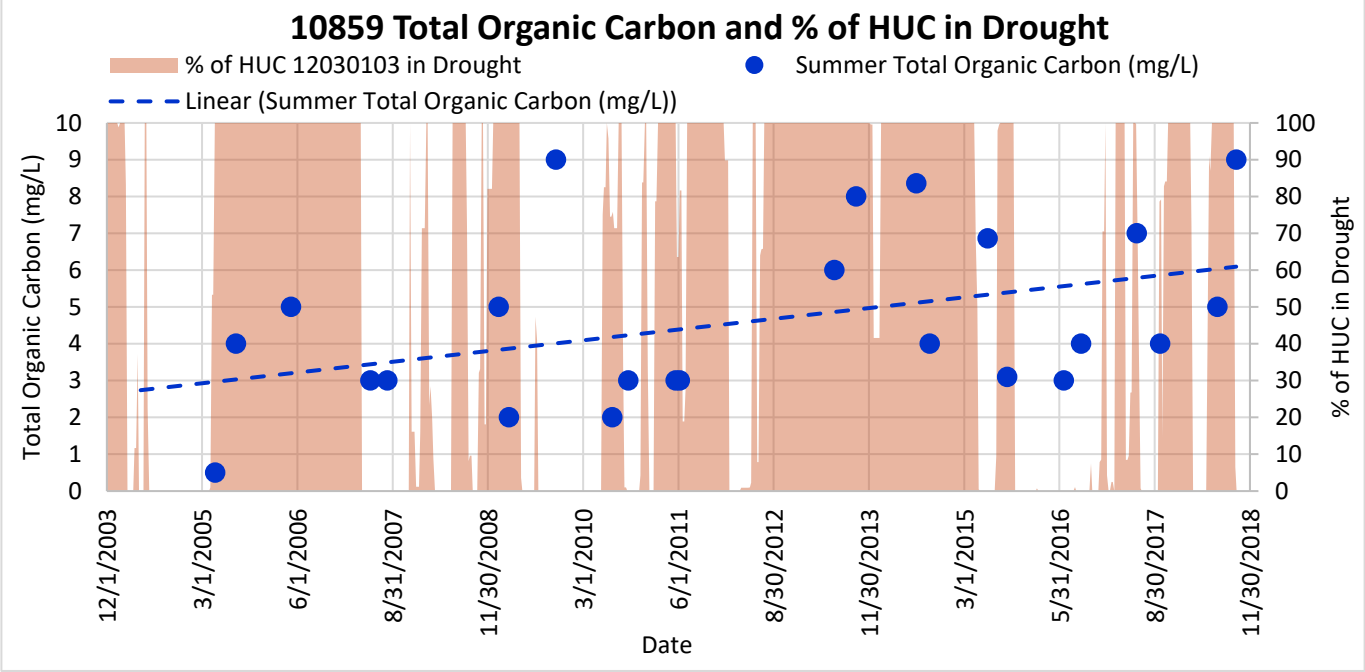


Figure 129: 10859 Total Organic Carbon and % of HUC in Drought

0823A – Little Elm Creek

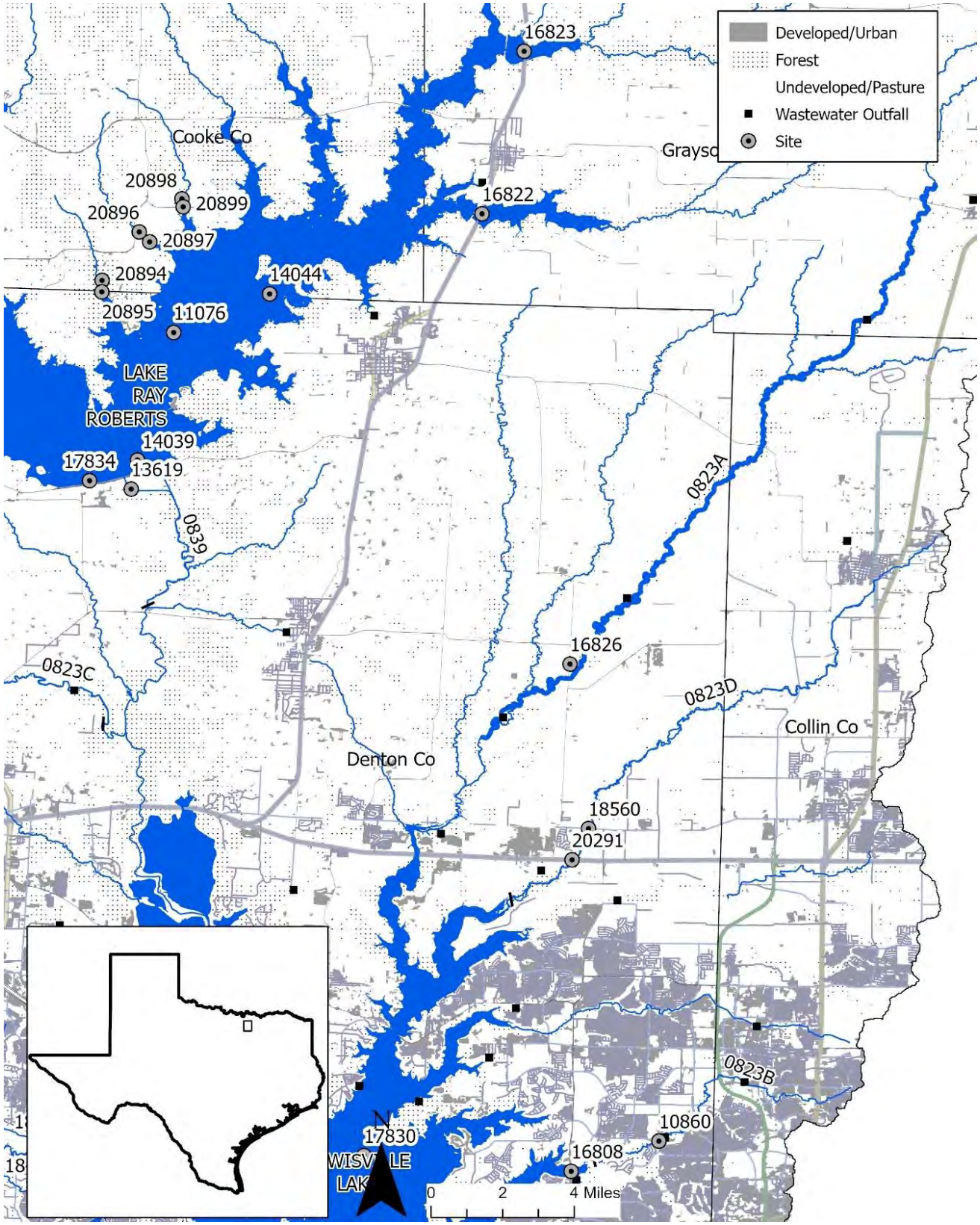


Figure 130: Segment 0823A Map

This 24.8-mile unclassified segment runs from 1.4 km above FM 453 in Collin County to the confluence with Lake Lewisville in Denton County (see Figure 130). Land use in this watershed is mainly pasture and hay and crop land. The watershed lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 88. Results of TRA trend analyses are shown in Table 89. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 88: TCEQ 2020 Texas Integrated Report Summary for Segment 0823A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0823A_01 From the confluence with Lake Lewisville in Denton Co., up to FM 455 in Collin Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0823A_01 From the confluence with Lake Lewisville in Denton Co., up to FM 455 in Collin Co.	Aquatic Life Use	Acute Toxic Substances in water		FS
0823A_01 From the confluence with Lake Lewisville in Denton Co., up to FM 455 in Collin Co.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0823A_01 From the confluence with Lake Lewisville in Denton Co., up to FM 455 in Collin Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		NC

FS = Fully Supporting NC = No Concern

There were no data available in assessment unit 0823A_02 for the period of record for this basin summary report.

Table 89: Significant Trends for Segment 0823A (P-value<0.1)

Segment & Assessment Unit		0823A_01
Site		16826
Air Temperature	All	Not Significant
	Summer	Not Significant
	Winter	↓
Flow	All	↓*
	Summer	Not Significant
	Winter	↑*
Dissolved Oxygen	All	No Trend
	Summer	↑
	Winter	Not Significant
pH	All	No Trend
	Summer	↑
	Winter	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Increasing summer trends for dissolved oxygen and pH were identified during data analysis. There is not enough information to fully address these trends. Sampling was discontinued in 2015 due to safety concerns at the monitoring station and there are no chlorophyll-*a* data available to determine if algal populations were affecting these parameters. However, because levels of these parameters were increasing through the drought of 2011 to 2015 as shown in Figure 131, it could be presumed that algal populations were increasing when flows were low and there was increased residence time in the stream. This has been observed in other waterbodies during the drought.

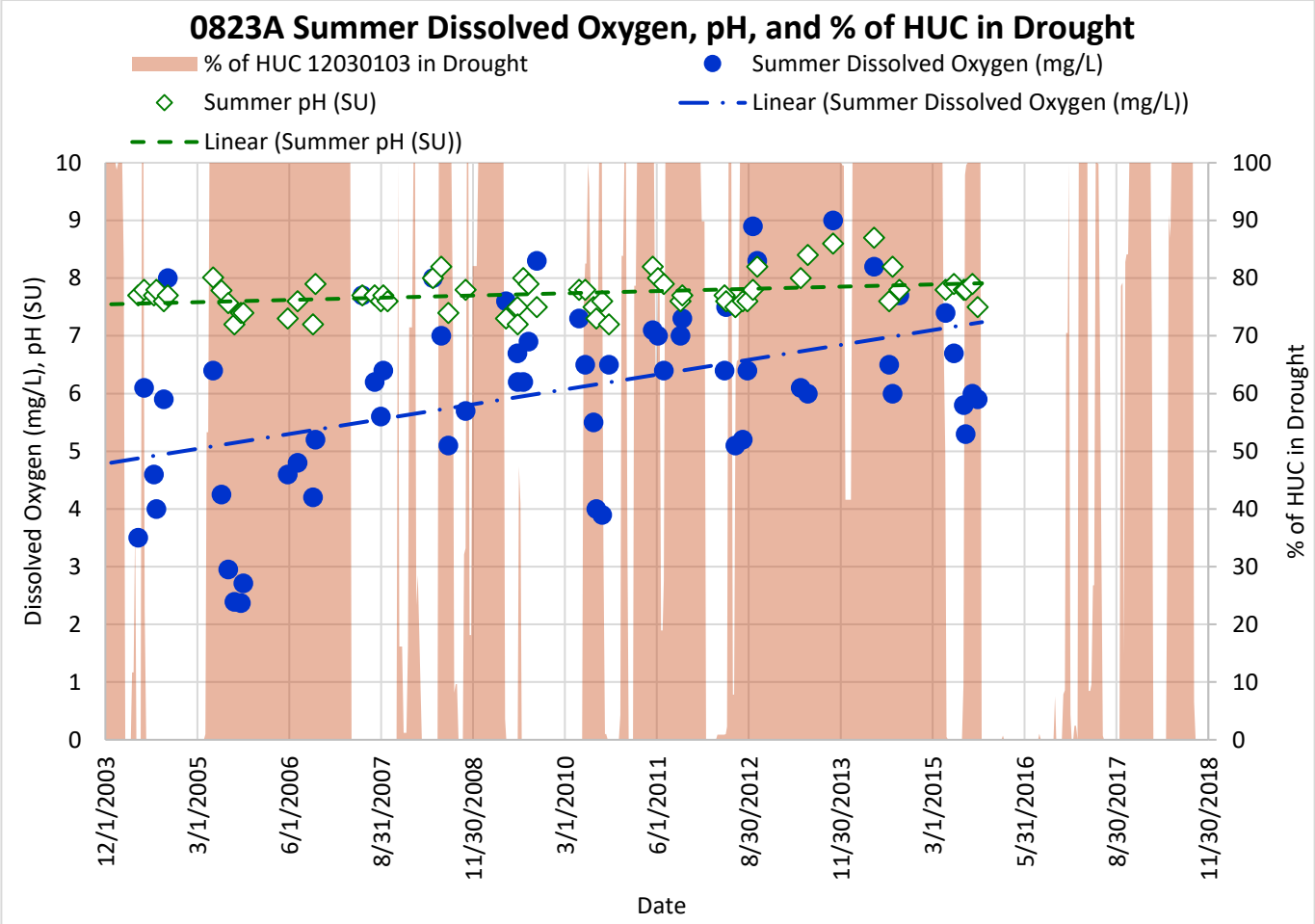


Figure 131: 0823A Summer dissolved oxygen, pH, and % of HUC in Drought

0823D – Doe Branch

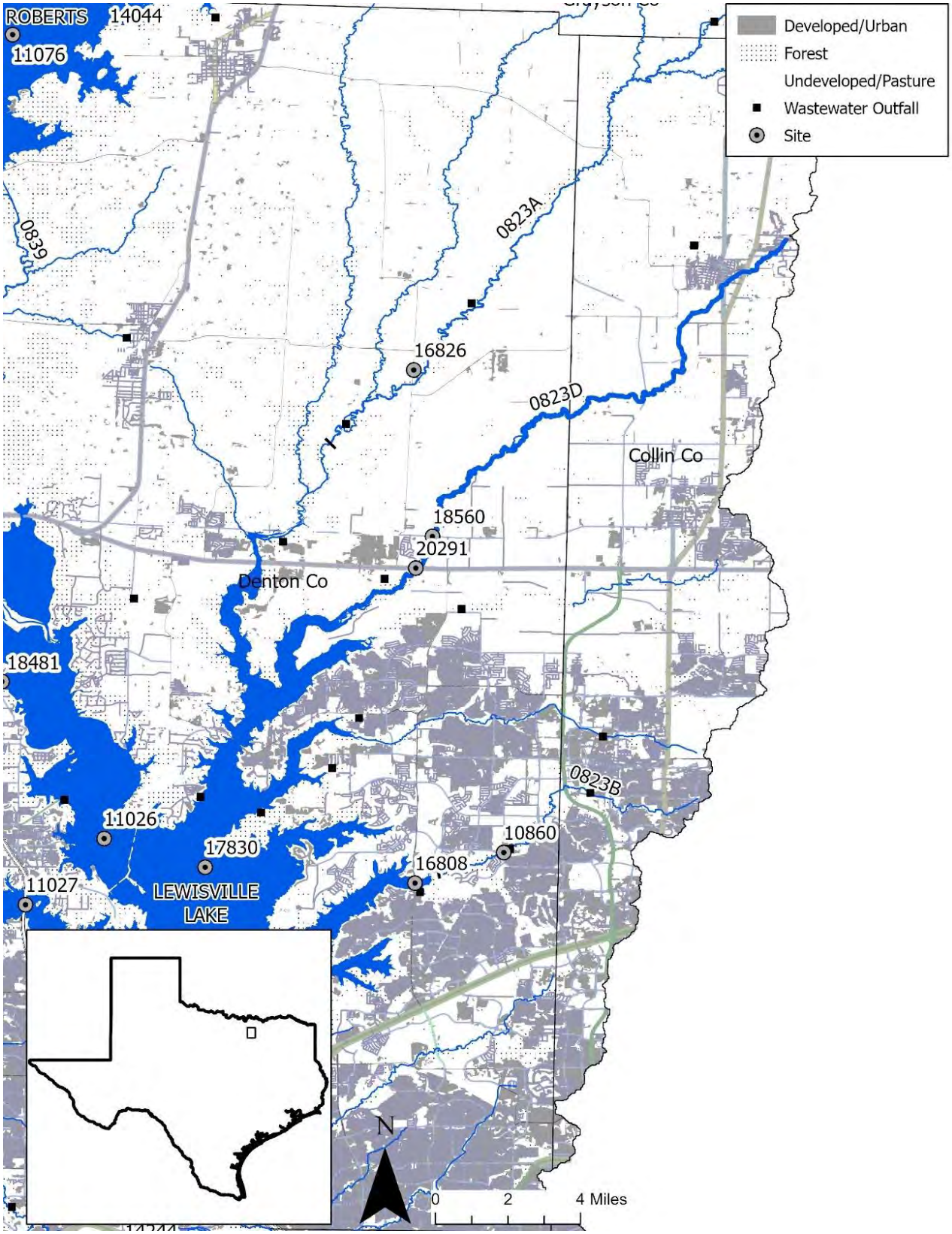


Figure 132: Segment 0823D Map

This 19-mile unclassified segment runs from the headwaters northeast of Celina in Collin County to the confluence with Lake Lewisville in Denton County (see Figure 132). Land use is this watershed is mostly crop land with some areas of development near the headwaters around the City of Celina and some residential development as the stream approaches Lewisville Lake. The watershed lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 90. Monitoring is being conducted by the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 90: Segment 0823D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0823D_01	Doe Branch at US 380 near Prosper (L3)	20291	City of Dallas (collecting entity DA)

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 91. Results of TRA trend analyses are shown in Table 92. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 91: TCEQ 2020 Texas Integrated Report Summary for Segment 0823D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0823D_01 From confluence with Lake Lewisville/Elm Fork Trinity in Denton Co. to headwaters	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	FS
0823D_01 From confluence with Lake Lewisville/Elm Fork Trinity in Denton Co. to headwaters	Aquatic Life Use	Acute Toxic Substances in water		NC
0823D_01 From confluence with Lake Lewisville/Elm Fork Trinity in Denton Co. to headwaters	Aquatic Life Use	Chronic Toxic Substances in water		FS
0823D_01 From confluence with Lake Lewisville/Elm Fork Trinity in Denton Co. to headwaters	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NC = No Concern

Table 92: Significant Trends for Segment 0823D (P-value<0.1)

Segment & Assessment Unit		0823D_01
Site		20291
Alkalinity	All	↓*
	Summer	Not Significant
	Winter	↓*

Segment & Assessment Unit		0823D_01
Site		20291
Ammonia	All	↑*
	Summer	Not Significant
	Winter	↑*
E. coli	All	Not Significant
	Summer	Not Significant
	Winter	↓*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The increasing trends for ammonia in this segment may have been due to a combination of factors. As shown in Figure 133, there are two distinct sets of data. Sampling was conducted in this segment by TRA from 2008 to 2011 and by the City of Dallas from 2015 to present. In contrast to what was seen in other segments, censoring of the detection limit did not introduce a false trend in this segment. The detection limit used in the earlier data set was very low and most of the data points in the later data set were reported well above that detection limit. There is an outfall for an interbasin water transfer just upstream of the monitoring station located at US 380 near Prosper. This water transfer may explain some of the difference between the two data sets below. However, the water transfers existed prior to the 2008 sampling so it is unlikely that this is the sole source of the increase in ammonia concentrations. Additionally, the overall flow between two periods was not drastically different. Average flow for the first data set was 74 cfs and for the second data set it was 85 cfs. It is recommended that additional data analysis and sampling upstream and downstream of the outfall be conducted to determine if the interbasin transfer may have caused the trend.

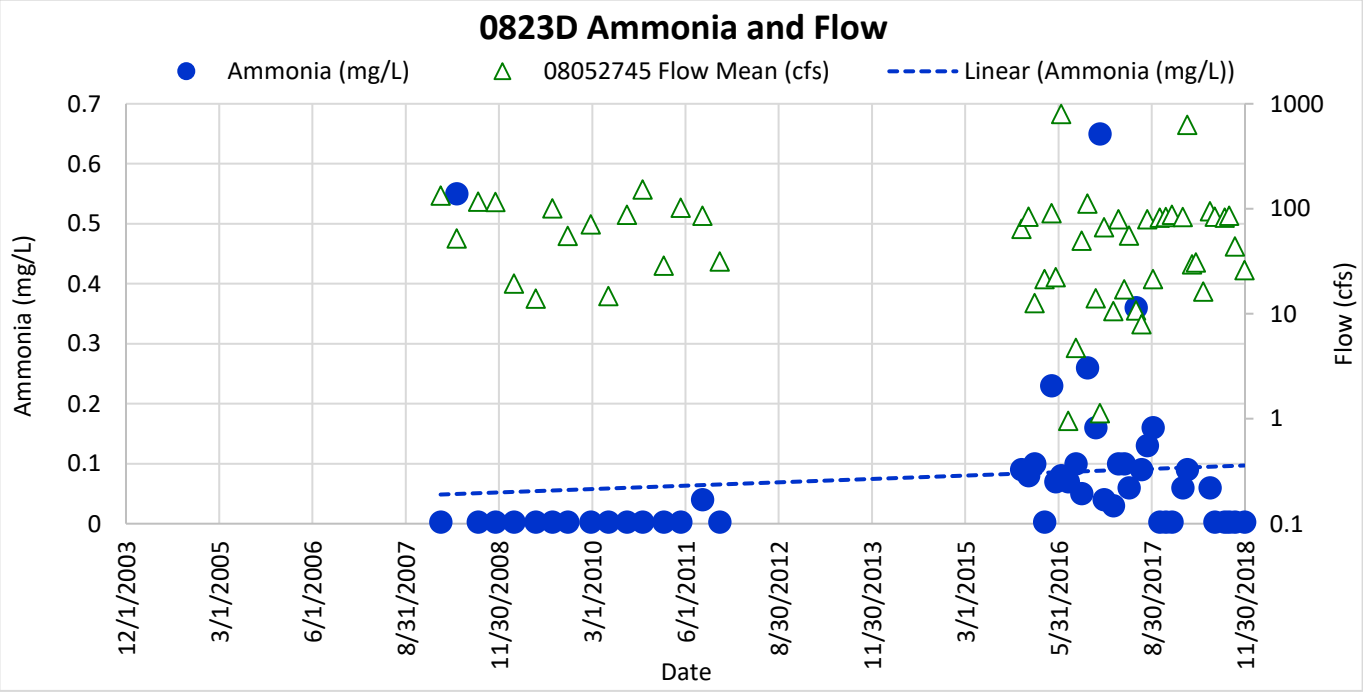


Figure 133: 0823D Ammonia and Flow

The most likely influence on water quality in this segment is the continuing development in the watershed. As shown in Figure 134, there was a significant increase in the development of the watershed over the period of record for this report. The top two images show the immediate watershed during the period of time that TRA conducted sampling at US 380; from 2008 to 2011. The bottom two images show the watershed from 2015 to 2019 when the City of Dallas sampled at US 380. There was very little increase in the development of residential communities from 2008 to 2011. More residential communities were built or in development by 2015 and by 2019 most of these were completed and more were in development. As the two wastewater dischargers are located downstream of the monitoring station at US 380 and the *E. coli* geomean for the entire data set is 75.6 MPN/100 mL, the likely source of ammonia in this stream is residential fertilizers. However, as stated above, the interbasin transfer may also be affecting water quality and additional work is necessary in order to rule out this source. Regardless, homeowner education or residential best management practices may help reduce ammonia levels in this stream.

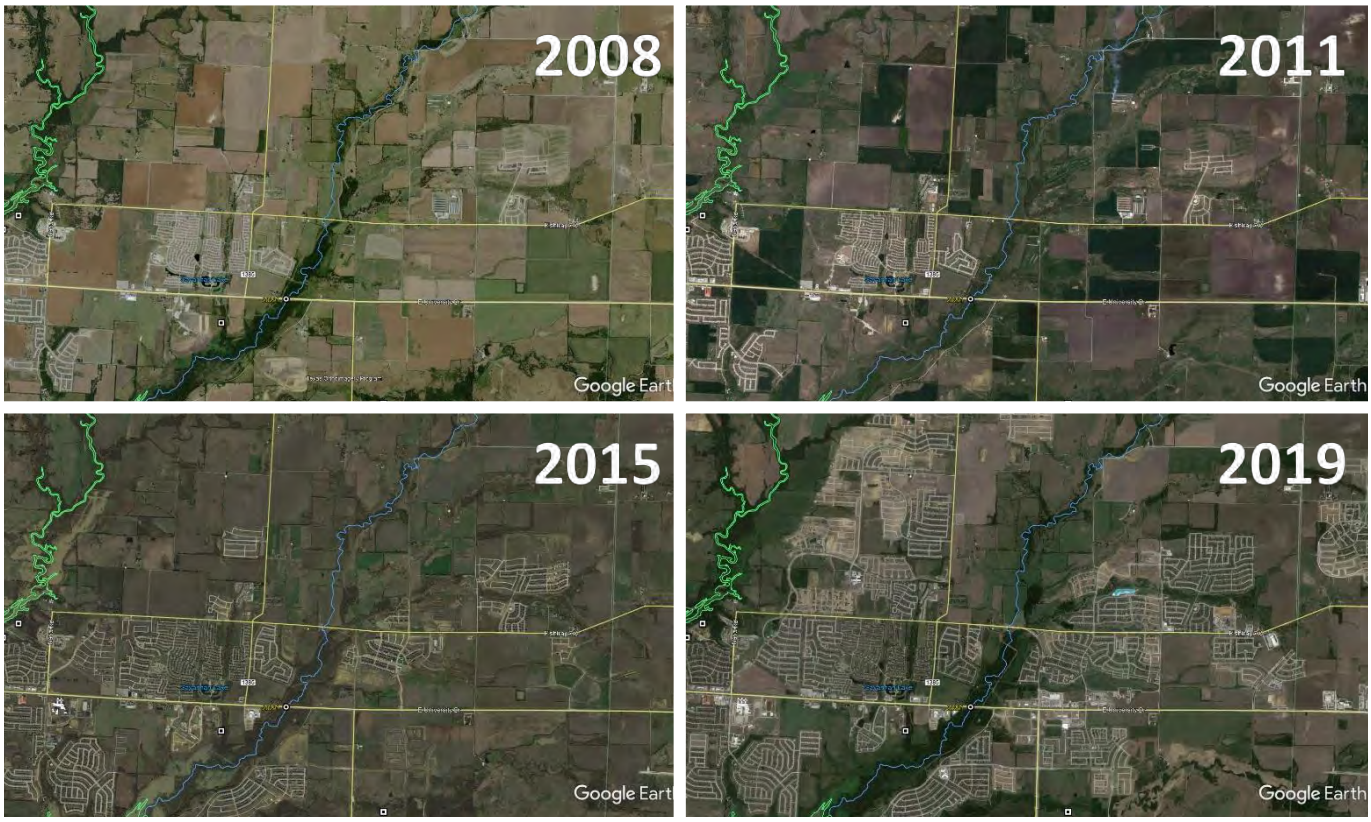


Figure 134: Doe Branch Development 2008, 2011, 2015, 2019

0823B – Stewart Creek

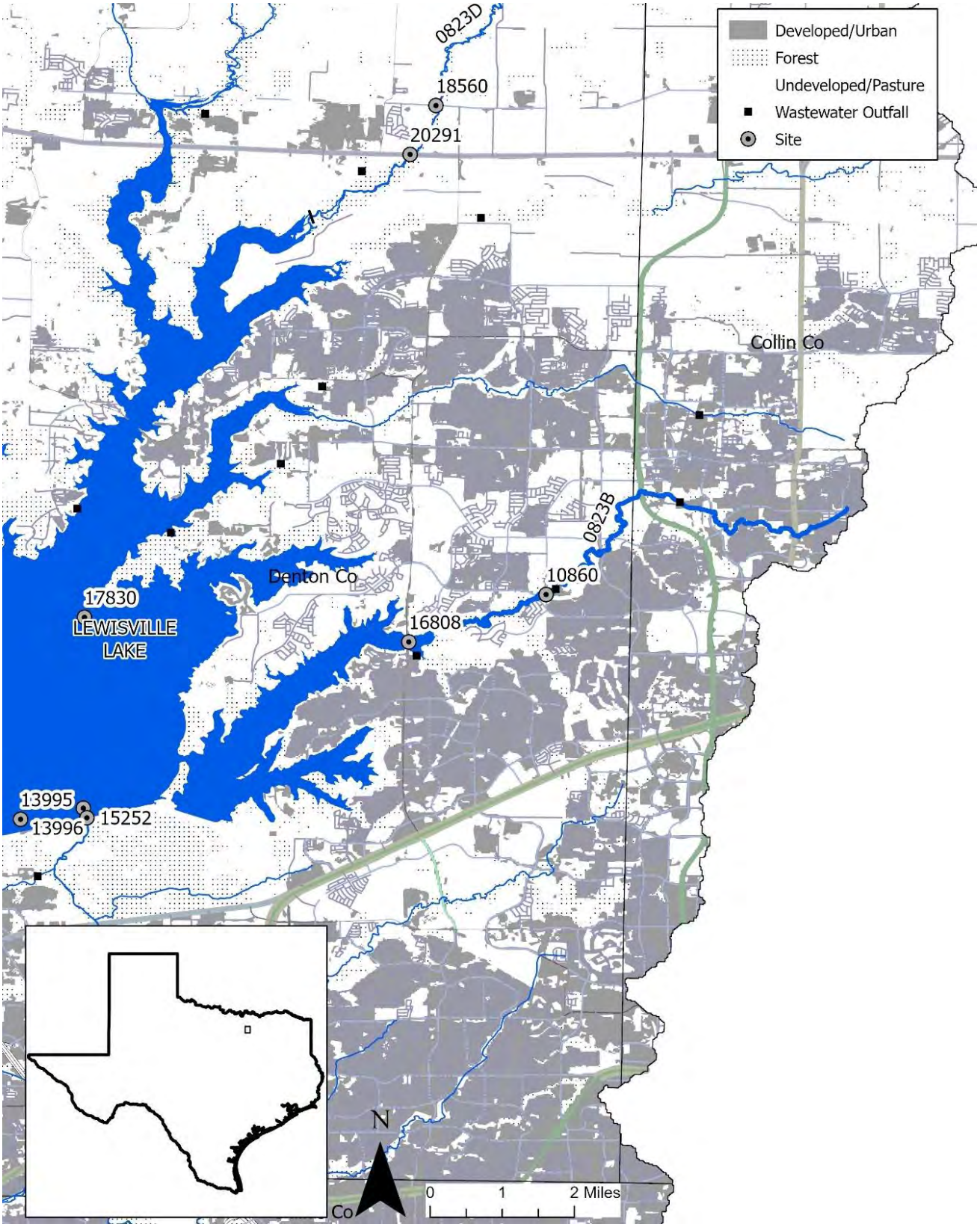


Figure 135: Segment 0823B Map

This 9.8-mile unclassified segment runs from the headwaters near Frisco in Collin County to the confluence with Lake Lewisville in Denton County (see Figure 135). This watershed drains mostly developed land around the City of Frisco. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 93. No significant trends were identified during TRA data analysis.

Table 93: TCEQ 2020 Texas Integrated Report Summary for Segment 0823B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0823B_01 From confluence with Lake Lewisville in Denton Co. to headwaters near Frisco in Collin Co.	General Use	Nitrate	1.95 mg/L	CS
0823B_01 From confluence with Lake Lewisville in Denton Co. to headwaters near Frisco in Collin Co.	General Use	Total Phosphorus	0.69 mg/L	CS

CS = Screening Level Concern

Data for assessment unit 0823B_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

Concerns for nitrate and total phosphorus were carried forward from previous integrated reports as there is no monitoring data available after 2007. It is recommended that monitoring be conducted in this segment in order to address the status of these concerns.

0822 – Elm Fork Trinity River Below Lewisville Lake

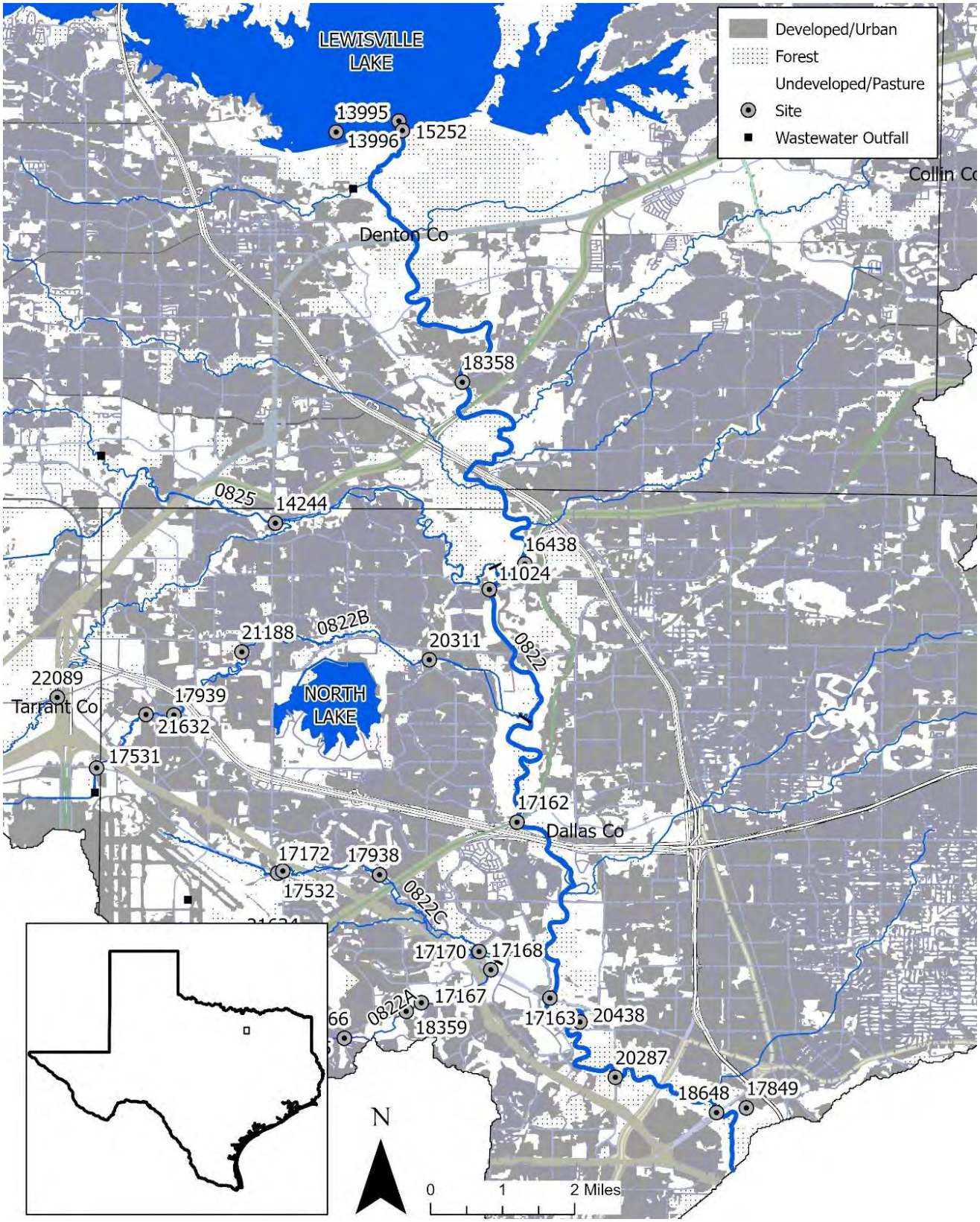


Figure 136: Segment 0822 Map

This 30-mile segment begins at the Lewisville Dam in Denton County and runs to the confluence with the West Fork Trinity River in Dallas County (see Figure 136). While there are some small areas of forested land, the majority of the watershed is highly developed by the cities of Lewisville, Carrollton, Farmers Branch, Irving, and Dallas, and Dallas-Fort Worth International Airport. This segment lies mainly within the Northern Blackland Prairie ecoregion with the Eastern Cross Timbers to the west edge of the watershed.

Clean Rivers Program water quality monitoring is being conducted at four sites within this segment as shown in Table 94. Monitoring is being conducted by the City of Dallas (collecting entity DA) and TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 94: Segment 0822 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0822_01	Elm Fork Trinity River at Wildwood Drive-TomBraniff Drive in Dallas	20287	TRA
0822_02	ELM FORK TRINITY RIVER AT INTAKE OF DALLAS WATER UTILITIES ELM FK TREATMENT PLANT 738 M DOWNSTREAM OF CONFLUENCE WITH DENTON CK IN CARROLLTON (E2)	16438	City of Dallas (collecting entity DA)
0822_03	ELM FORK TRINITY RIVER IMMEDIATELY DOWNSTREAM OF HEBRON PARKWAY SOUTHEAST OF LEWISVILLE TR255 (E4)	18358	City of Dallas (collecting entity DA)
0822_04	ELM FORK TRINITY RIVER AT LEWISVILLE LAKE SPILLWAY 3 MI NORTHEAST OF LEWISVILLE (E1)	15252	City of Dallas (collecting entity DA)

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 95. Results of TRA trend analyses are shown in Table 96. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 95: TCEQ 2020 Texas Integrated Report Summary for Segment 0822

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0822_01 Lower 11 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0822_04 Upper 1.5 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0822_01 Lower 11 mi of segment	Aquatic Life Use	Acute Toxic Substances in water		FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	Aquatic Life Use	Acute Toxic Substances in water		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	Aquatic Life Use	Acute Toxic Substances in water		FS
0822_04 Upper 1.5 mi of segment	Aquatic Life Use	Acute Toxic Substances in water		FS
0822_01 Lower 11 mi of segment	Aquatic Life Use	Chronic Toxic Substances in water		FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	Aquatic Life Use	Chronic Toxic Substances in water		FS
0822_04 Upper 1.5 mi of segment	Aquatic Life Use	Chronic Toxic Substances in water		FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	Aquatic Life Use	Chronic Toxic Substances in water - Cadmium (dissolved)	0.27 µg/L	CN
0822_01 Lower 11 mi of segment	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	Recreation Use	*E. coli*	126 MPN/100 mL	NA
0822_01 Lower 11 mi of segment	General Use	Ammonia	0.33 mg/L	NC
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	Ammonia	0.33 mg/L	NC
0822_01 Lower 11 mi of segment	General Use	Nitrate	1.95 mg/L	NC
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	Nitrate	1.95 mg/L	NC
0822_01 Lower 11 mi of segment	General Use	Total Phosphorus	0.69 mg/L	NC
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	Total Phosphorus	0.69 mg/L	NC
0822_01 Lower 11 mi of segment	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0822_04 Upper 1.5 mi of segment	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0822_01 Lower 11 mi of segment	General Use	pH	6.5 - 9 S.U.	FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	pH	6.5 - 9 S.U.	FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	General Use	pH	6.5 - 9 S.U.	FS
0822_04 Upper 1.5 mi of segment	General Use	pH	6.5 - 9 S.U.	FS
0822_01 Lower 11 mi of segment	General Use	Chloride	80 mg/L	FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	Chloride	80 mg/L	FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	General Use	Chloride	80 mg/L	FS
0822_04 Upper 1.5 mi of segment	General Use	Chloride	80 mg/L	FS
0822_01 Lower 11 mi of segment	General Use	Sulfate	60 mg/L	FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	Sulfate	60 mg/L	FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	General Use	Sulfate	60 mg/L	FS
0822_04 Upper 1.5 mi of segment	General Use	Sulfate	60 mg/L	FS
0822_01 Lower 11 mi of segment	General Use	Total Dissolved Solids	500 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	Total Dissolved Solids	500 mg/L	FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	General Use	Total Dissolved Solids	500 mg/L	FS
0822_04 Upper 1.5 mi of segment	General Use	Total Dissolved Solids	500 mg/L	FS
0822_01 Lower 11 mi of segment	General Use	Water temperature	32.2 °F	FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	General Use	Water temperature	32.2 °F	FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	General Use	Water temperature	32.2 °F	FS
0822_04 Upper 1.5 mi of segment	General Use	Water temperature	32.2 °F	FS
0822_01 Lower 11 mi of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0822_04 Upper 1.5 mi of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0822_01 Lower 11 mi of segment	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0822_02 4.5 mi upstream to 7.5 mi downstream DWU intake	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0822_03 1.0 mi upstream to 4.5 mi downstream SH 121	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0822_04 Upper 1.5 mi of segment	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CN = Use Concern CS = Screening Level Concern FS = Fully Supporting NA = Not Assessed
NC = No Concern

Table 96: Significant Trends for Segment 0822 (P-value<0.1)

Segment & Assessment Unit		0822_01	0822_01	0822_01	0822_02	0822_02	0822_03	0822_04
Site		17163	18310	20287	16438	17162	18358	15252
Air Temperature	All	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	No Trend	Not Significant
	Summer	Insufficient Data	Not Significant	Not Significant	↓	Not Significant	↓	Not Significant
	Winter	Insufficient Data	Not Significant	No Trend	↓	Not Significant	Not Significant	Not Significant
Flow	All	Insufficient Data	Insufficient Data	↑*	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↑*	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Secchi Depth	All	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	↑	No Trend	Insufficient Data	↑	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
Specific Conductance	All	Insufficient Data	↑	No Trend	No Trend	Not Significant	No Trend	No Trend
	Summer	Insufficient Data	↑	No Trend	Not Significant	↑	No Trend	Not Significant
	Winter	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	No Trend	No Trend

Segment & Assessment Unit		0822_01	0822_01	0822_01	0822_02	0822_02	0822_03	0822_04
Site		17163	18310	20287	16438	17162	18358	15252
Dissolved Oxygen	All	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	↑*	Not Significant	No Trend	No Trend	Not Significant	No Trend	No Trend
	Winter	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
pH	All	No Trend	No Trend	No Trend	No Trend	No Trend	Not Significant	Not Significant
	Summer	No Trend	No Trend	No Trend	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	↓	No Trend	Not Significant	Not Significant	Not Significant
Nitrite	All	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Nitrate	All	Insufficient Data	No Trend	Not Significant	No Trend	Not Significant	No Trend	No Trend
	Summer	Insufficient Data	Not Significant	Not Significant	No Trend	↑*	No Trend	No Trend
	Winter	Insufficient Data	↓	Not Significant	No Trend	Not Significant	No Trend	No Trend
Total Kjeldahl Nitrogen	All	Insufficient Data	No Trend	Not Significant	Insufficient Data	↓	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	No Trend	Not Significant	Insufficient Data	↓	Insufficient Data	Insufficient Data
Total Phosphorus	All	Insufficient Data	Not Significant	No Trend	No Trend	Not Significant	No Trend	↓
	Summer	Insufficient Data	Not Significant	No Trend	No Trend	Not Significant	No Trend	↓
	Winter	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	No Trend	↓
Ortho-phosphate	All	Insufficient Data	No Trend	Not Significant	No Trend	Not Significant	No Trend	Not Significant
	Summer	Insufficient Data	No Trend	Not Significant	No Trend	↑	No Trend	Not Significant
	Winter	Insufficient Data	No Trend	Not Significant	No Trend	Not Significant	No Trend	Not Significant
Hardness	All	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	No Trend	No Trend
	Summer	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	No Trend	No Trend
	Winter	Insufficient Data	↓	Not Significant	Not Significant	↓	Not Significant	No Trend
Dissolved Copper	All	Insufficient Data	No Trend	Not Significant	Not Significant	No Trend	Not Significant	Not Significant
	Summer	Insufficient Data	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	Not Significant
	Winter	Insufficient Data	↑	Not Significant	Not Significant	↑	Not Significant	Not Significant
Dissolved Iron	All	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Dissolved Nickel	All	Insufficient Data	Insufficient Data	↓	Not Significant	Insufficient Data	↓	No Trend
	Summer	Insufficient Data	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Not Significant	Not Significant
	Winter	Insufficient Data	Insufficient Data	Not Significant	Not Significant	Insufficient Data	↓	↓
Flow Severity	All	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	No Trend	No Trend
	Summer	Insufficient Data	↓	Not Significant	No Trend	↓	No Trend	No Trend
	Winter	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	No Trend	No Trend
E. coli	All	Insufficient Data	Not Significant	No Trend	No Trend	Not Significant	Not Significant	No Trend
	Summer	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	No Trend
	Winter	Insufficient Data	↑		No Trend	Not Significant	Not Significant	Not Significant
Total Dissolved Solids	All	Insufficient Data	Not Significant	Not Significant	No Trend	Not Significant	No Trend	No Trend
	Summer	Insufficient Data		Not Significant	No Trend	Not Significant	No Trend	No Trend
	Winter	Insufficient Data	Not Significant	↓	No Trend	Not Significant	No Trend	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The concern for dissolved cadmium in assessment unit 0822_02 was the result of a single high value recorded in November 2017 at station 16438 as shown in Figure 137. It is interesting to note that several other dissolved metals including arsenic, copper, lead, nickel, silver, and zinc were elevated for this sample. However, many other parameters such as those for nutrients, total and dissolved solids, dissolved chromium and selenium, and *E. coli* were not drastically different from other samples collected at this this station. Additionally, flows at the USGS gage just downstream from 16438 were falling and were reported as 0 cfs on the day of sampling. Based on this information, it seems there may have been either a single event that released metals into the system or the sample was contaminated.

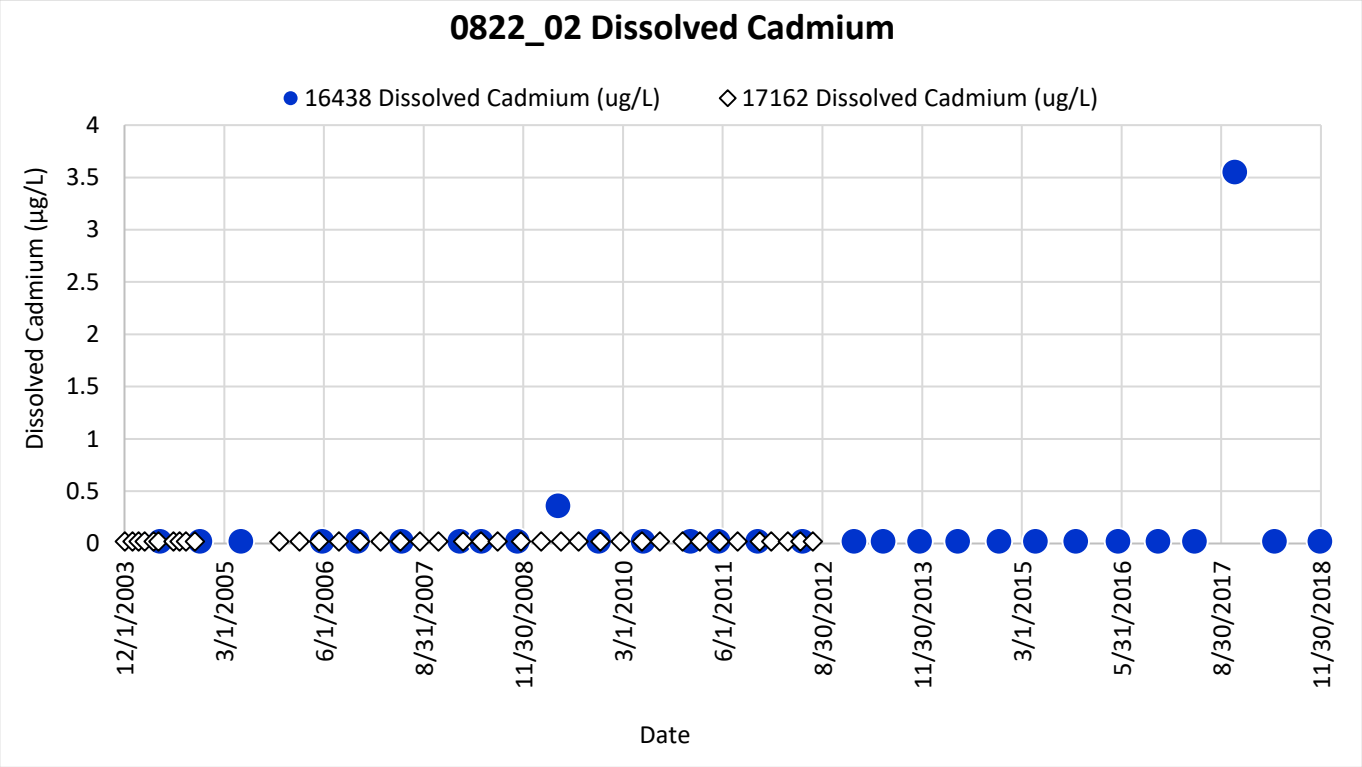


Figure 137: 0822_02 Dissolved Cadmium

Concerns for chlorophyll-*a* in assessment unit 0822_04 were carried forward from previous integrated reports. There is no current chlorophyll-*a* monitoring in this assessment unit. The concern is clearly related to the location of the sampling station in relation to the upstream reservoir. Station 15252 is located at the spillway of Lewisville Lake and samples collected at this station are dominated by releases from the reservoir. The screening level for chlorophyll-*a* in reservoirs is 26.7 µg/L while it is 14.1 in rivers and streams. It is recommended that TCEQ re-evaluate this concern and determine if the screening level for rivers and streams is appropriate for stations immediately downstream from reservoir spillways. Additional chlorophyll-*a* monitoring would be needed provide further information to TCEQ to address this recommendation.

Concerns for chlorophyll-*a* in assessment unit 0822_01 were based on data collected at two stations located near the bottom of the watershed. Station 18310 is located just before the

confluence with the lower West Fork Trinity River. Station 20287 is located slightly further upstream but still below the confluences of most major tributaries to the Elm Fork. Because of the size of the watershed, making correlations to specific sources or causes for the elevated chlorophyll-*a* levels is difficult. There is a wastewater treatment facility near the upstream end of the segment. However, correlations between chlorophyll-*a* and nutrients were very weak (correlation coefficients <0.299). As shown in Figure 138, chlorophyll-*a* values decreased during elevated flow. It seems likely that elevated chlorophyll-*a* may have been a result of algal populations being released from upstream reservoirs and which were then diluted during precipitation events. Even though chlorophyll-*a* levels are generally high, it does not appear that algal populations are having an effect on dissolved oxygen levels. Out of 115 dissolved oxygen readings collected between 2003 and 2018, only 16 were reported below 5 mg/L and, of those, only one was below 3 mg/L.

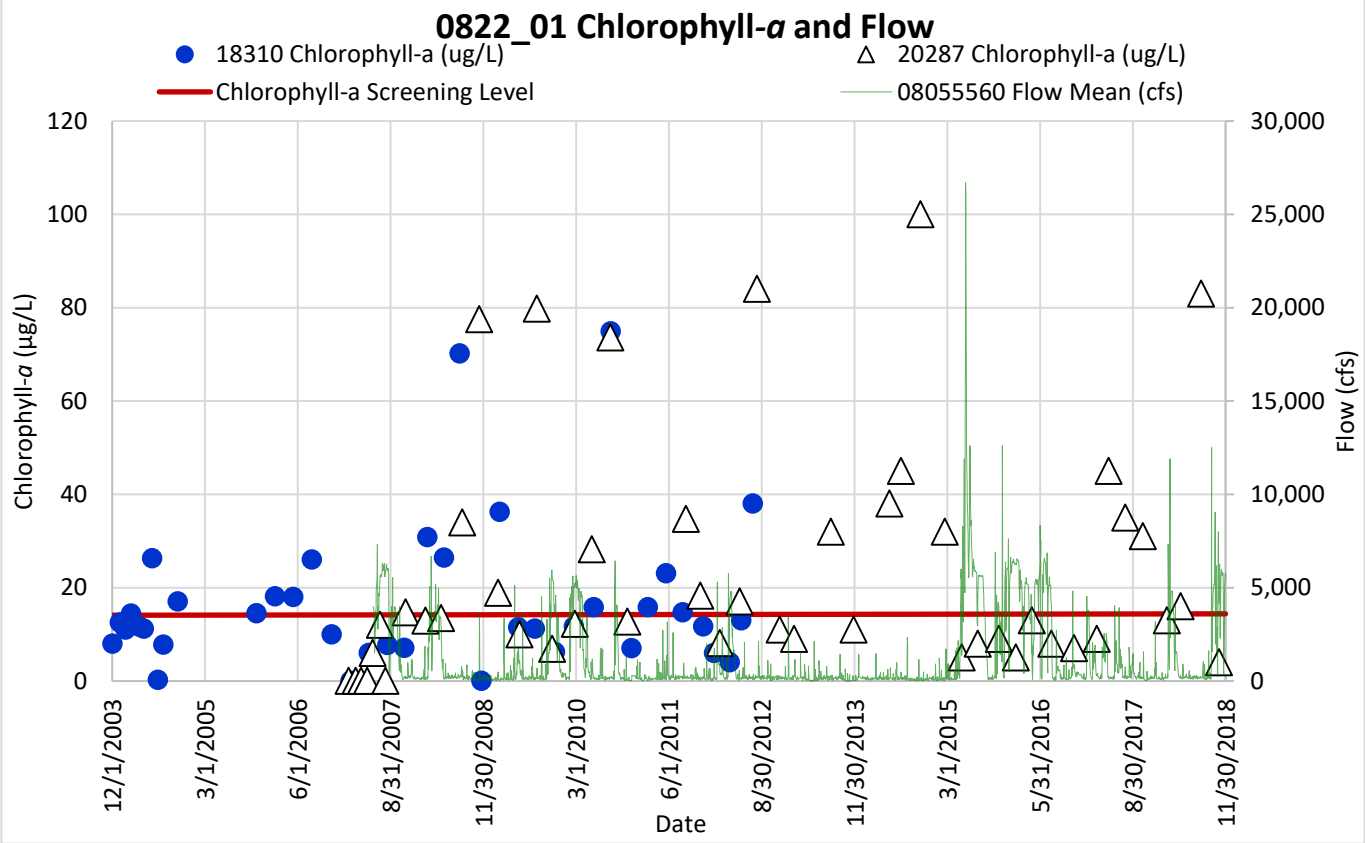


Figure 138: 0822_01 Chlorophyll-a and Flow

Increasing trends for specific conductance at station 18310 in assessment unit 0822_01 and station 17162 in 0822_02 appear to have been related to both drought conditions and the period of record for these stations as shown in Figure 139. Sampling was discontinued in 2012 at the beginning of an extended drought period. Increasing trends for nitrate and orthophosphate at station 17162 showed similar patterns to those seen for specific conductance. Effluent from upstream wastewater treatment facilities were the likely source for these nutrients. As previously discussed, lack of dilution from reservoir releases and precipitation cause receiving waters to become effluent-dominated during drought periods.

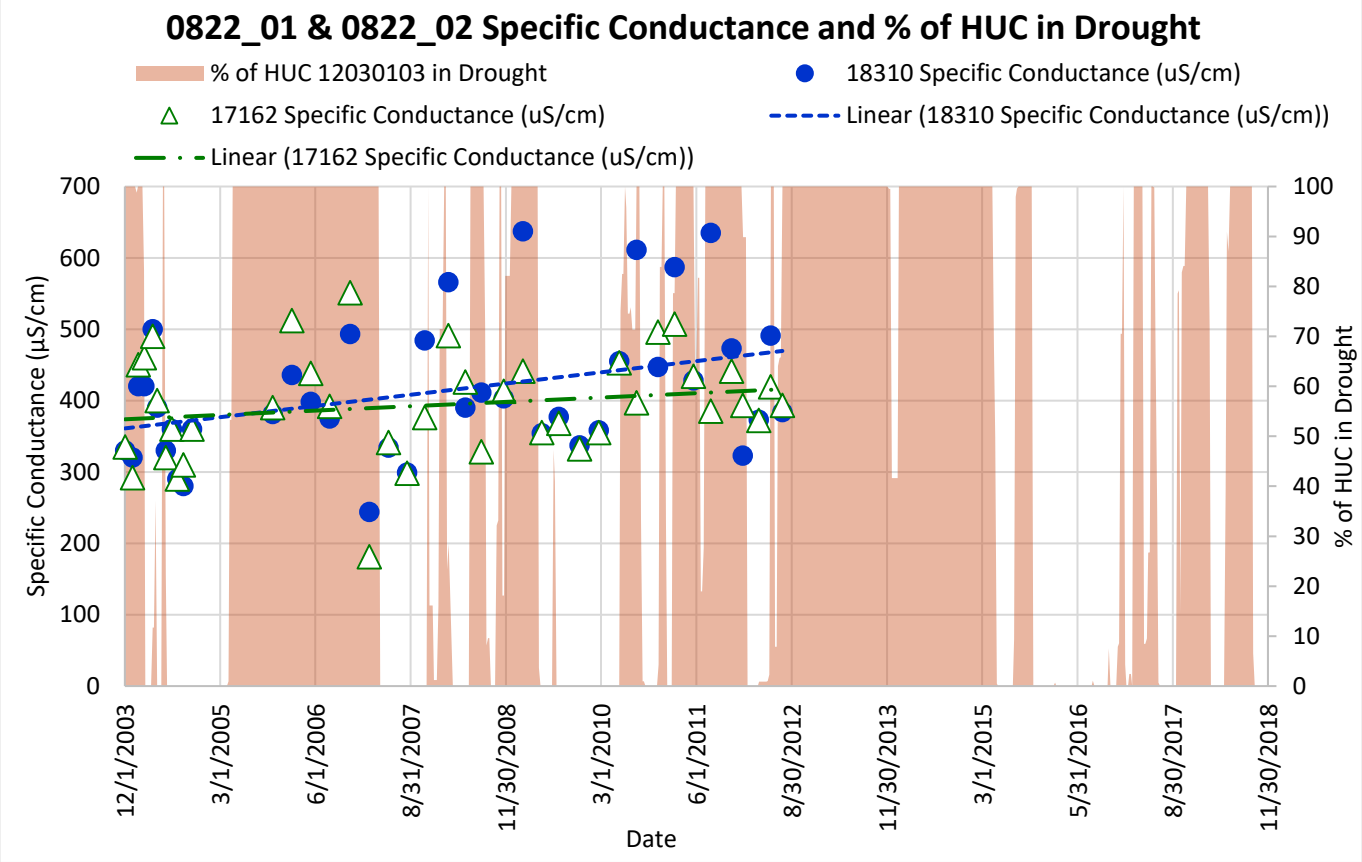


Figure 139: 0822_01 & 0822_02 Specific Conductance and % of HUC in Drought

Increasing trends for dissolved copper at station 18310 in assessment unit 0822_01 and at station 17162 in 0822_02 were weighted by single elevated values. With the exception of these two elevated values, all other reported values were below 2.35 µg/L. The acute and chronic exposure standards for copper in this segment are 16.33 and 10.75 µg/L, respectively. Because the elevated values occurred on different dates at each station and the corresponding values at the other station on the same dates, there could have been single events that released dissolved copper into the stream or these values could have been isolated contamination events.

The increasing trend for dissolved iron at station 20287 were an artifact of data censoring. Reported values ranged from 13.39 to 85.88 µg/L while early non-detect values were reported as <100 µg/L and later <50 µg/L. Because all non-detect data for dissolved iron were censored to one half of the lowest non-detect value in the data set, these values were censored to 3 µg/L; introducing a false trend.

There was a slight increasing trend identified for station 18310 in assessment unit 0822_01. This trend appears to be somewhat run-off related as shown in Figure 140. Many of the values reported above the standard of 126 MPN/100 mL occurred after recent precipitation events. This trend is not currently affecting contact recreation use in this assessment unit as the geomean for the period of record used in this report was 70.7 MPN/100 mL.

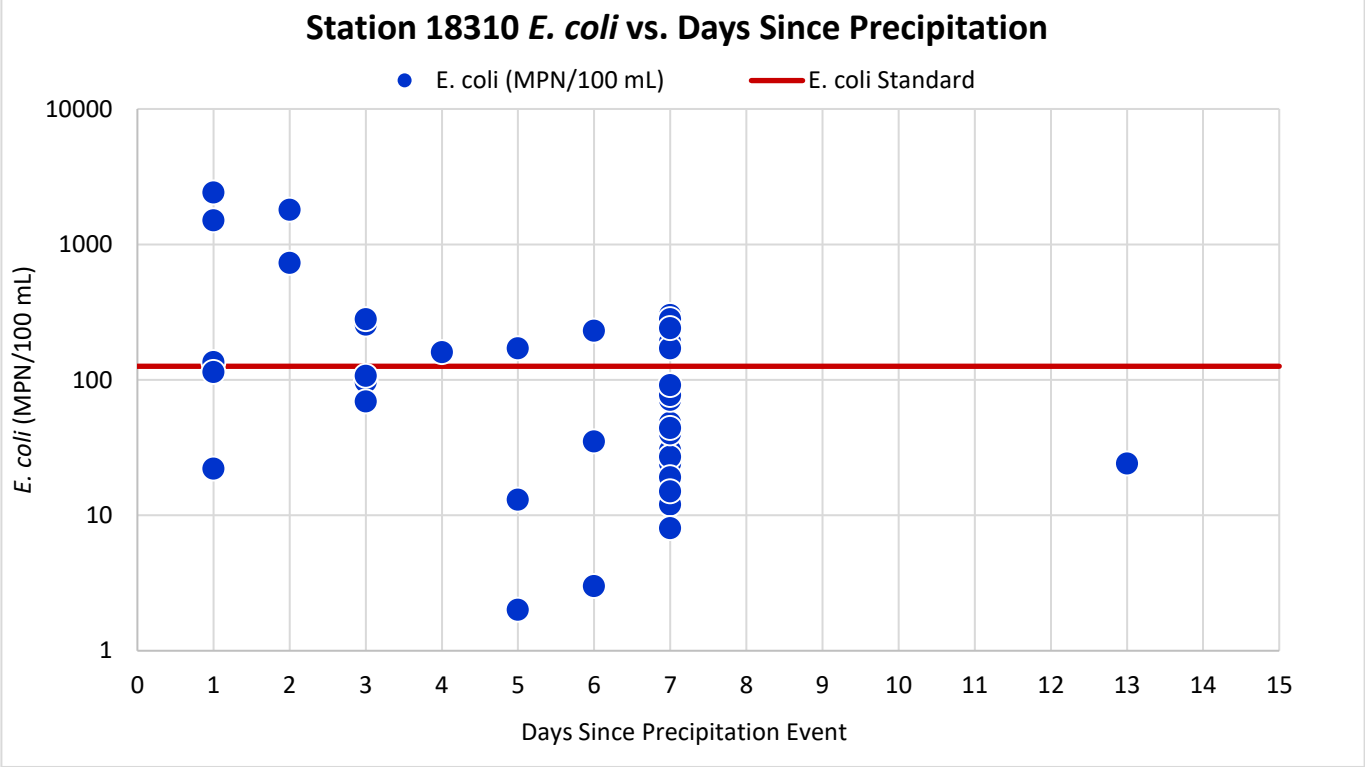


Figure 140: Station 18310 E. coli vs. Days Since Precipitation

0826A – Denton Creek

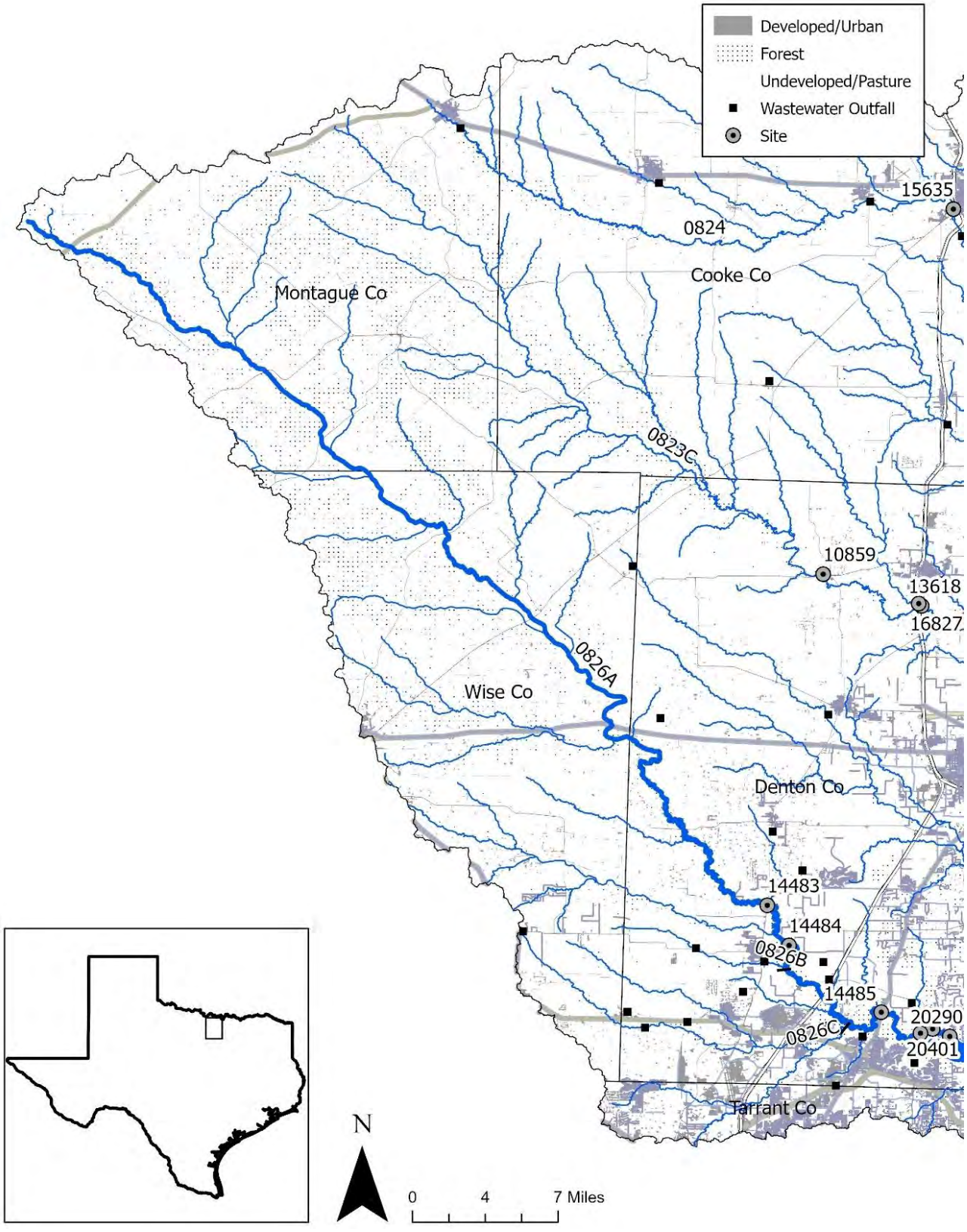


Figure 141: Segment 0826A Map

This 85-mile unclassified segment runs from 2.3 km upstream of TX-59 to the confluence with Grapevine Lake in Denton County (see Figure 141). The upper portion of the watershed is grassland and forest with small areas of pasture and crop land adjacent to the stream. The lower portion of the watershed becomes more dominated by pasture, hay, and crop land. The stream flows through the Western Cross Timbers and the Grand Prairie ecoregions.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 97. Monitoring is being conducted by the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 97: Segment 0826A FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0826A_02	DENTON CREEK AT FM 156 2.4 MILES NORTH OF JUSTIN (G1)	14483	City of Dallas (collecting entity DA)
0826A_02	DENTON CREEK AT FM 407 1.2 MILES EAST OF JUSTIN (G2)	14484	City of Dallas (collecting entity DA)

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 98. Results of TRA trend analyses are shown in Table 99. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 98: TCEQ 2020 Texas Integrated Report Summary for Segment 0826A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0826A_01 From headwaters of Grapevine Lake upstream to confluence of Trail Creek near City of Justin	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0826A_02 From confluence of Trail Creek near Justin to unnamed tributary 6.3 km upstream of FM-2449	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0826A_01 From headwaters of Grapevine Lake upstream to confluence of Trail Creek near City of Justin	Aquatic Life Use	Acute Toxic Substances in water		FS
0826A_02 From confluence of Trail Creek near Justin to unnamed tributary 6.3 km upstream of FM-2449	Aquatic Life Use	Acute Toxic Substances in water		FS
0826A_01 From headwaters of Grapevine Lake upstream to confluence of Trail Creek near City of Justin	Aquatic Life Use	Chronic Toxic Substances in water		FS
0826A_02 From confluence of Trail Creek near Justin to unnamed tributary 6.3 km upstream of FM-2449	Aquatic Life Use	Chronic Toxic Substances in water - Zinc (dissolved)	135.92 µg/L	CN
0826A_01 From headwaters of Grapevine Lake upstream to confluence of Trail Creek near City of Justin	General Use	Nitrate	1.95 mg/L	CS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0826A_01 From headwaters of Grapevine Lake upstream to confluence of Trail Creek near City of Justin	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826A_02 From confluence of Trail Creek near Justin to unnamed tributary 6.3 km upstream of FM-2449	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826A_03 From confluence with unnamed tributary 6.3 km upstream of FM-2449 to 1.7 km upstream of CR 2675	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826A_04 From 1.7 km upstream of County Road 2675 to 2.3 km upstream of TX-59	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CN = Use Concern CS = Screening Level Concern FS = Fully Supporting

Data for assessment units 0826A_03 and 0826A_04 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 99: Significant Trends for Segment 0826A (P-value<0.1)

Segment & Assessment Unit		0826A_01	0826A_02
Site		14485	14483
Specific Conductance	All	Not Significant	Not Significant
	Summer	Not Significant	↑
	Winter	Not Significant	Not Significant
Alkalinity	All	Not Significant	No Trend
	Summer	↑	No Trend
	Winter	Not Significant	No Trend
Hardness	All	Not Significant	Not Significant
	Summer	Not Significant	↑
	Winter	Not Significant	Not Significant
Dissolved Nickel	All	↓	↓
	Summer	↓	↓
	Winter	↓	↓
Dissolved Aluminum	All	Insufficient Data	No Trend
	Summer	Insufficient Data	No Trend
	Winter	Insufficient Data	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

The concern for nitrate in assessment unit 0826A_01 was likely due to nutrients from upstream wastewater treatment facilities compounded by the effects of drought conditions as shown in Figure 142. There are several wastewater treatment facilities upstream of station 14485 in this assessment unit. As previously discussed, most wastewater treatment facilities do not have advanced nutrient removal and as a result can introduce those nutrients into the receiving

stream. If there is a lack of freshwater inflows from precipitation as occurs during drought conditions, the stream can become effluent-dominated and nutrients levels increase. Most of the values reported above the screening level in this assessment unit occurred during periods of drought. It is likely that the elevated nutrient levels observed in this segment contributed to the concern for excessive algal growth downstream in Grapevine Lake.

The concern for dissolved zinc in assessment unit 0826A_02 was caused by a single value that was reported at 2009.88 µg/L. The next highest value in the data set used for the Integrated Report was 15.49 µg/L. This high value brought the average from 2.37 to 163.41 µg/L; the standard is 135.92 µg/L. It is unknown what may have caused this high value. This elevated value could have been due to a single event that released dissolved zinc into the stream or sample contamination. However, as all laboratory quality control checks were acceptable, this data point could not be rejected.

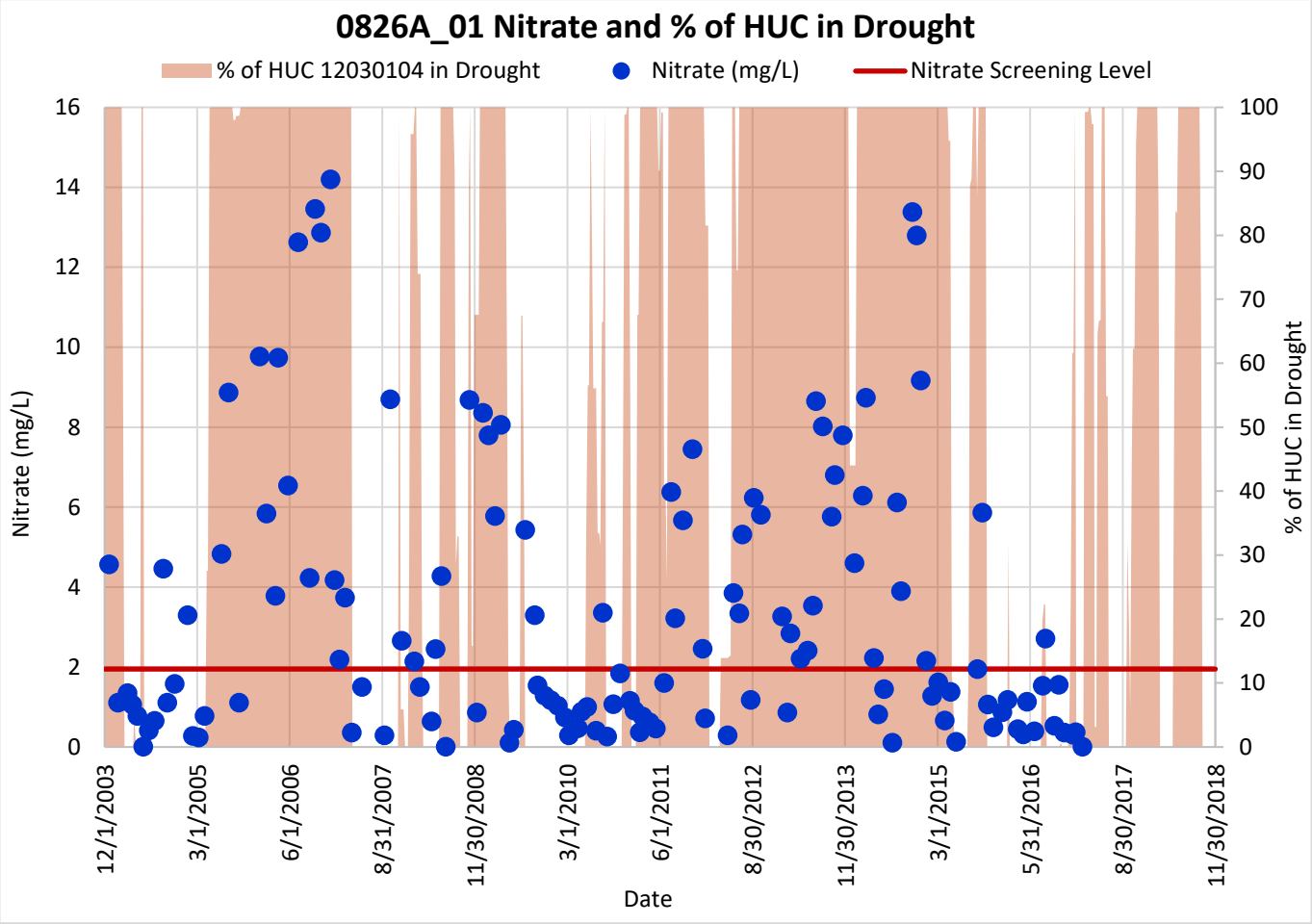


Figure 142: 0826A_01 Nitrate and % of HUC in Drought

The increasing summer trend for alkalinity in assessment unit 0826A_01 appears to have been related to drought and recovery cycles; specifically, the most recent cycle from 2011 to 2016. Alkalinity provides buffering capacity against rapid pH changes. This is important because it helps maintain pH levels in the range which is most amenable to aquatic life which is 6.5 to 9

S.U. Additionally, adequate alkalinity protects against metal toxicity by complexing with metals and making them less bioavailable. Most alkalinity is provided by the geology of the surrounding watershed due to weathering of carbonate rocks. As shown in Figure 143, alkalinity was seen to decrease throughout the drought of 2011 to 2015 and then increase during the flooding of 2015 and 2016.

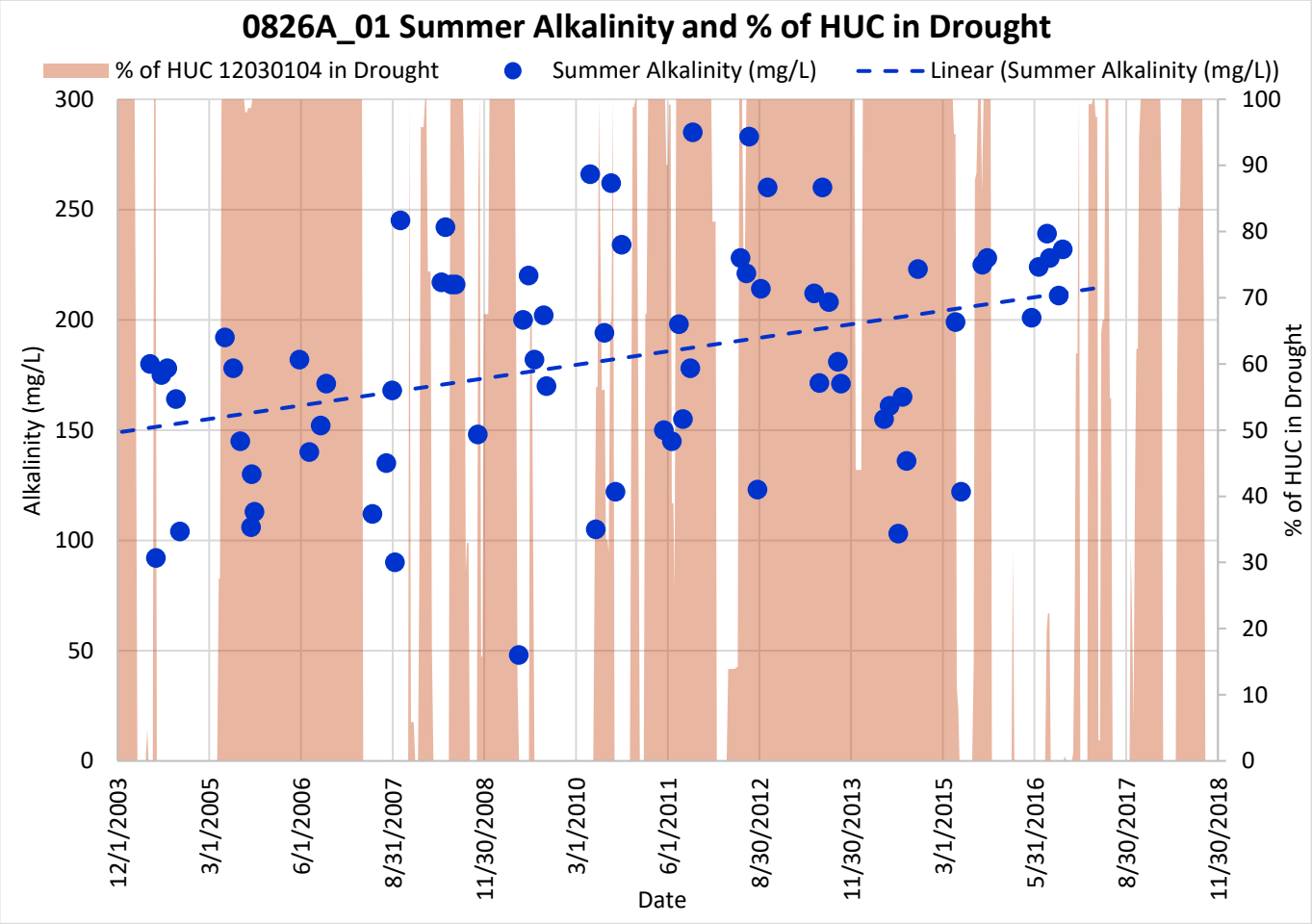


Figure 143: 0826A_01 Summer Alkalinity and % of HUC in Drought

Summertime increasing trends for specific conductance and hardness in assessment unit 0826A_02 were similarly affected by drought and recovery cycles. As shown in Figure 144, specific conductance decreased throughout the drought of 2011 to 2015 and increased during the recovery period in 2015 and 2016. There are several hay fields directly adjacent to the stream upstream of the monitoring station at 14483. Irrigation practices could have caused the sharp increase in specific conductance and hardness levels seen in 2015 and 2016. Irrigation and subsequent evaporation can cause salts and solids to build up on the surface. Precipitation of sufficient quantity to cause run-off can then wash the salts and solids into the stream.

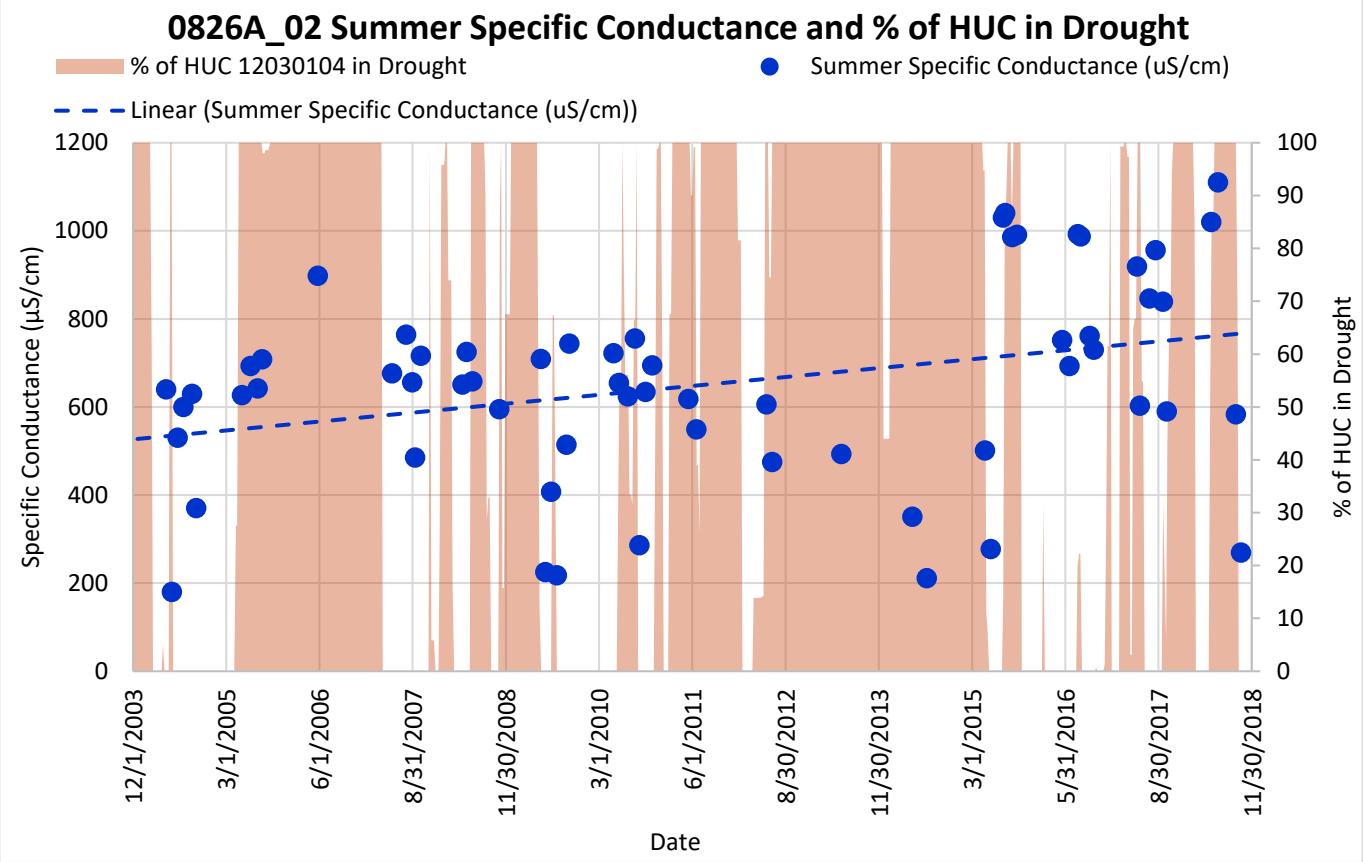


Figure 144: 0826A_02 Summer Specific Conductance and % of HUC in Drought

The increasing trend for dissolved aluminum in assessment unit 0826A_02 is a false trend introduced by censoring of non-detect data.

0826B – Trail Creek

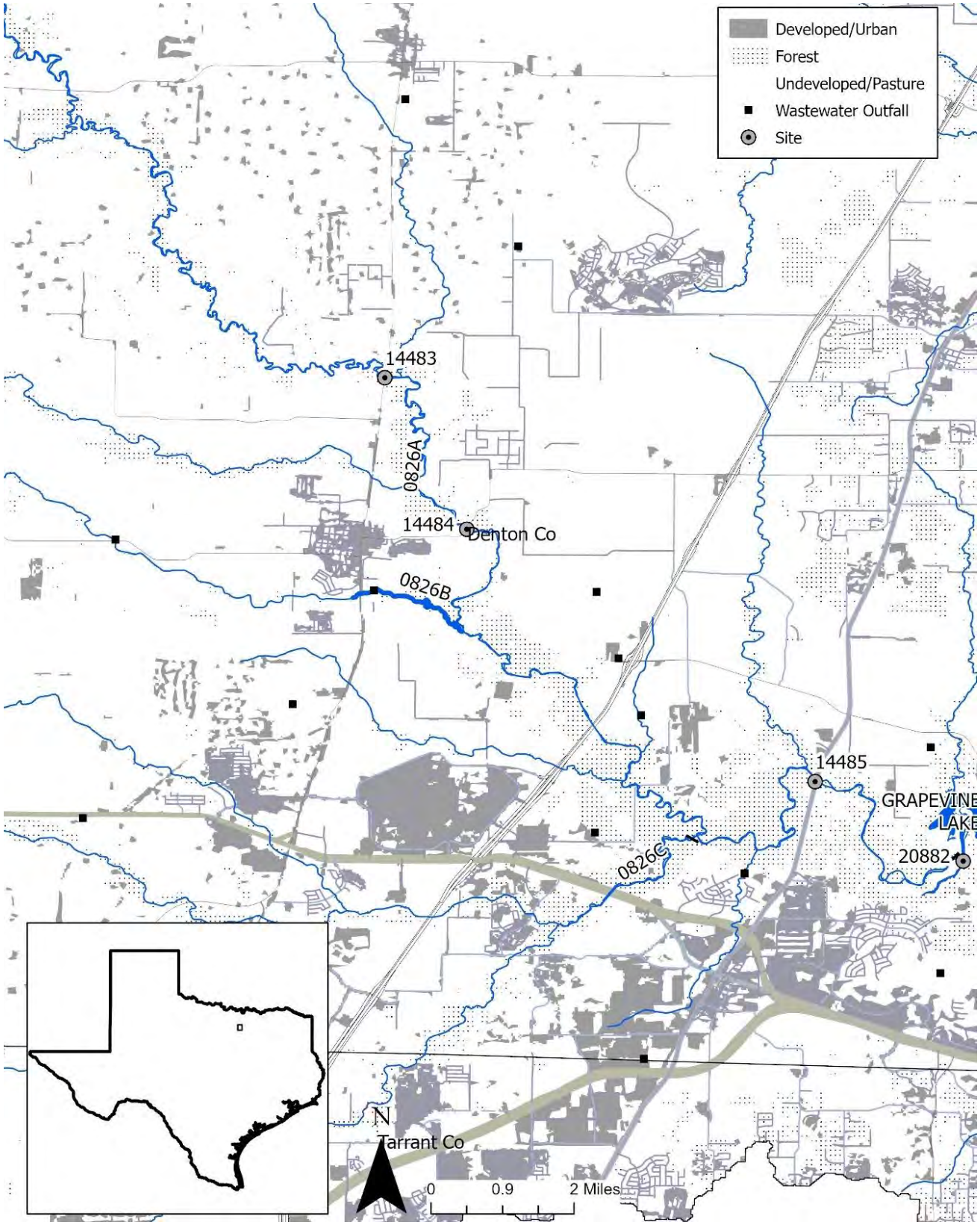


Figure 145: Segment 0826B Map

This 1.8-mile unclassified segment is a perennial stream that runs from 2.1 km upstream of SH 156 in Justin to the confluence with Denton Creek (see Figure 145). The watershed is a mix of development around the City of Justin on the north side and pasture, hay, and crop land to the south. It flows through the Grand Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0826B_01 for the period of record for this basin summary report.

0826C – Henrietta Creek

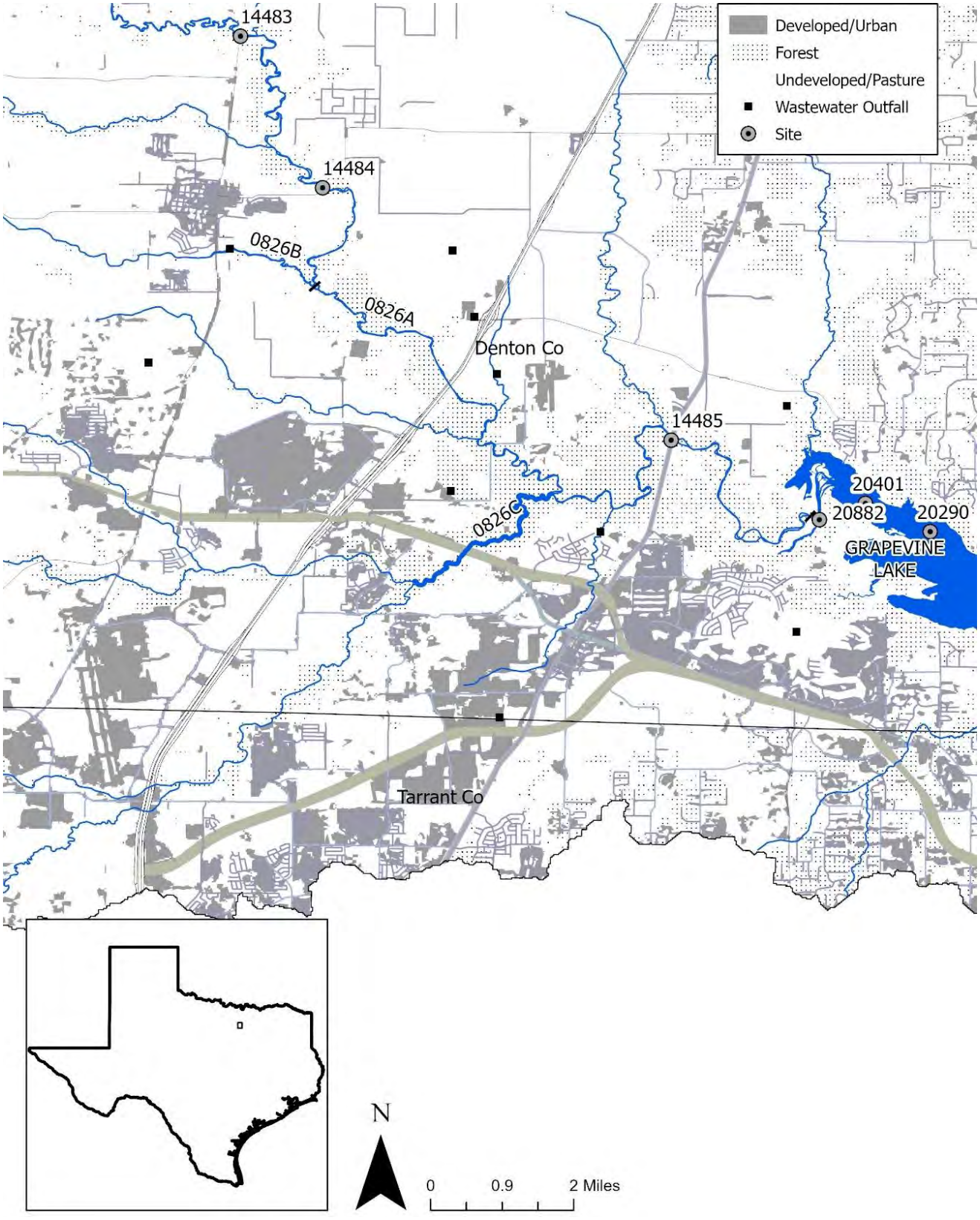


Figure 146: Segment 0826C Map

This 3-mile unclassified segment runs from the confluence with Elizabeth Creek to the confluence with Denton Creek (see Figure 146). The stream passes through the developed areas in the City of Roanoke to the southeast and Texas Motor Speedway to the northwest. The immediate riparian area downstream of SH 114 is forested. This watershed lies within the Grand Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0826C_01 for the period of record for this basin summary report.

0826 – Grapevine Lake

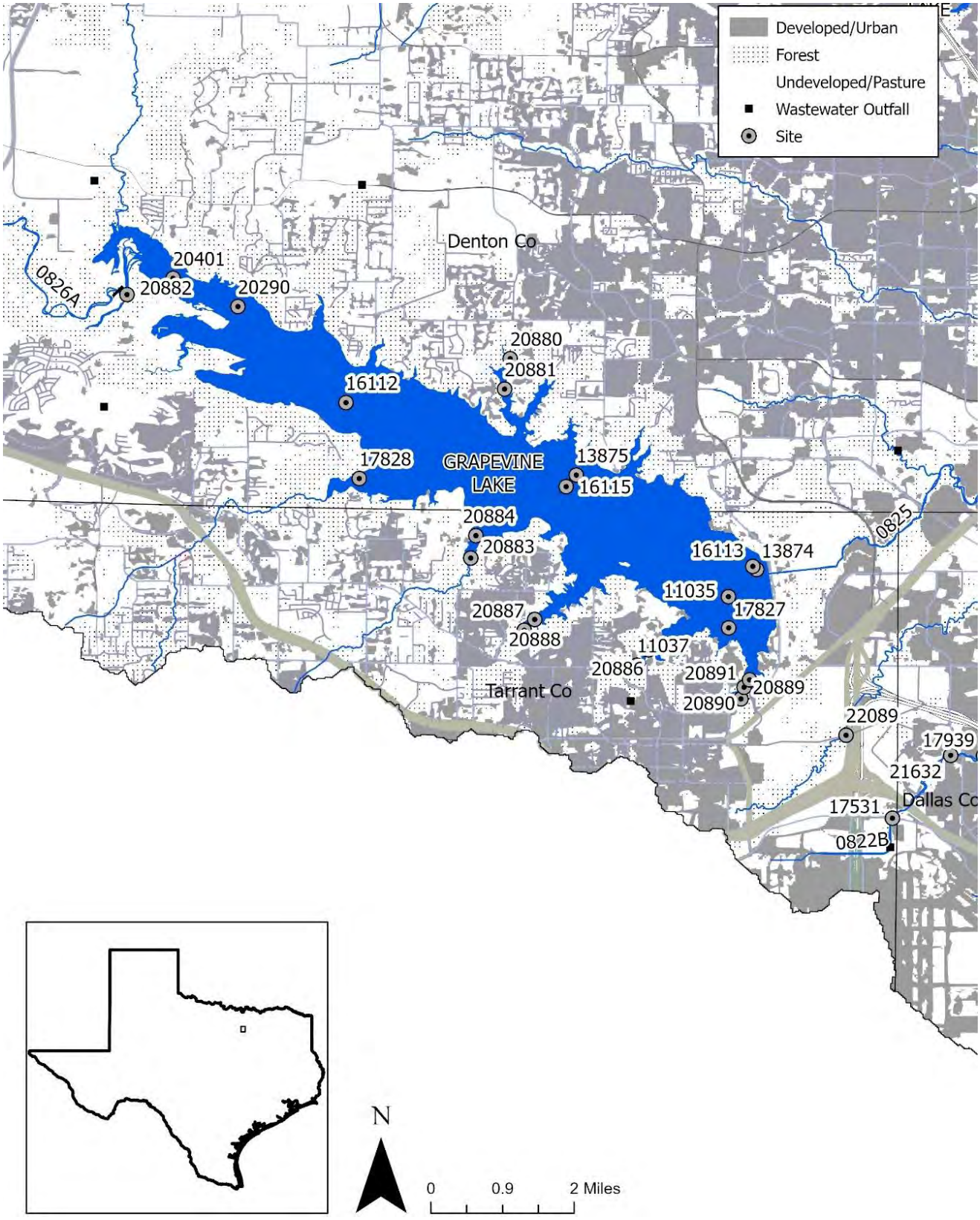


Figure 147: Segment 0826 Map

This 6,617-acre segment impounds Denton Creek up to a normal pool elevation of 535 feet (see Figure 147). With the exception of the northeast portion of the watershed, most of the land use is highly developed with cities including Flower Mound, Grapevine, Southlake, and Trophy Club. To the northeast, there is less development and some areas of pasture and hay. This segment lies within the Eastern Cross Timbers ecoregion. Grapevine Lake has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at five sites within this segment as shown in Table 100. Monitoring is being conducted by TCEQ Region 4 and the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 100: Segment 0826 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0826_01	GRAPEVINE RESERVOIR MID LAKE NEAR DAM 1.01 KM NORTH AND 318 METERS EAST OF INTERSECTION OF PARK ROAD 7 AND SILVERSIDE DRIVE	11035	TCEQ Region 4
0826_01	GRAPEVINE LAKE AT DALLAS WATER UTILITIES INTAKE 349 METERS NORTH AND 328 METERS EAST OF INTERSECTION OF SILVERSIDE DR AND PARK ROAD 7 (G4)	17827	City of Dallas (collecting entity DA)
0826_05	GRAPEVINE LAKE USGS SITE BC 753 METERS SOUTH AND 484 METERS WEST OF INTERSECTION OF WEST MURREL PARK ROAD AND SIMMONS ROAD (G5)	13875	City of Dallas (collecting entity DA)
0826_06	GRAPEVINE LAKE MID LAKE BETWEEN WALNUT GROVE PARK AND RED BUD PT 882 M N AND 1.39 KM E OF INTERSECTION OF BOB JONES RD AND SADDLE RIDGE	16112	TCEQ Region 4
0826_06	GRAPEVINE LAKE AT LITTLE PETES MARINA 392 METERS NORTH AND 136 METERS EAST OF INTERSECTION OF THOUSAND OAKS COURT AND CARMEL COURT (G3)	17828	City of Dallas (collecting entity DA)

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 101. Results of TRA trend analyses are shown in Table 102. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 101: TCEQ 2020 Texas Integrated Report Summary for Segment 0826

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0826_01 Lowermost portion of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0826_05 Middle portion of reservoir east of Meadowmere Park	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0826_01 Lowermost portion of reservoir	Aquatic Life Use	Acute Toxic Substances in water		FS
0826_05 Middle portion of reservoir east of Meadowmere Park	Aquatic Life Use	Acute Toxic Substances in water		FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	Aquatic Life Use	Acute Toxic Substances in water		FS
0826_01 Lowermost portion of reservoir	Aquatic Life Use	Chronic Toxic Substances in water		FS
0826_05 Middle portion of reservoir east of Meadowmere Park	Aquatic Life Use	Chronic Toxic Substances in water		FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	Aquatic Life Use	Chronic Toxic Substances in water		FS
0826_01 Lowermost portion of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0826_01 Lowermost portion of reservoir	General Use	Excessive algal growth in water		CS
0826_02 Morehead Creek cove	General Use	Excessive algal growth in water		CS
0826_03 Lower portion of reservoir north of Oak Grove Park	General Use	Excessive algal growth in water		CS
0826_04 North Main Slough cove	General Use	Excessive algal growth in water		CS
0826_05 Middle portion of reservoir east of Meadowmere Park	General Use	Excessive algal growth in water		CS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	General Use	Excessive algal growth in water		CS
0826_07 Upper portion of reservoir east of Marshall Creek Park	General Use	Excessive algal growth in water		CS
0826_08 Remainder of reservoir	General Use	Excessive algal growth in water		CS
0826_07 Upper portion of reservoir east of Marshall Creek Park	General Use	High pH	6.5 - 9 S.U.	NS
0826_01 Lowermost portion of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0826_05 Middle portion of reservoir east of Meadowmere Park	General Use	pH	6.5 - 9 S.U.	FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	General Use	pH	6.5 - 9 S.U.	FS
0826_01 Lowermost portion of reservoir	General Use	Chloride	80 mg/L	FS
0826_02 Morehead Creek cove	General Use	Chloride	80 mg/L	FS
0826_03 Lower portion of reservoir north of Oak Grove Park	General Use	Chloride	80 mg/L	FS
0826_04 North Main Slough cove	General Use	Chloride	80 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0826_05 Middle portion of reservoir east of Meadowmere Park	General Use	Chloride	80 mg/L	FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	General Use	Chloride	80 mg/L	FS
0826_07 Upper portion of reservoir east of Marshall Creek Park	General Use	Chloride	80 mg/L	FS
0826_08 Remainder of reservoir	General Use	Chloride	80 mg/L	FS
0826_01 Lowermost portion of reservoir	General Use	Sulfate	60 mg/L	FS
0826_02 Morehead Creek cove	General Use	Sulfate	60 mg/L	FS
0826_03 Lower portion of reservoir north of Oak Grove Park	General Use	Sulfate	60 mg/L	FS
0826_04 North Main Slough cove	General Use	Sulfate	60 mg/L	FS
0826_05 Middle portion of reservoir east of Meadowmere Park	General Use	Sulfate	60 mg/L	FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	General Use	Sulfate	60 mg/L	FS
0826_07 Upper portion of reservoir east of Marshall Creek Park	General Use	Sulfate	60 mg/L	FS
0826_08 Remainder of reservoir	General Use	Sulfate	60 mg/L	FS
0826_01 Lowermost portion of reservoir	General Use	Total Dissolved Solids	500 mg/L	FS
0826_02 Morehead Creek cove	General Use	Total Dissolved Solids	500 mg/L	FS
0826_03 Lower portion of reservoir north of Oak Grove Park	General Use	Total Dissolved Solids	500 mg/L	FS
0826_04 North Main Slough cove	General Use	Total Dissolved Solids	500 mg/L	FS
0826_05 Middle portion of reservoir east of Meadowmere Park	General Use	Total Dissolved Solids	500 mg/L	FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	General Use	Total Dissolved Solids	500 mg/L	FS
0826_07 Upper portion of reservoir east of Marshall Creek Park	General Use	Total Dissolved Solids	500 mg/L	FS
0826_08 Remainder of reservoir	General Use	Total Dissolved Solids	500 mg/L	FS
0826_01 Lowermost portion of reservoir	General Use	Water temperature	33.9 °F	FS
0826_05 Middle portion of reservoir east of Meadowmere Park	General Use	Water temperature	33.9 °F	FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	General Use	Water temperature	33.9 °F	FS
0826_01 Lowermost portion of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0826_05 Middle portion of reservoir east of Meadowmere Park	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0826_01 Lowermost portion of reservoir	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826_02 Morehead Creek cove	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0826_03 Lower portion of reservoir north of Oak Grove Park	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826_04 North Main Slough cove	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826_05 Middle portion of reservoir east of Meadowmere Park	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826_06 Middle portion of reservoir southeast of Walnut Grove Park	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826_07 Upper portion of reservoir east of Marshall Creek Park	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0826_08 Remainder of reservoir	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NS = Not Supporting

There were no data available in assessment unit 0826_03 for the period of record for this basin summary report. Data for assessment units 0826_02, 0826_04, 0826_07, and 0826_08 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 102: Significant Trends for Segment 0826 (P-value<0.1)

Segment & Assessment Unit		0826_01	0826_01	0826_05	0826_06	0826_06
Site		11035	17827	13875	16112	17828
Secchi Depth	All	↑	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
	Winter	Not Significant	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
Specific Conductance	All	Not Significant	Not Significant	Not Significant	Not Significant	↑
	Summer	Not Significant	↑	↑	Not Significant	↑
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Total Suspended Solids	All	Not Significant	No Trend	No Trend	No Trend	No Trend
	Summer	↓	No Trend	No Trend	Not Significant	No Trend
	Winter	Not Significant	No Trend	No Trend	Not Significant	No Trend
Total Phosphorus	All	Not Significant	↓	↓	Not Significant	No Trend
	Summer	Not Significant	↓	Not Significant	Not Significant	↓
	Winter	Not Significant	No Trend	↓	Not Significant	No Trend
Total Organic Carbon	All	↑	No Trend	No Trend	↑	No Trend
	Summer	↑	No Trend	No Trend	No Trend	Not Significant
	Winter	Not Significant	No Trend	Not Significant	Not Significant	No Trend
Dissolved Barium	All	Insufficient Data	↑	↑	Insufficient Data	Not Significant
	Summer	Insufficient Data	↑	Not Significant	Insufficient Data	Not Significant
	Winter	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Not Significant
Dissolved Nickel	All	Insufficient Data	↓	↓	Insufficient Data	↓
	Summer	Insufficient Data	Not Significant	↓	Insufficient Data	Not Significant
	Winter	Insufficient Data	↓	↓	Insufficient Data	↓

Segment & Assessment Unit		0826_01	0826_01	0826_05	0826_06	0826_06
Site		11035	17827	13875	16112	17828
E. coli	All	↓	No Trend	Insufficient Data	No Trend	Insufficient Data
	Summer	Not Significant	Not Significant	Insufficient Data	Not Significant	Insufficient Data
	Winter	Not Significant	No Trend	Insufficient Data	Not Significant	Insufficient Data
Total Dissolved Solids	All	↑	No Trend	No Trend	↑	No Trend
	Summer	Not Significant	No Trend	No Trend	Not Significant	No Trend
	Winter	Not Significant	No Trend	No Trend	Not Significant	No Trend
Geosmin	All	Insufficient Data	Not Significant	No Trend	Insufficient Data	↑
	Summer	Insufficient Data	Not Significant	Not Significant	Insufficient Data	Not Significant
	Winter	Insufficient Data	Not Significant	No Trend	Insufficient Data	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

Concerns for excessive algal growth were identified in this segment. As discussed in the 2019 TRA CRP Basin Highlights Report, algal growth in Grapevine Lake is assessed as a narrative criterion based on multiple lines of evidence. In this reservoir, the threshold value for chlorophyll-*a* was 10.48 µg/L. Figure 148 shows that reported chlorophyll-*a* values regularly exceeded this threshold. As discussed previously for segment 0826A, nutrients from upstream wastewater treatment facilities may be contributing to eutrophication in this reservoir. However, it does not appear that algal populations were excessively affecting dissolved oxygen or pH levels within the reservoir. There were a total of 515 dissolved oxygen and 519 pH values in the data set used for this report. Dissolved oxygen values ranged between 1.2 and 16.3 mg/L with 15 values reported below 5 mg/L. pH values ranged from 6.3 to 9 S.U. with one value reported below 6.5 S.U. The concern for high pH in assessment unit 0826_07 was carried forward from previous assessments as there has been no monitoring in this portion of the reservoir since 2009. It is recommended that monitoring be conducted in this assessment unit to determine if pH levels are still elevated.

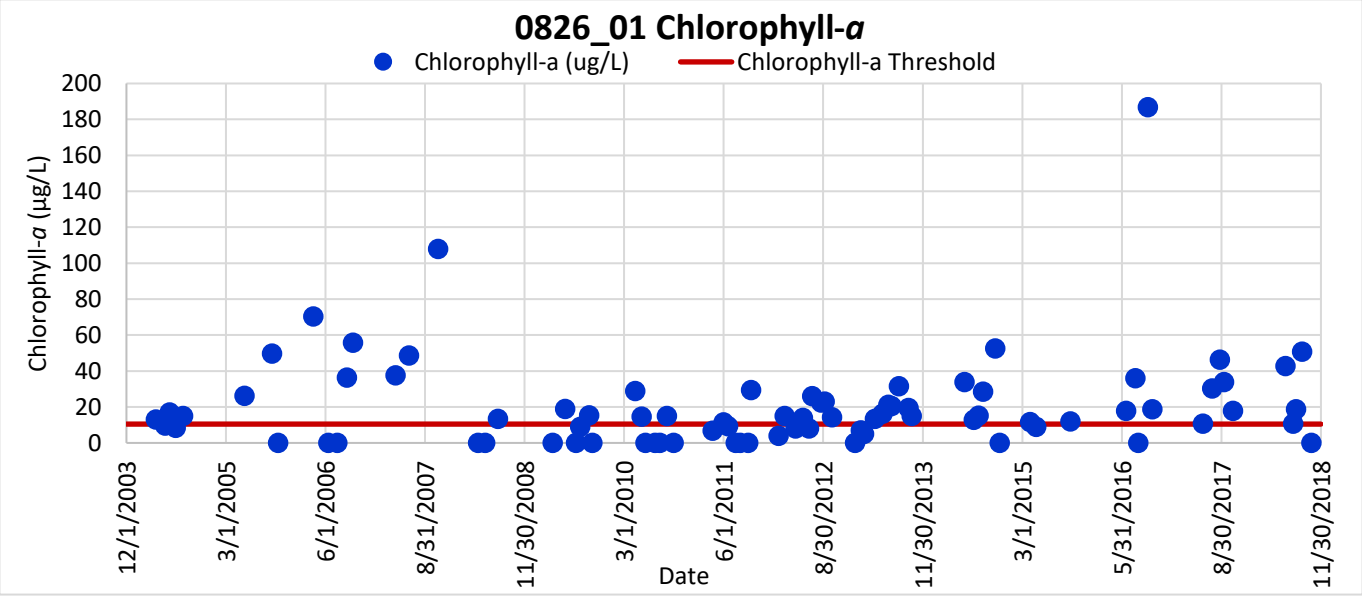


Figure 148: 0826_01 Chlorophyll-a

Increasing trends for specific conductance were related to drought conditions as shown in Figure 149 for assessment unit 0826_01. As reservoir elevations decrease, evaporation causes concentration of dissolved salts and solids which increased specific conductance levels.

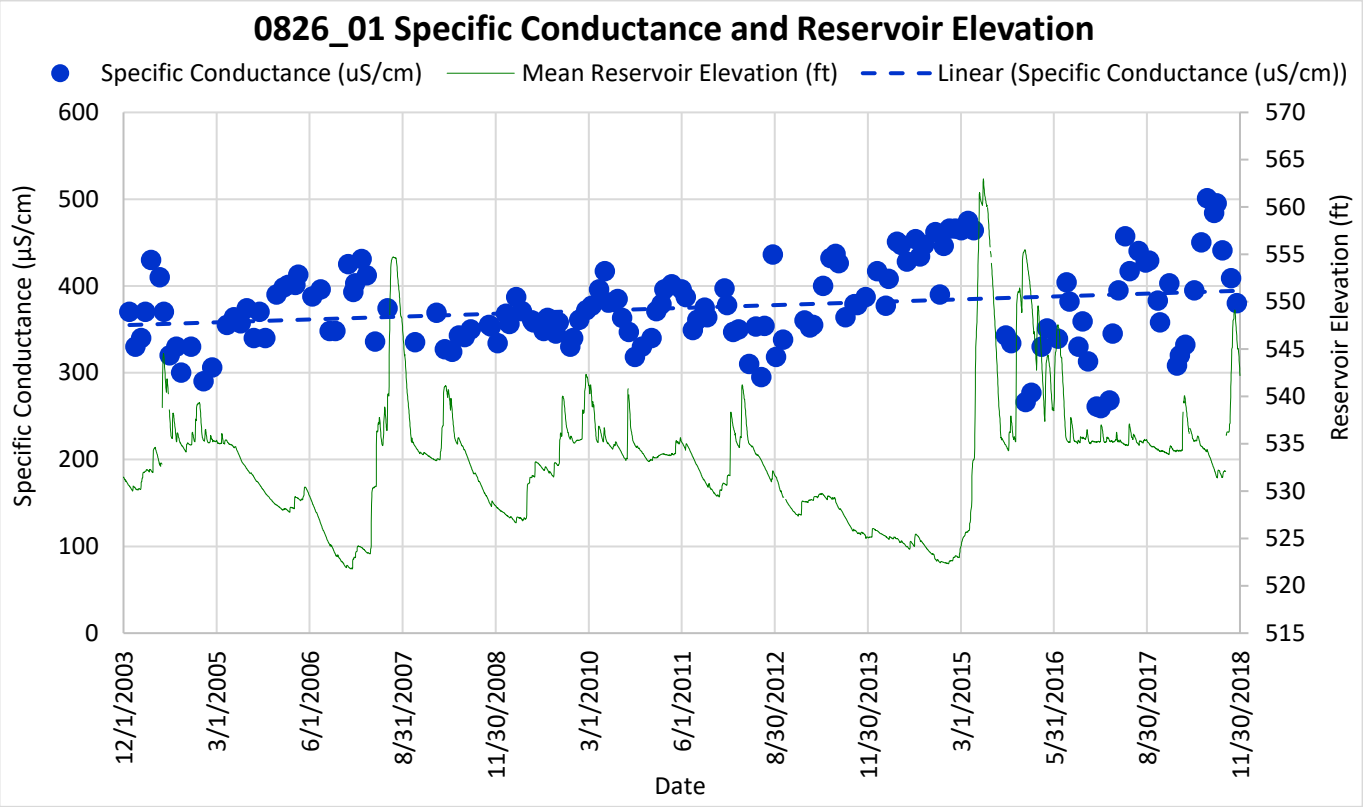


Figure 149: 0826_01 Specific Conductance and Reservoir Elevation

Total organic carbon trends in this segment are difficult to decipher and may not be true trends. There were no correlations to other parameters at the two stations for which increasing trends were identified. Additionally, most of the total organic carbon data at these two stations were reported as whole numbers which indicates that there may be issues with the data management of this parameter.

There were slight increasing trends for dissolved barium at station 17827 in assessment unit 0826_01 and 13875 in 0826_05. However, these trends do not appear to be leading to an issue with water quality. The average concentration for each station was 54.7 and 56.1 µg/L, respectively, while the surface water human health criteria for domestic water supplies is 2,000 µg/L.

Increasing trends for total dissolved solids were identified for station 11035 in assessment unit 0826_01 and station 16112 in 0826_06. As shown in Figure 150, total dissolved solids levels tracked well with decreases in reservoir elevation which indicates that evaporation during dry periods was concentrating the dissolved solids in the reservoir. The reservoir does not appear to be in danger of exceeding the total dissolved solid standard of 500 mg/L. Additionally, the trend was weighted by exceptionally high values that were reported during the drought of 2011 to 2015.

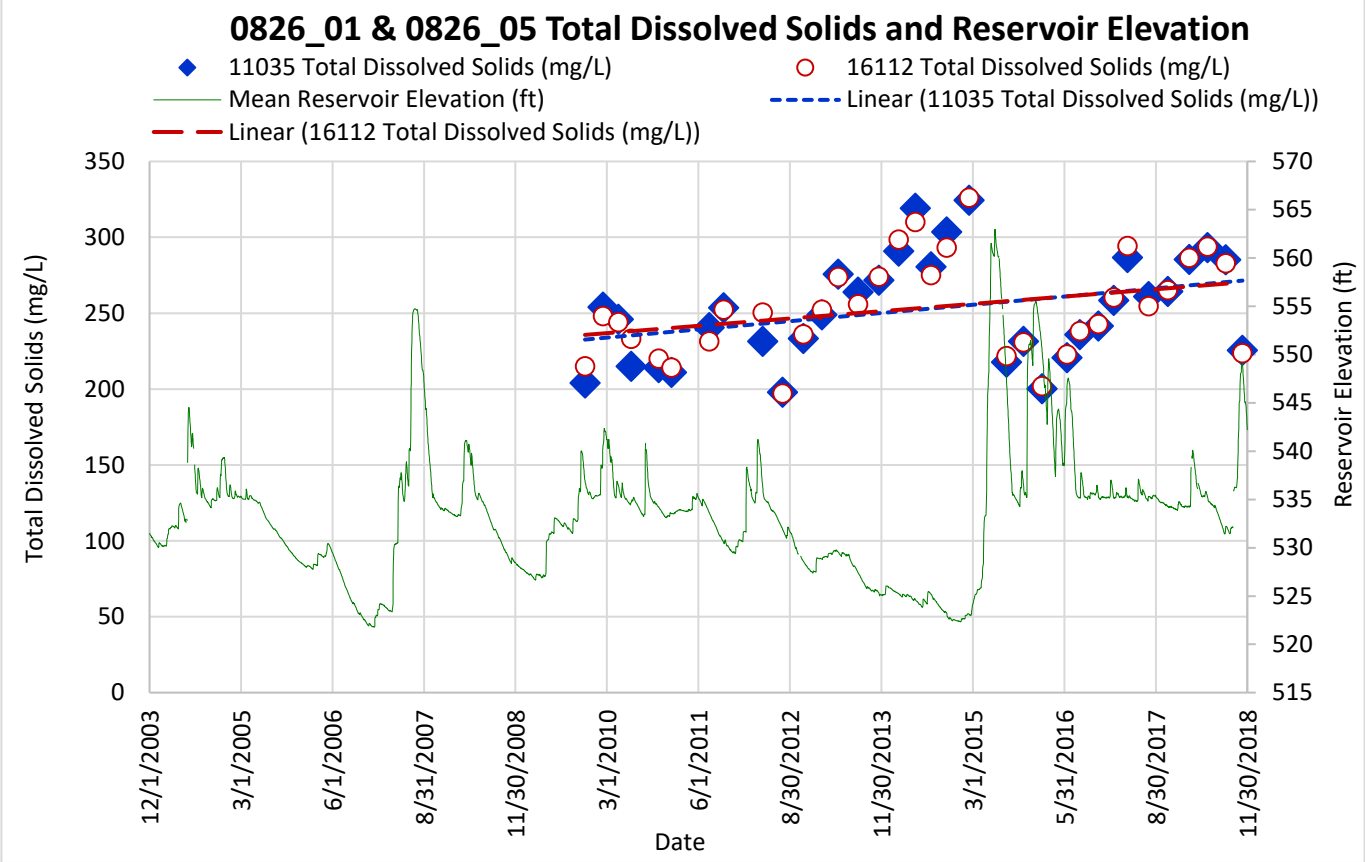


Figure 150: 0826_01 & 0826_05 Total Dissolved Solids and Reservoir Elevation

0825 – Denton Creek

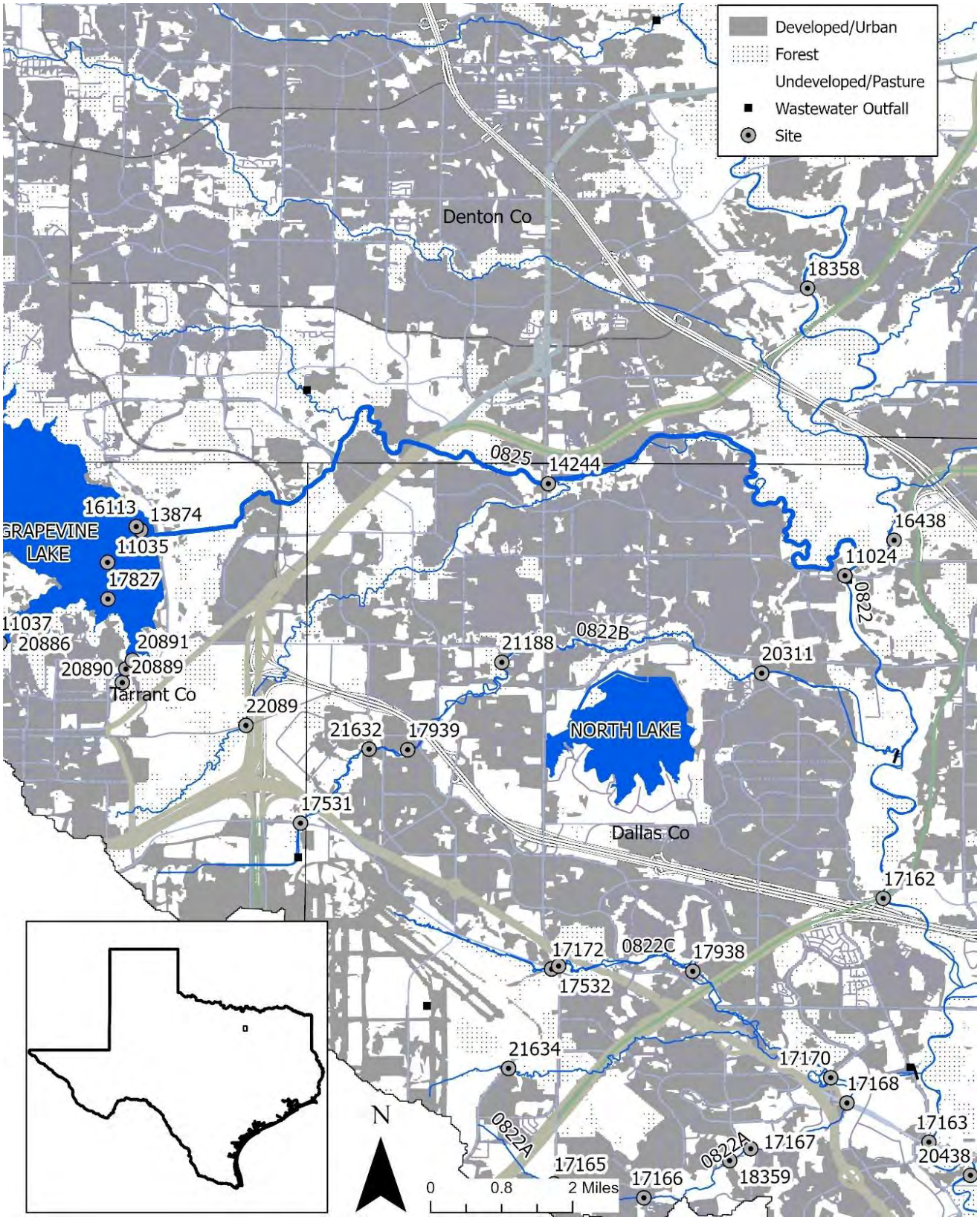


Figure 151: Segment 0825 Map

This 11-mile segment runs from Grapevine Dam in Tarrant County to the confluence with the Elm Fork Trinity River in Dallas County (see Figure 151). The watershed is highly developed; lying between the cities of Lewisville and Coppell. It begins in the Eastern Cross Timbers and flows into the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at three sites within this segment as shown in Table 103. Monitoring is being conducted by the City of Dallas (collecting entity DA), Dallas-Fort Worth Airport Environmental Affairs Department, and TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 103: Segment 0825 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0825_01	DENTON CREEK IMMEDIATELY DOWNSTREAM OF SH 121 SOUTH OF LEWISVILLE	11034	TRA
0825_01	DENTON CREEK 41 METERS UPSTREAM OF DENTON TAP ROAD 2 MI NORTH OF COPPELL (E5)	14244	City of Dallas (collecting entity DA)
0825	COTTONWOOD BRANCH AT KELLER GRAPEVINE ROAD IN IRVING	22089	Dallas-Fort Worth Airport Environmental Affairs Department

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 104. Results of TRA trend analyses are shown in

Table 105. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 104: TCEQ 2020 Texas Integrated Report Summary for Segment 0825

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	Aquatic Life Use	Acute Toxic Substances in water		FS
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	General Use	pH	6.5 - 9 S.U.	FS
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	General Use	Total Dissolved Solids	500 mg/L	FS
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	General Use	Water temperature	32.2 °F	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0825_01 From confluence with Elm Fork Trinity River in Dallas Co. to Grapevine Dam in Tarrant Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CN = Use Concern FS = Fully Supporting

Table 105: Significant Trends for Segment 0825 (P-value<0.1)

Segment & Assessment Unit		0825_01
Site		14244
Air Temperature	All	No Trend
	Summer	↓
	Winter	Not Significant
Chloride	All	Not Significant
	Summer	↑
	Winter	Not Significant
Dissolved Nickel	All	↓
	Summer	Not Significant
	Winter	↓
Chlorophyll-*a*	All	↑*
	Summer	↑*
	Winter	↑*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

This segment has concerns for elevated *E. coli*. As shown in Figure 152, *E. coli* are regularly reported above the standard of 126 MPN/100 mL. Additionally, *E. coli* levels were not well correlated to either days since precipitation or flow. This poor correlation may be due to reservoir releases diluting contributions from run-off. However, because *E. coli* levels in this segment were regularly elevated and the immediate watershed is highly developed, there is some concern that failing infrastructure may be introducing bacteria into the stream. It is recommended that sampling be conducted at several locations upstream of station 14244 in order to identify potential sources of bacteria.

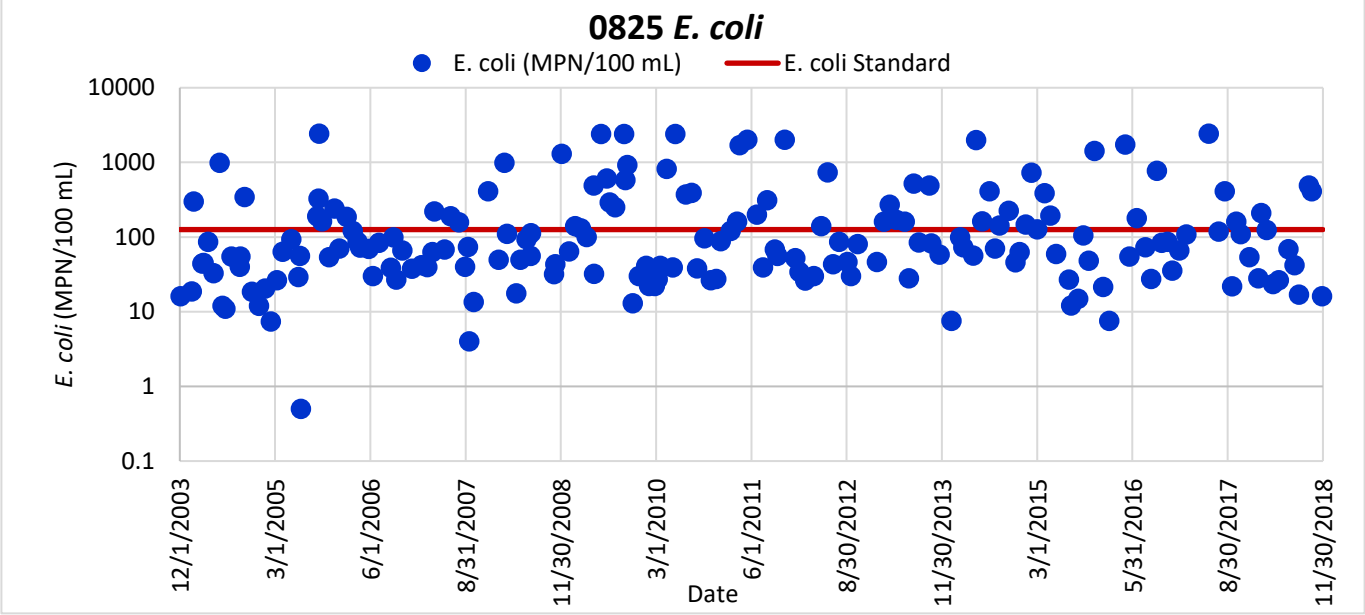


Figure 152: 0825 E. coli

The increasing trend for summertime chloride levels was weighted by the prolonged drought of 2011 to 2015. As shown in Figure 153, chloride levels tend to peak during drought periods.

Increasing trends for chlorophyll-*a* were inconclusive and likely false. Chlorophyll-*a* data were not available for station 14244 after 2010. Additionally, the data at the beginning of the data set were censored non-detect data which frequently introduces false trends.

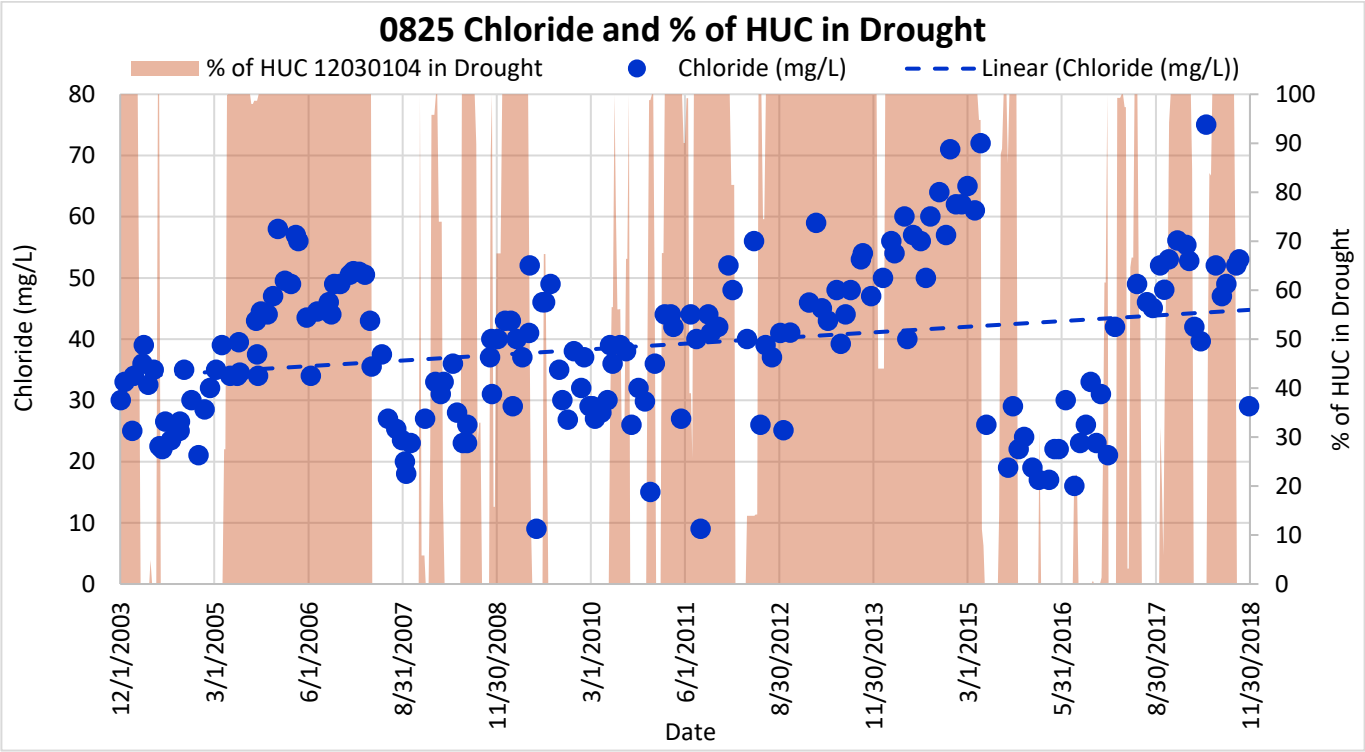


Figure 153: 0825 Summer Chloride and % of HUC in Drought

0822B – Grapevine Creek

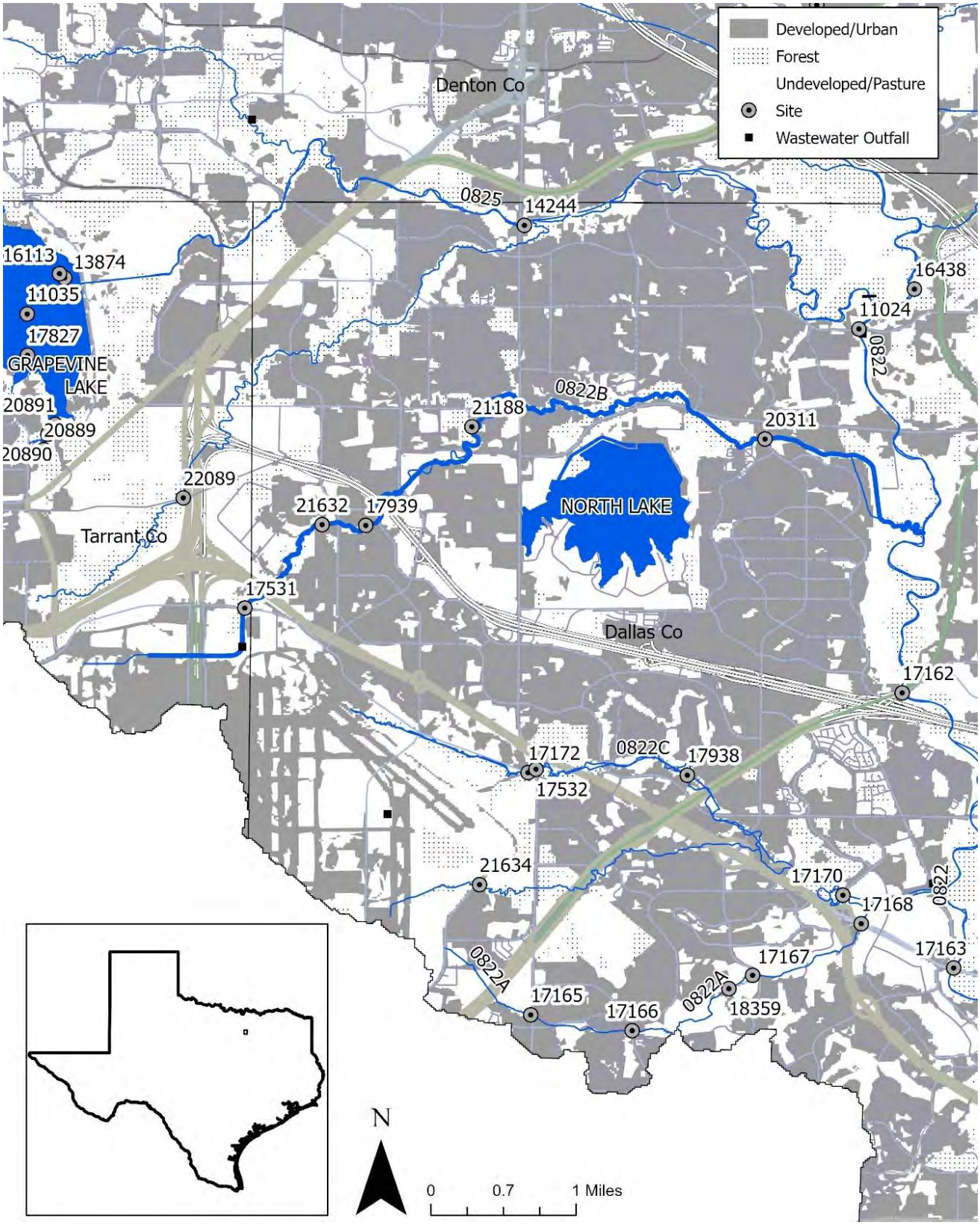


Figure 154: Segment 0822B Map

This 10.5-mile unclassified segment runs from its headwaters west of International Parkway at Dallas-Fort Worth Airport in Tarrant County to the confluence with the Elm Fork Trinity River in Dallas County upstream (see Figure 154). The watershed is heavily developed with the airport at its headwaters and flowing through the City of Coppell. It lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 106. Monitoring is being conducted by the Dallas-Fort Worth Airport Environmental Affairs Department and the City of Irving. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 106: Segment 0822B FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0822B_01	Grapevine Creek at North MacArthur Blvd. 3.5 KM Upstream of the confluence with the Elm Fork Trinity River	20311	City of Irving
0822B_01	GRAPEVINE CREEK APPROX 225 METERS UPSTREAM OF N ROYAL LANE AND 25 METERS UPSTREAM OF RAILROAD TRACKS IN IRVING	21632	Dallas-Fort Worth Airport Environmental Affairs Department

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 107. Results of TRA trend analyses are shown in Table 108.

Table 107: TCEQ 2020 Texas Integrated Report Summary for Segment 0822B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0822B_01 From confluence with Elm Fork Trinity Dallas Co. up to headwaters west of International Parkway	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	FS
0822B_01 From confluence with Elm Fork Trinity Dallas Co. up to headwaters west of International Parkway	Aquatic Life Use	Acute Toxic Substances in water		FS
0822B_01 From confluence with Elm Fork Trinity Dallas Co. up to headwaters west of International Parkway	Aquatic Life Use	Chronic Toxic Substances in water		FS
0822B_01 From confluence with Elm Fork Trinity Dallas Co. up to headwaters west of International Parkway	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0822B_01 From confluence with Elm Fork Trinity Dallas Co. up to headwaters west of International Parkway	General Use	Ammonia	0.33 mg/L	NC
0822B_01 From confluence with Elm Fork Trinity Dallas Co. up to headwaters west of International Parkway	General Use	Total Phosphorus	0.69 mg/L	NC
0822B_01 From confluence with Elm Fork Trinity Dallas Co. up to headwaters west of International Parkway	General Use	Chlorophyll-*a*	14.1 µg/L	NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 108: Significant Trends for Segment 0822B (P-value<0.1)

Segment & Assessment Unit		0822B_01
Site		20311
Flow	All	No Trend
	Summer	No Trend
	Winter	↑*
Flow Severity	All	Not Significant
	Summer	Not Significant
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

This segment was found to be not supporting the contact recreation use due to elevated levels of *E. coli*. As shown in Figure 155, *E. coli* levels were regularly reported above the standard of 126 MPN/100 mL. There were some gaps in flow data. However, the available data indicate that this issue may have been related to run-off as most of the elevated bacteria levels were reported under normal and high flow severities and when precipitation had occurred within the preceding 24 hours. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

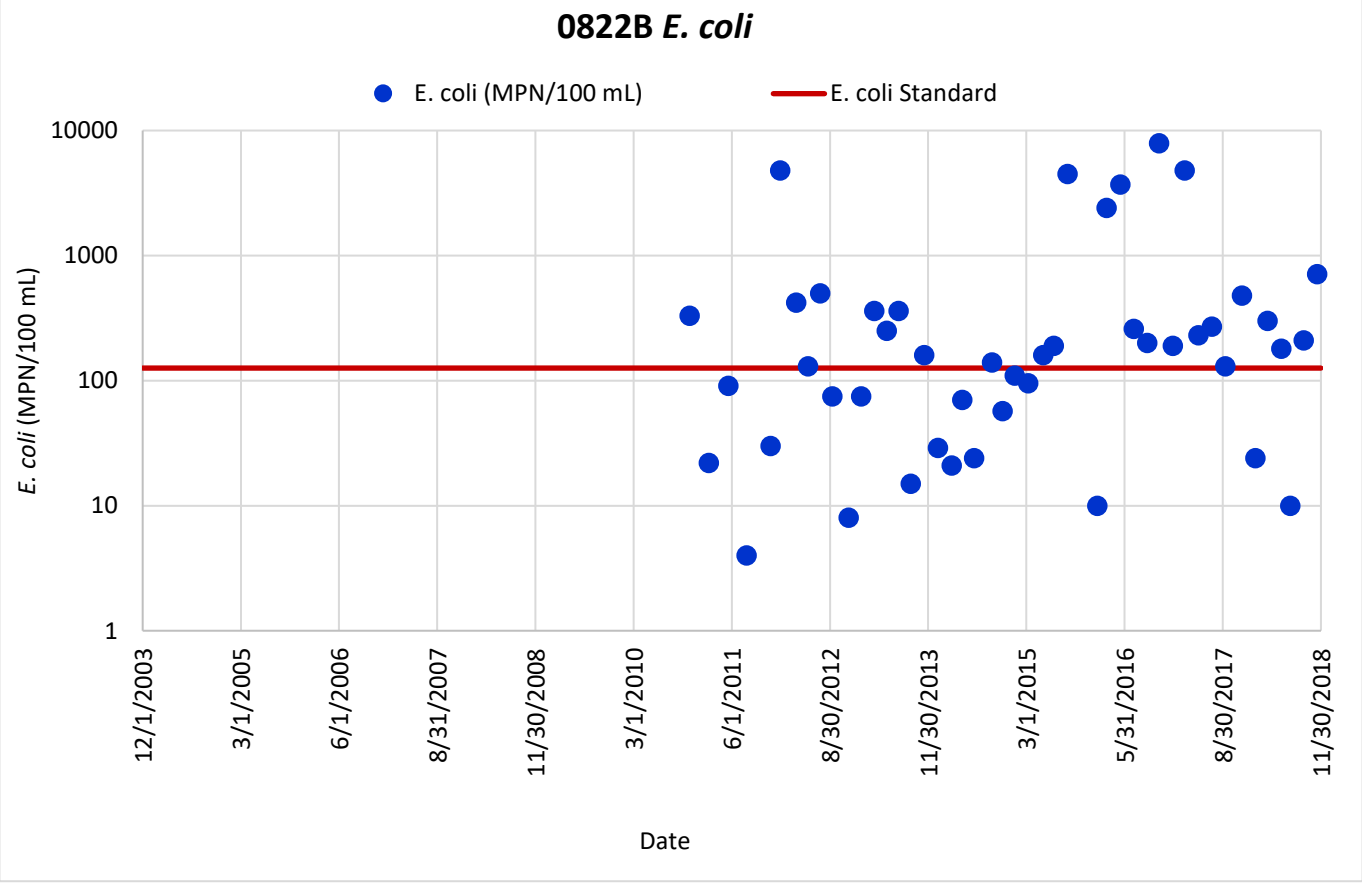


Figure 155: 0822B E. coli

0822C – Hackberry Creek

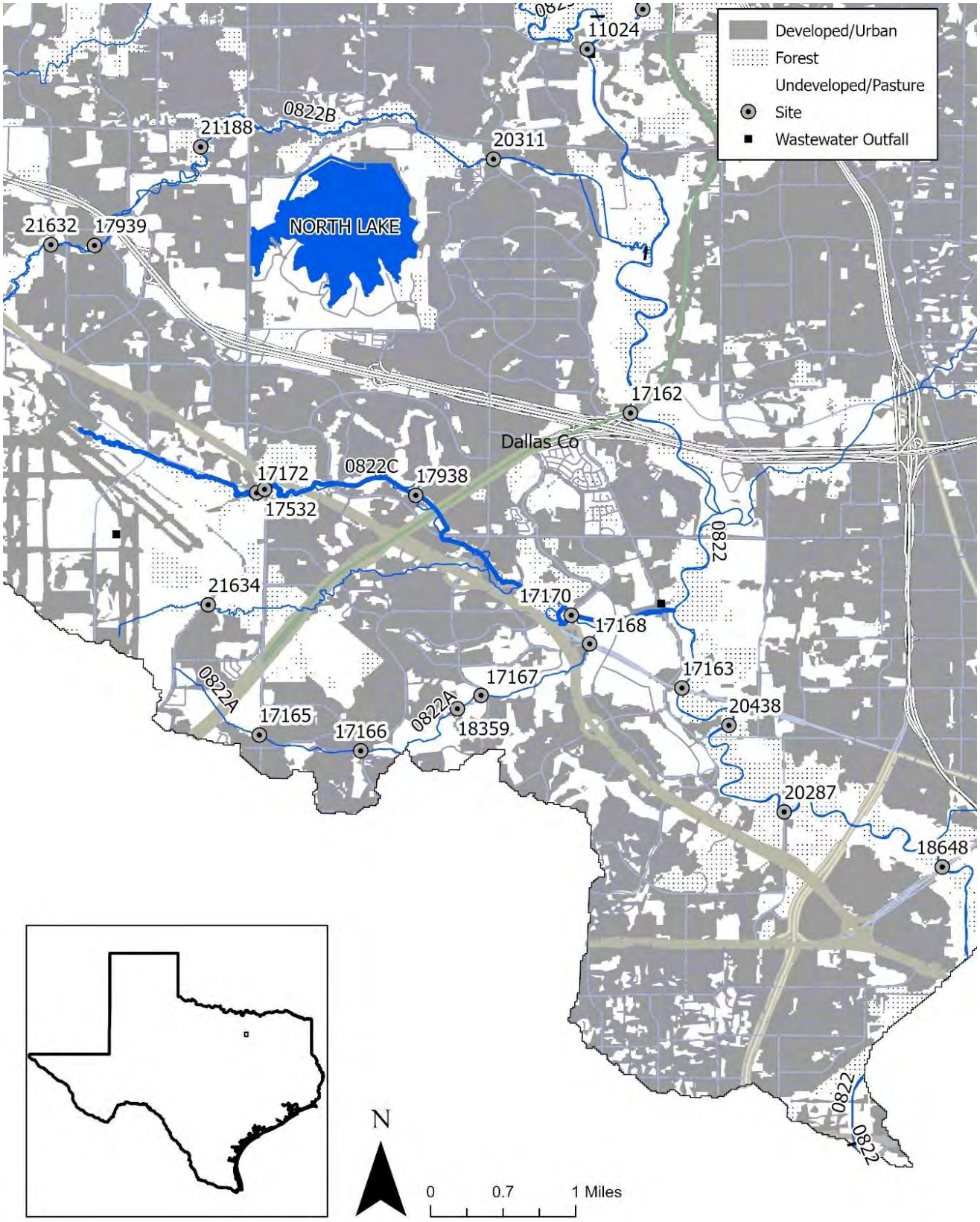


Figure 156: Segment 0822C Map

This 7-mile unclassified segment runs upstream from approximately 2.4 mi upstream of SH 114 in Irving to the confluence with Cottonwood Branch (see Figure 156). The watershed is heavily developed; beginning at Dallas-Fort Worth International Airport and flowing through the City of Irving. It lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at three sites within this segment as shown in Table 109. Monitoring is being conducted by the Dallas-Fort Worth Airport Environmental Affairs Department and the City of Irving. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 109: Segment 0822C FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0822C	SOUTH FORK HACKBERRY CREEK AT VALLEY VIEW LANE IN IRVING	21634	Dallas-Fort Worth Airport Environmental Affairs Department
0822C_01	HACKBERRY CREEK AT COLWELL BOULEVARD IN IRVING	17170	City of Irving
0822C_01	HACKBERRY CREEK AT CABELL ROAD IN IRVING	17172	Dallas-Fort Worth Airport Environmental Affairs Department

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 110. Results of TRA trend analyses are shown in Table 111.

Table 110: TCEQ 2020 Texas Integrated Report Summary for Segment 0822C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	Aquatic Life Use	Acute Toxic Substances in water		FS
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	Aquatic Life Use	Chronic Toxic Substances in water		FS
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	General Use	Ammonia	0.33 mg/L	NC
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	General Use	Nitrate	1.95 mg/L	NC
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	General Use	Total Phosphorus	0.69 mg/L	NC
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0822C_01 5.5 mi stretch from confluence with S. Fork Hackberry Ck to approx. 2.4 mi upstream of SH 114, Irving	Fish Consumption Use	HH Bioaccumulative Toxics in water		NC

CS = Screening Level Concern FS = Fully Supporting NC = No Concern

Table 111: Significant Trends for Segment 0822C (P-value<0.1)

Segment & Assessment Unit		0822C_01
Site		17170
Nitrate	All	No Trend
	Summer	↓
	Winter	Not Significant
Hardness	All	Not Significant
	Summer	Not Significant
	Winter	↓
Flow Severity	All	↓
	Summer	↓
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

Chlorophyll-*a* concerns were identified in this segment. Figure 157 shows that much of the data were reported above the screening level of 14.1 µg/L. Chlorophyll-*a* was well correlated to total kjeldahl nitrogen (correlation coefficient = 0.638). This stream has low water dams and very low flows with a wide channel and very little tree cover. These conditions provide ideal conditions for algal growth - sufficient nutrient, sunlight, high residence times. The immediate watershed several dense residential developments and a golf course which may be contributing total kjeldahl nitrogen via the use of residential and turf fertilizers. Algal populations did not appear to be excessively affecting dissolved oxygen levels in this segment. Of 68 dissolved oxygen values, no values were reported below 3 mg/L.

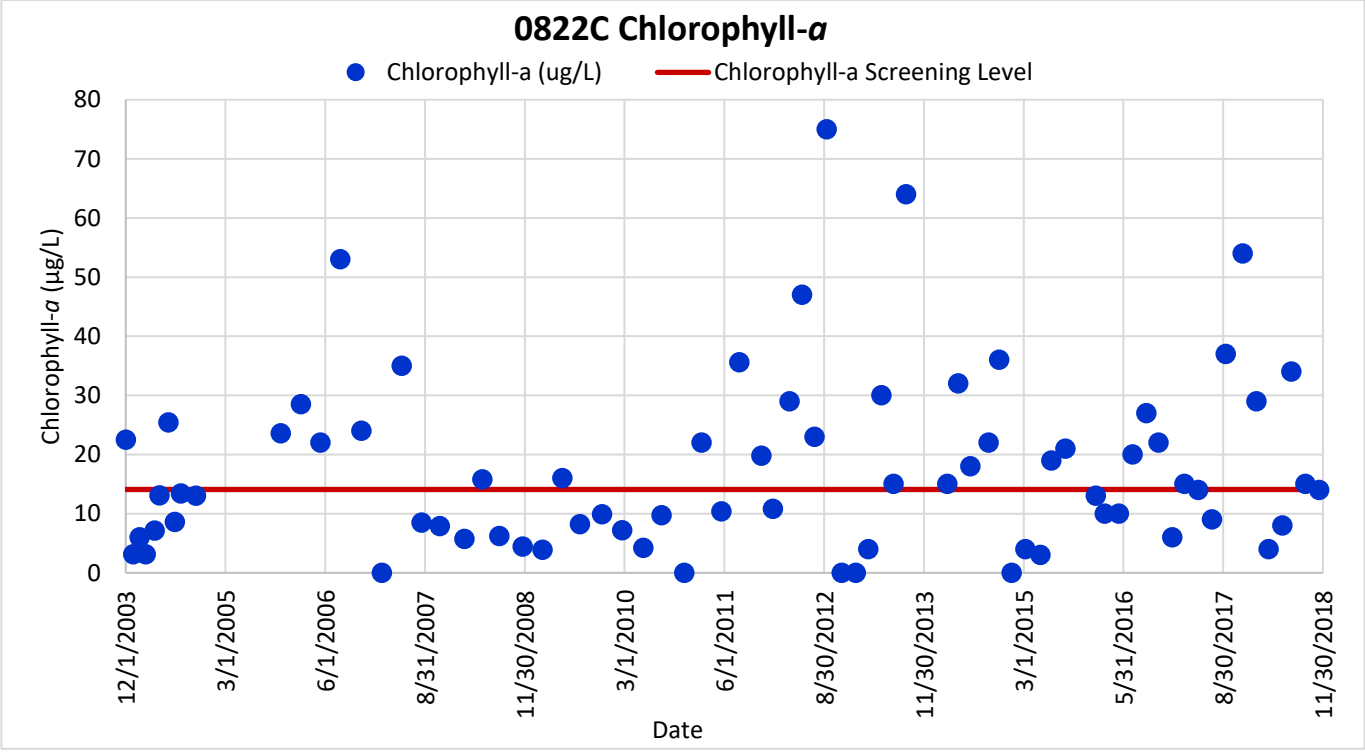


Figure 157: 0822C Chlorophyll-a

0822A – Cottonwood Branch

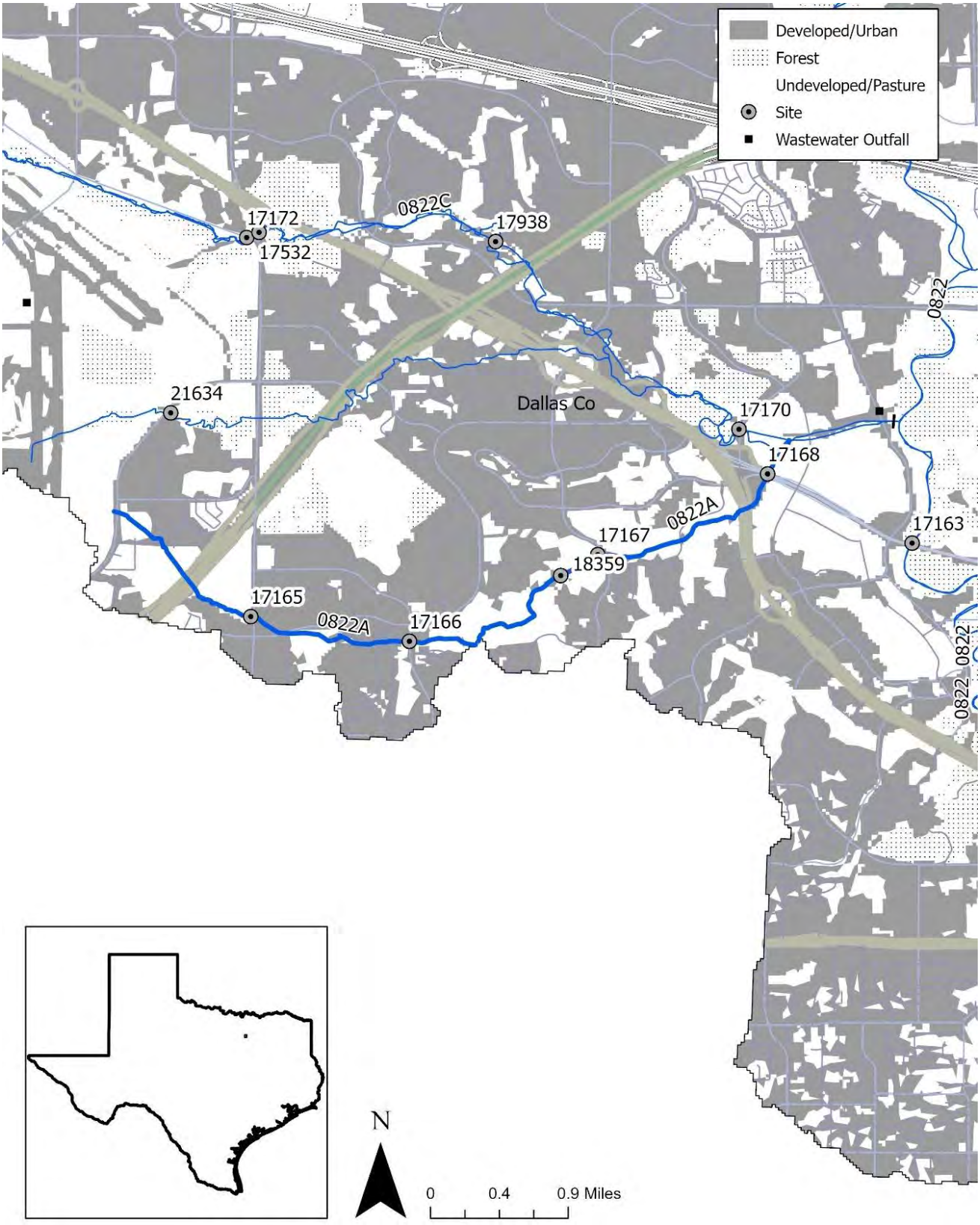


Figure 158: Segment 0822A Map

This 5-mile unclassified segment runs from Valley View Road in Dallas County to the confluence with Hackberry Creek (see Figure 158). The watershed is heavily developed; beginning at Dallas-Fort Worth International Airport and flowing through the City of Irving. It lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 112. Monitoring is being conducted by the City of Irving. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 112: Segment 0822A FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0822A_01	COTTONWOOD BRANCH 71 METERS UPSTREAM OF NORTH MACARTHUR BOULEVARD IN IRVING	17167	City of Irving
0822A_02	COTTONWOOD BRANCH AT NORTH STORY ROAD IN IRVING	17166	City of Irving

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 113. Results of TRA trend analyses are shown in Table 114.

Table 113: TCEQ 2020 Texas Integrated Report Summary for Segment 0822A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0822A_02 3. 5 mi stretch from approx. 0.5 mi downstream of N. Story Rd. to Valley View Rd, Dallas, Co.	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	Aquatic Life Use	Acute Toxic Substances in water		FS
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0822A_02 3. 5 mi stretch from approx. 0.5 mi downstream of N. Story Rd. to Valley View Rd, Dallas, Co.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	General Use	Ammonia	0.33 mg/L	NC
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	General Use	Nitrate	1.95 mg/L	NC
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	General Use	Total Phosphorus	0.69 mg/L	NC
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0822A_01 2.5 mi stretch from confluence with Hackberry Ck to approx. 0.5 mi downstream of N. Story Rd.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0822A_02 3. 5 mi stretch from approx. 0.5 mi downstream of N. Story Rd. to Valley View Rd, Dallas, Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 114: Significant Trends for Segment 0822A (P-value<0.1)

Segment & Assessment Unit		0822A_01	0822A_02
Site		17167	17166
Flow	All	Insufficient Data	No Trend
	Summer	Insufficient Data	No Trend
	Winter	Insufficient Data	↑
Secchi Depth	All	Not Significant	No Trend
	Summer	Not Significant	No Trend
	Winter	Not Significant	↓
Dissolved Oxygen	All	Not Significant	Not Significant
	Summer	Not Significant	↓
	Winter	Not Significant	Not Significant
Total Kjeldahl Nitrogen	All	↓*	Insufficient Data
	Summer	↓*	Insufficient Data
	Winter	↓*	Insufficient Data
Days Since Precipitation	All	Not Significant	Not Significant
	Summer	Not Significant	Not Significant
	Winter	↓*	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Chlorophyll-*a* concerns were identified in assessment unit 0822A_01. Similar to segment 0822C, the stream had relatively low flow severities, a wide channel, and little tree cover as shown in Figure 159. The stream also flows through a golf course. However, unlike segment 0822C, chlorophyll-*a* is not well correlated to any nutrient. While the nutrients from turf fertilizers may be contributing to the concern, it is likely that the long residence times and clarity of the stream were responsible for the concern in this assessment unit. Algal populations did not appear to be excessively affecting water quality for aquatic life in this assessment unit. Of 68 dissolved oxygen values, no values were reported below 2 mg/L.



Figure 159: Assessment unit 0822A_01 and station 17167

Assessment unit 0822A_02 was found to be not supporting the contact recreation use due to elevated levels of *E. coli* (see Figure 160). The data set for flow was limited but indicate that the upper portion of the stream is a very low flow system (maximum flow = 2.5 cfs) and higher bacteria levels were generally observed at the higher flows. The watershed above the monitoring station in this assessment unit contains several large multifamily developments in addition to small wooded areas directly adjacent to the stream. It is likely that the bacteria impairment in this segment were related to run-off from pets and, to a lesser extent, wildlife. Public education and pet waste best management practices in the apartment complexes may help reduce bacteria levels in this stream. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

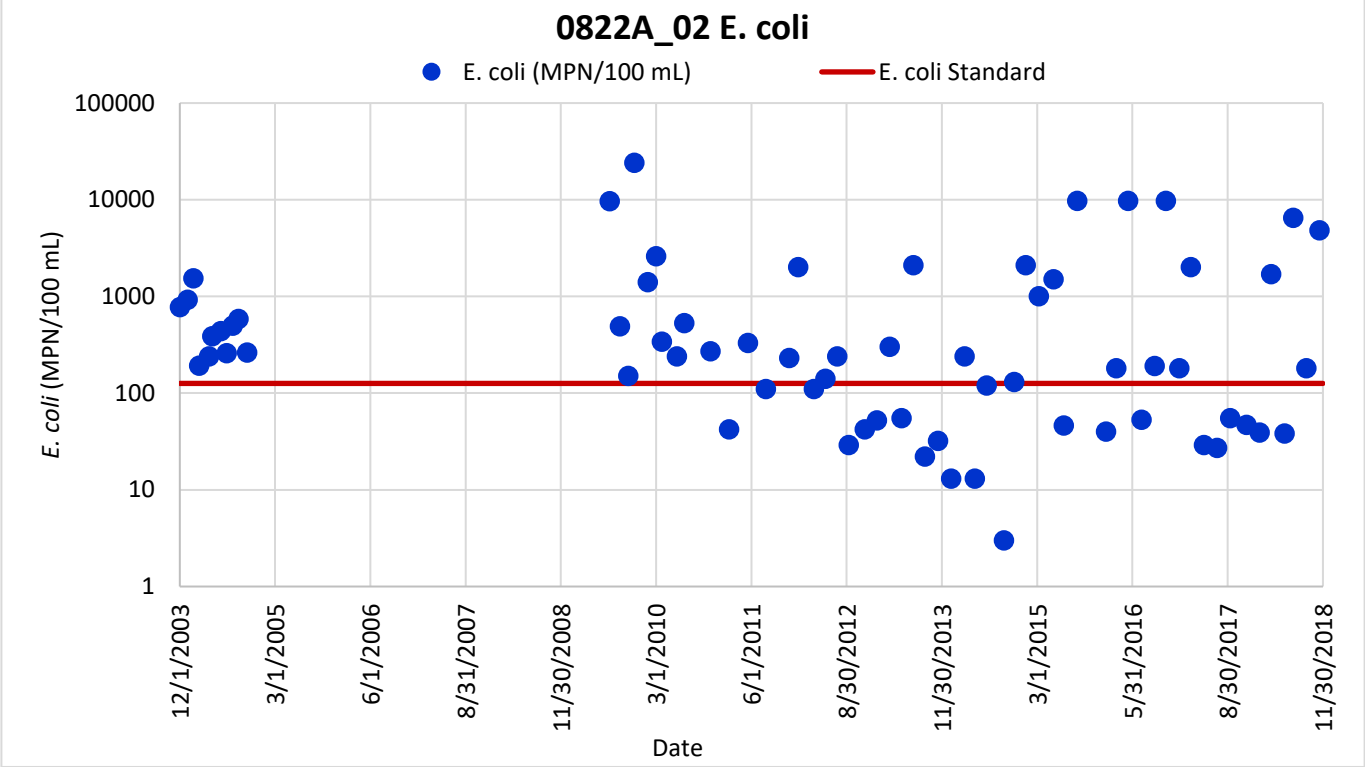


Figure 160: 0822A_02 E. coli

0822D – Ski Lake

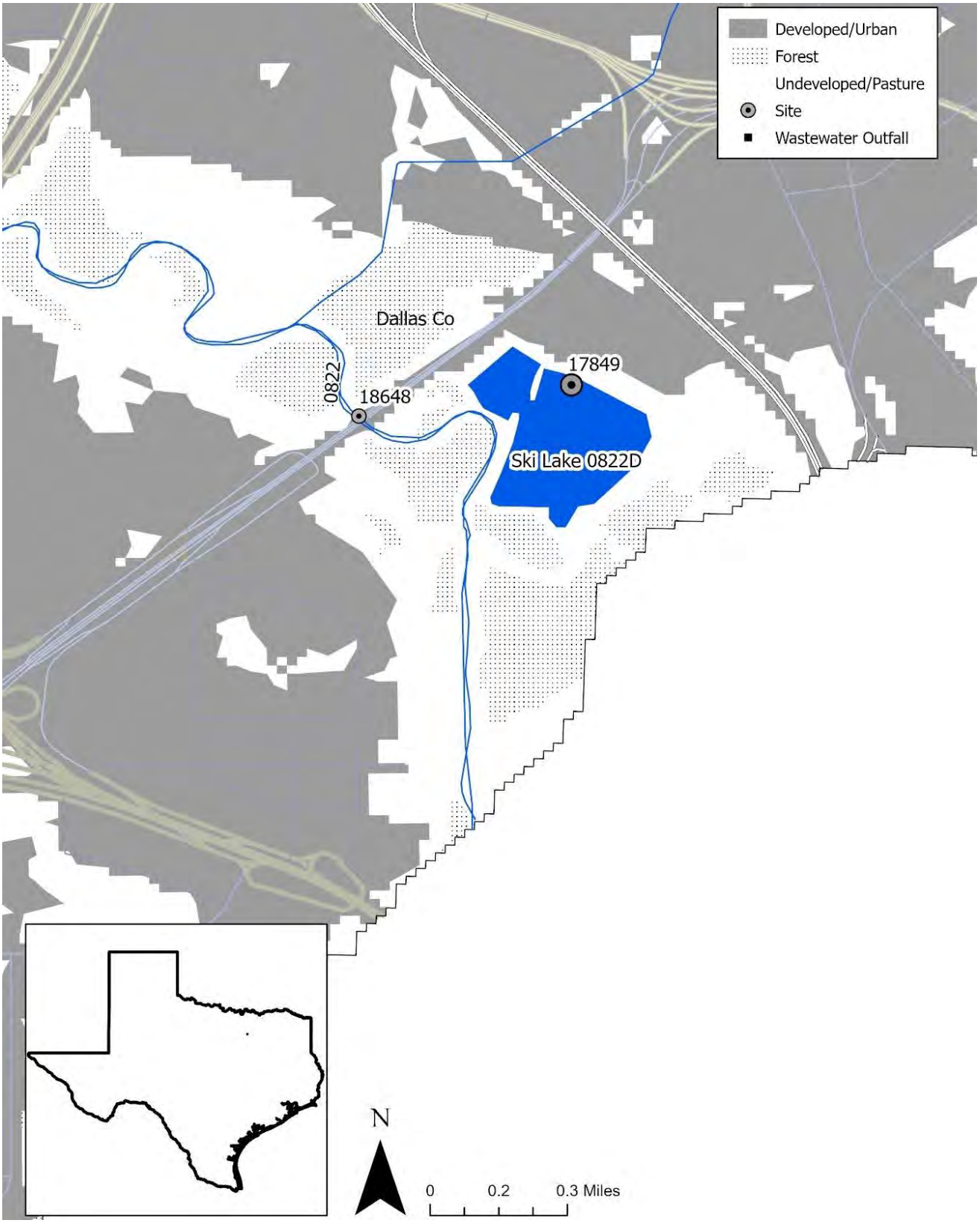


Figure 161: Segment 0822D Map

This 68-acre reservoir is located just south of the intersection of US 35E and spur 482 in Irving (see Figure 161). The watershed is heavily developed and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 115. Monitoring is being conducted by the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 115: Segment 0822D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0822D_01	SKI LAKE NEAR BARCHMAN TREATMENT PLANT INTAKE 543 METERS SOUTH AND 99 METERS WEST OF INTERSECTION OF SH 482 AND I 35 EAST (E3)	17849	City of Dallas (collecting entity DA)

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 116. Results of TRA trend analyses are shown in Table 117. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 116: TCEQ 2020 Texas Integrated Report Summary for Segment 0822D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0822D_01 A 65 acre reservoir locate just south of the intersection of US 35E and spur 482 in Irving	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0822D_01 A 65 acre reservoir locate just south of the intersection of US 35E and spur 482 in Irving	Aquatic Life Use	Acute Toxic Substances in water		FS
0822D_01 A 65 acre reservoir locate just south of the intersection of US 35E and spur 482 in Irving	Aquatic Life Use	Chronic Toxic Substances in water		FS
0822D_01 A 65 acre reservoir locate just south of the intersection of US 35E and spur 482 in Irving	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0822D_01 A 65 acre reservoir locate just south of the intersection of US 35E and spur 482 in Irving	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting

Table 117: Significant Trends for Segment 0822D (P-value<0.1)

Segment & Assessment Unit		0822D_01
Site		17849
Air Temperature	All	Not Significant
	Summer	↓
	Winter	↓

Segment & Assessment Unit		0822D_01
Site		17849
Dissolved Barium	All	Not Significant
	Summer	↑
	Winter	Not Significant
Dissolved Nickel	All	↓
	Summer	No Trend
	Winter	↓
Chlorophyll-*a*	All	No Trend
	Summer	No Trend
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

There was a slight increasing trend for dissolved barium in this segment as shown in Figure 162. This trend did not appear to be affected by drought which seems to indicate that there may be a source in the watershed that may be contributing barium to the reservoir. Sources of barium can include mineral deposits, natural gas drilling, and some industrial processes. As the watershed immediately surrounding Ski Lake is mostly industrial, it is likely that one or more of these facilities may be contributing barium to the reservoir. However, this trend does not indicate an immediate concern as the average of the available data was 42.4 µg/L while the surface water human health criteria for domestic water supplies is 2,000 µg/L. Additional sampling in the watershed would be required to determine if there may be an identifiable source of barium to this reservoir.

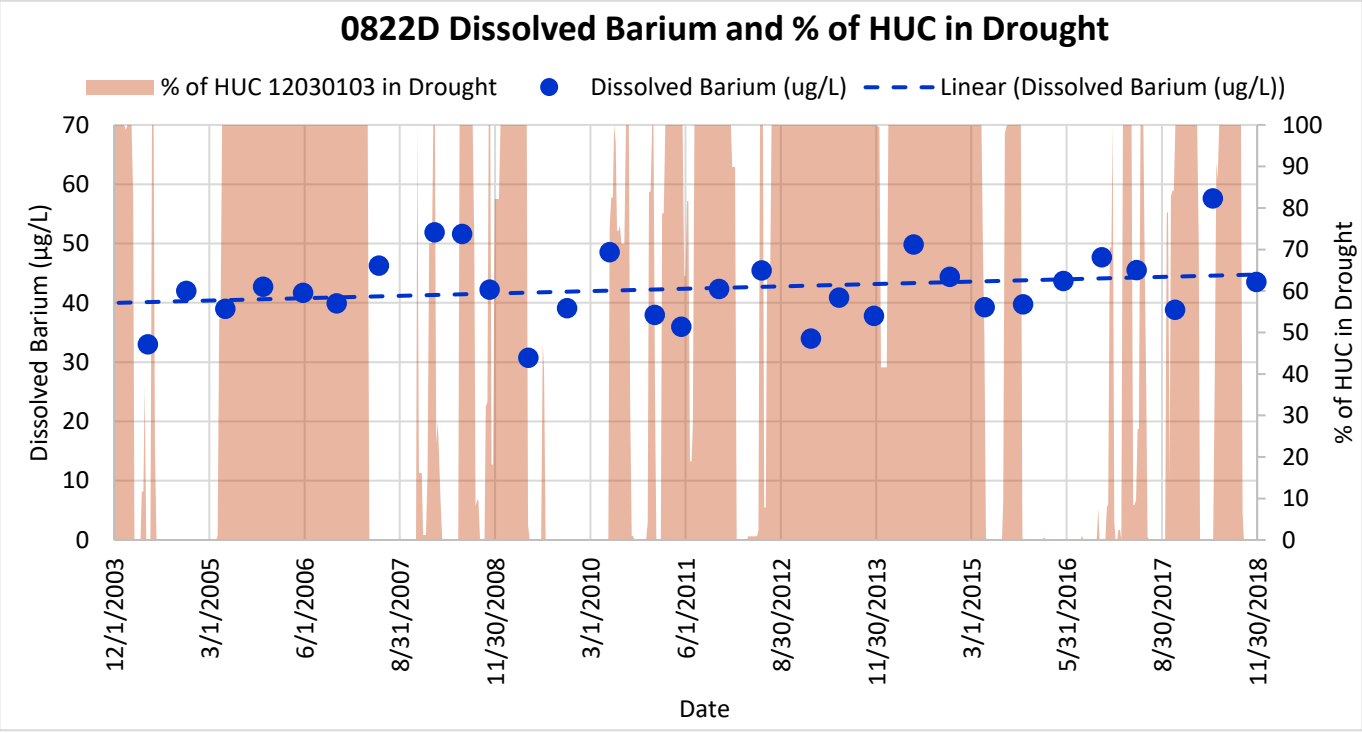


Figure 162: 0822D Dissolved Barium and % of HUC in Drought

Main Stem Trinity River

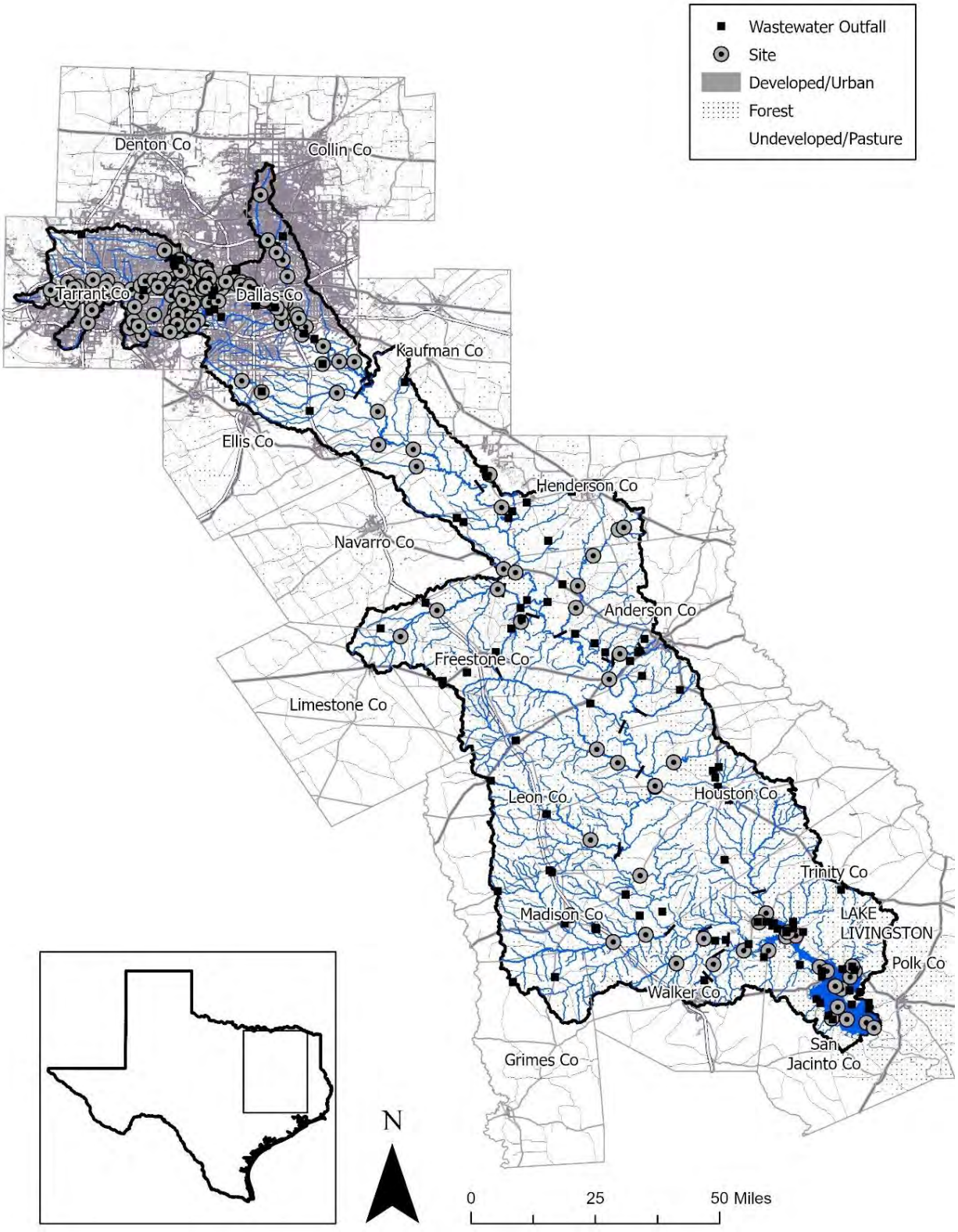


Figure 163: Main Stem Trinity River Overview Map

The Main Stem Trinity River runs 421 miles from the Lake Worth Dam past the confluence with the Clear Fork just north of downtown Fort Worth. It flows east through the mid-cities of the Dallas-Fort Worth Metroplex before being joined by the Elm Fork. South of Dallas, the East Fork connects to the Main Stem and it continues 200 miles south to headwaters of Lake Livingston near the city of Crockett. The Main Stem terminates at the Lake Livingston Dam which crosses Polk and San Jacinto counties (see Figure 163). In general, the Main Stem is highly urbanized and developed in the upper reaches around the Dallas-Fort Worth Metroplex. It becomes more rural with some crop, pasture, and hay land as well as forested areas as the river travels south to Trinidad, Palestine, and Crockett.

Through much of the Dallas-Fort Worth Metroplex, the Main Stem Trinity River has been channelized and leveed. Development along the urbanized portions of the river is taking place. The City of Fort Worth has created the Panther Island Central City Flood Project which includes plans to redevelop an industrial area at the confluence of the West and Clear Forks of the Trinity River into a mixed use community. The Trinity River Corridor Project in Dallas has projects that have revitalized the area surrounding the river near downtown. Both of these projects have components of flood protection, habitat restoration, and opportunities for the public to enjoy recreation in and around the Trinity River.

The Main Stem subwatershed averages 37 inches of rain per year in the upper portion of the watershed and 51 inches in the south. The subwatershed begins in the Grand Prairies before flowing through the Eastern Cross Timbers, Blackland Prairies, Post Oak Savanna, and finally into the Southern Tertiary Uplands ecoregion surrounding Lake Livingston.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0806 West Fork Trinity River Below Lake Worth
- 0806D Marine Creek
- 0806E Sycamore Creek
- 0806B Echo Lake
- 0806A Fosdic Lake
- 0806C Big Fossil Creek
- 0806F Little Fossil Creek
- 0841R Rush Creek
- 0841M Kee Branch
- 0841T Village Creek
- 0841 Lower West Fork Trinity River
- 0841L Johnson Creek
- 0841C Arbor Creek
- 0841G Dalworth Creek
- 0841D Big Bear Creek

- 0841B Bear Creek
- 0841J Estelle Creek
- 0841I Dry Branch Creek
- 0841S Vilbig Lakes
- 0841U West Irving Creek
- 0841P North Fork Cottonwood Creek
- 0841V Crockett Branch
- 0841F Cottonwood Creek
- 0841K Fish Creek
- 0841Q North Fork Fish Creek
- 0841N Kirby Creek
- 0841W Mountain Creek above Mountain Creek Lake
- 0841A Mountain Creek Lake
- 0841E Copart Branch Mountain Creek
- 0841O Mountain Creek
- 0841H Delaware Creek
- 0805 Upper Trinity River
- 0827A White Rock Creek Above White Rock Lake
- 0827B Cottonwood Creek
- 0827 White Rock Lake
- 0805C White Rock Creek Below White Rock Lake
- 0805D Fivemile Creek
- 0805B Parsons Slough
- 0805A Red Oak Creek
- 0804 Trinity River Above Lake Livingston
- 0835 Richland Creek Below Richland-Chambers Reservoir
- 0804I Big Brown Creek
- 0804J Fairfield Lake
- 0804F Tehuacana Creek
- 0804G Catfish Creek
- 0804M Bassett Creek
- 0804L Town Creek
- 0804B Keechi Creek
- 0804A Box Creek
- 0804E Northwest Branch
- 0804D Toms Creek
- 0804C Mims Creek
- 0804H Upper Keechi Creek
- 0813 Houston County Lake
- 0804K Lower Keechi Creek
- 0803G Lake Madisonville
- 0803 Lake Livingston

- 0803F Bedias Creek
- 0803E Nelson Creek
- 0803C Turkey Creek
- 0803D Parker Creek
- 0803A Harmon Creek
- 0803B White Rock Creek

0806 West Fork Trinity River Below Lake Worth

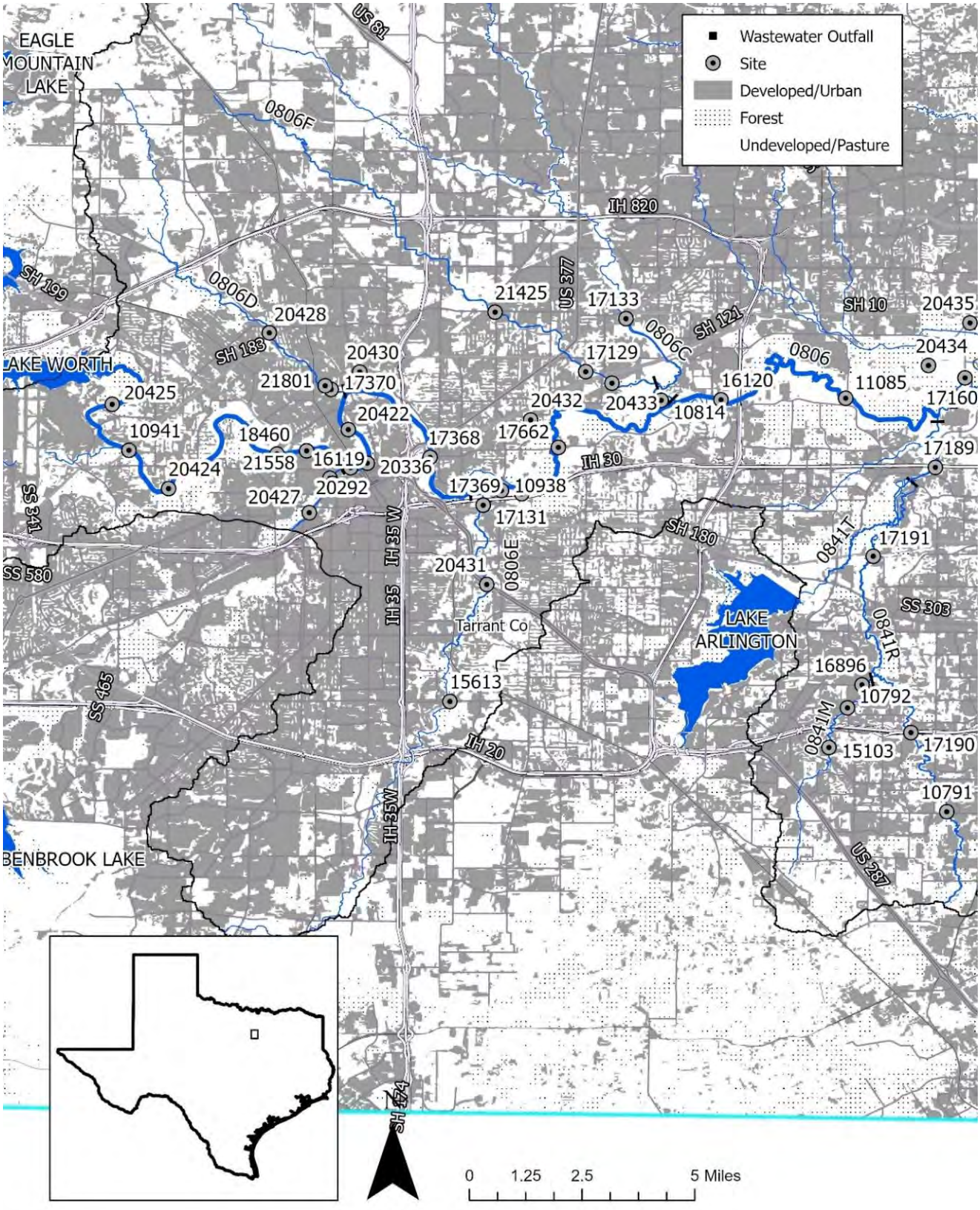


Figure 164: Segment 0806 Map

This 32-mile segment of the West Fork Trinity River travels southeast from the Lake Worth dam to the confluence of Village Creek in Tarrant County (see Figure 164). A majority of the segment is heavily developed by the cities of White Settlement, Fort Worth, Haltom City, and Arlington. There are some forested areas directly adjacent to the river. This segment begins in the Grand Prairie and ends in the Eastern Cross Timbers ecoregion.

Clean Rivers Program water quality monitoring is being conducted at six sites within this segment as shown in Table 118. Monitoring is being conducted by the City of Fort Worth and Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 118: Segment 0806 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0806_01	WEST FORK TRINITY RIVER 54 METERS DOWNSTREAM OF BEACH STREET IN FORT WORTH	10938	City of Fort Worth
0806_01	WEST FORK TRINITY RIVER 54 METERS DOWNSTREAM OF BEACH STREET IN FORT WORTH	10938	Tarrant Regional Water District
0806_01	WEST FORK TRINITY RIVER 260 METERS DOWNSTREAM OF HANDLEY EDERVILLE ROAD 0.55KM UPSTREAM OF IH 820 IN FORT WORTH	16120	City of Fort Worth
0806_01	WEST FORK TRINITY RIVER IMMEDIATELY DOWNSTREAM OF 4TH STREET EAST OF FORT WORTH	17368	City of Fort Worth
0806_01	WEST FORK TRINITY RIVER IMMEDIATELY DOWNSTREAM OF 4TH STREET EAST OF FORT WORTH	17368	Tarrant Regional Water District
0806_02	WEST FORK TRINITY RIVER AT BOAT RAMP IMMEDIATELY UPSTREAM OF JACKSBORO HIGHWAY/SH 199 IN FORT WORTH	21558	City of Fort Worth

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 119. Results of TRA trend analyses are shown in Table 120. Data used for these trend analyses includes data that was collected by the City of Fort Worth but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 119: TCEQ 2020 Texas Integrated Report Summary for Segment 0806

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	Aquatic Life Use	Acute Toxic Substances in water		FS
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	Aquatic Life Use	Chronic Toxic Substances in water		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	Ammonia	0.33 mg/L	NC
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	Nitrate	1.95 mg/L	NC
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	Total Phosphorus	0.69 mg/L	NC
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	pH	6.5 - 9 S.U.	FS
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	General Use	pH	6.5 - 9 S.U.	FS
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	Chloride	100 mg/L	NC
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	General Use	Chloride	100 mg/L	NC
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	Sulfate	100 mg/L	NC
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	General Use	Sulfate	100 mg/L	NC
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	Total Dissolved Solids	500 mg/L	FS
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	General Use	Total Dissolved Solids	500 mg/L	FS
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	General Use	Water temperature	33.9 °F	FS
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	General Use	Water temperature	33.9 °F	FS
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0806_01 From confluence of Village Creek upstream to confluence of Clear Fork Trinity River	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0806_02 From confluence of Clear Fork Trinity River upstream to Lake Worth Dam	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CN = Use Concern CS = Screening Level Concern FS = Fully Supporting NC = No Concern
NS = Not Supporting

Table 120: Significant Trends for Segment 0806 (P-value<0.1)

Segment & Assessment Unit		0806_01	0806_01	0806_01	0806_01	0806_02
Site		10938	16120	17368	17863	21558
Specific Conductance	All	Not Significant	No Trend	↑	Not Significant	Not Significant
	Summer	No Trend	↑	↑	↑	Not Significant
	Winter	Not Significant	↑	No Trend	Not Significant	Not Significant
pH	All	Not Significant	No Trend	No Trend	Not Significant	↓*
	Summer	Not Significant	No Trend	Not Significant	Not Significant	↓*
	Winter	↑	No Trend	No Trend	Not Significant	Not Significant
Total Kjeldahl Nitrogen	All	Insufficient Data	Insufficient Data	Insufficient Data	↓	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	Insufficient Data	↓	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Insufficient Data	↓	Insufficient Data
Flow Severity	All	Not Significant	Not Significant	No Trend	Not Significant	No Trend
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	No Trend
	Winter	↑	↑	↑	No Trend	No Trend
E. coli	All	Not Significant	No Trend	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	No Trend	Not Significant	Not Significant	↑*
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Total Dissolved Solids	All	Not Significant	No Trend	↑	Not Significant	Not Significant
	Summer	No Trend	↑	↑	Not Significant	Not Significant
	Winter	Not Significant	↑	No Trend	Not Significant	Not Significant
Days Since Precipitation	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	↑	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	↑*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The impairment for fish consumption use is based on unsafe levels of PCBs in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 53) to limit the consumption of several species of fish. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

Concerns for elevated levels of *E. coli* in assessment unit 0806_02 appear to have been somewhat related to run-off as shown in Figure 165. TRA data analysis also identified an increasing trend for *E. coli*. There was a distinct increase in *E. coli* levels with increasing flows. The decreased *E. coli* levels at the highest flows in the graph were likely due to samples being collected on the falling limb of the hydrograph. Samples collected on the falling limb of the hydrograph typically have lower levels of pollutants than samples collected at the same flow on the rising limb of the hydrograph because the first flush has passed and pollutants have been diluted and moved downstream. The watershed upstream of the sampling station is heavily developed and largely residential. Therefore, run-off from pet waste is likely the major contributor to bacterial concerns in this assessment unit. However, there were elevated bacteria levels even at lower flows. Failing infrastructure may have also contributed to this concern. Additional sampling along the assessment unit is recommended to determine if there are point sources of bacteria that may be repaired. Homeowner education and pet waste best management practices may help reduce bacteria levels.

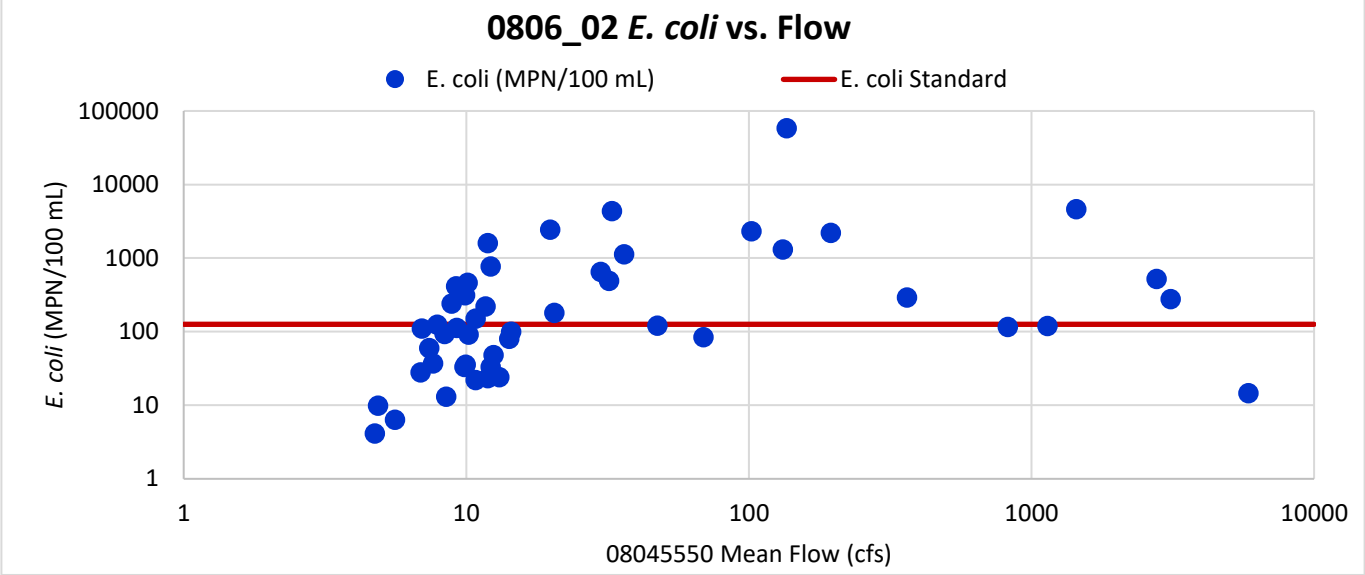


Figure 165: 0806_02 E. coli vs. Flow

A concern for elevated chlorophyll-*a* levels was identified in the lower portion of this segment. As shown in Figure 166, chlorophyll-*a* values were regularly reported above the screening level of 14.1 µg/L. Sampling was discontinued at station 17863 in 2012. Chlorophyll-*a* was not well correlated to any nutrients. However, the river upstream of the sampling station is channelized and has a series of low water dams that slow down the movement of water under low and normal flows. The channel is wide and lacks shading from riparian vegetation. These conditions – ample sunlight and long residence times – likely allowed algal populations to increase to these levels. It does not appear that algal populations were excessively affecting water quality. Of the 244 dissolved oxygen values reported at station 17863 and the downstream station 16120, only eight values were reported below 5 mg/L and no values were reported below 3 mg/L.

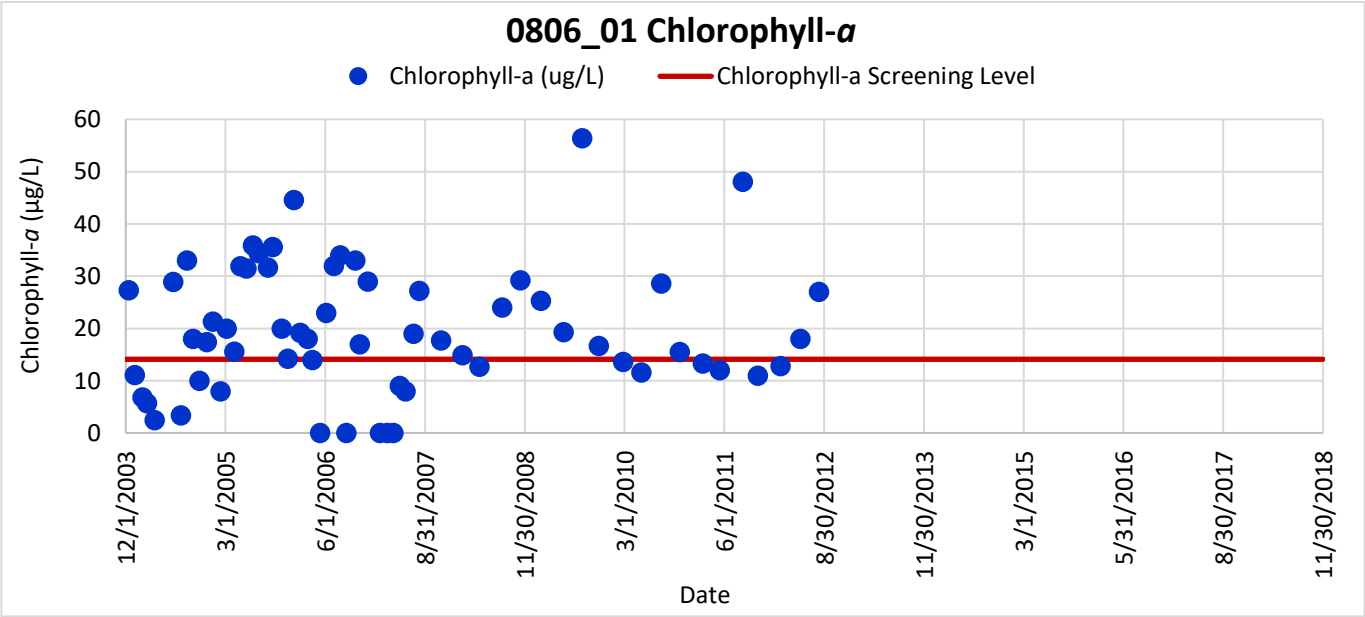


Figure 166: 0806_01 Chlorophyll-a

Increasing trends for specific conductance and total dissolved solids were identified for several stations in assessment unit 0806_01. Total dissolved solids for these stations were calculated from specific conductance. As shown in Figure 167, there was not a strong correlation between specific conductance and drought. Neither was there a correlation between specific conductance and flow (correlation coefficient = -0.091). The watershed has been heavily developed for many years so increasing development has likely not been a major influence. A number of other factors could be causing increased specific conductance in this segment such as an industry, irrigation practices, and failing infrastructure.

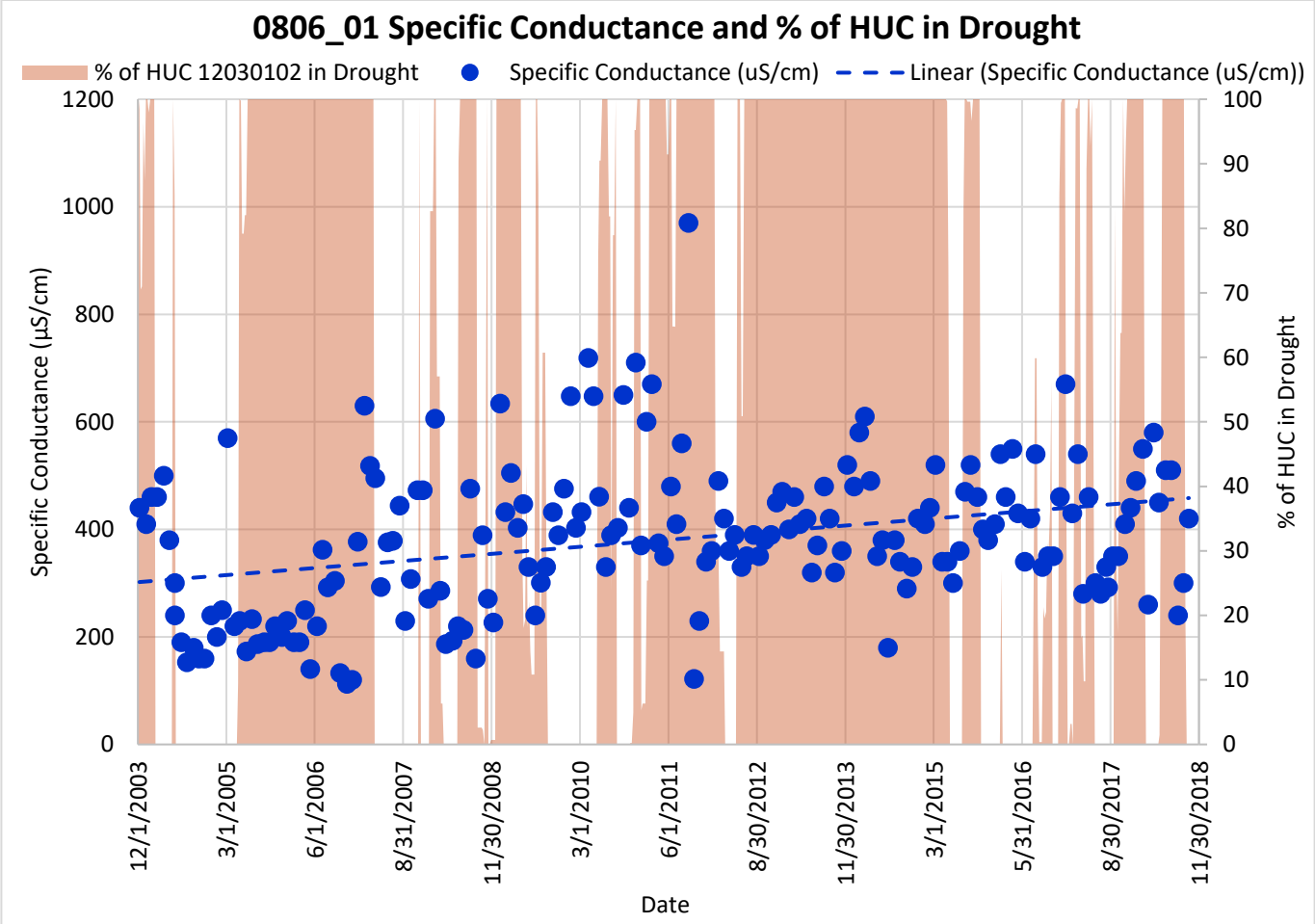


Figure 167: 0806_01 Specific Conductance and % of HUC in Drought

0806D Marine Creek

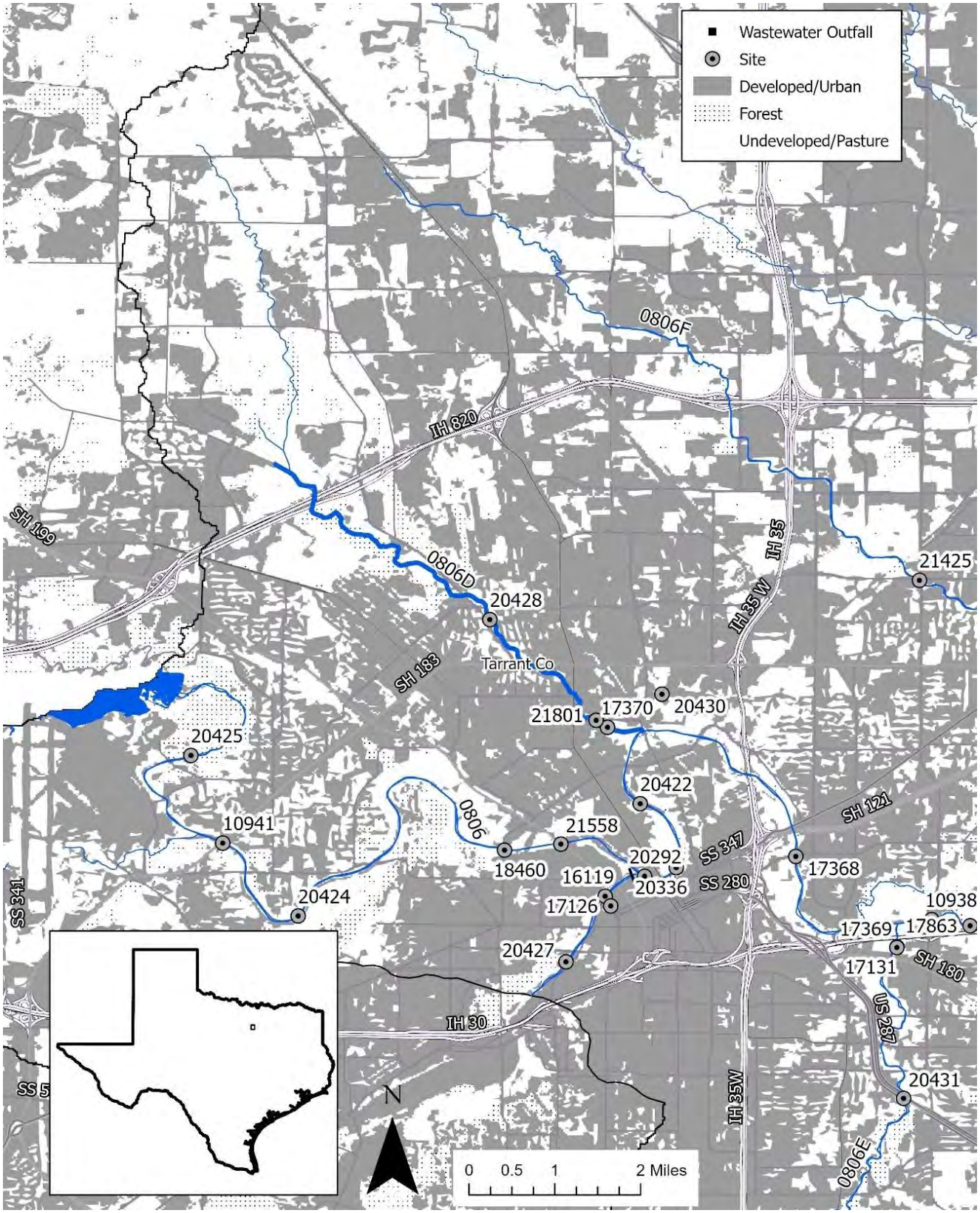


Figure 168: Segment 0806D Map

Marine Creek is a two-mile unclassified segment running from Tenmile Bridge Road in Fort Worth to the confluence with the West Fork Trinity River (see Figure 168). The watershed is heavily developed but has some areas of wood and grassland upstream of Marine Creek Reservoir and lies entirely within the Grand Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 121. Monitoring is being conducted by TCEQ Region 4 and the City of Fort Worth. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 121: Segment 0806D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0806D	MARINE CREEK LAKE 400 M WEST OF MARINE CREEK LAKE PUBLIC BOAT RAMP AND 210 M NORTH OF MARINE CREEK LAKE DAM IN FORT WORTH, TX	22142	TCEQ Region 4
0806D_01	MARINE CREEK AT NE 23rd STREET CONCRETE APRON APPROX 25 METERS WEST OF THE MULE ALLEY AND NE 23RD STREET INTERSECTION	21801	City of Fort Worth

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 122. Results of TRA trend analyses are shown in Table 123. Data used for these trend analyses includes data that was collected by the City of Fort Worth but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 122: TCEQ 2020 Texas Integrated Report Summary for Segment 0806D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0806D_01 From confluence with West Fork Trinity River Below Lake Worth up to Marine Creek Reservoir dam	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0806D_01 From confluence with West Fork Trinity River Below Lake Worth up to Marine Creek Reservoir dam	Recreation Use	*E. coli*	126 MPN/100 mL	NS

FS = Fully Supporting NS = Not Supporting

Table 123: Significant Trends for Segment 0806D (P-value<0.1)

Segment & Assessment Unit		0806D_01	0806D_01
Site		17370	21801
Air Temperature	All	↑*	Not Significant
	Summer	Not Significant	Not Significant
	Winter	↑*	Not Significant
Specific Conductance	All	Not Significant	Not Significant
	Summer	↑	Not Significant
	Winter	Not Significant	Not Significant

Segment & Assessment Unit		0806D_01	0806D_01
Site		17370	21801
pH	All	Not Significant	↓*
	Summer	Not Significant	Not Significant
	Winter	↑	Not Significant
Flow Severity	All	Not Significant	Not Significant
	Summer	Not Significant	Not Significant
	Winter	↑	↓*
E. coli	All	No Trend	No Trend
	Summer	Not Significant	No Trend
	Winter	No Trend	↓*
Total Dissolved Solids	All	Not Significant	Not Significant
	Summer	↑	Not Significant
	Winter	Not Significant	Not Significant
Days Since Precipitation	All	Not Significant	Not Significant
	Summer	↑	Not Significant
	Winter	Not Significant	↑*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The impairment for *E. coli* in this segment appears to be related to run-off. As shown in Figure 169, higher levels of *E. coli* were generally reported after recent precipitation events. The two stations that have been monitored in this segment are located immediately downstream of the Fort Worth Stockyards and adjacent to a horse-riding trail. Station 21801 is located off of Northeast 23rd Street immediately downstream of the Stockyards while station 17370 is located slightly further downstream. Therefore, it is highly likely that the Stockyards are the source of bacteria in this segment. It is recommended that samples be collected immediately upstream of the Stockyards to confirm this assumption.

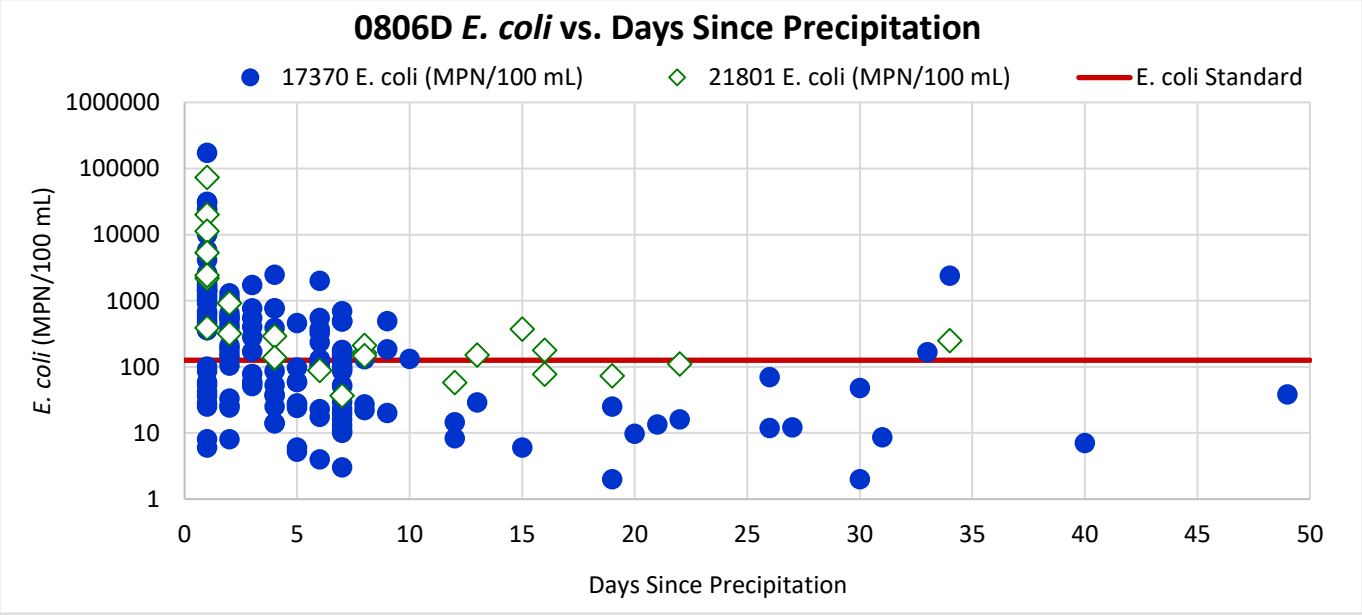


Figure 169: 0806D E. coli vs. Days Since Precipitation

Trends for pH and specific conductance also appear to be related to run-off. Specific conductance showed a similar pattern to *E. coli* in the figure above with higher values generally occurring after recent precipitation. Animal waste can increase conductivity and affect pH levels which supports the assumption made above that the Stockyards are the source of the *E. coli* impairment.

0806E Sycamore Creek

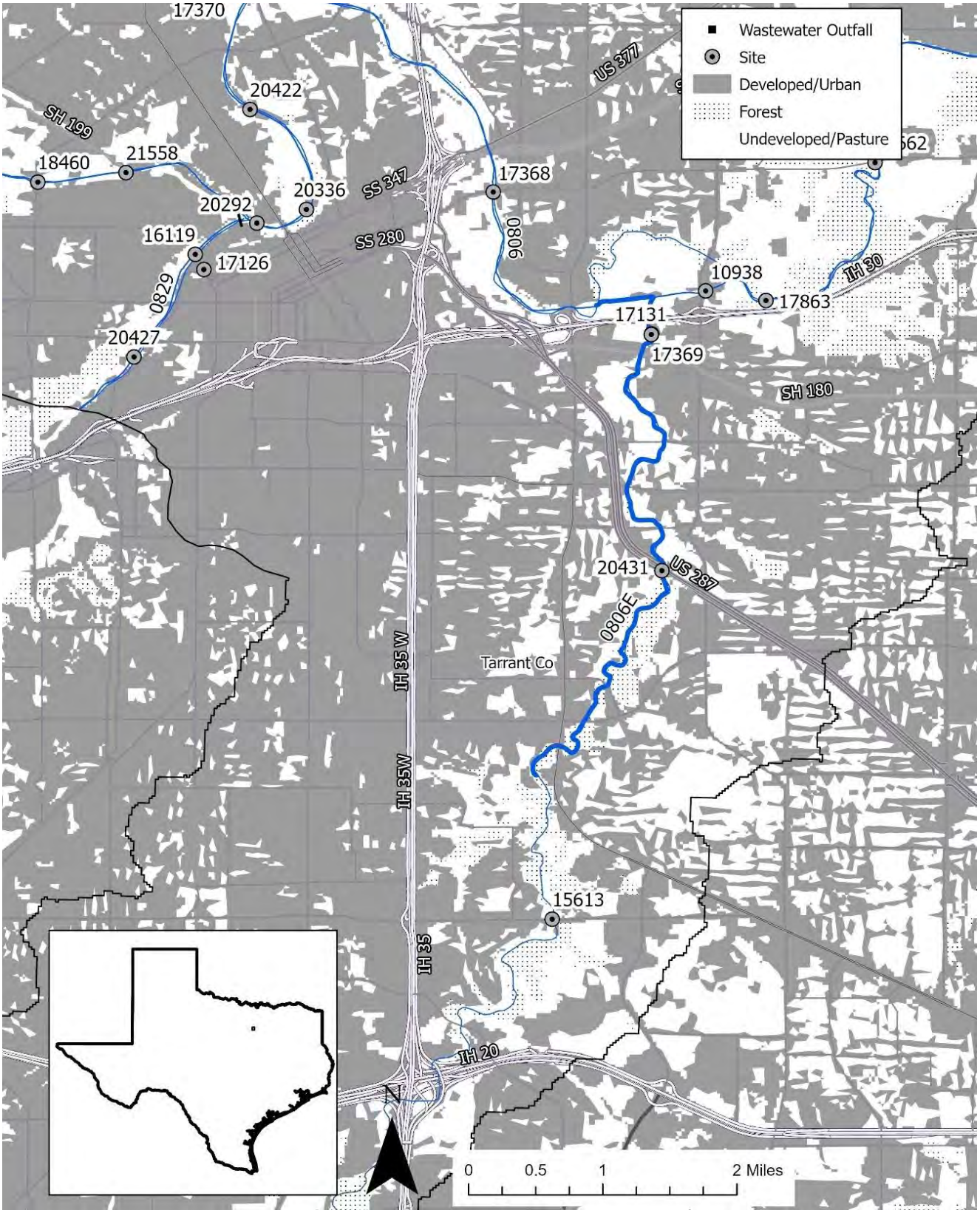


Figure 170: Segment 0806E Map

This unclassified segment is a five-mile stretch of Sycamore Creek running upstream from the confluence with Echo Lake Tributary in Fort Worth to the confluence with the West Fork Trinity River (see Figure 170). The watershed is heavily developed with some small wooded areas and parks directly adjacent to the stream. It lies within the Grand Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 124. Monitoring is being conducted by the City of Fort Worth. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 124: Segment 0806E FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0806E_01	SYCAMORE CREEK AT WESTERN END OF PAVEMENT OF SCOTT AVENUE 179 M UPSTREAM OF IH 30 IN EAST FORT WORTH	17369	City of Fort Worth

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 125. Results of TRA trend analyses are shown in Table 126. Data used for these trend analyses includes data that was collected by the City of Fort Worth but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 125: TCEQ 2020 Texas Integrated Report Summary for Segment 0806E

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0806E_01 5 mi stretch from confluence with West Fork Trinity to confluence with Echo Lake Tributary	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0806E_01 5 mi stretch from confluence with West Fork Trinity to confluence with Echo Lake Tributary	Recreation Use	*E. coli*	126 MPN/100 mL	NS

FS = Fully Supporting NS = Not Supporting

Table 126: Significant Trends for Segment 0806E (P-value<0.1)

Segment & Assessment Unit		0806E_01
Site		17369
Specific Conductance	All	Not Significant
	Summer	↑
	Winter	Not Significant
Dissolved Oxygen	All	Not Significant
	Summer	↓
	Winter	Not Significant
Flow Severity	All	Not Significant
	Summer	Not Significant
	Winter	↑
Total Dissolved Solids	All	Not Significant
	Summer	↑
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

The impairment for *E. coli* in this segment appears to be related to run-off. As shown in Figure 171, higher levels of *E. coli* were generally reported after recent precipitation events. The monitoring station in this segment is located downstream from a golf course and large residential area. It is likely that run-off carrying pet and wildlife waste contributed to the impairment. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

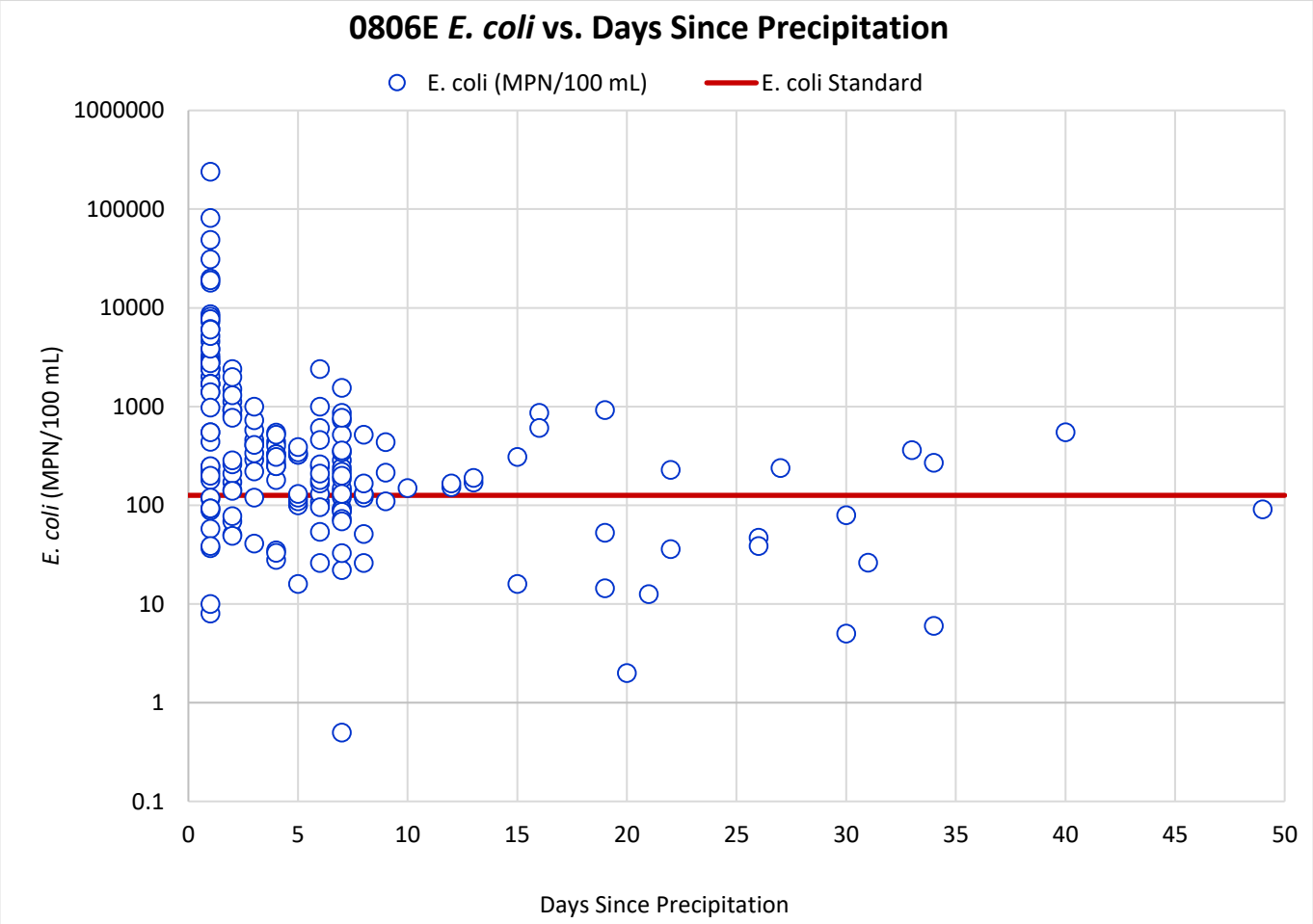


Figure 171: 0806E E. coli vs. Days Since Precipitation

Increasing trends for specific conductance and total dissolved solids were identified in this segment. Total dissolved solids in this segment were calculated from specific conductance. As shown in Figure 172, the trends appear to be influenced by periods of drought. Specific conductance levels were reported at higher levels during these periods and generally decreasing during drought recovery. Evaporation of surface water during droughts can concentrate salts and dissolved solids in the water; increasing specific conductance.

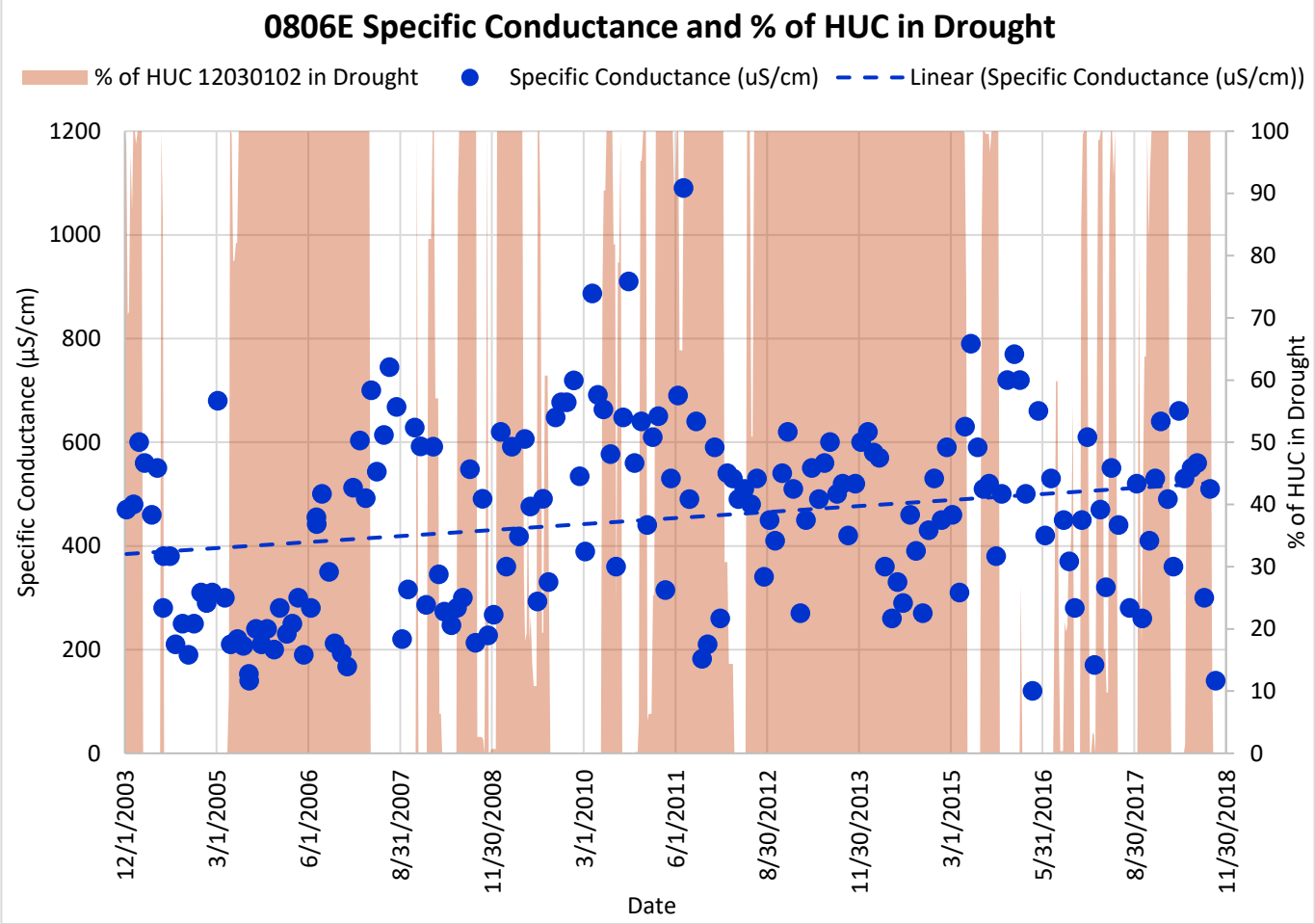


Figure 172: 0806E Specific Conductance and % of HUC in Drought

0806B Echo Lake

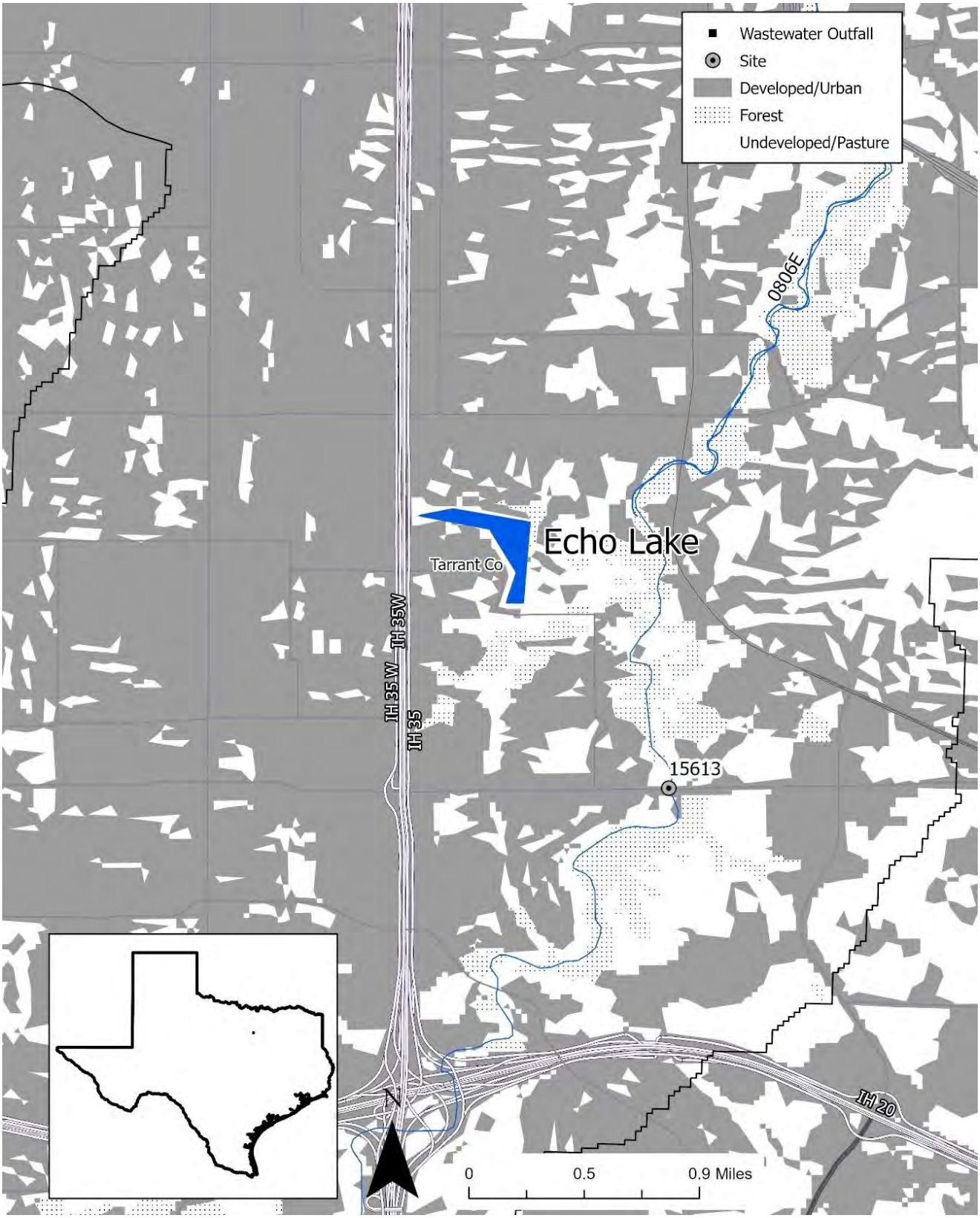


Figure 173: Segment 0806B Map

Echo Lake is a 16.8-acre reservoir in Fort Worth (see Figure 173). The watershed is developed and lies within the Grand Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 127.

Table 127: TCEQ 2020 Texas Integrated Report Summary for Segment 0806B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0806B_01 From Echo Lake Dam to the reservoirs headwaters in Tarrant County	Fish Consumption Use	PCBs, Dioxin, Dieldrin in edible tissue		NS

NS = Not Supporting

There were no data available in assessment unit 0806B_01 for the period of record for this basin summary report.

The impairment for fish consumption use is based on unsafe levels of PCBs, dioxins, and dieldrin in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 56) to advise against the consumption of common carp and limit the consumption of largemouth bass. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

0806A Fosdic Lake

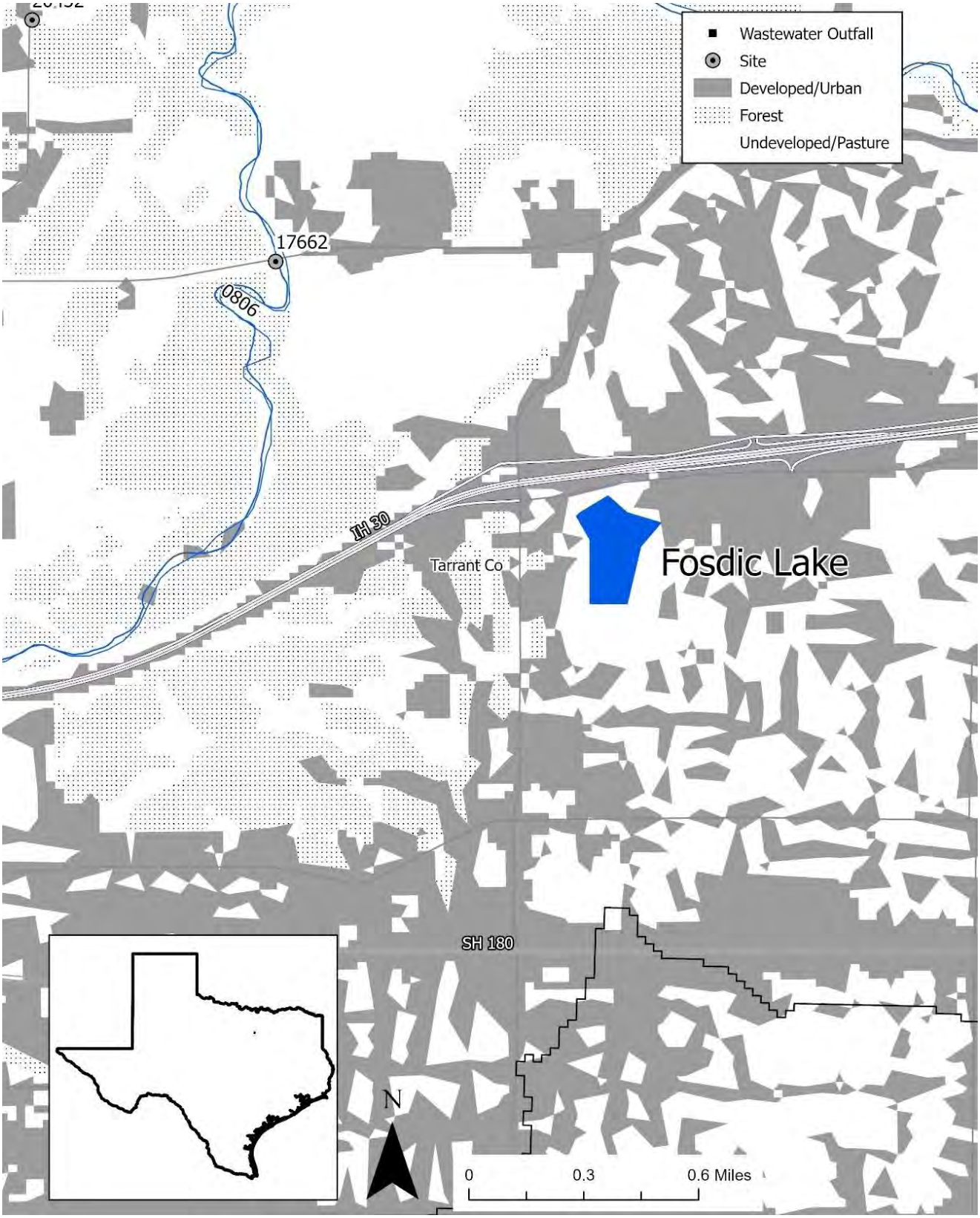


Figure 174: Segment 0806A Map

Fosdic Lake is a 6.7-acre reservoir in Fort Worth (see Figure 174). The watershed is developed and lies within the Grand Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 128.

Table 128: TCEQ 2020 Texas Integrated Report Summary for Segment 0806A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0806A_01 From Fosdic Lake Dam to the reservoir headwaters in Oakland Lake Park in Tarrant County	Fish Consumption Use	PCBs in edible tissue		NS
0806A_01 From Fosdic Lake Dam to the reservoir headwaters in Oakland Lake Park in Tarrant County	Fish Consumption Use	Bioaccumulative Toxics in fish tissue - Arsenic	0.04 ng/kg	CS

CS = Screening Level Concern NS = Not Supporting

There were no data available in assessment unit 0806A_01 for the period of record for this basin summary report.

The impairment for fish consumption use is based on unsafe levels of PCBs, dioxins, and dieldrin in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 33) to advise limited consumption of common carp. The concern for arsenic in fish tissue was carried forward from previous integrated reports. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

0806C Big Fossil Creek

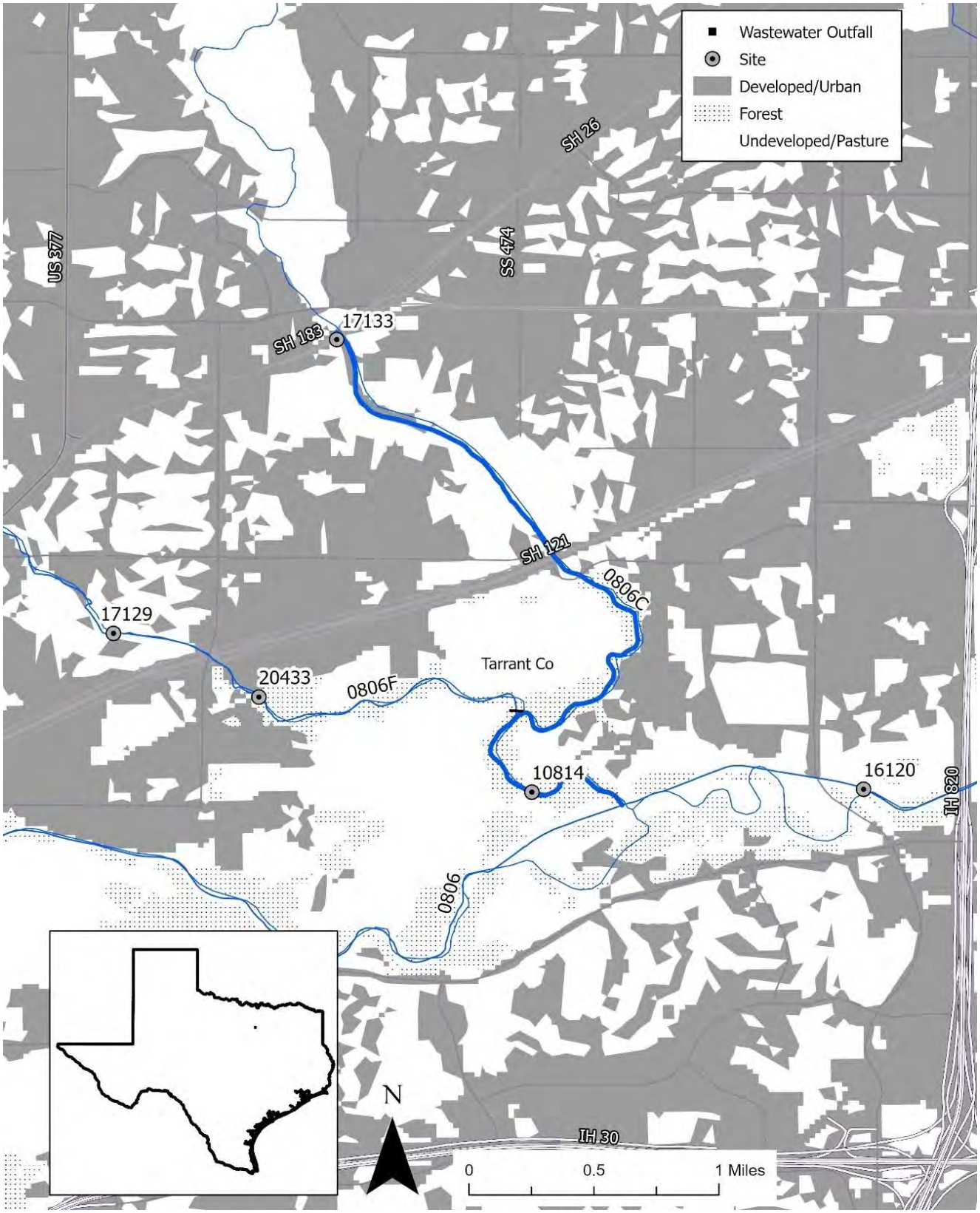


Figure 175: Segment 0806C Map

This unclassified segment is a 3-mile stretch of Big Fossil Creek that runs from Highway 183 in Haltom City to the confluence with the West Fork Trinity River (see Figure 175). The upper portion of the watershed is heavily developed but the lower portion has a narrow wooded riparian area and some grassy parks. The watershed begins in the Grand Prairie ecoregion and ends in the Eastern Cross Timbers. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. No significant trends were identified during TRA data analysis.

0806F Little Fossil Creek

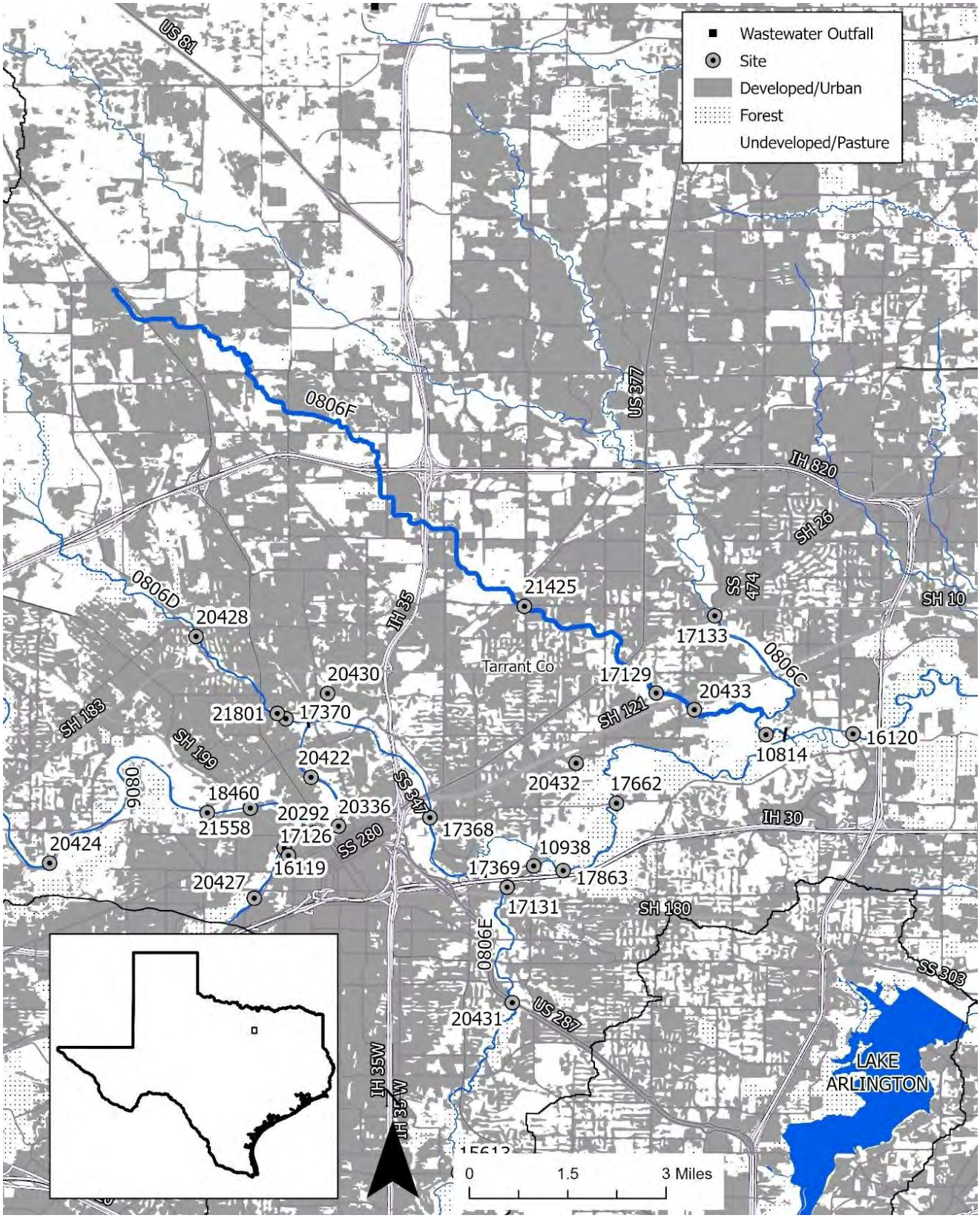


Figure 176: Segment 0806F Map

Little Fossil Creek is a 13.7-mile stream that runs from the headwaters in Saginaw to the confluence with Big Fossil Creek (see Figure 176). Much of the watershed is heavily developed with a few small areas of grassland. A majority of the watershed drains the Grand Prairie ecoregion with a small portion at the most downstream end flowing through the Eastern Cross Timbers.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 129. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 129: Segment 0806F FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0806F_01	LITTLE FOSSIL CREEK 43 METERS DOWNSTREAM OF THOMAS ROAD IN HALTOM CITY	17129	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 130.

Table 130: TCEQ 2020 Texas Integrated Report Summary for Segment 0806F

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0806F_01 13.7 mi stretch of Little Fossil Creek from confluence with segment 0806 to upper end of creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0806F_01 13.7 mi stretch of Little Fossil Creek from confluence with segment 0806 to upper end of creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN

CN = Use Concern FS = Fully Supporting

Data for assessment unit 0806F_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

The concern for *E. coli* was based on a limited data set for this segment. The full data set used for this basin summary report included thirteen data points collected at two stations in this segment. Five records were reported below the *E. coli* standard of 126 MPN/100 mL. The full data set had a geomean of 304.8 MPN/100 mL which supports the TCEQ findings.

0841R Rush Creek

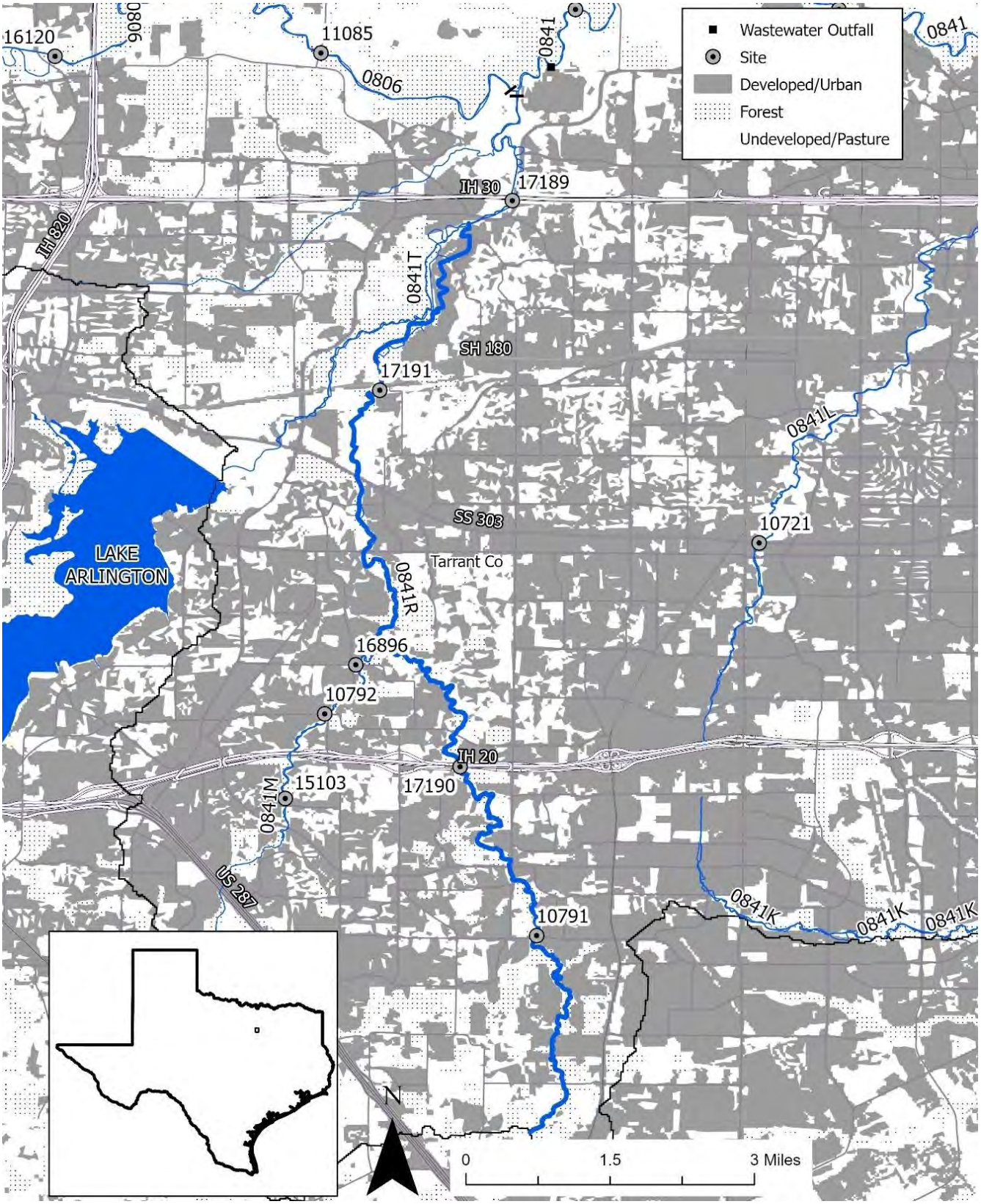


Figure 177: Segment 0841R Map

Rush Creek is a 14.9-mile stream that runs from near US 287 outside of Mansfield to the confluence with Village Creek (see Figure 177). The watershed is developed with a narrow wooded riparian buffer and small areas of grassland in the upper portion and lies entirely within the Eastern Cross Timbers.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 131. Monitoring is being conducted by the City of Arlington. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 131: Segment 0841R FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841R_01	RUSH CREEK IMMEDIATELY DOWNSTREAM OF WEST SUBLETT ROAD IN ARLINGTON	10791	City of Arlington
0841R_01	RUSH CREEK 46 METERS UPSTREAM OF SH 180 IN ARLINGTON	17191	City of Arlington

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 132. Results of TRA trend analyses are shown in Table 133.

Table 132: TCEQ 2020 Texas Integrated Report Summary for Segment 0841R

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841R_01 5 mi stretch from confluence with Village Ck to confluence with Kee Branch in Arlington	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0841R_01 5 mi stretch from confluence with Village Ck to confluence with Kee Branch in Arlington	Aquatic Life Use	Acute Toxic Substances in water		FS
0841R_01 5 mi stretch from confluence with Village Ck to confluence with Kee Branch in Arlington	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841R_01 5 mi stretch from confluence with Village Ck to confluence with Kee Branch in Arlington	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0841R_01 5 mi stretch from confluence with Village Ck to confluence with Kee Branch in Arlington	General Use	Nitrate	1.95 mg/L	NC
0841R_01 5 mi stretch from confluence with Village Ck to confluence with Kee Branch in Arlington	General Use	Total Phosphorus	0.69 mg/L	NC
0841R_01 5 mi stretch from confluence with Village Ck to confluence with Kee Branch in Arlington	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841R_01 5 mi stretch from confluence with Village Ck to confluence with Kee Branch in Arlington	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NC = No Concern

Table 133: Significant Trends for Segment 0841R (P-value<0.1)

Segment & Assessment Unit		0841R_01
Site		17190
pH	All	↓*
	Summer	↓*
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

A decreasing trend for pH was identified at station 17190. However, there was no chlorophyll-*a* data at this station available to determine if algal populations were influencing pH. Station 17191, which is located further downstream from station 17190, also had decreasing pH trend but was not significant. There was no correlation between pH and chlorophyll-*a* at station 17191 (correlation coefficient = -0.035).

0841M Kee Branch

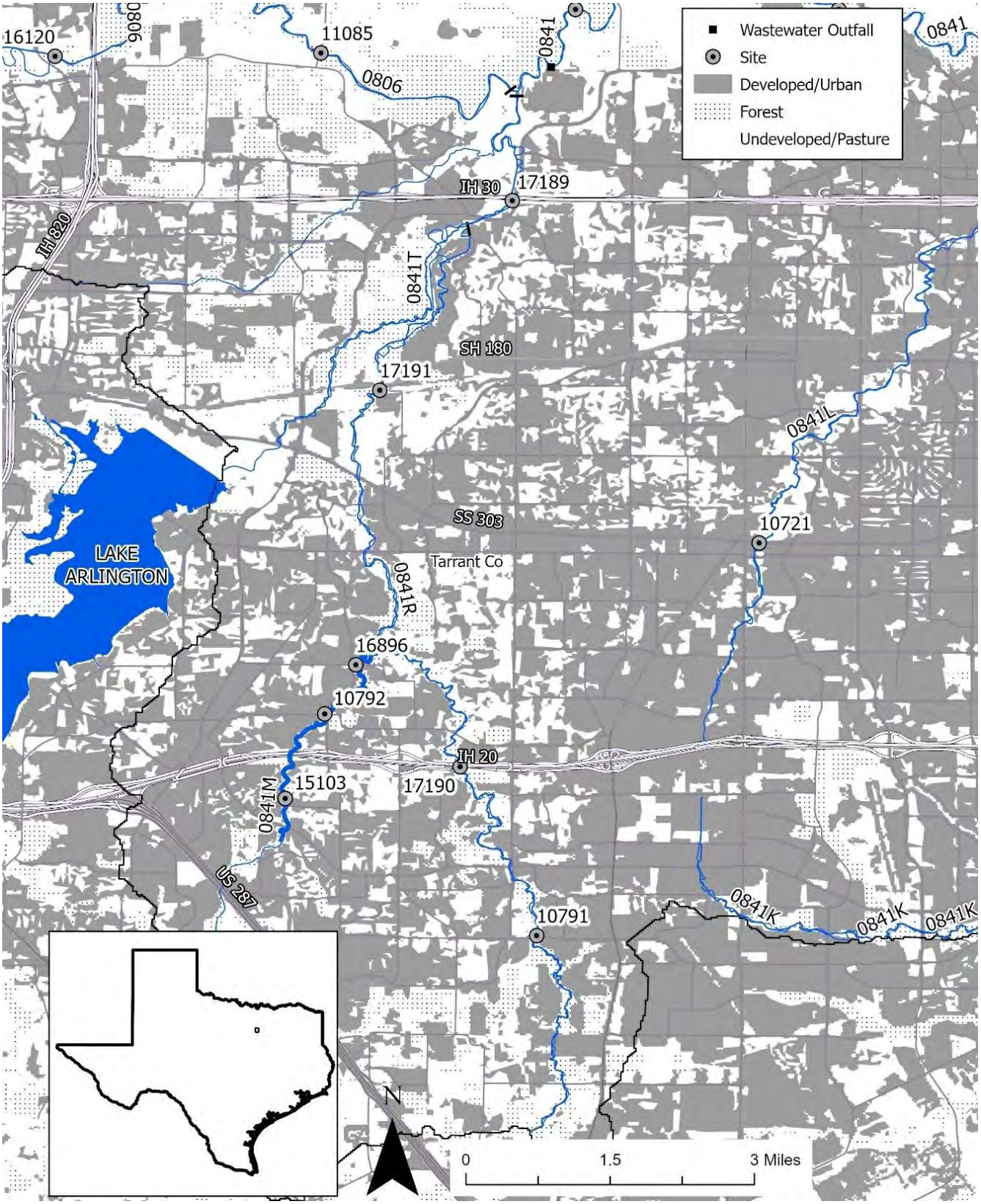


Figure 178: Segment 0841M Map

This unclassified segment is a 3-mile stretch of Kee Branch running from just upstream of Southwest Green Oaks Boulevard to the confluence with Rush Creek (see Figure 178). The watershed is developed with a narrow wooded riparian buffer and lies entirely within the Eastern Cross Timbers.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 134. Monitoring is being conducted by the City of Arlington. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 134: Segment 0841M FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841M_01	KEE BRANCH AT WEST PLEASANT RIDGE ROAD IN ARLINGTON	10792	City of Arlington

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 135. No significant trends were identified during TRA data analysis.

Table 135: TCEQ 2020 Texas Integrated Report Summary for Segment 0841M

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841M_01 Six mi of Kee Branch running upstream from confluence with Rush Creek to upper end of creek	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0841M_01 Six mi of Kee Branch running upstream from confluence with Rush Creek to upper end of creek	Aquatic Life Use	Acute Toxic Substances in water		FS
0841M_01 Six mi of Kee Branch running upstream from confluence with Rush Creek to upper end of creek	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841M_01 Six mi of Kee Branch running upstream from confluence with Rush Creek to upper end of creek	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0841M_01 Six mi of Kee Branch running upstream from confluence with Rush Creek to upper end of creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NS = Not Supporting

The cause of the dissolved oxygen concern in this segment is difficult to determine. As shown in Figure 179, there appears to have been some relationship between dissolved oxygen and periods of drought. There is limited data for flow so it is not possible to definitively state that low flows resulted in low dissolved oxygen. Additionally, there is no chlorophyll-*a* data available to make any conclusions about any affects that algal populations may be having on dissolved oxygen. The strongest correlation for dissolved oxygen was with water temperature (correlation coefficient = -0.632). This correlation is not unexpected and indicates that hot weather, as generally seen during drought and summers, is the strongest influence on dissolved oxygen in this stream. It is recommended that chlorophyll-*a* be collected in order to determine if algal populations were the cause for low dissolved oxygen.

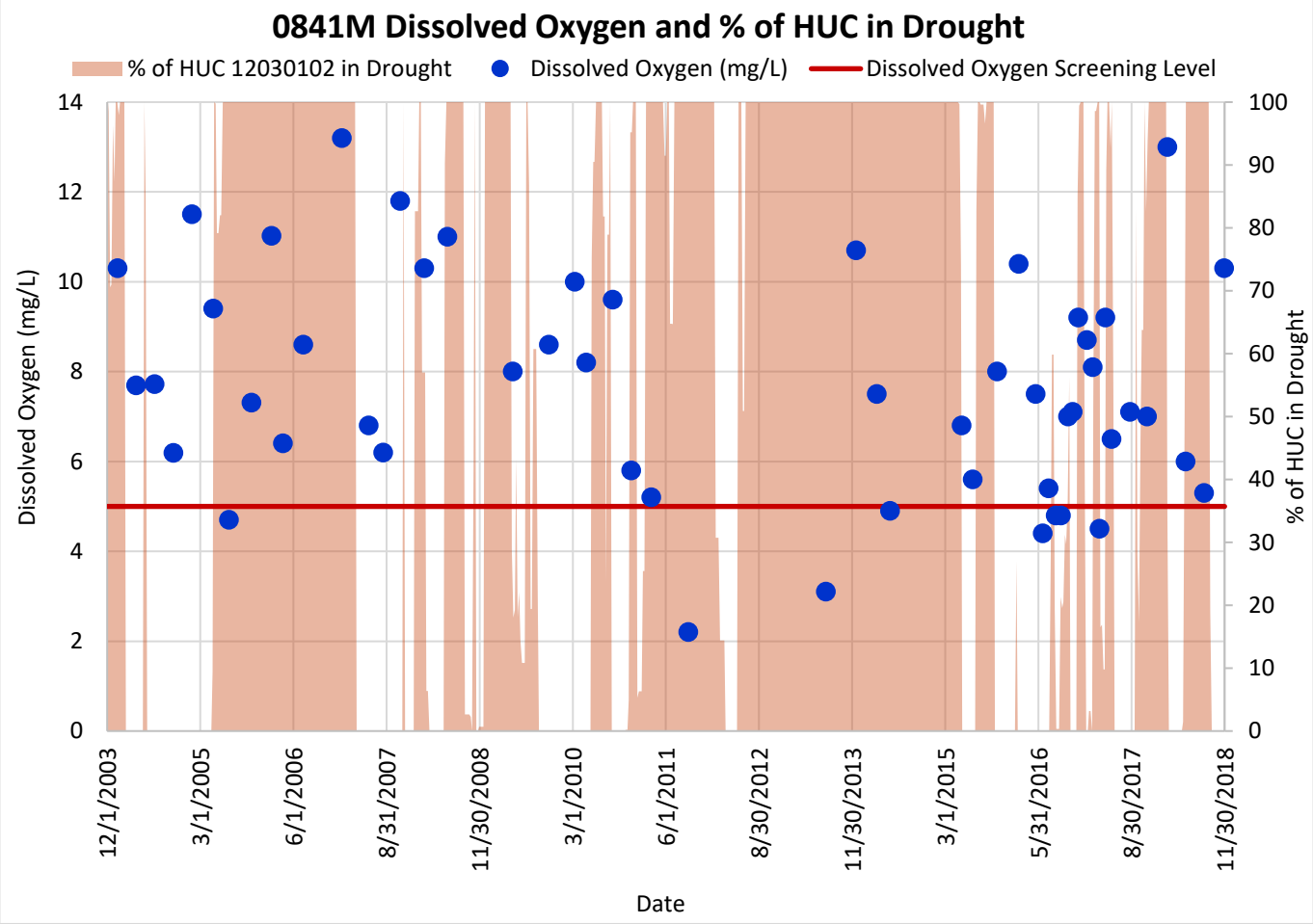


Figure 179: 0841M Dissolved Oxygen and % of HUC in Drought

This segment was found to be impaired due to elevated levels of *E. coli*. As with dissolved oxygen, there was limited flow data from which to draw any conclusions. However, for the available flow data, the relationship with *E. coli* was rather strong (correlation coefficient = 0.622). For the remainder of the *E. coli* data, levels appeared to decrease during periods of drought, when flows are typically lowest, as shown in Figure 180. This indicates that the impairment may be related to run-off. The watershed upstream of the monitoring station is heavily residential and has a densely wooded riparian area. Therefore, pets and wildlife are the most likely sources of bacteria in this stream. Homeowner education and pet waste best management practices may help reduce bacterial contributions from pets. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

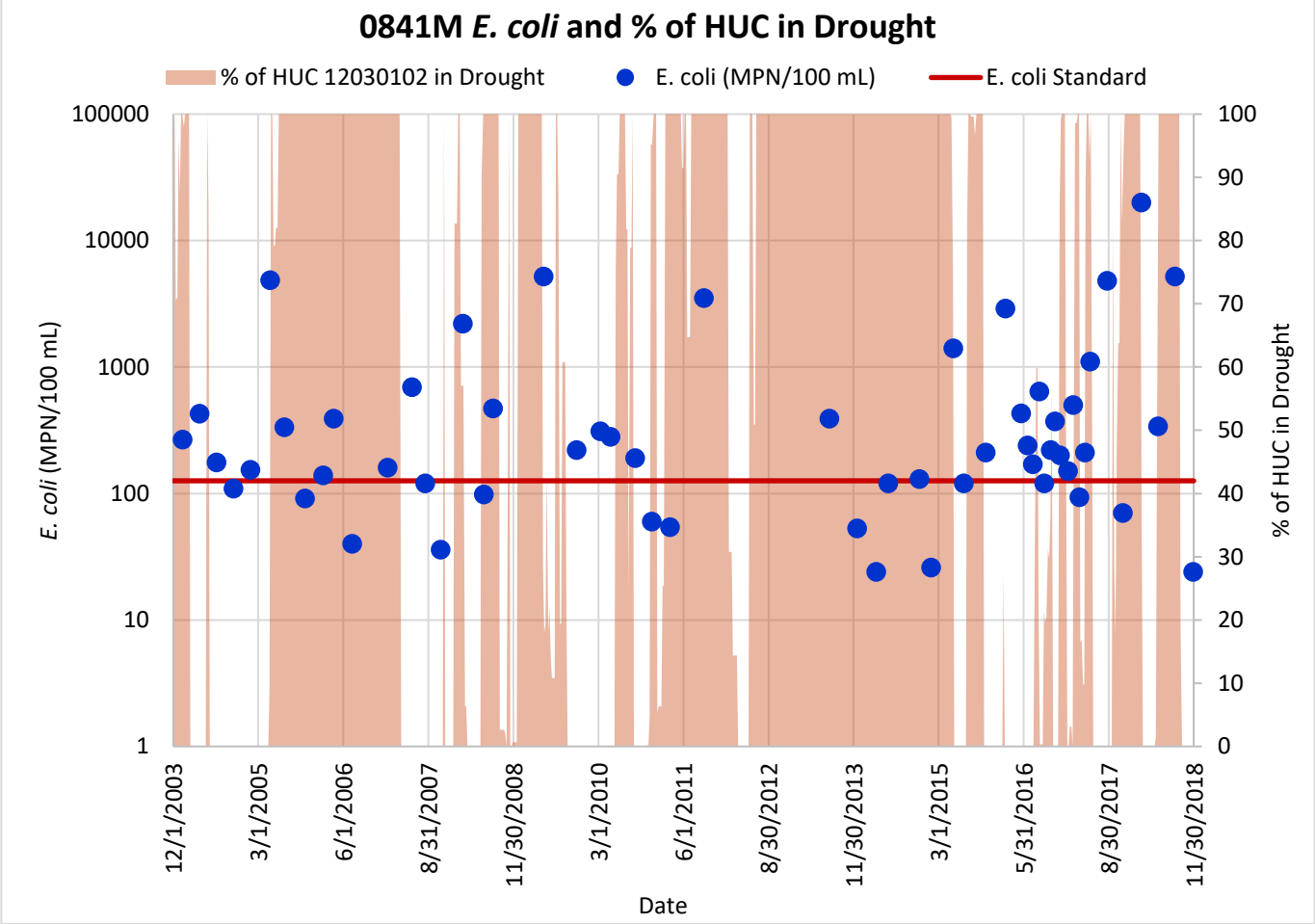


Figure 180: 0841M E. coli and % of HUC in Drought

0841T Village Creek

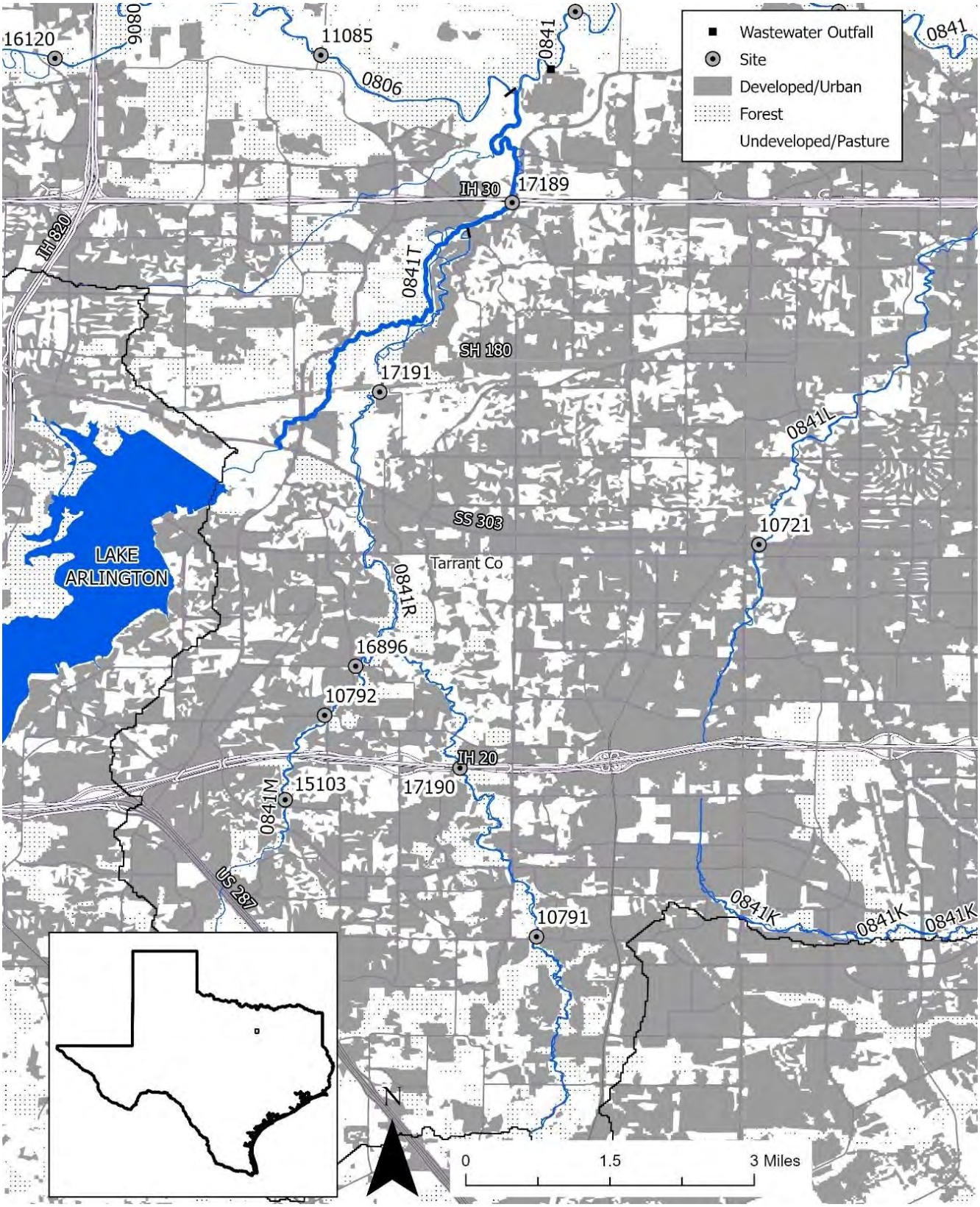


Figure 181: Segment 0841T Map

This unclassified segment is a 7-mile stretch of Village Creek running from SH 303 approximately 0.75-miles downstream of Lake Arlington to the confluence with the West Fork Trinity River (see Figure 181). Although the watershed is developed, the area directly adjacent to the stream is wooded with some grass and pasture land. The watershed lies within the Eastern Cross Timbers.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 136. Monitoring is being conducted by the City of Arlington. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 136: Segment 0841T FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841T_01	VILLAGE CREEK IMMEDIATELY UPSTREAM OF IH 30 IN ARLINGTON	17189	City of Arlington

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 137. No significant trends were identified during TRA data analysis.

Table 137: TCEQ 2020 Texas Integrated Report Summary for Segment 0841T

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841T_01 7 mi stretch from confluence with W Fork to SH 303 approx. 0.75 mi downstream of Lake Arlington	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0841T_01 7 mi stretch from confluence with W Fork to SH 303 approx. 0.75 mi downstream of Lake Arlington	Aquatic Life Use	Acute Toxic Substances in water		FS
0841T_01 7 mi stretch from confluence with W Fork to SH 303 approx. 0.75 mi downstream of Lake Arlington	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841T_01 7 mi stretch from confluence with W Fork to SH 303 approx. 0.75 mi downstream of Lake Arlington	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0841T_01 7 mi stretch from confluence with W Fork to SH 303 approx. 0.75 mi downstream of Lake Arlington	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CN = Use Concern FS = Fully Supporting

Concerns due to elevated levels of *E. coli* were identified in this segment. Similar to segment 0841M, *E. coli* in 0841T appears to have been somewhat affected by drought periods as shown in Figure 182. However, unlike segment 0841M, there is no correlation between *E. coli* and the limited flow data. This indicated that there may have been consistent sources of bacteria into the stream. The watershed upstream of the monitoring station is largely residential. There is a small wooded area and a small golf course in the upstream portion of this segment. In addition to the likely inputs from run-off containing pet and wildlife waste, there may be contributions from failing infrastructure. It is recommended that additional sampling be conducted upstream of monitoring station 17189 to determine if a potential wastewater source may be contributing bacteria to the stream. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort

Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

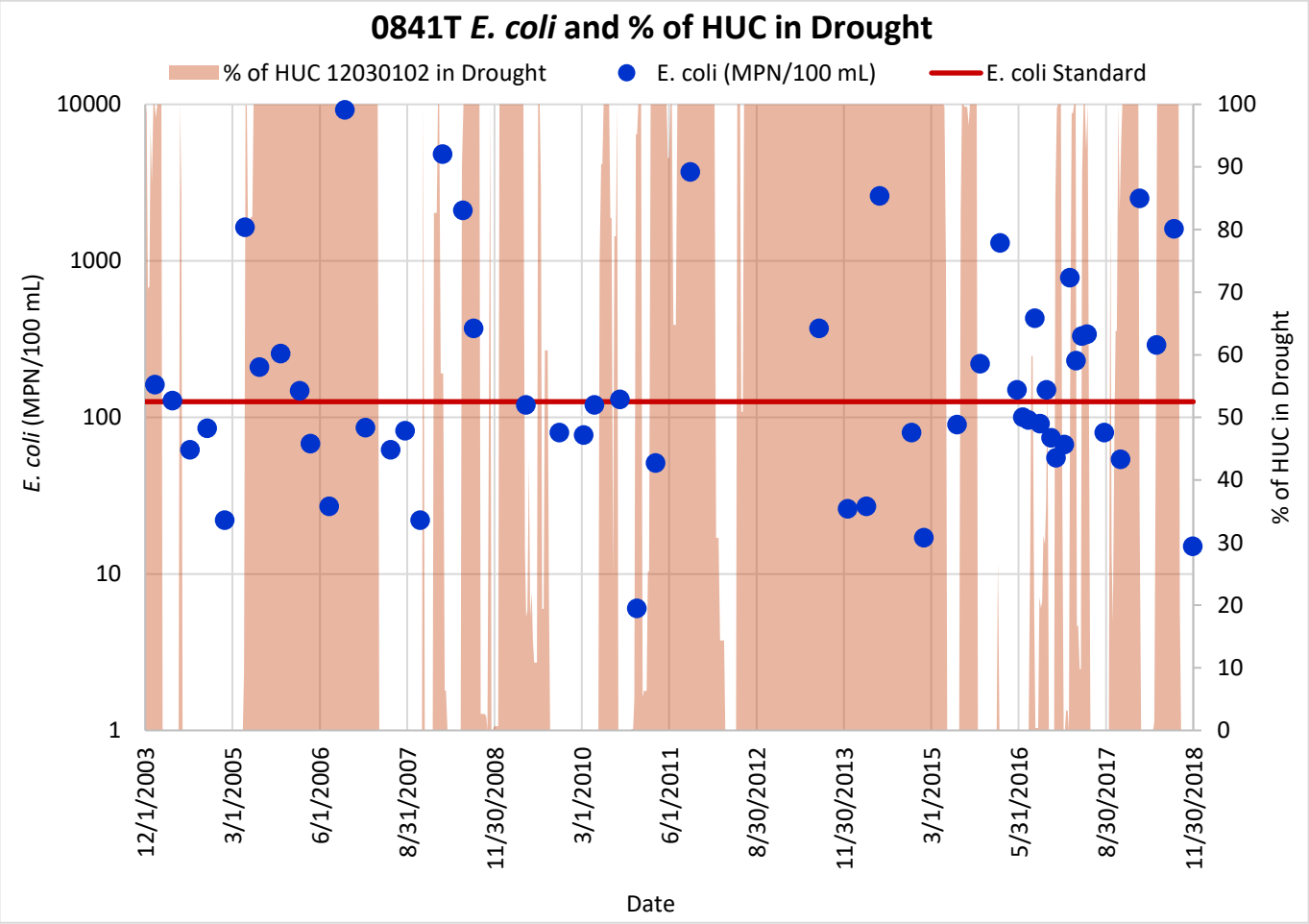


Figure 182: 0841T E. coli and % of HUC in Drought

0841 Lower West Fork Trinity River

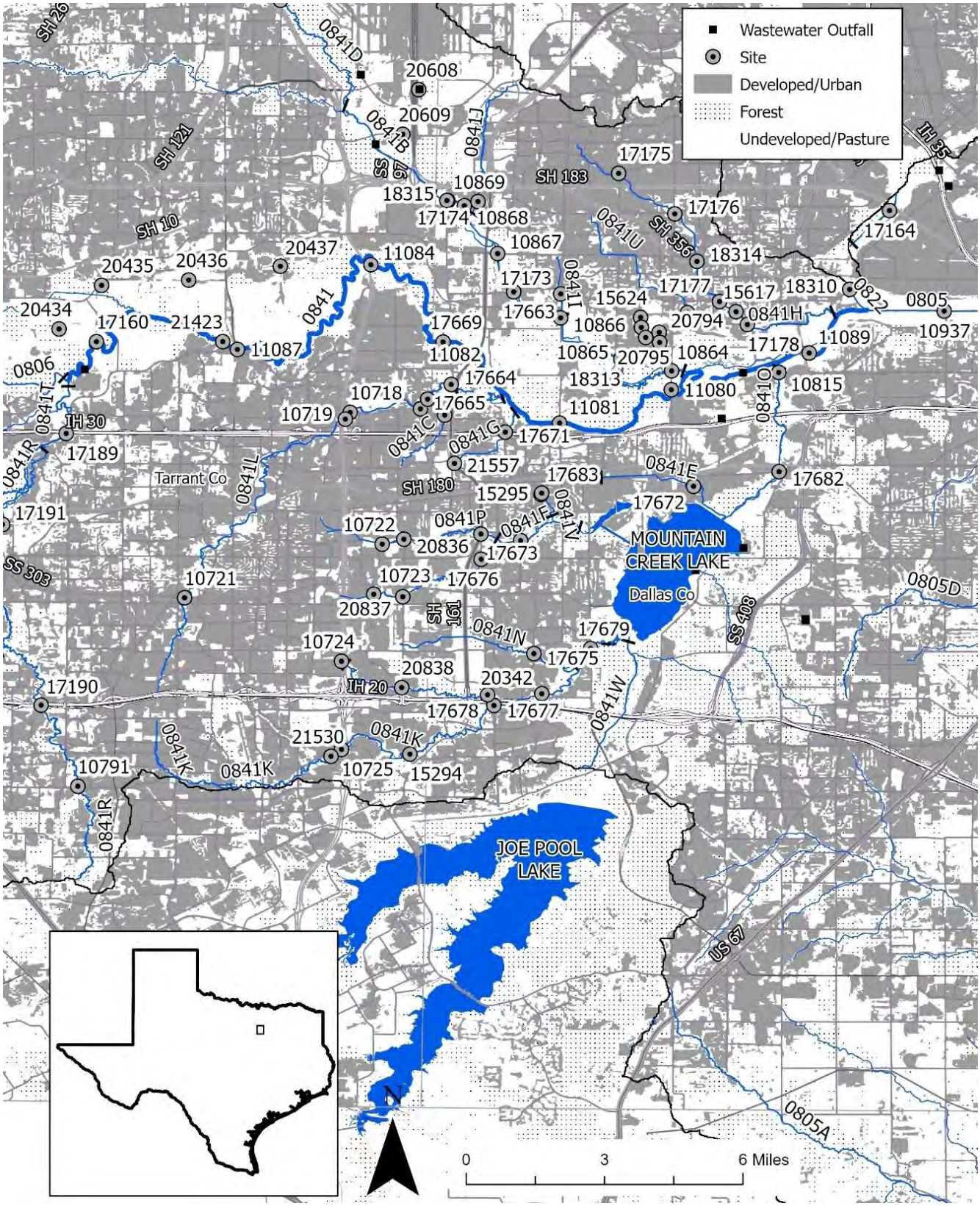


Figure 183: Segment 0841 Map

This 26.6-mile segment runs from a point immediately upstream of the confluence of Village Creek in Tarrant County to a point immediately upstream of the confluence of the Elm Fork Trinity River in Dallas County (see Figure 183). The upper half of this highly urbanized watershed is in the Eastern Cross Timbers and the lower half is in the Northern Blackland Prairie ecoregion. There are some areas of wooded and grassy riparian zones.

Clean Rivers Program water quality monitoring is being conducted at three sites within this segment as shown in Table 138. Monitoring is being conducted by the City of Grand Prairie and TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 138: Segment 0841 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841_01	LOWER WEST FORK TRINITY RIVER AT BELT LINE ROAD IN GRAND PRAIRIE	11081	TRA
0841_02	LOWER WEST FORK TRINITY RIVER AT ROY ORR BOULEVARD IN GRAND PRAIRIE (6)	17669	City of Grand Prairie
0841_02	WEST FORK TRINITY RIVER AT RIVER LEGACY PARK FOOTBRIDGE 557 METERS UPSTREAM OF NORTH COLLINS STREET	21423	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 139. Results of TRA trend analyses are shown in Table 140.

Table 139: TCEQ 2020 Texas Integrated Report Summary for Segment 0841

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	Aquatic Life Use	Acute Toxic Substances in water		FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	Aquatic Life Use	Acute Toxic Substances in water		NC
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	Aquatic Life Use	Chronic Toxic Substances in water		NC
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	Recreation Use	*E. coli*	126 MPN/100 mL	**NS**
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	Ammonia	0.33 mg/L	NC
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	Ammonia	0.33 mg/L	NC

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	Nitrate	1.95 mg/L	CS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	Nitrate	1.95 mg/L	CS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	Total Phosphorus	0.69 mg/L	CS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	Total Phosphorus	0.69 mg/L	CS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	pH	6.5 - 9 S.U.	FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	pH	6.5 - 9 S.U.	FS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	Chloride	175 mg/L	FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	Chloride	175 mg/L	FS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	Sulfate	175 mg/L	FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	Sulfate	175 mg/L	FS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	Total Dissolved Solids	850 mg/L	FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	Total Dissolved Solids	850 mg/L	FS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	General Use	Water temperature	35 °F	FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	General Use	Water temperature	35 °F	FS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0841_01 From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0841_02 From the confluence with Johnson Creek upstream to the confluence of Village Creek.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 140: Significant Trends for Segment 0841 (P-value<0.1)

Segment & Assessment Unit		0841_01	0841_02
Site		11081	17669
Air Temperature	All	Not Significant	Not Significant
	Summer	↓	No Trend
	Winter	No Trend	Not Significant
Nitrite	All		Insufficient Data
	Summer	↓	Insufficient Data
	Winter	↓	Insufficient Data
Total Kjeldahl Nitrogen	All	No Trend	Not Significant
	Summer	Not Significant	Not Significant
	Winter	↓	Not Significant
Total Phosphorus	All	Not Significant	↓
	Summer	↓	↓
	Winter	Not Significant	↓
Orthophosphate	All	Not Significant	↓
	Summer	Not Significant	↓
	Winter	Not Significant	Not Significant
Hardness	All	No Trend	↓
	Summer	No Trend	↓
	Winter	No Trend	↓
Sulfate	All	No Trend	↓
	Summer	No Trend	↓
	Winter	No Trend	↓
Dissolved Iron	All	↑	Insufficient Data
	Summer	↑	Insufficient Data
	Winter	↑	Insufficient Data
Dissolved Nickel	All	Not Significant	Insufficient Data
	Summer	Not Significant	Insufficient Data
	Winter	↓	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend

The *E. coli* impairment in assessment unit 0841_01 was influenced by flow as shown in Figure 184. Higher *E. coli* levels were reported under elevated flows. This indicates that bacteria were being washed into the river from the watershed. The watershed above this assessment unit is quite large and of mixed uses. However, the immediate watershed has a mix of industrial, residential, and wooded areas. It is likely that run-off containing waste from pets and wildlife were the main contributors. Bacteria may have also been introduced from failing infrastructure throughout the watershed. Bacterial source tracking studies would be required to determine if the bacteria were from animal or human sources. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

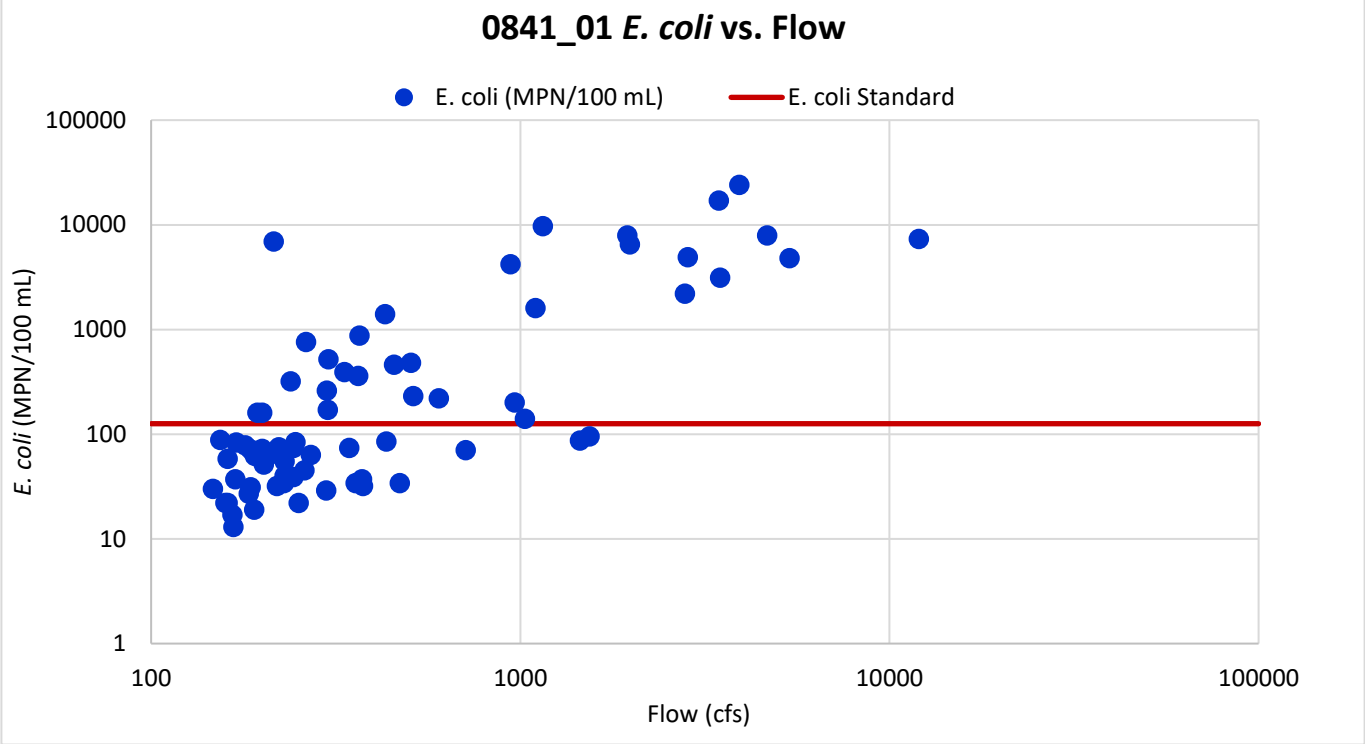


Figure 184: 0841_01 E. coli vs. Flow

Concerns for elevated nitrate and total phosphorus in both assessment unit 0841_01 and 0841_02 were related to effluent from upstream wastewater treatment facilities. As shown in Figure 185, nutrient levels were elevated at low flows and decreased as flows increased. This pattern is commonly seen in waterbodies downstream of wastewater treatment facilities and becomes more pronounced in the warm months of the year when native base flows in waterbodies are lowest. During these times, the waterbody will become effluent-dominated. Most wastewater treatment facilities do not yet have advanced nutrient removal systems. It does not appear that these elevated nutrient levels were excessively affecting algal populations or dissolved oxygen in segment 0841. Of 130 records for chlorophyll-*a*, 39 were reported above the screening level of 14.1 µg/L. Of 289 dissolved oxygen records, only 3 were reported below screening level of 4 mg/L with one of those below minimum standard of 3 mg/L.

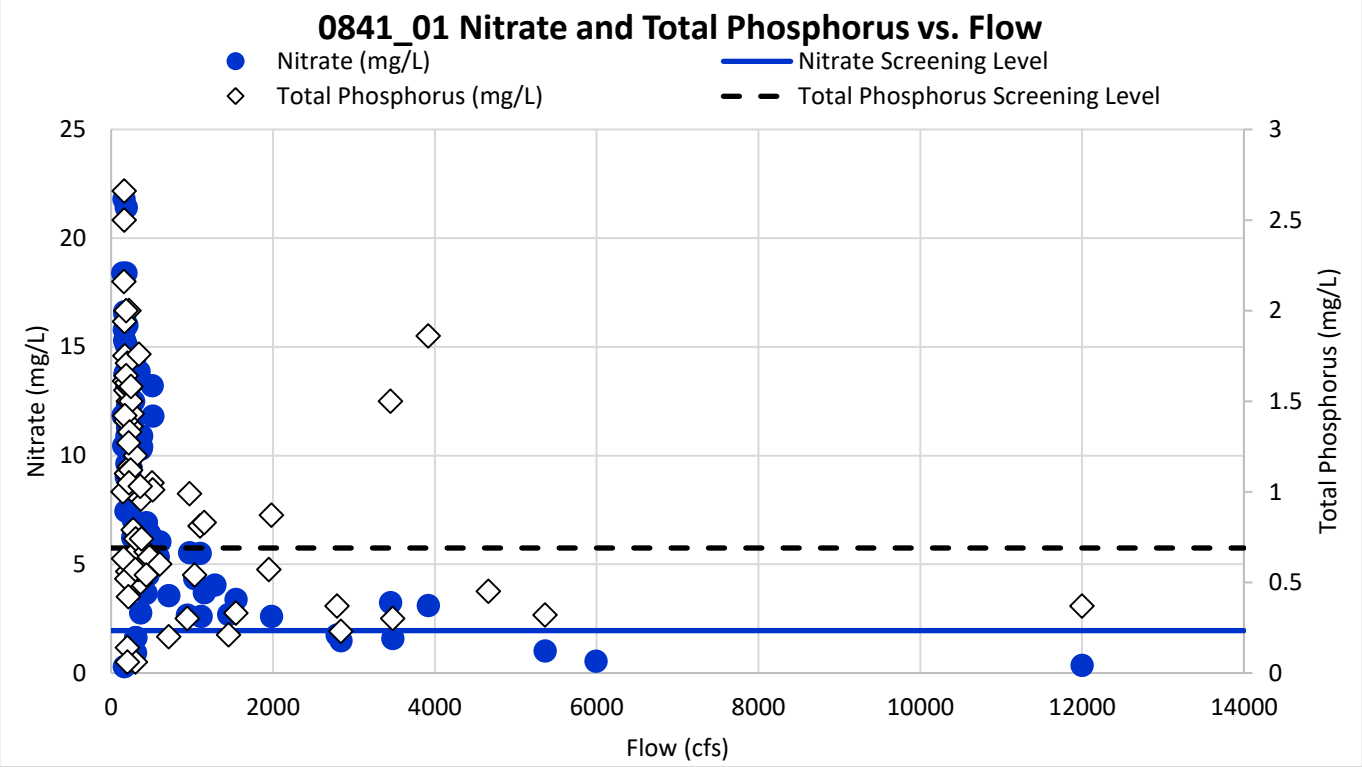


Figure 185: 0841_01 Nitrate and Total Phosphorus vs. Flow

The impairment for fish consumption use is based on unsafe levels of PCBs and dioxins in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 43) to advise against the consumption of several species of fish. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

The increasing trend for dissolved iron at station 11081 in assessment unit 0841_01 was a false trend introduced by censoring of non-detect data. As discussed previously, false trends can be introduced when a data set has a large concentration of censored non-detect data. For dissolved iron, early non-detect data were reported at <100 µg/L then later at <50 µg/L. For the purposes of this report, all non-detect data were censored to one half of the lowest non-detect value in the data set for each parameter, which was 3 µg/L for dissolved iron. The detected values for this assessment unit ranged from 7.55 to 167.33 µg/L.

The decreasing trends for total phosphorus, orthophosphate, hardness, and sulfate appear to have been weighted by the drought recovery period in 2015 and 2016. This is best illustrated by orthophosphate as shown in Figure 186. The trend across 2003 to 2015 was relatively flat then sharply decreased during the flooding of 2015 and 2016.

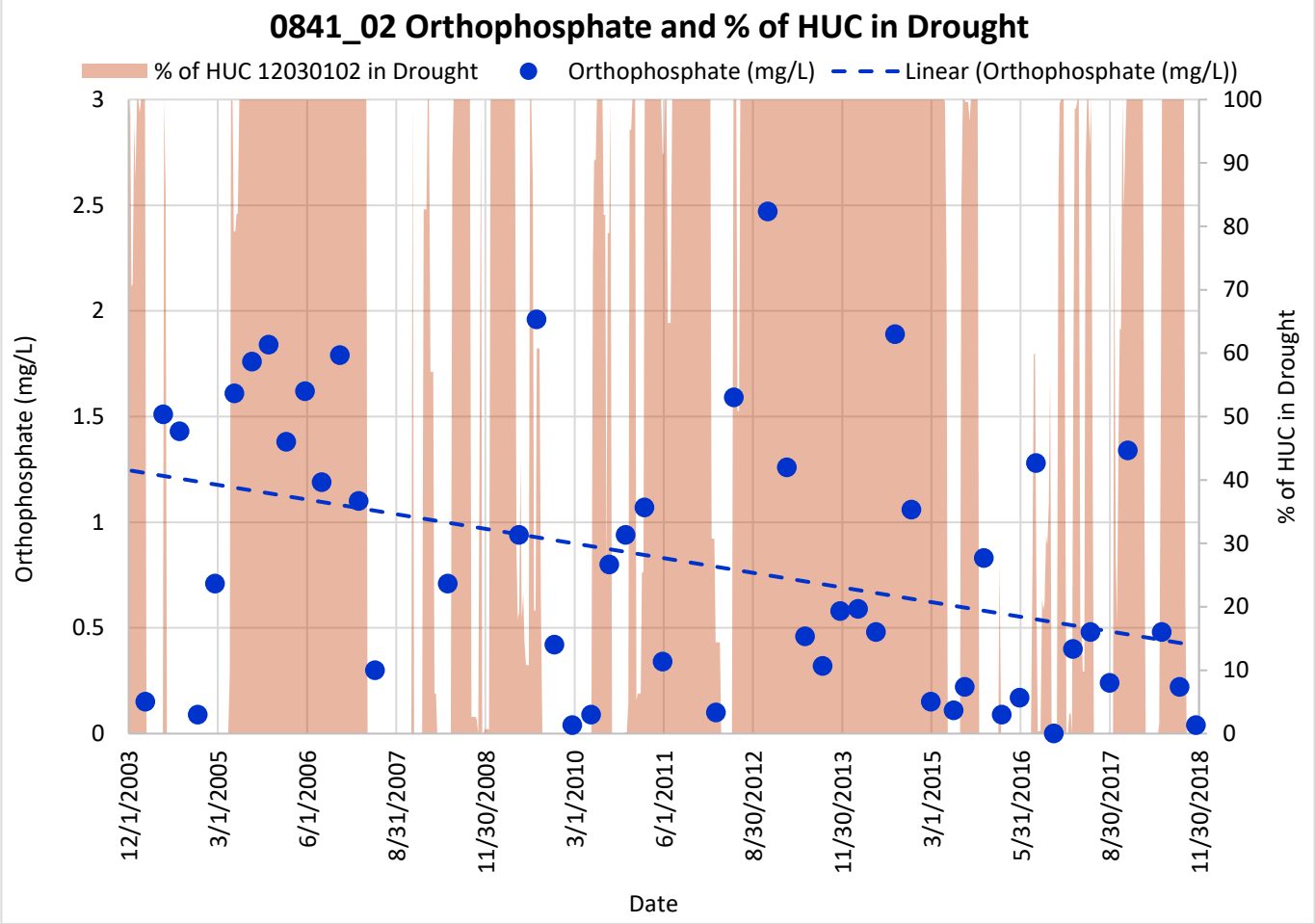


Figure 186: 0841_02 Orthophosphate and % of HUC in Drought

0841L Johnson Creek

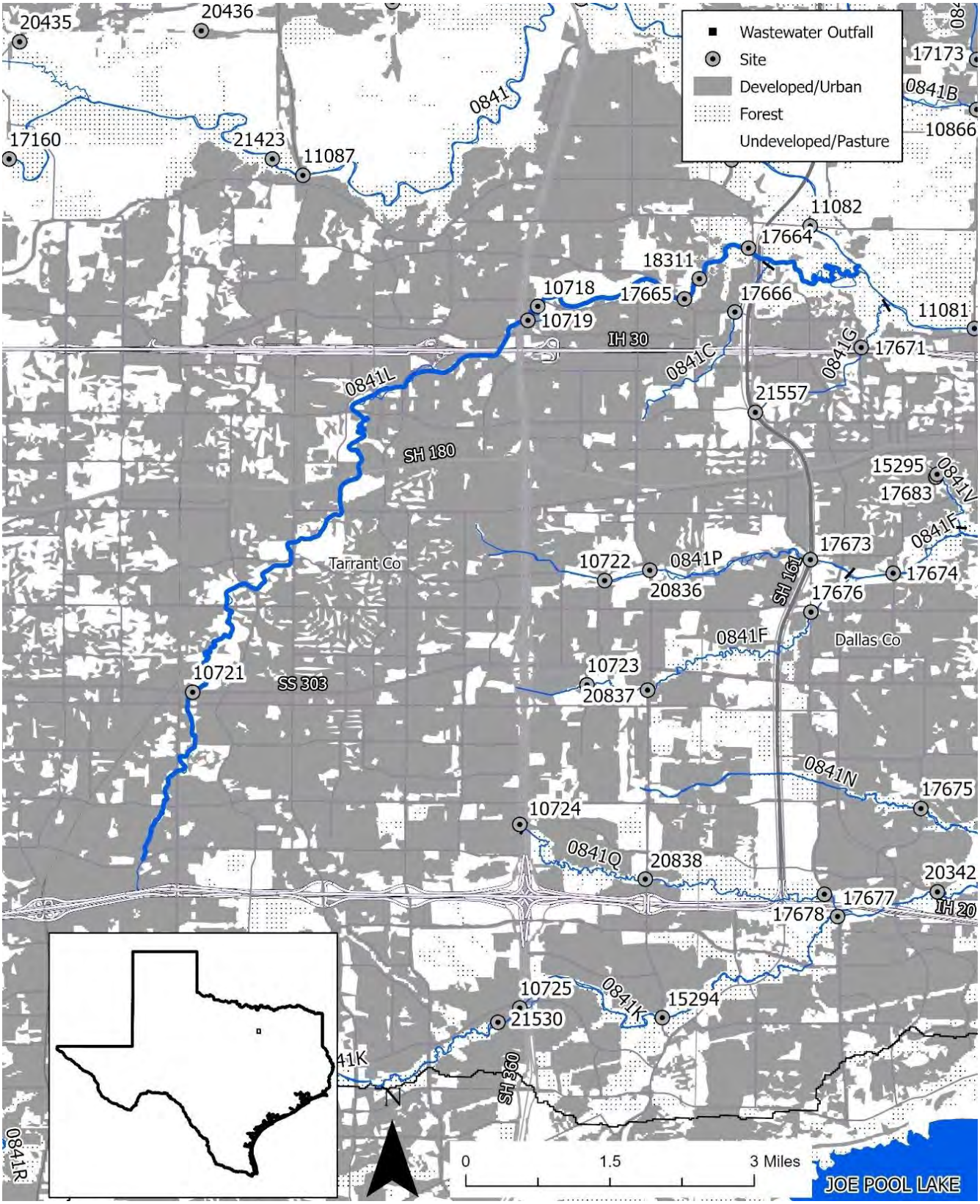


Figure 187: Segment 0841L Map

This 13.4-mile stream runs from the headwaters near Arbrook Boulevard in Arlington to the confluence with the Lower West Fork Trinity River in Grand Prairie (see Figure 188). The watershed is heavily developed and flows through the Eastern Cross Timbers and Northern Blackland Prairie ecoregions.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 141. Monitoring is being conducted by the City of Arlington. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 141: Segment 0841L FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841L_01	JOHNSON CREEK AT SH 360 IN ARLINGTON	10719	City of Arlington

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 142. Results of TRA trend analyses are shown in Table 143.

Table 142: TCEQ 2020 Texas Integrated Report Summary for Segment 0841L

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	Aquatic Life Use	Acute Toxic Substances in water		FS
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	General Use	Ammonia	0.33 mg/L	NC
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	General Use	Nitrate	1.95 mg/L	NC
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	General Use	Total Phosphorus	0.69 mg/L	NC
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841L_01 From confluence with Lower West Fork Trinity River up to south of Mayfield Road in Arlington	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 143: Significant Trends for Segment 0841L (P-value<0.1)

Segment & Assessment Unit		0841L_01	0841L_01	0841L_01
Site		10718	10721	17664
pH	All	No Trend	↓	No Trend
	Summer	Not Significant	No Trend	No Trend
	Winter	No Trend	↓	No Trend

Segment & Assessment Unit		0841L_01	0841L_01	0841L_01
Site		10718	10721	17664
Nitrate	All	Not Significant	Insufficient Data	↓
	Summer	Not Significant	Insufficient Data	Not Significant
	Winter	Not Significant	Insufficient Data	Not Significant
Total Phosphorus	All	No Trend	Insufficient Data	↑
	Summer	Not Significant	Insufficient Data	Not Significant
	Winter	No Trend	Insufficient Data	Not Significant
Hardness	All	↓*	Insufficient Data	Not Significant
	Summer	↓*	Insufficient Data	↓
	Winter	Not Significant	Insufficient Data	Not Significant
Sulfate	All	Not Significant	Insufficient Data	Not Significant
	Summer	↓*	Insufficient Data	↓
	Winter	Not Significant	Insufficient Data	Not Significant
Dissolved Copper	All	Insufficient Data	↑	Insufficient Data
	Summer	Insufficient Data	Not Significant	Insufficient Data
	Winter	Insufficient Data	↑	Insufficient Data
Flow Severity	All	Not Significant	↓	No Trend
	Summer	↓*	↓	Not Significant
	Winter	No Trend	No Trend	No Trend
Chlorophyll-*a*	All	Not Significant	Insufficient Data	Not Significant
	Summer	↓*	Insufficient Data	Not Significant
	Winter	Not Significant	Insufficient Data	No Trend
Field Turbidity	All	No Trend	Insufficient Data	No Trend
	Summer	No Trend	Insufficient Data	No Trend
	Winter	↓*	Insufficient Data	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

This segment was found to be impaired due to elevated levels of *E. coli*. Monitoring has taken place at several stations over the years. As shown in Figure 188, *E. coli* levels were regularly above the standard of 126 MPN/100 mL. The two stations represented in this graph are located in the middle (station 10719) and at the lower end (station 17664) of the stream. There are no flow data available for samples collected in this segment. However, based on flow severity and days since last precipitation, it is clear that *E. coli* levels increased with increasing flow. Elevated *E. coli* levels were reported at higher flow severities and when there was recent precipitation. This stream flows through a mix of land uses – single and multi-family residential, parks, commercial, industrial, and some wooded riparian areas. All of these likely have some impact on the impairment; from run-off carrying waste from pets and wildlife to failing wastewater infrastructure. Homeowner education and pet waste best management practices may help reduce bacteria levels to some degree. However, bacterial source tracking studies would be required in order to determine if the bacteria are more from human or animal sources. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

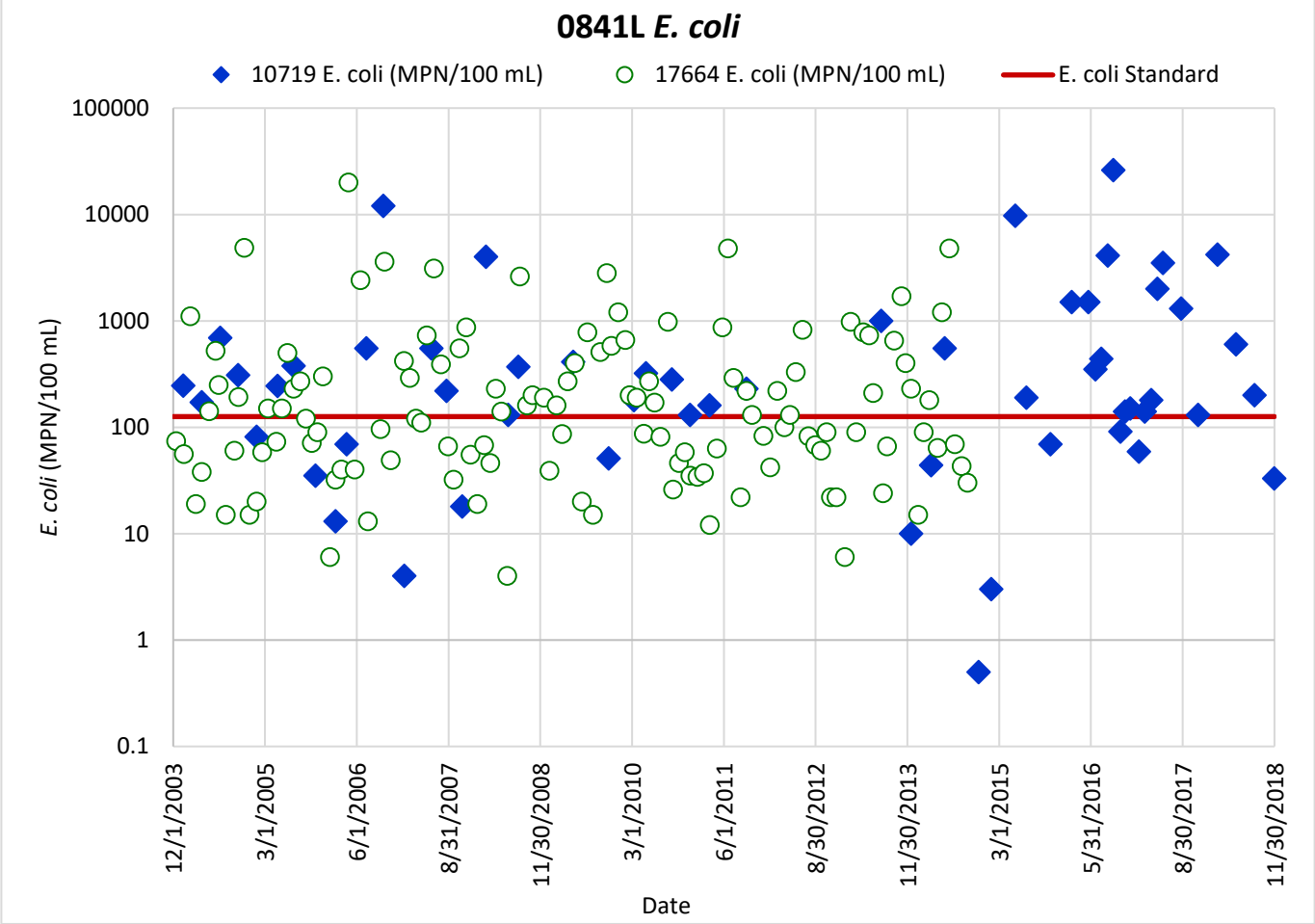


Figure 188: 0841L E. coli

The increasing trends for dissolved copper at station 10721 and total phosphorus at station 17664 appear to have been false trends introduced by censoring of non-detect data. As discussed previously, when higher non-detect values are grouped at the beginning of a data set, censoring of those values to a much lower value can make it appear as though there are increasing trends when there is no actual change in water quality.

0841C Arbor Creek

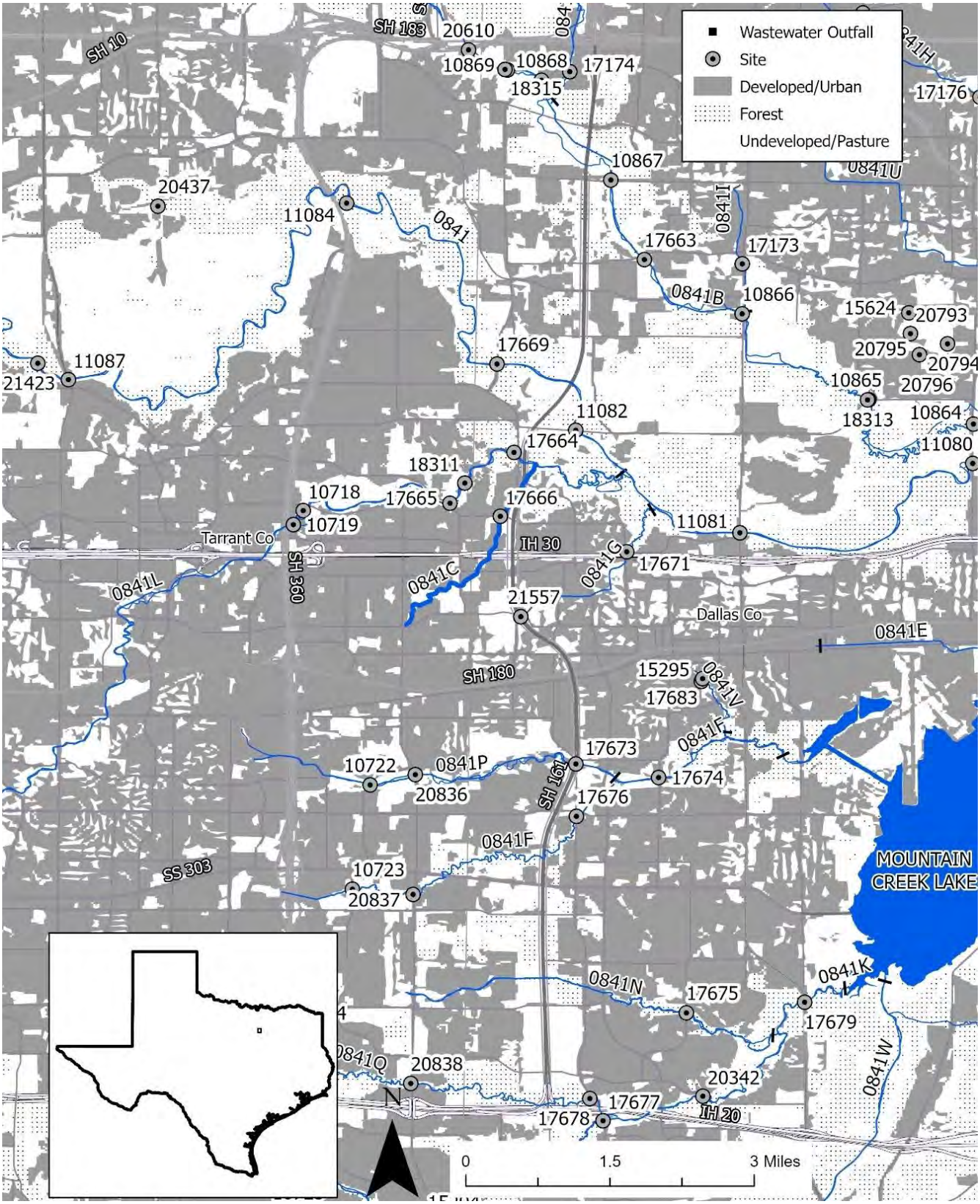


Figure 189: Segment 0841C Map

This unclassified segment is a 2.2-mile stretch of Arbor Creek that runs from North Great Southwest Parkway in Grand Prairie to the confluence with Johnson Creek (see Figure 189). The watershed is heavily developed and lies within the Northern Blackland Prairie. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. No significant trends were identified during TRA data analysis.

0841G Dalworth Creek

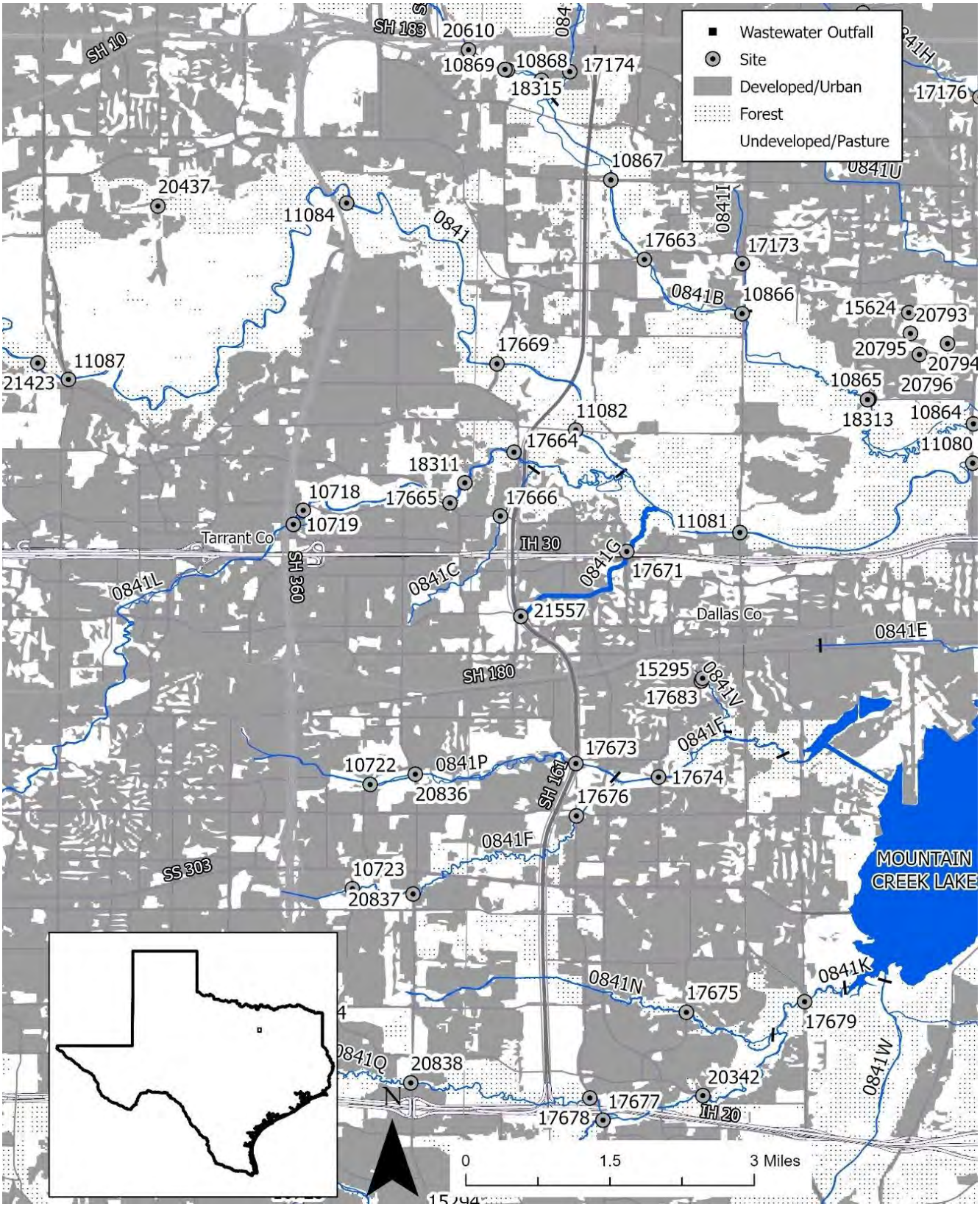


Figure 190: Segment 0841G Map

This unclassified segment is a 2.2-mile stretch of Dalworth Creek running from County Line Road in Grand Prairie to the confluence with the Lower West Fork Trinity River (see Figure 190). The watershed is developed and lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 144. Results of TRA trend analyses are shown in Table 145.

Table 144: TCEQ 2020 Texas Integrated Report Summary for Segment 0841G

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	Aquatic Life Use	Acute Toxic Substances in water		NA
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	Aquatic Life Use	Chronic Toxic Substances in water		NA
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	Recreation Use	*E. coli*	126 MPN/100 mL	**NS**
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	General Use	Ammonia	0.33 mg/L	NC
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	General Use	Nitrate	1.95 mg/L	NC
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	General Use	Total Phosphorus	0.69 mg/L	NC
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841G_01 2.2 mi stretch from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie	Fish Consumption Use	HH Bioaccumulative Toxics in water		NA

FS = Fully Supporting NA = Not Assessed NC = No Concern NS = Not Supporting

Table 145: Significant Trends for Segment 0841G (P-value<0.1)

Segment & Assessment Unit		0841G_01
Site		17671
Secchi Depth	All	Not Significant
	Summer	↑
	Winter	No Trend
Dissolved Oxygen	All	No Trend
	Summer	↑
	Winter	No Trend
Nitrate	All	↓
	Summer	Not Significant
	Winter	Not Significant
Total Kjeldahl Nitrogen	All	↓
	Summer	↓
	Winter	No Trend
Sulfate	All	Not Significant
	Summer	↓
	Winter	Not Significant

Segment & Assessment Unit		0841G_01
Site		17671
Flow Severity	All	Not Significant
	Summer	Not Significant
	Winter	↓
Chlorophyll-*a*	All	↓
	Summer	↓
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

This segment was found to be impaired due to elevated levels of *E. coli*. As shown in Figure 191, *E. coli* was regularly reported above the standard of 126 MPN/100 mL. There is no flow data available for the samples collected in this segment. Based on flow severity and days since last precipitation, the impairment appears to have been somewhat run-off related. Higher bacteria levels were generally reported at higher flow severities and after recent precipitation. The watershed upstream of the monitoring station is residential with some small wooded riparian areas. It is likely that run-off carrying pet and wildlife waste may be contributing to the bacteria impairment. However, there were many high *E. coli* values reported at low flow severities and many days after precipitation. Therefore, it seems that failing infrastructure may be the largest contributor of bacteria in this stream. It is recommended that sampling take place at several locations along the stream during low flows to help identify potential sources of *E. coli*. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

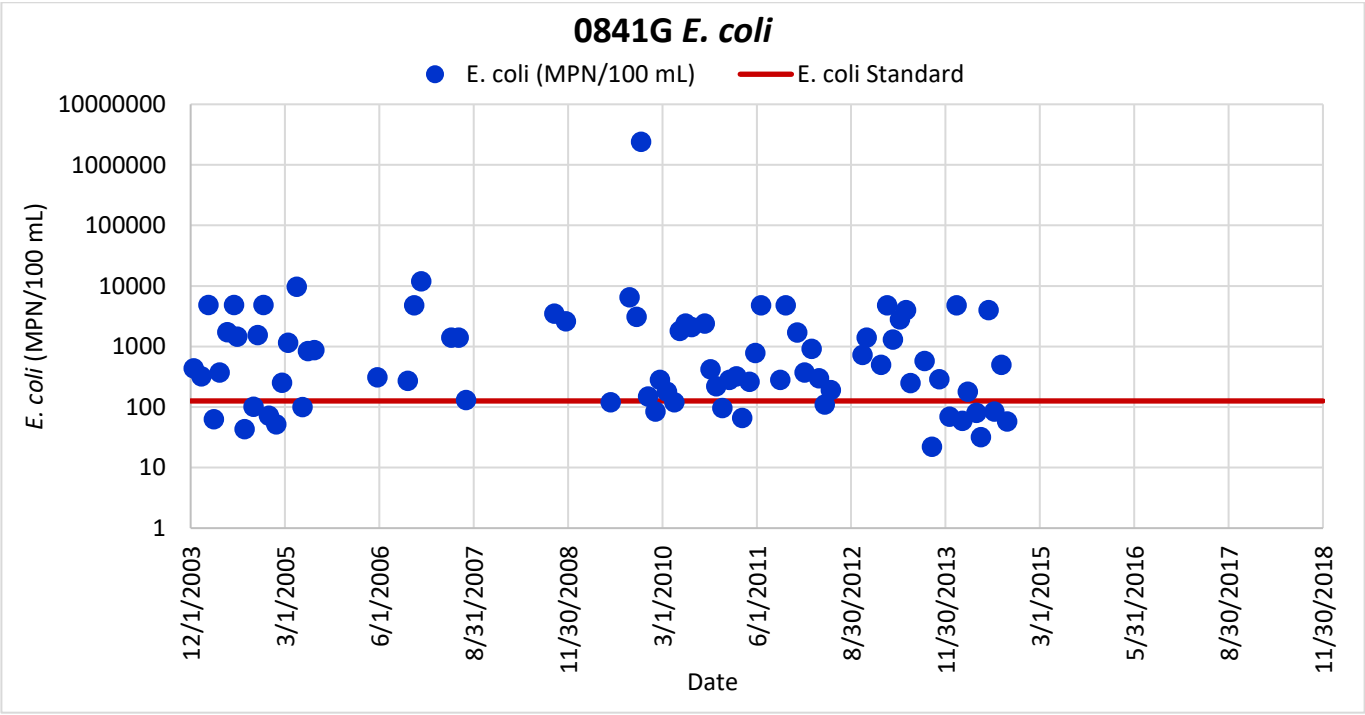


Figure 191: 0841G E. coli

0841D Big Bear Creek

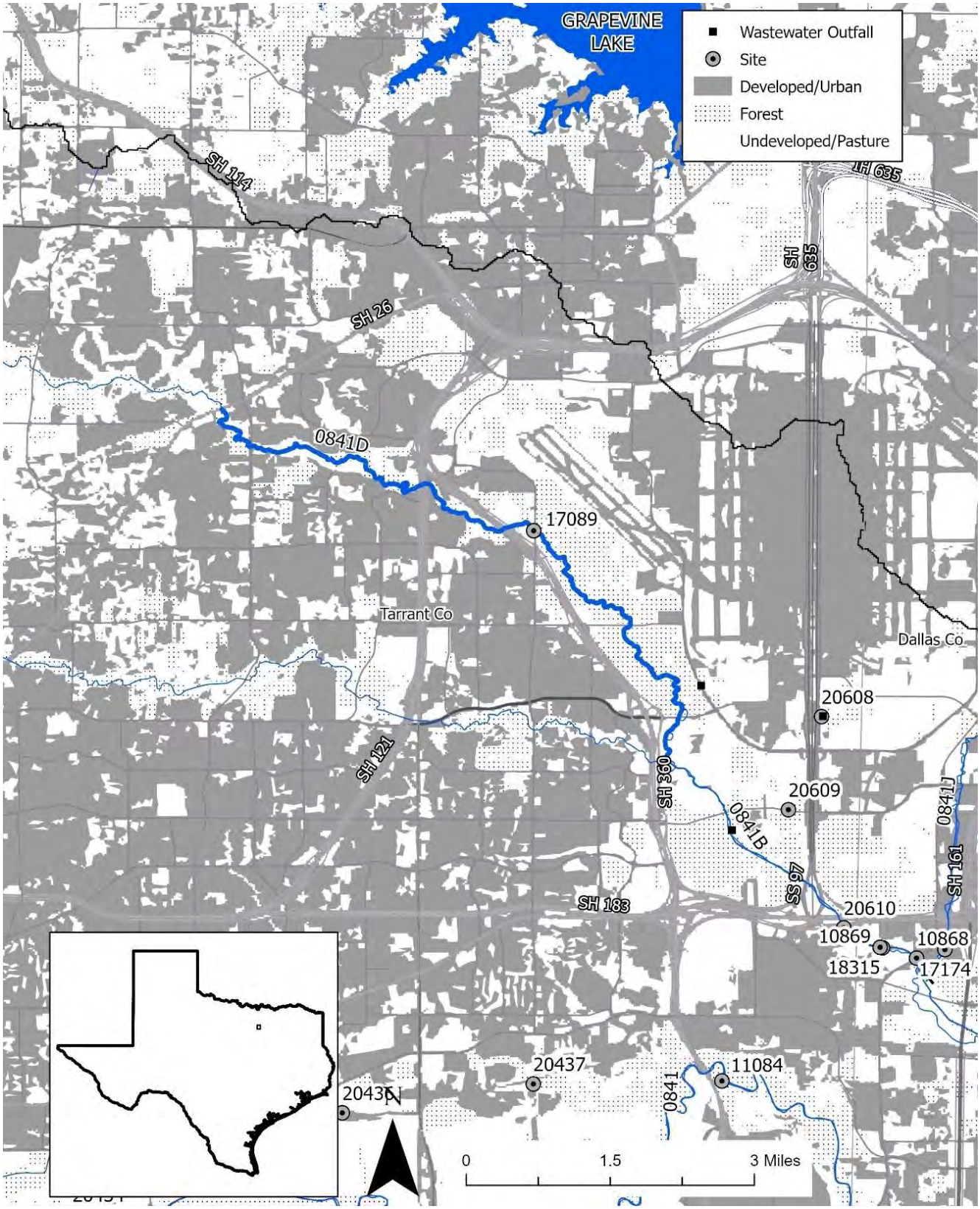


Figure 192: Segment 0841D Map

This unclassified segment is a 7.7-mile stretch of Big Bear Creek running from SH 26 near Colleyville to the confluence with Little Bear Creek near the southern end of Dallas-Fort Worth International Airport (see Figure 192). The watershed is heavily developed but has some wooded riparian areas and flows through the Eastern Cross Timbers and Northern Blackland Prairie ecoregions.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 146. Monitoring is being conducted by the Dallas-Fort Worth Airport Environmental Affairs Department and TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 146: Segment 0841D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841D_01	BIG BEAR CREEK IMMEDIATELY UPSTREAM OF EULESS-GRAPEVINE ROAD IN GRAPEVINE EAST OF HWY 360	17089	Dallas-Fort Worth Airport Environmental Affairs Department
0841D_01	BIG BEAR CREEK AT PARR PARK FOOTBRIDGE IN GRAPEVINE APPROXIMATELY 90 METERS SOUTH OF OLD MILL RUN DEAD END	22096	TRA

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 147. Results of TRA trend analyses are shown in Table 148.

Table 147: TCEQ 2020 Texas Integrated Report Summary for Segment 0841D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841D_01 From the confluence with Little Bear Creek to SH 26, Tarrant County.	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0841D_01 From the confluence with Little Bear Creek to SH 26, Tarrant County.	Aquatic Life Use	Acute Toxic Substances in water		FS
0841D_01 From the confluence with Little Bear Creek to SH 26, Tarrant County.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841D_01 From the confluence with Little Bear Creek to SH 26, Tarrant County.	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0841D_01 From the confluence with Little Bear Creek to SH 26, Tarrant County.	General Use	Ammonia	0.33 mg/L	NC
0841D_01 From the confluence with Little Bear Creek to SH 26, Tarrant County.	General Use	Total Phosphorus	0.69 mg/L	NC
0841D_01 From the confluence with Little Bear Creek to SH 26, Tarrant County.	General Use	Chlorophyll-*a*	14.1 µg/L	NC

FS = Fully Supporting NC = No Concern

Table 148: Significant Trends for Segment 0841D (P-value<0.1)

Segment & Assessment Unit		0841D_01
Site		17089
Alkalinity	All	↓*
	Summer	Not Significant
	Winter	↓*
Nitrate	All	No Trend
	Summer	Not Significant
	Winter	↑*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The increasing winter trend for nitrate at station 17089 was weighted by a single exceptionally high value. Based on associated data, the cause of this high value is unknown but is not a concern at this time.

0841B Bear Creek

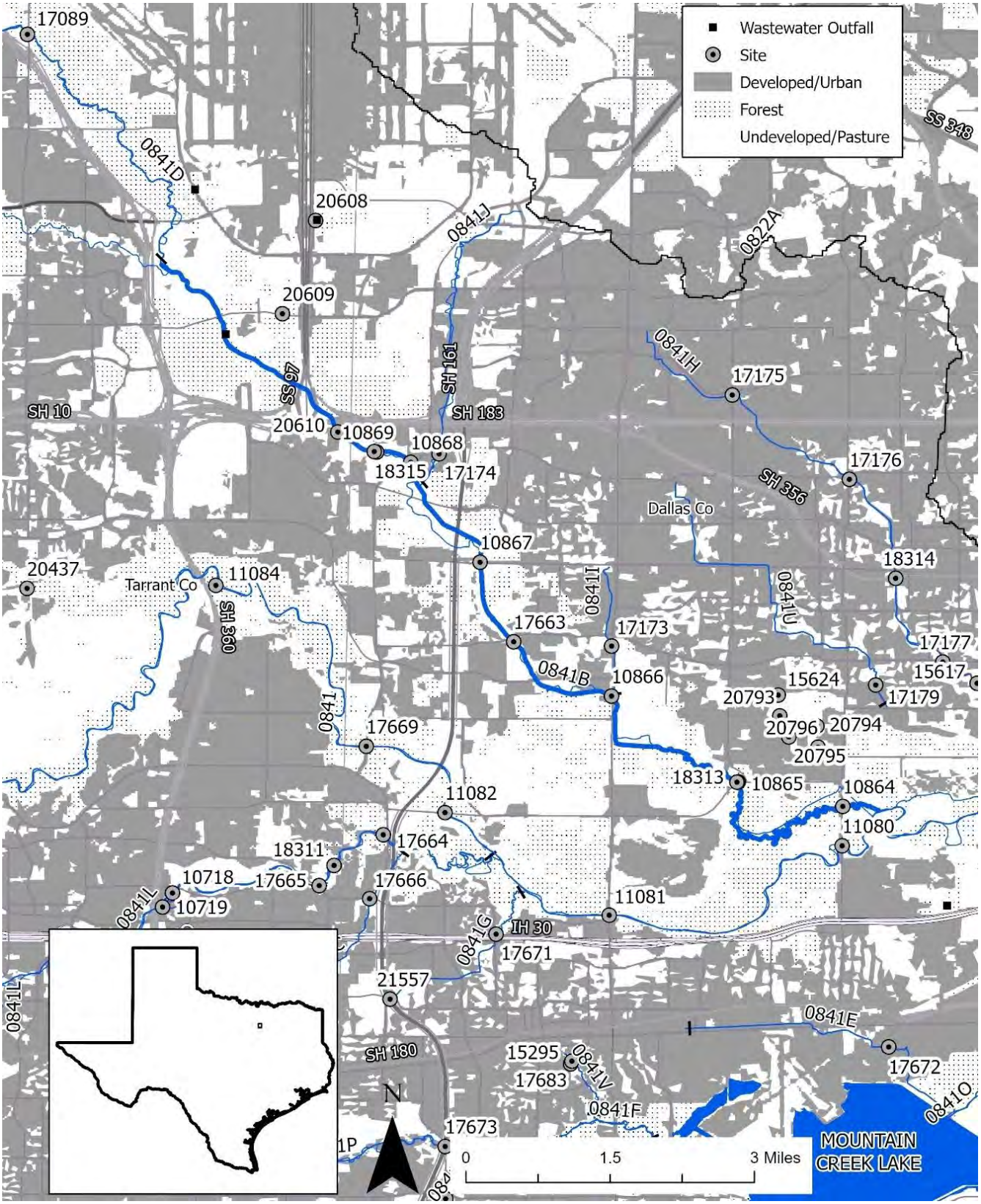


Figure 193: Segment 0841B Map

This unclassified segment is a 12-mile stretch of Bear Creek running from the confluence with Little Bear Creek just upstream of HWY 183 in Euless to the confluence with the Lower West Fork Trinity River (see Figure 193). The watershed is heavily developed with a few small wooded areas and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at two sites within this segment as shown in Table 149. Monitoring is being conducted by the City of Irving and Dallas-Fort Worth Airport Environmental Affairs Department. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 149: Segment 0841B FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841B_01	BEAR CREEK 37 METERS DOWNSTREAM OF COUNTY LINE ROAD SOUTH OF SR 183 IN IRVING	10869	City of Irving
0841B_01	BEAR CREEK AT COUNTY LINE ROAD 487 M SOUTH OF SH 183 IN IRVING	18315	Dallas-Fort Worth Airport Environmental Affairs Department

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 150. Results of TRA trend analyses are shown in Table 151.

Table 150: TCEQ 2020 Texas Integrated Report Summary for Segment 0841B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	Aquatic Life Use	Acute Toxic Substances in water		FS
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	Aquatic Life Use	Fish Community		FS
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	Aquatic Life Use	Macrobenthic Community		FS
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	Aquatic Life Use	Habitat		NC
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	General Use	Ammonia	0.33 mg/L	NC
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	General Use	Nitrate	1.95 mg/L	NC
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	General Use	Total Phosphorus	0.69 mg/L	NC

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841B_01 12 mi stretch from confluence with West Fork Trinity to confluence with Little Bear Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NC = No Concern

Table 151: Significant Trends for Segment 0841B (P-value<0.1)

Segment & Assessment Unit		0841B_01	0841B_01	0841B_01	0841B_01
Site		10865	10867	10869	17663
Flow	All	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↑*	Insufficient Data
Dissolved Oxygen	All	Not Significant	Not Significant	Not Significant	Insufficient Data
	Summer	↑	Not Significant	Not Significant	Insufficient Data
	Winter	Not Significant	Not Significant	↑	Insufficient Data
pH	All	No Trend	No Trend	Not Significant	Insufficient Data
	Summer	Not Significant	No Trend	No Trend	Insufficient Data
	Winter	No Trend	No Trend	↓	Insufficient Data
Ammonia	All	No Trend	Not Significant	Not Significant	Insufficient Data
	Summer	Not Significant	Not Significant	↑	Insufficient Data
	Winter	No Trend	Not Significant	No Trend	Insufficient Data
Total Kjeldahl Nitrogen	All	No Trend	No Trend	No Trend	Insufficient Data
	Summer	Not Significant	Not Significant	Not Significant	Insufficient Data
	Winter	Not Significant	↓	No Trend	Insufficient Data
Total Phosphorus	All	No Trend	Not Significant	↑	Insufficient Data
	Summer	No Trend	Not Significant	No Trend	Insufficient Data
	Winter	↑	Not Significant	↑	Insufficient Data
Hardness	All	Not Significant	Not Significant	Not Significant	Insufficient Data
	Summer	Not Significant	↓	↓	Insufficient Data
	Winter	Not Significant	Not Significant	Not Significant	Insufficient Data
Chloride	All	Not Significant	Not Significant	Insufficient Data	Insufficient Data
	Summer	Not Significant	↓	Insufficient Data	Insufficient Data
	Winter	Not Significant	↑	Insufficient Data	Insufficient Data
E. coli	All	No Trend	Not Significant	Not Significant	Insufficient Data
	Summer	No Trend	Not Significant	Not Significant	Insufficient Data
	Winter	Not Significant	↓	Not Significant	Insufficient Data
Field Turbidity	All	No Trend	No Trend	Insufficient Data	Insufficient Data
	Summer	No Trend	No Trend	Insufficient Data	Insufficient Data
	Winter	↓*	No Trend	Insufficient Data	Insufficient Data
Field Ammonia	All	Insufficient Data	No Trend	Insufficient Data	No Trend
	Summer	Insufficient Data	Not Significant	Insufficient Data	↓*
	Winter	Insufficient Data	No Trend	Insufficient Data	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Summertime increasing trends for ammonia and total phosphorus at station 10869 appear to have been affected by both the recent drought of 2011 to 2015 and upstream wastewater treatment facilities. There was limited flow data for the early portion of the data set. However, for the portion of the data set with flow data available, higher ammonia values were reported at lower flows; with the highest values being reported during the drought of 2011 to 2015 as shown in Figure 194 for ammonia. These occurrences were likely due to the small wastewater treatment facility upstream of station 10869. In addition, high ammonia values were frequently reported within five days of recent precipitation. There are large residential developments and several golf courses upstream of station 10869. It is likely that residential and turf fertilizers contribute ammonia to the stream during run-off events. Regardless, this trend does not appear to be leading to an issue in this segment. Of 65 ammonia records at this station, the highest value was 0.13 mg/L; well below the screening level of 0.33 mg/L. For total phosphorus, there were 66 records with only one value reported above the screening level of 0.69 mg/L.

The increasing winter trend for total phosphorus at station 10865 was similarly affected. As with station 10869, the trend does not appear to be leading to a concern. Of 50 total phosphorus records, the highest value was 0.18 mg/L.

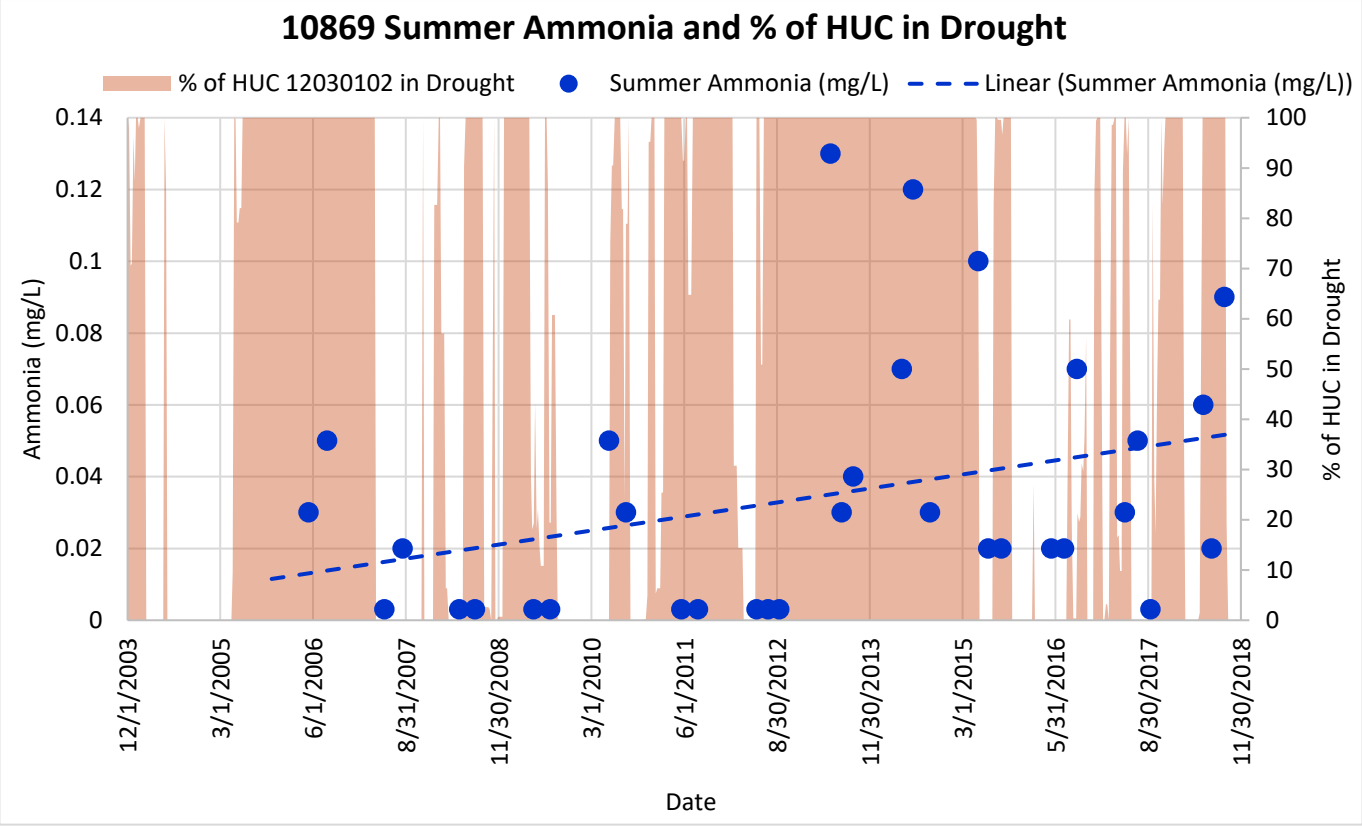


Figure 194: 10869 Summer Ammonia and % of HUC in Drought

The winter chloride trend at station 10867 appeared to have been related to drought conditions with higher chloride values being reported during periods of drought and as the number of days since the last precipitation event increased. Therefore, evaporation and concentration of salts likely influenced the trend at this station.

0841J Estelle Creek

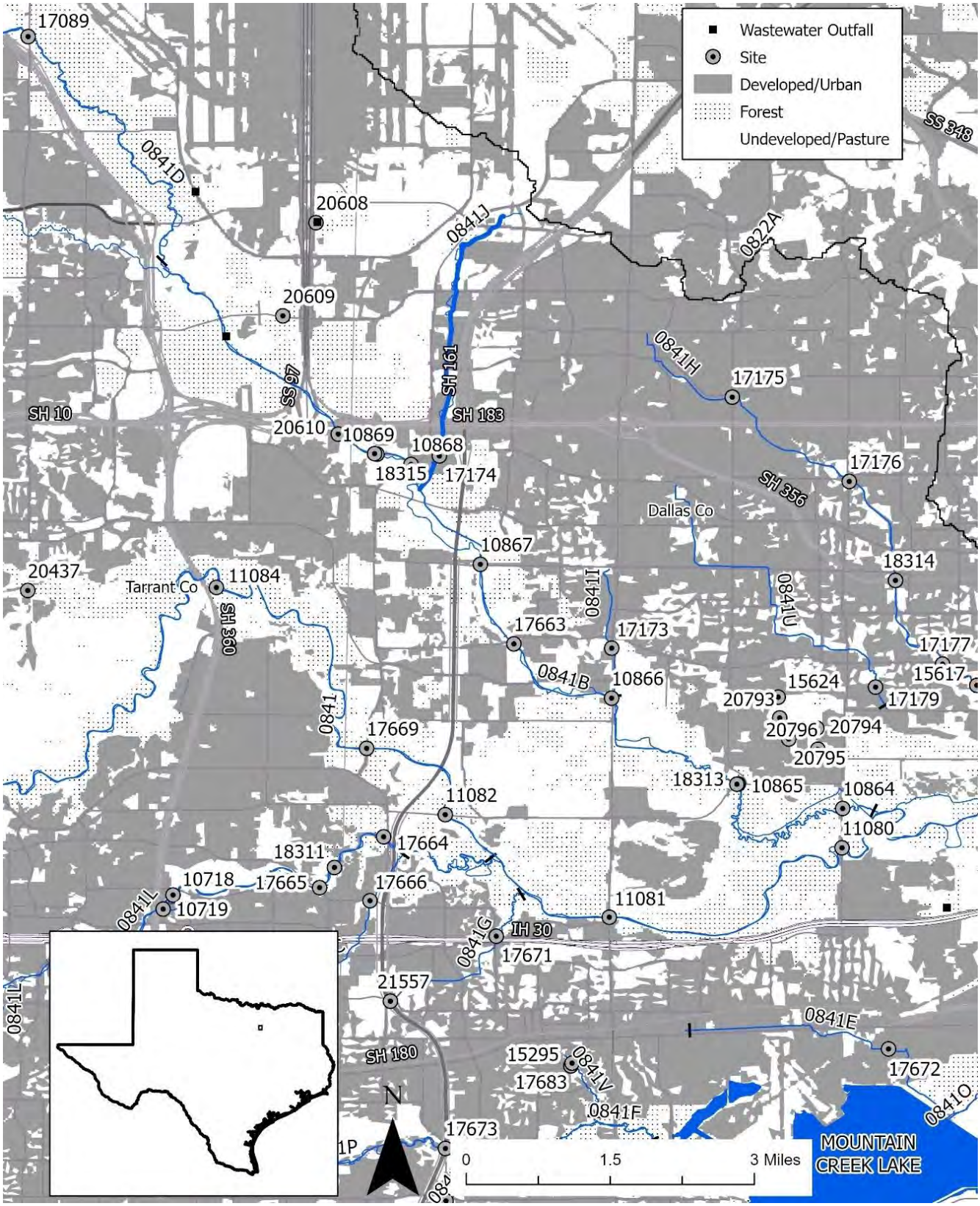


Figure 195: Segment 0841J Map

This unclassified segment is a 4-mile stretch of Estelle Creek running from Valley View Lane in Irving to the confluence with Bear Creek (see Figure 195). The watershed is heavily developed and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 152. Monitoring is being conducted by the City of Irving. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 152: Segment 0841J FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841J_01	ESTELLE CREEK 79 METERS UPSTREAM OF WEST PIONEER DRIVE IN IRVING	17174	City of Irving

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 153. Results of TRA trend analyses are shown in Table 154.

Table 153: TCEQ 2020 Texas Integrated Report Summary for Segment 0841J

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841J_01 4 mi stretch from confluence with Bear Creek to Valley View Lane in Irving, Dallas Co.	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	FS
0841J_01 4 mi stretch from confluence with Bear Creek to Valley View Lane in Irving, Dallas Co.	Recreation Use	*E. coli*	126 MPN/100 mL	FS

FS = Fully Supporting

Table 154: Significant Trends for Segment 0841J (P-value<0.1)

Segment & Assessment Unit		0841J_01
Site		17174
Dissolved Oxygen	All	↑*
	Summer	↑*
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The increasing trends for dissolved oxygen at station 17174 appears to have been somewhat related to low flows that typically occur during drought conditions as shown in Figure 196. There is no flow data available to definitively make this assumption. Dissolved oxygen was reported at higher levels when there has been recent precipitation. This trend may have also been related to algal populations because dissolved oxygen increased during the drought of 2011 to 2015. Station 17174 is located in a pooled section of the stream upstream from a low water dam. This portion of the stream is wide and unshaded. In these conditions, increased residence times and adequate sunlight can allow algal populations increase. However, there are no chlorophyll-*a* data available to confirm this conclusion.

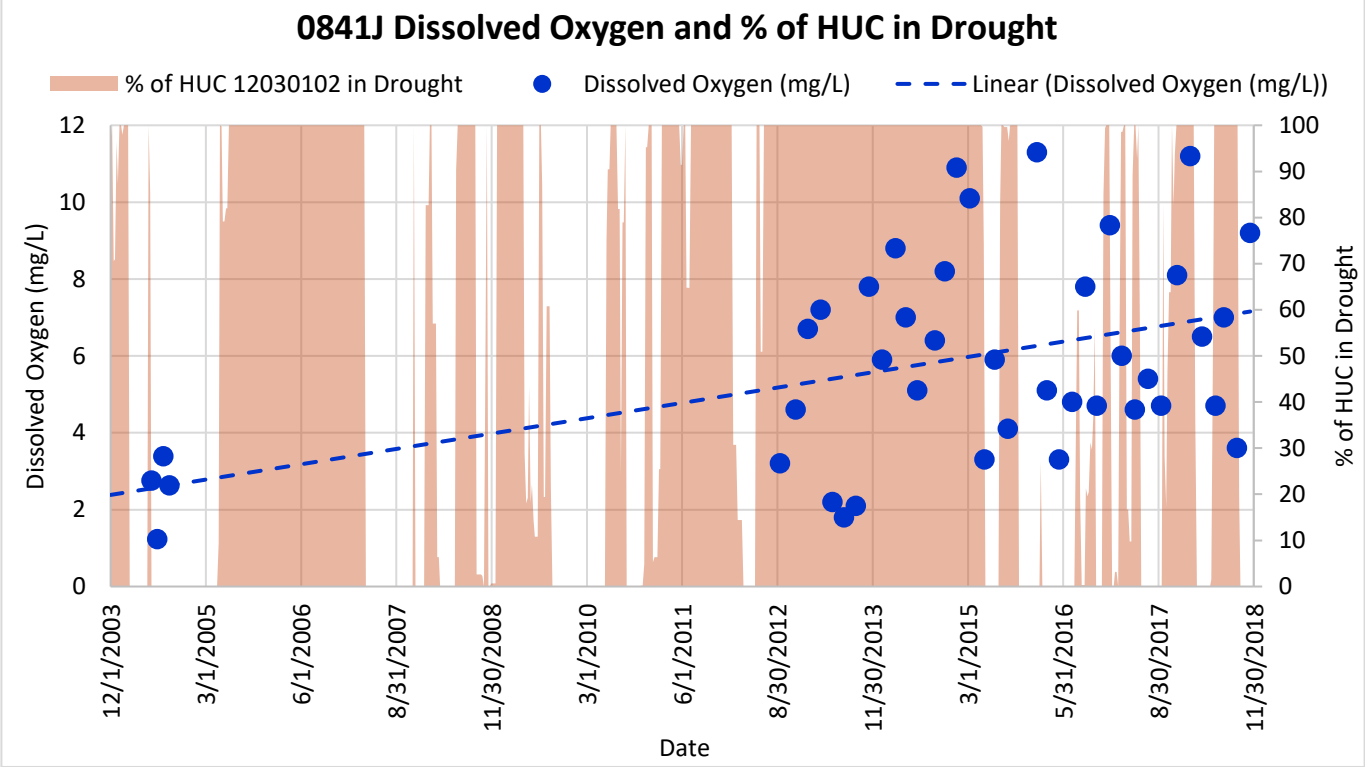


Figure 196: 0841J Dissolved Oxygen and % of HUC in Drought

0841I Dry Branch Creek

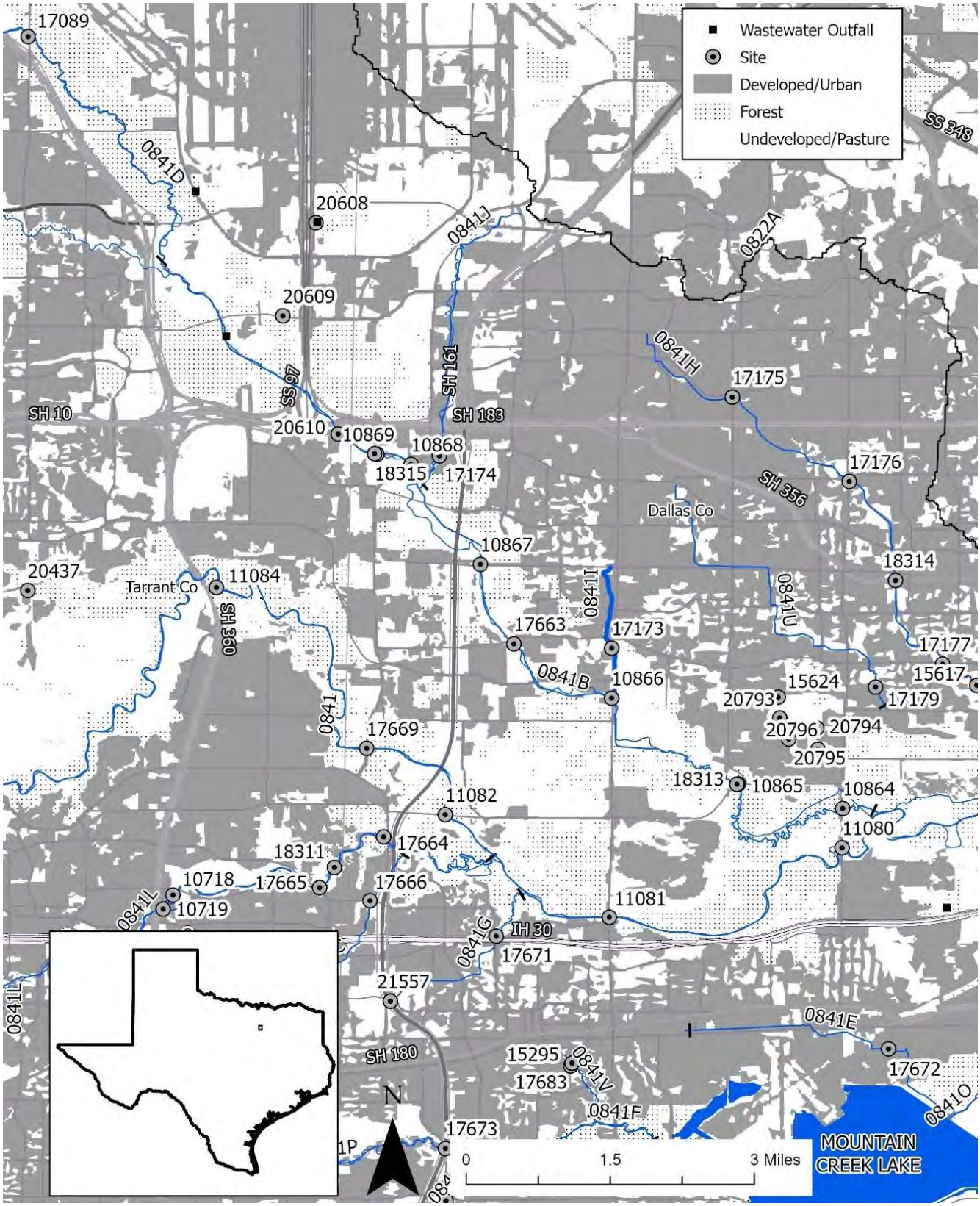


Figure 197: Segment 0841I Map

0841I is a 1.5-mile stretch of Dry Branch Creek running from Rock Island Road in Irving to the confluence with the Lower West Fork Trinity River (see Figure 197). The watershed is heavily developed with a small portion of pasture near the most downstream portion of the stream. It lies within Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 155. Monitoring is being conducted by the City of Irving. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 155: Segment 0841I FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841I_01	DRY BRANCH IMMEDIATELY UPSTREAM OF SOUTH BELTLINE ROAD IN IRVING	17173	City of Irving

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 156. No significant trends were identified during TRA data analysis.

Table 156: TCEQ 2020 Texas Integrated Report Summary for Segment 0841I

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841I_01 1.5 mi stretch from confluence with Lower W. Fork Trinity to Rock Island Road in Irving	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	FS
0841I_01 1.5 mi stretch from confluence with Lower W. Fork Trinity to Rock Island Road in Irving	Recreation Use	*E. coli*	126 MPN/100 mL	NS

FS = Fully Supporting NS = Not Supporting

This segment was found to be impaired due to elevated levels of *E. coli*. As shown in Figure 198, *E. coli* was regularly reported above the standard of 126 MPN/100 mL. *E. coli* levels generally increased as flows increased which indicates that the impairment was at least somewhat related to run-off. The watershed drains a mostly residential area which indicates that pet waste may be contributing bacteria to the stream. Homeowner education and pet waste best management practices may help reduce bacteria levels. However, there were several elevated values reported at lower flows. These may have been caused by failing infrastructure. It is recommended that upstream sampling be conducted during low flows to potentially identify sources of bacteria into the stream.

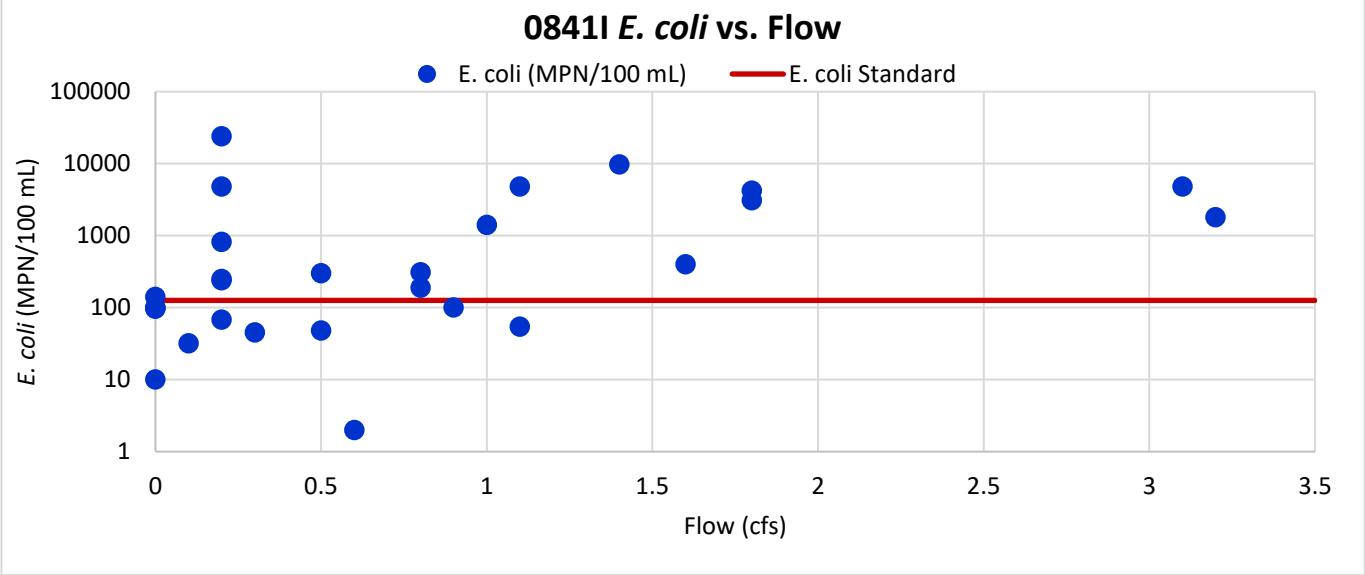


Figure 198: 0841I E. coli vs. Flow

0841S Vilbig Lakes

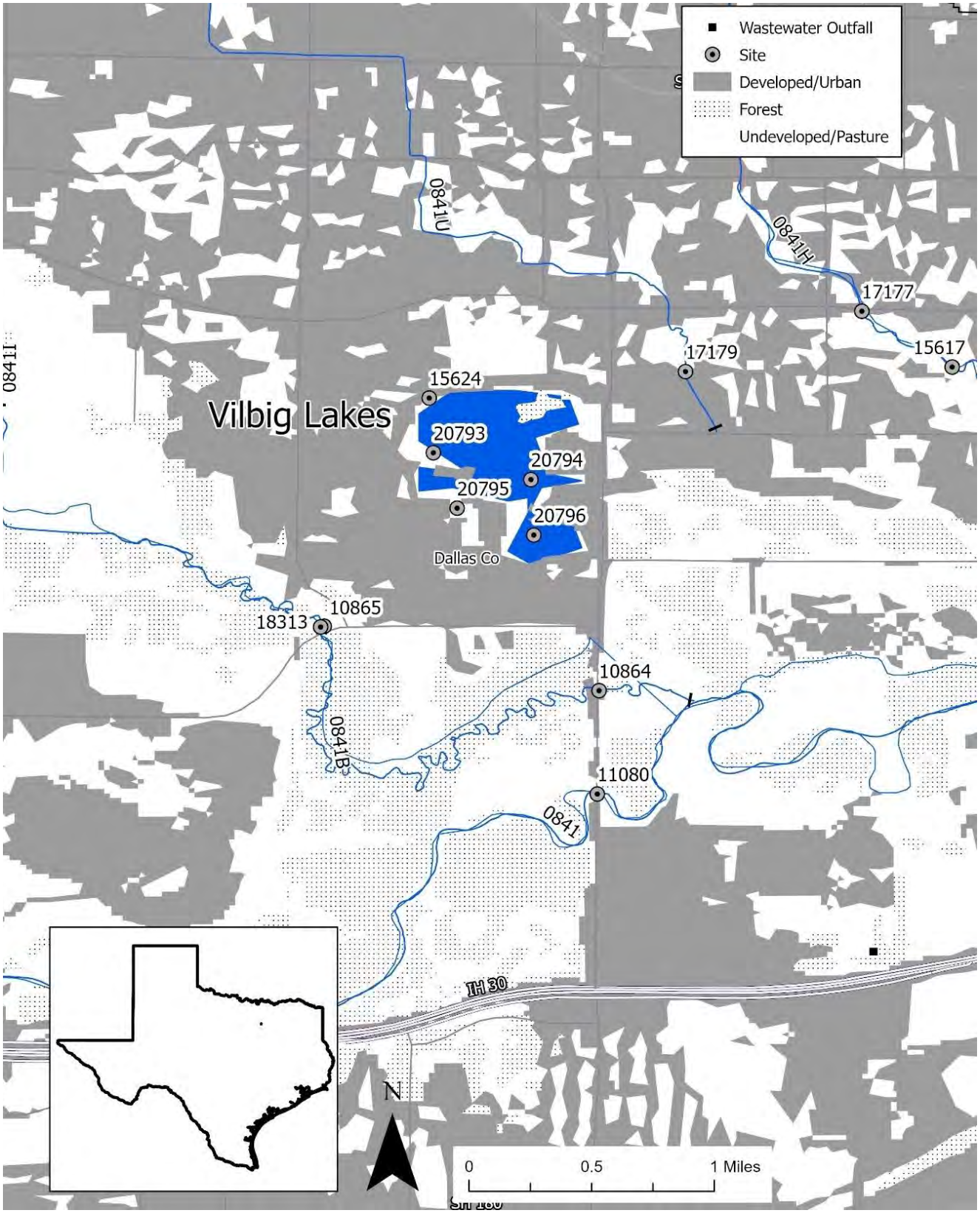


Figure 199: Segment 0841S Map

Lake Vilbig is a 120-acre reservoir in Irving. 0841S is a 5-acre area of this reservoir in the northwest corner near the confluence with an unnamed creek approximately 100-meters south of intersection of Rusdell Road and Marvel Drive in Irving (see Figure 199). The watershed is developed and lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 157. Results of TRA trend analyses are shown in Table 158. Sampling in this segment was discontinued in 2012. The segment is a private lake with no public access.

Table 157: TCEQ 2020 Texas Integrated Report Summary for Segment 0841S

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841S_01 5 acre area in NW corner near confluence with unnamed creek in Irving, Dallas, Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841S_01 5 acre area in NW corner near confluence with unnamed creek in Irving, Dallas, Co.	Recreation Use	*E. coli*	126 MPN/100 mL	FS

FS = Fully Supporting

Table 158: Significant Trends for Segment 0841S (P-value<0.1)

Segment & Assessment Unit		0841S_01	0841S_01	0841S_01
Site		20794	20795	20796
Specific Conductance	All	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	No Trend	Not Significant
	Winter	Not Significant	Not Significant	↓*
Dissolved Oxygen	All	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	No Trend	Not Significant
	Winter	↑*	Not Significant	Not Significant
pH	All	↓*	↓*	↓*
	Summer	↓*	Not Significant	↓*
	Winter	Not Significant	Not Significant	Not Significant
Total Dissolved Solids	All	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	No Trend	Not Significant
	Winter	Not Significant	Not Significant	↓*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

0841U West Irving Creek

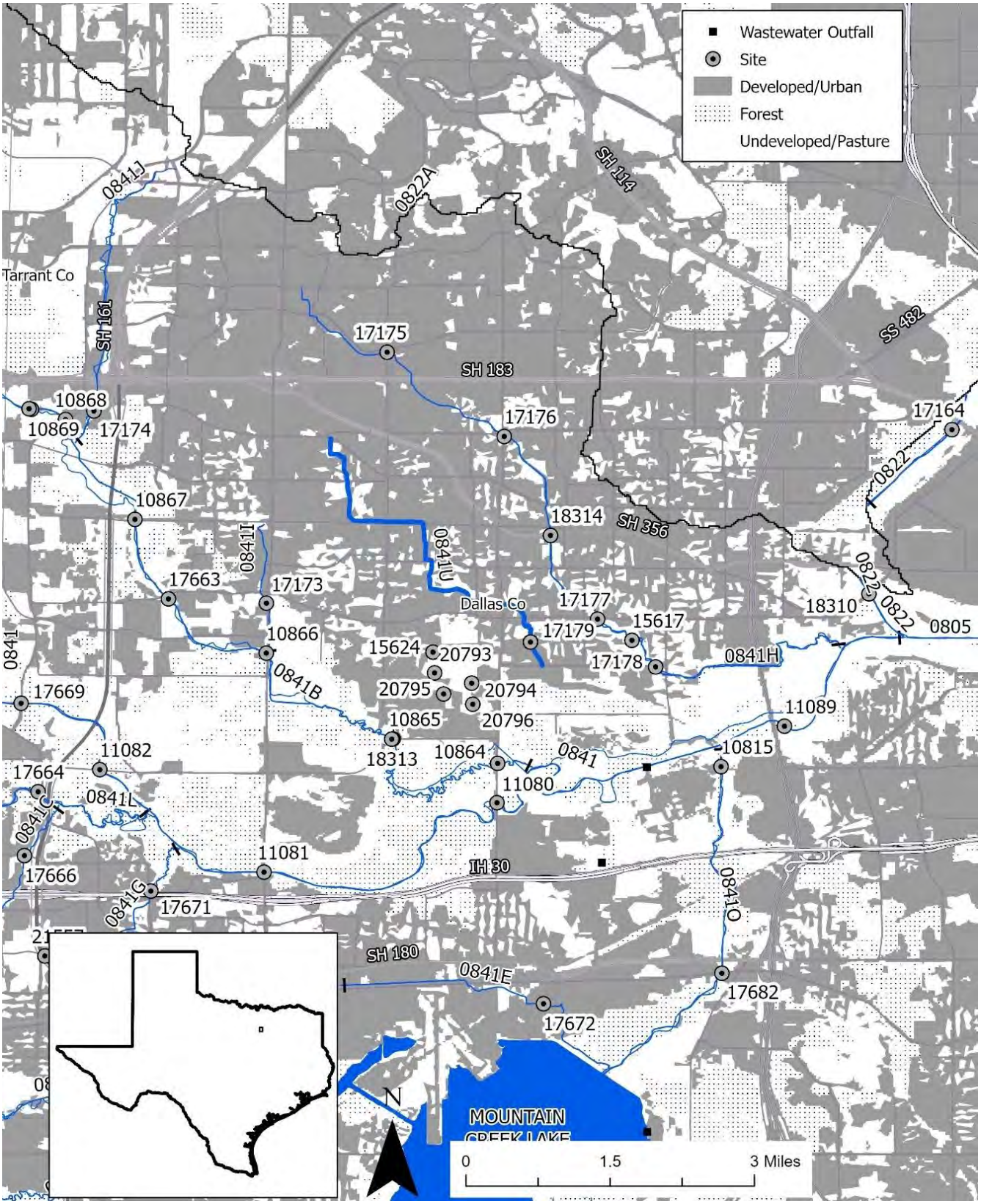


Figure 200: Segment 0841U Map

This unclassified segment is a 4-mile stretch of West Irving Branch running from near West Pioneer Drive in Irving to Oakdale Road (see Figure 200). The watershed is developed and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 159. Monitoring is being conducted by the City of Irving. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 159: Segment 0841U FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841U_01	WEST IRVING BRANCH AT WEST VILBIG STREET IN IRVING	17179	City of Irving

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 160. Results of TRA trend analyses are shown in Table 161.

Table 160: TCEQ 2020 Texas Integrated Report Summary for Segment 0841U

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841U_01 4 mi stretch from approx. 0.4 mi downstream of Oakdale Rd. to just south of Sowers Rd in Irving	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	FS
0841U_01 4 mi stretch from approx. 0.4 mi downstream of Oakdale Rd. to just south of Sowers Rd in Irving	Recreation Use	*E. coli*	126 MPN/100 mL	NS

FS = Fully Supporting NS = Not Supporting

Table 161: Significant Trends for Segment 0841U (P-value<0.1)

Segment & Assessment Unit		0841U_01
Site		17179
Flow	All	No Trend
	Summer	Not Significant
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

This segment was found to be impaired due to elevated *E. coli*. This stream is a relatively low flow system with all flows reported between 0 and 1.4 cfs. It flows through a largely residential area with some commercial and forested areas. Much of the stream is channelized for drainage. As shown in Figure 201, the highest *E. coli* values were reported after recent precipitation which indicates that run-off containing pet waste may be the most likely source of bacteria in this stream. Homeowner education and pet waste best management practices may reduce bacteria levels in this segment. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

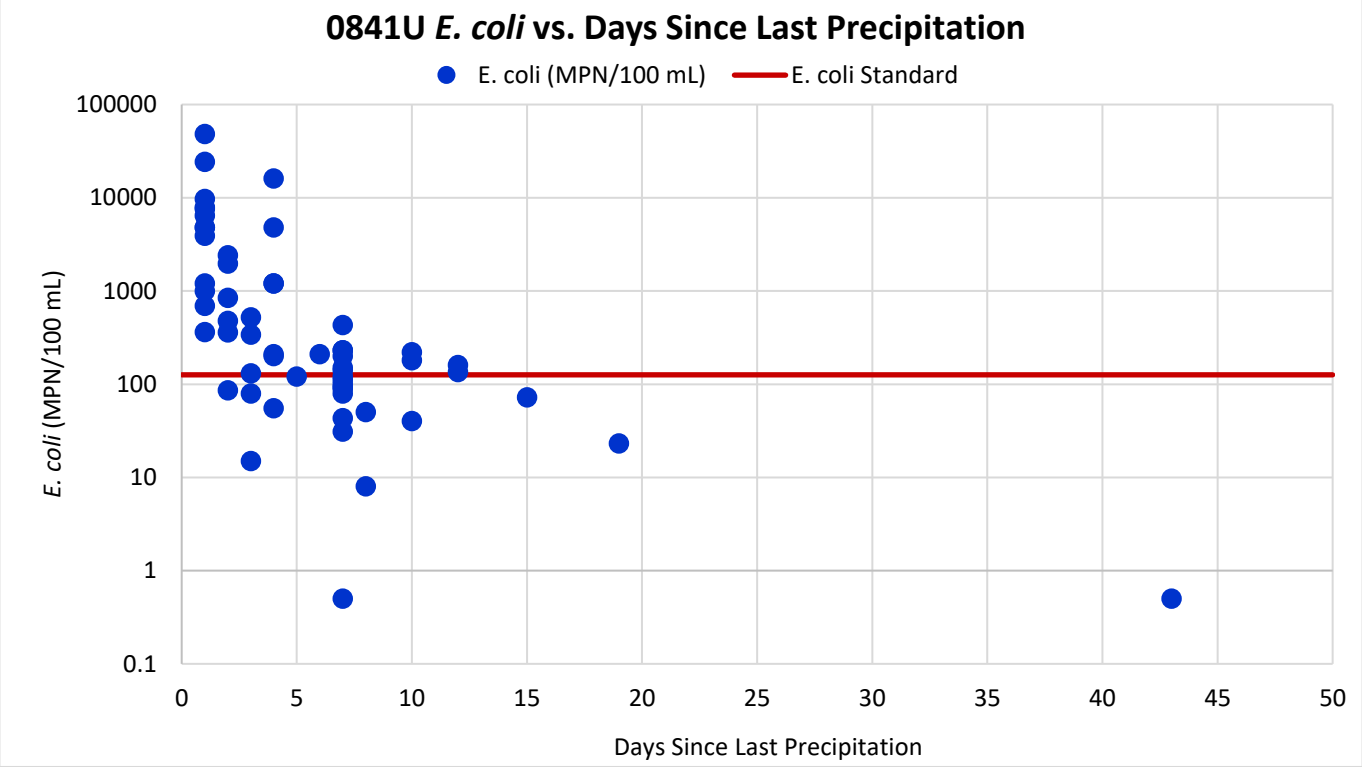


Figure 201: 0841U E. coli vs. Days Since Last Precipitation

0841P North Fork Cottonwood Creek

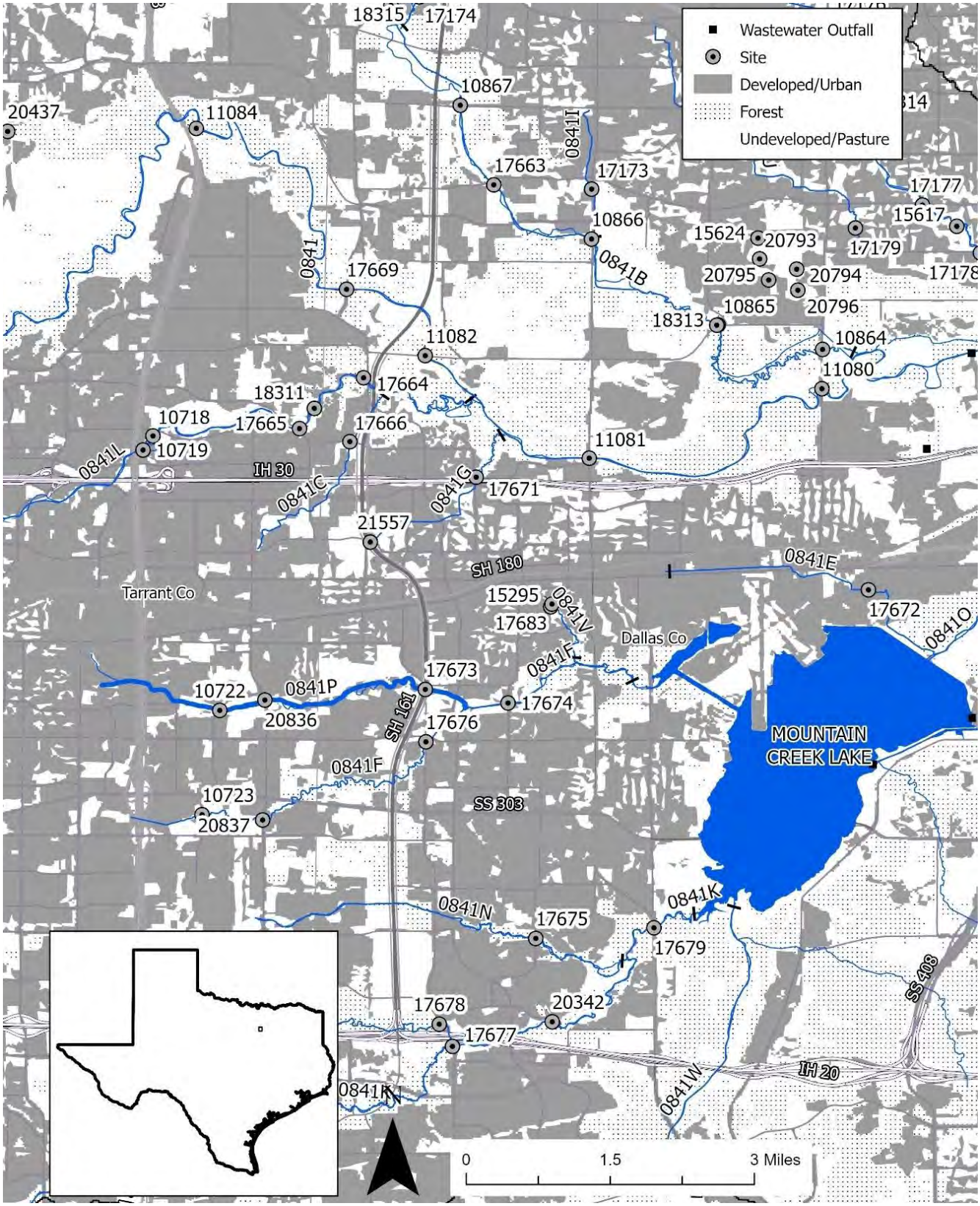


Figure 202: Segment 0841P Map

This unclassified segment is a 4.4-mile stretch of North Fork Cottonwood Creek running from approximately 0.3-miles upstream of Carter Street in Arlington to the confluence with the South Fork Cottonwood Creek in Grand Prairie (see Figure 202). The watershed is developed and has a relatively large area of grassland just upstream of SH 161. It lies within the Northern Blackland Prairie.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 162. Monitoring is being conducted by the City of Arlington. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 162: Segment 0841P FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841P_01	COTTONWOOD CREEK AT TIMBERLAKE DRIVE IN ARLINGTON	10722	City of Arlington

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 163. Results of TRA trend analyses are shown in Table 164.

Table 163: TCEQ 2020 Texas Integrated Report Summary for Segment 0841P

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	Aquatic Life Use	Acute Toxic Substances in water		FS
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	General Use	Ammonia	0.33 mg/L	NC
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	General Use	Nitrate	1.95 mg/L	NC
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	General Use	Total Phosphorus	0.69 mg/L	NC
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841P_01 4.4 mi stretch from confluence of S Fork Cottonwood Ck to approx. 0.3 mi upstream of Carter St.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 164: Significant Trends for Segment 0841P (P-value<0.1)

Segment & Assessment Unit		0841P_01
Site		20836
E. coli	All	Not Significant
	Summer	Not Significant
	Winter	↓*
Chlorophyll-*a*	All	No Trend
	Summer	↑*
	Winter	No Trend
Field Turbidity	All	No Trend
	Summer	No Trend
	Winter	↓*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

This segment is impaired due to elevated levels of *E. coli*. Sampling has taken place at several locations throughout the years. The most complete period of record was for station 10722 as shown in Figure 203. Flow data at this site were available only for data collected after 2015. However, there was no strong association between *E. coli* and flow; nor for *E. coli* and flow severity of days since precipitation. The watershed above station 10722 is residential and has a small forested area immediately upstream of the station. This indicates that there may be a mix of run-off and point sources – such as run-off carrying pet and wildlife waste and failing infrastructure – influencing bacteria levels at station 10722. Homeowner education and pet waste best management practices may help reduce bacteria contributions from pets. It is recommended that upstream sampling be conducted during low flows to determine if failing infrastructure may also be contributing *E. coli* to the stream. The two stations downstream of station 10722 had shorter data sets but had similarly high *E. coli* values. In contrast to station 10722, the two downstream stations were more correlated to precipitation with higher values occurring after recent precipitation. This indicates that the downstream stations were more influenced by run-off related sources of bacteria.

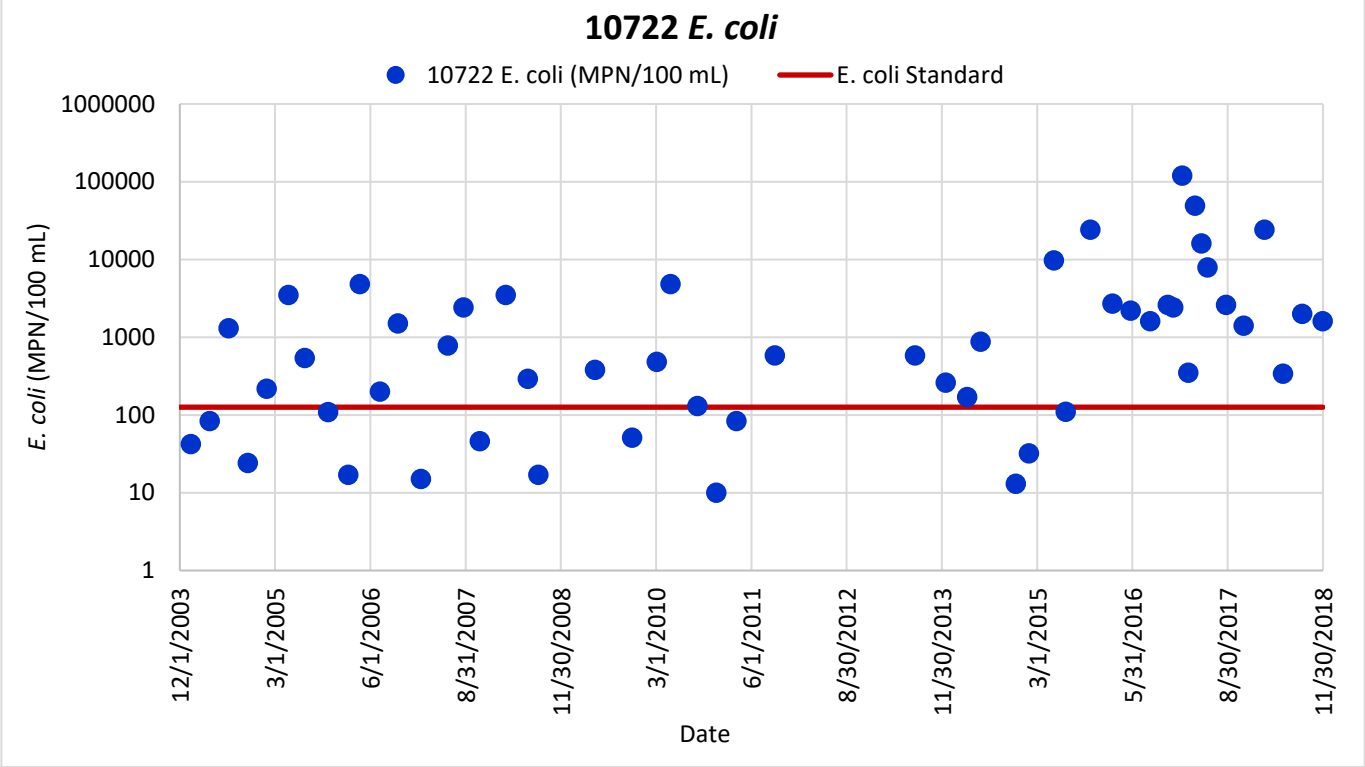


Figure 203: 10722 E. coli

0841V Crockett Branch

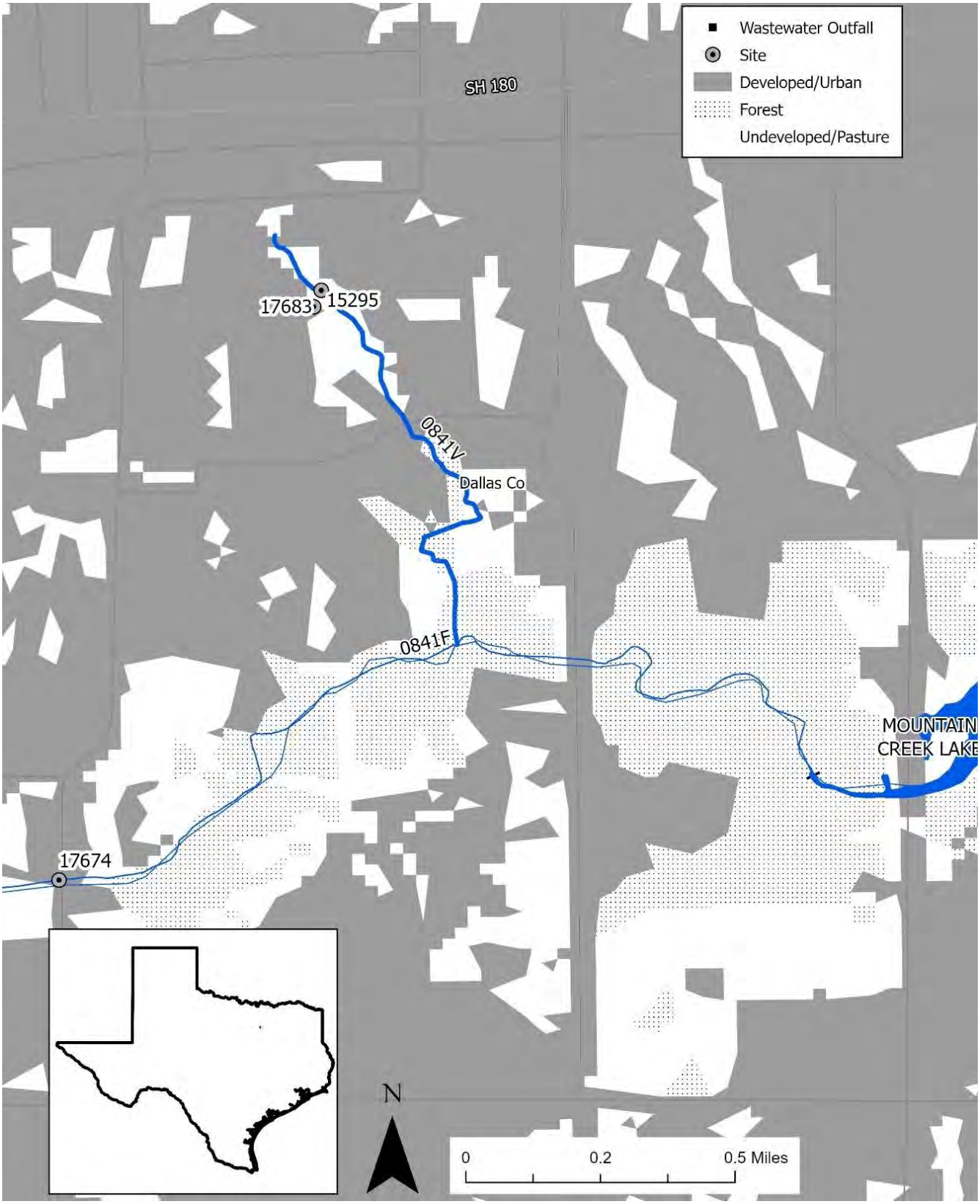


Figure 204: Segment 0841V Map

Crockett Branch is a 1-mile stream running from the headwaters near East Jefferson Street in Grand Prairie to the confluence with Cottonwood Creek (see Figure 204). The watershed is developed and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 165. Monitoring is being conducted by the City of Grand Prairie. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 165: Segment 0841V FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841V_01	CROCKETT BRANCH COTTONWOOD CREEK 179 METERS DOWNSTREAM OF EAST GRAND PRAIRIE ROAD IN GRAND PRAIRIE (22)	17683	City of Grand Prairie

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 166. Results of TRA trend analyses are shown in Table 167.

Table 166: TCEQ 2020 Texas Integrated Report Summary for Segment 0841V

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	Aquatic Life Use	Acute Toxic Substances in water		NC
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	Aquatic Life Use	Chronic Toxic Substances in water		NA
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	General Use	Ammonia	0.33 mg/L	NC
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	General Use	Nitrate	1.95 mg/L	NC
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	General Use	Total Phosphorus	0.69 mg/L	NC
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841V_01 A 1 mi stretch of Crockett Branch from confluence with Cottonwood Creek to upper end of creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		NA

FS = Fully Supporting NA = Not Assessed NC = No Concern NS = Not Supporting

Table 167: Significant Trends for Segment 0841V (P-value<0.1)

Segment & Assessment Unit		0841V_01
Site		17683
Specific Conductance	All	Not Significant
	Summer	↑
	Winter	Not Significant

Segment & Assessment Unit		0841V_01
Site		17683
Nitrate	All	↓
	Summer	↓
	Winter	Not Significant
Orthophosphate	All	Not Significant
	Summer	Not Significant
	Winter	↑
Chloride	All	↓
	Summer	↓
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

This segment was found to be impaired due to elevated levels of *E. coli*. As shown in Figure 205, *E. coli* are almost always reported above the standard of 126 MPN/100 mL. Because the watershed above the sampling station is very small and correlations between *E. coli* and flow or precipitation were weak, this impairment is very likely due to failing infrastructure such as broken sewer lines. It is recommended that additional sampling be conducted upstream in order to potentially identify a source of bacteria into this stream. A sewage source could also explain the increasing trend for specific conductance as well. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

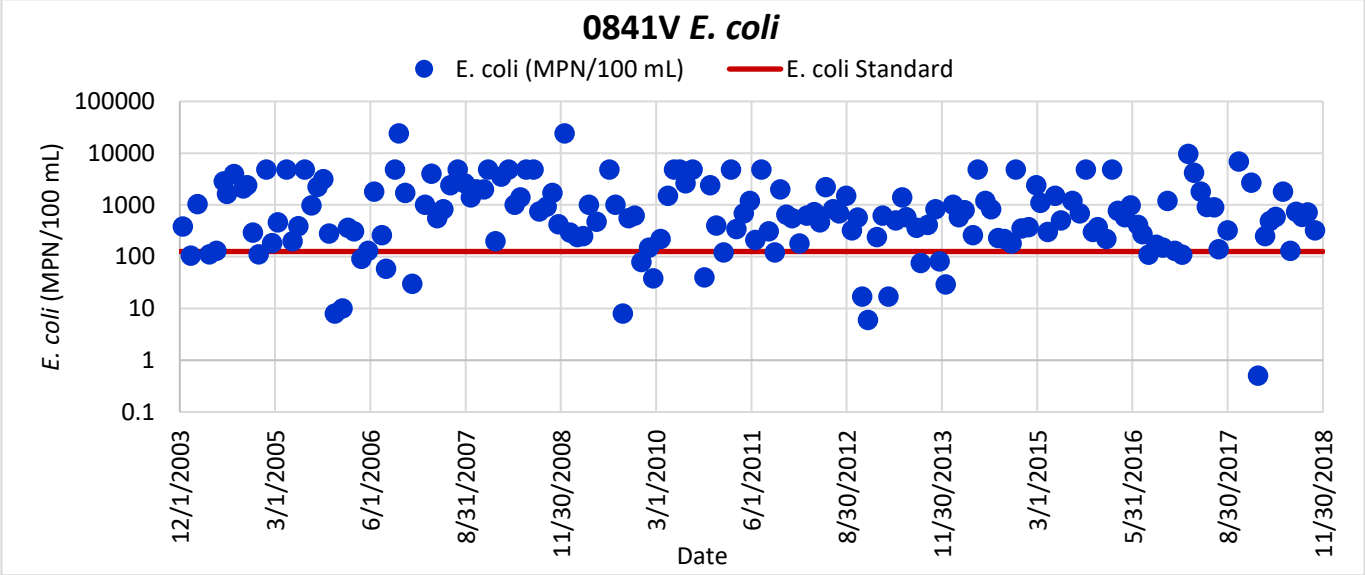


Figure 205: 0841V E. coli

The increasing winter trend for orthophosphate was a false trend introduced by censoring of non-detect values. Several non-detect data points were clustered at the beginning of the data set and were censored from <0.04 mg/L to 0.001 mg/L; one half of the lowest non-detect value for orthophosphate. The remainder of the winter data set range from 0.02 to 0.11 mg/L.

0841F Cottonwood Creek

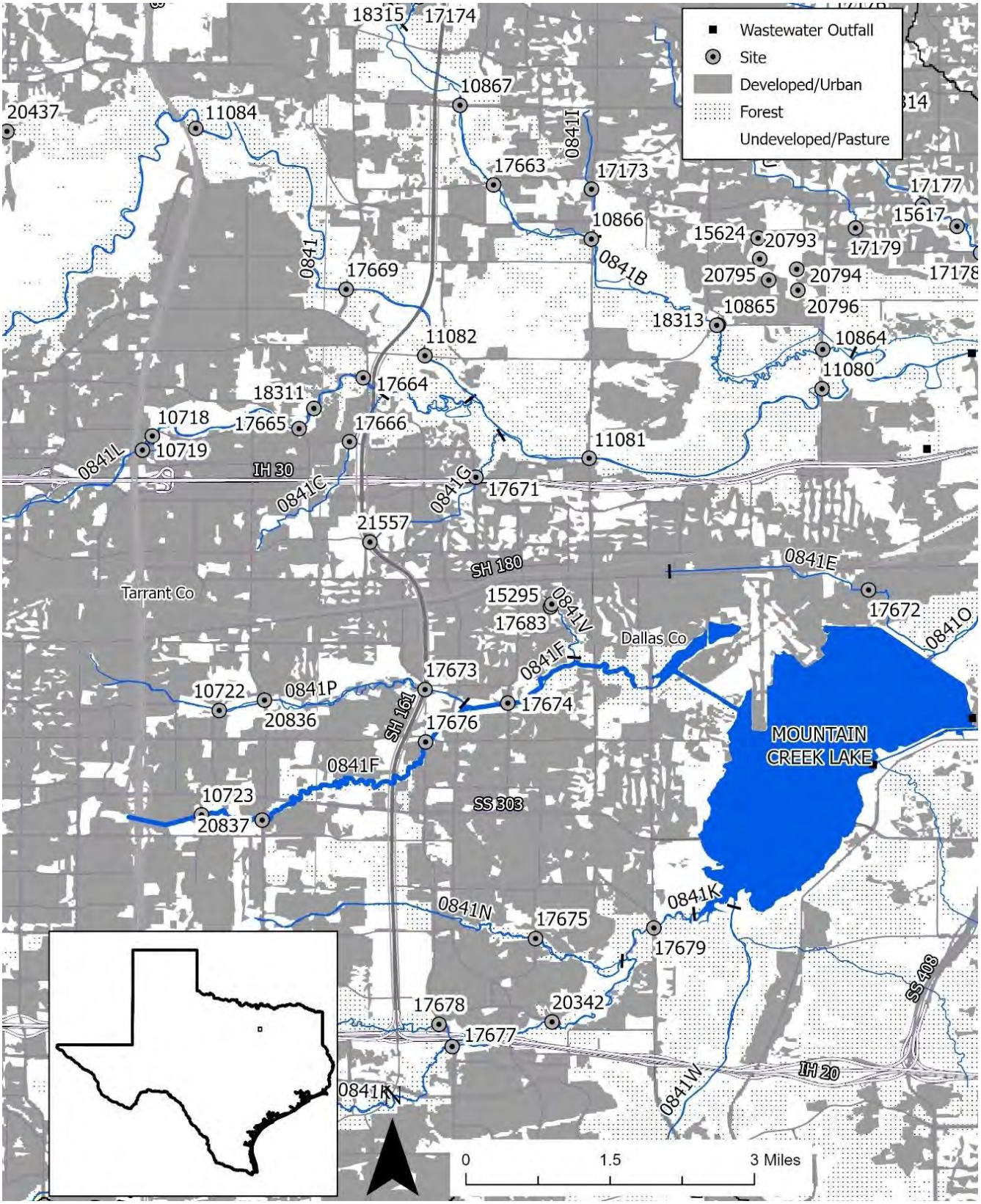


Figure 206: Segment 0841F Map

This unclassified segment is a 6.5-mile stretch of Cottonwood Creek running from SH 360 in Arlington to approximately 0.1-miles upstream of Mountain Creek Reservoir in Grand Prairie (see Figure 206). The watershed is heavily developed and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at three sites within this segment as shown in Table 168. Monitoring is being conducted by the cities of Arlington and Grand Prairie. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 168: Segment 0841F FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841F_01	UNNAMED TRIBUTARY OF COTTONWOOD CREEK AT NORTH BOUND DIRECTION OF FORUM DRIVE IN ARLINGTON	10723	City of Arlington
0841F_01	COTTONWOOD CREEK IMMEDIATELY UPSTREAM OF SOUTHWEST 3RD STREET IN GRAND PRAIRIE (11)	17674	City of Grand Prairie
0841F_01	SOUTH FORK COTTONWOOD CREEK AT ROBINSON ROAD IN GRAND PRAIRIE (9)	17676	City of Grand Prairie

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 169. Results of TRA trend analyses are shown in Table 170.

Table 169: TCEQ 2020Texas Integrated Report Summary for Segment 0841F

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	Aquatic Life Use	Acute Toxic Substances in water		FS
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	General Use	Ammonia	0.33 mg/L	NC
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	General Use	Nitrate	1.95 mg/L	NC
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	General Use	Total Phosphorus	0.69 mg/L	NC
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841F_01 6.5 mi stretch from approx. 0.1 mi upstream of Mountain Creek Reservoir to SH 360	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 170: Significant Trends for Segment 0841F (P-value<0.1)

Segment & Assessment Unit		0841F_01	0841F_01	0841F_01
Site		17674	17676	20837
Air Temperature	All	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	↓	Not Significant
	Winter	Not Significant	Not Significant	Not Significant
Ammonia	All	No Trend	No Trend	Insufficient Data
	Summer	No Trend	↑	Insufficient Data
	Winter	Not Significant	No Trend	Insufficient Data
Total Kjeldahl Nitrogen	All	No Trend	↓	Insufficient Data
	Summer	↓	↓	Insufficient Data
	Winter	No Trend	↓	Insufficient Data
Total Phosphorus	All	No Trend	No Trend	Insufficient Data
	Summer	↑	↑	Insufficient Data
	Winter	↑	↑	Insufficient Data
Orthophosphate	All	No Trend	No Trend	Insufficient Data
	Summer	↑	No Trend	Insufficient Data
	Winter	↑	No Trend	Insufficient Data
Hardness	All	Not Significant	↓	Insufficient Data
	Summer	↓	↓	Insufficient Data
	Winter	Not Significant	Not Significant	Insufficient Data
Chloride	All	Not Significant	Not Significant	Insufficient Data
	Summer	Not Significant	Not Significant	Insufficient Data
	Winter	↓	No Trend	Insufficient Data
Sulfate	All	Not Significant	No Trend	Insufficient Data
	Summer	↓	↓	Insufficient Data
	Winter	No Trend	Not Significant	Insufficient Data
Flow Severity	All	No Trend	No Trend	No Trend
	Summer	↓	Not Significant	↓*
	Winter	No Trend	Not Significant	No Trend
E. coli	All	No Trend	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant
	Winter	No Trend	Not Significant	↓*
Total Dissolved Solids	All	Not Significant	No Trend	Not Significant
	Summer	Not Significant	Not Significant	↓*
	Winter	No Trend	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

There were concerns for low dissolved oxygen identified in this segment. Several stations were monitored in this segment. As shown for the most downstream station 17674 in Figure 207, dissolved oxygen regularly dropped below the screening level of 5 mg/L. It appears that this concern was related to low stream flows. Flow data are limited to more recent years but did show some relationship between low flows and low flow measurements. Additionally, dissolved

oxygen levels generally increased with increased flow severities. For stations with chlorophyll-*a* data, there were only three dissolved oxygen readings below 5 mg/L with associated chlorophyll-*a* readings between 10 and 53 µg/L so it does not appear that algal populations were affecting dissolved oxygen levels.

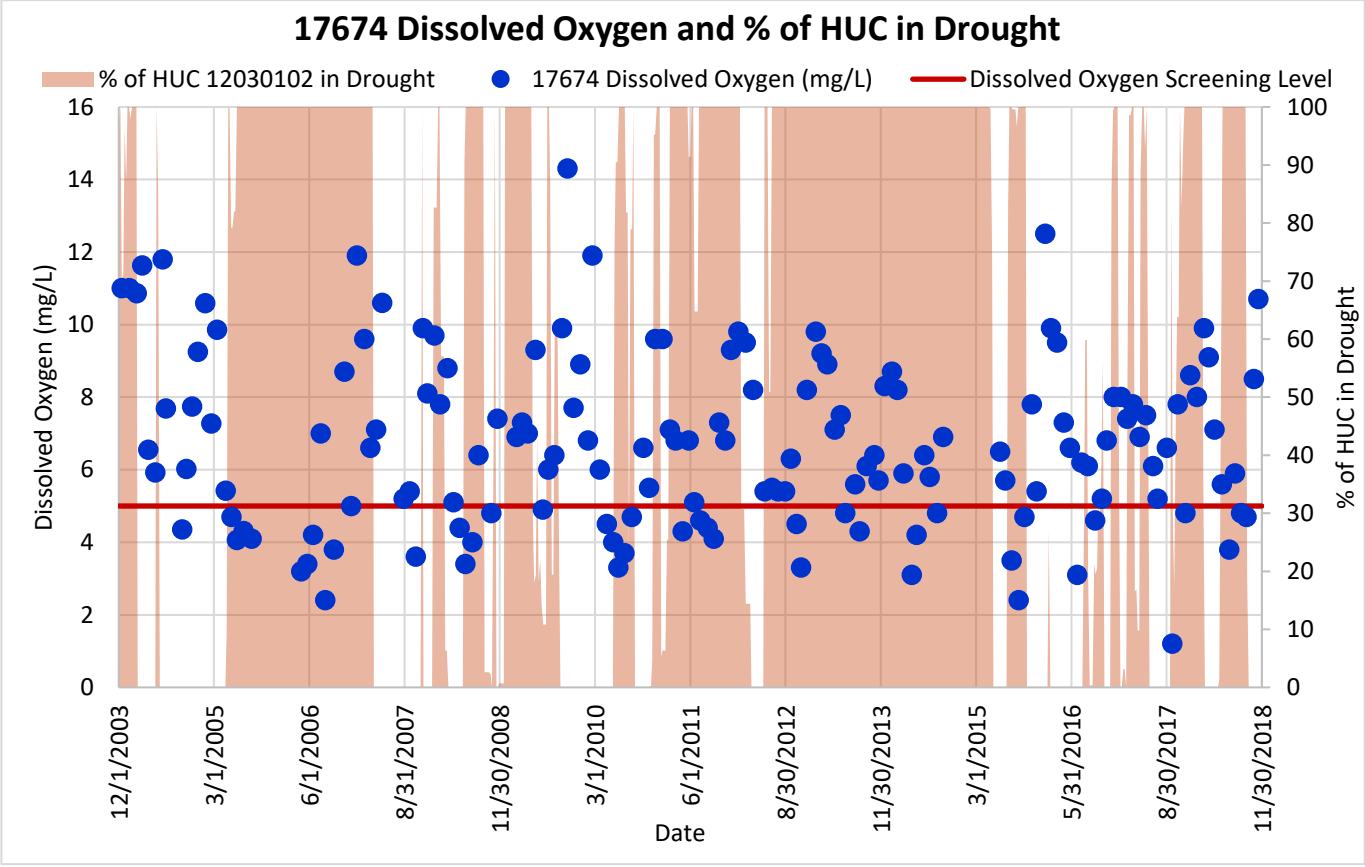


Figure 207: 17674 Dissolved Oxygen and % of HUC in Drought

This segment has an impairment due to elevated levels of *E. coli*. Monitoring has been conducted at a total of four stations in this segment. The *E. coli* geomeans at each of these stations ranged from 198 to 290 MPN/100 mL. Bacteria levels were regularly reported above the standard of 126 MPN/100 mL. There was not enough flow data available to provide a correlation between flow and *E. coli* levels. However, as shown for the most downstream station 17674 in Figure 208, many of the higher *E. coli* values were reported after recent precipitation events. Although the watershed is heavily developed and mostly industrial, there is a narrow riparian zone running along most of the creek and some residential development mostly concentrated toward the downstream end of the segment. Therefore, the impairment may be largely related to run-off carrying waste from wildlife in the riparian areas and pets from the residential areas. Homeowner education and pet waste best management practices may help reduce bacterial load from pets.

There may have also been some influence from failing infrastructure such as broken sewer lines. Optical brightener testing may be useful to help determine if there are any active sewer leaks into the stream. Optical brighteners are pigments that are added to detergents to make

clothing appear brighter and whiter and are therefore commonly found in wastewater. These pigments can be detected visually, especially in low flow systems where dilution of optical brighteners is not an issue. Sampling for optical brighteners involves the saturation of an unbleached cotton media with ambient water. The media is then viewed under an ultraviolet lamp. If the media has a purple-blue fluorescence, optical brighteners may be present in the water and can indicate that human waste may be entering the waterbody. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

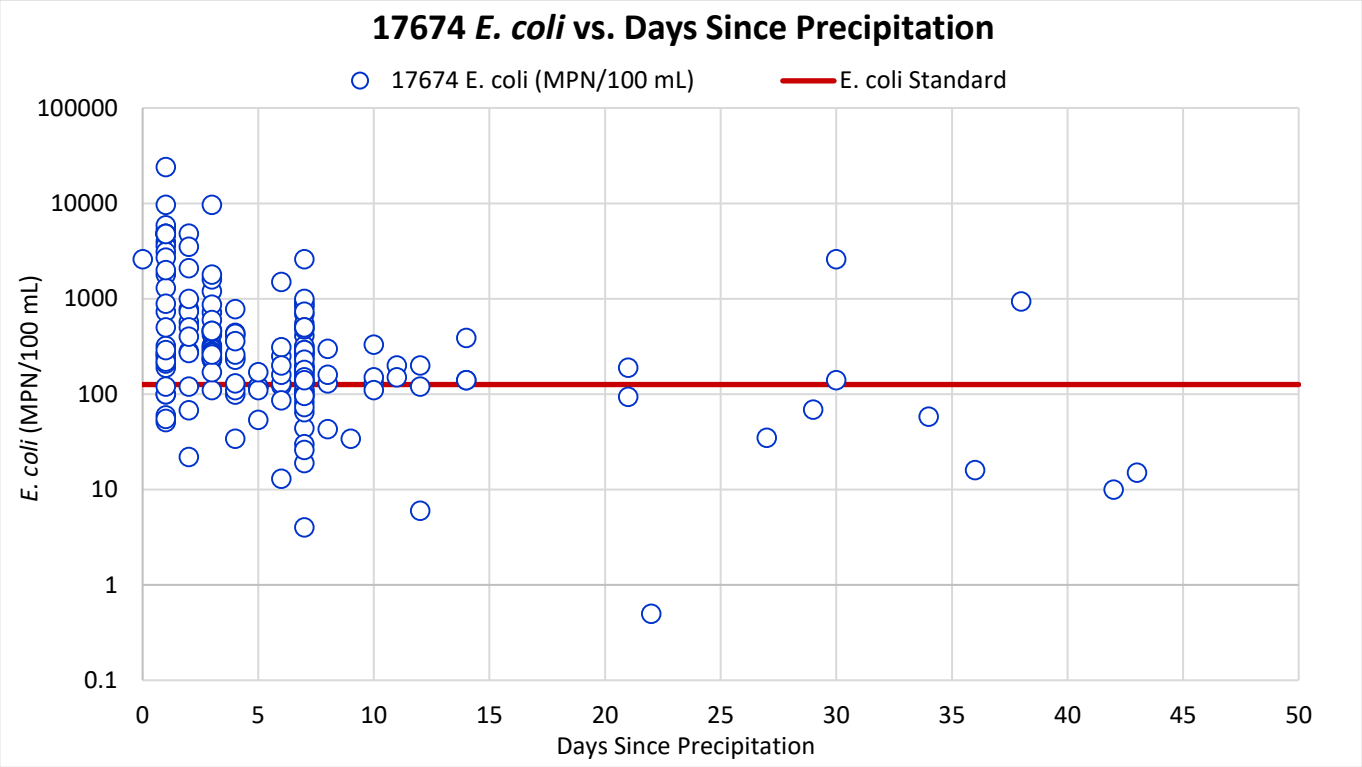


Figure 208: 17674 E. coli vs. Days Since Precipitation

The increasing summer trend for ammonia at station 17676 was weighted by a single high value reported at 0.41 mg/L in November of 2015 and was collected during a high flow event. All other data collected at this station were reported below 0.16 mg/L; well below the screening level of 0.33 mg/L. Increasing trends for total phosphorus at station 17676 were false trends introduced by censoring of non-detect data and do not represent a true change in water quality. All data were reported below 0.15; well below the screening level of 0.69 mg/L.

Station 17674 is located just downstream of the confluence with the North Fork Cottonwood Creek (segment 0841P). It is also adjacent to a residential development and a large sports field. It is likely that fertilizers were influencing the increasing trends (see Figure 209). Landowner and homeowner education may help slow the increasing trends at this site. However, it does not appear that the screening level will be exceeded in the near future. The highest value for total phosphorus was 0.25 mg/L while the screening level is 0.69 mg/L.

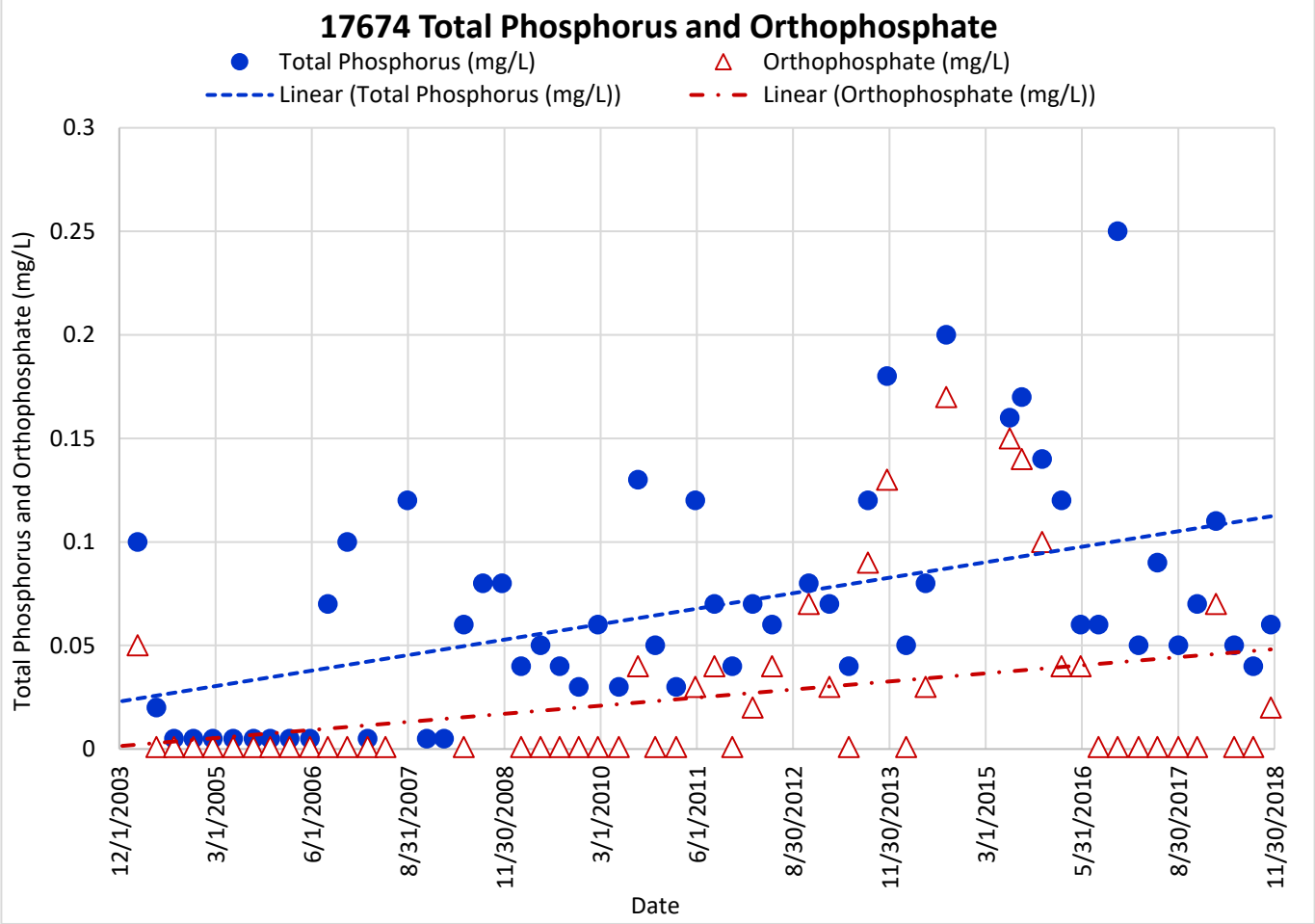


Figure 209: 17674 Total Phosphorus and Orthophosphate

0841K Fish Creek

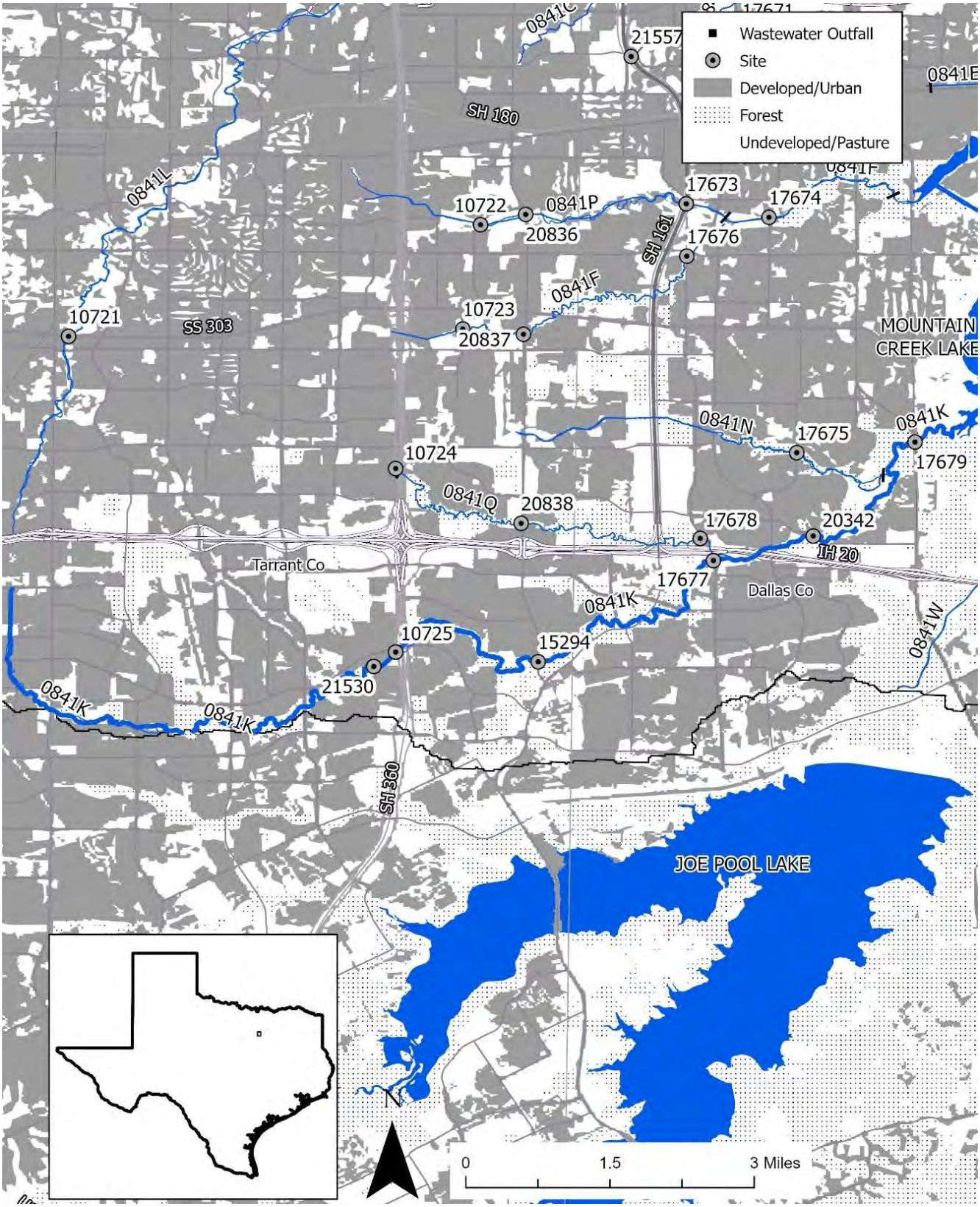


Figure 210: Segment 0841K Map

Fish Creek is a 15-mile stream running from the headwaters of the creek in Arlington to the confluence with Mountain Creek Reservoir in Grand Prairie (see Figure 210). The watershed is developed with some wooded riparian areas and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at three sites within this segment as shown in Table 171. Monitoring is being conducted by the cities of Arlington and Grand Prairie. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 171: Segment 0841K FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841K_01	FISH CREEK SOUTH BRANCH AT GREAT SOUTHWEST PARKWAY/LAKERIDGE PARKWAY IN GRAND PRAIRIE (28)	15294	City of Grand Prairie
0841K_01	FISH CREEK AT BELTLINE ROAD/FM1382 APPROXIMATELY 205 METERS SOUTH OF THE INTERSECTION OF SE 14TH STREET (15)	17679	City of Grand Prairie
0841K_01	FISH CREEK SOUTH BRANCH 433 METERS UPSTREAM OF SH 360 SOUTH BOUND SERVICE ROAD IN NATURAL CHANNEL IMMEDIATELY UPSTREAM OF CONCRETE LINED CHANNEL	21530	City of Arlington

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 172. Results of TRA trend analyses are shown in Table 173.

Table 172: TCEQ 2020 Texas Integrated Report Summary for Segment 0841K

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	Aquatic Life Use	Acute Toxic Substances in water		FS
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	Aquatic Life Use	Fish Community		FS
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	Aquatic Life Use	Macrobenthic Community		CN
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	Aquatic Life Use	Habitat		CS
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	General Use	Ammonia	0.33 mg/L	NC
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	General Use	Nitrate	1.95 mg/L	NC

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	General Use	Total Phosphorus	0.69 mg/L	NC
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841K_01 A 15 mi stretch running upstream from confluence with Mountain Creek Reservoir in Grand Prairie	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CN = Use Concern CS = Screening Level Concern FS = Fully Supporting NC = No Concern
NS = Not Supporting

Table 173: Significant Trends for Segment 0841K (P-value<0.1)

Segment & Assessment Unit		0841K_01	0841K_01	0841K_01	0841K_01
Site		10725	15294	17679	21530
Flow	All	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	↑*	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
Specific Conductance	All	Not Significant	Not Significant	No Trend	Not Significant
	Summer	↓	Not Significant	No Trend	↓*
	Winter	Not Significant	Not Significant	↓	Not Significant
Dissolved Oxygen	All	↓	Not Significant	Not Significant	Not Significant
	Summer	↓	No Trend	No Trend	Not Significant
	Winter	Not Significant	↑	Not Significant	No Trend
pH	All	Not Significant	No Trend	No Trend	Not Significant
	Summer	↓	↑	Not Significant	Not Significant
	Winter	Not Significant	No Trend	No Trend	Not Significant
Ammonia	All	Insufficient Data	No Trend	↑	Insufficient Data
	Summer	Insufficient Data	Not Significant	Not Significant	Insufficient Data
	Winter	Insufficient Data	No Trend	↑	Insufficient Data
Total Phosphorus	All	↑	No Trend	↑	Insufficient Data
	Summer	↑	Not Significant	Not Significant	Insufficient Data
	Winter	Not Significant	No Trend	↑	Insufficient Data
Orthophosphate	All	No Trend	↑	No Trend	Insufficient Data
	Summer	No Trend	↑	No Trend	Insufficient Data
	Winter	No Trend	↑	No Trend	Insufficient Data
Hardness	All	Not Significant	↓	↓	Insufficient Data
	Summer	Not Significant	↓	↓	Insufficient Data
	Winter	Not Significant	Not Significant	↓	Insufficient Data
Chloride	All	Insufficient Data	Not Significant	↓	Insufficient Data
	Summer	Insufficient Data	Not Significant	↓	Insufficient Data
	Winter	Insufficient Data	Not Significant	↓	Insufficient Data
Sulfate	All	Insufficient Data	Not Significant	↓	Insufficient Data
	Summer	Insufficient Data	Not Significant	↓	Insufficient Data
	Winter	Insufficient Data	Not Significant	↓	Insufficient Data

Segment & Assessment Unit		0841K_01	0841K_01	0841K_01	0841K_01
Site		10725	15294	17679	21530
Flow Severity	All	Not Significant	No Trend	↓	Insufficient Data
	Summer	Not Significant	No Trend	↓	Insufficient Data
	Winter	Not Significant	No Trend	↓	Insufficient Data
Total Dissolved Solids	All	Not Significant	Not Significant	No Trend	Not Significant
	Summer	↓	Not Significant	No Trend	↓*
	Winter	Not Significant	Not Significant	↓	Not Significant
Chlorophyll-*a*	All	↓*	No Trend	No Trend	Insufficient Data
	Summer	Not Significant	Not Significant	No Trend	Insufficient Data
	Winter	↓*	No Trend	Not Significant	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

A concern was identified for low dissolved oxygen in this segment. Sampling has been conducted at several sites in this segment over the years. As shown for the most downstream station 17679 in Figure 211, dissolved oxygen levels were frequently reported below the screening level of 5 mg/L. This concern appears to be somewhat related to drought conditions which indicates that low flows and elevated water temperatures may have been the strongest influence on dissolved oxygen levels. There was limited flow measurement data available in this segment to confirm this assumption. However, for the limited data set available, the correlation between dissolved oxygen and flow at station 15294, in the middle of the segment, was rather weak (correlation coefficient = 0.292). Correlations between dissolved oxygen and chlorophyll-*a* were similarly weak with the highest coefficient being 0.344 for data at station 10725 in the upper portion of the segment.

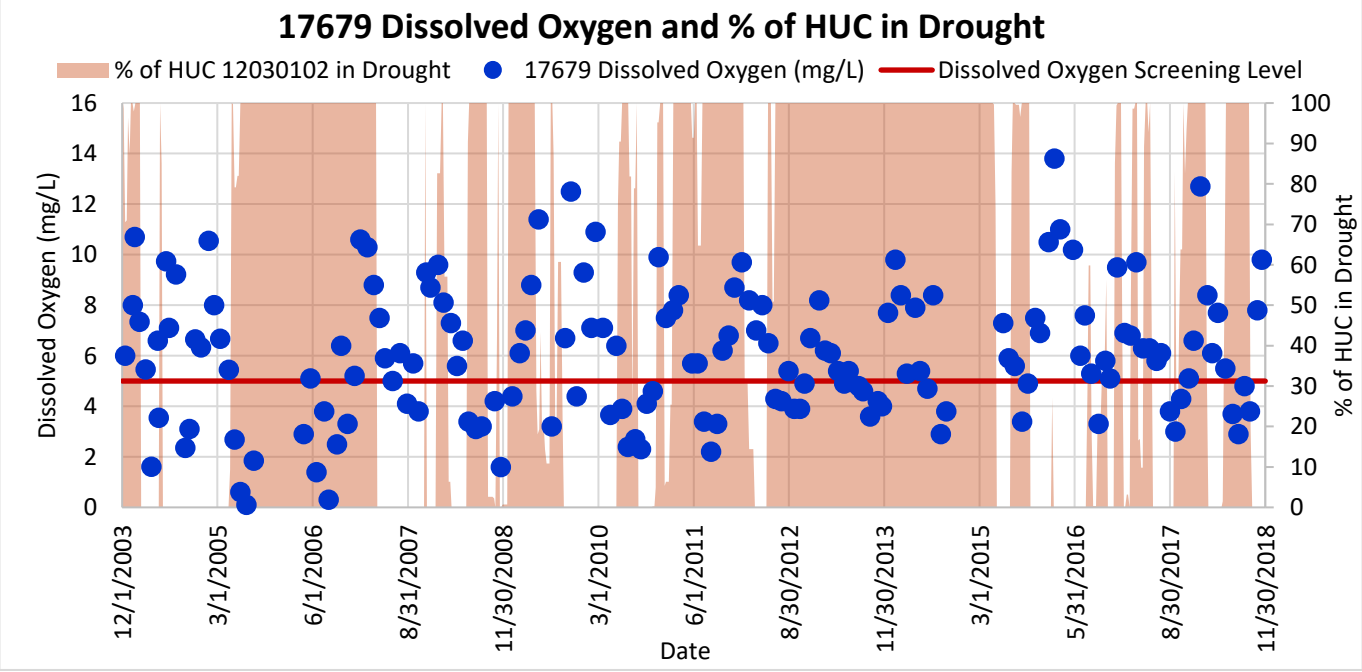


Figure 211: 17679 Dissolved Oxygen and % of HUC in Drought

This segment was found to have concerns for habitat and benthic macroinvertebrates. Aquatic life monitoring was conducted in this segment in 2018. Sampling was conducted on an area of the stream downstream of South Great Southwest Parkway in Grand Prairie adjacent to a park. There was a narrow riparian buffer and the stream was relatively straight with few riffles. During site scouting, it was observed that several of the aerial pipeline crossings upstream of the sampled reach had silted in over the years effectively damming the stream (see Figure 212) and creating large deep pools which contained several large bass. This damming of the stream may have impacted the downstream habitat. Much of the benthic macroinvertebrate community was made up of *Corbicula fluminea*. There was not a lot of species diversity. Again, the damming caused by the silted in aerial crossing may have caused the low species diversity by obstructing the downstream movement of benthic organisms and reducing the amount of flow in the stream during dry weather (see Figure 213). Fish populations were rather healthy with many sunfish species and supported the high aquatic life use designation for this segment (see Figure 214).



Figure 212: Silted in aerial pipeline crossing upstream of reach



Figure 213: Low flow over riffle during the Fish Creek aquatic life monitoring



Figure 214: Warmouth collected in Fish Creek

An impairment due to elevated levels of *E. coli* was identified in this segment. Figure 215 shows *E. coli* collected at the most downstream station 17679 and shows that elevated levels of *E. coli* were generally reported during drought recovery periods. Additionally, *E. coli* levels were reported at higher levels when precipitation had recently occurred at other stations in this segment. This indicates that the impairment was related to run-off. The watershed for this stream is largely residential. There is a wooded riparian zone along much of the stream and a golf course upstream of station 17679. This indicates that waste from pets and wildlife were the most likely sources of bacteria. Homeowner education and pet waste best management practices may help reduce bacteria levels in this segment. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

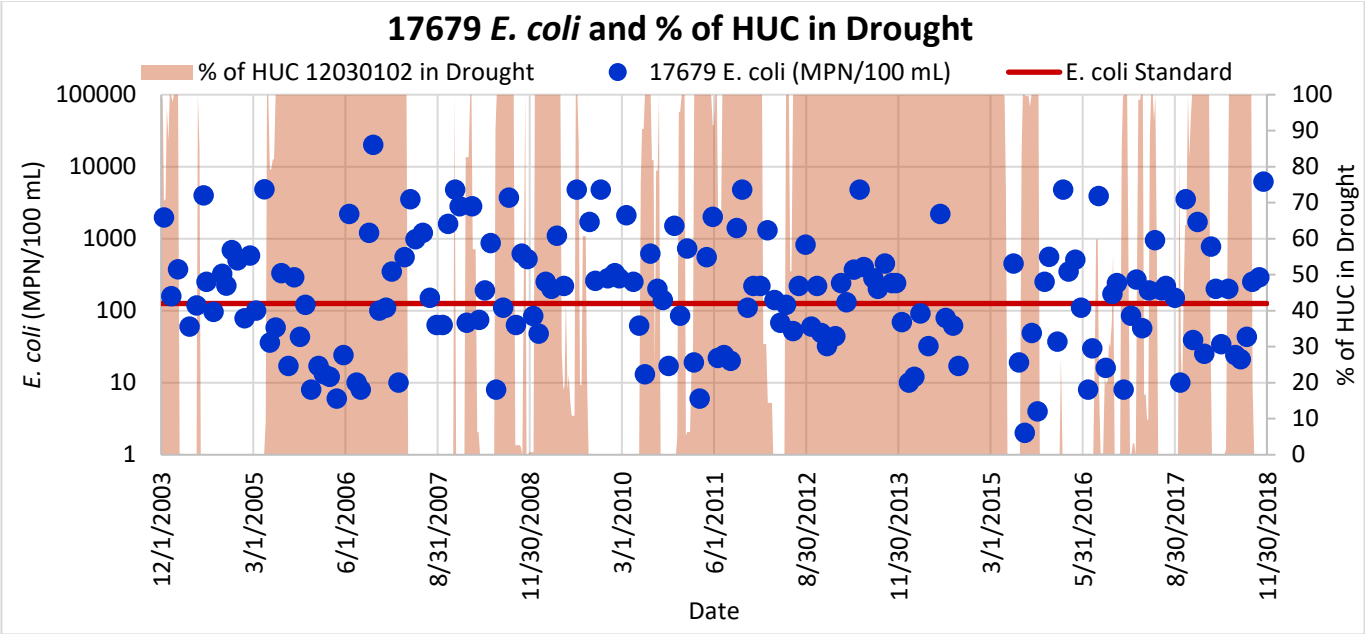


Figure 215: 17679 E. coli and % of HUC in Drought

Decreasing trends for dissolved oxygen at station 10725 were related to drought and appeared to have been an artifact of the period of record. Monitoring at this station was discontinued in 2014; at the height of the drought of 2011 to 2015.

Trends for ammonia and total phosphorus at stations 17679 and 10725 and for orthophosphate at station 15294 began to increase during the drought of 2011 to 2015. Because there was no corresponding increase in *E. coli* at these sites, failing infrastructure is not suspected. Rather it is likely that residential fertilizer use and over irrigation caused these trends. Homeowner education may be able to slow the increase of these trends. It does not appear as though these trends are presenting an immediate concern in this segment. Of 97 ammonia records, only three exceeded the screening level of 0.33 mg/L. For total phosphorus, there were 124 records and none exceeded the screening level of 0.69 mg/L.

0841Q North Fork Fish Creek

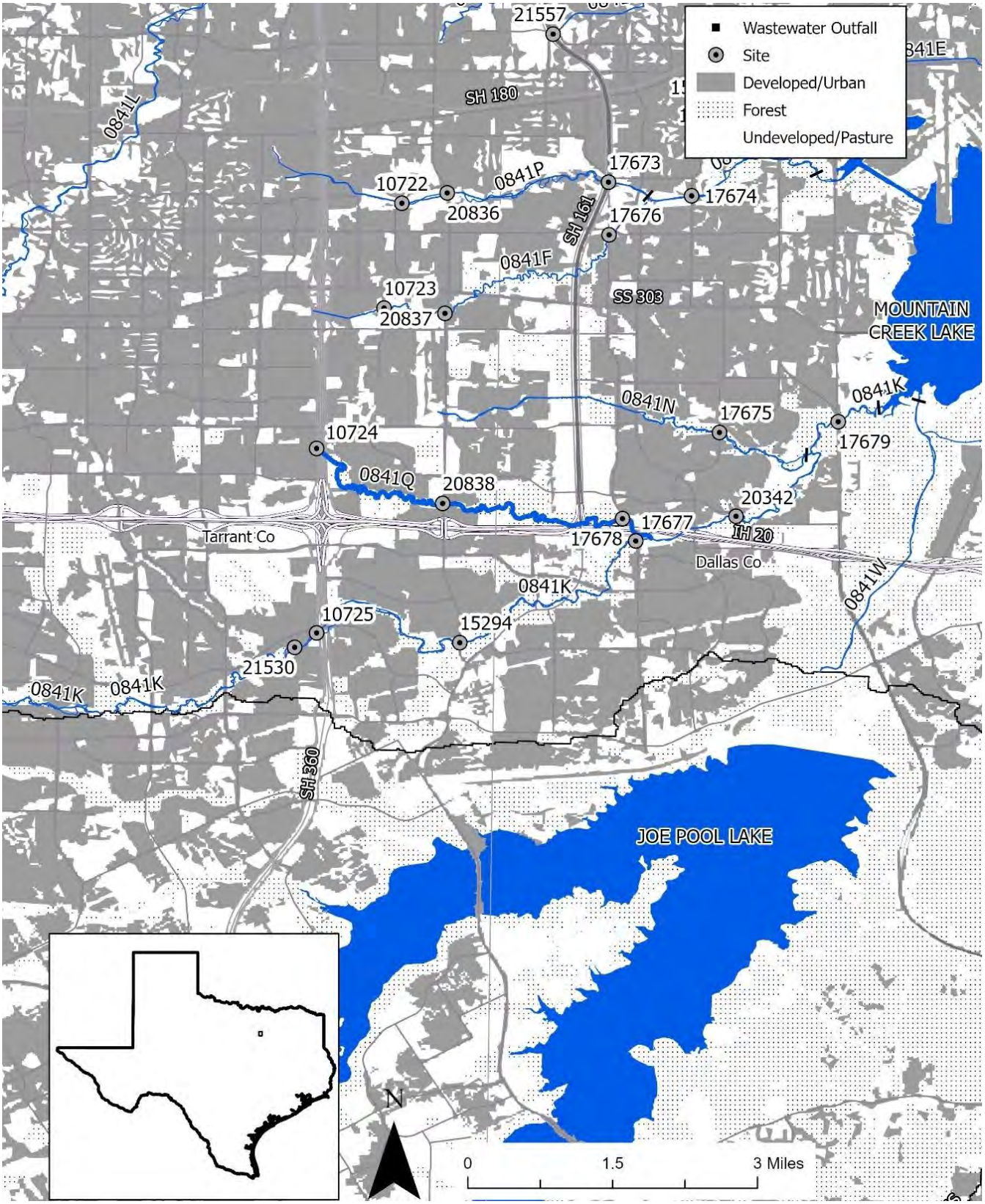


Figure 216: Segment 0841Q Map

This unclassified segment is a 4.9-mile stretch of North Fork Fish Creek running from SH 360 in Arlington to the confluence with Fish Creek in Grand Prairie (see Figure 216). The watershed is developed with some wooded riparian areas and lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 174. Results of TRA trend analyses are shown in Table 175.

Table 174: TCEQ 2020 Texas Integrated Report Summary for Segment 0841Q

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	Aquatic Life Use	Acute Toxic Substances in water		FS
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	Recreation Use	*E. coli*	126 MPN/100 mL	**NS**
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	General Use	Ammonia	0.33 mg/L	NC
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	General Use	Nitrate	1.95 mg/L	NC
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	General Use	Total Phosphorus	0.69 mg/L	NC
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841Q_01 North Fork Fish Creek from confluence with Fish Creek in Dallas Co. up to SH 360 Tarrant Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 175: Significant Trends for Segment 0841Q (P-value<0.1)

Segment & Assessment Unit		0841Q_01	0841Q_01
Site		10724	20838
Dissolved Oxygen	All	↓	Not Significant
	Summer	↓	Not Significant
	Winter	↓	Not Significant
pH	All	↓	No Trend
	Summer	↓	↑
	Winter	↓	No Trend
Chloride	All	Insufficient Data	Not Significant
	Summer	Insufficient Data	Not Significant
	Winter	Insufficient Data	↑*

Segment & Assessment Unit		0841Q_01	0841Q_01
Site		10724	20838
Dissolved Manganese	All	No Trend	Insufficient Data
	Summer	No Trend	Insufficient Data
	Winter	↑	Insufficient Data
Flow Severity	All	No Trend	No Trend
	Summer	Not Significant	Not Significant
	Winter	↑	Not Significant
E. coli	All	Not Significant	Not Significant
	Summer	↓	Not Significant
	Winter	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

An impairment for *E. coli* was identified for this segment. Three stations have been monitored along this stream over the years with sampling being discontinued in 2017; 10724 at the upper end, 20838 in the middle of the segment, and 17678 at the lower end. Figure 217 shows the data that have been collected at these stations. *E. coli* were regularly reported at levels above the standard of 126 MPN/100 mL. There was no flow measurement data available to fully investigate this impairment. The watershed upstream of 10724 is largely residential and the stream is channelized for drainage. *E. coli* were generally reported at higher levels at lower flow severities. This indicates that failing infrastructure may have introduced bacteria into the stream. It is recommended that upstream sampling during low flows be conducted in order to identify potential sources of bacteria. Downstream of station 10724, there is a forested riparian area adjacent to the stream. To the north of the stream are residential developments and commercial areas to the south. In contrast to station 10724, *E. coli* at stations 20838 and 17678 appears to have been related to run-off. Higher levels of bacteria were reported after recent precipitation. This indicates that either bacteria were being washed in from upstream pools or that bacteria from pet and wildlife waste were being washed into the stream via run-off. Homeowner education and pet best management practices may help reduce bacterial loadings from pets.

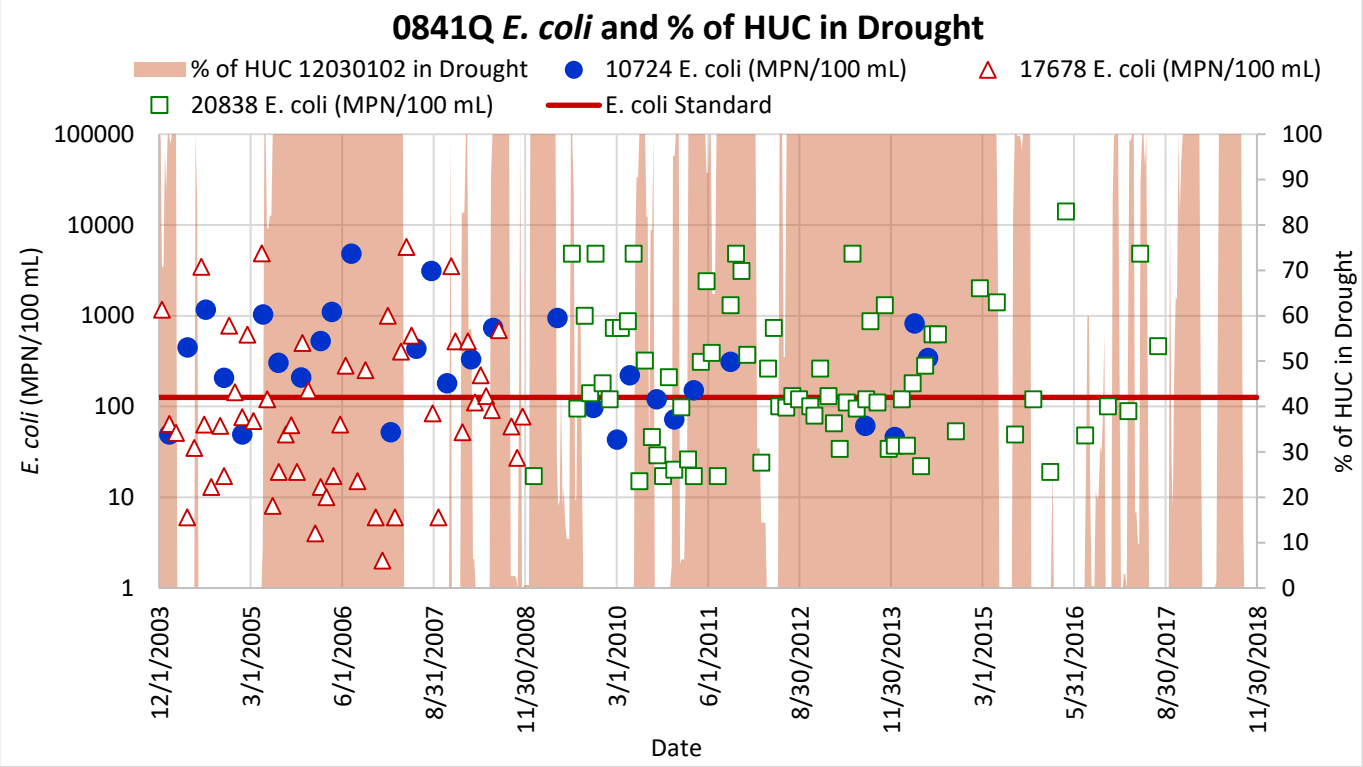


Figure 217: 0841Q E. coli and % of HUC in Drought

Decreasing trends for dissolved oxygen and pH at station 10724 were related to drought and appeared to have been an artifact of the period of record. Monitoring at this station was discontinued in 2014; at the height of the drought of 2011 to 2015. The increasing winter trend for dissolved manganese at this station was a false trend introduced by the censoring of non-detect data.

The increasing summer trend for pH at station 20838 is difficult to interpret. There was no correlation between chlorophyll-*a* and either period of record pH or summer pH values (correlation coefficients = -0.030 and 0.077, respectively). There is not enough information available to further address this trend. The increasing winter chloride trend for this station was related to drought and appears to have been an artifact of the period of record. Monitoring at this station was discontinued in 2014; at the height of the drought of 2011 to 2015.

0841N Kirby Creek

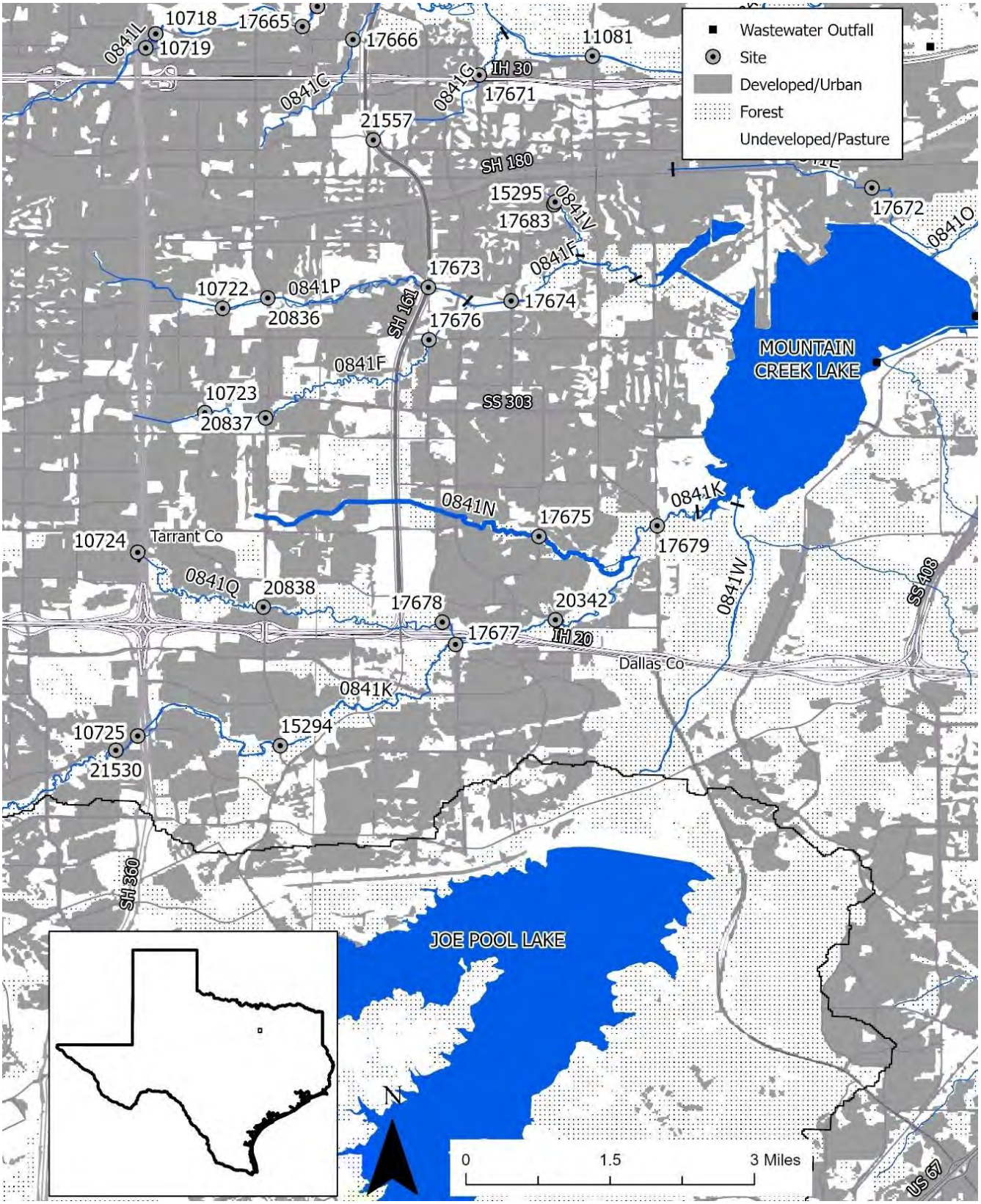


Figure 218: Segment 0841N Map

This unclassified segment is a 4-mile stretch of Kirby Creek running from just upstream of Great Southwest Parkway in Arlington to the confluence with Fish Creek in Grand Prairie (see Figure 218). The watershed is developed with some wooded riparian areas and crop land and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 176. Monitoring is being conducted by the City of Grand Prairie. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 176: Segment 0841N FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841N_01	KIRBY CREEK AT CORN VALLEY ROAD IN GRAND PRAIRIE (12)	17675	City of Grand Prairie

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 177. Results of TRA trend analyses are shown in Table 178.

Table 177: TCEQ 2020 Texas Integrated Report Summary for Segment 0841N

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	Aquatic Life Use	Acute Toxic Substances in water		FS
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	General Use	Ammonia	0.33 mg/L	NC
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	General Use	Nitrate	1.95 mg/L	NC
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	General Use	Total Phosphorus	0.69 mg/L	NC
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841N_01 4 mi stretch from confluence with Fish Ck in Grand Prairie to upstream of Great Southwest Parkway	Fish Consumption Use	HH Bioaccumulative Toxics in water		NC

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 178: Significant Trends for Segment 0841N (P-value<0.1)

Segment & Assessment Unit		0841N_01
Site		17675
Nitrate	All	↓
	Summer	↓
	Winter	↓
Total Kjeldahl Nitrogen	All	No Trend
	Summer	↓
	Winter	No Trend
Total Phosphorus	All	No Trend
	Summer	No Trend
	Winter	↑
Orthophosphate	All	No Trend
	Summer	↑
	Winter	↑
Hardness	All	↓
	Summer	↓
	Winter	Not Significant
Chloride	All	↓
	Summer	↓
	Winter	↓
Sulfate	All	↓
	Summer	↓
	Winter	↓
Field Ammonia	All	Not Significant
	Summer	Not Significant
	Winter	↓*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

A concern for low dissolved oxygen was identified for this segment. As shown in Figure 219, dissolved oxygen levels frequently fell below the screening level of 5 mg/L. The limited flow data available indicate that this stream is a relatively low flow system with a maximum measured flow of 8.5 cfs. Low flows were likely the cause of the dissolved oxygen concern as chlorophyll-*a* was only weakly correlated to dissolved oxygen (correlation coefficient = -0.280).

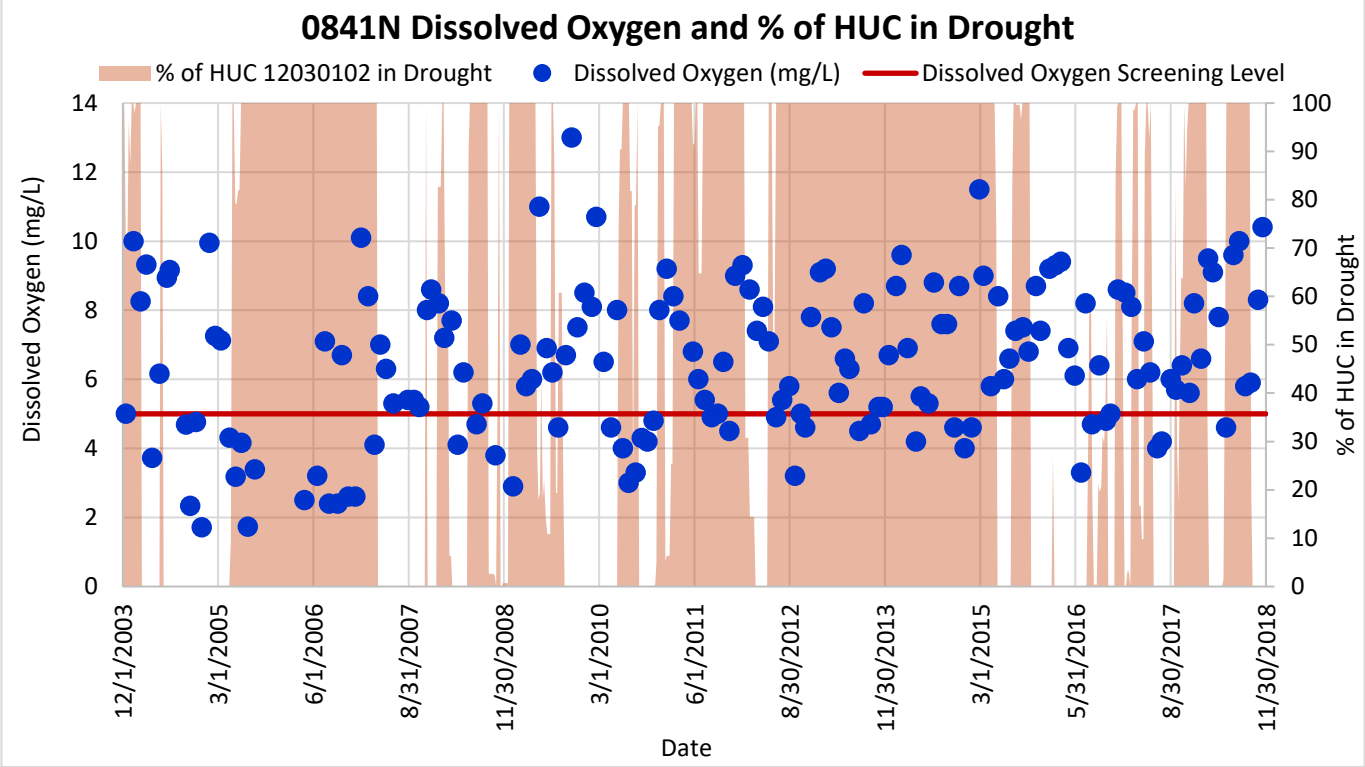


Figure 219: 0841N Dissolved Oxygen and % of HUC in Drought

This segment was found to be impaired due to elevated levels of *E. coli*. As shown in Figure 220, *E. coli* was regularly reported above the standard of 126 MPN/100 mL and high levels were reported during both drought and recovery periods. There were no correlations to either flow or days since precipitation. This indicates that there were both consistent and run-off related sources contributing to this impairment. The watershed upstream of monitoring station 17675 is residential with a wooded riparian area. There are also some commercial areas in the upper portion of the watershed. Run-off containing pet and wildlife waste were likely contributing bacteria during wet weather. Homeowner education and pet waste best management practices may help reduce bacteria levels from these sources. However, as bacteria levels were reported at high levels during dry weather, bacteria from failing infrastructure was likely the largest contributor to this impairment. It is recommended that upstream sampling be conducted during low flows to identify potential sources of bacteria. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

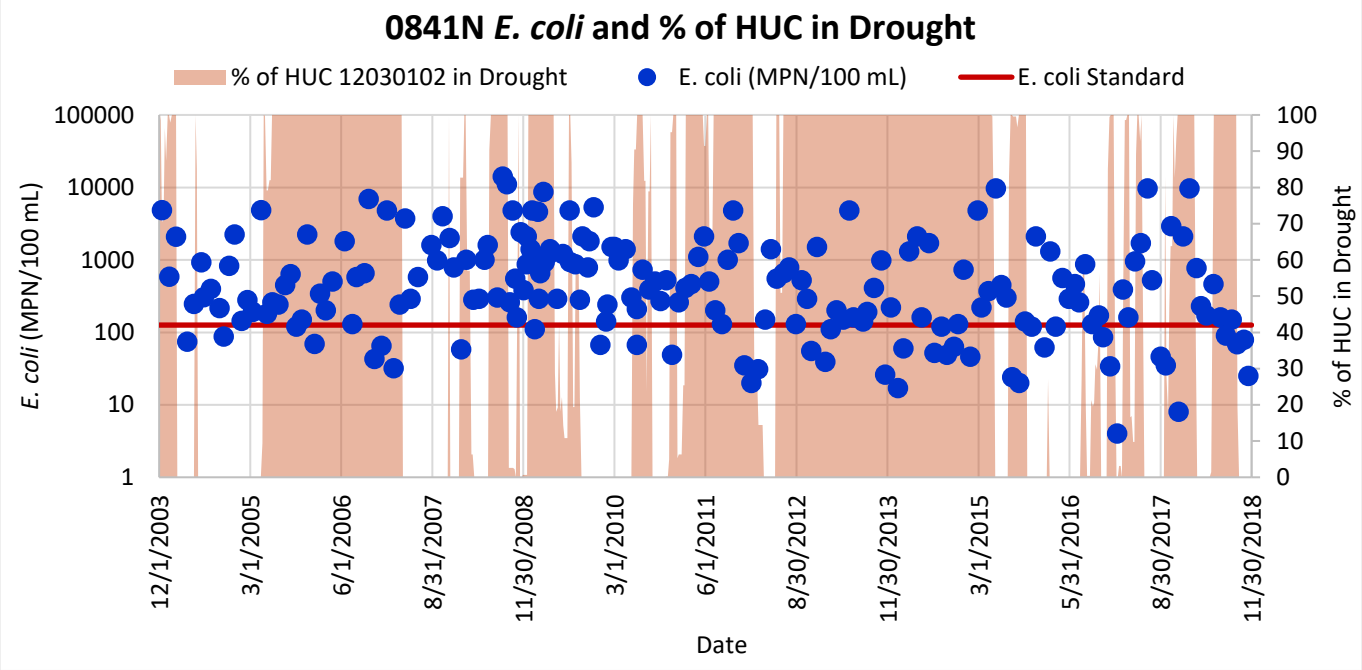


Figure 220: 0841N E. coli and % of HUC in Drought

Increasing trends for total phosphorus and orthophosphate appear to have been related to run-off. As shown in Figure 221, higher levels of these nutrients were reported after recent precipitation events. This indicates that the most likely source of phosphorus in this segment was fertilizer use. The increasing trends do not appear to be leading to an immediate concern as the highest total phosphorus value was 0.3 mg/L; well below the screening level of 0.69 mg/L. Additionally, there is no correlation between total phosphorus or orthophosphate and chlorophyll-*a* so these additional nutrients were not affecting algal populations.

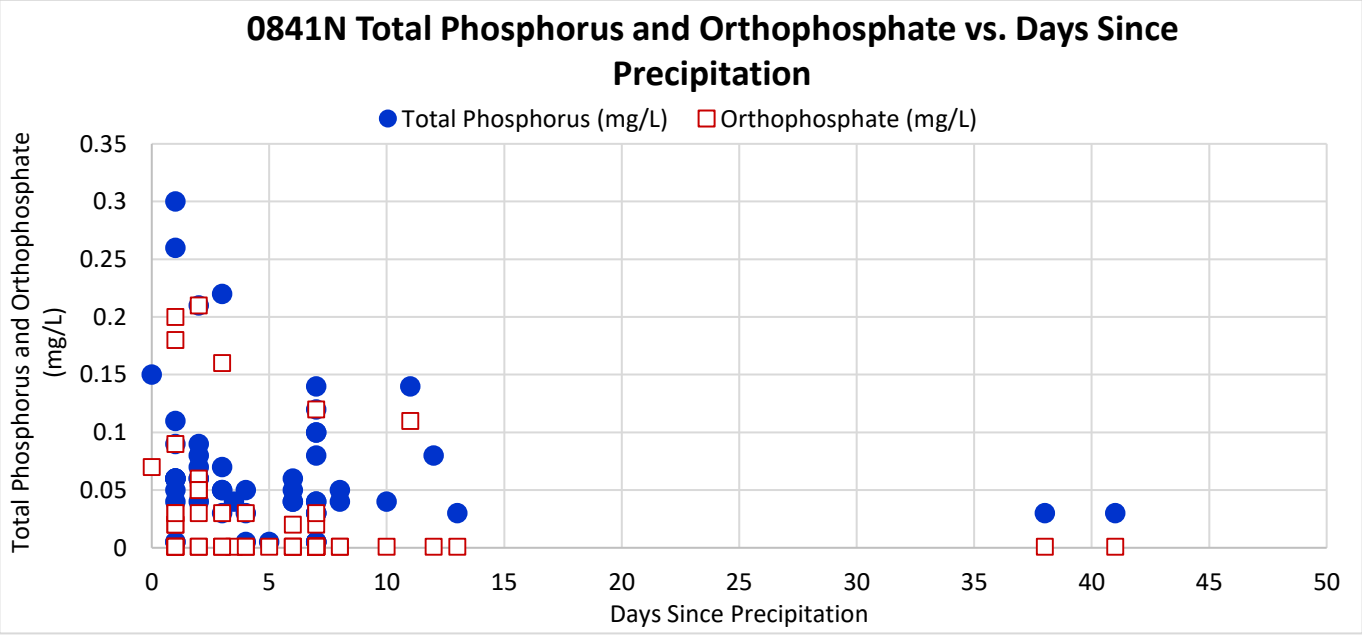


Figure 221: 0841N Total Phosphorus and Orthophosphate vs. Days Since Precipitation

0841W Mountain Creek above Mountain Creek Lake

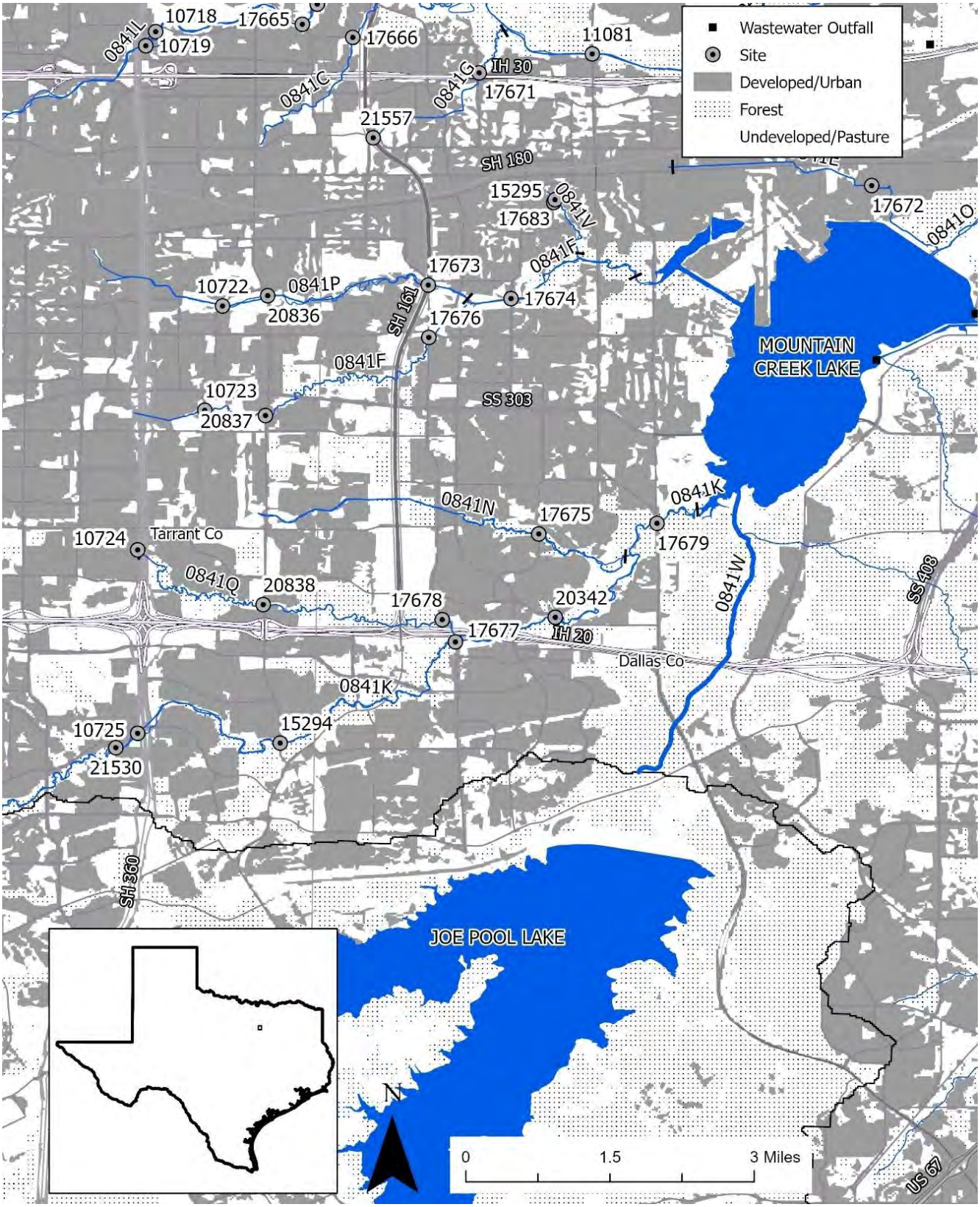


Figure 222: Segment 0841W Map

This unclassified segment is a 4.6-mile stretch of Mountain Creek running from the Joe Pool Lake dam in Grand Prairie to the confluence with Mountain Creek Lake (see Figure 222). The watershed immediately adjacent to the stream is undeveloped wetland and forest with residential and industrial areas outside of this. It lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 179. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 179: Segment 0841W FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841W_01	MOUNTAIN CREEK IMMEDIATELY UPSTREAM OF EAST CAMP WISDOM ROAD IN GRAND PRAIRIE	17681	TRA

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 180. Results of TRA trend analyses are shown in Table 181.

Table 180: TCEQ 2020 Texas Integrated Report Summary for Segment 0841W

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	Aquatic Life Use	Acute Toxic Substances in water		NA
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	Aquatic Life Use	Chronic Toxic Substances in water		NA
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	General Use	Ammonia	0.33 mg/L	NC
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	General Use	Nitrate	1.95 mg/L	NC
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	General Use	Total Phosphorus	0.69 mg/L	NC
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841W_01 From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam	Fish Consumption Use	HH Bioaccumulative Toxics in water		NA

FS = Fully Supporting NA = Not Assessed NC = No Concern

Table 181: Significant Trends for Segment 0841W (P-value<0.1)

Segment & Assessment Unit		0841W_01
Site		17681
Specific Conductance	All	↑
	Summer	↑
	Winter	↑

Segment & Assessment Unit		0841W_01
Site		17681
Nitrate	All	↓
	Summer	↓
	Winter	↓
Total Phosphorus	All	↑
	Summer	↑
	Winter	Not Significant
Chloride	All	No Trend
	Summer	No Trend
	Winter	↑
Fecal Coliform	All	Not Significant
	Summer	↑
	Winter	Not Significant
Fecal Strep	All	No Trend
	Summer	↑
	Winter	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend

Increasing trends for specific conductance and chloride were related to drought conditions as shown in Figure 223 for specific conductance.

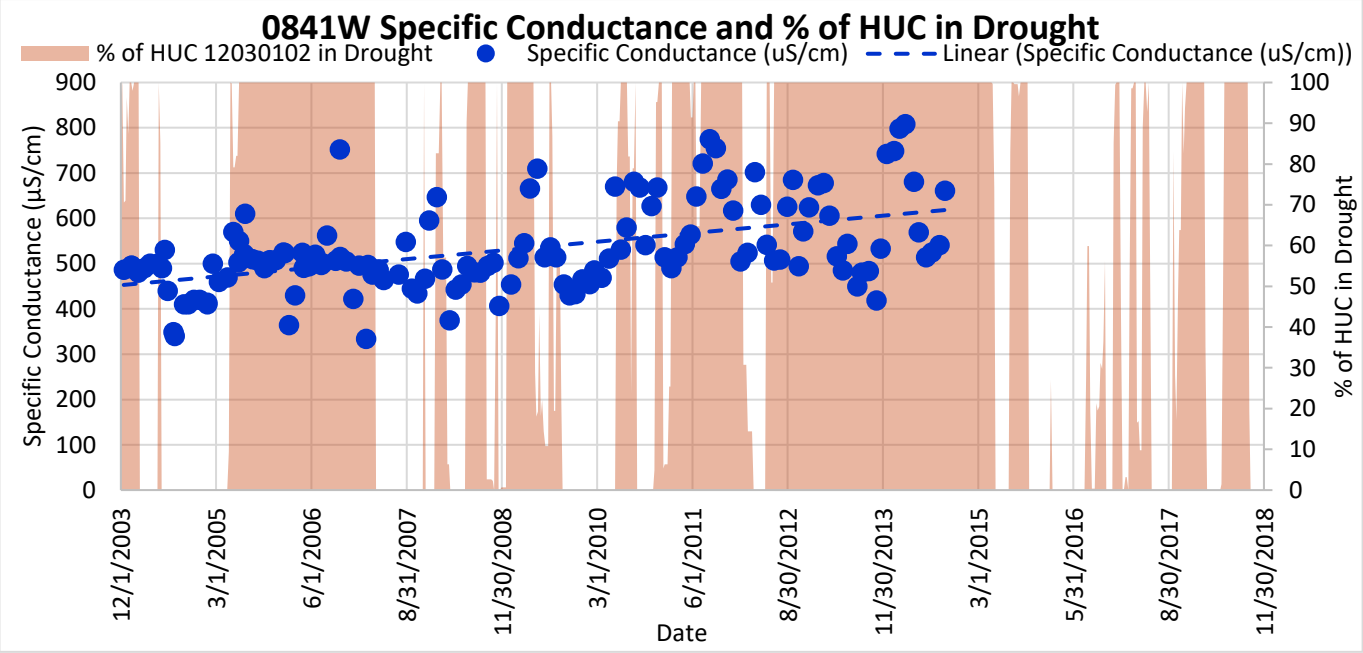


Figure 223: 0841W Specific Conductance and % of HUC in Drought

The increasing trend for total phosphorus was a false trend introduced by censoring of non-detect data at the beginning of the data set. There did not appear to be any change in water quality in the absence of these censored values. Increasing trends for fecal coliform and fecal streptococcus are not being evaluated as fecal coliform is no longer the indicator bacteria and there were non-significant decreasing trends for *E. coli*.

0841A Mountain Creek Lake

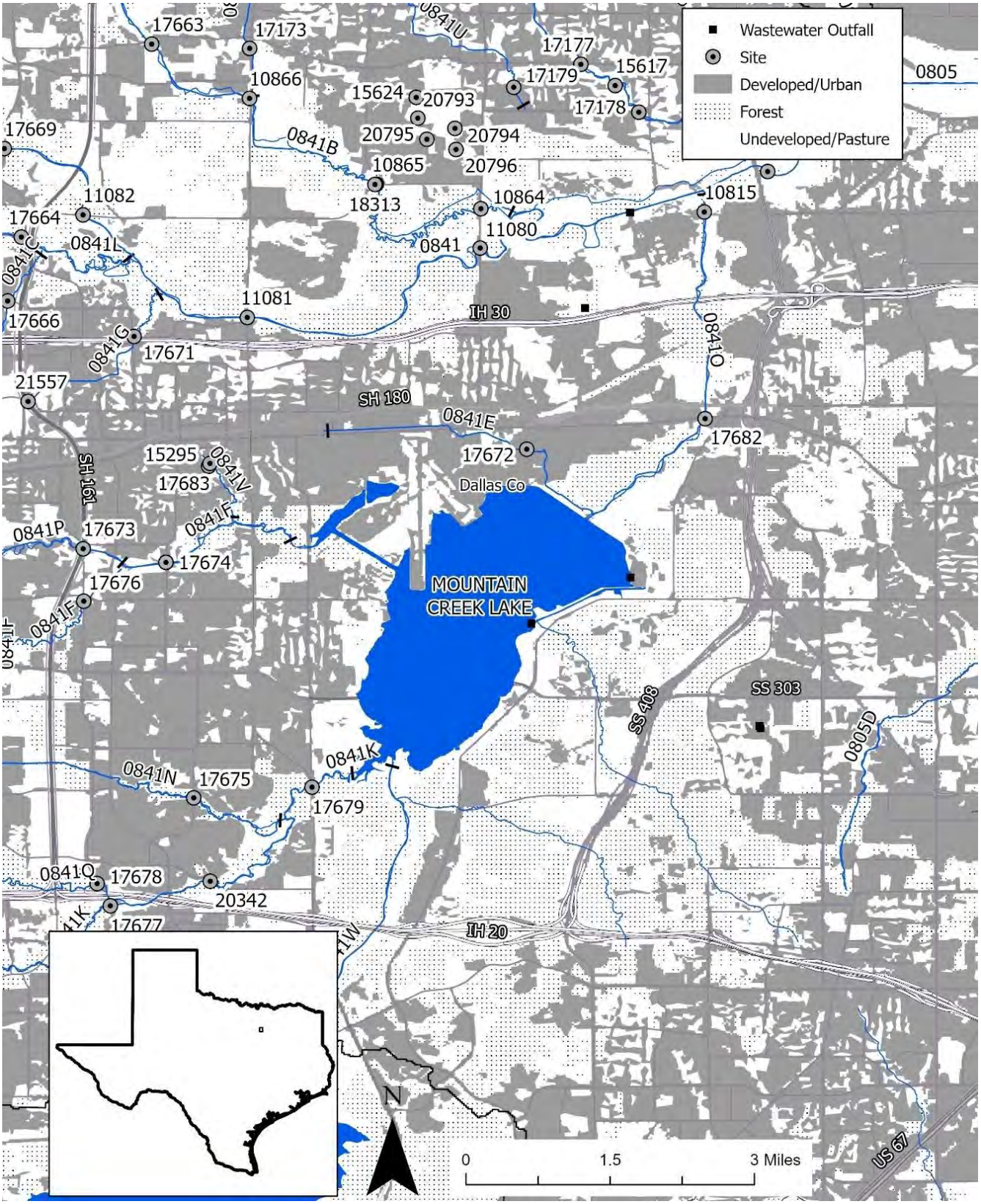


Figure 224: Segment 0841A Map

Mountain Creek Lake is a 2434-acre reservoir in Grand Prairie (see Figure 224). The watershed is a mix of heavy industrial and residential development and lies within the Northern Blackland Prairie. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 182.

Table 182: TCEQ 2020 Texas Integrated Report Summary for Segment 0841A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841A_01 From Mountain Creek Lake Dam to headwaters at confluence of Mountain & Fish Creeks, Dallas Co.	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS

NS = Not Supporting

There were no data available in assessment unit 0841A_01 for the period of record for this basin summary report.

The impairment for fish consumption use is based on unsafe levels of PCBs and dioxins in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 59) to advise against the consumption of several species of fish and limited consumption of several other species. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

0841E Copart Branch Mountain Creek

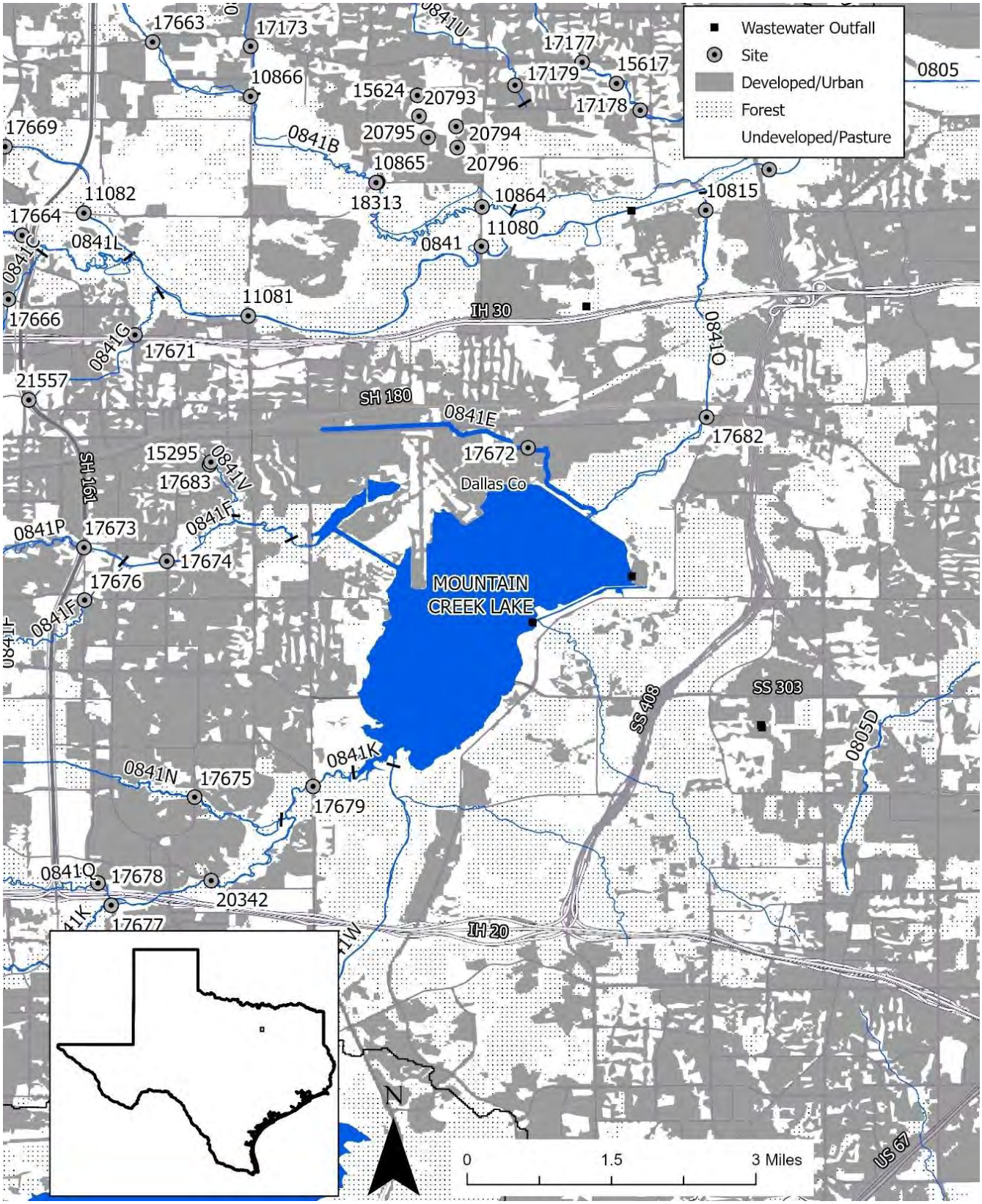


Figure 225: Segment 0841E Map

This segment is a 2.8-mile stretch of Copart Branch running from approximately 0.3-miles upstream of Camden Road on the Dallas Naval Academy to the confluence with Mountain Creek (see Figure 225). The watershed is heavy industrial development with some wooded riparian areas immediately upstream of the confluence with Mountain Creek. It lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 183. Results of TRA trend analyses are shown in Table 184.

Table 183: TCEQ 2020 Texas Integrated Report Summary for Segment 0841E

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	Aquatic Life Use	Acute Toxic Substances in water		NA
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	Aquatic Life Use	Chronic Toxic Substances in water		NA
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	General Use	Ammonia	0.33 mg/L	NC
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	General Use	Nitrate	1.95 mg/L	NC
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	General Use	Total Phosphorus	0.69 mg/L	NC
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841E_01 2.8 mi stretch from confluence with Mountain Ck to approx. 0.3 mi upstream of Camden Road	Fish Consumption Use	HH Bioaccumulative Toxics in water		NA

FS = Fully Supporting NA = Not Assessed NC = No Concern

Table 184: Significant Trends for Segment 0841E (P-value<0.1)

Segment & Assessment Unit		0841E_01
Site		17672
Ammonia	All	Not Significant
	Summer	↑
	Winter	Not Significant
Total Kjeldahl Nitrogen	All	No Trend
	Summer	No Trend
	Winter	↓
Total Phosphorus	All	↑
	Summer	Not Significant
	Winter	↑

Segment & Assessment Unit		0841E_01
Site		17672
Orthophosphate	All	↑
	Summer	Not Significant
	Winter	↑
Chloride	All	↑
	Summer	Not Significant
	Winter	↑
Sulfate	All	No Trend
	Summer	No Trend
	Winter	↑
Field Ammonia	All	↑*
	Summer	Not Significant
	Winter	↑*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Increasing trends for ammonia, total phosphorus, orthophosphate, chloride, and sulfate appear to have been related to drought conditions as shown for ammonia in Figure 226. Based on previous site visits, this stream is a very low flow system. The stream is surrounded by industry with residential areas on the periphery. Based on the available information, it seems likely that evaporation was causing increased concentrations of these parameters throughout the prolonged drought of 2011 to 2015. However, the initial source of these constituents could have included both run-off of fertilizers and failing infrastructure. This segment is part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

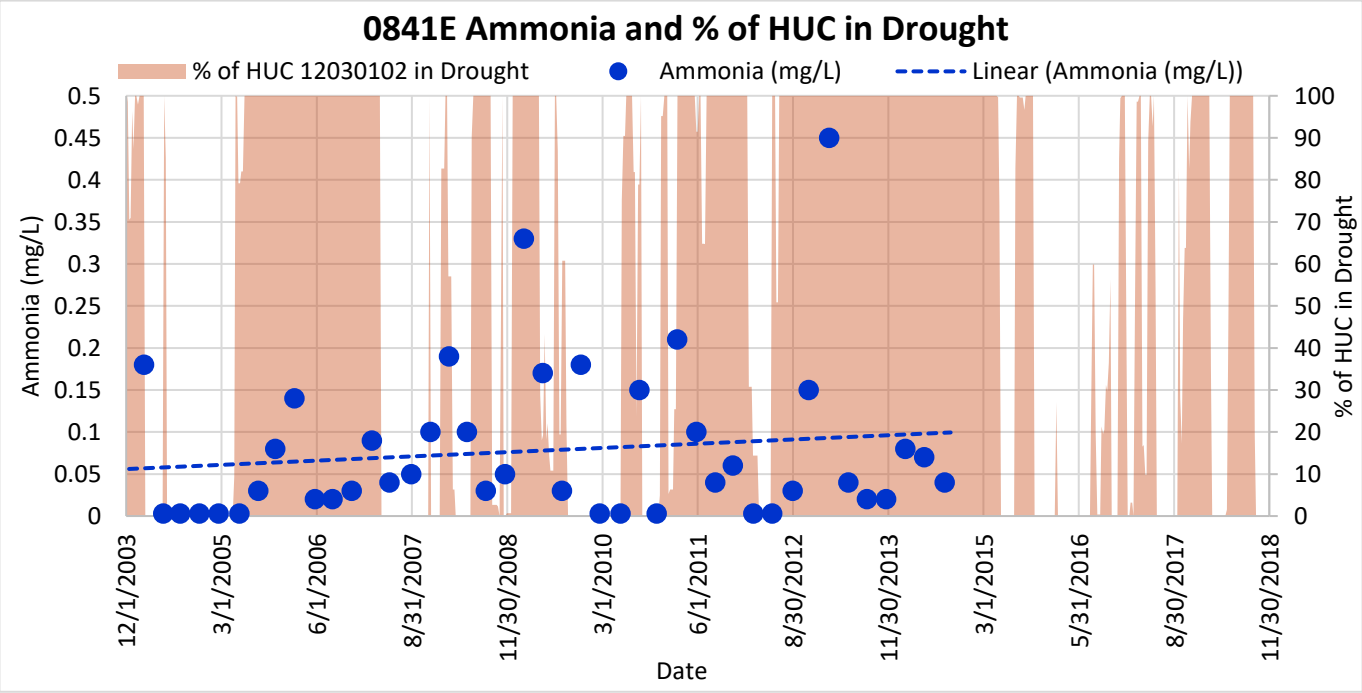


Figure 226: 0841E Ammonia and % of HUC in Drought

0841O Mountain Creek

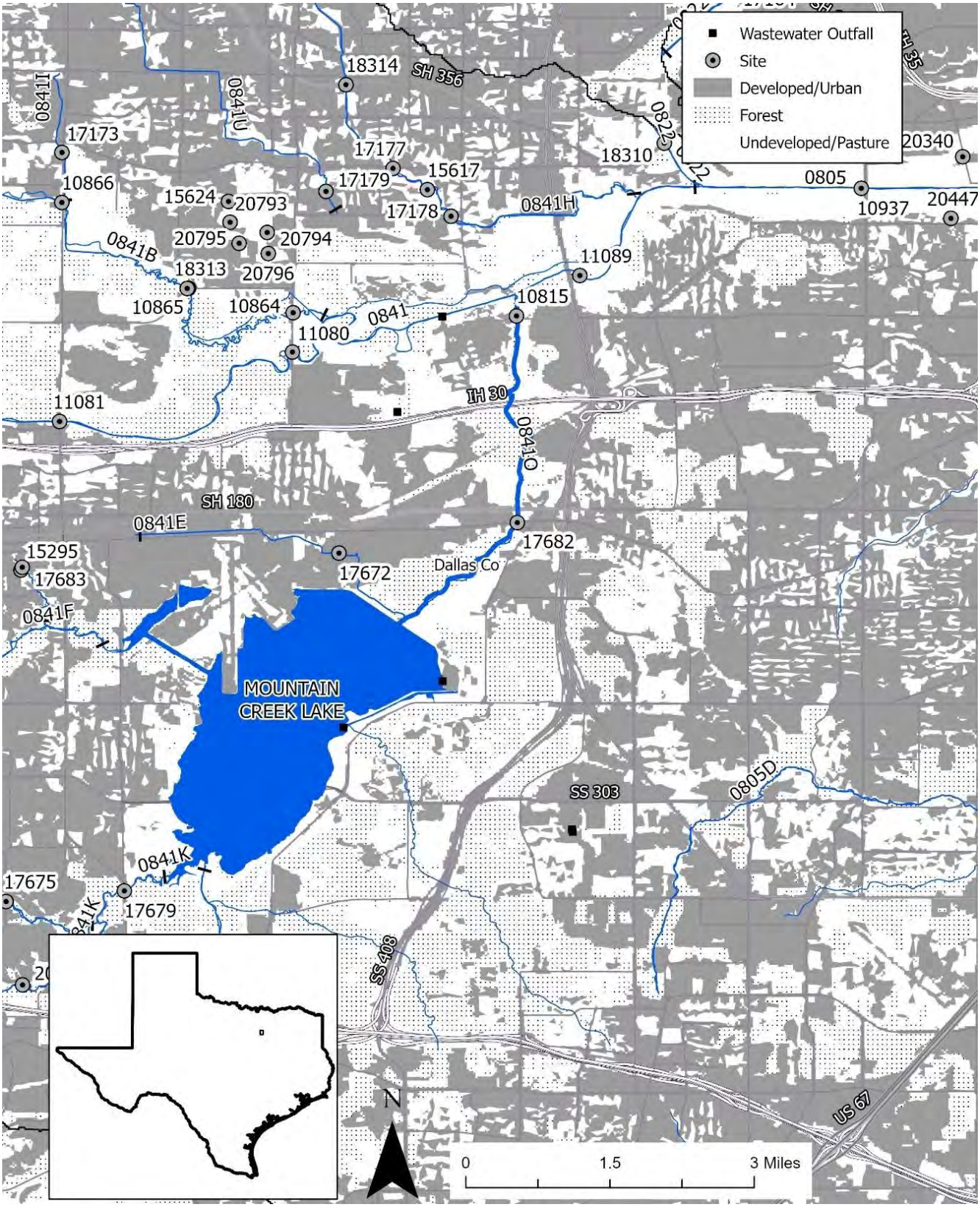


Figure 227: Segment 0841O Map

This unclassified segment is a 4-mile stretch of Mountain Creek running from approximately 0.3-miles downstream of Mountain Creek Lake in Grand Prairie to the confluence with the Lower West Fork Trinity River (see Figure 227). The watershed is heavily developed with some wooded and wetland riparian areas and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 185. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 185: Segment 0841O FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841O_01	MOUNTAIN CREEK IMMEDIATELY DOWNSTREAM OF SINGLETON BLVD IN GRAND PRAIRIE	10815	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 186. Results of TRA trend analyses are shown in Table 187.

Table 186: TCEQ 2020 Texas Integrated Report Summary for Segment 0841O

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	Aquatic Life Use	Acute Toxic Substances in water		FS
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	General Use	Ammonia	0.33 mg/L	CS
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	General Use	Nitrate	1.95 mg/L	NC
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	General Use	Total Phosphorus	0.69 mg/L	NC
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0841O_01 4 mi stretch from confluence with W Fork Trinity to approx. 0.3 mi downstream of Mountain Creek Lake	Fish Consumption Use	HH Bioaccumulative Toxics in water		NC

CN = Use Concern CS = Screening Level Concern FS = Fully Supporting NC = No Concern

Table 187: Significant Trends for Segment 0841O (P-value<0.1)

Segment & Assessment Unit		0841O_01	0841O_01
Site		10815	17682
Dissolved Oxygen % Saturation	All	No Trend	No Trend
	Summer	Not Significant	↑
	Winter	No Trend	No Trend
Biochemical Oxygen Demand	All	No Trend	Not Significant
	Summer	↑	↑
	Winter	No Trend	Not Significant
Ammonia	All	↑	No Trend
	Summer	↑	No Trend
	Winter	↑	No Trend
Nitrate	All	Not Significant	↓
	Summer	Not Significant	↓
	Winter	Not Significant	Not Significant
Total Kjeldahl Nitrogen	All	No Trend	↓
	Summer	Not Significant	Not Significant
	Winter	No Trend	Not Significant
Total Phosphorus	All	↑	No Trend
	Summer	Not Significant	Not Significant
	Winter	↑	↑
Hardness	All	Not Significant	↓
	Summer	Not Significant	↓
	Winter	Not Significant	Not Significant
Sulfate	All	Not Significant	Not Significant
	Summer	Not Significant	↓
	Winter	Not Significant	Not Significant
Fecal Coliform	All	↑	Not Significant
	Summer	↑	Not Significant
	Winter	↑	No Trend
Fecal Streptococcus	All	No Trend	No Trend
	Summer	No Trend	Not Significant
	Winter	↑	No Trend
E. coli	All	↑	No Trend
	Summer	↑	No Trend
	Winter	↑	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

Increasing trends for biochemical oxygen demand, ammonia, total phosphorus, and *E. coli* were discussed in the TRA CRP 2015 Basin Summary Report. Trends were caused by a broken wastewater pipeline that occurred at the beginning of the drought of 2011 to 2015. This pipeline was repaired very quickly after it was discovered. This break was also the cause of the concerns for *E. coli*, ammonia, and chlorophyll-a.

0841H Delaware Creek

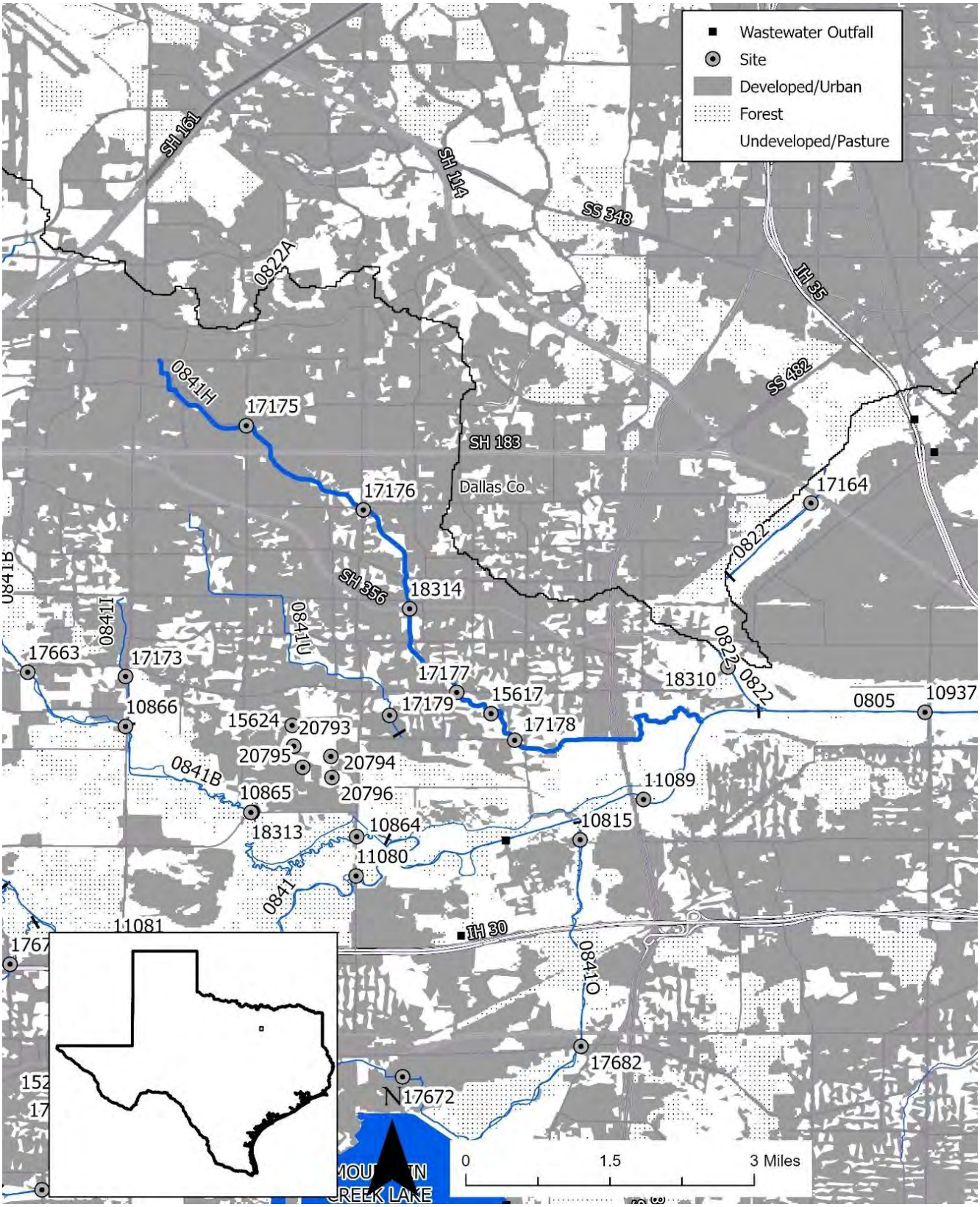


Figure 228: Segment 0841H Map

This unclassified segment is an 8.5-mile stretch of Delaware Creek running from Finley Road in Irving to the confluence with the Lower West Fork Trinity River (see Figure 229). The watershed is developed and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 188. Monitoring is being conducted by the City of Irving. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 188: Segment 0841H FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0841H_01	DELAWARE CREEK IMMEDIATELY DOWNSTREAM OF EAST OAKDALE ROAD IN IRVING	17178	City of Irving

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 189. Results of TRA trend analyses are shown in Table 190.

Table 189: TCEQ 2020 Texas Integrated Report Summary for Segment 0841H

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	Aquatic Life Use	Acute Toxic Substances in water		FS
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	General Use	Ammonia	0.33 mg/L	NC
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	General Use	Nitrate	1.95 mg/L	NC
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	General Use	Total Phosphorus	0.69 mg/L	NC
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0841H_01 8.5 mi stretch from confluence with Lower W. Fork Trinity to Finley Road in Irving.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NC = No Concern

Table 190: Significant Trends for Segment 0841H (P-value<0.1)

Segment & Assessment Unit		0841H_01
Site		17178
pH	All	↓
	Summer	Not Significant
	Winter	↓
Dissolved Copper	All	Not Significant
	Summer	↓
	Winter	Not Significant
Flow Severity	All	No Trend
	Summer	↓
	Winter	Not Significant
E. coli	All	Not Significant
	Summer	↓
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

Decreasing trends were identified in this segment as shown in Figure 229. The watershed upstream of station 17178 is residential. There are several areas along the stream that are pooled with low water dams. pH is weakly correlated to chlorophyll-*a* (correlation coefficient = 0.264) which is relatively strongly correlated to total kjeldahl nitrogen (correlation coefficient = 0.480). This indicates that algal populations in these pools were likely influencing pH levels. Homeowner educations may help reduce fertilizer contributions that may reduce algal populations in this stream.

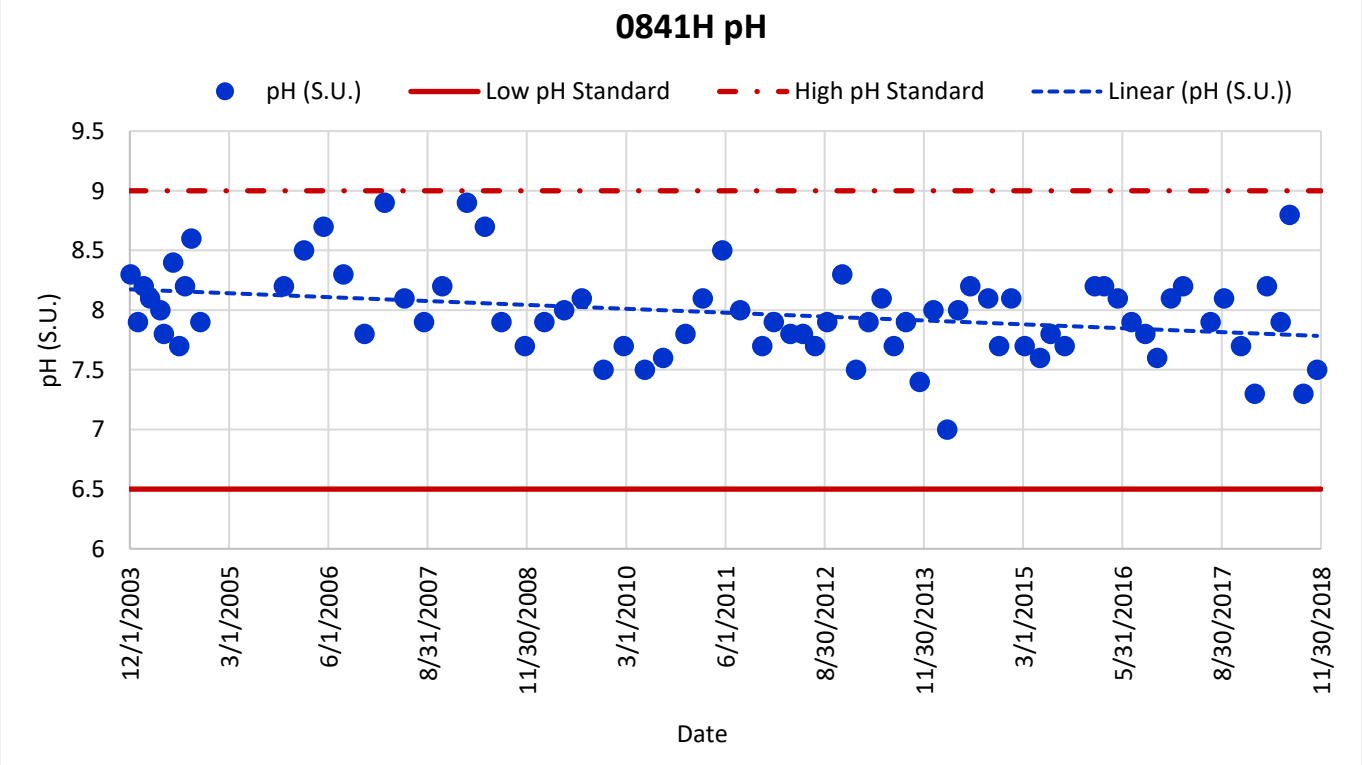


Figure 229: 0841H pH

0805 Upper Trinity River

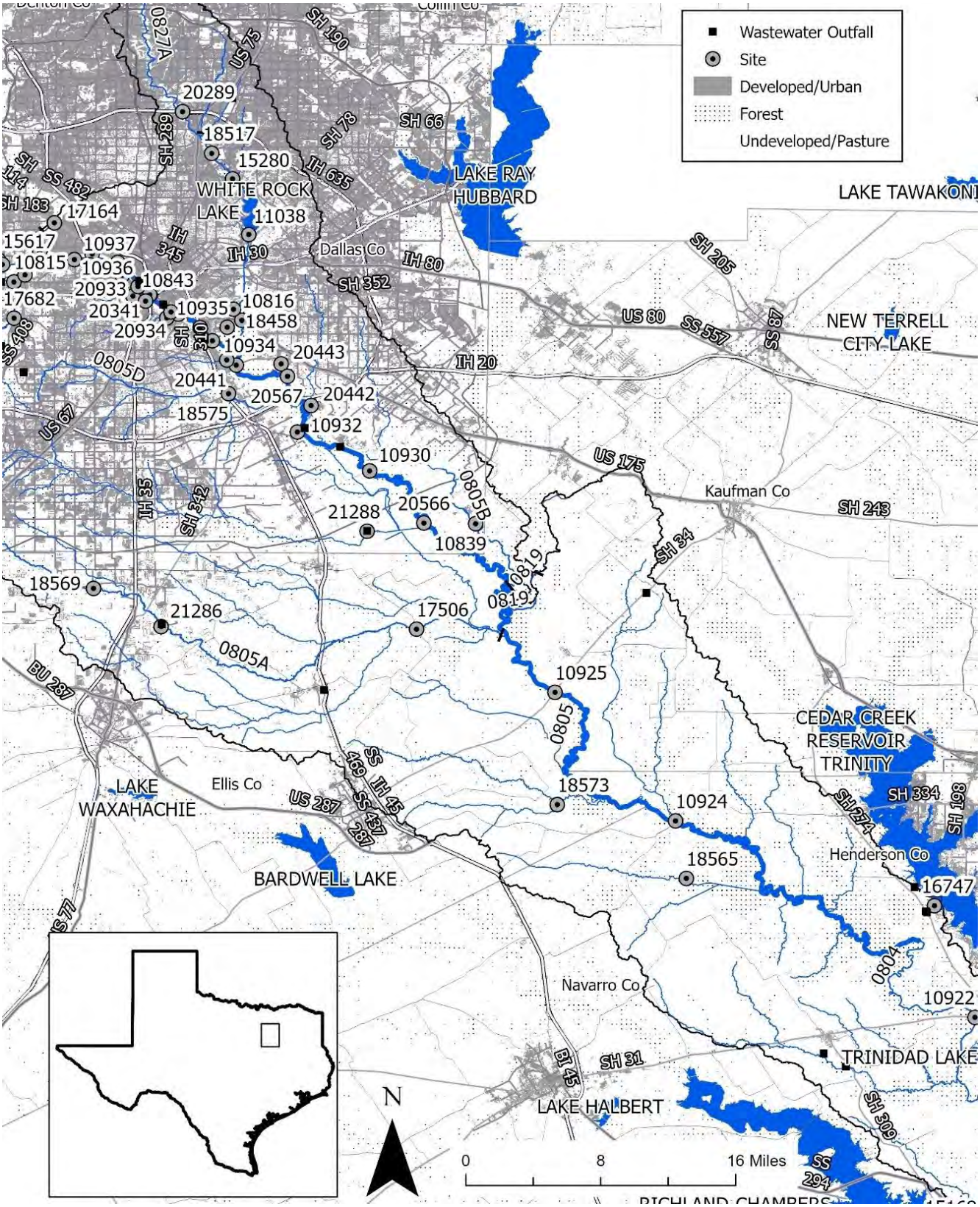


Figure 230: Segment 0805 Map

This 97-mile segment runs from the confluence of the Elm Fork Trinity River in Dallas County to the confluence of the Cedar Creek Reservoir discharge canal in Henderson/Navarro County (see Figure 230). The upper 15 miles of the watershed are highly urbanized and the lower 82 miles are mostly rural cropland and pasture. The flow in this section can be almost 100% wastewater effluent from the Dallas-Fort Worth Metroplex during the hot, dry summer months and periods of drought. Prior to the development of the large regional wastewater treatment facilities found along this segment, the Trinity River was known to go dry in the summer. The wastewater treatment facilities release high quality effluent that has provided the flow necessary for downstream aquatic life. Water here is generally very turbid as it flows through the Northern Blackland Prairie and into Northern Post Oak Savanna.

Clean Rivers Program water quality monitoring is being conducted at eight sites within this segment as shown in Table 191. Monitoring is being conducted by the City of Dallas (collecting entity DT) and TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 191: Segment 0805 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0805	TEN MILE CREEK 30 METERS UPSTREAM OF PARKINSON RD AND THE TRA TMC WWTP OUTFALL ABOVE THE MIXING ZONE	21287	TRA
0805_01	TRINITY RIVER 24 METERS DOWNSTREAM OF FM 85 WEST OF SEVEN POINTS	10924	TRA
0805_02	TRINITY RIVER 50 METERS DOWNSTREAM OF SH 34 NORTHEAST OF ENNIS	10925	TRA
0805_03	TRINITY RIVER AT SOUTH LOOP SH 12 SOUTH OF DALLAS	10934	TRA
0805_03	UPPER TRINITY RIVER 190 METERS DOWNSTREAM OF SOUTH CENTRAL EXPRESSWAY/SH 310 AND 105 METERS UPSTREAM OF RAILROAD BRIDGE	20444	City of Dallas (collecting entity DT)
0805_04	TRINITY RIVER 46 METERS UPSTREAM OF N WESTMORELAND ROAD IN DALLAS	10937	TRA
0805_04	UPPER TRINITY RIVER AT SYLVAN AVENUE IN DALLAS	20933	City of Dallas (collecting entity DT)
0805_04	UPPER TRINITY RIVER AT SANTA FE AVENUE IN DALLAS UNDER DART RAIL BRIDGE	20934	City of Dallas (collecting entity DT)

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 192. Results of TRA trend analyses are shown in Table 193.

Table 192: TCEQ 2020 Texas Integrated Report Summary for Segment 0805

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	Aquatic Life Use	Acute Toxic Substances in water		FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	Aquatic Life Use	Acute Toxic Substances in water		FS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	Aquatic Life Use	Acute Toxic Substances in water		FS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	Aquatic Life Use	Chronic Toxic Substances in water		FS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	Ammonia	0.33 mg/L	NC
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	Ammonia	0.33 mg/L	NC
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	Ammonia	0.33 mg/L	NC
0805_01 From confluence of the Cedar Creek Reservoir discharge canal to confluence of Smith Creek	General Use	Nitrate	1.95 mg/L	CS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	Nitrate	1.95 mg/L	CS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	Nitrate	1.95 mg/L	CS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	Nitrate	1.95 mg/L	CS
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek	General Use	Nitrate	1.95 mg/L	CS
0805_01 From confluence of the Cedar Creek Reservoir discharge canal to confluence of Smith Creek	General Use	Total Phosphorus	0.69 mg/L	CS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	Total Phosphorus	0.69 mg/L	CS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	Total Phosphorus	0.69 mg/L	CS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	Total Phosphorus	0.69 mg/L	CS
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek	General Use	Total Phosphorus	0.69 mg/L	CS
0805_01 From confluence of the Cedar Creek Reservoir discharge canal to confluence of Smith Creek	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	pH	6.5 - 9 S.U.	FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	pH	6.5 - 9 S.U.	FS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	pH	6.5 - 9 S.U.	FS
0805_01 From confluence of the Cedar Creek Reservoir discharge canal to confluence of Smith Creek	General Use	Chloride	175 mg/L	FS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	Chloride	175 mg/L	FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	Chloride	175 mg/L	FS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	Chloride	175 mg/L	FS
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek	General Use	Chloride	175 mg/L	FS
0805_01 From confluence of the Cedar Creek Reservoir discharge canal to confluence of Smith Creek	General Use	Sulfate	175 mg/L	FS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	Sulfate	175 mg/L	FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	Sulfate	175 mg/L	FS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	Sulfate	175 mg/L	FS
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek	General Use	Sulfate	175 mg/L	FS
0805_01 From confluence of the Cedar Creek Reservoir discharge canal to confluence of Smith Creek	General Use	Total Dissolved Solids	850 mg/L	FS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	Total Dissolved Solids	850 mg/L	FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	Total Dissolved Solids	850 mg/L	FS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	Total Dissolved Solids	850 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek	General Use	Total Dissolved Solids	850 mg/L	FS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	General Use	Water temperature	35 °F	FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	General Use	Water temperature	35 °F	FS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	General Use	Water temperature	35 °F	FS
0805_01 From confluence of the Cedar Creek Reservoir discharge canal to confluence of Smith Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0805_01 From confluence of the Cedar Creek Reservoir discharge canal to confluence of Smith Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Data for assessment unit 0805_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit. No significant trends were identified in assessment unit 0805_06.

Table 193: Significant Trends for Segment 0805 (P-value<0.1)

Segment & Assessment Unit		0805_02	0805_03	0805_03	0805_04	0805_04	0805_04
Site		10925	10934	20444	10937	20933	20934
Air Temperature	All	Not Significant	Not Significant	Not Significant	No Trend	Insufficient Data	Not Significant
	Summer	Not Significant	↓	Not Significant	↓	Insufficient Data	↑*
	Winter	Not Significant	No Trend	Not Significant	No Trend	Insufficient Data	Not Significant
Secchi Depth	All	Not Significant	Not Significant	Insufficient Data	No Trend	Insufficient Data	Insufficient Data
	Summer	Not Significant	Not Significant	Insufficient Data	↑	Insufficient Data	Insufficient Data
	Winter	Not Significant	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
Ammonia	All	No Trend	No Trend	Insufficient Data	↑	Insufficient Data	Insufficient Data
	Summer	Not Significant	No Trend	Insufficient Data	↑	Insufficient Data	Insufficient Data
	Winter	No Trend	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
Nitrite	All	↓	No Trend	Insufficient Data	No Trend	Insufficient Data	Insufficient Data
	Summer	↓	Not Significant	Insufficient Data	No Trend	Insufficient Data	Insufficient Data
	Winter	↓	Not Significant	Insufficient Data	No Trend	Insufficient Data	Insufficient Data
Dissolved Copper	All	Not Significant	Not Significant	Insufficient Data	↓	Insufficient Data	Insufficient Data
	Summer	Not Significant	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
	Winter	↓	Not Significant	Insufficient Data	↓	Insufficient Data	Insufficient Data
Dissolved Iron	All	No Trend	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
	Summer	Not Significant	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
	Winter	↑	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
Dissolved Nickel	All	↓	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	↓	Not Significant	Not Significant	↓	Not Significant	Not Significant
Dissolved Zinc	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	↓	Not Significant	Not Significant
Days Since Precipitation	All	Not Significant	Not Significant	↑*	No Trend	↑*	↑*
	Summer	Not Significant	Not Significant	↑*	Not Significant	↑*	↑*
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Impairments for elevated levels of *E. coli* were identified in assessment units 0805_03 and 0805_04. As shown in Figure 231, *E. coli* levels were generally reported at higher levels during elevated flows. This indicates that the impairment is likely due to run-off containing bacteria. Because the watershed upstream of these assessment units are a mix of land uses, sources could include pets, wildlife, livestock, and humans. These assessment units are part of the North Central Texas Council of Governments Total Maximum Daily Load Implementation Plan for several waterbodies in the Dallas-Fort Worth Metroplex. The Implementation Plan describes practices that stakeholders may implement in order to reduce bacteria levels.

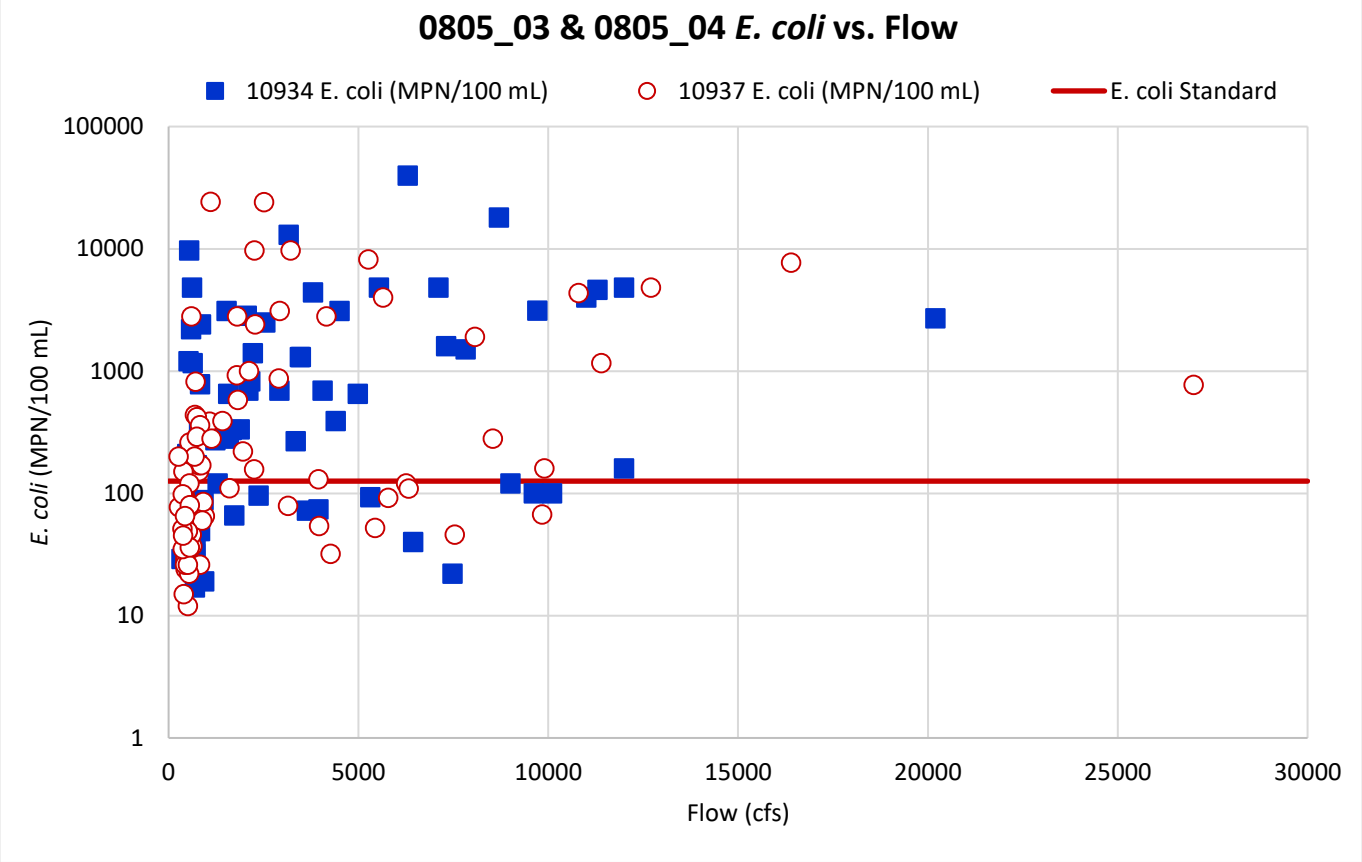


Figure 231: 0805_03 & 0805_04 E. coli vs. Flow

Concerns for nitrate and total phosphorus were identified for all assessment units in this segment. As shown in Figure 232 for assessment unit 0805_02, these concerns were related to flows. At lower flows, concentrations of these parameters increased and decreased with increasing flow as freshwater inflows from precipitation provide dilution. As previously discussed, this pattern is common for effluent-dominated streams. There are several large wastewater treatment facilities upstream of and in this segment. Most wastewater treatment facilities do not have advanced nutrient removal technology at this time. Although there were concerns for chlorophyll-*a* identified for assessment units 0805_01 and 0805_02, it does not appear that algal populations were excessively influencing dissolved oxygen levels in this portion of the river. Of 476 dissolved oxygen readings, there were no values reported below 3 mg/L and only 3 values reported below 5 mg/L.

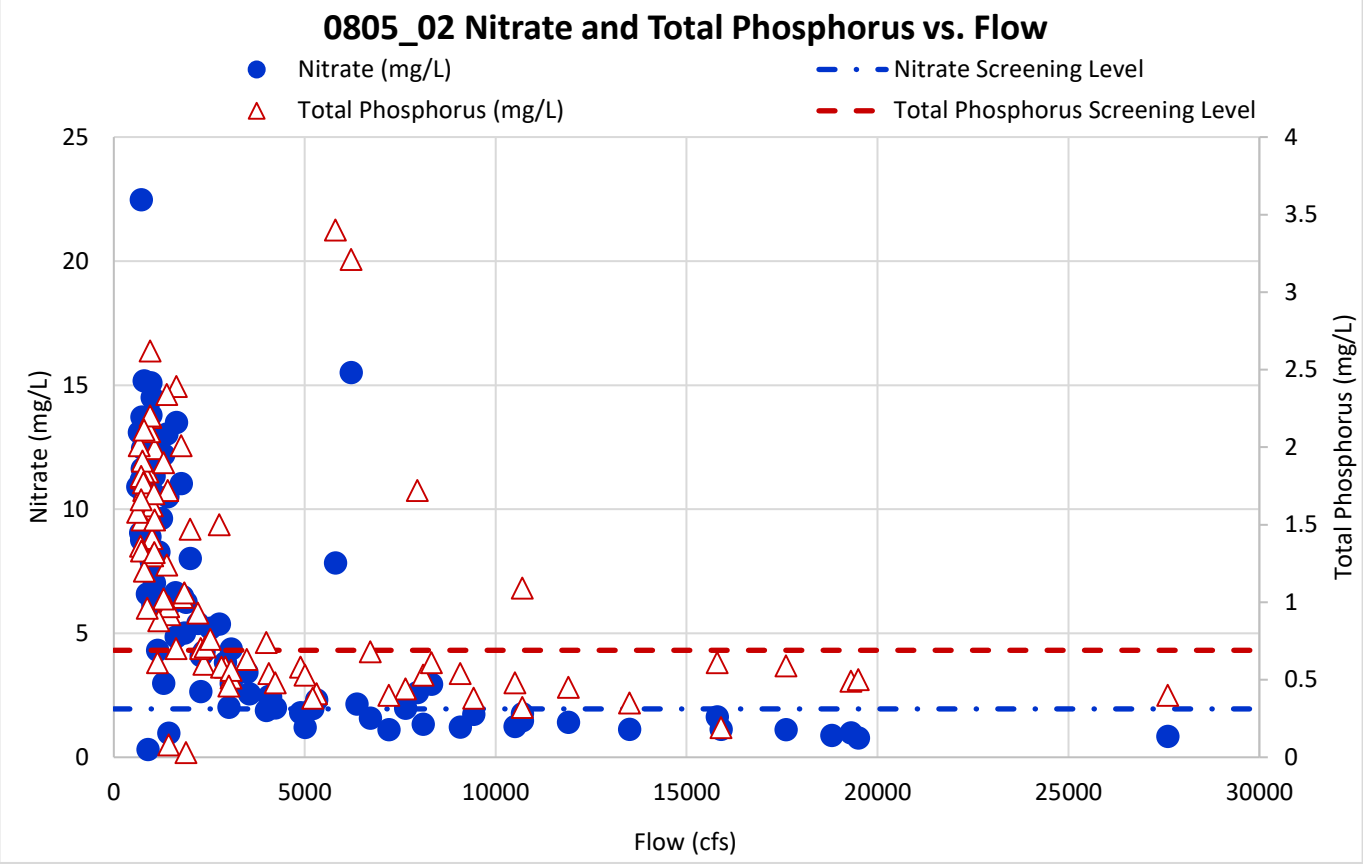


Figure 232: 0805_02 Nitrate and Total Phosphorus vs. Flow

The impairments for fish consumption use are based on unsafe levels of PCBs and dioxins in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 43) to advise against the consumption of several species of fish. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

The increasing trend for ammonia appears to have been related to drought conditions as shown in Figure 233. Ammonia had a similar relationship to flow as nitrate and total phosphorus in this segment. Ammonia levels likely trended up as drought conditions reduced flows in river.

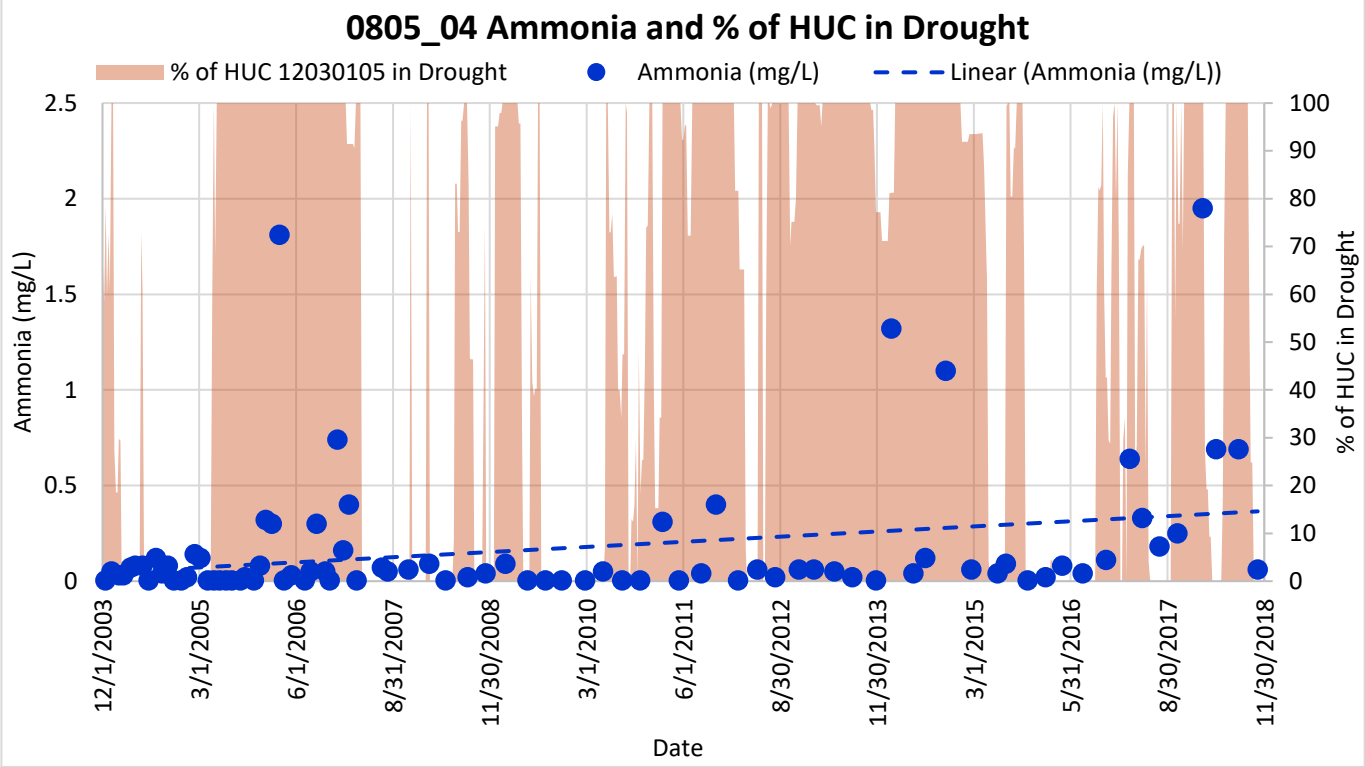


Figure 233: 0805_04 Ammonia and % of HUC in Drought

The increasing trend for dissolved iron in assessment unit 0805_02 was a false trend introduced by censoring of non-detect data and does not represent a true change in water quality.

0827A White Rock Creek Above White Rock Lake

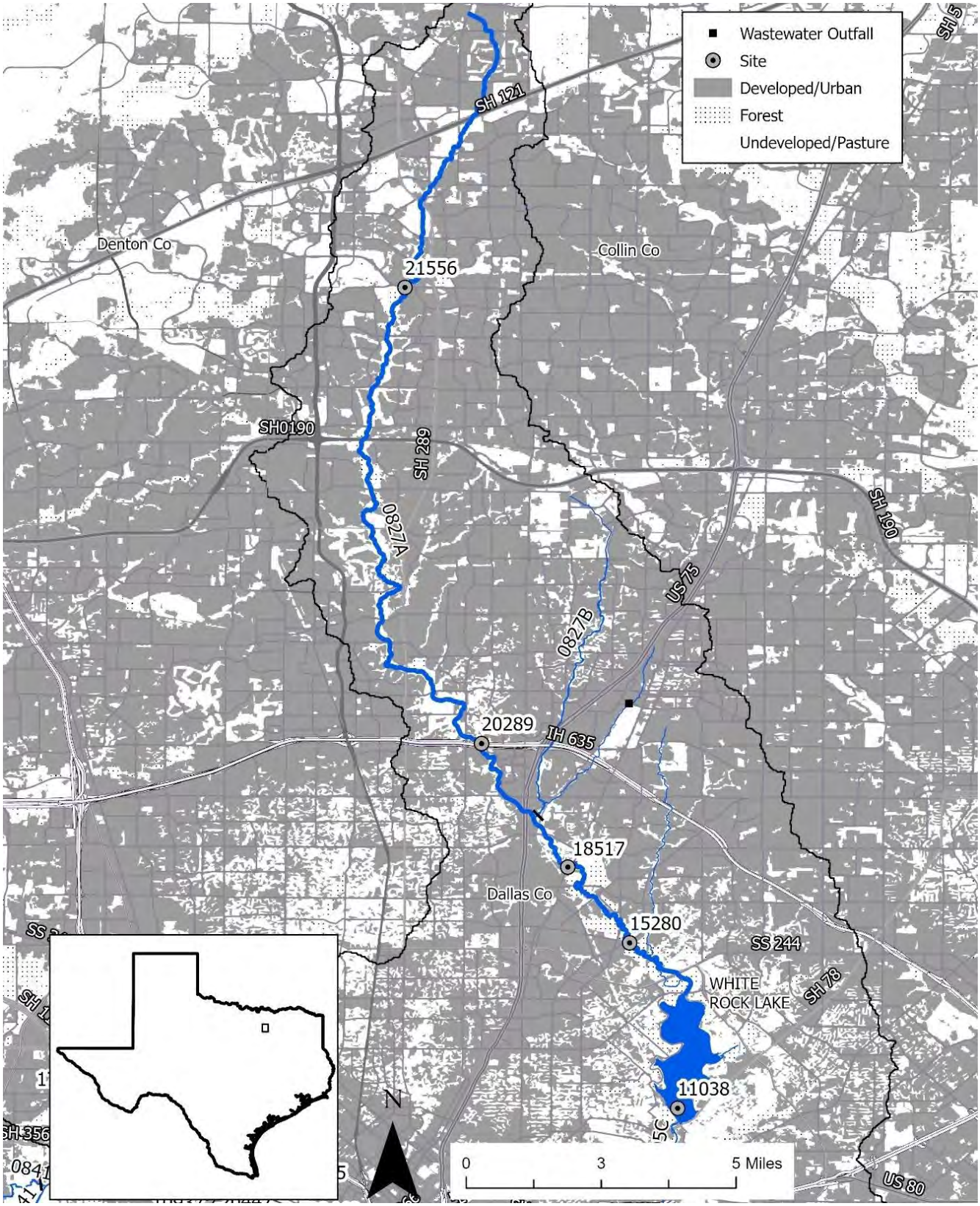


Figure 234: Segment 0827A Map

This 27-mile portion of White Rock Creek runs from the headwaters at Hilcrest Road in Frisco to the headwaters of White Rock Lake (see Figure 234). The watershed is heavily developed with some small wooded riparian areas and lies within the Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 194. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 194: Segment 0827A FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0827A_01	WHITE ROCK CREEK AT I-635 NORTH SERVICE ROAD IMMEDIATELY WEST OF PARK CENTRAL DRIVE	20289	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 195. Results of TRA trend analyses are shown in Table 196.

Table 195: TCEQ 2020 Texas Integrated Report Summary for Segment 0827A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	Aquatic Life Use	Acute Toxic Substances in water		FS
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	Aquatic Life Use	Chronic Toxic Substances in water		FS
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	Aquatic Life Use	Fish Community		FS
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	Aquatic Life Use	Macrobenthic Community		FS
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	Aquatic Life Use	Habitat		NC
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	Recreation Use	*E. coli*	126 MPN/100 mL	**NS**
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	General Use	Ammonia	0.33 mg/L	NC
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	General Use	Nitrate	1.95 mg/L	NC
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	General Use	Total Phosphorus	0.69 mg/L	NC
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0827A_01 From headwaters of White Rock Lake up to confluence with McKamy Branch east of Addison	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment unit 0827A_02 for the period of record for this basin summary report.

Table 196: Significant Trends for Segment 0827A (P-value<0.1)

Segment & Assessment Unit		0827A_01
Site		20289
Air Temperature	All	No Trend
	Summer	↓
	Winter	No Trend
Nitrate	All	Not Significant
	Summer	↓
	Winter	Not Significant
Total Kjeldahl Nitrogen	All	Not Significant
	Summer	↓
	Winter	Not Significant
Dissolved Copper	All	↓
	Summer	↓
	Winter	Not Significant
Dissolved Nickel	All	↓
	Summer	↓
	Winter	Not Significant
Flow Severity	All	No Trend
	Summer	No Trend
	Winter	↑
Total Dissolved Solids	All	Not Significant
	Summer	Not Significant
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

This segment was found to be impaired due to elevated levels of *E. coli* as shown in Figure 235. *E. coli* was not strongly correlated to flow (correlation coefficient = -0.124) and was only somewhat correlated to recent precipitation (correlation coefficient = -0.365). This indicates that run-off may have been introducing bacteria to the stream but that there may have been other direct sources as well. A study is currently underway to identify potential sources of *E. coli* during both wet and dry weather. Results will be made available on the TRA Reports webpage upon completion of the study.

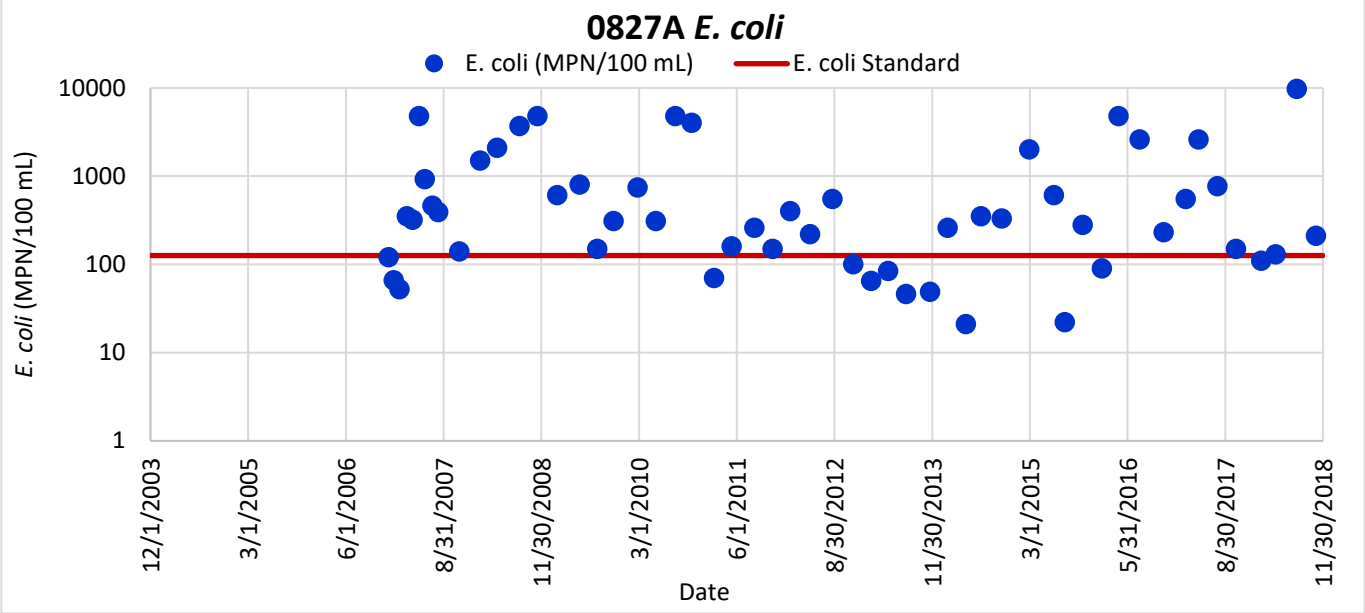


Figure 235: 0827A E. coli

Aquatic life monitoring was conducted in this segment in 2019. Benthic macroinvertebrates and habitat were found to be at or above the intermediate use level designated for this segment. Fish communities were found to be exceptional (see Figure 236 and Figure 237).



Figure 236: Channel catfish collected in White Rock Creek



Figure 237: Bigscale logperch collected in White Rock Creek

0827B Cottonwood Creek

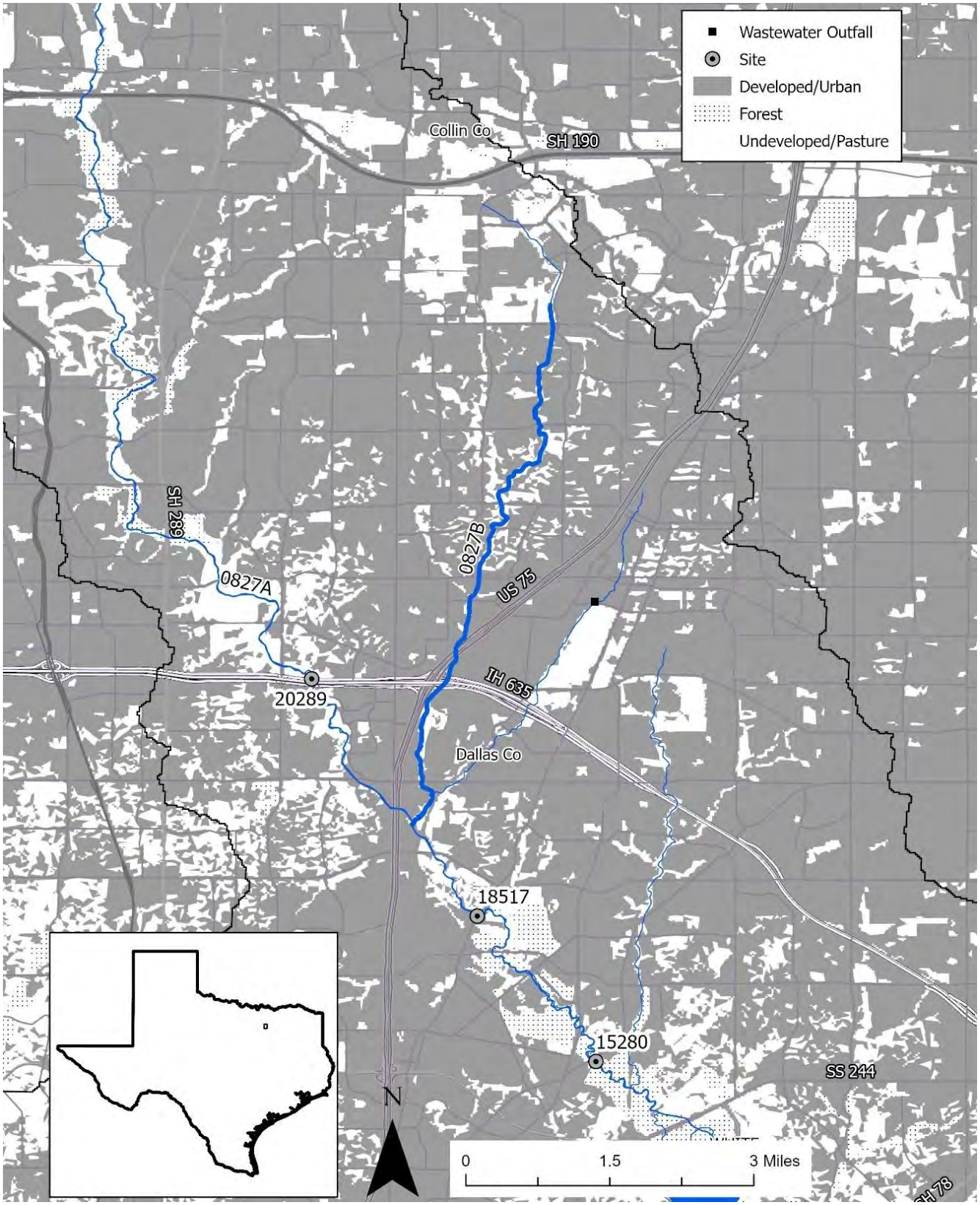


Figure 238: Segment 0827B Map

This unclassified segment is a 6.2-mile stretch of Cottonwood Creek running from the confluence with an unnamed tributary approximately 200 meters upstream of Campbell road in the City of Richardson to the confluence with White Rock Creek (see Figure 238). The watershed is heavily developed and lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0827B_01 for the period of record for this basin summary report.

0827 White Rock Lake

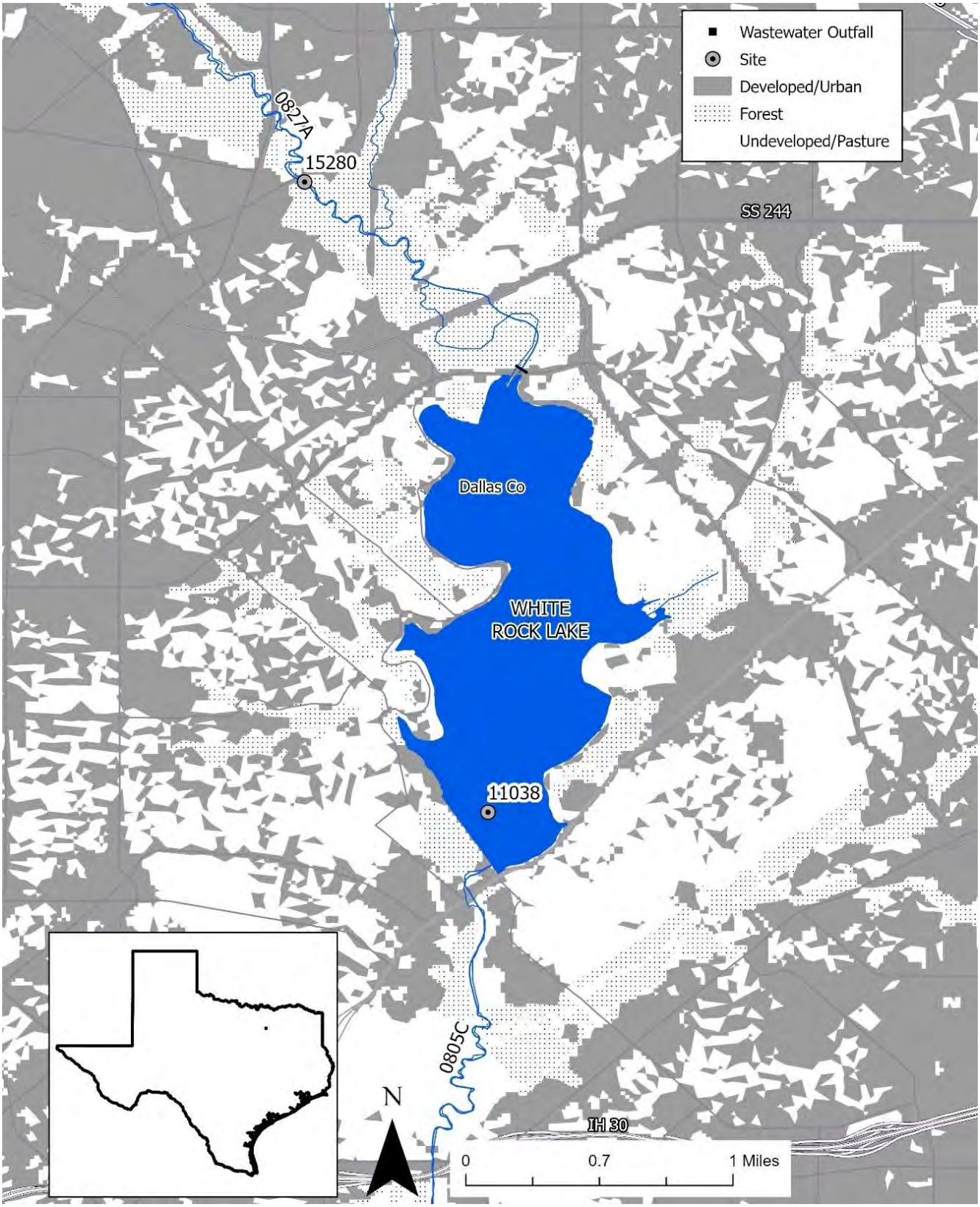


Figure 239: Segment 0827 Map

This 1,100-acre urban lake in Dallas County impounds White Rock Creek up to a normal pool elevation of 458 feet (see Figure 239). Segment 0827 is located entirely within the Northern Blackland Prairie ecoregion and the watershed is nearly all developed with some wooded areas adjacent to the shores of the reservoir. White Rock Lake has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 197. Monitoring is being conducted by TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 197: Segment 0827 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0827_01	WHITE ROCK LAKE MID LAKE NEAR DAM 79 METERS NORTH AND 597 METERS WEST OF INTERSECTION OF LAWTHER DRIVE & GARLAND ROAD	11038	TCEQ Region 4

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 198. Results of TRA trend analyses are shown in Table 199.

Table 198: TCEQ 2020 Texas Integrated Report Summary for Segment 0827

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0827_01 From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0827_01 From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0827_01 From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet	General Use	Excessive algal growth in water		CS
0827_01 From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet	General Use	pH	6.5 - 9 S.U.	FS
0827_01 From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet	General Use	Chloride	100 mg/L	FS
0827_01 From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet	General Use	Sulfate	100 mg/L	FS
0827_01 From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet	General Use	Total Dissolved Solids	400 mg/L	FS
0827_01 From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet	General Use	Water temperature	33.9 °F	FS

CS = Screening Level Concern FS = Fully Supporting

Table 199: Significant Trends for Segment 0827 (P-value<0.1)

Segment & Assessment Unit		0827_01
Site		11038
Dissolved Oxygen	All	↓
	Summer	↓
	Winter	Not Significant
pH	All	Not Significant
	Summer	↓
	Winter	Not Significant

Segment & Assessment Unit		0827_01
Site		11038
Alkalinity	All	Not Significant
	Summer	↑
	Winter	Not Significant
Nitrate	All	Not Significant
	Summer	↑
	Winter	Not Significant
Total Phosphorus	All	↑
	Summer	↑
	Winter	Not Significant
E. coli	All	↑
	Summer	↑
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

A concern for excessive algal growth was identified in this segment. Algal growth in this reservoir is assessed against a narrative criteria as described in the TRA CRP 2019 Basin Highlights Report. As shown in Figure 240, chlorophyll-*a* levels were generally reported above the threshold of 29.73 µg/L. There were no strong correlations between chlorophyll-*a* and nutrients; the strongest correlation was with total kjeldahl nitrogen (correlation coefficient = 0.297). It is likely that residence times in the reservoir were allowing algal populations to increase. It does appear that algal populations were causing the decreasing trend for dissolved oxygen levels as shown in Figure 241. Dissolved oxygen levels are approaching the screening level of 5 mg/L and may soon cause concerns for this parameter.

There were increasing trends for *E. coli* in this segment that appear to be approaching a concern as shown in Figure 242. There was a weak correlation between *E. coli* and recent precipitation (correlation coefficient = -0.277). This indicates that bacteria were likely being washed into the reservoir from the watershed. As discussed for segment 0827A, there is a study underway to identify potential sources of *E. coli* in White Rock Creek. In addition to bacteria moving into the reservoir from White Rock Creek, the area around the reservoir is heavily developed with residential areas and parks. There is also a wooded area immediately upstream of the reservoir. Run-off carrying waste from pets and wildlife were likely contributing to the trend in this segment. Homeowner education and pet waste best management practices may help reduce bacteria levels.

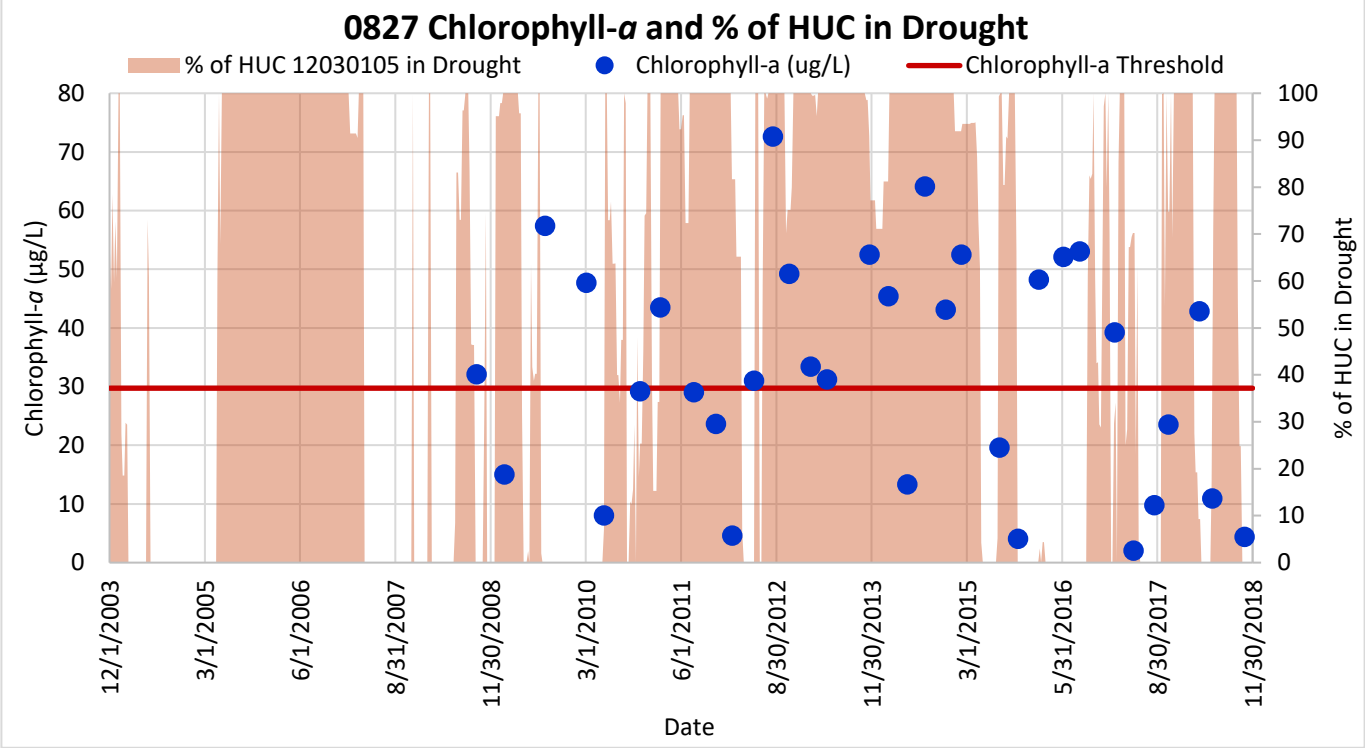


Figure 240: 0827 Chlorophyll-a and % of HUC in Drought

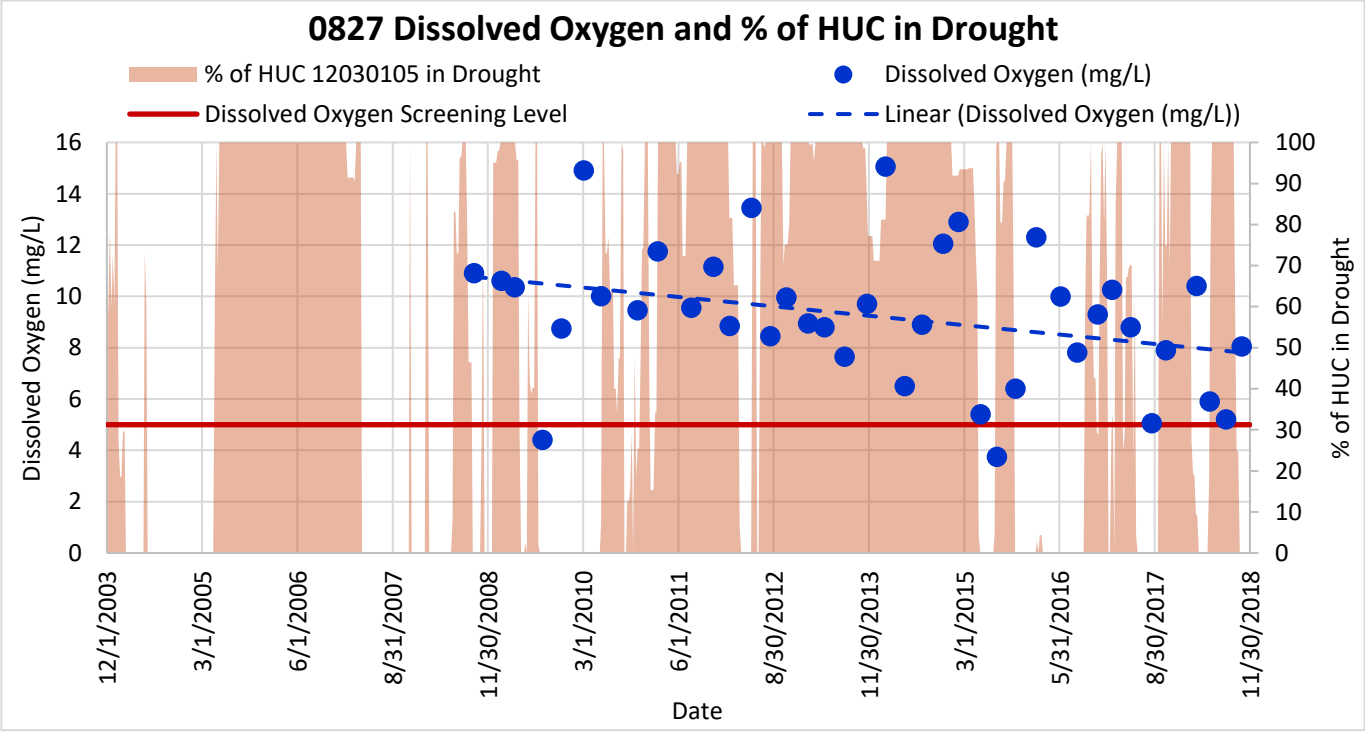


Figure 241: 0827 Dissolved Oxygen and % of HUC in Drought

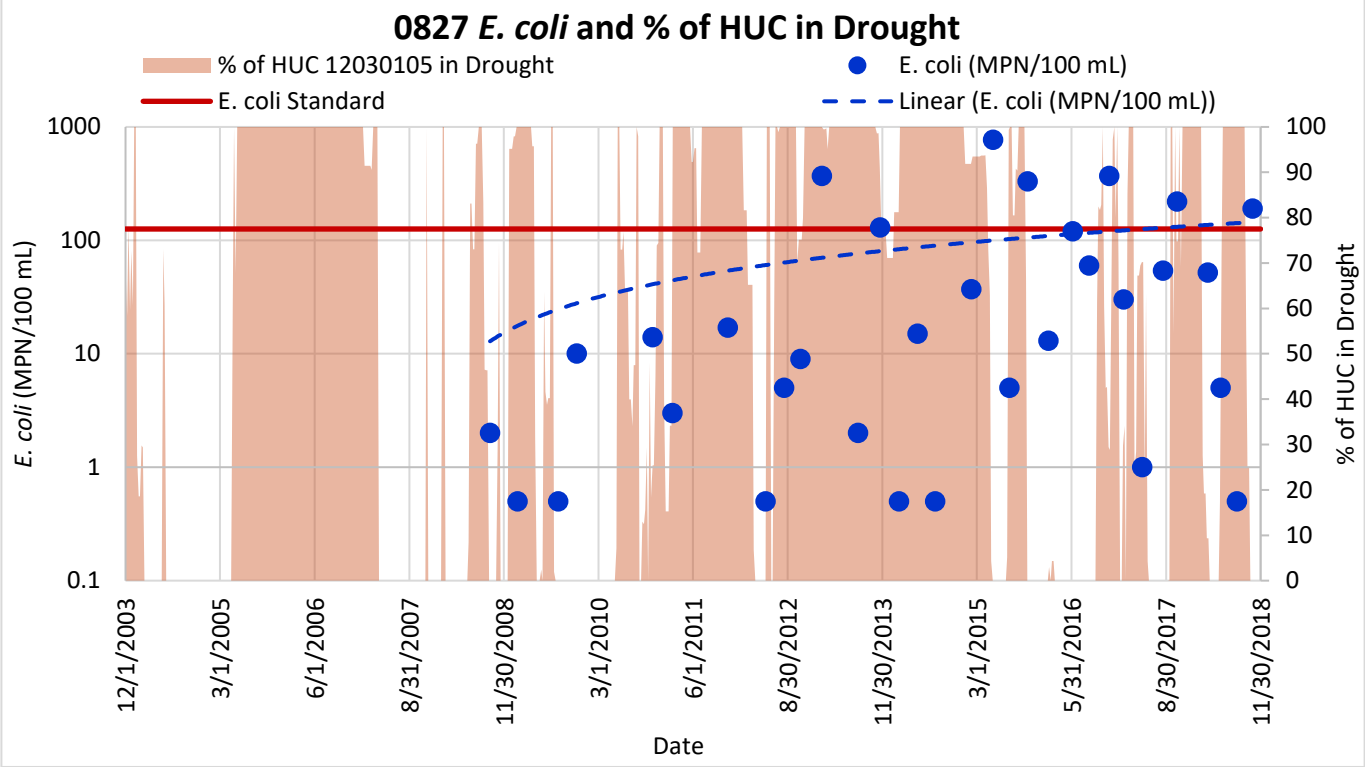


Figure 242: 0827 E. coli and % of HUC in Drought

0805C White Rock Creek Below White Rock Lake

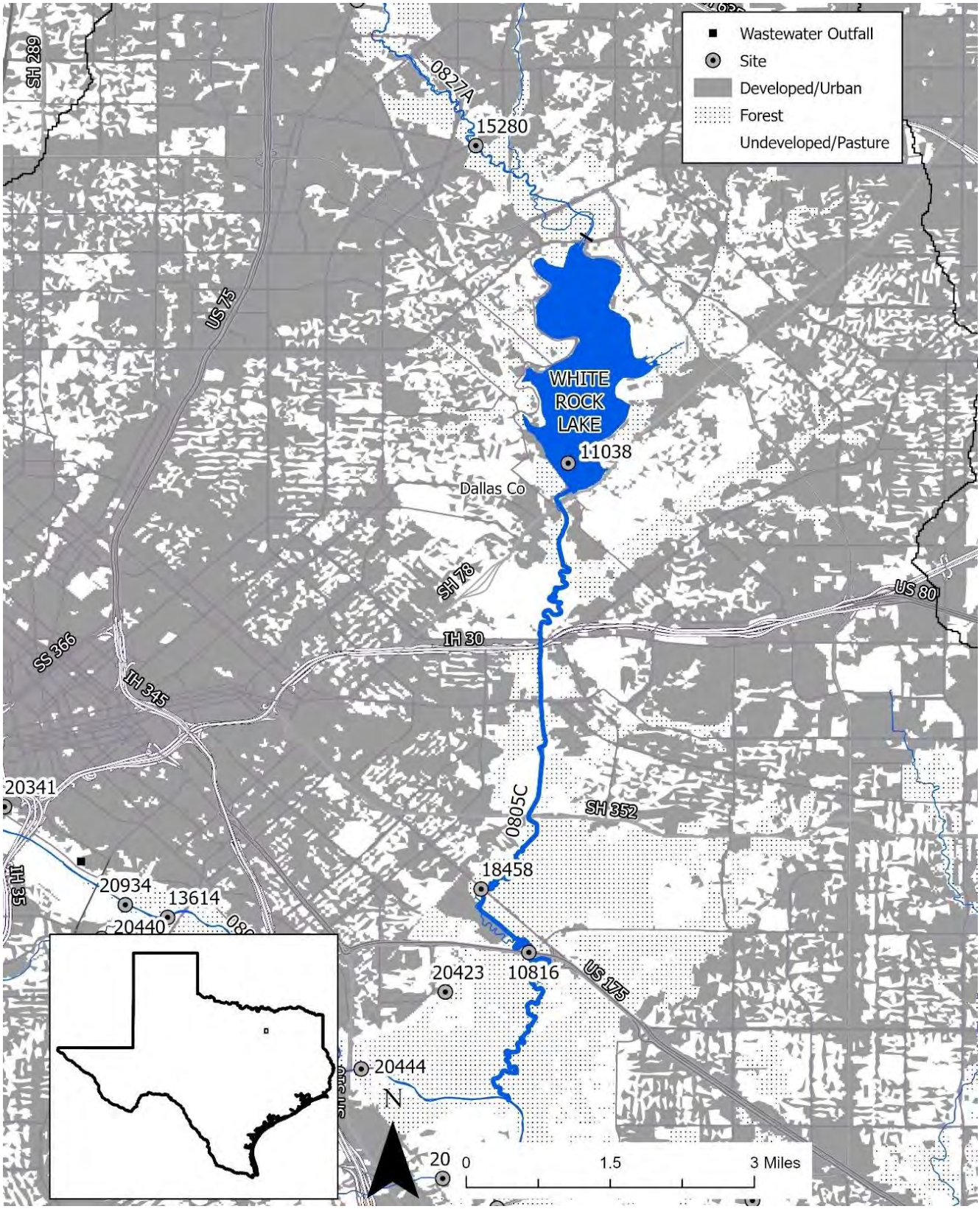


Figure 243: Segment 0805C Map

This unclassified segment is 9.5-mile stretch of White Rock Creek that runs from the White Rock Lake dam to the confluence with the Trinity River (see Figure 243). The upstream portion of the watershed is developed while the downstream portion is undeveloped forested wetland and lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0805C_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0805D Fivemile Creek

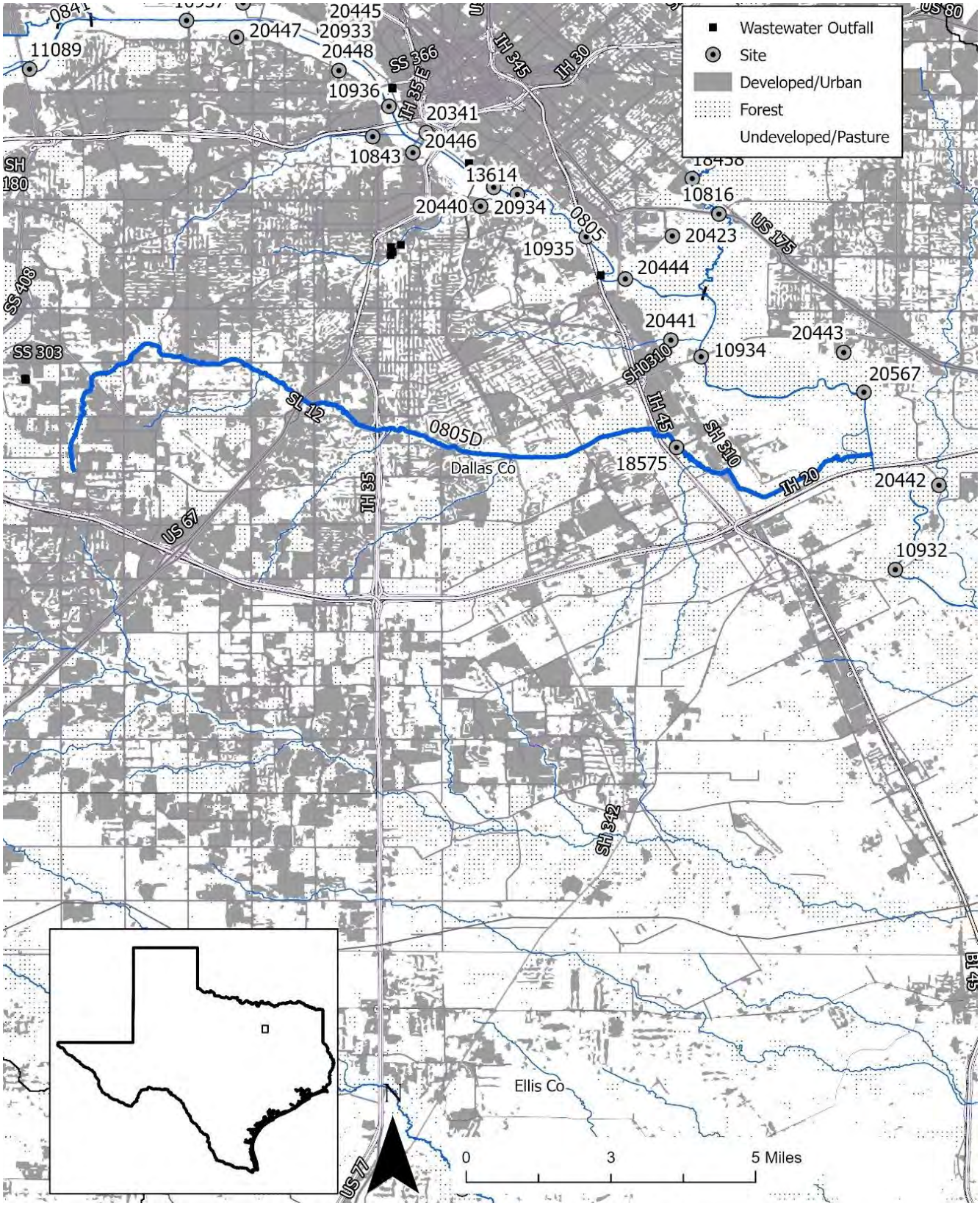


Figure 244: Segment 0805D Map

This unclassified segment is a 17-mile stretch of Fivemile Creek extending from the headwaters in Duncanville to the confluence with the Trinity River upstream (see Figure 244). The watershed is developed with wooded riparian areas and lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0805D_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0805B Parsons Slough

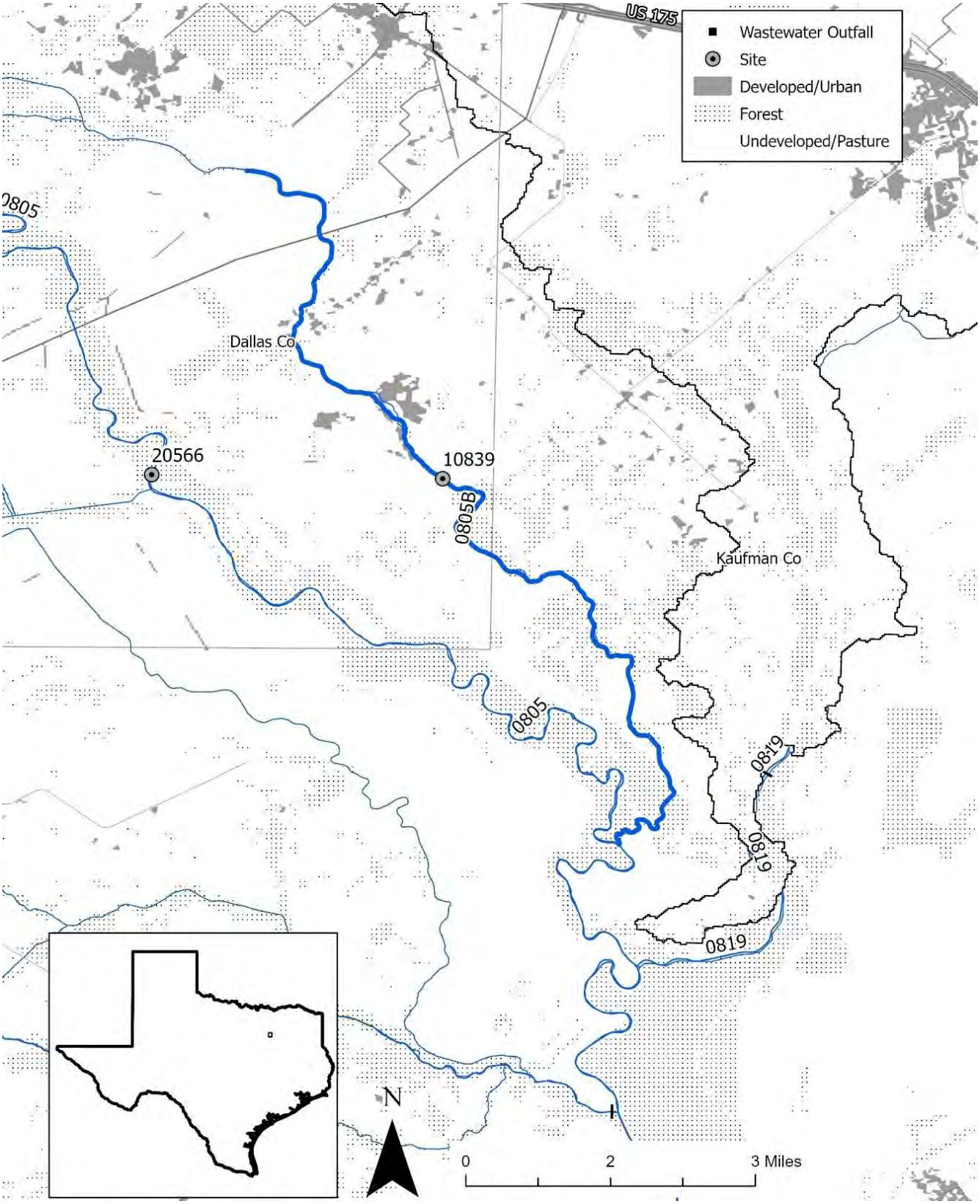


Figure 245: Segment 0805B Map

The unclassified segment is an 11-mile stretch of Parsons Slough running from Malloy Bridge Road in Dallas County to the confluence with the Trinity River in Kaufman County (see Figure 245). The watershed is rural with mostly pasture, hay, and crop land. It lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. No significant trends were identified during TRA data analysis.

0805A Red Oak Creek

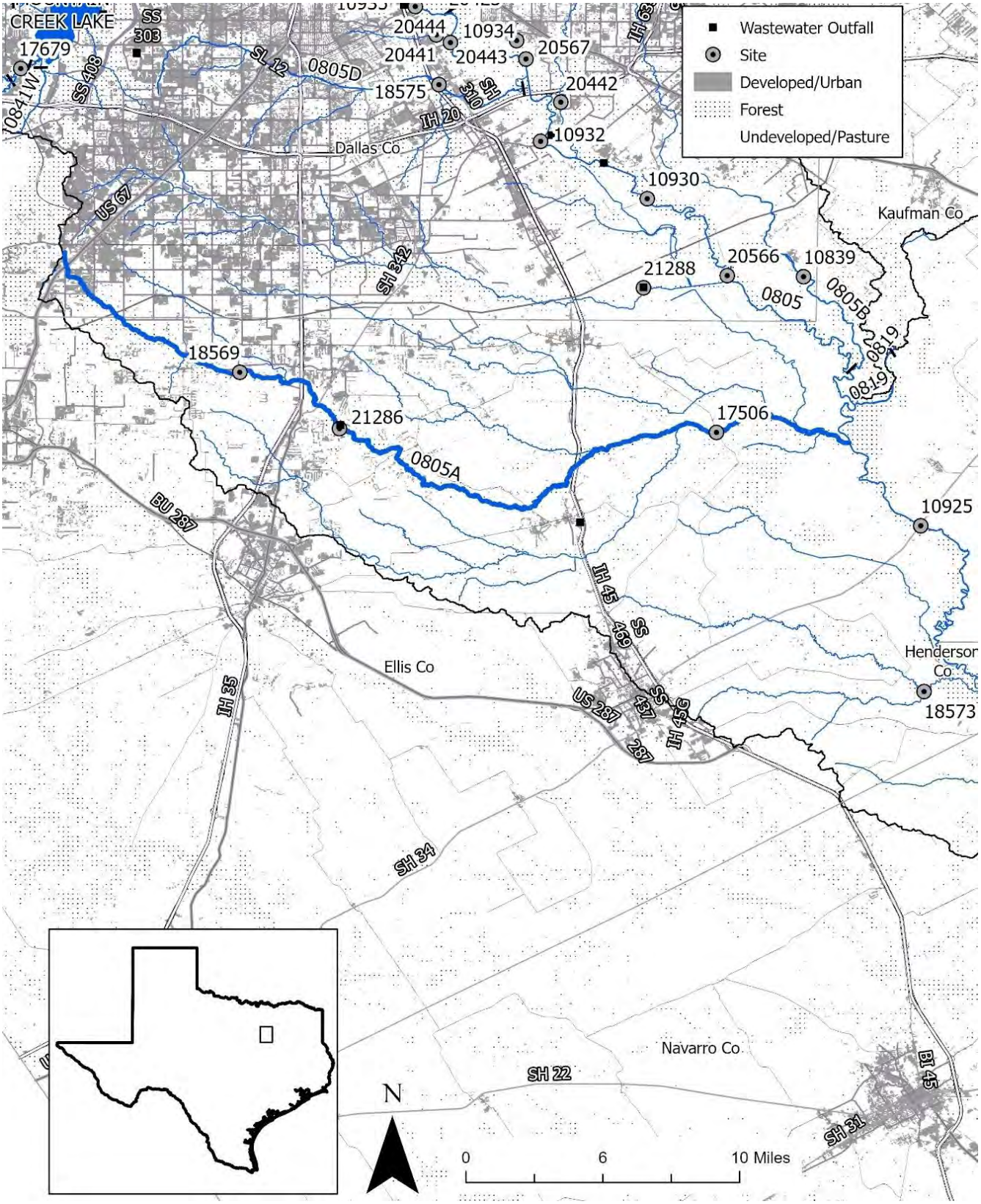


Figure 246: Segment 0805A Map

Red Oak Creek runs 42-miles runs from just upstream of US 287 in Cedar Hill to the confluence with the Trinity River (see Figure 246). The most upstream portion of the watershed is developed but the remainder is rural with pasture, hay, and crop land. It lies within Northern Blackland Prairie ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 200. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 200: Segment 0805A FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0805A_01	RED OAK CREEK 111 METERS DOWNSTREAM OF SHAWNEE ROAD	10842	TRA

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 201. No significant trends were identified during TRA data analysis.

Table 201: TCEQ 2020 Texas Integrated Report Summary for Segment 0805A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0805A_01 From confluence with segment 0805 Trinity River 12 mi upstream to I 45.	Aquatic Life Use	Fish Community		NA
0805A_01 From confluence with segment 0805 Trinity River 12 mi upstream to I 45.	Aquatic Life Use	Macrobenthic Community		NA
0805A_01 From confluence with segment 0805 Trinity River 12 mi upstream to I 45.	Aquatic Life Use	Habitat		NA

NA = Not Assessed

0804 Trinity River Above Lake Livingston

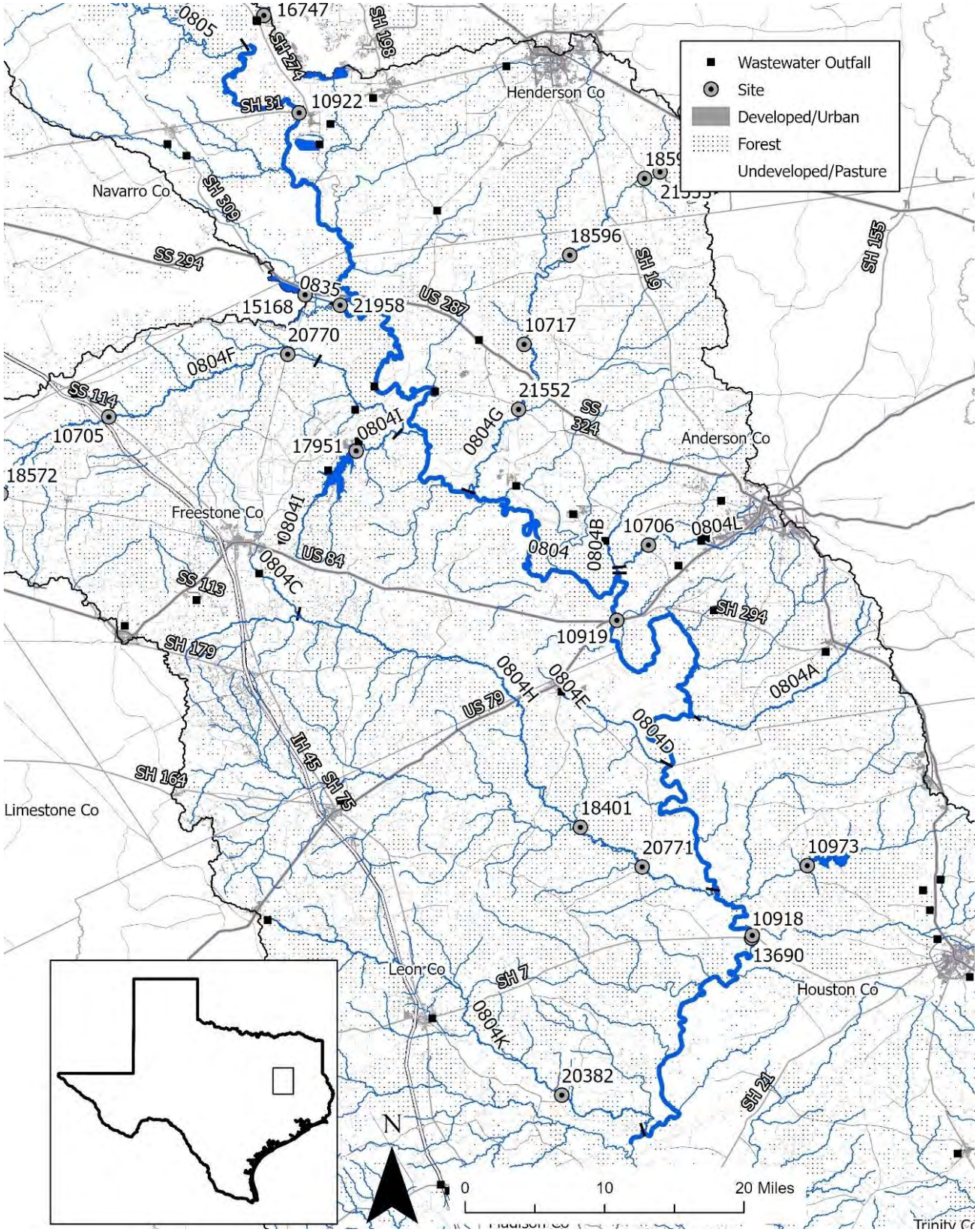


Figure 247: Segment 0804 Map

This 160-mile portion of the Trinity River begins at the confluence with the Cedar Creek Lake outfall canal and ends at the Lake Livingston headwaters southwest of Crockett (see Figure 247). This segment is generally considered the “Middle Trinity” and runs through the Northern and Southern Post Oak Savanna as well as the Tertiary Uplands ecoregions. The watershed is largely rural with some larger communities including Athens, Palestine, Fairfield, and Crockett. Land use in the watershed is largely hay and pasture land with some small pockets of crop land, grassland, and forest.

Clean Rivers Program water quality monitoring is being conducted at three sites within this segment as shown in Table 202. Monitoring is being conducted by the TRA Lake Livingston Project and TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 202: Segment 0804 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0804_01	TRINITY RIVER 304 METERS UPSTREAM OF SH 7 11.9 MI WEST OF CROCKETT	13690	TRA Lake Livingston Project
0804_04	TRINITY RIVER IMMEDIATELY DOWNSTREAM OF US 79 NORTHEAST OF OAKWOOD	10919	TRA
0804_07	TRINITY RIVER AT SH 31 IN TRINIDAD	10922	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 203. Results of TRA trend analyses are shown in Table 204.

Table 203: TCEQ 2020 Texas Integrated Report Summary for Segment 0804

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	Aquatic Life Use	Acute Toxic Substances in water		FS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	Aquatic Life Use	Acute Toxic Substances in water		FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	Aquatic Life Use	Acute Toxic Substances in water		FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	Aquatic Life Use	Chronic Toxic Substances in water		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	Aquatic Life Use	Chronic Toxic Substances in water		FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	Ammonia	0.33 mg/L	NC
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	Ammonia	0.33 mg/L	NC
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	Ammonia	0.33 mg/L	NC
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	Nitrate	1.95 mg/L	CS
0804_02 From upstream of confluence with Hurricane Bayou to above confluence with Boons Creek	General Use	Nitrate	1.95 mg/L	CS
0804_03 From upstream of confluence with Boons Creek up to above confluence with Caney Creek	General Use	Nitrate	1.95 mg/L	CS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	Nitrate	1.95 mg/L	CS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	Nitrate	1.95 mg/L	CS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	Total Phosphorus	0.69 mg/L	CS
0804_02 From upstream of confluence with Hurricane Bayou to above confluence with Boons Creek	General Use	Total Phosphorus	0.69 mg/L	CS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	Total Phosphorus	0.69 mg/L	CS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	Total Phosphorus	0.69 mg/L	CS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0804_02 From upstream of confluence with Hurricane Bayou to above confluence with Boons Creek	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	pH	6.5 - 9 S.U.	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	pH	6.5 - 9 S.U.	FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	pH	6.5 - 9 S.U.	FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	Chloride	150 mg/L	FS
0804_02 From upstream of confluence with Hurricane Bayou to above confluence with Boons Creek	General Use	Chloride	150 mg/L	FS
0804_03 From upstream of confluence with Boons Creek up to above confluence with Caney Creek	General Use	Chloride	150 mg/L	FS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	Chloride	150 mg/L	FS
0804_05 From above confluence with Indian Creek Anderson Co. up to above confluence with Tehuacana Creek	General Use	Chloride	150 mg/L	FS
0804_06 From above confluence with Tehuacana Creek to above confluence with Richland Creek	General Use	Chloride	150 mg/L	FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	Chloride	150 mg/L	FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	Sulfate	150 mg/L	FS
0804_02 From upstream of confluence with Hurricane Bayou to above confluence with Boons Creek	General Use	Sulfate	150 mg/L	FS
0804_03 From upstream of confluence with Boons Creek up to above confluence with Caney Creek	General Use	Sulfate	150 mg/L	FS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	Sulfate	150 mg/L	FS
0804_05 From above confluence with Indian Creek Anderson Co. up to above confluence with Tehuacana Creek	General Use	Sulfate	150 mg/L	FS
0804_06 From above confluence with Tehuacana Creek to above confluence with Richland Creek	General Use	Sulfate	150 mg/L	FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	Sulfate	150 mg/L	FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	Total Dissolved Solids	600 mg/L	FS
0804_02 From upstream of confluence with Hurricane Bayou to above confluence with Boons Creek	General Use	Total Dissolved Solids	600 mg/L	FS
0804_03 From upstream of confluence with Boons Creek up to above confluence with Caney Creek	General Use	Total Dissolved Solids	600 mg/L	FS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	Total Dissolved Solids	600 mg/L	FS
0804_05 From above confluence with Indian Creek Anderson Co. up to above confluence with Tehuacana Creek	General Use	Total Dissolved Solids	600 mg/L	FS
0804_06 From above confluence with Tehuacana Creek to above confluence with Richland Creek	General Use	Total Dissolved Solids	600 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	Total Dissolved Solids	600 mg/L	FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	General Use	Water temperature	33.9 °F	FS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	General Use	Water temperature	33.9 °F	FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	General Use	Water temperature	33.9 °F	FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0804_02 From upstream of confluence with Hurricane Bayou to above confluence with Boons Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0804_03 From upstream of confluence with Boons Creek up to above confluence with Caney Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0804_05 From above confluence with Indian Creek Anderson Co. up to above confluence with Tehuacana Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0804_06 From above confluence with Tehuacana Creek to above confluence with Richland Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0804_01 From lower end of segment up to just above confluence with Hurricane Bayou in Houston Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0804_02 From upstream of confluence with Hurricane Bayou to above confluence with Boons Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0804_03 From upstream of confluence with Boons Creek up to above confluence with Caney Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804_04 From confluence with Caney Creek to just above confluence with Indian Creek in Anderson Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0804_05 From above confluence with Indian Creek Anderson Co. up to above confluence with Tehuacana Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0804_06 From above confluence with Tehuacana Creek to above confluence with Richland Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0804_07 From just above confluence with Richland Creek in Henderson County to upper end of segment	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment units 0804_02, 0804_03, and 0804_05 for the period of record for this basin summary report. Data for assessment unit 0804_06 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 204: Significant Trends for Segment 0804 (P-value<0.1)

Segment & Assessment Unit		0804_01	0804_04	0804_07
Site		13690	10919	10922
Nitrite	All	No Trend	No Trend	↓
	Summer	No Trend	↓	↓
	Winter	No Trend	No Trend	Not Significant
Total Kjeldahl Nitrogen	All	No Trend	No Trend	Not Significant
	Summer	No Trend	Not Significant	Not Significant
	Winter	No Trend	Not Significant	↓
Dissolved Copper	All	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant
	Winter	No Trend	Not Significant	↓
Dissolved Iron	All	Not Significant	↑	↑
	Summer	Not Significant	Not Significant	↑
	Winter	↑	↑	Not Significant
Dissolved Nickel	All	No Trend	Not Significant	No Trend
	Summer	↓	Not Significant	Not Significant
	Winter	↓	Not Significant	No Trend
Dissolved Zinc	All	Not Significant	↓	Not Significant
	Summer	Not Significant	No Trend	Not Significant
	Winter	Not Significant	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

Concerns for nitrate and total phosphorus were identified for several assessment units in this segment. As shown in Figure 248 for the most downstream assessment unit 0804_01, these concerns were related to flows. At lower flows, concentrations of these parameters increased and decreased with increasing flow as freshwater inflows from precipitation provide dilution. As previously discussed, this pattern is common for effluent-dominated streams. There are several large wastewater treatment facilities upstream of and in this segment. Most wastewater treatment facilities do not have advanced nutrient removal technology at this time. Although there were concerns for chlorophyll-*a* identified for several assessment units, it does not appear that algal populations were excessively influencing dissolved oxygen levels in this portion of the river. Of 392 dissolved oxygen readings, there were no values reported below 3 mg/L and only one value reported below 5 mg/L.

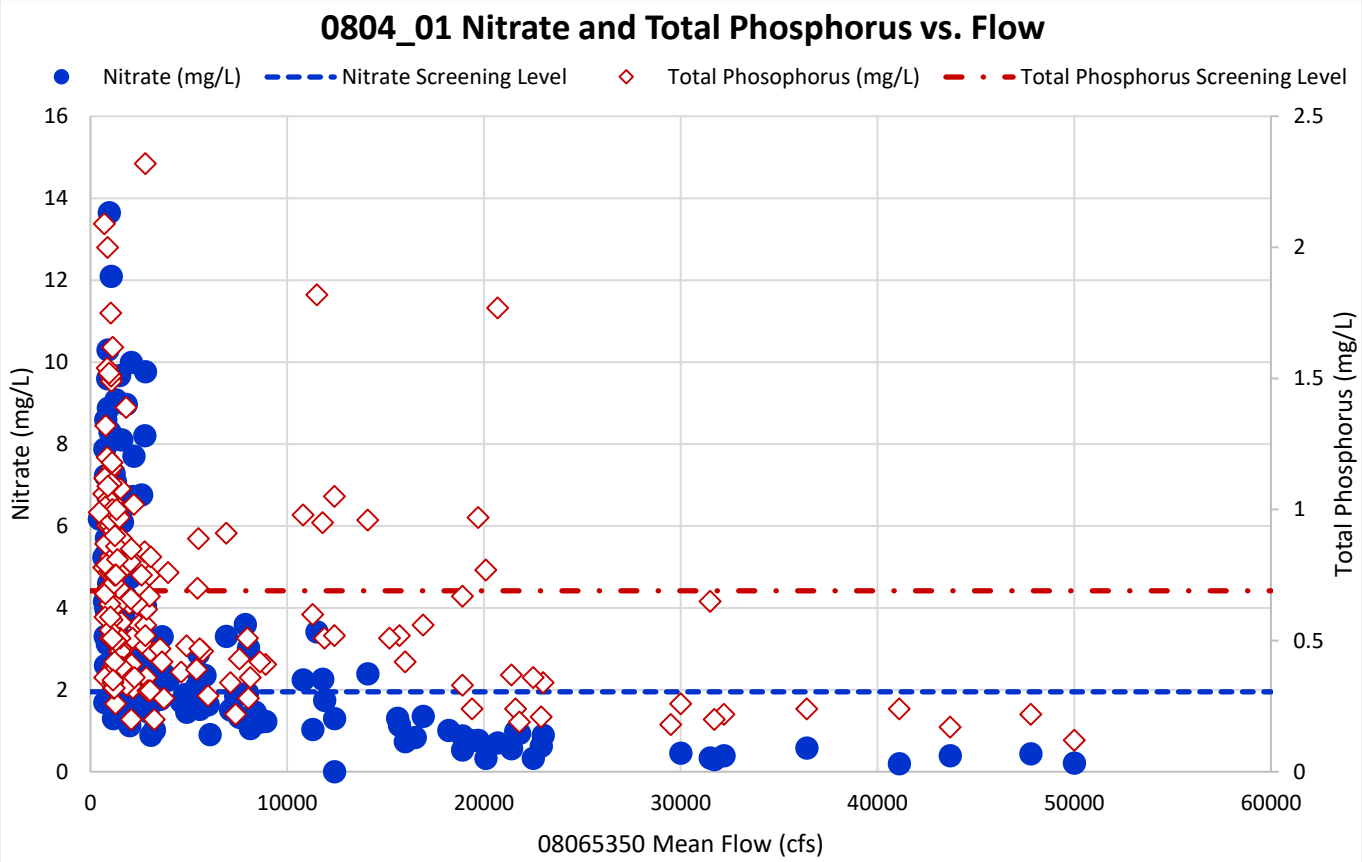


Figure 248: 0804_01 Nitrate and Total Phosphorus vs. Flow

The impairments for fish consumption use are based on unsafe levels of PCBs and dioxins in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 43 and Advisory 53) to advise against the consumption of several species of fish. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

Increasing trends for dissolved iron in assessment unit 0804_01, 0804_04, and 0804_07 appear to have been false trends introduced by censoring of non-detect data and do not represent true changes in water quality.

0835 Richland Creek Below Richland-Chambers Reservoir

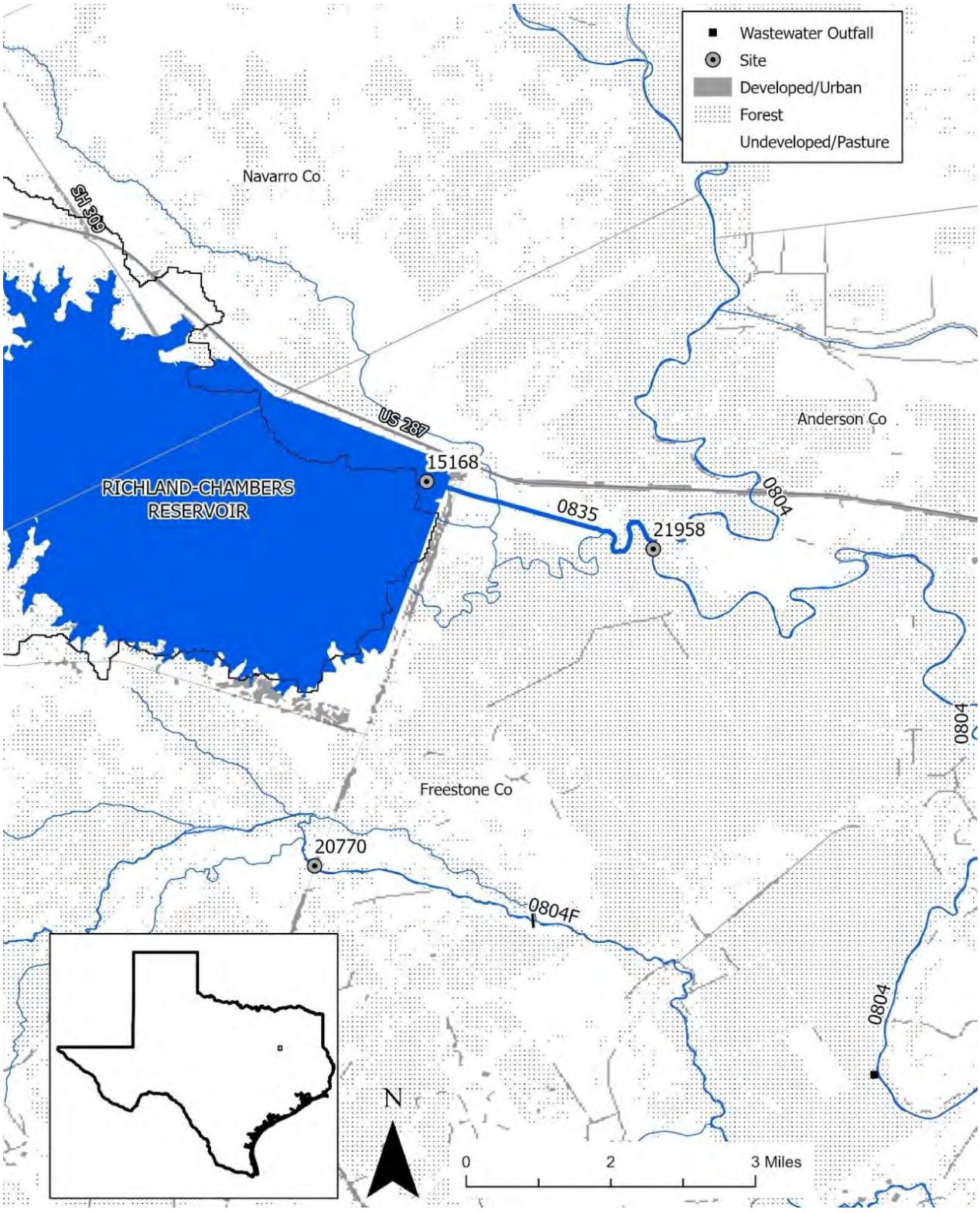


Figure 249: Segment 0835 Map

This 2.5-mile segment runs from the Richland-Chambers dam in Freestone County to the confluence of the Trinity River (see Figure 249). The watershed is undeveloped with grassland and wooded wetland and lies within the Southern Post Oak Savanna. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0835_01 for the period of record for this basin summary report.

0804I Big Brown Creek

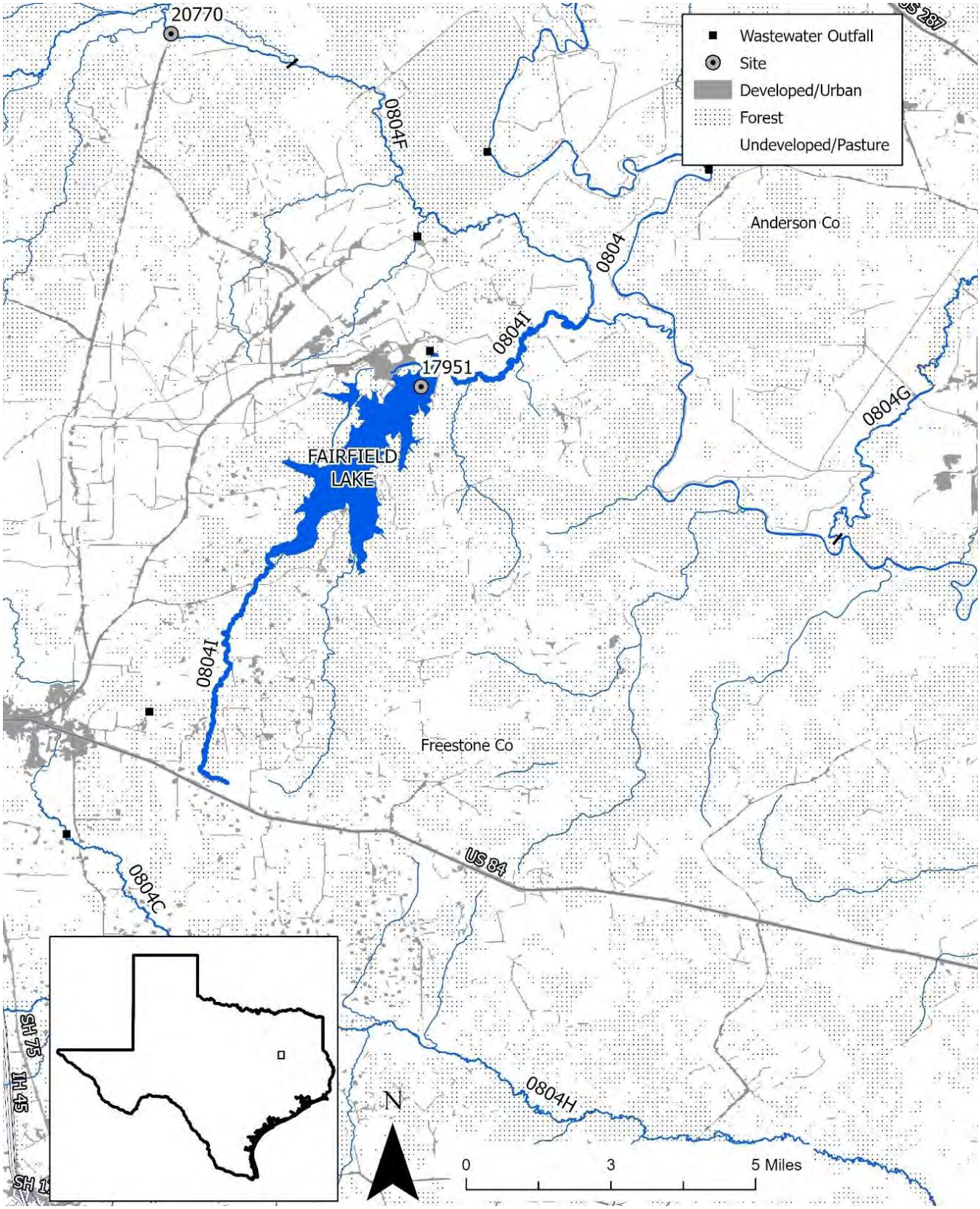


Figure 250: Segment 0804I Map

This 11-mile unclassified segment runs from the headwaters near US 84 outside of Fairfield to the confluence with Tehuacana Creek (see Figure 250). Fairfield Lake, segment 0804J, lies in the middle of this segment. The watershed is rural and consists mainly of hay and pasture land with wooded wetlands around the lake and lies within the Southern Post Oak Savanna. There are several oil and gas drilling pads in the upstream portion of the watershed as well as a sand and gravel mine to the east of Fairfield Lake. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment units 0804I_01 and 0804I_02 for the period of record for this basin summary report.

0804J Fairfield Lake

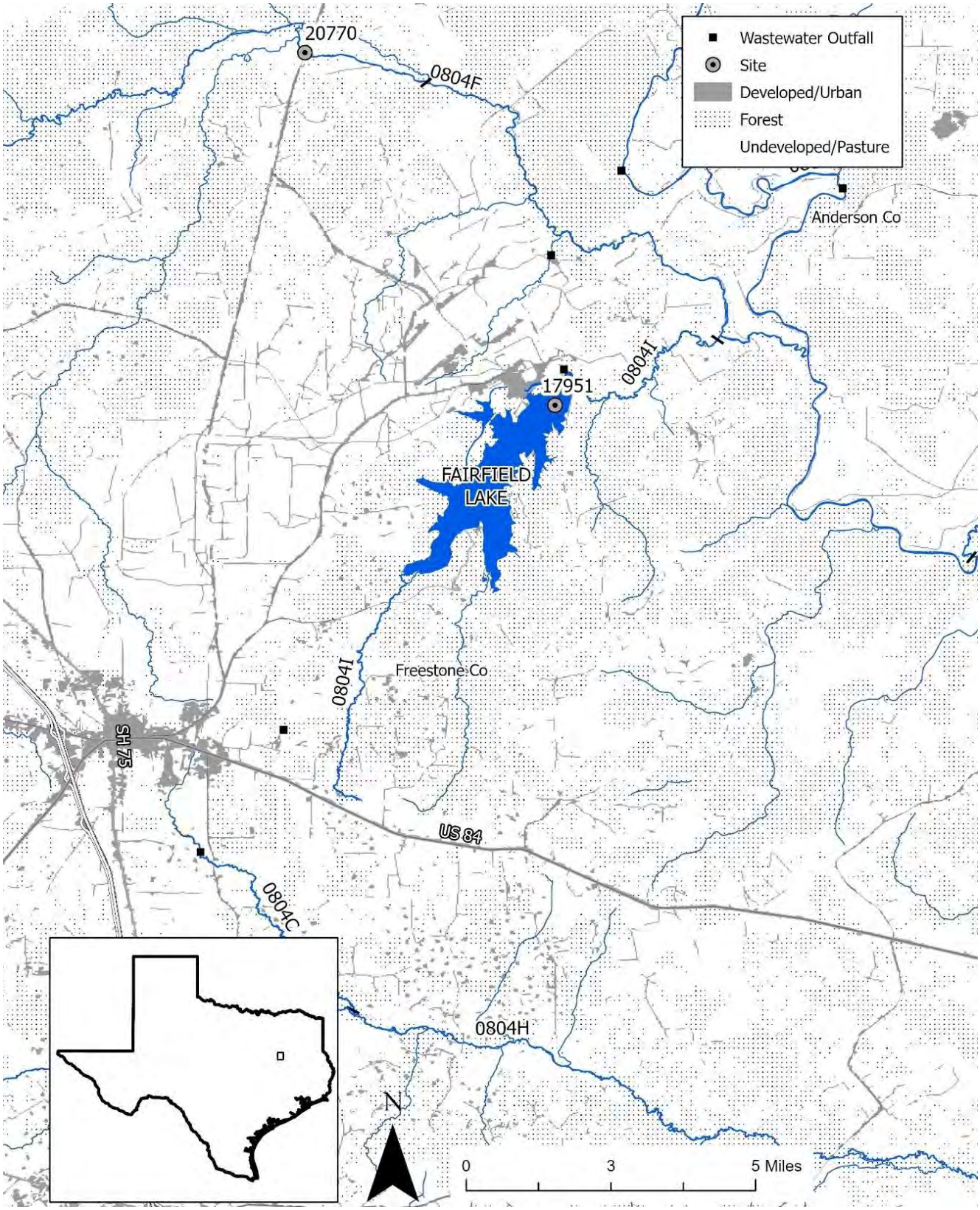


Figure 251: Segment 0804J Map

Fairfield Lake is a 2172-acre reservoir that impounds Big Brown Creek outside of Fairfield (see Figure 251). The watershed is rural and consists mainly of hay and pasture land with wooded wetlands around the lake and lies within the Southern Post Oak Savanna. Big Brown Power Plant lies on the north shore of the reservoir. Fairfield Lake was constructed to provide cooling water for this plant. Operations at the plant ended in 2018. Fairfield Lake has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 205. Monitoring is being conducted by TCEQ Region 9. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 205: Segment 0804J FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0804J_01	FAIRFIELD LAKE IN MAIN POOL 751 METERS SOUTH AND 503 METERS WEST OF NORTH END OF DAM 12.9 KM NORTHEAST OF FAIRFIELD	17951	TCEQ Region 9

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 206. Results of TRA trend analyses are shown in Table 207.

Table 206: TCEQ 2020 Texas Integrated Report Summary for Segment 0804J

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804J_01 Impounded Big Brown Creek in Freestone Co	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0804J_01 Impounded Big Brown Creek in Freestone Co	Aquatic Life Use	Toxic Substances in sediment		NC
0804J_01 Impounded Big Brown Creek in Freestone Co	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0804J_01 Impounded Big Brown Creek in Freestone Co	General Use	Ammonia	0.11 mg/L	NA
0804J_01 Impounded Big Brown Creek in Freestone Co	General Use	Nitrate	0.37 mg/L	NA
0804J_01 Impounded Big Brown Creek in Freestone Co	General Use	Total Phosphorus	0.2 mg/L	NA
0804J_01 Impounded Big Brown Creek in Freestone Co	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0804J_01 Impounded Big Brown Creek in Freestone Co	General Use	Fish Kill Reports		CN

CN = Use Concern FS = Fully Supporting NA = Not Assessed NC = No Concern

Table 207: Significant Trends for Segment 0804J (P-value<0.1)

Segment & Assessment Unit		0804J_01
Site		17951
Secchi Depth	All	↑
	Summer	↑
	Winter	↑
Specific Conductance	All	Not Significant
	Summer	↓
	Winter	Not Significant
Dissolved Oxygen	All	No Trend
	Summer	Not Significant
	Winter	↓

Segment & Assessment Unit		0804J_01
Site		17951
pH	All	Not Significant
	Summer	No Trend
	Winter	↓
Total Suspended Solids	All	↓
	Summer	Not Significant
	Winter	↓
Volatile Suspended Solids	All	↓
	Summer	Not Significant
	Winter	↓
Total Kjeldahl Nitrogen	All	↓
	Summer	↓
	Winter	↓
Total Organic Carbon	All	↓
	Summer	↓
	Winter	↓
Sulfate	All	Not Significant
	Summer	↓
	Winter	Not Significant
Fluoride	All	No Trend
	Summer	↓
	Winter	↓
Chlorophyll-*a*	All	↓
	Summer	Not Significant
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

Concerns for fish kills have been identified in Fairfield Lake. Several fish kills have been reported since 2003. The reports indicate that low dissolved oxygen due to algal blooms were the cause of these fish kills. Decreasing winter trends for dissolved oxygen and pH were also identified for this reservoir which may lead to additional fish kills in the future and were relatively well correlated to chlorophyll-*a* (correlation coefficients = 0.404 and 0.342, respectively).

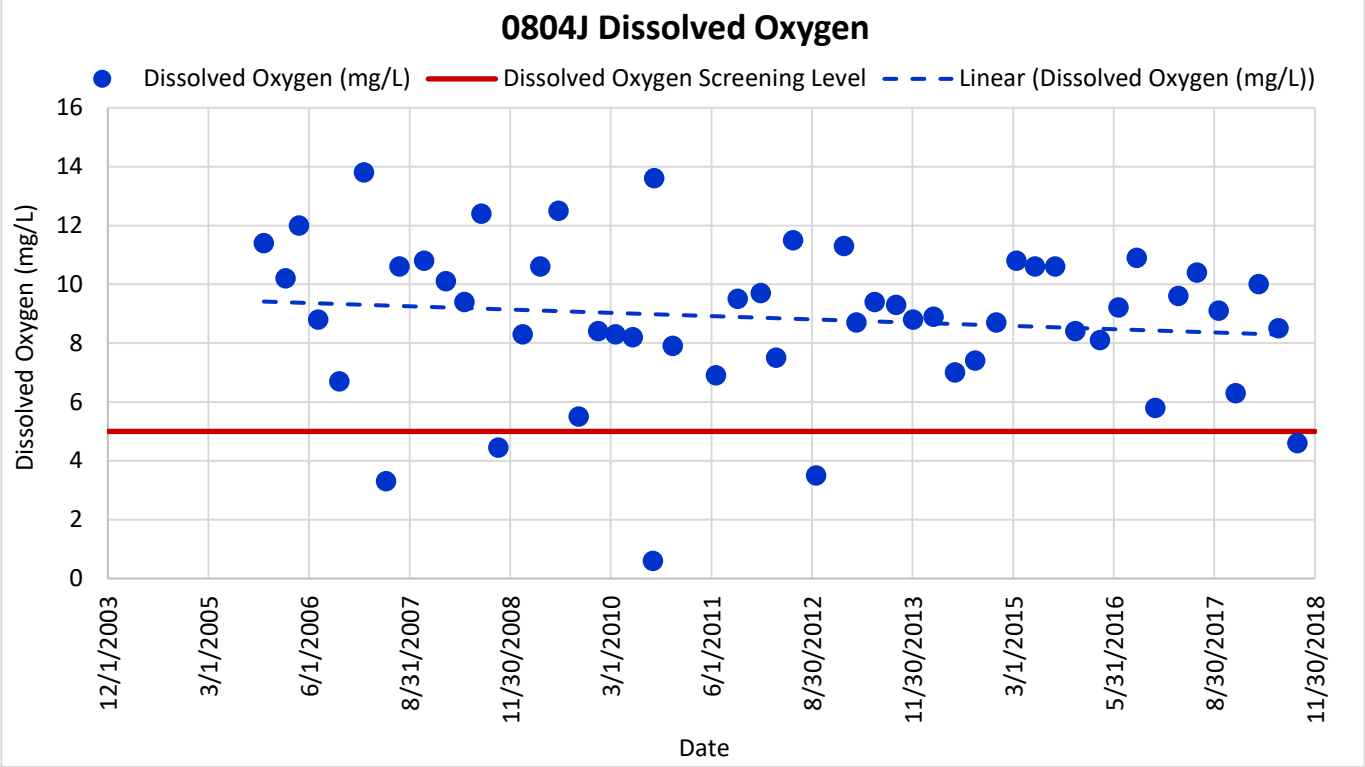


Figure 252: 0804J Dissolved Oxygen

0804F Tehuacana Creek

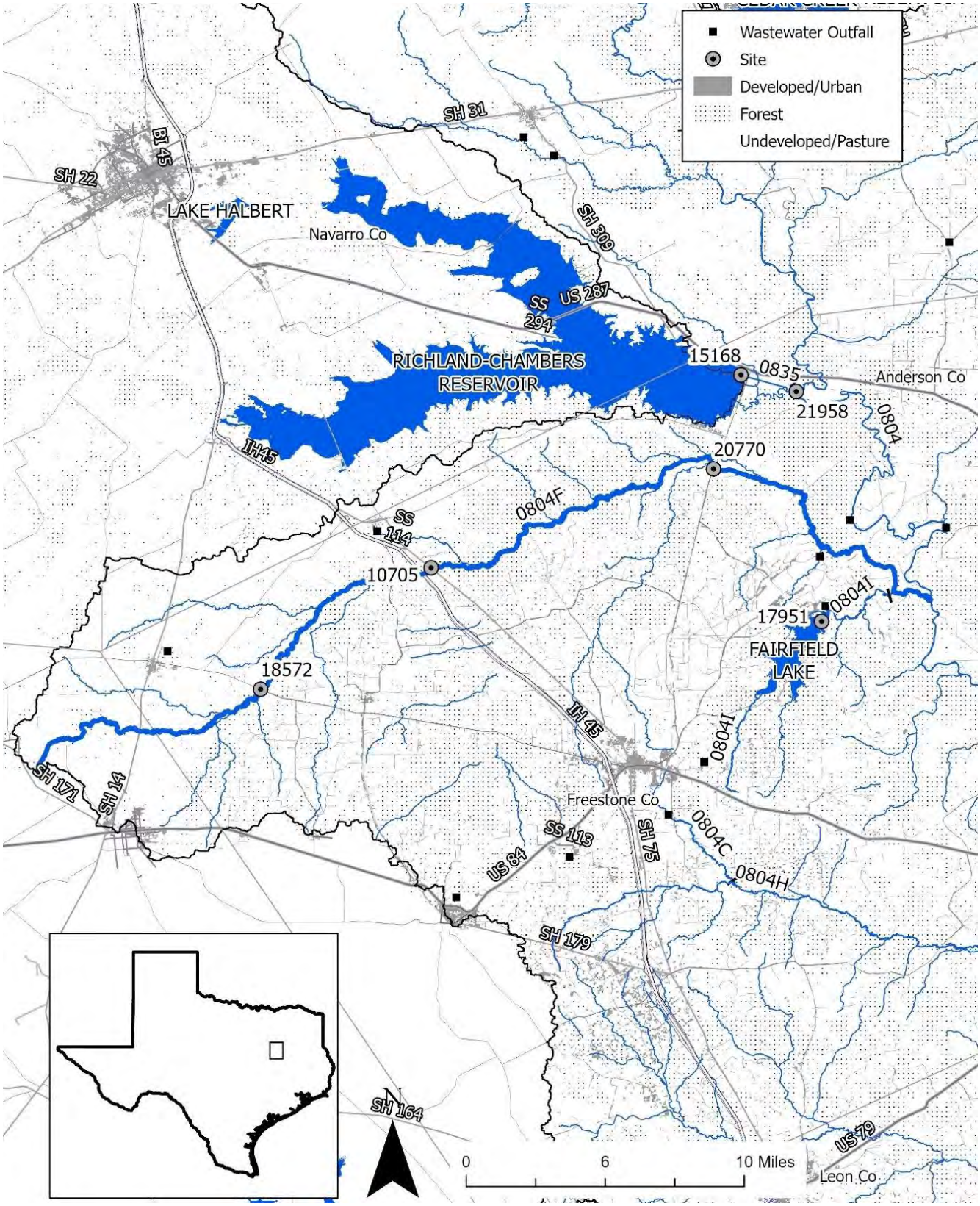


Figure 253: Segment 0804F Map

This 61-mile unclassified segment runs from the headwaters northwest of Mexia to the confluence with the Trinity River northeast of Fairfield (see Figure 253). The watershed is largely rural with hay, pasture, and grassland and flows through the Northern Blackland Prairie and Southern Post Oak Savanna ecoregions.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 208. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 208: Segment 0804F FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0804F_02	TEHUACANA CREEK 20 METERS DOWNSTREAM OF SH 75 SOUTHEAST OF STREETMAN	10705	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 209. No significant trends were identified during TRA data analysis.

Table 209: TCEQ 2020 Texas Integrated Report Summary for Segment 0804F

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0804F_02 A 28.4 mi stretch of Tehuacana Creek from confluence with Caney Creek to the upper end of creek	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	Aquatic Life Use	Acute Toxic Substances in water		FS
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	Aquatic Life Use	Chronic Toxic Substances in water		FS
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0804F_02 A 28.4 mi stretch of Tehuacana Creek from confluence with Caney Creek to the upper end of creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	General Use	Ammonia	0.33 mg/L	NC
0804F_02 A 28.4 mi stretch of Tehuacana Creek from confluence with Caney Creek to the upper end of creek	General Use	Ammonia	0.33 mg/L	NC
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	General Use	Nitrate	1.95 mg/L	NC
0804F_02 A 28.4 mi stretch of Tehuacana Creek from confluence with Caney Creek to the upper end of creek	General Use	Nitrate	1.95 mg/L	NC
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	General Use	Total Phosphorus	0.69 mg/L	NC
0804F_02 A 28.4 mi stretch of Tehuacana Creek from confluence with Caney Creek to the upper end of creek	General Use	Total Phosphorus	0.69 mg/L	NC

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0804F_01 27 mi stretch from confluence with segment 0804 up to confluence with Caney Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0804F_02 A 28.4 mi stretch of Tehuacana Creek from confluence with Caney Creek to the upper end of creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CN = Use Concern CS = Screening Level Concern FS = Fully Supporting NC = No Concern

There were no data available in assessment unit 0804F_01 for the period of record for this basin summary report. No significant trends were identified in assessment unit 0804F_02.

Concerns for *E. coli* were identified in this segment. *E. coli* data in assessment units 0804F_01 and 0804F_02 were limited. As shown in Figure 254, there was a clear relationship between high *E. coli* levels and elevated flows. This indicates that these concerns were run-off related. The watershed upstream of the monitoring stations in this segment is rural with mostly grassland and some forested areas. Therefore, livestock and wildlife were the most likely sources of bacteria. Landowner education and livestock best management practices may help reduce bacteria in this segment.

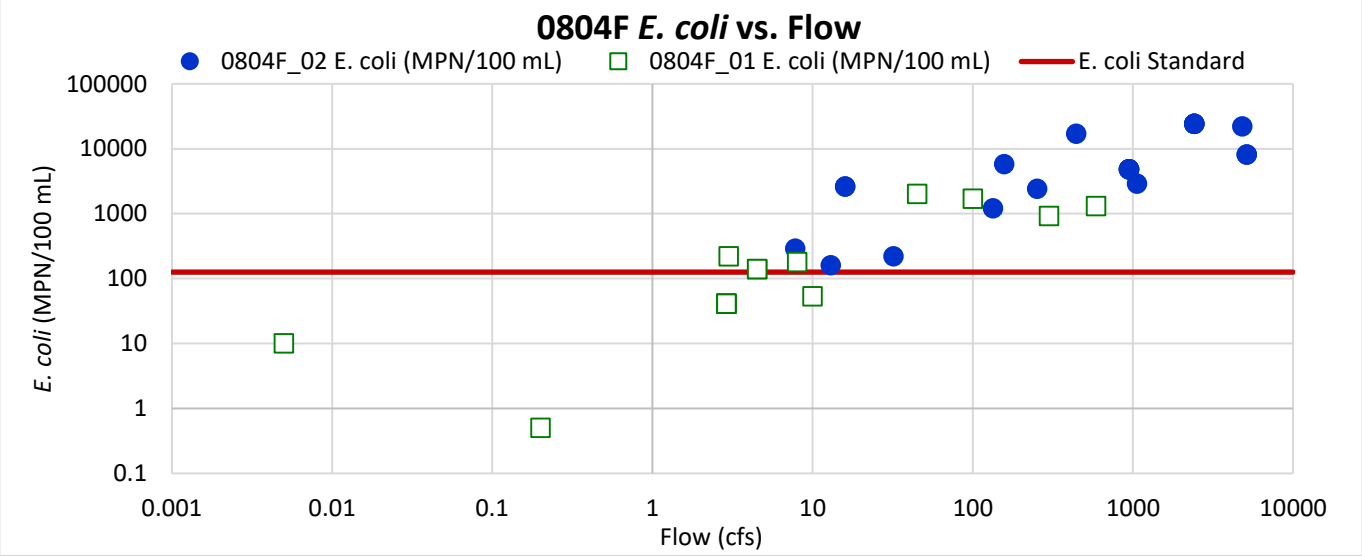


Figure 254: 0804F E. coli vs. Flow

A concern for chlorophyll-*a* was identified in assessment unit 0804F_01. There was a strong correlation between chlorophyll-*a* and total kjeldahl nitrogen (correlation coefficient = 0.775). However, there was no correlation between flow and total kjeldahl nitrogen. This indicates that there may be a mix of both direct consistent and run-off related sources. These sources could include livestock and failing septic systems. It is recommended that upstream sampling be conducted in order to identify potential sources of nitrogen that may be increasing algal populations.

0804G Catfish Creek

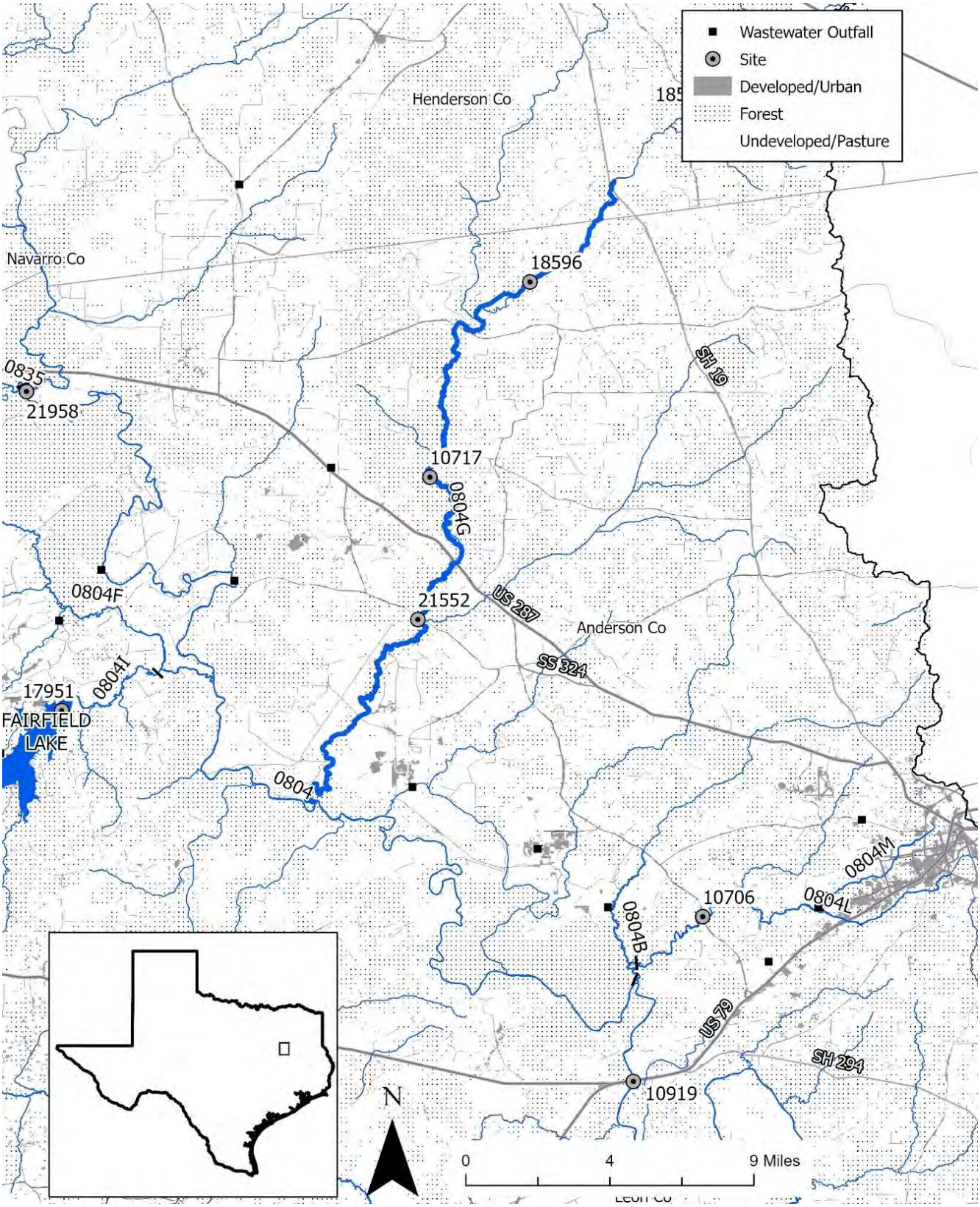


Figure 255: Segment 0804G Map

This unclassified segment is a 35-mile stretch of Catfish Creek running from Catfish Creek Ranch Lake just upstream of SH 19 in Henderson County to the confluence with the Trinity River (see Figure 255). The watershed is rural and is mainly hay and pasture land with some grassland and small areas of forest. It lies within the Northern Post Oak Savanna.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 210. Monitoring is being conducted by TCEQ Region 5. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 210: Segment 0804G FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0804G_01	CATFISH CK IMMEDIATELY DNSTM OF UNNAMED RD 1.70 KM DOWNSTREAM OF CONFLUENCE WITH LONG CREEK IN ENGLING WMA AT CAMP SITE 3 2.6 MILES E OF BETHEL	10717	TCEQ Region 5

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 211. Results of TRA trend analyses are shown in Table 212.

Table 211: TCEQ 2020 Texas Integrated Report Summary for Segment 0804G

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NS
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	Aquatic Life Use	Fish Community		NA
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	Aquatic Life Use	Macrobenthic Community		NA
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	Aquatic Life Use	Habitat		NA
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	General Use	Ammonia	0.33 mg/L	NC
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	General Use	Nitrate	1.95 mg/L	NC
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	General Use	Total Phosphorus	0.69 mg/L	NC
0804G_01 20 mi stretch from US 287, Anderson Co. to Catfish Ck Ranch Lake upstream of SH 19, Henderson Co.	General Use	Chlorophyll-*a*	14.1 µg/L	NC

NA = Not Assessed NC = No Concern NS = Not Supporting

Table 212: Significant Trends for Segment 0804G (P-value<0.1)

Segment & Assessment Unit		0804G_01
Site		10717
Volatile Suspended Solids	All	No Trend
	Summer	↓
	Winter	No Trend

Segment & Assessment Unit		0804G_01
Site		10717
Nitrate	All	Not Significant
	Summer	Not Significant
	Winter	↑
Chloride	All	↓
	Summer	↓
	Winter	↓
Sulfate	All	Not Significant
	Summer	↓
	Winter	Not Significant
Flow Severity	All	↑
	Summer	Not Significant
	Winter	↑
Total Dissolved Solids	All	↓
	Summer	No Trend
	Winter	↓
Chlorophyll-*a*	All	No Trend
	Summer	No Trend
	Winter	↑
Days Since Precipitation	All	Not Significant
	Summer	Not Significant
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

This segment is impaired due to depressed dissolved oxygen. As shown in Figure 256, dissolved oxygen was frequently reported below the 24-hour average standard of 5 mg/L. It appears that the impairment may have been due to low stream flows; the correlation coefficient between dissolved oxygen and measured flow was 0.549 and estimated flow was 0.352. Algal populations are not likely to be causing the impairment as the correlation coefficient between chlorophyll-*a* and dissolved oxygen was -0.021.

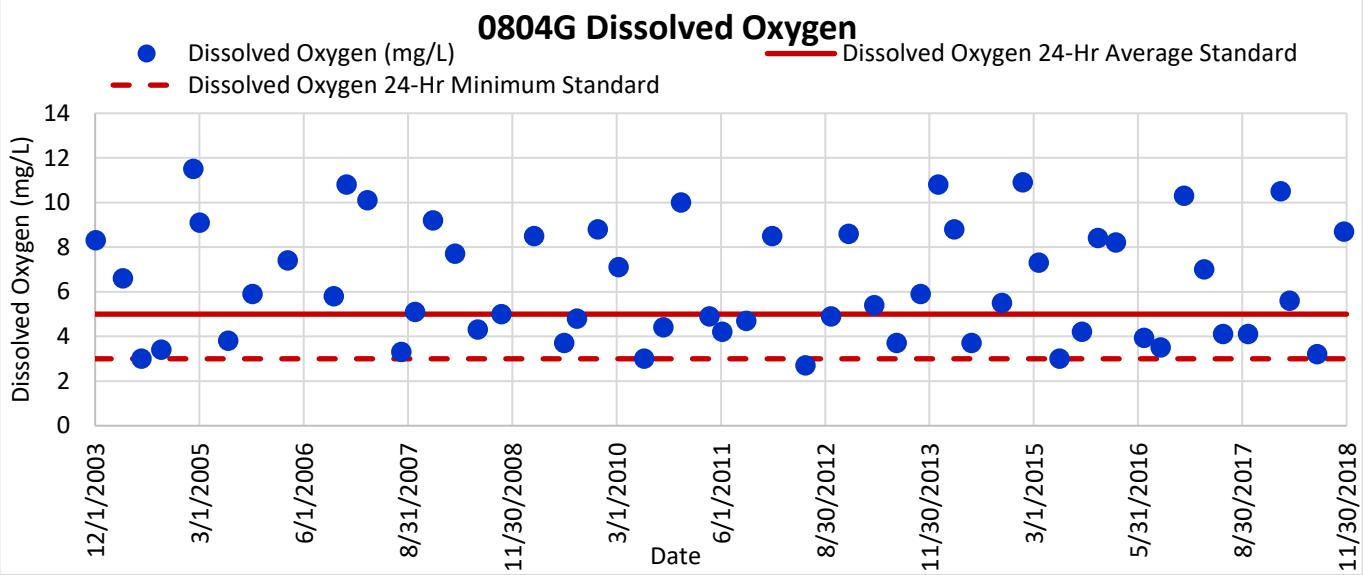


Figure 256: 0804G Dissolved Oxygen

The *E. coli* impairment appears to have been somewhat related to flows as shown in Figure 257. Some of the highest *E. coli* values were reported during elevated flows. The watershed upstream of the monitoring station 10717 is a mix of forest, crop, and grassland. Run-off containing waste from wildlife and livestock may likely be introducing bacteria to the stream. Landowner education and livestock best management practices may help reduce bacteria levels in this segment.

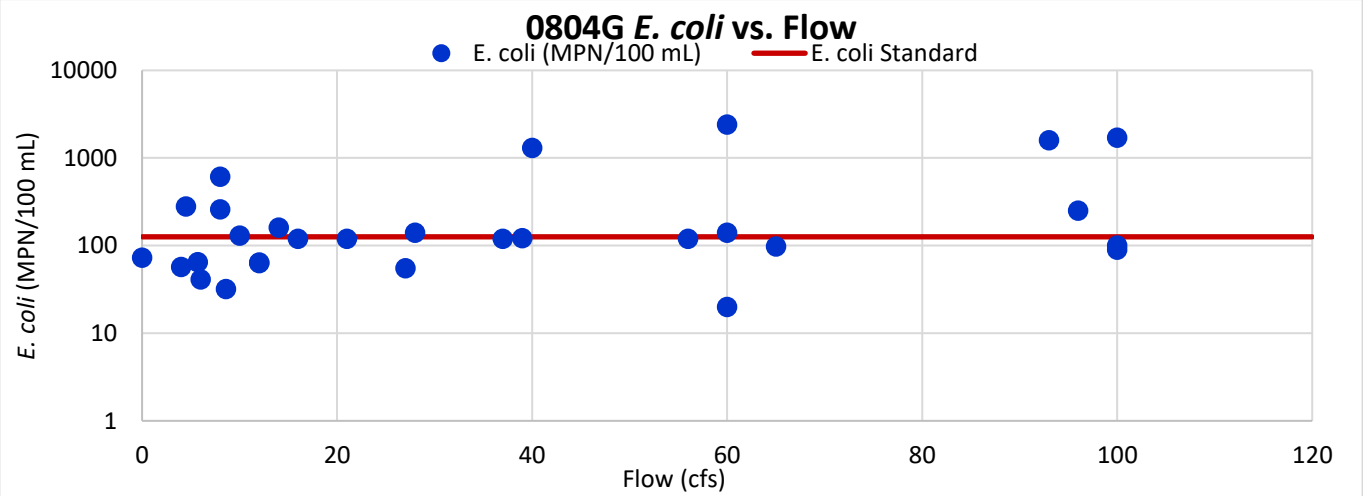


Figure 257: 0804G E. coli vs. Flow

The increasing winter trend for chlorophyll-*a* was a false trend introduced by censoring of non-detect data grouped together at the beginning of the data set and did not represent a true change in water quality. The increasing winter trend for nitrate was a true trend. However, it does not appear to be an immediate concern. For the full data set, the highest nitrate value was 0.29 mg/L; well below the screening level of 1.95 mg/L.

0804M Bassett Creek

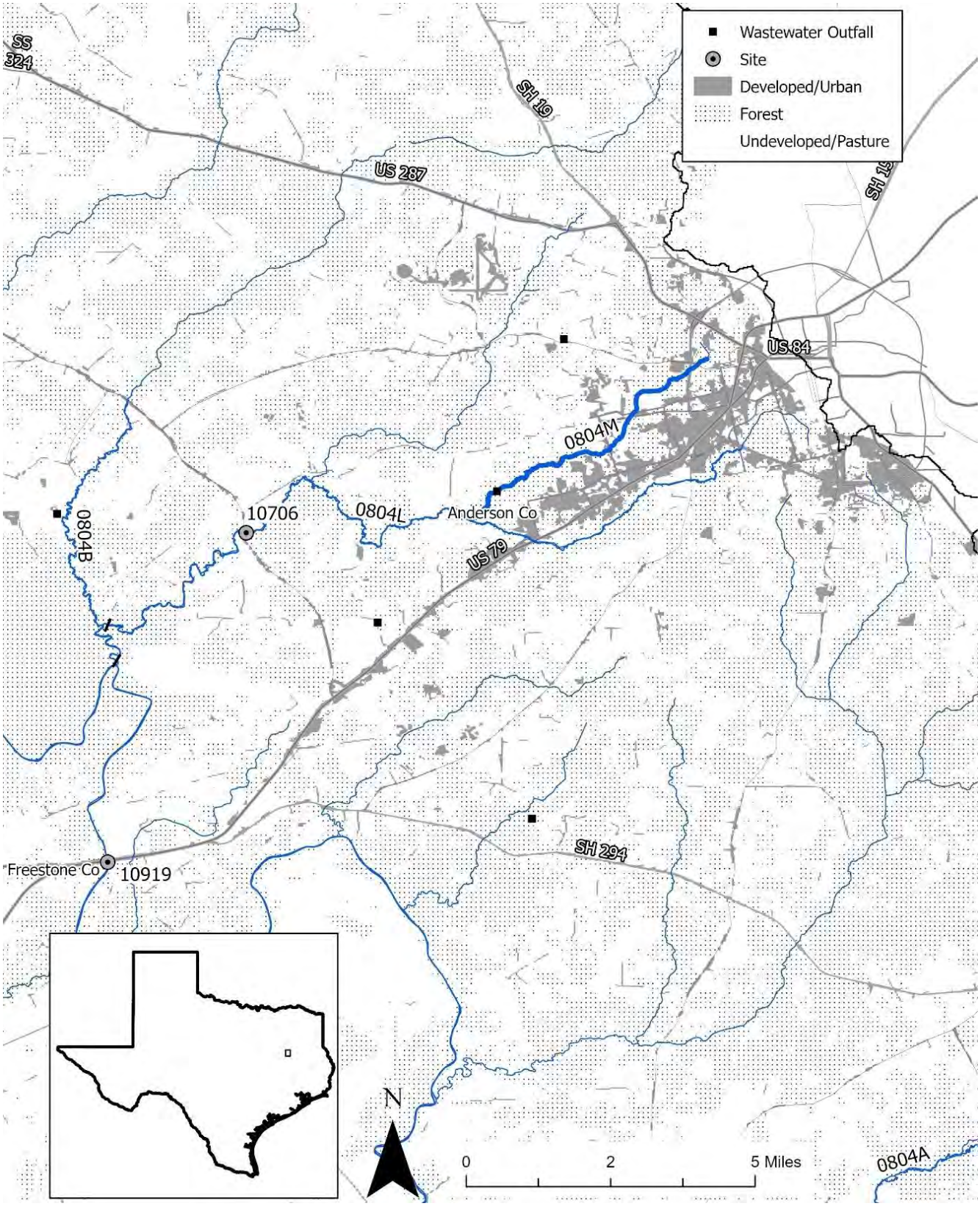


Figure 258: Segment 0804M Map

This 4.8-mile unclassified segment runs from Blue Lake in Palestine to the confluence with Town Creek (see Figure 258). The northwest portion of the watershed is largely rural with hay and pasture land while the southeast portion of the watershed is developed. It flows through the Tertiary Uplands ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 213.

Table 213: TCEQ 2020 Texas Integrated Report Summary for Segment 0804M

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804M_01 From confluence with Town Creek to approximately 15m upstream of processing plant outfall	Aquatic Life Use	Fish Community		NS
0804M_02 From approximately 15m upstream of the processing plant outfall upstream to Blue Lake	Aquatic Life Use	Fish Community		FS
0804M_01 From confluence with Town Creek to approximately 15m upstream of processing plant outfall	Aquatic Life Use	Macrobenthic Community		NS
0804M_02 From approximately 15m upstream of the processing plant outfall upstream to Blue Lake	Aquatic Life Use	Macrobenthic Community		CN
0804M_01 From confluence with Town Creek to approximately 15m upstream of processing plant outfall	Aquatic Life Use	Habitat		NC
0804M_02 From approximately 15m upstream of the processing plant outfall upstream to Blue Lake	Aquatic Life Use	Habitat		NC

CN = Use Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment units 0804M_01 and 0804M_02 for the period of record for this basin summary report.

This segment was found to have impairments and concerns for fish and macrobenthic communities. This stream has had aquatic life monitoring conducted in the past by the Texas Parks and Wildlife Department due to receiving effluent from a chicken processing facility. TRA conducts routine water quality monitoring downstream of this facility on Town Creek (segment 0804L).

0804L Town Creek

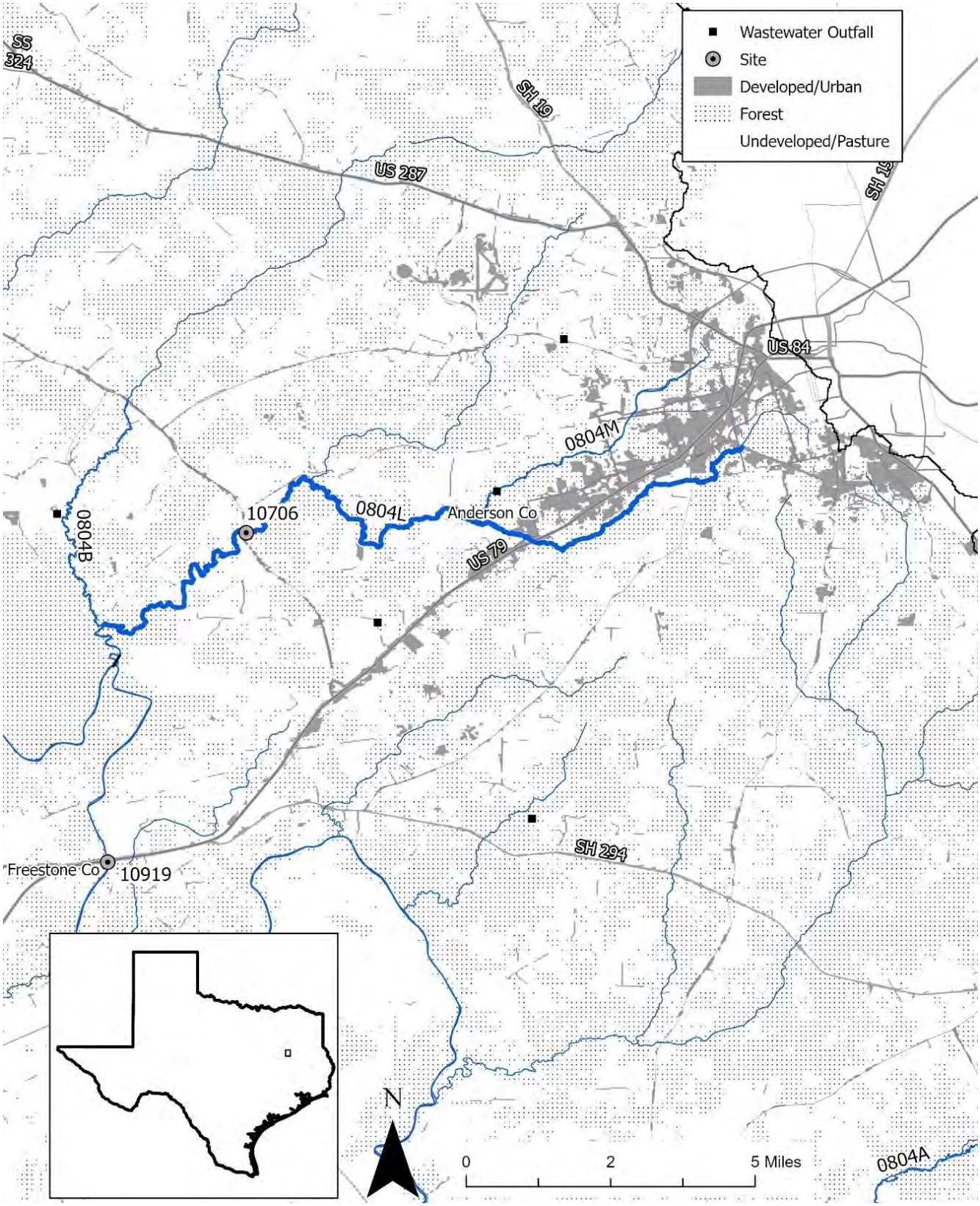


Figure 259: Segment 0804L Map

This 16-mile unclassified segment runs from SH 256 in Palestine to the confluence with Keechi Creek (see Figure 259). The watershed is developed to the north and rural to the south with pasture, hay, and grassland with some forested areas. It flows through the Tertiary Uplands and Northern Post Oak Savanna ecoregions.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 214. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 214: Segment 0804L FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0804L_01	TOWN CREEK 73 METERS UPSTREAM OF FM 645 SOUTHWEST OF PALESTINE	10706	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 215. Results of TRA trend analyses are shown in Table 216.

Table 215: TCEQ 2020 Texas Integrated Report Summary for Segment 0804L

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804L_01 From the confluence with Keechi Creek upstream to SH 256	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0804L_01 From the confluence with Keechi Creek upstream to SH 256	Aquatic Life Use	Fish Community		FS
0804L_01 From the confluence with Keechi Creek upstream to SH 256	Aquatic Life Use	Macrobenthic Community		FS
0804L_01 From the confluence with Keechi Creek upstream to SH 256	Aquatic Life Use	Habitat		NC
0804L_01 From the confluence with Keechi Creek upstream to SH 256	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0804L_01 From the confluence with Keechi Creek upstream to SH 256	General Use	Ammonia	0.33 mg/L	NC
0804L_01 From the confluence with Keechi Creek upstream to SH 256	General Use	Nitrate	1.95 mg/L	CS
0804L_01 From the confluence with Keechi Creek upstream to SH 256	General Use	Total Phosphorus	0.69 mg/L	CS
0804L_01 From the confluence with Keechi Creek upstream to SH 256	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 216: Significant Trends for Segment 0804L (P-value<0.1)

Segment & Assessment Unit		0804L_01
Site		10706
Water Temperature	All	Not Significant
	Summer	Not Significant
	Winter	↑*
Specific Conductance	All	↑*
	Summer	↑*
	Winter	↑*

Segment & Assessment Unit		0804L_01
Site		10706
pH	All	No Trend
	Summer	↑*
	Winter	Not Significant
Total Phosphorus	All	↑*
	Summer	↑*
	Winter	↑*
Orthophosphate	All	↑*
	Summer	↑*
	Winter	↑*
Hardness	All	↓*
	Summer	↓*
	Winter	Not Significant
Chloride	All	↑*
	Summer	↑*
	Winter	↑*
Sulfate	All	No Trend
	Summer	↓*
	Winter	Not Significant
E. coli	All	Not Significant
	Summer	↑*
	Winter	Not Significant
Total Dissolved Solids	All	↑*
	Summer	↑*
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

This segment was found to impaired due to elevated levels of *E. coli*. Of 21 samples collected since monitoring began November 2013, only one value was reported below the standard of 126 MPN/100 mL. There were some extremely high values reported at elevated flows indicating that run-off carrying wildlife and livestock waste may be contributing to the impairment. However, because levels were elevated at all flows, there may be consistent direct sources of bacteria. Based on Google Earth imagery, there are livestock trails in pastures directly upstream of the monitoring station. It is likely that livestock were visiting the stream for watering. Landowner education and livestock best management practices may help reduce bacteria levels in this segment.

Concerns for nitrate and total phosphorus were related to upstream wastewater treatment facilities. As shown in Figure 260, these parameters were reported at higher concentrations at lower flows and decreased with increasing flow. This pattern is common in streams that are effluent-dominated as many wastewater treatment facilities do not have advanced nutrient removal.

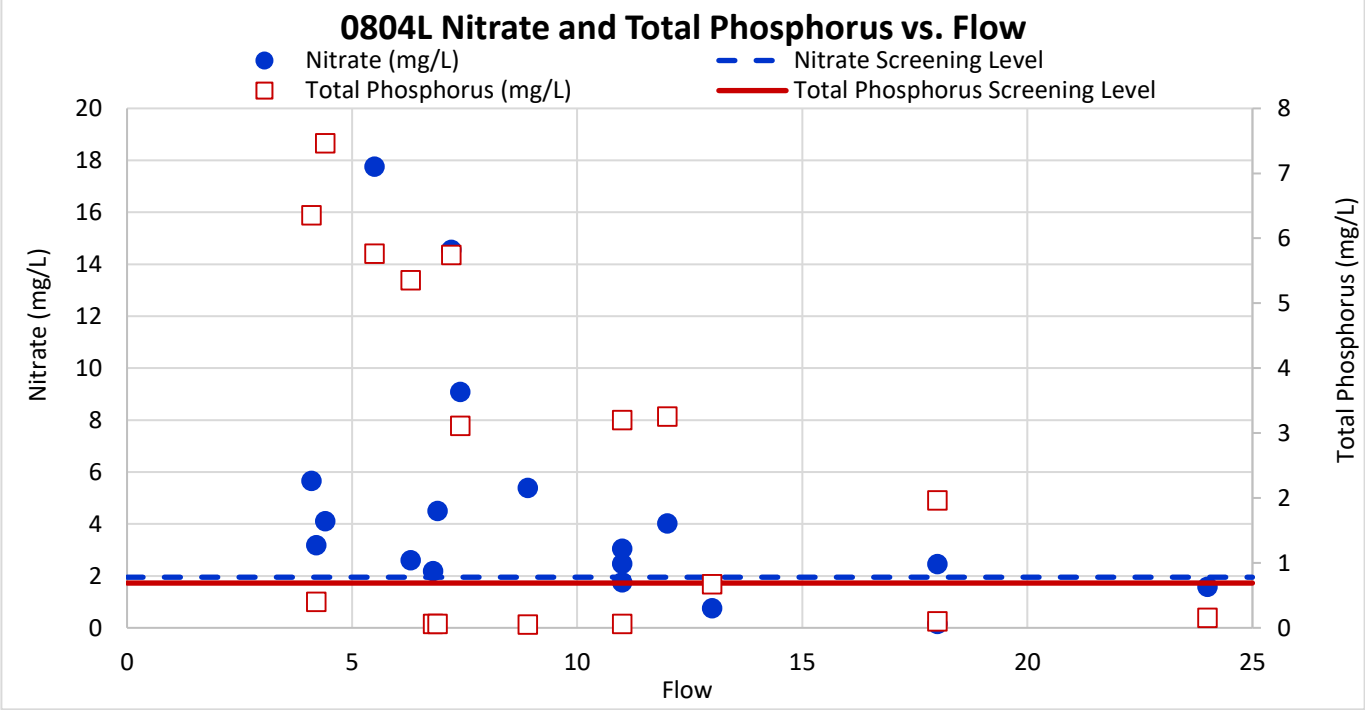


Figure 260: 0804L Nitrate and Total Phosphorus vs. Flow

Increasing trends for several parameters showed similar patterns of sharp increases after May 2016 as shown for chloride and total phosphorus in Figure 261. It is interesting to note that this increase coincides with full operations at the upstream Sanderson Farms chicken processing plant. This facility may be the source of the increasing trends in this segment.

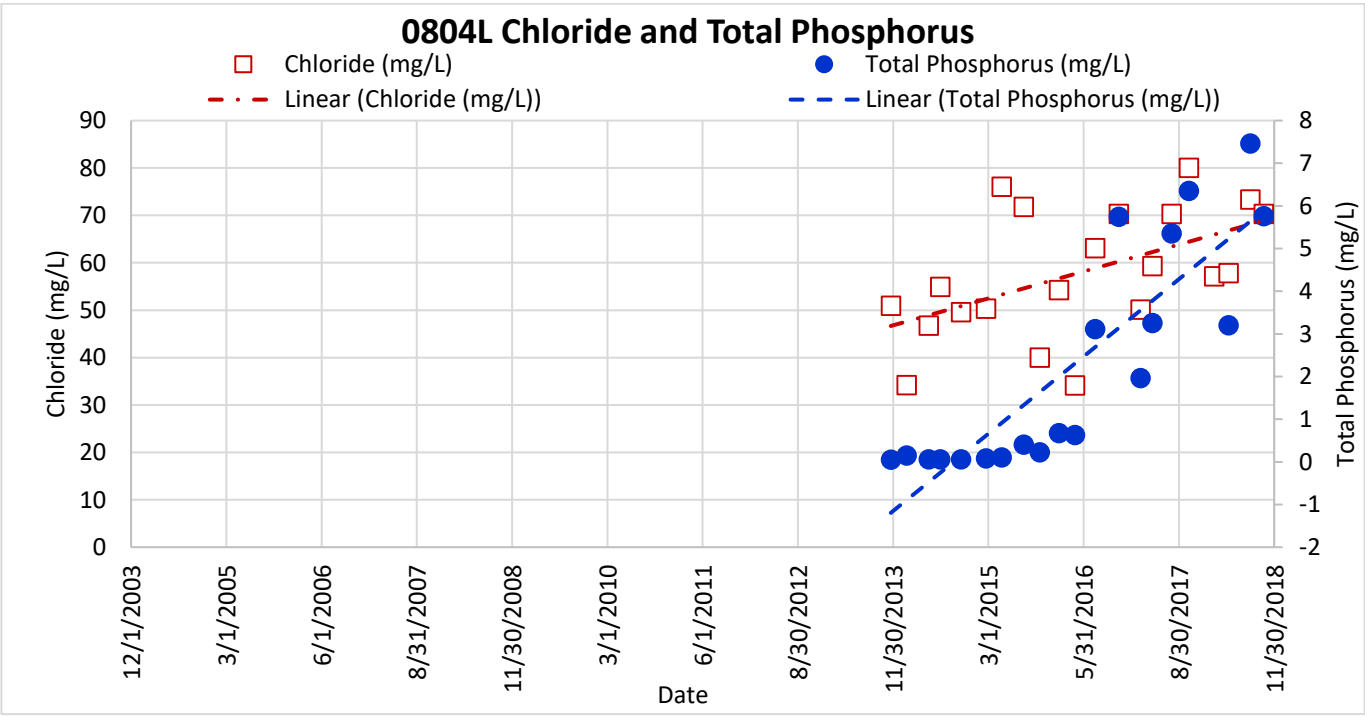


Figure 261: 0804L Chloride and Total Phosphorus

0804B Keechi Creek

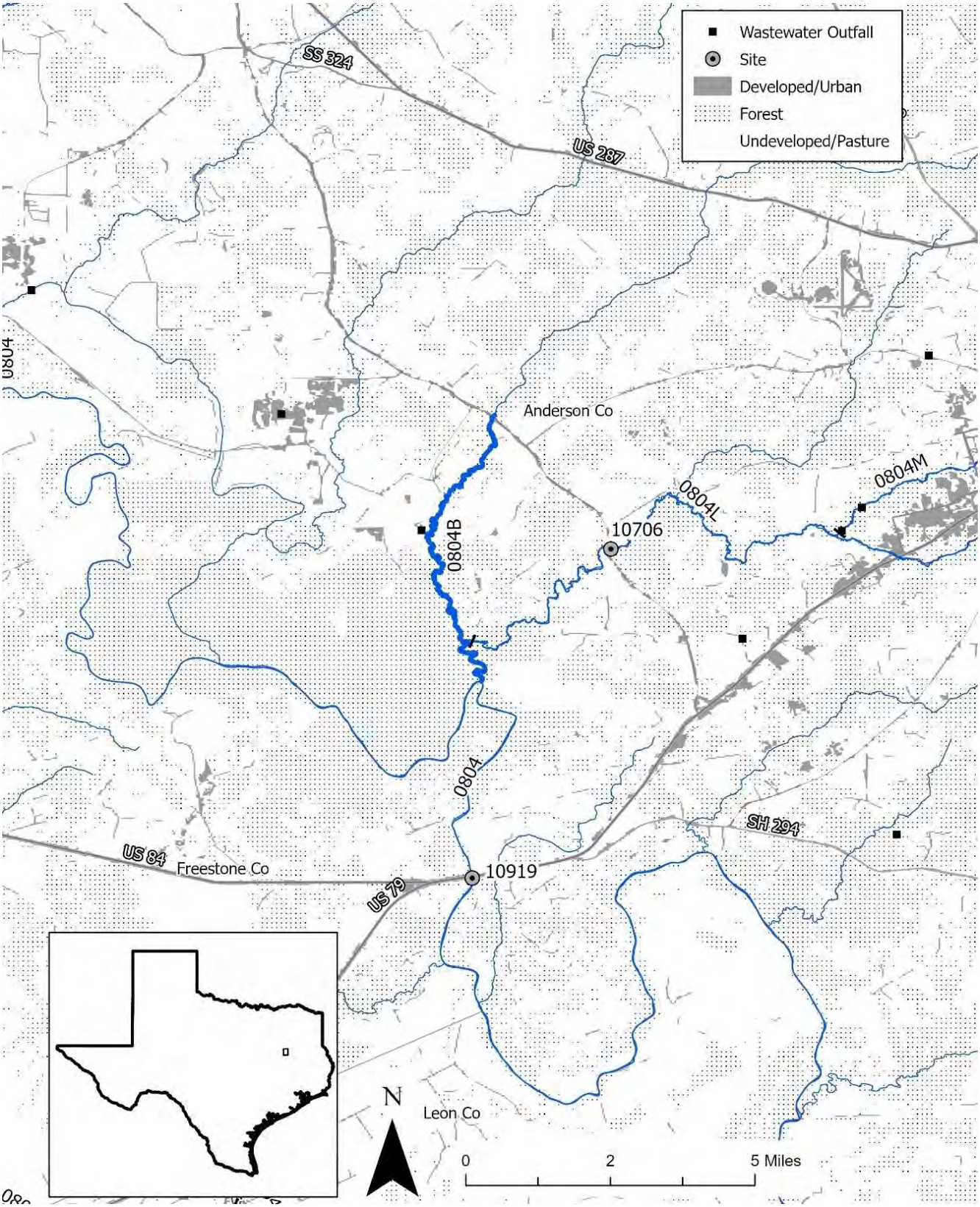


Figure 262: Segment 0804B Map

This 7-mile unclassified segment runs from a point 0.05 km upstream of FM 645 outside of Palestine to the confluence with the Trinity River (see Figure 262). The watershed is largely rural with hay and pasture land and flows through the Northern Post Oak Savanna ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0804B_01 for the period of record for this basin summary report.

0804A Box Creek

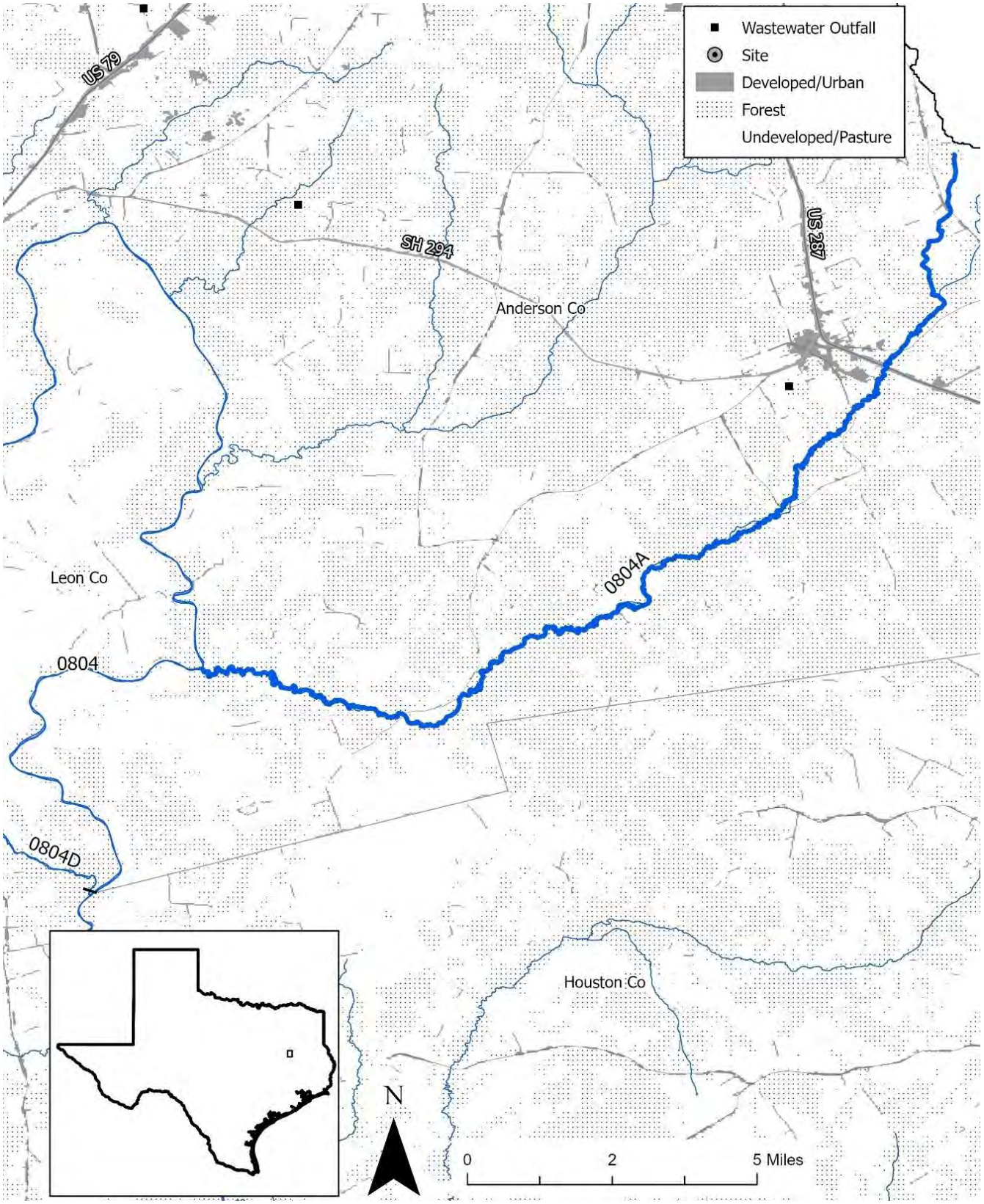


Figure 263: Segment 0804A Map

This 24-mile unclassified segment runs from Elkhart Creek to the Elkhart Lake dam northeast of the City of Elkhart to the confluence with the Trinity River (see Figure 263). A majority of the watershed is rural with hay, pasture, and grassland interspersed with some forested areas. It lies within the Tertiary Uplands ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0804A_01 for the period of record for this basin summary report.

0804E Northwest Branch

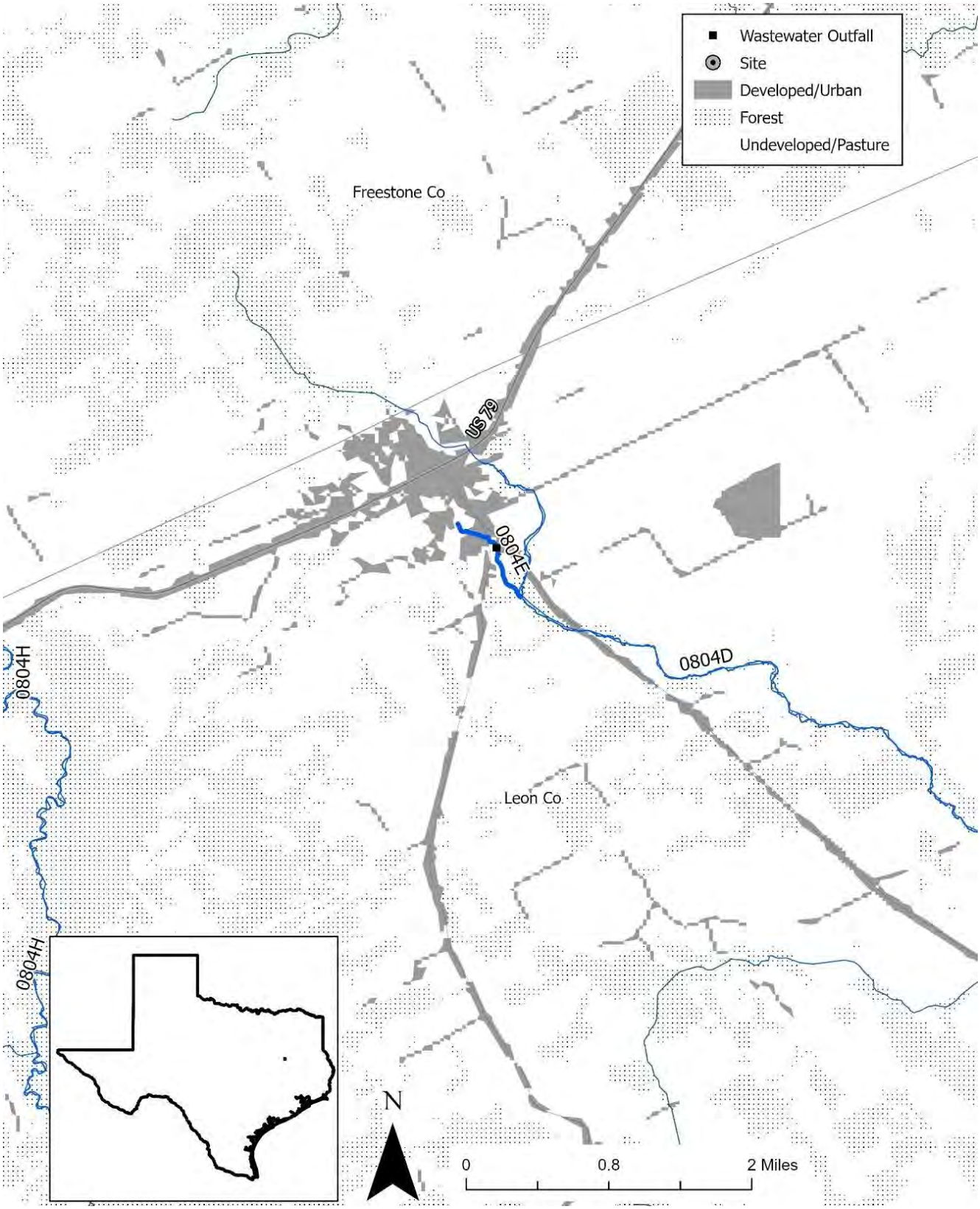


Figure 264: Segment 0804E Map

This 0.6-mile unclassified segment runs from a point 0.3 km upstream of FM 831 in Oakwood to the confluence with Toms Creek (see Figure 264). The watershed is developed by the Town of Oakwood and lies within the Southern Post Oak Savanna. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0804E_01 for the period of record for this basin summary report.

0804D Toms Creek

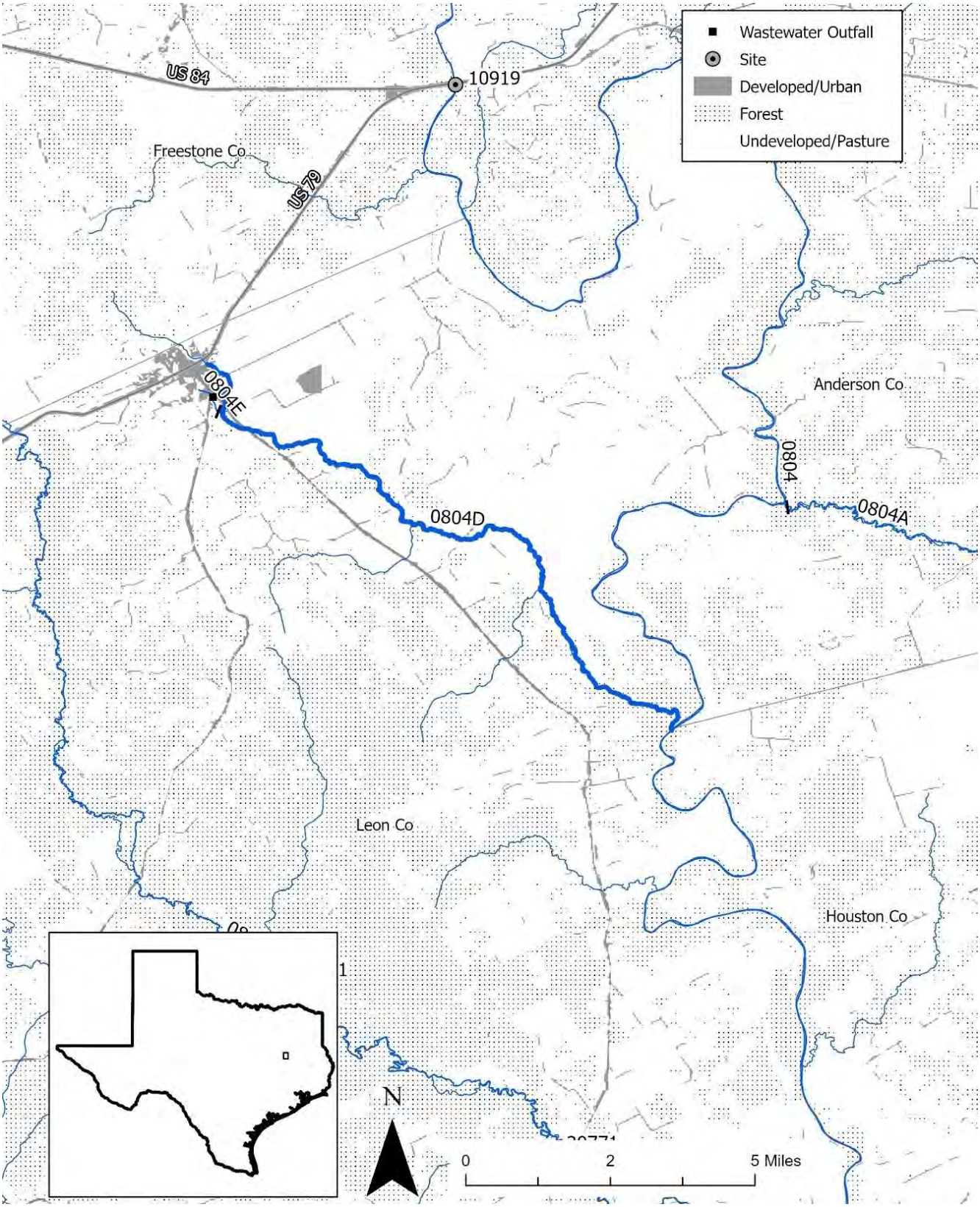


Figure 265: Segment 0804D Map

This 12-mile unclassified segment runs from the Missouri-Pacific Railroad crossing near Oakwood to the confluence with the Trinity River (see Figure 265). The most upstream portion of the watershed is developed by the Town of Oakwood with the remainder flowing through hay and pasture land. It lies within the Southern Post Oak Savanna. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0804D_01 for the period of record for this basin summary report.

0804C Mims Creek

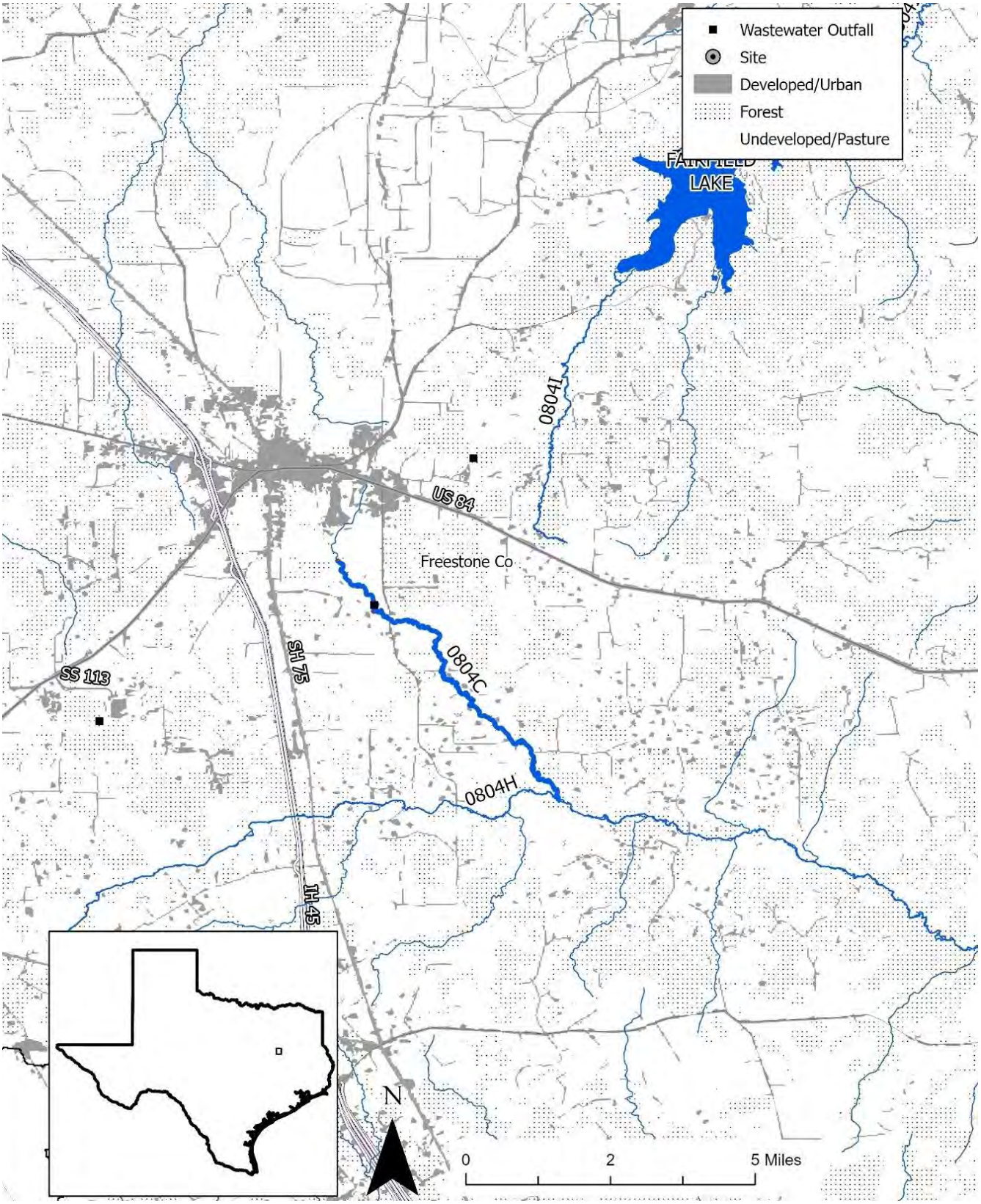


Figure 266: Segment 0804C Map

This 7-mile unclassified segment runs from the confluence of an unnamed tributary approximately 2.1 km upstream of FM 1580 near the City of Fairfield to the confluence with Upper Keechi Creek (see Figure 266). The most upstream portion of the watershed is developed and the remainder flows through hay and pasture land. There are several oil and gas drilling pads throughout the watershed. It lies within the Southern Post Oak Savanna. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0804C_01 for the period of record for this basin summary report.

0804H Upper Keechi Creek

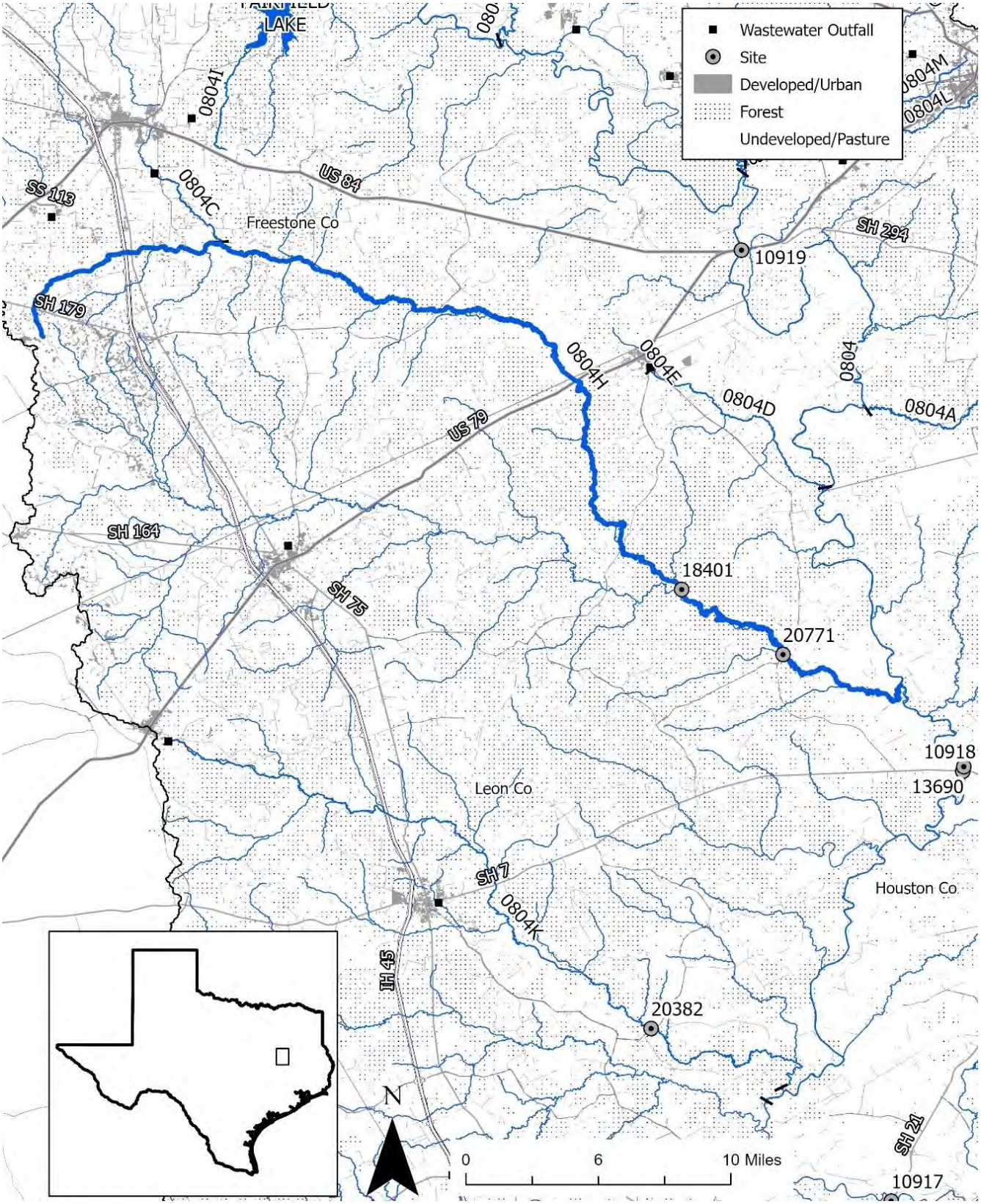


Figure 267: Segment 0804H Map

This 66-mile unclassified segment runs from the headwaters upstream of Route 179 southwest of Fairfield to the confluence with the Trinity River (see Figure 267). The watershed is largely rural with mostly hay and pasture land and some forested areas. There are several oil and gas drilling pads throughout the watershed. It lies within the Southern Post Oak Savanna.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 217. Monitoring is being conducted by TCEQ Region 9. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 217: Segment 0804H FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0804H_01	UPPER KEECHI CREEK IMMEDIATELY UPSTREAM OF FM 542 IN LEON COUNTY	20771	TCEQ Region 9

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 218. Results of TRA trend analyses are shown in Table 219.

Table 218: TCEQ 2020 Texas Integrated Report Summary for Segment 0804H

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NS
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	Aquatic Life Use	Acute Toxic Substances in water		NC
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	Aquatic Life Use	Chronic Toxic Substances in water		NC
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	General Use	Ammonia	0.33 mg/L	NC
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	General Use	Nitrate	1.95 mg/L	NC
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	General Use	Total Phosphorus	0.69 mg/L	NC
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0804H_01 From the confluence with segment 0804 up to confluence with Twin Branch	Fish Consumption Use	HH Bioaccumulative Toxics in water		NC

CN = Use Concern NC = No Concern NS = Not Supporting

There were no data available in assessment unit 0804H_02 for the period of record for this basin summary report.

Table 219: Significant Trends for Segment 0804H (P-value<0.1)

Segment & Assessment Unit		0804H_01
Site		20771
Dissolved Oxygen	All	Not Significant
	Summer	↓
	Winter	Not Significant
Total Suspended Solids	All	↓
	Summer	Not Significant
	Winter	Not Significant
Volatile Suspended Solids	All	↓
	Summer	↓
	Winter	↓
Ammonia	All	Not Significant
	Summer	Not Significant
	Winter	↑
Total Organic Carbon	All	↓
	Summer	↓
	Winter	Not Significant
Sulfate	All	Not Significant
	Summer	↑
	Winter	Not Significant
Flow Severity	All	Not Significant
	Summer	↑
	Winter	Not Significant
Chlorophyll-*a*	All	Not Significant
	Summer	Not Significant
	Winter	↓
Days Since Precipitation	All	Not Significant
	Summer	↑
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

An impairment for depressed dissolved oxygen was identified in previous Integrated Reports and carried forward into the current assessment. As shown in Figure 268, it does not appear that dissolved oxygen levels were still depressed. It is recommended that 24-hour monitoring be conducted in this segment in order to fully assess the current status of the impairment in this segment.

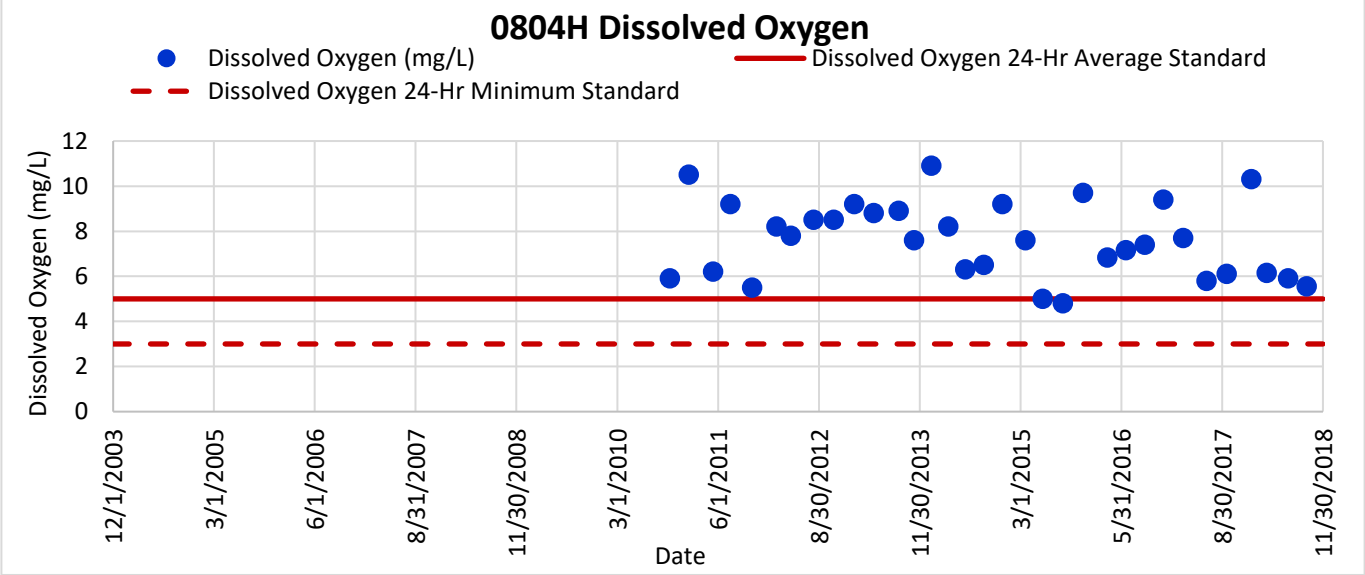


Figure 268: 0804H Dissolved Oxygen

The concern for elevated *E. coli* appears to be related to a consistent direct source as shown in Figure 269. *E. coli* levels were regularly reported above the standard of 126 MPN/100 mL. They were generally reported at higher levels during lower flows and decreased slightly at elevated flows. The watershed upstream of monitoring station 20771 is wooded with crop, pasture, and grassland. Based on Google Earth imagery, there are livestock trails leading to the stream in several of the pastures upstream of the monitoring station. Based in this information, livestock were the likely source of the bacteria leading to this concern. Landowner education and livestock best management practices may reduce bacteria in this segment.

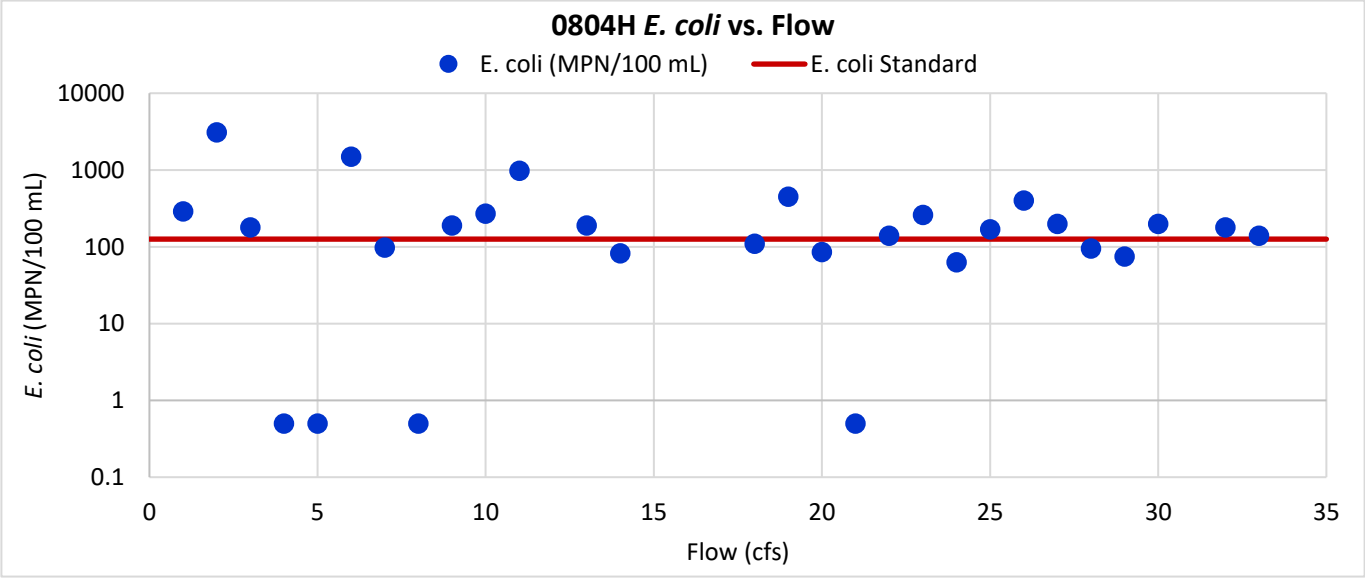


Figure 269: 0804H E. coli vs. Flow

0813 Houston County Lake

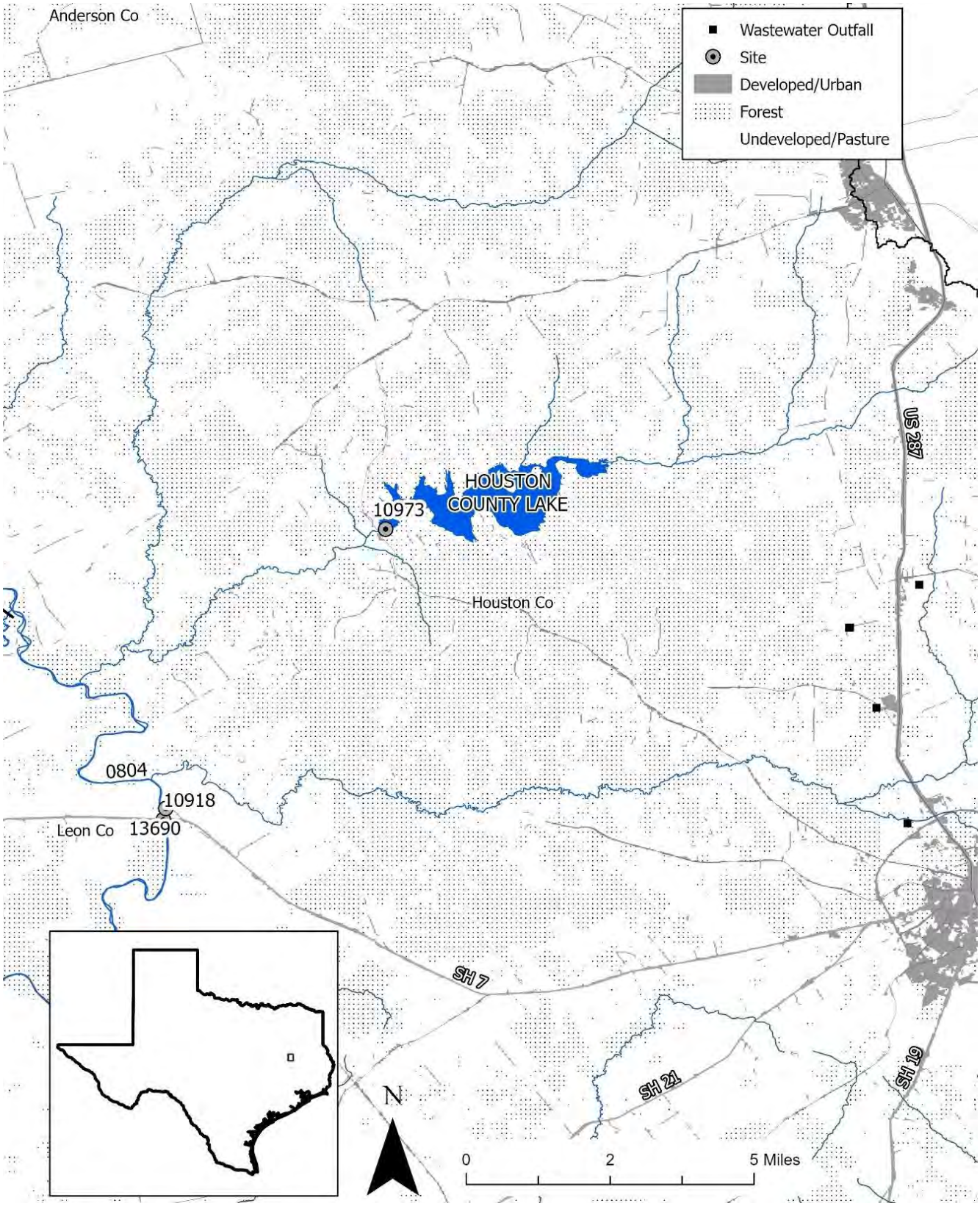


Figure 270: Segment 0813 Map

This 1,300-acre segment impounds Little Elkhart Creek in Houston County up to a normal pool elevation of 260 feet (see Figure 270). Portions of the watershed on the southwest side of the reservoir are developed but the vast majority of the watershed is rural with forest and hay and pasture land. The watershed lies within the Tertiary Uplands ecoregion. Houston County Lake has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 220. Monitoring is being conducted by TCEQ Region 10. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 220: Segment 0813 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0813_01	HOUSTON COUNTY LAKE NEAR DAM OVERFLOW	10973	TCEQ Region 10

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 221. Results of TRA trend analyses are shown in Table 222.

Table 221: TCEQ 2020 Texas Integrated Report Summary for Segment 0813

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	General Use	Nutrient Reservoir Criteria		FS
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	General Use	pH	6.5 - 9 S.U.	FS
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	General Use	Chloride	75 mg/L	FS
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	General Use	Sulfate	75 mg/L	FS
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	General Use	Total Dissolved Solids	300 mg/L	FS
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	General Use	Water Temperature	33.9 °F	FS
0813_01 From Houston County Dam in Houston County up to the normal pool elevation of 260 feet	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting

Table 222: Significant Trends for Segment 0813 (P-value<0.1)

Segment & Assessment Unit		0813_01
Site		10973
Secchi Depth	All	↓
	Summer	↓
	Winter	Not Significant
Specific Conductance	All	No Trend
	Summer	↑
	Winter	No Trend
pH	All	No Trend
	Summer	No Trend
	Winter	↓
Alkalinity	All	↑
	Summer	↑
	Winter	↑
Total Kjeldahl Nitrogen	All	↑
	Summer	↑
	Winter	↑
Total Phosphorus	All	No Trend
	Summer	No Trend
	Winter	↑
Total Organic Carbon	All	No Trend
	Summer	↑
	Winter	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend

Increasing trends for several parameters in this reservoir follow the pattern seen for alkalinity in Figure 271. Values increased during the drought of 2011 to 2015. In general, those values remained elevated after the drought recovery period of 2015 to 2016. Increases throughout the drought period may have simply been due to concentration of water quality parameters due to evaporation. However, because concentrations generally remained elevated after the drought was over, there is some indication that there may have been other ongoing issues. The watershed is largely undeveloped with a mix of forest and pasture land. The area directly adjacent to much of the shoreline has residential developments. A potential source of elevated water quality parameters in this segment may be these residential developments. Drought conditions could cause damage to wastewater infrastructure such as septic systems. However, it is interesting to note that a majority of the *E. coli* data were reported below the standard of 126 MPN/100 mL; of 52 reported values, 50 values were reported at or below 22 MPN/100 mL. The homes in the development may have separate greywater systems that could have been contributing alkalinity and nutrients but not bacteria. It is recommended that investigations around the reservoir take place to determine if greywater systems are draining into the reservoir.

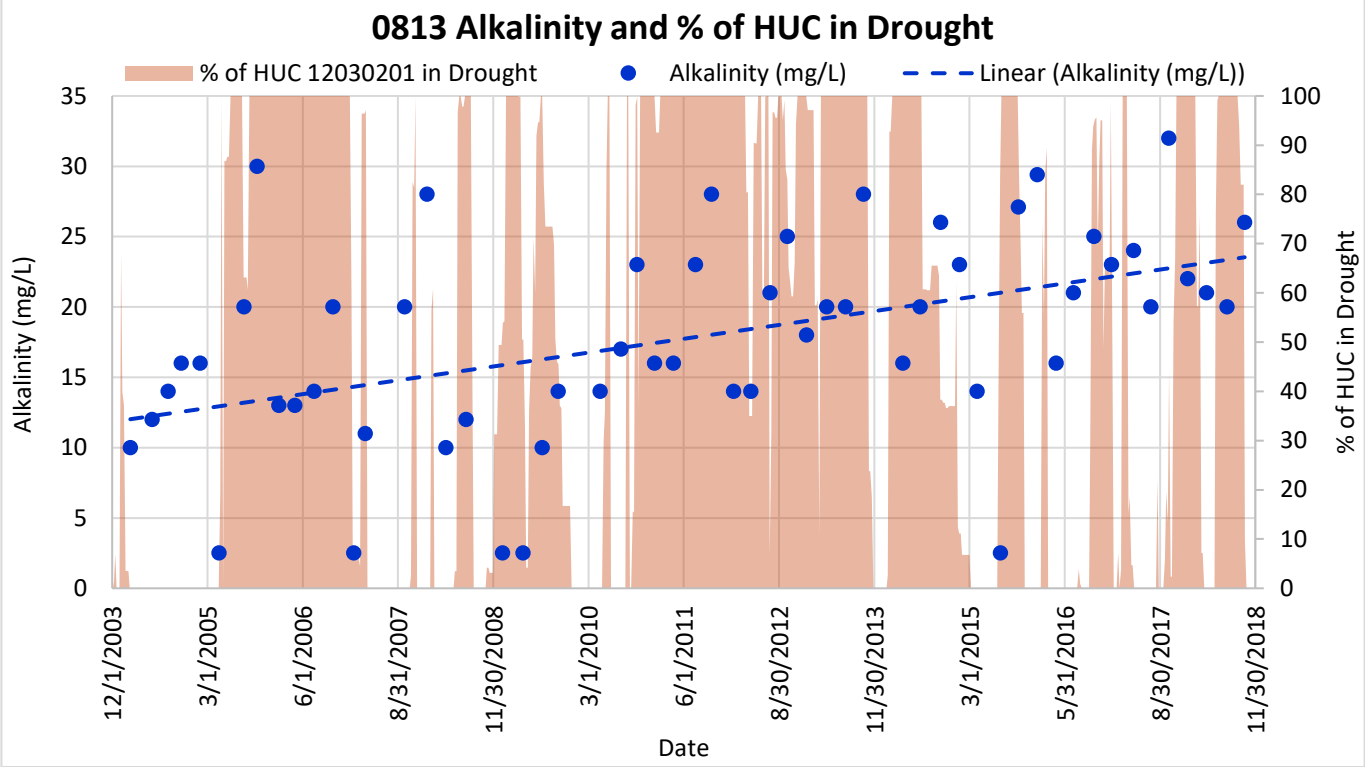


Figure 271: 0813 Alkalinity and % of HUC in Drought

0804K Lower Keechi Creek

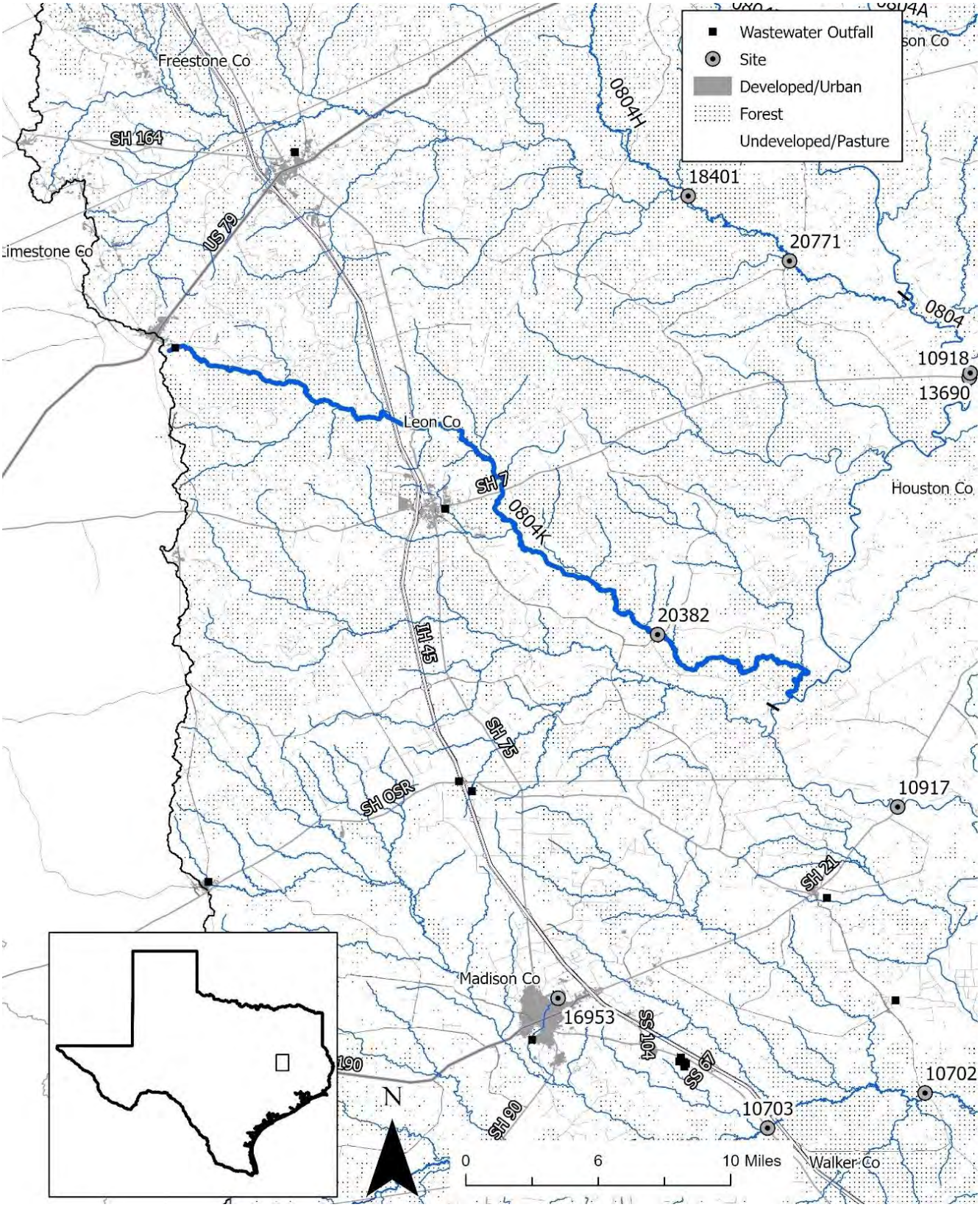


Figure 272: Segment 0804K Map

This 44-mile unclassified segment runs from the headwaters in the Town of Jewett to the confluence with the Trinity River upstream (see Figure 272). A majority of the watershed is rural with forested, hay, and pasture land. There are several oil and gas drilling pads in the middle and lower portion of the watershed. It lies within the Southern Post Oak Savanna.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 223. Monitoring is being conducted by TCEQ Region 9. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 223: Segment 0804K FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0804K_01	LOWER KEECHI CREEK 110 METERS UPSTREAM OF FM 811 IN LEON COUNTY	20382	TCEQ Region 9

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 224. Results of TRA trend analyses are shown in Table 225.

Table 224: TCEQ 2020 Texas Integrated Report Summary for Segment 0804K

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	Aquatic Life Use	Acute Toxic Substances in water		FS
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	General Use	Ammonia	0.33 mg/L	NC
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	General Use	Nitrate	1.95 mg/L	NC
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	General Use	Total Phosphorus	0.69 mg/L	NC
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0804K_01 From confluence with Trinity River in Leon Co. upstream to headwaters in Jewett in Leon Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 225: Significant Trends for Segment 0804K (P-value<0.1)

Segment & Assessment Unit		0804K_01
Site		20382
Flow	All	↑
	Summer	Not Significant
	Winter	↑

Segment & Assessment Unit		0804K_01
Site		20382
Ammonia	All	Not Significant
	Summer	↓
	Winter	↑
Chloride	All	Not Significant
	Summer	Not Significant
	Winter	↑
Flow Severity	All	Not Significant
	Summer	Not Significant
	Winter	↑
Days Since Precipitation	All	Not Significant
	Summer	↑
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

Dissolved oxygen concerns in this segment appear to have been related to low flow in this segment as shown in Figure 273. Dissolved oxygen was well correlated to both flow and water temperature (correlation coefficients = 0.433 and -0.824, respectively) indicating that hot dry summer conditions were the cause of the concern in this segment.

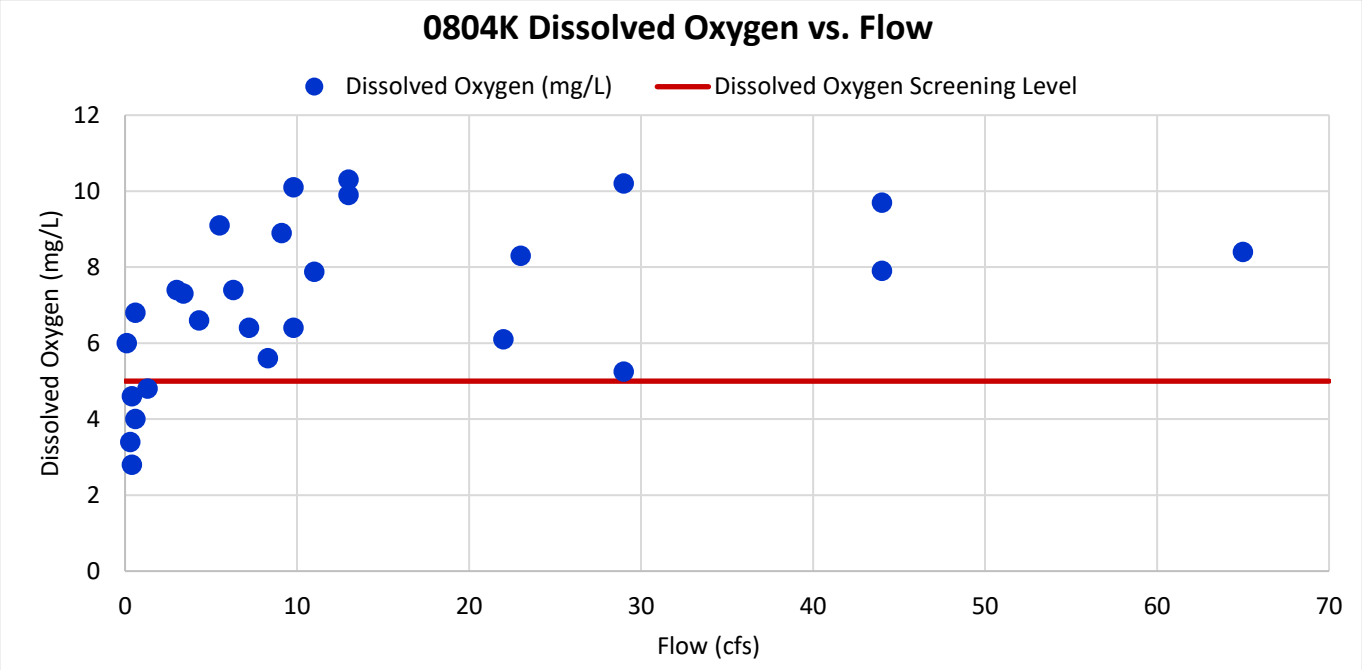


Figure 273: 0804K Dissolved Oxygen vs. Flow

This segment was found to be impaired due to elevated levels of *E. coli*. *E. coli* levels were well correlated to flows (correlation coefficient = 0.688) as shown in Figure 274. This indicates that the impairment was related to run-off carrying bacteria into the stream. The watershed upstream

of the sampling station at 20382 is largely undeveloped with grassland and some forested areas. Based on Google Earth imagery, there is evidence of livestock trails in many of the upstream grasslands which indicates that livestock are the most likely source of bacteria in this segment. Landowner education and livestock best management practices may help reduce bacteria levels.

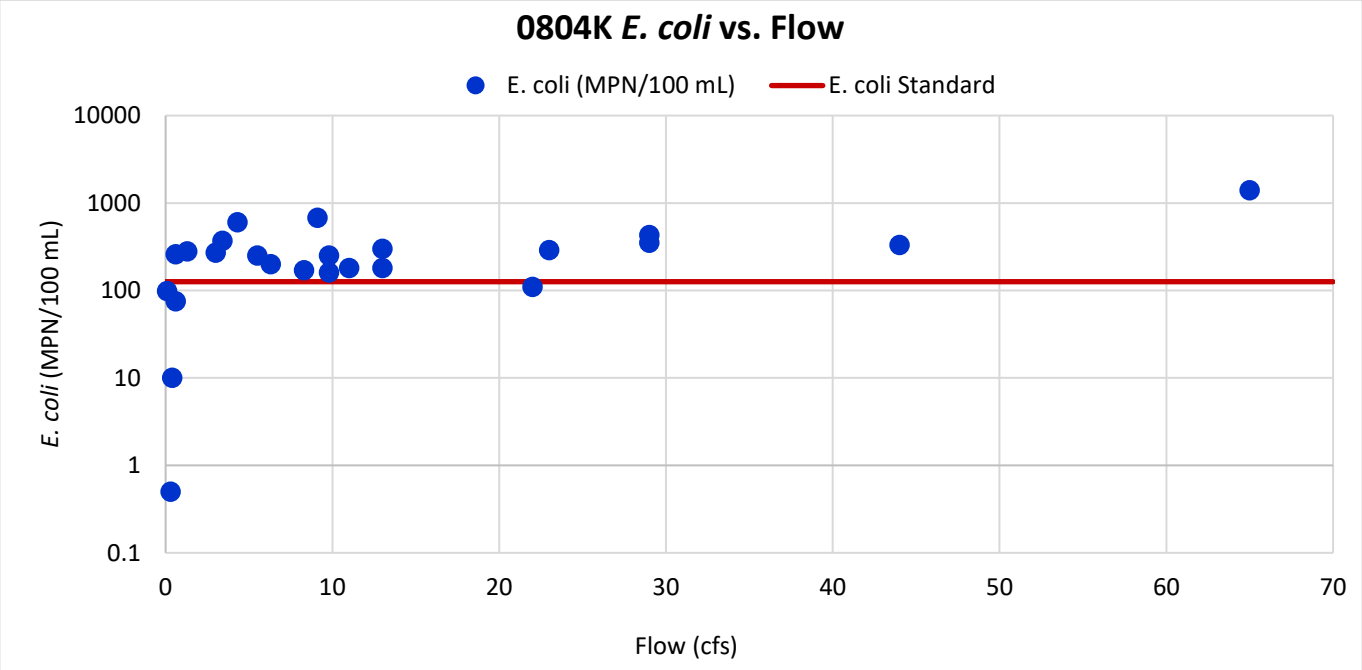


Figure 274: 0804K E. coli vs. Flow

Chloride was somewhat correlated to flow (correlation coefficient = 0.352). Chloride levels were generally reported at higher levels at elevated flows. This may have been caused by run-off from irrigated fields. As irrigation water evaporates, it leaves behind salts and dissolved solids. Precipitation of sufficient quantity to cause run-off can then wash these salts and solids into nearby waterbodies. However, based on Google Earth Imagery (see Figure 275), there has been some drilling activity that coincided with the increasing trend. It is likely that a combination of both irrigation and drilling activities in the watershed influenced chloride levels in this stream.

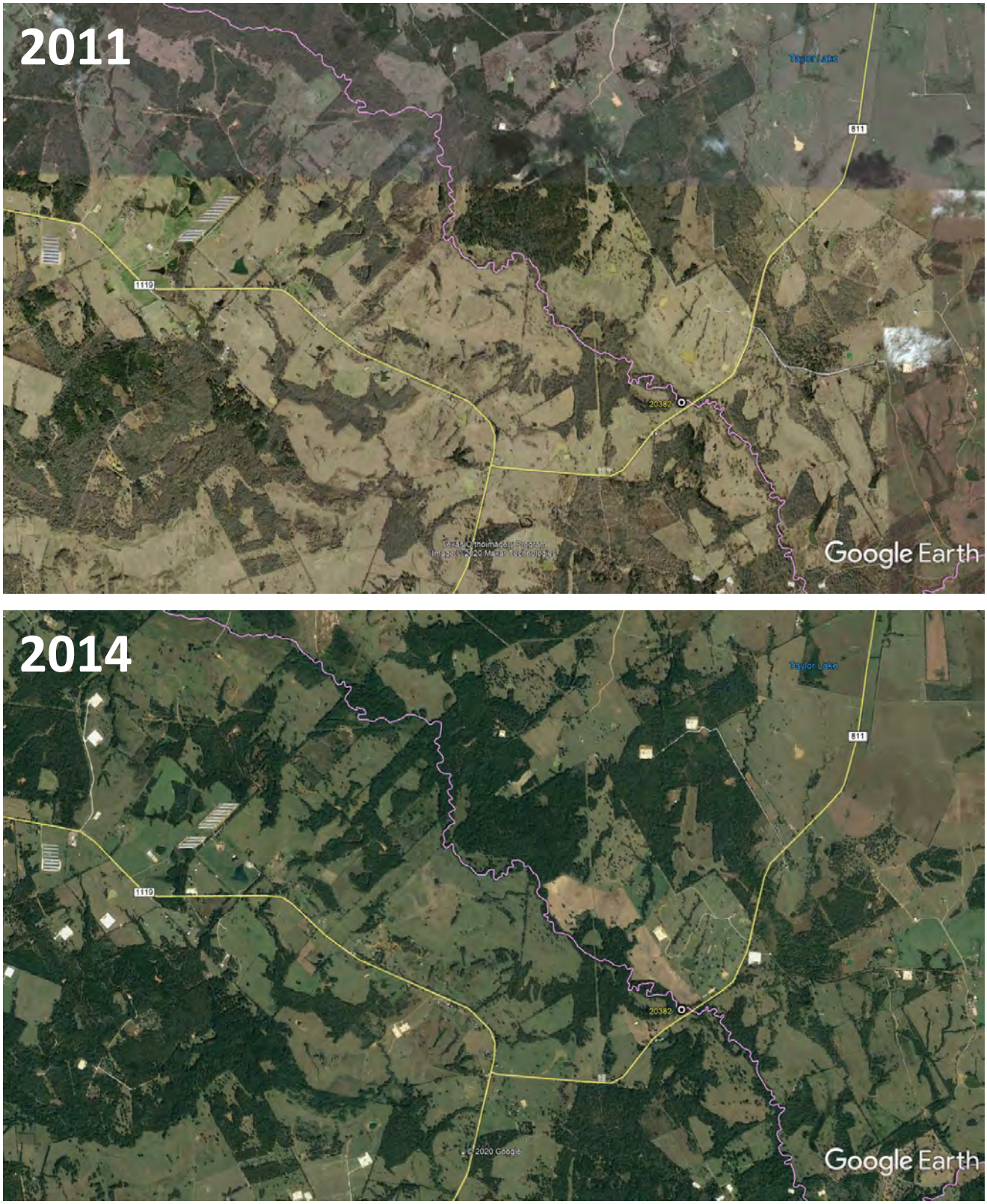


Figure 275: Google Earth Imagery showing white stone drilling pads

0803G Lake Madisonville

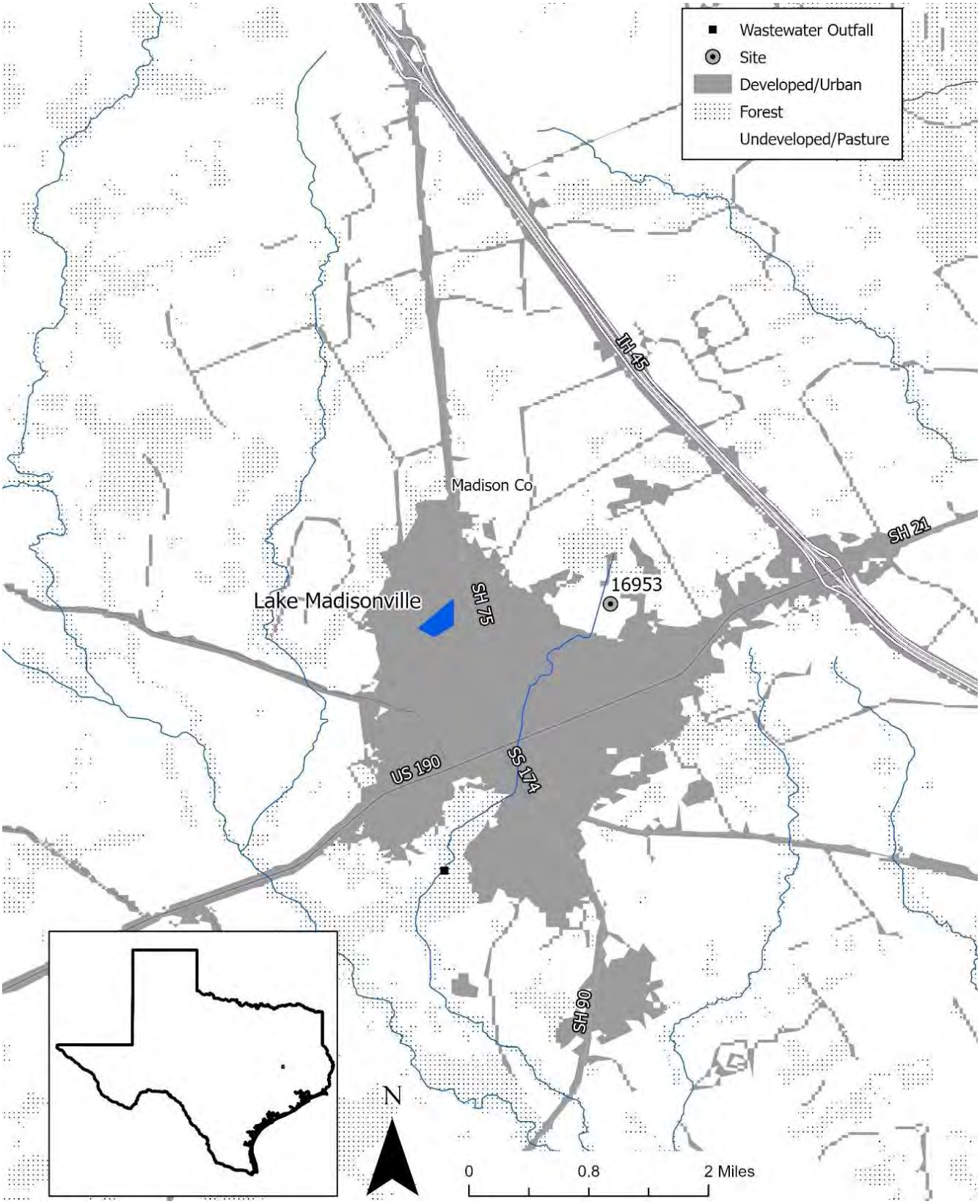


Figure 276: Segment 0803G Map

This 62-acre reservoir impounds Town Branch and lies just outside of Madisonville (see Figure 276). The upstream portion of the watershed is developed by the City of Madisonville while the downstream portion is largely hay and pasture land. It lies within the Southern Post Oak Savanna. Lake Madisonville has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 226. No significant trends were identified during TRA data analysis.

Table 226: TCEQ 2020 Texas Integrated Report Summary for Segment 0803G

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	Aquatic Life Use	Acute Toxic Substances in water		FS
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	Aquatic Life Use	Chronic Toxic Substances in water		FS
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	Aquatic Life Use	Toxic Substances in sediment		NC
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	General Use	Ammonia	0.11 mg/L	NA
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	General Use	Nitrate	0.37 mg/L	NA
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	General Use	Total Phosphorus	0.2 mg/L	NA
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	Fish Consumption Use	Mercury in edible tissue		**NS**
0803G_01 From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NA = Not Assessed NC = No Concern NS = Not Supporting

Data for assessment unit 0803G_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

The impairment for fish consumption use is based on unsafe levels of mercury in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 36) to limit consumption of largemouth bass. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

0803 Lake Livingston

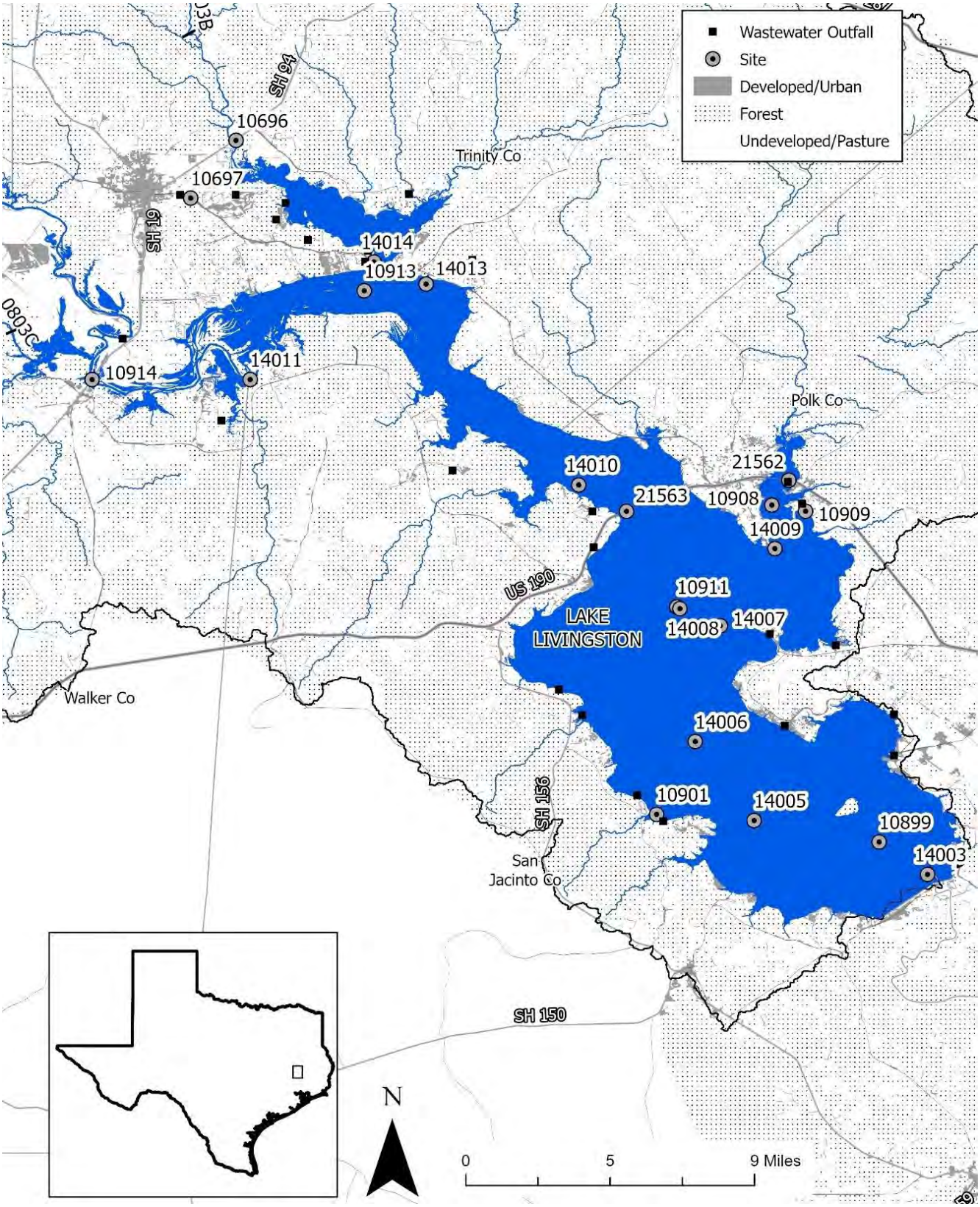


Figure 277: Segment 0803 Map

This 82,600-acre segment impounds 1,750,000 acre-feet of water along the Trinity River. It stretches from a point 1.1 miles upstream of Boggy Creek in Houston/Leon County to the Livingston Dam in Polk/San Jacinto County, up to a normal pool elevation of 131 feet (see Figure 277). This segment begins in the Southern Post Oak Savanna where the land use is hay and pasture land and transitions to the forested Southern Tertiary Uplands ecoregion. There are several developed areas in the communities around the reservoir. Lake Livingston has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at six sites within this segment as shown in Table 227. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 227: Segment 0803 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0803_01	LAKE LIVINGSTON IN MAIN POOL NEAR DAM AT TRA BOUY #2 4.25 KM WEST OF INTERSECTION OF FM 1988 AND FM 3128	10899	TRA Lake Livingston Project
0803_05	LAKE LIVINGSTON AT US 190 IN KICKAPOO CREEK BAY CHANNEL EAST OF ONALASKA TRA #12	21562	TRA Lake Livingston Project
0803_06	LAKE LIVINGSTON MAIN BODY AT US 190 WEST OF ONALASKA	21563	TRA Lake Livingston Project
0803_07	LK LIVINGSTON 1.8 KM S AND 496 METERS E OF INTERSECTION OF FM 356 AND DAVIS RDIN MAIN CHANNEL NEAR MOUTH OF WHITE ROCK CREEK BAY TRA 6	10913	TRA Lake Livingston Project
0803_10	LAKE LIVINGSTON AT SH 19 SOUTH OF TRINITY USGS SITE JC	10914	TRA Lake Livingston Project
0803_11	LAKE LIVINGSTON HEADWATERS AT SH 21 NORTHEAST OF MID WAY TRA 97	10917	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 228. Results of TRA trend analyses are shown in Table 229.

Table 228: TCEQ 2020 Texas Integrated Report Summary for Segment 0803

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803_01 Lowermost portion of reservoir, adjacent to dam	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803_02 Lower portion of reservoir, East Wolf Creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NC
0803_03 Lower portion of reservoir, East Willow Springs	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NC
0803_04 Middle portion of reservoir, East Pointblank	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803_06 Middle portion of reservoir, centering on US 190	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803_07 Upper portion of reservoir, west of Carlisle	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803_08 Cove off upper portion of reservoir, East Trinity	Aquatic Life Use	Dissolved Oxygen	5 mg/L	FS
0803_09 West Carolina Creek cove, off upper portion of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	CS
0803_10 Upper portion of reservoir, centering on SH 19	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803_11 Riverine portion of reservoir, centering on SH 21	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803_01 Lowermost portion of reservoir, adjacent to dam	Aquatic Life Use	Acute Toxic Substances in water		FS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	Aquatic Life Use	Acute Toxic Substances in water		FS
0803_06 Middle portion of reservoir, centering on US 190	Aquatic Life Use	Acute Toxic Substances in water		FS
0803_07 Upper portion of reservoir, west of Carlisle	Aquatic Life Use	Acute Toxic Substances in water		FS
0803_10 Upper portion of reservoir, centering on SH 19	Aquatic Life Use	Acute Toxic Substances in water		FS
0803_11 Riverine portion of reservoir, centering on SH 21	Aquatic Life Use	Acute Toxic Substances in water		FS
0803_01 Lowermost portion of reservoir, adjacent to dam	Aquatic Life Use	Chronic Toxic Substances in water		FS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	Aquatic Life Use	Chronic Toxic Substances in water		FS
0803_06 Middle portion of reservoir, centering on US 190	Aquatic Life Use	Chronic Toxic Substances in water		FS
0803_07 Upper portion of reservoir, west of Carlisle	Aquatic Life Use	Chronic Toxic Substances in water		FS
0803_10 Upper portion of reservoir, centering on SH 19	Aquatic Life Use	Chronic Toxic Substances in water		FS
0803_11 Riverine portion of reservoir, centering on SH 21	Aquatic Life Use	Chronic Toxic Substances in water		FS
0803_01 Lowermost portion of reservoir, adjacent to dam	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0803_04 Middle portion of reservoir, East Pointblank	Recreation Use	*E. coli*	126 MPN/100 mL	NA
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0803_06 Middle portion of reservoir, centering on US 190	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0803_07 Upper portion of reservoir, west of Carlisle	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0803_10 Upper portion of reservoir, centering on SH 19	Recreation Use	*E. coli*	126 MPN/100 mL	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803_11 Riverine portion of reservoir, centering on SH 21	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0803_01 Lowermost portion of reservoir, adjacent to dam	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_02 Lower portion of reservoir, East Wolf Creek	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_03 Lower portion of reservoir, East Willow Springs	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_04 Middle portion of reservoir, East Pointblank	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_06 Middle portion of reservoir, centering on US 190	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_07 Upper portion of reservoir, west of Carlisle	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_08 Cove off upper portion of reservoir, East Trinity	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_09 West Carolina Creek cove, off upper portion of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_10 Upper portion of reservoir, centering on SH 19	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_11 Riverine portion of reservoir, centering on SH 21	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_12 Remainder of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NC
0803_01 Lowermost portion of reservoir, adjacent to dam	General Use	pH	6.5 - 9 S.U.	FS
0803_02 Lower portion of reservoir, East Wolf Creek	General Use	pH	6.5 - 9 S.U.	NA
0803_03 Lower portion of reservoir, East Willow Springs	General Use	pH	6.5 - 9 S.U.	NC
0803_04 Middle portion of reservoir, East Pointblank	General Use	pH	6.5 - 9 S.U.	FS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	General Use	pH	6.5 - 9 S.U.	FS
0803_06 Middle portion of reservoir, centering on US 190	General Use	pH	6.5 - 9 S.U.	FS
0803_07 Upper portion of reservoir, west of Carlisle	General Use	pH	6.5 - 9 S.U.	FS
0803_08 Cove off upper portion of reservoir, East Trinity	General Use	pH	6.5 - 9 S.U.	FS
0803_10 Upper portion of reservoir, centering on SH 19	General Use	pH	6.5 - 9 S.U.	FS
0803_11 Riverine portion of reservoir, centering on SH 21	General Use	pH	6.5 - 9 S.U.	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803_01 Lowermost portion of reservoir, adjacent to dam	General Use	Chloride	150 mg/L	FS
0803_02 Lower portion of reservoir, East Wolf Creek	General Use	Chloride	150 mg/L	FS
0803_03 Lower portion of reservoir, East Willow Springs	General Use	Chloride	150 mg/L	FS
0803_04 Middle portion of reservoir, East Pointblank	General Use	Chloride	150 mg/L	FS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	General Use	Chloride	150 mg/L	FS
0803_06 Middle portion of reservoir, centering on US 190	General Use	Chloride	150 mg/L	FS
0803_07 Upper portion of reservoir, west of Carlisle	General Use	Chloride	150 mg/L	FS
0803_08 Cove off upper portion of reservoir, East Trinity	General Use	Chloride	150 mg/L	FS
0803_09 West Carolina Creek cove, off upper portion of reservoir	General Use	Chloride	150 mg/L	FS
0803_10 Upper portion of reservoir, centering on SH 19	General Use	Chloride	150 mg/L	FS
0803_11 Riverine portion of reservoir, centering on SH 21	General Use	Chloride	150 mg/L	FS
0803_12 Remainder of reservoir	General Use	Chloride	150 mg/L	FS
0803_01 Lowermost portion of reservoir, adjacent to dam	General Use	Sulfate	50 mg/L	NS
0803_02 Lower portion of reservoir, East Wolf Creek	General Use	Sulfate	50 mg/L	NS
0803_03 Lower portion of reservoir, East Willow Springs	General Use	Sulfate	50 mg/L	NS
0803_04 Middle portion of reservoir, East Pointblank	General Use	Sulfate	50 mg/L	NS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	General Use	Sulfate	50 mg/L	NS
0803_06 Middle portion of reservoir, centering on US 190	General Use	Sulfate	50 mg/L	NS
0803_07 Upper portion of reservoir, west of Carlisle	General Use	Sulfate	50 mg/L	NS
0803_08 Cove off upper portion of reservoir, East Trinity	General Use	Sulfate	50 mg/L	NS
0803_09 West Carolina Creek cove, off upper portion of reservoir	General Use	Sulfate	50 mg/L	NS
0803_10 Upper portion of reservoir, centering on SH 19	General Use	Sulfate	50 mg/L	NS
0803_11 Riverine portion of reservoir, centering on SH 21	General Use	Sulfate	50 mg/L	NS
0803_12 Remainder of reservoir	General Use	Sulfate	50 mg/L	NS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803_01 Lowermost portion of reservoir, adjacent to dam	General Use	Total Dissolved Solids	500 mg/L	FS
0803_02 Lower portion of reservoir, East Wolf Creek	General Use	Total Dissolved Solids	500 mg/L	FS
0803_03 Lower portion of reservoir, East Willow Springs	General Use	Total Dissolved Solids	500 mg/L	FS
0803_04 Middle portion of reservoir, East Pointblank	General Use	Total Dissolved Solids	500 mg/L	FS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	General Use	Total Dissolved Solids	500 mg/L	FS
0803_06 Middle portion of reservoir, centering on US 190	General Use	Total Dissolved Solids	500 mg/L	FS
0803_07 Upper portion of reservoir, west of Carlisle	General Use	Total Dissolved Solids	500 mg/L	FS
0803_08 Cove off upper portion of reservoir, East Trinity	General Use	Total Dissolved Solids	500 mg/L	FS
0803_09 West Carolina Creek cove, off upper portion of reservoir	General Use	Total Dissolved Solids	500 mg/L	FS
0803_10 Upper portion of reservoir, centering on SH 19	General Use	Total Dissolved Solids	500 mg/L	FS
0803_11 Riverine portion of reservoir, centering on SH 21	General Use	Total Dissolved Solids	500 mg/L	FS
0803_12 Remainder of reservoir	General Use	Total Dissolved Solids	500 mg/L	FS
0803_01 Lowermost portion of reservoir, adjacent to dam	General Use	Water temperature	33.9 °F	FS
0803_02 Lower portion of reservoir, East Wolf Creek	General Use	Water temperature	33.9 °F	NA
0803_03 Lower portion of reservoir, East Willow Springs	General Use	Water temperature	33.9 °F	NC
0803_04 Middle portion of reservoir, East Pointblank	General Use	Water temperature	33.9 °F	FS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	General Use	Water temperature	33.9 °F	FS
0803_06 Middle portion of reservoir, centering on US 190	General Use	Water temperature	33.9 °F	FS
0803_07 Upper portion of reservoir, west of Carlisle	General Use	Water temperature	33.9 °F	FS
0803_08 Cove off upper portion of reservoir, East Trinity	General Use	Water temperature	33.9 °F	FS
0803_10 Upper portion of reservoir, centering on SH 19	General Use	Water temperature	33.9 °F	FS
0803_11 Riverine portion of reservoir, centering on SH 21	General Use	Water temperature	33.9 °F	FS
0803_01 Lowermost portion of reservoir, adjacent to dam	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0803_04 Middle portion of reservoir, East Pointblank	Domestic Water Supply Use	Surface Water HH criteria DWS average		NA

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0803_06 Middle portion of reservoir, centering on US 190	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0803_07 Upper portion of reservoir, west of Carlisle	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0803_10 Upper portion of reservoir, centering on SH 19	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0803_11 Riverine portion of reservoir, centering on SH 21	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0803_01 Lowermost portion of reservoir, adjacent to dam	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_02 Lower portion of reservoir, East Wolf Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_03 Lower portion of reservoir, East Willow Springs	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_04 Middle portion of reservoir, East Pointblank	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_06 Middle portion of reservoir, centering on US 190	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_07 Upper portion of reservoir, west of Carlisle	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_08 Cove off upper portion of reservoir, East Trinity	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_09 West Carolina Creek cove, off upper portion of reservoir	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_10 Upper portion of reservoir, centering on SH 19	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_11 Riverine portion of reservoir, centering on SH 21	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_12 Remainder of reservoir	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0803_01 Lowermost portion of reservoir, adjacent to dam	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_02 Lower portion of reservoir, East Wolf Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_03 Lower portion of reservoir, East Willow Springs	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_04 Middle portion of reservoir, East Pointblank	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_05 Middle portion of reservoir, downstream of Kickapoo Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_06 Middle portion of reservoir, centering on US 190	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803_07 Upper portion of reservoir, west of Carlisle	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_08 Cove off upper portion of reservoir, East Trinity	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_09 West Carolina Creek cove, off upper portion of reservoir	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_10 Upper portion of reservoir, centering on SH 19	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_11 Riverine portion of reservoir, centering on SH 21	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803_12 Remainder of reservoir	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NA = Not Assessed NC = No Concern
NS = Not Supporting

There were no data available in assessment unit 0803_12 for the period of record for this basin summary report. Data for assessment units 0803_02, 0803_03, 0803_04, 0803_09 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units. No significant trends were identified in assessment unit 0803_08.

Table 229: Significant Trends for Segment 0803 (P-value<0.1)

Segment & Assessment Unit		0803_01	0803_05	0803_06	0803_07	0803_10	0803_11
Site		10899	21562	21563	10913	10914	10917
Air Temperature	All	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Insufficient Data	Not Significant	Not Significant	Not Significant	↓	Not Significant
	Winter	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Secchi Depth	All	Insufficient Data	↓	↓	↓	Not Significant	Not Significant
	Summer	Insufficient Data	↓	↓	↓	Not Significant	Not Significant
	Winter	Insufficient Data	↓	↓	↓	Not Significant	Not Significant
Specific Conductance	All	Insufficient Data	↓	↓	↓	Not Significant	Not Significant
	Summer	Insufficient Data	↓	↓	Not Significant	Not Significant	Not Significant
	Winter	Insufficient Data	Not Significant	Not Significant	↓	Not Significant	Not Significant
Dissolved Oxygen	All	Insufficient Data	Not Significant	Not Significant	↓	Not Significant	Not Significant
	Summer	Insufficient Data	Not Significant	Not Significant	↓	No Trend	No Trend
	Winter	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
pH	All	Insufficient Data	Not Significant	↓	Not Significant	No Trend	No Trend
	Summer	Insufficient Data	Not Significant	↓	↓	Not Significant	No Trend
	Winter	Insufficient Data	Not Significant	↓	Not Significant	No Trend	No Trend
Alkalinity	All	Not Significant	No Trend	No Trend	No Trend	Not Significant	No Trend
	Summer	Not Significant	↓	Not Significant	Not Significant	Not Significant	No Trend
	Winter	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant

Segment & Assessment Unit		0803_01	0803_05	0803_06	0803_07	0803_10	0803_11
Site		10899	21562	21563	10913	10914	10917
Ammonia	All	Insufficient Data	No Trend	No Trend	No Trend	No Trend	No Trend
	Summer	Insufficient Data	No Trend	No Trend	No Trend	No Trend	No Trend
	Winter	Insufficient Data	No Trend	No Trend	No Trend	↓	No Trend
Total Phosphorus	All	Insufficient Data	↓	No Trend	Not Significant	Not Significant	Not Significant
	Summer	Insufficient Data	↓	Not Significant	Not Significant	↓	Not Significant
	Winter	Insufficient Data	↓	Not Significant	Not Significant	Not Significant	Not Significant
Hardness	All	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	No Trend	↑	Not Significant	Not Significant
	Winter	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Chloride	All	Insufficient Data	Not Significant	Not Significant	Not Significant	No Trend	Not Significant
	Summer	Insufficient Data	Not Significant	↓	Not Significant	Not Significant	Not Significant
	Winter	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Sulfate	All	Insufficient Data	Not Significant	Not Significant	↓	Not Significant	Not Significant
	Summer	Insufficient Data	↓	↓	Not Significant	Not Significant	Not Significant
	Winter	Insufficient Data	Not Significant	Not Significant	↓	Not Significant	Not Significant
Dissolved Iron	All	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	No Trend	No Trend	No Trend	Not Significant	No Trend	↑
	Winter	↑	Not Significant	↑	Not Significant	Not Significant	Not Significant
Dissolved Nickel	All	No Trend	↓	↓	No Trend	No Trend	No Trend
	Summer	No Trend	↓	↓	↓	No Trend	No Trend
	Winter	No Trend	No Trend	No Trend	↓	No Trend	No Trend
Dissolved Zinc	All	↓	↓	↓	↓	Not Significant	Not Significant
	Summer	↓	↓	Not Significant	Not Significant	↓	Not Significant
	Winter	Not Significant	↓	↓	↓	No Trend	Not Significant
Total Dissolved Solids	All	Insufficient Data	No Trend	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Insufficient Data	↓	↓	Not Significant	Not Significant	Not Significant
	Winter	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Chlorophyll-*a*	All	No Trend	No Trend	Not Significant	No Trend	No Trend	No Trend
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	No Trend
	Winter	No Trend	No Trend	↓	No Trend	No Trend	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend

Impairments for elevated levels of sulfate were identified throughout the reservoir. The standard for sulfate is applied to an average value for all stations in a segment. Based on the data used for the TCEQ 2020 Texas Integrated Report, the average sulfate level for the reservoir was 50.08 mg/L and the standard was 50 mg/L. For the period of record used for this basin summary report, the average sulfate level for the reservoir was 51.6 mg/L. As shown in Figure 278, this average was influenced by the sulfate levels seen in the riverine portion of the reservoir while

concentrations in the main body of the reservoir were lower. Additionally, segment 0804, just upstream of Lake Livingston, has a sulfate standard of 150 mg/L and was found to be fully supporting this standard. In response, TCEQ has proposed increasing the sulfate standard to 60 mg/L. Upon approval by EPA, this new standard will be used in future Integrated Reports and it is expected that this impairment will be lifted.

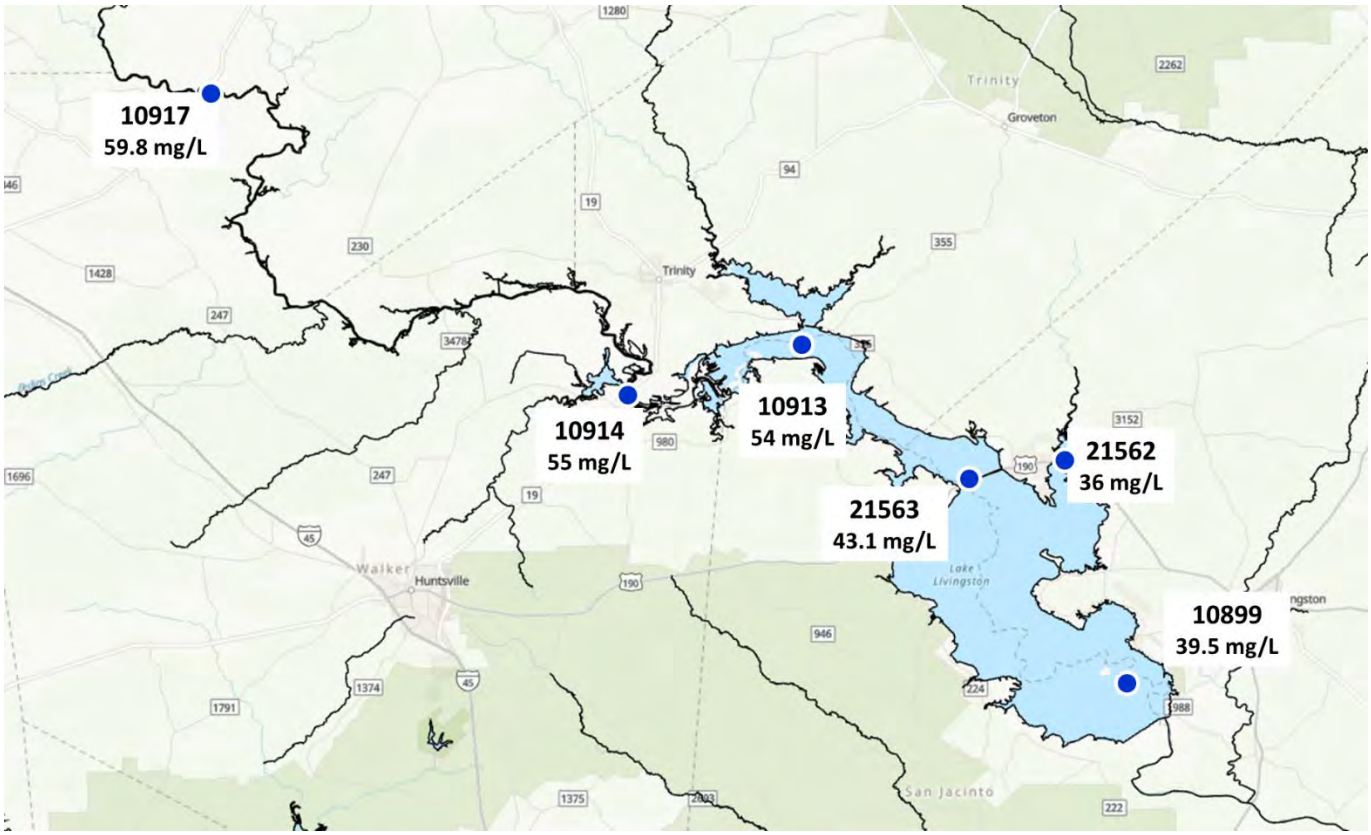


Figure 278: 0803 Sulfate averages

The impairment for fish consumption use is based on unsafe levels of PCBs in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 53) to limit the consumption of several species of fish. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

The concern for depressed dissolved oxygen in assessment unit 0803_09 was carried forward from previous Integrated Reports as there is no monitoring in this portion of the reservoir since 2004. It is recommended that dissolved oxygen monitoring be conducted in this assessment unit to determine if the concern still exists.

The decreasing trends seen for pH in assessment unit 0803_06 (Figure 279) were strongly positively correlated to chlorophyll-*a* levels (correlation coefficient = 0.684). This indicates that as chlorophyll-*a* levels increase or decrease, pH levels also increase or decrease in the same direction as shown in Figure 280. There were decreasing trends for chlorophyll-*a* in this assessment unit although they were only significant for the wintertime period. It is assumed that the decreasing trend in chlorophyll-*a* levels were also influencing the pH trends.

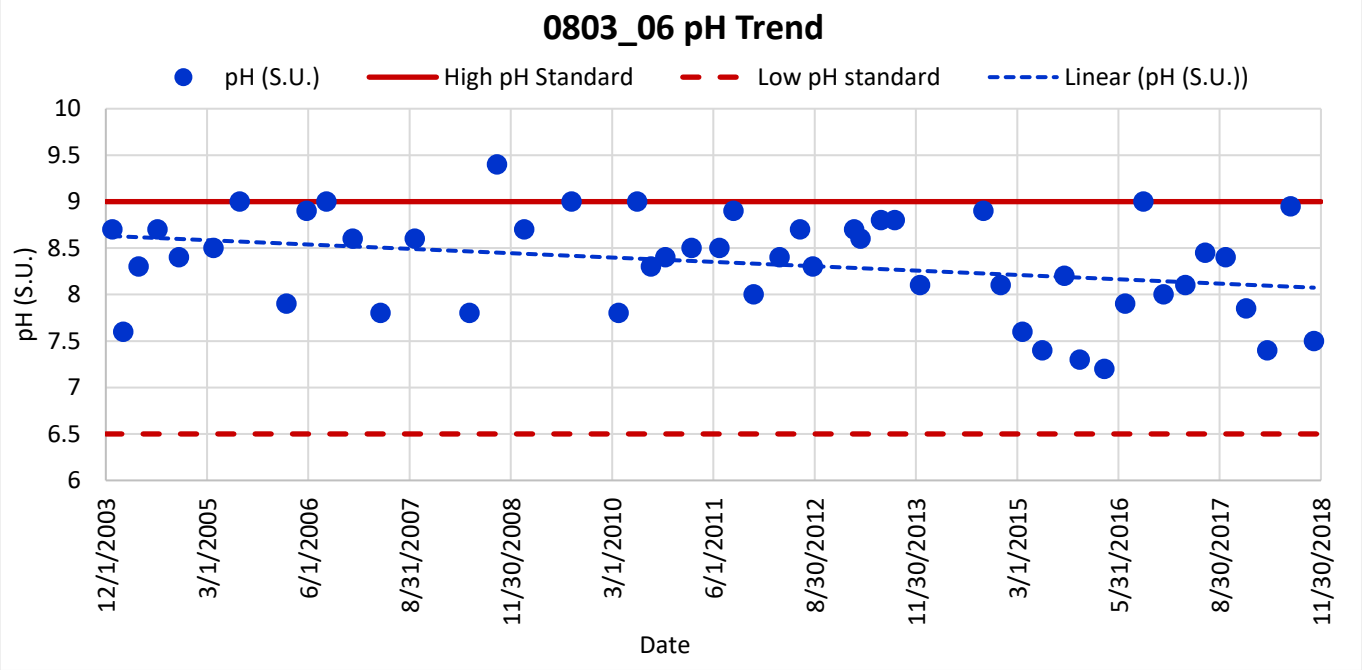


Figure 279: 0803_06 pH Trend

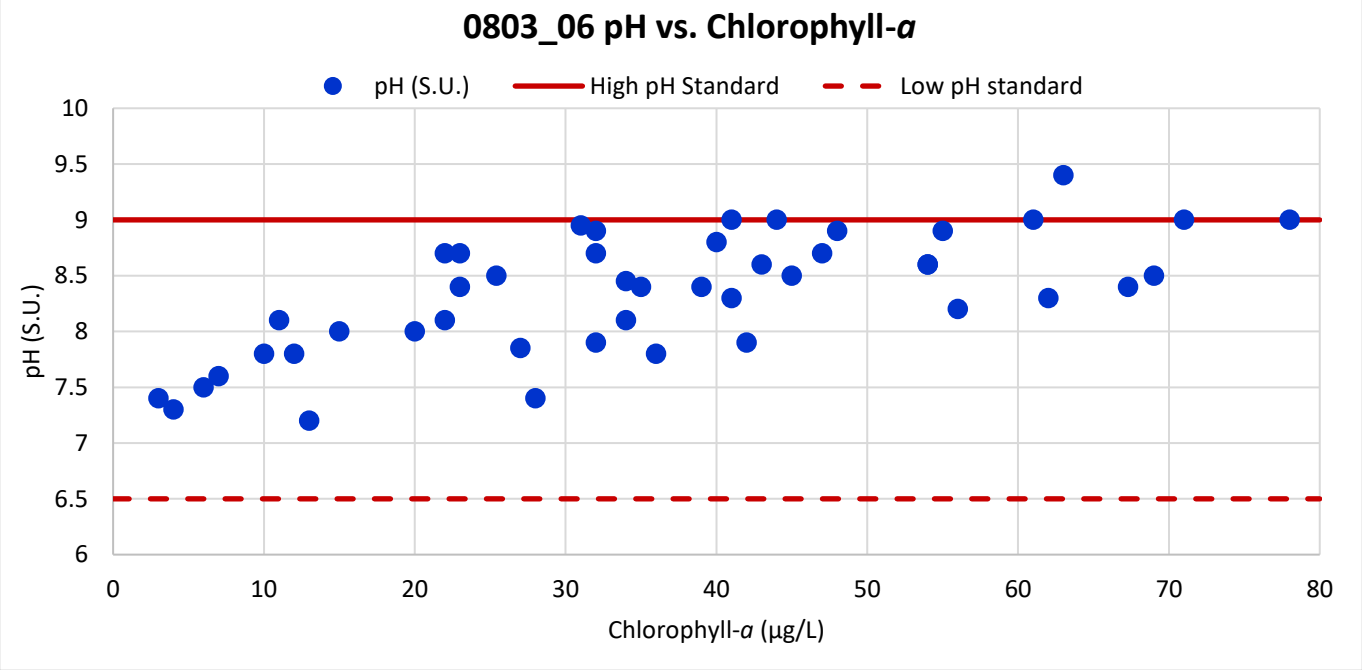


Figure 280: 0803_06 pH vs. Chlorophyll-a

Decreasing trends for secchi depth were identified for several assessment units as shown for assessment unit 0803_06 in Figure 281. It appears that these trends were weighted by higher secchi depth values in the early portion of the data set and stabilized after 2008.

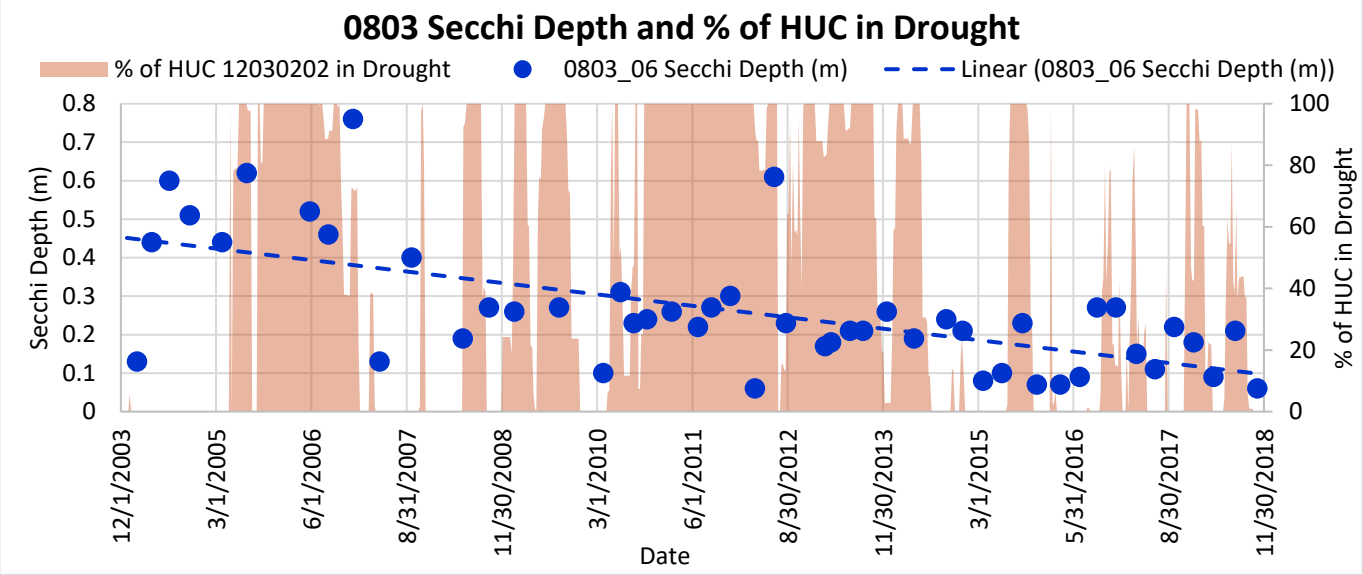


Figure 281: 0803 Secchi Depth and % of HUC in Drought

Increasing trends for dissolved iron in several assessment units appear to be somewhat related to changes in detection limits over time as shown in Figure 282. Early in the data sets, the detection limit was 300 µg/L and then later decreased to 50 µg/L. It is interesting to note that the concentrations began increasing after the recovery from the drought of 2011 to 2015. This may have been due to iron-containing sediments being washed into the reservoir during precipitation events.

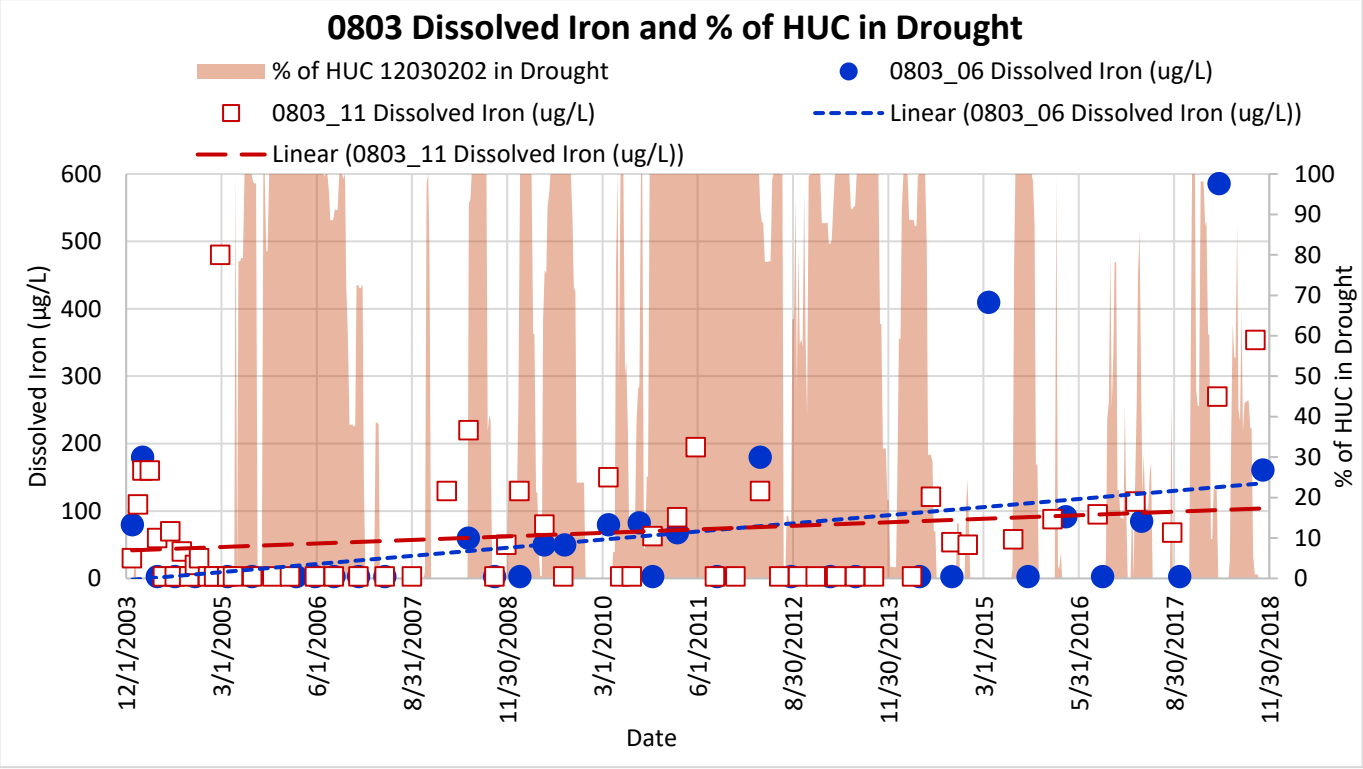


Figure 282: 0803 Dissolved Iron and % of HUC in Drought

0803F Bedias Creek

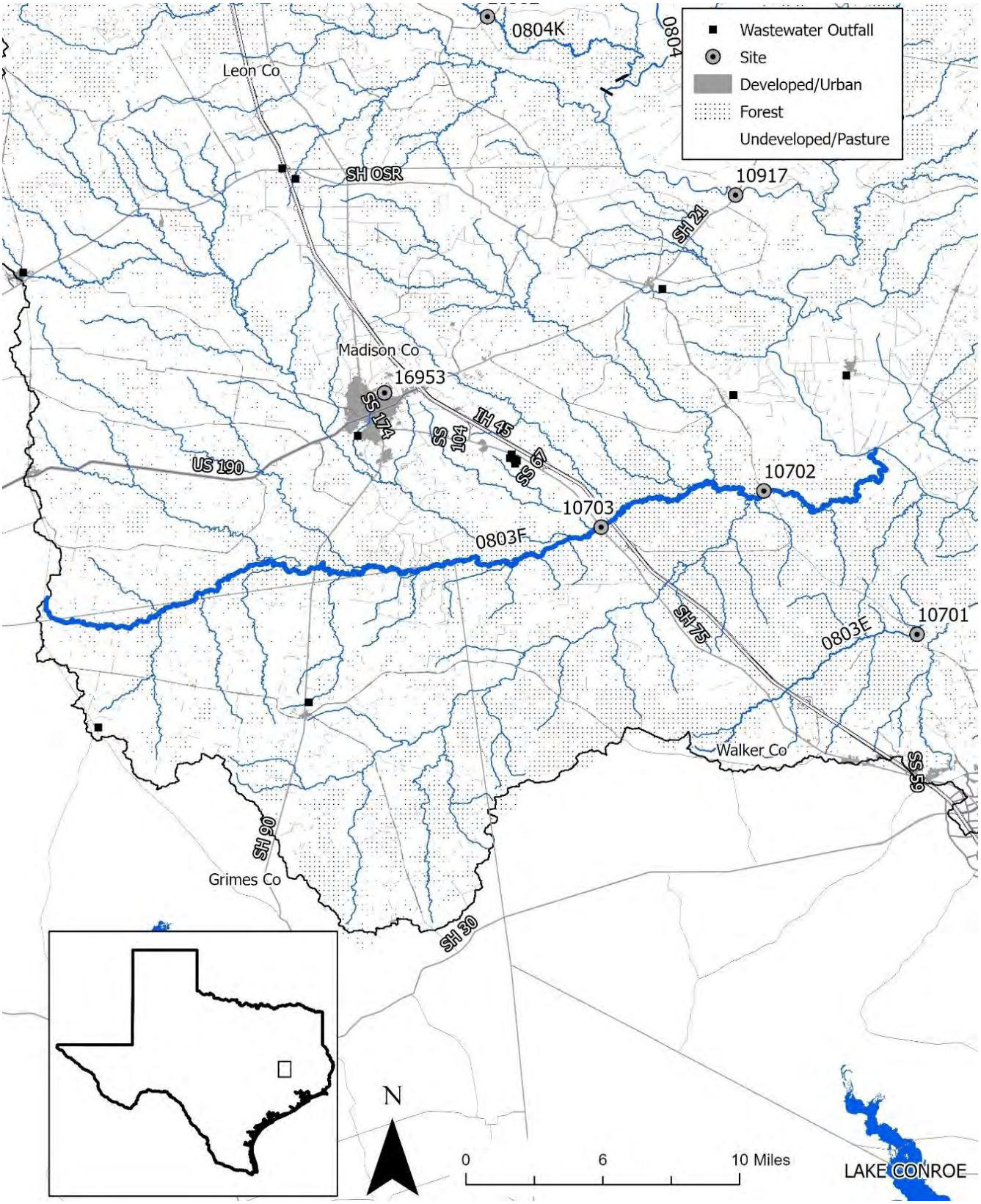


Figure 283: Segment 0803F Map

This 64-mile unclassified segment runs from the headwaters near Route 39 southwest of Madisonville to the confluence with Lake Livingston (see Figure 283). The watershed is largely hay and pasture land with forested areas near the downstream end. It lies within the Southern Post Oak Savanna ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 230. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 230: Segment 0803F FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0803F_02	BEDIAS CREEK IMMEDIATELY DOWNSTREAM OF US 75 SOUTHEAST OF MADISONVILLE	10703	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 231. No significant trends were identified during TRA data analysis.

Table 231: TCEQ 2020 Texas Integrated Report Summary for Segment 0803F

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NC
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	Aquatic Life Use	Acute Toxic Substances in water		NA
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	Aquatic Life Use	Acute Toxic Substances in water - Zinc (dissolved)	87.67 µg/L	CN
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	Aquatic Life Use	Chronic Toxic Substances in water		NA
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	Aquatic Life Use	Chronic Toxic Substances in water - Zinc (dissolved)	112.1 µg/L	CN
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	General Use	Ammonia	0.33 mg/L	NC
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	General Use	Ammonia	0.33 mg/L	NC
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	General Use	Nitrate	1.95 mg/L	NC
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	General Use	Nitrate	1.95 mg/L	NC

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	General Use	Total Phosphorus	0.69 mg/L	NC
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	General Use	Total Phosphorus	0.69 mg/L	NC
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0803F_01 From the confluence with segment 0803 Trinity River up to confluence with Poole Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0803F_02 From the confluence with Poole Creek to upper end of Bedias Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CN = Use Concern CS = Screening Level Concern FS = Fully Supporting NA = Not Assessed
NC = No Concern

Data for assessment units 0803F_01 and 0803F_02 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Concerns for elevated levels of dissolved zinc were carried forward from previous Integrated Reports. The data sets for the period of record used in this basin summary report for dissolved zinc in assessment units 0803F_01 and 0803F_02 were limited. There were a total of four data points for 0803F_01 with an average of 13.5 µg/L. For 0803F_02, there were 11 data points with an average of 55.8 µg/L. The acute criteria for zinc in assessment unit 0803F_01 was 85.36 µg/l and 87.67 µg/L in 0803F_02. The chronic criteria for both assessment units was 112.1 µg/L. It is recommended that dissolved zinc monitoring continue in this segment in order to fully address this concern.

The concern for *E. coli* in assessment unit 0803F_01 was carried forward from previous Integrated Reports as there is no current monitoring in this assessment unit. The concern in 0803F_02 was based on limited data. However, the geomean for the data set used in this basin summary report was 166 MPN/100 mL. There was a relatively strong correlation between *E. coli* and days since precipitation (correlation coefficient = -0.409) as well as *E. coli* and flow (correlation coefficient = 0.483). This indicates that bacteria concerns in this assessment unit were likely related to run-off carrying waste from livestock and wildlife in the upstream pastures and wooded areas. Landowner education and livestock best management practices may help reduce bacteria levels in this segment.

0803E Nelson Creek

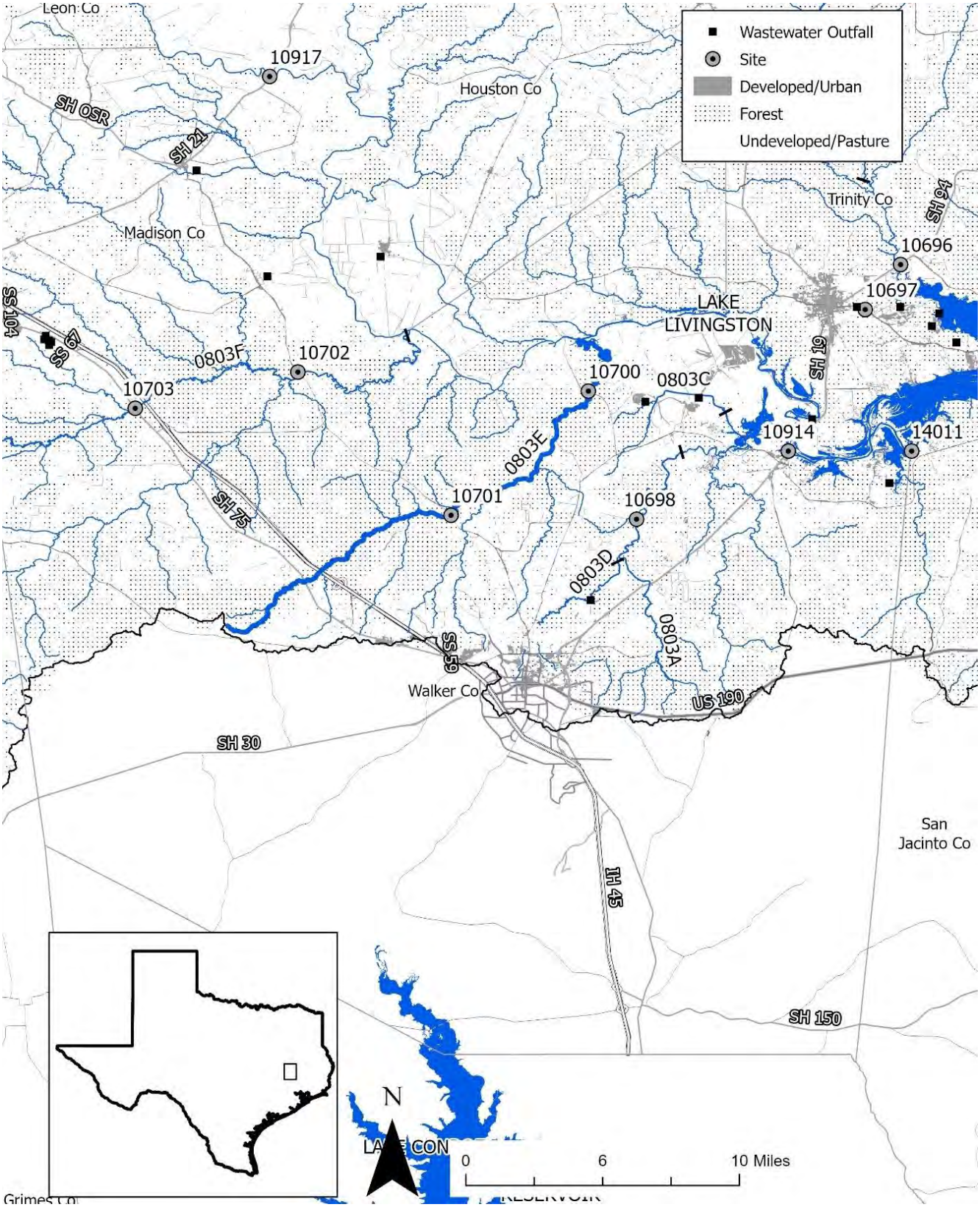


Figure 284: Segment 0803E Map

This 27-mile unclassified segment runs from the headwaters of the stream near FM 1696 west of Huntsville to the confluence with Lake Livingston (see Figure 284). The watershed is mostly forest to the north of the stream and a mix of forest, hay, and pasture land to the south. It lies within the Southern Tertiary Uplands ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 232. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 232: Segment 0803E FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0803E_01	NELSON CREEK AT FM 3478 NEAR MOUNT OLIVE TRA #20	10700	TRA Lake Livingston Project

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 233. No significant trends were identified during TRA data analysis.

Table 233: TCEQ 2020 Texas Integrated Report Summary for Segment 0803E

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	Aquatic Life Use	Acute Toxic Substances in water		FS
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	Aquatic Life Use	Chronic Toxic Substances in water		FS
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	General Use	Ammonia	0.33 mg/L	NC
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	General Use	Nitrate	1.95 mg/L	NC
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	General Use	Total Phosphorus	0.69 mg/L	NC
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0803E_01 From the confluence with segment 0803 Trinity River to upper end of Nelson Creek	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NC = No Concern

0803C Turkey Creek

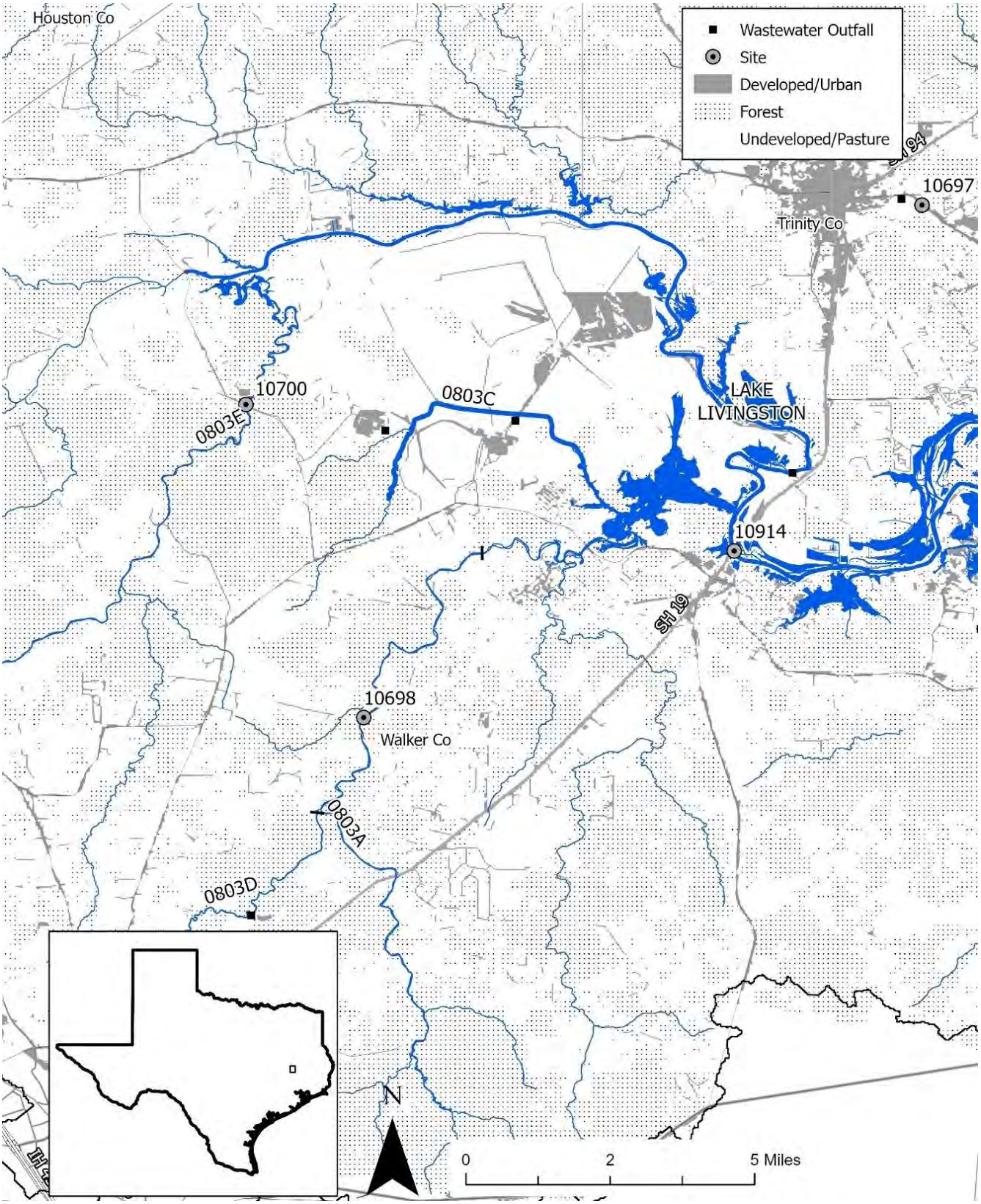


Figure 285: Segment 0803C Map

This 4.7-mile unclassified segment runs from the confluence with an unnamed tributary 2.85 km downstream of FM 980 west of Riverside to the confluence with Lake Livingston (see Figure 285). The watershed is largely rural with hay, pasture, and crop land. It lies within the Southern Tertiary Uplands ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0803C_01 for the period of record for this basin summary report.

0803D Parker Creek

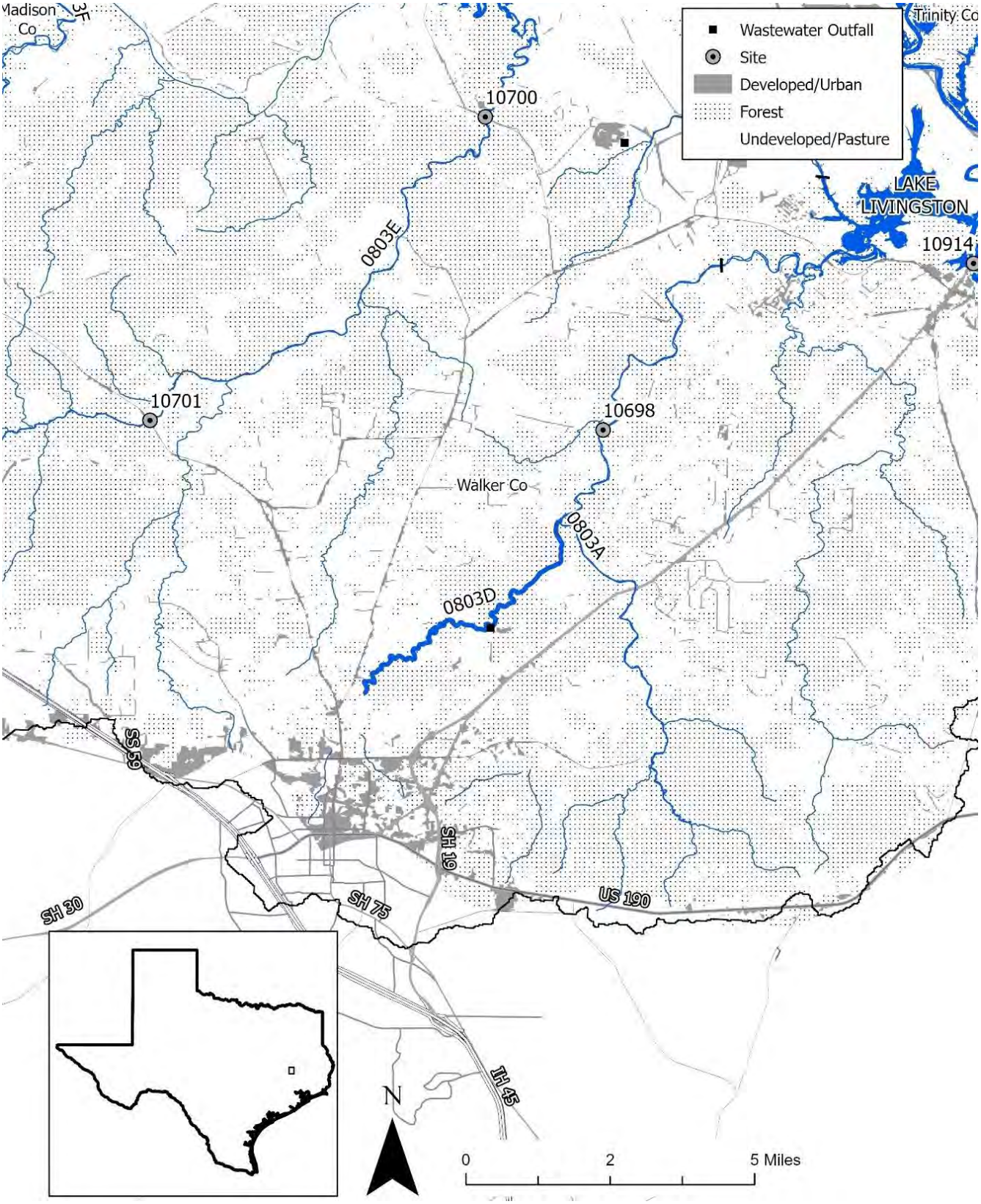


Figure 286: Segment 0803D Map

This 6-mile unclassified segment runs from the confluence with Town Branch north of Huntsville to the confluence with Harmon Creek (see Figure 286). The watershed is a mix of forest and hay and pasture land with some light development. It lies within the Southern Tertiary Uplands ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0803D_01 for the period of record for this basin summary report.

0803A Harmon Creek

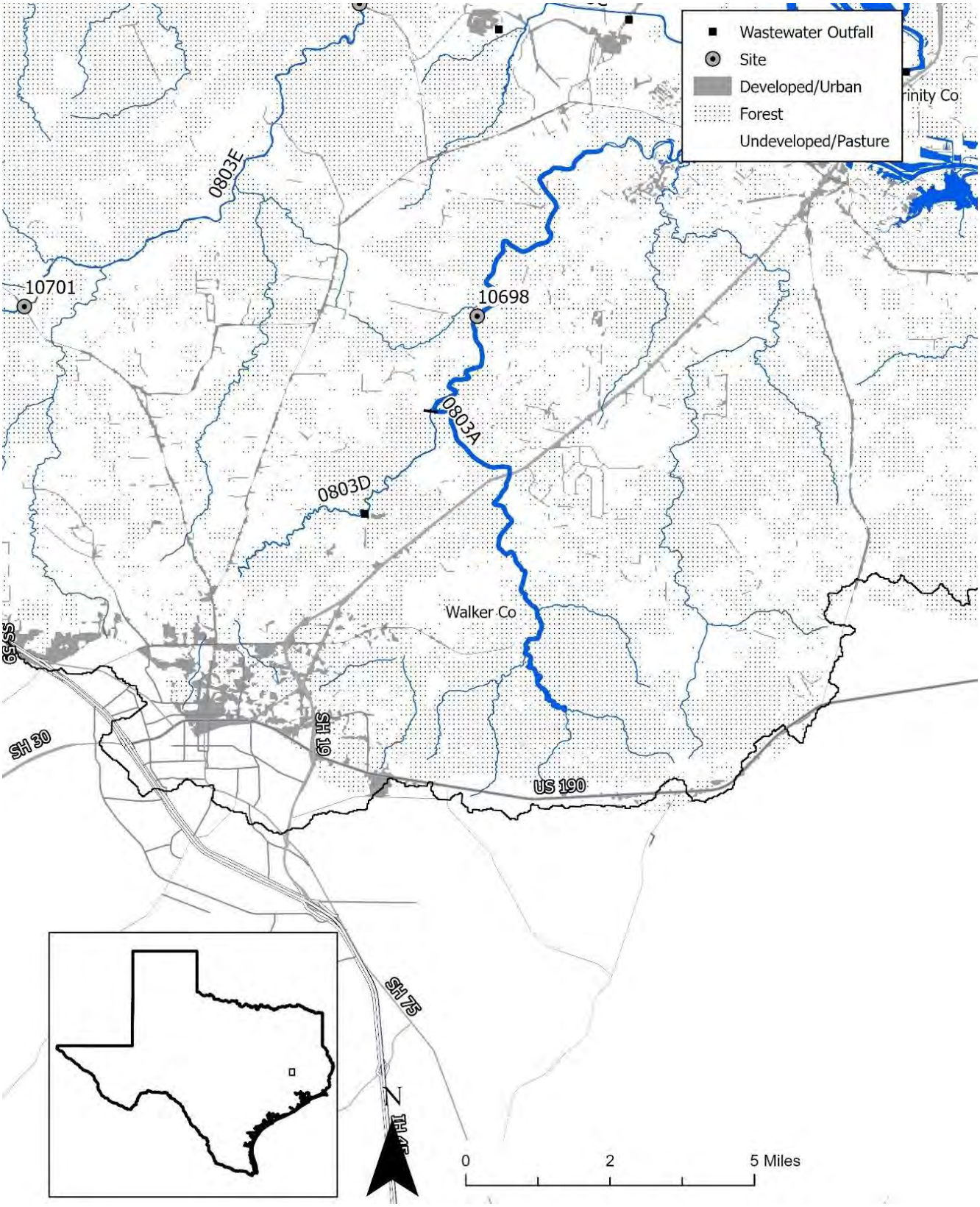


Figure 287: Segment 0803A Map

This 13.8-mile unclassified segment runs from the confluence of East Fork Harmon Creek east of Huntsville to the confluence with Lake Livingston (see Figure 287). The watershed is a mix of forest and hay and pasture land with some light development. It lies within the Southern Tertiary Uplands ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 234. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 234: Segment 0803A FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0803A_01	HARMON CREEK 509 METERS UPSTREAM FROM INTERSECTION WITH OTTER RD EAST OF FM 980 AND 7.6 MILES NORTHEAST OF HUNTSVILLE	10698	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 235. No significant trends were identified during TRA data analysis.

Table 235: TCEQ 2020 Texas Integrated Report Summary for Segment 0803A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803A_01 16 mi stretch from Lake Livingston upstream to confluence of East Fork Harmon Creek.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803A_01 16 mi stretch from Lake Livingston upstream to confluence of East Fork Harmon Creek.	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0803A_01 16 mi stretch from Lake Livingston upstream to confluence of East Fork Harmon Creek.	General Use	Ammonia	0.33 mg/L	NC
0803A_01 16 mi stretch from Lake Livingston upstream to confluence of East Fork Harmon Creek.	General Use	Nitrate	1.95 mg/L	CS
0803A_01 16 mi stretch from Lake Livingston upstream to confluence of East Fork Harmon Creek.	General Use	Total Phosphorus	0.69 mg/L	CS
0803A_01 16 mi stretch from Lake Livingston upstream to confluence of East Fork Harmon Creek.	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CS = Screening Level Concern FS = Fully Supporting NC = No Concern

Concerns for nitrate and total phosphorus appear to be related to upstream wastewater treatment facilities. Although flow data were limited, Figure 288 shows that concentrations of these parameters were generally reported at higher levels during periods of low flows. As discussed for other segments, this pattern is commonly seen in waterbodies downstream of wastewater treatment facilities.

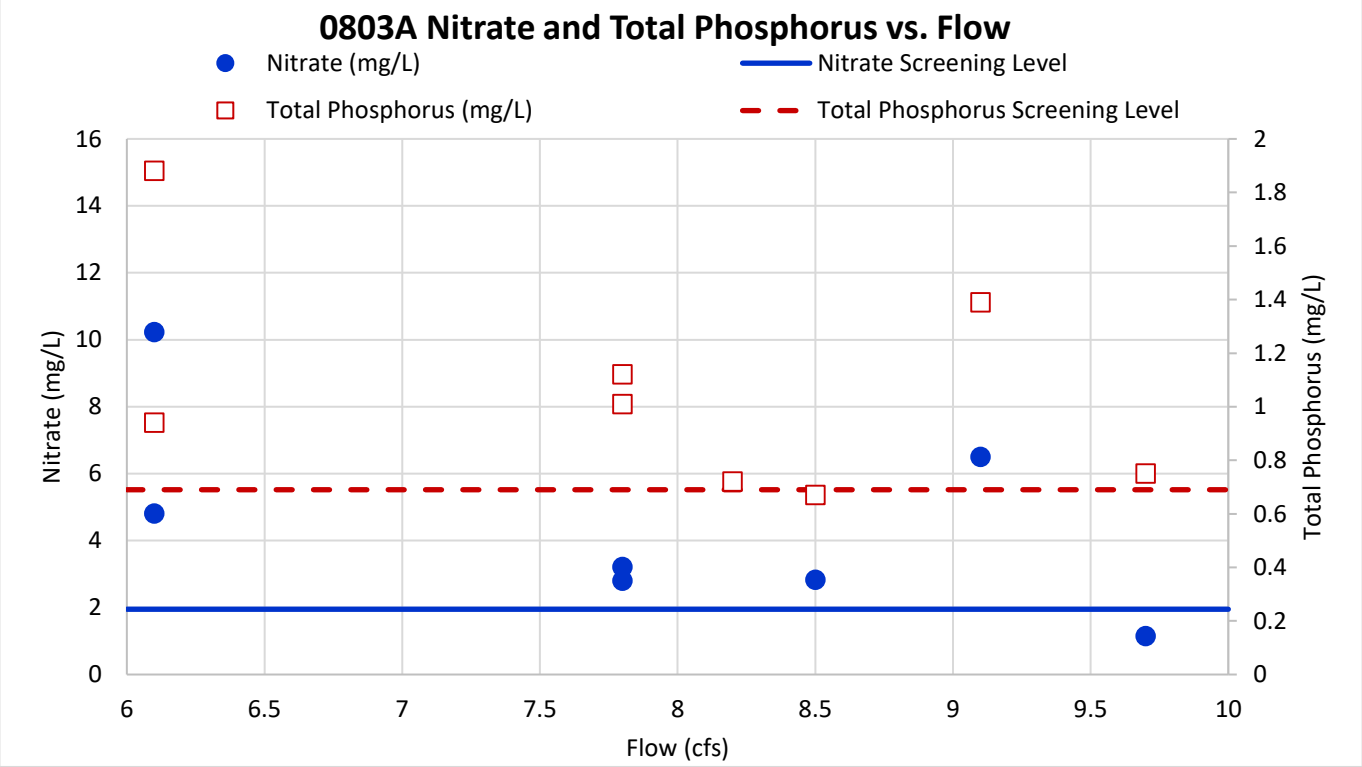


Figure 288: 0803A Nitrate and Total Phosphorus vs. Flow

0803B White Rock Creek

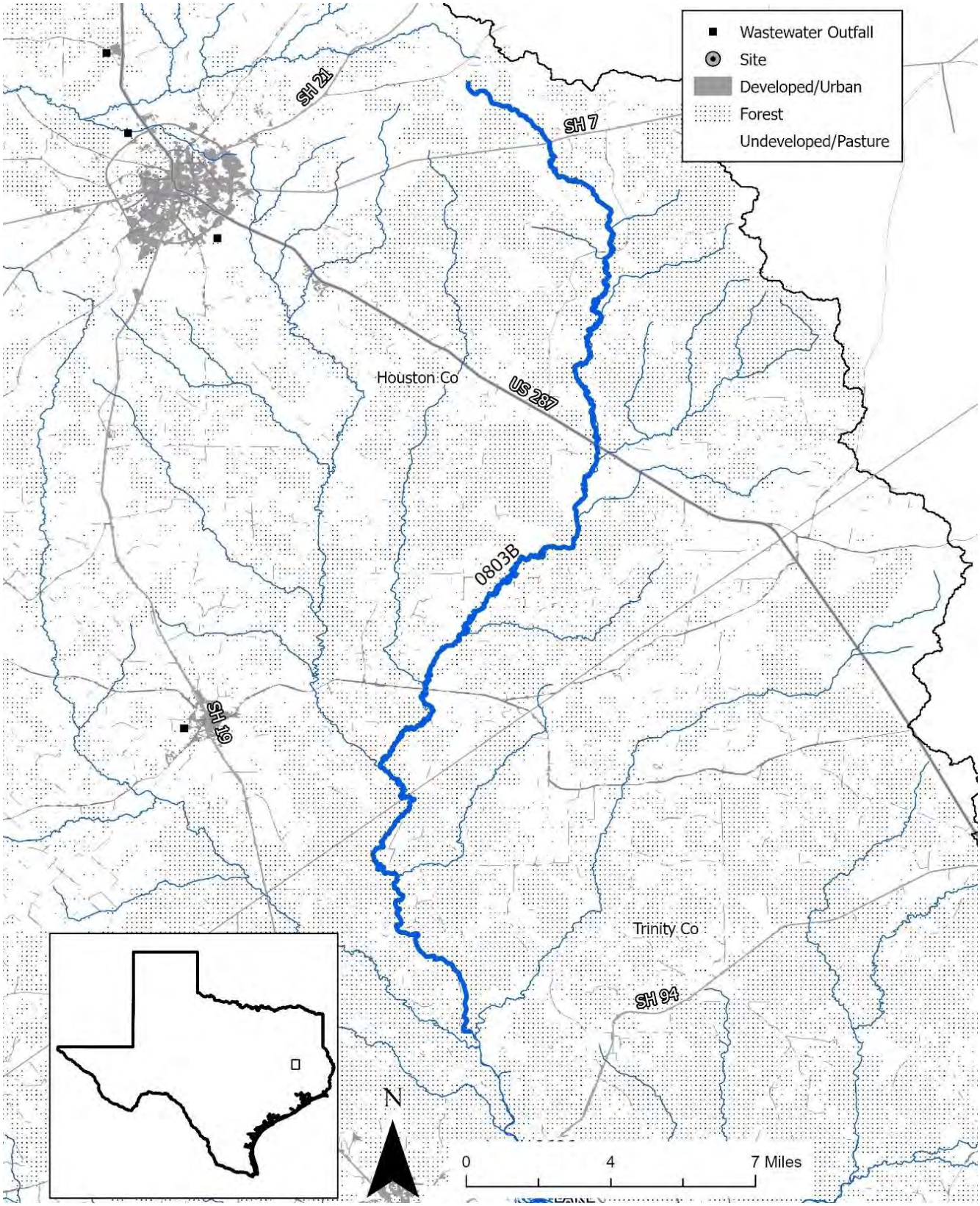


Figure 289: Segment 0803B Map

This 42-mile unclassified segment runs from upstream of Highway 7 east of Crockett to the confluence of Lake Livingston (see Figure 289). Much of the watershed is forested but there is quite a bit of hay and pasture land. There is some development around the City of Crockett. The watershed flows though the Southern Tertiary Uplands ecoregion.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 236. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 236: Segment 0803B FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0803B_01	WHITE ROCK CREEK AT SH 94 NORTHEAST OF TRINITY TRA #21	10696	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 237.

Table 237: TCEQ 2020 Texas Integrated Report Summary for Segment 0803B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0803B_01 Lower 25 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0803B_01 Lower 25 mi of segment	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0803B_01 Lower 25 mi of segment	General Use	Ammonia	0.33 mg/L	NC
0803B_01 Lower 25 mi of segment	General Use	Nitrate	1.95 mg/L	NC
0803B_01 Lower 25 mi of segment	General Use	Total Phosphorus	0.69 mg/L	NC
0803B_01 Lower 25 mi of segment	General Use	Chlorophyll-*a*	14.1 µg/L	CS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern

There were no data available in assessment units 0803B_01 and 0803B_02 for the period of record for this basin summary report.

The chlorophyll-*a* concern in this segment did not appear to be related to nutrients as there were no positive correlations between chlorophyll-*a* and either nitrogen or phosphorus. As shown in Figure 290, chlorophyll-*a* was generally reported at levels above the screening level of 14.1 µg/L. The station in this segment is located in a backwater area of Lake Livingston and was likely influenced by both algal populations in the reservoir as well as low stream flows as increased residence times can allow algal populations to increase. It does not appear that algal populations were having a negative effect on water quality; the lowest dissolved oxygen level reported was 5.9 mg/L.

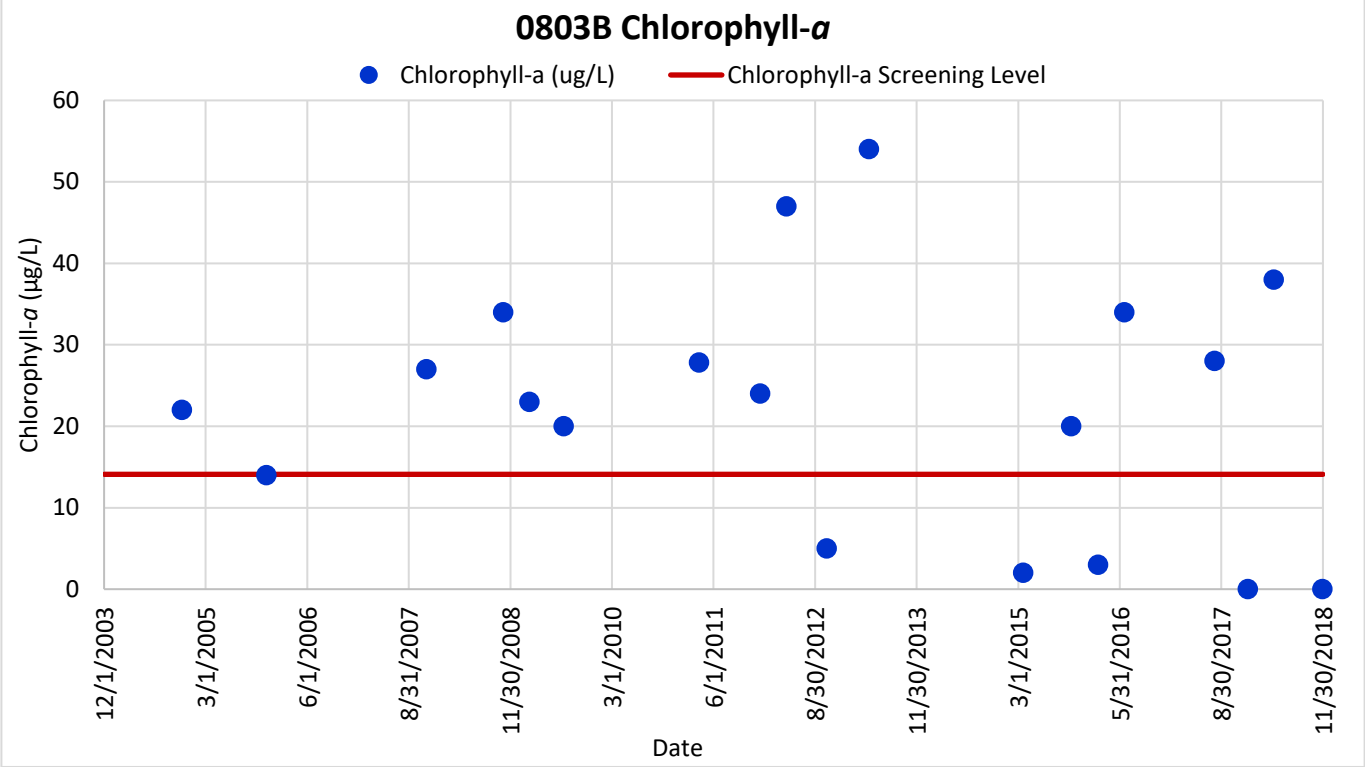


Figure 290: 0803B Chlorophyll-a

Village Creek

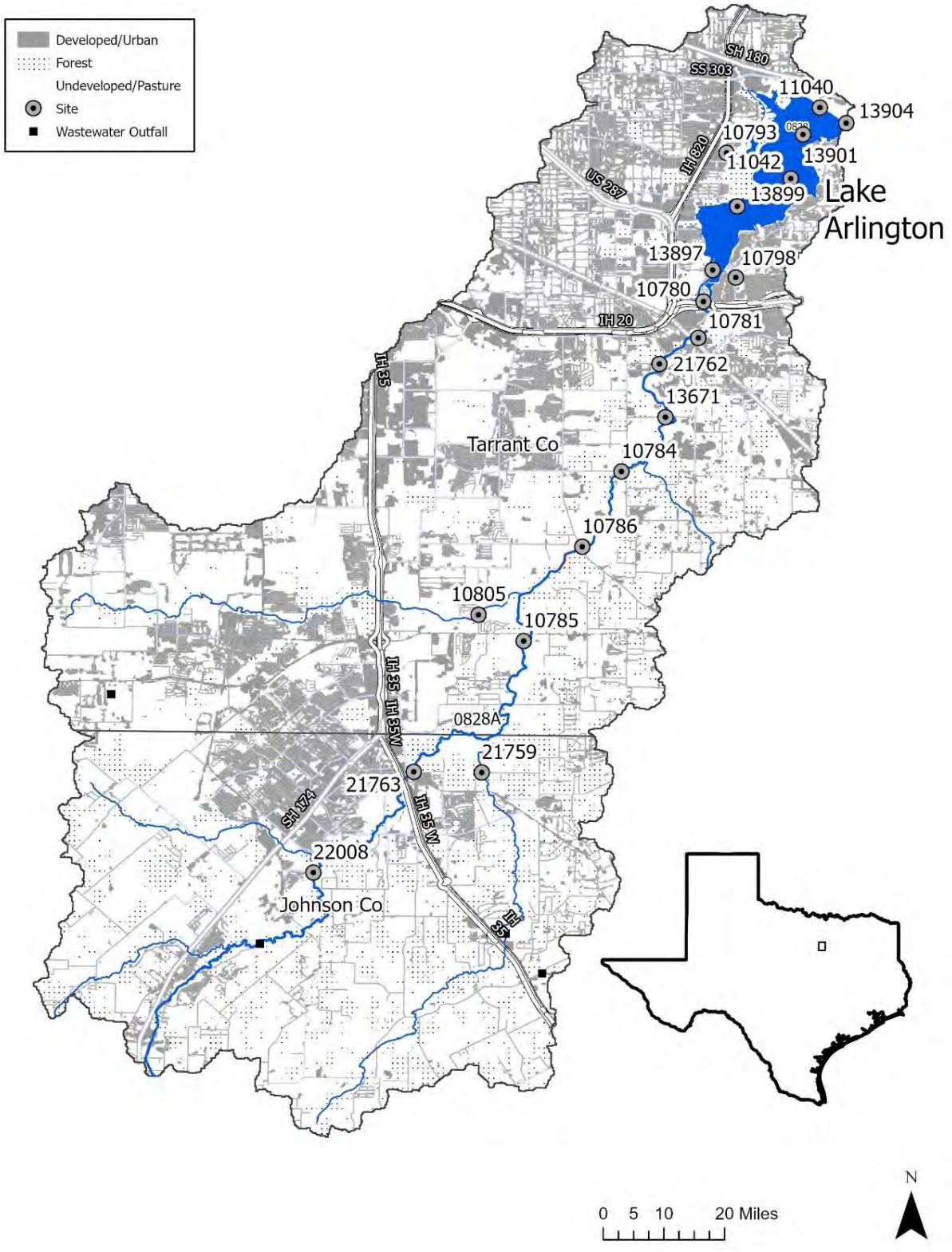


Figure 291: Village Creek Overview Map

The Village Creek subwatershed extends approximately 28 river miles from Johnson County to the Lake Arlington dam in Tarrant County (see Figure 291). Much of the watershed is highly urbanized especially around Lake Arlington and the communities of Forest Hill, Kennedale, and Burleson. The remainder of the subwatershed is rural with grassland and some crops and forested areas. Lake Arlington supplies water to the City of Arlington, as well as a portion of Tarrant County. Water rights permits for Lake Arlington are held by the City of Arlington and TXU Electric. Yields of the reservoir are supplemented by water imported from the Cedar Creek and Richland-Chambers reservoirs. This subwatershed receives between 35 and 37 inches of precipitation annually and is located within the Grand Prairie and Eastern Cross Timbers ecoregions.

In 2011, Trinity River Basin stakeholders created the 2011 Lake Arlington Master Plan which outlines a series of goals and objectives for Lake Arlington and the Village Creek subwatershed. These goals include protecting water quality, promoting recreation opportunities and enhancing wildlife preservation and fisheries. The Watershed Protection Plan has been approved by EPA and stakeholders are currently seeking grant funding for implementation activities. For more information, please visit the TRA VCLA WPP website.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0828A – Village Creek
- 0828 – Lake Arlington

0828A Village Creek

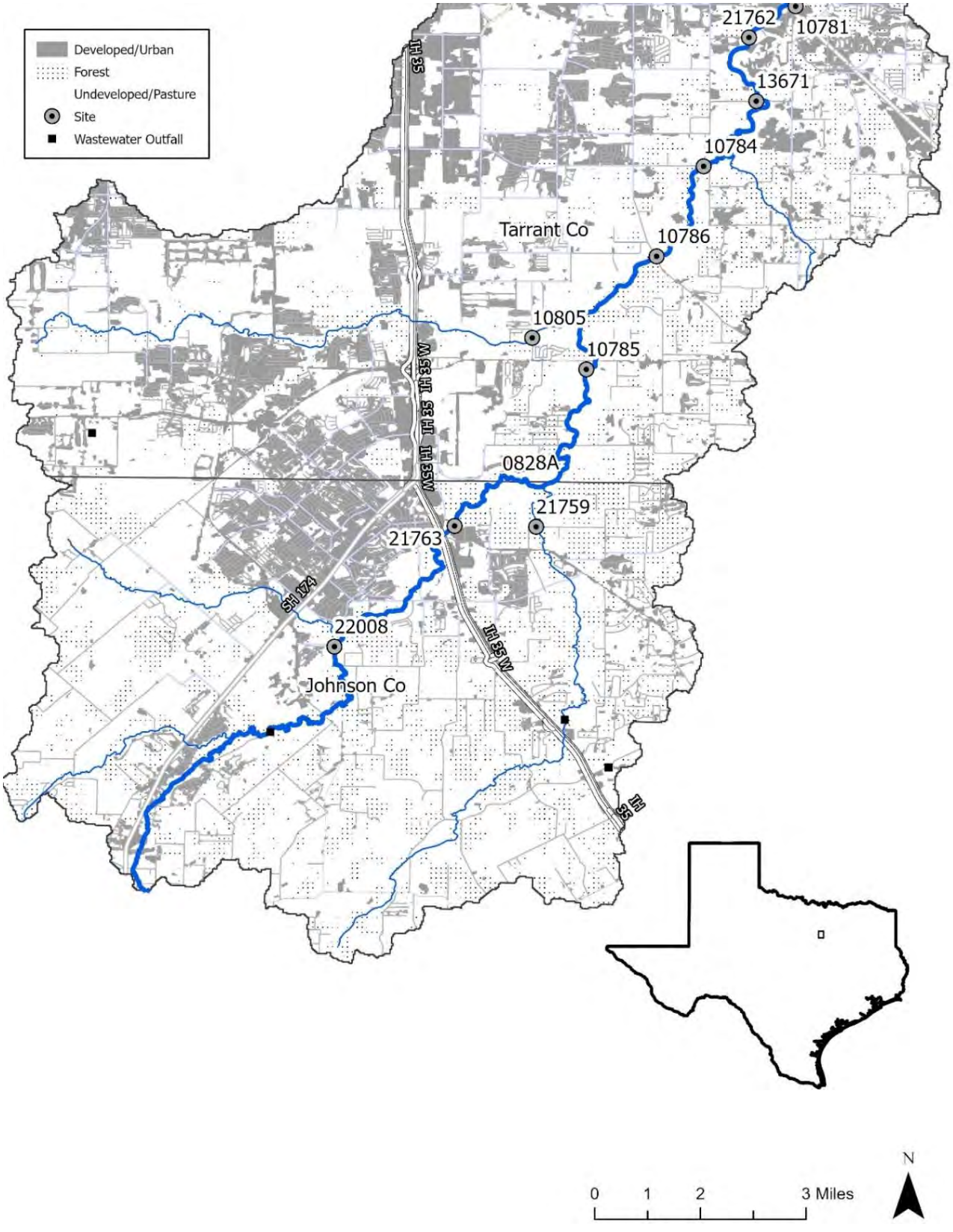


Figure 292: Segment 0828A Map

This 24-mile unclassified segment runs from the headwaters east of Joshua in Johnson County to the confluence with Lake Arlington in Tarrant County (see Figure 292). Development surrounds the cities of Burleson in the middle of the watershed and Forest Hill and Kennedale at the lower end of the watershed. The remainder of the watershed is largely pasture, hay, and grassland. There are some pockets of forested land throughout the watershed. The watershed flows through the Grand Prairie ecoregion to the west and the Eastern Cross Timbers to the east.

Clean Rivers Program water quality monitoring is being conducted at four sites within this segment as shown in Table 238. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 238: Segment 0828 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0828_07	LAKE ARLINGTON USGS SITE FC 570 METERS EAST OF INTERSECTION OF KAY DRIVE AND KALTENBRUN ROAD	13897	Tarrant Regional Water District
0828_06	LAKE ARLINGTON MID LAKE 177 METERS NORTH AND 865 METERS WEST OF INTERSECTION OF ARBOR VALLEY DRIVE & PERKINS ROAD	11042	Tarrant Regional Water District
0828_05	LAKE ARLINGTON USGS SITE EC 254 METERS SOUTH AND 493 METERS EAST OF INTERSECTION OF CRAVENS ROAD AND WILBARGER STREET	13899	Tarrant Regional Water District
0828_02	LK ARLINGTON USGS SITE AC ID 324304097113601 LOCATION MATCHES SITE MAP 518 M N AND 507 M W INTERSECT OF LK ARLINGTON BLVD AND GREEN OAK	13904	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 239. Results of TRA trend analyses are shown in Table 240.

Table 239: TCEQ 2020 Texas Integrated Report Summary for Segment 0828A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0828A_01 From Lake Arlington to the headwaters	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0828A_01 From Lake Arlington to the headwaters	Aquatic Life Use	Fish Community		FS
0828A_01 From Lake Arlington to the headwaters	Aquatic Life Use	Macrobenthic Community		FS
0828A_01 From Lake Arlington to the headwaters	Aquatic Life Use	Habitat		NC
0828A_01 From Lake Arlington to the headwaters	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0828A_01 From Lake Arlington to the headwaters	General Use	Ammonia	0.33 mg/L	NC
0828A_01 From Lake Arlington to the headwaters	General Use	Nitrate	1.95 mg/L	NC
0828A_01 From Lake Arlington to the headwaters	General Use	Total Phosphorus	0.69 mg/L	NC
0828A_01 From Lake Arlington to the headwaters	General Use	Chlorophyll-*a*	14.1 µg/L	NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 240: Significant Trends for Segment 0828A (P-value<0.1)

Segment & Assessment Unit		0828A_01
Site		10786
Flow	All	No Trend
	Summer	↓
	Winter	↓
Specific Conductance	All	Not Significant
	Summer	↑
	Winter	Not Significant
Total Suspended Solids	All	↓
	Summer	↓
	Winter	↓
Ammonia	All	↓
	Summer	↓
	Winter	↓
Nitrate	All	No Trend
	Summer	↓
	Winter	No Trend
Total Phosphorus	All	↓
	Summer	↓
	Winter	↓
Orthophosphate	All	No Trend
	Summer	↓
	Winter	No Trend
Total Organic Carbon	All	↓
	Summer	↓
	Winter	↓
Flow Severity	All	↓
	Summer	↓
	Winter	↓
Total Dissolved Solids	All	Not Significant
	Summer	↑
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

The TCEQ 2020 Texas Integrated Report found that assessment unit 0828A_01 was not supporting the Contact Recreation Use due to elevated levels of *E. coli*. As shown in Figure 293 for the long-term monitoring station 10786 and one of the stations monitored as part of the watershed protection plan watershed characterization; 13671. *E. coli* levels consistently exceeded the standard of 126 MPN/100 mL. Data collected at station 10786 span the period of record for this basin summary report. This station is located in roughly the middle of the segment. Additional samples were collected at several other stations between 2016 and 2018 for the Village Creek-Lake Arlington Watershed Protection Plan. *E. coli* levels at these stations

were consistent with those measured at station 10786. It appears that *E. coli* levels at most of the sites were positively correlated to flow indicating that run-off carrying waste from wildlife, livestock, and pets were the most likely sources of bacteria into the stream. Moving from upstream to downstream, the correlation coefficients for flow and *E. coli* at station 21763 on Village Creek and at station 21759 on Quil Miller Creek were 0.748 and 0.417, respectively. Below this confluence, at station 10785 on Village Creek, it was 0.664 and at a nearby tributary, station 10805 on Deer Creek, it was 0.544. Station 10786 is located downstream of the Village Creek and Deer Creek confluence. The correlation coefficient at this station was 0.142 which seems to indicate that there may have been continuous sources of *E. coli* into the stream. Additionally, much of the segment was intermittent with perennial pools and exhibited evidence of wildlife and livestock activity in and around the stream. Therefore, elevated bacteria levels could have been a result of direct deposition by animals visiting the stream for watering. It is recommended that fine scale sampling be conducted between stations 10786 and the upstream stations 10805 and 10785 to determine if there are sources such as broken infrastructure or failing septic systems. Moving further downstream, the correlation coefficient at station 13671 was 0.838 indicating that run-off related sources were predominate at this station. The correlation had weakened to 0.323 by the next downstream station; 21762. Overall, landowner education and livestock best management practices may help reduce *E. coli* levels in this segment.

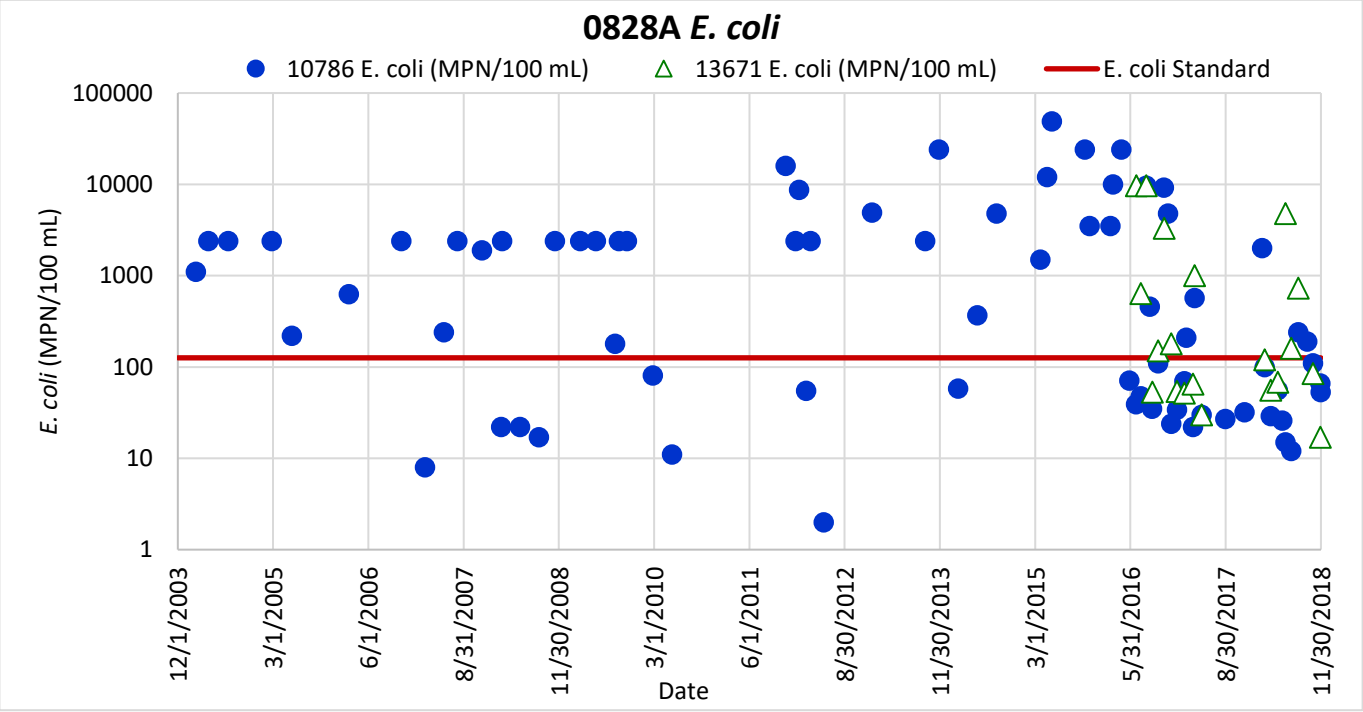


Figure 293: 0828A E. coli

Decreasing trends for ammonia in this segment were related to detection limits and did not represent a true change in water quality. Prior to 2010, the detection limit was 0.02 mg/L. It later increased to 0.1 mg/L. Of 56 records for the period of record for this basin summary report, only

10 records were reported above 0.1 mg/L and those records were scattered throughout the data set.

Decreasing trends for total suspended solids, total phosphorus, and total organic carbon appeared to have been true trends as shown for total suspended solids in Figure 294. Higher values generally occurred during drought and then decreased during drought recovery periods.

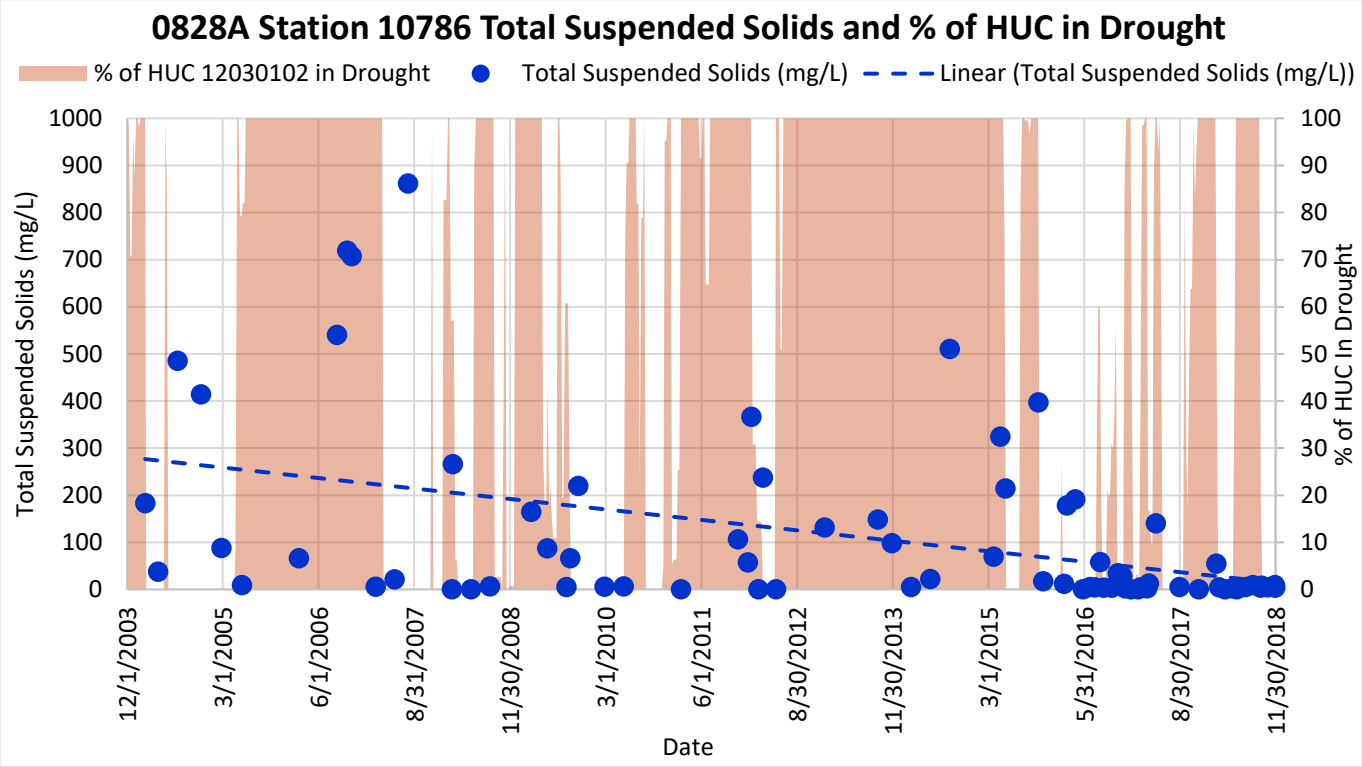


Figure 294: 0828A Station 10786 Total Suspended Solids and % of HUC in Drought

The increasing summer trend for total dissolved solids appears to have been related to the recent drought recovery period as shown in Figure 295. Overall, total dissolved solids was negatively correlated to flow (correlation coefficient = -0.494); total dissolved solids levels were higher at lower flows and decreased as flow increased. This seems to be at odds with the observed increasing trend occurring during drought recovery periods. However, run-off from irrigated fields can introduce total dissolved solids to a waterbody. As irrigation water evaporates, it leaves the dissolved solids and salts on the ground. During drought periods, successive irrigation continues to increase the quantity of these compounds. Precipitation that results in run-off can then wash these solids and salts into nearby waterbodies. This run-off may result in only a small increase in stream flow which remains consistent with the overall correlation.

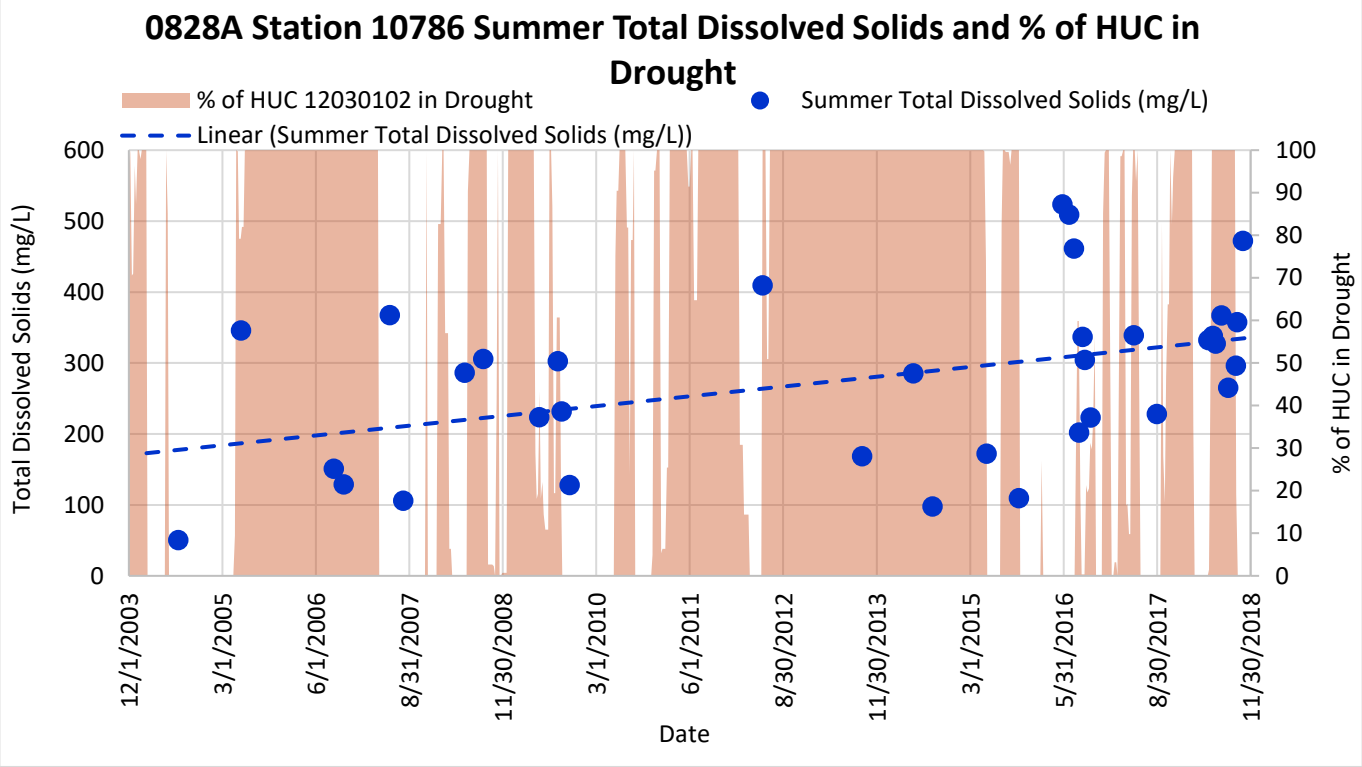


Figure 295: 0828A Station 10786 Summer Total Dissolved Solids and % of HUC in Drought

0828 Lake Arlington

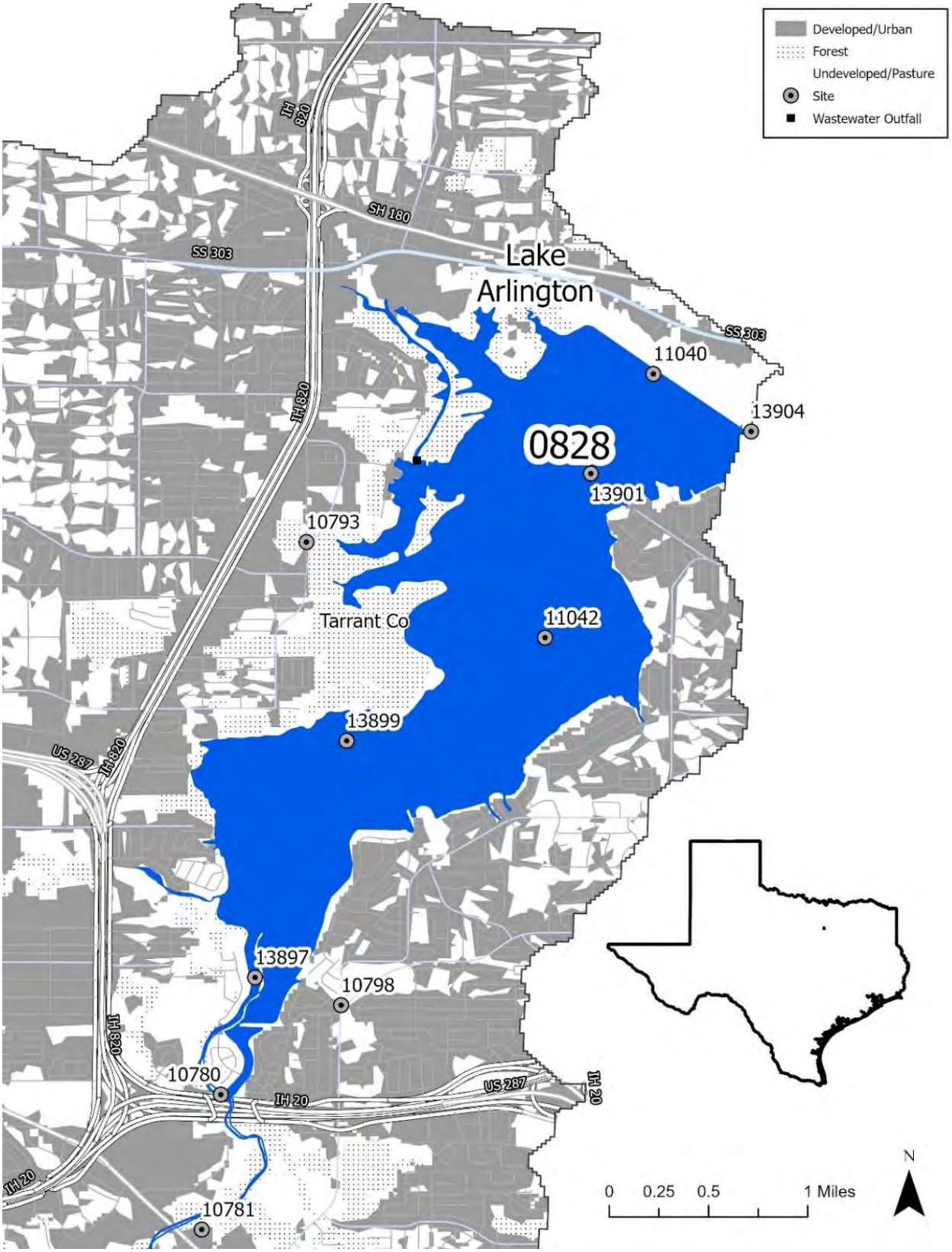


Figure 296: Segment 0828 Map

This segment covers 1,943 acres and impounds Village Creek from the Arlington dam in Tarrant County up to a normal pool elevation of 550 feet (see Figure 296). The land around the reservoir is developed with the heaviest development on the west side with some wooded areas directly adjacent to the west side of the reservoir. The watershed lies mostly in the Eastern Cross Timbers ecoregion with some tributaries to the west beginning in the Grand Prairie ecoregion. Lake Arlington has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 241. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 241: Segment 0828A FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0828A_01	VILLAGE CREEK IMMEDIATELY DOWNSTREAM OF RENDON ROAD SW OF ARLINGTON	10786	Tarrant Regional Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 242. Results of TRA trend analyses are shown in Table 243.

Table 242: TCEQ 2020 Texas Integrated Report Summary for Segment 0828

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0828_02 Lowermost portion of lake along eastern half of dam	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0828_05 Western half of upper portion of lake	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0828_06 Eastern half of upper portion of lake	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0828_07 Uppermost portion of lake	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0828_02 Lowermost portion of lake along eastern half of dam	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0828_05 Western half of upper portion of lake	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0828_06 Eastern half of upper portion of lake	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0828_07 Uppermost portion of lake	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0828_02 Lowermost portion of lake along eastern half of dam	General Use	Ammonia	0.11 mg/L	NA
0828_05 Western half of upper portion of lake	General Use	Ammonia	0.11 mg/L	NA
0828_06 Eastern half of upper portion of lake	General Use	Ammonia	0.11 mg/L	NA
0828_07 Uppermost portion of lake	General Use	Ammonia	0.11 mg/L	NA
0828_02 Lowermost portion of lake along eastern half of dam	General Use	Nitrate	0.37 mg/L	NA
0828_05 Western half of upper portion of lake	General Use	Nitrate	0.37 mg/L	NA
0828_06 Eastern half of upper portion of lake	General Use	Nitrate	0.37 mg/L	NA

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0828_07 Uppermost portion of lake	General Use	Nitrate	0.37 mg/L	NA
0828_02 Lowermost portion of lake along eastern half of dam	General Use	Total Phosphorus	0.2 mg/L	NA
0828_05 Western half of upper portion of lake	General Use	Total Phosphorus	0.2 mg/L	NA
0828_06 Eastern half of upper portion of lake	General Use	Total Phosphorus	0.2 mg/L	NA
0828_07 Uppermost portion of lake	General Use	Total Phosphorus	0.2 mg/L	NA
0828_02 Lowermost portion of lake along eastern half of dam	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0828_05 Western half of upper portion of lake	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0828_06 Eastern half of upper portion of lake	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0828_07 Uppermost portion of lake	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0828_02 Lowermost portion of lake along eastern half of dam	General Use	pH	6.5 - 9 S.U.	FS
0828_05 Western half of upper portion of lake	General Use	pH	6.5 - 9 S.U.	FS
0828_06 Eastern half of upper portion of lake	General Use	pH	6.5 - 9 S.U.	FS
0828_07 Uppermost portion of lake	General Use	pH	6.5 - 9 S.U.	FS
0828_01 Lowermost portion of lake along western half of dam	General Use	Chloride	100 mg/L	FS
0828_02 Lowermost portion of lake along eastern half of dam	General Use	Chloride	100 mg/L	FS
0828_03 Western half of lower portion of lake	General Use	Chloride	100 mg/L	FS
0828_04 Eastern half of lower portion of lake	General Use	Chloride	100 mg/L	FS
0828_05 Western half of upper portion of lake	General Use	Chloride	100 mg/L	FS
0828_06 Eastern half of upper portion of lake	General Use	Chloride	100 mg/L	FS
0828_07 Uppermost portion of lake	General Use	Chloride	100 mg/L	FS
0828_08 Remainder of lake	General Use	Chloride	100 mg/L	FS
0828_01 Lowermost portion of lake along western half of dam	General Use	Sulfate	100 mg/L	FS
0828_02 Lowermost portion of lake along eastern half of dam	General Use	Sulfate	100 mg/L	FS
0828_03 Western half of lower portion of lake	General Use	Sulfate	100 mg/L	FS
0828_04 Eastern half of lower portion of lake	General Use	Sulfate	100 mg/L	FS
0828_05 Western half of upper portion of lake	General Use	Sulfate	100 mg/L	FS
0828_06 Eastern half of upper portion of lake	General Use	Sulfate	100 mg/L	FS
0828_07 Uppermost portion of lake	General Use	Sulfate	100 mg/L	FS
0828_08 Remainder of lake	General Use	Sulfate	100 mg/L	FS
0828_01 Lowermost portion of lake along western half of dam	General Use	Total Dissolved Solids	300 mg/L	FS
0828_02 Lowermost portion of lake along eastern half of dam	General Use	Total Dissolved Solids	300 mg/L	FS
0828_03 Western half of lower portion of lake	General Use	Total Dissolved Solids	300 mg/L	FS
0828_04 Eastern half of lower portion of lake	General Use	Total Dissolved Solids	300 mg/L	FS
0828_05 Western half of upper portion of lake	General Use	Total Dissolved Solids	300 mg/L	FS
0828_06 Eastern half of upper portion of lake	General Use	Total Dissolved Solids	300 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0828_07 Uppermost portion of lake	General Use	Total Dissolved Solids	300 mg/L	FS
0828_08 Remainder of lake	General Use	Total Dissolved Solids	300 mg/L	FS
0828_02 Lowermost portion of lake along eastern half of dam	General Use	Water temperature	35 °F	FS
0828_05 Western half of upper portion of lake	General Use	Water temperature	35 °F	FS
0828_06 Eastern half of upper portion of lake	General Use	Water temperature	35 °F	FS
0828_07 Uppermost portion of lake	General Use	Water temperature	35 °F	FS
0828_02 Lowermost portion of lake along eastern half of dam	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0828_05 Western half of upper portion of lake	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0828_06 Eastern half of upper portion of lake	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0828_07 Uppermost portion of lake	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting NA = Not Assessed NC = No Concern

There were no data available in assessment units 0828_03 and 0828_08 for the period of record for this basin summary report. Data for assessment units 0828_01 and 0828_04 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 243: Significant Trends for Segment 0828 (P-value<0.1)

Segment & Assessment Unit		0828_02	0828_05	0828_06	0828_07
Site		13904	13899	11042	13897
Secchi Depth	All	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	↓	Not Significant	Not Significant
	Winter	↓	No Trend	↓	Not Significant
Specific Conductance	All	No Trend	Not Significant	No Trend	No Trend
	Summer	No Trend	No Trend	No Trend	No Trend
	Winter	↓	Not Significant	↓	No Trend
Total Suspended Solids	All	Not Significant	Insufficient Data	No Trend	No Trend
	Summer	Not Significant	Insufficient Data	↓	No Trend
	Winter	Not Significant	Insufficient Data	No Trend	No Trend
Ammonia	All	No Trend	Insufficient Data	No Trend	↓
	Summer	No Trend	Insufficient Data	No Trend	Not Significant
	Winter	Not Significant	Insufficient Data	↓	No Trend
Nitrate	All	Not Significant	Insufficient Data	Not Significant	Not Significant
	Summer	Not Significant	Insufficient Data	Not Significant	Not Significant
	Winter	No Trend	Insufficient Data	↑	Not Significant
Total Kjeldahl Nitrogen	All	No Trend	Insufficient Data	↓	No Trend
	Summer	↓	Insufficient Data	↓	No Trend
	Winter	Not Significant	Insufficient Data	Not Significant	Not Significant

Segment & Assessment Unit		0828_02	0828_05	0828_06	0828_07
Site		13904	13899	11042	13897
Total Phosphorus	All	No Trend	Insufficient Data	No Trend	No Trend
	Summer	Not Significant	Insufficient Data	↓	No Trend
	Winter	Not Significant	Insufficient Data	↓	↓
Orthophosphate	All	No Trend	Insufficient Data	No Trend	Not Significant
	Summer	Not Significant	Insufficient Data	Not Significant	Not Significant
	Winter	Not Significant	Insufficient Data	Not Significant	↓
Total Organic Carbon	All	Not Significant	Insufficient Data	↓	No Trend
	Summer	Not Significant	Insufficient Data	Not Significant	No Trend
	Winter	↓	Insufficient Data	↓	No Trend
Dissolved Organic Carbon	All	Not Significant	Insufficient Data	Not Significant	Not Significant
	Summer	Not Significant	Insufficient Data	Not Significant	Not Significant
	Winter	Not Significant	Insufficient Data	Not Significant	↓
Total Magnesium	All	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data	Insufficient Data
Total Sodium	All	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data	Insufficient Data
Chloride	All	Not Significant	Insufficient Data	Not Significant	Not Significant
	Summer	Not Significant	Insufficient Data	Not Significant	Not Significant
	Winter	Not Significant	Insufficient Data	Not Significant	↓
Sulfate	All	↓	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data	Insufficient Data
Total Arsenic	All	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data
Total Dissolved Solids	All	Not Significant	Not Significant	Not Significant	No Trend
	Summer	Not Significant	No Trend	No Trend	No Trend
	Winter	Not Significant	Not Significant	↓	Not Significant
Chlorophyll-*a*	All	↓	Insufficient Data	No Trend	No Trend
	Summer	↓	Insufficient Data	↓	Not Significant
	Winter	↓	Insufficient Data	↓	No Trend
Bromide	All	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	No Trend	Insufficient Data	Insufficient Data	Insufficient Data
Phytoplankton	All	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	↑	Insufficient Data	Insufficient Data	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend

Decreasing trends for chlorophyll-*a* were identified in assessment units 0828_02 and 0828_06. Chlorophyll-*a* levels were not well correlated to nutrients. As shown in Figure 297, there was a decreasing trend over the period of record with a distinct drop in chlorophyll-*a* levels during the drought recovery period in 2015 and 2016. Interestingly, there was also an increasing phytoplankton trend in assessment unit 0828_02 (see Figure 298). This dichotomy may have been due to a change in the algal biomass assemblage over time to species that contain other forms of the chlorophyll molecule. It is recommended that additional work be done in this reservoir to determine the cause of these trends. This may include phytoplankton species identification and analysis of the other forms of chlorophyll.

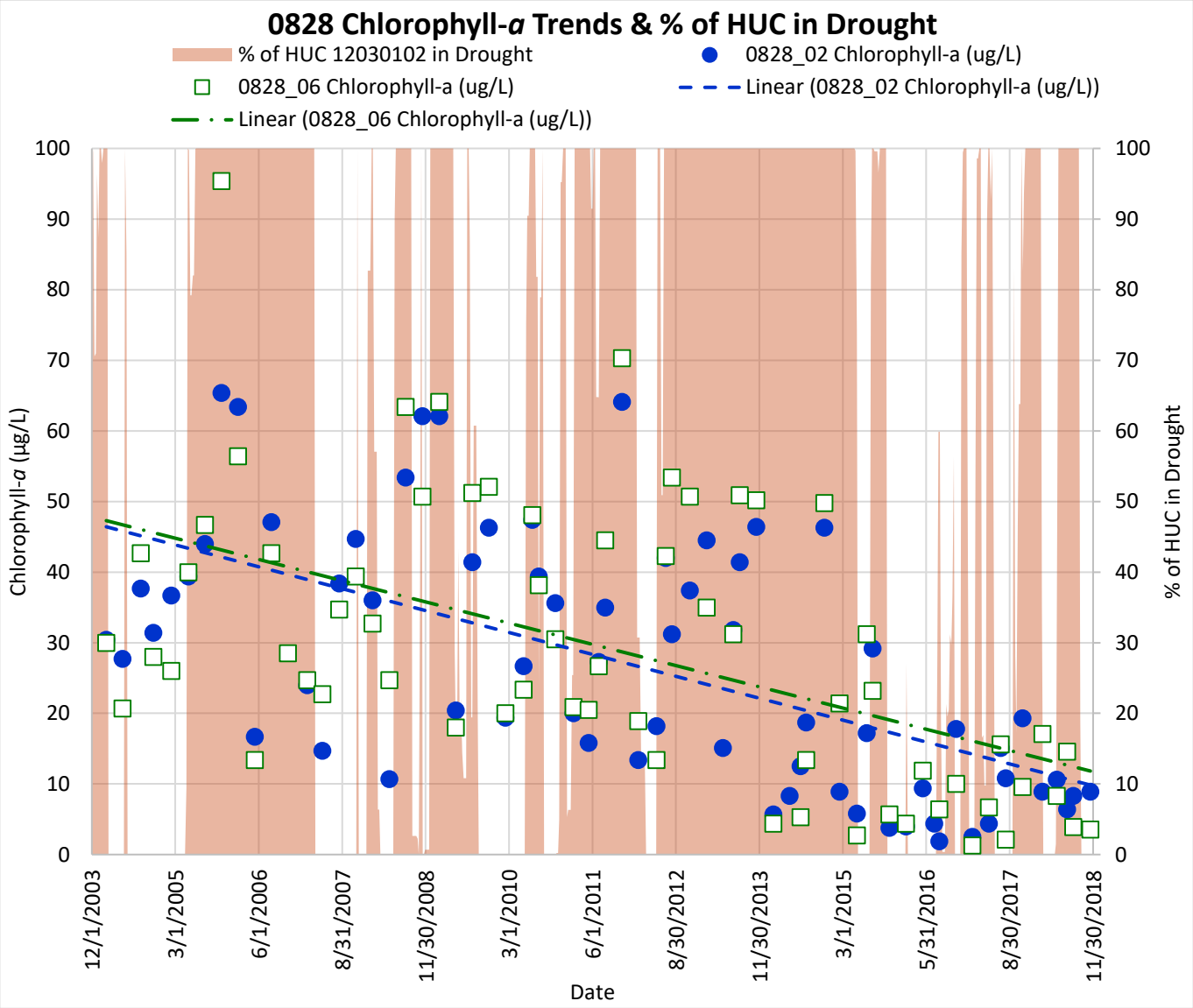


Figure 297: 0828 Chlorophyll-a Trends & % of HUC in Drought

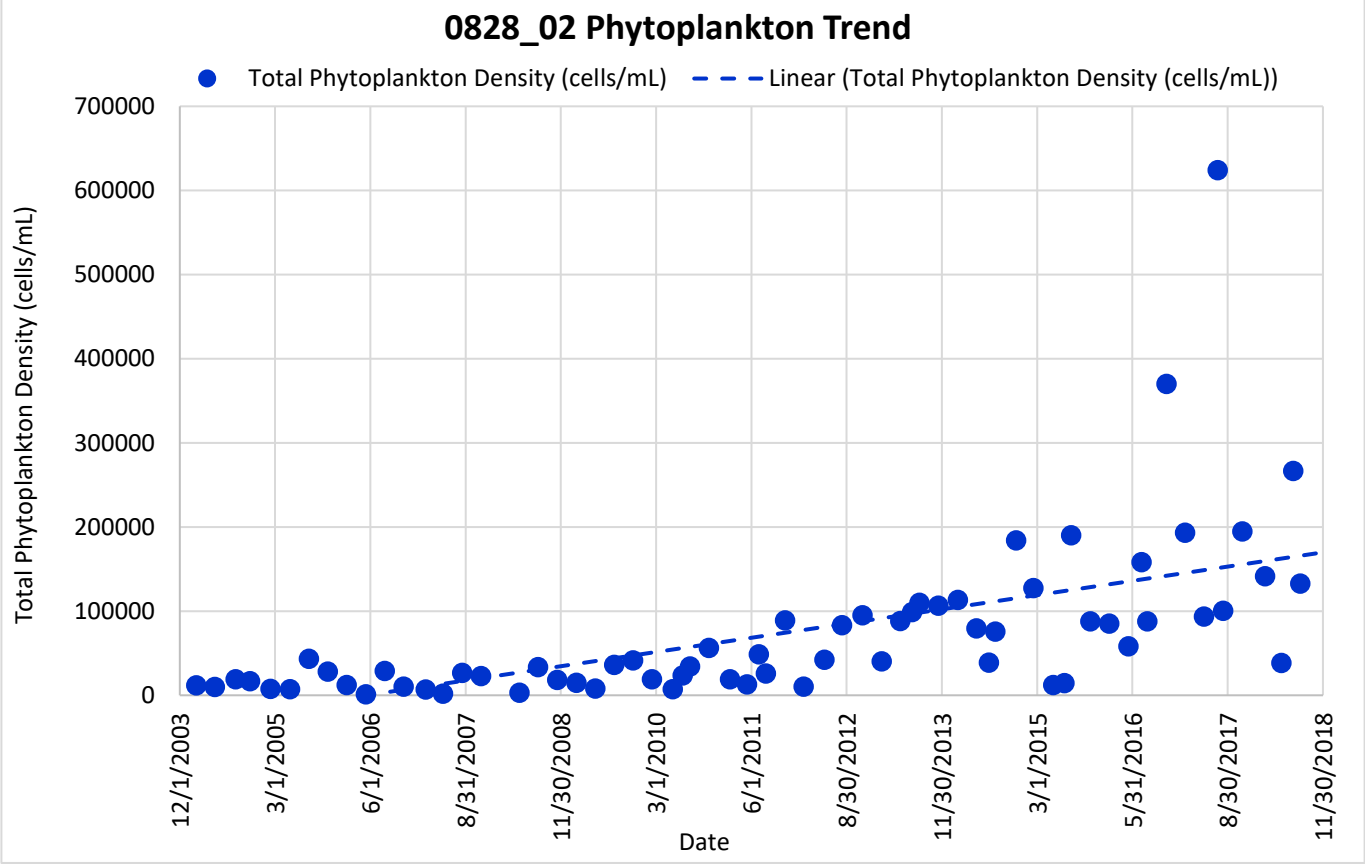


Figure 298: 0828_02 Phytoplankton Trend

The increasing trend for total arsenic in assessment unit 0828_02 was due to changes in the detection limit over time and does not represent a true change in water quality. The detection limit was 5 µg/L and later decreased to 2 µg/L. For the purposes of this data summary report as discussed in the Data Preparation section of Appendix C, data reported as a non-detect for total arsenic was censored to 0.25 µg/L. The highest reported value of 5.2 µg/L. Standards are based on dissolved arsenic but are much higher than the observed total arsenic levels. The acute standard for protection of aquatic life for dissolved arsenic in water is 340 µg/L and the chronic standard is 150 µg/L. The standard for human health protection is 10 µg/L.

The increasing winter trend for nitrate in assessment unit 0828_06 (see Figure 299) appears to have been weighted by samples collected in the drought recovery period of 2015 and 2016 as well as 2018. The elevated levels reported during these time periods were likely due to nutrients being washed into the lake during precipitation events and may indicate that the sources of nitrate could be residential and agricultural fertilizers.

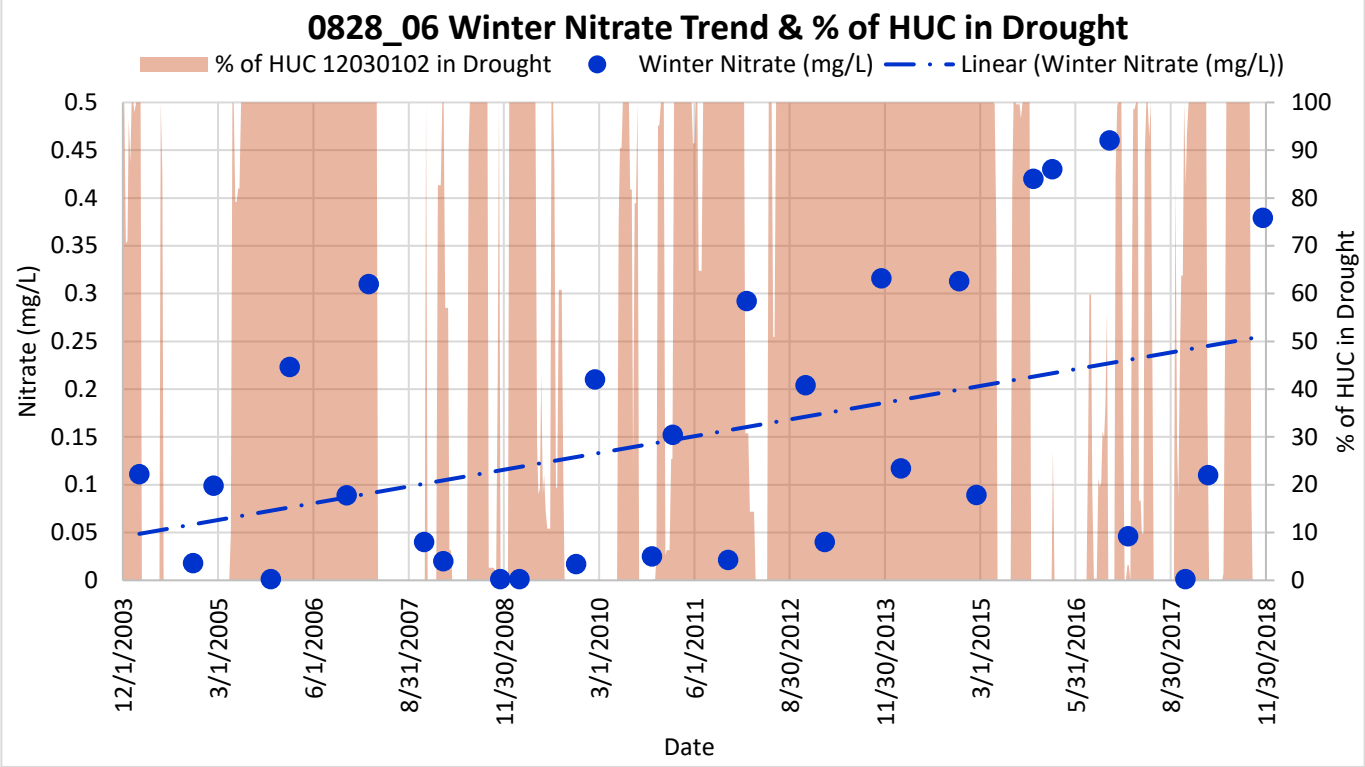


Figure 299: 0828_06 Winter Nitrate Trend & % of HUC in Drought

Mountain Creek

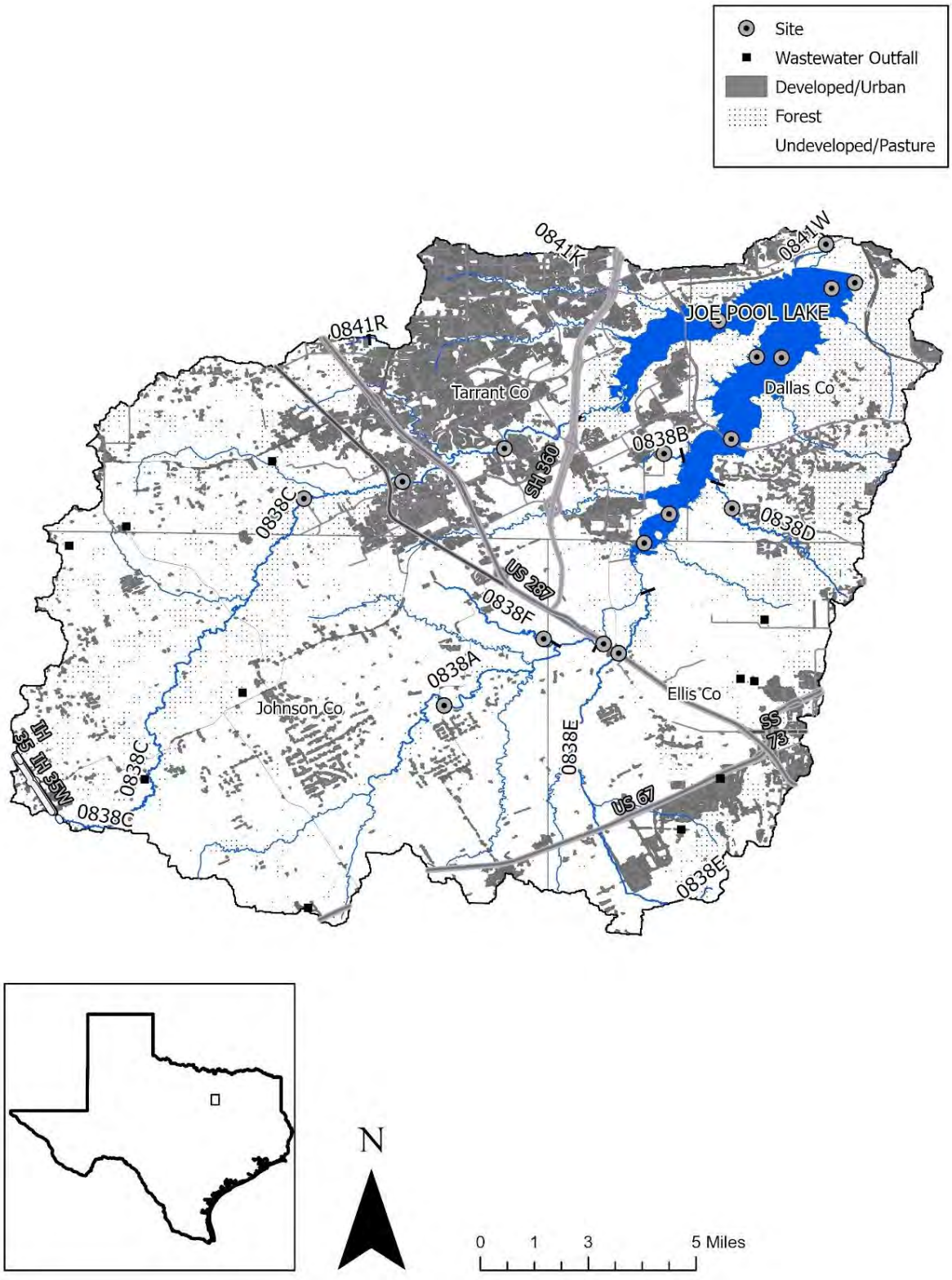


Figure 300: Mountain Creek Overview Map

The Mountain Creek subwatershed extends approximately 28 river miles from Johnson County to the Joe Pool Lake dam in Dallas County (see Figure 300). A majority of the subwatershed is rural with crop lands concentrated in the Mountain Creek half of the watershed. The Walnut Creek half of the watershed has seen a significant increase in urbanization in recent years. Major population centers include the cities of Mansfield, Midlothian, and Cedar Hill as well as the communities of the southern Dallas-Fort Worth Metroplex. TRA holds some water rights permits for Joe Pool Lake. The remaining water rights are currently unused. This subwatershed receives between 35 and 37 inches of precipitation annually and lies within the Eastern Cross Timbers and Northern Blackland Prairie ecoregions. A majority of this subwatershed is flat; however, the eastern edge is lifted by the Austin Chalk escarpment.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0838C – Walnut Creek
- 0838F – Unnamed tributary of Mountain Creek
- 0838A – Mountain Creek
- 0838E – Soap Creek
- 0838 – Joe Pool Lake
- 0838B – Sugar Creek
- 0838D – Hollings Branch

0838C Walnut Creek

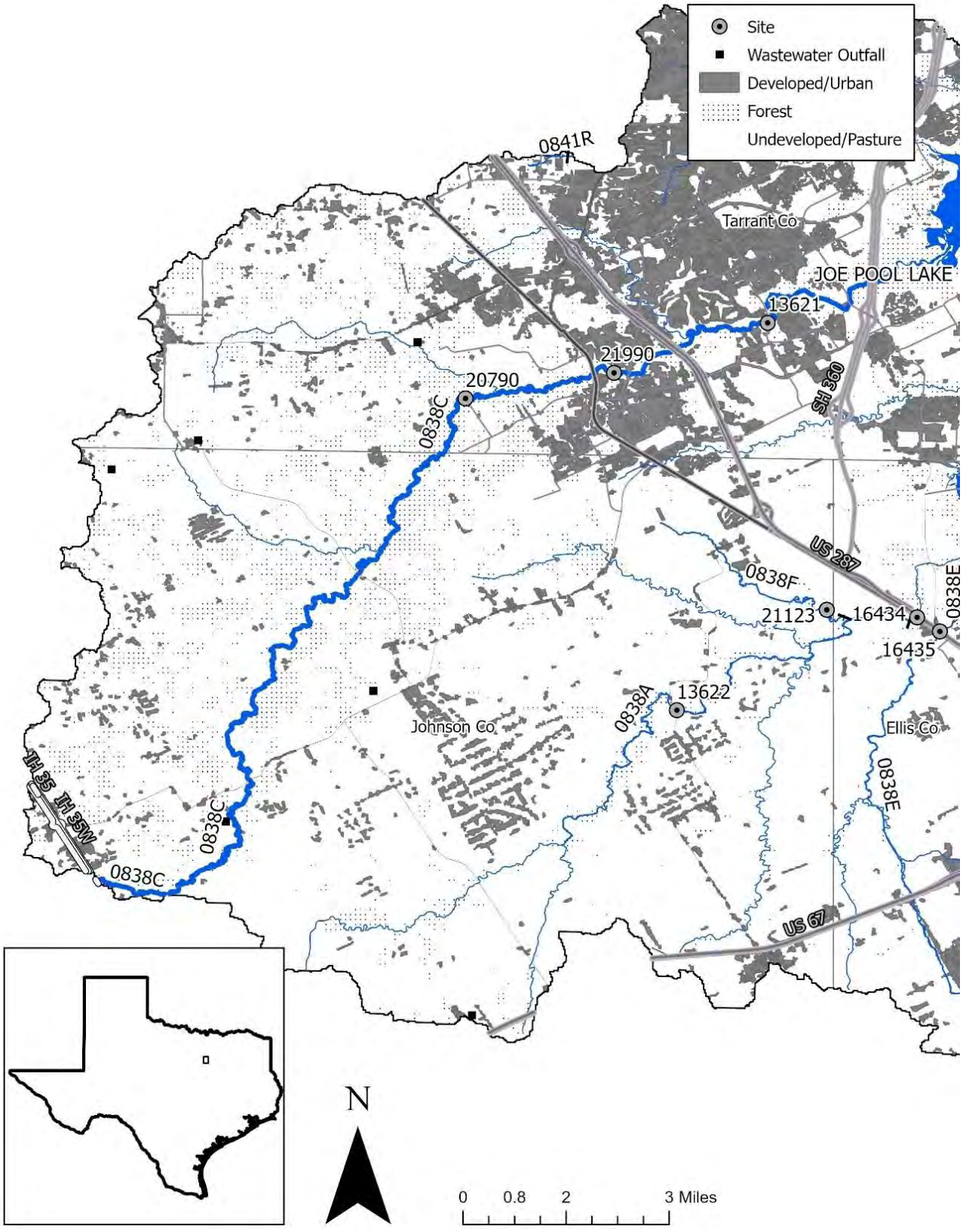


Figure 301: Segment 0838C Map

This 24.6-mile unclassified segment runs from the headwaters at Spring Street in Burleson to the confluence with Joe Pool Lake (see Figure 301). The upstream portion of the watershed is rural with a mix of hay, pasture, and crop land with some forested areas adjacent to the stream. The downstream half of the watershed becomes more developed as it approaches Joe Pool Lake. This development includes the City of Mansfield and several large residential communities near the reservoir. The watershed flows through both the Eastern Cross Timbers and Northern Blackland Prairie ecoregions.

Clean Rivers Program water quality monitoring is being conducted at one site within this segment as shown in Table 244. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 244: Segment 0838C FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0838C_01	WALNUT CREEK AT MATLOCK ROAD 2.6 MI NORTHEAST OF MANSFIELD	13621	TRA

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 245. Results of TRA trend analyses are shown in Table 246.

Table 245: TCEQ 2020 Texas Integrated Report Summary for Segment 0838C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0838C_01 From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson.	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0838C_01 From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson.	Aquatic Life Use	Fish Community		FS
0838C_01 From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson.	Aquatic Life Use	Macrobenthic Community		FS
0838C_01 From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson.	Aquatic Life Use	Habitat		NC
0838C_01 From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson.	Recreation Use	*E. coli*	126 MPN/100 mL	FS

FS = Fully Supporting NC = No Concern

Table 246: Significant Trends for Segment 0838C (P-value<0.1)

Segment & Assessment Unit		0838C_01
Site		13621
Specific Conductance	All	Not Significant
	Summer	↓
	Winter	Not Significant
Total Dissolved Solids	All	Not Significant
	Summer	↓
	Winter	Not Significant
Days Since Precipitation	All	Not Significant
	Summer	Not Significant
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

There was a decreasing trend for summer specific conductance identified in this segment. As shown in Figure 302, the decreasing trend occurs across both drought and recovery periods. However, there is a large gap in the data set during both the extreme drought and flood periods from 2011 to 2016 that reduces the reliability of this trend. Based on Google Earth imagery, there is evidence for quite a bit of oil and gas drilling in the watershed taking place between 2005 and 2008. By 2009, it does not appear that many new drilling sites were being installed. There was not a lot of development occurring in this period that may have increased run-off amounts. If the trend is true, it is likely that the decreasing trend for specific conductance was due to a combination of the reduction in oil and gas drilling and the extremely wet weather that occurred during the recent drought recovery period in 2015 and 2016. Planned future monitoring will help clarify the veracity of this trend.

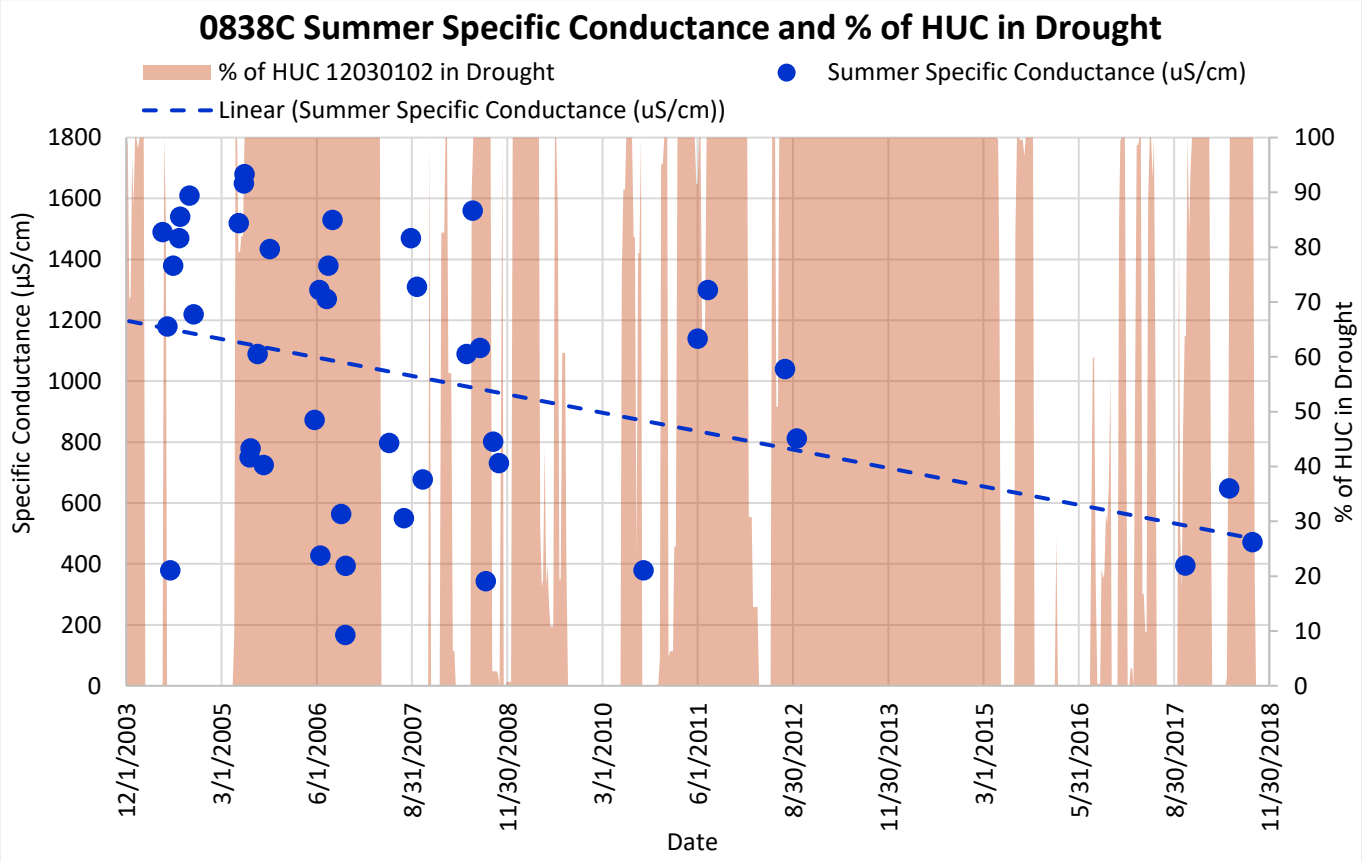


Figure 302: 0838C Summer Specific Conductance and % of HUC in Drought

0838F Unnamed tributary of Mountain Creek

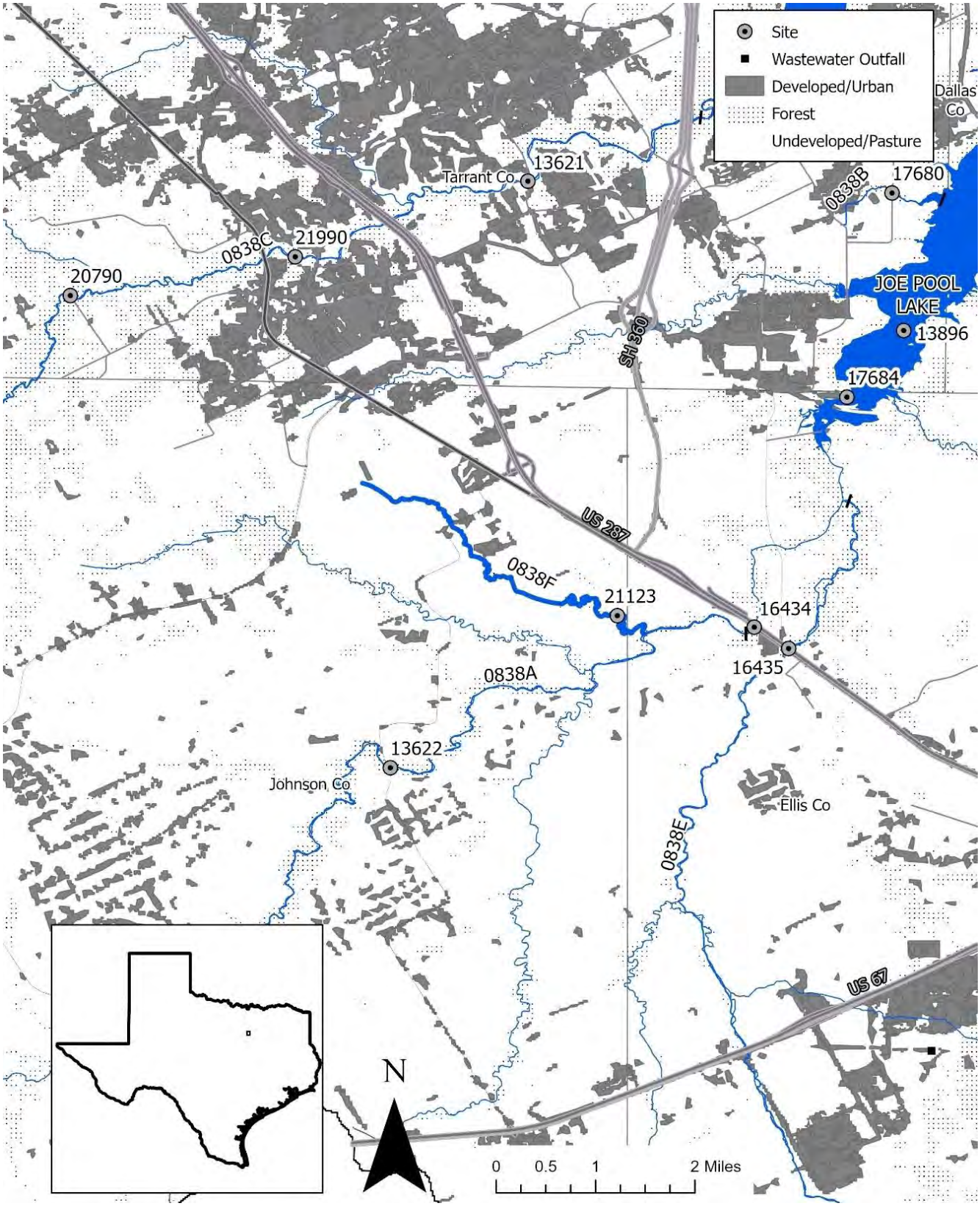


Figure 303: Segment 0838F Map

This 5-mile unclassified segment runs from the headwaters approximately 2.0 km upstream of FM 157 in Mansfield the confluence with Mountain Creek south of Mansfield (see Figure 303). Much of to the watershed is rural and predominantly crop land. However, there are some industrial complexes and a residential development in the middle of the watershed. It lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 247. Results of TRA trend analyses are shown in Table 248. There is very little data available for this segment and the stream was frequently dry or pooled.

Table 247: TCEQ 2020 Texas Integrated Report Summary for Segment 0838F

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0838F_01 From confluence with Mountain Ck up to headwaters approx. 2.0 km upstream of FM 157 in Mansfield	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	NC
0838F_01 From confluence with Mountain Ck up to headwaters approx. 2.0 km upstream of FM 157 in Mansfield	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0838F_01 From confluence with Mountain Ck up to headwaters approx. 2.0 km upstream of FM 157 in Mansfield	General Use	Ammonia	0.33 mg/L	NA
0838F_01 From confluence with Mountain Ck up to headwaters approx. 2.0 km upstream of FM 157 in Mansfield	General Use	Nitrate	1.95 mg/L	NA
0838F_01 From confluence with Mountain Ck up to headwaters approx. 2.0 km upstream of FM 157 in Mansfield	General Use	Total Phosphorus	0.69 mg/L	NA
0838F_01 From confluence with Mountain Ck up to headwaters approx. 2.0 km upstream of FM 157 in Mansfield	General Use	Chlorophyll-*a*	14.1 µg/L	NA

NA = Not Assessed NC = No Concern

Table 248: Significant Trends for Segment 0838F (P-value<0.1)

Segment & Assessment Unit		0838F_01
Site		21123
Days Since Precipitation	All	Not Significant
	Summer	↓*
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

0838A Mountain Creek

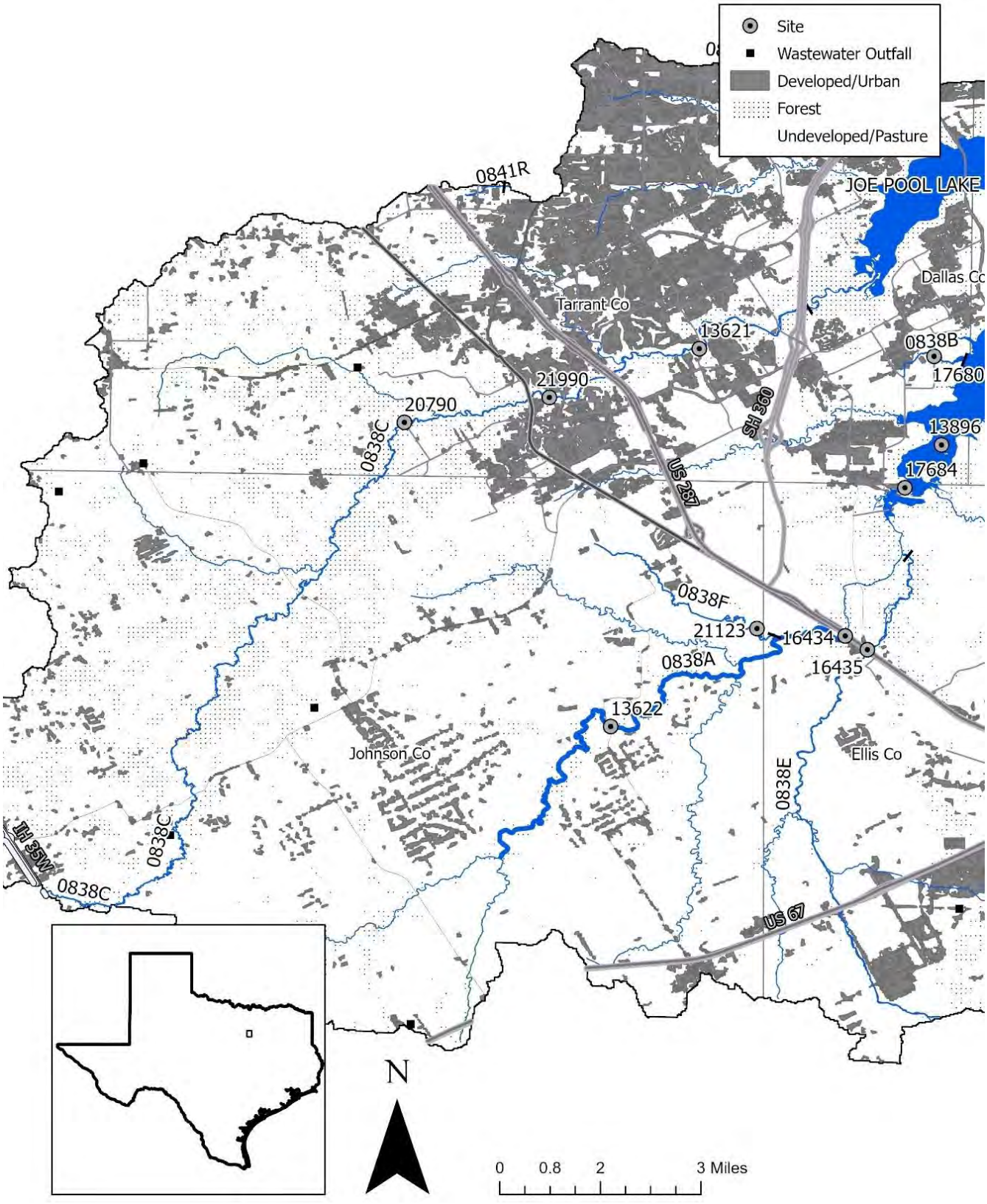


Figure 304: Segment 0838A Map

This unclassified segment is a ten-mile stretch of Mountain Creek running from the confluence with Fish Spring Branch in Johnson County to US 287 in Ellis County (see Figure 304). The watershed is largely comprised of hay, pasture, and crop land with some residential development and some small wooded areas adjacent to the stream. This segment flows through the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0838A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit. Upcoming planned monitoring will be conducted at station 16434 which is currently classified as being in assessment unit 0838_02. It is recommended that TCEQ modify the segment boundaries to classify this station as being located within segment 0838A because this site behaves as a stream. It has gone dry on several occasions and positive stream flows have been measured even when Joe Pool Lake elevations were above conservation pool elevation.

0838E Soap Creek

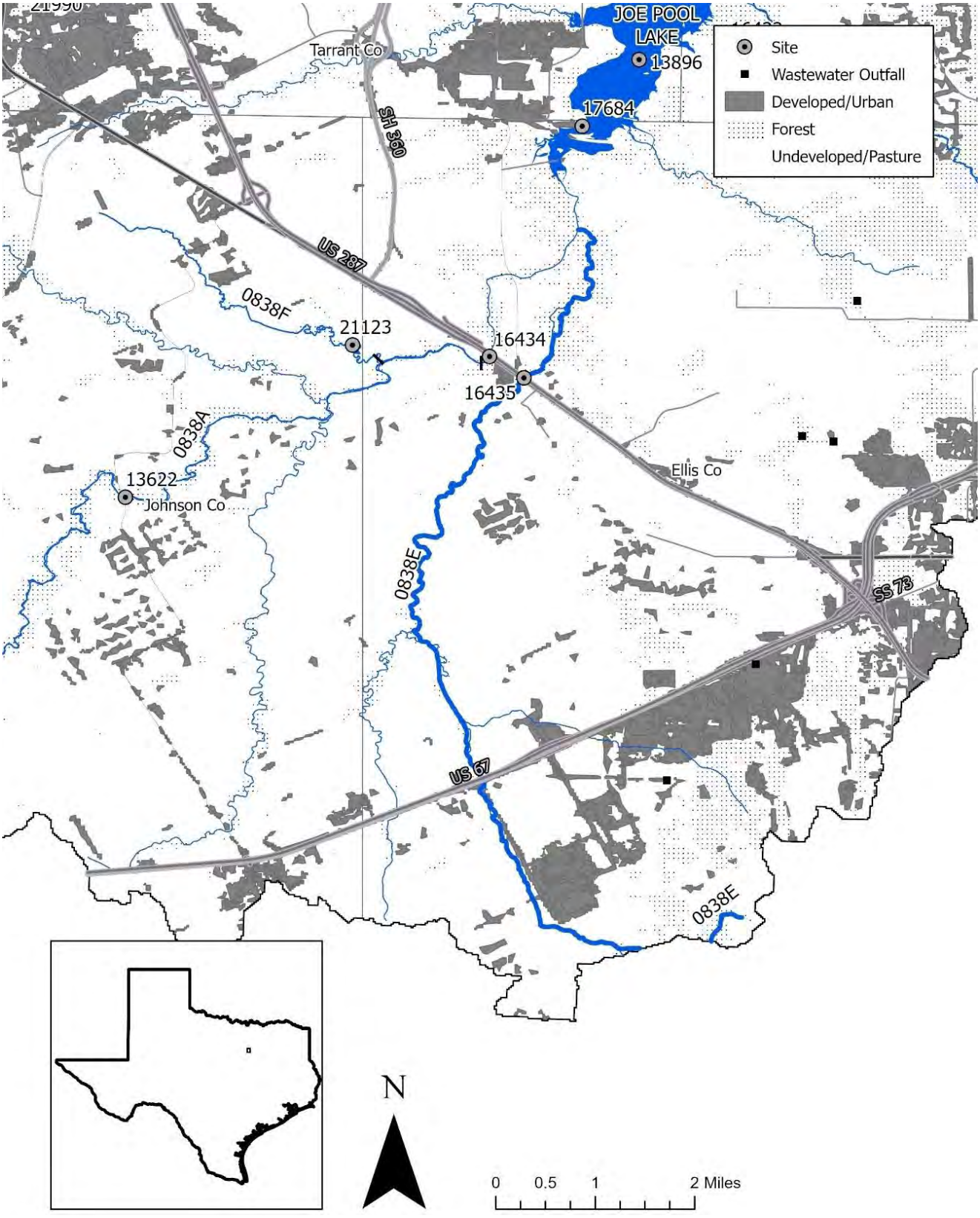


Figure 305: Segment 0838E Map

This 12-mile unclassified segment runs from the headwaters 3.98 miles upstream of US 67 in Midlothian to the confluence of the Mountain Creek arm of Joe Pool Lake upstream (see Figure 305). Much of the watershed is grass and crop land. There is a concentrated area along US 67 that is heavily developed with several industrial complexes that include cement production. This watershed lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 249. Results of TRA trend analyses are shown in Table 250.

Table 249: TCEQ 2020 Texas Integrated Report Summary for Segment 0838E

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	FS
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	Aquatic Life Use	Acute Toxic Substances in water		NA
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	Aquatic Life Use	Chronic Toxic Substances in water		NA
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	General Use	Ammonia	0.33 mg/L	NC
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	General Use	Nitrate	1.95 mg/L	NA
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	General Use	Total Phosphorus	0.69 mg/L	NC
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0838E_01 From confluence of Joe Pool Lake upstream to headwater 6.6 km upstream of US 67 in Midlothian	Fish Consumption Use	HH Bioaccumulative Toxics in water		NA

FS = Fully Supporting NA = Not Assessed NC = No Concern

Table 250: Significant Trends for Segment 0838E (P-value<0.1)

Segment & Assessment Unit		0838E_01
Site		16435
pH	All	No Trend
	Summer	↑*
	Winter	No Trend
Flow Severity	All	↓*
	Summer	↓*
	Winter	↓*
Days Since Precipitation	All	Not Significant
	Summer	Not Significant
	Winter	↑*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

There was an increasing summer pH trend identified in this segment. Based on the available data, the strongest correlation was between summer pH levels and flow severity (correlation coefficient = 0.432) although the data set is rather limited. As shown in Figure 306, summer pH levels increased during the prolonged drought of 2011 to 2015. There is not enough data available to fully assess this trend. However, it could be surmised that algal populations increased in the pools of this intermittent stream during the summer months. Planned future monitoring should provide data to more fully address this trend. It is important to note that, due to the short period of record for data in this segment, the date scale for Figure 306 has been reduced and does not match the date scale used for other graphs in this basin summary report.

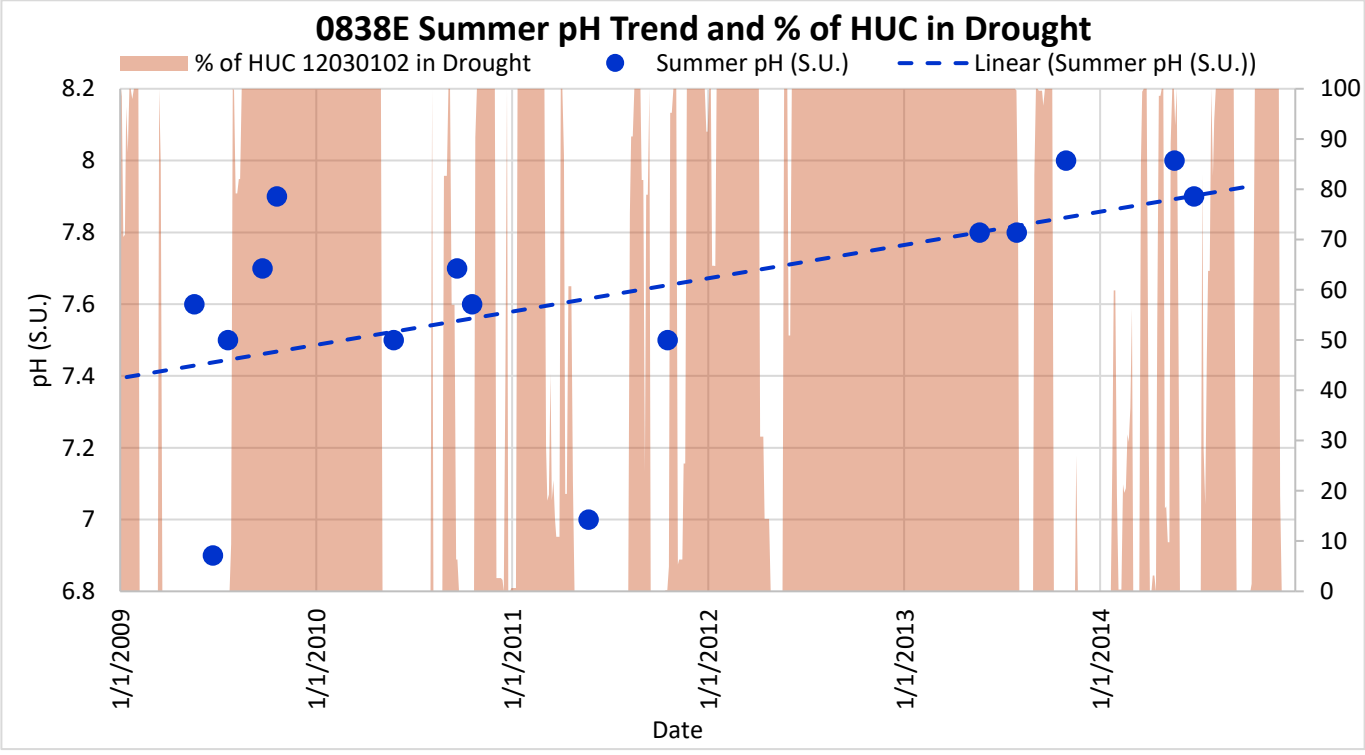


Figure 306: 0838E Summer pH Trend and % of HUC in Drought

0838 Joe Pool Lake

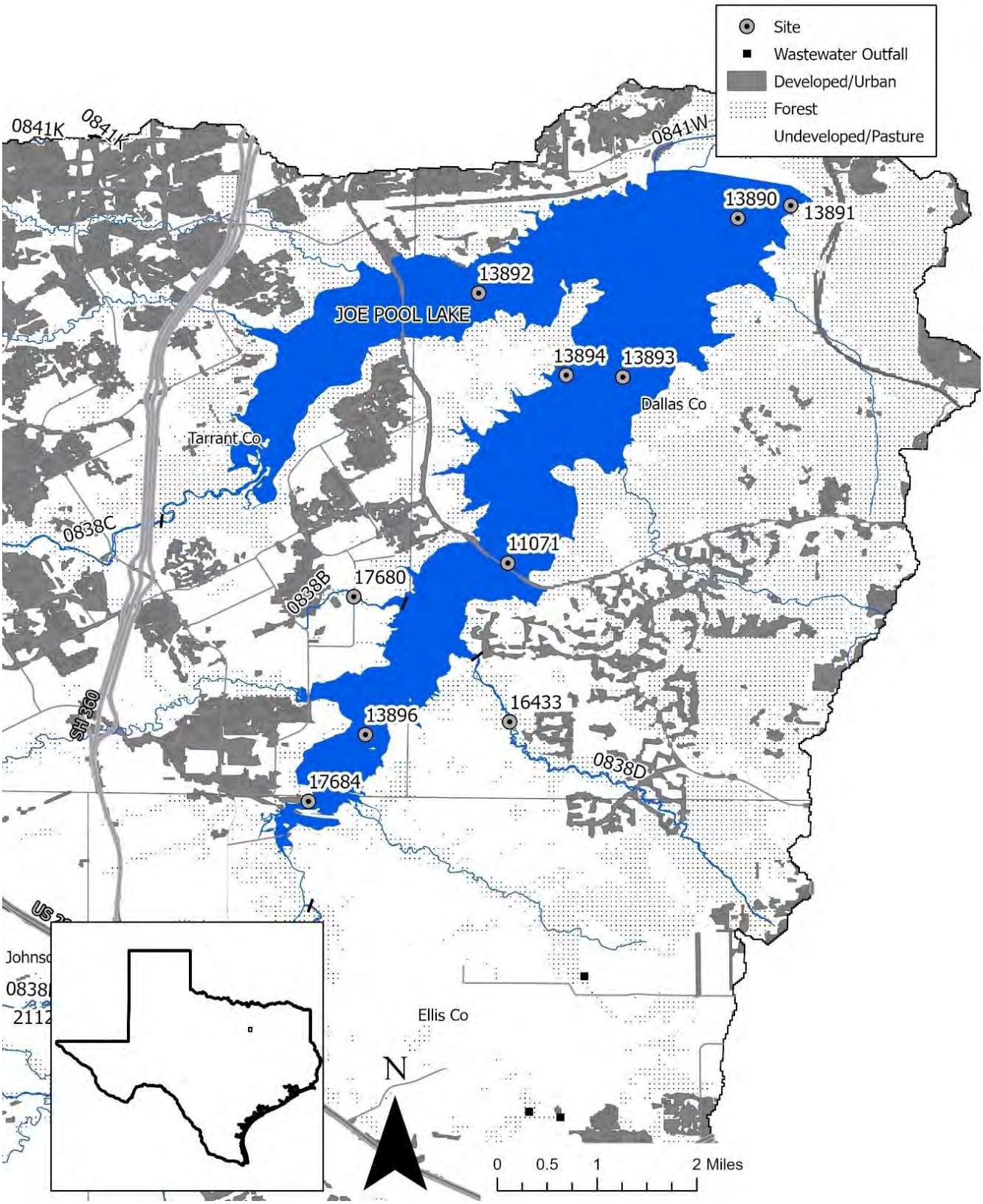


Figure 307: Segment 0838 Map

This unclassified segment covers 6,562 acres and impounds Mountain Creek from the Joe Pool dam in Dallas County up to the normal pool elevation of 522 feet (see Figure 307). The majority of the immediate watershed has been heavily developed with mostly residential communities on the west side of the reservoir and between the two arms. The east side of the reservoir remains largely undeveloped and forested in the Cedar Hill State Park and Cedar Ridge Reserve. The reservoir lies within the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Results of TRA trend analyses are shown in Table 251. Data for assessment units 0838_01 and 0838_03 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 251: Significant Trends for Segment 0838 (P-value<0.1)

Segment & Assessment Unit		0838_02
Site		17684
Secchi Depth	All	No Trend
	Summer	No Trend
	Winter	↑*
Field Ammonia	All	No Trend
	Summer	No Trend
	Winter	↑*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

There were no data available in assessment unit 0812_02 for the period of record for this basin summary report.

The increasing winter ammonia trend in assessment unit 0838_02 is based on a limited data set collected between 2003 and 2008. Additionally, the ammonia data were the results of a field test kit and therefore does not meet CRP precision and accuracy requirements. The field test kit data were collected by the City of Grand Prairie as part of their routine sampling activities. As the resultant data do not meet CRP requirements, they are not sent to TCEQ for inclusion in the SWQMIS database but are maintained by TRA as they are a valuable screening tool. One year of monitoring took place in this reservoir between 2019 and 2020 as part of the Joe Pool Lake Watershed Protection Plan. There is additional monitoring planned for this reservoir to be collected under a Clean Rivers Program Quality Assurance Project Plan starting in FY 2021. This additional data will help assess the reservoir and the potential ammonia trend in the future.

0838B Sugar Creek

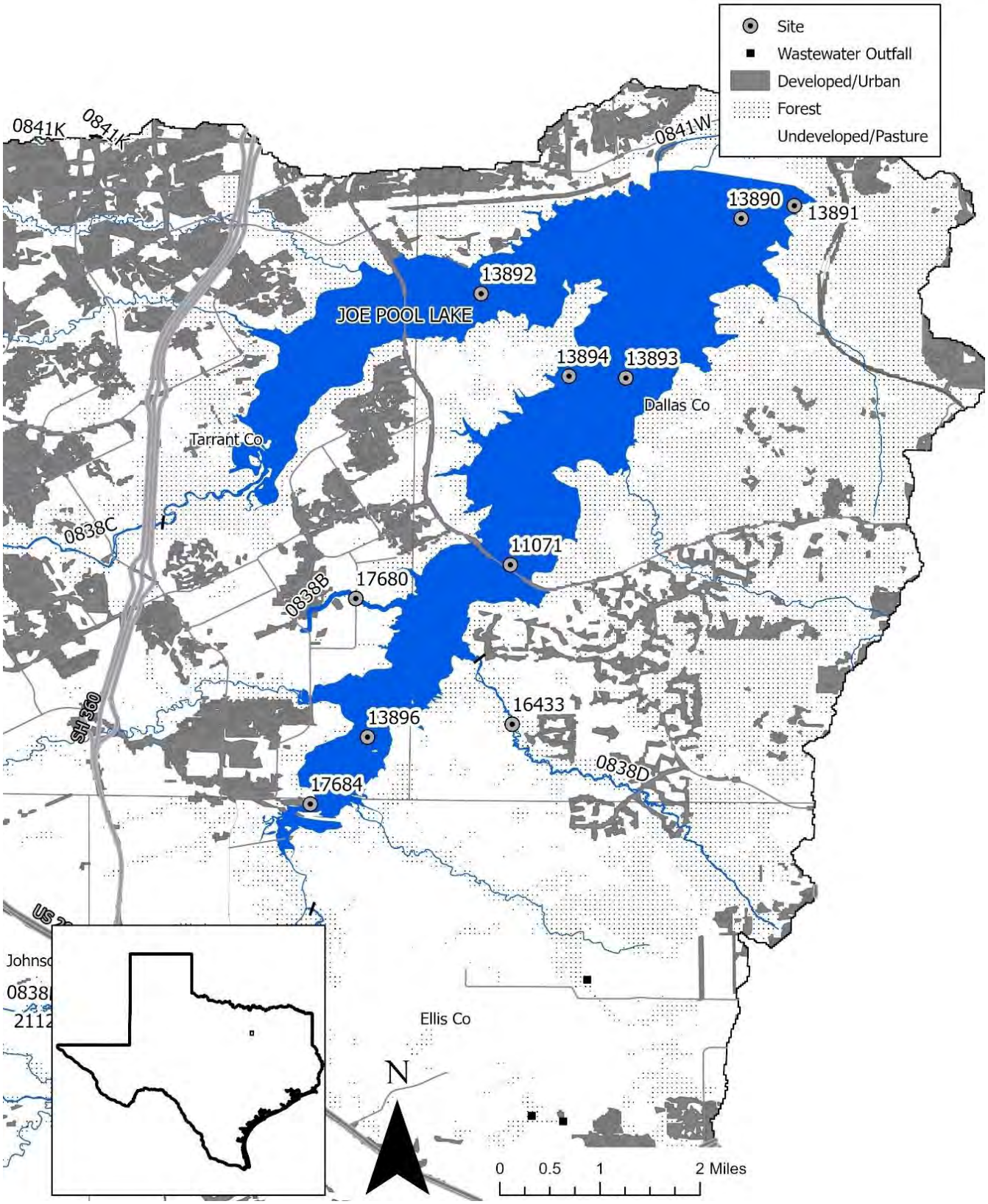


Figure 308: Segment 0838B Map

This 1.6-mile stretch of Sugar Creek runs from just upstream of Britton Road in Mansfield to the Tarrant/Dallas County line (see Figure 308). The entirety of the stream flows through residential developments with some wooded riparian areas just upstream from Joe Pool Lake. There are a few remaining agricultural fields at the upper end of the stream. It flows through the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 252. Results of TRA trend analyses are shown in Table 253.

Table 252: TCEQ 2020 Texas Integrated Report Summary for Segment 0838B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	Aquatic Life Use	Acute Toxic Substances in water		NA
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	Aquatic Life Use	Chronic Toxic Substances in water		NA
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	General Use	Ammonia	0.33 mg/L	NC
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	General Use	Nitrate	1.95 mg/L	NC
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	General Use	Total Phosphorus	0.69 mg/L	NC
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0838B_01 1.6 mi stretch from Tarrant/Dallas Co. line to just upstream of Britton Road in Mansfield	Fish Consumption Use	HH Bioaccumulative Toxics in water		NA

FS = Fully Supporting NA = Not Assessed NC = No Concern

Table 253: Significant Trends for Segment 0838B (P-value<0.1)

Segment & Assessment Unit		0838B_01
Site		17680
Secchi Depth	All	No Trend
	Summer	↑
	Winter	↑
Specific Conductance	All	↓
	Summer	Not Significant
	Winter	↓
pH	All	No Trend
	Summer	No Trend
	Winter	↑

Segment & Assessment Unit		0838B_01
Site		17680
Ammonia	All	↑
	Summer	No Trend
	Winter	Not Significant
Nitrate	All	↓
	Summer	↓
	Winter	Not Significant
Hardness	All	↓
	Summer	↓
	Winter	No Trend
Sulfate	All	↓
	Summer	↓
	Winter	Not Significant
Fecal Streptococcus	All	Not Significant
	Summer	↓
	Winter	No Trend
E. coli	All	↓
	Summer	↓
	Winter	Not Significant
Total Dissolved Solids	All	↓
	Summer	Not Significant
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

It is not clear what caused the increasing winter pH trend in this segment. As shown in Figure 309, there was some evidence of elevated pH levels occurring during drought periods. Although there was very little correlation between winter pH levels and chlorophyll-*a* (correlation coefficient = 0.200), it seems likely that algal populations or macrophytes may have been influencing pH levels as there are two residential ponds in this watershed. One of these ponds drains into Sugar Creek just upstream of monitoring station 17680. Algal blooms in this pond may have been affecting downstream pH levels.

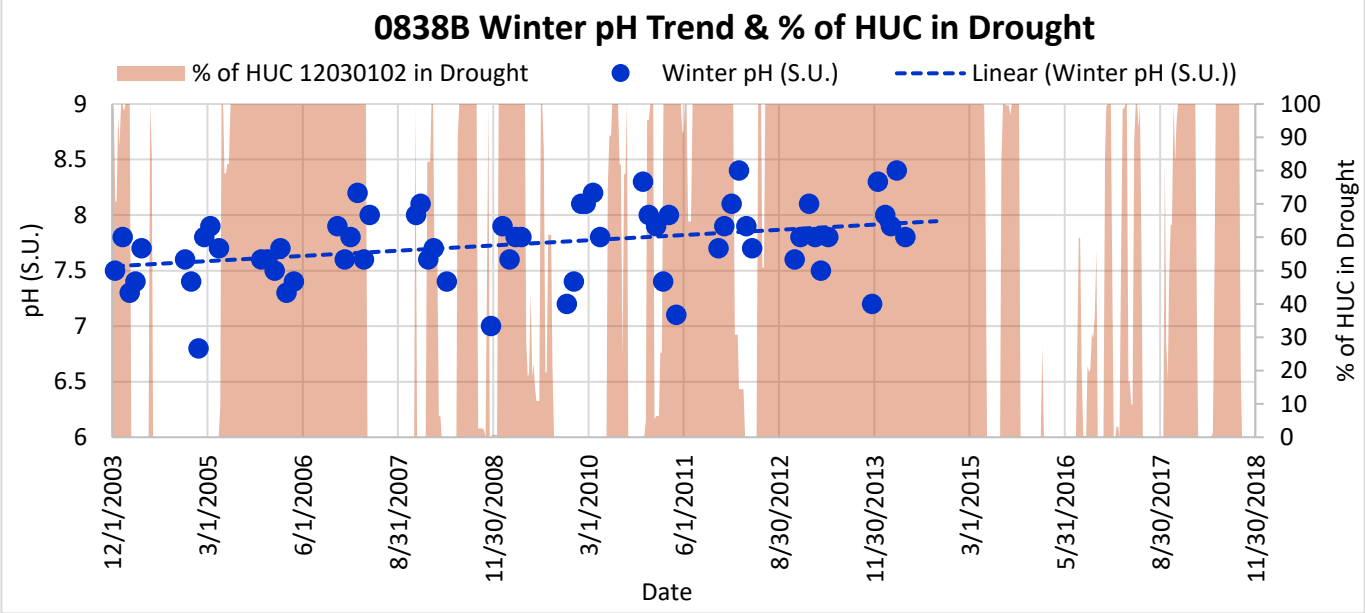


Figure 309: 0838B Winter pH Trend & % of HUC in Drought

The increasing trend for ammonia was largely weighted by a single high data point at the end of the data set as shown in Figure 310. A weak increasing trend still exists in the absence of this data point. Total kjeldahl nitrogen for that day was also reported at an abnormally high level and total phosphorus was slightly elevated as well. However, *E. coli* was reported at 20 MPN/100 mL. This indicates that the source of the elevated ammonia level was likely related to fertilizers rather than a sewage line break. Overall, it seems clear that the increasing ammonia trend was related to the increasing development and the use of residential fertilizers that has taken place in this watershed. Figure 311 shows Google Earth imagery of the expanding development that took place in this segment from 2003 to 2011.

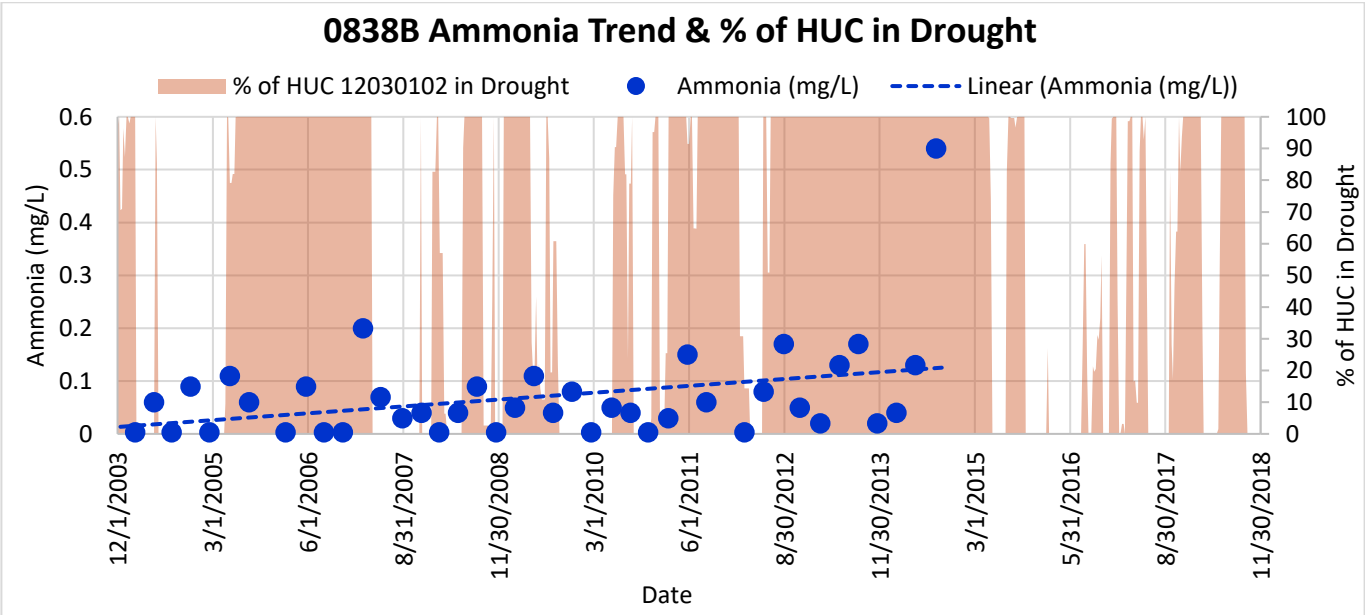


Figure 310: 0838B Ammonia Trend & % of HUC in Drought

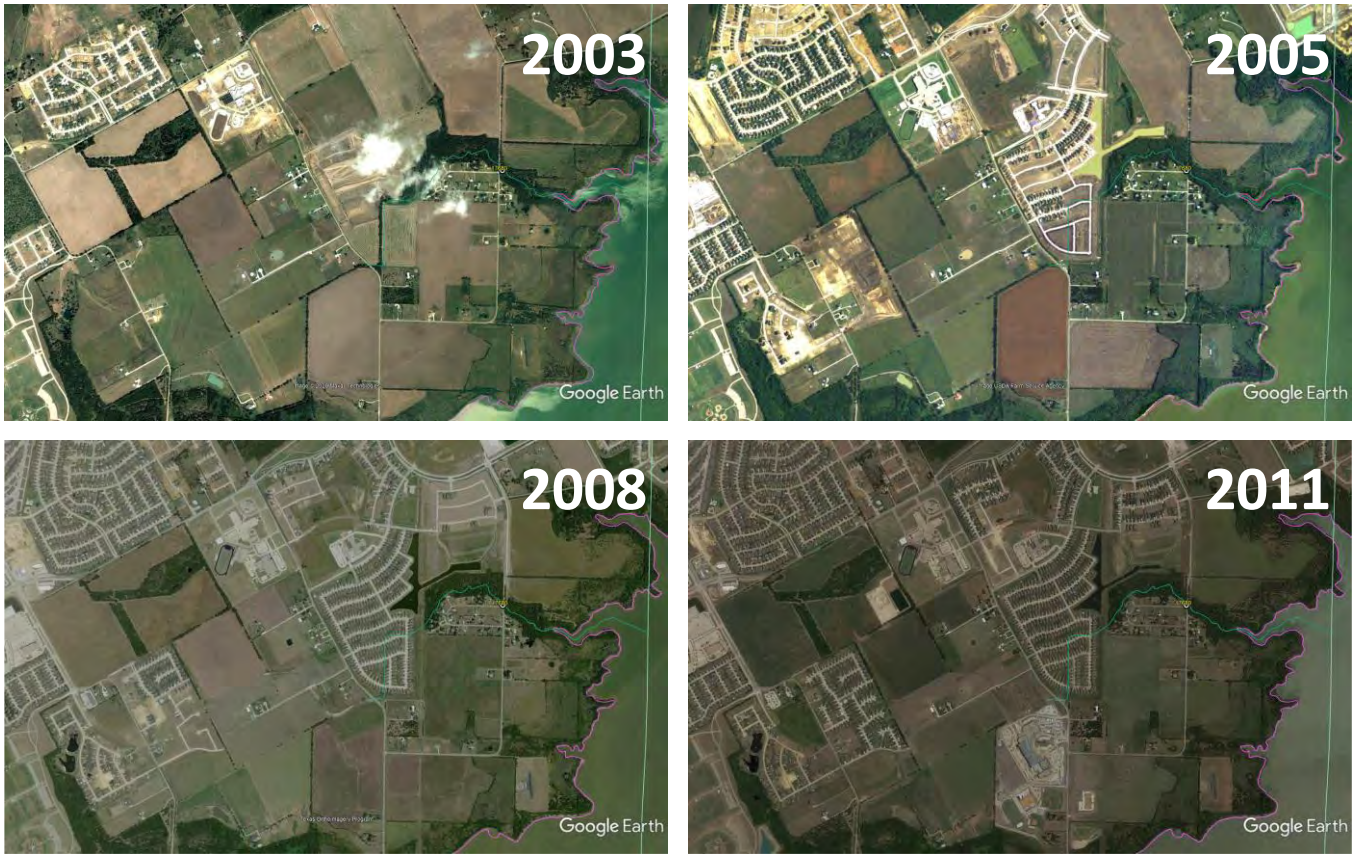


Figure 311: Google Earth Imagery of development in 0838B

It does not appear that the increasing development was having a negative effect on the water quality in Sugar Creek in regard to the aquatic life use. There was a non-significant increasing trend in dissolved oxygen levels. Of 120 measurements, only 11 values were reported below the dissolved oxygen grab screening level of 3 mg/L with three values reported below the grab minimum standard of 2 mg/L. Of these 11 values, only one was measured outside of drought conditions. Based on this information, it is likely that low flows and hot weather were the cause of the low dissolved oxygen measurements.

0838D Hollings Branch

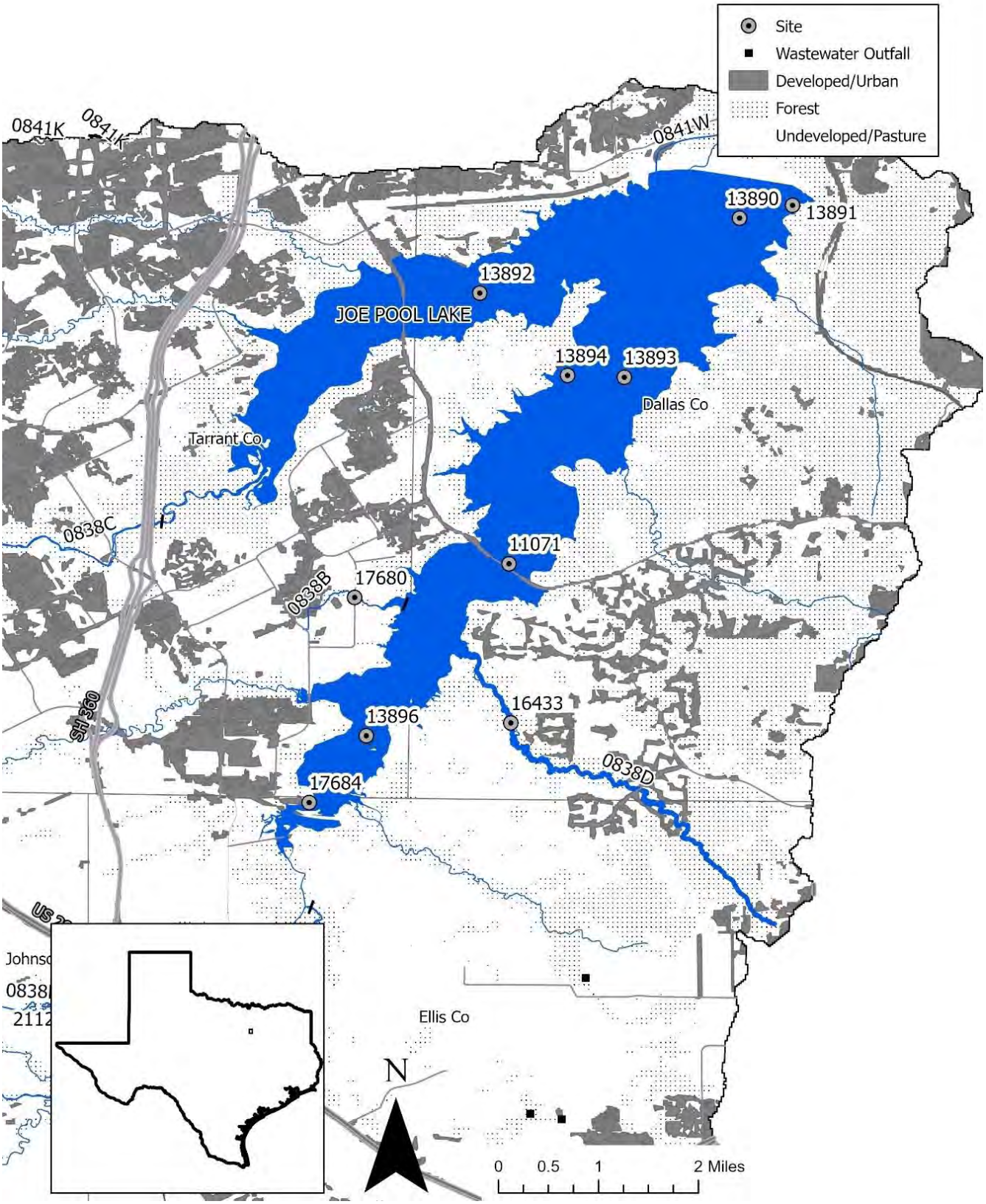


Figure 312: Segment 0838D Map

This 5.8-mile unclassified segment runs from the headwaters 500 m downstream of US 67 in Midlothian to the confluence of the Mountain Creek arm of Joe Pool Lake (see Figure 312). Much of the watershed is forested and grassland with residential communities throughout. There is also industrial development for cement production near US 67. The watershed flows through the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 254. Results of TRA trend analyses are shown in Table 255.

Table 254: TCEQ 2020 Texas Integrated Report Summary for Segment 0838D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	FS
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	Aquatic Life Use	Acute Toxic Substances in water		NA
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	Aquatic Life Use	Chronic Toxic Substances in water		NA
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	General Use	Ammonia	0.33 mg/L	NC
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	General Use	Nitrate	1.95 mg/L	NC
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	General Use	Total Phosphorus	0.69 mg/L	NC
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	General Use	Chlorophyll-*a*	14.1 µg/L	NC
0838D_01 From confluence of Joe Pool Lake upstream to headwater 500 m downstream of US 67 in Midlothian	Fish Consumption Use	HH Bioaccumulative Toxics in water		NA

FS = Fully Supporting NA = Not Assessed NC = No Concern

Table 255: Significant Trends for Segment 0838D (P-value<0.1)

Segment & Assessment Unit		0838D_01
Site		16433
Water Temperature	All	Not Significant
	Summer	↑*
	Winter	Not Significant
Specific Conductance	All	Not Significant
	Summer	↓*
	Winter	↑*
pH	All	No Trend
	Summer	↑*
	Winter	No Trend

Segment & Assessment Unit		0838D_01
Site		16433
Total Dissolved Solids	All	Not Significant
	Summer	↓*
	Winter	↑*
Field Turbidity	All	Not Significant
	Summer	↓*
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Increasing trends for specific conductance and total dissolved solids were identified in this segment. However, as discussed previously in the Data Preparation section of Appendix C, total dissolved solids were calculated from specific conductance. As shown in Figure 313, the increasing trend for specific conductance was related to drought conditions. Based on site visits by TRA staff, this segment is a very low flow system that frequently goes dry. It is clear that as the stream evaporated during drought conditions, the concentration of dissolved salts and solids in the water increased. It is important to note that, due to the short period of record for data in this segment, the date scale for Figure 313 has been reduced and does not match the date scale used for other graphs in this basin summary report.

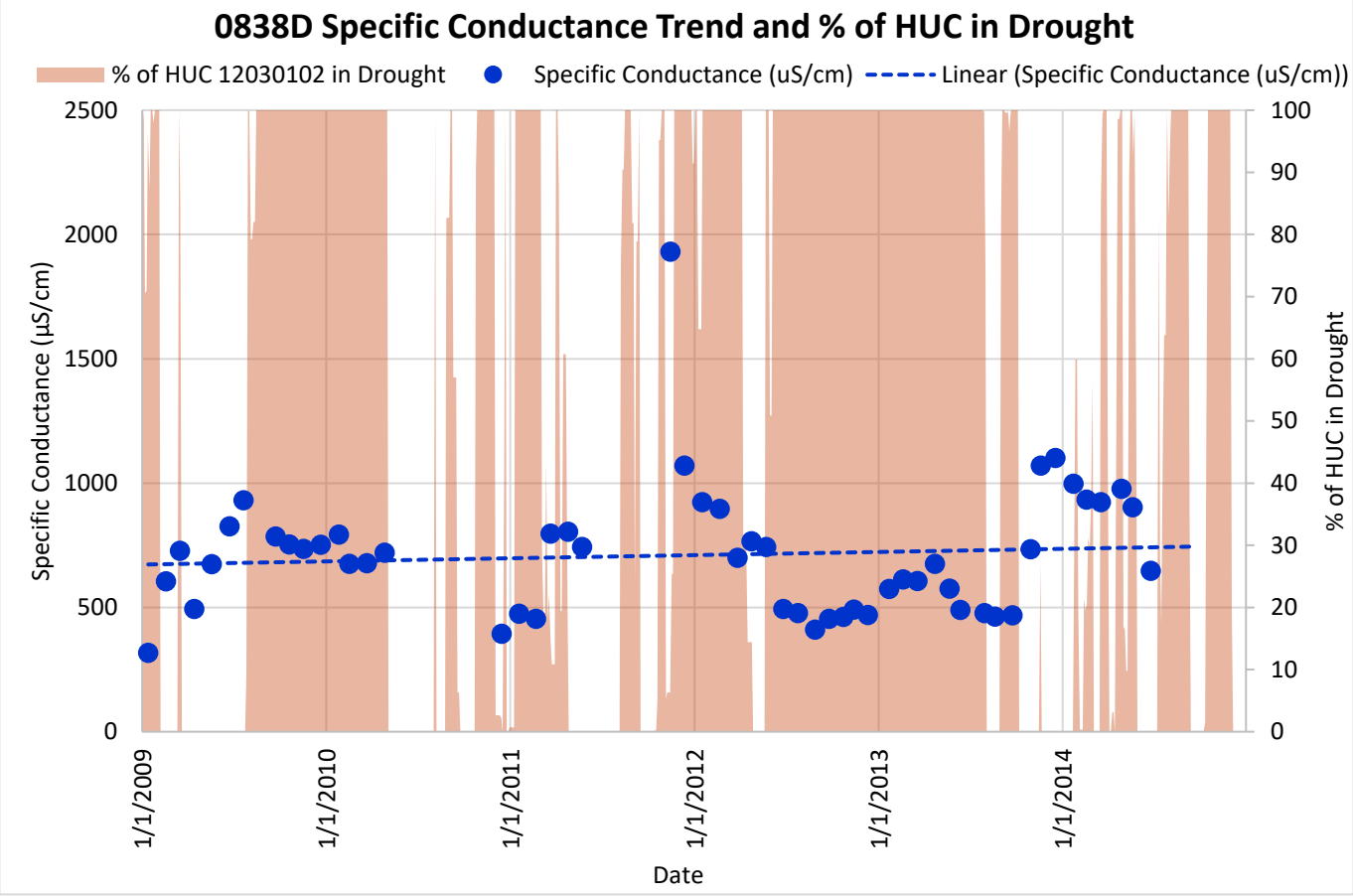


Figure 313: 0838D Specific Conductance Trend and % of HUC in Drought

An increasing summer pH trend was identified in this segment as shown in Figure 314. There are no chlorophyll-*a* data available to determine if algal populations may have been influencing pH levels in this segment. There was a sharp increase in pH levels during the prolonged drought of 2011 to 2015. It seems likely that algal blooms in the ephemeral pools along this stream may have been the cause for this increase. Planned future monitoring in this segment will help to further address this trend. It is important to note that, due to the short period of record for data in this segment, the date scale for Figure 314 has been reduced and does not match the date scale used for other graphs in this basin summary report.

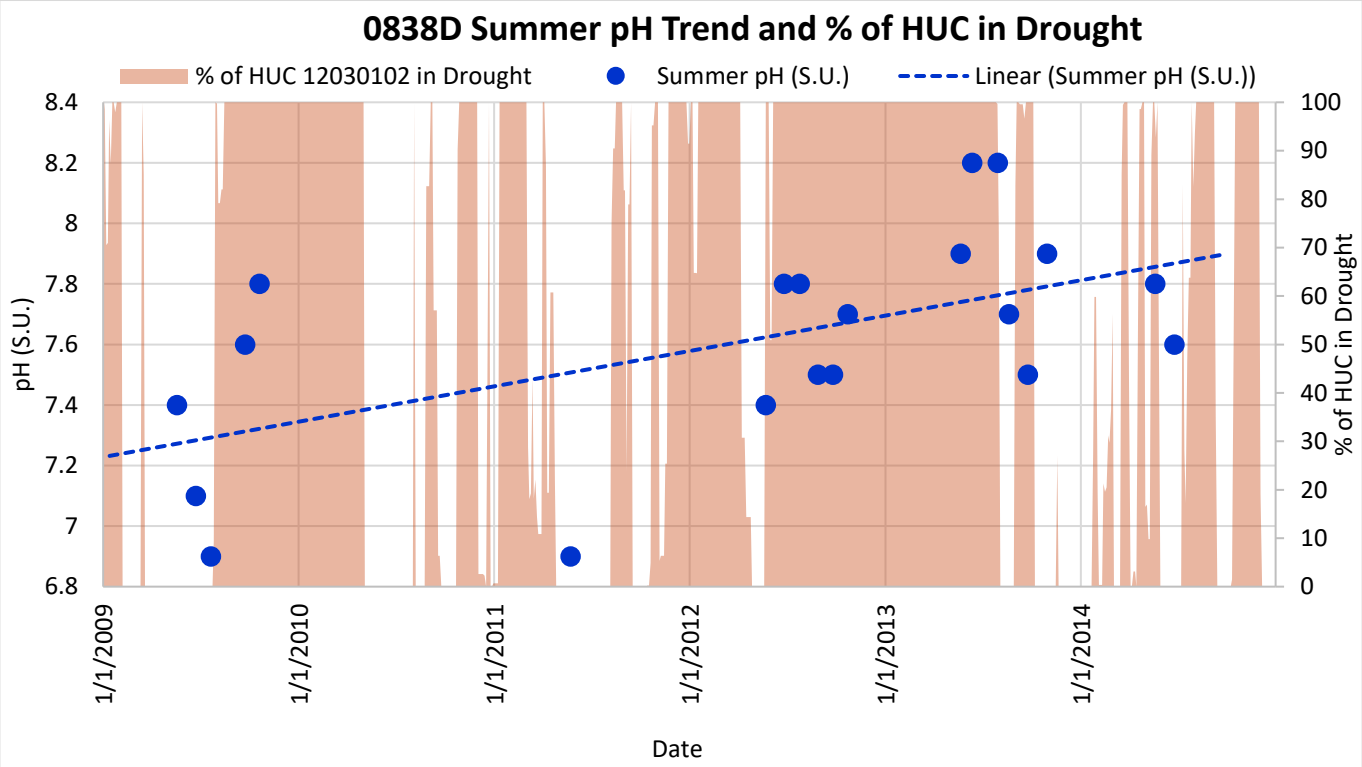


Figure 314: 0838D pH Trend and % of HUC in Drought

East Fork Trinity River

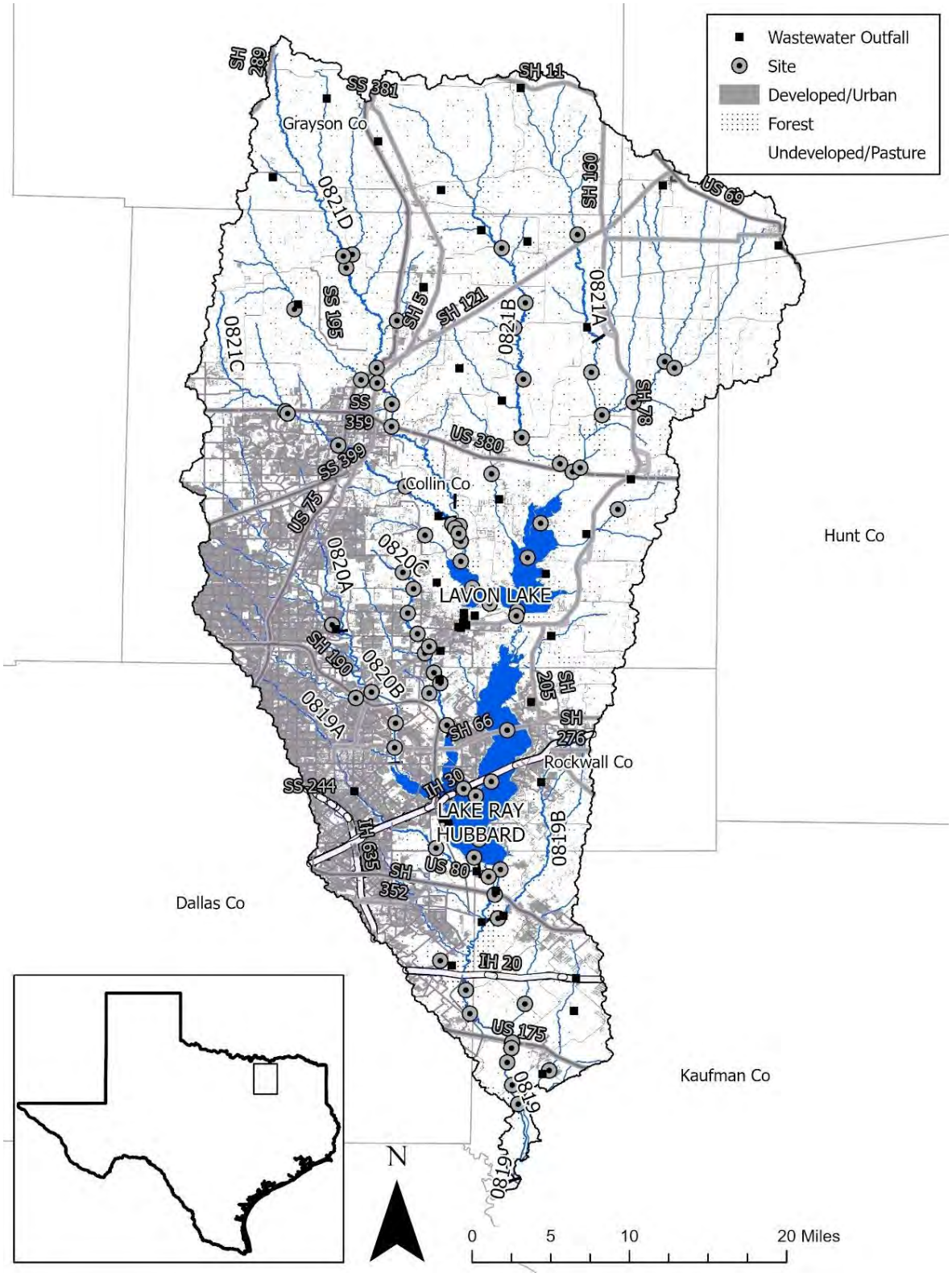


Figure 315: East Fork Trinity River Overview Map

The East Fork Trinity River subwatershed extends approximately 107 river miles from Grayson County to the confluence with the Main Stem Trinity in Kaufman County (see Figure 315). The far upper reaches of the subwatershed are primarily rural with crop and grasslands but is highly urbanized along to the west of Lake Lavon and Lake Ray Hubbard. Major population centers include the cities of McKinney, Allen, Plano, Garland, and Mesquite. Water rights for Lake Lavon and Lake Ray Hubbard are held by North Texas Municipal Water District (NTMWD) and the City of Dallas, respectively. This subwatershed receives between 39 and 43 inches of precipitation annually and lies within the Northern Blackland Prairie ecoregion.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0821D East Fork Trinity River above Lake Lavon
- 0821C Wilson Creek
- 0821B Sister Grove Creek
- 0821A Pilot Grove Creek
- 0821 Lake Lavon
- 0820 Lake Ray Hubbard
- 0820C Muddy Creek
- 0820A Cottonwood Creek
- 0820B Rowlett Creek
- 0819A Duck Creek
- 0819B Buffalo Creek
- 0819 East Fork Trinity River

0821C Wilson Creek

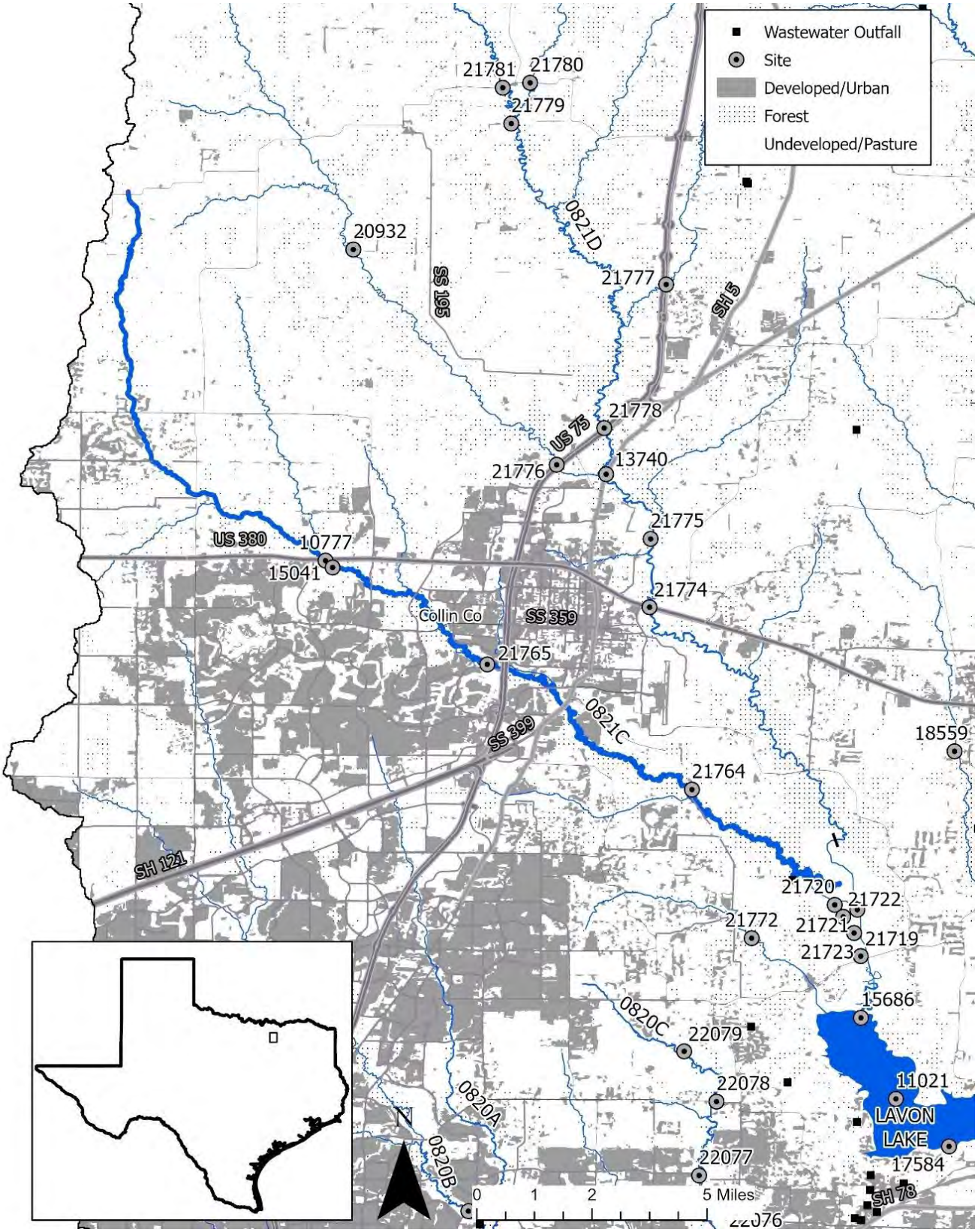


Figure 316: Segment 0821C Map

This 31-mile unclassified segment runs from West FM 455 just east of Celina in Collin County to the confluence with Lake Lavon (see Figure 316). The extreme upper and lower ends of the watershed are rural while the middle of the watershed is heavily developed. The upper portion of the stream drains crop, pasture, hay, and grassland. There is some light to medium development around the City of Prosper and transitions into heavy development as the stream flows through the City of McKinney. Just before the stream flows into Lake Lavon, there are several agricultural fields and grasslands as well as some forested riparian areas. The watershed drains the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 256. Monitoring is being conducted by TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 256: 0821C FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0821C_01	WILSON CREEK 67 METERS UPSTREAM OF COLLIN CR 158	15041	TCEQ Region 4

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 257. Results of TRA trend analyses are shown in Table 258.

Table 257: TCEQ 2020 Texas Integrated Report Summary for Segment 0821C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0821C_01 From confluence with Lake Lavon in Collin County to West FM 455 east of Celina, Collin Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0821C_01 From confluence with Lake Lavon in Collin County to West FM 455 east of Celina, Collin Co.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0821C_01 From confluence with Lake Lavon in Collin County to West FM 455 east of Celina, Collin Co.	General Use	Ammonia	0.33 mg/L	NC
0821C_01 From confluence with Lake Lavon in Collin County to West FM 455 east of Celina, Collin Co.	General Use	Nitrate	1.95 mg/L	NC
0821C_01 From confluence with Lake Lavon in Collin County to West FM 455 east of Celina, Collin Co.	General Use	Total Phosphorus	0.69 mg/L	NC
0821C_01 From confluence with Lake Lavon in Collin County to West FM 455 east of Celina, Collin Co.	General Use	Chlorophyll-*a*	14.1 µg/L	NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 258: Significant Trends for Segment 0821C (P-value<0.1)

Segment & Assessment Unit		0821C_01
Site		10777
Secchi Depth	All	↑
	Summer	No Trend
	Winter	↑
Specific Conductance	All	Not Significant
	Summer	↑
	Winter	Not Significant

Segment & Assessment Unit		0821C_01
Site		10777
Dissolved Oxygen	All	Not Significant
	Summer	↑
	Winter	No Trend
Nitrate	All	No Trend
	Summer	No Trend
	Winter	↓
Total Kjeldahl Nitrogen	All	Not Significant
	Summer	↓
	Winter	No Trend
Total Dissolved Solids	All	↑
	Summer	↑
	Winter	Not Significant
Chlorophyll-*a*	All	No Trend
	Summer	No Trend
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

This segment was found to be impaired due to elevated levels of *E. coli*. There was very little correlation between *E. coli* and flow (correlation coefficient = 0.110). This indicates that the impairment is not related to run-off. As shown in Figure 317, *E. coli* levels were regularly above the standard regardless of predominate weather conditions. The monitoring station at 10777 is located at approximately the halfway point along the stream length at West University Drive. Upstream of this station, the watershed contains mostly grass and crop land with some hay and pasture. There are also some residential developments including a golf course community. There is very little evidence of livestock activity in this area as there is a lack of livestock trails on Google Earth imagery. The most likely sources of *E. coli* in this segment are wildlife, pets, and improperly functioning septic systems. Homeowner education might be beneficial to help reduce bacteria levels. However, it is recommended that upstream sampling and optical brightener testing be conducted to determine if there may be septic systems or other failing infrastructure that are contributing to the impairment. Optical brighteners are pigments that are added to detergents to make clothing appear brighter and whiter and are therefore commonly found in wastewater. These pigments can be detected visually, especially in low flow systems where dilution of optical brighteners is not an issue. Sampling for optical brighteners involves the saturation of an unbleached cotton media with ambient water. The media is then viewed under an ultraviolet lamp. If the media has a purple-blue fluorescence, optical brighteners may be present in the water and can indicate that human waste may be entering the waterbody.

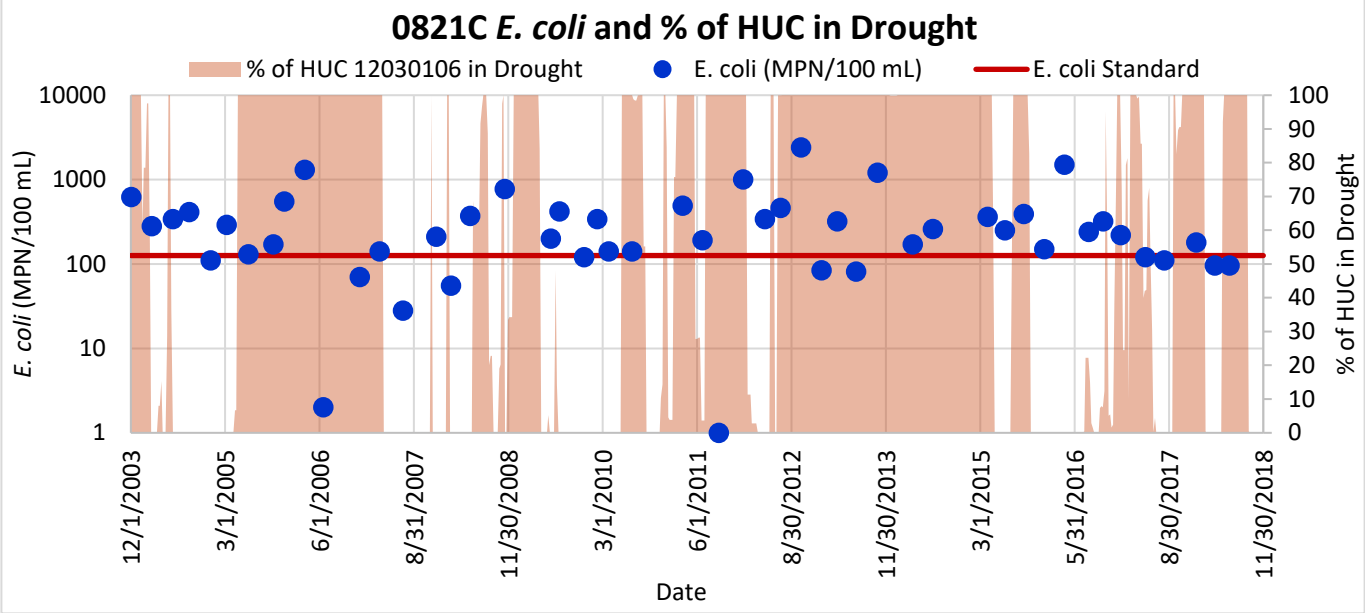


Figure 317: 0821C E. coli and % of HUC in Drought

Increasing trends for specific conductance and total dissolved solids appear to be influenced by drought conditions. Evaporation and a lack of inflows from precipitation can cause dissolved salts and solids to concentrate in waterbodies. This can be seen in Figure 318 where specific conductance increases during drought periods and decreases during recovery periods.

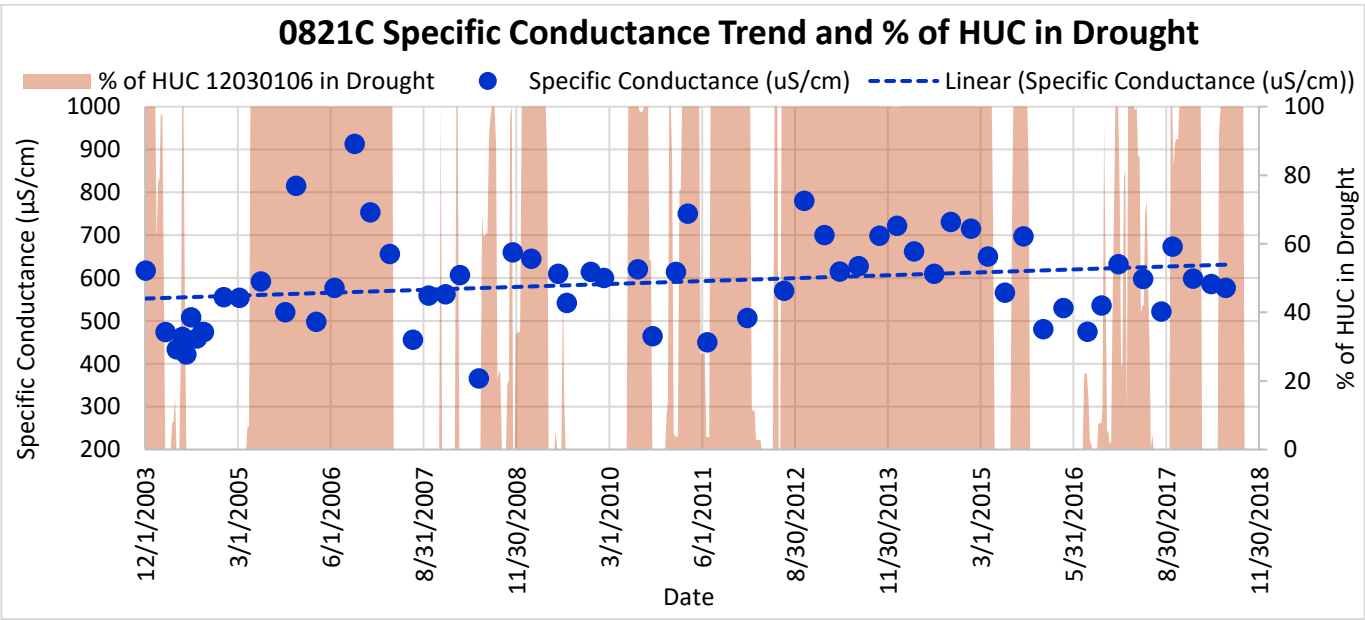


Figure 318: 0821C Specific Conductance Trend and % of HUC in Drought

The increasing winter trend for chlorophyll-*a* appears to be somewhat related to a change in detection limits. Early in the data set, the detection limit was 3 µg/L – these data are represented by the points along the zero line in Figure 319. Later in the data set, detected values below 3

µg/L were reported. However, winter chlorophyll-*a* levels were very well correlated to flow (correlation coefficient = 0.681). It is likely that during periods of high flow, algal populations may have been washed in from upstream ponds and stock tanks or instream pools. There is a residential development pond that drains into the stream immediately upstream of the monitoring station at 10777 (see Figure 320). It is recommended that observations about the flow from this pond be made during sampling events to determine if there are any correlations between chlorophyll-*a* levels and drainage from the pond.

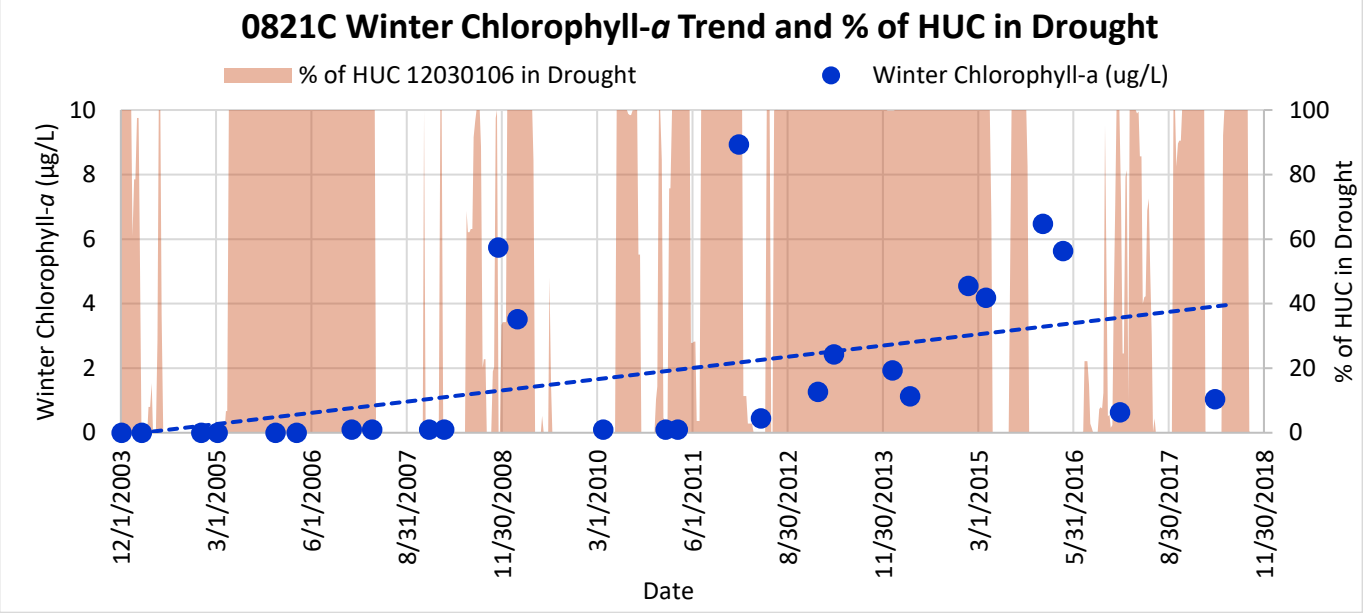


Figure 319: 0821C Winter Chlorophyll-a Trend and % of HUC in Drought



Figure 320: Residential pond upstream from monitoring station 10777

0821D East Fork Trinity River above Lake Lavon

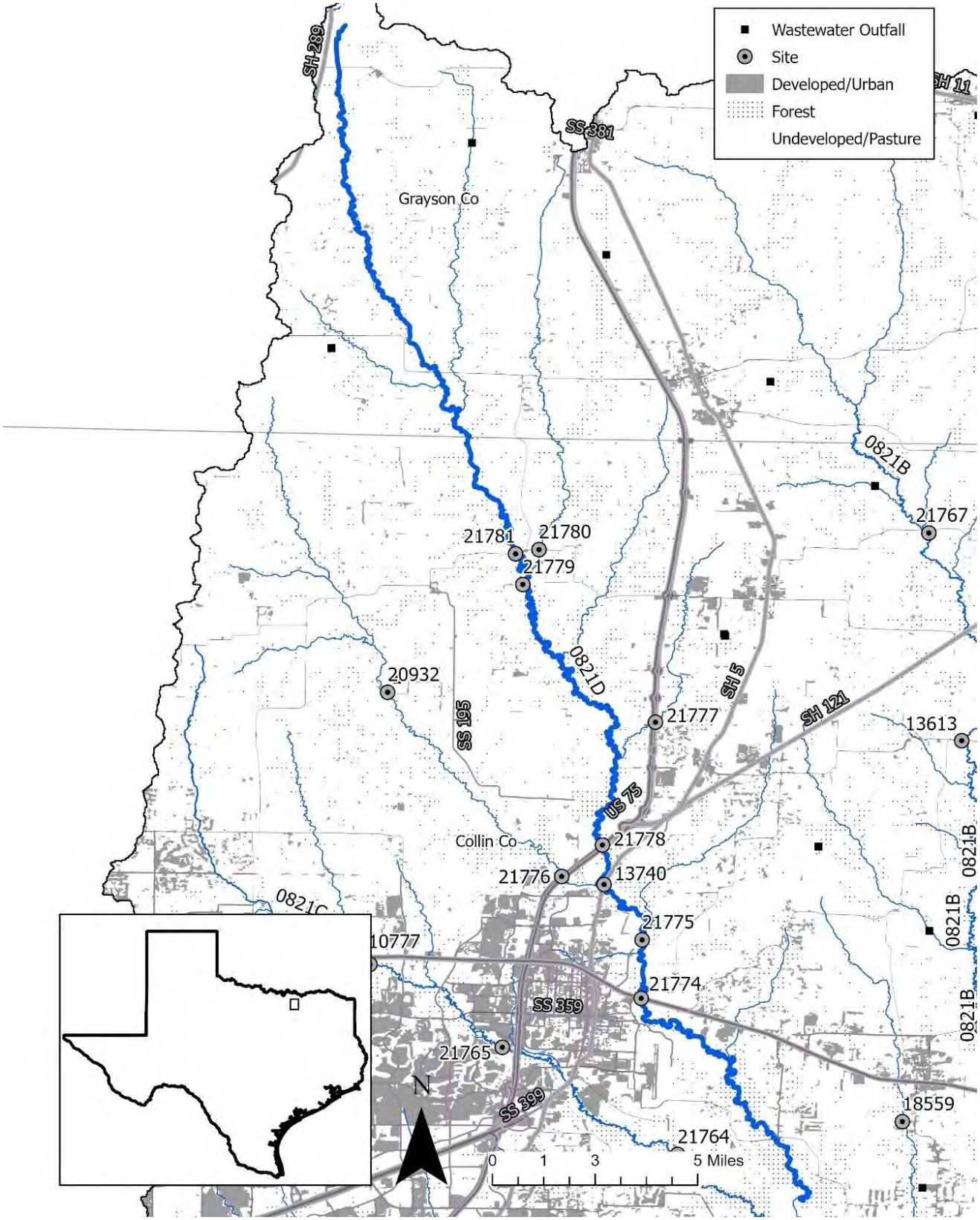


Figure 321: Segment 0821D Map

This 49-mile unclassified segment extends from the headwaters of the East Fork Trinity River upstream of FM 902 in Grayson County to the confluence with Lake Lavon (see Figure 321). Much of the watershed is rural with grass, hay, and pasture land predominating. There are some areas of crop land increasing further downstream and forested riparian areas. Most of the development in this portion of the watershed is confined to the area between I-75 and SH 5 near the cities of Anna and Melissa and south of I-75 as the river flows past the outlying areas of the City of McKinney. This watershed lies within the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 259. Monitoring is being conducted by TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 259: 0821D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0821D_01	EAST FORK TRINITY RIVER AT SH 5 3.3 MI NORTH OF MCKINNEY 1.7 MI UPSTREAM OF CLEMONS CREEK 750 FT DOWNSTREAM OF HONEY CREEK	13740	TCEQ Region 4

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 260. No significant trends were identified during TRA data analysis.

Table 260: TCEQ 2020 Texas Integrated Report Summary for Segment 0821D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0821D_01 A portion of East Fork Trinity from confluence with Lake Lavon to upper end of waterbody	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0821D_01 A portion of East Fork Trinity from confluence with Lake Lavon to upper end of waterbody	Recreation Use	*E. coli*	126 MPN/100 mL	**NS**
0821D_01 A portion of East Fork Trinity from confluence with Lake Lavon to upper end of waterbody	General Use	Ammonia	0.33 mg/L	NC
0821D_01 A portion of East Fork Trinity from confluence with Lake Lavon to upper end of waterbody	General Use	Nitrate	1.95 mg/L	NC
0821D_01 A portion of East Fork Trinity from confluence with Lake Lavon to upper end of waterbody	General Use	Total Phosphorus	0.69 mg/L	NC
0821D_01 A portion of East Fork Trinity from confluence with Lake Lavon to upper end of waterbody	General Use	Chlorophyll-*a*	14.1 µg/L	NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

An impairment due to elevated levels of *E. coli* was identified in this segment. *E. coli* levels were not correlated to flows (correlation coefficient = 0.026) and were regularly reported above the standard of 126 MPN/100 mL (see Figure 322). This indicates that there were likely both run-off related and regular sources of bacteria into the stream. In 2013, there was some sort of pipeline

work being done across a tributary just upstream of monitoring station 13740 at SH 5 as shown on the top in Figure 323. Additionally, the same area has evidence of livestock trails as shown on the bottom in Figure 323. It is likely that bacteria are being introduced by wildlife and livestock visiting the stream or river for watering during dry weather and via run-off from the animals during wet weather. Although it is unknown at this time what kind of pipeline was being worked on in 2013, it is recommended that a field investigation be conducted to determine if the pipeline is still intact after the prolonged drought and flooding during the drought recovery. Upstream monitoring is also recommended to determine if there may be a specific area that is contributing bacteria to the stream that could benefit from best management practices.

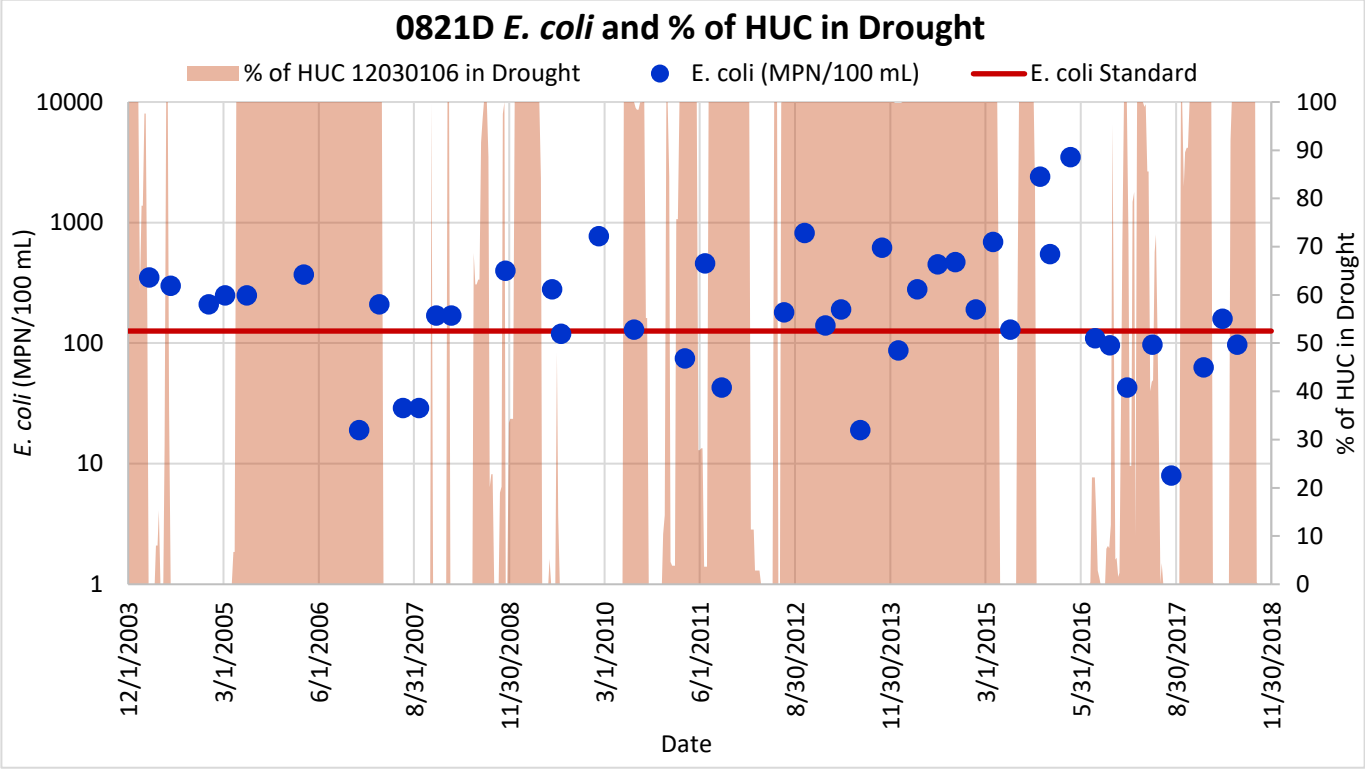


Figure 322: 0821D E. coli and % of HUC in Drought

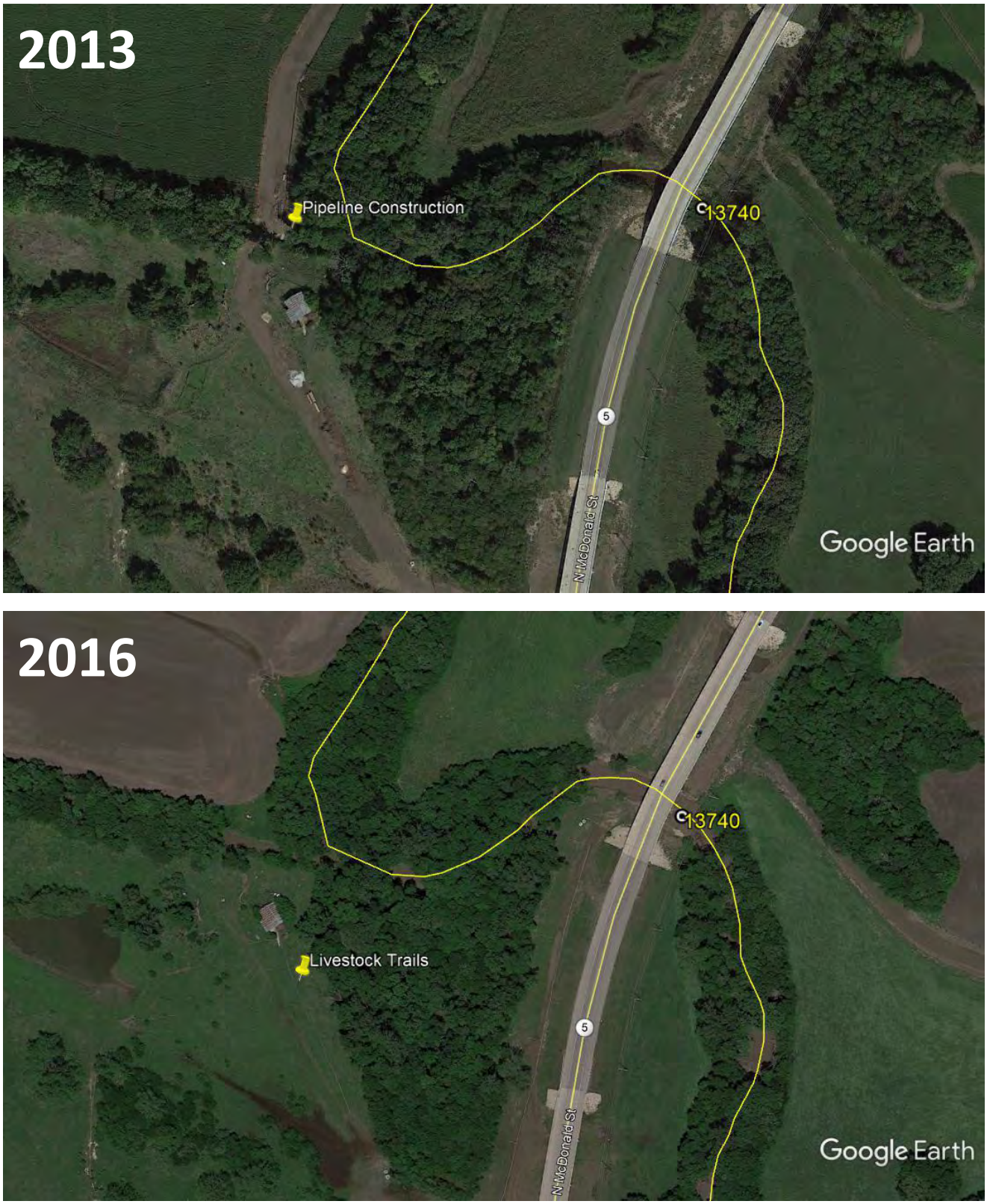


Figure 323: Pipeline construction and livestock trails in segment 0821D

0821B Sister Grove Creek

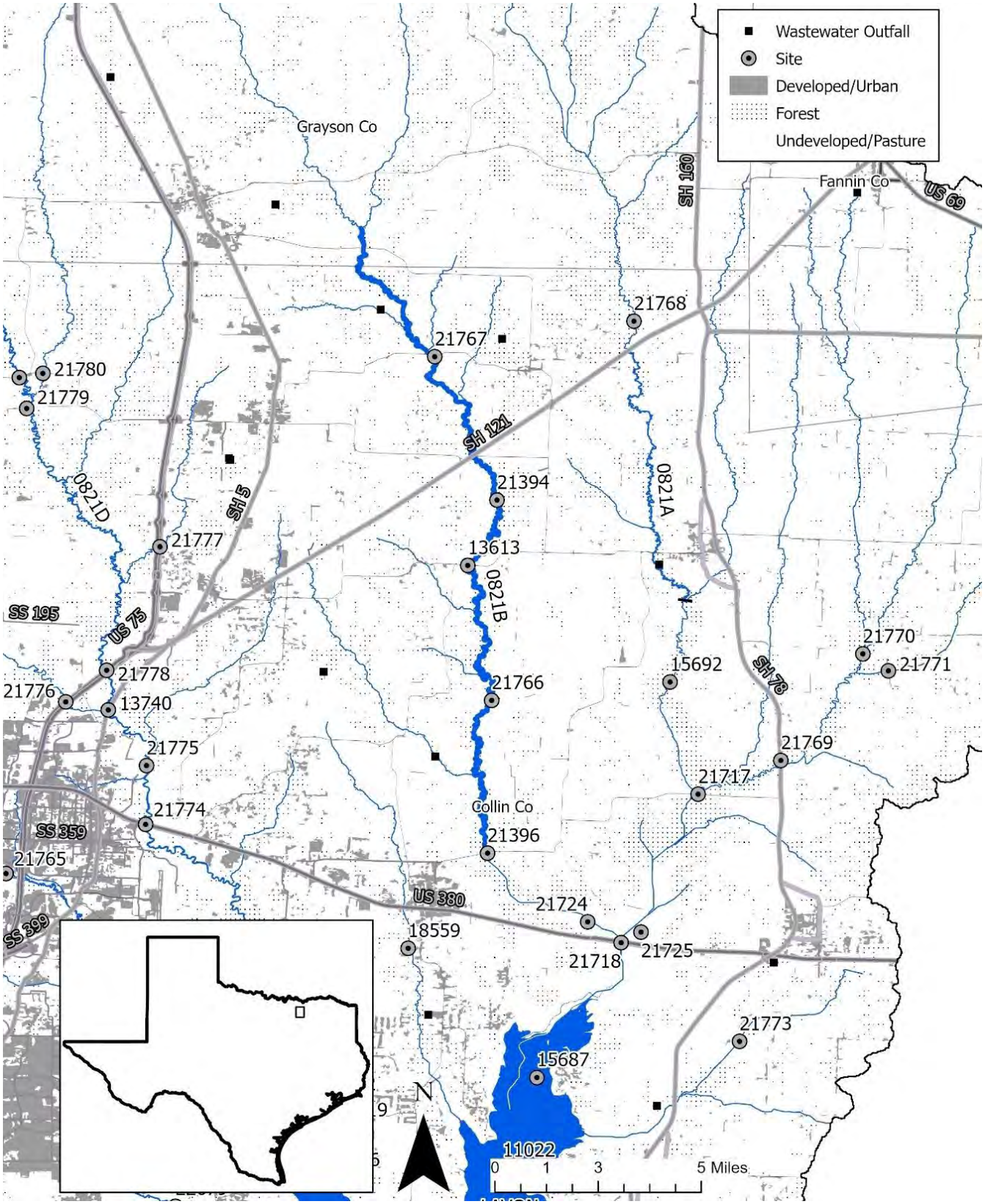


Figure 324: Segment 0821B Map

This 27-mile unclassified segment runs from the confluence of West Prong Sister Grove Creek/East Prong Sister Grove Creek east of Van Alstyne in Grayson County to the confluence with Lake Lavon in Collin County (see Figure 324). The watershed is rural with a mix of pasture, hay, and grassland with some small areas of crop land and forest throughout. It flows through the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 261. Monitoring is being conducted by North Texas Municipal Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 261: 0821B FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0821B_01	SISTER GROVE CREEK DOWNSTREAM FM 1377/MONTE CARLO BLVD 1.6 K EAST OF INTERSECTION OF 6TH STREET AND FM 1377 NEAR PRINCETON TX	21396	North Texas Municipal Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 262. Results of TRA trend analyses are shown in Table 263.

Table 262: TCEQ 2020 Texas Integrated Report Summary for Segment 0821B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0821B_01 From confluence with Lake Lavon to confluence of W. Prong Sister Grove/E. Prong Sister Grove Cks	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0821B_01 From confluence with Lake Lavon to confluence of W. Prong Sister Grove/E. Prong Sister Grove Cks	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0821B_01 From confluence with Lake Lavon to confluence of W. Prong Sister Grove/E. Prong Sister Grove Cks	General Use	Ammonia	0.33 mg/L	NC
0821B_01 From confluence with Lake Lavon to confluence of W. Prong Sister Grove/E. Prong Sister Grove Cks	General Use	Nitrate	1.95 mg/L	NC
0821B_01 From confluence with Lake Lavon to confluence of W. Prong Sister Grove/E. Prong Sister Grove Cks	General Use	Total Phosphorus	0.69 mg/L	NC
0821B_01 From confluence with Lake Lavon to confluence of W. Prong Sister Grove/E. Prong Sister Grove Cks	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CN = Use Concern CS = Screening Level Concern NC = No Concern

Table 263: Significant Trends for Segment 0821B (P-value<0.1)

Segment & Assessment Unit		0821B_01
Site		21396
Chemical Oxygen Demand	All	Not Significant
	Summer	↑*
	Winter	Not Significant
pH	All	↑*
	Summer	No Trend
	Winter	↑*
Total Suspended Solids	All	No Trend
	Summer	↑*
	Winter	Not Significant

Segment & Assessment Unit		0821B_01
Site		21396
Nitrate	All	Not Significant
	Summer	Not Significant
	Winter	↑*
Total Phosphorus	All	Not Significant
	Summer	↑*
	Winter	Not Significant
Orthophosphate	All	↑*
	Summer	Not Significant
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Concerns for depressed dissolved oxygen and elevated levels of *E. coli* were identified in this segment. Clean River Program monitoring began at station 21396 in 2016. Of 30 samples, 14 dissolved oxygen values were reported below the grab sample screening level of 5 mg/L with 5 of these being below the grab sample minimum standard of 3 mg/L. As shown in Figure 325, dissolved oxygen is fairly well correlated to chlorophyll-*a* (correlation coefficient = -0.468). This indicates that algal population or macrophytes may be the cause of the dissolved oxygen concern in this segment. The monitoring station is located in a woody wetland area immediately upstream from the boundary of Lake Lavon. Slower flows in a backwater environment combined with the abundant vegetation of the wetland may be contributing to this concern.

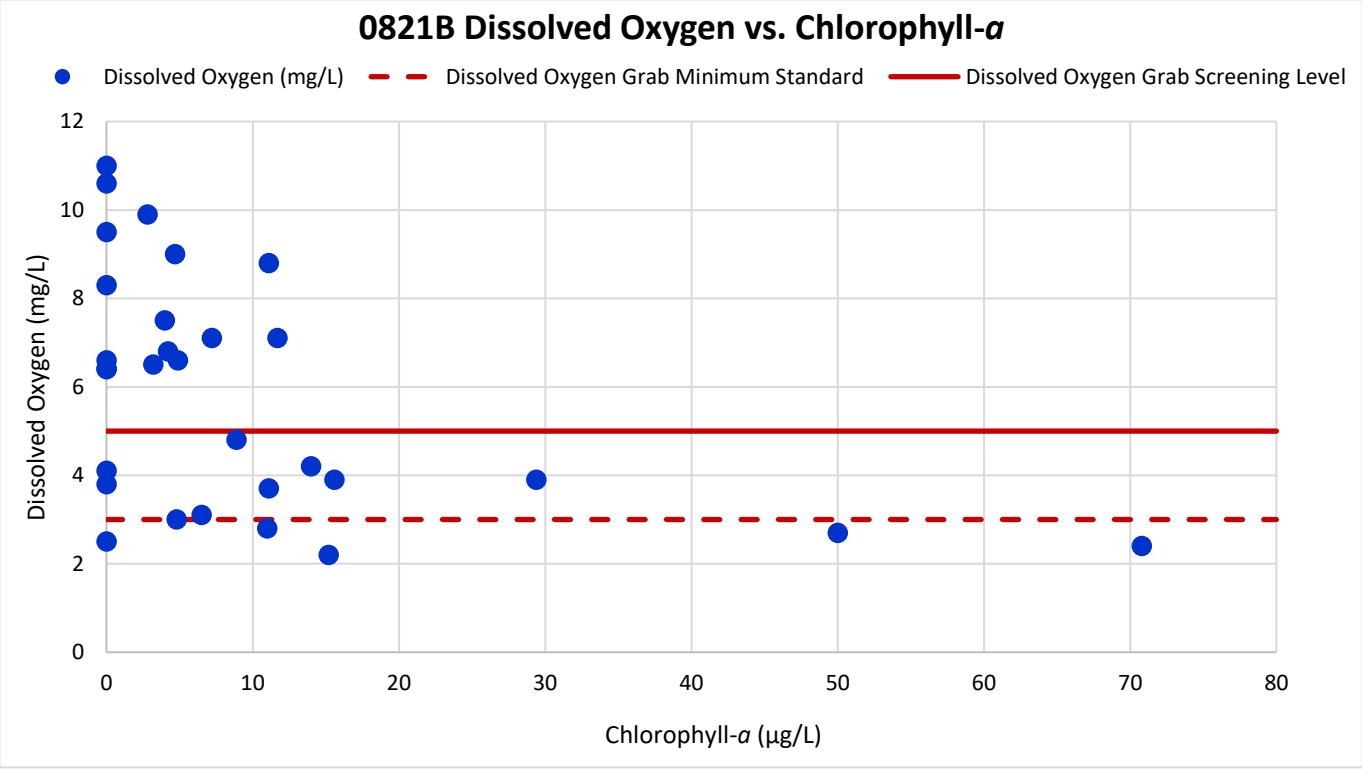


Figure 325: 0821B Dissolved Oxygen vs. Chlorophyll-a

Of 30 *E. coli* records, 17 values were reported above the standard of 126 MPN/100 mL. *E. coli* is not well correlated to flow related parameters. The best correlation coefficient was 0.391 for stream flow estimate. However, many of the stream flow estimates were reported as 0 cfs which may indicate that the stream was in a backwater condition for many of these data points as the Lake Lavon reservoir elevation was near the conservation pool elevation of 492 feet. Because the upstream watershed is rural and heavily wooded with some evidence of livestock trails based on Google Earth imagery, the most likely sources of bacteria include wildlife and livestock. Failing septic systems may have also been contributing to this concern. Landowner education and livestock best management practices may help reduce bacteria levels in this segment.

Increasing summer trends were identified for chemical oxygen demand, total phosphorus, and total suspended solids. As stated above, sampling began in 2016 so any trends identified in this data set are inherently weak. The trends may not be indicative of long-term water quality changes but rather responses to shorter-term weather patterns. Regardless, these trends should be watched and re-evaluated in the future. As shown for total phosphorus in Figure 326, higher values tended to be reported during drought conditions indicating that evaporation may be concentrating these constituents in the stream. A similar pattern was seen for the orthophosphate and winter nitrate. Monitoring continues in this segment and will allow for better trend analysis in the future.

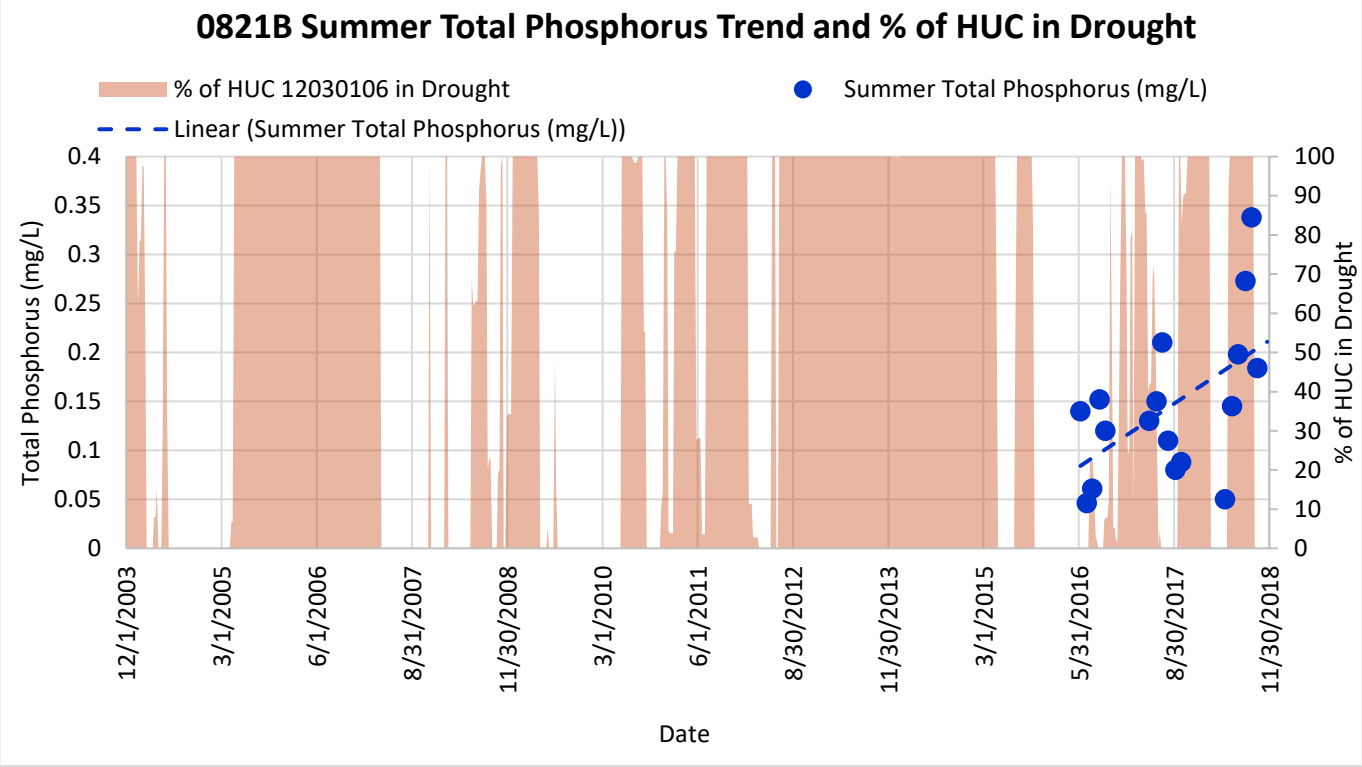


Figure 326: 0821B Summer Total Phosphorus Trend and % of HUC in Drought

0821A Pilot Grove Creek

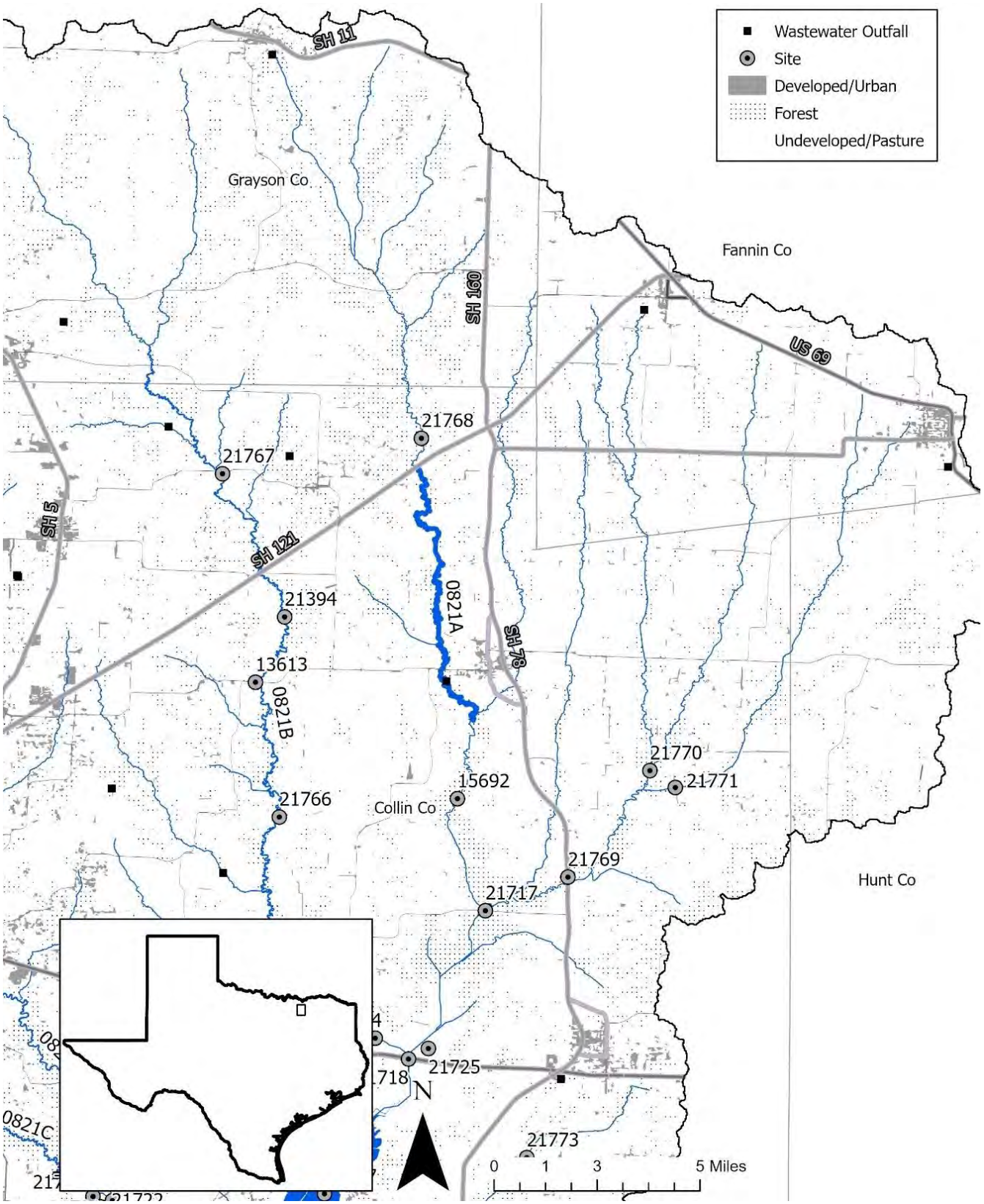


Figure 327: Segment 0821A Map

This 25.7-mile unclassified segment runs from the headwaters approximately 0.28 miles south of SH 11 west of Whitewright to the confluence with Lake Lavon in Collin county (see Figure 327). The watershed is rural with a mix of pasture, hay, and grassland with some small areas of crop land and forest throughout. It flows through the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 264. Monitoring is being conducted by North Texas Municipal Water District and TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 264: 0821A FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0821A	PILOT GROVE CREEK AT FM 2756 UPSTREAM OF LAKE LAVON	21717	North Texas Municipal Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 265. Results of TRA trend analyses are shown in Table 266.

Table 265: TCEQ 2020 Texas Integrated Report Summary for Segment 0821A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0821A_02 Pilot Grove Creek from confluence with Lake Lavon up to confluence with Desert Creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0821A_02 Pilot Grove Creek from confluence with Lake Lavon up to confluence with Desert Creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0821A_02 Pilot Grove Creek from confluence with Lake Lavon up to confluence with Desert Creek	General Use	Ammonia	0.33 mg/L	NC
0821A_02 Pilot Grove Creek from confluence with Lake Lavon up to confluence with Desert Creek	General Use	Nitrate	1.95 mg/L	NC
0821A_02 Pilot Grove Creek from confluence with Lake Lavon up to confluence with Desert Creek	General Use	Total Phosphorus	0.69 mg/L	NC
0821A_02 Pilot Grove Creek from confluence with Lake Lavon up to confluence with Desert Creek	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

Table 266: Significant Trends for Segment 0821A (P-value<0.1)

Segment & Assessment Unit		0821A_01
Site		21717
Nitrite	All	No Trend
	Summer	↑*
	Winter	No Trend
Total Kjeldahl Nitrogen	All	Not Significant
	Summer	↓*
	Winter	Not Significant
E. coli	All	No Trend
	Summer	↓*
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

A concern for *E. coli* was identified in this segment. Monitoring station 21717 is located in a woody wetland area just upstream from the boundary of Lake Lavon. Of 33 *E. coli* records, 21 values were reported above the standard of 126 MPN/100 mL. There was some correlation between *E. coli* and stream flow estimate (correlation coefficient = 0.474). However, there were several stream flow estimates reported at 0 cfs after both recent precipitation events and more than a month since the previous precipitation event. This may indicate that the stream was in a backwater condition as the Lake Lavon reservoir elevation was near the conservation pool elevation of 492 feet. Because the upstream watershed is rural and heavily wooded it is likely that wildlife are the cause of the concern in this segment. However, it is recommended that upstream sampling be conducted to determine if there is a specific contributing area or factor that can be identified.

The increasing summer trend for nitrite does not appear to be an artifact of the detection limit rather than a true trend. Additionally, CRP sampling began at this site in late 2015 so the period of record for this report is rather short so any trends identified in this data set are inherently weak. The trends may not be indicative of long-term water quality changes but rather responses to shorter-term weather patterns. Regardless, these trends should be watched and re-evaluated in the future. Of the 19 samples collected during the warmer months of the year (summer), 13 were reported below the detection limit of 0.02 mg/L. One value in 2016 was reported as 0.0203 mg/L and 5 values in 2018 were reported as 0.02 mg/L.

Monitoring at this station is ongoing and should help clarify both the *E. coli* concern and the nitrite trend.

0821 Lake Lavon

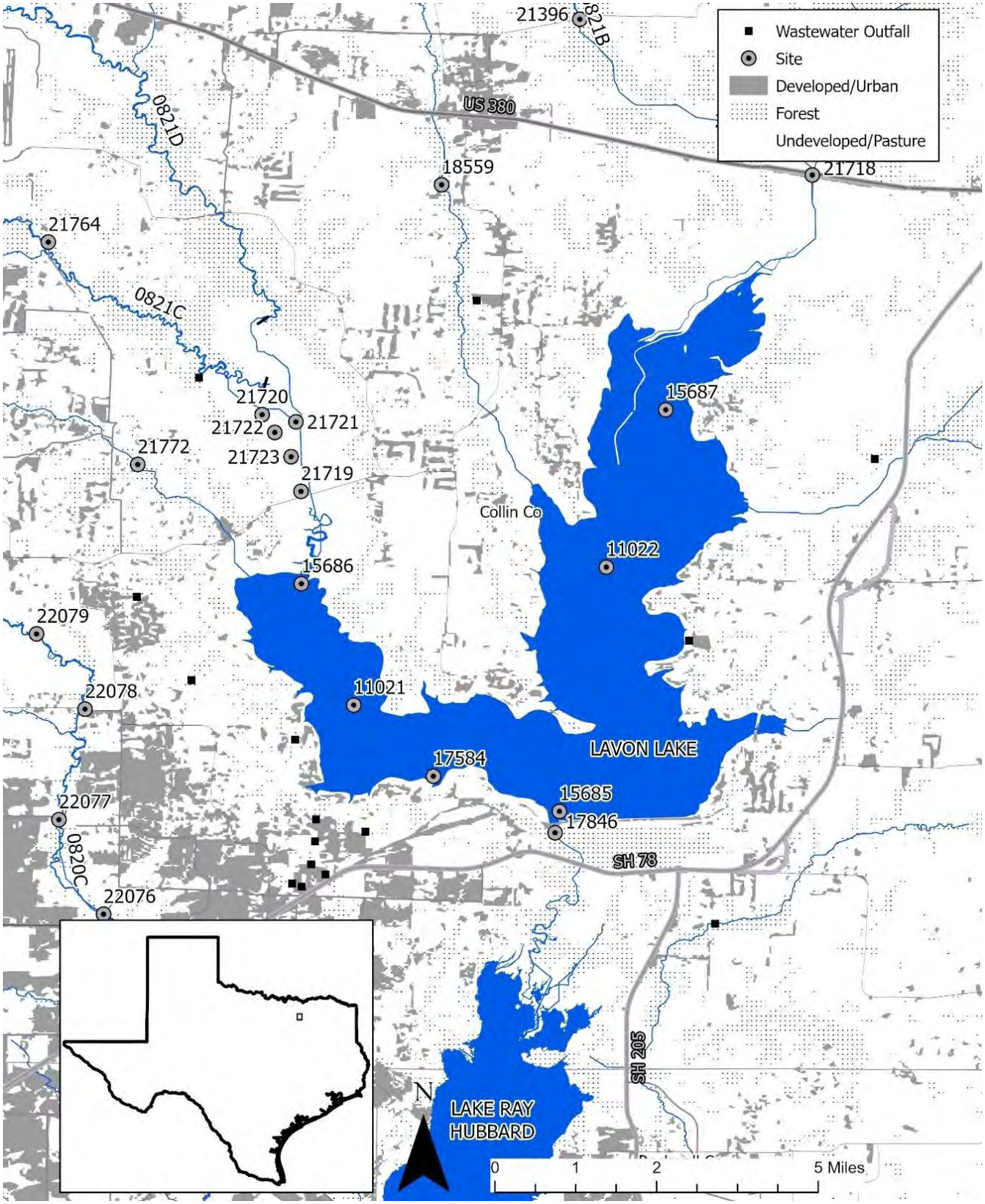


Figure 328: Segment 0821 Map

This 20,609-acre segment impounds the East Fork Trinity River up to a normal pool elevation of 492 feet (see Figure 328). Much of the watershed is rural with grassland, hay and pasture being the predominate land use. Some smaller areas of crop land exist mostly in the middle of the watershed. Development increases toward the west of the reservoir with cities of McKinney, Princeton, Fairview, and Lucas. The watershed lies within the Northern Blackland Prairie ecoregion. Lake Lavon has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Water quality monitoring is being conducted at 14 sites within this segment as shown in Table 267. Monitoring is being conducted by North Texas Municipal Water District and TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 267: 0821 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0821_01	LAVON LAKE USGS SITE AC 1.01 KM NORTH AND 927 METERS EAST OF INTERSECTION OF SH 78 AND SKYVIEW DRIVE NEAR DAM (7)	15685	North Texas Municipal Water District
0821_01	LAKE LAVON WEST OF EASTFORK PARK AND EAST OF INTAKE #3 467 METERS N AND 456 METERS W OF INTERSECTION OF SKYVIEW DR AND PRIVATE RD 5313 (8)	17584	North Texas Municipal Water District
0821_02	LAKE LAVON EAST FORK ARM 273 METERS NORTH AND 1.04 KM WEST OF INTERSECTION OF SUNNY LANE AND LAVON LAKE ROAD (RAW 3)	11021	North Texas Municipal Water District
0821_02	LAVON LAKE USGS SITE EC 1.69 KM EAST OF INTERSECTION OF BROCKDALE PARK AND COLLIN CR 967 (9)	15686	North Texas Municipal Water District
0821_02	LAKE LAVON EAST FORK ARM 130 METERS NORTH OF EAST LUCAS ROAD AND 1.6 KILOMETERS WEST AND 340 METERS SOUTH OF THE INTERSECTION OF EAST LUCAS ROAD AND OF FM 546	21719	North Texas Municipal Water District
0821_02	LAKE LAVON EAST FORK ARM 1.37 KILOMETERS NORTH AND 2.33 KILOMETERS WEST OF THE INTERSECTION OF EAST LUCAS ROAD AND FM 546	21720	North Texas Municipal Water District
0821_02	LAKE LAVON EAST FORK ARM 1.20 KILOMETERS NORTH AND 1.72 KILOMETERS WEST OF THE INTERSECTION OF EAST LUCAS ROAD AND FM 546	21721	North Texas Municipal Water District
0821_02	LAKE LAVON EAST FORK ARM 970 METERS NORTH AND 2.10 KILOMETERS WEST OF THE INTERSECTION OF EAST LUCAS ROAD AND FM 546	21722	North Texas Municipal Water District
0821_02	LAKE LAVON EAST FORK ARM 430 METERS NORTH AND 1.81 KILOMETERS WEST OF THE INTERSECTION OF EAST LUCAS ROAD AND FM 546	21723	North Texas Municipal Water District
0821_03	LAVON LAKE USGS SITE BC 194 METERS NORTH AND 719 METERS WEST OF INTERSECTION OF COLLIN CR 1047 AND COLLIN CR 1055 (2)	15687	North Texas Municipal Water District
0821_04	LAKE LAVON PILOT GROVE ARM 207 METERS NORTH AND 1.82 KM WEST OF INTERSECTION OF CR 761 AND CR 546 (6)	11022	North Texas Municipal Water District

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0821_04	LAKE LAVON AT HWY 380 AT THE CONFLUENCE OF SISTER GROVE CREEK ARM AND PILOT GROVE CREEK ARM APPROX 250 METERS EAST OF THE INTERSECTION OF FM 559 AND HWY 380	21718	North Texas Municipal Water District
0821_04	LAKE LAVON AT THE MOUTH OF SISTER GROVE CREEK ARM 735 METERS NORTH AND 860 METERS WEST OF THE INTERSECTION OF HWY 380 AND FM 559	21724	North Texas Municipal Water District
0821_04	LAKE LAVON AT THE MOUTH OF PILOT GROVE CREEK ARM 320 METERS NORTH AND 890 METERS EAST OF THE INTERSECTION OF HWY 380 AND FM 559	21725	North Texas Municipal Water District

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 268. Results of TRA trend analyses are shown in Table 269.

Table 268: TCEQ 2020 Texas Integrated Report Summary for Segment 0821

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0821_01 Lowermost portion of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0821_02 East Fork arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0821_03 Middle portion of Sister Grove Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0821_04 Remainder of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0821_01 Lowermost portion of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0821_02 East Fork arm	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0821_03 Middle portion of Sister Grove Creek arm	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0821_04 Remainder of segment	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0821_01 Lowermost portion of reservoir	General Use	Ammonia	0.11 mg/L	NA
0821_02 East Fork arm	General Use	Ammonia	0.11 mg/L	NA
0821_03 Middle portion of Sister Grove Creek arm	General Use	Ammonia	0.11 mg/L	NA
0821_04 Remainder of segment	General Use	Ammonia	0.11 mg/L	NA
0821_01 Lowermost portion of reservoir	General Use	Nitrate	0.37 mg/L	NA
0821_02 East Fork arm	General Use	Nitrate	0.37 mg/L	NA
0821_03 Middle portion of Sister Grove Creek arm	General Use	Nitrate	0.37 mg/L	NA
0821_04 Remainder of segment	General Use	Nitrate	0.37 mg/L	NA
0821_01 Lowermost portion of reservoir	General Use	Total Phosphorus	0.2 mg/L	NA
0821_02 East Fork arm	General Use	Total Phosphorus	0.2 mg/L	NA
0821_03 Middle portion of Sister Grove Creek arm	General Use	Total Phosphorus	0.2 mg/L	NA
0821_04 Remainder of segment	General Use	Total Phosphorus	0.2 mg/L	NA

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0821_01 Lowermost portion of reservoir	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0821_02 East Fork arm	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0821_03 Middle portion of Sister Grove Creek arm	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0821_04 Remainder of segment	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0821_01 Lowermost portion of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0821_02 East Fork arm	General Use	pH	6.5 - 9 S.U.	FS
0821_03 Middle portion of Sister Grove Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0821_04 Remainder of segment	General Use	pH	6.5 - 9 S.U.	FS
0821_01 Lowermost portion of reservoir	General Use	Chloride	80 mg/L	FS
0821_02 East Fork arm	General Use	Chloride	80 mg/L	FS
0821_03 Middle portion of Sister Grove Creek arm	General Use	Chloride	80 mg/L	FS
0821_04 Remainder of segment	General Use	Chloride	80 mg/L	FS
0821_01 Lowermost portion of reservoir	General Use	Sulfate	60 mg/L	FS
0821_02 East Fork arm	General Use	Sulfate	60 mg/L	FS
0821_03 Middle portion of Sister Grove Creek arm	General Use	Sulfate	60 mg/L	FS
0821_04 Remainder of segment	General Use	Sulfate	60 mg/L	FS
0821_01 Lowermost portion of reservoir	General Use	Total Dissolved Solids	400 mg/L	FS
0821_02 East Fork arm	General Use	Total Dissolved Solids	400 mg/L	FS
0821_03 Middle portion of Sister Grove Creek arm	General Use	Total Dissolved Solids	400 mg/L	FS
0821_04 Remainder of segment	General Use	Total Dissolved Solids	400 mg/L	FS
0821_01 Lowermost portion of reservoir	General Use	Water temperature	33.9 °F	FS
0821_02 East Fork arm	General Use	Water temperature	33.9 °F	FS
0821_03 Middle portion of Sister Grove Creek arm	General Use	Water temperature	33.9 °F	FS
0821_04 Remainder of segment	General Use	Water temperature	33.9 °F	FS
0821_01 Lowermost portion of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0821_02 East Fork arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0821_03 Middle portion of Sister Grove Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0821_04 Remainder of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting NA = Not Assessed

Table 269: Significant Trends for Segment 0821 (P-value<0.1)

Segment & Assessment Unit		0821	0821	0821	0821_01	0821_01	0821_02	0821_02	0821_02	0821_02	0821_02	0821_02	0821_02	0821_03	0821_ 04
Site		21718	21724	21725	15685	17584	11021	15686	21719	21720	21721	21722	21723	15687	11022
Secchi Depth	All	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	↑*	↑*	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	↑*	↑*
	Winter	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Specific Conductance	All	Not Significant	Not Significant	Not Significant	↑*	↑*	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*	↑*
	Summer	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	↑*	↑*	Not Significant	Not Significant	Not Significant	↑*	Not Significant	Not Significant	Not Significant
	Winter	↑*	Not Significant	↑*	↑*	↑*	↑*	↑*	Not Significant	↑*	Not Significant	Not Significant	Not Significant	↑*	↑*
Chemical Oxygen Demand	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*	↑*	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
pH	All	Not Significant	↑*	No Trend	No Trend	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	↑*	No Trend	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	Not Significant
	Winter	Not Significant	Not Significant	No Trend	No Trend	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Alkalinity	All	Not Significant	↓*	Not Significant	↓*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	↓*	↓*
	Summer	Not Significant	Not Significant	Not Significant	↓*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	↓*
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	Not Significant	Not Significant	Not Significant
Total Suspended Solids	All	Not Significant	↑*	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	Not Significant	Not Significant
Volatile Suspended Solids	All	Not Significant	↑*	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Nitrite	All	No Trend	No Trend	No Trend	No Trend	Not Significant	↑*	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	No Trend
	Summer	↑*	No Trend	No Trend	↑*	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	No Trend
	Winter	No Trend	No Trend	No Trend	No Trend	Not Significant	↑*	Not Significant	Not Significant	↑*	Not Significant	↑*	Not Significant	Not Significant	Not Significant
Nitrate	All	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	No Trend	No Trend	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	↑*	Not Significant	↑*	Not Significant	Not Significant	Not Significant	No Trend	No Trend	Not Significant	Not Significant	No Trend	↑*	↑*
	Winter	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	Not Significant	Not Significant	Not Significant
Total Kjeldahl Nitrogen	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Total Phosphorus	All	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	↑*
	Summer	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	No Trend	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Ortho-phosphate	All	Not Significant	No Trend	Not Significant	No Trend	No Trend	No Trend	No Trend	No Trend	Not Significant	No Trend	↓*	No Trend	No Trend	No Trend
	Summer	Not Significant	No Trend	Not Significant	No Trend	No Trend	No Trend	No Trend	No Trend	Not Significant	No Trend	↓*	No Trend	No Trend	No Trend
	Winter	Not Significant	Not Significant	Not Significant	↑*	No Trend	No Trend	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	No Trend
Total Organic Carbon	All	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	Not Significant	Not Significant	No Trend	No Trend
	Summer	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend	Not Significant	Not Significant	No Trend	No Trend
	Winter	Not Significant	Not Significant	↑*	Not Significant	Not Significant	Not Significant	Not Significant	↑*	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

Segment & Assessment Unit		0821	0821	0821	0821_01	0821_01	0821_02	0821_02	0821_02	0821_02	0821_02	0821_02	0821_02	0821_03	0821_ 04
Site		21718	21724	21725	15685	17584	11021	15686	21719	21720	21721	21722	21723	15687	11022
Hardness	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	Not Significant	No Trend
	Summer	Not Significant	↓*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	No Trend
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	Not Significant	Not Significant
Chloride	All	↑*	↑*	No Trend	↑*	↑*	↑*	↑*	↑*	No Trend	Not Significant	↑*	↑*	↑*	↑*
	Summer	Not Significant	Not Significant	↑*	↑*	↑*	↑*	↑*	↑*	Not Significant	Not Significant	↑*	↑*	↑*	↑*
	Winter	↑*	↑*	↑*	↑*	↑*	↑*	↑*	↑*	↑*	Not Significant	Not Significant	Not Significant	↑*	↑*
Sulfate	All	↑*	↑*	↑*	↑*	↑*	↑*	↑*	↑*	Not Significant	Not Significant	Not Significant	Not Significant	↑*	↑*
	Summer	↑*	↑*	↑*	↑*	↑*	↑*	↑*	↑*	Not Significant	Not Significant	↑*	↑*	↑*	↑*
	Winter	↑*	Not Significant	↑*	↑*	↑*	↑*	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*	↑*
Total Iron	All	No Trend	Not Significant	Not Significant	No Trend	No Trend	No Trend	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	No Trend
	Summer	Not Significant	↑*	Not Significant	↑*	↑*	↑*	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*	↑*
	Winter	Not Significant	Not Significant	Not Significant	No Trend	No Trend	Not Significant	Not Significant	↓*	Not Significant	↓*	↓*	Not Significant	Not Significant	No Trend
Total Manganese	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	↓*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	Not Significant	Not Significant
E. coli	All	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	No Trend	No Trend	No Trend	Not Significant	Not Significant	Not Significant	No Trend	No Trend	Not Significant
	Summer	No Trend	Not Significant	Not Significant	No Trend	No Trend	No Trend	↑*	↑*	↑*	↑*	↑*	↑*	No Trend	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↓*	Not Significant	↓*	↓*	↓*	Not Significant	Not Significant
Total Dissolved Solids	All	Not Significant	Not Significant	Not Significant	↑*	↑*	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*	↑*
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	↑*	Not Significant	↑*	↑*	↑*	↑*	↑*	Not Significant	↑*	Not Significant	Not Significant	Not Significant	↑*	↑*
Chlorophyll-*a*	All	↑*	No Trend	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	↑*	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	↑*	Not Significant	↑*	↑*	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	No Trend
Lab Turbidity	All	Not Significant	Not Significant	No Trend	No Trend	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	↑*	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	No Trend	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	↓*	↓*	Not Significant	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Stations 21718, 21724, and 21725 shown in the first three columns of Table 269 are currently classified as being in assessment unit 0821_04. It is defined as the “remainder of the reservoir” and comprises the upper and lower portions of the Sister Grove Creek arm of Lake Lavon. The middle portion of this arm of the reservoir is identified as assessment unit 0821_03. These three stations are relatively new locations that were added when North Texas Municipal Water District joined the TRA Clean Rivers Program. As there are now stations in both portions of assessment unit 0821_04, it is recommended that TCEQ redefine the boundaries to create separate assessment units for the upper and lower portions of Sister Grove Creek arm.

Several increasing trends were identified in this reservoir. However, CRP monitoring only began in 2015 so any trends identified in this data set are inherently weak. The trends may not be

indicative of long-term water quality changes but rather responses to shorter-term weather patterns. Regardless, these trends should be watched and re-evaluated in the future.

Several trends including chloride, sulfate, total dissolved solids, and chemical oxygen demand followed the pattern seen for chloride in assessment unit 0821_01 (see Figure 329). Concentrations of these parameters generally increased during drought periods and decreased during drought recovery. This indicates that evaporation and concentration of these constituents in the reservoir were the cause for these trends.

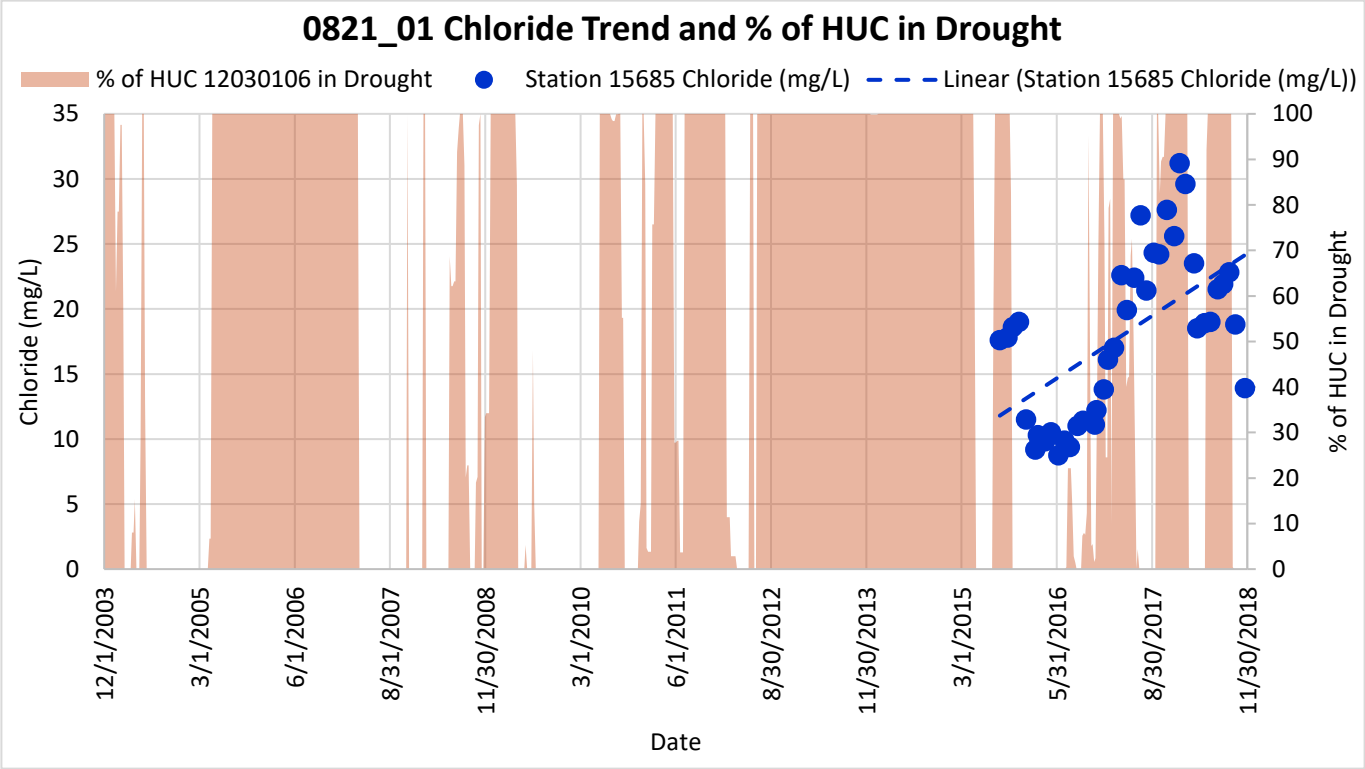


Figure 329: 0821_01 Chloride Trend and % of HUC in Drought

A somewhat opposing pattern was seen for nutrients such as nitrate and total phosphorus as shown in Figure 330 for nitrate in 0821_03. Although there were periods of drought, there were also precipitation events that lead to various levels of reservoir elevation increases. Nutrient levels typically decreased during decreases in reservoir elevation and then increased substantially when reservoir elevations increased. This indicates that nutrients are being washed in to the reservoir from the watershed. There are several wastewater treatment facilities located throughout the watershed as well as agriculture and residential developments. It is likely that all of these sources contributed to the increasing trends. Wastewater effluent that may have been held in pools in the intermittent streams may have been washed down as stream flows increased. Run-off from fertilized yards and agricultural fields may have also washed nutrients into the reservoir during precipitation events.

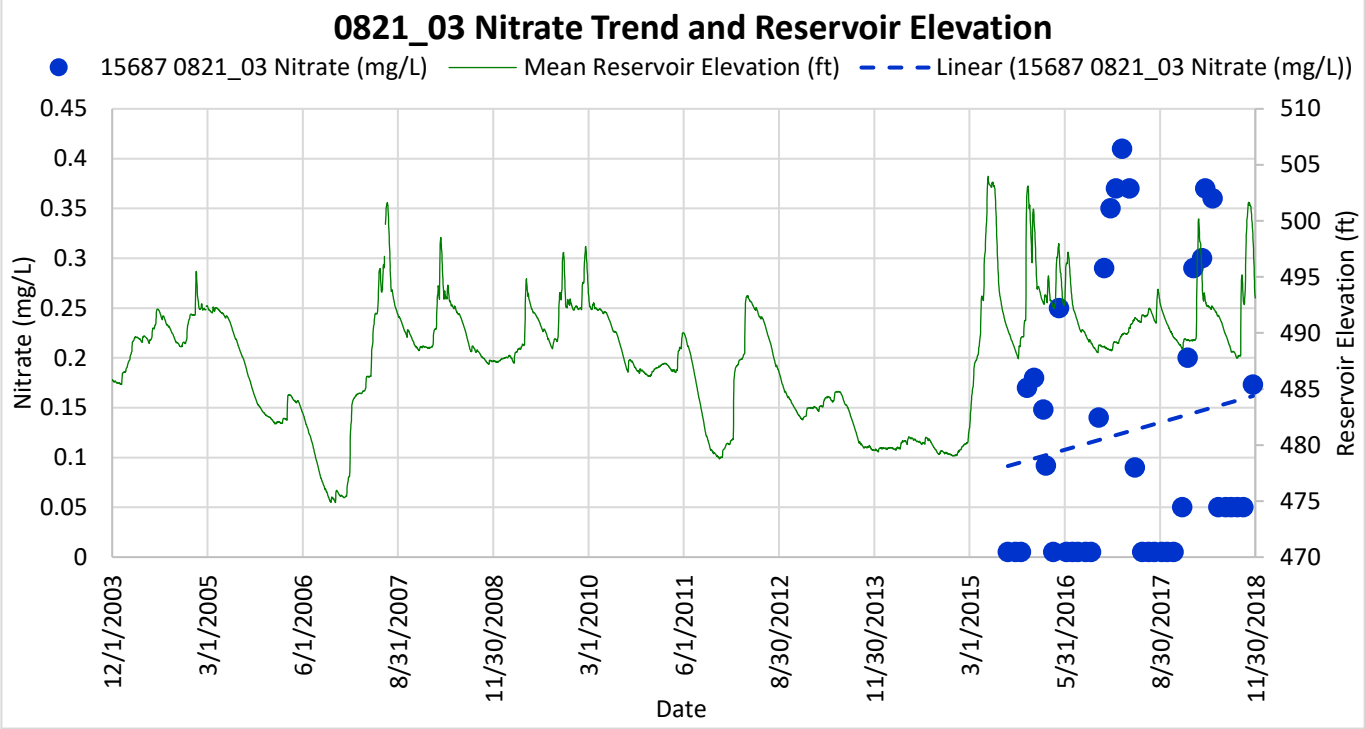


Figure 330: 0821_03 Nitrate Trend and Reservoir Elevation

Similarly, total iron trends tracked with increases and decreases in reservoir elevations as shown in Figure 331. This was likely due to iron containing soils being washed into the reservoir during precipitation events.

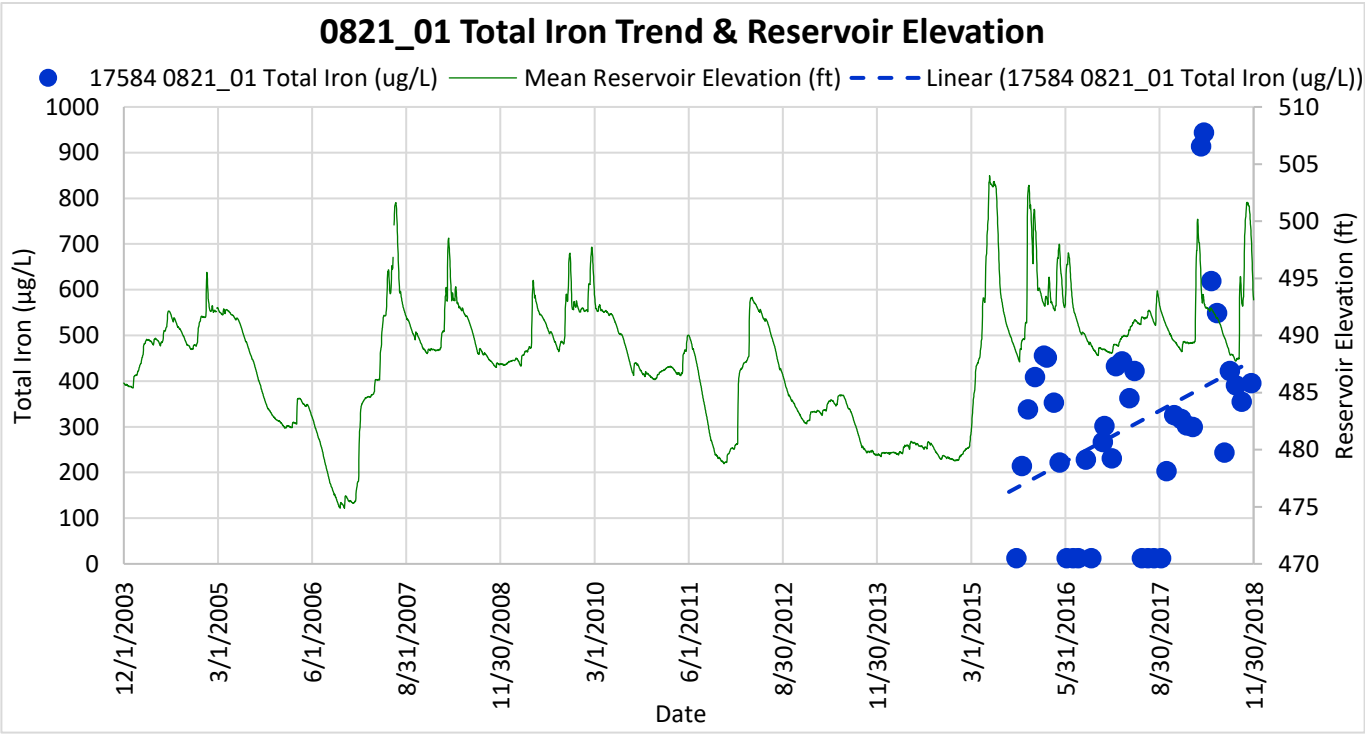


Figure 331: 0821_01 Total Iron Trend & Reservoir Elevation

The increasing summer trends for *E. coli* do not appear to be leading to an issue. For the six stations where increasing trends were identified, there was a total of 117 summer samples collected. Of these there was only one sample reported just above the standard of 126 MPN/100 mL at 130 MPN/100 mL. The remainder of the summer samples were reported below 84 MPN/100 mL.

Increasing trends for pH and chlorophyll-*a* appeared to have been related to those stations in the upper portion of the East Fork Trinity River arm (stations 21721, 21719, and 21722). The correlation coefficients between pH and chlorophyll-*a* at these sites were greater than 0.609 indicating that algal populations may be affecting pH levels in this arm of the reservoir. Correlations between pH and chlorophyll-*a* in the upper portion of the Sister Grove Creek arm were not well correlated (correlation coefficients < 0.255). Additionally, pH levels were not well correlated to any other parameters in this arm of the lake. It is unknown at this time what is affecting pH levels in the Sister Grove Creek arm.

Ongoing sampling in this reservoir may help to further assess these trends.

0820 Lake Ray Hubbard

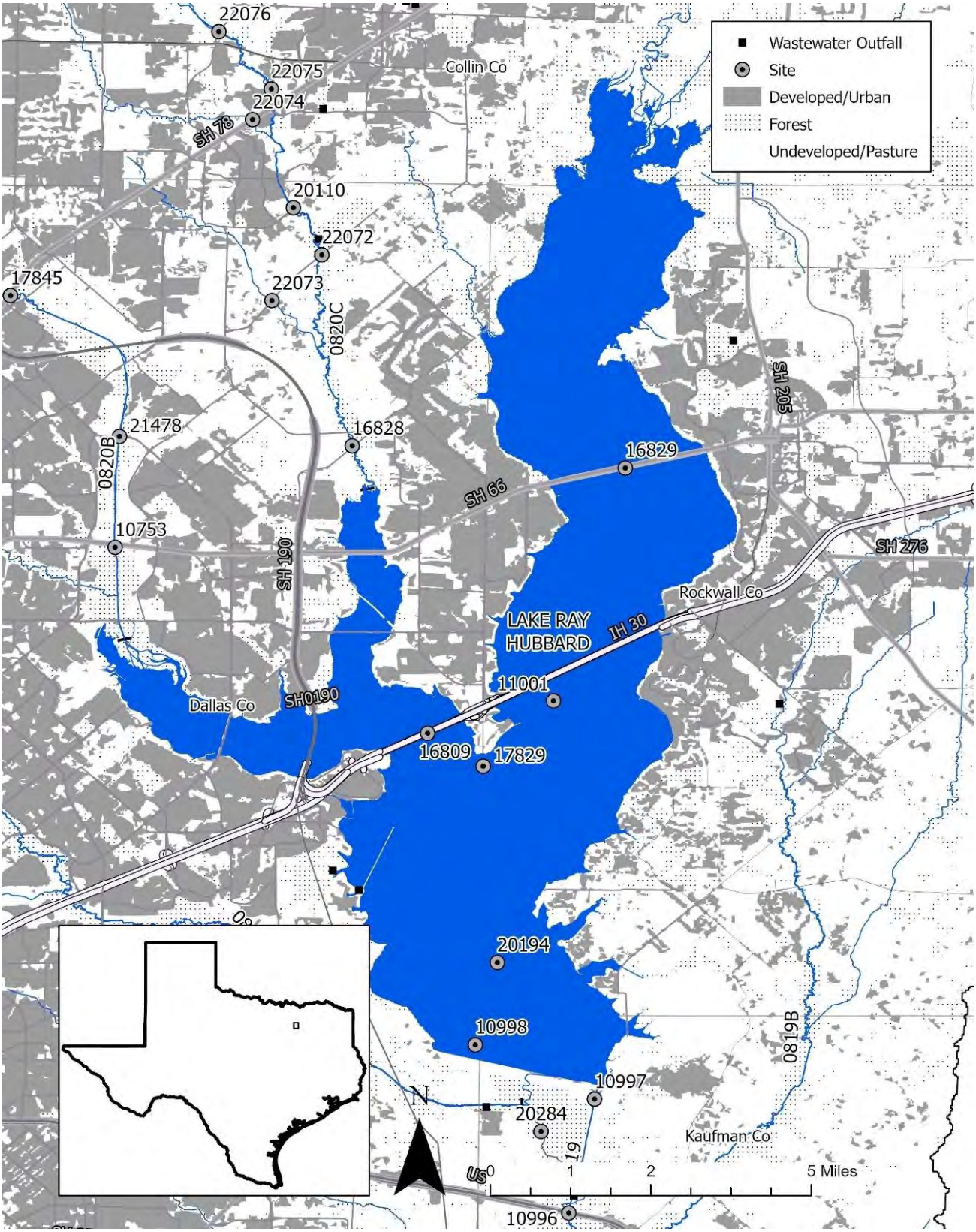


Figure 332: Segment 0820 Map

This 21,834-acre segment impounds the East Fork Trinity River from Rockwall-Forney Dam to Lavon Dam in Collin County up to a normal pool elevation of 435.5 feet (see Figure 332). The watershed to the northeast is largely rural with crop land being the predominate land use. Much of the land directly around the reservoir is developed by the cities of Rowlett, Sachse, Rockwall, and Garland. The watershed lies within the Northern Blackland Prairie ecoregion. Lake Ray Hubbard has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Water quality monitoring is being conducted at seven sites within this segment as shown in Table 270. Monitoring is being conducted by the City of Dallas (collecting entity DA) and TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 270: 0820 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0820_01	LAKE RAY HUBBARD AT I 30 BRIDGE 766 METERS NORTH AND 1.26 KM EAST OF INTERSECTION OF CHAHA ROAD AND I 30	16809	City of Dallas (collecting entity DA)
0820_02	LAKE RAY HUBBARD 173 METERS N AND 1.31 KM E OF INTERSECTION OF DALROCK RD AND I 30 CONFLUENCE OF EAST FORK ARM WITH MAIN BODY OF LAKE	11001	TCEQ Region 4
0820_02	LAKE RAY HUBBARD EAST FORK ARM AT US 66 494 M NORTH AND 1.83 KM EAST OF INTERSECTION OF US 66 AND SCENIC DRIVE WEST OF ROCKWALL	16829	City of Dallas (collecting entity DA)
0820_04	LAKE RAY HUBBARD 1.79 KM E AND 193 METERS S OF INTERSECT GLORIA RD AND E FORK RD NEAR DALLAS WATER INTAKE STRUCTURE AT WEST END OF DAM	10998	TCEQ Region 4
0820_04	LAKE RAY HUBBARD 1.79 KM E AND 193 METERS S OF INTERSECT GLORIA RD AND E FORK RD NEAR DALLAS WATER INTAKE STRUCTURE AT WEST END OF DAM	10998	City of Dallas (collecting entity DA)
0820_05	LAKE RAY HUBBARD MID LAKE 1.13 KM SOUTH AND 165 METERS EAST OF INTERSECTION OF DALROCK ROAD AND COOKE DRIVE	17829	City of Dallas (collecting entity DA)
0820_06	LAKE RAY HUBBARD/EAST FORK TRINITY RIVER 200 METERS DOWNSTREAM OF LAKE LAVON OUTFALL AT COLLIN CR 384	17846	City of Dallas (collecting entity DA)

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 271. Results of TRA trend analyses are shown in

Table 272. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 271: TCEQ 2020 Texas Integrated Report Summary for Segment 0820

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0820_01 Lower portion of East Fork arm, centering on IH 30	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0820_02 Middle portion of East Fork arm, centering on SH 66	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0820_06 Outfall canal from Lake Lavon Dam	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0820_01 Lower portion of East Fork arm, centering on IH 30	Aquatic Life Use	Acute Toxic Substances in water		FS
0820_02 Middle portion of East Fork arm, centering on SH 66	Aquatic Life Use	Acute Toxic Substances in water		FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	Aquatic Life Use	Acute Toxic Substances in water		FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	Aquatic Life Use	Acute Toxic Substances in water		FS
0820_06 Outfall canal from Lake Lavon Dam	Aquatic Life Use	Acute Toxic Substances in water		FS
0820_01 Lower portion of East Fork arm, centering on IH 30	Aquatic Life Use	Chronic Toxic Substances in water		FS
0820_02 Middle portion of East Fork arm, centering on SH 66	Aquatic Life Use	Chronic Toxic Substances in water		FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	Aquatic Life Use	Chronic Toxic Substances in water		FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	Aquatic Life Use	Chronic Toxic Substances in water		FS
0820_06 Outfall canal from Lake Lavon Dam	Aquatic Life Use	Chronic Toxic Substances in water		FS
0820_02 Middle portion of East Fork arm, centering on SH 66	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	Ammonia	0.11 mg/L	NA
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	Ammonia	0.11 mg/L	NA
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	Ammonia	0.11 mg/L	NA
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	Ammonia	0.11 mg/L	NA
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	Nitrate	0.37 mg/L	NA
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	Nitrate	0.37 mg/L	NA

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	Nitrate	0.37 mg/L	NA
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	Nitrate	0.37 mg/L	NA
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	Total Phosphorus	0.2 mg/L	NA
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	Total Phosphorus	0.2 mg/L	NA
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	Total Phosphorus	0.2 mg/L	NA
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	Total Phosphorus	0.2 mg/L	NA
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	Chlorophyll-*a*	26.7 µg/L	NA
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	pH	6.5 - 9 S.U.	FS
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	pH	6.5 - 9 S.U.	FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	pH	6.5 - 9 S.U.	FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	pH	6.5 - 9 S.U.	FS
0820_06 Outfall canal from Lake Lavon Dam	General Use	pH	6.5 - 9 S.U.	FS
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	Chloride	100 mg/L	FS
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	Chloride	100 mg/L	FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	Chloride	100 mg/L	FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	Chloride	100 mg/L	FS
0820_06 Outfall canal from Lake Lavon Dam	General Use	Chloride	100 mg/L	FS
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	Sulfate	100 mg/L	FS
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	Sulfate	100 mg/L	FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	Sulfate	100 mg/L	FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	Sulfate	100 mg/L	FS
0820_06 Outfall canal from Lake Lavon Dam	General Use	Sulfate	100 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	Total Dissolved Solids	500 mg/L	FS
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	Total Dissolved Solids	500 mg/L	FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	Total Dissolved Solids	500 mg/L	FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	Total Dissolved Solids	500 mg/L	FS
0820_06 Outfall canal from Lake Lavon Dam	General Use	Total Dissolved Solids	500 mg/L	FS
0820_01 Lower portion of East Fork arm, centering on IH 30	General Use	Water temperature	33.9 °F	FS
0820_02 Middle portion of East Fork arm, centering on SH 66	General Use	Water temperature	33.9 °F	FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	General Use	Water temperature	33.9 °F	FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	General Use	Water temperature	33.9 °F	FS
0820_06 Outfall canal from Lake Lavon Dam	General Use	Water temperature	33.9 °F	FS
0820_01 Lower portion of East Fork arm, centering on IH 30	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0820_02 Middle portion of East Fork arm, centering on SH 66	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0820_06 Outfall canal from Lake Lavon Dam	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0820_01 Lower portion of East Fork arm, centering on IH 30	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0820_02 Middle portion of East Fork arm, centering on SH 66	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0820_04 Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0820_05 Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0820_06 Outfall canal from Lake Lavon Dam	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting NA = Not Assessed

Table 272: Significant Trends for Segment 0820 (P-value<0.1)

Segment & Assessment Unit		0820_01	0820_02	0820_02	0820_04	0820_05	0820_06
Site		16809	11001	16829	10998	17829	17846
Air Temperature	All	Not Significant	Insufficient Data	No Trend	No Trend	No Trend	Not Significant
	Summer	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	↓	Insufficient Data	↓	↓	↓	↓

Segment & Assessment Unit		0820_01	0820_02	0820_02	0820_04	0820_05	0820_06
Site		16809	11001	16829	10998	17829	17846
Secchi Depth	All	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Specific Conductance	All	Not Significant	↓	↓	Not Significant	No Trend	↓
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	No Trend	↓
	Winter	Not Significant	Not Significant	↓	Not Significant	↓	↓
Ammonia	All	Not Significant	No Trend	No Trend	No Trend	No Trend	No Trend
	Summer	Not Significant	No Trend	Not Significant	No Trend	Not Significant	↑
	Winter	Not Significant	No Trend	Not Significant	No Trend	Not Significant	Not Significant
Nitrate	All	No Trend	Not Significant	Not Significant	No Trend	No Trend	No Trend
	Summer	Not Significant	Not Significant	No Trend	Not Significant	No Trend	↑
	Winter	No Trend	Not Significant	No Trend	No Trend	No Trend	No Trend
Total Kjeldahl Nitrogen	All	Insufficient Data	Not Significant	Insufficient Data	No Trend	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	↓	Insufficient Data	↓	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Not Significant	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data
Total Phosphorus	All	No Trend	Not Significant	No Trend	Not Significant	No Trend	No Trend
	Summer	No Trend	Not Significant	No Trend	↓	No Trend	No Trend
	Winter	No Trend	Not Significant	Not Significant	Not Significant	No Trend	No Trend
Total Organic Carbon	All	No Trend	No Trend	No Trend	No Trend	No Trend	Not Significant
	Summer	Not Significant	↓	No Trend	No Trend	No Trend	Not Significant
	Winter	No Trend	No Trend	Not Significant	No Trend	No Trend	Not Significant
Biochemical Oxygen Demand	All	No Trend	↓	No Trend	No Trend	No Trend	No Trend
	Summer	Not Significant	↓	Not Significant	Not Significant	Not Significant	No Trend
	Winter	No Trend	Not Significant	No Trend	No Trend	No Trend	Not Significant
Hardness	All	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	No Trend
	Summer	Not Significant	Insufficient Data	Not Significant	↓	↓	↓
	Winter	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant
Chloride	All	↓	↓	↓	Not Significant	↓	↓
	Summer	↓	↓	↓	No Trend	↓	↓
	Winter	↓	Not Significant	↓	↓	↓	↓
Sulfate	All	Insufficient Data	↓	Insufficient Data	↓	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	↓	Insufficient Data	↓	Insufficient Data	Insufficient Data
	Winter	Insufficient Data		Insufficient Data		Insufficient Data	Insufficient Data
Fluoride	All	Insufficient Data		Insufficient Data		Insufficient Data	
	Summer	Insufficient Data		Insufficient Data		Insufficient Data	
	Winter	Insufficient Data	↑	Insufficient Data		Insufficient Data	
Dissolved Barium	All	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	↓
	Summer	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant
Dissolved Copper	All	Not Significant	Insufficient Data	No Trend	No Trend	Not Significant	↓
	Summer	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Insufficient Data	Not Significant	No Trend	↑	↓
Dissolved Nickel	All	↓	Insufficient Data	↓	↓	↓	↓
	Summer	↓	Insufficient Data	↓	↓	Not Significant	↓
	Winter	↓	Insufficient Data	↓	↓	↓	Not Significant

Segment & Assessment Unit		0820_01	0820_02	0820_02	0820_04	0820_05	0820_06
Site		16809	11001	16829	10998	17829	17846
Total Dissolved Solids	All	No Trend	↓	No Trend	No Trend	No Trend	No Trend
	Summer	No Trend	Not Significant	No Trend	No Trend	No Trend	No Trend
	Winter	No Trend	Not Significant	No Trend	No Trend	No Trend	No Trend
Days Since Precipitation	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	↑	Not Significant	Not Significant	Not Significant	Not Significant
Lab Turbidity	All	No Trend	Insufficient Data	No Trend	Not Significant	No Trend	Not Significant
	Summer	Not Significant	Insufficient Data	No Trend	↑	No Trend	Not Significant
	Winter	No Trend	Insufficient Data	No Trend	Not Significant	↑	↑
Geosmin	All	No Trend	Insufficient Data	No Trend	↑	↑	Insufficient Data
	Summer	No Trend	Insufficient Data	Not Significant	No Trend	↑	Insufficient Data
	Winter	No Trend	Insufficient Data	Not Significant	Not Significant	↑	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend

Increasing summer trends for ammonia and nitrate were identified at station 17846 in assessment unit 0820_06. Because this station is located immediately downstream of the Lake Lavon outfall, water quality in this assessment unit would normally be dominated by water quality conditions within that reservoir. However, during drought periods, when reservoir releases are very low or absent, water quality will be dominated by other factors. As shown for the ammonia trend in assessment unit 0820_06 in Figure 333, ammonia levels were generally higher during drought periods. This indicates that evaporation may have been concentrating these constituents within this portion of the Lake Ray Hubbard.

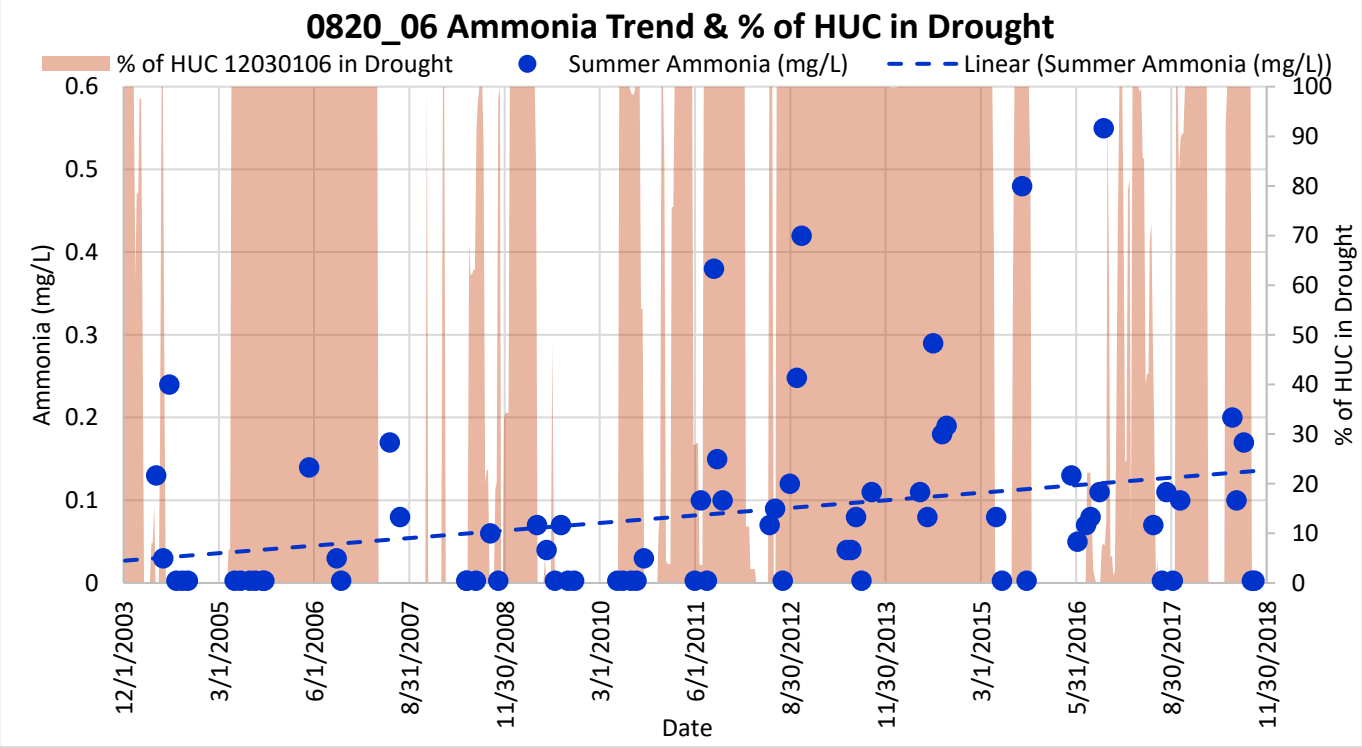


Figure 333: 0820_06 Ammonia Trend & % of HUC in Drought

An increasing winter trend for fluoride was identified at station 11001 in assessment unit 0820_02. As shown in Figure 334, this trend was weighted by the prolonged drought of 2011 to 2015. Concentrations of fluoride likely increased due to evaporation of the reservoir and a lack of fresh inputs from precipitation. Increasing trends for geosmin – a compound released during the decay of some algal species that causes taste and odor issues in drinking water – were also identified in this segment. It appears that these trends were similarly affected by drought conditions with higher levels being reported during drought periods. In addition to the concentrating effects of evaporation, algal blooms and die-offs occurring during the drought may have contributed to this trend.

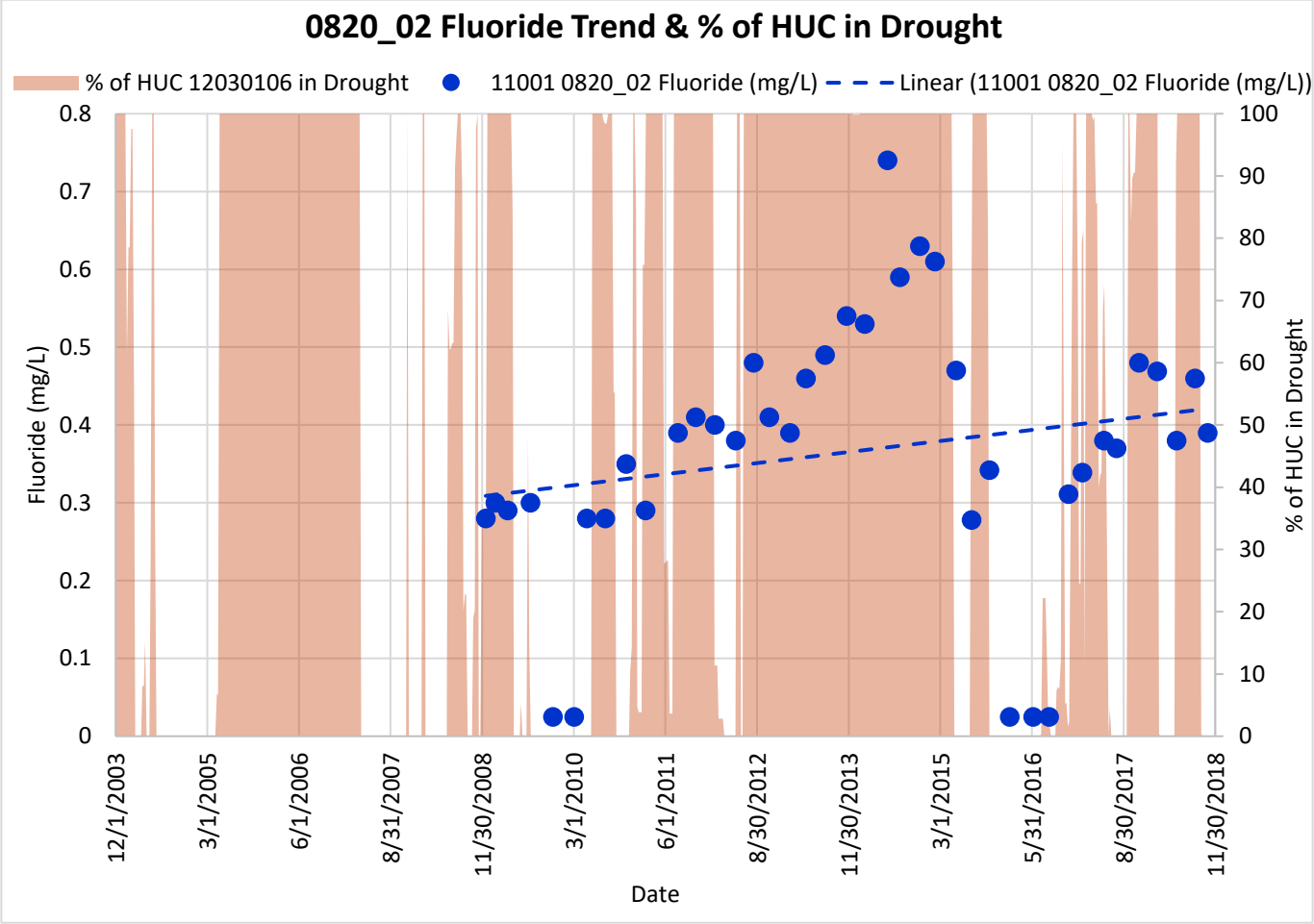


Figure 334: 0820_02 Fluoride Trend & % of HUC in Drought

The increasing dissolved copper trend in assessment unit 0820_05 appears to have been weighted by a single high value of 4.37 µg/L occurring at the end of the drought in 2015. The other 27 values reported at this station were below 2.4 µg/L. This does not present a concern for the data at this time. All values were reported well below the aquatic life use standards of 13.93 µg/L for acute exposure and 9.31 for chronic exposure.

0820C Muddy Creek

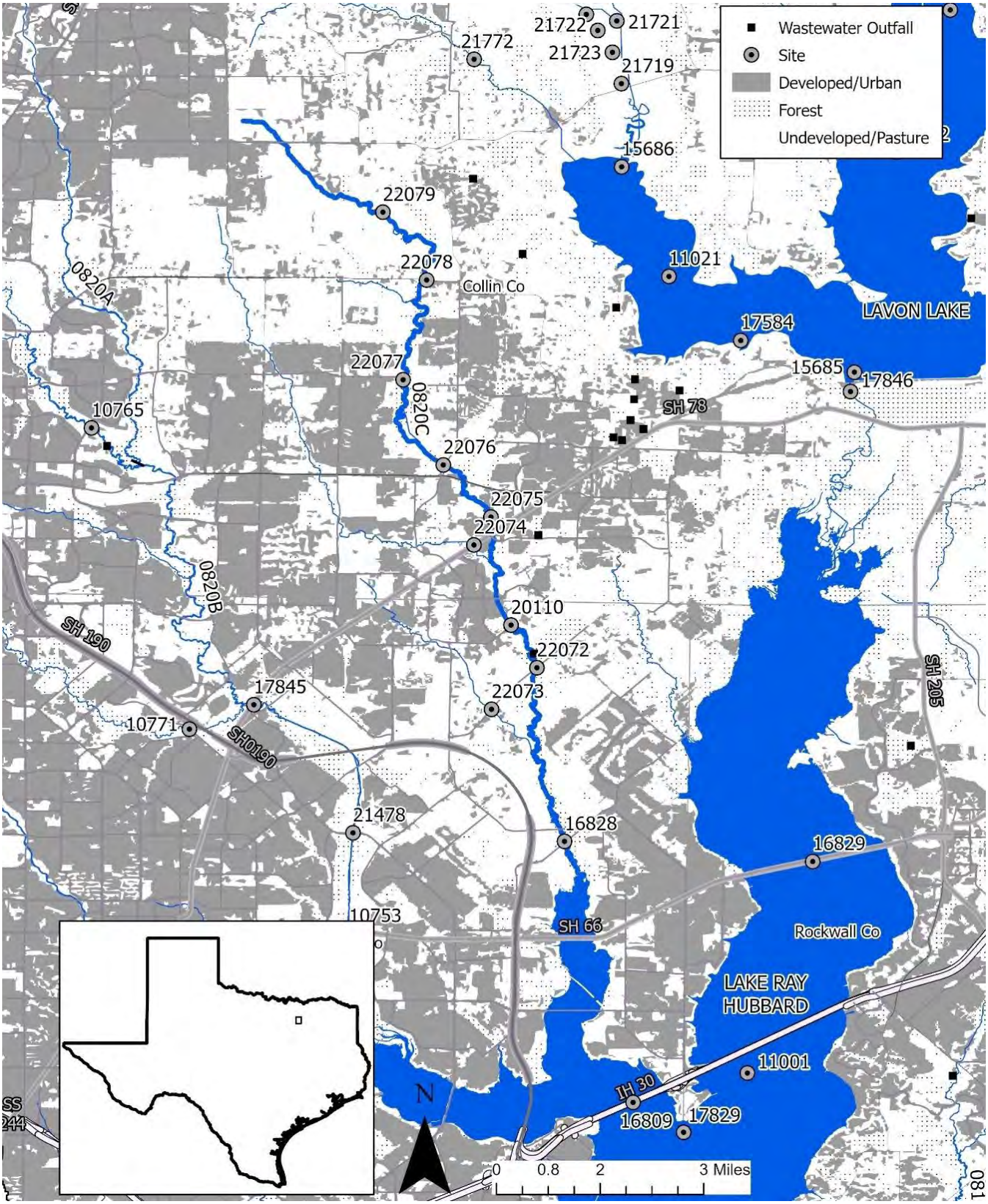


Figure 335: Segment 0820C Map

This 18.3-mile unclassified segment runs from the headwaters east of Allen in Collin County to the confluence with Lake Ray Hubbard in Dallas County (see Figure 335). Much of the watershed is heavily developed near the cities of Murphy and Sachse with some less densely developed areas around the headwaters and just before the stream enters the reservoir. The watershed flows through the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 273. Monitoring is being conducted by the City of Dallas (collecting entity DA). Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 273: 0820C FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0820C_01	MUDDY CREEK AT LIBERTY GROVE ROAD 0.65KM UPSTREAM OF LAKE RAY HUBBARD (H5)	16828	City of Dallas (collecting entity DA)

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 274. Results of TRA trend analyses are shown in Table 275. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 274: TCEQ 2020 Texas Integrated Report Summary for Segment 0820C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0820C_01 From confluence with Lake Ray Hubbard in Dallas Co. to headwaters east of Allen Collin Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0820C_01 From confluence with Lake Ray Hubbard in Dallas Co. to headwaters east of Allen Collin Co.	Aquatic Life Use	Acute Toxic Substances in water		FS
0820C_01 From confluence with Lake Ray Hubbard in Dallas Co. to headwaters east of Allen Collin Co.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0820C_01 From confluence with Lake Ray Hubbard in Dallas Co. to headwaters east of Allen Collin Co.	General Use	Nitrate	1.95 mg/L	CS
0820C_01 From confluence with Lake Ray Hubbard in Dallas Co. to headwaters east of Allen Collin Co.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting

Table 275: Significant Trends for Segment 0820C (P-value<0.1)

Segment & Assessment Unit		0820C_01
Site		16828
Air Temperature	All	Not Significant
	Summer	↓
	Winter	↓

Segment & Assessment Unit		0820C_01
Site		16828
Biochemical Oxygen Demand	All	No Trend
	Summer	↓
	Winter	No Trend
Alkalinity	All	No Trend
	Summer	↓
	Winter	No Trend
Nitrate	All	No Trend
	Summer	↑
	Winter	No Trend
Total Organic Carbon	All	↓
	Summer	↓
	Winter	↓
Dissolved Nickel	All	↓
	Summer	Not Significant
	Winter	↓
Dissolved Aluminum	All	No Trend
	Summer	No Trend
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

A concern and increasing summer trend for nitrate were identified in this segment. The concern was carried forward as there was no current data available to TCEQ for use in the Integrated Report. However, the City of Dallas monitors regularly at station 16828. Much of this data are not submitted to TCEQ because the City of Dallas laboratory is not NELAP accredited for surface water analysis. Regardless, this data is useful for trend analysis. As shown in Figure 336, nitrate was regularly reported well above the screening level of 1.95 mg/L. Measured stream flow was not available for this site. However, higher nitrate levels were reported during low and normal flow severities and at lower concentrations at high and flood flows. This seems to point to a consistent source of nitrate into the stream. This trend appears to have been exacerbated by drought conditions with higher levels of nitrate being reported during these periods. There is a wastewater treatment facility upstream of the station 16828 that may have contributed to this concern and trend. As discussed previously in other watersheds, effluent-dominated streams frequently have elevated nutrient levels at low flows because most wastewater treatment facilities do not have advanced nutrient removal. It is recommended that 1) samples for nitrate be collected at 16828 and analyzed at a NELAP accredited laboratory, 2) flow be measured at this site in order to further address this concern and trend, and 3) upstream sampling be conducted to determine if there may be another source of nitrate into the stream.

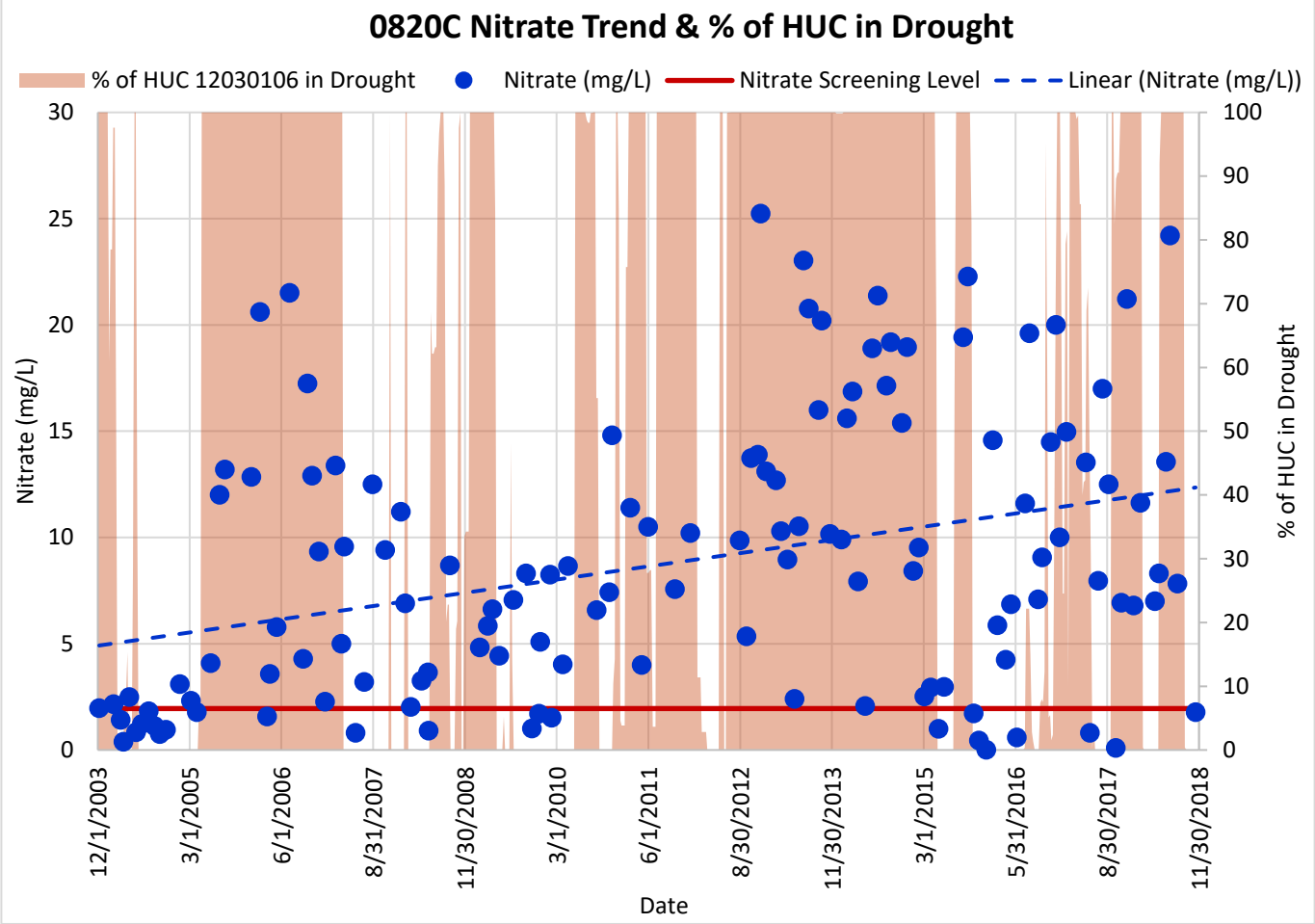


Figure 336: 0820C Nitrate Trend & % of HUC in Drought

An increasing winter trend was identified for dissolved aluminum. Many of the values were reported below the detection limit of 50 µg/L. However, data collected in the winter of 2017 and 2018 were reported at 158.38 µg/L and 283.92 mg/L. These values were reported on days with precipitation in the preceding 24 hours indicating that dissolved aluminum is being washed in from the watershed. This trend does not present a concern at this time as all values were reported well below the aquatic life use standard of 991 µg/L. However, continued monitoring at this station will help further address the trend at this station.

0820A Cottonwood Creek

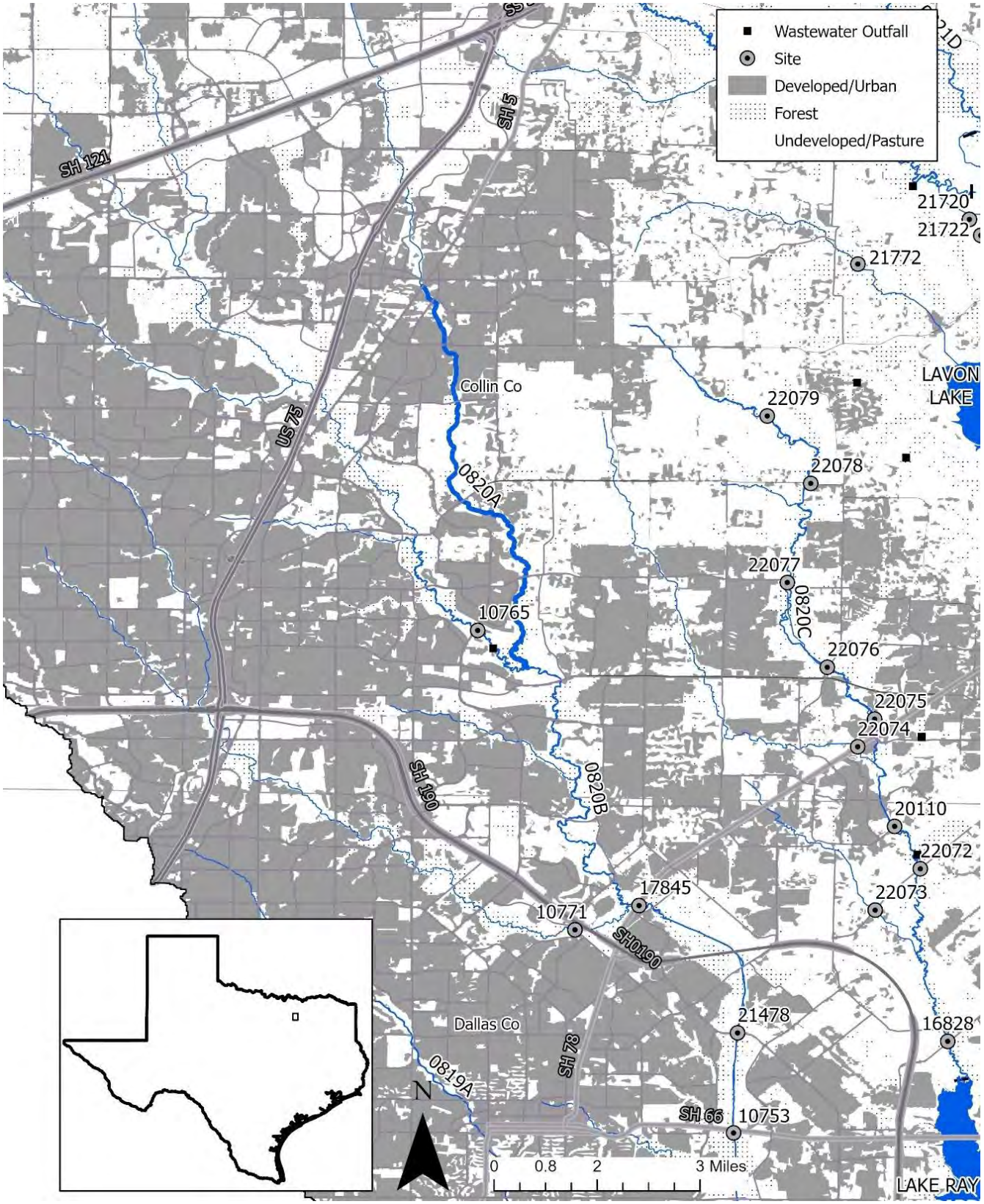


Figure 337: Segment 0820A Map

This 7.6-mile stretch of Cottonwood Creek runs from SH 5 in Allen to the confluence with Rowlett Creek (see Figure 337). The upper portion of the watershed is heavily developed around the City of Allen. The lower portion of the watershed is developed to the west near the City of Plano but less densely developed to the east near Parker. There are some hay, pasture, and crop lands on the east side of the stream. The watershed flows through the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. There were no data available in assessment unit 0820A_01 for the period of record for this basin summary report.

0820B Rowlett Creek

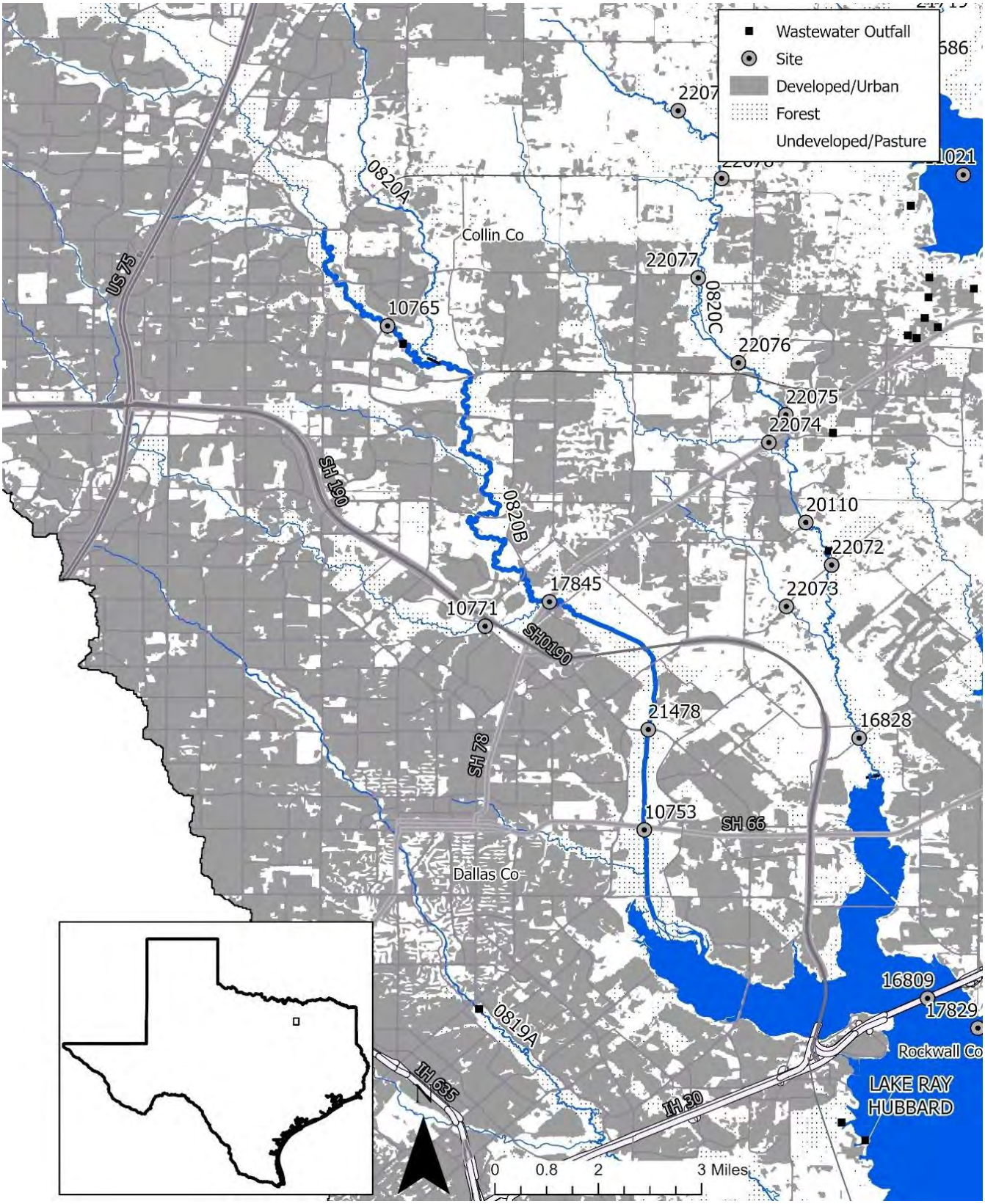


Figure 338: Segment 0820B Map

This 17.3-mile segment runs from the Parker Road crossing to the confluence with Lake Ray Hubbard upstream (see Figure 338). A majority of the watershed is heavily developed by the cities of Allen, Plano, Sachse, Garland, and Rowlett. There are some forested riparian areas throughout the watershed. The stream flows through the Northern Blackland Prairie ecoregion. A watershed protection plan is under development for this segment.

Water quality monitoring is being conducted at two sites within this segment as shown in Table 276. Monitoring is being conducted by the City of Dallas (collecting entity DA) and TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 276: 0820B FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0820B_01	ROWLETT CREEK 45 METERS DOWNSTREAM OF BEN DAVIS/DAMASCUS RD RIVER KM 8.5	10756	TRA
0820B_01	ROWLETT CREEK AT FIREWHEEL PARKWAY NEAR ROWLETT (H6)	21478	City of Dallas (collecting entity DA)

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 277. Results of TRA trend analyses are shown in

Table 278. Data used for these trend analyses includes data that was collected by the City of Dallas (collecting entity DA) but were not submitted to TCEQ as they were analyzed at a lab that was not NELAP certified. NELAP certification is a nation-wide program that ensures lab analyzed data are of "known and documented quality" and applies to all laboratories that analyze samples for customers. Some cities have labs that do not analyze samples for outside customers and those labs are not subject to NELAP accreditation. Only data that are NELAP accredited are submitted to TCEQ for inclusion into SWQMIS.

Table 277: TCEQ 2020 Texas Integrated Report Summary for Segment 0820B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	Aquatic Life Use	Acute Toxic Substances in water		FS
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	Aquatic Life Use	Chronic Toxic Substances in water		FS
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	General Use	Ammonia	0.33 mg/L	NC
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	General Use	Nitrate	1.95 mg/L	CS
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	General Use	Total Phosphorus	0.69 mg/L	NC
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	General Use	Chlorophyll-*a*	14.1 µg/L	NC

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0820B_01 From the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 278: Significant Trends for Segment 0820B (P-value<0.1)

Segment & Assessment Unit		0820B_01	0820B_01	0820B_01
Site		10753	17845	21478
Air Temperature	All	Not Significant	No Trend	Not Significant
	Summer	↓	No Trend	↓*
	Winter	Not Significant	Not Significant	Not Significant
Secchi Depth	All	Not Significant	Insufficient Data	Insufficient Data
	Summer	↑	Insufficient Data	Insufficient Data
	Winter	Not Significant	Insufficient Data	Insufficient Data
Specific Conductance	All	Not Significant	Not Significant	Not Significant
	Summer	↑	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	↓*
Dissolved Oxygen	All	↓	Not Significant	Not Significant
	Summer	No Trend	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant
pH	All	No Trend	Not Significant	No Trend
	Summer	No Trend	No Trend	↓*
	Winter	Not Significant	Not Significant	↓*
Ammonia	All	Not Significant	Not Significant	↓*
	Summer	Not Significant	Not Significant	No Trend
	Winter	No Trend	Not Significant	Not Significant
Nitrite	All	No Trend	Insufficient Data	Insufficient Data
	Summer	↓	Insufficient Data	Insufficient Data
	Winter	No Trend	Insufficient Data	Insufficient Data
Nitrate	All	↑	No Trend	↓*
	Summer	↑	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	↓*
Total Kjeldahl Nitrogen	All	↓	Insufficient Data	Insufficient Data
	Summer	Not Significant	Insufficient Data	Insufficient Data
	Winter	↓	Insufficient Data	Insufficient Data
Orthophosphate	All	No Trend	No Trend	Not Significant
	Summer	↑	No Trend	Not Significant
	Winter	↑	No Trend	No Trend
Total Organic Carbon	All	Insufficient Data	Not Significant	↓*
	Summer	Insufficient Data	Not Significant	Not Significant
	Winter	Insufficient Data	↓	↓*
Hardness	All	No Trend	Not Significant	Not Significant
	Summer	No Trend	Not Significant	Not Significant
	Winter	↓	No Trend	Not Significant

Segment & Assessment Unit		0820B_01	0820B_01	0820B_01
Site		10753	17845	21478
Chloride	All	↑*	Not Significant	Not Significant
	Summer	Not Significant	No Trend	Not Significant
	Winter	↑*	Not Significant	Not Significant
Sulfate	All	↑*	Insufficient Data	Insufficient Data
	Summer	Not Significant	Insufficient Data	Insufficient Data
	Winter	↑*	Insufficient Data	Insufficient Data
Dissolved Copper	All	Insufficient Data	↓	Insufficient Data
	Summer	Insufficient Data	Not Significant	Insufficient Data
	Winter	Insufficient Data	Not Significant	Insufficient Data
Dissolved Nickel	All	Insufficient Data	↓	Insufficient Data
	Summer	Insufficient Data	Not Significant	Insufficient Data
	Winter	Insufficient Data	↓	Insufficient Data
Dissolved Zinc	All	Insufficient Data	↓	Insufficient Data
	Summer	Insufficient Data	↓	Insufficient Data
	Winter	Insufficient Data	Not Significant	Insufficient Data
E. coli	All	↓	No Trend	↑*
	Summer	↓	Not Significant	Not Significant
	Winter	Not Significant	No Trend	↑*
Bromodichloromethane	All	Insufficient Data	No Trend	No Trend
	Summer	Insufficient Data	No Trend	↑*
	Winter	Insufficient Data	No Trend	No Trend
Bromoform	All	Insufficient Data	No Trend	No Trend
	Summer	Insufficient Data	No Trend	↑*
	Winter	Insufficient Data	No Trend	No Trend
Dibromochloromethane	All	Insufficient Data	No Trend	No Trend
	Summer	Insufficient Data	No Trend	↑*
	Winter	Insufficient Data	No Trend	No Trend
Chloroform	All	Insufficient Data	No Trend	↑*
	Summer	Insufficient Data	Not Significant	↑*
	Winter	Insufficient Data	Not Significant	↑*
Days Since Precipitation	All	Not Significant	Not Significant	↓*
	Summer	Not Significant	Not Significant	↓*
	Winter	Not Significant	Not Significant	↓*
Lab Turbidity	All	Insufficient Data	No Trend	No Trend
	Summer	Insufficient Data	No Trend	No Trend
	Winter	Insufficient Data	No Trend	↑*
Total Trihalomethane	All	Insufficient Data	Not Significant	↑*
	Summer	Insufficient Data	Not Significant	↑*
	Winter	Insufficient Data	Not Significant	↑*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

An impairment due to elevated levels of *E. coli* was identified in this segment. Monitoring has occurred at three stations downstream of SH 78 over the years. As shown in Figure 339, *E. coli* was regularly reported above the standard of 126 MPN/100 mL. There was a noticeable decrease in *E. coli* levels during the prolonged drought of 2011 to 2015. *E. coli* levels were fairly well correlated to flow as measured at the USGS gage 08061540 at SH 78. Station 17845 is located at the gage and the correlation coefficient at this station was 0.446. Approximately three miles downstream at Firewheel Parkway (station 21478) the correlation coefficient was 0.563. At SH 66, approximately 4.25 miles downstream of the gage, the correlation coefficient was 0.963. This indicates that the *E. coli* impairment was related to run-off. The watershed upstream of these stations is large and heavily developed. There are dense residential developments, golf courses, parks and greenspaces, and some wooded riparian areas. Based on this information, it is likely that wildlife and pets were the sources of bacteria in this stream. Bacterial source tracking would be required to determine the exact sources of bacteria. Homeowner education and pet waste best management practices may reduce bacterial contributions from pet sources.

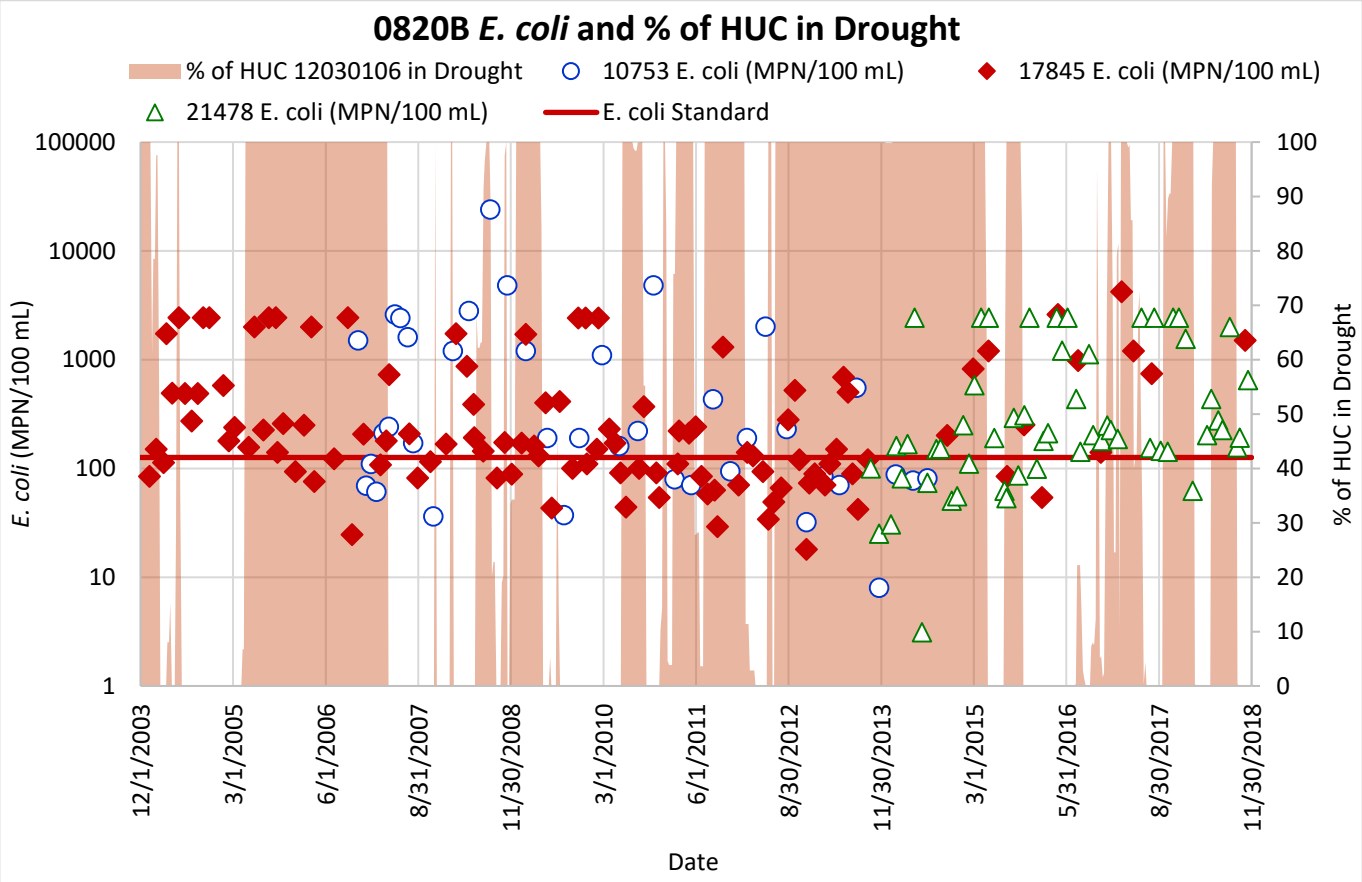


Figure 339: 0820B E. coli and % of HUC in Drought

A concern for nitrate was identified in this segment. As shown in Figure 340, nitrate levels were regularly reported above the screening level of 1.95 mg/L and were somewhat correlated to flow as measured at the USGS gage at SH 78. The weakest correlation coefficient of -0.295 occurred at the most upstream station; 10753. Correlations were stronger at the two stations further downstream; 21478 and 10753 (correlation coefficients = -0.478 and -0.414,

respectively) with higher levels reported at lower flows. It is important to point out that the flow values used for these correlations came from the USGS gage located at station 10753 so actual correlations may be weaker but there is no flow data for these stations to confirm this assumption. Regardless, the correlations seem to indicate that there was a constant source of nitrate into the stream. There is a wastewater treatment facility upstream of the monitoring stations. As discussed previously in other segments, effluent-dominated streams can exhibit the pattern seen in Figure 340. Additionally, run-off from over-irrigation of fertilized golf courses, parks, and homes may have also been contributing nitrate to the stream. An increasing trend for nitrate was also identified at station 10753. Values began increasing during periods of drought which would have caused the stream to become more effluent or over-irrigation run-off dominated. Monitoring is no longer conducted at station 10753 due to safety reasons and inability to measure flow. Monitoring is being conducted at station 21478 approximately 1.5 miles upstream.

Increasing trends were identified for chloride and sulfate at station 10753. As seen in many other streams, values began increasing during the prolonged drought of 2011 to 2015. Therefore, evaporation of water in the stream and the resulting concentration of dissolved salts and solids were the likely cause for the increasing trend.

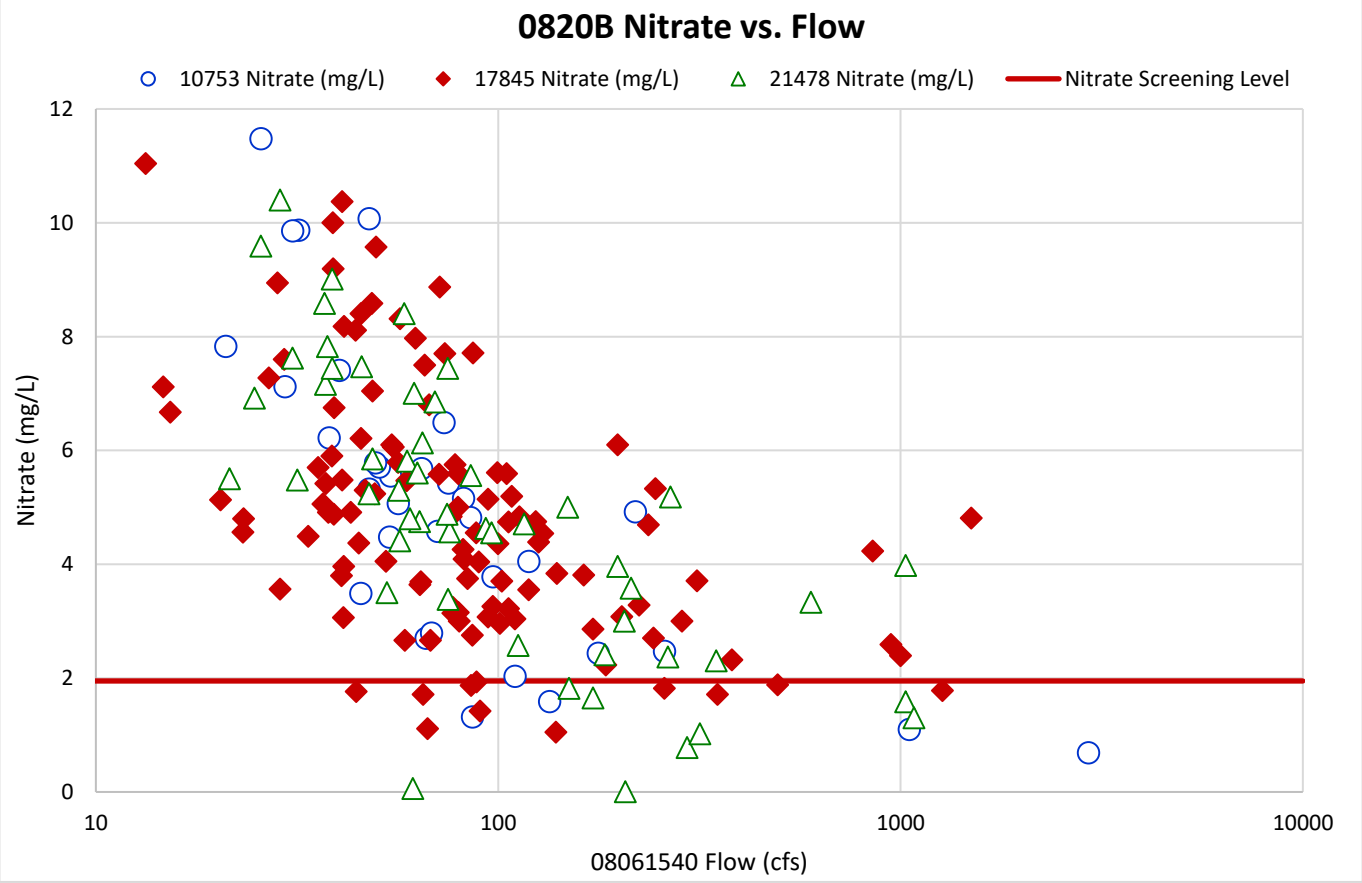


Figure 340: 0820B Nitrate vs. Flow

Increasing trends for bromodichloromethane, bromoform, dibromochloromethane, chloroform, and total trihalomethane were an artifact of changes in detections limits rather than actual changes in water quality. Each of these parameters had a detection limit of 5 µg/L for the early portion of the data set. For the latter portion of the data sets, bromodichloromethane and chloroform had a detection limit of 0.5 µg/L while bromoform and dibromochloromethane had a detection limit of 0.4 µg/L. All values for these parameters were below 5 µg/L. For total trihalomethane, the later detection limit was 1.8 µg/L and only a single data point was reported above 5 µg/L.

0819A Duck Creek

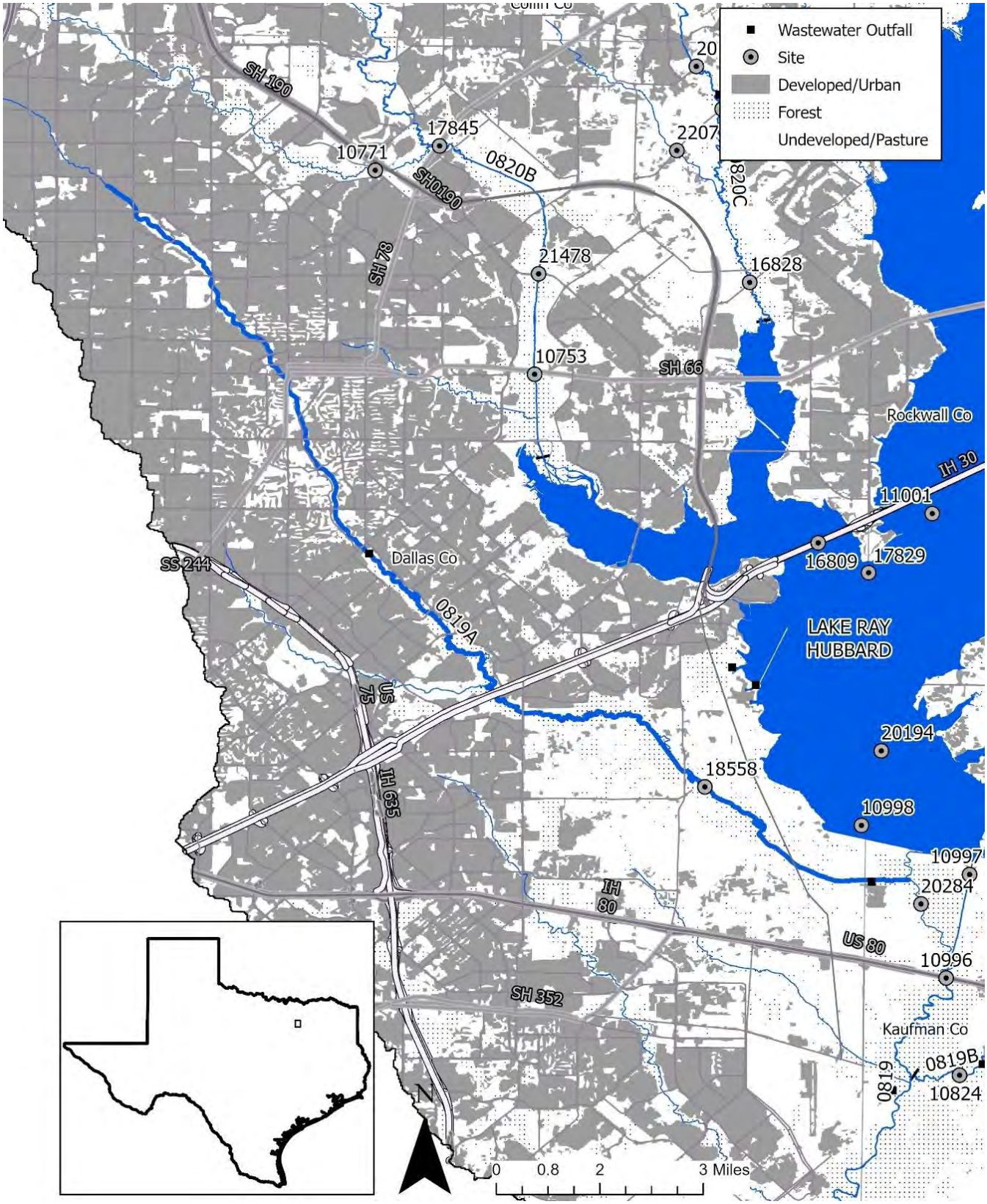


Figure 341: Segment 0819A Map

This 19.5-mile unclassified segment runs from the confluence of an unnamed tributary 0.6 km upstream of Jupiter Road in Dallas County to the confluence with the East Fork Trinity River in Kaufman County upstream (see Figure 341). The upstream portion of the watershed is heavily developed in the cities of Garland and Centerville. Downstream of North Beltline Road, the watershed becomes less densely developed in Sunnyvale. This portion of the watershed is mostly hay and pasture land with some forested areas. The watershed drains the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0819A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0819B Buffalo Creek

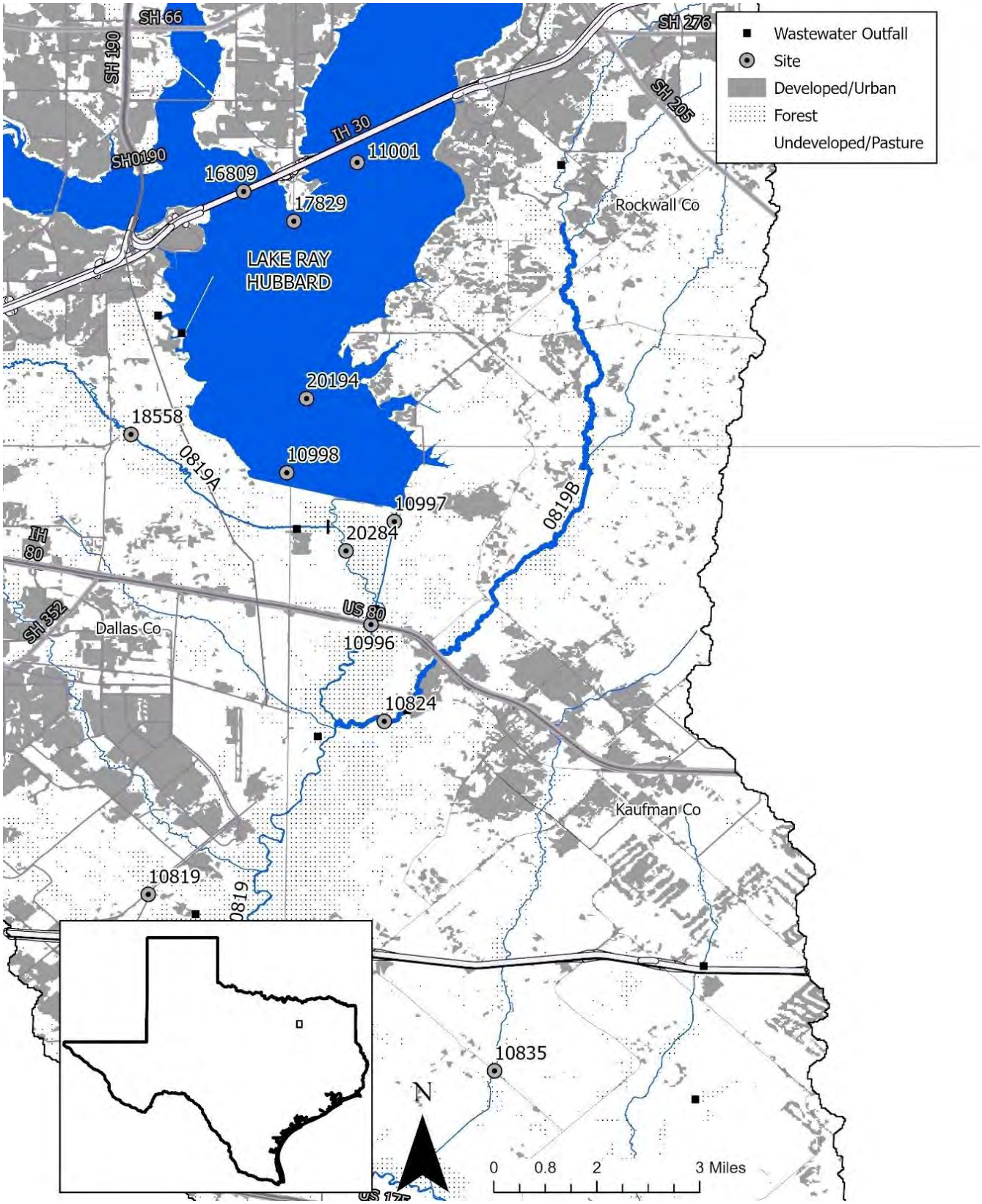


Figure 342: Segment 0819B Map

This 13.2-mile unclassified segment runs from 0.6 km above the confluence of Little Buffalo Creek to the confluence with the East Fork Trinity River (see Figure 342). The watershed is mostly hay, pasture, and grassland with some small areas of development around the cities of Heath and Forney. This stream flows through the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 279.

Table 279: TCEQ 2020 Texas Integrated Report Summary for Segment 0819B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0819B_01 From confluence with East Fork Trinity River to 0.6 km above confluence of Little Buffalo Creek	General Use	Nitrate	1.95 mg/L	CS
0819B_01 From confluence with East Fork Trinity River to 0.6 km above confluence of Little Buffalo Creek	General Use	Total Phosphorus	0.69 mg/L	CS

CS = Screening Level Concern

Data for assessment unit 0819B_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

The concerns for nitrate and total phosphorus in this segment were carried forward from previous integrated reports as there has been no monitoring in this segment since 2004. It is recommended that monitoring be conducted in this segment to further assess these concerns.

0819 East Fork Trinity River

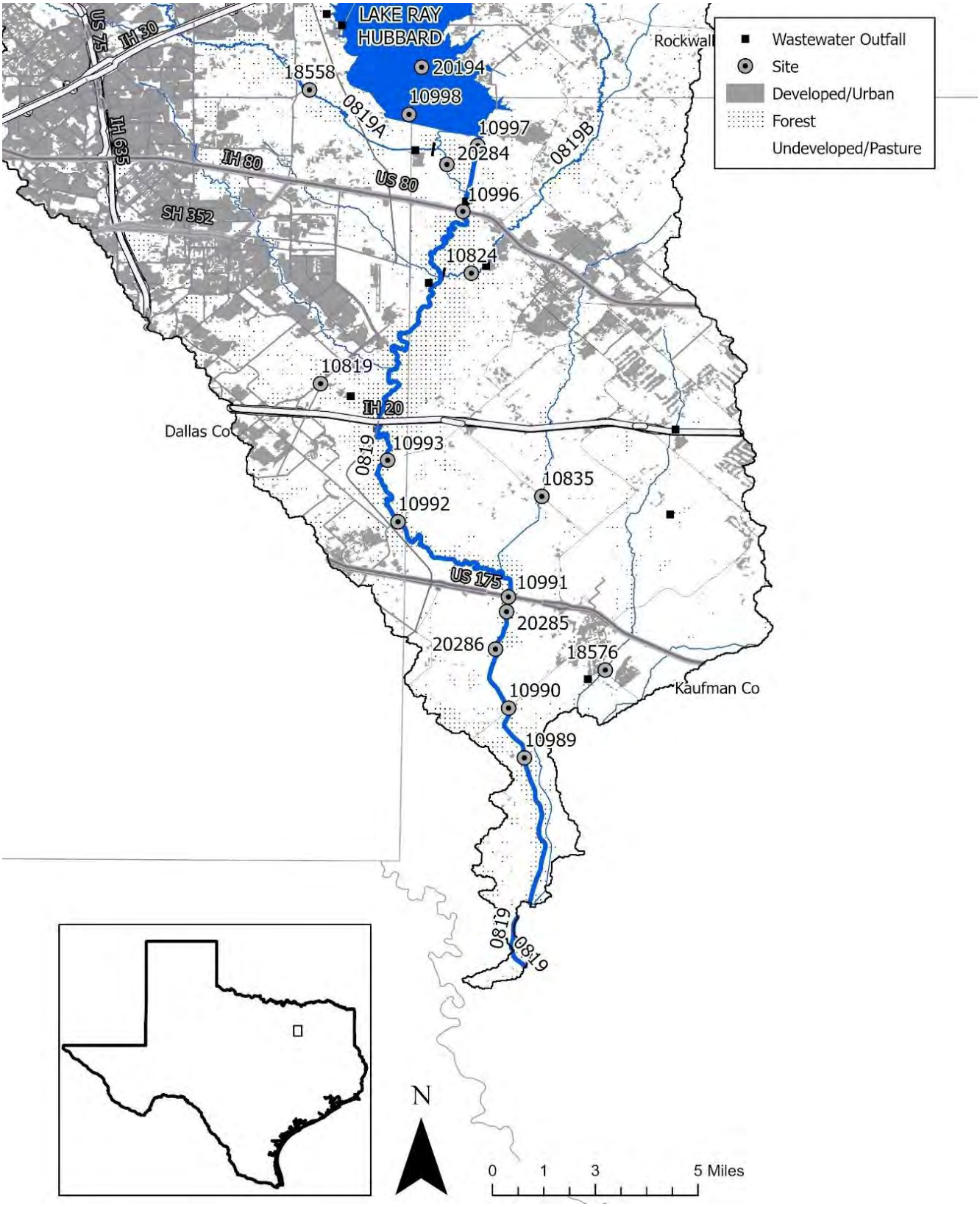


Figure 343: Segment 0819 Map

This 30-mile segment stretches from the Rockwall-Forney Dam in Kaufman County to the confluence of the Main Stem Trinity River in Kaufman County (see Figure 343). Hay, pasture, and crop land make up most of the land use in the watershed. There are also woody wetlands adjacent to the river. There are some areas of development by the cities of Mesquite, Balch Springs, Forney, Seagoville, Crandall, and Combine. The Floodplains and Low Terraces ecoregion makes up the immediate watershed around the river while the tributaries flow through the Northern Blackland Prairie.

Water quality monitoring is being conducted at two sites within this segment as shown in Table 280. Monitoring is being conducted by TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 280: 0819 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0819_01	EAST FORK TRINITY RIVER AT US 175 NW OF CRANDALL RIVER KM 20.3	10991	TCEQ Region 4
0819_01	EAST FORK TRINITY RIVER AT US 80 NORTHWEST OF FORNEY	10996	TCEQ Region 4

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 281. Results of TRA trend analyses are shown in Table 282.

Table 281: TCEQ 2020 Texas Integrated Report Summary for Segment 0819

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	Ammonia	0.33 mg/L	NC
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	Nitrate	1.95 mg/L	CS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	Total Phosphorus	0.69 mg/L	CS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	pH	6.5 - 9 S.U.	FS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	Chloride	100 mg/L	FS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	Sulfate	100 mg/L	NS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	Total Dissolved Solids	500 mg/L	FS
0819_01 From confluence with Trinity River in Kaufman Co. to Rockwall-Forney Dam in Kaufman Co.	General Use	Water temperature	32.8 °F	FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 282: Significant Trends for Segment 0819 (P-value<0.1)

Segment & Assessment Unit		0819_01	0819_01
Site		10991	10996
Secchi Depth	All	Not Significant	Not Significant
	Summer	Not Significant	Not Significant
	Winter	Not Significant	↓
Specific Conductance	All	↓	↓
	Summer	↓	↓
	Winter	↓	Not Significant
Dissolved Oxygen	All	Not Significant	↑
	Summer	No Trend	↑
	Winter	↑	Not Significant
pH	All	No Trend	↑
	Summer	No Trend	↑
	Winter	No Trend	↑
Volatile Suspended Solids	All	No Trend	Not Significant
	Summer	No Trend	↑
	Winter	Not Significant	Not Significant
Ammonia	All	No Trend	No Trend
	Summer	↓	↓
	Winter	No Trend	↓
Nitrate	All	↓	↓
	Summer	↓	↓
	Winter	Not Significant	↓
Total Kjeldahl Nitrogen	All	↓	Not Significant
	Summer	↓	↓
	Winter	Not Significant	Not Significant
Total Phosphorus	All	↓	↓
	Summer	↓	↓
	Winter	Not Significant	Not Significant
Orthophosphate	All	Not Significant	Not Significant
	Summer	Not Significant	↓*
	Winter	Not Significant	Not Significant
Total Organic Carbon	All	Not Significant	Not Significant
	Summer	Not Significant	↓
	Winter	Not Significant	Not Significant
Chloride	All	↓	↓
	Summer	↓	↓
	Winter	↓	↓
Sulfate	All	↓	↓
	Summer	↓	↓
	Winter	↓	Not Significant
Fluoride	All	↓	No Trend
	Summer	↓	↓
	Winter	↓	↓

Segment & Assessment Unit		0819_01	0819_01
Site		10991	10996
Total Dissolved Solids	All	↓	↓
	Summer	↓	↓
	Winter	↓	Not Significant
Chlorophyll-*a*	All	No Trend	No Trend
	Summer	No Trend	↑
	Winter	Not Significant	Not Significant
Days Since Precipitation	All	No Trend	Not Significant
	Summer	↑	↑
	Winter	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

An impairment was identified in this segment due to elevated levels of *E. coli*. Monitoring has been conducted at two stations in this segment; 10996 is in the upstream portion of the segment and 10991 is located near the middle of the segment. As shown in Figure 344, *E. coli* levels were regularly reported above the standard of 126 MPN/100 mL. There was no correlation between flow and *E. coli* at these stations. This indicates that there were constant sources of bacteria into the stream. There is no evidence of livestock trails leading to the river. Therefore, livestock were likely not a primary source of bacteria. There is a heavily wooded wetland riparian area along the river. This indicates that wildlife may have been contributing to the impairment. There are several dense residential communities along both sides of the river as well. There is evidence of wastewater pipelines crossing the river as lines of manholes can be seen on Google Earth imagery. It is recommended that samples be taken at several locations upstream of these two monitoring stations in order to rule out the possibility of a sewage leak from a damaged pipeline.

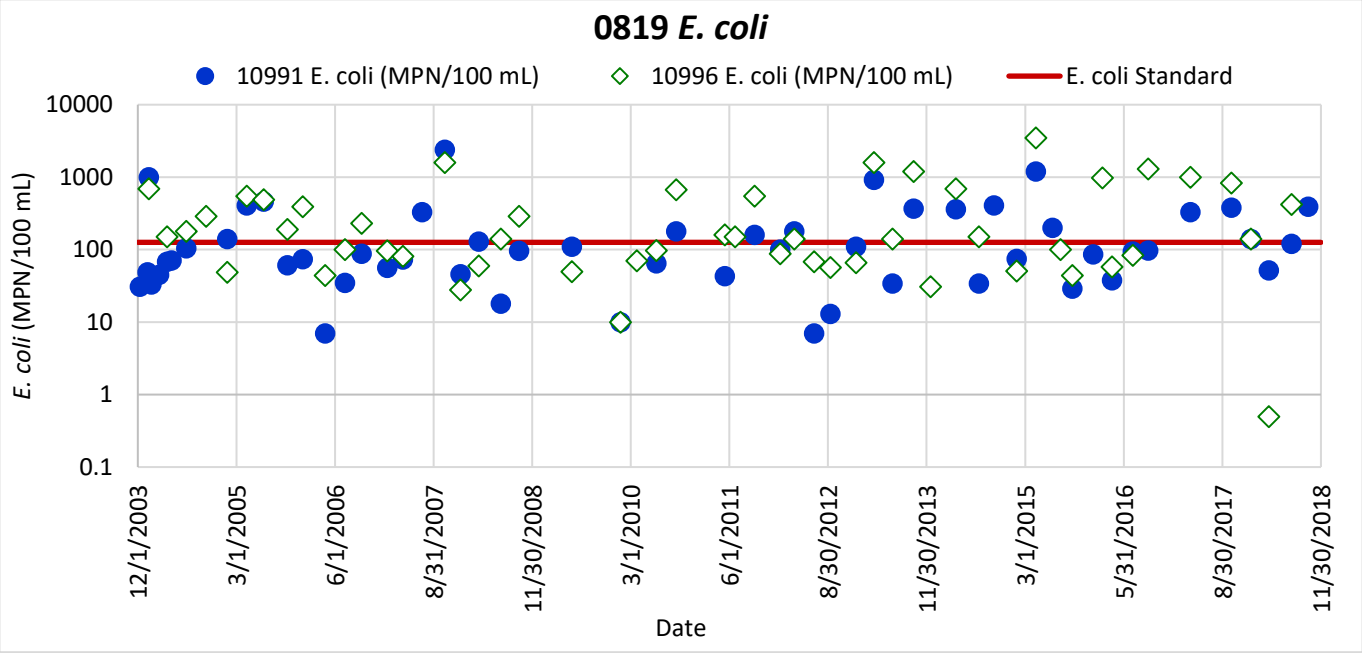


Figure 344: 0819 E. coli

Concerns were identified for nitrate and total phosphorus. As shown in Figure 345 for station 10991, levels of these parameters were reported at higher levels when flows were low and decreased with increasing flows. As discussed for other segments, this pattern is commonly seen in effluent-dominated streams as many wastewater treatment facilities do not have advanced nutrient removal. There are several wastewater treatment facilities upstream of both stations that are contributing to these concerns. Trend analysis identified decreasing trends for both of these parameters as well. Based on the presumption that the wastewater treatment facilities are the source of nutrients in this segment, the decreases may be due to upgrades and better treatment technology at these facilities.

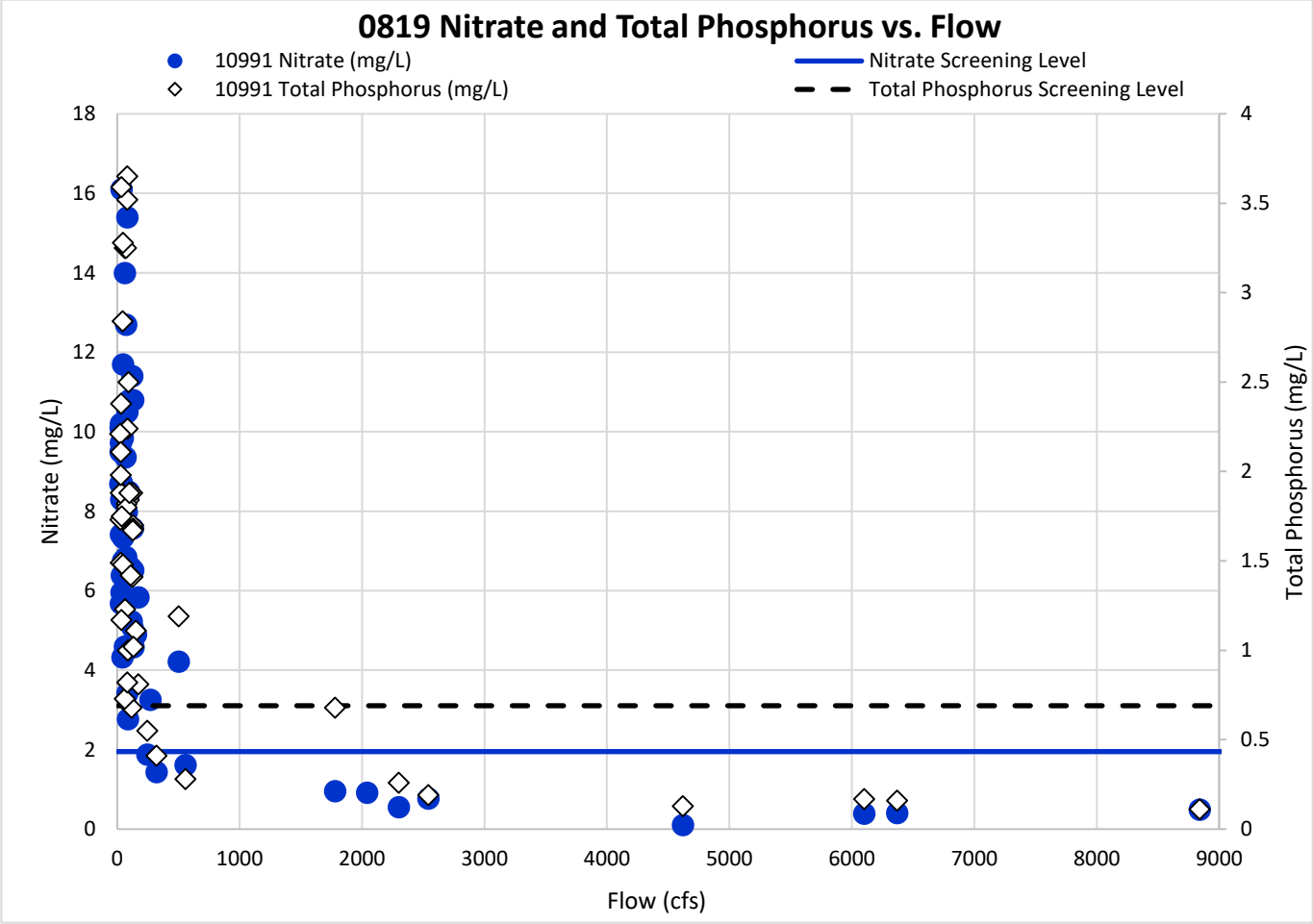


Figure 345: 0819 Nitrate and Total Phosphorus vs. Flow

A concern was identified for chlorophyll-*a* in this segment. However, there were no strong correlations between chlorophyll-*a* and nutrients for either of the stations in this segment. As shown in Figure 346, chlorophyll-*a* was regularly reported at levels above the screening level of 14.1 µg/L especially during periods of drought. This indicates that chlorophyll-*a* may not be due to reservoir releases washing algal populations in from Lake Ray Hubbard as reservoir releases are generally very low during drought periods. Long residence times in the river and the surrounding wooded wetlands allowing algal populations to increase may have been the cause for the chlorophyll-*a* concern. It does not appear the algal populations were having a negative

effect on dissolved oxygen levels. Of 117 values recorded at the two stations, only two values were reported below the dissolved oxygen grab sample screening level of 4 mg/L.

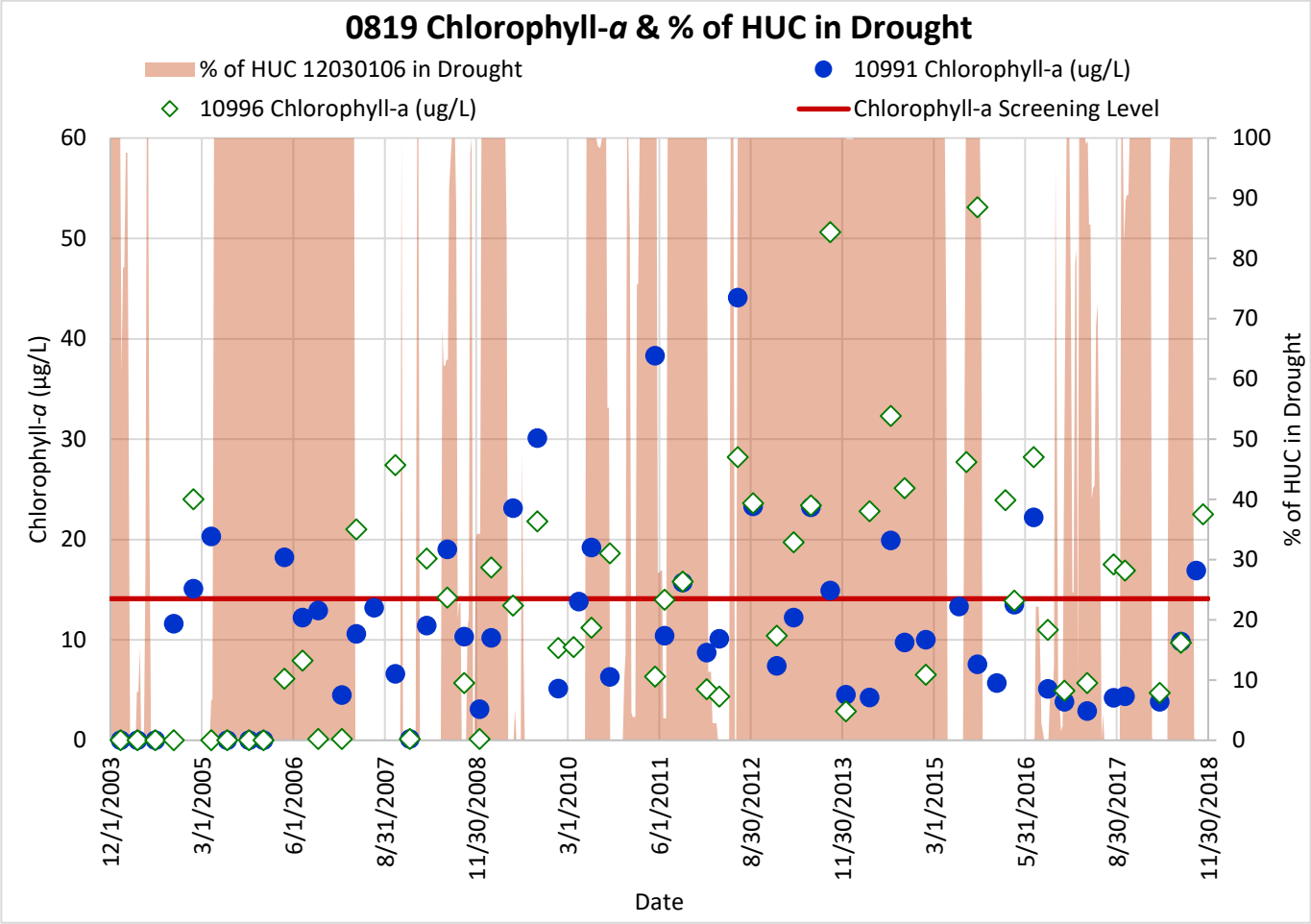


Figure 346: 0819 Chlorophyll-a & % of HUC in Drought

This segment was found to be impaired due to elevated sulfate levels. As shown in Figure 347, sulfate levels were generally reported above the standard of 100 mg/L during periods of drought. Sulfate levels were fairly well correlated to flow at stations 10996 and 10991 (correlation coefficients = -0.492 and -0.475, respectively) indicating that sulfate levels decreased with increasing flows. Drought and the concentration of dissolved salts and solids due to evaporation were the likely cause for the sulfate impairment. There were also decreasing trends for sulfate in this segment. It is unknown what is causing the decreasing trend. Improving effluent quality at upstream wastewater treatment facilities, reduced run-off, and increased freshwater inflows from precipitation in more recent years are all possibilities.

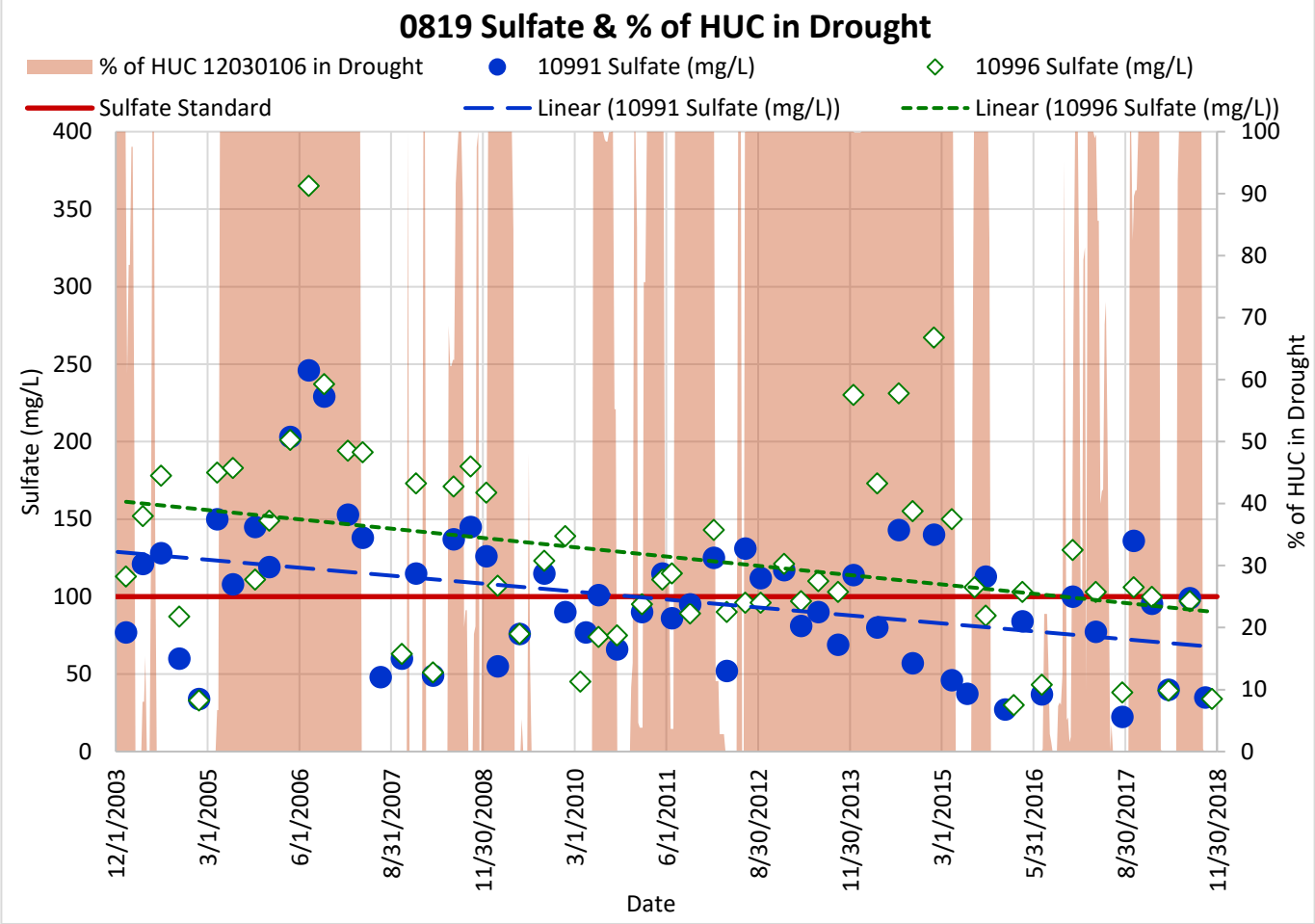


Figure 347: 0819 Sulfate & % of HUC in Drought

Cedar Creek

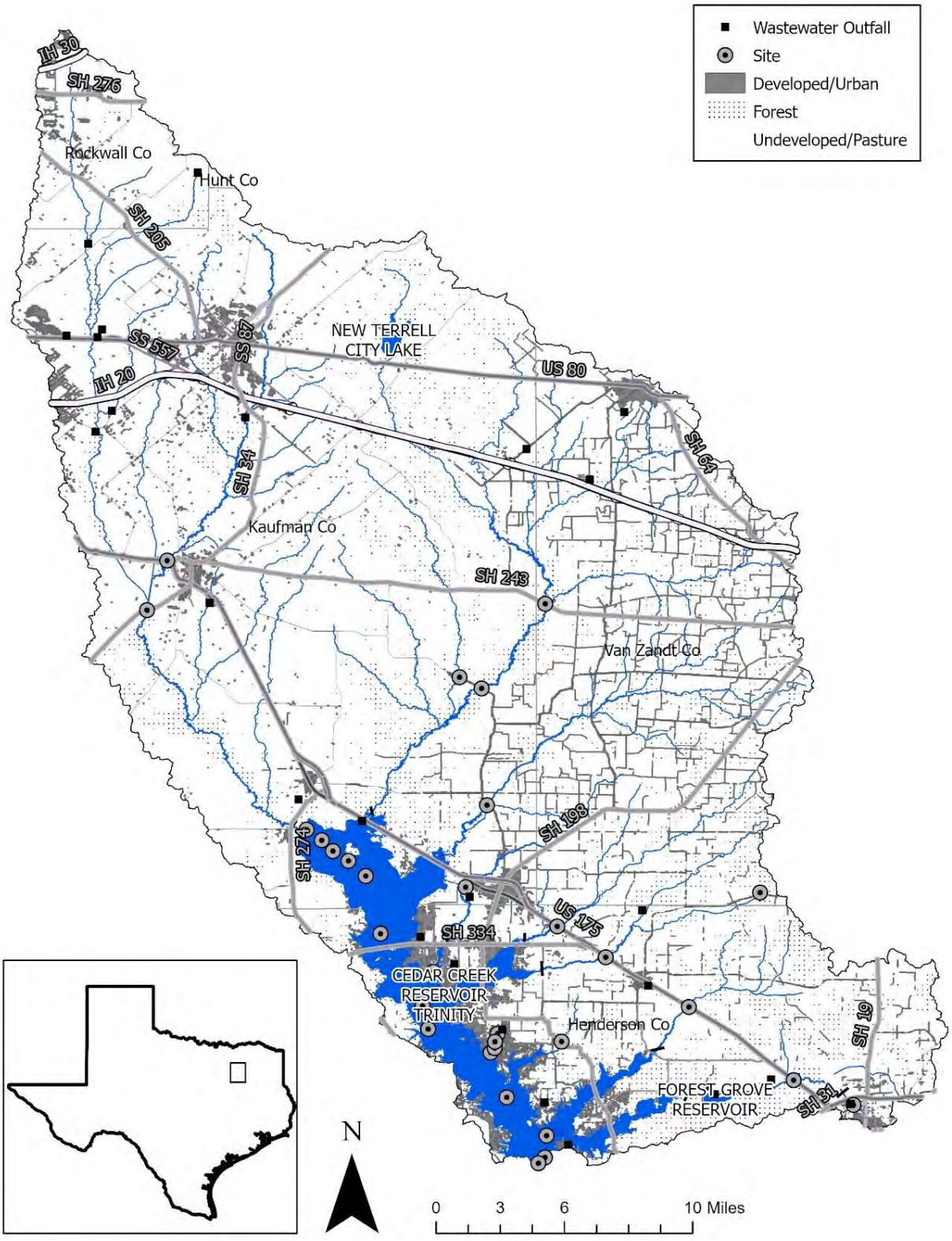


Figure 348: Cedar Creek Overview Map

The Cedar Creek subwatershed extends approximately 55 river miles from Kaufman County to the Cedar Creek Reservoir dam in Henderson County (see Figure 348). The watershed is largely rural with pasture and grassland. However, a large portion of the land directly adjacent to the reservoir (especially on the eastern side) has been developed. Major population centers include the cities of Terrell and Kaufman. Water rights permits for Cedar Creek Reservoir are held by TRWD. This subwatershed receives between 39 and 43 inches of precipitation annually. The upper reaches of the subwatershed lie within the Northern Blackland Prairie ecoregion while the reservoir and lower portions of the subwatershed lie within the Northern Post Oak Savanna.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0818C Kings Creek
- 0818B Cedar Creek above Cedar Creek Reservoir
- 0818D Lacy Fork
- 0818E Prairie Creek
- 0818G North Twin Creek
- 0818H South Twin Creek
- 0818F Clear Creek
- 0818I Caney Creek
- 0818A One Mile Creek
- 0818 Cedar Creek Reservoir

0818C Kings Creek

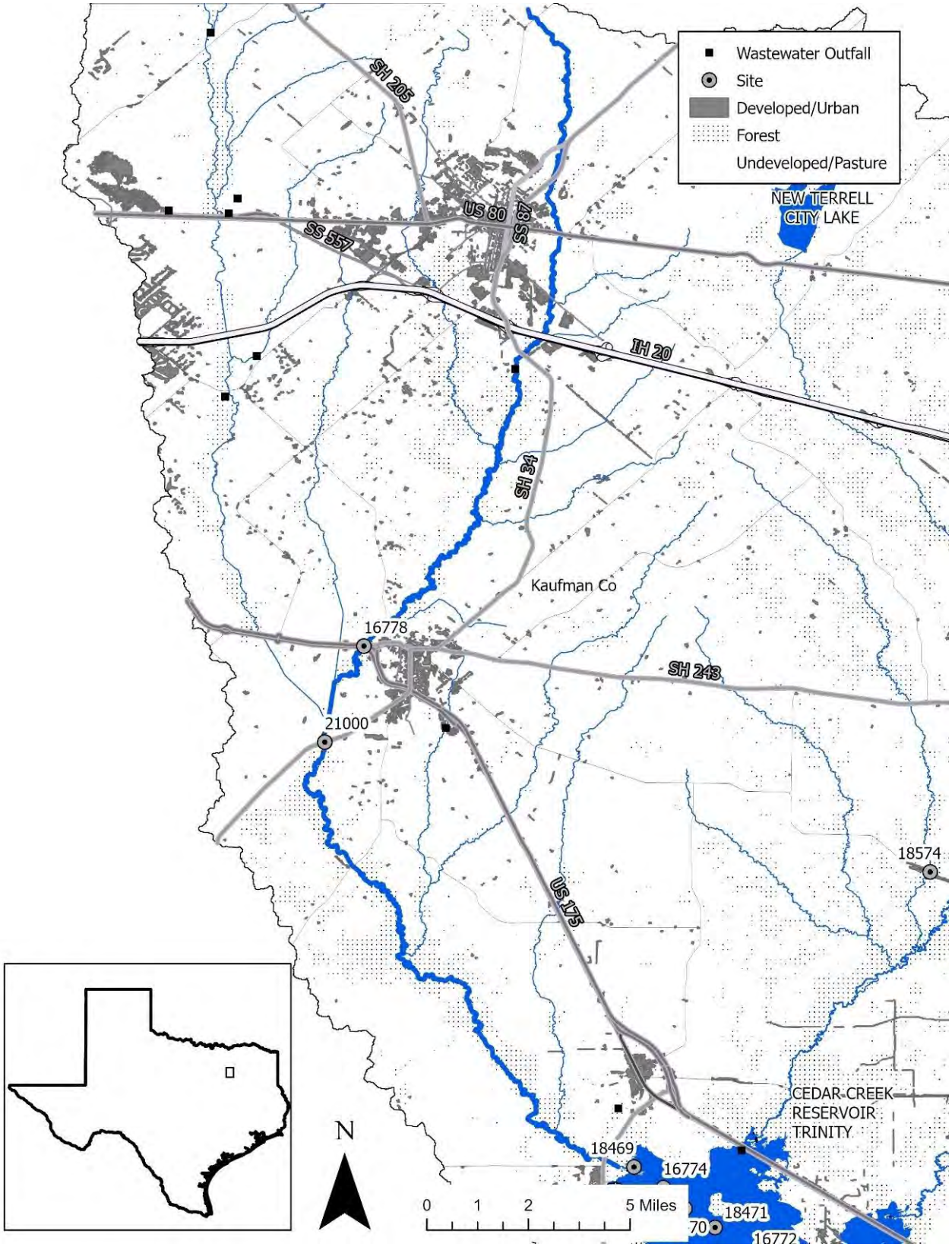


Figure 349: Segment 0818C Map

This 46.5-mile unclassified segment runs from the headwaters adjacent to FM 986 approximately 5 km north of Terrell in Kaufman County to the confluence with Cedar Creek Reservoir at normal pool elevation upstream (see Figure 349). A majority of the watershed is rural with pasture and hay land being the predominate land use. There are a few crop fields located toward the middle of the watershed and some development around the cities of Terrell, Kaufman, and Kemp. The stream flows through the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 283. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 283: Segment 0818C FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818C_01	KINGS CREEK AT SH34 UPSTREAM OF CEDAR CREEK RESERVOIR SOUTHWEST OF KAUFMAN 3.44 KM SOUTHWEST ON SH34 FROM US175	21000	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 284. Results of TRA trend analyses are shown in Table 285.

Table 284: TCEQ 2020 Texas Integrated Report Summary for Segment 0818C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818C_01 From confluence with Cedar Creek Reservoir at normal pool elevation to headwaters near FM 986	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0818C_01 From confluence with Cedar Creek Reservoir at normal pool elevation to headwaters near FM 986	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0818C_01 From confluence with Cedar Creek Reservoir at normal pool elevation to headwaters near FM 986	General Use	Ammonia	0.33 mg/L	NC
0818C_01 From confluence with Cedar Creek Reservoir at normal pool elevation to headwaters near FM 986	General Use	Nitrate	1.95 mg/L	CS
0818C_01 From confluence with Cedar Creek Reservoir at normal pool elevation to headwaters near FM 986	General Use	Total Phosphorus	0.69 mg/L	CS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 285: Significant Trends for Segment 0818C (P-value<0.1)

Segment & Assessment Unit		0818C_01	0818C_01
Site		16778	21000
Ammonia	All	No Trend	Not Significant
	Summer	Not Significant	No Trend
	Winter	↓*	Not Significant
Nitrate	All	↓*	Not Significant
	Summer	Not Significant	↓*
	Winter	Not Significant	Not Significant
Total Kjeldahl Nitrogen	All	↓*	Not Significant
	Summer	No Trend	Not Significant
	Winter	↓*	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

An impairment due to elevated levels of *E. coli* was identified in this segment. Over the period of record for this basin summary report, monitoring took place at two locations near the City of Kaufman; one at US 175 (station 16778) for the first half of the data set and later approximately three miles downstream at SR 34 (station 21000). As shown in Figure 350, *E. coli* levels were almost always reported above the standard of 126 MPN/100 mL. The first half of the data set was analyzed without dilution resulting in the flat line of data at 2,400 MPN/100 mL. In addition, there was no measured flow data to fully assess this portion of the data. However, for the second half of the data, there appeared to have been generally higher levels reported during drought. There was also a correlation coefficient of 0.634 between *E. coli* data collected at station 21000 and flow data reported at the USGS gage station. This indicates that there were both constant sources of *E. coli* into the stream during all weather conditions and when flows were low and run-off related inputs during wet weather when flows increased. There is a relatively dense riparian zone upstream of both of these stations. Based on Google Earth imagery, there did not appear to be evidence of livestock trails leading directly to the stream but this may have been masked by tree cover. Therefore, it is likely that wildlife and potentially livestock were visiting the stream for watering and contributing to the bacterial load during dry weather. There was evidence of livestock trails in the pastures of the watershed which points to run-off containing waste from both livestock and wildlife being washed into the stream. Improperly functioning septic systems in the watershed may have also contributed to the impairment. It is recommended that upstream sampling be conducted to determine if a source can be identified. Landowner education and livestock best management practices may help reduce bacterial loads from livestock sources.

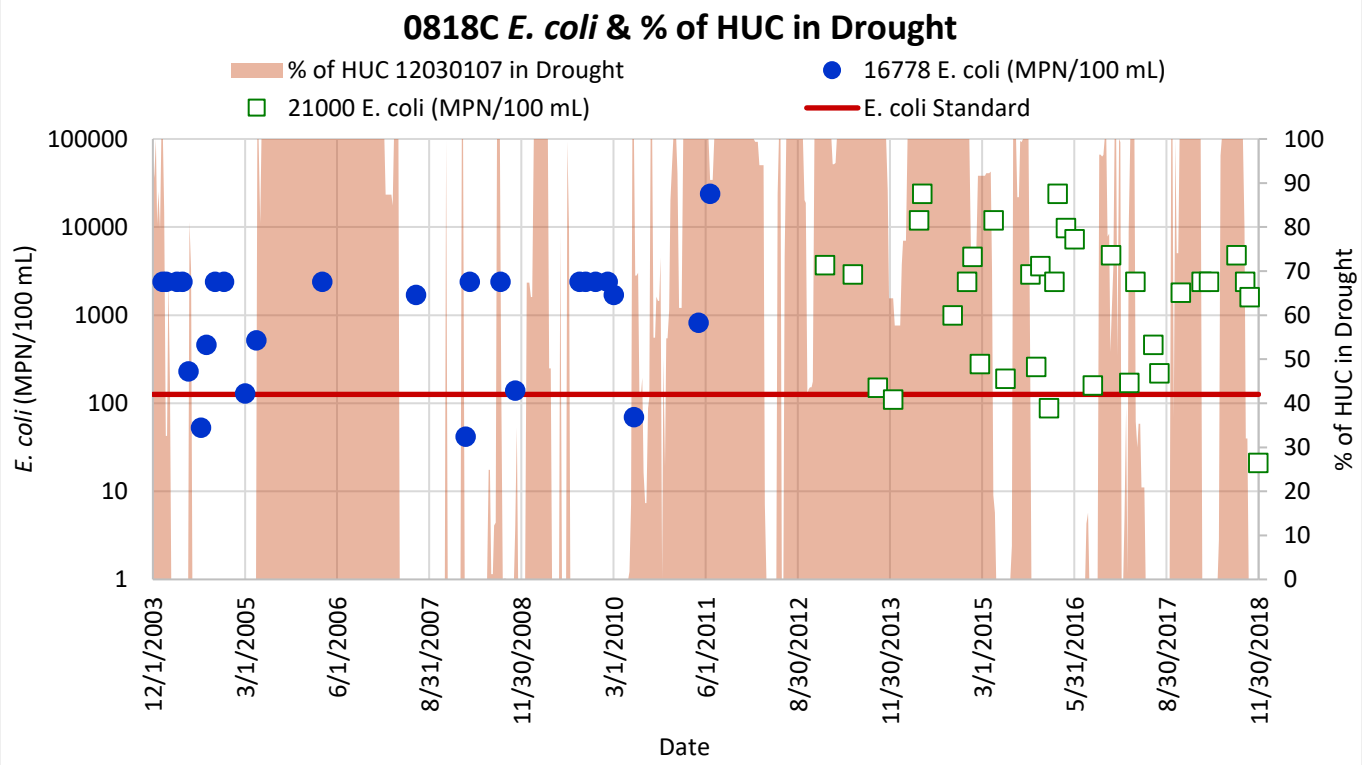


Figure 350: 0818C E. coli & % of HUC in Drought

Concerns for elevated levels of nitrate and total phosphorus were identified in this stream. A majority of the data used in the Integrated Report were collected at station 21000 and were accompanied by USGS flow data. Figure 351 shows that nitrate and phosphorus levels were generally higher during low flows. This pattern is commonly seen in waterbodies downstream of wastewater treatment facilities as effluent can be nutrient rich and most facilities do not have advanced nutrient removal systems. There are at least two wastewater treatment facilities on the tributaries upstream of monitoring station 21000. The correlation between nitrate and flow (correlation coefficient = -0.419) was much better than for total phosphorus and flow (correlation coefficient = -0.183). This seems to imply that nitrate sources were largely from the wastewater treatment facilities but that there were other sources for total phosphorus. Because there were some slightly elevated total phosphorus levels reported during higher flows, there may be run-off related sources contributing to this concern. Based on land use, those sources could be phosphorus fertilizers. Landowner education and fertilizer best management practices may help address the total phosphorus concern in this stream.

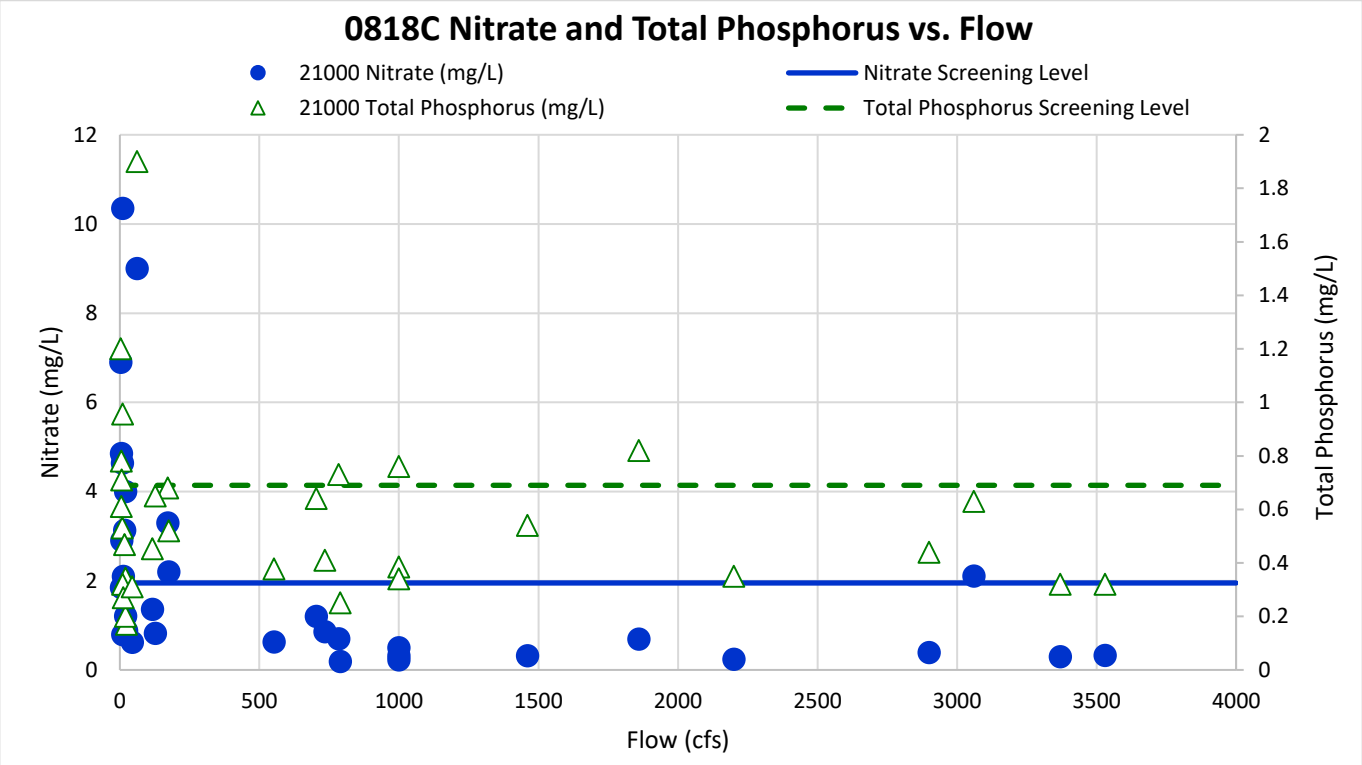


Figure 351: 0818C Nitrate and Total Phosphorus vs. Flow

0818B Cedar Creek above Cedar Creek Reservoir

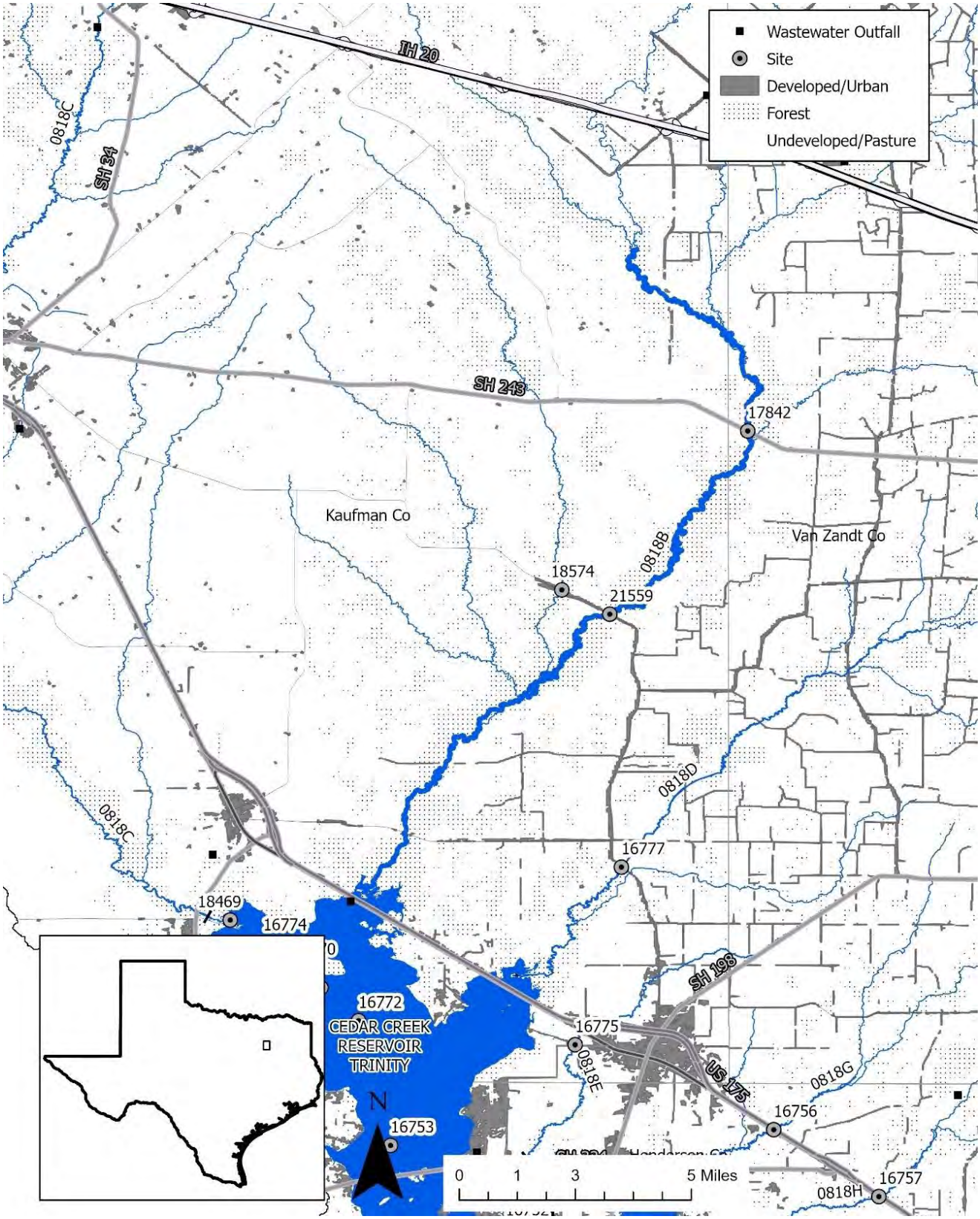


Figure 352: Segment 0818B Map

This 32.4-mile unclassified segment runs from the confluence of Muddy Cedar Creek and Rocky Cedar Creek in Kaufman County to the confluence with Cedar Creek Reservoir at normal pool elevation upstream (see Figure 352). A majority of the watershed contains hay and pasture land with woody wetland riparian areas along the stream. It drains the Northern Post Oak Savanna ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 286. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 286: Segment 0818B FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818B_01	CEDAR CREEK AT FM 1836 NORTHEAST OF KEMP	21559	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 287. Results of TRA trend analyses are shown in Table 288.

Table 287: TCEQ 2020 Texas Integrated Report Summary for Segment 0818B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818B_01 From confluence with Cedar Creek Reservoir up to confluence of Muddy Cedar Ck & Rocky Cedar Ck	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818B_01 From confluence with Cedar Creek Reservoir up to confluence of Muddy Cedar Ck & Rocky Cedar Ck	Recreation Use	*E. coli*	126 MPN/100 mL	**NS**
0818B_01 From confluence with Cedar Creek Reservoir up to confluence of Muddy Cedar Ck & Rocky Cedar Ck	General Use	Ammonia	0.33 mg/L	NC
0818B_01 From confluence with Cedar Creek Reservoir up to confluence of Muddy Cedar Ck & Rocky Cedar Ck	General Use	Nitrate	1.95 mg/L	NC
0818B_01 From confluence with Cedar Creek Reservoir up to confluence of Muddy Cedar Ck & Rocky Cedar Ck	General Use	Total Phosphorus	0.69 mg/L	NC

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 288: Significant Trends for Segment 0818B (P-value<0.1)

Segment & Assessment Unit		0818B_01	0818B_01
Site		17842	21559
pH	All	Insufficient Data	Not Significant
	Summer	Insufficient Data	↑*
	Winter	Insufficient Data	Not Significant
Ammonia	All	↓	No Trend
	Summer	Not Significant	No Trend
	Winter	Not Significant	No Trend
Nitrate	All	No Trend	↓*
	Summer	Not Significant	↓*
	Winter	No Trend	↓*
Total Kjeldahl Nitrogen	All	No Trend	Not Significant
	Summer	↓	Not Significant
	Winter	No Trend	Not Significant

Segment & Assessment Unit		0818B_01	0818B_01
Site		17842	21559
Total Organic Carbon	All	↓	Not Significant
	Summer	↓	Not Significant
	Winter	↓	Not Significant
E. coli	All	↑	Not Significant
	Summer	Not Significant	Not Significant
	Winter	↑	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

An impairment due to elevated levels of *E. coli* was identified in this segment. Over the period of record for this basin summary report, monitoring took place at two stations; one at SR 243 (station 17842) for the first half of the data set and later several miles downstream at FM 1836 (station 21559). As shown in Figure 353, *E. coli* levels were almost always reported above the standard of 126 MPN/100 mL. The first half of the data set was analyzed without dilution resulting in the flat line of data at 2,400 MPN/100 mL. In addition, there was no measured flow data to fully assess this portion of the data. For the second half of the data, there was flow data available from a USGS gage at station 21559. However, there was not a strong correlation between flow and *E. coli* at this site (correlation coefficient = 0.199). This indicates that there were constant sources of bacteria into the stream. There are wooded riparian areas upstream of both stations. In addition, based on Google Earth imagery, there is evidence of livestock trails entering the stream. It is likely that wildlife and livestock visiting the stream for watering were contributing to this impairment. Landowner education and livestock best management practices may help reduce bacteria levels in this stream. There was an increasing trend for *E. coli* identified at station 17842. However, sampling at this site ended in 2013 after which the site was moved downstream to station 21559 at the USGS gage station. The apparent trend at this site could have been an artifact of the period of record at this station in relation to the prolonged drought of 2011 to 2015. Less inflow from precipitation and an increasing dependence on the stream for water by wildlife and livestock would lead to increasing bacteria concentrations. Additionally, the trend could have been due to a change in analytical procedures. After 2011, it appears that samples were diluted in order to achieve a higher upper detection level. The upper detection level for an undiluted *E. coli* sample is 2,400 MPN/100 mL; to achieve higher detection levels, the upper end of the range is multiplied by the dilution factor. Therefore, this may be a false trend.

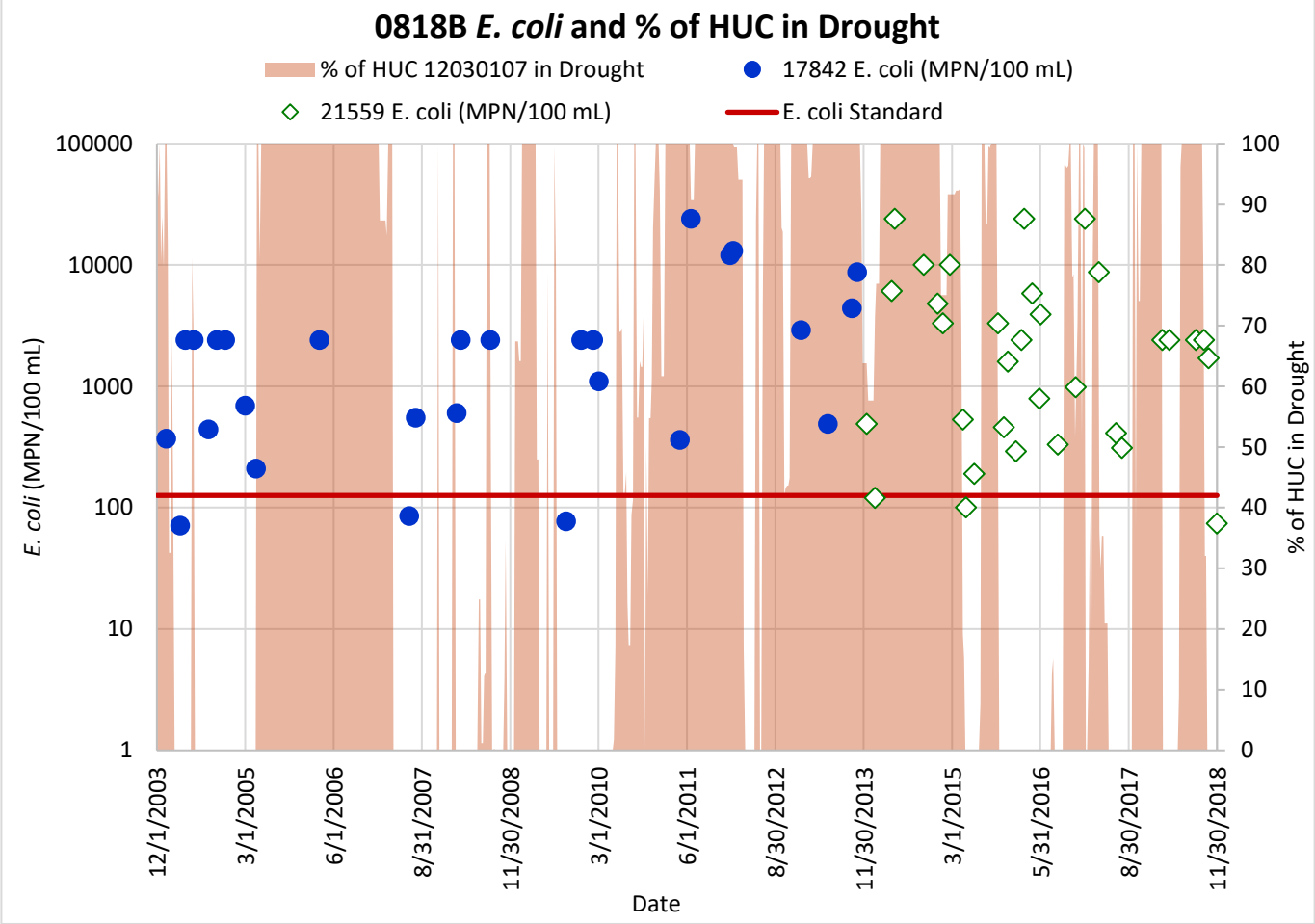


Figure 353: 0818B E. coli and % of HUC in Drought

The increasing summer pH trend at station 21559 is difficult to decipher. There was a non-significant decreasing summer pH trend for station 17842 for data collected between 2004 to 2013 then the increasing trend for station 21559 for data collected after 2013. The increasing pH levels coincided with the drought recovery in 2015 and 2016. It seems logical that additional water in the stream allowed for more algal biomass. However, there was no chlorophyll-*a* data available to further assess this trend. It is recommended that chlorophyll-*a* be collected at station 21559.

0818D Lacy Fork

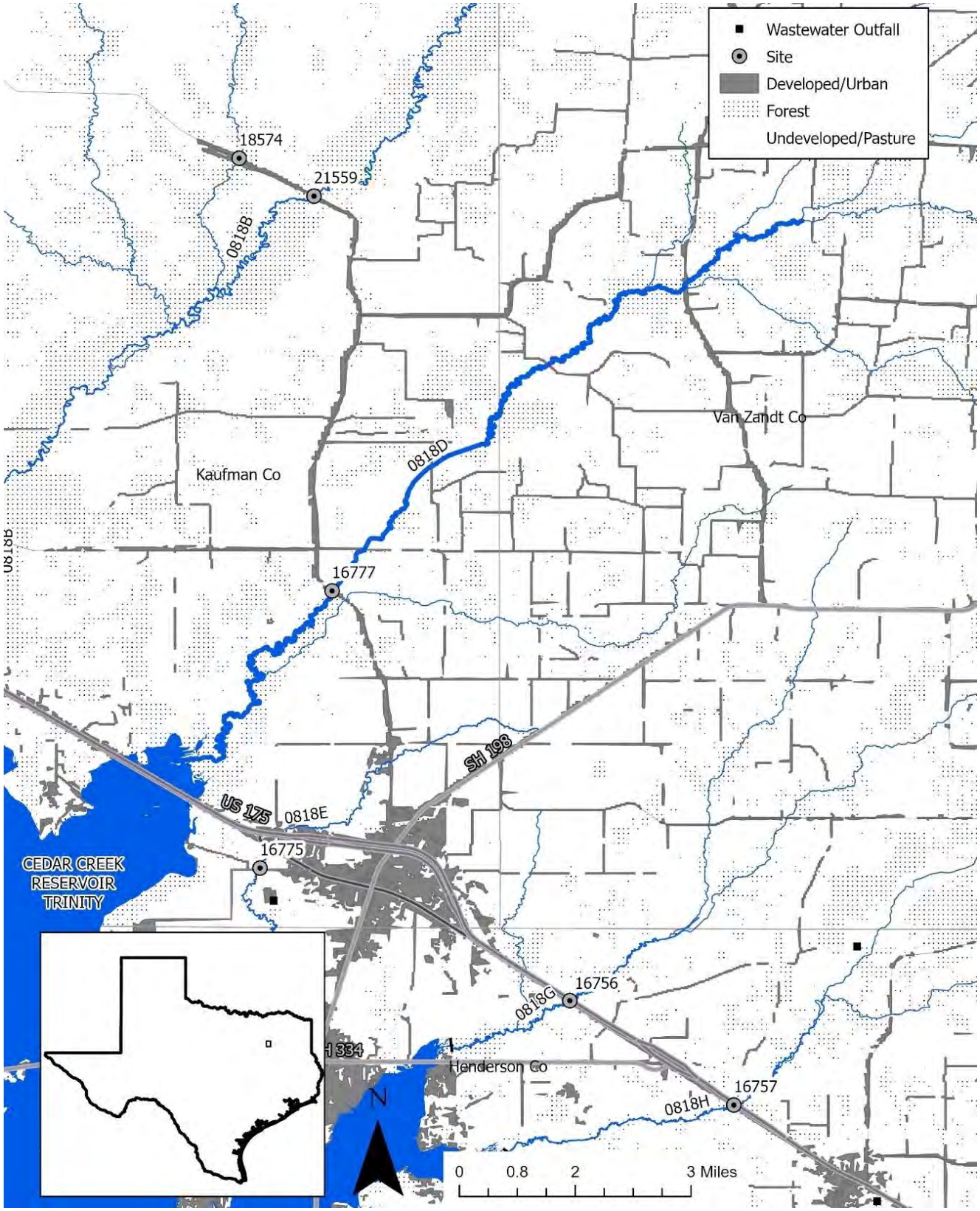


Figure 354: Segment 0818D Map

This 18.2-mile unclassified segment runs from the confluence of Dry Lacy Fork and Wet Lacy Fork in Van Zandt County to the confluence with Cedar Creek Reservoir at normal pool elevation (see Figure 354). A majority of the watershed contains hay and pasture land with woody wetland riparian areas along portions of the stream. It drains the Northern Post Oak Savanna ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 289. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 289: Segment 0818D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818D_01	LACY FORK CREEK 25 METERS UPSTREAM OF FM 90 5.9KM UPSTREAM OF CEDAR CREEK RESERVOIR	16777	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 290. No significant trends were identified during TRA data analysis.

Table 290: TCEQ 2020 Texas Integrated Report Summary for Segment 0818D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818D_01 From confluence with Cedar Creek Reservoir normal pool up to confluence of Dry & Wet Lacy Fork	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0818D_01 From confluence with Cedar Creek Reservoir normal pool up to confluence of Dry & Wet Lacy Fork	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0818D_01 From confluence with Cedar Creek Reservoir normal pool up to confluence of Dry & Wet Lacy Fork	General Use	Ammonia	0.33 mg/L	NC
0818D_01 From confluence with Cedar Creek Reservoir normal pool up to confluence of Dry & Wet Lacy Fork	General Use	Nitrate	1.95 mg/L	NC
0818D_01 From confluence with Cedar Creek Reservoir normal pool up to confluence of Dry & Wet Lacy Fork	General Use	Total Phosphorus	0.69 mg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

The Integrated Report identified a concern due to elevated levels of *E. coli*. There was no measured flow data available at this station however there was a weak correlation between *E. coli* and flow severity (correlation coefficient = 0.344) as shown in Figure 355 with some higher concentrations being reported at higher flow severities. Please note that flow severity data has been recategorized to reflect incremental increases in flow from dry to flood. As with previous segments in this watershed, *E. coli* levels were almost always reported above the standard of 126 MPN/100 mL indicating that there were constant sources of *E. coli* into the stream. Based on Google Earth imagery, there was evidence of livestock trails entering the stream directly upstream of monitoring station 16777 at FM 90 as well as many other locations upstream. It is likely that livestock entering the stream for watering were contributing bacteria at lower flows and run-off containing livestock waste from the pastures were washing bacteria into the stream at higher flows. Landowner education and livestock best management practices may reduce

bacteria levels in this segment. It is recommended that flow be measured at this station in order to further clarify this concern in the future.

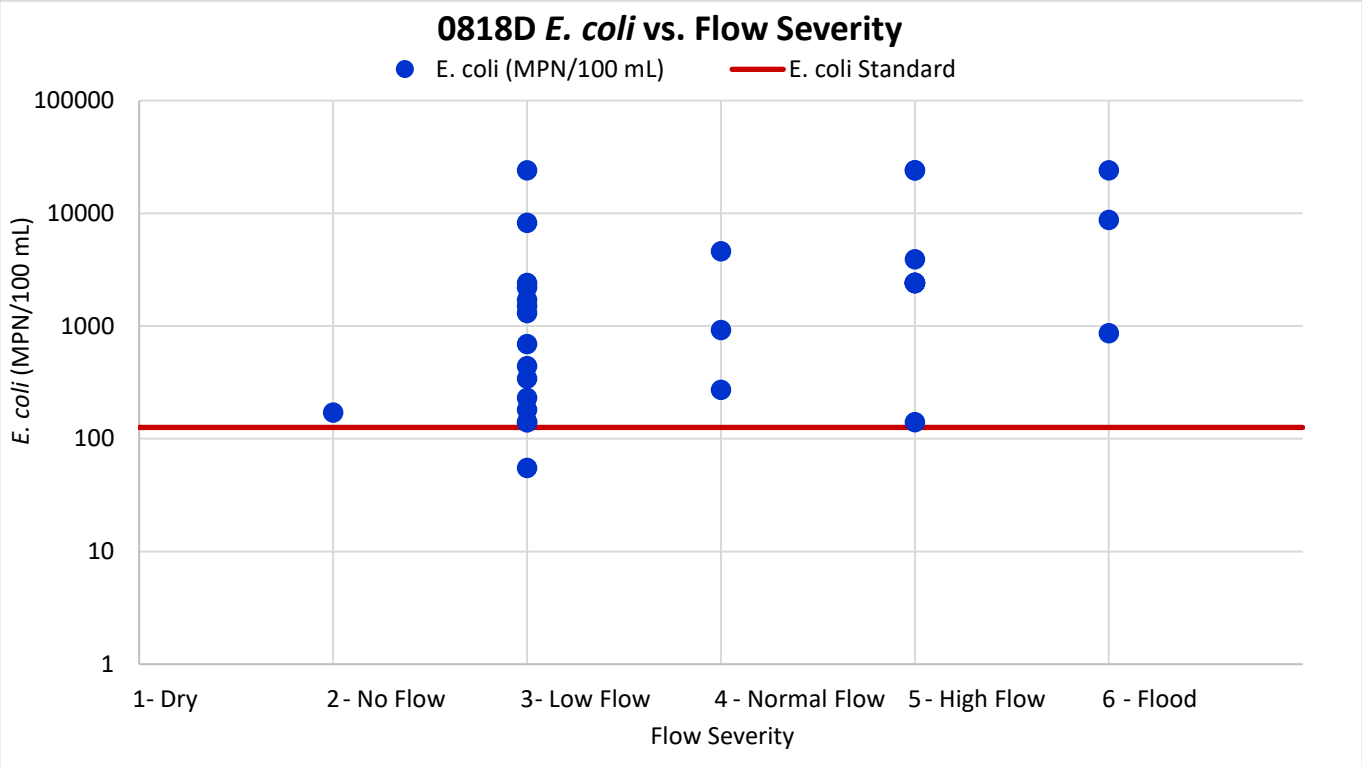


Figure 355: 0818D E. coli vs. Flow Severity

0818E Prairie Creek

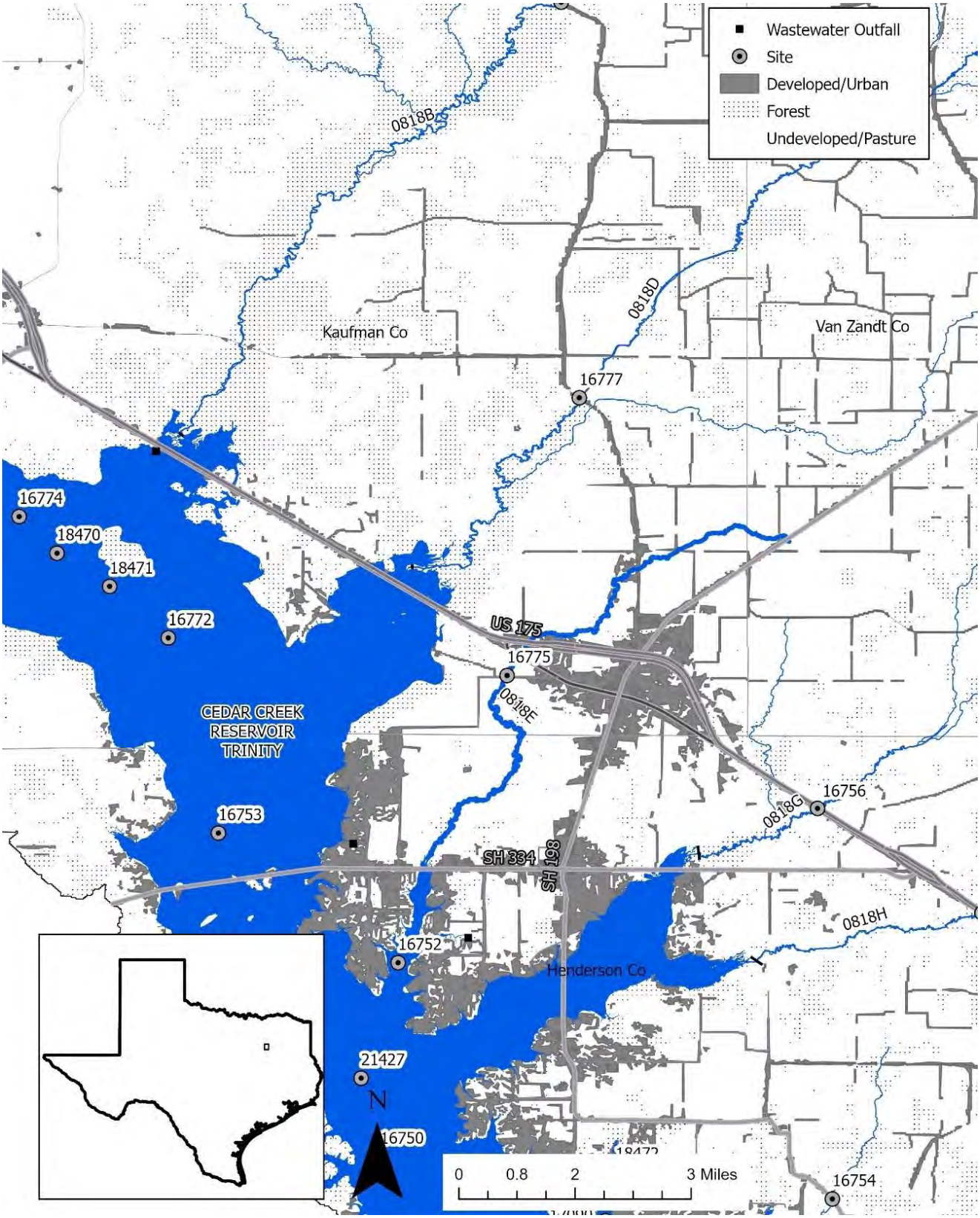


Figure 356: Segment 0818E Map

This 10.4-mile stream runs from the headwaters adjacent to SH 198 in Van Zandt County to the confluence with Cedar Creek Reservoir at normal pool elevation (see Figure 356). A majority of the watershed contains hay and pasture land with woody wetland riparian areas along the stream. There is development around the cities of Mabank and Gun Barrel City. The stream drains the Northern Post Oak Savanna ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 291. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 291: Segment 0818E FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818E_01	PRAIRIE CREEK AT KAUFMAN CR 4006/RODEO ROAD 5.7 KM UPSTREAM OF CEDAR CREEK RESERVOIR WEST OF MABANK	16775	Tarrant Regional Water District

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0818E_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0818G North Twin Creek

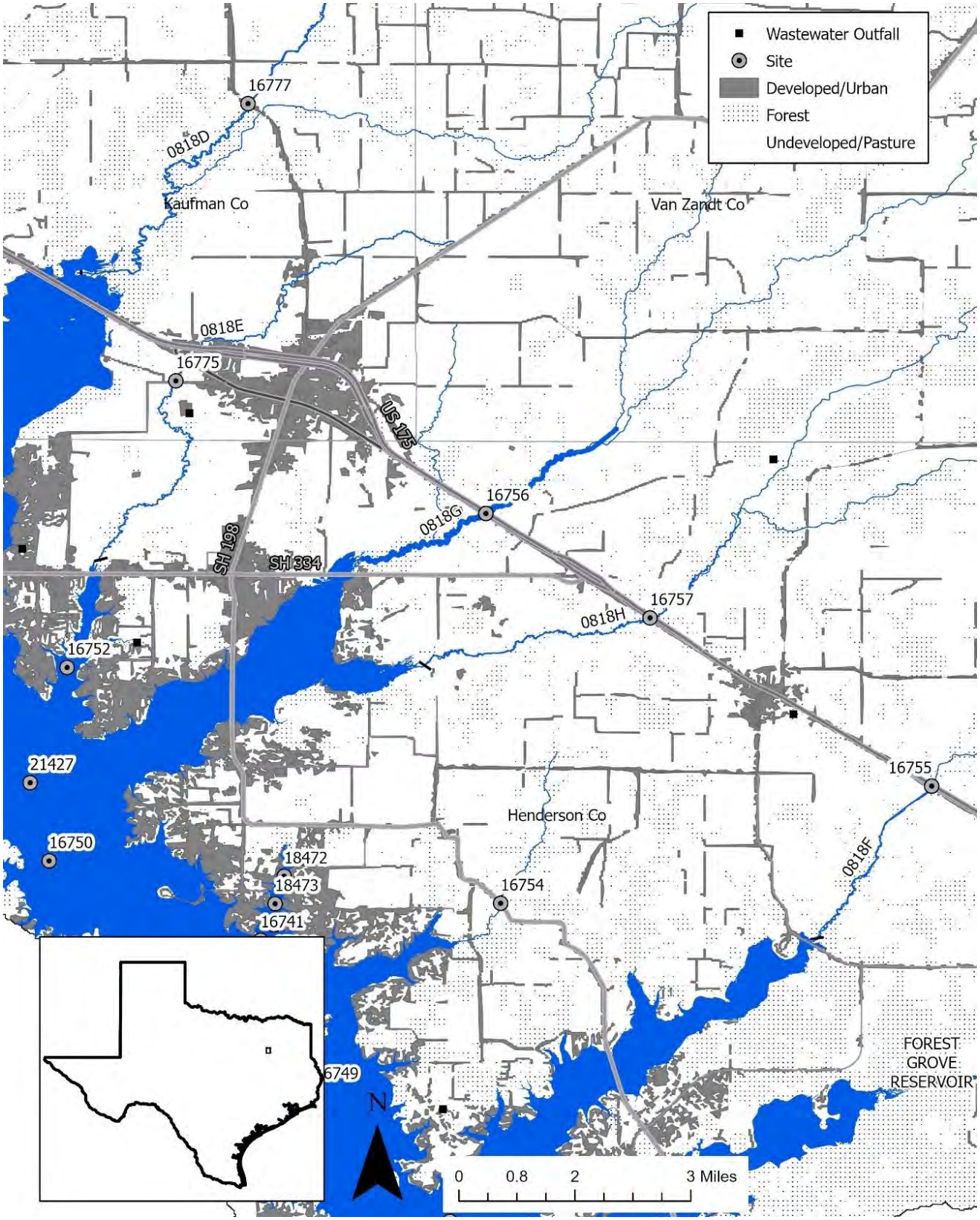


Figure 357: Segment 0818G Map

This 5.9-mile segment runs from 3 km northeast of the intersection of highway 175 to the confluence with Twin Creeks cove (see Figure 357). A majority of the watershed contains hay and pasture land with woody wetland riparian areas along portions of the stream. It drains the Northern Post Oak Savanna ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 292. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 292: Segment 0818G FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818G_01	NORTH TWIN CREEK AT US 175 3.3KM UPSTREAM OF CEDAR CREEK RESERVOIR	16756	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 293. No significant trends were identified during TRA data analysis.

Table 293: TCEQ 2020 Texas Integrated Report Summary for Segment 0818G

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818G_01 From the confluence with Twin Creeks cove to 3 km northeast of the intersection of highway 175	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818G_01 From the confluence with Twin Creeks cove to 3 km northeast of the intersection of highway 175	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0818G_01 From the confluence with Twin Creeks cove to 3 km northeast of the intersection of highway 175	General Use	Ammonia	0.33 mg/L	NC
0818G_01 From the confluence with Twin Creeks cove to 3 km northeast of the intersection of highway 175	General Use	Nitrate	1.95 mg/L	NC
0818G_01 From the confluence with Twin Creeks cove to 3 km northeast of the intersection of highway 175	General Use	Total Phosphorus	0.69 mg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

A concern due to elevated levels of *E. coli* was identified in this segment. There was no measured flow data available at this station however there was a very weak correlation between *E. coli* and flow severity (correlation coefficient = 0.236) as shown in Figure 358 with some higher concentrations being reported at higher flow severities. Please note that flow severity data has been recategorized to reflect incremental increases in flow from dry to flood. As with previous segments in this watershed, *E. coli* levels were almost always reported above the standard of 126 MPN/100 mL indicating that there were constant sources of *E. coli* into the stream. Based on Google Earth imagery, there was evidence of livestock trails entering the stream just upstream of monitoring station 16756 at US 175. It is likely that livestock entering the stream for watering were contributing bacteria at lower flows and run-off containing livestock waste from the pastures were washing bacteria into the stream at higher flows. Landowner education and livestock best management practices may reduce bacteria levels in this segment. It is recommended that flow be measured at this station in order to further clarify this concern in the future.

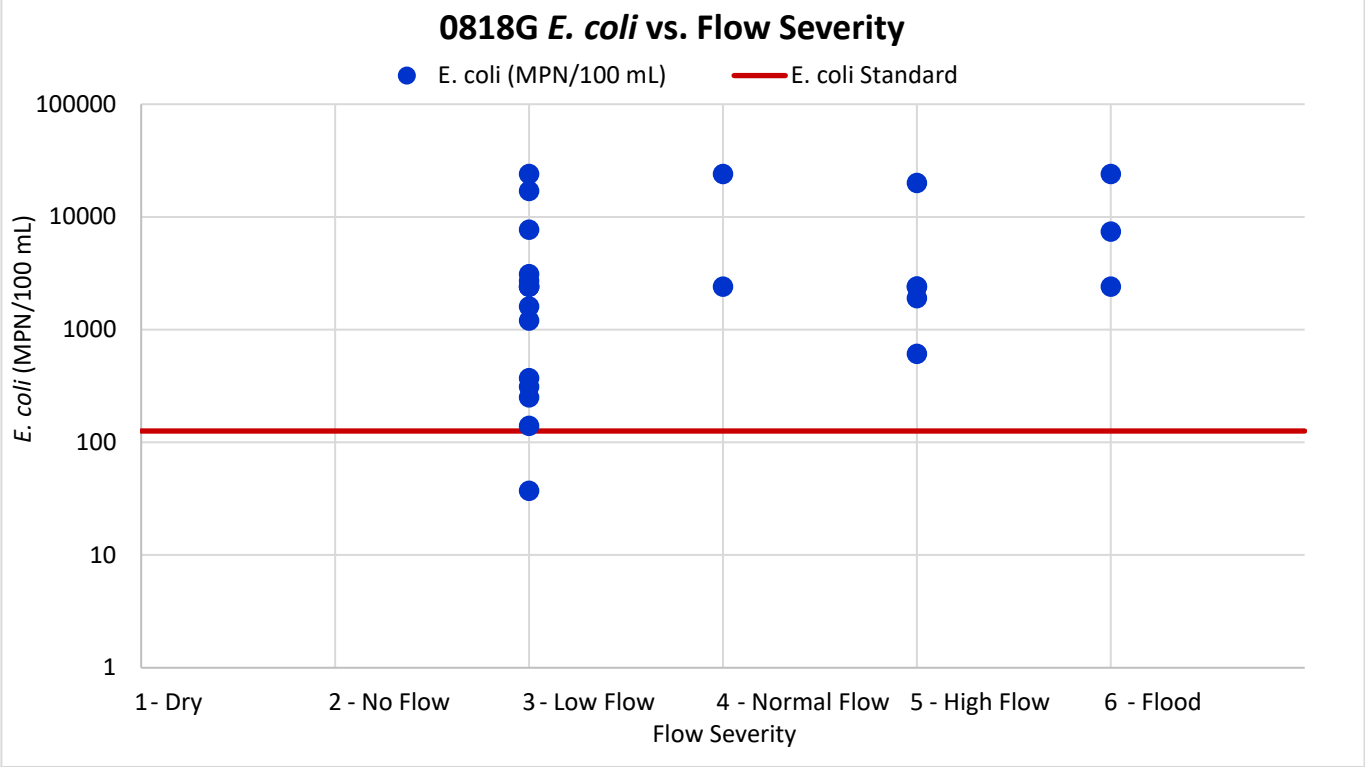


Figure 358: 0818G E. coli vs. Flow Severity

0818H South Twin Creek

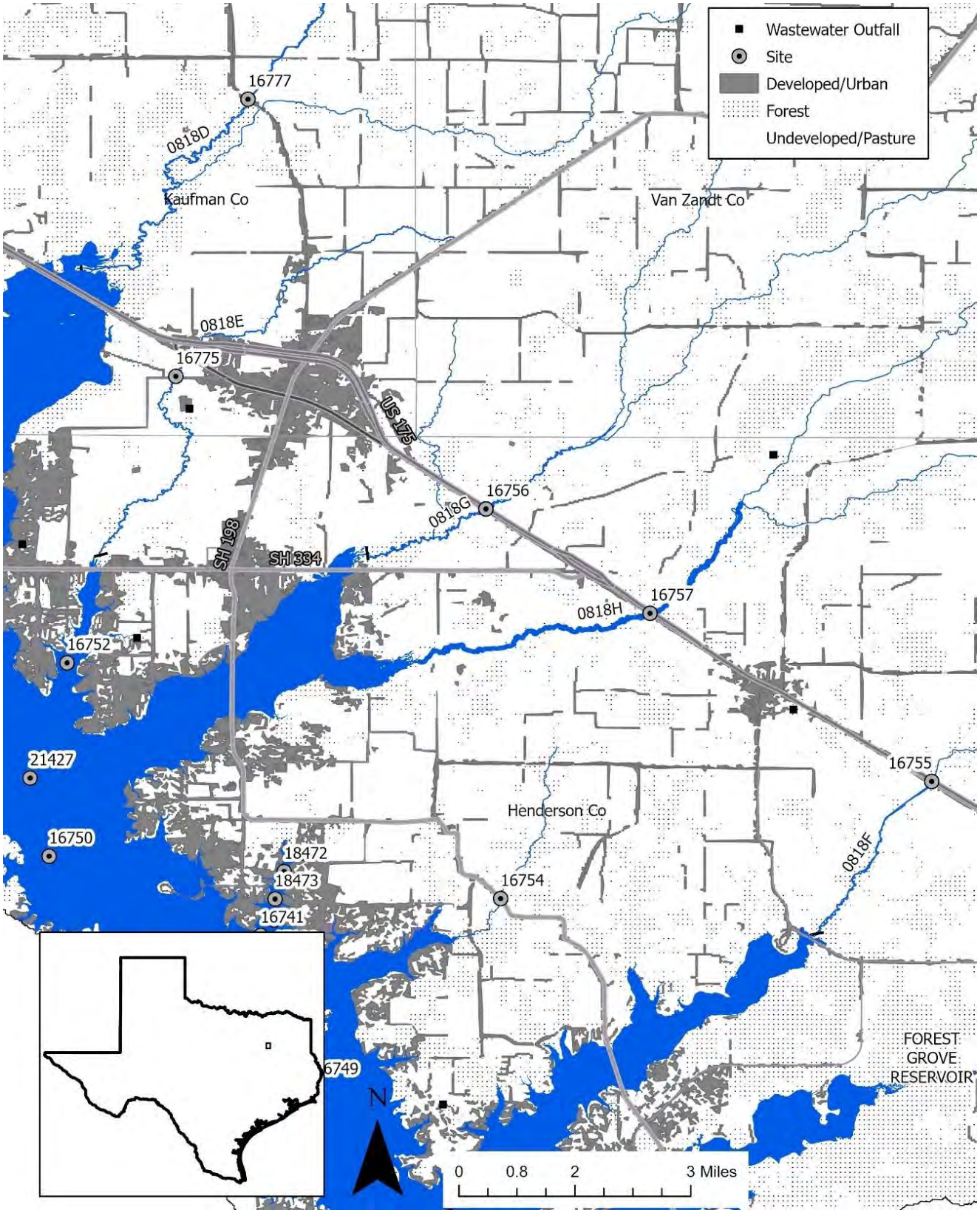


Figure 359: Segment 0818H Map

This 6.9-mile unclassified segment runs from 3.15 km northeast of where the waterbody intersects highway 175 to the confluence with Twin Creeks cove upstream (see Figure 359). A majority of the watershed contains hay and pasture land with woody wetland riparian areas along portions of the stream. It drains the Northern Post Oak Savanna ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 294. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 294: Segment 0818H FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818H_01	SOUTH TWIN CREEK AT US 175 5.0KM UPSTREAM OF CEDAR CREEK RESERVOIR	16757	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 295. No significant trends were identified during TRA data analysis.

Table 295: TCEQ 2020 Texas Integrated Report Summary for Segment 0818H

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818H_01 From confluence with Twin Creeks cove up to 3.15 km northeast of US 175	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818H_01 From confluence with Twin Creeks cove up to 3.15 km northeast of US 175	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0818H_01 From confluence with Twin Creeks cove up to 3.15 km northeast of US 175	General Use	Ammonia	0.33 mg/L	NC
0818H_01 From confluence with Twin Creeks cove up to 3.15 km northeast of US 175	General Use	Nitrate	1.95 mg/L	NC
0818H_01 From confluence with Twin Creeks cove up to 3.15 km northeast of US 175	General Use	Total Phosphorus	0.69 mg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

A concern due to elevated levels of *E. coli* was identified in this segment. There was no measured flow data available at this station. Unlike the previously discussed segments in this subwatershed, there was no correlation between *E. coli* and flow severity (correlation coefficient = 0.022) as shown in Figure 360. Again, *E. coli* levels were almost always reported above the standard of 126 MPN/100 mL but there appeared to be decreases in concentrations at higher flow severities. This may have been caused by timing of sample collection in relation to the hydrograph. Concentrations of pollutants are generally higher on the rising limb of the hydrograph than at corresponding flows on the falling limb of the hydrograph. There was a relatively weak correlation between *E. coli* and days since precipitation (correlation coefficient = -0.358) indicating that higher *E. coli* levels were reported after recent precipitation. It is likely that the same mechanisms influencing *E. coli* levels in the other segments in this subwatershed were influencing levels in this stream. Based on Google Earth imagery, there was evidence of livestock trails entering the stream just upstream of monitoring station 16757 at US 175. It is likely that livestock entering the stream for watering were contributing bacteria at lower flows

and run-off containing livestock waste from the pastures were washing bacteria into the stream at higher flows. Landowner education and livestock best management practices may reduce bacteria levels in this segment. It is recommended that flow be measured at this station in order to further clarify this concern in the future.

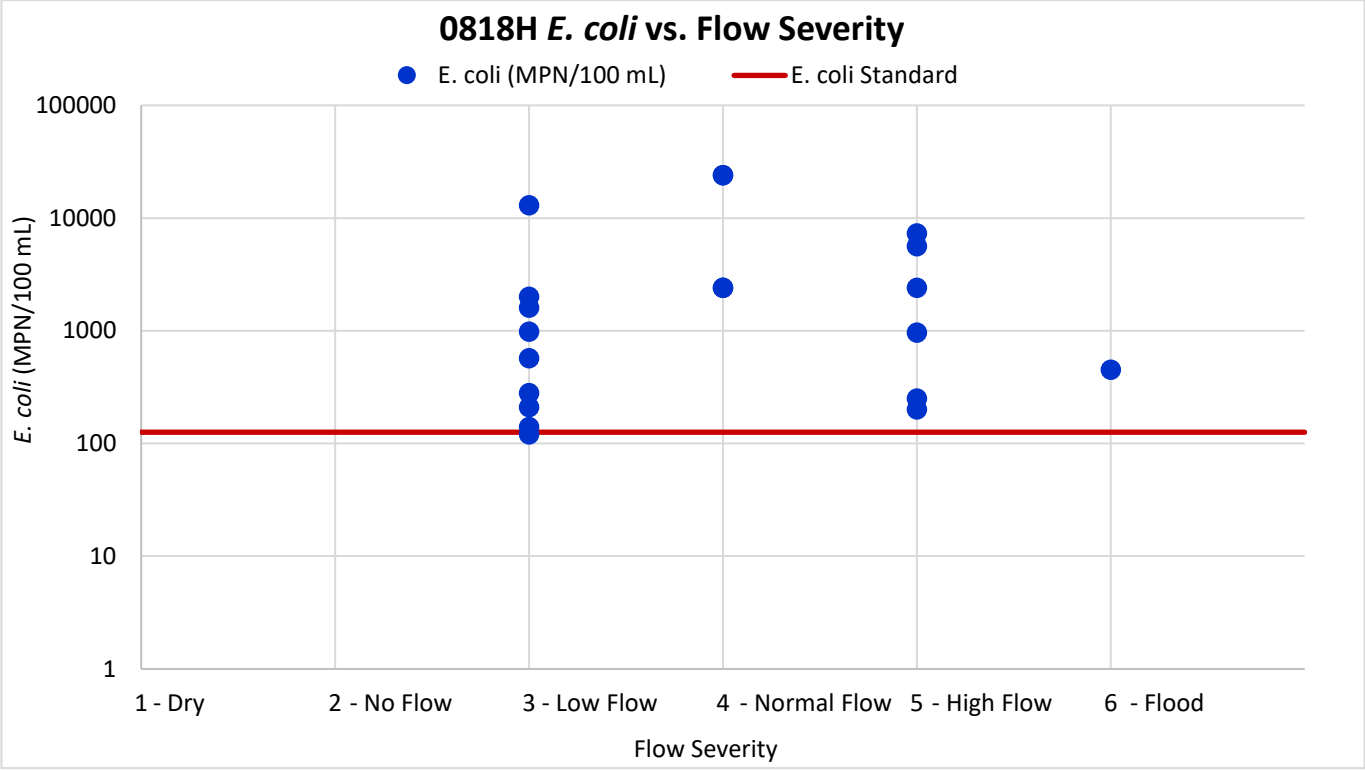


Figure 360: 0818H E. coli vs. Flow Severity

0818F Clear Creek

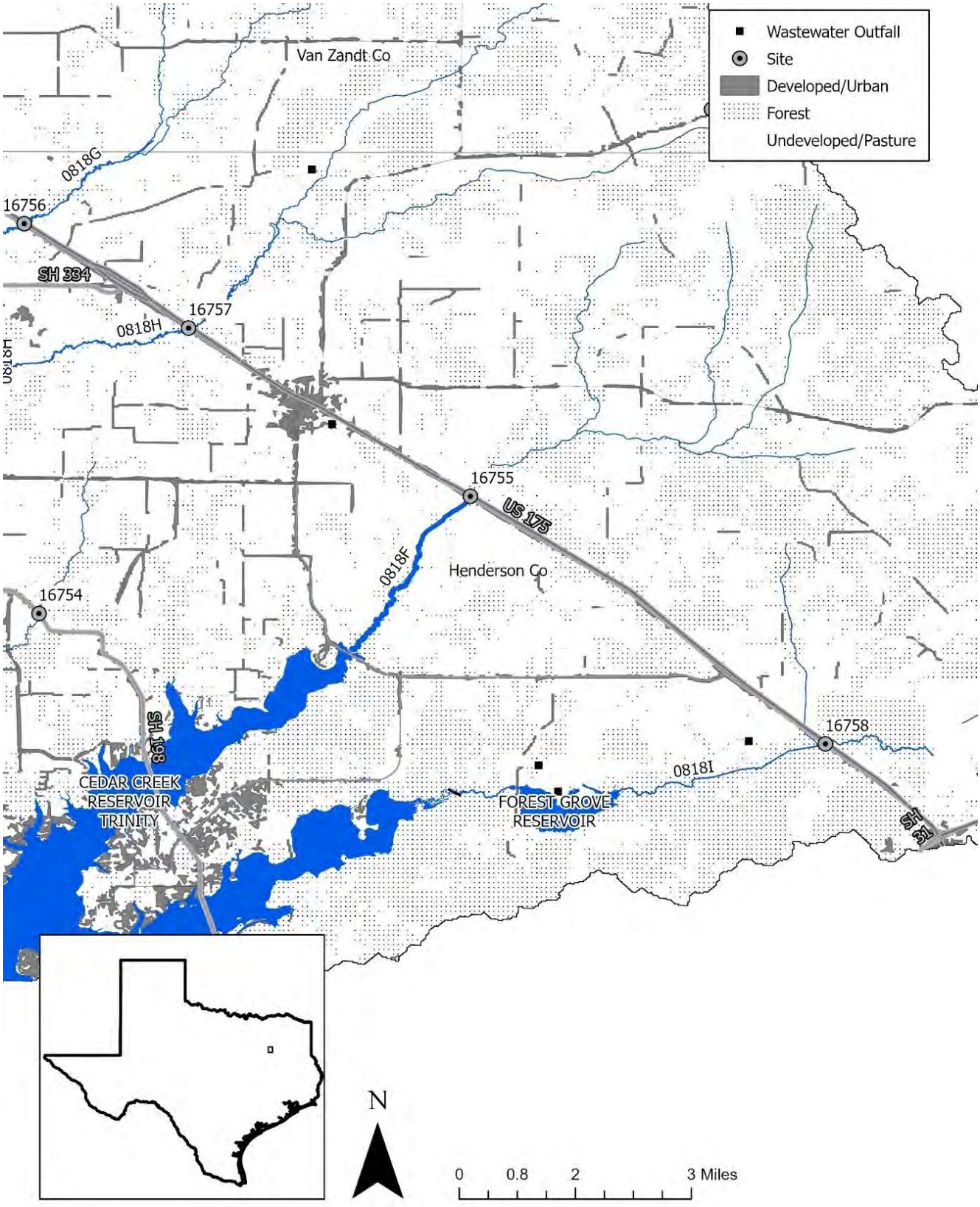


Figure 361: Segment 0818F Map

This 3.4-mile unclassified segment runs from US 175 to the confluence with Clear Creek Cove (see Figure 361). A majority of the watershed contains hay and pasture land with woody wetland riparian areas along portions of the stream. It drains the Northern Post Oak Savanna ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 296. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 296: Segment 0818F FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818F_01	CLEAR CREEK AT US 175 4.3 KM UPSTREAM OF CEDAR CREEK RESERVOIR	16755	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 297. No significant trends were identified during TRA data analysis.

Table 297: TCEQ 2020 Texas Integrated Report Summary for Segment 0818F

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818F_01 From the confluence with Clear Creek Cove upstream to the north edge of the highway 175	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818F_01 From the confluence with Clear Creek Cove upstream to the north edge of the highway 175	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0818F_01 From the confluence with Clear Creek Cove upstream to the north edge of the highway 175	General Use	Ammonia	0.33 mg/L	NC
0818F_01 From the confluence with Clear Creek Cove upstream to the north edge of the highway 175	General Use	Nitrate	1.95 mg/L	NC
0818F_01 From the confluence with Clear Creek Cove upstream to the north edge of the highway 175	General Use	Total Phosphorus	0.69 mg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

The Integrated Report identified a concern due to elevated levels of *E. coli*. There was no measured flow data available at this station however there was a relatively strong correlation between *E. coli* and flow severity (correlation coefficient = 0.533) as shown in Figure 362 with some higher concentrations being reported at higher flow severities. As with previous segments in this watershed, *E. coli* levels were routinely reported above the standard of 126 MPN/100 mL indicating that there were constant sources of *E. coli* into the stream. Based on Google Earth imagery, there were wooded riparian areas upstream of monitoring station 16755 at US 175. There was also evidence of several livestock trails entering the stream in the wooded area just upstream of the monitoring station. It is likely that livestock entering the stream for watering were contributing bacteria at lower flows and run-off containing livestock waste from the pastures were washing bacteria into the stream at higher flows. Landowner education and livestock best management practices may reduce bacteria levels in this segment. It is recommended that flow be measured at this station in order to further clarify this concern in the future.

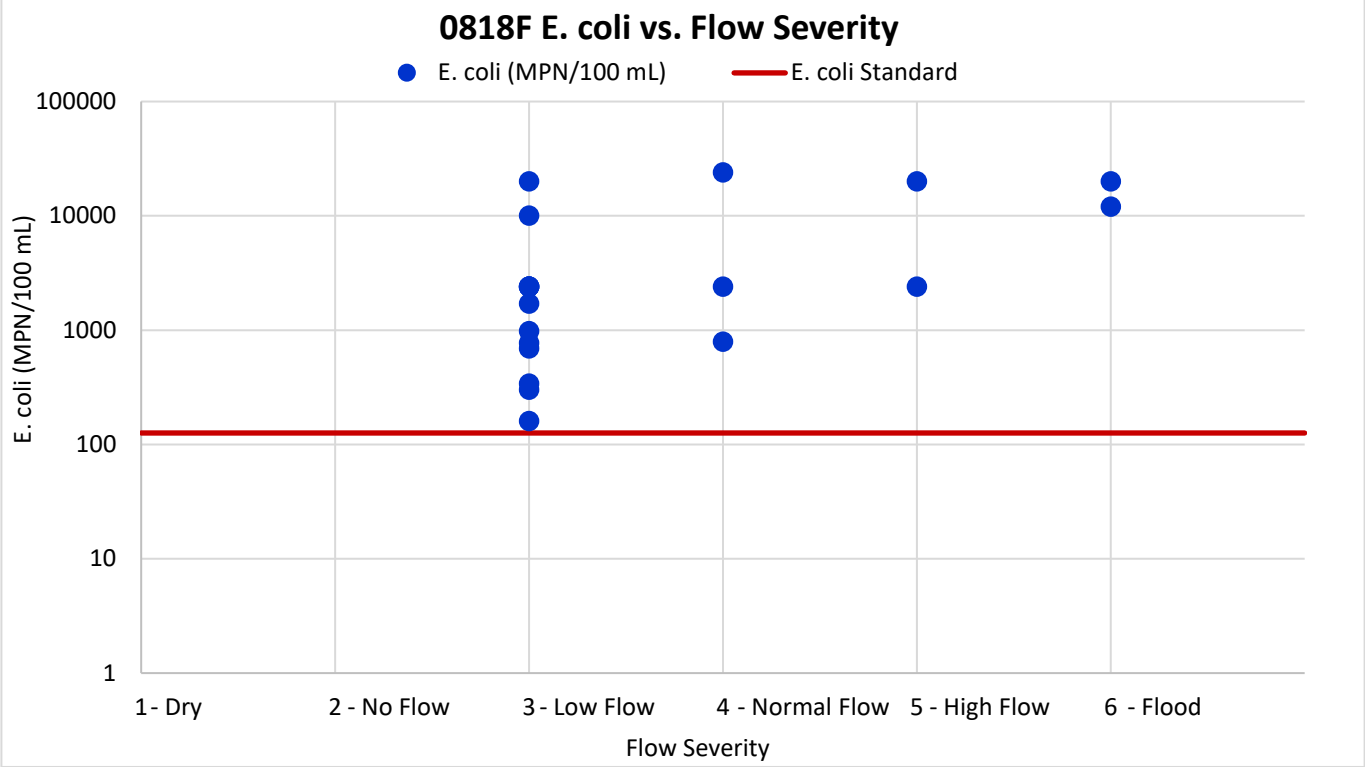


Figure 362: 0818F E. coli vs. Flow Severity

0818I Caney Creek

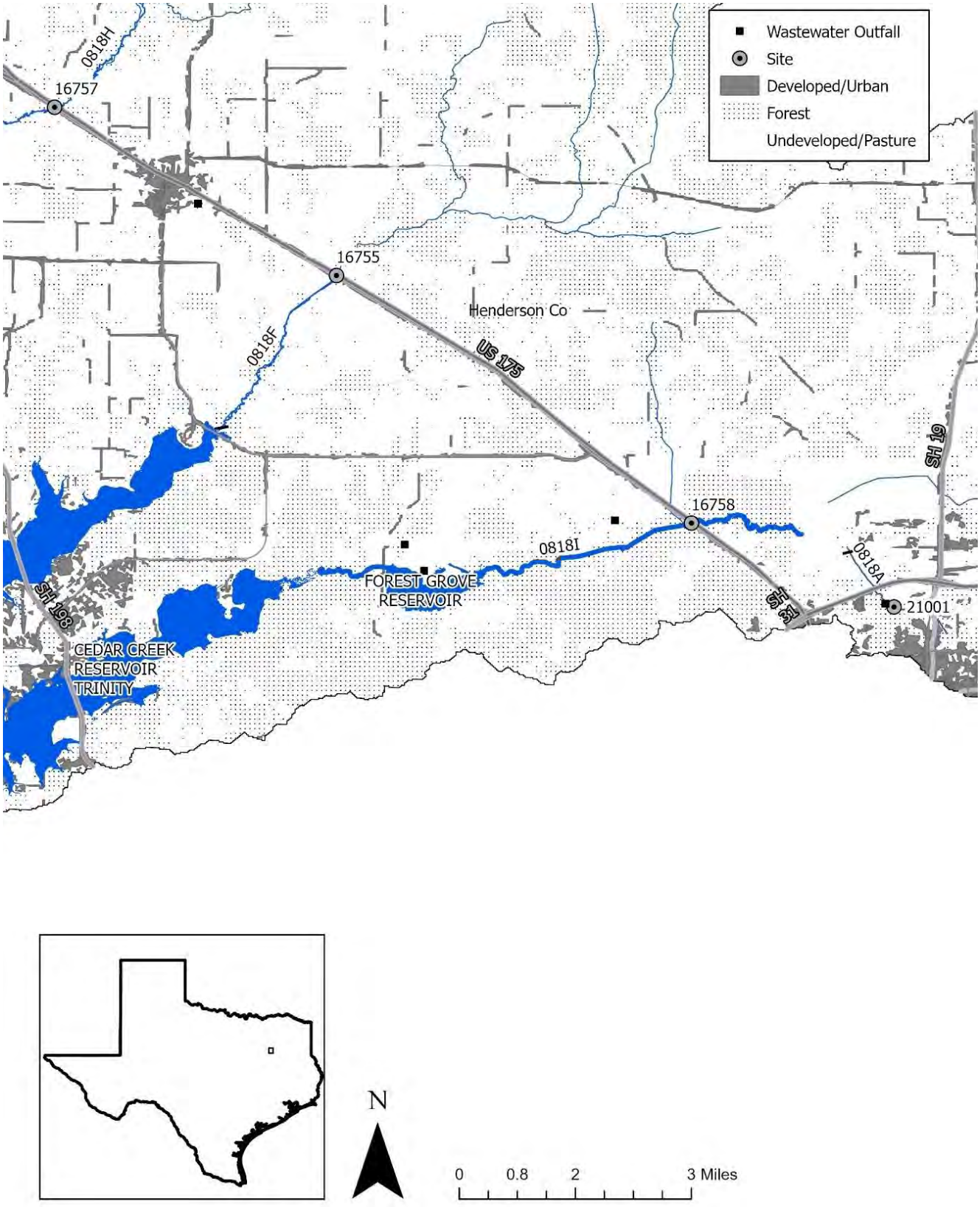


Figure 363: Segment 0818I Map

This 7.4-mile unclassified segment runs from the dam on Third Caney Creek approximately 1.8 km north of the intersection of SH 7 and US 175 in Athens to the confluence with Cedar Creek Reservoir (see Figure 363). A majority of the watershed contains hay and pasture land with woody wetland riparian areas along portions of the stream. There is some development along the outskirts of the City of Athens. Its watershed flows through the Northern Post Oak Savanna ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 298. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 298: Segment 0818I FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818I_01	CANEY CREEK AT US 175 8.4KM UPSTREAM OF CEDAR CREEK RESERVOIR NORTHWEST OF ATHENS	16758	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 299. No significant trends were identified during TRA data analysis.

Table 299: TCEQ 2020 Texas Integrated Report Summary for Segment 0818I

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818I_01 From confluence with Cedar Creek Reservoir up to the dam on Third Caney Creek	Aquatic Life Use	Dissolved Oxygen	2 mg/L	FS
0818I_01 From confluence with Cedar Creek Reservoir up to the dam on Third Caney Creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0818I_01 From confluence with Cedar Creek Reservoir up to the dam on Third Caney Creek	General Use	Ammonia	0.33 mg/L	NC
0818I_01 From confluence with Cedar Creek Reservoir up to the dam on Third Caney Creek	General Use	Nitrate	1.95 mg/L	NC
0818I_01 From confluence with Cedar Creek Reservoir up to the dam on Third Caney Creek	General Use	Total Phosphorus	0.69 mg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

A concern due to elevated levels of *E. coli* was identified in this segment. There was no measured flow data available at this station however there was a weak correlation between *E. coli* and flow severity (correlation coefficient = 0.293) as shown in Figure 364. *E. coli* levels were regularly reported above the standard of 126 MPN/100 mL. Based on this information, it is likely that there were both constant and run-off related sources of bacteria into the stream. There is small densely wooded riparian area just upstream of monitoring station 16758 at US 175 and a fairly large pond less than two miles upstream. There is evidence of livestock trails along the periphery of the riparian area immediately upstream of the monitoring station in Google Earth imagery. Although the tree cover is too dense to determine if livestock trails lead to the stream, it is almost certain that livestock were visiting the stream in this area for watering and contributing to the bacterial load. There is evidence of livestock trails leading into the upstream pond as well as several houses along the shores. Both livestock and improperly functioning septic systems

may be introducing bacteria into the pond which then drains to the stream. Landowner and homeowner education as well as livestock best management practices may help reduce bacteria levels in this stream. It is also recommended that flow be measured at station 16758 in order to further clarify this concern in the future.

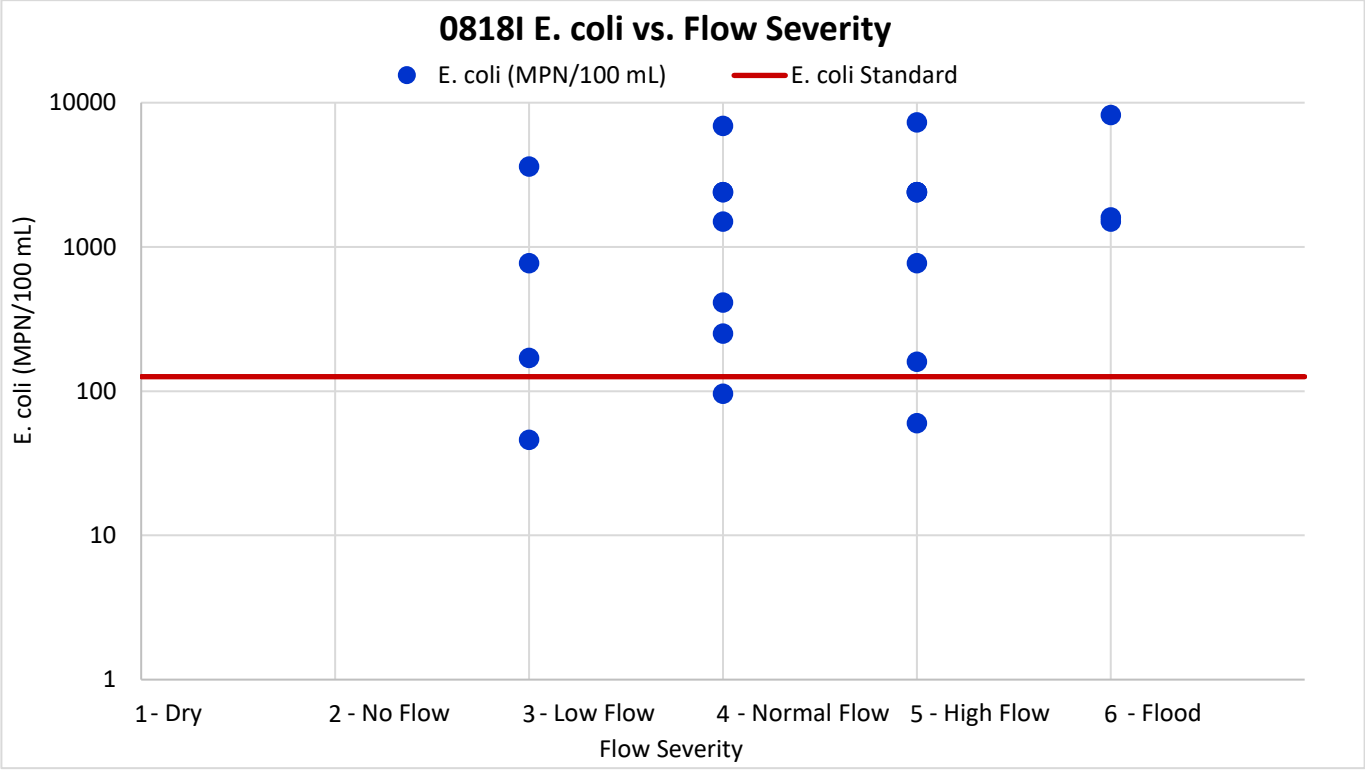


Figure 364: 0818I E. coli vs. Flow Severity

0818A One Mile Creek

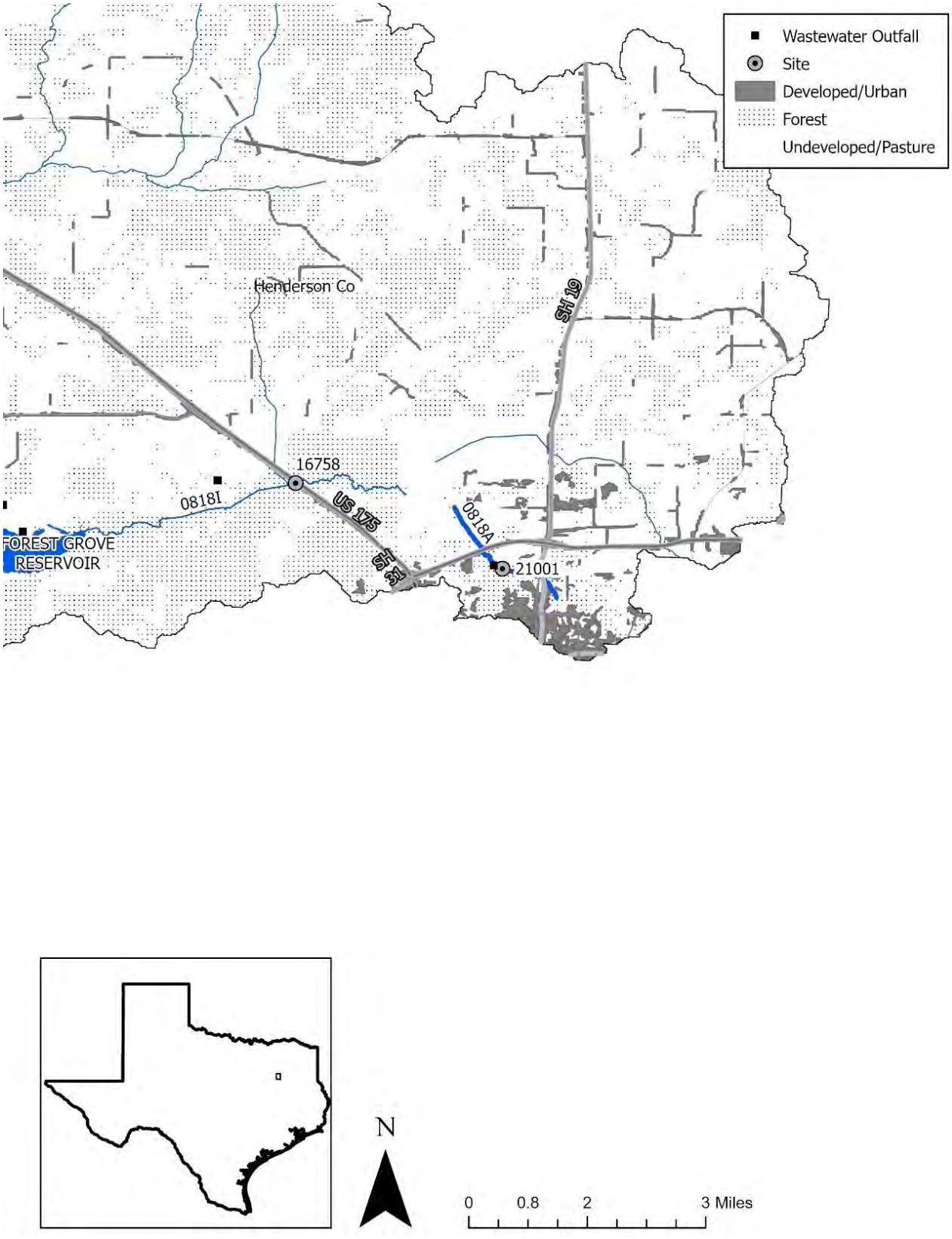


Figure 365: Segment 0818A Map

This 2-mile unclassified segment runs from the confluence with an unnamed tributary 0.8 km upstream of SH 19 near Athens to the confluence with Valley View Reservoir (see Figure 365). The upstream end of the stream drains the developed City of Athens while the downstream portion drains hay and pasture land. The watershed lies within the Northern Post Oak Savanna ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. No significant trends were identified during TRA data analysis. Monitoring in this segment was limited to permit support flow monitoring conducted from 2011 to 2013.

0818 Cedar Creek Reservoir

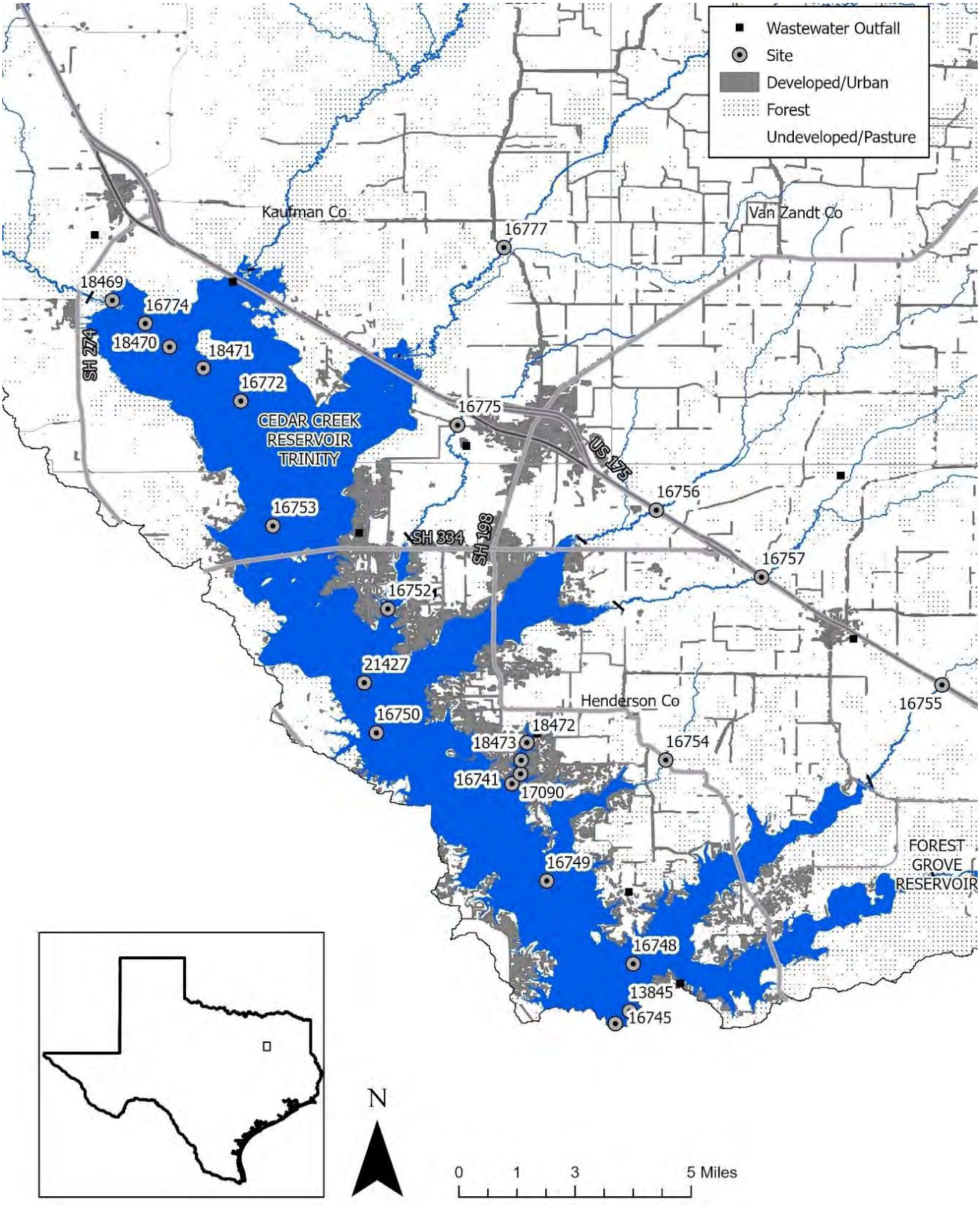


Figure 366: Segment 0818 Map

This 32,900-acres reservoir impounds Cedar Creek from the Joe B. Hoggsett Dam in Henderson County up to a normal pool elevation of 322 feet (see Figure 366). The watershed is largely rural with hay and pasture land being the predominate land use especially to the east of the reservoir. To the west of the reservoir, there are some grasslands and small patches of forest. The shores of the reservoir are developed and contain mostly residential communities around the cities of Kemp, Mabank, Gun Barrel City, Seven Points, Tool, Enchanted Oaks, Log Cabin, and Star Harbor. The reservoir lies within the Northern Post Oak Savanna ecoregion. Cedar Creek Reservoir has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Water quality monitoring is being conducted at seven sites within this segment as shown in Table 300. Monitoring is being conducted by Tarrant Regional Water District and TCEQ Region 5. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 300: Segment 0818 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0818	PURTIS CREEK LAKE IN MAIN POOL 218 METERS NORTH AND 841 METERS W OF INTERSECTION OF VAN ZANDT CR 2914 AND FM 1861 19.3 KM N OF ATHENS	17949	TCEQ Region 5
0818_01	CEDAR CREEK RESERVOIR 710 M W AND 1.01 M W OF INTERSECTION OF WOODLAWN WAY AND SUNSET BLVD AT CONFLUENCE OF CANEY CK AND CLEAR CK COVES	16748	Tarrant Regional Water District
0818_04	CEDAR CREEK RESERVOIR 1.01 KM SOUTH AND 1.34 KM WEST OF INTERSECTION OF CAROLYNN ROAD AND OAKVIEW TRAIL	16749	Tarrant Regional Water District
0818_06	CEDAR CREEK RESERVOIR 12 METERS NORTH AND 586 METERS EAST OF INTERSECTION OF ASHBY LANE AND BURLEY LOOP	16747	Tarrant Regional Water District
0818_09	CEDAR CREEK RESERVOIR 1.42 KM NORTH AND 1.37 KM EAST OF INTERSECTION OF NOB HILL ROAD AND SH 334	16753	Tarrant Regional Water District
0818_11	CEDAR CREEK RESERVOIR NORTH MID LAKE 800 M NORTH AND 2.59 KM EAST OF INTERSECTION OF KAUFMAN CR 4042 AND KAUFMAN CR 4043	16772	Tarrant Regional Water District
0818_14	CEDAR CREEK RESERVOIR 1.07 KM EAST AND 40 METERS NORTH OF THE INNER CIRCLE UPPER CHANNEL NEAR INTERSECTION OF HEATHER WOODS DRIVE AND LEISA PLACE IN THE CITY OF TOOL	21427	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 301. Results of TRA trend analyses are shown in Table 302.

Table 301: TCEQ 2020 Texas Integrated Report Summary for Segment 0818

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818_04 Lower portion of reservoir east of Key Ranch Estates	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818_11 Upper portion of reservoir east of Tolosa	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818_13 From Joe B. Hoggsett Dam in Henderson County up to normal pool elevation of 322 feet	Aquatic Life Use	Dissolved Oxygen	3 mg/L	CS
0818_14 Remainder of reservoir	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0818_04 Lower portion of reservoir east of Key Ranch Estates	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0818_11 Upper portion of reservoir east of Tolosa	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0818_14 Remainder of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_02 Caney Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_03 Clear Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_04 Lower portion of reservoir east of Key Ranch Estates	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_05 Cove off lower portion of reservoir adjacent to Clearview Estates	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_07 Twin Creeks cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_08 Prairie Creek cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_10 Lacy Fork cove	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_11 Upper portion of reservoir east of Tolosa	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_12 Uppermost portion of reservoir downstream of Kings Creek	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_13 From Joe B. Hoggsett Dam in Henderson County up to normal pool elevation of 322 feet	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_14 Remainder of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NC
0818_02 Caney Creek cove	General Use	High pH	6 - 8.5 S.U.	NS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818_03 Clear Creek cove	General Use	High pH	6 - 8.5 S.U.	NS
0818_04 Lower portion of reservoir east of Key Ranch Estates	General Use	High pH	6 - 8.5 S.U.	NS
0818_05 Cove off lower portion of reservoir adjacent to Clearview Estates	General Use	High pH	6 - 8.5 S.U.	NS
0818_07 Twin Creeks cove	General Use	High pH	6 - 8.5 S.U.	NS
0818_08 Prairie Creek cove	General Use	High pH	6 - 8.5 S.U.	NS
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	General Use	High pH	6 - 8.5 S.U.	NS
0818_11 Upper portion of reservoir east of Tolosa	General Use	High pH	6 - 8.5 S.U.	NS
0818_12 Uppermost portion of reservoir downstream of Kings Creek	General Use	High pH	6 - 8.5 S.U.	NS
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	General Use	pH	6 - 8.5 S.U.	FS
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	General Use	pH	6 - 8.5 S.U.	FS
0818_14 Remainder of reservoir	General Use	pH	6 - 8.5 S.U.	FS
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	General Use	Chloride	50 mg/L	FS
0818_02 Caney Creek cove	General Use	Chloride	50 mg/L	FS
0818_03 Clear Creek cove	General Use	Chloride	50 mg/L	FS
0818_04 Lower portion of reservoir east of Key Ranch Estates	General Use	Chloride	50 mg/L	FS
0818_05 Cove off lower portion of reservoir adjacent to Clearview Estates	General Use	Chloride	50 mg/L	FS
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	General Use	Chloride	50 mg/L	FS
0818_07 Twin Creeks cove	General Use	Chloride	50 mg/L	FS
0818_08 Prairie Creek cove	General Use	Chloride	50 mg/L	FS
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	General Use	Chloride	50 mg/L	FS
0818_10 Lacy Fork cove	General Use	Chloride	50 mg/L	FS
0818_11 Upper portion of reservoir east of Tolosa	General Use	Chloride	50 mg/L	FS
0818_12 Uppermost portion of reservoir downstream of Kings Creek	General Use	Chloride	50 mg/L	FS
0818_13 From Joe B. Hoggsett Dam in Henderson County up to normal pool elevation of 322 feet	General Use	Chloride	50 mg/L	FS
0818_14 Remainder of reservoir	General Use	Chloride	50 mg/L	FS
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	General Use	Sulfate	100 mg/L	FS
0818_02 Caney Creek cove	General Use	Sulfate	100 mg/L	FS
0818_03 Clear Creek cove	General Use	Sulfate	100 mg/L	FS
0818_04 Lower portion of reservoir east of Key Ranch Estates	General Use	Sulfate	100 mg/L	FS
0818_05 Cove off lower portion of reservoir adjacent to Clearview Estates	General Use	Sulfate	100 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	General Use	Sulfate	100 mg/L	FS
0818_07 Twin Creeks cove	General Use	Sulfate	100 mg/L	FS
0818_08 Prairie Creek cove	General Use	Sulfate	100 mg/L	FS
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	General Use	Sulfate	100 mg/L	FS
0818_10 Lacy Fork cove	General Use	Sulfate	100 mg/L	FS
0818_11 Upper portion of reservoir east of Tolosa	General Use	Sulfate	100 mg/L	FS
0818_12 Uppermost portion of reservoir downstream of Kings Creek	General Use	Sulfate	100 mg/L	FS
0818_13 From Joe B. Hoggsett Dam in Henderson County up to normal pool elevation of 322 feet	General Use	Sulfate	100 mg/L	FS
0818_14 Remainder of reservoir	General Use	Sulfate	100 mg/L	FS
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	General Use	Total Dissolved Solids	200 mg/L	FS
0818_02 Caney Creek cove	General Use	Total Dissolved Solids	200 mg/L	FS
0818_03 Clear Creek cove	General Use	Total Dissolved Solids	200 mg/L	FS
0818_04 Lower portion of reservoir east of Key Ranch Estates	General Use	Total Dissolved Solids	200 mg/L	FS
0818_05 Cove off lower portion of reservoir adjacent to Clearview Estates	General Use	Total Dissolved Solids	200 mg/L	FS
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	General Use	Total Dissolved Solids	200 mg/L	FS
0818_07 Twin Creeks cove	General Use	Total Dissolved Solids	200 mg/L	FS
0818_08 Prairie Creek cove	General Use	Total Dissolved Solids	200 mg/L	FS
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	General Use	Total Dissolved Solids	200 mg/L	FS
0818_10 Lacy Fork cove	General Use	Total Dissolved Solids	200 mg/L	FS
0818_11 Upper portion of reservoir east of Tolosa	General Use	Total Dissolved Solids	200 mg/L	FS
0818_12 Uppermost portion of reservoir downstream of Kings Creek	General Use	Total Dissolved Solids	200 mg/L	FS
0818_13 From Joe B. Hoggsett Dam in Henderson County up to normal pool elevation of 322 feet	General Use	Total Dissolved Solids	200 mg/L	FS
0818_14 Remainder of reservoir	General Use	Total Dissolved Solids	200 mg/L	FS
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	General Use	Water temperature	33.9 °F	FS
0818_04 Lower portion of reservoir east of Key Ranch Estates	General Use	Water temperature	33.9 °F	FS
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	General Use	Water temperature	33.9 °F	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	General Use	Water temperature	33.9 °F	FS
0818_11 Upper portion of reservoir east of Tolosa	General Use	Water temperature	33.9 °F	FS
0818_14 Remainder of reservoir	General Use	Water temperature	33.9 °F	FS
0818_01 Lowermost portion of the reservoir, adjacent to the dam.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0818_04 Lower portion of reservoir east of Key Ranch Estates	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0818_06 Middle portion of reservoir downstream of Twin Creeks cove	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0818_09 Upper portion of reservoir adjacent to Lacy Fork cove	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0818_11 Upper portion of reservoir east of Tolosa	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0818_14 Remainder of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment units 0818_02, 0818_03, 0818_05, 0818_07, 0818_10, and 0818_13 for the period of record for this basin summary report. Data for assessment units 0818_08 and 0818_12 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

Table 302: Significant Trends for Segment 0818 (P-value<0.1)

Segment & Assessment Unit		0818_01	0818_04	0818_06	0818_06	0818_09	0818_11	0818_14
Site		16748	16749	16747	16750	16753	16772	21427
Water Temperature	All	No Trend	No Trend	No Trend	Not Significant	No Trend	No Trend	Not Significant
	Summer	Not Significant	Not Significant	No Trend	↑	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Secchi Depth	All	Not Significant	Not Significant	Insufficient Data	No Trend	Not Significant	Not Significant	Insufficient Data
	Summer	↑	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	Insufficient Data
	Winter	↓	Not Significant	Insufficient Data	Not Significant	Not Significant	Not Significant	Insufficient Data
Specific Conductance	All	↓	↓	No Trend	↓	↓	↓	↓*
	Summer	↓	↓	↓	↓	↓	↓	Not Significant
	Winter	↓	↓	↓	Not Significant	↓	↓	Not Significant
Dissolved Oxygen	All	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	↓*
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant

Segment & Assessment Unit		0818_01	0818_04	0818_06	0818_06	0818_09	0818_11	0818_14
Site		16748	16749	16747	16750	16753	16772	21427
pH	All	Not Significant	Not Significant	No Trend	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	↓	↓	↓	Not Significant	↓	↓	Not Significant
	Winter	Not Significant	↓	↓	Not Significant	Not Significant	Not Significant	Not Significant
Alkalinity	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Insufficient Data	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Insufficient Data	Not Significant
	Winter	↓	↓	↓	↓	↓	Insufficient Data	Not Significant
Total Suspended Solids	All	No Trend	No Trend	No Trend	No Trend	Not Significant	Insufficient Data	Not Significant
	Summer	No Trend	No Trend	Not Significant	No Trend	Not Significant	Insufficient Data	Not Significant
	Winter	↑	No Trend	No Trend	Not Significant	Not Significant	Insufficient Data	Not Significant
Ammonia	All	↓	No Trend	↓	↓	↓	Insufficient Data	No Trend
	Summer	↓	No Trend	↓	↓	No Trend	Insufficient Data	No Trend
	Winter	↓	↓	↓	Not Significant	↓	Insufficient Data	Not Significant
Nitrate	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Insufficient Data	Insufficient Data
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Insufficient Data	Insufficient Data
	Winter	No Trend	No Trend	No Trend	↑	↑	Insufficient Data	Insufficient Data
Total Kjeldahl Nitrogen	All	No Trend	No Trend	Not Significant	No Trend	Not Significant	Insufficient Data	↑*
	Summer	No Trend	Not Significant	↓	↓	Not Significant	Insufficient Data	↑*
	Winter	↓	↓	Not Significant	No Trend	Not Significant	Insufficient Data	Not Significant
Total Phosphorus	All	No Trend	No Trend	No Trend	Not Significant	No Trend	Insufficient Data	Not Significant
	Summer	No Trend	↓	↓	No Trend	No Trend	Insufficient Data	Not Significant
	Winter	↓	No Trend	No Trend	Not Significant	No Trend	Insufficient Data	Not Significant
Orthophosphate	All	Not Significant	Not Significant	Not Significant	No Trend	No Trend	Insufficient Data	Not Significant
	Summer	Not Significant	Not Significant	↓	No Trend	No Trend	Insufficient Data	Not Significant
	Winter	Not Significant	No Trend	No Trend	Not Significant	Not Significant	Insufficient Data	Not Significant
Total Organic Carbon	All	No Trend	No Trend	No Trend	↓	No Trend	Insufficient Data	Not Significant
	Summer	No Trend	No Trend	No Trend	Not Significant	No Trend	Insufficient Data	Not Significant
	Winter	Not Significant	Not Significant	↓	↓	Not Significant	Insufficient Data	Not Significant
Hardness	All	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Calcium	All	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Magnesium	All	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Sodium	All	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Chloride	All	↓	↓	↓	Not Significant	↓	Insufficient Data	Insufficient Data
	Summer	↓	↓	↓	Not Significant	↓	Insufficient Data	Insufficient Data
	Winter	↓	↓	↓	Not Significant	↓	Insufficient Data	Insufficient Data
Sulfate	All	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data

Segment & Assessment Unit		0818_01	0818_04	0818_06	0818_06	0818_09	0818_11	0818_14
Site		16748	16749	16747	16750	16753	16772	21427
Total Iron	All	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Dissolved Solids	All	↓	↓	↓	No Trend	↓	Not Significant	↓*
	Summer	↓	↓	↓	Not Significant	↓	↓	↓*
	Winter	↓	↓	↓	Not Significant	Not Significant	Not Significant	↓*
Chlorophyll-*a*	All	No Trend	No Trend	↓	Not Significant	No Trend	Insufficient Data	Insufficient Data
	Summer	↓	↓	↓		↓	Insufficient Data	Insufficient Data
	Winter	↓	↓	↓	↓	No Trend	Insufficient Data	Insufficient Data
Phytoplankton	All	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

An impairment for elevated pH was identified for several assessment units in this reservoir. However, the pH standard range for this reservoir is 6 to 8.5 S.U. while the standard is 6.5 to 9 S.U. for other waterbodies in the Trinity Basin. For the data used in this basin summary report, there were at total of 539 pH records. Of these, 170 records were greater than or equal to 8.5 S.U. There were 54 records reported at greater than or equal to 9 S.U. Assessment unit 0818_06 (station 16747) had the most data points (n=157). pH for this station is shown in Figure 367. Overall, it does appear that algal populations were affecting pH levels in this reservoir. For each of the stations and assessment units shown in Table 302, correlation coefficients between pH and chlorophyll-*a* ranged between 0.397 and 0.658 with station 16747 in assessment unit 0818_06 being the highest. These pH impairments are a concern for aquatic life because higher pH levels can increase the solubility of nutrients making them more available for algal uptake which could lead to algal blooms that can affect dissolved oxygen levels and fish kills. It does appear that algal populations may have been having some effect on dissolved oxygen levels in some of the upper portions of the reservoir but were not a concern overall. Of 532 dissolved oxygen values, only 15 were reported below the grab sample screening level of 5 mg/L. Only one value was reported below the grab sample minimum standard of 3 mg/L and this value was reported during a drought period. There was a concern for depressed dissolved oxygen in assessment unit 0818_13. This concern was carried forward from previous Integrated Reports as there was not current monitoring available in this assessment unit. 0818_13 is located in the cove of Cedar Creek in the far northeastern portion of the reservoir. It is interesting to note that the adjacent assessment unit – 0818_11 – had a correlation coefficient of -0.554 between dissolved oxygen and chlorophyll-*a* which indicates that lower dissolved oxygen levels were reported when there were higher algal populations present and may support the assumption that similar issues still exist in 0818_13. It is recommended that monitoring be conducted in 0818_13 to further address the carry forward concern in the Integrated Report.

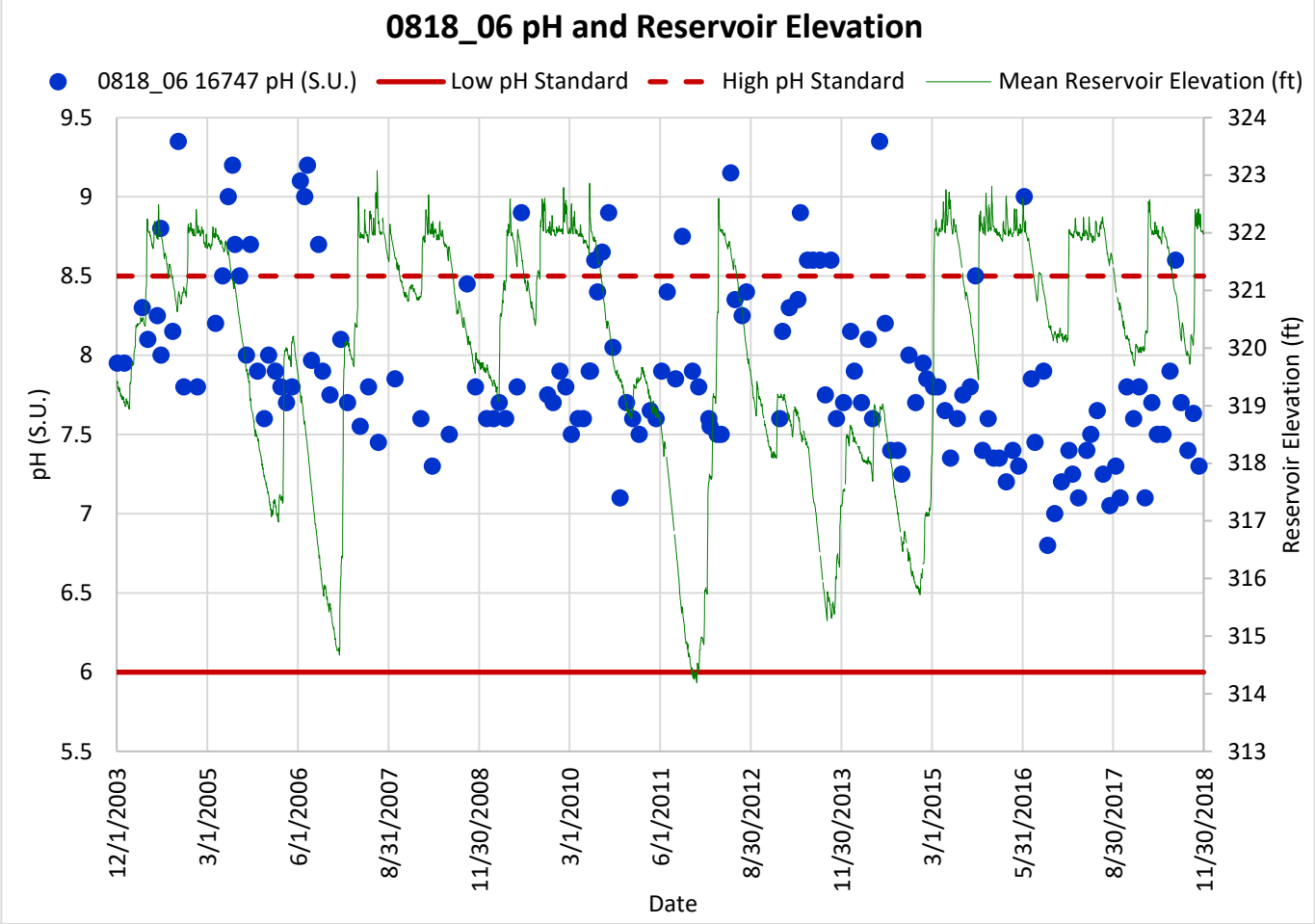


Figure 367: 0818_06 pH and Reservoir Elevation

The increasing winter trend for total suspended solids in assessment unit 0818_01 appears to have been related to the drought recovery period in 2015 and 2016 as shown in Figure 368. The prolonged drought of 2011 to 2015 broke in the winter of 2015 which coincides with the increasing total suspended solids trend seen in this assessment unit. This would have been caused by sediments being washed into the reservoir during the precipitation events that increased the reservoir elevation during the drought recovery period. This same pattern was seen in the increasing winter nitrate trend in assessment unit 0818_09 and was likely caused by fertilizers being washed into the reservoir during drought recovery precipitation events.

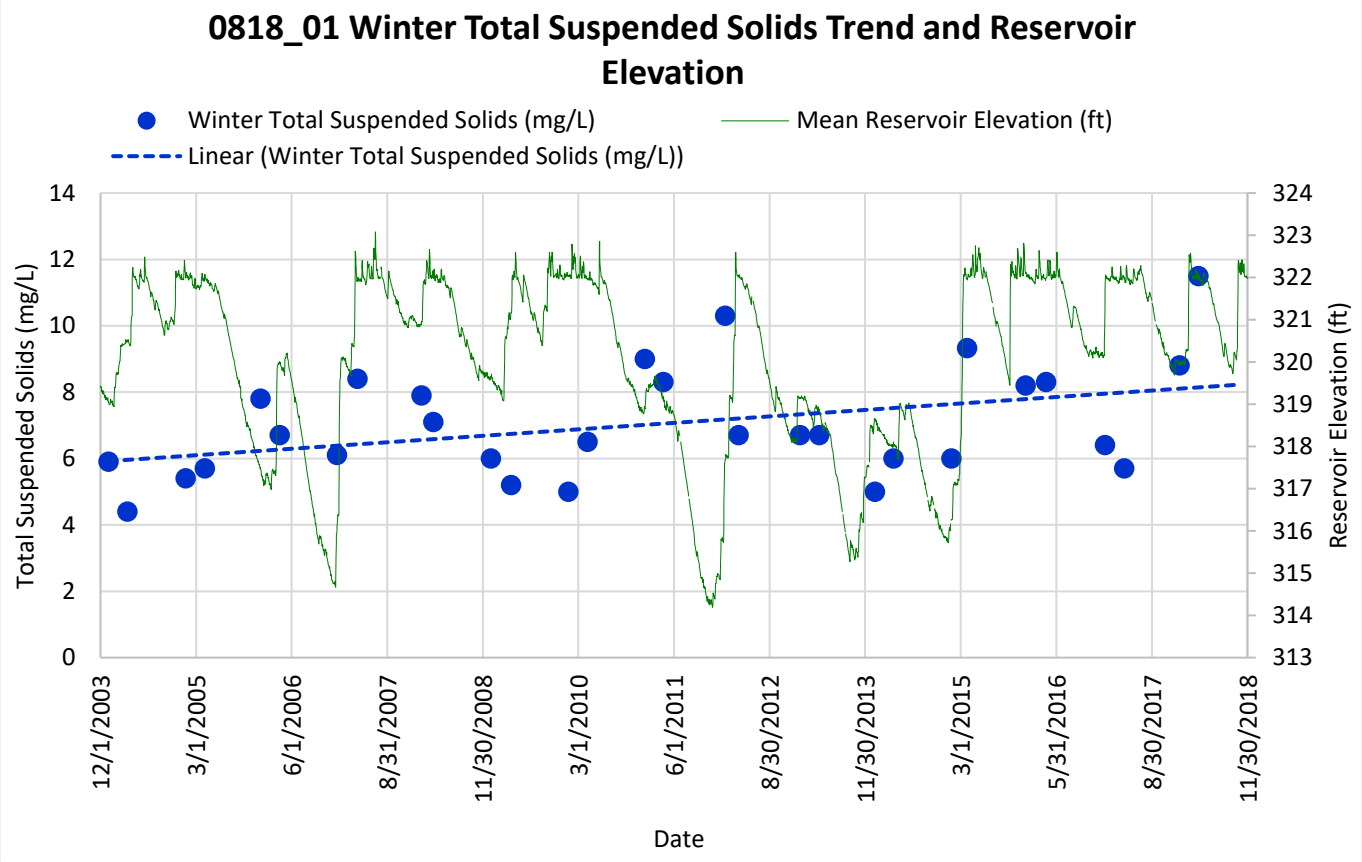


Figure 368: 0818_01 Winter Total Suspended Solids Trend and Reservoir Elevation

There was an increasing trend for total kjeldahl nitrogen identified in assessment unit 0818_14. Monitoring in this assessment unit began in 2014 during the prolonged drought of 2011 to 2015 so any trends identified in this data set are inherently weak. The trends may not be indicative of long-term water quality changes but rather responses to shorter-term weather patterns. Regardless, these trends should be watched and re-evaluated in the future. Increased levels of total kjeldahl nitrogen were measured as reservoir elevations increased. Ongoing monitoring in this assessment unit will help determine if this was a true change in water quality or an artifact of the timing of sampling in regard to the drought and recovery cycle.

An increasing trend was identified for total iron in assessment unit 0818_06 (station 16747) as shown in Figure 369. This trend appears to have been related to two factors: changes in detection limits and drought recovery. In the early portion of the data set, the detection limit was 300 µg/L and decreased to 125 µg/L in late 2007 and is currently 20 µg/L. Of the 63 data points represented in the graph, only 10 were reported above 300 µg/L. In addition, 6 of these were collected during drought recovery periods. Iron containing sediments being washed into the reservoir during precipitation events was the likely cause for these elevated levels of total iron.

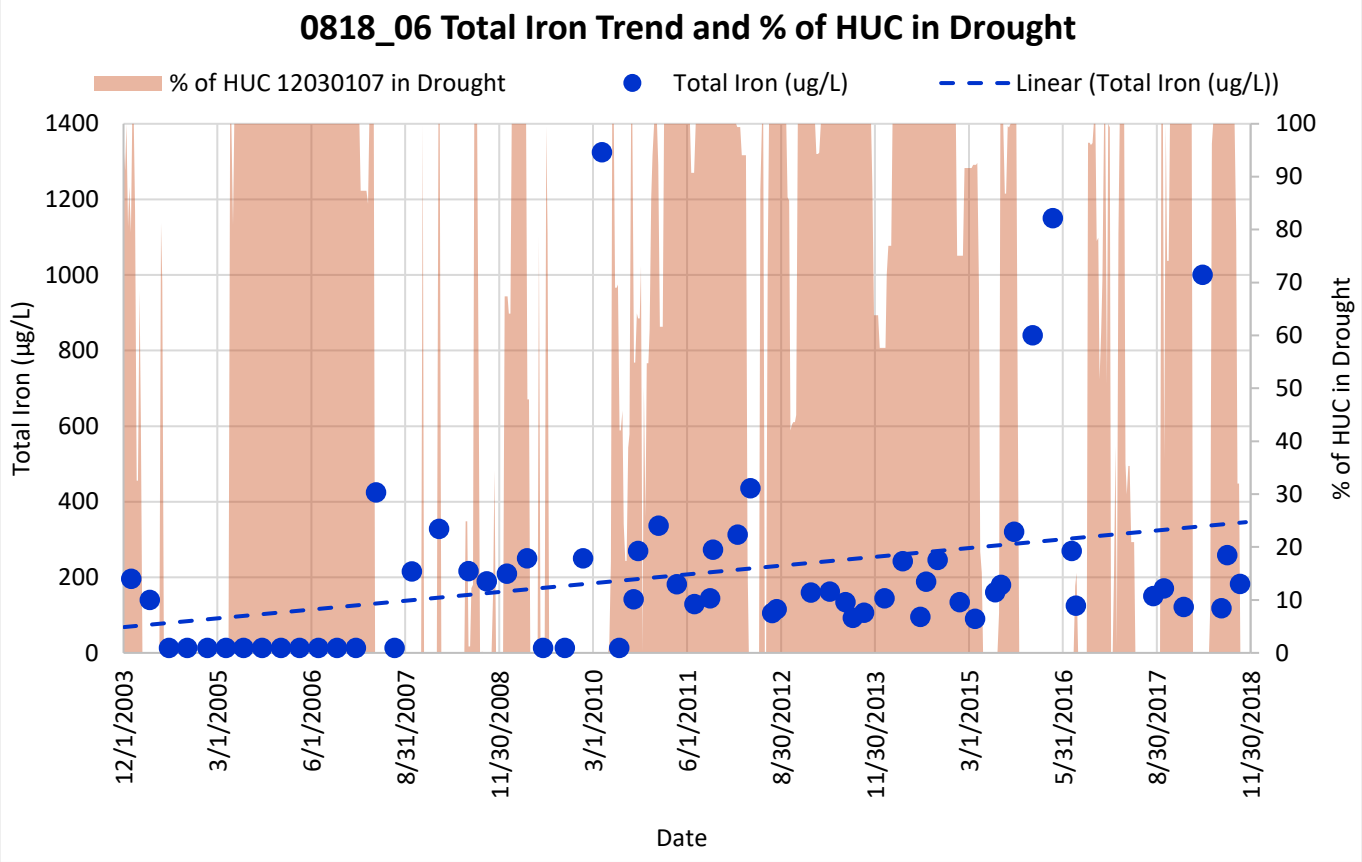


Figure 369: 0818_06 Total Iron Trend and % of HUC in Drought

Richland-Chambers

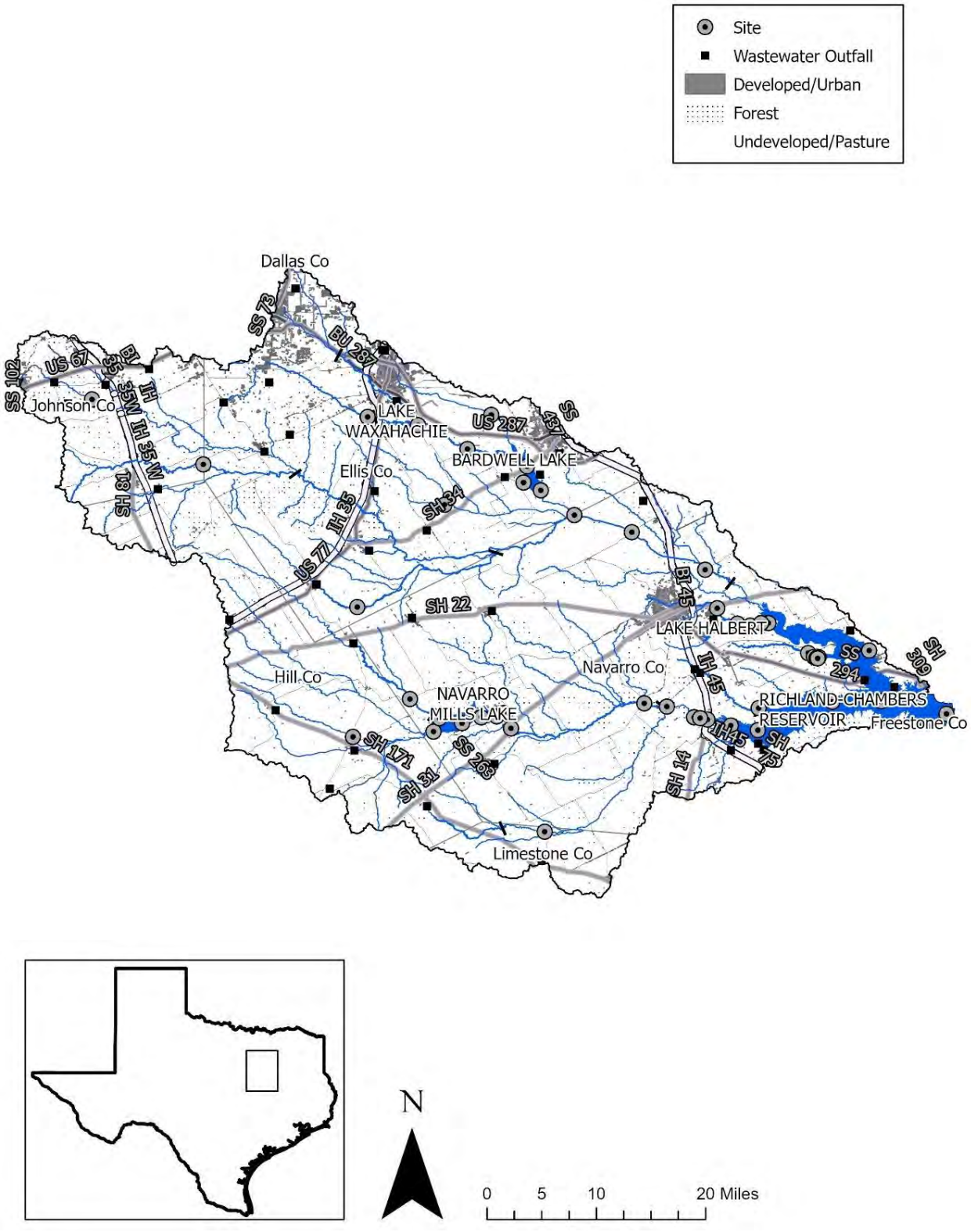


Figure 370: Richland-Chambers Overview Map

The Richland-Chambers subwatershed extends approximately 100 river miles on the Chambers Creek branch and 79 miles on the Richland Creek branch (see Figure 370). Chambers Creek begins in Johnson County and Richland Creek begins in Hill County. These two creeks come together to form Richland-Chambers Reservoir and the subwatershed ends at the dam in Freestone County. The subwatershed is predominately rural with crop and grasslands. The major population centers include Waxahachie and Corsicana. This subwatershed receives between 35 and 41 inches of precipitation annually. The far northwestern portion of the subwatershed drains the Eastern Cross Timbers while the remainder of the watershed drains the Northern Blackland Prairie with the exception of a small area of Southern Post Oak Savanna around the downstream end of the reservoir.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0816A South Prong Creek
- 0816 Lake Waxahachie
- 0815A Waxahachie Creek
- 0815 Bardwell Reservoir
- 0814B South Fork Chambers Creek
- 0814A Mill Creek
- 0814 Chambers Creek Above Richland-Chambers Reservoir
- 0836D Post Oak Creek
- 0836B Cedar Creek
- 0836C Grape Creek
- 0817A Richland Creek
- 0817 Navarro Mills Lake
- 0837 Richland Creek Above Richland-Chambers Reservoir
- 0836A Pin Oak Creek
- 0836 Richland-Chambers Reservoir

0816A South Prong Creek

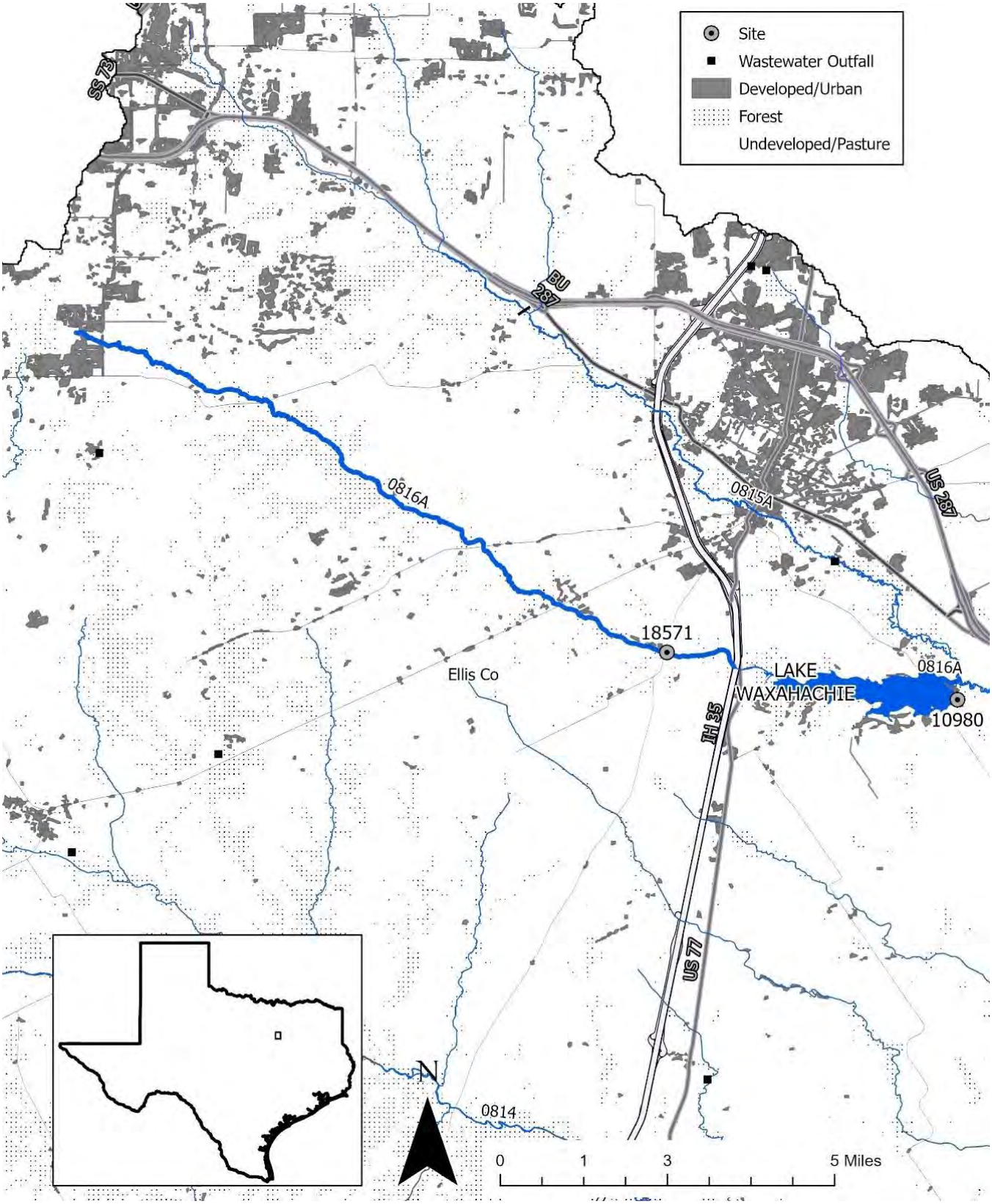


Figure 371: Segment 0816A Map

This 12.2-mile stream runs from the upper end of the creek in Midlothian to the confluence with Lake Waxahachie (see Figure 371). The most upstream portion of the stream drains the developed areas on the outskirts of the City of Midlothian. The remainder of the watershed is rural with a mix of grass, hay, pasture, and crop land. There are some wooded areas near the middle of the watershed. The stream drains the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0816A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0816 Lake Waxahachie

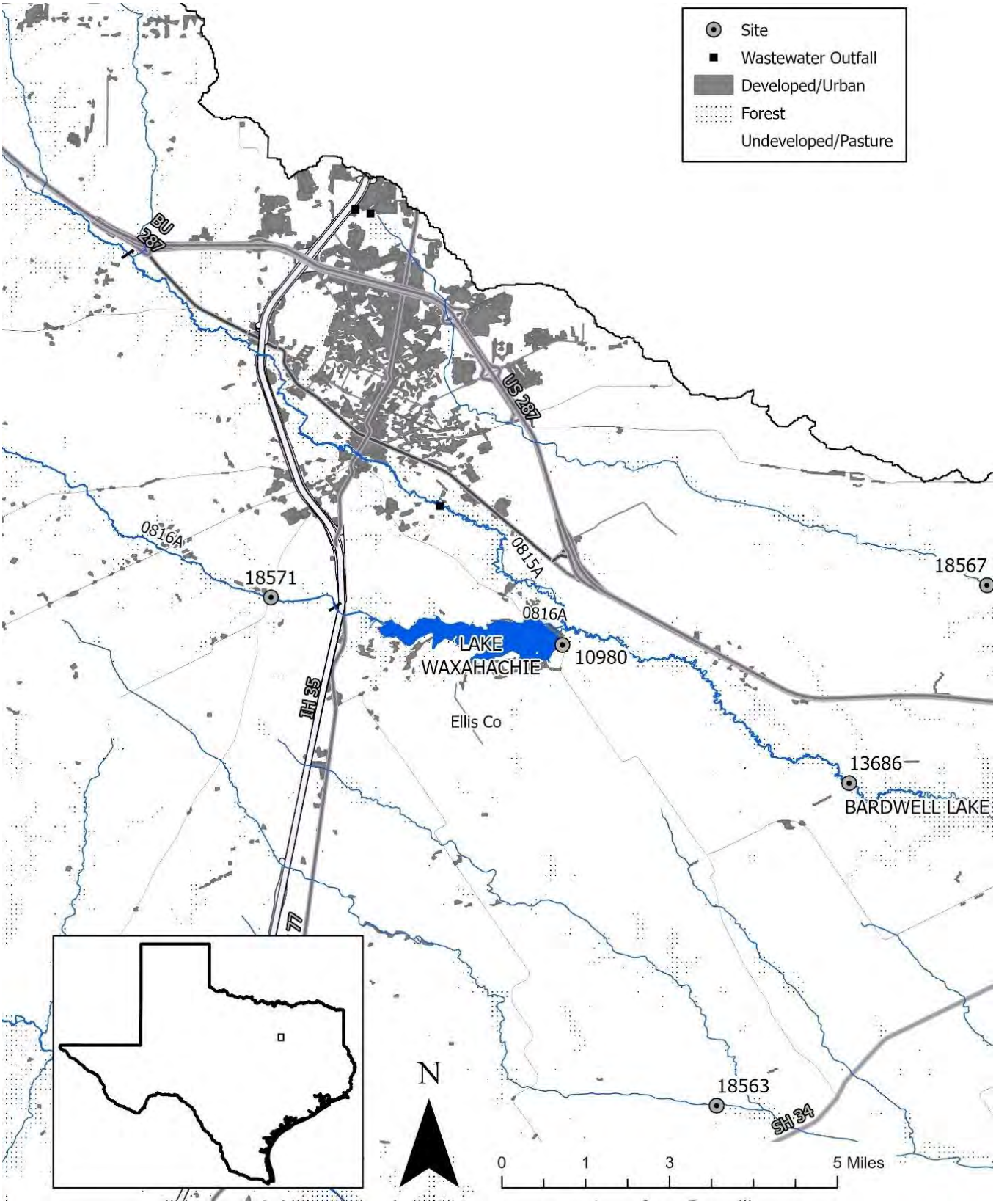


Figure 372: Segment 0816 Map

This 669.9-acre segment impounds South Prong Creek in Ellis County up to a normal pool elevation of 531.5 feet (see Figure 372). The reservoir is surrounded by grass and crop land with some smaller areas of hay and pasture land, forest, and development along the shores of the reservoir. It lies within the Northern Blackland Prairie ecoregion. Lake Waxahachie has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Water quality monitoring is being conducted at one site within this segment as shown in Table 303. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 303: Segment 0816 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0816_01	LAKE WAXAHACHIE 474 METERS NORTH AND 143 METERS EAST OF INTERSECTION OF OLD HOWARD LANE AND PENN ROAD MID LAKE NEAR DAM	10980	TRA

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 304. Results of TRA trend analyses are shown in Table 305.

Table 304: TCEQ 2020 Texas Integrated Report Summary for Segment 0816

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	General Use	Nutrient Reservoir Criteria		FS
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	General Use	pH	6.5 - 9 S.U.	FS
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	General Use	Chloride	50 mg/L	FS
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	General Use	Sulfate	50 mg/L	FS
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	General Use	Total Dissolved Solids	300 mg/L	FS
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	General Use	Water temperature	32.8 °F	FS
0816_01 From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting

Table 305: Significant Trends for Segment 0816 (P-value<0.1)

Segment & Assessment Unit		0816_01
Site		10980
Secchi Depth	All	↓
	Summer	↓
	Winter	Not Significant
Specific Conductance	All	↑
	Summer	↑
	Winter	Not Significant
Total Phosphorus	All	↑
	Summer	↑
	Winter	↑
Chloride	All	↑
	Summer	↑
	Winter	Not Significant
Sulfate	All	Not Significant
	Summer	↑
	Winter	Not Significant
Fluoride	All	Not Significant
	Summer	↑
	Winter	Not Significant
Days Since Precipitation	All	No Trend
	Summer	No Trend
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

Increasing trends for specific conductance, chloride, sulfate, and fluoride were identified for this reservoir. These trends were clearly influenced by drought conditions and is best illustrated by chloride in Figure 373. As shown, the highest concentrations were measured during the prolonged drought of 2011 to 2015. During drought conditions, as water in the streams and reservoirs evaporate, the remaining constituents in the water begin to concentrate. Then these concentrations will decrease due to dilution from precipitation during the drought recovery periods.

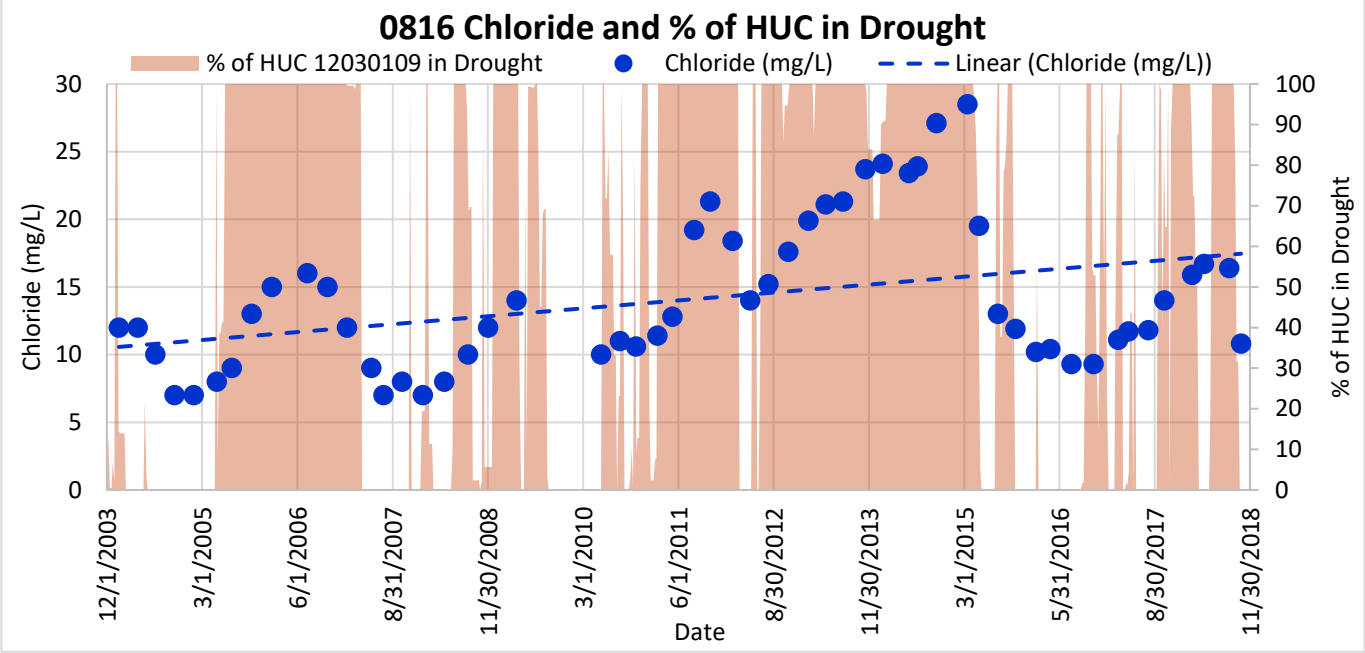


Figure 373: 0816 Chloride and % of HUC in Drought

The increasing trend for total phosphorus appears to have largely been an artifact of the detection limit rather than actual changes in water quality as shown in Figure 374. Data collected in the early portion of the data set were analyzed with a detection limit of 0.06 and 0.05 mg/L and were censored down to 0.005 mg/L as discussed in the Data Preparation section of Appendix C. The detection limit was later decreased to 0.02 mg/L. For the period of record used in this basin summary report, only one record was reported above 0.06 mg/L.

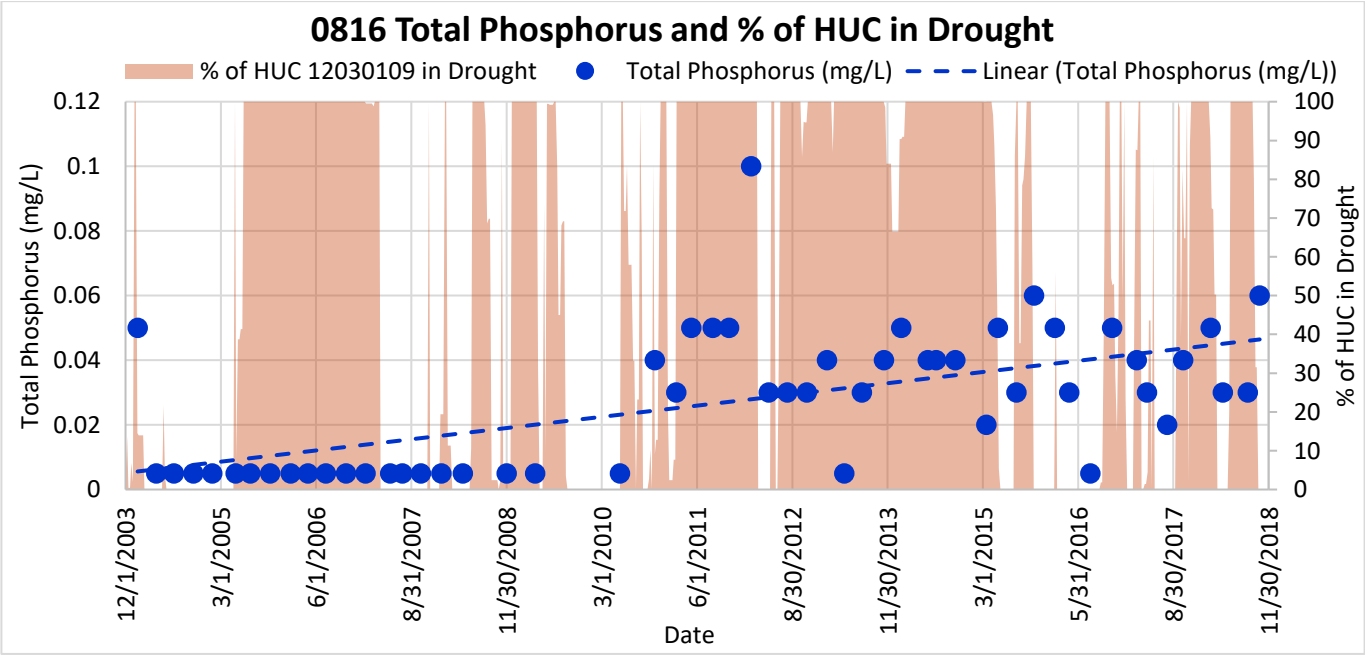


Figure 374: 0816 Total Phosphorus and % of HUC in Drought

0815A Waxahachie Creek

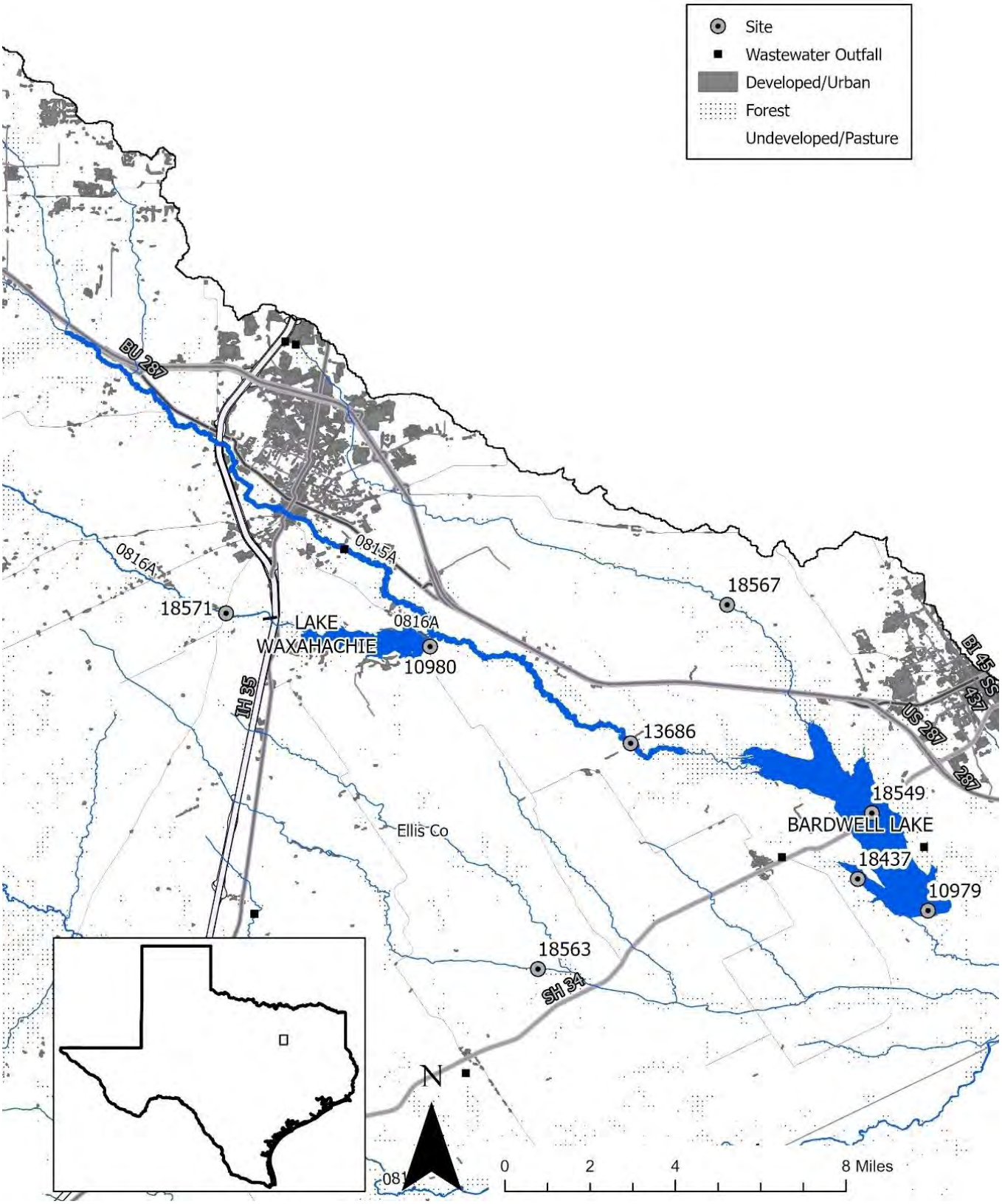


Figure 375: Segment 0815A Map

This 24.2-mile unclassified segment runs from the confluence with North Prong Creek to the confluence with the normal pool elevation of Bardwell Reservoir (see Figure 375). The upper portion of the stream drains the developed areas in the cities of Midlothian and Waxahachie. Between these two cities, the watershed is a mix of grass, hay, pasture, and crop land. Downstream of Waxahachie, the watershed is largely crop land. The stream flows through the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 306. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 306: Segment 0815A FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0815A_01	WAXAHACHIE CREEK AT GELZENDANER ROAD	13686	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 307.

Table 307: TCEQ 2020 Texas Integrated Report Summary for Segment 0815A

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0815A_01 From confluence with normal pool Bardwell Reservoir up to confluence with North Prong Creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NC
0815A_01 From confluence with normal pool Bardwell Reservoir up to confluence with North Prong Creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0815A_01 From confluence with normal pool Bardwell Reservoir up to confluence with North Prong Creek	General Use	Ammonia	0.33 mg/L	NC
0815A_01 From confluence with normal pool Bardwell Reservoir up to confluence with North Prong Creek	General Use	Nitrate	1.95 mg/L	CS
0815A_01 From confluence with normal pool Bardwell Reservoir up to confluence with North Prong Creek	General Use	Total Phosphorus	0.69 mg/L	NC
0815A_01 From confluence with normal pool Bardwell Reservoir up to confluence with North Prong Creek	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CN = Use Concern CS = Screening Level Concern NC = No Concern

Data for assessment unit 0815A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

The concerns for *E. coli* and nitrate were based on limited data sets although there was a concern for nitrate that was carried forward from previous assessments prior to recent monitoring. TRA began sampling in this segment in late 2016 in response to the findings of prior Integrated Reports. The site is being maintained on the TRA monitoring schedule as it is providing useful input for the Richland-Chambers Watershed Protection Plan.

The geomean for the *E. coli* data was 180 MPN/100 mL which exceeds the standard of 126 MPN/100 mL. Of the nine samples in the data set for this basin summary report, only one sample was reported below the standard; the minimum value was 58 MPN/100 mL and the maximum was 480 MPN/100 mL. There was no correlation between *E. coli* and flow (correlation

coefficient = 0.071). This indicates that there may have been constant sources of bacteria into the stream. There is a wooded riparian area directly upstream of monitoring station 13686 at Getzendaner Road and there is evidence of livestock trails entering the stream near the confluence with the Lake Waxahachie outfall based on Google Earth imagery. There is also a tributary entering Waxahachie Creek immediately upstream of the monitoring station and there is evidence of livestock trails entering this tributary. Therefore, the most likely sources of bacteria in this segment are livestock and wildlife. Landowner education and livestock best management practices may help reduce bacteria levels in Waxahachie Creek.

The concern for nitrate was well correlated to flow (correlation coefficient = -0.764) as shown in Figure 376 although this is based on a very small data set. As discussed for several other sections, this pattern of higher nutrient concentrations at lower flows is commonly seen in waterbodies downstream of wastewater treatment facilities. There is a wastewater treatment facility upstream of the confluence with the Lake Waxahachie outfall. There were strong correlations between chlorophyll-*a* and ammonia, nitrite, total phosphorus, and orthophosphate (correlation coefficients = 0.868, 0.875, 0.903, and 0.866, respectively) which might indicate that algal populations could be influenced by the nutrient levels in the stream and could potentially affect dissolved oxygen levels. However, the data set was very small, the maximum chlorophyll-*a* concentration was 17 µg/L, and the minimum dissolved oxygen level was 6.2 mg/L. The ongoing monitoring in this segment will help to further clarify these concerns and any relationships between flow and pollutant concentrations.

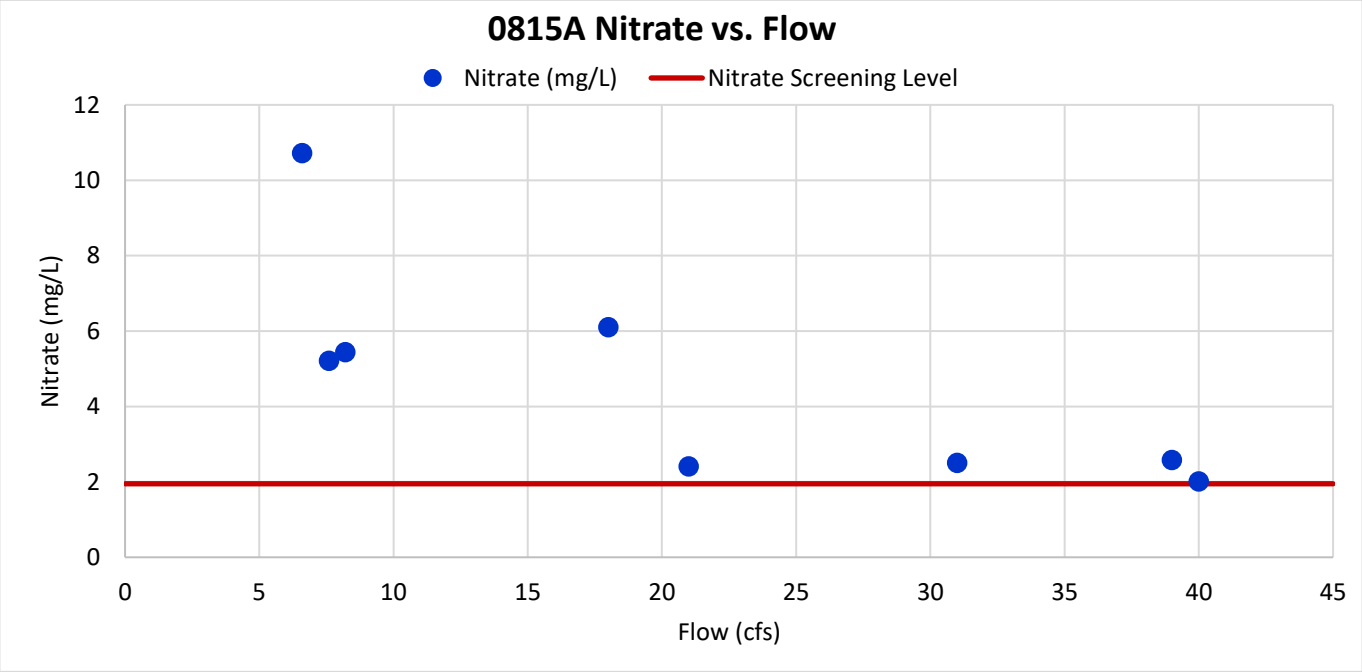


Figure 376: 0815A Nitrate vs. Flow

0815 Bardwell Reservoir

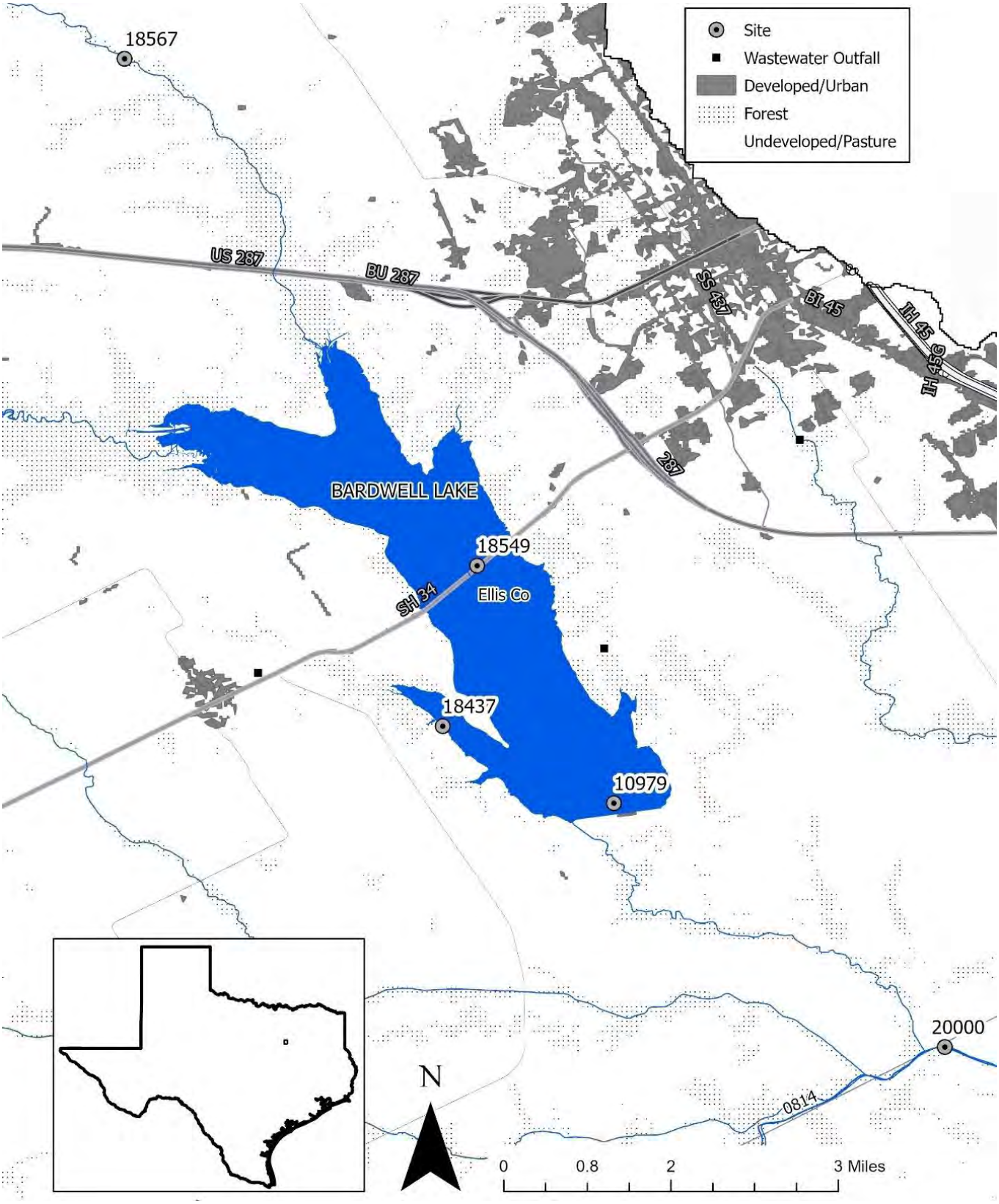


Figure 377: Segment 0815 Map

This 3280.6-acre reservoir impounds Waxahachie Creek from Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet (see Figure 377). Along the west side of the reservoir, the watershed is largely crop land while the east side is mostly hay, pasture, and grassland. The east side of the watershed is also developed by the City of Ennis. The reservoir lies within the Northern Blackland Prairie ecoregion. Bardwell Reservoir has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Water quality monitoring is being conducted at one site within this segment as shown in Table 308. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 308: Segment 0815 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0815_01	BARDWELL RESERVOIR 1.91 KM EAST AND 787 METERS NORTH OF INTERSECTION OF BARDWELL DAM RD AND FM 985 MID LAKE NEAR DAM USGS SITE AC	10979	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 309. Results of TRA trend analyses are shown in Table 310.

Table 309: TCEQ 2020 Texas Integrated Report Summary for Segment 0815

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	General Use	Nutrient Reservoir Narrative Criteria		NC
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	General Use	pH	6.5 - 9 S.U.	FS
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	General Use	Chloride	50 mg/L	FS
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	General Use	Sulfate	50 mg/L	**NS**
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	General Use	Total Dissolved Solids	300 mg/L	FS
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	General Use	Water temperature	32.8 °F	FS
0815_01 From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 310: Significant Trends for Segment 0815 (P-value<0.1)

Segment & Assessment Unit		0815_01
Site		10979
Secchi Depth	All	↓
	Summer	↓
	Winter	↓
pH	All	Not Significant
	Summer	↓
	Winter	Not Significant
Total Suspended Solids	All	Not Significant
	Summer	Not Significant
	Winter	↑
Total Kjeldahl Nitrogen	All	No Trend
	Summer	No Trend
	Winter	↓
Total Phosphorus	All	↑
	Summer	↑
	Winter	Not Significant
Total Organic Carbon	All	No Trend
	Summer	↑
	Winter	No Trend
Chloride	All	↑
	Summer	↑
	Winter	Not Significant
Sulfate	All	Not Significant
	Summer	↑
	Winter	Not Significant
Fluoride	All	↑
	Summer	↑
	Winter	↑
Days Since Precipitation	All	No Trend
	Summer	No Trend
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

An impairment due to elevated levels of sulfate was identified in this segment. As shown in Figure 378, this impairment appears to have been related to drought conditions. Many of the observations that were above the standard of 50 mg/L were seen during periods of drought; especially during the prolonged drought of 2011 to 2015. During drought conditions, as water in the streams and reservoirs evaporate, the remaining constituents in the water begin to concentrate. Then these concentrations will decrease due to dilution from precipitation during the drought recovery periods. There were increasing trends identified for total organic carbon, chloride, sulfate, and fluoride. These all followed the same pattern as see in Figure 378, being weighted by the recent prolonged drought.

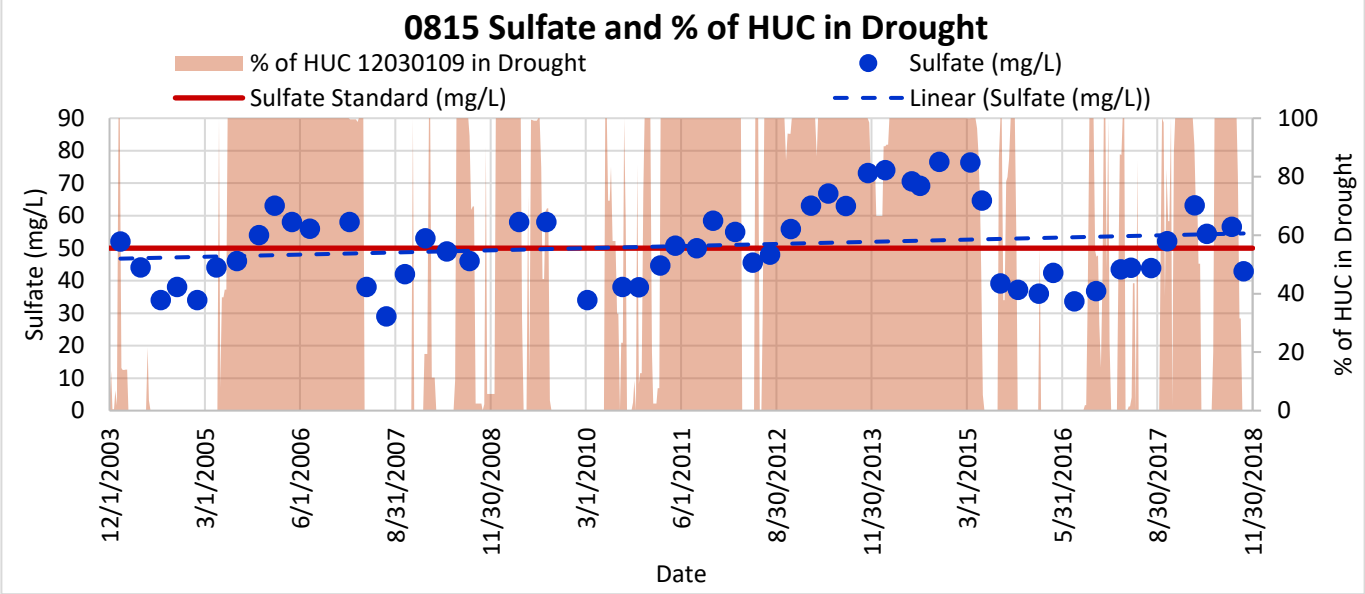


Figure 378: 0815 Sulfate and % of HUC in Drought

An increasing winter trend for total suspended solids was identified in this segment as shown in Figure 379. This trend was weighted by the drought recovery period in 2015 and 2016 and was likely due to sediments from the watershed being washed into the reservoir during winter precipitation events that broke the drought.

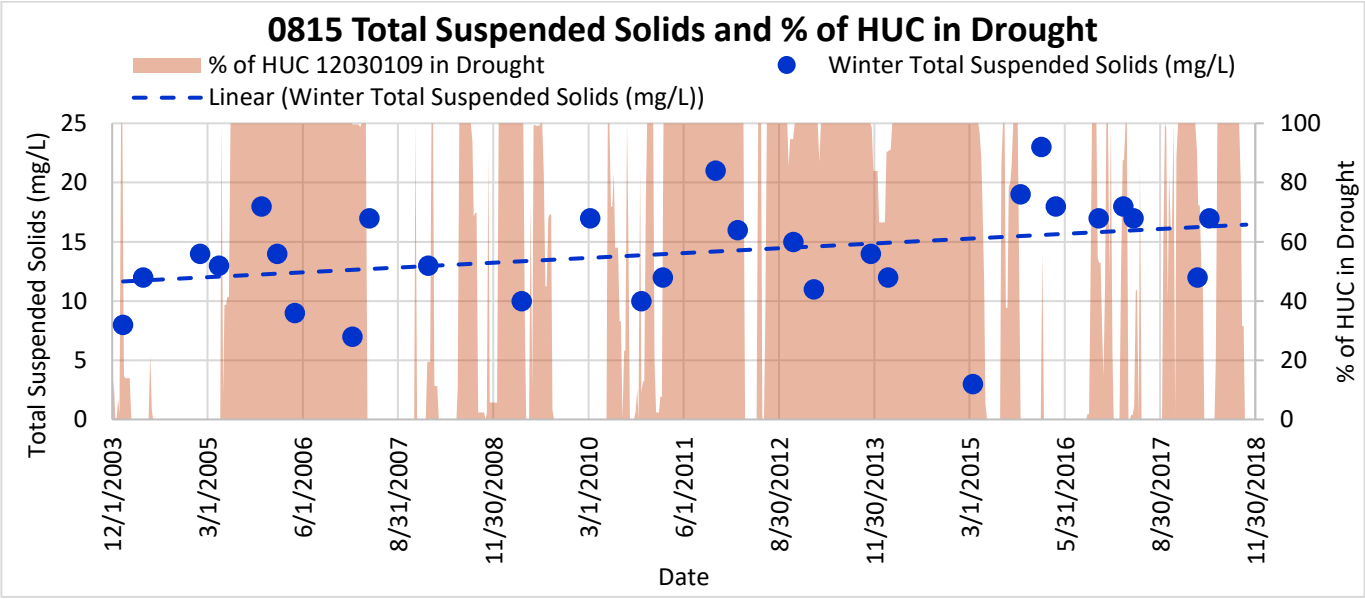


Figure 379: 0815 Total Suspended Solids and % of HUC in Drought

The increasing trend for total phosphorus was an artifact of changes in the detection limit rather than a true change in water quality. Early in the data set the detection limit was either 0.05 or 0.06 mg/l and later decreased to 0.02 mg/L. Of 56 records in the data set, only 10 samples were reported at levels above 0.06 mg/L.

0814B South Fork Chambers Creek

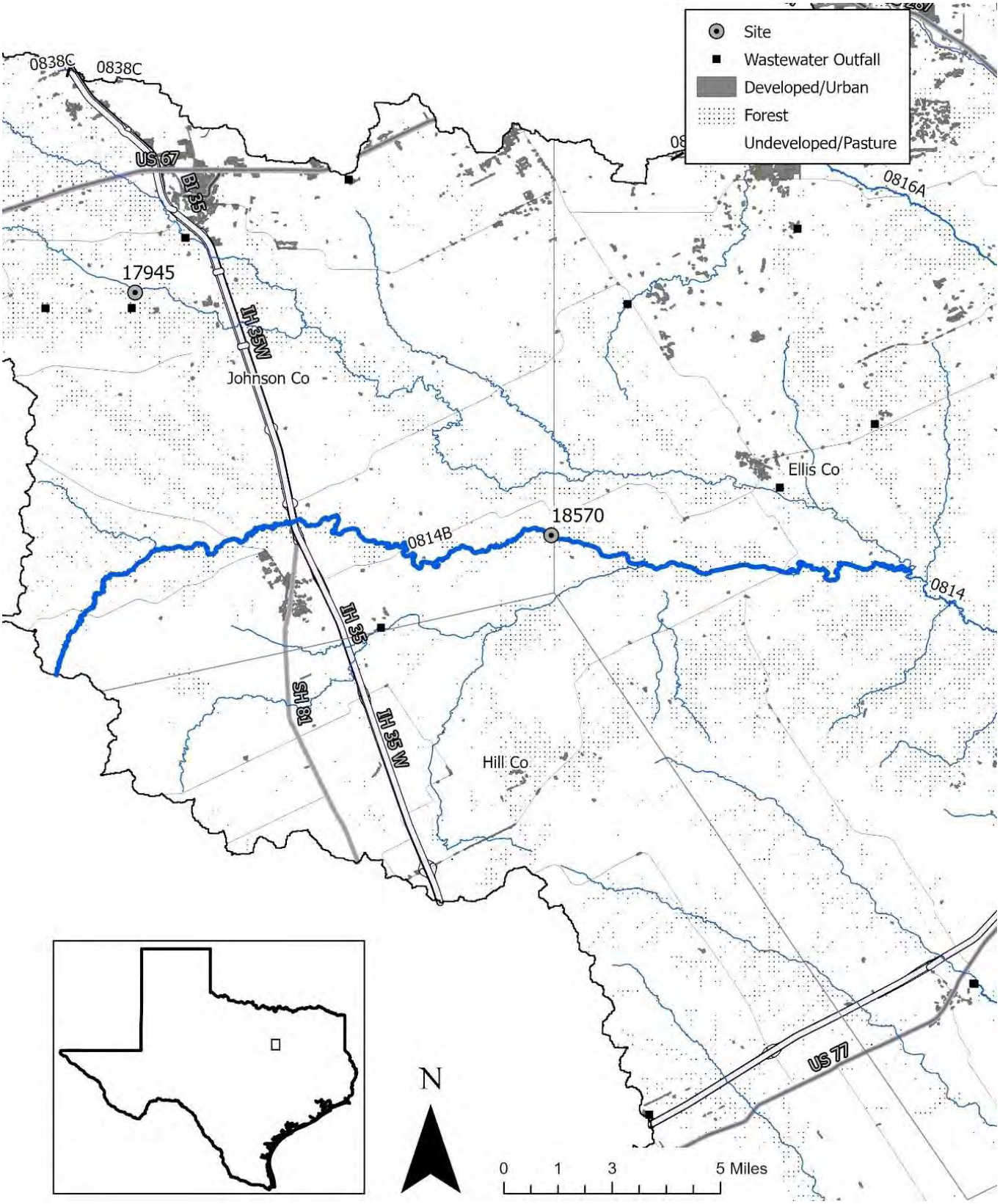


Figure 380: Segment 0814B Map

This 29-mile stream runs from the upper end of South Fork Chambers Creek to the confluence with Chambers Creek (see Figure 380). Much of the watershed contains crop, grass, hay and pasture land with some development around the City of Grandview. The watershed lies within the Northern Blackland Prairie with a small portion in the Eastern Cross Timbers ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0814B_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0814A Mill Creek

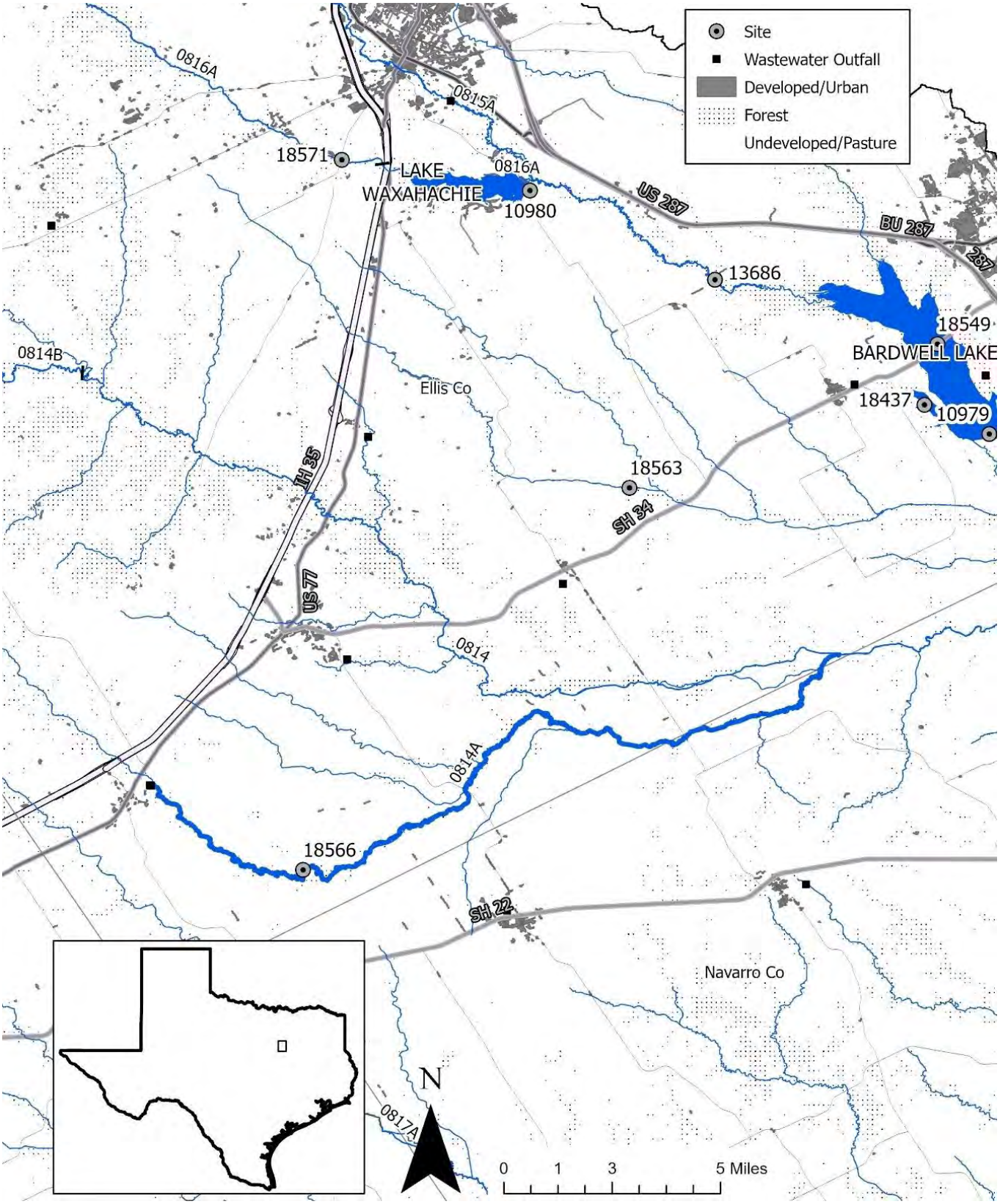


Figure 381: Segment 0814A Map

This 25.5-mile unclassified segment runs from the Union Pacific Railroad in Milford to the confluence with Chambers Creek in Navarro County (see Figure 381). The upstream portion of the stream drains grasslands. The land use transitions to crop land along the middle portion of the stream and then hay and pasture land along the downstream end. The stream flows through the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0814A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0814 Chambers Creek Above Richland-Chambers Reservoir

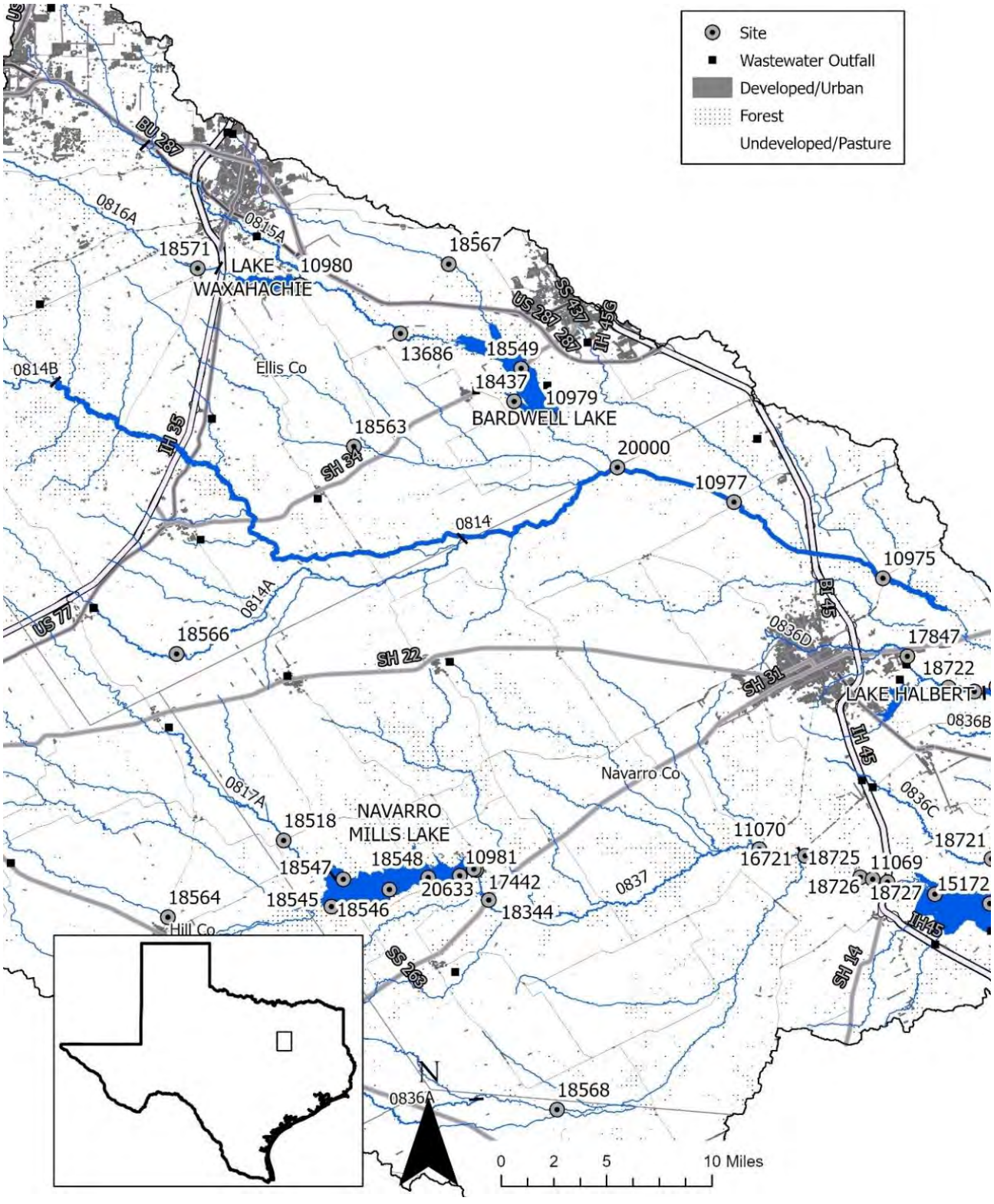


Figure 382: Segment 0814 Map

This 50-mile segment runs from the confluence of the North Fork Chambers Creek and South Fork Chambers Creek to a point 2.5 miles downstream of Tupelo Branch in Navarro County (see Figure 382). The upper portion of the stream drains mostly grassland and forest to the south and grass and crop lands to the north. The lower portion of the stream flows through mostly crop land to the north, and hay, pasture, and grassland to the south. It flows through the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at three sites within this segment as shown in Table 311. Monitoring is being conducted by Tarrant Regional Water District and TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 311: Segment 0814 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0814_01	CHAMBERS CREEK AT FM 3041	10975	TCEQ Region 4
0814_02	CHAMBERS CREEK AT FM 1126	10977	Tarrant Regional Water District
0814_03	CHAMBERS CREEK AT ELLIS COUNTY ROAD 55 EAST OF ITALY	22058	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 312. Results of TRA trend analyses are shown in Table 313.

Table 312: TCEQ 2020 Texas Integrated Report Summary for Segment 0814

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	Ammonia	0.33 mg/L	NC
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	General Use	Ammonia	0.33 mg/L	NC
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	Nitrate	1.95 mg/L	NC
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	General Use	Nitrate	1.95 mg/L	CS
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	Total Phosphorus	0.69 mg/L	CS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	General Use	Total Phosphorus	0.69 mg/L	NC
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	Chlorophyll-*a*	14.1 µg/L	NC

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	pH	6.5 - 9 S.U.	FS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	General Use	pH	6.5 - 9 S.U.	FS
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	Chloride	90 mg/L	FS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	General Use	Chloride	90 mg/L	FS
0814_03 From above confluence with Waxahachie Creek up to above confluence with Mill Branch	General Use	Chloride	90 mg/L	FS
0814_04 From just above the confluence with Mill Branch to the upper end of the segment.	General Use	Chloride	90 mg/L	FS
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	Sulfate	160 mg/L	FS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	General Use	Sulfate	160 mg/L	FS
0814_03 From above confluence with Waxahachie Creek up to above confluence with Mill Branch	General Use	Sulfate	160 mg/L	FS
0814_04 From just above the confluence with Mill Branch to the upper end of the segment.	General Use	Sulfate	160 mg/L	FS
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	Total Dissolved Solids	500 mg/L	FS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	General Use	Total Dissolved Solids	500 mg/L	FS
0814_03 From above confluence with Waxahachie Creek up to above confluence with Mill Branch	General Use	Total Dissolved Solids	500 mg/L	FS
0814_04 From just above the confluence with Mill Branch to the upper end of the segment.	General Use	Total Dissolved Solids	500 mg/L	FS
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	General Use	Water temperature	32.2 °F	FS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	General Use	Water temperature	32.2 °F	FS
0814_01 From the lower end of the segment up to just above the confluence with Cummins Creek.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0814_02 From above confluence with Cummins Creek to above confluence with Waxahachie Creek	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment units 0814_03 and 0814_04 for the period of record for this basin summary report. No significant trends were identified in assessment unit 0814_02.

Table 313: Significant Trends for Segment 0814 (P-value<0.1)

Segment & Assessment Unit		0814_01
Site		10975
Flow	All	↓
	Summer	No Trend
	Winter	↓
Volatile Suspended Solids	All	↓
	Summer	Not Significant
	Winter	No Trend
E. coli	All	↓
	Summer	Not Significant
	Winter	Not Significant
Days Since Precipitation	All	Not Significant
	Summer	Not Significant
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

An impairment due to elevated levels of *E. coli* was identified in assessment unit 0814_02 which was monitored at station 10977. As shown in Figure 383, levels at station 10977 as well as in the downstream assessment unit 0814_01 (station 10975) were frequently above the standard of 126 MPN/100 mL. There were slightly lower overall concentrations at the downstream station 10975 as compared to the upstream station 10977. This may have been due to dilution of instream concentrations from tributaries between the two stations or die-off due to exposure to sunlight. There were no correlations between *E. coli* and flow in either of the assessment units. This indicates that there were constant sources of bacteria into the stream. There are small wooded riparian areas upstream of the monitoring stations in both assessment units. In addition, there is evidence of livestock trails entering the tributaries of Chambers Creek in several locations. It is likely that much of the bacteria load in the stream was contributed by wildlife and livestock visiting the streams for watering. Landowner education and livestock best management practices may help reduce levels in this segment. There are several small wastewater treatment facilities and residential areas that are most likely using septic systems. If these facilities or septic systems were not functioning properly they may have been contributing bacteria as well. It is recommended that upstream sampling on Chambers Creek and the tributaries be conducted in order to determine if a potential source can be identified. Additionally, bacteria source tracking studies could be conducted to identify if the bacteria impairment may have been caused by humans, livestock, or wildlife.

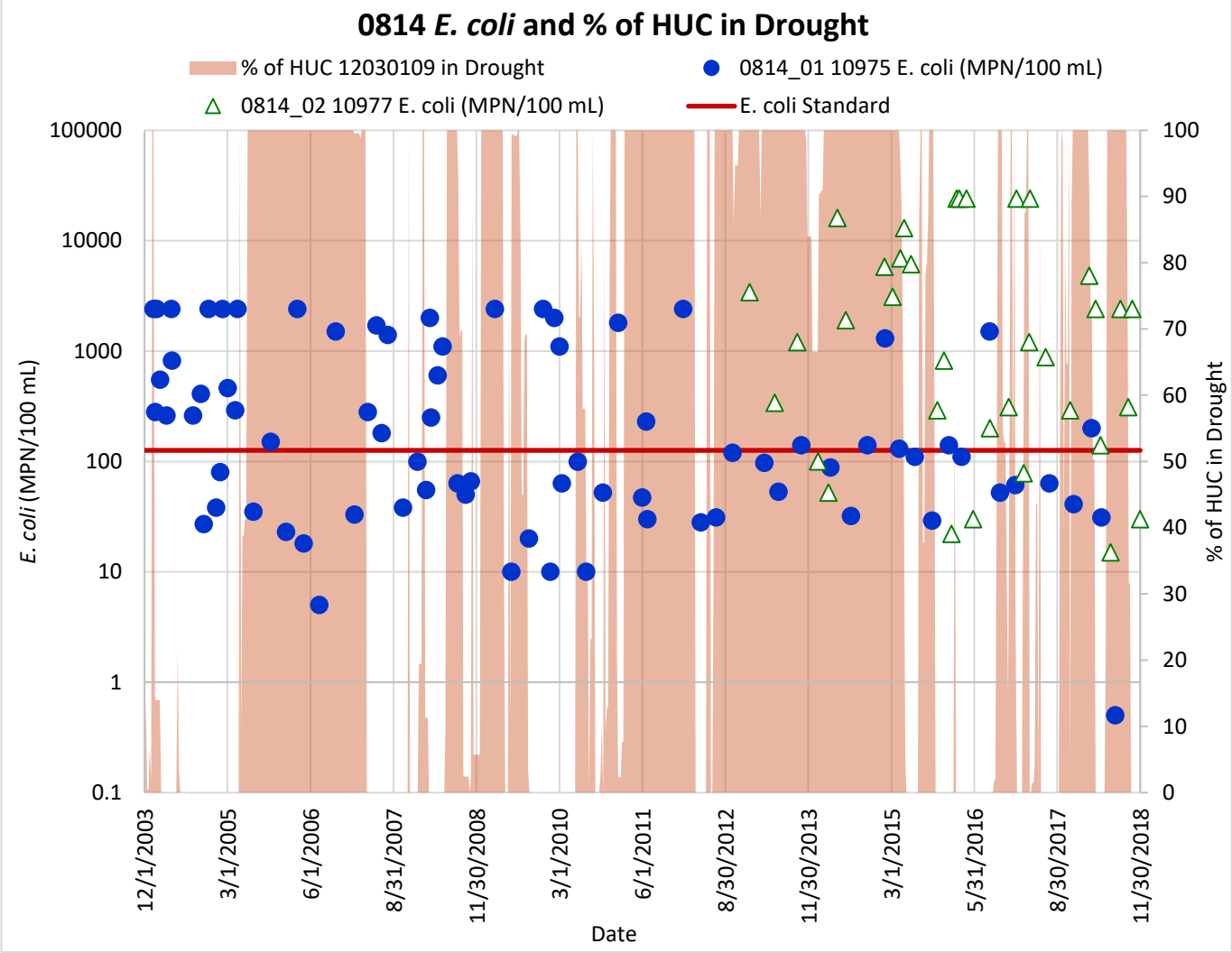


Figure 383: 0814 E. coli and % of HUC in Drought

Concerns were found for total phosphorus in assessment unit 0814_01 and for nitrate in 0814_02. As shown in Figure 384, these nutrients were frequently reported above their respective screening levels. Neither of these nutrients were correlated to flow. This indicates that there may have been constant sources of the nutrients into the stream as well as run-off related sources. As noted for many other segments, the small wastewater treatment facilities in this watershed may be contributing nutrients into the stream. However, it does not appear that Chambers Creek is effluent-dominated since there was not the typical strong negative correlation between flow and nutrients. Run-off containing waste from livestock or fertilizer from crop land may be contributing nutrients during precipitation events. Leaks from failing septic systems or run-off from over-irrigation of fertilized fields and yards may have also been a factor. Landowner and homeowner education and best management practices for livestock, fertilizer use, and septic systems may help reduce the levels of these nutrients in this segment. It is important to note that these nutrient levels did not appear to be overly influencing chlorophyll-*a* levels. Chlorophyll-*a* was not collected in the upstream assessment unit 0814_02. However, in the downstream assessment unit 0814_01, there were 66 chlorophyll-*a* records in the period of

record for this basin summary report with 26 exceeding the screening level of 14.1 µg/L. The average chlorophyll-*a* value for the full data set was 12.54 µg/L while the average for the exceedances was 21.5 µg/L. Further, algal populations did not appear to be negatively affecting dissolved oxygen levels as measured in either assessment unit. There were a total of 174 dissolved oxygen measurements. Ten of these measurements were less than the grab sample screening level of 5 mg/L with two measurements below the grab sampling minimum standard of 3 mg/L.

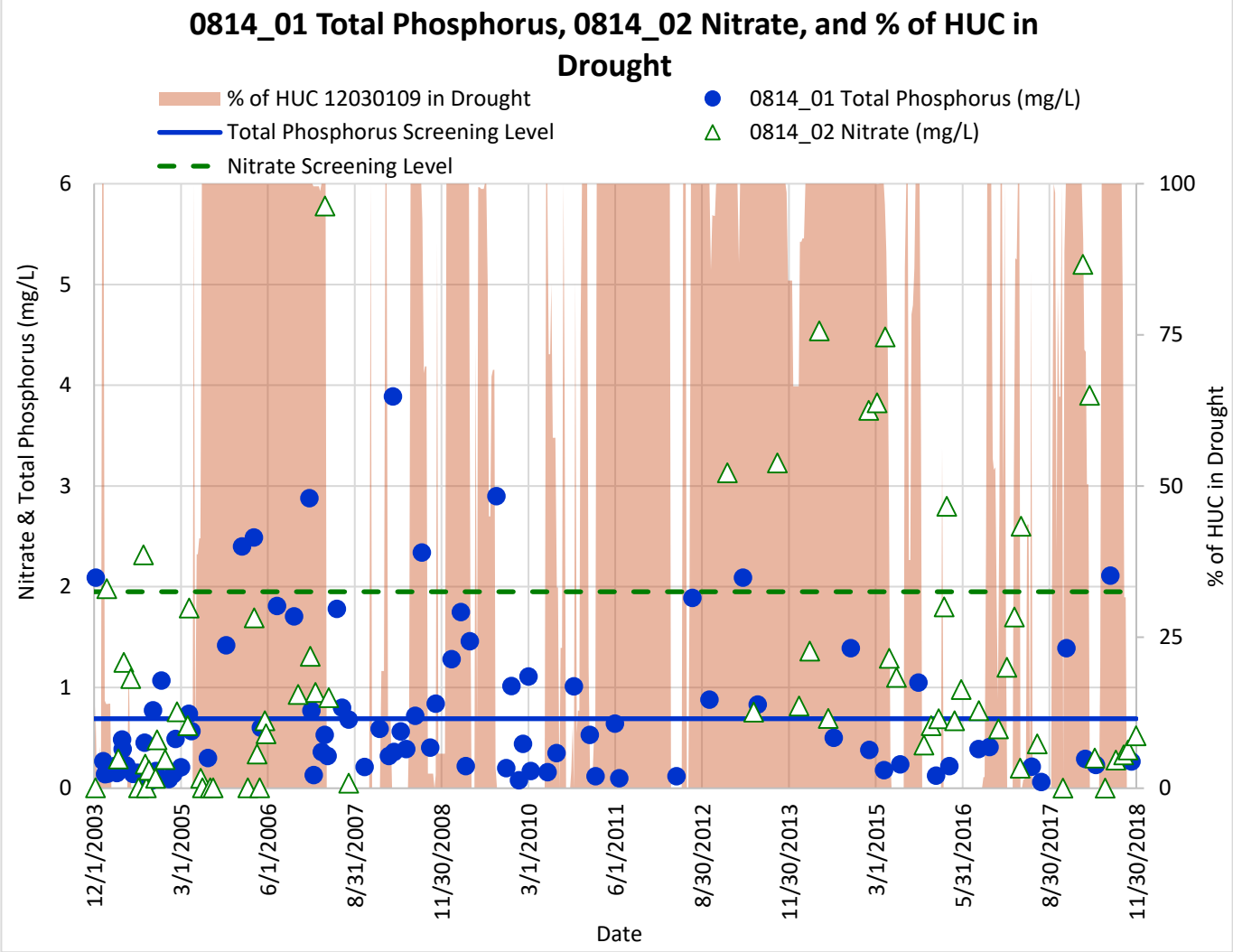


Figure 384: 0814_01 Total Phosphorus, 0814_02 Nitrate, and % of HUC in Drought

0836D Post Oak Creek

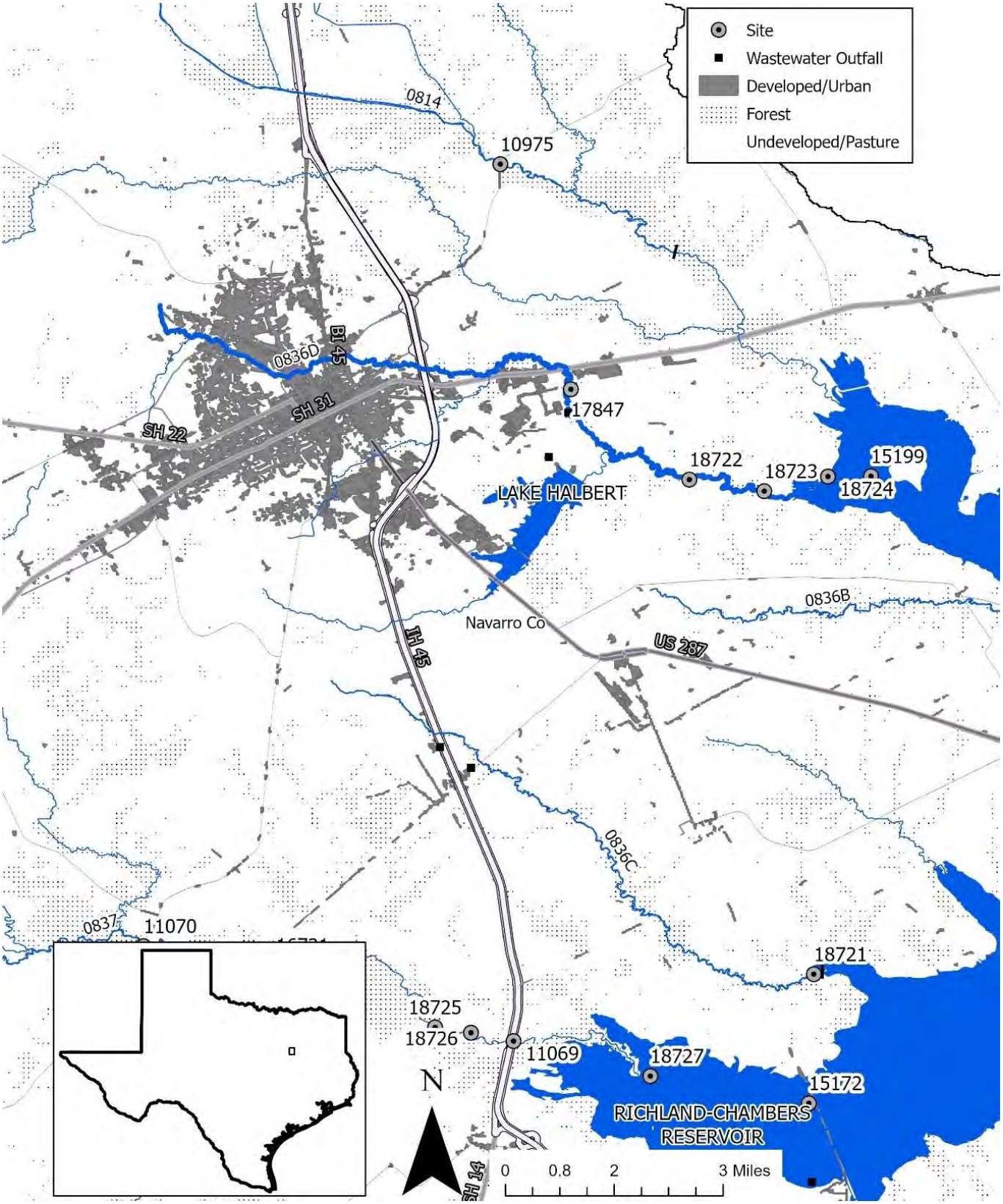


Figure 385: Segment 0836D Map

This 14.8-mile stream runs from the upper end of the creek to the confluence with Richland Chambers Reservoir (see Figure 385). The upper portion of the stream flows through the developed lands of the City of Corsicana. The lower portion of the stream flows through largely hay and pasture land with some grass and crop lands. The watershed lies within the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at two sites within this segment as shown in Table 314. Monitoring is being conducted by Tarrant Regional Water District and TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 314: Segment 0836D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0836D_01	POST OAK CREEK 109 METERS DOWNSTREAM OF POWELL PIKE EAST OF CORSICANA	17847	Tarrant Regional Water District
0836D_01	POST OAK CREEK AT NAVARRO COUNTY ROAD CRSE 0010 EAST OF CORSICANA	22053	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 315. Results of TRA trend analyses are shown in Table 316.

Table 315: TCEQ 2020 Texas Integrated Report Summary for Segment 0836D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0836D_01 From the confluence with Richland Chambers Reservoir to the upper end of the creek	Aquatic Life Use	Dissolved Oxygen	1.5 mg/L	FS
0836D_01 From the confluence with Richland Chambers Reservoir to the upper end of the creek	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0836D_01 From the confluence with Richland Chambers Reservoir to the upper end of the creek	General Use	Ammonia	0.33 mg/L	NC
0836D_01 From the confluence with Richland Chambers Reservoir to the upper end of the creek	General Use	Nitrate	1.95 mg/L	NC
0836D_01 From the confluence with Richland Chambers Reservoir to the upper end of the creek	General Use	Total Phosphorus	0.69 mg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

Table 316: Significant Trends for Segment 0836D (P-value<0.1)

Segment & Assessment Unit		0836D_01
Site		17847
Total Suspended Solids	All	No Trend
	Summer	↑
	Winter	No Trend

↓ = Decreasing Trend, ↑ = Increasing Trend

A concern for elevated levels of *E. coli* was identified in this segment. There was very little measured flow data available, however, there was some correlation between *E. coli* and flow severity (correlation coefficient = 0.433) as shown in Figure 386. *E. coli* levels were routinely

above the standard of 126 MPN/100 mL but also increased with increasing flow severity. The stream flows through several park and residential areas in the City of Corsicana. Downstream of IH 45 there are some wooded riparian areas and evidence of livestock trails entering the stream. Sources of bacteria may include run-off from pets, wildlife, and livestock during wet weather and livestock and wildlife visiting the stream for watering during dry weather. Homeowner and landowner education as well as pet and livestock best management practices may help decrease bacteria levels in this segment.

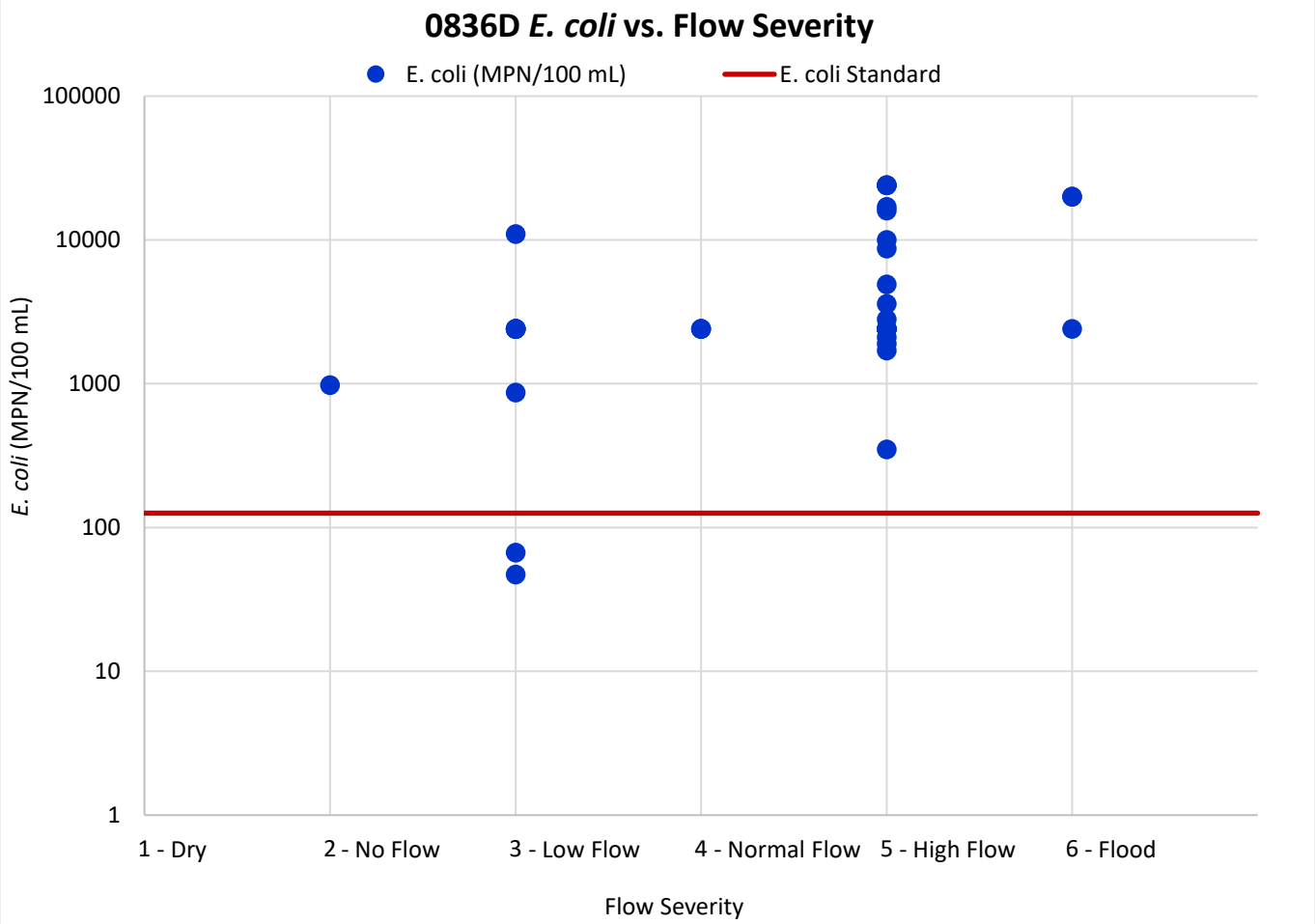


Figure 386: 0836D E. coli vs. Flow Severity

An increasing summer trend for total suspended solids was identified and is illustrated in Figure 387. There was a very strong correlation between total suspended solids and flow severity (correlation coefficient = 0.749). As shown in the graph, many of the elevated levels were reported during drought recovery periods. This indicates that sediments were being washed into the stream during precipitation.

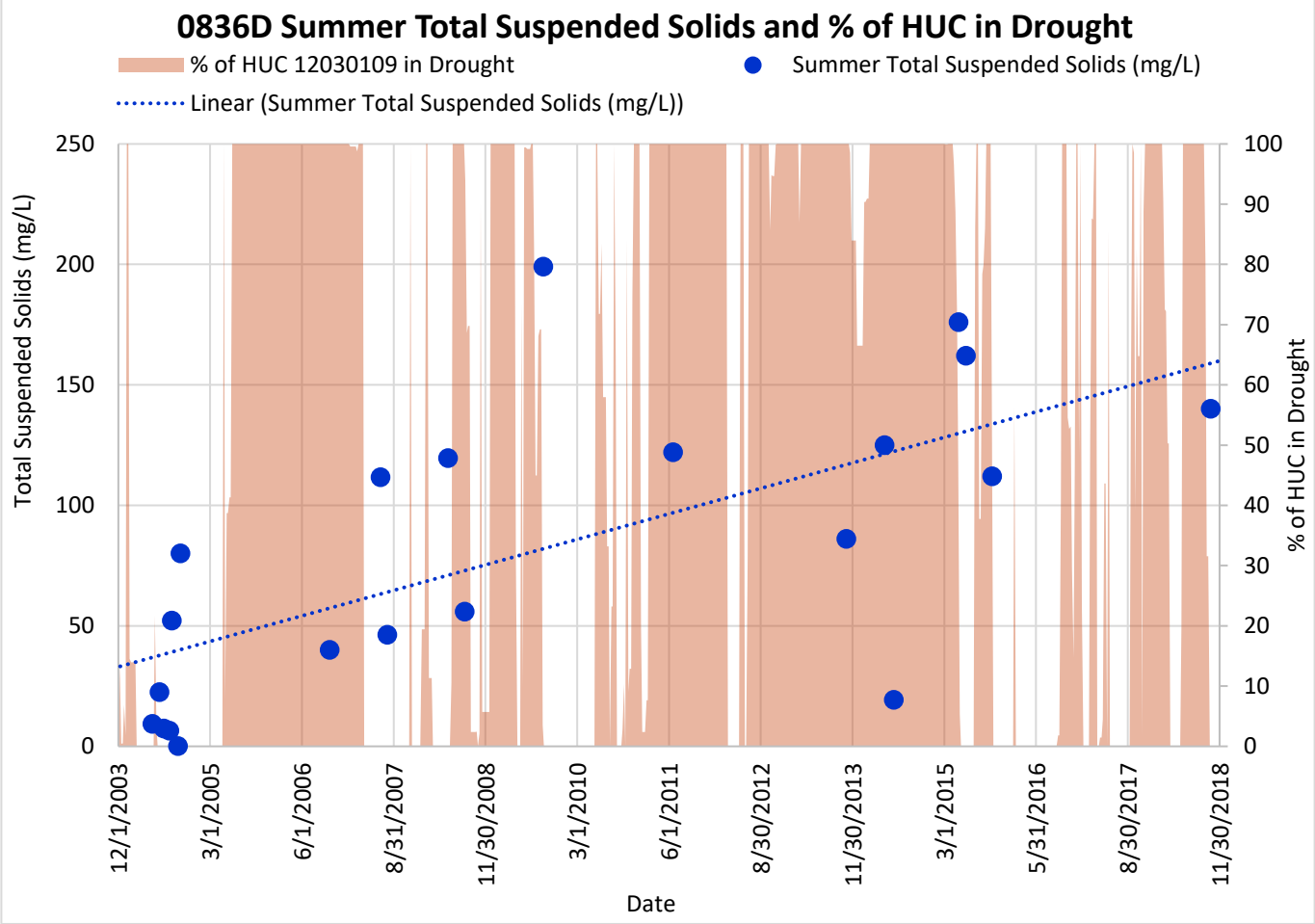


Figure 387: 0836D Summer Total Suspended Solids and % of HUC in Drought

0836B Cedar Creek

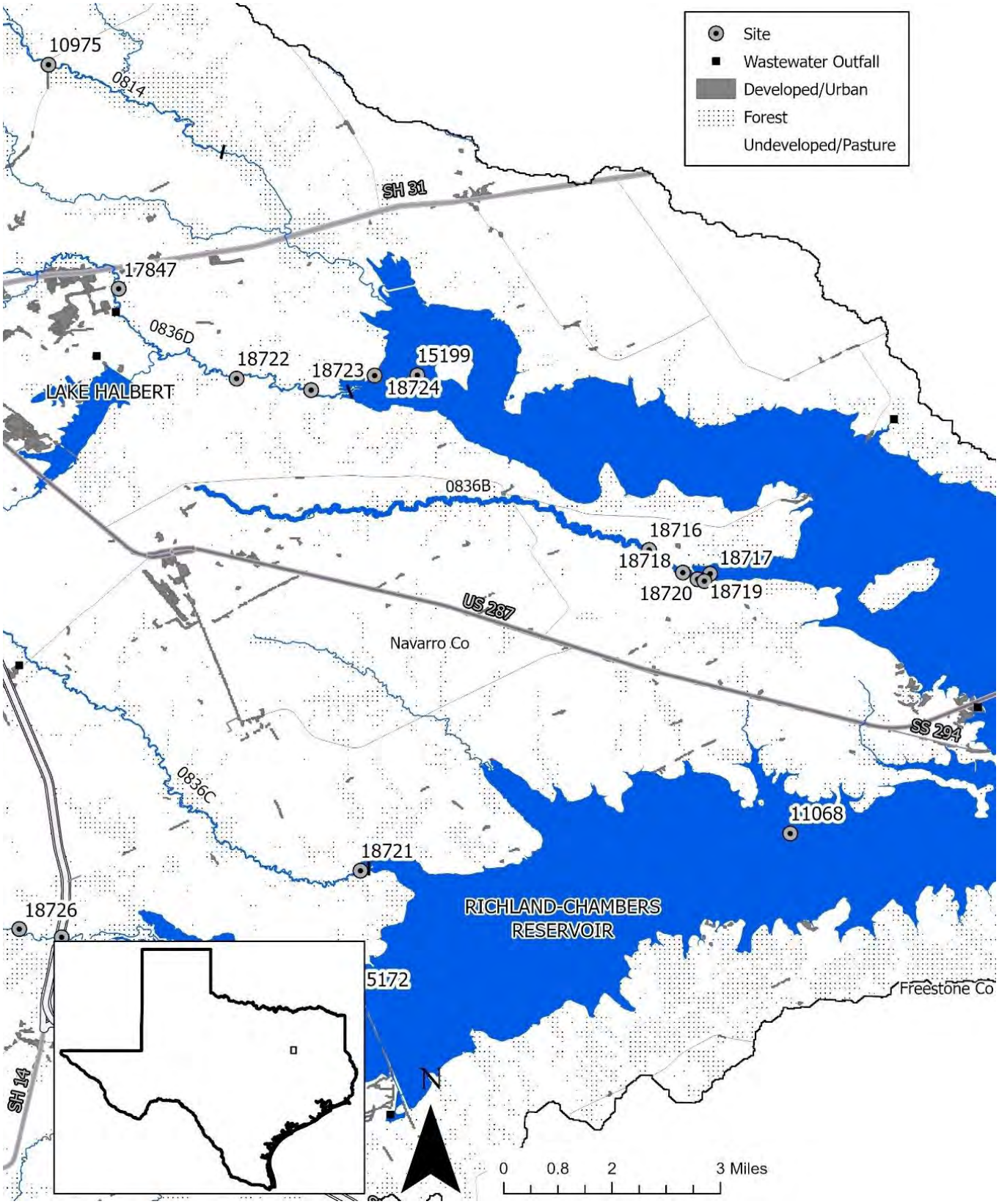


Figure 388: Segment 0836B Map

This 11-mile stream runs from the upper end of the creek to the confluence with Richland Chambers Reservoir (see Figure 388). The land use within this watershed is largely hay, pasture, and grassland. It lies within the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 317. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 317: Segment 0836B FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0836B_01	CEDAR CREEK AT FM 637 SOUTHEAST OF CORSICANA	22054	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 318.

Table 318: TCEQ 2020 Texas Integrated Report Summary for Segment 0836B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0836B_01 From the confluence with Richland Chambers Reservoir to the upper end of the creek	Aquatic Life Use	Dissolved Oxygen	5 mg/L	NS

NS = Not Supporting

Data for assessment unit 0836B_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

The impairment for depressed dissolved oxygen was carried forward from previous assessments as there was no recent monitoring. TRA conducted two years of diurnal monitoring in this segment in order to address this concern from late 2018 to 2020. This timeframe was outside of the period of record used for this basin summary report. Sampling is not yet complete but it appears that the impairment remains based on current standards. As shown in Figure 389, two minimum dissolved oxygen measurements were reported below the standard of 5 mg/L. However, this segment has been classified as a perennial stream based on a presumption from flow type. During the course of sampling, the stream was dry during one event and in isolated pools during another event. It is recommended that the standards for this segment be revised based on the observed flow status. The change in standards to those for intermittent streams would result in a 24-hour dissolved oxygen standard of 2 mg/L for the average value and 1.5 mg/L for the minimum value. The lowest reported value was 2.76 mg/L.

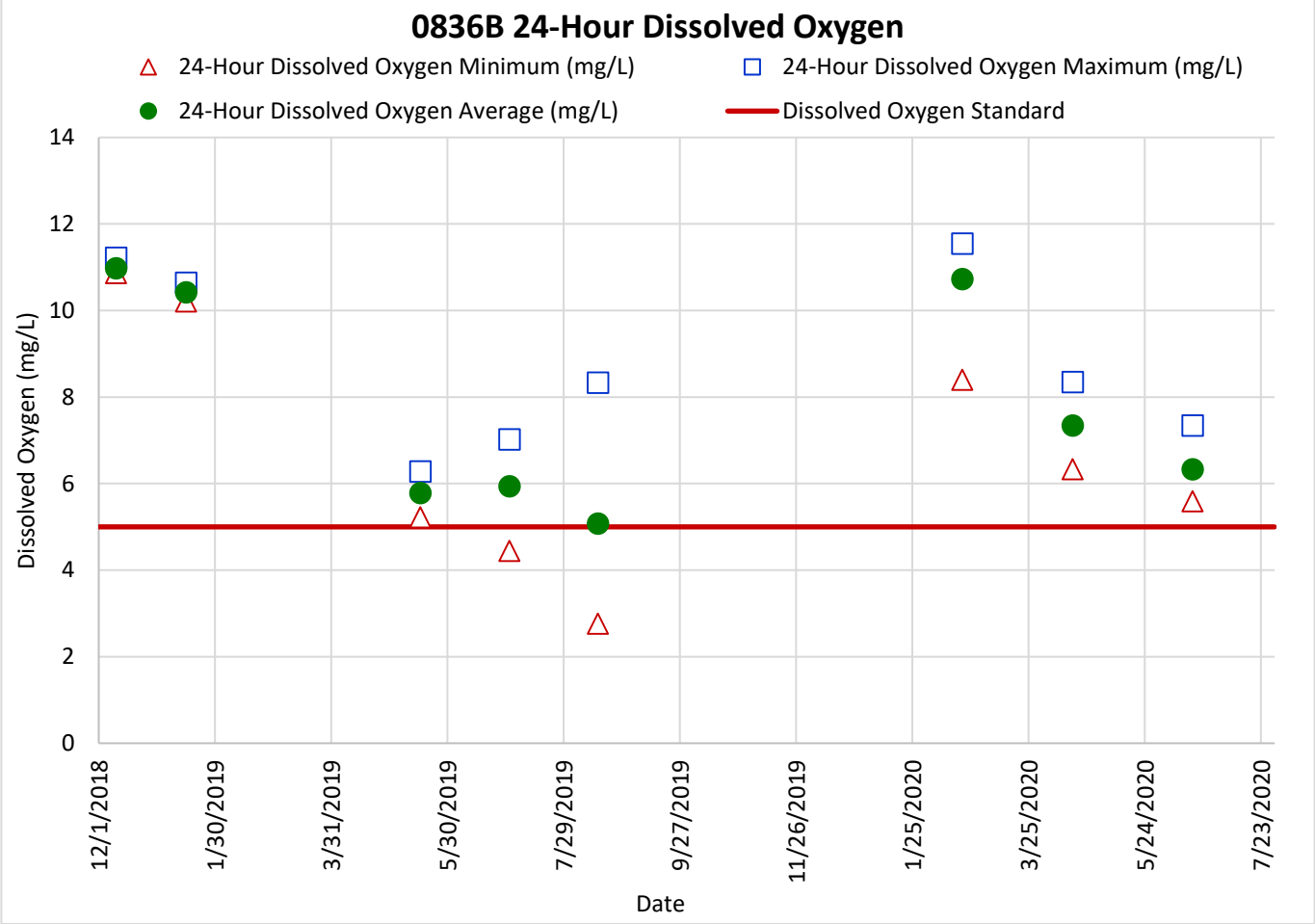


Figure 389: 0836B 24-Hour Dissolved Oxygen

0836C Grape Creek

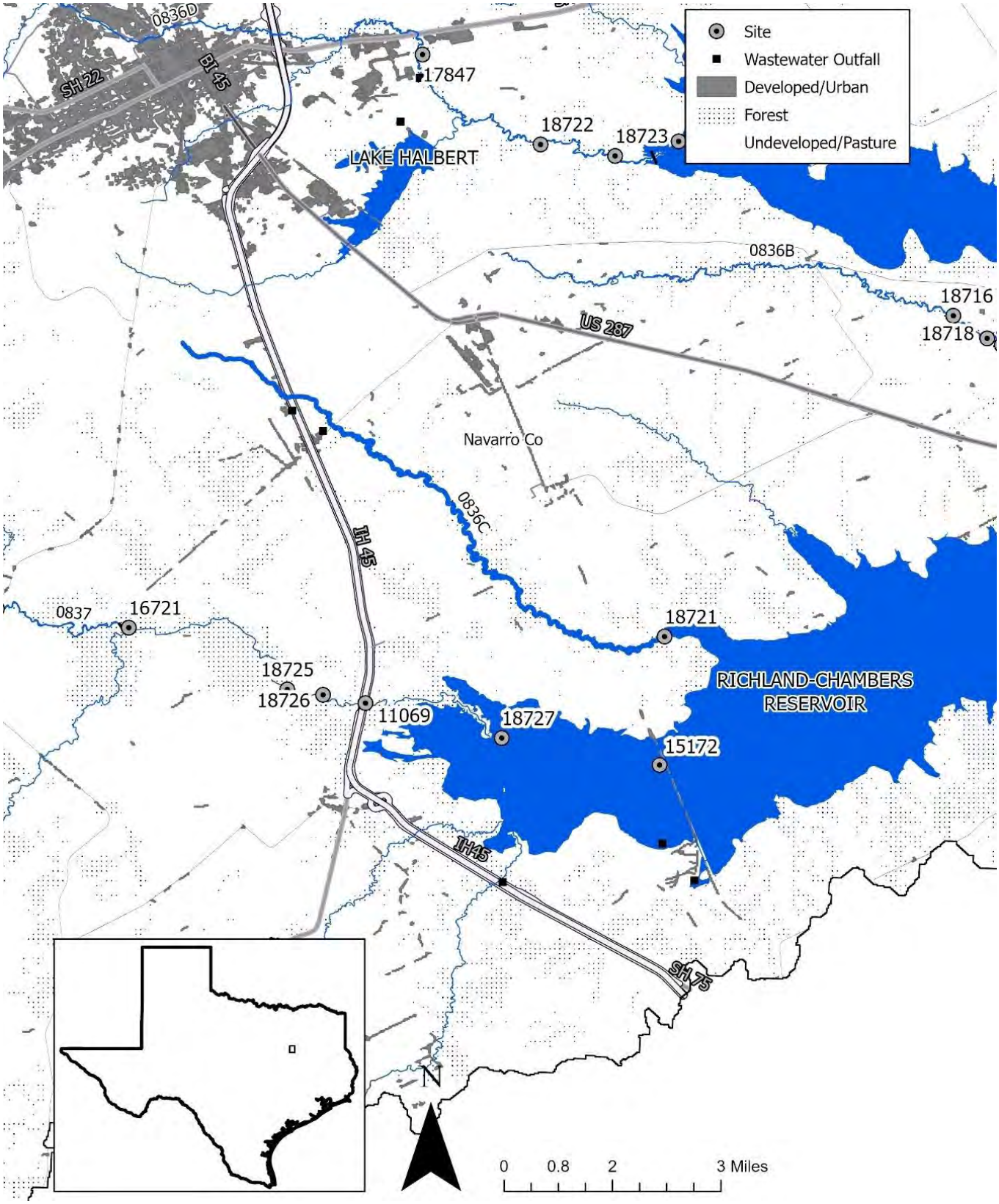


Figure 390: Segment 0836C Map

This 12.8-mile stream runs from the upper end of the creek southwest of Corsicana to the confluence with Richland Chambers Reservoir (see Figure 390). The land use within this watershed is largely hay, pasture, and grassland. It lies within the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 319. Monitoring is being conducted by TRA. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 319: Segment 0836C FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0836C_01	GRAPE CREEK AT NAVARRO COUNTY ROAD SE CR 1080 SOUTHEAST OF CORSICANA	22055	TRA

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 320.

Table 320: TCEQ 2020 Texas Integrated Report Summary for Segment 0836C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0836C_01 From confluence with Richland Chambers Reservoir to upper end of creek	Aquatic Life Use	Dissolved Oxygen	2 mg/L	CN

CN = Use Concern

Data for assessment unit 0836C_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

The concern for depressed dissolved oxygen was carried forward from previous assessments as there was no recent monitoring. TRA conducted two years of diurnal monitoring in this segment in order to address this concern from late 2018 to 2020. This timeframe was outside of the period of record used for this basin summary report. Sampling is not yet complete but it appears that the impairment remains based on current standards. As shown in Figure 391, several values were reported below the 24-hour average standard of 3 mg/L and the 24-hour minimum standard of 2 mg/L. However, this segment has been classified as an intermittent stream with perennial pools based on a previous TCEQ permit decision. During the course of sampling, the stream was dry during one event and in isolated pools during another event. It is recommended that the standards for this segment be revised based on the observed flow status. The change in standards to those for intermittent streams would result in a 24-hour dissolved oxygen standard of 2 mg/L for the average value and 1.5 mg/L for the minimum value. This segment may still be found to be impaired even with the lowered standards; there were three 24-hour minimum values and one 24-hour average value reported below 1.5 mg/L.

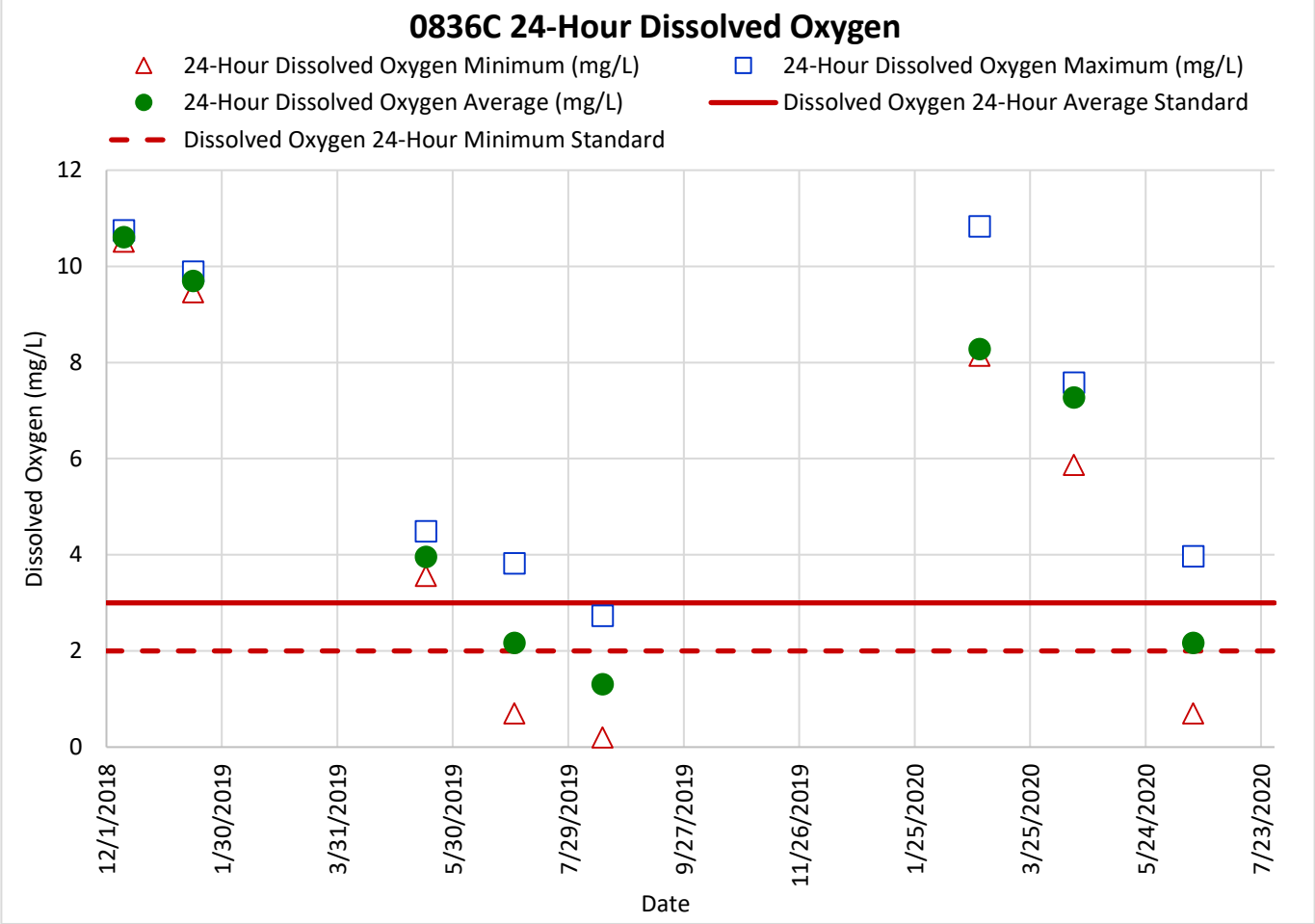


Figure 391: 0836C 24-Hour Dissolved Oxygen

0817A Richland Creek

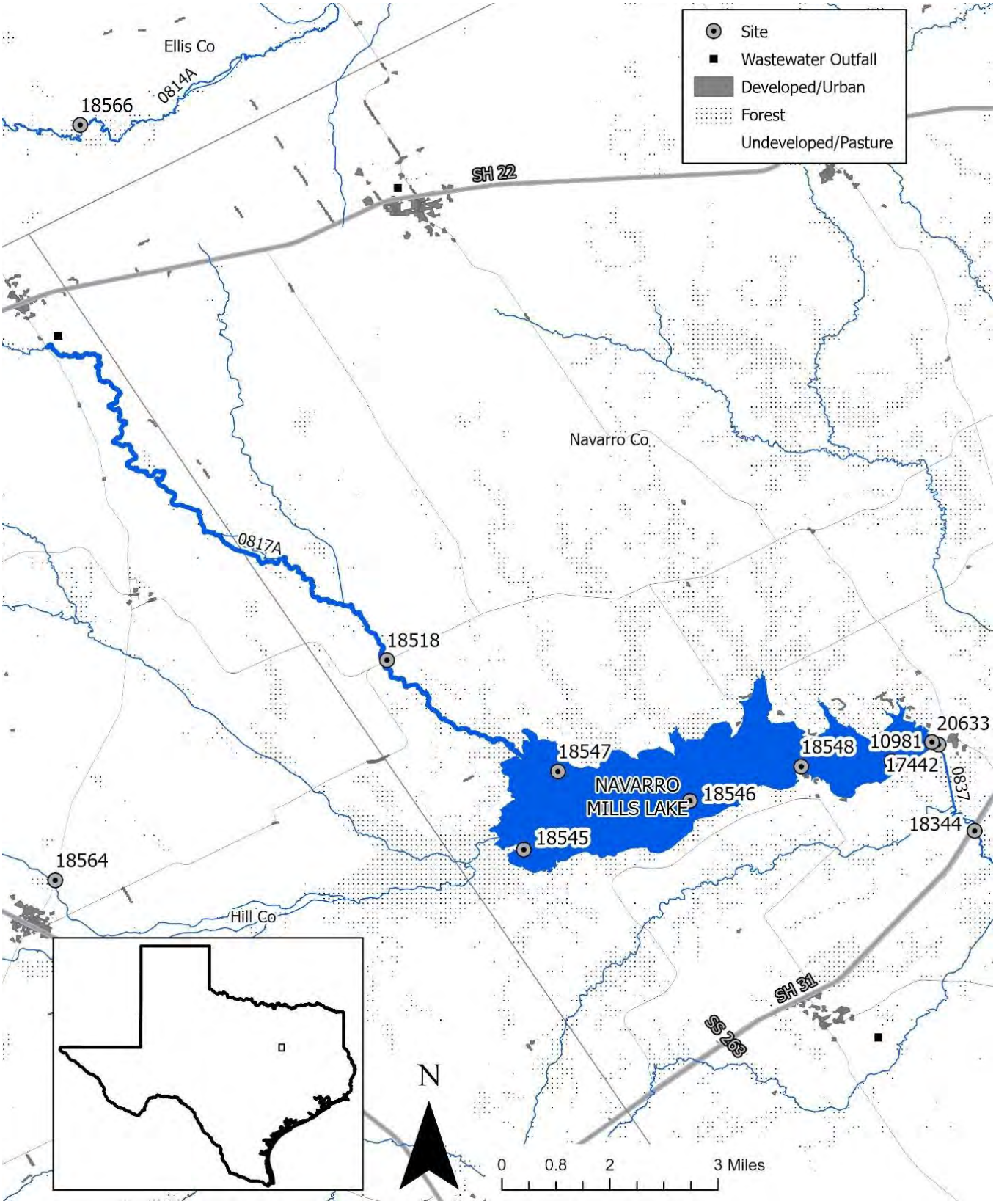


Figure 392: Segment 0817A Map

This 10-mile segment runs upstream from FM 308 south of Mertens in Hill County to 0.5 miles downstream of FM 744 in Navarro County (see Figure 392). Must of the land use around this stream is crop land with some small areas of grass, hay, and pasture land. The stream drains the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0817A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0817 Navarro Mills Lake

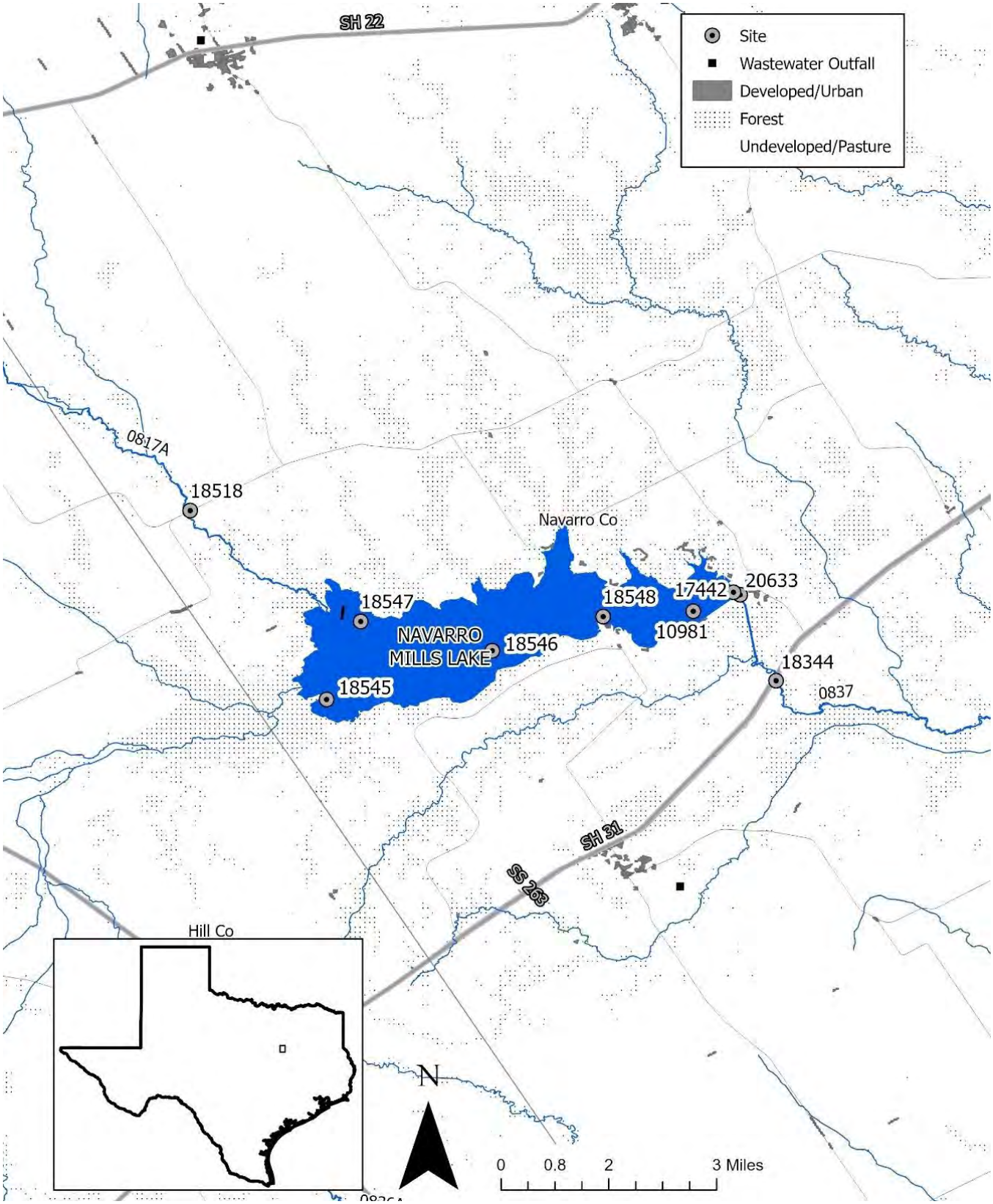


Figure 393: Segment 0817 Map

This 4752.9-acre reservoir impounds Richland Creek from Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet (see Figure 393). The land use to the west of the reservoir is largely crop land. To the north and south of the reservoir the land use is a mix of hay, pasture, and grassland. The reservoir lies within the Northern Blackland Prairie ecoregion. Navarro Milles Lake has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Water quality monitoring is being conducted at one site within this segment as shown in Table 321. Monitoring is being conducted by TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 321: Segment 0817 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0817_01	NAVARRO MILLS RESERVOIR 1.94 KM WEST AND 202 METERS SOUTH OF INTERSECTION OF NW 3050 RD AND FM 667 MID LAKE NEAR DAM USGS SITE AR	10981	TCEQ Region 4

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments as shown in the summary results in Table 322. Results of TRA trend analyses are shown in Table 323.

Table 322: TCEQ 2020 Texas Integrated Report Summary for Segment 0817

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	Aquatic Life Use	Acute Toxic Substances in water		FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	Aquatic Life Use	Chronic Toxic Substances in water		FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	General Use	Nutrient Reservoir Criteria		FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	General Use	pH	6.5 - 9 S.U.	FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	General Use	Chloride	50 mg/L	FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	General Use	Sulfate	75 mg/L	FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	General Use	Total Dissolved Solids	300 mg/L	FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	General Use	Water temperature	32.2 °F	FS
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0817_01 From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

FS = Fully Supporting

Table 323: Significant Trends for Segment 0817 (P-value<0.1)

Segment & Assessment Unit		0817_01
Site		10981
Total Organic Carbon	All	No Trend
	Summer	No Trend
	Winter	↑
Sulfate	All	↓
	Summer	Not Significant
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

An increasing winter trend for total organic carbon was identified in this segment as shown in Figure 394. Several of the elevated total organic carbon values were reported during drought recovery periods when organic materials would have been washed into the reservoir during precipitation events. It does not appear that the prolonged drought of 2011 to 2015 and the subsequent recovery period alone is responsible for the trend. It is not known at this time what may have caused this trend. It is interesting to note that there was a gap in sampling between July 2006 and April 2007. After sampling resumed, there was an increase in total organic carbon levels. A similar change in results was seen in regard to the decreasing sulfate trend shown in Figure 395. Again, it is not known what caused this decreasing trend but there was a noticeable decrease in reported values after sampling was resumed in April 2007. Perhaps there was a change in labs, lab methods, or there was some event in the watershed that caused the changes but this is purely speculation.

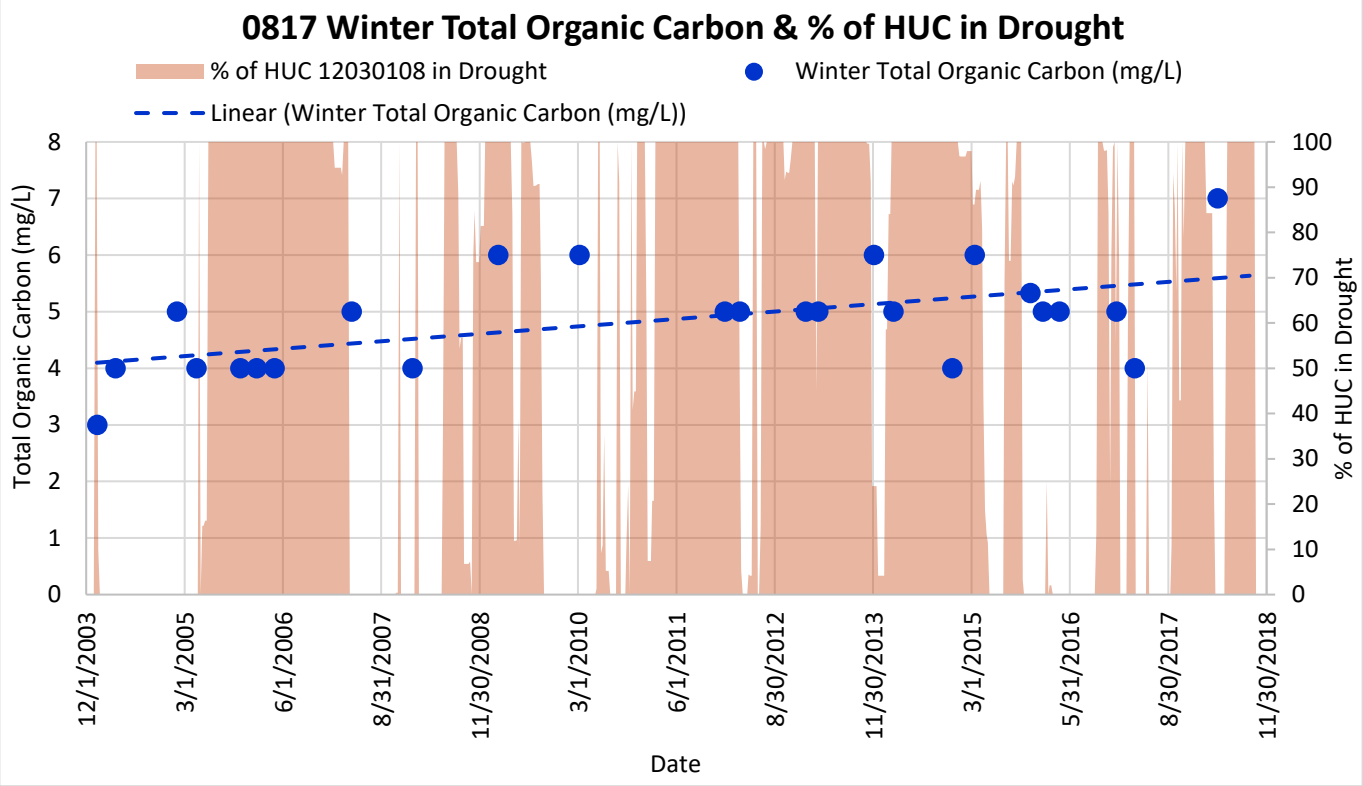


Figure 394: 0817 Winter Total Organic Carbon & % of HUC in Drought

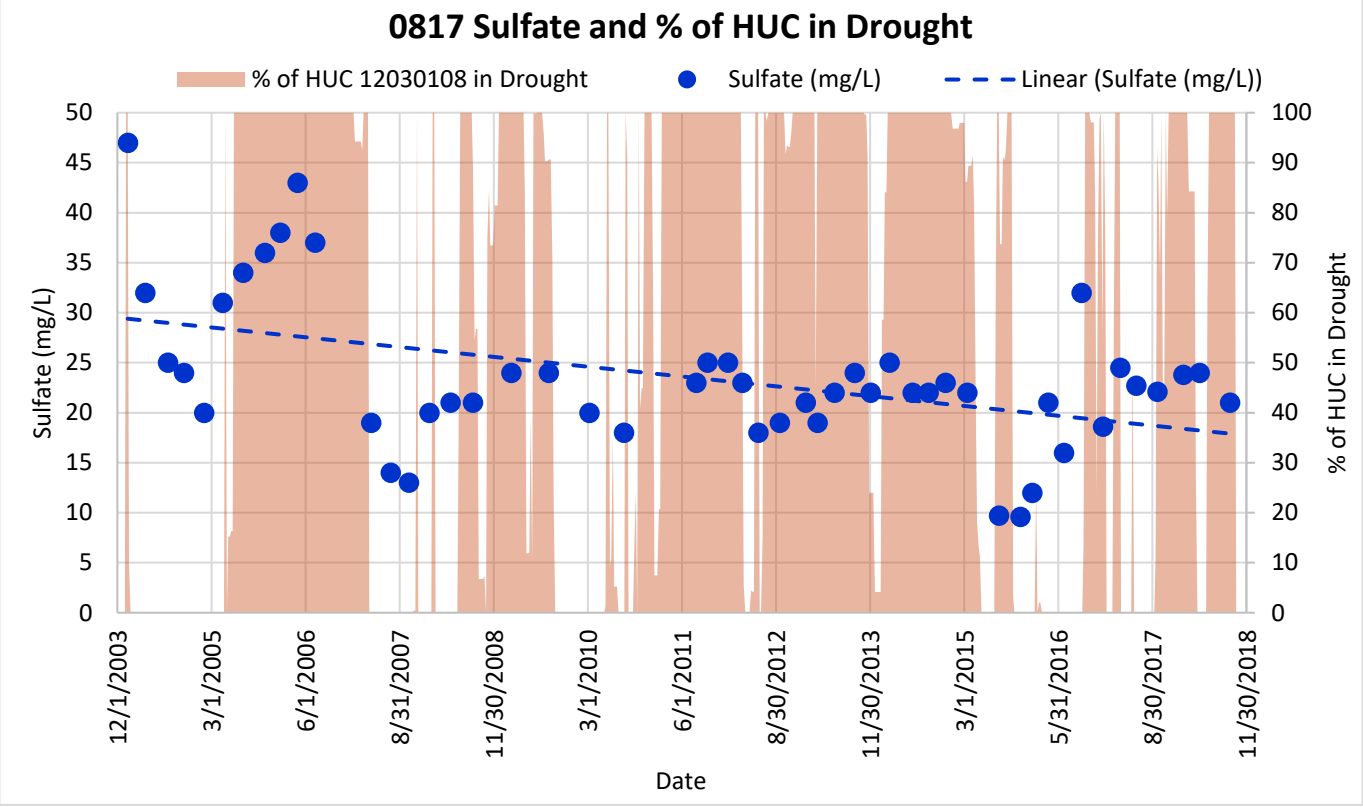


Figure 395: 0817 Sulfate and % of HUC in Drought

0837 Richland Creek Above Richland-Chambers Reservoir

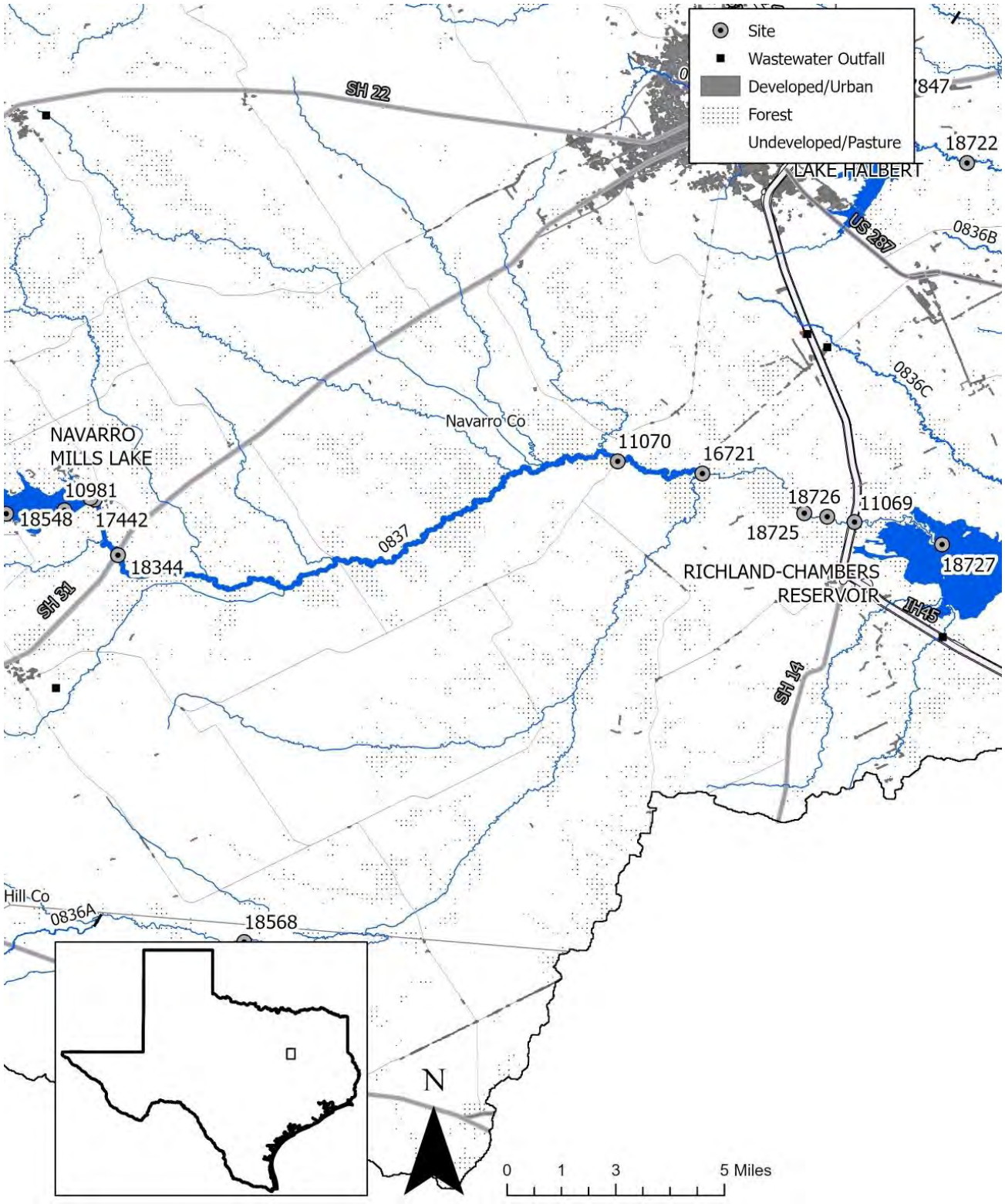


Figure 396: Segment 0837 Map

This 22.7-mile segment runs from Navarro Mills Dam to the confluence of Pin Oak Creek (see Figure 396). Much of the watershed is a mix of hay, pasture, and grassland. There are some areas of crop land to the south of the stream and woody wetland riparian areas. The stream flows through the Northern Blackland Prairie ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 324. Monitoring is being conducted by TCEQ Region 4. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 324: Segment 0837 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0837_01	RICHLAND CREEK 60 METERS DOWNSTREAM OF FM 709 2.8 KM UPSTREAM OF RICHLAND CHAMBERS RESERVOIR	11070	TCEQ Region 4

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 325. Results of TRA trend analyses are shown in Table 326.

Table 325: TCEQ 2020 Texas Integrated Report Summary for Segment 0837

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	Ammonia	0.33 mg/L	NC
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	Nitrate	1.95 mg/L	NC
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	Total Phosphorus	0.69 mg/L	NC
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	pH	6.5 - 9 S.U.	FS
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	Chloride	145 mg/L	FS
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	Sulfate	170 mg/L	FS
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	Total Dissolved Solids	500 mg/L	FS
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	General Use	Water temperature	32.2 °F	FS
0837_01 From confluence of Pin Oak Creek in Navarro Co. to Navarro Mills Dam in Navarro Co.	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 326: Significant Trends for Segment 0837 (P-value<0.1)

Segment & Assessment Unit		0837_01
Site		11070
Dissolved Oxygen	All	Not Significant
	Summer	↑
	Winter	Not Significant
Total Kjeldahl Nitrogen	All	Not Significant
	Summer	↓
	Winter	Not Significant
Total Organic Carbon	All	Not Significant
	Summer	↓
	Winter	Not Significant
Chlorophyll-*a*	All	↓
	Summer	↓
	Winter	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

Concerns for both depressed dissolved oxygen and chlorophyll-*a* were identified in this segment as shown in Figure 397 and Figure 398. There was limited flow data available for the first half of the data set but the correlation between dissolved oxygen and flow was relatively strong with a correlation coefficient of 0.583 indicating that higher levels were reported during higher flows. As shown in Figure 397, many of the dissolved oxygen levels reported below the screening level occurred during drought conditions when flows would typically be lower with warmer water temperatures. Therefore, it appears that stream flow may have been one of the factors influencing dissolved oxygen levels in this segment. There was also a relatively strong correlation between dissolved oxygen and chlorophyll-*a* (correlation coefficient = -0.409). This indicates that lower dissolved oxygen levels were reported at higher chlorophyll-*a* levels. As shown in Figure 398, higher levels of chlorophyll-*a* were reported during periods of drought and coincided with the low dissolved oxygen levels. Algal populations may have bloomed during these periods when flows would have been lower and moved slower through the stream. That increased residence time in the stream would have allowed those algal populations to consume the dissolved oxygen in the stream.

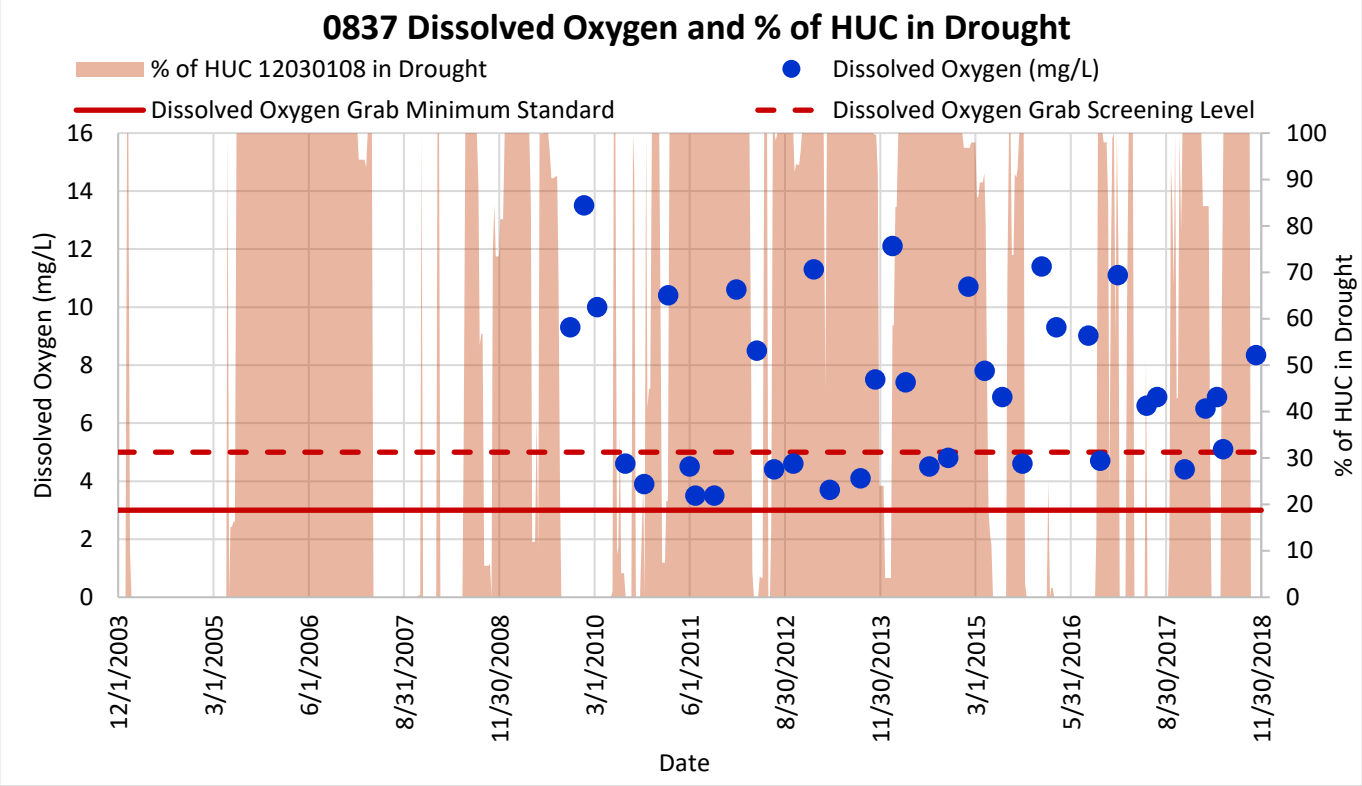


Figure 397: 0837 Dissolved Oxygen and % of HUC in Drought

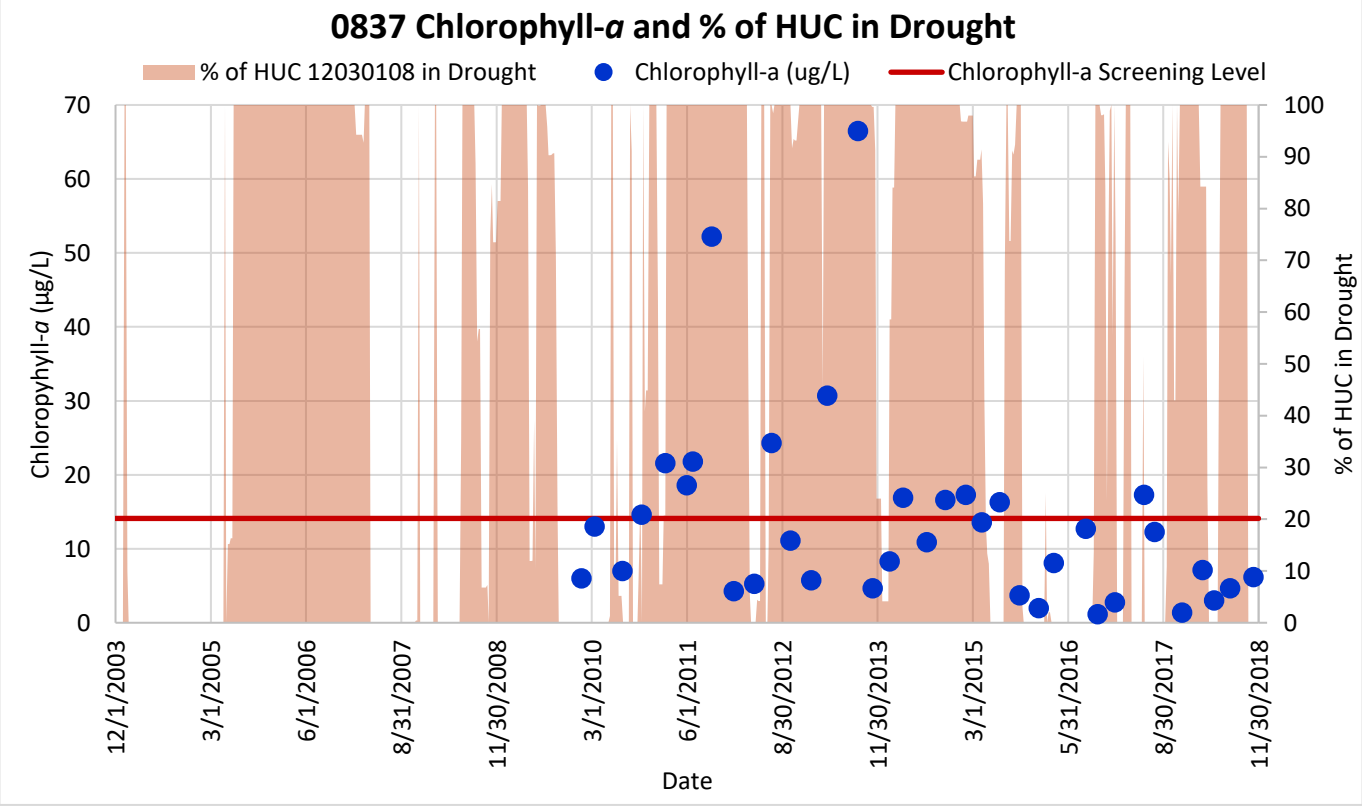


Figure 398: 0837 Chlorophyll-a and % of HUC in Drought

An impairment due to elevated levels of *E. coli* as shown in Figure 399. This graph shows that *E. coli* levels were frequently reported above the standard of 126 MPN/100 mL. There was no correlation between flow and *E. coli* but there was a weak correlation between days since precipitation and *E. coli* (correlation coefficient = -0.304). This indicates that run-off related sources of *E. coli* may have had some influence on in-stream measurements but that there may have been constant sources that had the most influence. There is evidence of livestock trails entering the stream on several of the tributaries upstream of monitoring station 11070 at FM 709. There is also a large wooded area upstream of the monitoring station. It is likely that wildlife and livestock visiting the stream for watering were contributing to the impairment.

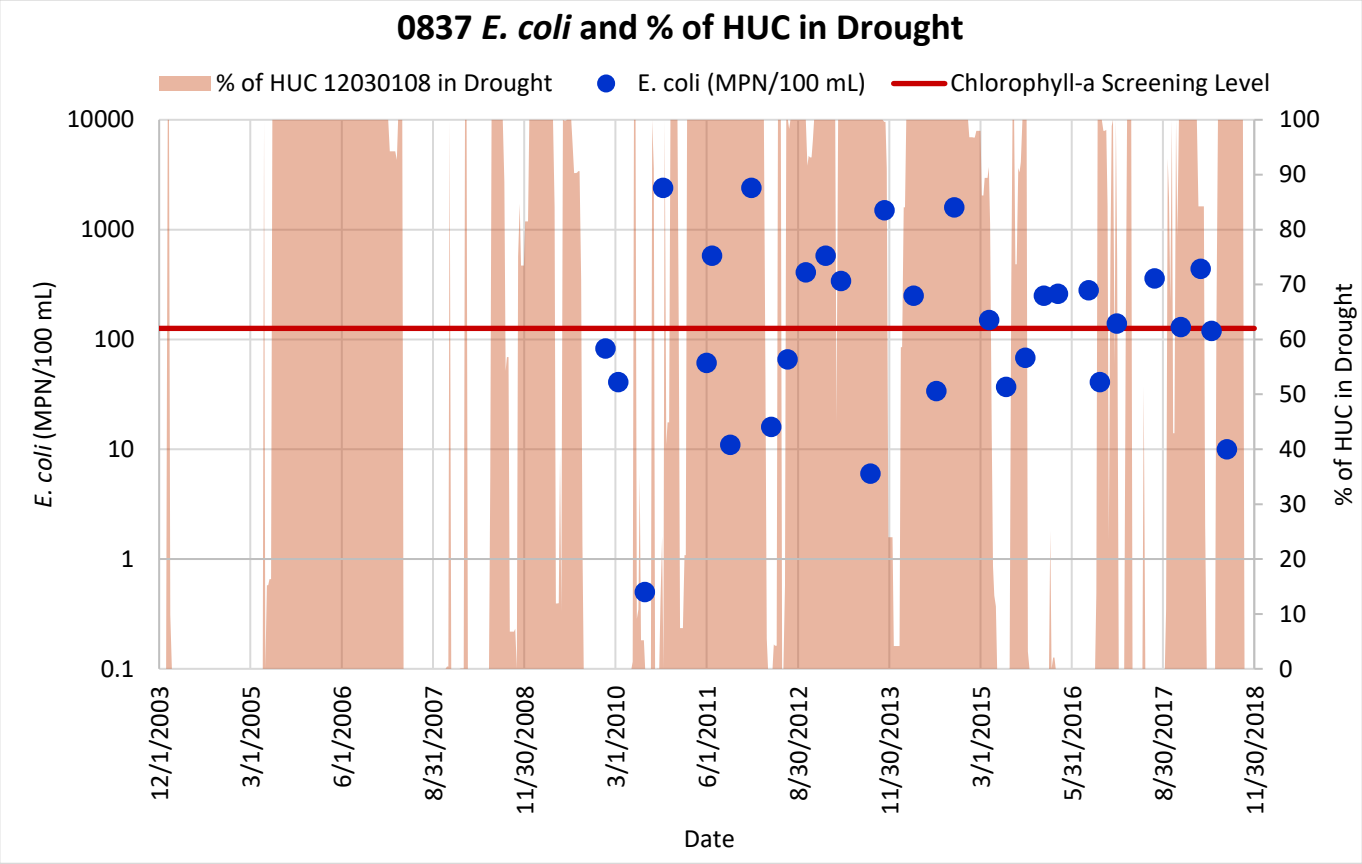


Figure 399: 0837 E. coli and % of HUC in Drought

0836A Pin Oak Creek

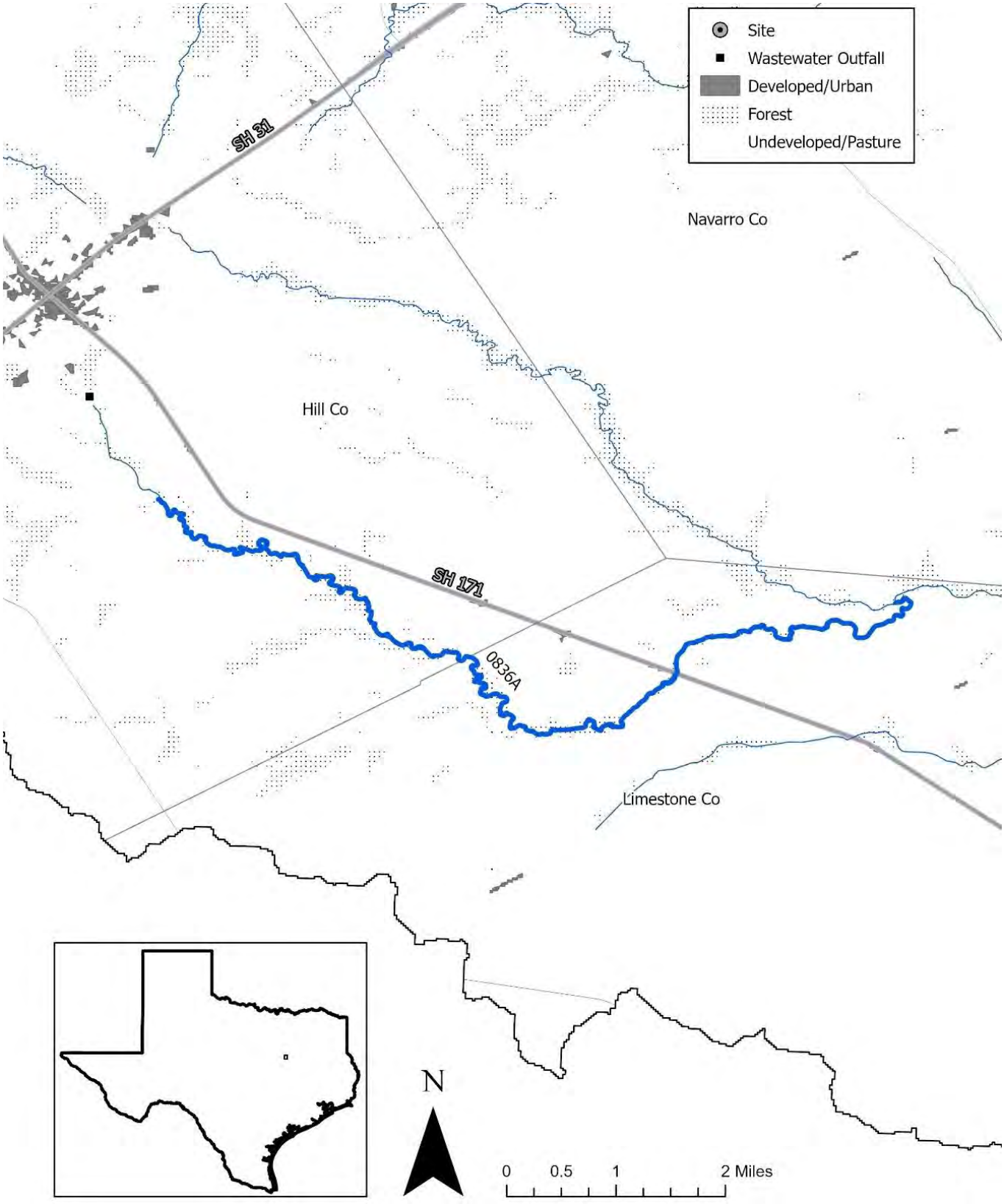


Figure 400: Segment 0836A Map

This 10-mile unclassified segment runs from the confluence with Pin Oak Creek and an unnamed tributary flowing from the west approximately 2.8 km downstream of SH 171 near the City of Hubbard to the confluence with the North Fork of Pin Oak Creek in Limestone County (see Figure 400). Much of the watershed is hay and pasture land with some small areas of crop land. The stream flows through the Northern Blackland Prairie ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0836A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0836 Richland-Chambers Reservoir

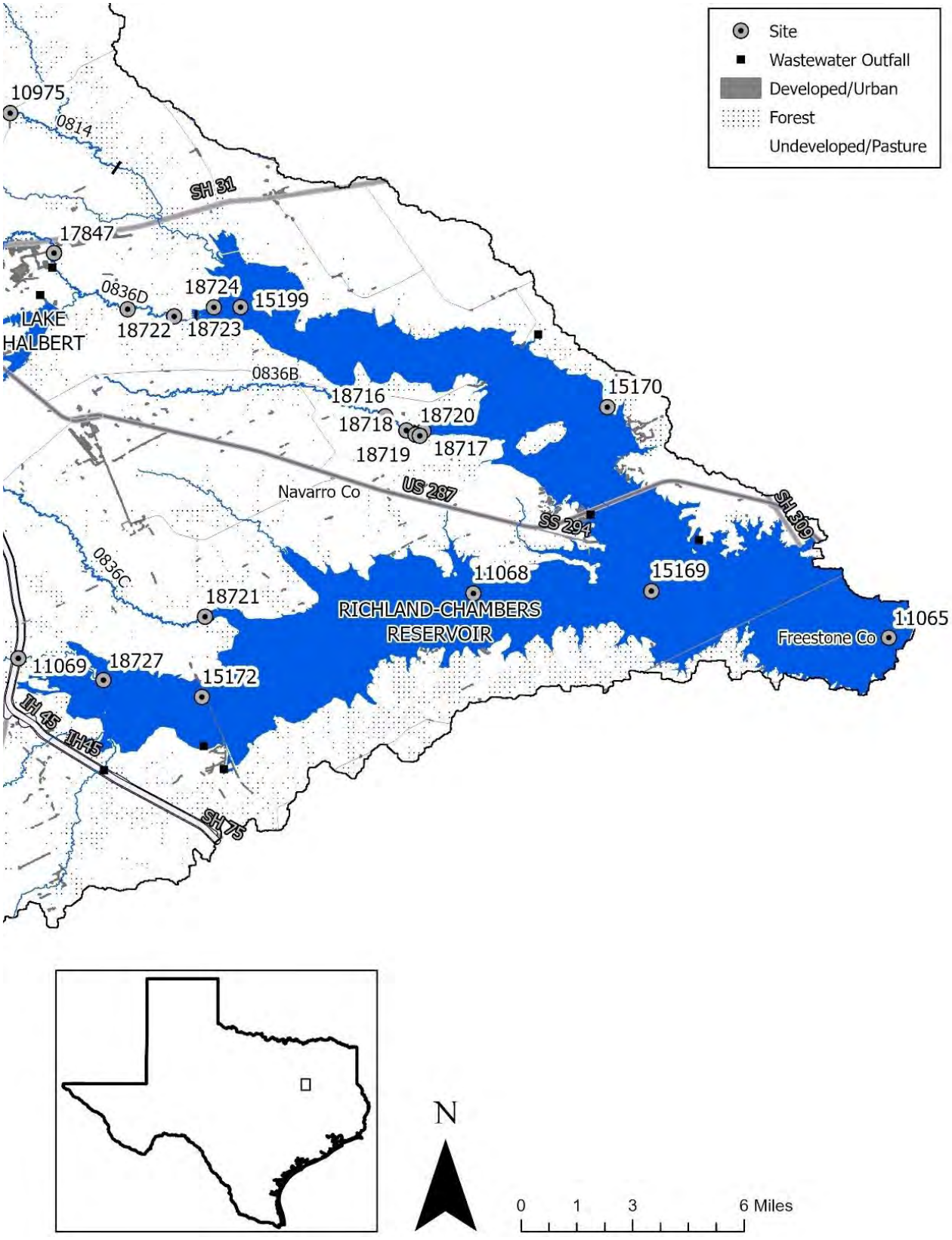


Figure 401: Segment 0836 Map

This 42,978-acre reservoir runs from a point immediately upstream of the confluence of Pin Oak Creek on the Richland Creek Arm and from a point 2.5 miles downstream of Tupelo Branch on the Chambers Creek Arm to the Richland-Chambers Dam. It impounds Richland and Chambers Creeks up to the normal pool elevation of 315 feet (see Figure 401). A majority of the watershed is hay and pasture land. There are some areas of crop land to the north of the Chambers Creek arm and forest to the south of the Richland Creek arm. The City of Corsicana lies upstream of the Chambers Creek arm. The reservoir lies within the Northern Blackland Prairie ecoregion with a small portion of the downstream end of the reservoir in the Floodplains and Low Terraces. Richland-Chambers Reservoir has been noted as being eutrophic by the TCEQ Trophic Classification of Texas Reservoirs report.

Water quality monitoring is being conducted at seven sites within this segment as shown in Table 327. Monitoring is being conducted by Tarrant Regional Water District. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 327: Segment 0836 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0836_01	RICHLAND-CHAMBERS RESERVOIR AT NORTH END OF DAM 332 METERS SOUTH AND 555 METERS WEST OF INTERSECTION OF US 287 AND RR 488	15168	Tarrant Regional Water District
0836_02	RICHLAND-CHAMBERS RESERVOIR 1.95 KM NORTH AND 2.26 KM WEST OF INTERSECTION OF SE 3190 ROAD AND OLD HIGHWAY 287	15169	Tarrant Regional Water District
0836_03	RICHLAND-CHAMBERS RESERVOIR CHAMBERS CREEK ARM NEAR TCWCID 1 PUMP STATION 570 M S AND 1.16 KM W OF INTERSECT OF SE 3240 AND SE 3250	15170	Tarrant Regional Water District
0836_04	RICHLAND-CHAMBERS RESERVOIR UPPER END OF CHAMBERS CREEK ARM 2.52 KM NORTH AND 329 METERS WEST OF INTERSECTION OF WICHITA TRL AND FM 637	15199	Tarrant Regional Water District
0836_05	RICHLAND-CHAMBERS RESERVOIR RICHLAND CREEK ARM MID LAKE 2.24 KM SOUTH AND 276 METERS EAST OF INTERSECTION OF PETTY RD AND SE 2230 RD	11068	Tarrant Regional Water District
0836_06	RICHLAND-CHAMBERS RESERVOIR IN UPPER END OF RICHLAND CREEK ARM 2.01 KM S AND 150 METERS E OF INTERSECTION OF NAVARRO SLAB AND SE 1095	15172	Tarrant Regional Water District
0836_07	RICHLAND CREEK AT SW 0030 RD UPSTREAM OF RICHLAND-CHAMBERS RESERVOIR	16721	Tarrant Regional Water District

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 328. Results of TRA trend analyses are shown in Table 329.

Table 328: TCEQ 2020 Texas Integrated Report Summary for Segment 0836

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0836_01 Lowermost portion of reservoir, adjacent to dam	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0836_02 Confluence of Richland and Chambers Creek arms	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0836_03 Lower portion of Chambers Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0836_04 Upper portion of Chambers Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0836_05 Lower portion of Richland Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0836_06 Upper portion of Richland Creek arm	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0836_07 Remainder of reservoir	Aquatic Life Use	Dissolved Oxygen	5 mg/L	CS
0836_01 Lowermost portion of reservoir, adjacent to dam	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0836_02 Confluence of Richland and Chambers Creek arms	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0836_03 Lower portion of Chambers Creek arm	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0836_04 Upper portion of Chambers Creek arm	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0836_05 Lower portion of Richland Creek arm	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0836_06 Upper portion of Richland Creek arm	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0836_07 Remainder of reservoir	Recreation Use	*E. coli*	126 MPN/100 mL	NS
0836_01 Lowermost portion of reservoir, adjacent to dam	General Use	Nutrient Reservoir Narrative Criteria		NC
0836_02 Confluence of Richland and Chambers Creek arms	General Use	Nutrient Reservoir Narrative Criteria		NC
0836_03 Lower portion of Chambers Creek arm	General Use	Nutrient Reservoir Narrative Criteria		NC
0836_04 Upper portion of Chambers Creek arm	General Use	Nutrient Reservoir Narrative Criteria		NC
0836_05 Lower portion of Richland Creek arm	General Use	Nutrient Reservoir Narrative Criteria		NC
0836_06 Upper portion of Richland Creek arm	General Use	Nutrient Reservoir Narrative Criteria		NC
0836_07 Remainder of reservoir	General Use	Nutrient Reservoir Narrative Criteria		NC
0836_08 Post Oak Creek Arm off of Chambers Creek Arm of Richland Chambers Reservoir	General Use	Nutrient Reservoir Narrative Criteria		NC
0836_01 Lowermost portion of reservoir, adjacent to dam	General Use	pH	6.5 - 9 S.U.	FS
0836_02 Confluence of Richland and Chambers Creek arms	General Use	pH	6.5 - 9 S.U.	FS
0836_03 Lower portion of Chambers Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0836_04 Upper portion of Chambers Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0836_05 Lower portion of Richland Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0836_06 Upper portion of Richland Creek arm	General Use	pH	6.5 - 9 S.U.	FS
0836_07 Remainder of reservoir	General Use	pH	6.5 - 9 S.U.	FS
0836_01 Lowermost portion of reservoir, adjacent to dam	General Use	Chloride	75 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0836_02 Confluence of Richland and Chambers Creek arms	General Use	Chloride	75 mg/L	FS
0836_03 Lower portion of Chambers Creek arm	General Use	Chloride	75 mg/L	FS
0836_04 Upper portion of Chambers Creek arm	General Use	Chloride	75 mg/L	FS
0836_05 Lower portion of Richland Creek arm	General Use	Chloride	75 mg/L	FS
0836_06 Upper portion of Richland Creek arm	General Use	Chloride	75 mg/L	FS
0836_07 Remainder of reservoir	General Use	Chloride	75 mg/L	FS
0836_08 Post Oak Creek Arm off of Chambers Creek Arm of Richland Chambers Reservoir	General Use	Chloride	75 mg/L	FS
0836_01 Lowermost portion of reservoir, adjacent to dam	General Use	Sulfate	110 mg/L	FS
0836_02 Confluence of Richland and Chambers Creek arms	General Use	Sulfate	110 mg/L	FS
0836_03 Lower portion of Chambers Creek arm	General Use	Sulfate	110 mg/L	FS
0836_04 Upper portion of Chambers Creek arm	General Use	Sulfate	110 mg/L	FS
0836_05 Lower portion of Richland Creek arm	General Use	Sulfate	110 mg/L	FS
0836_06 Upper portion of Richland Creek arm	General Use	Sulfate	110 mg/L	FS
0836_07 Remainder of reservoir	General Use	Sulfate	110 mg/L	FS
0836_08 Post Oak Creek Arm off of Chambers Creek Arm of Richland Chambers Reservoir	General Use	Sulfate	110 mg/L	FS
0836_01 Lowermost portion of reservoir, adjacent to dam	General Use	Total Dissolved Solids	400 mg/L	FS
0836_02 Confluence of Richland and Chambers Creek arms	General Use	Total Dissolved Solids	400 mg/L	FS
0836_03 Lower portion of Chambers Creek arm	General Use	Total Dissolved Solids	400 mg/L	FS
0836_04 Upper portion of Chambers Creek arm	General Use	Total Dissolved Solids	400 mg/L	FS
0836_05 Lower portion of Richland Creek arm	General Use	Total Dissolved Solids	400 mg/L	FS
0836_06 Upper portion of Richland Creek arm	General Use	Total Dissolved Solids	400 mg/L	FS
0836_07 Remainder of reservoir	General Use	Total Dissolved Solids	400 mg/L	FS
0836_08 Post Oak Creek Arm off of Chambers Creek Arm of Richland Chambers Reservoir	General Use	Total Dissolved Solids	400 mg/L	FS
0836_01 Lowermost portion of reservoir, adjacent to dam	General Use	Water temperature	32.8 °F	FS
0836_02 Confluence of Richland and Chambers Creek arms	General Use	Water temperature	32.8 °F	FS
0836_03 Lower portion of Chambers Creek arm	General Use	Water temperature	32.8 °F	FS
0836_04 Upper portion of Chambers Creek arm	General Use	Water temperature	32.8 °F	FS
0836_05 Lower portion of Richland Creek arm	General Use	Water temperature	32.8 °F	FS
0836_06 Upper portion of Richland Creek arm	General Use	Water temperature	32.8 °F	FS
0836_07 Remainder of reservoir	General Use	Water temperature	32.8 °F	FS
0836_01 Lowermost portion of reservoir, adjacent to dam	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0836_02 Confluence of Richland and Chambers Creek arms	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0836_03 Lower portion of Chambers Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0836_04 Upper portion of Chambers Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0836_05 Lower portion of Richland Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0836_06 Upper portion of Richland Creek arm	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0836_07 Remainder of reservoir	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

There were no data available in assessment unit 0836_08 for the period of record for this basin summary report.

Table 329: Significant Trends for Segment 0836 (P-value<0.1)

Segment & Assessment Unit		0836_01	0836_02	0836_03	0836_04	0836_05	0836_06	0836_07
Site		15168	15169	15170	15199	11068	15172	16721
Secchi Depth	All	Not Significant	Not Significant	Not Significant	↑	Not Significant	Not Significant	Insufficient Data
	Summer	No Trend	Not Significant	Not Significant	↑	Not Significant	Not Significant	Insufficient Data
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	↓	↓	Insufficient Data
Specific Conductance	All	Not Significant	↓	No Trend	↓	Not Significant	No Trend	Insufficient Data
	Summer	Not Significant	↓	No Trend	↓	Not Significant	Not Significant	Insufficient Data
	Winter	Not Significant	↓	↓	↓	No Trend	No Trend	Insufficient Data
pH	All	No Trend	Not Significant	No Trend	No Trend	Not Significant	No Trend	Insufficient Data
	Summer	No Trend	Not Significant	No Trend	No Trend	Not Significant	Not Significant	Insufficient Data
	Winter	No Trend	↓	No Trend	No Trend	No Trend	No Trend	Insufficient Data
Ammonia	All	Insufficient Data	↓	↓	↓	↓	↓	Insufficient Data
	Summer	Insufficient Data	No Trend	No Trend	↓	↓	↓	Insufficient Data
	Winter	Insufficient Data	↓	↓	Not Significant	↓	Not Significant	Insufficient Data
Nitrate	All	No Trend	Not Significant	No Trend	Not Significant	Not Significant	No Trend	Insufficient Data
	Summer	Not Significant	Not Significant	Not Significant	↑	Not Significant	Not Significant	Insufficient Data
	Winter	↑	↑	↑	No Trend	↑	Not Significant	Insufficient Data
Total Kjeldahl Nitrogen	All	No Trend	No Trend	No Trend	↓	↓	↓	Insufficient Data
	Summer	No Trend	No Trend	Not Significant	↓	No Trend	↓	Insufficient Data
	Winter	Not Significant	No Trend	No Trend	↓	↓	Not Significant	Insufficient Data

Segment & Assessment Unit		0836_01	0836_02	0836_03	0836_04	0836_05	0836_06	0836_07
Site		15168	15169	15170	15199	11068	15172	16721
Total Phosphorus	All	No Trend	No Trend	No Trend	Not Significant	No Trend	Not Significant	Insufficient Data
	Summer	↓	↓	↓	Not Significant	↓	Not Significant	Insufficient Data
	Winter	No Trend	No Trend	Not Significant	↓	No Trend	Not Significant	Insufficient Data
Orthophosphate	All	↓	↓	↓	No Trend	↓	↓	Insufficient Data
	Summer	No Trend	↓	↓	Not Significant	↓	↓	Insufficient Data
	Winter	Not Significant	Not Significant	↓	No Trend	Not Significant	Not Significant	Insufficient Data
Total Organic Carbon	All	No Trend	↓	↓	↓	No Trend	Insufficient Data	↓
	Summer	↓	↓	Not Significant	↓	↓	Insufficient Data	Not Significant
	Winter	↓	↓	↓	↓	↓	Insufficient Data	↓
Dissolved Organic Carbon	All	No Trend	No Trend	Not Significant	No Trend	No Trend	Insufficient Data	Insufficient Data
	Summer	No Trend	No Trend	Not Significant	No Trend	No Trend	Insufficient Data	Insufficient Data
	Winter	No Trend	Not Significant	↓	No Trend	Not Significant	Insufficient Data	Insufficient Data
Hardness	All	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Magnesium	All	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Chloride	All	No Trend	↓	Not Significant	Not Significant	Not Significant	Insufficient Data	Insufficient Data
	Summer	No Trend	Not Significant	Not Significant	Not Significant	Not Significant	Insufficient Data	Insufficient Data
	Winter	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Insufficient Data	Insufficient Data
Sulfate	All	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↓	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Arsenic	All	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Total Iron	All	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data

Segment & Assessment Unit		0836_01	0836_02	0836_03	0836_04	0836_05	0836_06	0836_07
Site		15168	15169	15170	15199	11068	15172	16721
Total Manganese	All	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Chlorophyll-*a*	All	No Trend	No Trend	No Trend	No Trend	↓	No Trend	Insufficient Data
	Summer	Not Significant	Not Significant	↓	Not Significant	↓	Not Significant	Insufficient Data
	Winter	No Trend	No Trend	↓	↓	↓	↓	Insufficient Data
Phytoplankton	All	Insufficient Data	Insufficient Data	↑	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	No Trend	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data

↓ = Decreasing Trend, ↑ = Increasing Trend

An impairment due to elevated levels of *E. coli* was identified in assessment unit 0836_07 which is located in the riverine portion of the Richland Creek arm at SW County Road 0030. As shown in Figure 402, *E. coli* levels were generally reported above the standard of 126 MPN/100 mL. There was no correlation with reservoir elevation or stream flow and only weak correlations with flow severity and days since precipitation (correlation coefficients = 0.336 and -0.292, respectively). This indicates that the impairment was likely more related to constant sources of bacteria into the reservoir rather than run-off related sources. Monitoring station 16721 in this assessment unit in approximately 3 miles downstream of station 11070 in segment 0837 that had similar correlations and likely similar causes for the impairment. In fact, there is also a wooded area upstream of monitoring station 16721 and evidence of livestock trails entering the tributaries that confluence with the reservoir immediately upstream of 16721. Wildlife and livestock visiting the stream for watering were the most likely source of bacteria in this assessment unit. Landowner education and livestock best management practices may help reduce bacteria levels in this portion of the reservoir.

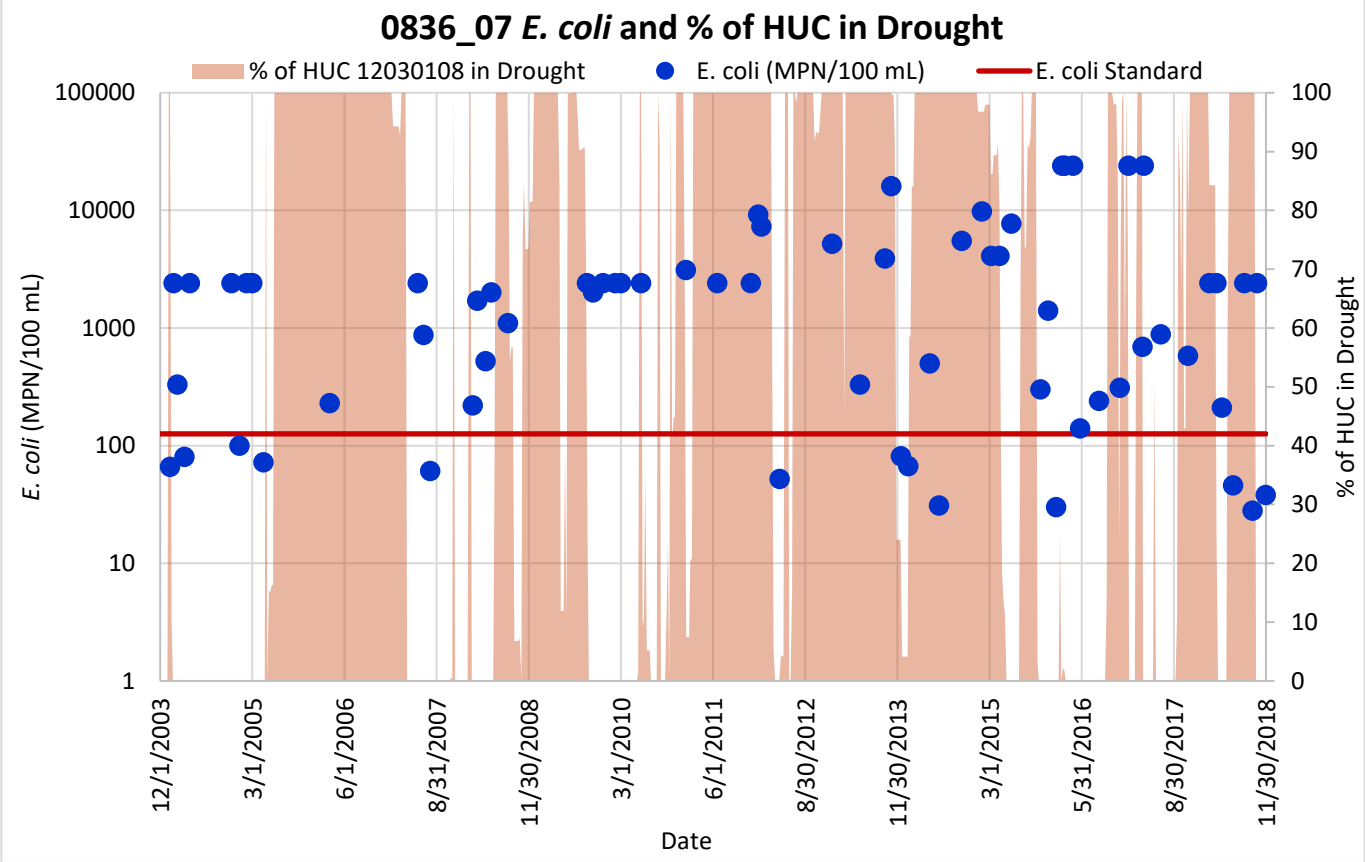


Figure 402: 0836_07 E. coli and % of HUC in Drought

There was a concern for depressed dissolved oxygen identified in assessment unit 0836_07. As shown in Figure 403, dissolved oxygen levels were generally reported below the screening level and standard during periods of drought. There was a weak correlation between dissolved oxygen and flow severity (correlation coefficient = 0.311). Based on that correlation and the drought relationship, it is likely that low flows were the main factor influencing dissolved oxygen in this portion of the reservoir. However, there was no chlorophyll-*a* data available to determine if there may have been a relationship between dissolved oxygen and algal populations. It is recommended that chlorophyll-*a* be collected in order to more fully address this concern.

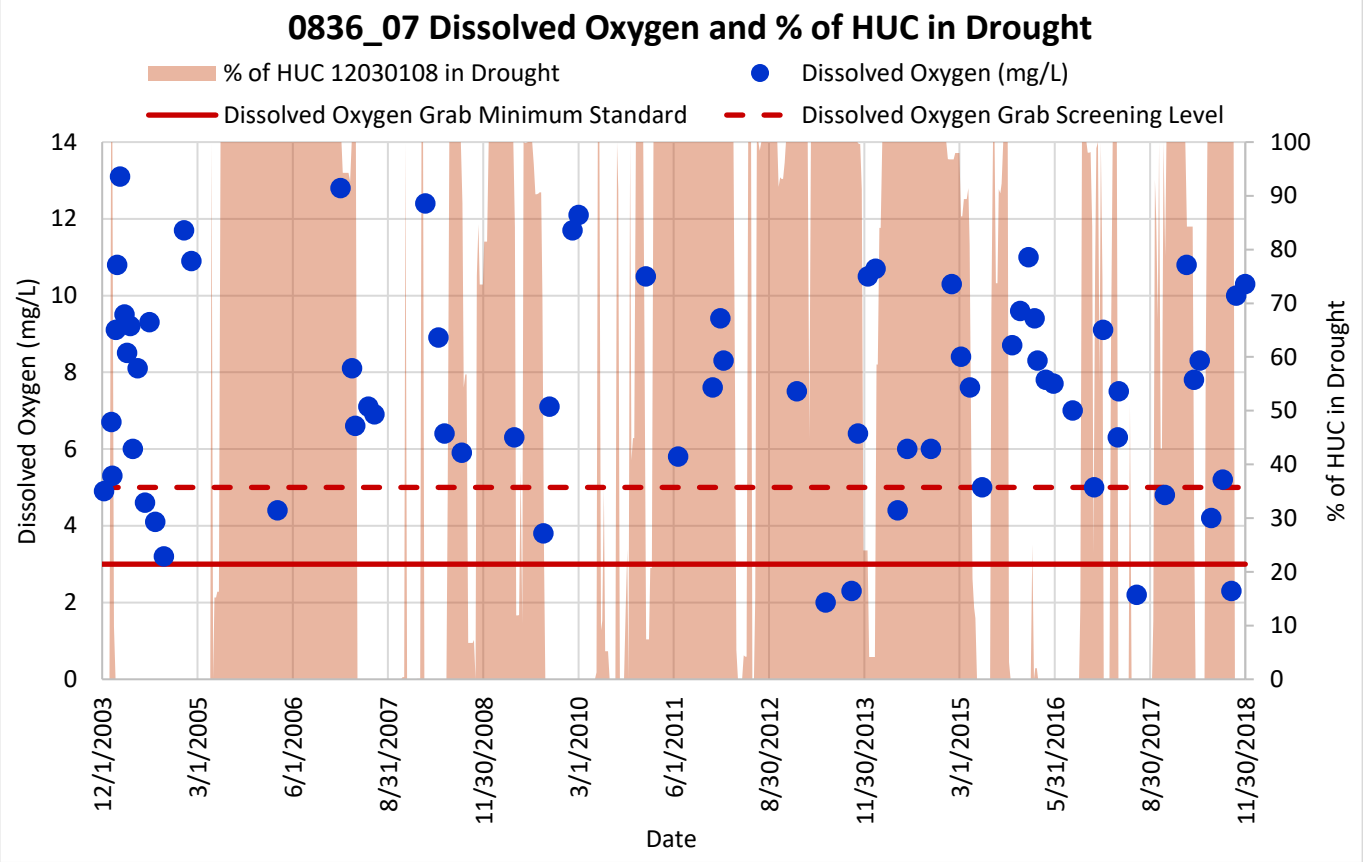


Figure 403: 0836_07 Dissolved Oxygen and % of HUC in Drought

The increasing summer nitrate trend in assessment unit 0836_04 was weighted by a single high measurement reported during a small increase in the reservoir elevation during the prolonged drought of 2011 to 2015. It is likely that this was as a result of residential fertilizers from homes in the City of Corsicana and agricultural fertilizers on the nearby crop land being washed into the upper portion of the Chambers Creek arm during a recent precipitation event. There were winter nitrate trends identified in several assessment units. Figure 404 shows this trend for assessment unit 0836_03 which is the main body at the confluence of the two arms of the reservoir. It appears that the trend was weighted by increases during the drought of record which coincided with small increases in reservoir elevation. This may have been due to increased amounts of fertilizers being used during the drought and being washed in during precipitation events or by over-irrigation of fields. However, there was a decrease in nitrate levels after the prolonged drought so this trend may be an artifact of the period of record for this basin summary report in relation to the drought.

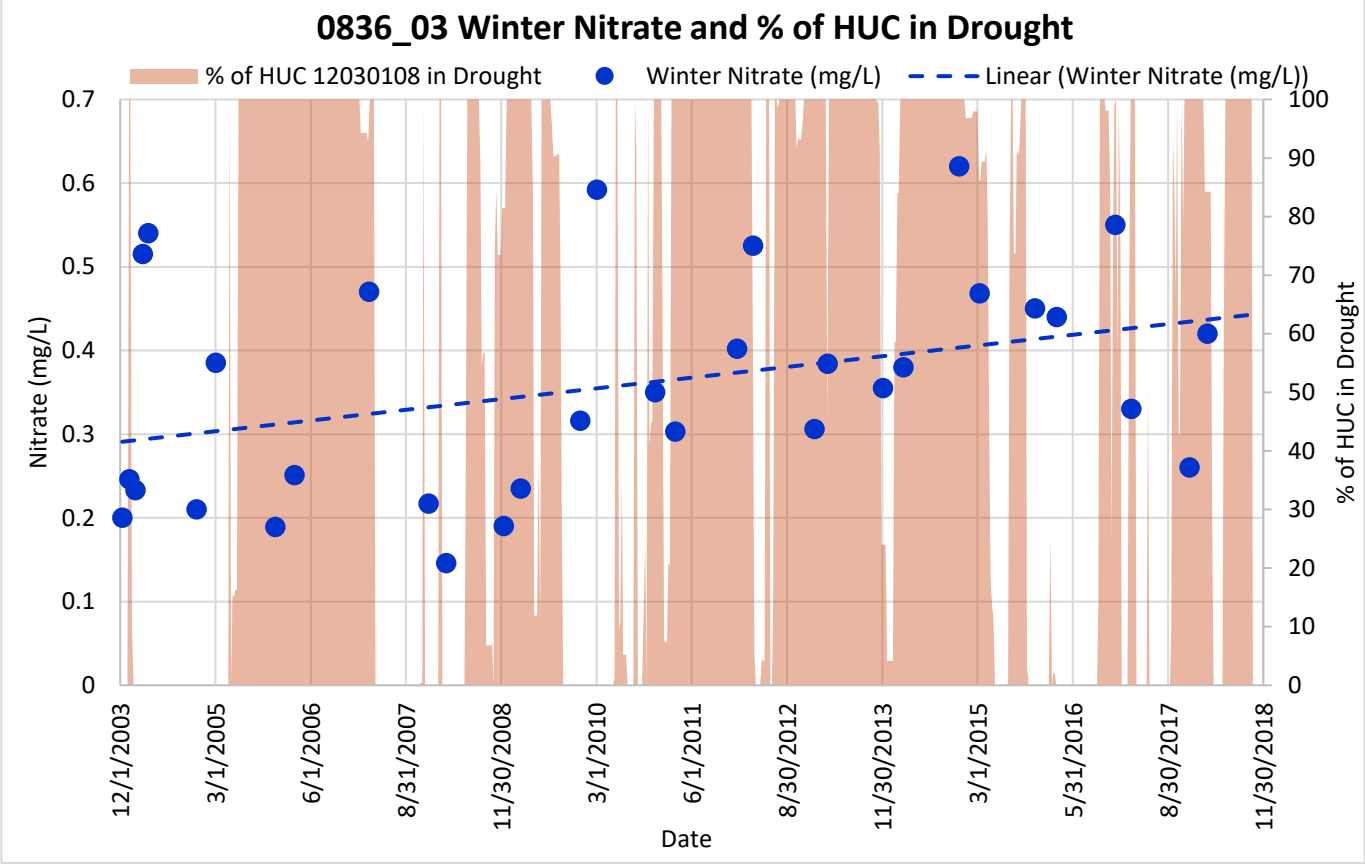


Figure 404: 0836_03 Winter Nitrate and % of HUC in Drought

The increasing winter trend for total arsenic was an artifact of the detection limit and did not represent a true change in water quality. During the early portion of the data set, the detection limit was 5 µg/L. Data reported as <5 µg/L were censored down to 0.25 µg/L for this report. Later the detection limit decreased to 1 µg/L and no values in the winter data set were reported above 5 µg/L. Similarly, the increasing trend for total iron and total manganese were related to the detection limit and did not represent a true change in water quality. For total iron, the detection limit for the early portion of the data set was 300 µg/L and later decreased to 125 µg/L. There were only four winter total iron records reported above 300 µg/L. For total manganese, the detection limit decreased from 50 µg/L to 10 µg/L with only one value reported above 50 µg/L.

Lower Trinity River

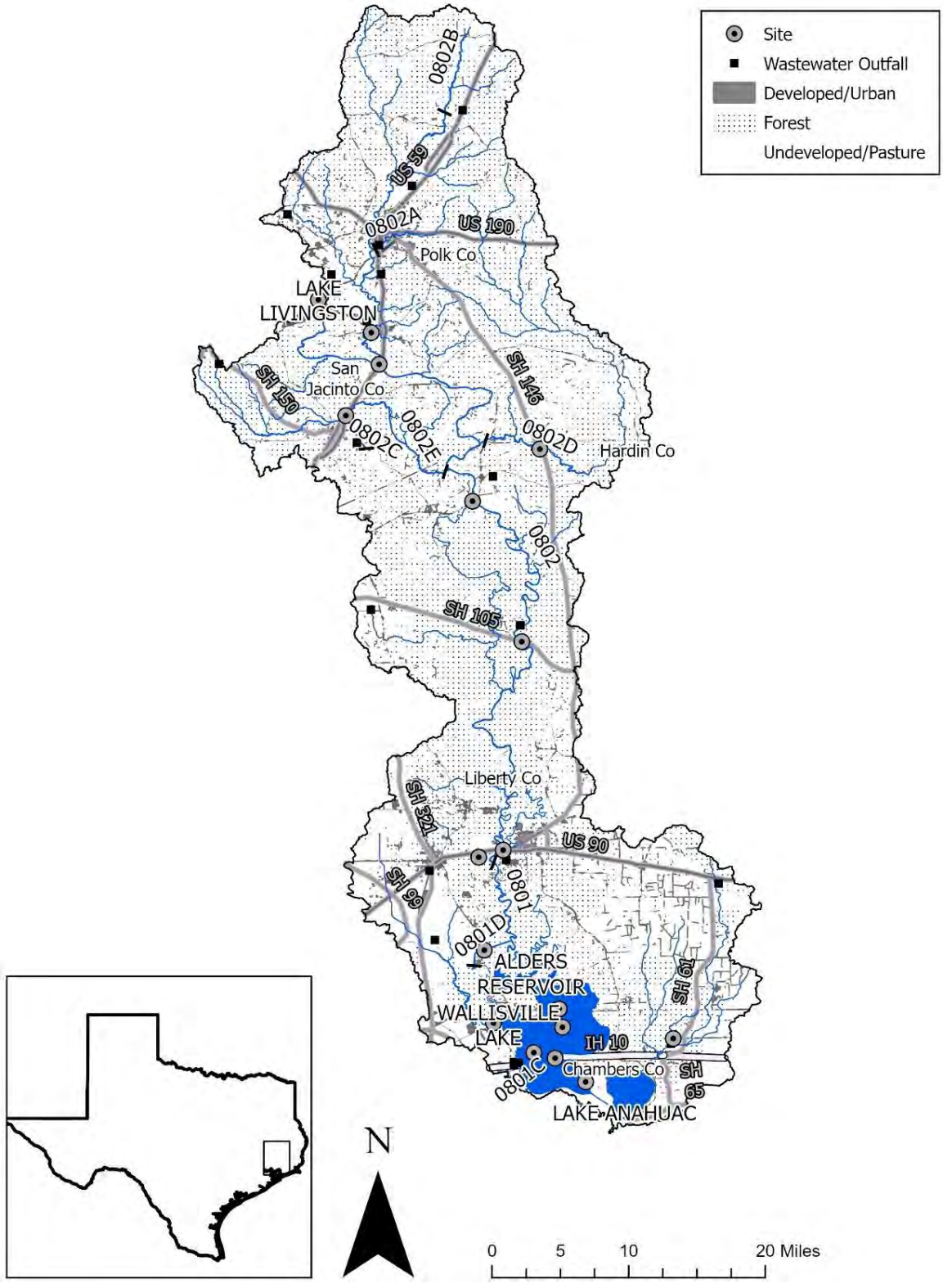


Figure 405: Lower Trinity River Overview Map

The Lower Trinity River subwatershed extends 119 river miles from the Lake Livingston Dam in San Jacinto and Polk counties to the mouth of the river in Chambers County (see Figure 405). The subwatershed is largely rural and major population centers include the cities of Livingston and Liberty. The City of Houston, which lies outside of the basin, pulls water from the river in this area via the Coastal Water Authority Canal. This subwatershed receives between 50 and 60 inches of rain annually.

Classified and unclassified segments in this watershed are listed below. Classified segments are waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards. Unclassified waterbodies are not defined in Appendix A and are identified by the segment number of the waterbody into which they flow followed by a letter suffix. The waterbodies listed below and in the following subsections are in hydrologic order from upstream to downstream, to the extent possible.

- 0802 Trinity River Below Lake Livingston
- 0802B Long King Creek
- 0802A Choates Creek
- 0802D Menard Creek
- 0802E Big Creek
- 0802C Unnamed Tributary of Coley Creek
- 0801 Trinity River Tidal
- 0801D Lynchburg Canal
- 0801B Old River
- 0801A Lost River
- 0801C Cotton Bayou

0802 Trinity River Below Lake Livingston

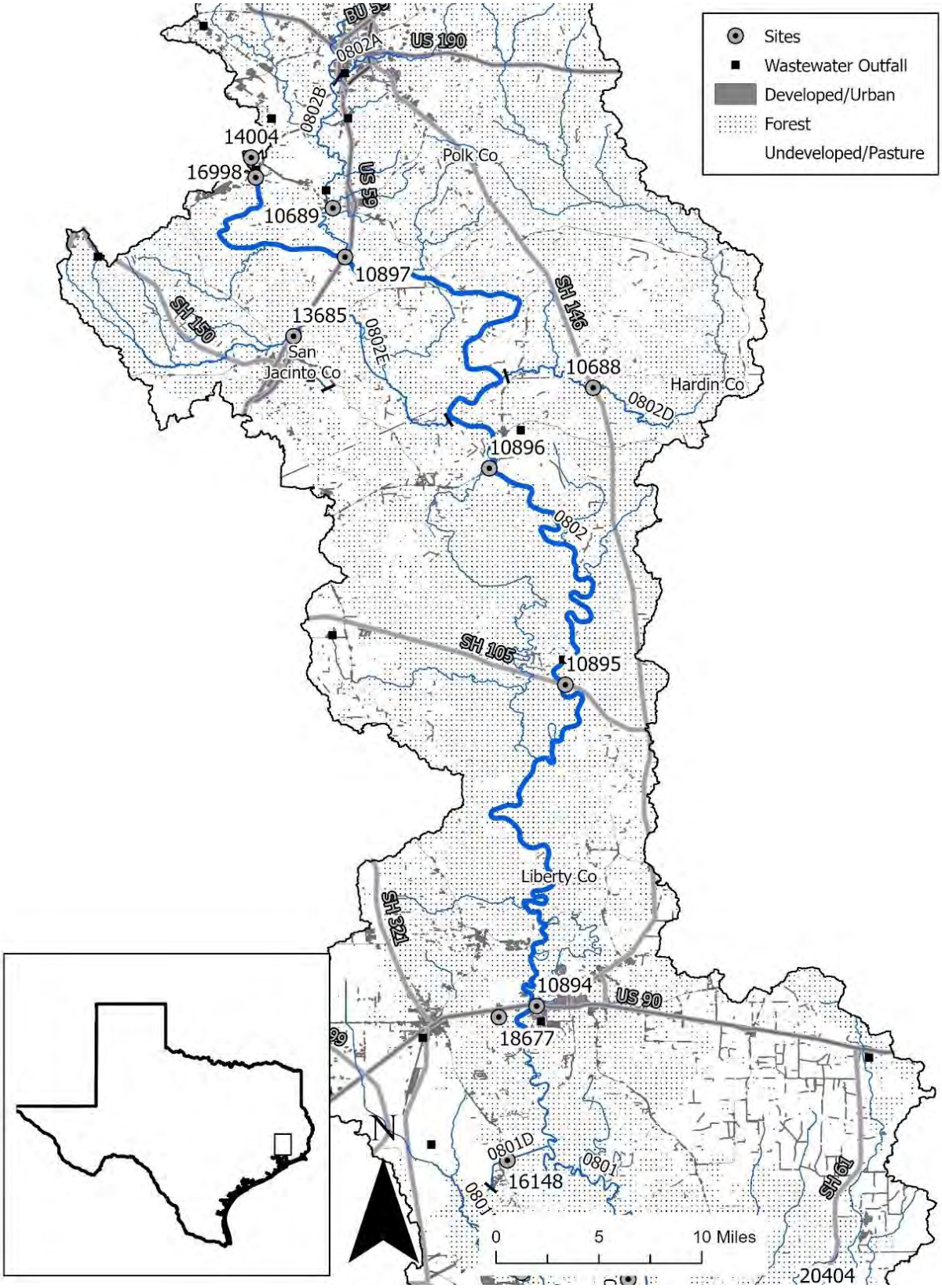


Figure 406: Segment 0802 Map

This 76-mile segment runs from the Livingston Dam on the border of Polk and San Jacinto counties to a point 1.9 miles downstream of US 90 in Liberty County (see Figure 406). This watershed is largely rural with a mix of hay and pasture lands, woody wetlands, and forest. There is some development around the cities of Goodrich, Romayor, and Liberty. The river flows through the Floodplains and Low Terraces ecoregion.

Water quality monitoring is being conducted at five sites within this segment as shown in Table 330. Monitoring is being conducted by the TRA Lake Livingston Project and TCEQ Region 12. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 330: Segment 0802 FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0802_01	TRINITY RIVER AT US 90 IN LIBERTY TRA #33	10894	TCEQ Region 12
0802_02	TRINITY RIVER AT SH 105 NEAR MOSS HILL TRA #32	10895	TRA Lake Livingston Project
0802_03	TRINITY RIVER 125 METERS UPSTREAM OF FM 787 NEAR ROMAYOR	10896	TCEQ Region 12
0802_04	TRINITY RIVER AT US 59 SOUTH OF GOODRICH TRA #30	10897	TRA Lake Livingston Project
0802_05	TRINITY RIVER AT FM 3278 775 METERS DOWNSTREAM OF LAKE LIVINGSTON AND 8MI EAST OF COLDSPRING	16998	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 331. Results of TRA trend analyses are shown in Table 332.

Table 331: TCEQ 2020 Texas Integrated Report Summary for Segment 0802

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0802_01 Lower 17 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0802_02 Approximately 9 mi upstream to approximately 15 mi downstream of SH 105	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0802_04 5 mi upstream to 11 mi downstream of US 59	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0802_05 Upper 6 mi of segment	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0802_04 5 mi upstream to 11 mi downstream of US 59	Aquatic Life Use	Acute Toxic Substances in water		FS
0802_04 5 mi upstream to 11 mi downstream of US 59	Aquatic Life Use	Chronic Toxic Substances in water		FS
0802_01 Lower 17 mi of segment	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0802_04 5 mi upstream to 11 mi downstream of US 59	Recreation Use	*E. coli*	126 MPN/100 mL	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0802_05 Upper 6 mi of segment	Recreation Use	*E. coli*	126 MPN/100 mL	FS
0802_01 Lower 17 mi of segment	General Use	Ammonia	0.33 mg/L	NC
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	Ammonia	0.33 mg/L	NC
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	Ammonia	0.33 mg/L	NC
0802_05 Upper 6 mi of segment	General Use	Ammonia	0.33 mg/L	NC
0802_01 Lower 17 mi of segment	General Use	Nitrate	1.95 mg/L	NC
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	Nitrate	1.95 mg/L	NC
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	Nitrate	1.95 mg/L	NC
0802_05 Upper 6 mi of segment	General Use	Nitrate	1.95 mg/L	NC
0802_01 Lower 17 mi of segment	General Use	Total Phosphorus	0.69 mg/L	NC
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	Total Phosphorus	0.69 mg/L	NC
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	Total Phosphorus	0.69 mg/L	NC
0802_05 Upper 6 mi of segment	General Use	Total Phosphorus	0.69 mg/L	NC
0802_01 Lower 17 mi of segment	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0802_05 Upper 6 mi of segment	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0802_01 Lower 17 mi of segment	General Use	pH	6.5 - 9 S.U.	FS
0802_02 Approximately 9 mi upstream to approximately 15 mi downstream of SH 105	General Use	pH	6.5 - 9 S.U.	FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	pH	6.5 - 9 S.U.	FS
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	pH	6.5 - 9 S.U.	FS
0802_05 Upper 6 mi of segment	General Use	pH	6.5 - 9 S.U.	FS
0802_01 Lower 17 mi of segment	General Use	Chloride	125 mg/L	FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	Chloride	125 mg/L	FS
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	Chloride	125 mg/L	FS
0802_05 Upper 6 mi of segment	General Use	Chloride	125 mg/L	FS
0802_01 Lower 17 mi of segment	General Use	Sulfate	100 mg/L	FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	Sulfate	100 mg/L	FS
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	Sulfate	100 mg/L	FS
0802_05 Upper 6 mi of segment	General Use	Sulfate	100 mg/L	FS

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0802_01 Lower 17 mi of segment	General Use	Total Dissolved Solids	600 mg/L	FS
0802_02 Approximately 9 mi upstream to approximately 15 mi downstream of SH 105	General Use	Total Dissolved Solids	600 mg/L	FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	Total Dissolved Solids	600 mg/L	FS
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	Total Dissolved Solids	600 mg/L	FS
0802_05 Upper 6 mi of segment	General Use	Total Dissolved Solids	600 mg/L	FS
0802_01 Lower 17 mi of segment	General Use	Water temperature	33.9 °F	FS
0802_02 Approximately 9 mi upstream to approximately 15 mi downstream of SH 105	General Use	Water temperature	33.9 °F	FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	General Use	Water temperature	33.9 °F	FS
0802_04 5 mi upstream to 11 mi downstream of US 59	General Use	Water temperature	33.9 °F	FS
0802_05 Upper 6 mi of segment	General Use	Water temperature	33.9 °F	FS
0802_01 Lower 17 mi of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0802_02 Approximately 9 mi upstream to approximately 15 mi downstream of SH 105	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0802_04 5 mi upstream to 11 mi downstream of US 59	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0802_05 Upper 6 mi of segment	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS
0802_01 Lower 17 mi of segment	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0802_02 Approximately 9 mi upstream to approximately 15 mi downstream of SH 105	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0802_04 5 mi upstream to 11 mi downstream of US 59	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0802_05 Upper 6 mi of segment	Fish Consumption Use	PCBs, Dioxin in edible tissue		NS
0802_01 Lower 17 mi of segment	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0802_02 Approximately 9 mi upstream to approximately 15 mi downstream of SH 105	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0802_03 11 mi upstream to approximately 9 mi downstream of FM 787	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0802_04 5 mi upstream to 11 mi downstream of US 59	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS
0802_05 Upper 6 mi of segment	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern NS = Not Supporting

Table 332: Significant Trends for Segment 0802 (P-value<0.1)

Segment & Assessment Unit		0802_01	0802_02	0802_03	0802_04	0802_05
Site		10894	10895	10896	10897	16998
Water Temperature	All	Not Significant	Not Significant	Not Significant	Not Significant	No Trend
	Summer	No Trend	Not Significant	No Trend	No Trend	No Trend
	Winter	Not Significant	↑*	Not Significant	↑	Not Significant
Flow	All	Insufficient Data	Insufficient Data	No Trend	No Trend	No Trend
	Summer	Insufficient Data	Insufficient Data	Not Significant	No Trend	No Trend
	Winter	Insufficient Data	Insufficient Data	Not Significant	Not Significant	↑
Secchi Depth	All	Not Significant	Not Significant	No Trend	Not Significant	No Trend
	Summer	Not Significant	Not Significant	No Trend	Not Significant	↓
	Winter	Not Significant	Not Significant	Not Significant	↓	↓
Specific Conductance	All	Not Significant	Not Significant	No Trend	↓	↓
	Summer	Not Significant	Not Significant	↓	↓	↓
	Winter	Not Significant	Not Significant	No Trend	↓	↓
Dissolved Oxygen	All	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	Not Significant	Not Significant	↓	Not Significant	Not Significant
Alkalinity	All	Not Significant	Insufficient Data	Not Significant	Not Significant	No Trend
	Summer	Not Significant	Insufficient Data	Not Significant	↓	No Trend
	Winter	Not Significant	Insufficient Data	Not Significant	Not Significant	No Trend
Ammonia	All	No Trend	Insufficient Data	No Trend	No Trend	No Trend
	Summer	No Trend	Insufficient Data	No Trend	No Trend	No Trend
	Winter	No Trend	Insufficient Data	No Trend	↓	No Trend
Total Phosphorus	All	↓	Insufficient Data	No Trend	↓	No Trend
	Summer	↓	Insufficient Data	Not Significant	Not Significant	Not Significant
	Winter	↓	Insufficient Data	↓	↓	No Trend
Orthophosphate	All	↓*	Insufficient Data	↓*	Not Significant	No Trend
	Summer	↓*	Insufficient Data	↓*	Not Significant	Not Significant
	Winter	↓*	Insufficient Data	↓*	Not Significant	No Trend
Sulfate	All	Not Significant	Insufficient Data	↓	↓	↓
	Summer	Not Significant	Insufficient Data	↓	↓	↓
	Winter	Not Significant	Insufficient Data	Not Significant	Not Significant	↓
Fluoride	All	↓	Insufficient Data	No Trend	Insufficient Data	Insufficient Data
	Summer	↓	Insufficient Data	↓	Insufficient Data	Insufficient Data
	Winter	Not Significant	Insufficient Data	↓	Insufficient Data	Insufficient Data
Dissolved Iron	All	Insufficient Data	Insufficient Data	Insufficient Data	↑	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data
Dissolved Zinc	All	Insufficient Data	Insufficient Data	Insufficient Data	↓	Insufficient Data
	Summer	Insufficient Data	Insufficient Data	Insufficient Data	↓	Insufficient Data
	Winter	Insufficient Data	Insufficient Data	Insufficient Data	Not Significant	Insufficient Data

Segment & Assessment Unit		0802_01	0802_02	0802_03	0802_04	0802_05
Site		10894	10895	10896	10897	16998
Total Dissolved Solids	All	Not Significant	Not Significant	No Trend	↓	↓
	Summer	↓	Not Significant	Not Significant	↓	↓
	Winter	Not Significant	Not Significant	No Trend	Not Significant	↓
Days Since Precipitation	All	Not Significant	↑*	Not Significant	Not Significant	No Trend
	Summer	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Winter	↑	↑*	↑	Not Significant	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

The impairment for fish consumption use is based on unsafe levels of PCBs and dioxins in edible fish tissue. The Texas Department of State Health Services has recommended a consumption advisory (Advisory 53) to limit the consumption of several species of fish. Sampling for fish consumption advisories is conducted only by the Texas Department of State Health Services.

Concerns for elevated levels of chlorophyll-*a* were identified in several assessment units. As shown in Figure 407 for the most upstream (0802_05) and most downstream (0802_01) assessment units, chlorophyll-*a* was frequently reported above the screening level of 14.1 µg/L. Levels also tended to increase during periods of drought but there were no strong correlations between chlorophyll-*a* and nutrients. The Lake Livingston dam is operated as a run of the river dam; releases match the flow coming in to the reservoir. At low flows, the algal populations in the river were likely seeded by the populations in the reservoir. The river along this segment is wide with little change in elevation and no shading from overarching tree canopy. These slow meandering flows with plenty of sunlight are ideal conditions for algal populations to increase and this appears to be the cause of the concerns. This conclusion is further supported by the pattern of decreasing chlorophyll-*a* levels with increasing flows. This is best illustrated for assessment unit 0802_04 as shown in Figure 408 (correlation coefficient = -0.470).

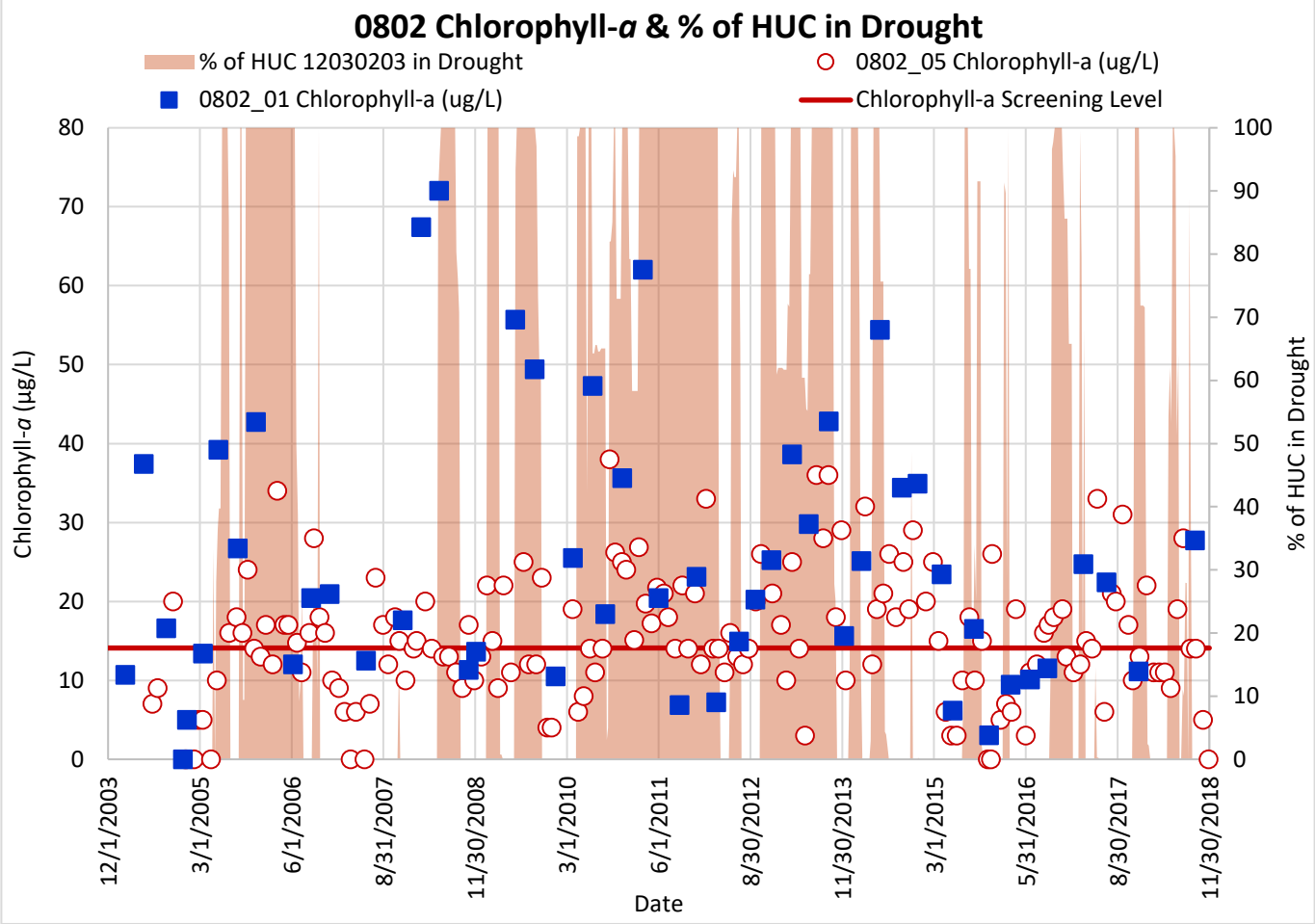


Figure 407: 0802 Chlorophyll-a & % of HUC in Drought

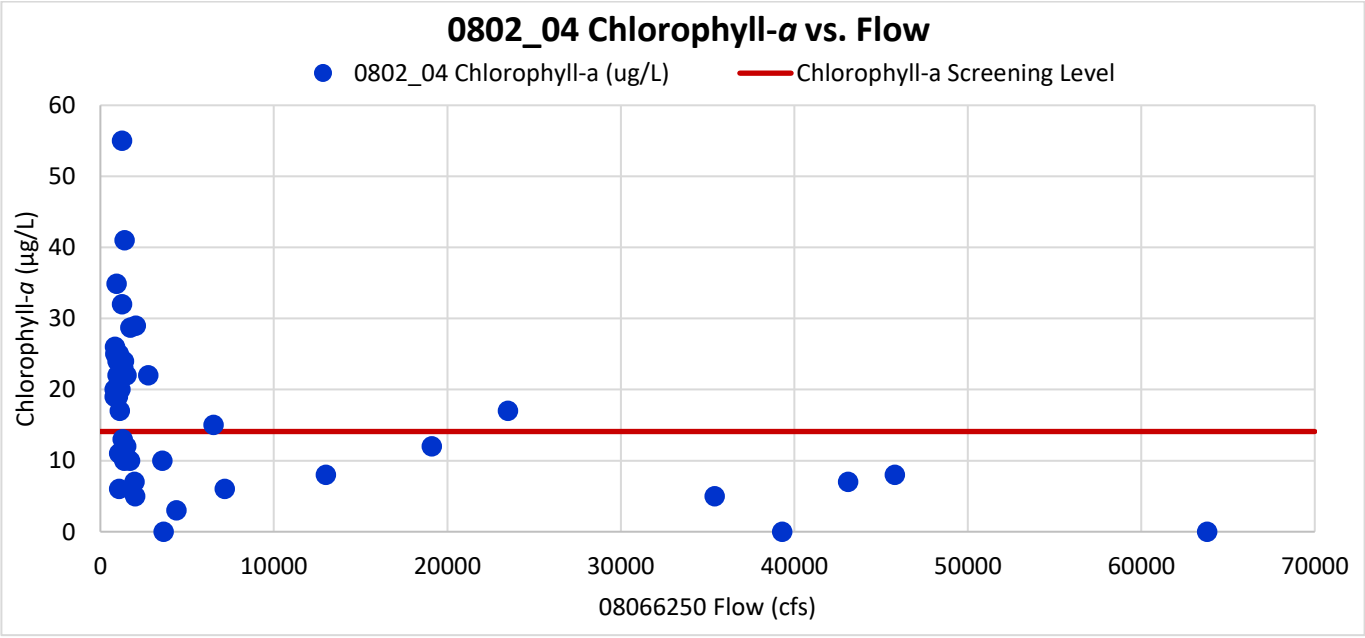


Figure 408: 0802_04 Chlorophyll-a vs. Flow

A decreasing winter dissolved oxygen trend was identified in assessment unit 0802_03 as shown in Figure 409. There was no correlation with chlorophyll-*a* so algal populations were not influencing dissolved oxygen levels. There was no correlation with other parameters that influence dissolved oxygen levels such as stream flow or water temperature nor did dissolved oxygen levels rebound during the drought recovery period of 2015 and 2016. At this time, it is unknown what may have been causing this decreasing trend. It is important to note that dissolved oxygen levels are still well above the standard of 5 mg/L. Additionally, at the current rate of decrease, dissolved oxygen levels would not approach the standard until 2080.

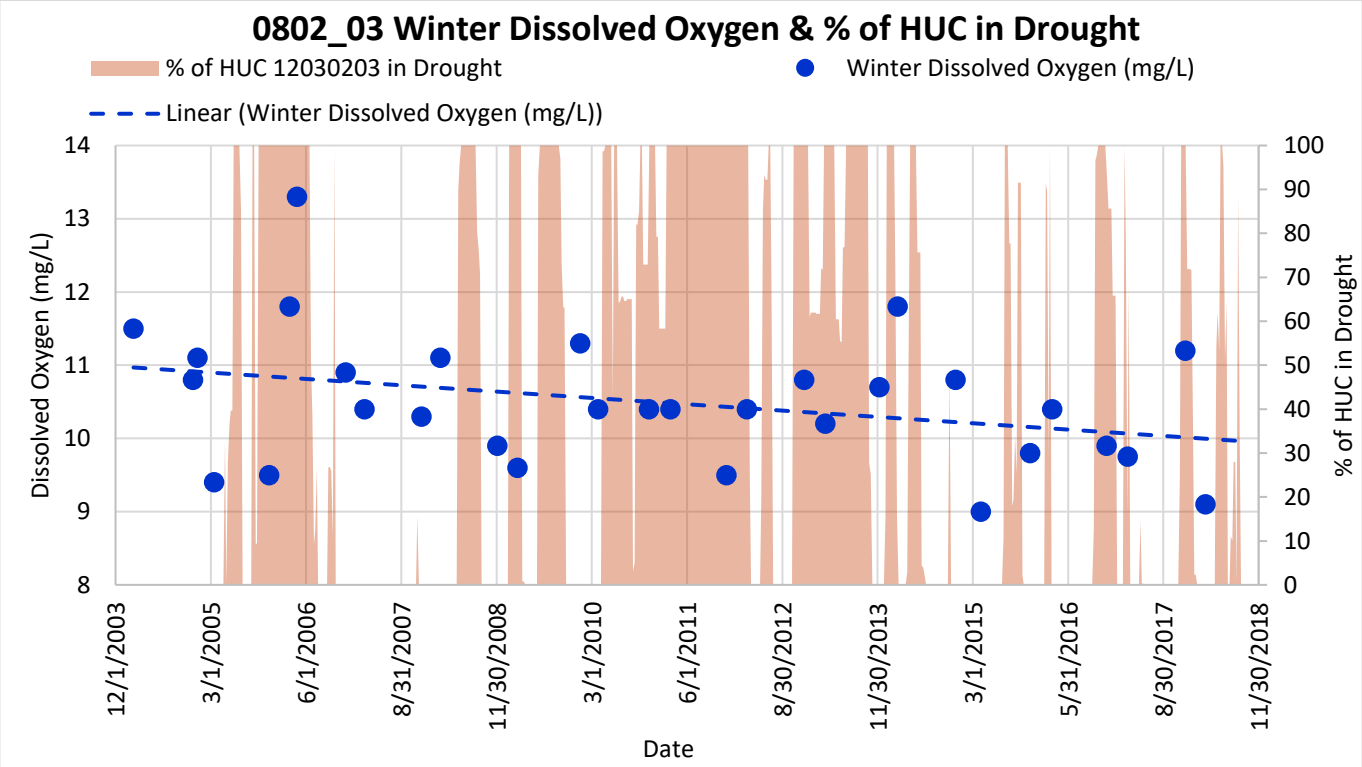


Figure 409: 0802_03 Winter Dissolved Oxygen & % of HUC in Drought

There was an increasing trend identified for dissolved iron in assessment unit 0802_04 as shown in Figure 410. There was a component of changes in detection limits from 300 to 50 µg/L. However, there does appear to have been an increasing trend in the absence of this change that occurred during the drought recovery period in 2015 and 2016. Elevated values observed during this period was likely due to iron containing sediments being washed into the river.

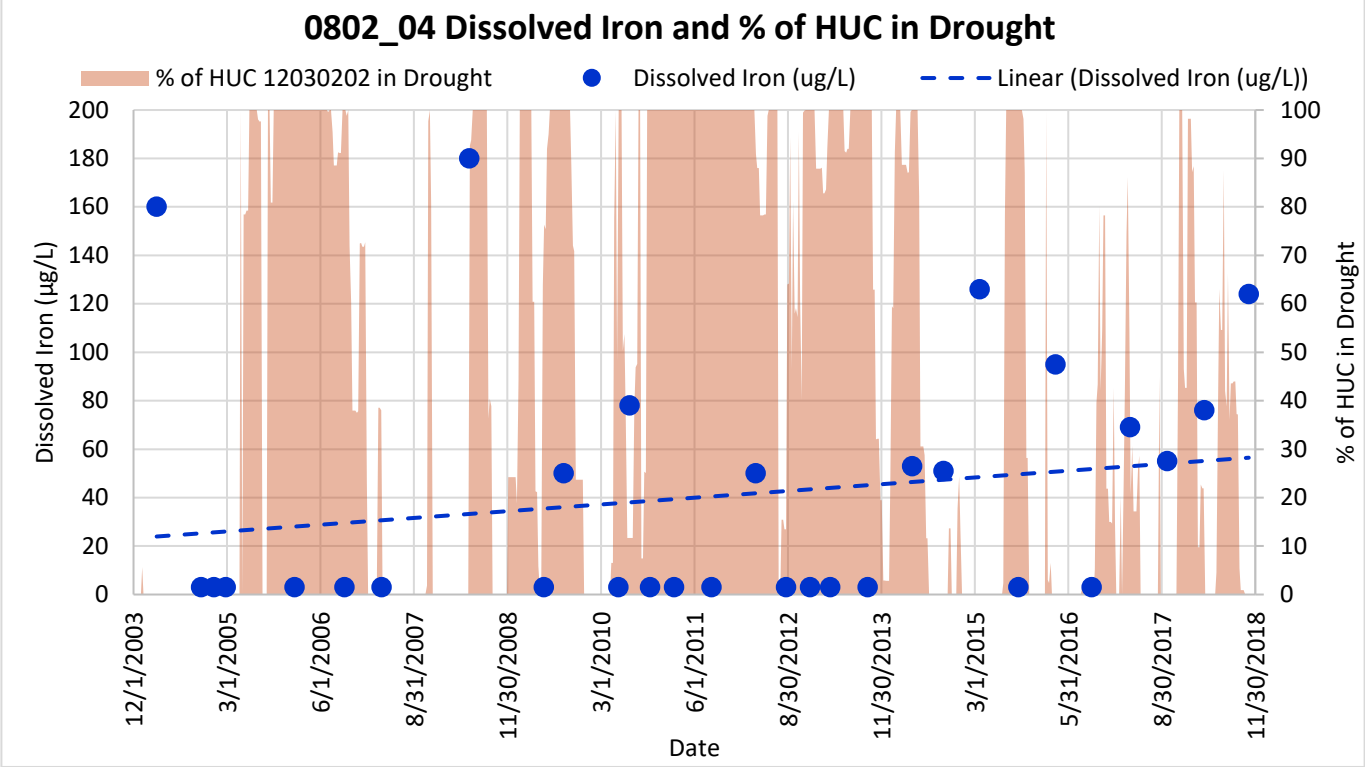


Figure 410: 0802_04 Dissolved Iron and % of HUC in Drought

0802B Long King Creek

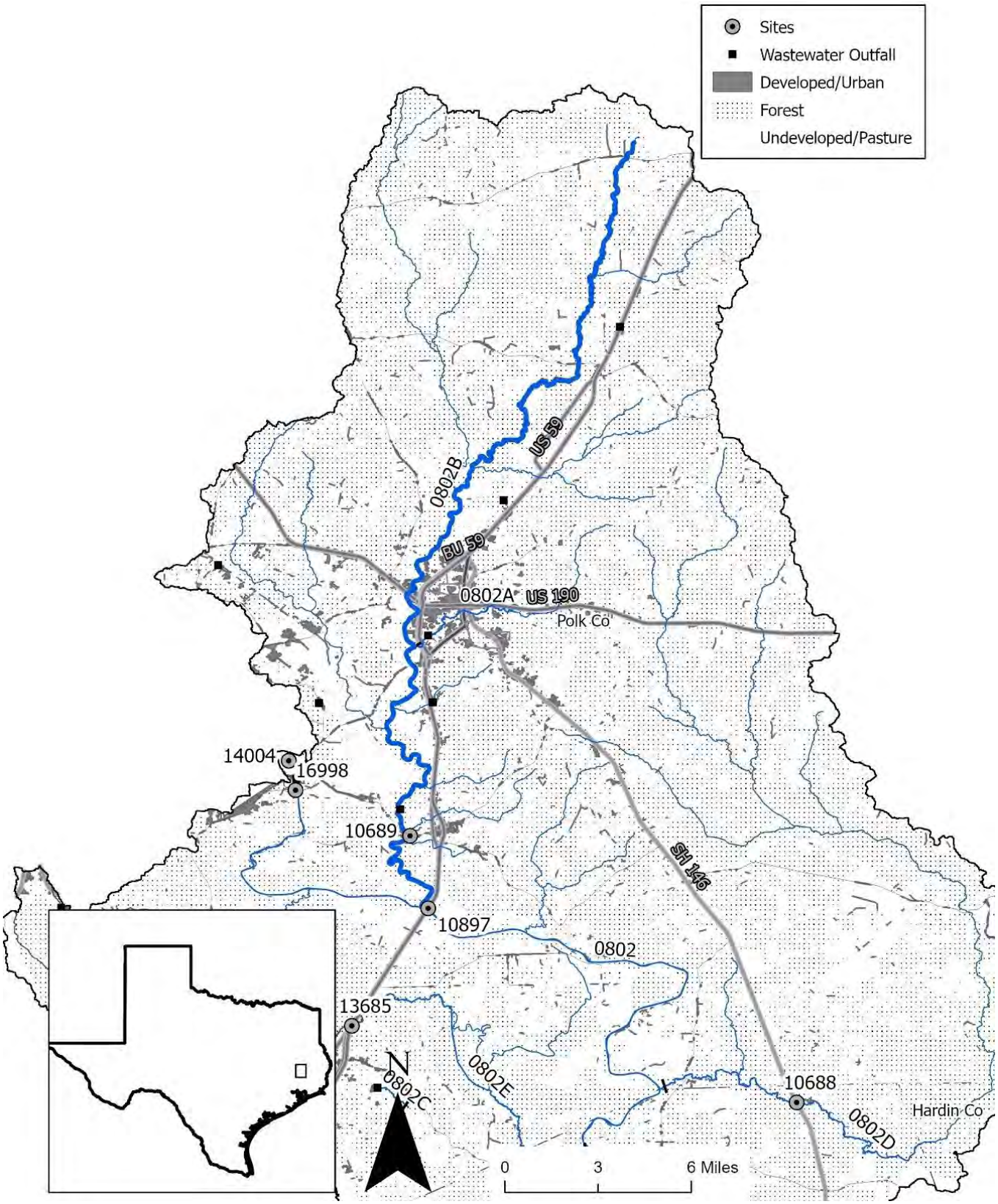


Figure 411: Segment 0802B Map

This 37.7-mile unclassified segment runs from the confluence with an unnamed tributary approximately 1.2 km upstream of FM 350 near the City of Livingston to the confluence with the Trinity River (see Figure 411). The watershed is largely rural outside the developed lands of the City of Livingston. Much of the remaining land use are a mix of hay and pasture land and forest. The stream flows through the Southern Tertiary Uplands with the lower portion flowing through the Flatwoods before entering the Floodplains and Low Terraces ecoregion just before the confluence with the river.

Water quality monitoring is being conducted at one site within this segment as shown in Table 333. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 333: Segment 0802B FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0802B_02	LONG KING CREEK 80 METERS UPSTREAM OF FM 1988 WEST OF GOODRICH TRA #36	10689	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 334.

Table 334: TCEQ 2020 Texas Integrated Report Summary for Segment 0802B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0802B_02 From upstream of confluence with unnamed tributary to confluence with Mud Creek, Polk Co.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NC
0802B_02 From upstream of confluence with unnamed tributary to confluence with Mud Creek, Polk Co.	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0802B_02 From upstream of confluence with unnamed tributary to confluence with Mud Creek, Polk Co.	General Use	Ammonia	0.33 mg/L	NC
0802B_02 From upstream of confluence with unnamed tributary to confluence with Mud Creek, Polk Co.	General Use	Nitrate	1.95 mg/L	NC
0802B_02 From upstream of confluence with unnamed tributary to confluence with Mud Creek, Polk Co.	General Use	Total Phosphorus	0.69 mg/L	NC
0802B_02 From upstream of confluence with unnamed tributary to confluence with Mud Creek, Polk Co.	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CN = Use Concern NC = No Concern

There were no data available in assessment unit 0802B_01 for the period of record for this basin summary report. Data for assessment unit 0802B_02 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in these assessment units.

A concern due to elevated levels of *E. coli* was identified in this segment. This concern was carried forward from previous Integrated Reports and there were limited data to fully assess this concern. The current Integrated Report had a geomean of 106.08 MPN/100 mL and the geomean for the period of record used in this basin summary report was 110.78 MPN/100 mL based on 16 data points. This indicates that the concern may no longer exist. Monitoring is

being conducted at station 10689 at FM 1988 in City of Goodrich twice a year. It is recommended that *E. coli* monitoring be increased from twice a year to quarterly in order to obtain sufficient data to fully assess the current status of the concern in future Integrated Reports. There is some correlation between *E. coli* and days since precipitation (correlation coefficient = -0.431). It is likely that the major contributors to the bacteria concern were likely run-off related. The area upstream of the monitoring station is densely wooded so wildlife may be the major contributors. However, there are some residential areas very close to the stream. It is recommended that upstream sampling be conducted to determine if a potential source can be identified.

0802A Choates Creek

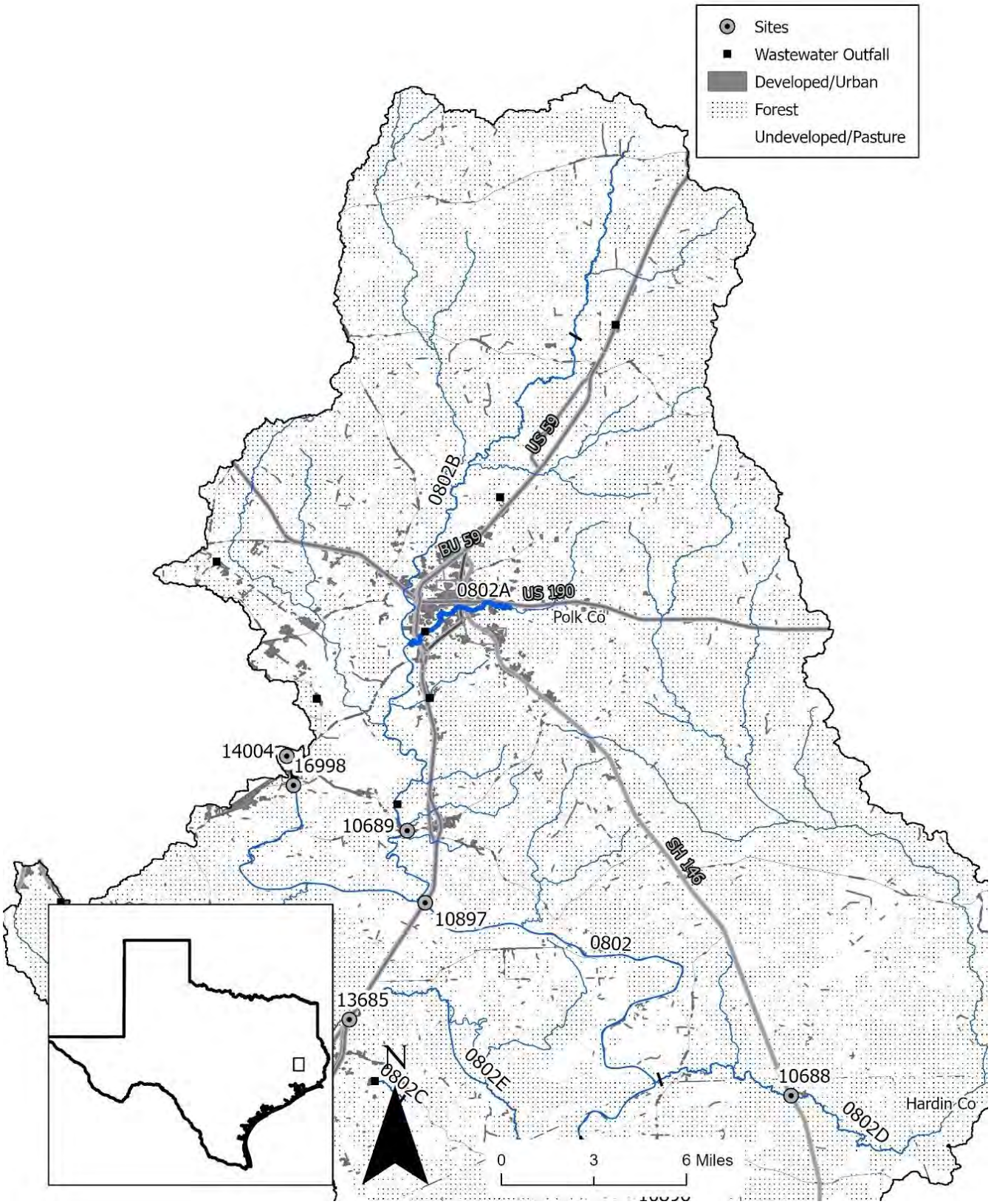


Figure 412: Segment 0802A Map

This 4.9-mile unclassified segment runs from the confluence with an unnamed tributary approximately 3.0 km upstream of SH 146 near the City of Livingston to the confluence with Long King Creek (see Figure 412). The upper portion of the stream drains mostly forested land while the lower portion flows through the developed lands in the City of Livingston. It flows through the Southern Tertiary Uplands ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. No significant trends were identified during TRA data analysis as there were no data available in assessment unit 0802A_01 for the period of record for this basin summary report.

0802D Menard Creek

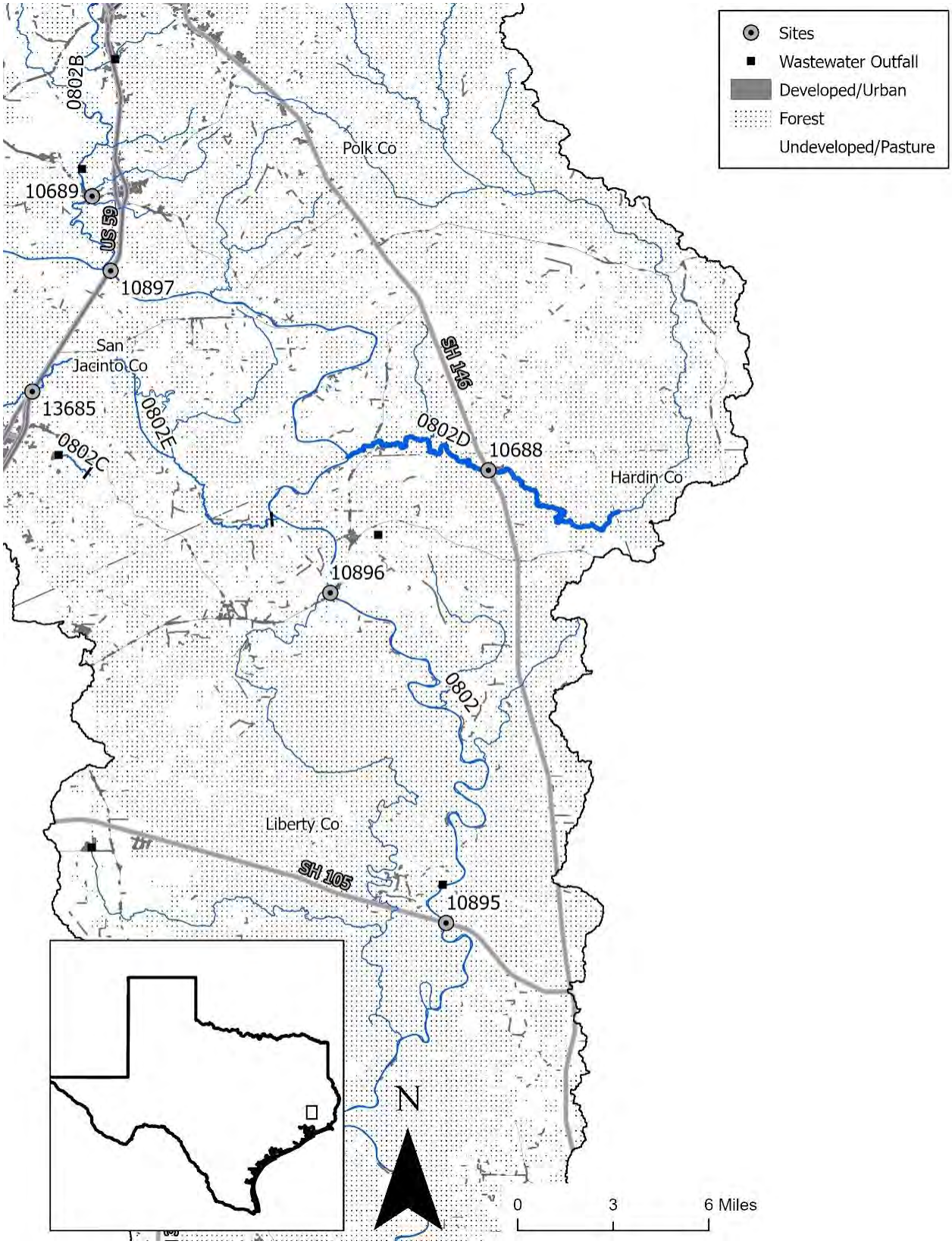


Figure 413: Segment 0802D Map

This 12.9-mile unclassified segment runs from the confluence with Meetinghouse Creek to the confluence with the Trinity River (see Figure 413). Much of the watershed is forested with some woody wetland riparian areas. The stream flows through the Flatwoods and Floodplains and Low Terraces ecoregion just before the confluence with the river.

Water quality monitoring is being conducted at one site within this segment as shown in Table 335. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 335: Segment 0802D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0802D_01	MENARD CREEK AT SH 146 SOUTHEAST OF LIVINGSTON TRA #37	10688	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 336. Results of TRA trend analyses are shown in Table 337.

Table 336: TCEQ 2020 Texas Integrated Report Summary for Segment 0802D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0802D_01 From confluence with segment 0802 up to the confluence with Meetinghouse Creek.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0802D_01 From confluence with segment 0802 up to the confluence with Meetinghouse Creek.	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0802D_01 From confluence with segment 0802 up to the confluence with Meetinghouse Creek.	General Use	Ammonia	0.33 mg/L	NC
0802D_01 From confluence with segment 0802 up to the confluence with Meetinghouse Creek.	General Use	Nitrate	1.95 mg/L	NC
0802D_01 From confluence with segment 0802 up to the confluence with Meetinghouse Creek.	General Use	Total Phosphorus	0.69 mg/L	NC
0802D_01 From confluence with segment 0802 up to the confluence with Meetinghouse Creek.	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

Table 337: Significant Trends for Segment 0802D (P-value<0.1)

Segment & Assessment Unit		0802D_01
Site		10688
Secchi Depth	All	↓
	Summer	Not Significant
	Winter	Not Significant
pH	All	↑
	Summer	Not Significant
	Winter	↑
Alkalinity	All	Not Significant
	Summer	Not Significant
	Winter	↑

Segment & Assessment Unit		0802D_01
Site		10688
Total Phosphorus	All	Not Significant
	Summer	↑
	Winter	Not Significant
Hardness	All	No Trend
	Summer	↑
	Winter	No Trend
Lab Turbidity	All	No Trend
	Summer	No Trend
	Winter	↓*

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

A concern due to elevated levels of *E. coli* was identified in this segment. As shown in Figure 414, there was a strong correlation between *E. coli* and flow (correlation coefficient = 0.703) indicating that the concern was related to run-off. The area upstream of the monitoring station is heavily wooded. Therefore, wildlife is the mostly likely source of bacteria in this stream.

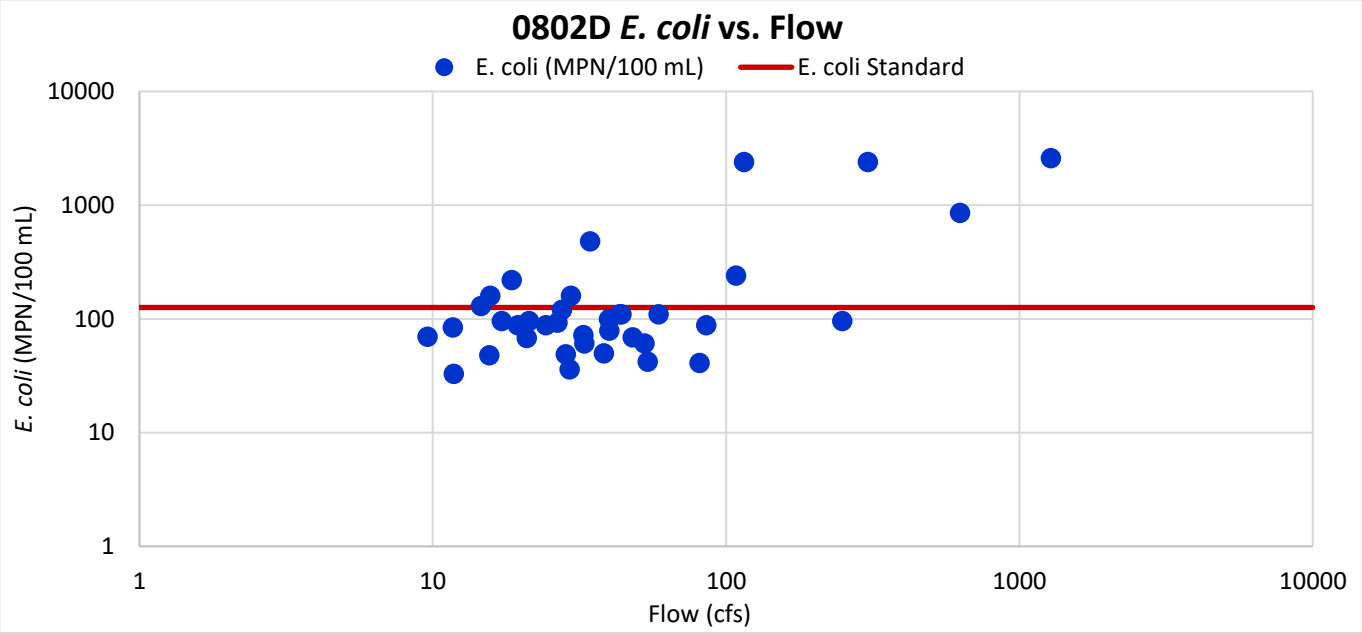


Figure 414: 0802D E. coli vs. Flow

An increasing pH trend was identified in this segment as shown in Figure 415. However, all chlorophyll-*a* values were reported below the detection limit so algal populations were not likely to have been influencing pH levels. The stream flows through a densely wooded pine forest. Therefore, pH levels may have been affected by humic acids from the decay of pine needles. Increases in pH levels may have been due to the lack of rainfall during the drought that would have resulted in less pine needles being washed into the stream where they would decay and release humic acid.

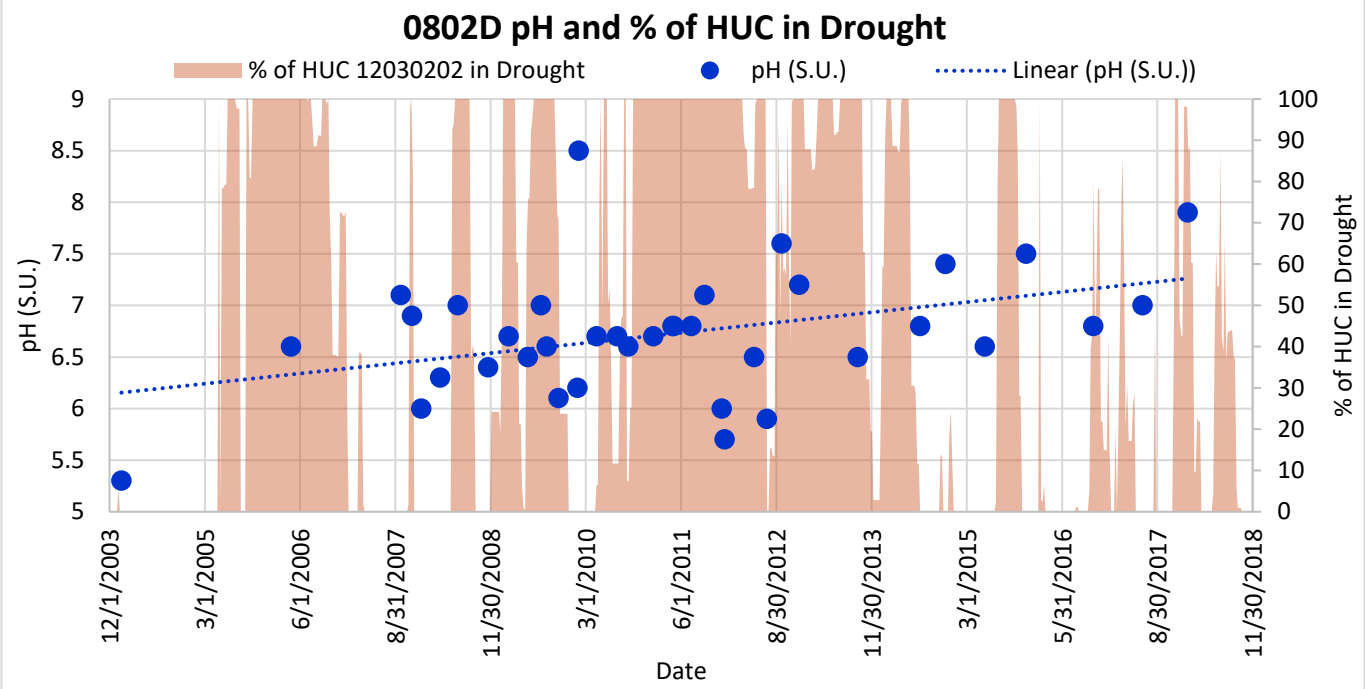


Figure 415: 0802D pH and % of HUC in Drought

The increasing summer total phosphorus trend was largely weighted by a few high values that occurred during periods of drought recovery and may have been related to run-off containing residential fertilizers. The increasing summer hardness trend was similarly influenced by drought recovery periods (see Figure 416) and likely represented calcium and magnesium containing sediments being washed into the stream due to precipitation events.

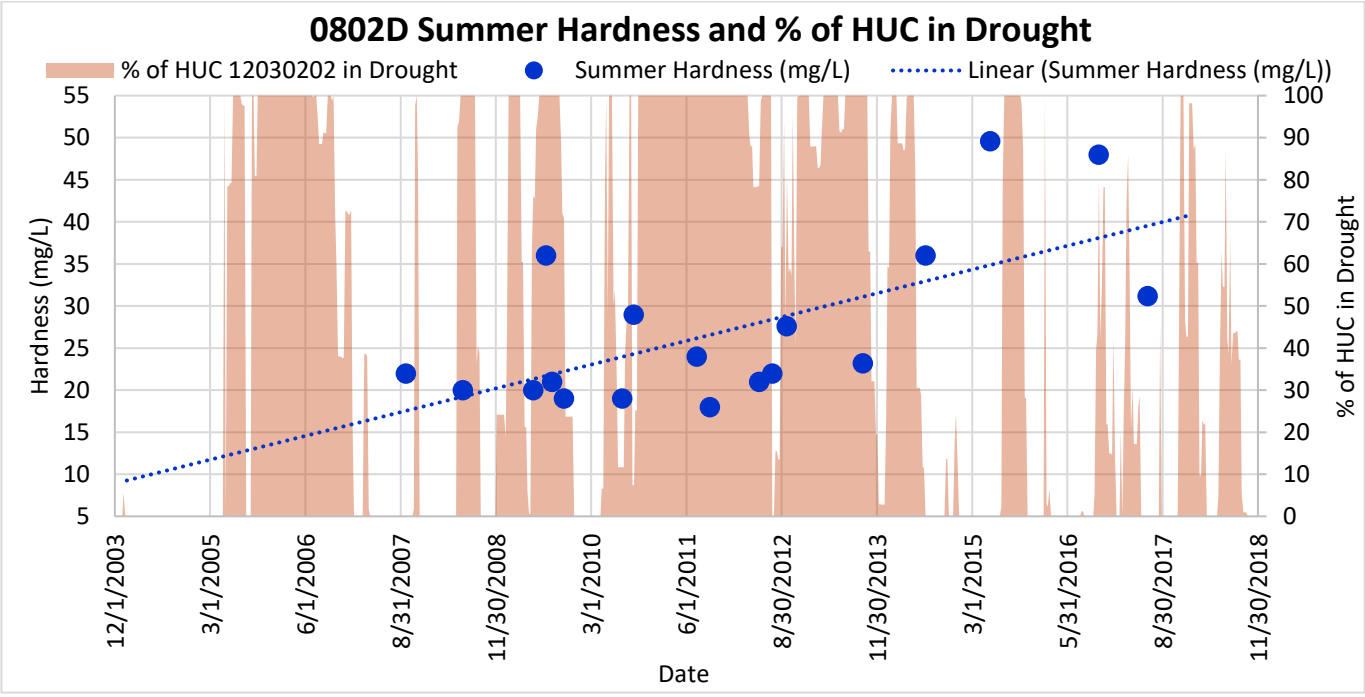


Figure 416: 0802D Summer Hardness and % of HUC in Drought

0802E Big Creek

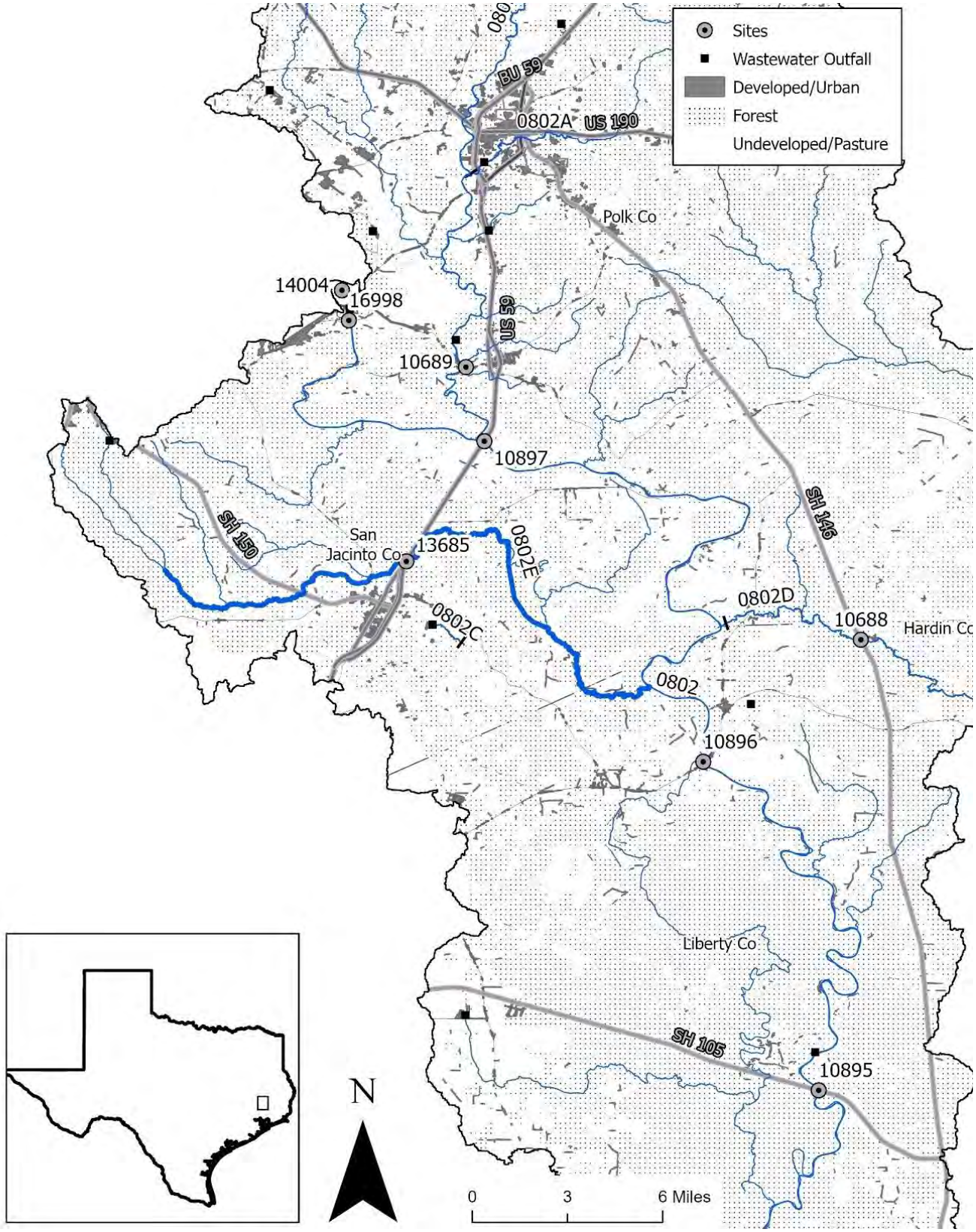


Figure 417: Segment 0802E Map

This 23.2-mile unclassified segment runs from the confluence of Double Lake Branch and Henry Lake Branch in San Jacinto County to the confluence with the Trinity River in Liberty County (see Figure 417). The upstream portion of the watershed is largely forested. The stream flows by the developed lands outside the City of Shepherd. The downstream portion of the watershed is a mix of hay, pasture, and woody wetlands. It drains the Southern Tertiary Uplands and Flatwoods ecoregion.

Water quality monitoring is being conducted at one site within this segment as shown in Table 338. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 338: Segment 0802E FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0802E_01	BIG CREEK AT US 59 NORTH 1.5 MI NE OF SHEPHERD 11.6 MI UPSTREAM FROM MOUTH	13685	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 339. No significant trends were identified during TRA data analysis.

Table 339: TCEQ 2020 Texas Integrated Report Summary for Segment 0802E

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0802E_01 From confluence with Trinity River up to confluence of Double Lake & Henry Lake Branch	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0802E_01 From confluence with Trinity River up to confluence of Double Lake & Henry Lake Branch	Recreation Use	*E. coli*	126 MPN/100 mL	CN
0802E_01 From confluence with Trinity River up to confluence of Double Lake & Henry Lake Branch	General Use	Ammonia	0.33 mg/L	NC
0802E_01 From confluence with Trinity River up to confluence of Double Lake & Henry Lake Branch	General Use	Nitrate	1.95 mg/L	NC
0802E_01 From confluence with Trinity River up to confluence of Double Lake & Henry Lake Branch	General Use	Total Phosphorus	0.69 mg/L	NC
0802E_01 From confluence with Trinity River up to confluence of Double Lake & Henry Lake Branch	General Use	Chlorophyll-*a*	14.1 µg/L	NC

CN = Use Concern FS = Fully Supporting NC = No Concern

A concern due to elevated levels of *E. coli*. There was a limited data set for which there were measured flow values. Based on the period of record used in this basin summary report, the geomean for the data set was 205 MPN/100 mL. Measured flow data were limited to the most recent half of the data set but there was some correlation between flow and *E. coli* levels (correlation coefficient = 0.477) which indicates that the concern may be somewhat run-off related. The watershed upstream of monitoring station 13685 at US 59 is forested and has some residential developments around the City of Shepherd. Run-off containing waste from pets and wildlife may be contributing to bacteria in the stream. Homeowner education may help reduce bacteria levels from pet sources. There was also evidence of livestock trails entering the stream in the upper portion of the watershed. Bacteria may be introduced via livestock visiting the stream for watering and also from run-off containing livestock waste. Landowner education and livestock best management practices may help reduce bacteria from these sources.

0802C Unnamed Tributary of Coley Creek

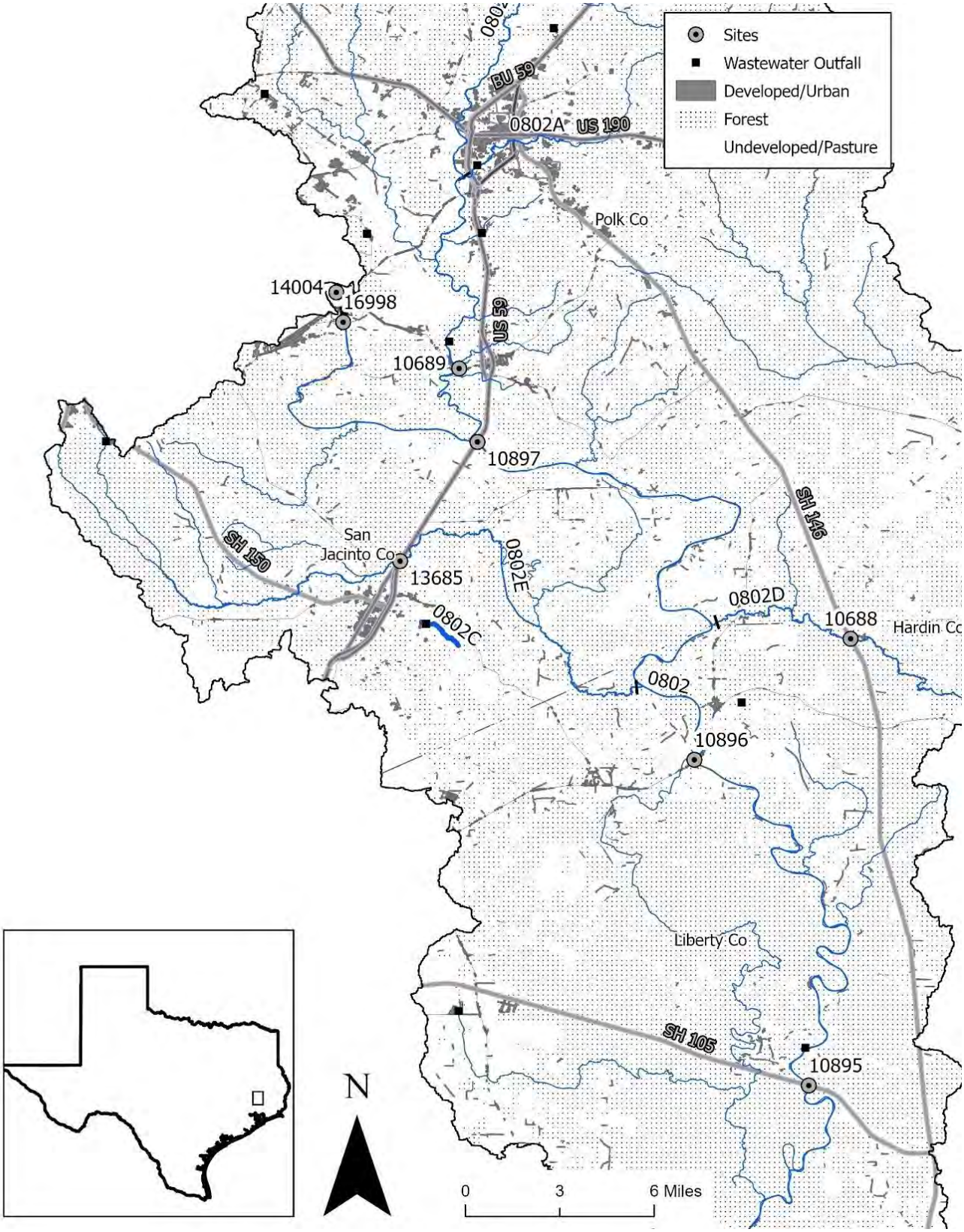


Figure 418: Segment 0802C Map

This 1.6-mile unclassified segment runs from its origin at the culvert leading from Lake Run-Amuck at Wright Road to the confluence with Coley Creek (see Figure 418). The segment flows through the developed lands of the City of Shepherd and lies within the Flatwoods ecoregion. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. No significant trends were identified during TRA data analysis as there were no data available in assessment unit 0802C_01 for the period of record for this basin summary report.

0801 Trinity River Tidal

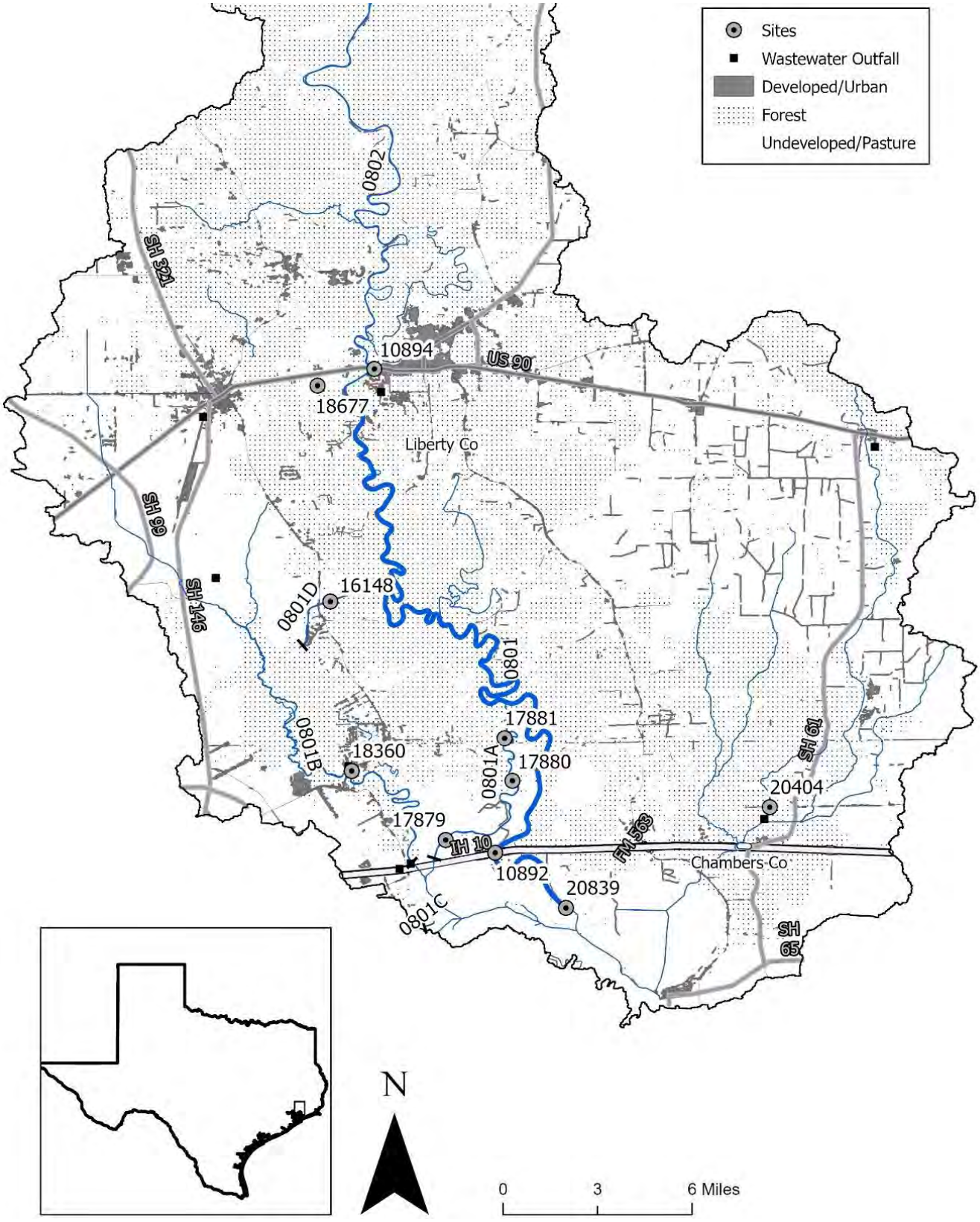


Figure 419: Segment 0801 Map

This 31.3-mile segment is tidally influenced and runs from a point 1.9 miles downstream of US 90 in Liberty County to the Wallisville Saltwater Barrier 3.4 miles downstream of IH 10 in Chambers County (see Figure 419). Much of the immediate watershed is woody wetland with hay, pasture, and crop lands lying outside the wetlands. There is some development near the upstream end of the segment around the cities of Dayton and Liberty. The river flows through the Floodplains and Low Terraces and the Texas-Louisiana Coastal Marshes ecoregions.

Water quality monitoring is being conducted at one site within this segment as shown in Table 340. Monitoring is being conducted by TCEQ Region 12. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 340: Segment 0801 FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0801_01	TRINITY RIVER TIDAL AT IH 10 NEAR LIBERTY TRA #35	10892	TCEQ Region 12

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 341. Results of TRA trend analyses are shown in Table 342.

Table 341: TCEQ 2020 Texas Integrated Report Summary for Segment 0801

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	Aquatic Life Use	Toxic Substances in sediment		NA
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	Recreation Use	*Enterococcus*	35 MPN/100 mL	FS
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	General Use	Ammonia	0.46 mg/L	NC
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	General Use	Nitrate	1.1 mg/L	NC
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	General Use	Total Phosphorus	0.66 mg/L	NC
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	General Use	Chlorophyll-*a*	21 µg/L	CS
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	General Use	pH	6.5 - 9 S.U.	FS
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	General Use	Water temperature	35 °F	FS
0801_01 From saltwater barrier in Chambers County upstream to Lynchburg Canal in Liberty County	Domestic Water Supply Use	Surface Water HH criteria DWS average		FS

CS = Screening Level Concern FS = Fully Supporting NA = Not Assessed NC = No Concern

There were no data available in assessment unit 0802_02 for the period of record for this basin summary report.

Table 342: Significant Trends for Segment 0801 (P-value<0.1)

Segment & Assessment Unit		0801_01	0801_01
Site		10892	20839
Air Temperature	All	Not Significant	Not Significant
	Summer	↓*	Not Significant
	Winter	No Trend	Not Significant
Dissolved Oxygen	All	Not Significant	Not Significant
	Summer	Not Significant	↓*
	Winter	Not Significant	Not Significant
pH	All	Not Significant	Not Significant
	Summer	Not Significant	↓*
	Winter	Not Significant	No Trend
Salinity	All	No Trend	Insufficient Data
	Summer	No Trend	Insufficient Data
	Winter	↓	Insufficient Data
Total Suspended Solids	All	Not Significant	↓*
	Summer	Not Significant	Not Significant
	Winter	Not Significant	Not Significant
Total Phosphorus	All	No Trend	↓*
	Summer	No Trend	↓*
	Winter	No Trend	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend, * - trend based on less than 9 years of data

Concerns for chlorophyll-*a* were identified in this segment. As shown in Figure 420, chlorophyll-*a* levels were frequently reported above the screening level of 21 µg/L. Patterns that were seen in the upstream segment 0802 were also seen in this segment - elevated levels of chlorophyll-*a* that tended to occur during periods of drought and no strong correlations between chlorophyll-*a* and nutrients. As described for 0802, the river in this segment is also wide, flat, meandering, and unshaded which would allow for algal populations to continue increasing.

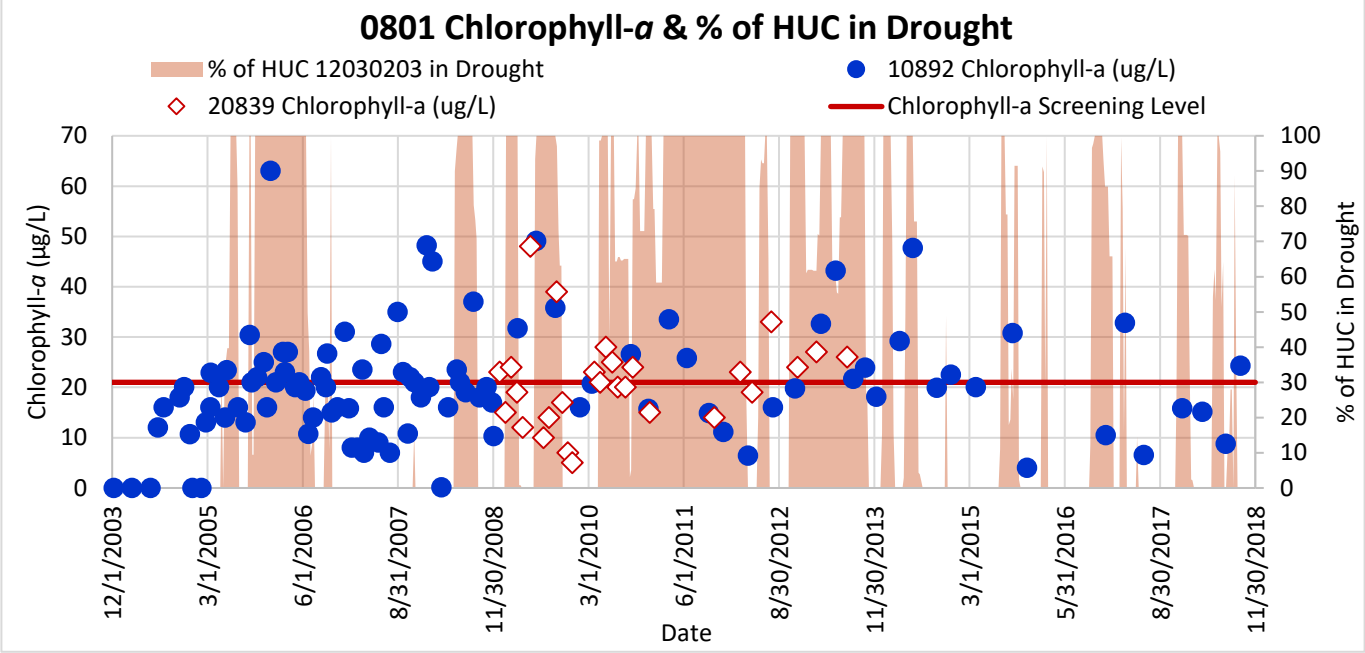


Figure 420: 0801 Chlorophyll-a & % of HUC in Drought

Decreasing trends for summer dissolved oxygen and pH were identified at monitoring station 20839 which was located at the Wallisville Saltwater Barrier dam as shown in Figure 421. Monitoring at this station occurred during a prolonged period of drought therefore the trend may not be representative of long-term trends in this portion of the river. It appears that these parameters were at least somewhat related to algal populations. Chlorophyll-*a* levels for the summer period ranged from 10 to 48 µg/L and correlations to dissolved oxygen and pH were 0.532 and 0.368, respectively. It is important to note that, due to the short period of record for data in this segment, the date scale for Figure 421 has been reduced and does not match the date scale used for other graphs in this basin summary report.

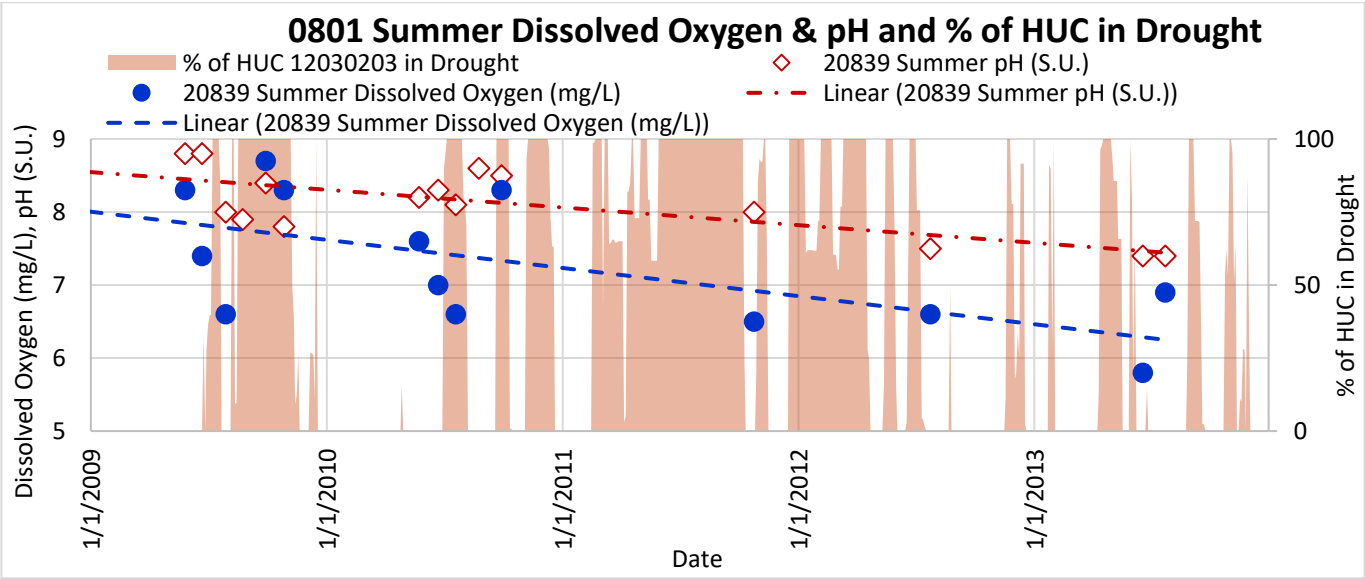


Figure 421: 0801 Summer Dissolved Oxygen & pH and % of HUC in Drought

0801D Lynchburg Canal

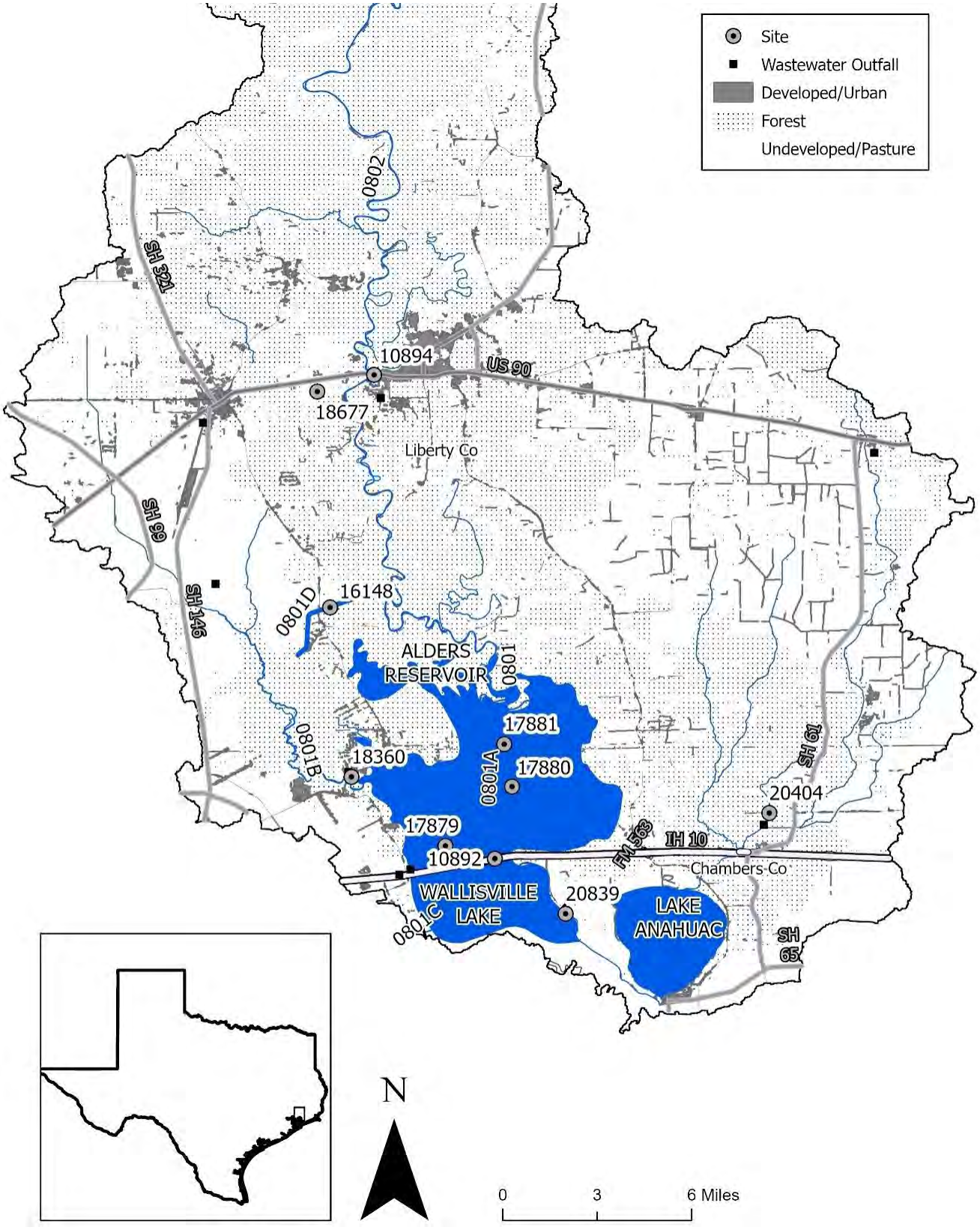


Figure 422: Segment 0801D Map

The 3.9-mile unclassified segment runs from the confluence with Big Caney Creek to the confluence with the Trinity River Tidal (see Figure 422). The watershed is largely woody wetland with some crop, hay, and pasture land to the west. The canal flows through the Northern Humid Gulf Coastal Prairies and the Floodplains and Low Terraces ecoregion just before the confluence with the river. However, the canal flows between levees and receives water pumped from segment 0801 and flows toward Houston.

Water quality monitoring is being conducted at one site within this segment as shown in Table 343. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 343: Segment 0801D FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0801D_01	COASTAL WATER AUTHORITY CANAL/LYNCHBURG CANAL 533 METERS UPSTREAM OF FM 1409 3.6KM DOWNSTREAM OF CONFLUENCE WITH TRINITY RIVER SOUTH OF LIBERTY	16148	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 344. Results of TRA trend analyses are shown in

Table 345.

Table 344: TCEQ 2020 Texas Integrated Report Summary for Segment 0801D

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	Aquatic Life Use	Acute Toxic Substances in water		FS
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	Aquatic Life Use	Chronic Toxic Substances in water		FS
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	Recreation Use	*E. coli*	126 MPN/100 mL	NC
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	General Use	Ammonia	0.33 mg/L	NC
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	General Use	Nitrate	1.95 mg/L	NC
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	General Use	Total Phosphorus	0.69 mg/L	NC
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	General Use	Chlorophyll-*a*	14.1 µg/L	CS
0801D_01 From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.	Fish Consumption Use	HH Bioaccumulative Toxics in water		FS

CS = Screening Level Concern FS = Fully Supporting NC = No Concern

Table 345: Significant Trends for Segment 0801D (P-value<0.1)

Segment & Assessment Unit		0801D_01
Site		16148
Hardness	All	No Trend
	Summer	↑
	Winter	No Trend
Dissolved Arsenic	All	No Trend
	Summer	↑
	Winter	No Trend
Dissolved Manganese	All	↓
	Summer	Not Significant
	Winter	↓
Dissolved Zinc	All	No Trend
	Summer	↓
	Winter	↓

↓ = Decreasing Trend, ↑ = Increasing Trend

A concern due to elevated levels of chlorophyll-*a* was identified in this segment. As shown in Figure 423, chlorophyll-*a* was frequently reported above the screening level of 14.1 µg/L. These elevated values generally occurred during periods of drought. As stated in the description for this segment, water in the canal is pumped directly from the Trinity River. Therefore, the chlorophyll-*a* levels in the river were the source of this concern. However, chlorophyll-*a* did not appear to be having a negative influence on dissolved oxygen; the lowest dissolved oxygen values was reported at 6.3 mg/L. It is important to note that samples are collected twice a year so any conclusions made about this data set may be questionable.

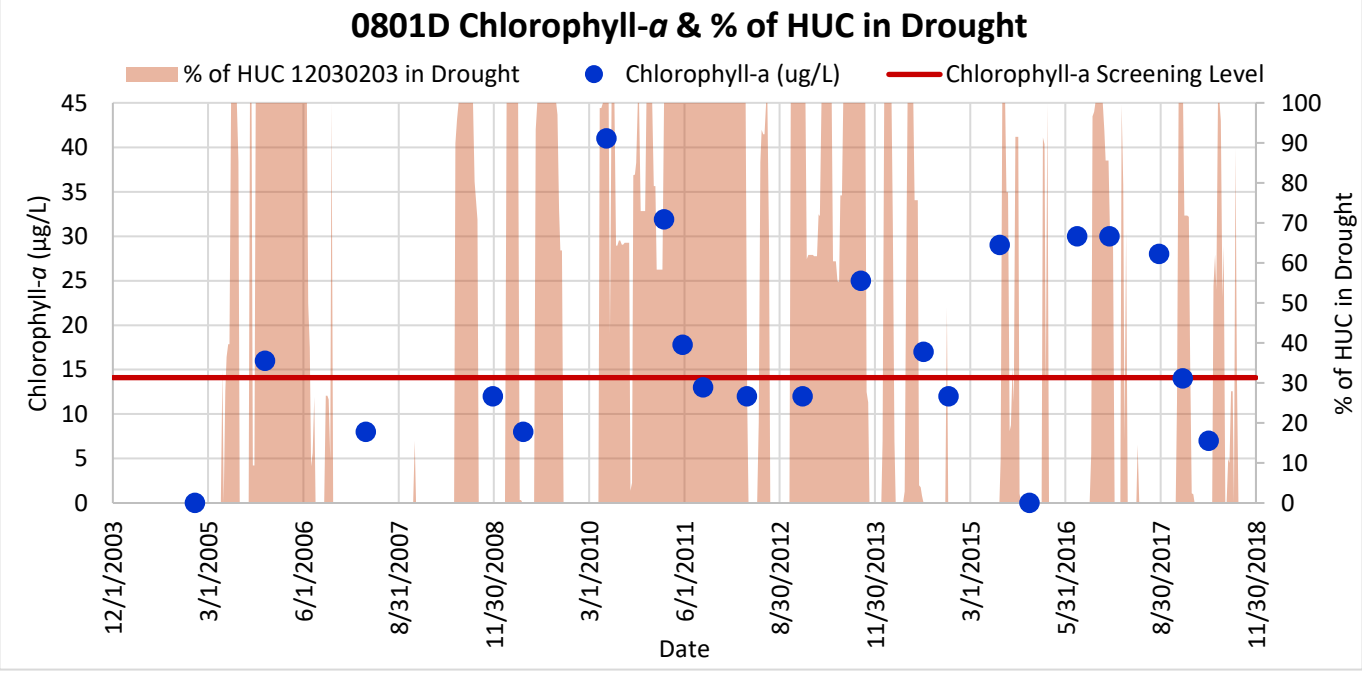


Figure 423: 0801D Chlorophyll-a & % of HUC in Drought

There was an increasing summer trend for hardness. Figure 424 shows the data for the entire period of record rather than only the summer samples. Hardness levels remained relatively stable throughout much of the data set and the trend appears to have been weighted by very few data points collected in 2017. Continued monitoring at this station will help determine if this trend continues in the future.

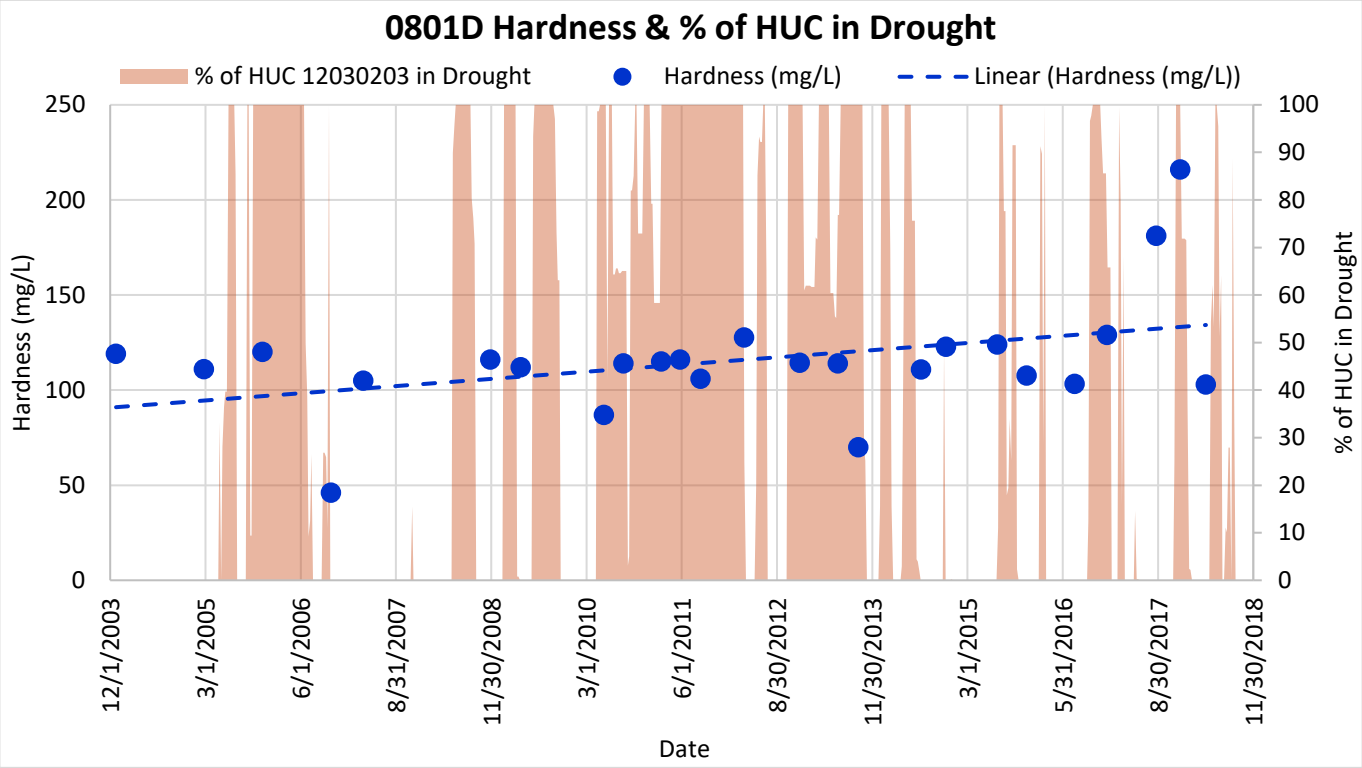


Figure 424: 0801D Hardness & % of HUC in Drought

The increasing summer trend for dissolved arsenic was an artifact of censored non-detect data and did not represent a true change in water quality. Of 25 available data points, 21 were reported below the detection limits of 5 µg/L in the early portion of the data set and 3 µg/L in the latter portion. The highest reported value was 5.8 µg/L which was well below the chronic and acute aquatic life exposure standards of 150 and 991 µg/L, respectively.

0801B Old River

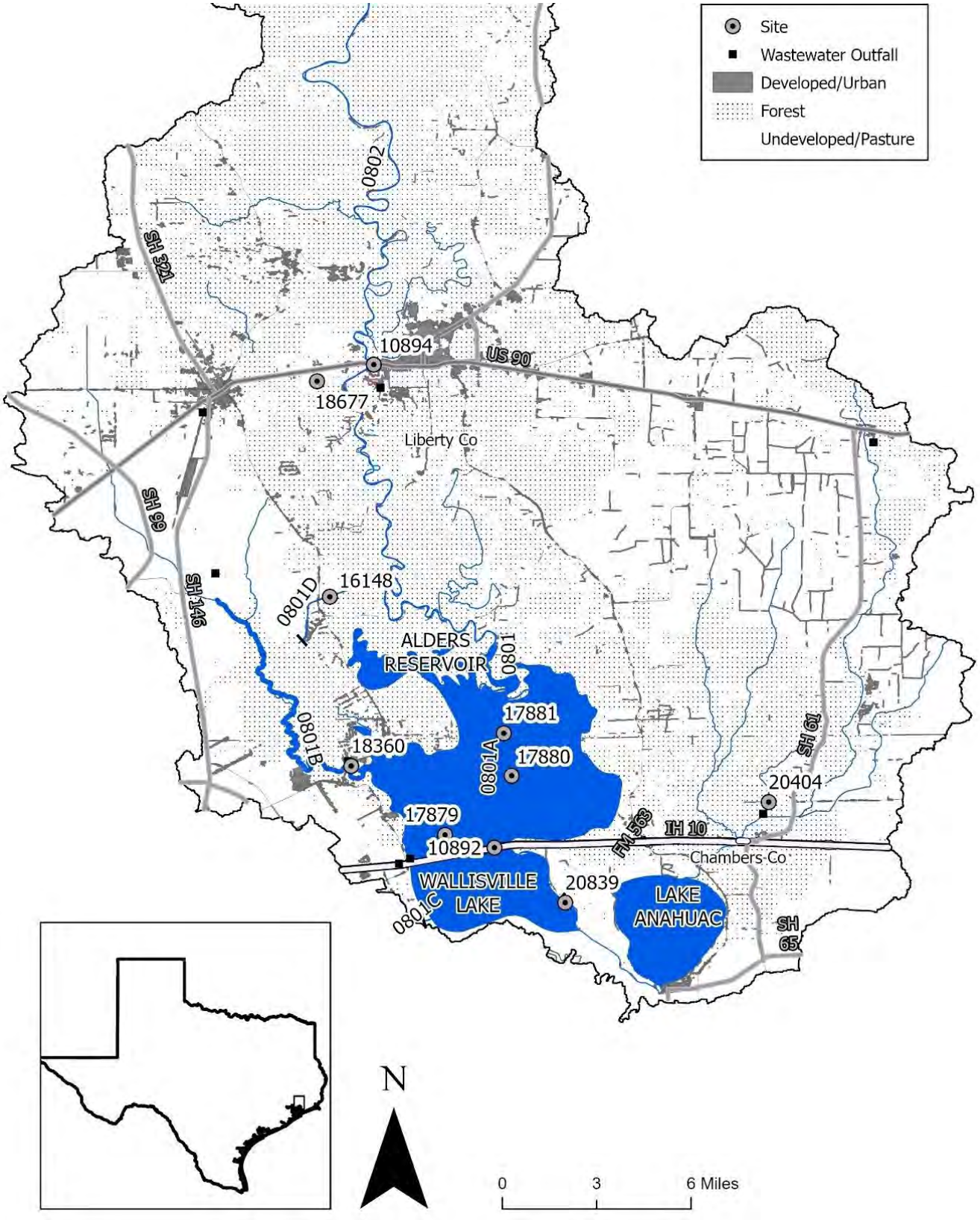


Figure 425: Segment 0801B Map

This 17.3-mile unclassified segment runs from the confluence with East Prong Old River and West Prong Old River approximately 4.4 miles north of Mont Belvieu to IH 10 in Chambers County (see Figure 425). Much of the watershed is woody and herbaceous wetland to the east and hay, pasture, and crop land to the west with development around the City of Mont Belvieu. The watershed lies within the Northern Humid Gulf Coastal Prairies and Texas-Louisiana Coastal Marches ecoregions.

Water quality monitoring is being conducted at one site within this segment as shown in Table 346. Monitoring is being conducted by the TRA Lake Livingston Project. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 346: Segment 0801B FY 2020 Monitoring Stations

Segment/Assessment Unit	Station Description	Station ID	Collecting Entity
0801B_01	OLD RIVER AT FM 1409 SOUTHWEST OF WINFREE	18360	TRA Lake Livingston Project

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 347. Results of TRA trend analyses are shown in Table 348.

Table 347: TCEQ 2020 Texas Integrated Report Summary for Segment 0801B

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0801B_01 From IH 10 in Chambers Co. up to confluence with East & West Prong Old River	Aquatic Life Use	Dissolved Oxygen	3 mg/L	FS
0801B_01 From IH 10 in Chambers Co. up to confluence with East & West Prong Old River	General Use	Ammonia	0.33 mg/L	NC
0801B_01 From IH 10 in Chambers Co. up to confluence with East & West Prong Old River	General Use	Nitrate	1.95 mg/L	NC
0801B_01 From IH 10 in Chambers Co. up to confluence with East & West Prong Old River	General Use	Total Phosphorus	0.69 mg/L	NC
0801B_01 From IH 10 in Chambers Co. up to confluence with East & West Prong Old River	General Use	Chlorophyll-*a*	14.1 µg/L	**CS**

CS = Screening Level Concern FS = Fully Supporting NC = No Concern

Table 348: Significant Trends for Segment 0801B (P-value<0.1)

Segment & Assessment Unit		0801B_01
Site		18360
Total Suspended Solids	All	Not Significant
	Summer	↓
	Winter	Not Significant
Days Since Precipitation	All	Not Significant
	Summer	Not Significant
	Winter	↑

↓ = Decreasing Trend, ↑ = Increasing Trend

A concern due to elevated levels of chlorophyll-*a* was identified in this segment. As shown in Figure 426, chlorophyll-*a* levels were regularly reported above the screening level of 14.1 µg/L. Chlorophyll-*a* was not correlated to nutrients and may have been negatively influencing dissolved oxygen levels. Of 92 dissolved oxygen readings, 10 were reported below the grab sample screening level of 5 mg/L with one sample below the grab sampling minimum standard of 3 mg/L.

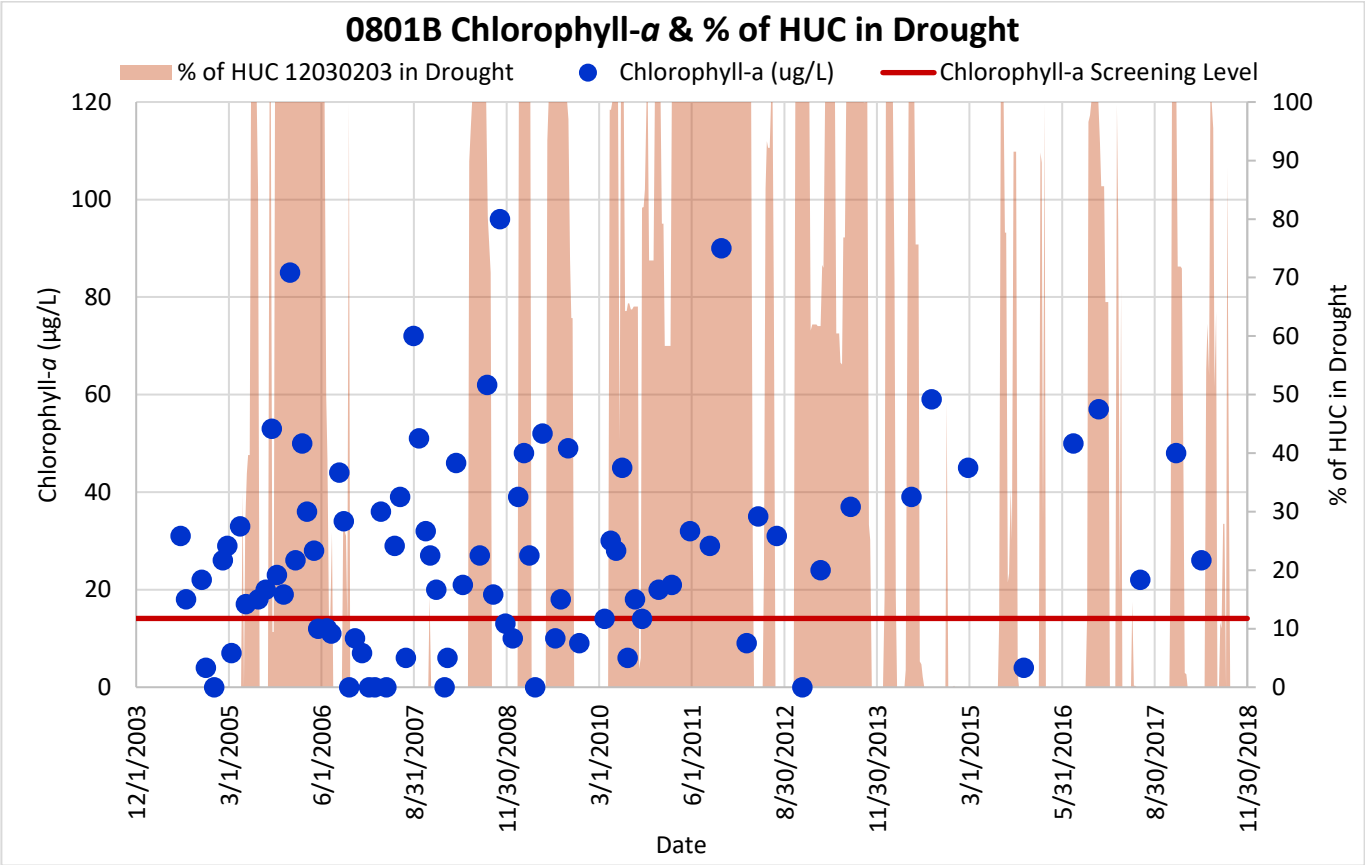


Figure 426: 0801B Chlorophyll-a & % of HUC in Drought

0801A Lost River

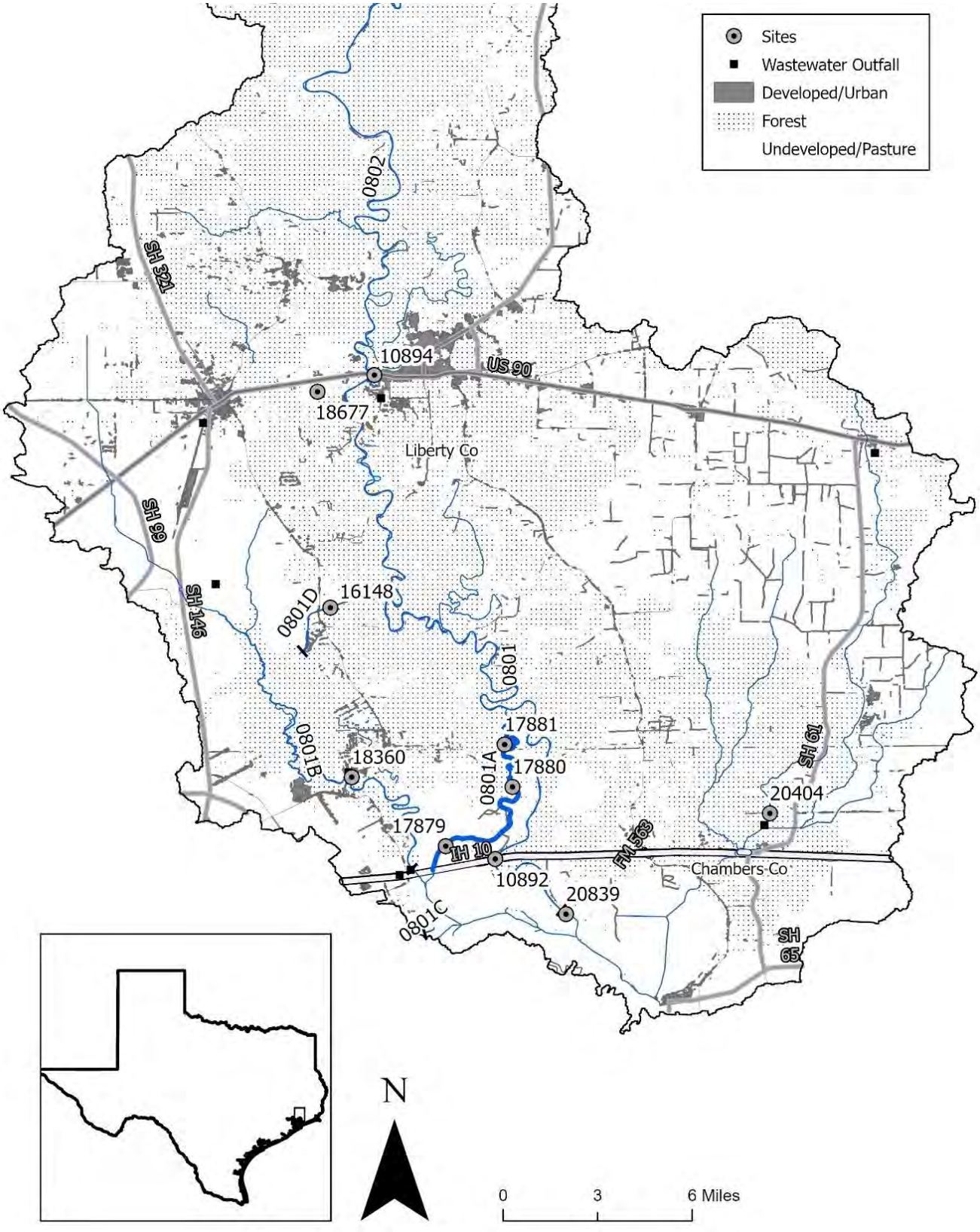


Figure 427: Segment 0801A Map

This 8-mile unclassified segment runs from approximately 3.7 miles upstream of the confluence with John Wiggins Bayou to IH 10 in Chambers County (see Figure 427). The watershed is woody and herbaceous wetland and flows through the Floodplains and Low Terraces and Texas-Louisiana Coastal Marshes ecoregions. There is no Clean Rivers Program monitoring scheduled in this segment for FY 2020.

This segment was not assessed in the TCEQ 2020 Texas Integrated Report. Data for assessment unit 0801A_01 did not meet requirements for the minimum number of data points needed for trend analysis as described in the Data Preparation section of Appendix C. Therefore, trend analyses were not conducted in this assessment unit.

0801C Cotton Bayou

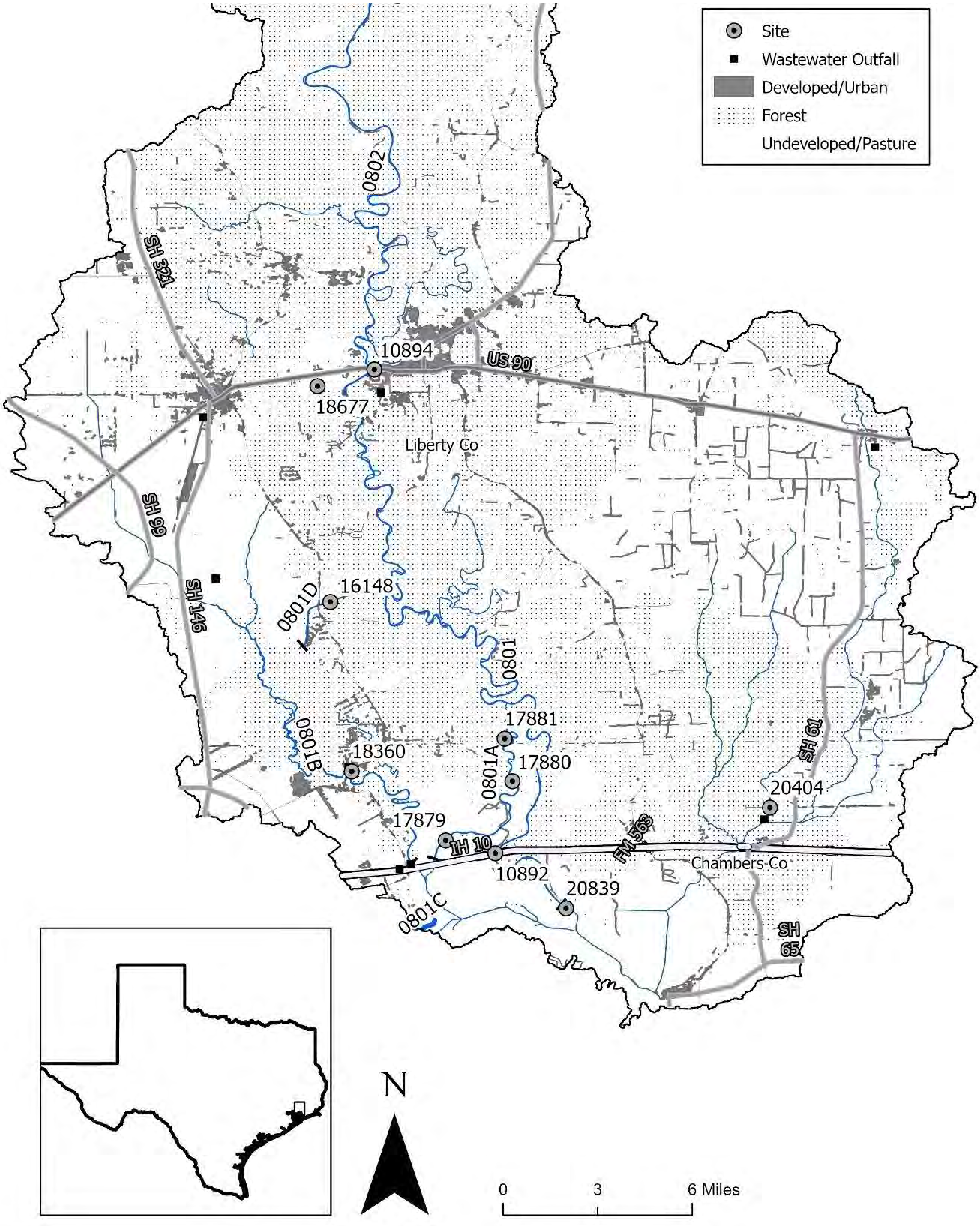


Figure 428: Segment 0801C Map

This 6.9-mile unclassified segment runs from a point approximately 1 mile north of IH 10 in Chambers County to the confluence of Cotton Lake southeast of Mont Belvieu in Chambers County (see Figure 428). The watershed is a mix of hay, pasture, and crop land as well as development around the City of Mont Belvieu. It lies within the Northern Humid Gulf Coastal Prairies and Texas-Louisiana Coastal Marshes ecoregions.

Water quality monitoring is being conducted at two sites within this segment as shown in Table 349. Monitoring is being conducted by TCEQ Region 12. Additional details of sampling can be found in the FY 2020 Coordinated Monitoring Schedule.

Table 349: Segment 0801C FY 2020 Monitoring Stations

Segment/ Assessment Unit	Station Description	Station ID	Collecting Entity
0801C_01	COTTON BAYOU AT FM 565	18696	TCEQ Region 12
0801C_01	COTTON BAYOU AT BOAT RAMP 0.46 KM UPSTREAM OF THE CONFLUENCE WITH COTTON LAKE	18697	TCEQ Region 12

A summary of the results of the TCEQ 2020 Texas Integrated Report is shown in Table 350. Results of TRA trend analyses are shown in Table 351.

Table 350: TCEQ 2020 Texas Integrated Report Summary for Segment 0801C

Segment/Assessment Unit Description	Designated Use	Parameter	Criteria	Status
0801C_01 From confluence of Cotton Lake SE of Mont Belvieu Chambers Co. up to approx 1 mi north of IH 10	Aquatic Life Use	Dissolved Oxygen	3 mg/L	NS
0801C_01 From confluence of Cotton Lake SE of Mont Belvieu Chambers Co. up to approx 1 mi north of IH 10	Recreation Use	*Enterococcus*	35 MPN/100 mL	NS
0801C_01 From confluence of Cotton Lake SE of Mont Belvieu Chambers Co. up to approx 1 mi north of IH 10	General Use	Ammonia	0.46 mg/L	NC
0801C_01 From confluence of Cotton Lake SE of Mont Belvieu Chambers Co. up to approx 1 mi north of IH 10	General Use	Nitrate	1.1 mg/L	CS
0801C_01 From confluence of Cotton Lake SE of Mont Belvieu Chambers Co. up to approx 1 mi north of IH 10	General Use	Total Phosphorus	0.66 mg/L	CS
0801C_01 From confluence of Cotton Lake SE of Mont Belvieu Chambers Co. up to approx 1 mi north of IH 10	General Use	Chlorophyll-*a*	21 µg/L	CS

CS = Screening Level Concern NC = No Concern NS = Not Supporting

Table 351: Significant Trends for Segment 0801C (P-value<0.1)

Segment & Assessment Unit		0801C_01	0801C_01
Site		18696	18697
Specific Conductance	All	Not Significant	Not Significant
	Summer	↓	↓
	Winter	Not Significant	Not Significant
Dissolved Oxygen	All	Not Significant	Not Significant
	Summer	Not Significant	Not Significant
	Winter	No Trend	↓

Segment & Assessment Unit		0801C_01	0801C_01
Site		18696	18697
pH	All	↑	Not Significant
	Summer	↑	Not Significant
	Winter	↑	Not Significant
Alkalinity	All	Not Significant	Not Significant
	Summer	↓	↓
	Winter	Not Significant	Not Significant
Salinity	All	Not Significant	Not Significant
	Summer	Not Significant	↓
	Winter	Not Significant	Not Significant
Total Suspended Solids	All	No Trend	Not Significant
	Summer	↑	Not Significant
	Winter	No Trend	Not Significant
Volatile Suspended Solids	All	↑	Not Significant
	Summer	↑	Not Significant
	Winter	Not Significant	Not Significant
Ammonia	All	No Trend	Not Significant
	Summer	Not Significant	Not Significant
	Winter	↑	Not Significant
Total Phosphorus	All	↓	No Trend
	Summer	↓	Not Significant
	Winter	Not Significant	No Trend
Total Organic Carbon	All	No Trend	Not Significant
	Summer	Not Significant	↑
	Winter	No Trend	Not Significant
Chloride	All	Not Significant	Not Significant
	Summer	↓	Not Significant
	Winter	Not Significant	Not Significant
Sulfate	All	Not Significant	Not Significant
	Summer	Not Significant	↓
	Winter	Not Significant	Not Significant
Fluoride	All	Not Significant	Not Significant
	Summer	↓	Not Significant
	Winter	Not Significant	Not Significant
Enterococcus	All	Not Significant	Not Significant
	Summer	No Trend	↑
	Winter	No Trend	Not Significant

↓ = Decreasing Trend, ↑ = Increasing Trend

Impairments for depressed dissolved oxygen and elevated levels of *Enterococcus* were identified in this segment. As shown in Figure 429, low dissolved oxygen levels generally occurred during periods of drought. Dissolved oxygen was not well correlated to chlorophyll-*a* which indicates that the impairment was not strongly related to algal populations. It is interesting to note that all but two of the dissolved oxygen values reported below 4 mg/L coincided with high specific conductance values which indicates that the impairment may be largely related to the tidal nature of this segment.

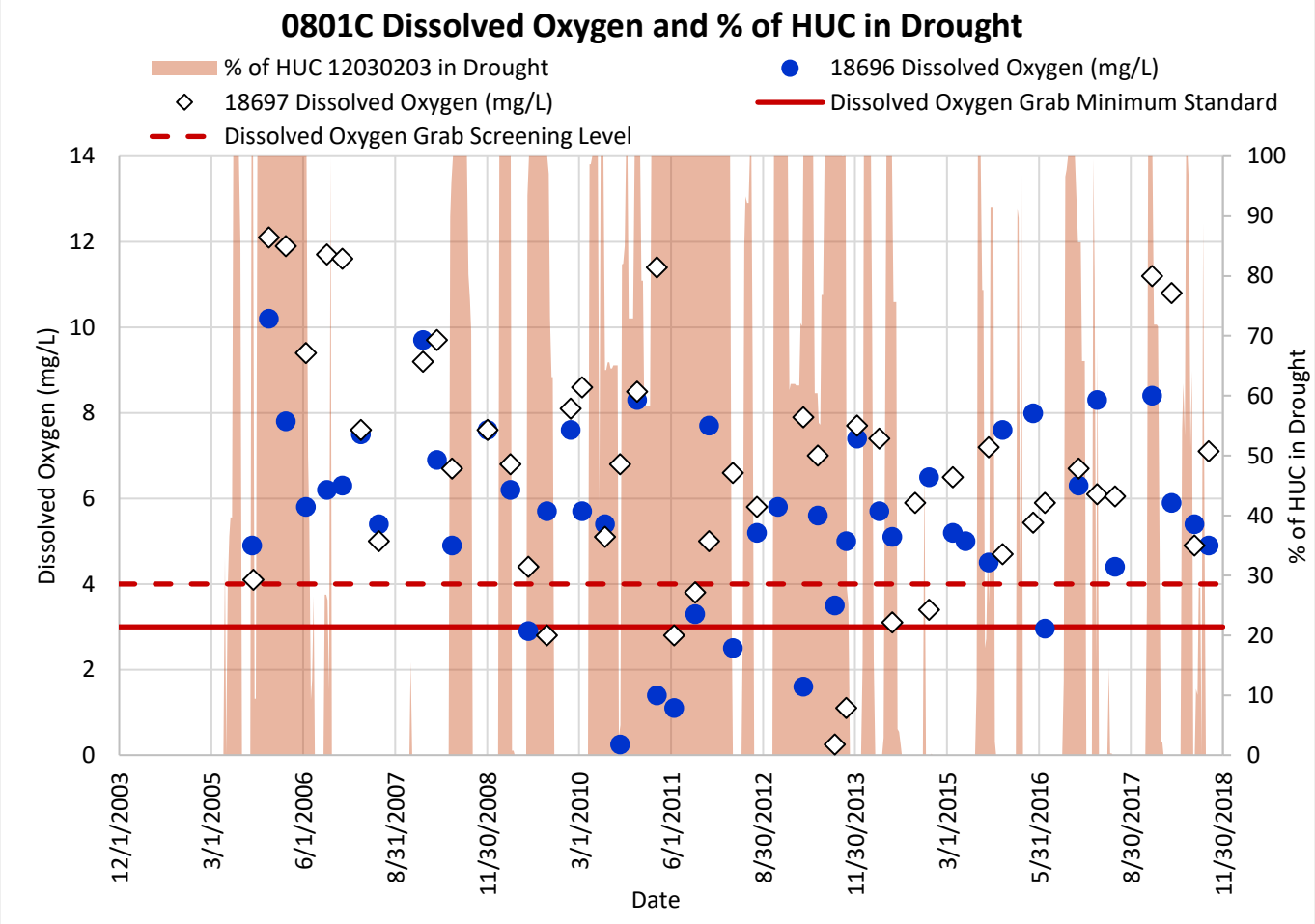


Figure 429: 0801C Dissolved Oxygen and % of HUC in Drought

Enterococcus levels were regularly reported above the standard of 35 MPN/100 mL as shown in Figure 430. *Enterococcus* levels were somewhat correlated to days since precipitation. A very weak correlation coefficient of -0.288 existed at the upstream station 18696 and a stronger correlation of -0.404 existed at the downstream station 18697. Based on this information, it appears that there may have been constant sources of bacteria at the upstream station while run-off related sources of bacteria were more predominate at the downstream station. There are residential communities upstream of both stations but there is a wooded area on the right bank of the bayou between the two stations. Run-off containing waste from pets was a likely contributor to the impairment at both stations. However, run-off from wildlife in the wooded area upstream of station 18697 may have also contributed to the bacterial load at that station. It is

recommended that upstream sampling and optical brightener testing be conducted upstream of station 18696 to determine if there may have been failing infrastructure contributing to the impairment. Optical brighteners are pigments that are added to detergents to make clothing appear brighter and whiter and are therefore commonly found in wastewater. These pigments can be detected visually, especially in low flow systems where dilution of optical brighteners is not an issue. Sampling for optical brighteners involves the saturation of an unbleached cotton media with ambient water. The media is then viewed under an ultraviolet lamp. If the media has a purple-blue fluorescence, optical brighteners may be present in the water and can indicate that human waste may be entering the waterbody.

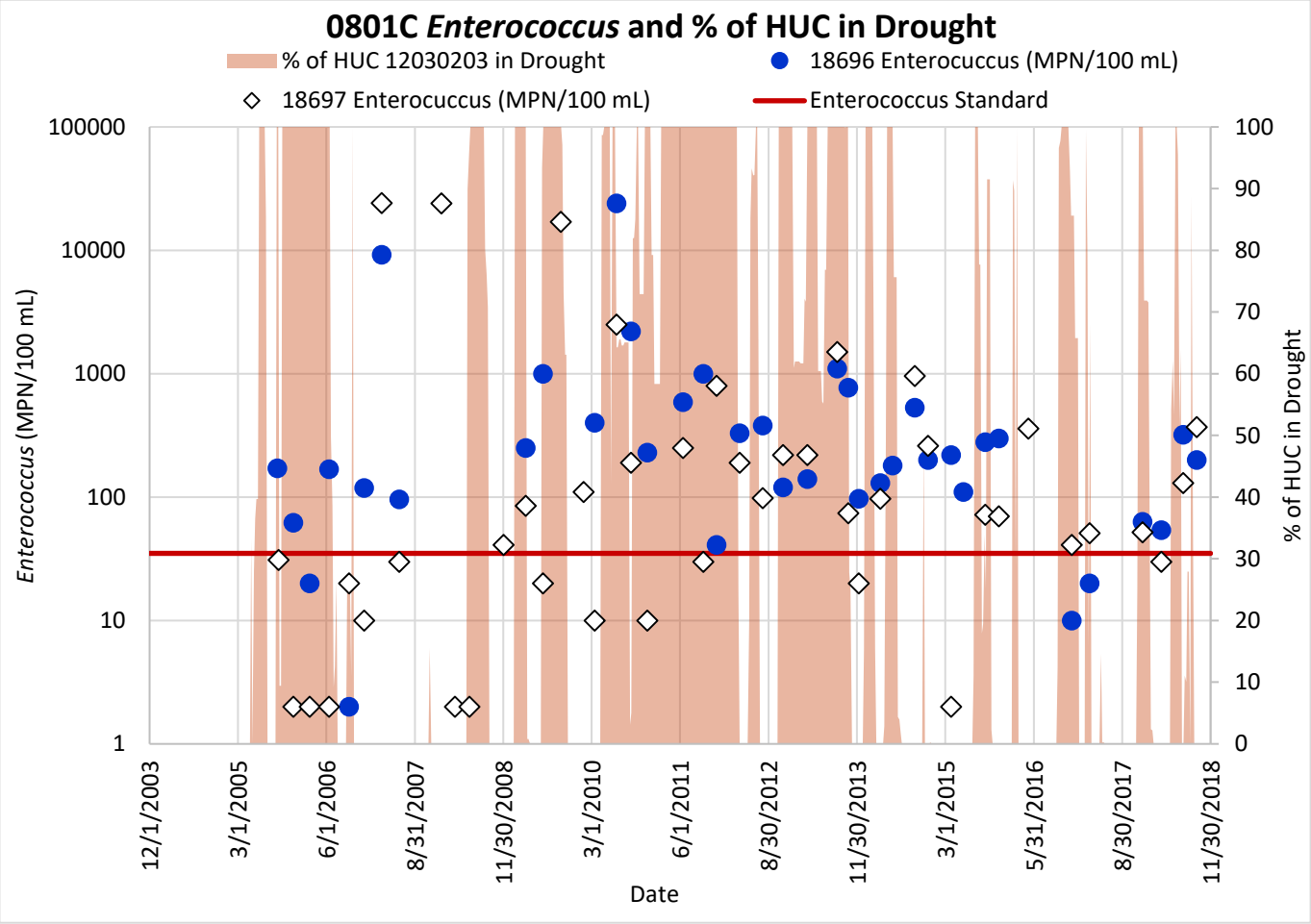


Figure 430: 0801C Enterococcus and % of HUC in Drought

Concerns for elevated levels of nitrate, total phosphorus, and chlorophyll-*a* were identified. There was a distinct difference in the data sets at the two stations in this segment for nitrate and total phosphorus. As shown for total phosphorus in Figure 431, levels of nitrate and total phosphorus were regularly reported above the screening levels at the upstream station 18696 and infrequently at the downstream station 18697. There are three wastewater treatment discharges that may be contributing to these concerns – one at the upper end of the stream, one at a recreational vehicle park upstream of station 18696, and one at a mobile home park downstream of station 18696. As discussed for many other segments, waterbodies that are

downstream of wastewater treatment facilities frequently have elevated levels of nutrients because most wastewater treatment facilities do not have advanced nutrient removal technology. However, in light of the above discussion for *Enterococcus*, it is recommended that upstream sampling be conducted to help determine if there may be failing infrastructure contributing to the concerns for these nutrients.

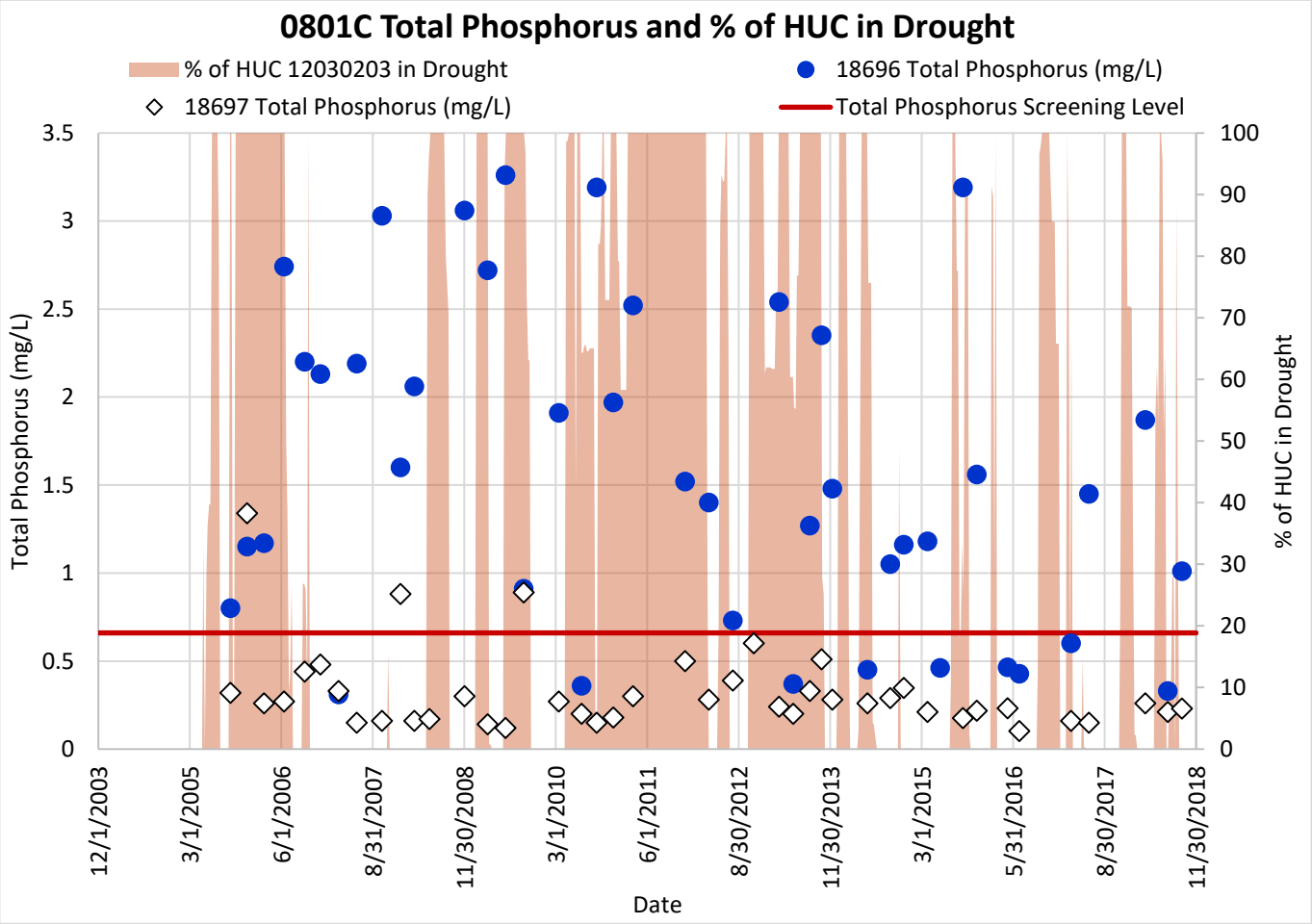


Figure 431: 0801C Total Phosphorus and % of HUC in Drought

The concern for chlorophyll-*a* appeared to have been largely related to drought as shown in Figure 432. Many of the elevated chlorophyll-*a* levels were reported during the prolonged drought of 2011 to 2015.

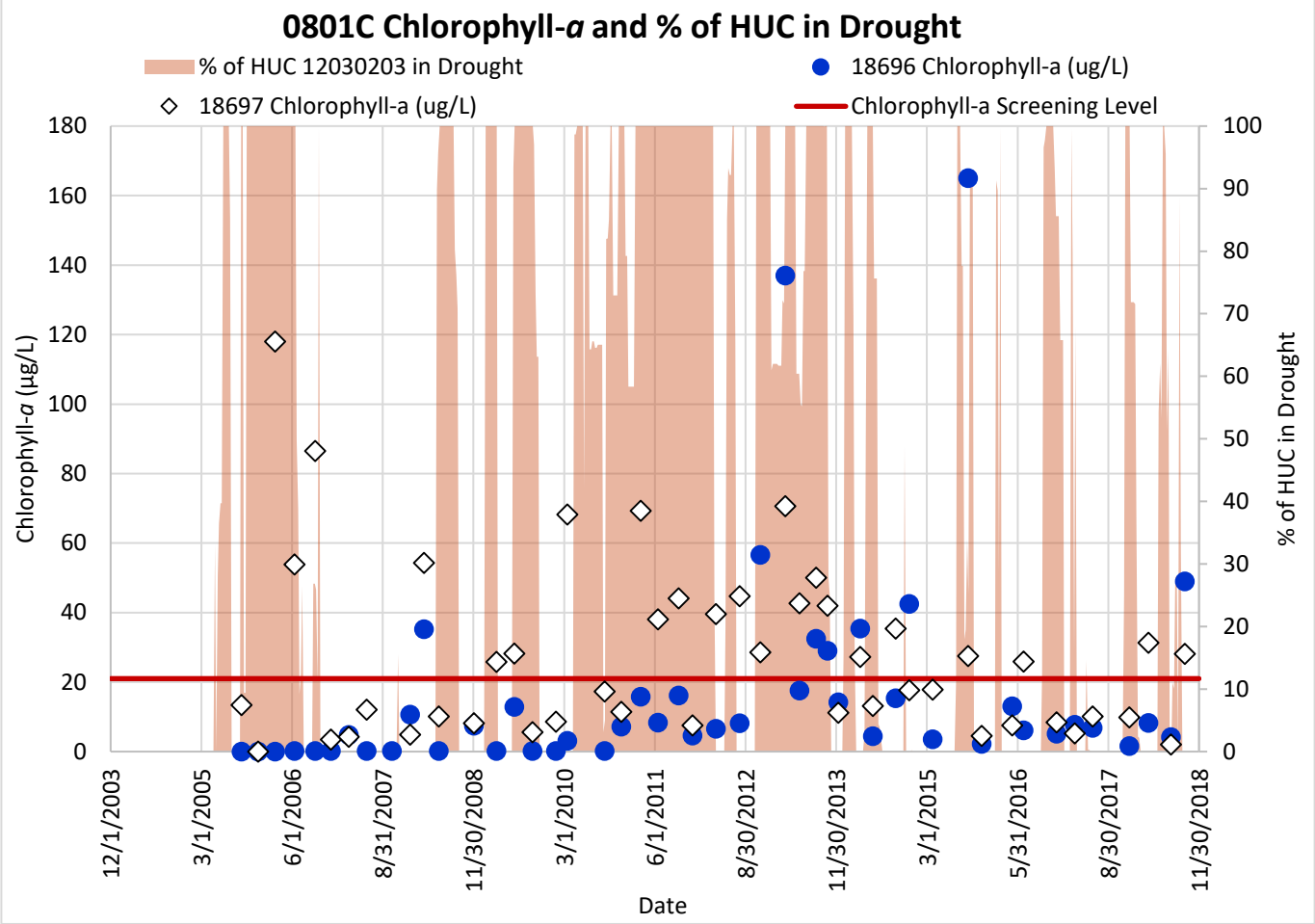


Figure 432: 0801C Chlorophyll-a and % of HUC in Drought

The increasing trends for total suspended solids and volatile suspended solids at station 18696 and for total organic carbon at station 18697 appeared to have been related to drought and drought recovery conditions. Elevated values tended to occur during decreases in drought intensity, which would occur during precipitation events that wash sediments into the bayou.

Appendix A: Glossary

A

Algae – Aquatic plants that are either attached or free floating in the water. Can affect dissolved oxygen and PH levels through photosynthesis and respiration.

Algal Blooms – Increase in algal population which can be caused by excessive nutrients and can lead to dissolved oxygen depletion.

Ammonia – Substance found in water and wastewater that is a nutrient for algal growth. Sources can include human and animal waste and fertilizers.

Assessment unit – A sub-section of a classified or unclassified segment that represent discrete areas of the segment such as arms of a reservoir or portions of a stream between tributary confluences.

B

Best Management Practices – Types of pollution control techniques or methods.

Bioaccumulate – accumulation of contaminants in the tissues of an organism through the consumption of contaminated food sources

Biomagnify – higher order contamination of an organism caused by the consumption of organisms that have bioaccumulated contaminants

Brownfield – Properties that may be redeveloped after the clean-up of hazardous materials located on that site.

C

Chloride – One of the major ions in water and wastewater. Concentrations can be increased by industrial processes. High chloride concentrations can affect metallic objects and growing plants.

Chlorophyll-*a* – Photosynthetic pigment that is found in all green plants. The concentration of chlorophyll-*a* is used to estimate phytoplankton biomass in surface water.

Classified Segment – Waterbodies that are defined in Appendix A of the Texas Surface Water Quality Standards.

Clean Rivers Program (CRP) – A partnership between the TCEQ and regional water authorities to coordinate and conduct water quality monitoring, assessment, and stakeholder participation to improve the quality of surface water within each river basin in Texas.

Conductivity -– The measure of water's ability to conduct an electrical current due to the amount of dissolved solids in the water. Value is affected by water temperature.

Conventionals – A grouping of water chemistry parameters which does not include field, nutrients, bacteria, or metals. Includes parameters such as solids, sulfate, turbidity, chlorophyll-*a*, hardness, and alkalinity.

Cubic Feet Per Second (cfs) – Unit of measurement for stream flow.

D

Dissolved Oxygen – The measure of the amount of oxygen that is freely available in water. It is vital to fish and other aquatic life. Dissolved oxygen is widely accepted as the single most important indicator of a waterbody's ability to support desirable aquatic life.

E

Ecoregion – geographic areas with similar geology, vegetation, climate, and hydrology

Enforcement and Compliance History Online (ECHO) – Online EPA database that includes information on facilities regulated by the Clean Air Act, Clean Water Act, and RCRA.

Environmental Protection Agency (EPA) – Federal regulatory agency responsible for protection of human and environmental health.

Escherichia coli (*E. coli*) – A gram negative rod-shaped bacterium that can be an ideal indicator of environmental samples for fecal contamination. 0157:H7 is the illness causing strain of *E. Coli*.

Eutrophic – Nutrient rich body of water which typically has high algal concentration and poor water quality.

F

Flow – Quantity of water moving through a stream at a given point measured in cubic feet per second.

G

Geographic Information System – Used in special analysis of water quality and data.

Geosmin – a compound released during the decay of some algal species that causes taste and odor issues in drinking water.

H

Hydrologic Unit Code (HUC) – A number code that identifies a watershed and subdivisions of watersheds. More digits in the code represent smaller watersheds.

Hypereutrophic – Waterbodies with very high levels of nutrients and algal production.

L

Legacy Pollutants – Contaminants which have been banned from production sale or use but which may persist in the environment.

M

Mesotrophic – Waterbodies with moderate levels of nutrients and algal production.

Micrograms Per Liter (µg/L) – Unit of measurement for constituents in water. Equal to parts per billion in pure water at standard temperature and pressure.

Microsiemens Per Centimeter (µS/cm) – The unit of measure for conductivity and standard conductance.

Milligrams Per Liter (mg/L) – Unit of measurement for constituents in water. Equal to parts per million in pure water at standard temperature and pressure.

Most Probable Number (MPN) – Unit for *E. coli* values based on a statistical range for the analytical method.

N

Nitrate – The fraction of nitrogen that is readily available for plants and algae. High levels of nitrate in drinking water can cause methemoglobinemia, especially in infants.

Nitrite – Reduction of nitrate. Nitrite is the intermediate that oxidizes iron in the blood to methemoglobin and reduces oxygen-carrying capacity.

Non-Point Source – All sources of pollution not discharged from a pipe, includes runoff, atmospheric deposition, and precipitation.

North Texas Municipal Water District – A conservation and reclamation district and political subdivision of the State of Texas. Authorized to acquire, treat, and distribute potable water, and to collect, treat and dispose of wastes, both liquid and solid, in order to reduce pollution, conserve and develop the natural resources of Texas.

Number (N) – Number of values evaluated.

Nutrient – Any substance used by living things to promote growth; commonly nitrogen and phosphorus species.

O

Oligotrophic – Waterbodies with high clarity and low levels of nutrients and algal productivity.

Orthophosphate – The inorganic fraction of phosphorous most commonly found in water, generally the limiting nutrient for plant growth.

P

Period of Record – Date range for data being evaluated.

Photic Zone – The portion of the water column where light penetrates and algae can photosynthesize and reproduce.

Photosynthesis – The process by which sunlight, carbon dioxide, and water is converted into carbohydrates used for plant growth.

Point Source – Sources of pollution that are discharged from a pipe

Polychlorinated Biphenyl (PCB) – Highly toxic class of organic compounds that were banned in by the United States Congress in 1979. PCB's were widely used as dielectric fluids in transformers, capacitors, and coolants.

R

Resource Conservation and Recovery Act (RCRA) – Federal regulations governing the disposal of solid and hazardous waste.

S

Screening Level – Water quality criterion for parameters which do not have standards.

Sediment – Bottom layers composed of particles of sand, clay, silt, and plant or animal matter carried in water which are deposited in reservoirs and slow-moving areas of streams and rivers.

Specific Conductance – The measure of water's ability to conduct an electrical current due to the amount of dissolved solids in the water. Value is corrected to standard temperature (25ºC). This is the most commonly reported value.

Standard Units (S.U.) – Unit of measurement for pH. Usually ranges from 0 to 14 with 7 being neutral.

Subwatershed – A portion of a larger watershed.

Sulfate – A naturally occurring substance commonly found in the water column that may cause digestive issues when in drinking water at high concentration levels.

Superfund Site – Abandoned sites and facilities that are determined by the EPA to be contaminated and are in need of clean up.

T

Tarrant Regional Water District – A raw water supplier for the north central Texas area covering an eleven county area. Maintains dams for reservoirs and more than 150 miles of pipeline. Also manages a flood control system in Tarrant county.

Texas Commission on Environmental Quality (TCEQ) – Environmental Agency for the State of Texas.

Texas Department of State Health Services – State agency which conducts tissue surveys and issues fish consumption bans in order to protect the public health as part of their many state health services.

Total Dissolved Solids – The total amount of inorganic and organic material dissolved in water.

Total Phosphorus – The total of all phosphorus and can lead to eutrophication.

Total Maximum Daily Load (TMDL) – A value of the maximum amount of a pollutant that a body of water can receive and still meet water quality standards.

Tributary – A stream or river that flows into a larger stream or river or into a reservoir.

Trophic Status Index – Quantification of the eutrophication of reservoirs ranging from oligotrophic with low nutrient levels hypereutrophic with high nutrient levels.

Turbidity – A measure of water clarity which can be due to algae and other suspended particles.

U

Unclassified Segment – Waterbodies that are not defined in Appendix A of the Texas Surface Water Quality Standard. These waterbodies are identified by the segment number of the waterbody they flow in to followed by a letter suffix.

United States Geological Survey (USGS) – Federal scientific research agency that gathers information on biology, geography, geology, and hydrology.

W

Watershed – The area of land from which precipitation drains to a particular stream, river, or lake.

Wastewater Treatment Plant (WWTP) – Regional or local facility that treats municipal and industrial waste to acceptable levels which is then released into receiving waterbodies.

Appendix B: Segment and Assessment Unit Dictionary

- Segment: 0801 Trinity River Tidal - from the saltwater barrier, which is 5.5 km (3.4 mi) downstream of IH 10, in Chambers County to a point 3.1 km (1.9 mi) downstream of US 90 in Liberty County
    - Assessment Unit: 0801_01 - From the saltwater barrier, which is 5.5 km (3.4 mi) downstream of IH 10, in Chambers County upstream to the Lynchburg Canal in Liberty County
        - Tidal Stream
        - Station ID(s): 10892; 20839
    - Assessment Unit: 0801_02 - From the Lynchburg Canal in Liberty County upstream to a point 3.1 km (1.9 mi) downstream of US 90 in Liberty County
        - Tidal Stream
        - Station ID(s): No Stations
- Segment: 0801A Lost River - From IH 10 in Chambers County to approximately 6 KM upstream of confluence with John Wiggins Bayou.
    - Assessment Unit: 0801A_01 - From IH 10 in Chambers County to approximately 6 KM upstream of confluence with John Wiggins Bayou.
        - Tidal Stream
        - Station ID(s): No Stations
- Segment: 0801B Old River - From IH 10 in Chambers County upstream to the confluence with East Prong Old River and West Prong Old River approximately 4.4 mi (7.0 km) north of Mont Belvieu
    - Assessment Unit: 0801B_01 - From IH 10 in Chambers County upstream to the confluence with East Prong Old River and West Prong Old River approximately 4.4 mi (7.0 km) north of Mont Belvieu
        - Perennial Freshwater Stream
        - Station ID(s): 18360
- Segment: 0801C Cotton Bayou - From the confluence of Cotton Lake southeast of Mont Belvieu in Chambers County upstream to a point (NHD RC 12040203000496) approximately 1 mi north of IH 10 in Chambers County
    - Assessment Unit: 0801C_01 - From the confluence of Cotton Lake southeast of Mont Belvieu in Chambers County upstream to a point (NHD RC 12040203000496) approximately 1 mi north of IH 10 in Chambers County
        - Tidal Stream
        - Station ID(s): 18696; 18697
- Segment: 0801D Lynchburg Canal - From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.

    - Assessment Unit: 0801D_01 - From confluence with Trinity River Tidal upstream to confluence with Big Caney Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 16148
- Segment: 0802 Trinity River Below Lake Livingston - From a point 3.1 km (1.9 mi) downstream of US 90 in Liberty County to Livingston Dam in Polk/San Jacinto County
    - Assessment Unit: 0802_01 - Lower 17 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): 10894
    - Assessment Unit: 0802_02 - Approximately 9 mi upstream to approximately 15 mi downstream of SH 105
        - Perennial Freshwater Stream
        - Station ID(s): 10895
    - Assessment Unit: 0802_03 - 11 mi upstream to approximately 9 mi downstream of FM 787
        - Perennial Freshwater Stream
        - Station ID(s): 10896
    - Assessment Unit: 0802_04 - 5 mi upstream to 11 mi downstream of US 59
        - Perennial Freshwater Stream
        - Station ID(s): 10897
    - Assessment Unit: 0802_05 - Upper 6 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): 16998
- Segment: 0802A Choates Creek - Perennial stream from the confluence with Long King Creek upstream to the confluence with an unnamed tributary approximately 3.0 km upstream of SH 146 near the City of Livingston
    - Assessment Unit: 0802A_01 - Perennial stream from the confluence with Long King Creek upstream to the confluence with an unnamed tributary approximately 3.0 km upstream of SH 146 near the City of Livingston
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0802B Long King Creek - Perennial stream from the confluence with the Trinity River upstream to the confluence with an unnamed tributary approximately 1.2 km upstream of FM 350 near the City of Livingston
    - Assessment Unit: 0802B_01 - From the confluence with segment 0802 of the Trinity River to just upstream of confluence with unknown tributary (NHD RC 12030202001817)
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0802B_02 - From just upstream of the confluence with unnamed tributary (NHD RC 12030202001817) up to the confluence with Mud Creek, in Polk County.
        - Perennial Freshwater Stream
        - Station ID(s): 10689

- Segment: 0802C Unnamed Tributary of Coley Creek - Perennial stream from the confluence with Coley Creek upstream to its origin at the culvert leading from Lake Run-Amuck at Wright Road
    - Assessment Unit: 0802C_01 - Perennial stream from the confluence with Coley Creek upstream to its origin at the culvert leading from Lake Run-Amuck at Wright Road
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0802D Menard Creek - From the confluence with segment 0802 of the Trinity River up to the confluence with Meetinghouse Creek.
    - Assessment Unit: 0802D_01 - From the confluence with segment 0802 of the Trinity River up to the confluence with Meetinghouse Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 10688
- Segment: 0802E Big Creek - Perennial stream from the confluence with the Trinity River in Liberty County upstream to the confluence of Double Lake Branch and Henry Lake Branch in San Jacinto County
    - Assessment Unit: 0802E_01 - Perennial stream from the confluence with the Trinity River in Liberty County upstream to the confluence of Double Lake Branch and Henry Lake Branch in San Jacinto County
        - Perennial Freshwater Stream
        - Station ID(s): 13685
- Segment: 0803 Lake Livingston - From Livingston Dam in Polk/San Jacinto County to a point 1.8 km (1.1 mi) upstream of Boggy Creek in Houston/Leon County, up to normal pool elevation of 131 feet (impounds Trinity River)
    - Assessment Unit: 0803_01 - Lowermost portion of reservoir, adjacent to dam
        - Reservoir
        - Station ID(s): 10899
    - Assessment Unit: 0803_02 - Lower portion of reservoir, East Wolf Creek
        - Reservoir
        - Station ID(s): 10901; 14005
    - Assessment Unit: 0803_03 - Lower portion of reservoir, East Willow Springs
        - Reservoir
        - Station ID(s): 14006
    - Assessment Unit: 0803_04 - Middle portion of reservoir, East Pointblank
        - Reservoir
        - Station ID(s): 10911; 14007
    - Assessment Unit: 0803_05 - Middle portion of reservoir, downstream of Kickapoo Creek
        - Reservoir
        - Station ID(s): 10908; 10909; 21562
    - Assessment Unit: 0803_06 - Middle portion of reservoir, centering on US 190
        - Reservoir
        - Station ID(s): 21563

    - Assessment Unit: 0803_07 - Upper portion of reservoir, west of Carlisle
        - Reservoir
        - Station ID(s): 10913
    - Assessment Unit: 0803_08 - Cove off upper portion of reservoir, East Trinity
        - Reservoir
        - Station ID(s): 14014
    - Assessment Unit: 0803_09 - West Carolina Creek cove, off upper portion of reservoir
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0803_10 - Upper portion of reservoir, centering on SH 19
        - Reservoir
        - Station ID(s): 10914
    - Assessment Unit: 0803_11 - Riverine portion of reservoir, centering on SH 21
        - Reservoir
        - Station ID(s): 10917
    - Assessment Unit: 0803_12 - Remainder of reservoir
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0803A Harmon Creek - From the confluence with Lake Livingston (normal pool elevation of 131 feet) to the confluence of East Fork Harmon Creek east of Huntsville in Walker County
    - Assessment Unit: 0803A_01 - A 16 mi (25.7 km) stretch of Harmon Creek extending from Lake Livingston (normal pool elevation of 131 feet) upstream to the confluence of East Fork Harmon Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 10698
- Segment: 0803B White Rock Creek - From the confluence of Lake Livingston northeast of Trinity in Trinity County to the upstream perennial portion of the stream east of Lovelady in Houston County
    - Assessment Unit: 0803B_01 - Lower 25 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): 10696
    - Assessment Unit: 0803B_02 - Upper 13 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0803C Turkey Creek - Perennial stream from the normal pool elevation of Lake Livingston upstream to the confluence with an unnamed tributary 2.85 km downstream of FM 980
    - Assessment Unit: 0803C_01 - Perennial stream from the normal pool elevation of Lake Livingston upstream to the confluence with an unnamed tributary 2.85 km downstream of FM 980
        - Perennial Freshwater Stream
        - Station ID(s): No Stations

- Segment: 0803D Parker Creek - Perennial stream from the confluence with Harmon Creek upstream to the confluence with Town Branch
    - Assessment Unit: 0803D_01 - Perennial stream from the confluence with Harmon Creek upstream to the confluence with Town Branch
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0803E Nelson Creek - From the confluence with segment 0803 Trinity River, to upper end of Nelson Creek NHD RC 12030202005424
    - Assessment Unit: 0803E_01 - From the confluence with segment 0803 Trinity River, to upper end of Nelson Creek NHD RC 12030202005424
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 10700
- Segment: 0803F Bedias Creek - From the confluence with segment 0803 Trinity River, to upper end of Bedias Creek, NHD RC 12030202000350
    - Assessment Unit: 0803F_01 - From the confluence with segment 0803 Trinity River up to confluence with Poole Creek (NHD RC 12030202000572)
        - Perennial Freshwater Stream
        - Station ID(s): 10702
    - Assessment Unit: 0803F_02 - From the confluence with Poole Creek (NHD RC 12030202000572) to upper end of NHD RC Bedias Creek (NHD RC 12030202000350)
        - Perennial Freshwater Stream
        - Station ID(s): 10703
- Segment: 0803G Lake Madisonville - From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet (impounds Town Branch)
    - Assessment Unit: 0803G_01 - From Lake Madisonville Dam in Madison County up to the normal pool elevation of 285 feet (impounds Town Branch)
        - Reservoir
        - Station ID(s): 16953
- Segment: 0804 Trinity River Above Lake Livingston - From a point 1.8 km (1.1 mi) upstream of Boggy Creek in Houston/Leon County to a point immediately upstream of the confluence of the Cedar Creek Reservoir discharge canal in Henderson/Navarro County
    - Assessment Unit: 0804_01 - From the lower end of the segment up to just above the confluence with Hurricane Bayou in Houston County.
        - Perennial Freshwater Stream
        - Station ID(s): 10918; 13690
    - Assessment Unit: 0804_02 - From just upstream of the confluence with Hurricane Bayou up to just above the confluence with Boons Creek.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0804_03 - From just upstream of the confluence with Boons Creek up to just above the confluence with Caney Creek.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations

    - Assessment Unit: 0804_04 - From the confluence with Caney Creek up to just above the confluence with Indian Creek in Anderson County.
        - Perennial Freshwater Stream
        - Station ID(s): 10919
    - Assessment Unit: 0804_05 - From just above the confluence with Indian Creek in Anderson County up to just above the confluence with Tehuacana Creek.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0804_06 - From just above the confluence with Tehuacana Creek to just above the confluence with Richland Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 21958
    - Assessment Unit: 0804_07 - From just above the confluence with Richland Creek in Henderson County, up to the upper end of the segment.
        - Perennial Freshwater Stream
        - Station ID(s): 10922
- Segment: 0804A Box Creek - Perennial stream from the confluence of Elkhart Creek upstream to the Elkhart Lake dam northeast of the City of Elkhart
    - Assessment Unit: 0804A_01 - Perennial stream from the confluence of Elkhart Creek upstream to the Elkhart Lake dam northeast of the City of Elkhart
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0804B Keechi Creek - Perennial stream from the confluence with the Trinity River to a point 0.05 km upstream of FM 645
    - Assessment Unit: 0804B_01 - Perennial stream from the confluence with the Trinity River to a point 0.05 km upstream of FM 645
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0804C Mims Creek - Perennial stream from the confluence with Upper Keechi Creek upstream to the confluence of an unnamed tributary approximately 2.1 km upstream of FM 1580 near the City of Fairfield
    - Assessment Unit: 0804C_01 - Perennial stream from the confluence with Upper Keechi Creek upstream to the confluence of an unnamed tributary approximately 2.1 km upstream of FM 1580 near the City of Fairfield
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0804D Toms Creek - Perennial stream from the confluence with the Trinity River to the Missouri-Pacific Railroad crossing near Oakwood
    - Assessment Unit: 0804D_01 - Perennial stream from the confluence with the Trinity River to the Missouri-Pacific Railroad crossing near Oakwood
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0804E Northwest Branch - Perennial stream from the confluence with Toms Creek to a point 0.3 km upstream of FM 831

    - Assessment Unit: 0804E_01 - Perennial stream from the confluence with Toms Creek to a point 0.3 km upstream of FM 831
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0804F Tehuacana Creek - From the confluence with the Trinity River northeast of Fairfield in Freestone County to the headwaters northwest of Mexia in Limestone County
    - Assessment Unit: 0804F_01 - A 27 mi stretch of Tehuacana Creek extending from the confluence with 0804 of the Trinity River up to the confluence with Caney Creek (NHD RC 120302010000226)
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 20770
    - Assessment Unit: 0804F_02 - A 28.4 mi (45.7 km) stretch of Tehuacana Creek extending from the confluence with Caney Creek to the upper end (NHD RC 120302010000225) of Tehuacana Creek
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 10705; 18572
- Segment: 0804G Catfish Creek - Twenty mile stretch of Catfish Creek running upstream from US 287 in Anderson Co., to Catfish Creek Ranch Lake just upstream of SH 19 in Henderson Co.
    - Assessment Unit: 0804G_01 - A 20 mi stretch of Catfish Creek running upstream from US 287 in Anderson Co., to Catfish Creek Ranch Lake just upstream of SH 19 in Henderson Co.
        - Perennial Freshwater Stream
        - Station ID(s): 10717; 18596; 21552
- Segment: 0804H Upper Keechi Creek - From confluence with segment 0804 Trinity River to the upper end of NHD stream Upper Keechi Creek (NHD RC 12030201001075)
    - Assessment Unit: 0804H_01 - From the confluence with segment 0804 Trinity River up to confluence with Twin Branch (NHD RC 12030201027099)
        - Perennial Freshwater Stream
        - Station ID(s): 20771
    - Assessment Unit: 0804H_02 - From the confluence with Twin Branch (NHD RC 12030201027099) to the upper end (NHD RC 12030201001075) of NHD RC stream Upper Keechi Creek
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0804I Big Brown Creek - From the confluence with segment 0804 of the Trinity River upstream to the end of segment (NHD RC Reach Code 112030201000928).
    - Assessment Unit: 0804I_01 - From the confluence with the Trinity River (0804) upstream to the Fairfield Lake Dam in Freestone County
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): No Stations
    - Assessment Unit: 0804I_02 - From the upper end of Fairfield Lake upstream to headwaters (NHD RC 112030201000928)
        - Intermittent Freshwater Stream

        - Station ID(s): No Stations
- Segment: 0804J Fairfield Lake - Impounded Big Brown Creek in Freestone County
    - Assessment Unit: 0804J_01 - Impounded Big Brown Creek in Freestone County
        - Reservoir
        - Station ID(s): 17951
- Segment: 0804K Lower Keechi Creek - Perennial stream from the confluence with the Trinity River in Leon County upstream to the headwaters in Jewett in Leon County
    - Assessment Unit: 0804K_01 - Perennial stream from the confluence with the Trinity River in Leon County upstream to the headwaters in Jewett in Leon County
        - Perennial Freshwater Stream
        - Station ID(s): 20382
- Segment: 0804L Town Creek - Perennial stream from the confluence with Keechi Creek upstream to SH 256 (Appendix D)
    - Assessment Unit: 0804L_01 - Perennial stream from the confluence with Keechi Creek upstream to SH 256 (Appendix D)
        - Perennial Freshwater Stream
        - Station ID(s): 10706
- Segment: 0804M Bassett Creek - Perennial stream from the confluence with Town Creek upstream to Blue Lake
    - Assessment Unit: 0804M_01 - From the confluence with Town Creek upstream to approximately 15m upstream of the processing plant outfall
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0804M_02 - From approximately 15m upstream of the processing plant outfall upstream to Blue Lake
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0805 Upper Trinity River - From a point immediately upstream of the confluence of the Cedar Creek Reservoir discharge canal in Henderson/Navarro County to a point immediately upstream of the confluence of Elm Fork Trinity River in Dallas County
    - Assessment Unit: 0805_01 - From confluence of the Cedar Creek Reservoir discharge canal upstream to confluence of Smith Creek.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0805_02 - From confluence of Smith Creek upstream to confluence of Tenmile Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 10925
    - Assessment Unit: 0805_03 - From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 10934; 20444
    - Assessment Unit: 0805_04 - From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River

        - Perennial Freshwater Stream
        - Station ID(s): 10937; 20933; 20934
    - Assessment Unit: 0805_06 - From confluence of Tenmile Creek upstream to confluence of Fivemile Creek
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0805A Red Oak Creek - From confluence with segment 0805 Trinity River 12 mi upstream to I 45.
    - Assessment Unit: 0805A_01 - From confluence with segment 0805 Trinity River 12 mi upstream to I 45.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0805B Parsons Slough - From confluence with segment 0805 Trinity River in Kaufman County, 11 mi upstream to Malloy Bridge Road in Dallas Co.
    - Assessment Unit: 0805B_01 - From confluence with segment 0805 Trinity River in Kaufman County, 11 mi upstream to Malloy Bridge Road in Dallas Co.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): No Stations
- Segment: 0805C White Rock Creek below White Rock Lake - From the confluence with segment 0805 of the Trinity River up to the confluence with 0827 White Rock Lake.
    - Assessment Unit: 0805C_01 - From the confluence with segment 0805 of the Trinity River up to the confluence with 0827 White Rock Lake.
        - Perennial Freshwater Stream
        - Station ID(s): 10816
- Segment: 0805D Fivemile Creek - A 17 mi stretch of Fivemile Creek extending from confluence with segment 0805 Trinity River upstream to upper end of NHD stream Fivemile Creek (NHD RC 12030105000066).
    - Assessment Unit: 0805D_01 - A 17 mi stretch of Fivemile Creek extending from confluence with segment 0805 Trinity River upstream to upper end of NHD stream Fivemile Creek (NHD RC 12030105000066).
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0806 West Fork Trinity River Below Lake Worth - From a point immediately upstream of the confluence of Village Creek in Tarrant County to Lake Worth Dam in Tarrant County
    - Assessment Unit: 0806_01 - From confluence of Village Creek upstream to confluence of Clear Fork Trinity River
        - Perennial Freshwater Stream
        - Station ID(s): 10938; 16120; 17368; 17863; 20292
    - Assessment Unit: 0806_02 - From confluence of Clear Fork Trinity River upstream to Lake Worth Dam
        - Perennial Freshwater Stream
        - Station ID(s): 10941; 21558

- Segment: 0806A Fosdic Lake - From Fosdic Lake Dam to the reservoir headwaters in Oakland Lake Park in Tarrant County
    - Assessment Unit: 0806A_01 - From Fosdic Lake Dam to the reservoir headwaters in Oakland Lake Park in Tarrant County
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0806B Echo Lake - From Echo Lake Dam to the reservoirs headwaters in Tarrant County
    - Assessment Unit: 0806B_01 - From Echo Lake Dam to the reservoirs headwaters in Tarrant County
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0806C Big Fossil Creek - From confluence with Little Fossil Creek in Haltom City, to HWY 183 in Tarrant Co.
    - Assessment Unit: 0806C_01 - From confluence with Little Fossil Creek in Haltom City, to HWY 183 in Tarrant Co.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0806D Marine Creek - Marine Creek from the confluence with West Fork Trinity River Below Lake Worth upstream to the Marine Creek Reservoir dam
    - Assessment Unit: 0806D_01 - Marine Creek from the confluence with West Fork Trinity River Below Lake Worth upstream to the Marine Creek Reservoir dam
        - Perennial Freshwater Stream
        - Station ID(s): 17370; 21801
- Segment: 0806E Sycamore Creek - Five mi stretch of Sycamore Creek running upstream from confluence with the W. Fork of Trinity River to confluence with Echo Lake Tributary in Fort Worth.
    - Assessment Unit: 0806E_01 - Five mi stretch of Sycamore Creek running upstream from confluence with the W. Fork of Trinity River to confluence with Echo Lake Tributary in Fort Worth
        - Perennial Freshwater Stream
        - Station ID(s): 17369
- Segment: 0806F Little Fossil Creek - A 13.7 mi stretch of Little Fossil Creek running upstream from confluence with segment 0806 W. Fork Trinity River upstream to upper end (NHD RC Reach Code of NHD RC stream Little Fossil Creek.
    - Assessment Unit: 0806F_01 - A 13.7 mi stretch of Little Fossil Creek running upstream from confluence with segment 0806 W. Fork Trinity River upstream to upper end (NHD RC Reach Code of NHD RC stream Little Fossil Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 17129; 21425
- Segment: 0806G Marine Creek Reservoir - From the Marine Creek Reservoir Dam at Loop 820 in Fort Worth up to normal pool elevation of 690 feet (impounds Marine Creek)
    - Assessment Unit: 0806G_01 - From the Marine Creek Reservoir Dam at Loop 820 in Fort Worth up to normal pool elevation of 690 feet (impounds Marine Creek)

        - Reservoir
        - Station ID(s): No Stations
- Segment: 0807 Lake Worth - From Lake Worth Dam in Tarrant County to a point 4.0 km (2.5 mi) downstream of Eagle Mountain Dam in Tarrant County, up to normal pool elevation of 594 feet (impounds West Fork Trinity River)
    - Assessment Unit: 0807_01 - From Lake Worth Dam in Tarrant County to a point 4.0 km (2.5 mi) downstream of Eagle Mountain Dam in Tarrant County, up to normal pool elevation of 594 feet (impounds West Fork Trinity River)
        - Reservoir
        - Station ID(s): 10942; 15163; 15166; 15167
- Segment: 0808 West Fork Trinity River Below Eagle Mountain Reservoir - From a point 4.0 km (2.5 mi) downstream of Eagle Mountain Dam in Tarrant County to Eagle Mountain Dam in Tarrant County
    - Assessment Unit: 0808_01 - From a point 4.0 km (2.5 mi) downstream of Eagle Mountain Dam in Tarrant County to Eagle Mountain Dam in Tarrant County
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0809 Eagle Mountain Reservoir - From Eagle Mountain Dam in Tarrant County to a point 0.6 km (0.4 mi) downstream of the confluence of Oates Branch in Wise County up to normal pool elevation of 649.1 feet (impounds West Fork Trinity River)
    - Assessment Unit: 0809_01 - Lowermost portion of reservoir near east end of dam
        - Reservoir
        - Station ID(s): 10944
    - Assessment Unit: 0809_02 - Dosier Slough cove
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0809_03 - Ash Creek cove
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0809_04 - Lowermost portion of reservoir near west end of dam
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0809_05 - Lower portion of reservoir east of Walnut Creek cove
        - Reservoir
        - Station ID(s): 10952
    - Assessment Unit: 0809_06 - Walnut Creek cove
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0809_07 - Old Ranch cove
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0809_08 - Middle portion of reservoir near Cole subdivision
        - Reservoir
        - Station ID(s): 10956
    - Assessment Unit: 0809_09 - Indian Creek cove

        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0809_10 - Upper portion of reservoir near Indian Creek cove
        - Reservoir
        - Station ID(s): 10960
    - Assessment Unit: 0809_11 - Darrett Creek cove
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0809_12 - Upper portion of reservoir near Newark Beach
        - Reservoir
        - Station ID(s): 10964
    - Assessment Unit: 0809_14 - Mid-Lake, from just above Walnut Cr. Cove to Oakwood Rd. peninsula
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0809A Walnut Creek - From the normal pool elevation of Eagle Mountain Reservoir up to the headwaters approximately 2.1 mi upstream of State Highway 199 in Parker County.
    - Assessment Unit: 0809A_01 - From the normal pool elevation of Eagle Mountain Reservoir up to the headwaters approximately 2.1 mi upstream of State Highway 199 in Parker County.
        - Perennial Freshwater Stream
        - Station ID(s): 10853
- Segment: 0809B Ash Creek - Intermittent stream with perennial pools from Eagle Mountain Lake in Tarrant County upstream to its confluence with Mill Branch in Parker County
    - Assessment Unit: 0809B_01 - Intermittent stream with perennial pools from Eagle Mountain Lake in Tarrant County upstream to its confluence with Mill Branch in Parker County
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 10854
- Segment: 0809C Dosier Creek - Perennial stream from the confluence of Dosier Slough cove upstream to the confluence with an intermittent stream 1 km upstream of Boat Club Road
    - Assessment Unit: 0809C_01 - Perennial stream from the confluence of Dosier Slough cove upstream to the confluence with an intermittent stream 1 km upstream of Boat Club Road
        - Perennial Freshwater Stream
        - Station ID(s): 10855
- Segment: 0809D Derrett Creek - Perennial stream from the confluence with Derrett Creek cove to 0.22 km upstream of FM 718 where the waterbody meets an intermittent stream
    - Assessment Unit: 0809D_01 - Perennial stream from the confluence with Derrett Creek cove to 0.22 km upstream of FM 718 where the waterbody meets an intermittent stream
        - Perennial Freshwater Stream

        - Station ID(s): 10858
- Segment: 0810 West Fork Trinity River Below Bridgeport Reservoir - From a point 0.6 km (0.4 mi) downstream of the confluence of Oates Branch in Wise County to Bridgeport Dam in Wise County
    - Assessment Unit: 0810_01 - Lower 25 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): 10967; 10969; 14246; 17844
    - Assessment Unit: 0810_02 - Upper 11 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): 14904; 20840
- Segment: 0810A Big Sandy Creek - Big Sandy Creek from the confluence with Waggoner Branch upstream to FM 1810 west of Decatur
    - Assessment Unit: 0810A_01 - Big Sandy Creek from the confluence with Waggoner Branch upstream to FM 1810 west of Decatur
        - Perennial Freshwater Stream
        - Station ID(s): 15688
- Segment: 0810B Garrett Creek - Eighteen mi stretch of Garrett Creek running upstream from confluence with Salt Creek to Wise County Road approximately 14 mi upstream of SH114, Wise County
    - Assessment Unit: 0810B_01 - Eighteen mi stretch of Garrett Creek running upstream from confluence with Salt Creek to Wise County Road approximately 14 mi upstream of SH114, Wise Co.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 16767
- Segment: 0810C Martin Branch - The eight mi stretch of Martin Branch running upstream from confluence with Center Creek to FM 730 south of Decatur, Wise County.
    - Assessment Unit: 0810C_01 - Eight mi stretch of Martin Branch running upstream from confluence with Center Creek to FM 730 south of Decatur, Wise County.
        - Perennial Freshwater Stream
        - Station ID(s): 17848
- Segment: 0810D Salt Creek - Eleven mi stretch of Salt Creek running upstream from confluence with Garrett Creek, Wise County.
    - Assessment Unit: 0810D_01 - Eleven mi stretch of Salt Creek running upstream from confluence with Garrett Creek, Wise County.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 16766
- Segment: 0811 Bridgeport Reservoir - From Bridgeport Dam in Wise County to a point immediately upstream of the confluence of Bear Hollow in Jack County, up to normal pool elevation of 836 feet (impounds West Fork Trinity River)
    - Assessment Unit: 0811_01 - Southeast portion of main body of reservoir
        - Reservoir
        - Station ID(s): 16762
    - Assessment Unit: 0811_02 - Southwest portion of main body of reservoir
        - Reservoir

        - Station ID(s): No Stations
    - Assessment Unit: 0811_03 - Central portion of main body of reservoir
        - Reservoir
        - Station ID(s): 10970
    - Assessment Unit: 0811_04 - Northern portion of main body of reservoir
        - Reservoir
        - Station ID(s): 15164
    - Assessment Unit: 0811_05 - Remainder of reservoir
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0811A Big Creek - From the confluence with Bridgeport Reservoir at normal pool elevation upstream to the headwaters adjacent to FM 2127 in Jack County
    - Assessment Unit: 0811A_01 - From the confluence with Bridgeport Reservoir at normal pool elevation upstream to the headwaters adjacent to FM 2127 in Jack County
        - Perennial Freshwater Stream
        - Station ID(s): 16768
- Segment: 0811B Beans Creek - Perennial stream from the confluence with Bridgeport Reservoir at normal pool elevation upstream to the headwaters approximately 4.4 km north of Perrin in Jack County
    - Assessment Unit: 0811B_01 - Perennial stream from the confluence with Bridgeport Reservoir at normal pool elevation upstream to the headwaters approximately 4.4 km north of Perrin in Jack County
        - Perennial Freshwater Stream
        - Station ID(s): 16737
- Segment: 0812 West Fork Trinity River Above Bridgeport Reservoir - From a point immediately upstream of the confluence of Bear Hollow in Jack County to SH 79 in Archer County
    - Assessment Unit: 0812_01 - Lower 25 mi of segment
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 10972; 18059
    - Assessment Unit: 0812_02 - Upper 60 mi of segment
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): No Stations
- Segment: 0813 Houston County Lake - From Houston County Dam in Houston County up to the normal pool elevation of 260 feet (impounds Little Elkhart Creek)
    - Assessment Unit: 0813_01 - From Houston County Dam in Houston County up to the normal pool elevation of 260 feet (impounds Little Elkhart Creek)
        - Reservoir
        - Station ID(s): 10973
- Segment: 0814 Chambers Creek Above Richland-Chambers Reservoir - From a point 4.0 km (2.5 mi) downstream of Tupelo Branch in Navarro County to the confluence of North Fork Chambers Creek and South Fork Chambers Creek

    - Assessment Unit: 0814_01 - From the lower end of the segment up to just above the confluence with Cummins Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 10975
    - Assessment Unit: 0814_02 - From just above the confluence with Cummins Creek up to just above the confluence with Waxahachie Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 10977
    - Assessment Unit: 0814_03 - From just above the confluence with Waxahachie Creek up to just above the confluence with Mill Branch.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0814_04 - From just above the confluence with Mill Branch to the upper end of the segment.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0814A Mill Creek - Twenty-five mi stretch of Mill Creek running upstream from confluence with Chambers Creek in Navarro Co., to Union Pacific RR in Milford, Ellis Co.
    - Assessment Unit: 0814A_01 - Twenty-five mi stretch of Mill Creek running upstream from confluence with Chambers Creek in Navarro Co. to Union Pacific RR in Milford, Ellis Co.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0814B South Fork Chambers Creek - A Twenty-nine mi stretch of the South Fork of Chambers creek stretching from the confluence with Chambers Creek (Segment 0814) to the upper end of South Fork Chambers Creek (NHD RC Reach Code 12030109000299)
    - Assessment Unit: 0814B_01 - A Twenty-nine mi stretch of the South Fork of Chambers creek stretching from the confluence with Chambers Creek (Segment 0814) to the upper end of South Fork Chambers Creek (NHD RC Reach Code 12030109000299)
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0815 Bardwell Reservoir - From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet (impounds Waxahachie Creek)
    - Assessment Unit: 0815_01 - From Bardwell Dam in Ellis County up to the normal pool elevation of 421 feet (impounds Waxahachie Creek)
        - Reservoir
        - Station ID(s): 10979
- Segment: 0815A Waxahachie Creek - Perennial stream from the confluence with the normal pool elevation of Bardwell Reservoir upstream to the confluence with North Prong Creek
    - Assessment Unit: 0815A_01 - Perennial stream from the confluence with the normal pool elevation of Bardwell Reservoir upstream to the confluence with North Prong Creek
        - Perennial Freshwater Stream

        - Station ID(s): 13686
- Segment: 0816 Lake Waxahachie - From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet (impounds South Prong Creek)
    - Assessment Unit: 0816_01 - From South Prong Dam in Ellis County up to normal pool elevation of 531.5 feet (impounds South Prong Creek)
        - Reservoir
        - Station ID(s): 10980
- Segment: 0816A South Prong Creek - A 12.2 mi stretch of South Prong Creek running upstream from the confluence with Segment 0816 (Lake Waxahachie) to the upper end of the creek (NHD RC 12030109000044), in Midlothian, Ellis County, TX.
    - Assessment Unit: 0816A_01 - A 12.2 mi stretch of South Prong Creek running upstream from the confluence with Segment 0816 (Lake Waxahachie) to the upper end of the creek (NHD RC 12030109000044), in Midlothian, Ellis County, TX.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0817 Navarro Mills Lake - From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet (impounds Richland Creek)
    - Assessment Unit: 0817_01 - From Navarro Mills Dam in Navarro County up to normal pool elevation of 424.5 feet (impounds Richland Creek)
        - Reservoir
        - Station ID(s): 10981
- Segment: 0817A Richland Creek - Ten mi stretch of Richland Creek running upstream from 0.5 mi downstream of FM 744 in Navarro Co., to FM 308 south of Mertens, Hill Co.
    - Assessment Unit: 0817A_01 - Ten mi stretch of Richland Creek running upstream from 0.5 mi downstream of FM 744 in Navarro Co., to FM 308 South of Mertens, Hill Co.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0818 Cedar Creek Reservoir - From Joe B. Hoggsett Dam in Henderson County up to normal pool elevation of 322 feet (impounds Cedar Creek)
    - Assessment Unit: 0818_01 - Lowermost portion of the reservoir, adjacent to the dam.
        - Reservoir
        - Station ID(s): 16748
    - Assessment Unit: 0818_02 - Caney Creek cove
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0818_03 - Clear Creek cove
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0818_04 - Lower portion of reservoir east of Key Ranch Estates
        - Reservoir
        - Station ID(s): 16749

  - Assessment Unit: 0818_05 - Cove off lower portion of reservoir adjacent to Clearview Estates
    - Reservoir
    - Station ID(s): No Stations
  - Assessment Unit: 0818_06 - Middle portion of reservoir downstream of Twin Creeks cove
    - Reservoir
    - Station ID(s): 16747; 16750
  - Assessment Unit: 0818_07 - Twin Creeks cove
    - Reservoir
    - Station ID(s): No Stations
  - Assessment Unit: 0818_08 - Prairie Creek cove
    - Reservoir
    - Station ID(s): No Stations
  - Assessment Unit: 0818_09 - Upper portion of reservoir adjacent to Lacy Fork cove
    - Reservoir
    - Station ID(s): 16753
  - Assessment Unit: 0818_10 - Lacy Fork cove
    - Reservoir
    - Station ID(s): No Stations
  - Assessment Unit: 0818_11 - Upper portion of reservoir east of Tolosa
    - Reservoir
    - Station ID(s): 16772
  - Assessment Unit: 0818_12 - Uppermost portion of reservoir downstream of Kings Creek
    - Reservoir
    - Station ID(s): No Stations
  - Assessment Unit: 0818_13 - From Joe B. Hoggsett Dam in Henderson County up to normal pool elevation of 322 feet (impounds Cedar Creek)
    - Reservoir
    - Station ID(s): No Stations
  - Assessment Unit: 0818_14 - Remainder of reservoir
    - Reservoir
    - Station ID(s): 21427
- Segment: 0818A One Mile Creek - Perennial stream from the confluence with Valley View Reservoir upstream to the confluence with an unnamed tributary 0.8 km upstream of SH 19
  - Assessment Unit: 0818A_01 - Perennial stream from the confluence with Valley View Reservoir upstream to the confluence with an unnamed tributary 0.8 km upstream of SH 19
    - Perennial Freshwater Stream
    - Station ID(s): 21001
- Segment: 0818B Cedar Creek above Cedar Creek Reservoir - Perennial stream from the confluence with Cedar Creek Reservoir at normal pool elevation upstream to the confluence of Muddy Cedar Creek and Rocky Cedar Creek in Kaufman County

    - Assessment Unit: 0818B_01 - Perennial stream from the confluence with Cedar Creek Reservoir at normal pool elevation upstream to the confluence of Muddy Cedar Creek and Rocky Cedar Creek in Kaufman County
        - Perennial Freshwater Stream
        - Station ID(s): 17842; 21559
- Segment: 0818C Kings Creek - Intermittent stream with perennial pools from the confluence with Cedar Creek Reservoir at normal pool elevation upstream to the headwaters adjacent to FM 986 approximately 5 km north of Terrell in Kaufman County
    - Assessment Unit: 0818C_01 - Intermittent stream with perennial pools from the confluence with Cedar Creek Reservoir at normal pool elevation upstream to the headwaters adjacent to FM 986 approximately 5 km north of Terrell in Kaufman County
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 16778; 21000
- Segment: 0818D Lacy Fork - Intermittent stream with perennial pools from the confluence with Cedar Creek Reservoir at normal pool elevation upstream to the confluence of Dry Lacy Fork and Wet Lacy Fork in Van Zandt County
    - Assessment Unit: 0818D_01 - Intermittent stream with perennial pools from the confluence with Cedar Creek Reservoir at normal pool elevation upstream to the confluence of Dry Lacy Fork and Wet Lacy Fork in Van Zandt County
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 16777
- Segment: 0818E Prairie Creek - Intermittent stream with perennial pools from the confluence with Cedar Creek Reservoir at normal pool elevation upstream to the headwaters adjacent to SH 198 in Van Zandt County
    - Assessment Unit: 0818E_01 - Intermittent stream with perennial pools from the confluence with Cedar Creek Reservoir at normal pool elevation upstream to the headwaters adjacent to SH 198 in Van Zandt County
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 16775
- Segment: 0818F Clear Creek - Perennial stream from the confluence with Clear Creek Cove upstream to the north edge of the highway 175.
    - Assessment Unit: 0818F_01 - Perennial stream from the confluence with Clear Creek Cove upstream to the north edge of the highway 175.
        - Perennial Freshwater Stream
        - Station ID(s): 16755
- Segment: 0818G North Twin Creek - Perennial stream from the confluence with Twin Creeks cove to 3 km northeast of the intersection of highway 175
    - Assessment Unit: 0818G_01 - Perennial stream from the confluence with Twin Creeks cove to 3 km northeast of the intersection of highway 175
        - Perennial Freshwater Stream
        - Station ID(s): 16756
- Segment: 0818H South Twin Creek - Perennial stream from the confluence with Twin Creeks cove upstream to 3.15 km northeast of where the waterbody intersects highway 175

    - Assessment Unit: 0818H_01 - Perennial stream from the confluence with Twin Creeks cove upstream to 3.15 km northeast of where the waterbody intersects highway 175
        - Perennial Freshwater Stream
        - Station ID(s): 16757
- Segment: 0818I Caney Creek - Intermittent stream with perennial pools from the confluence with Cedar Creek Reservoir upstream to the dam on Third Caney Creek approximately 1.8 km north of the intersection of SH 7 and US 175 in Athens
    - Assessment Unit: 0818I_01 - Intermittent stream with perennial pools from the confluence with Cedar Creek Reservoir upstream to the dam on Third Caney Creek approximately 1.8 km north of the intersection of SH 7 and US 175 in Athens
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 16758
- Segment: 0819 East Fork Trinity River - From the confluence with the Trinity River in Kaufman County to Rockwall-Forney Dam in Kaufman County
    - Assessment Unit: 0819_01 - From the confluence with the Trinity River in Kaufman County to Rockwall-Forney Dam in Kaufman County
        - Perennial Freshwater Stream
        - Station ID(s): 10989; 10990; 10991; 10993; 10996; 20284; 20285; 20286
- Segment: 0819A Duck Creek - Perennial stream from the confluence with the East Fork Trinity River in Kaufman County upstream to the confluence of an unnamed tributary 0.6 km upstream of Jupiter Road in Dallas County
    - Assessment Unit: 0819A_01 - Perennial stream from the confluence with the East Fork Trinity River in Kaufman County upstream to the confluence of an unnamed tributary 0.6 km upstream of Jupiter Road in Dallas County
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0819B Buffalo Creek - Perennial stream from the confluence with the East Fork Trinity River up to 0.6 km above the confluence of Little Buffalo Creek
    - Assessment Unit: 0819B_01 - Perennial stream from the confluence with the East Fork Trinity River up to 0.6 km above the confluence of Little Buffalo Creek
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0820 Lake Ray Hubbard - From Rockwall-Forney Dam in Kaufman County to Lavon Dam in Collin County, up to normal pool elevation of 435.5 feet (impounds East Fork Trinity River)
    - Assessment Unit: 0820_01 - Lower portion of East Fork arm, centering on IH 30
        - Reservoir
        - Station ID(s): 16809
    - Assessment Unit: 0820_02 - Middle portion of East Fork arm, centering on SH 66
        - Reservoir
        - Station ID(s): 11001; 16829

    - Assessment Unit: 0820_04 - Lower portion of main body of reservoir extending up from dam to Yankee Creek Arm
        - Reservoir
        - Station ID(s): 10998
    - Assessment Unit: 0820_05 - Mid-reservoir, I30 crossing Rowlett Creek Arm to Yankee Creek Arm
        - Reservoir
        - Station ID(s): 17829
    - Assessment Unit: 0820_06 - Outfall canal from Lake Lavon Dam
        - Reservoir
        - Station ID(s): 17846
- Segment: 0820A Cottonwood Creek - Perennial stream from the confluence with Rowlett Creek up to SH 5 (near Greenville Road)
    - Assessment Unit: 0820A_01 - Perennial stream from the confluence with Rowlett Creek upstream to SH 5 (near Greenville Road)
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0820B Rowlett Creek - Perennial stream from the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing
    - Assessment Unit: 0820B_01 - Perennial stream from the normal pool elevation of Lake Ray Hubbard upstream to the Parker Road crossing
        - Perennial Freshwater Stream
        - Station ID(s): 10753; 10765; 17845; 21478
- Segment: 0820C Muddy Creek - From the confluence with Lake Ray Hubbard, in Dallas County, to the headwaters east of Allen, in Collin County
    - Assessment Unit: 0820C_01 - From the confluence with Lake Ray Hubbard, in Dallas County, to the headwaters east of Allen, in Collin County
        - Perennial Freshwater Stream
        - Station ID(s): 16828; 20110; 22072; 22075; 22076; 22077; 22078; 22079
- Segment: 0821 Lake Lavon From Lavon Dam in Collin County, up to normal pool elevation of 492 feet (impounds East Fork Trinity River)
    - Assessment Unit: 0821_01 - Lowermost portion of reservoir
        - Reservoir
        - Station ID(s): 15685; 17584
    - Assessment Unit: 0821_02 - East Fork arm
        - Reservoir
        - Station ID(s): 11021; 15686; 21719; 21720; 21721; 21722; 21723
    - Assessment Unit: 0821_03 - Middle portion of Sister Grove Creek arm
        - Reservoir
        - Station ID(s): 15687
    - Assessment Unit: 0821_04 - Remainder of segment
        - Reservoir
        - Station ID(s): 11022; 21718; 21724; 21725

- Segment: 0821A Pilot Grove Creek - Perennial stream from confluence of Desert Creek up to FM 121 near Blue Ridge
    - Assessment Unit: 0821A_01 - From confluence of Desert Creek up to FM 121 near Blue Ridge
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0821A_02 - Pilot Grove Creek from the confluence with Lake Lavon upstream to the confluence with Desert Creek
        - Perennial Freshwater Stream
        - Station ID(s): 15692; 21717
    - Assessment Unit: 0821A_03 - Perennial stream from the confluence of Desert Creek upstream to FM 121 approximately five mi north of the City of Blue Ridge (Appendix D)
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0821A_04 - Pilot Grove Creek from FM 121 approximately five mi north of the City of Blue Ridge upstream to the headwaters approximately 450 m (0.28 mi) south of SH 11 west of Whitewright
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 21768
- Segment: 0821B Sister Grove Creek - From the confluence with Lake Lavon in Collin County to the confluence of West Prong Sister Grove Creek/East Prong Sister Grove Creek, east of Van Alstyne in Grayson County
    - Assessment Unit: 0821B_01 - From the confluence with Lake Lavon in Collin County to the confluence of West Prong Sister Grove Creek/East Prong Sister Grove Creek, east of Van Alstyne in Grayson County
        - Perennial Freshwater Stream
        - Station ID(s): 21394; 21396; 21766; 21767
- Segment: 0821C Wilson Creek - From the confluence with Lake Lavon in Collin County up to West FM 455 (NHD RC 12030106000086), just east of Celina, Collin Co., TX.
    - Assessment Unit: 0821C_01 - From the confluence with Lake Lavon in Collin County up to West FM 455 (NHD RC 12030106000086), just east of Celina, Collin Co., TX.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 10777; 15041; 21764; 21765
- Segment: 0821D East Fork Trinity River above Lake Lavon - A portion of the East Fork Trinity River extending from the confluence with Lake Lavon (segment 0821) to the upper end of the waterbody (NHD RC 12030106000074) in Grayson County, Texas.
    - Assessment Unit: 0821D_01 - A portion of the East Fork Trinity River extending from the confluence with Lake Lavon (segment 0821) to the upper end of the waterbody (NHD RC 12030106000074) in Grayson County, Texas.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 13740; 21774; 21775; 21778; 21779; 21781

- Segment: 0822 Elm Fork Trinity River Below Lewisville Lake - From the confluence with the West Fork Trinity River in Dallas County to Lewisville Dam in Denton County
    - Assessment Unit: 0822_01 - Lower 11 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): 18310; 20287
    - Assessment Unit: 0822_02 - 4.5 mi upstream to 7.5 mi downstream DWU intake
        - Perennial Freshwater Stream
        - Station ID(s): 16438; 17162
    - Assessment Unit: 0822_03 - 1.0 mi upstream to 4.5 mi downstream SH 121
        - Perennial Freshwater Stream
        - Station ID(s): 18358
    - Assessment Unit: 0822_04 - Upper 1.5 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): 15252
- Segment: 0822A Cottonwood Branch - A 6 mi stretch of Cottonwood Branch running upstream from confluence with Hackberry Creek, to Valley View Road in Dallas County.
    - Assessment Unit: 0822A_01 - A 2.5 mi stretch of Cottonwood Branch running upstream from confluence with Hackberry Creek to approx. 0.5 mi downstream of N. Story Rd., Dallas Co.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17167
    - Assessment Unit: 0822A_02 - A 3. 5 mi stretch of Cottonwood Branch running upstream from approximately 0.5 mi downstream of N. Story Rd. to Valley View Rd, Dallas, Co.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17166
- Segment: 0822B Grapevine Creek - From the confluence with Elm Fork Trinity River in Dallas County upstream to its headwaters west of International Parkway at Dallas-Fort Worth Airport in Tarrant County
    - Assessment Unit: 0822B_01 - From the confluence with Elm Fork Trinity River in Dallas County upstream to its headwaters west of International Parkway at Dallas-Fort Worth Airport in Tarrant County
        - Intermittent Freshwater Stream
        - Station ID(s): 20311; 21188; 21632
- Segment: 0822C Hackberry Creek - A 5.5 mi stretch of Hackberry Creek running upstream from confluence with Cottonwood Branch, to approximately 2.4 mi upstream of SH 114, in Irving, Dallas County.
    - Assessment Unit: 0822C_01 - A 5.5 mi stretch of Hackberry Creek running upstream from confluence with S. Fork Hackberry Creek to approximately 2.4 mi upstream of SH 114 in Irving, Dallas Co.
        - Perennial Freshwater Stream
        - Station ID(s): 17170; 17172
- Segment: 0822D Ski Lake - A 65 acre reservoir locate just south of the intersection of US 35E and spur 482 in Irving.

    - Assessment Unit: 0822D_01 - A 65 acre reservoir locate just south of the intersection of US 35E and spur 482 in Irving
        - Reservoir
        - Station ID(s): 17849
- Segment: 0823 Lewisville Lake - From Lewisville Dam in Denton County to a point 100 meters (110 yards) upstream of US 380 in Denton County, up to normal pool elevation of 515 feet (impounds Elm Fork Trinity River)
    - Assessment Unit: 0823_01 - Lowermost portion of reservoir
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0823_02 - Stewart Creek arm
        - Reservoir
        - Station ID(s): 16808
    - Assessment Unit: 0823_03 - Hickory Creek arm
        - Reservoir
        - Station ID(s): 11027; 18475; 20893
    - Assessment Unit: 0823_04 - Little Elm Creek arm
        - Reservoir
        - Station ID(s): 17830
    - Assessment Unit: 0823_05 - Middle portion of reservoir east of Lake Dallas
        - Reservoir
        - Station ID(s): 11026
    - Assessment Unit: 0823_06 - Remainder of reservoir
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0823A Little Elm Creek - From confluence with Lake Lewisville in Denton Co., up to 1.4 km above FM 453 in Collin Co.
    - Assessment Unit: 0823A_01 - From the confluence with Lake Lewisville in Denton Co., up to FM 455 in Collin Co. (Lower 12 mi of segment).
        - Perennial Freshwater Stream
        - Station ID(s): 16826
    - Assessment Unit: 0823A_02 - From FM 455 in Collin Co., up to 1.4 km above FM 121 in Grayson, Co. near Guenther. (Upper 15 mi of segment).
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0823B Stewart Creek - From the confluence with Lake Lewisville in Denton County to the headwaters near Frisco in Collin County.
    - Assessment Unit: 0823B_01 - From the confluence with Lake Lewisville in Denton County to the headwaters near Frisco in Collin County.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0823C Clear Creek - From the confluence with Lake Lewisville in Denton County to the headwaters west of Montague in Montague County
    - Assessment Unit: 0823C_01 - Lower 25 mi of segment

        - Perennial Freshwater Stream
        - Station ID(s): 10859; 13618; 16827
    - Assessment Unit: 0823C_02 - Upper 40 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0823D Doe Branch - From the confluence (NHD RC 12030103023518) with Lake Lewisville/Elm Fork Trinity in Denton County to the headwaters (NHD RC 12030103005935) northeast of Celina, Collin Co., TX.
    - Assessment Unit: 0823D_01 - From the confluence (NHD RC 12030103023518) with Lake Lewisville/Elm Fork Trinity in Denton County to the headwaters (NHD RC 12030103005935) northeast of Celina, Collin Co., TX.
        - Intermittent Freshwater Stream
        - Station ID(s): 20291
- Segment: 0824 Elm Fork Trinity River Above Ray Roberts Lake - From a point 9.5 km (5.9 mi) downstream of the confluence of Pecan Creek in Cooke County to US 82 in Montague County
    - Assessment Unit: 0824_01 - Lower 7.5 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): 11031
    - Assessment Unit: 0824_02 - 2 mi reach near unmarked county road, 1.4 km downstream Gainesville WWTP
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0824_03 - 3.5 mi reach near SH 51
        - Perennial Freshwater Stream
        - Station ID(s): 15635
    - Assessment Unit: 0824_04 - 25 mi reach near FM 3108
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0824_05 - Upper 48 mi of segment
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0825 Denton Creek - From the confluence with the Elm Fork Trinity River in Dallas County to Grapevine Dam in Tarrant County
    - Assessment Unit: 0825_01 - From the confluence with the Elm Fork Trinity River in Dallas County to Grapevine Dam in Tarrant County
        - Perennial Freshwater Stream
        - Station ID(s): 14244
- Segment: 0826 Grapevine Lake - From Grapevine Dam in Tarrant County up to normal pool elevation of 535 feet (impounds Denton Creek)
    - Assessment Unit: 0826_01 - Lowermost portion of reservoir
        - Reservoir
        - Station ID(s): 11035; 16113; 17827; 20889; 20890; 20891
    - Assessment Unit: 0826_02 - Morehead Creek cove

        - Reservoir
        - Station ID(s): 11037; 20886
    - Assessment Unit: 0826_03 - Lower portion of reservoir north of Oak Grove Park
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0826_04 - North Main Slough cove
        - Reservoir
        - Station ID(s): 20887; 20888
    - Assessment Unit: 0826_05 - Middle portion of reservoir east of Meadowmere Park
        - Reservoir
        - Station ID(s): 13875; 16115
    - Assessment Unit: 0826_06 - Middle portion of reservoir southeast of Walnut Grove Park
        - Reservoir
        - Station ID(s): 16112; 17828
    - Assessment Unit: 0826_07 - Upper portion of reservoir east of Marshall Creek Park
        - Reservoir
        - Station ID(s): 20882
    - Assessment Unit: 0826_08 - Remainder of reservoir
        - Reservoir
        - Station ID(s): 20880; 20881; 20883; 20884
- Segment: 0826A Denton Creek - From the confluence with Grapevine Lake in Denton County upstream to 2.3 km upstream of TX-59
    - Assessment Unit: 0826A_01 - Perennial stream from the headwaters of Grapevine Lake upstream to the confluence of Trail Creek near the City of Justin
        - Perennial Freshwater Stream
        - Station ID(s): 14485
    - Assessment Unit: 0826A_02 - From the confluence of Trail Creek near the City of Justin to the confluence with an unnamed tributary 6.3 km upstream of FM-2449
        - Perennial Freshwater Stream
        - Station ID(s): 14483; 14484
    - Assessment Unit: 0826A_03 - From the confluence with an unnamed tributary 6.3 km upstream of FM-2449 to 1.7 km upstream of County Road 2675
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0826A_04 - From 1.7 km upstream of County Road 2675 to 2.3 km upstream of TX-59
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0826B Trail Creek - Perennial stream from the confluence with Denton Creek up to 2.1 km upstream of SH 156 in Justin
    - Assessment Unit: 0826B_01 - Perennial stream from the confluence with Denton Creek up to 2.1 km upstream of SH 156 in Justin
        - Perennial Freshwater Stream

        - Station ID(s): No Stations
- Segment: 0826C Henrietta Creek - A 3 km stretch of Henrietta Creek, running upstream from the confluence with Denton Creek to confluence with Elizabeth Creek.
    - Assessment Unit: 0826C_01 - A 3 km stretch of Henrietta Creek, running upstream from the confluence with Denton Creek to confluence with Elizabeth Creek.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0827 White Rock Lake - From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet (impounds White Rock Creek)
    - Assessment Unit: 0827_01 - From White Rock Dam in Dallas County up to the normal pool elevation of 458 feet (impounds White Rock Creek)
        - Reservoir
        - Station ID(s): 11038
- Segment: 0827A White Rock Creek above White Rock Lake - Perennial stream from the headwaters of White Rock Lake upstream to the headwaters at Hilcrest Road in Frisco
    - Assessment Unit: 0827A_01 - Perennial stream from the headwaters of White Rock Lake upstream to the confluence with McKamy Branch east of the City of Addison
        - Perennial Freshwater Stream
        - Station ID(s): 15280; 18517; 20289; 21556
    - Assessment Unit: 0827A_02 - From the confluence with McKamy Branch east of the City of Addison upstream to the headwaters at Hillcrest Road in Frisco
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0827B Cottonwood Creek - Perennial stream from the confluence with White Rock Creek upstream to the confluence with an unnamed tributary approximately 0.25 km upstream of Campbell road in the City of Richardson
    - Assessment Unit: 0827B_01 - Perennial stream from the confluence with White Rock Creek upstream to the confluence with an unnamed tributary approximately 0.25 km upstream of Campbell road in the City of Richardson
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0828 Lake Arlington - From Arlington Dam in Tarrant County up to the normal pool elevation of 550 feet (impounds Village Creek)
    - Assessment Unit: 0828_01 - Lowermost portion of lake along western half of dam
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0828_02 - Lowermost portion of lake along eastern half of dam
        - Reservoir
        - Station ID(s): 13904
    - Assessment Unit: 0828_03 - Western half of lower portion of lake
        - Reservoir
        - Station ID(s): No Stations

    - Assessment Unit: 0828_04 - Eastern half of lower portion of lake
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0828_05 - Western half of upper portion of lake
        - Reservoir
        - Station ID(s): 13899
    - Assessment Unit: 0828_06 - Eastern half of upper portion of lake
        - Reservoir
        - Station ID(s): 11042
    - Assessment Unit: 0828_07 - Uppermost portion of lake
        - Reservoir
        - Station ID(s): 13897
    - Assessment Unit: 0828_08 - Remainder of lake
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0828A Village Creek - From the confluence with Lake Arlington in Tarrant County to the headwaters east of Joshua in Johnson County
    - Assessment Unit: 0828A_01 - From Lake Arlington to the headwaters
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 10780; 10781; 10784; 10785; 10786; 13671; 21762; 21763
- Segment: 0829 Clear Fork Trinity River Below Benbrook Lake - From the confluence with the West Fork Trinity River in Tarrant County to Benbrook Dam in Tarrant County
    - Assessment Unit: 0829_01 - From the confluence with West Fork Trinity River to 1 mi upstream
        - Perennial Freshwater Stream
        - Station ID(s): 16119
    - Assessment Unit: 0829_02 - From 1 mi upstream of the confluence with West Fork Trinity River up to the confluence with Mary's Creek
        - Perennial Freshwater Stream
        - Station ID(s): 11045; 18456
    - Assessment Unit: 0829_03 - From the confluence with Mary's Creek up to Benbrook Dam in Tarrant County, TX
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0829A Lake Como - From Lake Como Dam to the reservoir headwaters in Lake Como Park in Tarrant County
    - Assessment Unit: 0829A_01 - From Lake Como Dam to the reservoir headwaters in Lake Como Park in Tarrant County
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0830 Benbrook Lake - From Benbrook Dam in Tarrant County to a point 200 meters (220 yards) downstream of US 377 in Tarrant County, up to normal pool elevation of 694 feet (impounds Clear Fork Trinity River)
    - Assessment Unit: 0830_01 - Lower portion of reservoir

        - Reservoir
        - Station ID(s): 15151
    - Assessment Unit: 0830_02 - Middle portion of reservoir
        - Reservoir
        - Station ID(s): 15156
    - Assessment Unit: 0830_03 - Upper portion of reservoir
        - Reservoir
        - Station ID(s): 15158
    - Assessment Unit: 0830_05 - Rock/Mustang Creek arm of Benbrook Lake.
        - Reservoir
        - Station ID(s): 13832
- Segment: 0830A Rock Creek - Intermittent stream with perennial pools from the confluence with Benbrook Lake at normal pool elevation upstream to the headwaters near FM 917 approximately 2.8 km west of Burleson in Johnson County
    - Assessment Unit: 0830A_01 - Intermittent stream with perennial pools from the confluence with Benbrook Lake at normal pool elevation upstream to the headwaters near FM 917 approximately 2.8 km west of Burleson in Johnson County
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 16725
- Segment: 0830B Bear Creek - Intermittent stream with perennial pools from the confluence with Benbrook Lake at normal pool elevation upstream to the headwaters adjacent to SH 171 approximately 7.8 km southeast of Weatherford in Parker County
    - Assessment Unit: 0830B_01 - Intermittent stream with perennial pools from the confluence with Benbrook Lake at normal pool elevation upstream to the headwaters adjacent to SH 171 approximately 7.8 km southeast of Weatherford in Parker County
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 13624
- Segment: 0831 Clear Fork Trinity River Below Lake Weatherford - From a point 200 meters (220 yards) downstream of US 377 in Tarrant County to Weatherford Dam in Parker County
    - Assessment Unit: 0831_01 - Lower 12.75 mi, downstream from South Fork Trinity River confluence
        - Perennial Freshwater Stream
        - Station ID(s): 13691; 16414; 17444
    - Assessment Unit: 0831_03 - From the confluence with South Fork of Trinity River to a point 2 mi upstream
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
    - Assessment Unit: 0831_04 - 2 mi upstream of South Fork Trinity River confluence to Squaw Creek Confluence
        - Perennial Freshwater Stream
        - Station ID(s): 11060
    - Assessment Unit: 0831_05 - From the confluence of Squaw Creek to Lake Weatherford Dam

        - Perennial Freshwater Stream
        - Station ID(s): 17637
- Segment: 0831A South Fork Trinity River - Eleven mi stretch of South Fork Trinity River running upstream from confluence with Clear Fork Trinity River to confluence with Willow Creek, Parker Co.
    - Assessment Unit: 0831A_01 - Eleven mi stretch of South Fork Trinity River running upstream from confluence with Clear Fork Trinity River to confluence with Willow Creek, Parker Co.
        - Perennial Freshwater Stream
        - Station ID(s): 17455
- Segment: 0831B Unnamed Tributary of South Fork Trinity River - A 4.4 mi (7.1 KM) stretch of unnamed tributary to South Fork Trinity River stretching from the confluence to the upper end of the creek (NHD RC 12030102000351)
    - Assessment Unit: 0831B_01 - A 4.4 mi (7.1 km) stretch of unnamed tributary to South Fork Trinity River stretching from the confluence to the upper end of the creek (NHD RC 12030102000351)
        - Perennial Freshwater Stream
        - Station ID(s): 17456
- Segment: 0831C Town Creek - A 19.5 mi (31.4 KM) stretch of Town Creek extending from the confluence with the South Fork of the Trinity River up to the upper end of the creek (NHD RC 12030102000062)
    - Assessment Unit: 0831C_01 - A 12.3 mi (19.8 km) stretch of Town Creek extending from the confluence with the South Fork Trinity River up to the confluence with Pogue Branch in Weatherford, Parker County, TX.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0832 Lake Weatherford - From Weatherford Dam in Parker County to a point 3.1 km (1.9 mi) upstream of FM 730 in Parker County, up to the normal pool elevation of 896 feet (impounds Clear Fork Trinity River)
    - Assessment Unit: 0832_01 - From Weatherford Dam in Parker County to a point 3.1 km (1.9 mi) upstream of FM 730 in Parker County, up to the normal pool elevation of 896 feet (impounds Clear Fork Trinity River)
        - Reservoir
        - Station ID(s): 11061
- Segment: 0833 Clear Fork Trinity River Above Lake Weatherford - From a point 3.1 km (1.9 mi) upstream of FM 730 in Parker County, to the confluence with Strickland Creek approximately 8 km (5 mi) upstream of FM 51 in Parker County
    - Assessment Unit: 0833_03 - From the confluence of McKnight Branch to the confluence of Strickland Ck. approximately 8 km (5 mi) upstream of FM 51 in Parker County.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 11062
    - Assessment Unit: 0833_04 - From the confluence with Dobbs Branch to confluence with McKnight Branch

        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17461
    - Assessment Unit: 0833_05 - From the confluence of Dobbs Branch to the lower end of segment
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17462
- Segment: 0833A Clear Fork Trinity River Above Strickland Creek - From the confluence with Strickland Creek up to Turpin Lake Road in Parker County.
    - Assessment Unit: 0833A_01 - From the confluence with Strickland Creek up to Turpin Lake Road in Parker County.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0834 Lake Amon G. Carter - From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet (impounds Big Sandy Creek)
    - Assessment Unit: 0834_01 - From Amon G. Carter Dam in Montague County up to the normal pool elevation of 920 feet (impounds Big Sandy Creek)
        - Reservoir
        - Station ID(s): 11063; 22070
- Segment: 0835 Richland Creek Below Richland-Chambers Reservoir - From the confluence with the Trinity River in Freestone County to Richland-Chambers Dam in Freestone County
    - Assessment Unit: 0835_01 - From the confluence with the Trinity River in Freestone County to Richland-Chambers Dam in Freestone County
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0836 Richland-Chambers Reservoir - From Richland-Chambers Dam to a point immediately upstream of the confluence of Pin Oak Creek on the Richland Creek Arm and to a point 4.0 km (2.5 mi) downstream of Tupelo Branch on the Chambers Creek Arm, up to the normal pool elevation of 315 ft
    - Assessment Unit: 0836_01 - Lowermost portion of reservoir, adjacent to dam
        - Reservoir
        - Station ID(s): 15168
    - Assessment Unit: 0836_02 - Confluence of Richland and Chambers Creek arms
        - Reservoir
        - Station ID(s): 15169
    - Assessment Unit: 0836_03 - Lower portion of Chambers Creek arm
        - Reservoir
        - Station ID(s): 15170
    - Assessment Unit: 0836_04 - Upper portion of Chambers Creek arm
        - Reservoir
        - Station ID(s): 15199
    - Assessment Unit: 0836_05 - Lower portion of Richland Creek arm
        - Reservoir
        - Station ID(s): 11068
    - Assessment Unit: 0836_06 - Upper portion of Richland Creek arm

        - Reservoir
        - Station ID(s): 15172
    - Assessment Unit: 0836_07 - Remainder of reservoir
        - Reservoir
        - Station ID(s): 16721
    - Assessment Unit: 0836_08 - Post Oak Creek Arm off of Chambers Creek Arm of Richland Chambers Reservoir
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0836A Pin Oak Creek - Perennial stream from the confluence with the North Fork of Pin Oak Creek in Limestone County upstream to the confluence with Pin Oak Creek and an unnamed tributary flowing from the west approximately 2.8 km downstream of SH 171 near the City of Hubbard
    - Assessment Unit: 0836A_01 - Perennial stream from the confluence with the North Fork of Pin Oak Creek in Limestone County upstream to the confluence with Pin Oak Creek and an unnamed tributary flowing from the west approximately 2.8 km downstream of SH 171 near the City of Hubbard
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0836B Cedar Creek - From the confluence with Richland Chambers Reservoir to the upper end of the creek (NHD RC 12030109012807)
    - Assessment Unit: 0836B_01 - From the confluence with Richland Chambers Reservoir to the upper end of the creek (NHD RC 12030109012807)
        - Perennial Freshwater Stream
        - Station ID(s): No Stations
- Segment: 0836C Grape Creek - From the confluence with Richland Chambers Reservoir to the upper end of the creek (NHD RC 12030108000107) southwest of Corsicana, Navarro County, TX.
    - Assessment Unit: 0836C_01 - From the confluence with Richland Chambers Reservoir to the upper end of the creek (NHD RC 12030108000107) southwest of Corsicana, Navarro County, TX.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): No Stations
- Segment: 0836D Post Oak Creek - From the confluence with Richland Chambers Reservoir to the upper end of the creek (NHD RC 12030109012706)
    - Assessment Unit: 0836D_01 - From the confluence with Richland Chambers Reservoir to the upper end of the creek (NHD RC 12030109012706)
        - Intermittent Freshwater Stream
        - Station ID(s): 17847
- Segment: 0837 Richland Creek Above Richland-Chambers Reservoir - From the confluence of Pin Oak Creek in Navarro County to Navarro Mills Dam in Navarro County
    - Assessment Unit: 0837_01 - From the confluence of Pin Oak Creek in Navarro County to Navarro Mills Dam in Navarro County
        - Perennial Freshwater Stream

        - Station ID(s): 11070
- Segment: 0838 Joe Pool Lake - From Joe Pool Dam in Dallas County up to the normal pool elevation of 522 feet (impounds Mountain Creek)
    - Assessment Unit: 0838_01 - Lowermost portion of reservoir adjacent to the dam
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0838_02 - Mountain Creek arm
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0838_03 - Walnut Creek arm
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0838A Mountain Creek - Ten mi stretch of Mountain Creek running upstream from US 287 in Ellis Co., to confluence with Fish Spring Branch in Johnson County.
    - Assessment Unit: 0838A_01 - Ten mi stretch of Mountain Creek running upstream from US 287 in Ellis Co., to confluence with Fish Spring Branch in Johnson County.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 13622
- Segment: 0838B Sugar Creek - A 1.6 mi stretch of Sugar Creek running upstream from Tarrant/Dallas County line, to just upstream of Britton Road in Mansfield, Tarrant County.
    - Assessment Unit: 0838B_01 - A 1.6 mi stretch of Sugar Creek running upstream from Tarrant/Dallas County line, to just upstream of Britton Road in Mansfield, Tarrant County.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17680
- Segment: 0838C Walnut Creek - From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson.
    - Assessment Unit: 0838C_01 - From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 13621; 20790; 21990
- Segment: 0838D Hollings Branch - Hollings Branch from the confluence of the Mountain Creek arm of Joe Pool Lake upstream to the headwater 500 m downstream of US 67 in Midlothian
    - Assessment Unit: 0838D_01 - Hollings Branch from the confluence of the Mountain Creek arm of Joe Pool Lake upstream to the headwater 500 m downstream of US 67 in Midlothian
        - Intermittent Freshwater Stream
        - Station ID(s): 16433
- Segment: 0838E Soap Creek - Soap Creek from the confluence of the Mountain Creek arm of Joe Pool Lake upstream to the headwater 6.6 km (3.98 mi) upstream of US 67 in Midlothian

    - Assessment Unit: 0838E_01 - Soap Creek from the confluence of the Mountain Creek arm of Joe Pool Lake upstream to the headwater 6.6 km (3.98 mi) upstream of US 67 in Midlothian
        - Intermittent Freshwater Stream
        - Station ID(s): 16435
- Segment: 0838F Unnamed tributary of Mountain Creek - Intermittent stream from the confluence with Mountain Creek south of Mansfield upstream to the headwaters approximately 2.0 km upstream of FM 157 in Mansfield
    - Assessment Unit: 0838F_01 - Intermittent stream from the confluence with Mountain Creek south of Mansfield upstream to the headwaters approximately 2.0 km upstream of FM 157 in Mansfield
        - Intermittent Freshwater Stream
        - Station ID(s): 21123
- Segment: 0839 Elm Fork Trinity River Below Ray Roberts Lake - From a point 100 meters (110 yards) upstream of US 380 in Denton County to Ray Roberts Dam in Denton County
    - Assessment Unit: 0839_01 - From a point 100 meters (110 yards) upstream of US 380 in Denton County to Ray Roberts Dam in Denton County
        - Perennial Freshwater Stream
        - Station ID(s): 13619
- Segment: 0840 Ray Roberts Lake - From Ray Roberts Dam in Denton County to a point 9.5 km (5.9 mi) upstream of the confluence of Pecan Creek in Cooke County, up to the normal pool elevation of 632.5 feet (impounds Elm Fork Trinity River)
    - Assessment Unit: 0840_01 - Lowermost portion of reservoir adjacent to dam
        - Reservoir
        - Station ID(s): 14039; 17834
    - Assessment Unit: 0840_02 - Lower portion of Jordan Creek arm west of Pilot Point
        - Reservoir
        - Station ID(s): 11076; 14044
    - Assessment Unit: 0840_03 - Upper portion of Jordan Creek arm
        - Reservoir
        - Station ID(s): 16823
    - Assessment Unit: 0840_04 - Buck Creek cove
        - Reservoir
        - Station ID(s): 16822
    - Assessment Unit: 0840_05 - Lower portion of Elm Fork arm
        - Reservoir
        - Station ID(s): No Stations
    - Assessment Unit: 0840_06 - Middle portion of Elm Fork arm
        - Reservoir
        - Station ID(s): 14043
    - Assessment Unit: 0840_07 - Upper portion of Elm Fork arm
        - Reservoir
        - Station ID(s): 16824
    - Assessment Unit: 0840_08 - Remainder of reservoir
        - Reservoir

        - Station ID(s): 20894; 20895; 20896; 20897; 20898; 20899
- Segment: 0840A Unnamed Tributary of Jordan Creek - From the confluence with Jordan Creek south of CR 226 to the headwaters near South Neathery Street in Collinsville in Grayson County
    - Assessment Unit: 0840A_01 - From the confluence with Jordan Creek south of CR 226 to the headwaters near South Neathery Street in Collinsville in Grayson County
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): No Stations
- Segment: 0841 Lower West Fork Trinity River - From a point immediately upstream of the confluence of the Elm Fork Trinity River in Dallas County to a point immediately upstream of the confluence of Village Creek in Tarrant County
    - Assessment Unit: 0841_01 - From confluence of the Elm Fork Trinity River to the confluence with Johnson Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 11081; 11089
    - Assessment Unit: 0841_02 - From the confluence with Johnson Creek upstream to the confluence of Village Creek.
        - Perennial Freshwater Stream
        - Station ID(s): 11082; 17669; 21423
- Segment: 0841A Mountain Creek Lake - From Mountain Creek Lake Dam to the reservoir headwater at the confluence of Mountain and Fish Creeks, in Dallas County (impounds Mountain Creek)
    - Assessment Unit: 0841A_01 - From Mountain Creek Lake Dam to the reservoir headwater at the confluence of Mountain and Fish Creeks, in Dallas County (impounds Mountain Creek)
        - Reservoir
        - Station ID(s): No Stations
- Segment: 0841B Bear Creek - A 12 mi stretch of Bear Creek running upstream from confluence with West Fork Trinity River, to the confluence with Little Bear Creek just upstream of HWY 183 in Euless, Tarrant County, TX.
    - Assessment Unit: 0841B_01 - A 12 mi stretch of Bear Creek running upstream from confluence with West Fork Trinity River, to the confluence with Little Bear Creek just upstream of HWY 183 in Euless, Tarrant County, TX.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 10865; 10867; 10868; 10869; 18315
- Segment: 0841C Arbor Creek - A 2.2 mi stretch of Arbor Creek running upstream from confluence with Johnson Creek, to approx. 0.5 mi upstream of Tarrant/Dallas county line.
    - Assessment Unit: 0841C_01 - A 2.2 mi stretch of Arbor Creek running upstream from confluence with Johnson Creek, to approx. 0.5 mi upstream of Tarrant/Dallas county line.
        - Perennial Freshwater Stream
        - Station ID(s): No Stations

- Segment: 0841D Big Bear Creek - An 8 mi stretch of Big Bear Creek running upstream from confluence with Little Bear Creek to SH 26, Tarrant Co.
    - Assessment Unit: 0841D_01 - From the confluence with Little Bear Creek to SH 26, Tarrant County.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17089
- Segment: 0841E Copart Branch Mountain Creek - A 2.8 mi stretch of Copart Branch running upstream from confluence with Mountain Creek to approximately 0.3 mi upstream of Camden Road on Dallas Naval Academy, Dallas County.
    - Assessment Unit: 0841E_01 - A 2.8 mi stretch of Copart Branch running upstream from confluence with Mountain Creek to approximately 0.3 mi upstream of Camden Road on Dallas Naval Academy, Dallas County.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17672
- Segment: 0841F Cottonwood Creek - A 6.5 mi stretch of Cottonwood Creek running upstream from approx. 0.1 mi upstream of Mountain Creek Reservoir in Dallas Co., to SH 360 in, Tarrant Co.
    - Assessment Unit: 0841F_01 - A 6.5 mi stretch of Cottonwood Creek running upstream from approx. 0.1 mi upstream of Mountain Creek Reservoir in Dallas Co., to SH 360 in, Tarrant Co.
        - Perennial Freshwater Stream
        - Station ID(s): 10723; 17674; 17676; 20837
- Segment: 0841G Dalworth Creek - A 2.2 mi stretch of Dalworth Creek running upstream from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie, Dallas Co.
    - Assessment Unit: 0841G_01 - A 2.2 mi stretch of Dalworth Creek running upstream from confluence with Lower W. Fork Trinity to County Line Road in Grand Prairie, Dallas Co.
        - Perennial Freshwater Stream
        - Station ID(s): 17671; 21557
- Segment: 0841H Delaware Creek - An 8.5 mi stretch of Delaware Creek running upstream from confluence with Lower W. Fork Trinity to Finley Road in Irving.
    - Assessment Unit: 0841H_01 - An 8.5 mi stretch of Delaware Creek running upstream from confluence with Lower W. Fork Trinity to Finley Road in Irving.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17178
- Segment: 0841I Dry Branch Creek - A 1.5 mi stretch of Dry Branch Creek running upstream from confluence with Lower W. Fork Trinity to Rock Island Road in Irving, Dallas County.
    - Assessment Unit: 0841I_01 - A 1.5 mi stretch of Dry Branch Creek running upstream from confluence with Lower W. Fork Trinity to Rock Island Road in Irving, Dallas County.
        - Intermittent Freshwater Stream
        - Station ID(s): 17173
- Segment: 0841J Estelle Creek - A 4 mi stretch of Estelle Creek running upstream from confluence with Bear Creek to Valley View Lane in Irving, Dallas County.

    - Assessment Unit: 0841J_01 - A 4 mi stretch of Estelle Creek running upstream from confluence with Bear Creek to Valley View Lane in Irving, Dallas County.
        - Intermittent Freshwater Stream
        - Station ID(s): 17174
- Segment: 0841K Fish Creek - A 15 mi stretch of Fish Creek running upstream from the confluence with Mountain Creek Reservoir in Grand Prairie, Dallas Co., to the upper end of the creek (NHD RC 12030102000107) in Arlington, Tarrant Co.
    - Assessment Unit: 0841K_01 - A 15 mi stretch of Fish Creek running upstream from the confluence with Mountain Creek Reservoir in Grand Prairie, Dallas Co., to the upper end of the creek (NHD RC 12030102000107) in Arlington, Tarrant Co.
        - Perennial Freshwater Stream
        - Station ID(s): 10725; 15294; 17679; 20342; 21530
- Segment: 0841L Johnson Creek - Four mi stretch of Johnson Creek running upstream from confluence with the Arbor Creek to just upstream of I30 in Grand Prairie, Tarrant Co.
    - Assessment Unit: 0841L_01 - From the confluence with the Lower West Fork Trinity River, upstream to just south of Mayfield Road in Arlington, Tarrant, Co.
        - Perennial Freshwater Stream
        - Station ID(s): 10718; 10719; 10721; 17664
- Segment: 0841M Kee Branch - Six mi stretch of Kee Branch running upstream from confluence with Rush Creek to upper end of the creek (NHD RC 12030102000165).
    - Assessment Unit: 0841M_01 - Six mi stretch of Kee Branch running upstream from confluence with Rush Creek to upper end of the creek (NHD RC 12030102000165).
        - Perennial Freshwater Stream
        - Station ID(s): 10792; 15103; 16896
- Segment: 0841N Kirby Creek - Four mi stretch of Kirby Creek running upstream from confluence with Fish Creek in Grand Prairie, Dallas Co., to just upstream of Great Southwest Parkway in Arlington, Tarrant Co.
    - Assessment Unit: 0841N_01 - Four mi stretch of Kirby Creek running upstream from confluence with Fish Creek in Grand Prairie, Dallas Co., to just upstream of Great Southwest Parkway in Arlington, Tarrant Co.
        - Perennial Freshwater Stream
        - Station ID(s): 17675
- Segment: 0841O Mountain Creek - Four mi stretch of Mountain Creek running upstream from confluence with West Fork Trinity, to approximately 0.3 mi downstream of Mountain Creek Lake in Grand Prairie, Dallas Co.
    - Assessment Unit: 0841O_01 - Four mi stretch of Mountain Creek running upstream from confluence with West Fork Trinity, to approximately 0.3 mi downstream of Mountain Creek Lake in Grand Prairie, Dallas Co.
        - Perennial Freshwater Stream
        - Station ID(s): 10815; 17682
- Segment: 0841P North Fork Cottonwood Creek - A 4.4 mi stretch of North Fork Cottonwood Creek running upstream from confluence with the S. Fork Cottonwood Creek in Grand Prairie, Dallas Co., to approx. 0.3 mi upstream of Carter St. in Arlington, Tarrant Co.

    - Assessment Unit: 0841P_01 - A 4.4 mi stretch of North Fork Cottonwood Creek running upstream from confluence with the S. Fork Cottonwood Creek in Grand Prairie, Dallas Co., to approx. 0.3 mi upstream of Carter St. in Arlington, Tarrant Co.
        - Perennial Freshwater Stream
        - Station ID(s): 10722; 20836
- Segment: 0841Q North Fork Fish Creek - North Fork Fish Creek from confluence with Fish Creek in Dallas Co. upstream to SH 360 in Tarrant Co.
    - Assessment Unit: 0841Q_01 - North Fork Fish Creek from confluence with Fish Creek in Dallas Co. upstream to SH 360 in Tarrant Co.
        - Perennial Freshwater Stream
        - Station ID(s): 10724; 20838
- Segment: 0841R Rush Creek - A 5 mi stretch of Rush Creek running upstream from confluence with Village Creek to confluence with Kee Branch in Arlington, Tarrant Co.
    - Assessment Unit: 0841R_01 - A 5 mi stretch of Rush Creek running upstream from confluence with Village Creek to confluence with Kee Branch in Arlington, Tarrant Co.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 10791; 17190; 17191
- Segment: 0841S Vilbig Lakes - A 5 acre area in NW corner of Vilbig Lakes, near confluence with unnamed creek, approx. 100 m south of intersection of Rusdell Rd./Marvel Dr. in Irving, Dallas, Co.
    - Assessment Unit: 0841S_01 - A 5 acre area in NW corner of Vilbig Lakes, near confluence with unnamed creek, approx. 100 m south of intersection of Rusdell Rd./Marvel Dr. in Irving, Dallas, Co.
        - Reservoir
        - Station ID(s): 20793; 20794; 20795; 20796
- Segment: 0841T Village Creek - A 7 mi stretch of Village Creek running upstream from confluence with West Fork Trinity River to SH 303 approx. 0.75 mi downstream of Lake Arlington.
    - Assessment Unit: 0841T_01 - A 7 mi stretch of Village Creek running upstream from confluence with West Fork Trinity River to SH 303 approx. 0.75 mi downstream of Lake Arlington.
        - Intermittent Freshwater Stream with Perennial Pools
        - Station ID(s): 17189
- Segment: 0841U West Irving Creek - A 4 mi stretch of West Irving Branch running upstream from approx. 0.4 mi downstream of Oakdale Rd. to just south of Sowers Road in Irving, Dallas Co.
    - Assessment Unit: 0841U_01 - A 4 mi stretch of West Irving Branch running upstream from approx. 0.4 mi downstream of Oakdale Rd. to just south of Sowers Road in Irving, Dallas Co.
        - Intermittent Freshwater Stream
        - Station ID(s): 17179

- Segment: 0841V Crockett Branch - A 1 mi (1.5 KM) stretch of Crockett Branch extending upstream from the confluence with Cottonwood Creek to the upper end of the creek (NHD RC 12030102044745)
    - Assessment Unit: 0841V_01 - A 1 mi (1.5 KM) stretch of Crockett Branch extending upstream from the confluence with Cottonwood Creek to the upper end of the creek (NHD RC 12030102044745)
        - Perennial Freshwater Stream
        - Station ID(s): 17683
- Segment: 0841W Mountain Creek above Mountain Creek Lake - From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam
    - Assessment Unit: 0841W_01 - From the confluence with Mountain Creek Lake upstream to the Joe Pool Lake dam
        - Perennial Freshwater Stream
        - Station ID(s): 17681

Appendix C: Data Preparation and Trend Analysis Procedure

Data Preparation

There are many ways to handle data sets containing greater than and less than values. These methods range from simply removing the greater than and less than symbols to deleting the data points that are below or above analytical limits. For this report, data reported at greater than a certain upper limit were taken as the upper limit value. Data reported at less than the detection limit were censored to one-half the lowest detection limit found in the data set for each parameter. This prevents influencing trends with changes in detection limits over time when the censored values are scattered throughout a data set. However, when the censored values are concentrated at the beginning or end of a data set, they can introduce false trends as seen in Figure 433. This clustering of censored values is typically seen at the beginning of a data set because detection limits generally decrease over time. Therefore, higher detection limits from many years ago can appear as higher values in a data set where the less than symbols are simply removed or censored to one-half the detection limit. The data in the graphs are for an imaginary Parameter X. Values between 0 and 15 were randomly generated. The solid, stepped down line shows the change in detection limit over time. The top graph shows the values reported below the detection limit as the detection limit. For example, if the detection limit was 10 and the value was reported as <10, then the value is plotted at 10. This has introduced a decreasing trend as shown by the dashed line. The data set in the middle graph has been censored to one half of the reported detection limit. This has introduced a slight increasing trend. The data set in the bottom graph has been censored to one half of the lowest detection limit seen in the period of record. This has introduced an increasing trend. While each method of censoring may introduce false trends, censoring to one half of the lowest detection limit was chosen for the following reasons:

1) It maintains a record that a sample was collected.
2) It reduces the influence of the censored values when they are spread throughout a data set.
3) It makes false trends caused by the censored values more obvious in a data set with a large number of non-detect data clustered toward the beginning of the period of record.

After data were censored, the resultant data set was then averaged by station, sample date, and parameter code to reduce multiple samples collected at different depths less than 1.01 meters

and at different times of the day to one value. From this, similar parameters were grouped to increase the data availability. The remaining data parameter codes were updated to the priority parameter code. No averages across parameters were made. For example, if dissolved ammonia (parameter code 00608) and total ammonia (00610) were available for Site X on a particular date, then the total ammonia (00610) was used and dissolved ammonia (00608) was deleted. If only dissolved ammonia was available, the parameter code was updated from 00608 to “Ammonia mg/L” for further data analysis. When total dissolved solids (70300) were not available, this parameter was calculated from an available specific conductance multiplied by the conversion factor of 0.65. Similarly, if hardness (00900) was not available, it was calculated from total calcium and total magnesium. These methods are similar to those used by TCEQ during data analysis for the Integrated Report. Table 352 lists the parameter priorities and combinations that were made. Additional data manipulation was conducted on flow severity values (01351). Data for this parameter are reported as a single digit value categorizing a broad range of flows. Due to the addition of new categories over time, the existing values do not represent a linear increase in flow ranges: 1=no flow, 2=low flow, 3=normal flow, 4=flood, 5=high flow, 6=dry. These values were recategorized as follows in order to be meaningful for trend analysis: 1=dry, 2=no flow, 3=low flow, 4=normal flow, 5=high flow, 6=flood.

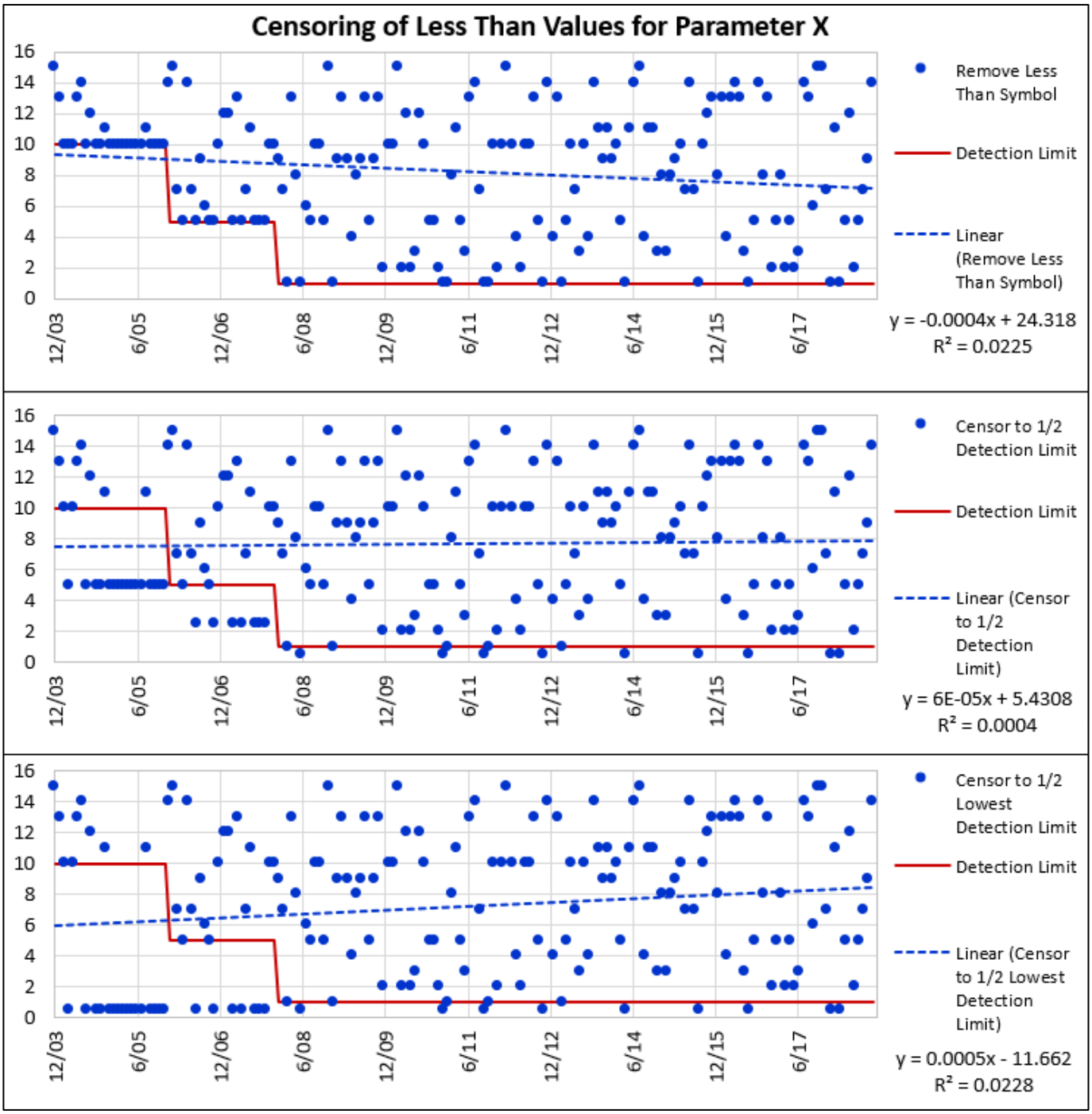


Figure 433: Censoring of Less Than Values for Parameter X

Table 352: Parameter Priorities and Combinations

New Parameter Group	Raw Parameter Code	Order of Priority	Raw Parameter Description
Fecal Coliform (#/100 mL)	31616	1	FECAL COLIFORM,MEMBR FILTER,M-FC BROTH, #/100ML
	31625	2	FECAL COLIFORM, MF, M-FC, 0.7 UM
Ammonia (mg/L)	00610	1	NITROGEN, AMMONIA, TOTAL (MG/L AS N)
	00608	2	NITROGEN, AMMONIA, DISSOLVED (MG/L AS N)
Chloride (mg/L)	00940	1	CHLORIDE (MG/L AS CL)
	00941	2	CHLORIDE, DISSOLVED (MG/L)
Chlorophyll-*a* (µg/L)	70953	1	CHLOROPHYLL-*A*, FLUOROMETRIC METHOD, UG/L
	32211	2	CHLOROPHYLL-*A* UG/L SPECTROPHOTOMETRIC ACID. METH
Nitrate (mg/L)	00620	1	NITRATE NITROGEN, TOTAL (MG/L AS N)
	00630	2	NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)
	00593	3	NO2 PLUS NO3-N, TOTAL, CALCULATED VALUE (MG/L)
	00631	4	NITRITE PLUS NITRATE, DISS 1 DET. (MG/L AS N)
	00618	5	NITRATE NITROGEN, DISSOLVED (MG/L AS N)
Orthophosphate (mg/L)	00671	1	ORTHOPHOSPHATE PHOSPHORUS,DISS,MG/L,FLDFILT<15MIN
	70507	2	ORTHOPHOSPHATE PHOSPHORUS,DISS,MG/L,FILTER >15MIN
	00660	3	PHOSPHATE, ORTHO (MG/L AS PO4)
Total Dissolved Solids (mg/L)	70300	1	RESIDUE,TOTAL FILTRABLE (DRIED AT 180C) (MG/L)
	00212 (value*0.65)	2	SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR AVG
	00094 (value*0.65)	3	SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)
	00095 (value*0.65)	4	SPECIFIC CONDUCTANCE,LAB (UMHOS/CM @ 25C)
	70294	5	RESIDUE, TOT DISS,UNSPEC CALC BASED ON COND (MG/L)
	70301	6	SOLIDS, DISSOLVED-SUM OF CONSTITUENTS (MG/L)
Specific Conductance (µS/cm)	00094	1	SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)
	00095	2	SPECIFIC CONDUCTANCE,LAB (UMHOS/CM @ 25C)
Hardness (mg/L)	00900	1	HARDNESS, TOTAL (MG/L AS CACO3)
	82394	2	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)
	(2.5*00916) + (4.1*00927)	3	00916 - CALCIUM, TOTAL (MG/L AS CA) & 00927 - MAGNESIUM, TOTAL (MG/L AS MG)
	46570	4	HARDNESS, DISSOLVED, CALCULATED (MG/L AS CaCO3)

After all parameter combinations were completed, data were deleted for which there were less than 20 data points for each station and parameter as these data sets are inadequate for trend analysis. The remaining data were then used for trend analyses.

Three different trend analyses were conducted for each station and parameter; entire period of record, summer months (growing season), and winter months (dormant season). The summer (growing season) months were designated as May through October while the winter (dormant season) months were designated as November through April. The seasons were based on temperature data recorded at a continuously operating NOAA weather station, currently located at Dallas-Fort Worth International Airport, between 1899 and 2008. Trend analyses were conducted for individual stations rather than grouping data for all stations in an assessment unit. This was due to the fact that localized conditions may affect water quality and these conditions could be missed if data are analyzed on the larger scale of the assessment unit.

Data for which there were ten or more data points for each station, parameter, and summer/winter season were passed to the next step in preparing for trend analysis. Sample dates were converted to decimal times based on quarters resulting in 60 unique decimal times. These decimal times were used to determine if the data for each station and parameter were evenly distributed over the fifteen-year period of record. This prevents influencing trends with weighting of data to the beginning or end of the period of record. It also ensures accurate trends by removing data sets where only a small amount of data exists for one or two years.

The decimal times were assigned bin numbers from 0 to 59. The data were crosstabed on station, date, and parameter with the bin number standing in for the value. From this crosstab, 50 columns of data were randomly selected using a random number generator. These randomly selected columns were used to determine the distribution of the data over the period of record. The data for these columns were placed in a separate document where all identifying information was made invisible. The resultant document appeared simply as a page with columns of black boxes representing where data existed. Four qualified personnel reviewed the document and marked whether or not a column looked evenly distributed. The results were compiled and columns where three or more people agreed that it was evenly distributed were returned to their numeric bin number states. The mean and standard deviation of the bin number values for these columns ranged from 10.39 to 54.5 and from 2.92 to 18.8, respectively. These values were rounded up or down to the nearest whole number and used to select columns of data from the whole data set with bin number means between 10 and 55 and standard deviations between 2 and 19. This resulted in 5,402 unique stations and parameters that were determined to be evenly distributed across the fifteen-year period of record and for which trend analyses were conducted. Because trends were run on the full year data set and the summer and winter data sets, there were a total of 16,206 trend analyses run.

Trend Analysis Procedure

To determine normality and significance, the data were processed in a statistical program written in SAS.

Water quality data results are a “sample” of the “population” of water quality data. Therefore, inferences about a waterbody’s population of overall water quality can be made from the samples. The first step in determining if a data set is appropriate for statistical analysis is to determine normality. Normality can be determined by the skewness and kurtosis of the data set.

Skewness refers to the length of one tail compared to the other on a distribution plot. In a normally distributed data set, the skewness is zero. This indicates that the length of the tails on either side of the peak are equal. If skewness is less than zero, the data is skewed to the left indicating that the left tail is longer compared to the right tail. If skewness is greater than zero, the data is skewed to the right indicating that the right tail is longer than the left tail. To extend these findings to a population, a test statistic must be calculated. Skewness divided by the standard error of skewness is a common test statistic. If the test statistic for the sample set is greater than two or less than negative 2, then it can be inferred that the population is likely to be skewed in the same direction as the sample set.

Kurtosis is a measure of peakness of a data set. The standard kurtosis calculation for a normally distributed data set results in a value of three. Excess kurtosis simply subtracts a value of three from the standard calculation, resulting in a value of zero. This is a matter of convention and ease of comprehension. For this report, excess kurtosis is used. If excess kurtosis is positive, the peak is taller and narrower with longer tails indicating that there are more values around the mean than a normal distribution. If excess kurtosis is negative, the peak is shorter and flatter with shorter tails indicating that there are more values at the extremes than a normal distribution. Similar to skewness, a test statistic is calculated by dividing excess kurtosis by the standard error of excess kurtosis. If the test statistic is greater than three or less than negative three, then it can be inferred that the population is peaked in a manner similar to the sample set.

Data sets, either in their raw or natural log transformed states, meeting the requirements below were determined to be within the acceptable range of normality to result in reliable statistical analysis. These range values increase the number of data sets included in trend analysis. A total of 6,435 data sets did not pass the normality test.

- Skewness Test Statistic→ -2<=Skewness/Standard Error of Skewness<=2
- Excess Kurtosis Test Statistic→ -3<=Excess Kurtosis/Standard Error of Kurtosis<=3

60% of the data sets passed the normality test and were then tested for significance of trends. The R^2 value is used as a measure of how well the predicted line, or the regression line, fits the observed data. R^2 values range from zero to one with one being a perfect fit. R^2 values greater than or equal to 0.1 were considered to be a good fit; meaning that 10% of the difference between the observed and predicted values is explained by the independent variable. Although this may not seem like a good fit, as stated previously, most water quality data are not normally distributed while most statistics are based on normality. An R^2 value of 0.1 was selected because it is more inclusive. Figure 434 shows the number of trends that fell within each R^2 value range. 75% of the data sets that passed the normality tests and had trends had R^2 values below 0.1. An R^2 of 0.1 retained 25% of the data sets which were passed to the p-value step described below. 12% or less of the data sets would have been retained if an R^2 of 0.2 or higher was used.

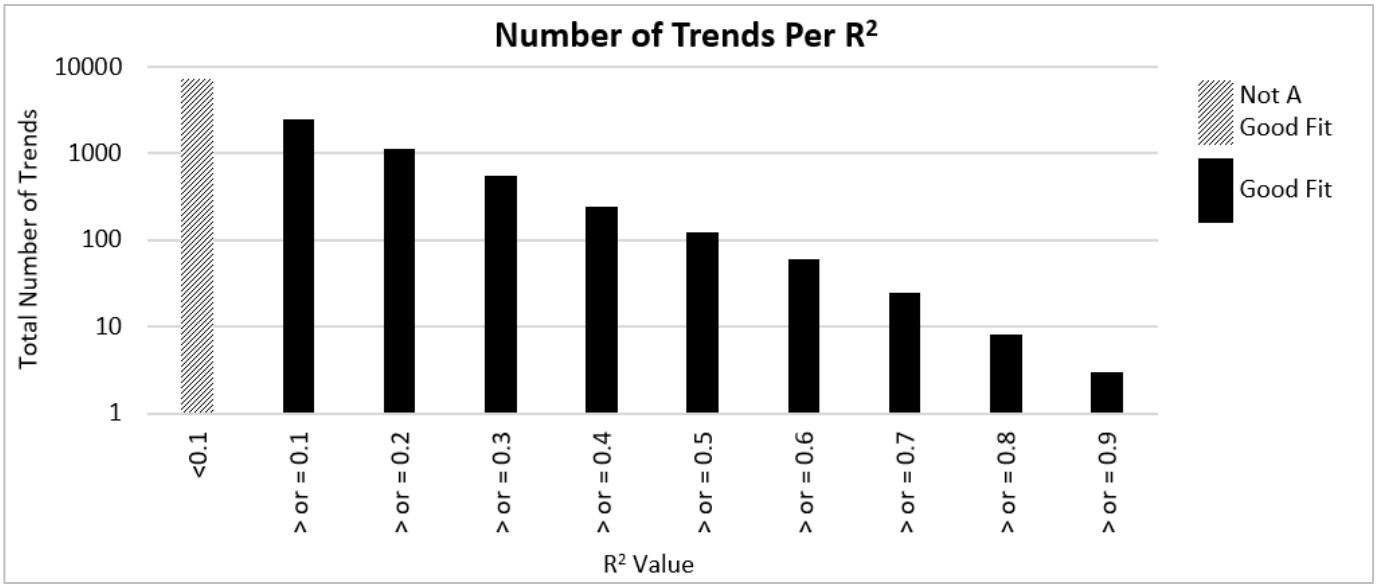


Figure 434: Number of Trends Per R^2

The null hypothesis for temporal trend analysis is that there is no correlation between time and measured values; in other words, there is no significant trend. The p-value is the probability of a null hypothesis being true or a measure of confidence that a data set can be used to make predictions and that the observed values are not random. A significance level of 0.1 gives a 90% confidence level. If the p-value is greater than 0.1, the trend is not significant. If the p-value is less than 0.1, the trend is significant and the observed values are not random. 19% of the data sets that passed the R^2 test had p-values greater than 0.1 and were determined to be not significant. The remaining 81% of the data sets were passed to the t-statistic step described below.

The t-statistic is the probability that a correlation (or slope) is due to chance. If the regression line falls entirely within one standard error away from the slope, then the t-statistic value is close to zero and the correlation is due to chance and therefore not significant. If the regression line crosses over the lines one standard error away from the slope, then the t-statistic is greater than the absolute value of one and the correlation is not due to chance and is significant. 100% of the data sets that passed the p-value test were greater than one standard error away from the slope. If the data set passed the R^2, p-value, and t-statistic tests, then the trend was considered significant.

Overall, 12% of the original 16,206 data sets passed all normality and significance tests. This indicates that water quality at a majority of the monitored sites is stable and is neither improving nor degrading.

Figure 435 illustrates the process of determining normality and trend significance. As described above, this figure shows that a large amount of data passed the normality tests but failed to pass trend significance tests. A summary of the trend analysis with indicators of directionality of significant trends is located Subwatershed Summary section for each major subwatershed. Details of the significant trends are found in Appendix D.

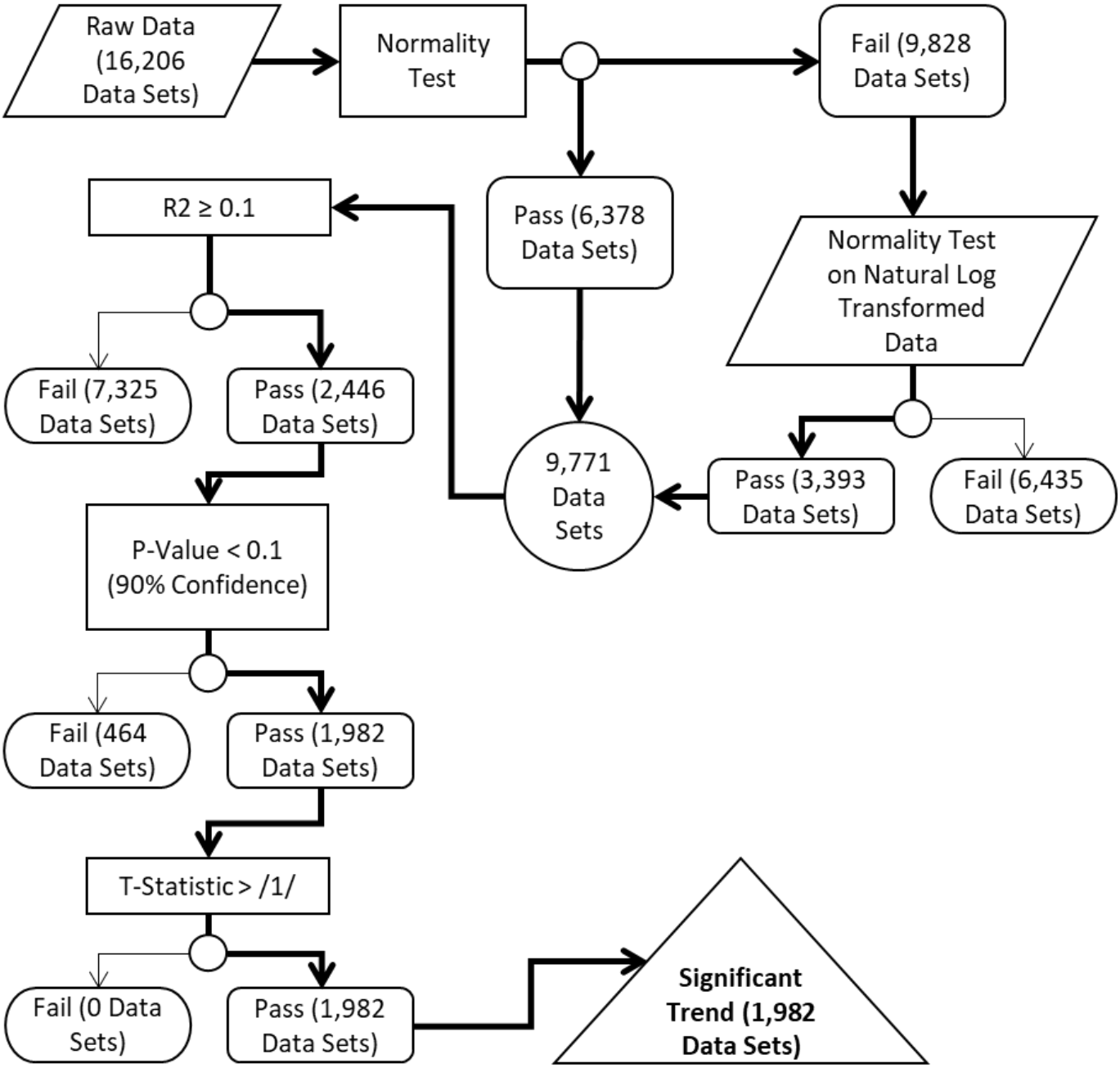


Figure 435: Normality and Significance Testing Flowchart

Deviations from TCEQ Data Analysis Guidance

TCEQ recommends that trend analyses be conducted on data sets that meet the following guidelines:

- Greater than 9 years of data
- Minimum of 20 data points
- Consistent Sampling
- P-value < 0.1
- T-Statistic ≥ /2/

Some data sets used for trend analyses in this report did not have more than nine years of data. TRA felt it was important to include data sets with shorter periods of record because many stations are relatively recent additions to the TRA CRP. Although, the resultant trends may not be as reliable as a trend based on a longer data set, it is not any less important to be aware of these possible trends. This allows those stations and parameters to be more closely observed as additional samples are collected in the future and increases the potential to identify an issue early. Of the trends identified in this report, 71% were based on more than nine years of data.

Trend analyses for the entire period of record are based on data sets with a minimum of 20 data points, which meets TCEQ guidelines. These data sets were split into summer and winter season so these trends may have been run with as few as ten data points and do not meet TCEQ guidelines. Therefore, the summer and winter trends are presented here as supplemental information as they may provide insight into the seasonality of trends.

Consistency of sampling was ensured with the bin number step discussed in the Data Preparation section. Development of this method took into consideration the nuances of the TRA CRP monitoring program. Specifically, the monitoring programs of the Within Basin Participating Agencies. Some stations have a shorter period of record due to the date each agency joined the TRA CRP. Some stations have large gaps in their data sets because the agencies rotated though the sites in their regions or a site was dropped by one agency and later picked up by another. Due to these factors, data used for trend analyses may not strictly adhere to the common definition of consistency.

TRA followed the recommended guidance for the p-value of less than 0.1. However, TRA used a t-statistic value of greater than or equal to the absolute value of one rather than the TCEQ recommendation of two. This was done to widen the range of acceptability for identified trends so that more potential issues can be identified. However, it can also lead to false trends where no trend actually exists. Using this wider t-statistic range allowed for 14% more data to be included in the final set of data that was classified as having significant trends.

Appendix D: Significant Trend Results

Subwatershed	Segment_ Assessment Unit	Station	Parameter Code	Season	Normality Pass	Skewness/ Standard Error of Skewness	Excess Kurtosis/ Standard Error of Kurtosis	R^2	P Value	T Statistic	Slope
Cedar Creek	0818_01	16748	00078	Summer	Natural Log Data	0.379	0.431	0.253	0.006	2.970	0.029
Cedar Creek	0818_01	16748	00078	Winter	Raw Data	0.977	0.681	0.218	0.012	-2.690	-0.014
Cedar Creek	0818_01	16748	00094	All	Raw Data	-1.175	-0.461	0.236	0.000	-4.777	-3.702
Cedar Creek	0818_01	16748	00094	Summer	Raw Data	-0.799	-0.540	0.260	0.000	-3.935	-3.808
Cedar Creek	0818_01	16748	00094	Winter	Raw Data	-0.810	-0.056	0.224	0.008	-2.841	-3.681
Cedar Creek	0818_01	16748	00400	Summer	Raw Data	-1.129	-0.996	0.151	0.008	-2.799	-0.055
Cedar Creek	0818_01	16748	00410	Winter	Raw Data	-0.515	0.723	0.225	0.008	-2.849	-1.230
Cedar Creek	0818_01	16748	00530	Winter	Raw Data	1.771	0.359	0.168	0.024	2.378	0.157
Cedar Creek	0818_01	16748	00610	All	Natural Log Data	1.599	-2.549	0.449	0.000	-7.105	-0.215
Cedar Creek	0818_01	16748	00610	Summer	Natural Log Data	1.890	-1.453	0.433	0.000	-5.092	-0.213
Cedar Creek	0818_01	16748	00610	Winter	Natural Log Data	0.394	-1.998	0.446	0.000	-4.571	-0.213
Cedar Creek	0818_01	16748	00625	Winter	Raw Data	1.488	0.352	0.198	0.015	-2.585	-0.018
Cedar Creek	0818_01	16748	00665	Winter	Raw Data	1.135	0.710	0.393	0.000	-4.255	-0.004
Cedar Creek	0818_01	16748	00940	All	Raw Data	-0.592	-0.558	0.199	0.000	-3.827	-0.435
Cedar Creek	0818_01	16748	00940	Summer	Raw Data	-0.441	-0.472	0.244	0.003	-3.214	-0.466
Cedar Creek	0818_01	16748	00940	Winter	Raw Data	-0.570	-0.163	0.139	0.056	-2.006	-0.380
Cedar Creek	0818_01	16748	70300	All	Raw Data	-0.207	-0.471	0.244	0.000	-4.948	-2.313
Cedar Creek	0818_01	16748	70300	Summer	Raw Data	-0.237	-0.628	0.279	0.000	-4.215	-2.782
Cedar Creek	0818_01	16748	70300	Winter	Raw Data	-0.727	-0.547	0.216	0.010	-2.777	-1.686
Cedar Creek	0818_01	16748	70953	Summer	Raw Data	1.631	-0.188	0.384	0.000	-4.672	-2.304
Cedar Creek	0818_01	16748	70953	Winter	Raw Data	1.330	-0.071	0.364	0.000	-4.007	-1.174
Cedar Creek	0818_04	16749	00094	All	Raw Data	-1.134	-0.381	0.221	0.000	-4.611	-3.555
Cedar Creek	0818_04	16749	00094	Summer	Raw Data	-0.721	-0.485	0.237	0.001	-3.738	-3.537
Cedar Creek	0818_04	16749	00094	Winter	Raw Data	-0.770	-0.065	0.218	0.009	-2.796	-3.680
Cedar Creek	0818_04	16749	00400	Summer	Raw Data	-1.090	-1.159	0.147	0.008	-2.784	-0.050
Cedar Creek	0818_04	16749	00400	Winter	Raw Data	0.195	-0.481	0.147	0.037	-2.196	-0.026
Cedar Creek	0818_04	16749	00410	Winter	Raw Data	-0.457	1.864	0.122	0.058	-1.976	-0.889
Cedar Creek	0818_04	16749	00610	Winter	Raw Data	1.719	-0.656	0.442	0.000	-4.542	-0.004
Cedar Creek	0818_04	16749	00625	Winter	Raw Data	-1.519	2.693	0.213	0.012	-2.705	-0.024

Subwatershed	Segment_ Assessment Unit	Station	Parameter Code	Season	Normality Pass	Skewness/ Standard Error of Skewness	Excess Kurtosis/ Standard Error of Kurtosis	R^2	P Value	T Statistic	Slope
Cedar Creek	0818_04	16749	00665	Summer	Raw Data	1.159	1.505	0.390	0.000	-4.728	-0.004
Cedar Creek	0818_04	16749	00940	All	Raw Data	-0.545	-0.516	0.191	0.000	-3.770	-0.418
Cedar Creek	0818_04	16749	00940	Summer	Raw Data	-0.447	-0.487	0.239	0.003	-3.215	-0.448
Cedar Creek	0818_04	16749	00940	Winter	Raw Data	-0.411	-0.107	0.136	0.058	-1.984	-0.375
Cedar Creek	0818_04	16749	70300	All	Raw Data	-0.074	-0.866	0.218	0.000	-4.630	-2.101
Cedar Creek	0818_04	16749	70300	Summer	Raw Data	-0.305	-0.751	0.238	0.000	-3.836	-2.410
Cedar Creek	0818_04	16749	70300	Winter	Raw Data	0.077	-0.850	0.201	0.013	-2.652	-1.654
Cedar Creek	0818_04	16749	70953	Summer	Raw Data	0.947	-0.986	0.227	0.003	-3.163	-1.844
Cedar Creek	0818_04	16749	70953	Winter	Raw Data	1.641	0.584	0.319	0.001	-3.624	-1.295
Cedar Creek	0818_06	16747	00094	Summer	Raw Data	-1.671	0.002	0.257	0.000	-5.193	-3.749
Cedar Creek	0818_06	16747	00094	Winter	Raw Data	-1.215	-0.911	0.247	0.000	-4.890	-4.377
Cedar Creek	0818_06	16747	00400	Summer	Raw Data	0.672	-1.637	0.238	0.000	-4.930	-0.066
Cedar Creek	0818_06	16747	00400	Winter	Raw Data	-0.044	0.011	0.174	0.000	-3.923	-0.029
Cedar Creek	0818_06	16747	00410	Winter	Raw Data	0.299	0.469	0.114	0.068	-1.902	-0.811
Cedar Creek	0818_06	16747	00610	All	Natural Log Data	1.434	-2.588	0.432	0.000	-6.924	-0.226
Cedar Creek	0818_06	16747	00610	Summer	Natural Log Data	1.761	-1.637	0.372	0.000	-4.554	-0.216
Cedar Creek	0818_06	16747	00610	Winter	Natural Log Data	0.245	-1.881	0.500	0.000	-5.096	-0.234
Cedar Creek	0818_06	16747	00625	Summer	Raw Data	-1.562	0.634	0.104	0.048	-2.044	-0.026
Cedar Creek	0818_06	16747	00665	Summer	Raw Data	1.028	0.927	0.292	0.001	-3.745	-0.004
Cedar Creek	0818_06	16747	00671	Summer	Natural Log Data	-0.708	-1.993	0.163	0.015	-2.571	-0.143
Cedar Creek	0818_06	16747	00680	Winter	Raw Data	1.597	0.396	0.125	0.065	-1.927	-0.087
Cedar Creek	0818_06	16747	00900	Winter	Raw Data	-0.529	-0.586	0.241	0.011	-2.763	-1.119
Cedar Creek	0818_06	16747	00916	Winter	Raw Data	0.020	-0.229	0.200	0.017	-2.550	-0.307
Cedar Creek	0818_06	16747	00927	Winter	Raw Data	-0.510	-0.708	0.117	0.081	-1.818	-0.048
Cedar Creek	0818_06	16747	00929	All	Raw Data	-0.796	-1.059	0.147	0.002	-3.274	-0.273
Cedar Creek	0818_06	16747	00929	Summer	Raw Data	-0.559	-0.647	0.106	0.057	-1.976	-0.214
Cedar Creek	0818_06	16747	00929	Winter	Raw Data	-0.551	-0.859	0.205	0.014	-2.638	-0.354
Cedar Creek	0818_06	16747	00940	All	Raw Data	-0.463	-0.415	0.198	0.000	-3.848	-0.449
Cedar Creek	0818_06	16747	00940	Summer	Raw Data	-0.284	-0.566	0.250	0.002	-3.317	-0.479
Cedar Creek	0818_06	16747	00940	Winter	Raw Data	-0.455	0.079	0.140	0.055	-2.016	-0.407
Cedar Creek	0818_06	16747	00945	All	Raw Data	-1.706	-0.014	0.284	0.000	-5.075	-0.691
Cedar Creek	0818_06	16747	00945	Summer	Raw Data	-1.495	-0.292	0.191	0.006	-2.915	-0.584
Cedar Creek	0818_06	16747	00945	Winter	Raw Data	-0.707	-0.058	0.417	0.000	-4.392	-0.755
Cedar Creek	0818_06	16747	01045	All	Natural Log Data	-1.884	-0.938	0.319	0.000	5.342	0.176
Cedar Creek	0818_06	16747	01045	Summer	Raw Data	0.341	-1.154	0.341	0.000	4.193	12.669

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Cedar Creek	0818_06	16747	01045	Winter	Natural Log Data	-1.560	-0.128	0.295	0.003	3.233	0.179
Cedar Creek	0818_06	16747	70300	All	Raw Data	-1.441	-0.765	0.255	0.000	-7.302	-2.626
Cedar Creek	0818_06	16747	70300	Summer	Raw Data	-1.626	0.646	0.261	0.000	-5.349	-2.529
Cedar Creek	0818_06	16747	70300	Winter	Raw Data	-0.479	-1.495	0.249	0.000	-4.925	-2.748
Cedar Creek	0818_06	16747	70953	All	Natural Log Data	-0.901	-0.861	0.213	0.000	-4.194	-0.081
Cedar Creek	0818_06	16747	70953	Summer	Raw Data	1.271	-0.557	0.320	0.000	-4.061	-2.632
Cedar Creek	0818_06	16747	70953	Winter	Natural Log Data	-0.850	0.024	0.392	0.000	-4.251	-0.085
Cedar Creek	0818_06	16747	95999	All	Natural Log Data	-0.832	-0.568	0.325	0.000	4.650	0.216
Cedar Creek	0818_06	16747	95999	Summer	Natural Log Data	-0.576	0.990	0.313	0.003	3.308	0.158
Cedar Creek	0818_06	16747	95999	Winter	Natural Log Data	0.508	-0.347	0.418	0.002	3.693	0.228
Cedar Creek	0818_06	16750	00010	Summer	Raw Data	-1.321	-0.898	0.102	0.080	1.814	0.293
Cedar Creek	0818_06	16750	00094	All	Raw Data	0.851	-0.849	0.115	0.014	-2.551	-3.191
Cedar Creek	0818_06	16750	00094	Summer	Raw Data	-0.059	-0.892	0.127	0.049	-2.055	-3.639
Cedar Creek	0818_06	16750	00410	Winter	Raw Data	0.357	1.295	0.199	0.049	-2.114	-1.166
Cedar Creek	0818_06	16750	00610	All	Raw Data	1.357	-0.459	0.248	0.001	-3.489	-0.004
Cedar Creek	0818_06	16750	00610	Summer	Raw Data	0.944	-1.320	0.340	0.006	-3.129	-0.004
Cedar Creek	0818_06	16750	00620	Winter	Raw Data	1.975	0.353	0.247	0.026	2.432	0.015
Cedar Creek	0818_06	16750	00625	Summer	Raw Data	0.948	1.459	0.364	0.003	-3.381	-0.070
Cedar Creek	0818_06	16750	00680	All	Natural Log Data	1.538	1.696	0.124	0.032	-2.229	-0.027
Cedar Creek	0818_06	16750	00680	Winter	Raw Data	0.149	-0.149	0.194	0.067	-1.965	-0.187
Cedar Creek	0818_06	16750	70953	Winter	Raw Data	0.855	0.263	0.161	0.080	-1.857	-1.118
Cedar Creek	0818_09	16753	00094	All	Raw Data	-1.173	0.713	0.138	0.001	-3.461	-3.239
Cedar Creek	0818_09	16753	00094	Summer	Raw Data	-0.345	-0.758	0.141	0.009	-2.715	-3.029
Cedar Creek	0818_09	16753	00094	Winter	Raw Data	-1.015	1.319	0.182	0.019	-2.498	-3.795
Cedar Creek	0818_09	16753	00400	Summer	Raw Data	-0.607	-0.018	0.201	0.002	-3.368	-0.050
Cedar Creek	0818_09	16753	00410	Winter	Raw Data	0.539	0.445	0.156	0.034	-2.231	-0.948
Cedar Creek	0818_09	16753	00610	All	Natural Log Data	1.427	-2.621	0.363	0.000	-5.948	-0.201
Cedar Creek	0818_09	16753	00610	Winter	Natural Log Data	-0.086	-1.976	0.284	0.004	-3.149	-0.187
Cedar Creek	0818_09	16753	00620	Winter	Natural Log Data	-1.849	-0.443	0.411	0.000	4.260	0.313
Cedar Creek	0818_09	16753	00940	All	Raw Data	-0.492	-0.435	0.148	0.002	-3.197	-0.462
Cedar Creek	0818_09	16753	00940	Summer	Raw Data	-0.068	-0.853	0.130	0.034	-2.217	-0.415
Cedar Creek	0818_09	16753	00940	Winter	Raw Data	-0.665	0.442	0.176	0.033	-2.260	-0.544
Cedar Creek	0818_09	16753	70300	All	Raw Data	0.071	-0.871	0.128	0.001	-3.360	-1.905
Cedar Creek	0818_09	16753	70300	Summer	Raw Data	0.151	-0.897	0.177	0.003	-3.183	-2.197
Cedar Creek	0818_09	16753	70953	Summer	Raw Data	0.160	-1.412	0.328	0.000	-4.132	-3.165

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Cedar Creek	0818_11	16772	00094	All	Raw Data	-1.414	1.257	0.134	0.001	-3.403	-3.249
Cedar Creek	0818_11	16772	00094	Summer	Raw Data	-0.463	-0.619	0.129	0.013	-2.577	-3.007
Cedar Creek	0818_11	16772	00094	Winter	Raw Data	-1.749	2.205	0.203	0.013	-2.669	-3.884
Cedar Creek	0818_11	16772	00400	Summer	Natural Log Data	1.281	2.914	0.234	0.001	-3.706	-0.007
Cedar Creek	0818_11	16772	70300	Summer	Raw Data	0.562	-0.423	0.110	0.021	-2.384	-1.780
Cedar Creek	0818_14	21427	00094	All	Raw Data	-0.359	-0.649	0.159	0.048	-2.089	-11.078
Cedar Creek	0818_14	21427	00300	All	Raw Data	0.774	-0.845	0.115	0.097	-1.730	-0.422
Cedar Creek	0818_14	21427	00625	All	Raw Data	-0.271	0.591	0.118	0.092	1.758	0.075
Cedar Creek	0818_14	21427	00625	Summer	Raw Data	-0.947	1.168	0.378	0.015	2.808	0.143
Cedar Creek	0818_14	21427	70300	All	Raw Data	0.305	-0.579	0.258	0.010	-2.827	-8.914
Cedar Creek	0818_14	21427	70300	Summer	Raw Data	-0.053	-0.458	0.200	0.095	-1.803	-6.321
Cedar Creek	0818_14	21427	70300	Winter	Raw Data	0.374	-0.669	0.379	0.058	-2.208	-13.637
Cedar Creek	0818B_01	17842	00610	All	Natural Log Data	-1.872	-0.558	0.229	0.009	-2.831	-0.206
Cedar Creek	0818B_01	17842	00625	Summer	Raw Data	-0.055	-0.671	0.534	0.016	-3.028	-0.211
Cedar Creek	0818B_01	17842	00680	All	Natural Log Data	1.140	-0.090	0.480	0.000	-4.990	-0.060
Cedar Creek	0818B_01	17842	00680	Summer	Natural Log Data	1.531	0.437	0.567	0.012	-3.234	-0.061
Cedar Creek	0818B_01	17842	00680	Winter	Raw Data	1.744	1.294	0.420	0.003	-3.509	-0.889
Cedar Creek	0818B_01	17842	31699	All	Natural Log Data	-0.450	-0.435	0.182	0.026	2.361	0.197
Cedar Creek	0818B_01	17842	31699	Winter	Natural Log Data	-0.516	0.036	0.316	0.023	2.543	0.245
Cedar Creek	0818B_01	21559	00400	Summer	Raw Data	0.255	1.134	0.264	0.073	1.984	0.178
Cedar Creek	0818B_01	21559	00620	All	Raw Data	0.927	-0.802	0.248	0.004	-3.095	-0.059
Cedar Creek	0818B_01	21559	00620	Summer	Raw Data	-0.506	-0.490	0.272	0.068	-2.027	-0.046
Cedar Creek	0818B_01	21559	00620	Winter	Raw Data	1.163	-0.670	0.329	0.013	-2.802	-0.086
Cedar Creek	0818C_01	16778	00610	Winter	Natural Log Data	0.642	0.087	0.205	0.078	-1.903	-0.142
Cedar Creek	0818C_01	16778	00620	All	Natural Log Data	-0.665	-0.354	0.146	0.049	-2.071	-0.191
Cedar Creek	0818C_01	16778	00625	All	Natural Log Data	1.317	-0.240	0.339	0.002	-3.506	-0.096
Cedar Creek	0818C_01	16778	00625	Winter	Raw Data	1.456	0.722	0.341	0.017	-2.694	-0.194
Cedar Creek	0818C_01	21000	00620	Summer	Natural Log Data	1.163	-0.379	0.510	0.006	-3.385	-0.432
Clear Fork	0829_02	11045	00010	Winter	Raw Data	1.035	0.351	0.111	0.084	1.799	0.311
Clear Fork	0829_02	11045	00300	Summer	Raw Data	0.406	0.916	0.119	0.066	1.912	0.102
Clear Fork	0829_02	11045	00610	Summer	Natural Log Data	-0.270	-2.169	0.194	0.017	-2.551	-0.172
Clear Fork	0829_02	11045	00680	All	Natural Log Data	-1.680	1.983	0.185	0.001	3.402	0.029
Clear Fork	0829_02	11045	00680	Summer	Natural Log Data	1.016	1.840	0.221	0.010	2.771	0.026
Clear Fork	0829_02	11045	01351	All	Raw Data	0.087	0.137	0.109	0.010	-2.660	-0.043
Clear Fork	0829_02	11045	01351	Summer	Raw Data	0.413	0.306	0.232	0.005	-3.009	-0.060

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Clear Fork	0829_02	11045	31699	Winter	Natural Log Data	1.211	0.096	0.134	0.066	1.928	0.134
Clear Fork	0829_02	11045	31704	All	Raw Data	0.548	-0.407	0.173	0.009	-2.741	-0.368
Clear Fork	0829_02	11045	31704	Summer	Raw Data	-0.559	-0.615	0.224	0.035	-2.282	-0.369
Clear Fork	0829_02	18456	00094	All	Raw Data	0.824	-1.523	0.135	0.000	4.999	13.257
Clear Fork	0829_02	18456	00094	Summer	Raw Data	1.424	0.670	0.102	0.004	2.998	10.543
Clear Fork	0829_02	18456	00094	Winter	Raw Data	-0.354	-1.840	0.193	0.000	4.347	16.740
Clear Fork	0829_02	18456	00300	Summer	Raw Data	-0.294	-0.224	0.132	0.001	-3.445	-0.119
Clear Fork	0829_02	18456	00400	Winter	Raw Data	0.846	1.742	0.163	0.000	3.893	0.029
Clear Fork	0829_02	18456	70300	All	Raw Data	0.824	-1.523	0.135	0.000	4.999	8.617
Clear Fork	0829_02	18456	70300	Summer	Raw Data	1.424	0.670	0.102	0.004	2.998	6.853
Clear Fork	0829_02	18456	70300	Winter	Raw Data	-0.354	-1.840	0.193	0.000	4.347	10.881
Clear Fork	0830_01	15151	00010	Summer	Raw Data	-1.777	0.854	0.125	0.019	2.445	0.136
Clear Fork	0830_01	15151	00078	Winter	Natural Log Data	1.294	0.360	0.102	0.070	-1.875	-0.017
Clear Fork	0830_01	15151	00620	Winter	Raw Data	0.800	-1.563	0.165	0.019	2.478	0.012
Clear Fork	0830_01	15151	00665	All	Raw Data	1.825	1.474	0.253	0.000	-4.906	-0.003
Clear Fork	0830_01	15151	00665	Summer	Raw Data	0.774	1.075	0.273	0.001	-3.777	-0.003
Clear Fork	0830_01	15151	00665	Winter	Raw Data	1.319	0.790	0.217	0.006	-2.932	-0.003
Clear Fork	0830_01	15151	00680	Summer	Natural Log Data	1.426	-0.530	0.191	0.005	-2.997	-0.014
Clear Fork	0830_01	15151	00681	Summer	Raw Data	0.924	-0.479	0.114	0.041	-2.118	-0.048
Clear Fork	0830_01	15151	01055	All	Natural Log Data	-0.890	-1.674	0.130	0.004	2.989	0.068
Clear Fork	0830_01	15151	01055	Summer	Natural Log Data	-0.065	-1.260	0.127	0.033	2.220	0.067
Clear Fork	0830_01	15151	70953	Summer	Raw Data	0.828	-0.967	0.219	0.002	-3.394	-1.390
Clear Fork	0830_01	15151	95999	Summer	Natural Log Data	-1.201	-0.860	0.585	0.000	7.226	0.212
Clear Fork	0830_02	15156	00078	Summer	Raw Data	0.760	0.162	0.101	0.035	-2.173	-0.017
Clear Fork	0830_02	15156	00620	Winter	Raw Data	0.706	-1.450	0.167	0.020	2.453	0.011
Clear Fork	0830_02	15156	00625	All	Raw Data	1.175	0.162	0.372	0.000	-6.532	-0.037
Clear Fork	0830_02	15156	00625	Summer	Raw Data	0.267	0.495	0.404	0.000	-5.202	-0.038
Clear Fork	0830_02	15156	00625	Winter	Raw Data	1.498	-0.317	0.325	0.001	-3.798	-0.035
Clear Fork	0830_02	15156	00665	Summer	Raw Data	1.218	0.132	0.365	0.000	-4.546	-0.004
Clear Fork	0830_02	15156	00680	All	Raw Data	1.846	0.112	0.123	0.004	-2.995	-0.058
Clear Fork	0830_02	15156	00680	Summer	Raw Data	1.760	-0.218	0.125	0.025	-2.327	-0.055
Clear Fork	0830_02	15156	00680	Winter	Raw Data	0.882	0.444	0.122	0.081	-1.824	-0.064
Clear Fork	0830_02	15156	70953	Summer	Raw Data	0.744	-1.558	0.268	0.000	-3.878	-1.708
Clear Fork	0830_03	15158	00078	Summer	Raw Data	1.138	-0.979	0.112	0.030	-2.249	-0.014
Clear Fork	0830_03	15158	00620	Winter	Raw Data	0.915	-1.218	0.206	0.008	2.839	0.015

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Clear Fork	0830_03	15158	00625	All	Raw Data	0.388	1.038	0.283	0.000	-5.365	-0.038
Clear Fork	0830_03	15158	00625	Summer	Raw Data	-0.067	0.901	0.337	0.000	-4.510	-0.040
Clear Fork	0830_03	15158	00625	Winter	Raw Data	0.510	0.737	0.212	0.007	-2.890	-0.034
Clear Fork	0830_03	15158	00665	Winter	Natural Log Data	1.039	-0.155	0.288	0.002	-3.486	-0.047
Clear Fork	0830_03	15158	00680	All	Natural Log Data	1.466	-0.113	0.247	0.000	-4.433	-0.016
Clear Fork	0830_03	15158	00680	Summer	Natural Log Data	1.748	-0.319	0.225	0.003	-3.188	-0.016
Clear Fork	0830_03	15158	00680	Winter	Raw Data	-0.567	-0.453	0.329	0.003	-3.355	-0.070
Clear Fork	0830_03	15158	70953	All	Raw Data	1.996	-1.395	0.178	0.000	-3.976	-1.554
Clear Fork	0830_03	15158	70953	Summer	Raw Data	1.570	-0.675	0.257	0.001	-3.722	-1.814
Clear Fork	0830_03	15158	70953	Winter	Raw Data	1.500	-1.221	0.136	0.034	-2.213	-1.398
Clear Fork	0830_05	13832	00530	All	Natural Log Data	-0.846	-0.571	0.168	0.001	-3.481	-0.047
Clear Fork	0830_05	13832	00530	Summer	Natural Log Data	-0.155	-0.447	0.138	0.028	-2.302	-0.047
Clear Fork	0830_05	13832	00530	Winter	Raw Data	0.895	-0.182	0.235	0.010	-2.770	-0.744
Clear Fork	0830_05	13832	00620	Winter	Raw Data	-0.040	-1.556	0.178	0.028	2.326	0.013
Clear Fork	0830_05	13832	00625	Summer	Raw Data	0.130	0.416	0.212	0.004	-3.066	-0.037
Clear Fork	0830_05	13832	00671	Winter	Natural Log Data	0.421	-1.403	0.151	0.055	-2.026	-0.126
Clear Fork	0830_05	13832	00940	All	Natural Log Data	0.037	2.822	0.104	0.015	-2.520	-0.015
Clear Fork	0830_05	13832	70953	All	Raw Data	1.536	-1.363	0.321	0.000	-5.369	-2.150
Clear Fork	0830_05	13832	70953	Summer	Raw Data	0.749	-1.437	0.362	0.000	-4.460	-2.335
Clear Fork	0830_05	13832	70953	Winter	Raw Data	1.626	-0.028	0.328	0.002	-3.420	-2.107
Clear Fork	0830A_01	16725	00061	Summer	Natural Log Data	-1.237	-1.142	0.182	0.054	-2.053	-0.659
Clear Fork	0830A_01	16725	00065	Winter	Raw Data	-1.496	0.617	0.336	0.001	3.628	0.260
Clear Fork	0830A_01	16725	00665	Winter	Natural Log Data	0.842	-0.989	0.109	0.013	-2.575	-0.104
Clear Fork	0830A_01	16725	01351	Summer	Raw Data	-0.207	-1.305	0.106	0.036	-2.174	-0.075
Clear Fork	0830A_01	16725	89835	All	Raw Data	-1.346	-2.422	0.746	0.000	10.834	0.257
Clear Fork	0830A_01	16725	89835	Winter	Raw Data	-0.183	-2.144	0.770	0.000	8.393	0.292
Clear Fork	0830B_01	13624	00665	All	Natural Log Data	0.876	-1.956	0.132	0.000	-3.797	-0.116
Clear Fork	0830B_01	13624	00665	Summer	Natural Log Data	0.660	-1.012	0.139	0.027	-2.308	-0.118
Clear Fork	0830B_01	13624	00665	Winter	Natural Log Data	0.628	-1.641	0.128	0.004	-2.972	-0.116
Clear Fork	0830B_01	13624	89835	Summer	Raw Data	-0.962	-2.180	0.800	0.000	10.567	0.217
Clear Fork	0830B_01	13624	89835	Winter	Raw Data	-1.512	-2.292	0.414	0.000	5.249	0.171
Clear Fork	0831_01	13691	72053	Summer	Raw Data	-0.152	-2.588	0.100	0.050	-2.030	-0.365
Clear Fork	0831_01	16414	00300	Summer	Raw Data	1.106	1.023	0.103	0.060	1.946	0.171
Clear Fork	0831_01	16414	00665	Summer	Raw Data	-0.578	-0.624	0.106	0.064	-1.920	-0.050
Clear Fork	0831_01	16414	00680	Winter	Raw Data	1.280	2.082	0.142	0.018	-2.472	-0.264

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Clear Fork	0831_01	16414	00940	Summer	Raw Data	-0.102	-1.309	0.114	0.092	-1.755	-4.853
Clear Fork	0831_01	17444	00061	All	Natural Log Data	-0.472	-0.261	0.157	0.015	2.549	0.162
Clear Fork	0831_01	17444	00061	Summer	Natural Log Data	0.165	-0.424	0.214	0.035	2.274	0.177
Clear Fork	0831_01	17444	00610	All	Natural Log Data	0.092	-1.055	0.142	0.013	-2.608	-0.236
Clear Fork	0831_01	17444	00610	Winter	Natural Log Data	0.374	-0.678	0.183	0.060	-2.006	-0.288
Clear Fork	0831_01	17444	00665	Winter	Raw Data	1.983	0.893	0.175	0.084	-1.844	-0.048
Clear Fork	0831_01	17444	00951	Winter	Natural Log Data	1.291	-0.061	0.232	0.031	-2.335	-0.083
Clear Fork	0831_04	11060	72053	Summer	Raw Data	-0.827	-1.499	0.130	0.091	-1.774	-0.205
Clear Fork	0832_01	11061	00053	All	Raw Data	-0.737	-1.730	0.332	0.001	3.597	4.840
Clear Fork	0832_01	11061	00053	Summer	Raw Data	-1.219	-1.116	0.358	0.009	2.984	4.234
Clear Fork	0832_01	11061	00300	Summer	Raw Data	-1.271	2.037	0.105	0.071	1.873	0.085
Clear Fork	0832_01	11061	00535	All	Raw Data	0.652	-0.701	0.161	0.004	3.064	0.272
Clear Fork	0832_01	11061	00535	Summer	Raw Data	-0.036	-0.999	0.275	0.003	3.263	0.325
Clear Fork	0832_01	11061	00625	All	Raw Data	0.393	-0.043	0.134	0.008	2.749	0.017
Clear Fork	0832_01	11061	00625	Winter	Raw Data	-0.502	-0.592	0.371	0.003	3.348	0.022
Clear Fork	0832_01	11061	00665	All	Raw Data	1.927	0.711	0.123	0.013	2.573	0.002
Clear Fork	0832_01	11061	00665	Summer	Raw Data	1.980	1.158	0.194	0.017	2.551	0.003
Clear Fork	0832_01	11061	00680	Summer	Natural Log Data	1.710	2.514	0.163	0.030	2.292	0.018
Clear Fork	0832_01	11061	00680	Winter	Raw Data	-0.370	0.425	0.463	0.001	4.046	0.159
Clear Fork	0832_01	11061	70953	All	Raw Data	1.952	0.777	0.203	0.001	3.499	1.740
Clear Fork	0832_01	11061	70953	Summer	Raw Data	1.283	-0.077	0.275	0.002	3.320	2.272
Clear Fork	0832_01	11061	72053	Winter	Natural Log Data	-1.184	-0.061	0.231	0.020	2.511	0.103
East Fork	821	21718	00094	Winter	Raw Data	-1.383	0.658	0.175	0.075	1.900	29.201
East Fork	821	21718	00400	Summer	Raw Data	0.878	-0.612	0.355	0.006	3.149	0.142
East Fork	821	21718	00615	Summer	Raw Data	1.909	-0.733	0.247	0.026	2.433	0.004
East Fork	821	21718	00620	All	Natural Log Data	0.673	-2.045	0.113	0.036	2.175	0.610
East Fork	821	21718	00620	Winter	Raw Data	1.191	-0.829	0.239	0.034	2.312	0.078
East Fork	821	21718	00665	Summer	Raw Data	1.401	-0.500	0.153	0.089	1.800	0.014
East Fork	821	21718	00940	All	Raw Data	1.504	-0.053	0.178	0.008	2.826	3.130
East Fork	821	21718	00940	Winter	Raw Data	1.091	-0.819	0.255	0.028	2.409	4.908
East Fork	821	21718	00945	All	Raw Data	1.775	0.497	0.122	0.029	2.271	3.158
East Fork	821	21718	00945	Summer	Raw Data	-0.707	0.209	0.187	0.057	2.037	2.056
East Fork	821	21718	00945	Winter	Raw Data	0.345	-0.890	0.191	0.062	2.002	5.203
East Fork	821	21718	31704	Summer	Raw Data	-0.397	-0.712	0.243	0.044	-2.195	-0.313
East Fork	821	21718	70300	Winter	Raw Data	0.251	-0.683	0.177	0.073	1.912	13.028

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East Fork	821	21718	70953	All	Raw Data	1.483	0.326	0.137	0.028	2.291	7.956
East Fork	821	21718	70953	Summer	Raw Data	0.730	-0.492	0.204	0.068	1.963	10.042
East Fork	821	21724	00400	All	Raw Data	-1.403	0.127	0.198	0.005	3.021	0.232
East Fork	821	21724	00410	All	Natural Log Data	0.909	-0.038	0.113	0.039	-2.146	-0.067
East Fork	821	21724	00530	All	Natural Log Data	0.485	1.373	0.155	0.013	2.606	0.242
East Fork	821	21724	00530	Summer	Natural Log Data	-0.647	1.040	0.288	0.015	2.697	0.302
East Fork	821	21724	00535	All	Natural Log Data	-0.347	0.593	0.219	0.004	3.084	0.250
East Fork	821	21724	00535	Winter	Natural Log Data	0.333	0.734	0.306	0.017	2.657	0.338
East Fork	821	21724	00620	Summer	Natural Log Data	1.523	-0.620	0.161	0.080	1.857	0.596
East Fork	821	21724	00900	Summer	Raw Data	1.444	-0.405	0.152	0.099	-1.743	-7.884
East Fork	821	21724	00940	All	Natural Log Data	-1.571	0.886	0.152	0.014	2.577	0.248
East Fork	821	21724	00940	Winter	Raw Data	1.914	0.155	0.230	0.038	2.251	4.562
East Fork	821	21724	00945	All	Natural Log Data	-1.037	0.756	0.105	0.044	2.085	0.135
East Fork	821	21724	00945	Summer	Raw Data	-0.335	-0.623	0.173	0.069	1.937	2.040
East Fork	821	21724	01045	Summer	Natural Log Data	-0.380	0.549	0.358	0.007	3.082	0.309
East Fork	821	21724	31704	Summer	Raw Data	-0.071	-1.106	0.353	0.012	-2.863	-0.341
East Fork	821	21724	82079	Summer	Raw Data	1.157	0.563	0.288	0.018	2.621	8.315
East Fork	821	21724	89966	Summer	Raw Data	0.157	-1.054	0.256	0.023	2.492	0.390
East Fork	821	21725	00094	Winter	Raw Data	-1.430	0.622	0.216	0.045	2.164	34.307
East Fork	821	21725	00400	Summer	Raw Data	-1.760	1.688	0.253	0.024	2.471	0.172
East Fork	821	21725	00680	Winter	Raw Data	1.139	0.267	0.159	0.091	1.791	0.342
East Fork	821	21725	00940	Summer	Raw Data	-0.848	-0.413	0.182	0.061	2.002	2.049
East Fork	821	21725	00940	Winter	Raw Data	1.446	-0.211	0.221	0.042	2.193	4.973
East Fork	821	21725	00945	All	Raw Data	1.519	0.204	0.115	0.035	2.195	3.327
East Fork	821	21725	00945	Summer	Raw Data	-0.943	0.122	0.239	0.029	2.379	2.591
East Fork	821	21725	00945	Winter	Raw Data	0.100	-0.923	0.162	0.087	1.814	5.100
East Fork	821	21725	01055	Summer	Raw Data	0.643	-0.492	0.156	0.094	-1.774	-13.531
East Fork	821	21725	70300	Winter	Raw Data	-0.343	-0.060	0.228	0.039	2.240	16.339
East Fork	0819_01	10991	00094	All	Natural Log Data	-1.212	0.008	0.208	0.000	-3.866	-0.043
East Fork	0819_01	10991	00094	Summer	Natural Log Data	-0.405	0.323	0.262	0.003	-3.206	-0.049
East Fork	0819_01	10991	00094	Winter	Raw Data	0.369	-0.373	0.187	0.022	-2.442	-25.154
East Fork	0819_01	10991	00300	Winter	Raw Data	-0.530	-0.437	0.119	0.072	1.875	0.130
East Fork	0819_01	10991	00610	Summer	Natural Log Data	-0.859	-1.216	0.294	0.002	-3.355	-0.263
East Fork	0819_01	10991	00620	All	Raw Data	0.471	-0.737	0.130	0.005	-2.892	-0.329
East Fork	0819_01	10991	00620	Summer	Raw Data	0.055	-0.515	0.194	0.015	-2.594	-0.407

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East Fork	0819_01	10991	00625	All	Natural Log Data	0.356	-0.388	0.133	0.008	-2.771	-0.031
East Fork	0819_01	10991	00625	Summer	Natural Log Data	0.394	-0.776	0.334	0.001	-3.615	-0.053
East Fork	0819_01	10991	00665	All	Raw Data	1.213	-0.642	0.139	0.007	-2.809	-0.082
East Fork	0819_01	10991	00665	Summer	Raw Data	0.358	-0.903	0.272	0.007	-2.934	-0.118
East Fork	0819_01	10991	00940	All	Natural Log Data	-0.570	0.134	0.190	0.001	-3.629	-0.063
East Fork	0819_01	10991	00940	Summer	Natural Log Data	-0.370	0.415	0.255	0.005	-3.040	-0.077
East Fork	0819_01	10991	00940	Winter	Natural Log Data	-0.683	-0.217	0.143	0.043	-2.118	-0.050
East Fork	0819_01	10991	00945	All	Natural Log Data	-1.815	0.054	0.141	0.003	-3.061	-0.045
East Fork	0819_01	10991	00945	Summer	Natural Log Data	-1.232	0.192	0.198	0.014	-2.627	-0.058
East Fork	0819_01	10991	00945	Winter	Raw Data	0.871	0.187	0.127	0.058	-1.979	-3.266
East Fork	0819_01	10991	00951	All	Raw Data	1.827	0.124	0.300	0.000	-4.904	-0.021
East Fork	0819_01	10991	00951	Summer	Raw Data	0.938	0.162	0.385	0.000	-4.112	-0.025
East Fork	0819_01	10991	00951	Winter	Raw Data	1.667	0.305	0.256	0.005	-3.046	-0.018
East Fork	0819_01	10991	70300	All	Natural Log Data	-1.242	-0.012	0.207	0.000	-3.887	-0.042
East Fork	0819_01	10991	70300	Summer	Natural Log Data	-0.525	0.369	0.245	0.005	-3.070	-0.046
East Fork	0819_01	10991	70300	Winter	Raw Data	0.300	-0.703	0.195	0.016	-2.561	-16.044
East Fork	0819_01	10991	72053	Summer	Natural Log Data	-1.898	0.845	0.120	0.052	2.026	0.052
East Fork	0819_01	10996	00078	Winter	Raw Data	1.240	-0.568	0.145	0.038	-2.177	-0.020
East Fork	0819_01	10996	00094	All	Natural Log Data	-0.714	0.054	0.146	0.003	-3.088	-0.037
East Fork	0819_01	10996	00094	Summer	Natural Log Data	0.642	0.981	0.243	0.007	-2.944	-0.048
East Fork	0819_01	10996	00300	All	Raw Data	0.572	-0.664	0.154	0.002	3.192	0.152
East Fork	0819_01	10996	00300	Summer	Raw Data	-0.199	0.121	0.458	0.000	4.776	0.213
East Fork	0819_01	10996	00400	All	Raw Data	1.447	-0.018	0.184	0.001	3.580	0.030
East Fork	0819_01	10996	00400	Summer	Raw Data	0.920	0.284	0.300	0.002	3.405	0.040
East Fork	0819_01	10996	00400	Winter	Raw Data	1.176	-0.090	0.109	0.075	1.848	0.022
East Fork	0819_01	10996	00535	Summer	Raw Data	1.157	0.148	0.243	0.009	2.834	0.485
East Fork	0819_01	10996	00610	Summer	Natural Log Data	-0.703	-1.519	0.366	0.001	-3.795	-0.318
East Fork	0819_01	10996	00610	Winter	Natural Log Data	-1.912	2.007	0.100	0.089	-1.764	-0.106
East Fork	0819_01	10996	00620	All	Raw Data	0.231	-0.967	0.144	0.004	-3.038	-0.452
East Fork	0819_01	10996	00620	Summer	Raw Data	0.865	-0.446	0.198	0.018	-2.531	-0.543
East Fork	0819_01	10996	00620	Winter	Raw Data	-0.481	-1.413	0.122	0.063	-1.935	-0.396
East Fork	0819_01	10996	00625	Summer	Raw Data	1.967	1.352	0.224	0.015	-2.632	-0.058
East Fork	0819_01	10996	00665	All	Raw Data	0.626	-1.308	0.126	0.013	-2.575	-0.110
East Fork	0819_01	10996	00665	Summer	Raw Data	0.062	-0.985	0.291	0.010	-2.867	-0.167
East Fork	0819_01	10996	00671	Summer	Raw Data	-0.094	-1.188	0.429	0.021	-2.742	-0.398

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East Fork	0819_01	10996	00680	Summer	Raw Data	0.771	-0.819	0.202	0.016	-2.568	-0.225
East Fork	0819_01	10996	00940	All	Natural Log Data	-1.064	0.465	0.170	0.001	-3.356	-0.060
East Fork	0819_01	10996	00940	Summer	Natural Log Data	0.356	0.688	0.233	0.011	-2.757	-0.069
East Fork	0819_01	10996	00940	Winter	Raw Data	1.574	-0.133	0.142	0.040	-2.152	-4.243
East Fork	0819_01	10996	00945	All	Natural Log Data	-1.687	0.214	0.112	0.010	-2.654	-0.042
East Fork	0819_01	10996	00945	Summer	Natural Log Data	0.365	0.637	0.192	0.020	-2.486	-0.052
East Fork	0819_01	10996	00951	Summer	Natural Log Data	0.873	0.437	0.293	0.004	-3.220	-0.045
East Fork	0819_01	10996	00951	Winter	Raw Data	-0.538	0.231	0.139	0.042	-2.129	-0.016
East Fork	0819_01	10996	70300	All	Natural Log Data	-0.991	0.139	0.124	0.006	-2.846	-0.033
East Fork	0819_01	10996	70300	Summer	Natural Log Data	0.419	0.882	0.217	0.011	-2.732	-0.043
East Fork	0819_01	10996	70953	Summer	Raw Data	1.992	1.134	0.326	0.001	3.617	1.860
East Fork	0819_01	10996	72053	Summer	Natural Log Data	-1.098	1.373	0.263	0.004	3.160	0.093
East Fork	0820_01	16809	00020	Winter	Raw Data	-0.387	-1.276	0.138	0.001	-3.527	-0.581
East Fork	0820_01	16809	00940	All	Raw Data	0.558	-0.376	0.147	0.000	-5.129	-1.007
East Fork	0820_01	16809	00940	Summer	Raw Data	0.189	0.435	0.151	0.000	-3.696	-0.957
East Fork	0820_01	16809	00940	Winter	Raw Data	0.340	-0.793	0.141	0.001	-3.492	-1.039
East Fork	0820_01	16809	01065	All	Raw Data	0.999	1.398	0.671	0.000	-7.281	-0.110
East Fork	0820_01	16809	01065	Summer	Raw Data	-0.161	-1.039	0.647	0.001	-4.488	-0.089
East Fork	0820_01	16809	01065	Winter	Raw Data	0.967	1.610	0.726	0.000	-5.871	-0.130
East Fork	0820_01	16809	89979	All	Raw Data	-1.268	-1.799	0.212	0.021	-2.486	-0.297
East Fork	0820_02	11001	00078	Summer	Raw Data	1.893	0.744	0.342	0.007	3.059	0.057
East Fork	0820_02	11001	00094	All	Raw Data	0.651	-0.266	0.127	0.026	-2.321	-5.907
East Fork	0820_02	11001	00625	Summer	Raw Data	0.983	-0.028	0.229	0.038	-2.249	-0.036
East Fork	0820_02	11001	00680	Summer	Raw Data	1.684	0.685	0.150	0.091	-1.785	-0.124
East Fork	0820_02	11001	00940	All	Raw Data	-0.637	-0.400	0.152	0.013	-2.613	-1.081
East Fork	0820_02	11001	00940	Summer	Raw Data	-0.741	-0.118	0.219	0.033	-2.306	-1.360
East Fork	0820_02	11001	00945	All	Raw Data	-0.261	-0.995	0.167	0.009	-2.756	-1.385
East Fork	0820_02	11001	00945	Summer	Raw Data	-0.003	-0.516	0.201	0.041	-2.188	-1.663
East Fork	0820_02	11001	00951	Winter	Raw Data	-0.862	-0.093	0.166	0.083	1.842	0.023
East Fork	0820_02	11001	31704	Winter	Raw Data	-0.551	0.211	0.376	0.015	-2.796	-0.450
East Fork	0820_02	11001	70300	All	Raw Data	0.603	-0.356	0.123	0.027	-2.307	-3.781
East Fork	0820_02	11001	72053	Winter	Raw Data	1.560	0.100	0.191	0.061	2.002	0.747
East Fork	0820_02	16829	00020	Winter	Raw Data	-0.955	-1.283	0.143	0.001	-3.604	-0.594
East Fork	0820_02	16829	00094	All	Raw Data	1.198	1.987	0.104	0.000	-4.313	-5.092
East Fork	0820_02	16829	00094	Winter	Raw Data	-0.186	0.342	0.136	0.001	-3.529	-6.962

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East Fork	0820_02	16829	00940	All	Raw Data	-0.249	-1.675	0.287	0.000	-7.828	-1.421
East Fork	0820_02	16829	00940	Summer	Raw Data	0.343	-0.638	0.282	0.000	-5.462	-1.329
East Fork	0820_02	16829	00940	Winter	Raw Data	-0.693	-1.465	0.293	0.000	-5.537	-1.510
East Fork	0820_02	16829	01065	All	Raw Data	-0.023	-0.563	0.332	0.002	-3.451	-0.057
East Fork	0820_02	16829	01065	Summer	Raw Data	-0.360	-0.857	0.243	0.087	-1.881	-0.044
East Fork	0820_02	16829	01065	Winter	Raw Data	0.208	-0.117	0.420	0.017	-2.824	-0.070
East Fork	0820_02	16829	89978	All	Raw Data	1.721	-0.699	0.241	0.013	-2.704	-1.121
East Fork	0820_02	16829	89978	Summer	Raw Data	0.828	-0.974	0.313	0.037	-2.340	-1.366
East Fork	0820_04	10998	00020	Winter	Raw Data	-0.565	-1.572	0.132	0.001	-3.472	-0.578
East Fork	0820_04	10998	00625	Summer	Raw Data	0.880	1.670	0.192	0.020	-2.486	-0.051
East Fork	0820_04	10998	00665	Summer	Natural Log Data	-1.114	0.407	0.143	0.000	-3.900	-0.115
East Fork	0820_04	10998	00900	Summer	Natural Log Data	1.140	0.106	0.161	0.000	-3.822	-0.019
East Fork	0820_04	10998	00940	Winter	Natural Log Data	-0.799	1.177	0.220	0.000	-5.073	-0.042
East Fork	0820_04	10998	00945	All	Raw Data	-1.537	1.558	0.153	0.014	-2.587	-1.492
East Fork	0820_04	10998	00945	Summer	Raw Data	-1.383	1.694	0.160	0.072	-1.903	-1.754
East Fork	0820_04	10998	01065	All	Raw Data	-0.052	-0.851	0.452	0.000	-4.635	-0.081
East Fork	0820_04	10998	01065	Summer	Raw Data	0.049	-0.926	0.260	0.075	-1.964	-0.063
East Fork	0820_04	10998	01065	Winter	Raw Data	-0.158	-0.071	0.692	0.000	-5.399	-0.099
East Fork	0820_04	10998	31704	Winter	Raw Data	0.202	-0.321	0.279	0.063	-2.065	-0.330
East Fork	0820_04	10998	82079	Summer	Natural Log Data	-0.873	-0.546	0.121	0.002	3.262	0.026
East Fork	0820_04	10998	GESMN	All	Natural Log Data	-1.567	-1.669	0.141	0.001	3.343	0.177
East Fork	0820_05	17829	00020	Winter	Raw Data	-0.232	-1.534	0.160	0.000	-3.856	-0.635
East Fork	0820_05	17829	00094	Winter	Raw Data	-1.697	-0.465	0.132	0.001	-3.467	-5.797
East Fork	0820_05	17829	00900	Summer	Natural Log Data	0.796	1.649	0.135	0.001	-3.448	-0.019
East Fork	0820_05	17829	00940	All	Raw Data	0.857	-1.346	0.205	0.000	-6.280	-1.121
East Fork	0820_05	17829	00940	Summer	Raw Data	1.090	0.172	0.198	0.000	-4.367	-1.025
East Fork	0820_05	17829	00940	Winter	Raw Data	0.036	-1.584	0.211	0.000	-4.445	-1.206
East Fork	0820_05	17829	01040	Winter	Natural Log Data	1.809	0.246	0.199	0.095	1.798	0.079
East Fork	0820_05	17829	01065	All	Raw Data	-0.017	-0.008	0.318	0.002	-3.478	-0.066
East Fork	0820_05	17829	01065	Winter	Raw Data	-1.717	-0.129	0.519	0.002	-3.748	-0.068
East Fork	0820_05	17829	82079	Winter	Natural Log Data	1.963	-0.520	0.146	0.001	3.504	0.073
East Fork	0820_05	17829	89978	All	Natural Log Data	0.246	-2.159	0.158	0.049	-2.076	-2.829
East Fork	0820_05	17829	89978	Summer	Raw Data	1.726	0.037	0.578	0.002	-4.058	-3.589
East Fork	0820_05	17829	GESMN	All	Natural Log Data	-1.247	-1.972	0.141	0.001	3.393	0.190
East Fork	0820_05	17829	GESMN	Summer	Natural Log Data	-1.771	-1.458	0.120	0.008	2.765	0.169

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East Fork	0820_05	17829	GESMN	Winter	Natural Log Data	0.358	-1.210	0.219	0.091	1.836	0.263
East Fork	0820_06	17846	00020	Winter	Raw Data	-0.644	-1.335	0.182	0.000	-4.118	-0.706
East Fork	0820_06	17846	00094	All	Natural Log Data	-0.564	2.180	0.336	0.000	-8.917	-0.025
East Fork	0820_06	17846	00094	Summer	Natural Log Data	1.154	0.531	0.340	0.000	-6.333	-0.021
East Fork	0820_06	17846	00094	Winter	Natural Log Data	-0.747	1.102	0.354	0.000	-6.499	-0.030
East Fork	0820_06	17846	00610	Summer	Natural Log Data	-0.304	-2.982	0.119	0.002	3.142	0.147
East Fork	0820_06	17846	00620	Summer	Natural Log Data	1.419	-1.922	0.106	0.005	2.900	0.157
East Fork	0820_06	17846	00900	Summer	Raw Data	1.587	-0.245	0.226	0.000	-4.674	-2.702
East Fork	0820_06	17846	00940	All	Natural Log Data	0.467	0.565	0.435	0.000	-10.739	-0.081
East Fork	0820_06	17846	00940	Summer	Natural Log Data	1.558	1.108	0.495	0.000	-8.579	-0.082
East Fork	0820_06	17846	00940	Winter	Natural Log Data	-0.495	-0.206	0.389	0.000	-6.816	-0.080
East Fork	0820_06	17846	01005	All	Raw Data	0.680	-0.515	0.178	0.025	-2.373	-1.237
East Fork	0820_06	17846	01040	All	Natural Log Data	-0.981	-0.874	0.129	0.060	-1.963	-0.067
East Fork	0820_06	17846	01040	Winter	Natural Log Data	-0.432	-0.633	0.214	0.083	-1.881	-0.087
East Fork	0820_06	17846	01065	All	Raw Data	0.630	0.327	0.235	0.009	-2.825	-0.064
East Fork	0820_06	17846	01065	Summer	Raw Data	-1.033	0.383	0.669	0.001	-4.714	-0.100
East Fork	0820_06	17846	82079	Winter	Natural Log Data	0.620	0.107	0.108	0.004	2.947	0.049
East Fork	0820_06	17846	89978	All	Natural Log Data	-1.516	-1.733	0.246	0.005	3.023	2.723
East Fork	0820B_01	10753	00020	Summer	Raw Data	0.379	-0.569	0.230	0.044	-2.185	-0.950
East Fork	0820B_01	10753	00078	Summer	Raw Data	0.408	-0.577	0.171	0.099	1.759	0.028
East Fork	0820B_01	10753	00094	Summer	Raw Data	-1.900	2.224	0.237	0.041	2.227	36.679
East Fork	0820B_01	10753	00300	All	Raw Data	0.995	-1.174	0.100	0.053	-2.003	-0.209
East Fork	0820B_01	10753	00615	Summer	Natural Log Data	1.621	0.509	0.409	0.014	-2.883	-0.382
East Fork	0820B_01	10753	00620	All	Raw Data	1.249	-0.032	0.266	0.002	3.354	0.562
East Fork	0820B_01	10753	00620	Summer	Raw Data	0.766	-0.545	0.477	0.004	3.446	0.870
East Fork	0820B_01	10753	00625	All	Raw Data	0.562	1.339	0.118	0.046	-2.072	-0.033
East Fork	0820B_01	10753	00625	Winter	Raw Data	0.448	-0.260	0.273	0.026	-2.454	-0.067
East Fork	0820B_01	10753	00671	Summer	Natural Log Data	0.442	-0.669	0.244	0.044	2.198	0.153
East Fork	0820B_01	10753	00671	Winter	Raw Data	1.744	0.585	0.418	0.004	3.389	0.018
East Fork	0820B_01	10753	00900	Winter	Raw Data	0.077	-0.520	0.154	0.087	-1.812	-9.664
East Fork	0820B_01	10753	00940	All	Raw Data	0.870	1.962	0.298	0.009	2.914	8.093
East Fork	0820B_01	10753	00940	Winter	Raw Data	-1.400	0.348	0.555	0.013	3.157	10.716
East Fork	0820B_01	10753	00945	All	Raw Data	-1.007	1.187	0.320	0.006	3.071	9.857
East Fork	0820B_01	10753	00945	Winter	Raw Data	-1.632	1.015	0.501	0.022	2.836	14.318
East Fork	0820B_01	10753	31699	All	Natural Log Data	1.244	-0.253	0.139	0.021	-2.411	-0.259

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East Fork	0820B_01	10753	31699	Summer	Natural Log Data	1.247	-0.062	0.271	0.027	-2.438	-0.365
East Fork	0820B_01	17845	00680	Winter	Raw Data	0.974	1.463	0.106	0.021	-2.388	-0.111
East Fork	0820B_01	17845	01040	All	Natural Log Data	0.525	-0.175	0.184	0.033	-2.275	-0.047
East Fork	0820B_01	17845	01065	All	Raw Data	0.074	-0.554	0.254	0.012	-2.738	-0.139
East Fork	0820B_01	17845	01065	Winter	Raw Data	0.144	-0.667	0.373	0.027	-2.560	-0.168
East Fork	0820B_01	17845	01090	All	Raw Data	0.315	-0.825	0.233	0.020	-2.525	-0.528
East Fork	0820B_01	17845	01090	Summer	Raw Data	-0.370	-0.167	0.652	0.003	-4.110	-0.849
East Fork	0820B_01	21478	00020	Summer	Raw Data	0.893	-0.203	0.121	0.064	-1.930	-1.245
East Fork	0820B_01	21478	00094	Winter	Raw Data	-1.714	0.916	0.198	0.014	-2.632	-51.839
East Fork	0820B_01	21478	00400	Summer	Raw Data	1.683	0.768	0.165	0.026	-2.351	-0.080
East Fork	0820B_01	21478	00400	Winter	Natural Log Data	1.979	0.486	0.643	0.000	-7.103	-0.024
East Fork	0820B_01	21478	00610	All	Natural Log Data	-1.395	1.306	0.136	0.008	-2.775	-0.409
East Fork	0820B_01	21478	00620	All	Raw Data	0.097	-0.727	0.108	0.017	-2.463	-0.556
East Fork	0820B_01	21478	00620	Winter	Raw Data	-0.415	-0.289	0.160	0.039	-2.182	-0.582
East Fork	0820B_01	21478	00680	All	Raw Data	1.177	-0.802	0.137	0.006	-2.878	-0.318
East Fork	0820B_01	21478	00680	Winter	Raw Data	1.081	-0.805	0.327	0.002	-3.486	-0.474
East Fork	0820B_01	21478	31699	All	Natural Log Data	-0.259	0.524	0.138	0.005	2.945	0.359
East Fork	0820B_01	21478	31699	Winter	Natural Log Data	0.813	-0.798	0.229	0.012	2.724	0.453
East Fork	0820B_01	21478	32101	Summer	Natural Log Data	-0.025	-0.999	0.194	0.025	2.400	0.822
East Fork	0820B_01	21478	32104	Summer	Natural Log Data	1.845	2.664	0.183	0.060	2.010	0.635
East Fork	0820B_01	21478	32105	Summer	Natural Log Data	1.583	-1.219	0.332	0.005	3.150	1.389
East Fork	0820B_01	21478	32106	All	Natural Log Data	0.254	-2.430	0.327	0.000	4.778	1.203
East Fork	0820B_01	21478	32106	Summer	Raw Data	0.645	-1.659	0.250	0.009	2.828	0.294
East Fork	0820B_01	21478	32106	Winter	Natural Log Data	1.371	-1.602	0.376	0.002	3.559	1.406
East Fork	0820B_01	21478	72053	All	Natural Log Data	1.389	-1.464	0.141	0.003	-3.092	-0.264
East Fork	0820B_01	21478	72053	Summer	Natural Log Data	0.986	-1.151	0.152	0.033	-2.242	-0.292
East Fork	0820B_01	21478	72053	Winter	Natural Log Data	0.785	-1.166	0.154	0.032	-2.254	-0.255
East Fork	0820B_01	21478	82079	Winter	Natural Log Data	1.394	-0.964	0.162	0.041	2.157	0.331
East Fork	0820B_01	21478	TLTHM	All	Natural Log Data	0.260	-2.511	0.352	0.000	5.048	1.448
East Fork	0820B_01	21478	TLTHM	Summer	Raw Data	1.788	0.059	0.374	0.001	3.786	0.639
East Fork	0820B_01	21478	TLTHM	Winter	Natural Log Data	1.016	-1.406	0.338	0.004	3.271	1.549
East Fork	0820C_01	16828	00020	Summer	Raw Data	-0.532	-1.336	0.108	0.003	-3.092	-0.415
East Fork	0820C_01	16828	00020	Winter	Raw Data	-0.644	-1.345	0.257	0.000	-5.232	-0.871
East Fork	0820C_01	16828	00310	Summer	Natural Log Data	1.474	-1.676	0.175	0.000	-4.019	-0.072
East Fork	0820C_01	16828	00410	Summer	Raw Data	1.192	0.453	0.115	0.002	-3.158	-2.561

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East Fork	0820C_01	16828	00620	Summer	Raw Data	1.429	-1.616	0.121	0.006	2.850	0.538
East Fork	0820C_01	16828	00680	All	Natural Log Data	-0.647	0.882	0.206	0.000	-6.266	-0.022
East Fork	0820C_01	16828	00680	Summer	Natural Log Data	0.871	0.001	0.273	0.000	-5.308	-0.023
East Fork	0820C_01	16828	00680	Winter	Raw Data	1.361	0.338	0.210	0.000	-4.433	-0.153
East Fork	0820C_01	16828	01065	All	Natural Log Data	0.391	-0.505	0.214	0.013	-2.664	-0.066
East Fork	0820C_01	16828	01065	Winter	Raw Data	1.619	0.495	0.351	0.026	-2.549	-0.669
East Fork	0820C_01	16828	01106	Winter	Natural Log Data	1.903	0.233	0.552	0.006	3.509	0.343
East Fork	0821_01	15685	00094	All	Raw Data	0.864	-0.566	0.147	0.016	2.523	14.017
East Fork	0821_01	15685	00094	Winter	Raw Data	0.642	-0.878	0.245	0.031	2.346	20.070
East Fork	0821_01	15685	00410	All	Raw Data	-0.327	-0.742	0.150	0.016	-2.518	-5.274
East Fork	0821_01	15685	00410	Summer	Raw Data	0.831	-0.371	0.197	0.057	-2.041	-6.699
East Fork	0821_01	15685	00615	Summer	Natural Log Data	1.695	-0.702	0.352	0.006	3.128	0.480
East Fork	0821_01	15685	00620	Summer	Natural Log Data	0.733	-1.317	0.325	0.009	2.944	1.083
East Fork	0821_01	15685	00671	Winter	Natural Log Data	1.723	-0.586	0.273	0.055	2.125	1.128
East Fork	0821_01	15685	00940	All	Raw Data	0.474	-1.179	0.342	0.000	4.385	3.871
East Fork	0821_01	15685	00940	Summer	Raw Data	-0.723	-1.041	0.363	0.005	3.204	3.511
East Fork	0821_01	15685	00940	Winter	Raw Data	0.953	-0.800	0.344	0.008	2.983	4.425
East Fork	0821_01	15685	00945	All	Raw Data	0.565	-1.398	0.266	0.001	3.665	3.920
East Fork	0821_01	15685	00945	Summer	Raw Data	0.379	-0.887	0.291	0.014	2.718	3.775
East Fork	0821_01	15685	00945	Winter	Raw Data	0.364	-1.104	0.275	0.021	2.541	4.364
East Fork	0821_01	15685	01045	Summer	Raw Data	1.274	-0.896	0.580	0.000	4.849	170.030
East Fork	0821_01	15685	70300	All	Raw Data	0.001	-0.301	0.143	0.018	2.485	9.700
East Fork	0821_01	15685	70300	Winter	Raw Data	-0.738	0.311	0.302	0.015	2.713	15.474
East Fork	0821_01	15685	89966	Summer	Raw Data	0.069	-0.361	0.210	0.042	2.189	0.266
East Fork	0821_01	15685	89969	Winter	Raw Data	-1.056	-1.651	0.160	0.090	-1.798	-0.428
East Fork	0821_01	17584	00078	Summer	Raw Data	0.407	-0.466	0.196	0.051	2.095	0.090
East Fork	0821_01	17584	00094	All	Raw Data	1.269	0.481	0.148	0.016	2.538	15.419
East Fork	0821_01	17584	00094	Winter	Raw Data	1.458	0.227	0.323	0.011	2.851	22.906
East Fork	0821_01	17584	00940	All	Raw Data	0.803	-1.081	0.342	0.000	4.387	4.063
East Fork	0821_01	17584	00940	Summer	Raw Data	-0.549	-1.144	0.334	0.008	3.005	3.496
East Fork	0821_01	17584	00940	Winter	Raw Data	1.230	-0.602	0.367	0.006	3.140	4.835
East Fork	0821_01	17584	00945	All	Raw Data	0.830	-1.071	0.284	0.000	3.831	4.019
East Fork	0821_01	17584	00945	Summer	Raw Data	0.460	-0.832	0.267	0.020	2.561	3.747
East Fork	0821_01	17584	00945	Winter	Raw Data	0.749	-0.702	0.348	0.008	3.011	4.665
East Fork	0821_01	17584	01045	Summer	Raw Data	1.153	-0.795	0.436	0.002	3.626	148.205

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East Fork	0821_01	17584	70300	All	Raw Data	0.659	-0.214	0.160	0.012	2.652	10.839
East Fork	0821_01	17584	70300	Summer	Raw Data	0.246	-0.591	0.148	0.094	1.771	9.254
East Fork	0821_01	17584	70300	Winter	Raw Data	0.953	-0.349	0.382	0.005	3.242	16.015
East Fork	0821_01	17584	89966	Summer	Raw Data	-1.726	-1.134	0.197	0.050	2.099	0.212
East Fork	0821_02	11021	00078	Summer	Raw Data	0.938	1.477	0.180	0.062	1.989	0.067
East Fork	0821_02	11021	00094	All	Raw Data	1.032	0.114	0.176	0.008	2.815	17.384
East Fork	0821_02	11021	00094	Summer	Raw Data	0.165	0.036	0.179	0.063	1.980	15.479
East Fork	0821_02	11021	00094	Winter	Raw Data	1.245	-0.555	0.327	0.011	2.872	23.978
East Fork	0821_02	11021	00615	All	Natural Log Data	1.945	-1.442	0.143	0.018	2.483	0.370
East Fork	0821_02	11021	00615	Winter	Natural Log Data	1.965	-0.489	0.201	0.054	2.067	0.476
East Fork	0821_02	11021	00940	All	Raw Data	0.880	-1.079	0.344	0.000	4.409	4.343
East Fork	0821_02	11021	00940	Summer	Raw Data	-0.664	-1.200	0.351	0.006	3.122	3.753
East Fork	0821_02	11021	00940	Winter	Raw Data	1.297	-0.663	0.361	0.007	3.096	5.166
East Fork	0821_02	11021	00945	All	Raw Data	0.620	-1.157	0.282	0.001	3.815	4.079
East Fork	0821_02	11021	00945	Summer	Raw Data	-0.142	-1.172	0.349	0.006	3.109	4.047
East Fork	0821_02	11021	00945	Winter	Raw Data	0.666	-0.897	0.274	0.021	2.533	4.484
East Fork	0821_02	11021	01045	Summer	Raw Data	0.907	-0.214	0.535	0.000	4.420	152.857
East Fork	0821_02	11021	70300	All	Raw Data	0.198	-0.376	0.145	0.017	2.507	10.943
East Fork	0821_02	11021	70300	Winter	Raw Data	0.458	-1.073	0.357	0.007	3.072	15.562
East Fork	0821_02	15686	00094	Summer	Raw Data	0.439	-0.206	0.159	0.082	1.844	16.171
East Fork	0821_02	15686	00094	Winter	Raw Data	0.179	-0.631	0.188	0.064	1.985	22.548
East Fork	0821_02	15686	00940	All	Raw Data	0.845	-1.020	0.264	0.001	3.646	4.246
East Fork	0821_02	15686	00940	Summer	Raw Data	-0.269	-0.875	0.269	0.019	2.573	3.584
East Fork	0821_02	15686	00940	Winter	Raw Data	0.861	-0.961	0.299	0.015	2.695	5.309
East Fork	0821_02	15686	00945	All	Raw Data	0.672	-0.821	0.164	0.010	2.698	3.553
East Fork	0821_02	15686	00945	Summer	Raw Data	0.179	-0.949	0.302	0.012	2.790	3.889
East Fork	0821_02	15686	00945	Winter	Raw Data	0.071	-0.744	0.154	0.097	1.756	3.889
East Fork	0821_02	15686	01045	Summer	Raw Data	0.205	0.528	0.162	0.088	1.811	94.328
East Fork	0821_02	15686	31699	Summer	Natural Log Data	1.961	0.257	0.185	0.059	2.019	0.370
East Fork	0821_02	15686	70300	Winter	Raw Data	0.515	-0.838	0.159	0.091	1.793	11.787
East Fork	0821_02	15686	89965	Winter	Raw Data	-0.135	-1.042	0.162	0.088	-1.811	-0.463
East Fork	0821_02	15686	89969	Winter	Raw Data	-1.056	-1.651	0.160	0.090	-1.798	-0.428
East Fork	0821_02	21719	00680	Winter	Raw Data	-0.447	-0.712	0.212	0.047	2.137	0.167
East Fork	0821_02	21719	00940	All	Raw Data	0.835	0.191	0.219	0.003	3.220	6.040
East Fork	0821_02	21719	00940	Summer	Raw Data	-0.803	0.283	0.242	0.028	2.397	5.060

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East Fork	0821_02	21719	00940	Winter	Raw Data	1.303	0.153	0.210	0.049	2.124	7.129
East Fork	0821_02	21719	00945	All	Raw Data	-0.585	0.765	0.110	0.039	2.144	4.394
East Fork	0821_02	21719	00945	Summer	Raw Data	-1.449	0.554	0.248	0.026	2.434	4.934
East Fork	0821_02	21719	01045	Winter	Natural Log Data	1.844	0.591	0.190	0.062	-1.999	-0.276
East Fork	0821_02	21719	31699	Summer	Natural Log Data	1.844	0.765	0.209	0.043	2.178	0.618
East Fork	0821_02	21719	31699	Winter	Natural Log Data	1.694	0.666	0.243	0.032	-2.335	-0.946
East Fork	0821_02	21719	70953	Summer	Raw Data	1.727	1.245	0.255	0.039	2.265	20.514
East Fork	0821_02	21720	00094	Winter	Raw Data	1.083	0.739	0.172	0.077	1.880	81.937
East Fork	0821_02	21720	00615	Winter	Natural Log Data	-1.122	0.105	0.328	0.010	2.881	0.675
East Fork	0821_02	21720	00625	Winter	Raw Data	1.502	1.627	0.236	0.035	2.290	0.211
East Fork	0821_02	21720	00680	Winter	Natural Log Data	1.312	0.648	0.359	0.007	3.083	0.085
East Fork	0821_02	21720	00940	Winter	Raw Data	1.670	0.292	0.209	0.049	2.119	16.778
East Fork	0821_02	21720	31699	Summer	Natural Log Data	0.795	-0.932	0.286	0.033	2.371	1.119
East Fork	0821_02	21720	70300	Winter	Raw Data	1.587	1.253	0.152	0.099	1.747	45.989
East Fork	0821_02	21720	82903	All	Natural Log Data	0.722	-0.784	0.167	0.010	-2.720	-0.238
East Fork	0821_02	21720	82903	Summer	Raw Data	1.471	-0.080	0.238	0.029	-2.372	-0.422
East Fork	0821_02	21720	89965	Winter	Raw Data	-0.015	-0.497	0.238	0.034	-2.306	-0.476
East Fork	0821_02	21720	89968	Winter	Raw Data	-0.445	-0.616	0.191	0.061	-2.003	-0.454
East Fork	0821_02	21721	01045	Winter	Natural Log Data	0.533	0.021	0.167	0.082	-1.848	-0.288
East Fork	0821_02	21721	31699	Summer	Natural Log Data	1.163	-0.611	0.149	0.093	1.773	0.653
East Fork	0821_02	21721	31699	Winter	Natural Log Data	0.695	0.638	0.330	0.010	-2.897	-1.037
East Fork	0821_02	21721	70953	All	Raw Data	1.317	-1.360	0.117	0.044	2.092	13.605
East Fork	0821_02	21721	70953	Summer	Raw Data	-0.204	-1.283	0.228	0.052	2.108	17.312
East Fork	0821_02	21721	82079	Winter	Natural Log Data	-0.045	-0.225	0.176	0.073	-1.908	-0.315
East Fork	0821_02	21721	89965	Winter	Raw Data	-0.494	-0.158	0.190	0.062	-1.996	-0.395
East Fork	0821_02	21721	89968	Winter	Raw Data	-0.280	-0.638	0.154	0.096	-1.760	-0.401
East Fork	0821_02	21722	00094	Summer	Raw Data	0.361	-0.852	0.164	0.077	1.876	27.895
East Fork	0821_02	21722	00335	Summer	Raw Data	-0.027	-0.219	0.250	0.035	2.307	5.350
East Fork	0821_02	21722	00410	All	Raw Data	-0.448	-0.972	0.131	0.035	-2.197	-12.762
East Fork	0821_02	21722	00410	Winter	Raw Data	0.205	0.091	0.306	0.026	-2.485	-11.812
East Fork	0821_02	21722	00530	Winter	Raw Data	1.860	0.706	0.287	0.032	-2.373	-16.703
East Fork	0821_02	21722	00615	Winter	Raw Data	1.470	0.320	0.210	0.075	1.927	0.018
East Fork	0821_02	21722	00620	Winter	Raw Data	-0.228	-0.399	0.223	0.065	-2.002	-0.689
East Fork	0821_02	21722	00671	All	Natural Log Data	1.765	-1.578	0.116	0.065	-1.920	-0.833
East Fork	0821_02	21722	00671	Summer	Natural Log Data	1.731	-0.862	0.431	0.004	-3.368	-1.442

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East Fork	0821_02	21722	00900	All	Raw Data	0.688	-0.288	0.181	0.012	-2.657	-19.006
East Fork	0821_02	21722	00900	Winter	Raw Data	0.336	0.304	0.492	0.002	-3.682	-25.049
East Fork	0821_02	21722	00940	All	Raw Data	1.350	-0.612	0.138	0.030	2.267	7.670
East Fork	0821_02	21722	00940	Summer	Raw Data	0.867	0.088	0.346	0.010	2.913	11.682
East Fork	0821_02	21722	00945	Summer	Raw Data	0.015	0.015	0.313	0.016	2.702	9.979
East Fork	0821_02	21722	01045	Winter	Natural Log Data	0.957	0.225	0.234	0.058	-2.067	-0.337
East Fork	0821_02	21722	01055	All	Natural Log Data	-0.070	-0.039	0.147	0.025	-2.344	-0.227
East Fork	0821_02	21722	01055	Winter	Natural Log Data	-0.214	-0.086	0.393	0.009	-3.013	-0.393
East Fork	0821_02	21722	20424	Winter	Raw Data	-1.251	-0.277	0.215	0.046	-2.158	-0.307
East Fork	0821_02	21722	31699	Summer	Natural Log Data	0.979	-0.615	0.280	0.017	2.643	0.840
East Fork	0821_02	21722	31699	Winter	Natural Log Data	1.646	0.737	0.420	0.003	-3.508	-1.233
East Fork	0821_02	21722	70953	Summer	Raw Data	0.887	-0.187	0.243	0.045	2.193	20.970
East Fork	0821_02	21722	82079	Winter	Natural Log Data	0.144	0.129	0.247	0.050	-2.141	-0.366
East Fork	0821_02	21722	89965	Winter	Raw Data	-0.602	-0.444	0.217	0.044	-2.173	-0.456
East Fork	0821_02	21723	00335	All	Raw Data	0.925	-0.390	0.144	0.027	2.322	3.827
East Fork	0821_02	21723	00335	Summer	Raw Data	-0.256	-0.528	0.333	0.012	2.828	6.286
East Fork	0821_02	21723	00410	All	Raw Data	-0.285	-0.926	0.136	0.032	-2.248	-13.170
East Fork	0821_02	21723	00410	Summer	Raw Data	0.823	-0.795	0.182	0.078	-1.885	-12.831
East Fork	0821_02	21723	00530	Winter	Raw Data	1.587	0.572	0.235	0.057	-2.071	-13.212
East Fork	0821_02	21723	00900	All	Raw Data	0.995	0.010	0.153	0.022	-2.409	-17.954
East Fork	0821_02	21723	00900	Summer	Raw Data	0.844	-0.746	0.190	0.071	-1.937	-13.396
East Fork	0821_02	21723	00900	Winter	Raw Data	1.083	1.295	0.197	0.085	-1.855	-16.382
East Fork	0821_02	21723	00940	All	Raw Data	1.090	-0.712	0.154	0.021	2.418	7.481
East Fork	0821_02	21723	00940	Summer	Raw Data	0.367	-0.008	0.341	0.011	2.875	9.973
East Fork	0821_02	21723	00945	Summer	Raw Data	-0.255	0.337	0.236	0.041	2.225	7.635
East Fork	0821_02	21723	01055	All	Natural Log Data	-0.312	-0.370	0.104	0.063	-1.929	-0.195
East Fork	0821_02	21723	01055	Winter	Raw Data	1.827	1.241	0.232	0.059	-2.059	-15.563
East Fork	0821_02	21723	31699	Summer	Natural Log Data	1.550	-0.471	0.143	0.100	1.735	0.633
East Fork	0821_02	21723	31699	Winter	Natural Log Data	1.701	1.401	0.274	0.021	-2.535	-1.060
East Fork	0821_02	21723	89965	Winter	Raw Data	0.164	-0.252	0.177	0.073	-1.911	-0.382
East Fork	0821_03	15687	00078	All	Raw Data	1.777	0.051	0.125	0.027	2.304	0.058
East Fork	0821_03	15687	00078	Summer	Raw Data	0.919	-0.585	0.279	0.017	2.639	0.096
East Fork	0821_03	15687	00094	All	Raw Data	1.017	0.075	0.102	0.048	2.047	12.324
East Fork	0821_03	15687	00094	Winter	Raw Data	0.992	-0.439	0.198	0.056	2.048	19.774
East Fork	0821_03	15687	00410	All	Raw Data	0.255	-1.241	0.148	0.017	-2.502	-6.045

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East Fork	0821_03	15687	00410	Summer	Raw Data	1.511	-0.161	0.217	0.045	-2.168	-6.986
East Fork	0821_03	15687	00620	Summer	Natural Log Data	1.538	-0.692	0.255	0.023	2.480	0.770
East Fork	0821_03	15687	00900	Summer	Raw Data	0.246	-1.067	0.211	0.048	-2.130	-8.551
East Fork	0821_03	15687	00940	All	Raw Data	1.069	-0.751	0.283	0.000	3.821	3.707
East Fork	0821_03	15687	00940	Summer	Raw Data	-0.605	-0.948	0.302	0.012	2.792	3.208
East Fork	0821_03	15687	00940	Winter	Raw Data	1.510	-0.304	0.278	0.020	2.558	4.319
East Fork	0821_03	15687	00945	All	Raw Data	1.125	-0.852	0.226	0.002	3.288	3.756
East Fork	0821_03	15687	00945	Summer	Raw Data	0.545	-0.565	0.255	0.023	2.484	3.432
East Fork	0821_03	15687	00945	Winter	Raw Data	0.898	-0.730	0.222	0.042	2.205	4.314
East Fork	0821_03	15687	01045	Summer	Raw Data	0.782	0.143	0.164	0.086	1.825	80.088
East Fork	0821_03	15687	31704	Summer	Raw Data	-0.513	-0.345	0.199	0.073	-1.929	-0.317
East Fork	0821_03	15687	70300	All	Raw Data	-0.481	-0.448	0.106	0.043	2.092	7.392
East Fork	0821_03	15687	70300	Winter	Raw Data	-0.420	-0.547	0.301	0.015	2.705	12.465
East Fork	0821_04	11022	00078	Summer	Raw Data	1.901	0.724	0.193	0.053	2.072	0.091
East Fork	0821_04	11022	00094	All	Raw Data	0.745	-0.246	0.141	0.018	2.465	13.255
East Fork	0821_04	11022	00094	Winter	Raw Data	1.046	-0.340	0.250	0.029	2.381	19.270
East Fork	0821_04	11022	00410	All	Raw Data	-0.058	-1.418	0.142	0.020	-2.436	-5.263
East Fork	0821_04	11022	00410	Summer	Raw Data	0.887	-1.108	0.193	0.060	-2.019	-6.677
East Fork	0821_04	11022	00620	Summer	Natural Log Data	0.836	-1.260	0.361	0.005	3.188	1.039
East Fork	0821_04	11022	00665	All	Raw Data	1.502	-0.211	0.105	0.044	2.081	0.006
East Fork	0821_04	11022	00665	Summer	Raw Data	0.230	-1.145	0.154	0.087	1.810	0.007
East Fork	0821_04	11022	00940	All	Raw Data	0.909	-0.883	0.344	0.000	4.403	3.832
East Fork	0821_04	11022	00940	Summer	Raw Data	-0.602	-1.016	0.341	0.007	3.051	3.388
East Fork	0821_04	11022	00940	Winter	Raw Data	1.455	-0.345	0.361	0.007	3.097	4.446
East Fork	0821_04	11022	00945	All	Raw Data	0.870	-1.261	0.283	0.000	3.822	3.957
East Fork	0821_04	11022	00945	Summer	Raw Data	0.486	-0.907	0.267	0.020	2.562	3.603
East Fork	0821_04	11022	00945	Winter	Raw Data	0.768	-0.838	0.310	0.013	2.763	4.492
East Fork	0821_04	11022	01045	Summer	Raw Data	0.775	-0.533	0.385	0.005	3.265	143.684
East Fork	0821_04	11022	31704	Summer	Raw Data	-0.494	-0.453	0.206	0.067	-1.975	-0.318
East Fork	0821_04	11022	70300	All	Raw Data	-0.334	-0.777	0.119	0.032	2.235	8.276
East Fork	0821_04	11022	70300	Winter	Raw Data	-0.398	-0.610	0.210	0.048	2.129	11.611
East Fork	0821_04	11022	89966	Summer	Raw Data	-0.537	0.418	0.290	0.014	2.709	0.286
East Fork	0821_04	11022	89969	Winter	Raw Data	-1.056	-1.651	0.152	0.099	-1.744	-0.417
East Fork	0821A_01	21717	00615	Summer	Raw Data	1.535	-1.261	0.317	0.012	2.809	0.004
East Fork	0821A_01	21717	00625	Summer	Raw Data	1.018	-0.196	0.174	0.075	-1.895	-0.081

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East Fork	0821A_01	21717	31699	Summer	Raw Data	1.942	0.897	0.184	0.086	-1.840	-94.875
East Fork	0821B_01	21396	00335	Summer	Raw Data	1.774	0.940	0.241	0.045	2.184	6.292
East Fork	0821B_01	21396	00400	All	Raw Data	-1.425	-0.081	0.104	0.082	1.807	0.192
East Fork	0821B_01	21396	00400	Winter	Raw Data	-0.199	-0.837	0.300	0.052	2.174	0.417
East Fork	0821B_01	21396	00530	Summer	Raw Data	1.666	0.677	0.183	0.087	1.831	17.953
East Fork	0821B_01	21396	00620	Winter	Raw Data	0.911	-1.308	0.374	0.026	2.563	0.221
East Fork	0821B_01	21396	00665	Summer	Raw Data	1.663	0.880	0.290	0.026	2.475	0.051
East Fork	0821B_01	21396	00671	All	Natural Log Data	0.851	-2.060	0.145	0.038	2.176	0.982
East Fork	0821C_01	10777	00078	All	Natural Log Data	-1.857	2.545	0.333	0.000	5.514	0.063
East Fork	0821C_01	10777	00078	Winter	Natural Log Data	-0.831	0.641	0.343	0.001	3.756	0.067
East Fork	0821C_01	10777	00094	Summer	Natural Log Data	0.884	0.289	0.162	0.020	2.447	0.016
East Fork	0821C_01	10777	00300	Summer	Raw Data	-0.686	1.102	0.128	0.038	2.164	0.117
East Fork	0821C_01	10777	00620	Winter	Raw Data	1.813	1.210	0.115	0.067	-1.903	-0.063
East Fork	0821C_01	10777	00625	Summer	Natural Log Data	0.220	-0.076	0.181	0.030	-2.300	-0.042
East Fork	0821C_01	10777	31704	All	Raw Data	-0.132	-0.671	0.313	0.000	-3.932	-0.375
East Fork	0821C_01	10777	31704	Summer	Raw Data	-0.515	-0.505	0.281	0.024	-2.503	-0.398
East Fork	0821C_01	10777	31704	Winter	Raw Data	0.889	-0.764	0.358	0.009	-2.989	-0.351
East Fork	0821C_01	10777	70300	All	Natural Log Data	0.571	0.193	0.131	0.003	3.101	0.014
East Fork	0821C_01	10777	70300	Summer	Natural Log Data	1.859	0.963	0.227	0.003	3.203	0.019
East Fork	0821C_01	10777	70953	Winter	Natural Log Data	-1.995	-0.623	0.648	0.000	6.779	0.772
East Fork	0821C_01	10777	89835	Winter	Raw Data	-1.810	-1.110	0.655	0.000	6.460	0.222
East Fork	0821D_01	13740	82903	Summer	Natural Log Data	-0.740	2.781	0.232	0.027	2.399	0.058
East Fork	0821D_01	13740	82903	Winter	Raw Data	1.722	1.644	0.236	0.035	2.294	0.021
East Fork	0821D_01	13740	89835	All	Raw Data	-0.042	-2.566	0.643	0.000	7.943	0.342
East Fork	0821D_01	13740	89835	Summer	Raw Data	-0.891	-1.636	0.455	0.002	3.767	0.284
East Fork	0821D_01	13740	89835	Winter	Raw Data	0.863	-1.721	0.816	0.000	8.422	0.389
Elm Fork	0822_01	17163	00300	All	Raw Data	-0.140	-1.464	0.649	0.000	6.233	0.738
Elm Fork	0822_01	17163	00300	Summer	Raw Data	0.188	-1.014	0.722	0.000	5.093	0.789
Elm Fork	0822_01	17163	00300	Winter	Raw Data	-0.440	-1.021	0.615	0.004	3.794	0.697
Elm Fork	0822_01	18310	00078	Summer	Natural Log Data	1.903	0.785	0.290	0.047	2.216	0.090
Elm Fork	0822_01	18310	00094	All	Natural Log Data	0.700	-0.136	0.141	0.017	2.493	0.030
Elm Fork	0822_01	18310	00094	Summer	Natural Log Data	1.533	0.797	0.449	0.001	3.826	0.050
Elm Fork	0822_01	18310	00620	Winter	Raw Data	0.237	0.382	0.197	0.065	-1.981	-0.038
Elm Fork	0822_01	18310	00900	Winter	Raw Data	-0.107	-1.068	0.173	0.068	-1.940	-4.740
Elm Fork	0822_01	18310	01040	Winter	Natural Log Data	0.421	1.661	0.505	0.000	4.287	0.179

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Elm Fork	0822_01	18310	01351	Summer	Raw Data	1.276	0.737	0.308	0.011	-2.829	-0.161
Elm Fork	0822_01	18310	31699	Winter	Natural Log Data	0.398	0.123	0.138	0.088	1.791	0.201
Elm Fork	0822_01	20287	00061	All	Natural Log Data	0.733	0.040	0.220	0.024	2.434	0.360
Elm Fork	0822_01	20287	00061	Summer	Natural Log Data	0.587	-0.038	0.373	0.027	2.558	0.468
Elm Fork	0822_01	20287	00400	Winter	Raw Data	-0.152	1.915	0.385	0.001	-3.792	-0.066
Elm Fork	0822_01	20287	00615	Winter	Natural Log Data	1.677	-1.278	0.451	0.000	-4.252	-0.192
Elm Fork	0822_01	20287	01046	All	Natural Log Data	1.321	-1.554	0.274	0.007	2.948	0.201
Elm Fork	0822_01	20287	01046	Summer	Raw Data	0.992	-0.994	0.254	0.079	1.937	4.416
Elm Fork	0822_01	20287	01065	All	Raw Data	-0.711	0.473	0.143	0.082	-1.830	-0.075
Elm Fork	0822_01	20287	70300	Winter	Raw Data	-0.495	-0.247	0.148	0.058	-1.997	-5.181
Elm Fork	0822_01	20287	89835	Summer	Raw Data	-1.860	-0.580	0.387	0.013	2.863	0.319
Elm Fork	0822_02	16438	00020	Summer	Raw Data	-1.371	-0.534	0.123	0.001	-3.437	-0.470
Elm Fork	0822_02	16438	00020	Winter	Raw Data	-1.059	-1.192	0.109	0.003	-3.106	-0.609
Elm Fork	0822_02	16438	89979	All	Raw Data	0.926	-2.271	0.164	0.022	2.424	0.225
Elm Fork	0822_02	16438	89979	Winter	Raw Data	0.720	-1.655	0.243	0.062	2.041	0.290
Elm Fork	0822_02	17162	00078	Summer	Raw Data	0.036	-0.866	0.228	0.084	1.882	0.014
Elm Fork	0822_02	17162	00094	Summer	Raw Data	-0.248	-0.892	0.254	0.023	2.478	8.488
Elm Fork	0822_02	17162	00620	Summer	Raw Data	0.497	-0.267	0.254	0.039	2.259	0.058
Elm Fork	0822_02	17162	00625	All	Natural Log Data	1.234	0.392	0.171	0.017	-2.528	-0.053
Elm Fork	0822_02	17162	00625	Winter	Raw Data	1.820	0.531	0.195	0.076	-1.909	-0.052
Elm Fork	0822_02	17162	00671	Summer	Raw Data	0.669	-0.670	0.261	0.026	2.448	0.007
Elm Fork	0822_02	17162	00900	Winter	Raw Data	-0.368	-1.195	0.261	0.021	-2.524	-4.572
Elm Fork	0822_02	17162	01040	Winter	Raw Data	-0.689	-0.671	0.202	0.047	2.134	0.081
Elm Fork	0822_02	17162	01351	Summer	Raw Data	0.187	-0.346	0.264	0.025	-2.467	-0.115
Elm Fork	0822_03	18358	00020	Summer	Raw Data	-1.097	0.447	0.124	0.001	-3.441	-0.459
Elm Fork	0822_03	18358	01065	All	Raw Data	1.165	2.392	0.131	0.049	-2.055	-0.070
Elm Fork	0822_03	18358	01065	Winter	Natural Log Data	0.732	1.095	0.342	0.022	-2.601	-0.040
Elm Fork	0822_04	15252	00665	All	Natural Log Data	-1.997	-0.084	0.144	0.000	-4.898	-0.122
Elm Fork	0822_04	15252	00665	Summer	Natural Log Data	-1.446	-0.167	0.164	0.000	-3.813	-0.137
Elm Fork	0822_04	15252	00665	Winter	Natural Log Data	-1.909	0.052	0.129	0.002	-3.149	-0.106
Elm Fork	0822_04	15252	01065	Winter	Raw Data	-1.480	-0.574	0.488	0.004	-3.517	-0.074
Elm Fork	0822A_01	17167	00625	All	Natural Log Data	0.835	0.390	0.340	0.001	-3.867	-0.084
Elm Fork	0822A_01	17167	00625	Summer	Raw Data	0.963	-0.146	0.442	0.004	-3.446	-0.081
Elm Fork	0822A_01	17167	00625	Winter	Natural Log Data	1.349	1.373	0.247	0.071	-1.983	-0.072
Elm Fork	0822A_01	17167	72053	Winter	Natural Log Data	0.628	-0.424	0.194	0.077	-1.901	-0.244

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Elm Fork	0822A_02	17166	00061	Winter	Natural Log Data	0.044	-1.004	0.261	0.036	2.304	0.291
Elm Fork	0822A_02	17166	00078	Winter	Raw Data	-0.108	-1.694	0.132	0.097	-1.741	-0.026
Elm Fork	0822A_02	17166	00300	Summer	Raw Data	1.820	1.038	0.175	0.030	-2.303	-0.133
Elm Fork	0822B_01	20311	00061	Winter	Natural Log Data	0.875	-0.191	0.200	0.082	1.870	0.263
Elm Fork	0822B_01	20311	01351	Winter	Raw Data	0.915	0.884	0.147	0.071	1.899	0.077
Elm Fork	0822C_01	17170	00620	Summer	Natural Log Data	0.179	-1.472	0.146	0.034	-2.227	-0.157
Elm Fork	0822C_01	17170	00900	Winter	Raw Data	1.284	0.460	0.231	0.002	-3.285	-3.273
Elm Fork	0822C_01	17170	01351	All	Raw Data	1.557	-2.453	0.528	0.000	-9.107	-0.172
Elm Fork	0822C_01	17170	01351	Summer	Natural Log Data	1.603	-1.573	0.628	0.000	-7.797	-0.059
Elm Fork	0822C_01	17170	01351	Winter	Raw Data	0.134	-2.114	0.483	0.000	-5.796	-0.165
Elm Fork	0822D_01	17849	00020	Summer	Raw Data	-1.107	0.174	0.167	0.000	-4.034	-0.558
Elm Fork	0822D_01	17849	00020	Winter	Raw Data	-0.076	-1.337	0.121	0.001	-3.303	-0.608
Elm Fork	0822D_01	17849	01005	Summer	Raw Data	0.141	-0.087	0.209	0.087	1.854	0.736
Elm Fork	0822D_01	17849	01065	All	Raw Data	-1.738	1.527	0.263	0.004	-3.163	-0.077
Elm Fork	0822D_01	17849	01065	Winter	Raw Data	0.352	0.278	0.625	0.000	-4.651	-0.110
Elm Fork	0822D_01	17849	70953	Winter	Raw Data	1.354	0.730	0.367	0.037	2.407	1.907
Elm Fork	0822D_01	17849	89978	All	Natural Log Data	-0.273	-2.427	0.244	0.004	-3.109	-2.912
Elm Fork	0822D_01	17849	89978	Summer	Raw Data	0.463	-1.238	0.217	0.060	-2.036	-0.864
Elm Fork	0822D_01	17849	89978	Winter	Natural Log Data	-0.196	-1.795	0.314	0.030	-2.437	-3.524
Elm Fork	0823_02	16808	00610	All	Natural Log Data	-1.510	0.721	0.115	0.000	-4.269	-0.170
Elm Fork	0823_02	16808	00610	Winter	Natural Log Data	-0.748	1.146	0.178	0.000	-3.838	-0.210
Elm Fork	0823_02	16808	00665	Winter	Natural Log Data	-1.957	-0.380	0.328	0.000	-5.839	-0.135
Elm Fork	0823_02	16808	01005	All	Raw Data	-0.944	1.022	0.131	0.049	2.056	0.758
Elm Fork	0823_02	16808	01005	Summer	Raw Data	-0.515	0.781	0.219	0.078	1.912	1.026
Elm Fork	0823_02	16808	01065	All	Raw Data	-0.627	-0.302	0.196	0.014	-2.609	-0.109
Elm Fork	0823_02	16808	01065	Winter	Raw Data	0.398	1.057	0.497	0.003	-3.586	-0.164
Elm Fork	0823_02	16808	01090	All	Natural Log Data	-1.422	1.202	0.122	0.080	-1.830	-0.146
Elm Fork	0823_03	11027	00310	Summer	Raw Data	1.882	-0.925	0.101	0.005	2.862	0.171
Elm Fork	0823_03	11027	00665	All	Natural Log Data	0.066	-1.048	0.143	0.000	-4.793	-0.121
Elm Fork	0823_03	11027	00665	Summer	Natural Log Data	1.038	-0.760	0.209	0.000	-4.273	-0.158
Elm Fork	0823_03	11027	00940	Summer	Natural Log Data	-0.519	0.261	0.118	0.003	-3.118	-0.023
Elm Fork	0823_03	11027	01065	Summer	Raw Data	-0.142	-0.113	0.219	0.079	-1.909	-0.045
Elm Fork	0823_03	11027	GESMN	All	Natural Log Data	-1.752	-1.988	0.144	0.003	3.151	0.162
Elm Fork	0823_03	11027	GESMN	Winter	Natural Log Data	0.380	-1.308	0.354	0.041	2.341	0.208
Elm Fork	0823_04	17830	00665	All	Natural Log Data	-0.543	-1.457	0.200	0.000	-5.967	-0.143

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Elm Fork	0823_04	17830	00665	Summer	Natural Log Data	-0.133	-0.981	0.198	0.000	-4.213	-0.139
Elm Fork	0823_04	17830	00665	Winter	Natural Log Data	-0.663	-0.948	0.201	0.000	-4.136	-0.147
Elm Fork	0823_04	17830	01065	All	Raw Data	-0.614	-0.692	0.451	0.000	-4.714	-0.074
Elm Fork	0823_04	17830	01065	Summer	Raw Data	0.078	-0.209	0.215	0.095	-1.812	-0.046
Elm Fork	0823_04	17830	01065	Winter	Raw Data	-0.806	-0.522	0.714	0.000	-5.693	-0.100
Elm Fork	0823_04	17830	89978	All	Natural Log Data	-1.120	-1.769	0.175	0.038	-2.207	-2.876
Elm Fork	0823_04	17830	GESMN	All	Natural Log Data	-1.289	-1.867	0.125	0.006	2.855	0.156
Elm Fork	0823_04	17830	GESMN	Winter	Natural Log Data	0.693	-0.773	0.307	0.061	2.106	0.225
Elm Fork	0823_05	11026	00900	Summer	Raw Data	1.013	-0.709	0.192	0.000	-4.055	-1.845
Elm Fork	0823_05	11026	00940	Summer	Natural Log Data	-0.671	-0.125	0.164	0.001	-3.655	-0.028
Elm Fork	0823_05	11026	01065	All	Raw Data	-0.791	-0.722	0.305	0.003	-3.314	-0.068
Elm Fork	0823_05	11026	01065	Summer	Raw Data	0.155	-0.433	0.334	0.024	-2.553	-0.073
Elm Fork	0823_05	11026	01065	Winter	Raw Data	-1.694	0.400	0.261	0.089	-1.881	-0.058
Elm Fork	0823_05	11026	31699	All	Natural Log Data	1.908	-0.712	0.127	0.000	3.802	0.142
Elm Fork	0823_05	11026	31699	Winter	Natural Log Data	1.177	-1.081	0.263	0.000	4.183	0.213
Elm Fork	0823_05	11026	GESMN	Summer	Natural Log Data	-0.188	-1.711	0.107	0.025	2.323	0.154
Elm Fork	0823A_01	16826	00020	Winter	Raw Data	-0.679	-0.356	0.116	0.007	-2.805	-0.730
Elm Fork	0823A_01	16826	00061	All	Natural Log Data	-0.608	-1.775	0.311	0.009	-2.926	-0.932
Elm Fork	0823A_01	16826	00061	Winter	Raw Data	1.276	-0.087	0.310	0.094	1.897	0.610
Elm Fork	0823A_01	16826	00300	Summer	Raw Data	-1.544	-0.039	0.216	0.000	4.026	0.205
Elm Fork	0823A_01	16826	00400	Summer	Natural Log Data	1.878	1.368	0.114	0.007	2.781	0.004
Elm Fork	0823C_01	10859	00078	Summer	Raw Data	0.617	-1.422	0.121	0.076	-1.852	-0.028
Elm Fork	0823C_01	10859	00665	All	Natural Log Data	0.538	-2.119	0.181	0.003	3.190	0.165
Elm Fork	0823C_01	10859	00665	Summer	Natural Log Data	0.255	-1.521	0.166	0.043	2.140	0.162
Elm Fork	0823C_01	10859	00665	Winter	Natural Log Data	0.362	-1.817	0.186	0.040	2.191	0.161
Elm Fork	0823C_01	10859	00680	Summer	Raw Data	1.145	-0.557	0.181	0.043	2.158	0.234
Elm Fork	0823C_01	10859	70300	Summer	Natural Log Data	1.242	2.225	0.109	0.046	-2.072	-0.029
Elm Fork	0823C_01	13618	00061	Winter	Natural Log Data	-1.248	0.939	0.286	0.027	2.452	0.402
Elm Fork	0823C_01	16827	00410	Summer	Raw Data	-0.088	-0.907	0.116	0.006	2.827	3.255
Elm Fork	0823C_01	16827	00665	Summer	Natural Log Data	0.188	-1.543	0.166	0.001	-3.450	-0.165
Elm Fork	0823C_01	16827	01065	All	Raw Data	-0.033	0.377	0.450	0.000	-4.141	-0.135
Elm Fork	0823C_01	16827	01065	Summer	Raw Data	-0.642	-0.206	0.507	0.006	-3.362	-0.113
Elm Fork	0823C_01	16827	01065	Winter	Raw Data	-0.249	0.217	0.508	0.021	-2.872	-0.171
Elm Fork	0823C_01	16827	89979	All	Raw Data	0.000	-2.469	0.125	0.047	2.071	0.200
Elm Fork	0823D_01	20291	00410	All	Natural Log Data	1.412	-0.972	0.202	0.006	-2.932	-0.145

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Elm Fork	0823D_01	20291	00410	Winter	Raw Data	1.586	0.479	0.229	0.045	-2.178	-20.162
Elm Fork	0823D_01	20291	00610	All	Natural Log Data	0.474	-2.310	0.168	0.003	3.079	0.213
Elm Fork	0823D_01	20291	00610	Winter	Natural Log Data	0.594	-1.596	0.344	0.003	3.394	0.309
Elm Fork	0823D_01	20291	31699	Winter	Natural Log Data	-1.103	-0.385	0.143	0.057	-2.003	-0.238
Elm Fork	0823D_01	20291	89979	Winter	Raw Data	1.629	-0.790	0.408	0.014	-2.877	-0.355
Elm Fork	0824_01	11031	00020	Summer	Raw Data	0.266	-1.772	0.103	0.003	-3.068	-0.390
Elm Fork	0824_01	11031	00094	Winter	Raw Data	-0.091	-1.123	0.132	0.001	-3.440	-16.731
Elm Fork	0824_01	11031	00900	Winter	Raw Data	-1.563	-0.458	0.105	0.005	2.902	4.417
Elm Fork	0824_01	11031	00940	Winter	Raw Data	0.502	-1.029	0.115	0.003	-3.082	-1.640
Elm Fork	0824_01	11031	01040	Summer	Raw Data	0.085	-0.950	0.240	0.075	-1.947	-0.061
Elm Fork	0824_01	11031	01065	All	Natural Log Data	1.564	1.864	0.131	0.050	-2.050	-0.045
Elm Fork	0824_01	11031	01351	Winter	Natural Log Data	1.012	-0.420	0.113	0.001	3.393	0.014
Elm Fork	0824_03	15635	00671	Winter	Natural Log Data	1.812	-0.406	0.347	0.027	-2.523	-0.521
Elm Fork	0824_03	15635	31699	Winter	Natural Log Data	0.918	-0.905	0.114	0.029	2.267	0.131
Elm Fork	0825_01	14244	00020	Summer	Raw Data	-1.041	-0.500	0.100	0.003	-3.063	-0.384
Elm Fork	0825_01	14244	00940	Summer	Raw Data	1.125	0.398	0.145	0.000	3.979	1.108
Elm Fork	0825_01	14244	01065	All	Raw Data	-1.764	0.468	0.262	0.004	-3.150	-0.082
Elm Fork	0825_01	14244	01065	Winter	Raw Data	-0.341	-0.259	0.713	0.000	-5.676	-0.117
Elm Fork	0825_01	14244	70953	All	Raw Data	0.518	-0.962	0.273	0.005	3.061	1.712
Elm Fork	0825_01	14244	70953	Summer	Raw Data	0.510	-0.908	0.302	0.052	2.181	1.728
Elm Fork	0825_01	14244	70953	Winter	Raw Data	0.290	-0.361	0.311	0.038	2.328	1.906
Elm Fork	0826_01	11035	00052	All	Raw Data	1.636	0.158	0.182	0.026	2.359	1.564
Elm Fork	0826_01	11035	00052	Winter	Raw Data	1.402	0.537	0.247	0.060	2.063	1.773
Elm Fork	0826_01	11035	00053	All	Raw Data	-1.584	-1.272	0.228	0.014	2.663	3.689
Elm Fork	0826_01	11035	00053	Summer	Raw Data	-1.005	-0.980	0.370	0.036	2.423	5.109
Elm Fork	0826_01	11035	00078	All	Raw Data	0.947	-0.248	0.134	0.030	2.262	0.033
Elm Fork	0826_01	11035	00078	Summer	Raw Data	0.461	-0.798	0.221	0.077	1.923	0.049
Elm Fork	0826_01	11035	00530	Summer	Raw Data	-0.309	-0.719	0.313	0.047	-2.237	-0.744
Elm Fork	0826_01	11035	00680	All	Raw Data	0.075	-0.979	0.155	0.021	2.426	0.101
Elm Fork	0826_01	11035	00680	Summer	Raw Data	0.092	0.123	0.277	0.053	2.146	0.123
Elm Fork	0826_01	11035	31699	All	Natural Log Data	1.605	-0.427	0.102	0.086	-1.781	-0.143
Elm Fork	0826_01	11035	31704	Summer	Raw Data	0.342	-0.850	0.346	0.035	2.410	0.622
Elm Fork	0826_01	11035	70300	All	Raw Data	0.676	-0.836	0.122	0.043	2.112	4.314
Elm Fork	0826_01	11035	82903	All	Raw Data	1.744	0.316	0.150	0.031	2.260	0.342
Elm Fork	0826_01	11035	82903	Winter	Raw Data	1.379	0.265	0.248	0.042	2.221	0.459

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Elm Fork	0826_01	17827	00094	Summer	Natural Log Data	1.278	-1.115	0.356	0.000	6.485	0.017
Elm Fork	0826_01	17827	00665	All	Natural Log Data	-1.925	-0.945	0.111	0.000	-4.128	-0.102
Elm Fork	0826_01	17827	00665	Summer	Natural Log Data	-0.676	-1.007	0.143	0.001	-3.471	-0.123
Elm Fork	0826_01	17827	01005	All	Raw Data	1.051	-0.213	0.273	0.004	3.126	0.592
Elm Fork	0826_01	17827	01005	Summer	Raw Data	0.682	0.641	0.567	0.003	3.797	0.854
Elm Fork	0826_01	17827	01065	All	Raw Data	0.645	0.369	0.206	0.015	-2.596	-0.059
Elm Fork	0826_01	17827	01065	Winter	Raw Data	0.256	0.198	0.325	0.026	-2.503	-0.085
Elm Fork	0826_05	13875	00094	Summer	Natural Log Data	1.695	-0.907	0.381	0.000	6.744	0.018
Elm Fork	0826_05	13875	00665	All	Natural Log Data	-0.923	-0.750	0.100	0.000	-3.848	-0.102
Elm Fork	0826_05	13875	00665	Winter	Natural Log Data	-1.979	-1.226	0.116	0.007	-2.777	-0.103
Elm Fork	0826_05	13875	01005	All	Raw Data	0.829	-0.652	0.131	0.058	1.981	0.363
Elm Fork	0826_05	13875	01065	All	Natural Log Data	0.650	2.082	0.397	0.000	-4.139	-0.038
Elm Fork	0826_05	13875	01065	Summer	Natural Log Data	0.971	1.294	0.418	0.012	-2.936	-0.044
Elm Fork	0826_05	13875	01065	Winter	Raw Data	-1.444	-0.055	0.364	0.022	-2.621	-0.055
Elm Fork	0826_06	16112	00052	All	Raw Data	1.560	0.169	0.173	0.035	2.237	1.490
Elm Fork	0826_06	16112	00052	Winter	Raw Data	1.402	0.537	0.247	0.060	2.063	1.773
Elm Fork	0826_06	16112	00053	All	Raw Data	-1.584	-1.272	0.228	0.014	2.663	3.689
Elm Fork	0826_06	16112	00053	Summer	Raw Data	-1.005	-0.980	0.370	0.036	2.423	5.109
Elm Fork	0826_06	16112	00680	All	Raw Data	-0.220	-0.338	0.150	0.026	2.337	0.089
Elm Fork	0826_06	16112	31704	Summer	Raw Data	0.633	-0.250	0.372	0.027	2.554	0.644
Elm Fork	0826_06	16112	70300	All	Raw Data	0.782	-0.665	0.110	0.056	1.984	3.842
Elm Fork	0826_06	17828	00094	All	Raw Data	1.562	0.053	0.100	0.000	4.042	3.408
Elm Fork	0826_06	17828	00094	Summer	Natural Log Data	1.570	-1.007	0.395	0.000	6.951	0.017
Elm Fork	0826_06	17828	00665	Summer	Natural Log Data	-1.588	-1.124	0.157	0.001	-3.583	-0.126
Elm Fork	0826_06	17828	01065	All	Raw Data	0.181	-0.316	0.254	0.006	-2.973	-0.053
Elm Fork	0826_06	17828	01065	Winter	Raw Data	-0.112	0.165	0.353	0.025	-2.557	-0.068
Elm Fork	0826_06	17828	GESMN	All	Natural Log Data	-1.323	-2.217	0.102	0.011	2.626	0.140
Elm Fork	0826A_01	14485	00410	Summer	Raw Data	-0.652	-0.673	0.132	0.002	3.260	4.913
Elm Fork	0826A_01	14485	01065	All	Raw Data	0.243	-0.172	0.517	0.000	-5.176	-0.220
Elm Fork	0826A_01	14485	01065	Summer	Raw Data	0.344	-0.235	0.492	0.008	-3.265	-0.257
Elm Fork	0826A_01	14485	01065	Winter	Raw Data	0.302	-0.739	0.619	0.001	-4.417	-0.186
Elm Fork	0826A_01	14485	89979	All	Raw Data	1.607	-1.375	0.362	0.003	3.372	0.530
Elm Fork	0826A_01	14485	89979	Winter	Raw Data	0.549	-1.600	0.309	0.061	2.112	0.527
Elm Fork	0826A_02	14483	00094	Summer	Raw Data	-0.441	-0.435	0.110	0.009	2.694	16.155
Elm Fork	0826A_02	14483	00900	Summer	Raw Data	0.478	-0.674	0.102	0.016	2.475	6.018

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Elm Fork	0826A_02	14483	01065	All	Natural Log Data	-1.424	-0.067	0.419	0.000	-4.071	-0.105
Elm Fork	0826A_02	14483	01065	Summer	Natural Log Data	-0.849	0.207	0.247	0.059	-2.067	-0.082
Elm Fork	0826A_02	14483	01065	Winter	Raw Data	-0.148	-0.454	0.765	0.001	-5.099	-0.224
Elm Fork	0826A_02	14483	01106	Winter	Raw Data	0.975	-0.949	0.410	0.046	2.359	6.118
Elm Fork	0826A_02	14483	89978	Winter	Natural Log Data	1.870	-0.557	0.439	0.007	-3.193	-3.710
Elm Fork	0839_01	13619	00094	Winter	Raw Data	-1.224	1.497	0.409	0.000	-7.248	-6.078
Elm Fork	0839_01	13619	00665	All	Natural Log Data	0.696	-2.726	0.162	0.000	-5.145	-0.142
Elm Fork	0839_01	13619	00665	Summer	Natural Log Data	0.047	-2.160	0.148	0.001	-3.513	-0.134
Elm Fork	0839_01	13619	00665	Winter	Natural Log Data	0.979	-1.556	0.191	0.000	-3.883	-0.157
Elm Fork	0839_01	13619	00900	All	Natural Log Data	1.378	2.327	0.162	0.000	-5.314	-0.017
Elm Fork	0839_01	13619	00900	Winter	Natural Log Data	0.446	1.585	0.262	0.000	-4.982	-0.021
Elm Fork	0839_01	13619	00940	Winter	Natural Log Data	-0.153	2.745	0.289	0.000	-5.333	-0.057
Elm Fork	0839_01	13619	01005	All	Raw Data	0.646	-0.172	0.485	0.000	-5.043	-0.731
Elm Fork	0839_01	13619	01005	Summer	Raw Data	0.068	-0.117	0.645	0.000	-4.857	-0.919
Elm Fork	0839_01	13619	01005	Winter	Raw Data	0.665	0.291	0.330	0.032	-2.429	-0.513
Elm Fork	0839_01	13619	01065	All	Raw Data	0.231	0.093	0.500	0.000	-5.198	-0.086
Elm Fork	0839_01	13619	01065	Summer	Raw Data	0.612	0.109	0.390	0.017	-2.773	-0.086
Elm Fork	0839_01	13619	01065	Winter	Raw Data	-0.906	-0.215	0.689	0.000	-5.366	-0.085
Elm Fork	0839_01	13619	89978	All	Natural Log Data	-1.770	-1.594	0.102	0.074	1.851	1.755
Elm Fork	0840_01	14039	00010	Winter	Raw Data	-0.083	-0.345	0.258	0.064	2.040	0.688
Elm Fork	0840_01	14039	00053	Winter	Raw Data	-0.794	-1.151	0.383	0.032	2.489	3.537
Elm Fork	0840_01	14039	00078	All	Raw Data	-0.084	-0.067	0.126	0.043	2.110	0.044
Elm Fork	0840_01	14039	00078	Summer	Raw Data	0.121	-0.145	0.241	0.028	2.388	0.053
Elm Fork	0840_01	14039	00078	Winter	Raw Data	-0.428	0.154	0.264	0.073	1.985	0.047
Elm Fork	0840_01	14039	00094	All	Raw Data	-1.985	0.723	0.309	0.001	-3.841	-5.589
Elm Fork	0840_01	14039	00094	Winter	Raw Data	-0.560	-1.070	0.222	0.089	-1.848	-4.679
Elm Fork	0840_01	14039	00410	All	Raw Data	0.086	-0.423	0.102	0.069	-1.881	-0.798
Elm Fork	0840_01	14039	00410	Winter	Raw Data	-1.530	0.385	0.238	0.077	-1.934	-0.721
Elm Fork	0840_01	14039	00940	All	Raw Data	-0.384	-1.529	0.209	0.008	-2.819	-0.584
Elm Fork	0840_01	14039	00940	Summer	Raw Data	-0.219	-1.087	0.245	0.037	-2.281	-0.626
Elm Fork	0840_01	14039	00945	All	Raw Data	-0.243	-1.862	0.380	0.000	-4.289	-0.822
Elm Fork	0840_01	14039	00945	Summer	Raw Data	-0.133	-1.324	0.397	0.005	-3.245	-0.875
Elm Fork	0840_01	14039	00945	Winter	Raw Data	-0.236	-1.461	0.385	0.018	-2.743	-0.792
Elm Fork	0840_01	14039	70300	All	Raw Data	-1.795	0.316	0.280	0.001	-3.583	-3.544
Elm Fork	0840_01	14039	70300	Summer	Raw Data	-1.510	0.803	0.240	0.024	-2.451	-3.346

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Elm Fork	0840_01	14039	70300	Winter	Raw Data	-0.920	-0.987	0.423	0.012	-2.965	-4.304
Elm Fork	0840_01	17834	00665	Summer	Natural Log Data	1.865	-1.387	0.104	0.005	-2.886	-0.111
Elm Fork	0840_01	17834	00900	Winter	Raw Data	1.616	0.833	0.141	0.001	-3.408	-1.559
Elm Fork	0840_01	17834	00940	Winter	Raw Data	0.889	-0.651	0.395	0.000	-6.664	-0.960
Elm Fork	0840_01	17834	01005	All	Raw Data	0.125	-0.297	0.553	0.000	-5.776	-0.749
Elm Fork	0840_01	17834	01005	Summer	Raw Data	-0.361	0.411	0.510	0.003	-3.681	-0.693
Elm Fork	0840_01	17834	01005	Winter	Raw Data	0.467	-0.364	0.597	0.001	-4.218	-0.810
Elm Fork	0840_01	17834	01065	All	Natural Log Data	0.219	-1.048	0.529	0.000	-5.504	-0.099
Elm Fork	0840_01	17834	01065	Summer	Natural Log Data	0.055	-0.775	0.653	0.000	-4.749	-0.122
Elm Fork	0840_01	17834	01065	Winter	Raw Data	0.077	-1.268	0.401	0.011	-2.948	-0.066
Elm Fork	0840_01	17834	GESMN	Winter	Raw Data	1.589	-0.355	0.564	0.005	3.595	2.671
Elm Fork	0840_02	11076	00094	Summer	Raw Data	-1.652	0.146	0.103	0.005	-2.911	-1.471
Elm Fork	0840_02	11076	00094	Winter	Raw Data	-1.817	0.120	0.470	0.000	-8.212	-6.267
Elm Fork	0840_02	11076	00610	Winter	Natural Log Data	1.104	-2.648	0.117	0.004	2.982	0.140
Elm Fork	0840_02	11076	00665	Winter	Natural Log Data	0.556	-1.909	0.105	0.007	-2.776	-0.098
Elm Fork	0840_02	11076	00900	Winter	Natural Log Data	1.826	0.217	0.153	0.001	-3.556	-0.016
Elm Fork	0840_02	11076	00940	All	Natural Log Data	-0.491	0.853	0.364	0.000	-9.178	-0.054
Elm Fork	0840_02	11076	00940	Summer	Natural Log Data	0.423	2.261	0.499	0.000	-8.588	-0.053
Elm Fork	0840_02	11076	00940	Winter	Natural Log Data	-1.116	-0.145	0.286	0.000	-5.333	-0.055
Elm Fork	0840_02	11076	01005	Summer	Raw Data	-0.059	0.438	0.371	0.016	-2.771	-0.629
Elm Fork	0840_02	11076	01065	All	Raw Data	-0.856	-1.030	0.345	0.001	-3.768	-0.071
Elm Fork	0840_02	11076	01065	Summer	Raw Data	-0.286	-1.260	0.685	0.000	-5.113	-0.114
Elm Fork	0840_02	11076	89978	All	Natural Log Data	-1.997	-1.057	0.257	0.010	-2.820	-3.401
Elm Fork	0840_02	11076	89978	Summer	Raw Data	0.946	-0.798	0.320	0.035	-2.378	-5.084
Elm Fork	0840_02	11076	GESMN	Winter	Natural Log Data	-0.111	-1.192	0.342	0.046	2.281	0.290
Elm Fork	0840_02	14044	00053	Winter	Raw Data	-0.794	-1.151	0.383	0.032	2.489	3.537
Elm Fork	0840_02	14044	00078	All	Natural Log Data	0.410	0.476	0.110	0.064	1.923	0.026
Elm Fork	0840_02	14044	00078	Summer	Raw Data	1.422	1.746	0.278	0.020	2.557	0.054
Elm Fork	0840_02	14044	00094	All	Raw Data	-1.124	1.108	0.198	0.009	-2.766	-5.416
Elm Fork	0840_02	14044	00094	Winter	Raw Data	-0.796	-1.045	0.423	0.016	-2.839	-7.827
Elm Fork	0840_02	14044	00410	Winter	Raw Data	-0.803	0.193	0.265	0.072	-1.993	-1.354
Elm Fork	0840_02	14044	00680	Winter	Natural Log Data	1.431	1.270	0.478	0.009	3.174	0.046
Elm Fork	0840_02	14044	00940	All	Raw Data	-0.339	-1.570	0.281	0.002	-3.367	-0.711
Elm Fork	0840_02	14044	00940	Summer	Raw Data	-0.085	-1.093	0.237	0.040	-2.230	-0.590
Elm Fork	0840_02	14044	00940	Winter	Raw Data	-0.468	-1.180	0.403	0.020	-2.723	-0.987

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Elm Fork	0840_02	14044	00945	All	Raw Data	-0.258	-1.955	0.452	0.000	-4.890	-0.987
Elm Fork	0840_02	14044	00945	Summer	Raw Data	-0.114	-1.373	0.398	0.005	-3.253	-0.903
Elm Fork	0840_02	14044	00945	Winter	Raw Data	-0.297	-1.548	0.597	0.002	-4.035	-1.218
Elm Fork	0840_02	14044	70300	All	Raw Data	-0.788	0.874	0.127	0.042	-2.125	-2.842
Elm Fork	0840_02	14044	70300	Winter	Raw Data	-0.796	-1.045	0.423	0.016	-2.839	-5.088
Elm Fork	0840_03	16823	00020	Summer	Raw Data	0.747	-0.527	0.101	0.003	-3.034	-0.384
Elm Fork	0840_03	16823	00094	Winter	Raw Data	0.348	0.232	0.177	0.000	-4.095	-6.052
Elm Fork	0840_03	16823	00671	Summer	Natural Log Data	-1.873	-0.922	0.101	0.005	-2.927	-0.146
Elm Fork	0840_03	16823	00940	Summer	Natural Log Data	-1.703	0.031	0.251	0.000	-5.141	-0.060
Elm Fork	0840_03	16823	01005	All	Raw Data	-0.221	0.029	0.101	0.092	-1.746	-0.551
Elm Fork	0840_03	16823	01005	Summer	Raw Data	0.571	0.559	0.291	0.038	-2.311	-0.952
Elm Fork	0840_03	16823	01065	All	Raw Data	0.309	-0.441	0.174	0.022	-2.427	-0.092
Elm Fork	0840_03	16823	01065	Winter	Raw Data	0.550	-0.200	0.282	0.042	-2.261	-0.119
Elm Fork	0840_03	16823	89978	Winter	Natural Log Data	1.879	-0.535	0.437	0.007	-3.177	-3.394
Elm Fork	0840_03	16823	89979	All	Raw Data	1.962	-1.580	0.221	0.007	-2.914	-0.247
Elm Fork	0840_04	16822	00665	Summer	Natural Log Data	-1.508	-1.859	0.145	0.001	-3.523	-0.121
Elm Fork	0840_04	16822	00900	Summer	Natural Log Data	1.970	1.185	0.249	0.000	-5.083	-0.025
Elm Fork	0840_04	16822	00940	Summer	Raw Data	1.957	-0.165	0.372	0.000	-6.803	-0.726
Elm Fork	0840_04	16822	00940	Winter	Natural Log Data	0.165	2.899	0.225	0.000	-4.569	-0.061
Elm Fork	0840_04	16822	01065	All	Raw Data	0.231	-0.198	0.275	0.003	-3.200	-0.084
Elm Fork	0840_04	16822	01065	Winter	Raw Data	0.941	0.225	0.573	0.002	-4.010	-0.136
Elm Fork	0840_06	14043	00010	Winter	Raw Data	-0.363	-0.189	0.272	0.056	2.118	0.652
Elm Fork	0840_06	14043	00053	All	Raw Data	-1.874	-0.824	0.239	0.010	2.805	2.549
Elm Fork	0840_06	14043	00053	Winter	Raw Data	-0.794	-1.151	0.383	0.032	2.489	3.537
Elm Fork	0840_06	14043	00078	All	Raw Data	-0.364	0.487	0.336	0.000	4.026	0.052
Elm Fork	0840_06	14043	00078	Summer	Raw Data	0.687	-0.330	0.223	0.035	2.275	0.040
Elm Fork	0840_06	14043	00078	Winter	Raw Data	-1.006	0.319	0.680	0.000	5.051	0.072
Elm Fork	0840_06	14043	00094	All	Raw Data	-1.578	0.296	0.312	0.001	-3.809	-5.463
Elm Fork	0840_06	14043	00094	Summer	Raw Data	-1.537	1.438	0.280	0.016	-2.648	-5.337
Elm Fork	0840_06	14043	00094	Winter	Raw Data	-0.722	-1.064	0.376	0.020	-2.686	-5.797
Elm Fork	0840_06	14043	00410	All	Raw Data	1.171	-0.205	0.172	0.018	-2.497	-1.066
Elm Fork	0840_06	14043	00410	Winter	Raw Data	1.301	0.974	0.536	0.004	-3.567	-1.623
Elm Fork	0840_06	14043	00625	All	Raw Data	1.460	0.683	0.113	0.069	-1.892	-0.015
Elm Fork	0840_06	14043	00680	All	Natural Log Data	-0.968	2.426	0.382	0.000	4.164	0.038
Elm Fork	0840_06	14043	00680	Summer	Raw Data	-1.837	2.015	0.550	0.001	4.280	0.203

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Elm Fork	0840_06	14043	00680	Winter	Natural Log Data	1.431	1.270	0.275	0.066	2.044	0.032
Elm Fork	0840_06	14043	00940	All	Raw Data	-0.441	-1.254	0.224	0.007	-2.896	-0.575
Elm Fork	0840_06	14043	00940	Summer	Raw Data	0.018	-0.923	0.225	0.047	-2.157	-0.547
Elm Fork	0840_06	14043	00940	Winter	Raw Data	-0.705	-0.750	0.238	0.091	-1.851	-0.624
Elm Fork	0840_06	14043	00945	All	Raw Data	-0.519	-1.829	0.408	0.000	-4.475	-0.844
Elm Fork	0840_06	14043	00945	Summer	Raw Data	-0.179	-1.408	0.419	0.004	-3.398	-0.868
Elm Fork	0840_06	14043	00945	Winter	Raw Data	-0.652	-1.225	0.413	0.018	-2.782	-0.831
Elm Fork	0840_06	14043	70300	All	Raw Data	0.051	0.735	0.263	0.002	-3.375	-3.627
Elm Fork	0840_06	14043	70300	Winter	Raw Data	0.514	-0.026	0.524	0.003	-3.633	-5.513
Elm Fork	0840_06	14043	82903	All	Raw Data	0.045	-1.120	0.209	0.007	2.861	0.217
Elm Fork	0840_06	14043	82903	Winter	Raw Data	0.215	-1.251	0.514	0.006	3.414	0.355
Elm Fork	0840_07	16824	00310	Summer	Natural Log Data	0.565	-2.673	0.145	0.001	3.498	0.065
Elm Fork	0840_07	16824	00665	All	Natural Log Data	0.149	-2.893	0.121	0.000	-4.364	-0.113
Elm Fork	0840_07	16824	00665	Summer	Natural Log Data	0.818	-2.014	0.133	0.002	-3.296	-0.122
Elm Fork	0840_07	16824	00665	Winter	Natural Log Data	-0.909	-2.171	0.104	0.007	-2.773	-0.102
Elm Fork	0840_07	16824	01005	All	Raw Data	0.211	-0.060	0.413	0.000	-4.278	-0.597
Elm Fork	0840_07	16824	01005	Summer	Raw Data	0.229	0.144	0.343	0.022	-2.605	-0.553
Elm Fork	0840_07	16824	01005	Winter	Raw Data	0.163	0.153	0.530	0.005	-3.523	-0.657
Elm Fork	0840_07	16824	01065	All	Raw Data	-1.278	-0.710	0.540	0.000	-5.520	-0.089
Elm Fork	0840_07	16824	01065	Summer	Raw Data	-1.172	-0.565	0.607	0.001	-4.302	-0.097
Elm Fork	0840_07	16824	01065	Winter	Raw Data	-0.684	-0.146	0.468	0.007	-3.250	-0.081
Lower Trinity	0801_01	10892	00020	Summer	Raw Data	-0.022	-0.910	0.624	0.000	-5.909	-2.744
Lower Trinity	0801_01	10892	00480	Winter	Raw Data	-1.779	-1.328	0.130	0.064	-1.935	-0.013
Lower Trinity	0801_01	10892	01351	All	Raw Data	1.338	0.497	0.244	0.000	3.893	0.140
Lower Trinity	0801_01	10892	01351	Summer	Raw Data	1.347	-0.025	0.384	0.001	3.701	0.161
Lower Trinity	0801_01	20839	00300	Summer	Raw Data	0.288	-0.828	0.408	0.019	-2.753	-0.385
Lower Trinity	0801_01	20839	00400	Summer	Raw Data	-0.194	-0.731	0.540	0.002	-3.907	-0.241
Lower Trinity	0801_01	20839	00530	All	Natural Log Data	1.165	0.917	0.149	0.043	-2.130	-0.263
Lower Trinity	0801_01	20839	00665	All	Natural Log Data	0.652	1.648	0.104	0.082	-1.806	-0.108
Lower Trinity	0801_01	20839	00665	Summer	Natural Log Data	1.107	0.433	0.207	0.088	-1.842	-0.112
Lower Trinity	0801B_01	18360	00530	Summer	Raw Data	1.957	-0.229	0.107	0.032	-2.214	-0.935
Lower Trinity	0801B_01	18360	72053	Winter	Raw Data	1.457	-1.318	0.130	0.065	1.931	0.208
Lower Trinity	0801C_01	18696	00094	Summer	Raw Data	0.436	-1.471	0.130	0.083	-1.816	-40.606
Lower Trinity	0801C_01	18696	00400	All	Natural Log Data	1.808	1.474	0.211	0.001	3.544	0.004
Lower Trinity	0801C_01	18696	00400	Summer	Raw Data	1.677	0.925	0.185	0.036	2.236	0.036

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Lower Trinity	0801C_01	18696	00400	Winter	Raw Data	1.007	0.414	0.300	0.005	3.137	0.029
Lower Trinity	0801C_01	18696	00410	Summer	Raw Data	0.484	-0.899	0.113	0.100	-1.715	-7.140
Lower Trinity	0801C_01	18696	00530	Summer	Raw Data	1.151	-0.799	0.218	0.019	2.531	2.073
Lower Trinity	0801C_01	18696	00535	All	Natural Log Data	0.245	-2.107	0.105	0.022	2.369	0.120
Lower Trinity	0801C_01	18696	00535	Summer	Raw Data	0.480	-1.280	0.259	0.009	2.836	0.491
Lower Trinity	0801C_01	18696	00610	Winter	Natural Log Data	-1.770	0.502	0.126	0.082	1.820	0.160
Lower Trinity	0801C_01	18696	00665	All	Raw Data	0.850	-1.358	0.119	0.025	-2.327	-0.081
Lower Trinity	0801C_01	18696	00665	Summer	Raw Data	1.112	-1.242	0.200	0.037	-2.237	-0.119
Lower Trinity	0801C_01	18696	00940	Summer	Raw Data	0.792	-1.146	0.142	0.063	-1.955	-7.192
Lower Trinity	0801C_01	18696	00951	Summer	Raw Data	0.456	-1.271	0.166	0.043	-2.143	-0.058
Lower Trinity	0801C_01	18696	82903	All	Natural Log Data	0.321	-0.439	0.226	0.005	3.055	0.072
Lower Trinity	0801C_01	18696	82903	Summer	Raw Data	1.729	0.033	0.209	0.065	1.989	0.045
Lower Trinity	0801C_01	18696	82903	Winter	Raw Data	0.812	-0.021	0.313	0.019	2.616	0.039
Lower Trinity	0801C_01	18697	00094	Summer	Natural Log Data	-0.898	-1.067	0.156	0.062	-1.968	-0.147
Lower Trinity	0801C_01	18697	00300	Winter	Raw Data	0.100	-0.629	0.170	0.045	-2.126	-0.255
Lower Trinity	0801C_01	18697	00410	Summer	Raw Data	0.900	-0.439	0.141	0.071	-1.897	-1.586
Lower Trinity	0801C_01	18697	00480	Summer	Natural Log Data	-0.811	-0.962	0.148	0.070	-1.909	-0.142
Lower Trinity	0801C_01	18697	00680	Summer	Raw Data	0.926	-0.706	0.136	0.091	1.776	0.197
Lower Trinity	0801C_01	18697	00945	Summer	Natural Log Data	-0.410	-0.908	0.143	0.076	-1.870	-0.135
Lower Trinity	0801C_01	18697	31701	Summer	Natural Log Data	0.333	0.252	0.182	0.069	1.944	0.247
Lower Trinity	0801D_01	16148	00900	Summer	Raw Data	0.604	1.545	0.503	0.014	3.020	7.632
Lower Trinity	0801D_01	16148	01000	Summer	Raw Data	1.913	0.294	0.406	0.035	2.479	0.420
Lower Trinity	0801D_01	16148	01056	All	Natural Log Data	1.649	-1.159	0.371	0.002	-3.521	-0.389
Lower Trinity	0801D_01	16148	01056	Winter	Natural Log Data	0.748	-1.329	0.682	0.001	-4.632	-0.429
Lower Trinity	0801D_01	16148	01090	Summer	Natural Log Data	1.008	-1.120	0.366	0.049	-2.280	-0.320
Lower Trinity	0801D_01	16148	01090	Winter	Natural Log Data	1.521	-0.052	0.517	0.006	-3.433	-0.353
Lower Trinity	0802_01	10894	00665	All	Raw Data	0.742	-0.065	0.175	0.002	-3.219	-0.005
Lower Trinity	0802_01	10894	00665	Summer	Raw Data	0.751	-0.699	0.116	0.077	-1.844	-0.004
Lower Trinity	0802_01	10894	00665	Winter	Raw Data	0.694	0.647	0.370	0.002	-3.509	-0.008
Lower Trinity	0802_01	10894	00671	All	Raw Data	1.122	-0.781	0.402	0.000	-4.178	-0.015
Lower Trinity	0802_01	10894	00671	Summer	Raw Data	0.350	-0.595	0.344	0.035	-2.401	-0.016
Lower Trinity	0802_01	10894	00671	Winter	Raw Data	1.330	-0.059	0.505	0.003	-3.644	-0.015
Lower Trinity	0802_01	10894	00951	All	Raw Data	-0.804	-1.570	0.114	0.011	-2.633	-0.012
Lower Trinity	0802_01	10894	00951	Summer	Raw Data	0.054	-1.243	0.128	0.056	-1.993	-0.014
Lower Trinity	0802_01	10894	70300	Summer	Raw Data	1.914	1.153	0.118	0.068	-1.901	-3.120

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Lower Trinity	0802_01	10894	72053	Winter	Raw Data	1.666	0.905	0.181	0.021	2.444	0.324
Lower Trinity	0802_02	10895	00010	Winter	Raw Data	-0.665	-0.322	0.671	0.004	4.043	1.865
Lower Trinity	0802_02	10895	72053	All	Natural Log Data	-0.175	-1.075	0.154	0.078	1.861	0.257
Lower Trinity	0802_02	10895	72053	Winter	Natural Log Data	1.077	-0.349	0.335	0.080	2.006	0.455
Lower Trinity	0802_03	10896	00094	Summer	Raw Data	-0.644	0.668	0.110	0.084	-1.797	-4.114
Lower Trinity	0802_03	10896	00300	Winter	Raw Data	1.892	1.880	0.111	0.067	-1.901	-0.069
Lower Trinity	0802_03	10896	00665	Winter	Raw Data	0.555	0.240	0.242	0.015	-2.652	-0.006
Lower Trinity	0802_03	10896	00671	All	Raw Data	1.068	-0.327	0.413	0.000	-4.277	-0.015
Lower Trinity	0802_03	10896	00671	Summer	Raw Data	0.807	0.169	0.397	0.021	-2.690	-0.017
Lower Trinity	0802_03	10896	00671	Winter	Raw Data	0.627	-0.835	0.476	0.004	-3.439	-0.014
Lower Trinity	0802_03	10896	00945	All	Raw Data	-0.054	-0.579	0.125	0.006	-2.828	-0.768
Lower Trinity	0802_03	10896	00945	Summer	Raw Data	0.001	-0.515	0.147	0.040	-2.155	-0.883
Lower Trinity	0802_03	10896	00951	Summer	Raw Data	-1.009	-0.802	0.161	0.031	-2.277	-0.014
Lower Trinity	0802_03	10896	00951	Winter	Raw Data	-1.827	1.655	0.238	0.010	-2.793	-0.013
Lower Trinity	0802_03	10896	72053	Winter	Raw Data	1.666	0.905	0.181	0.021	2.444	0.324
Lower Trinity	0802_04	10897	00010	Winter	Raw Data	-0.114	-0.642	0.130	0.077	1.851	0.251
Lower Trinity	0802_04	10897	00078	Winter	Raw Data	1.447	0.920	0.184	0.066	-1.961	-0.009
Lower Trinity	0802_04	10897	00094	All	Raw Data	1.204	-0.202	0.234	0.001	-3.543	-6.700
Lower Trinity	0802_04	10897	00094	Summer	Raw Data	0.991	0.386	0.226	0.025	-2.418	-7.435
Lower Trinity	0802_04	10897	00094	Winter	Raw Data	0.784	-0.364	0.236	0.026	-2.420	-6.139
Lower Trinity	0802_04	10897	00410	Summer	Raw Data	-0.537	0.860	0.188	0.027	-2.361	-1.547
Lower Trinity	0802_04	10897	00610	Winter	Natural Log Data	1.835	-0.610	0.216	0.029	-2.349	-0.142
Lower Trinity	0802_04	10897	00665	All	Natural Log Data	0.489	-0.517	0.100	0.025	-2.312	-0.033
Lower Trinity	0802_04	10897	00665	Winter	Natural Log Data	0.938	-0.433	0.240	0.018	-2.574	-0.049
Lower Trinity	0802_04	10897	00945	All	Raw Data	0.454	-0.702	0.148	0.009	-2.735	-1.010
Lower Trinity	0802_04	10897	00945	Summer	Raw Data	-0.312	-0.868	0.174	0.053	-2.054	-1.192
Lower Trinity	0802_04	10897	01046	All	Natural Log Data	0.859	-2.052	0.127	0.053	2.021	0.138
Lower Trinity	0802_04	10897	01090	All	Natural Log Data	0.453	-2.242	0.182	0.019	-2.496	-0.162
Lower Trinity	0802_04	10897	01090	Summer	Natural Log Data	1.068	-1.367	0.236	0.056	-2.079	-0.206
Lower Trinity	0802_04	10897	70300	All	Raw Data	1.637	1.314	0.148	0.005	-2.950	-3.487
Lower Trinity	0802_04	10897	70300	Summer	Natural Log Data	-0.469	2.207	0.277	0.005	-3.098	-0.021
Lower Trinity	0802_05	16998	00061	Winter	Natural Log Data	1.250	-1.933	0.157	0.007	2.833	0.244
Lower Trinity	0802_05	16998	00078	Summer	Raw Data	1.939	0.512	0.122	0.002	-3.188	-0.011
Lower Trinity	0802_05	16998	00078	Winter	Natural Log Data	-1.340	0.583	0.126	0.002	-3.200	-0.034
Lower Trinity	0802_05	16998	00094	All	Raw Data	-0.303	0.074	0.158	0.000	-5.643	-5.341

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Lower Trinity	0802_05	16998	00094	Summer	Raw Data	0.542	-0.433	0.129	0.001	-3.577	-4.410
Lower Trinity	0802_05	16998	00094	Winter	Raw Data	-0.751	0.237	0.189	0.000	-4.368	-6.353
Lower Trinity	0802_05	16998	00945	All	Raw Data	-0.112	-1.598	0.421	0.000	-8.271	-3.028
Lower Trinity	0802_05	16998	00945	Summer	Raw Data	-0.113	-1.848	0.432	0.000	-5.917	-2.993
Lower Trinity	0802_05	16998	00945	Winter	Raw Data	-0.151	-0.546	0.406	0.000	-5.611	-3.014
Lower Trinity	0802_05	16998	70300	All	Raw Data	0.379	0.538	0.343	0.000	-9.430	-5.866
Lower Trinity	0802_05	16998	70300	Summer	Raw Data	0.078	0.288	0.319	0.000	-6.352	-5.717
Lower Trinity	0802_05	16998	70300	Winter	Raw Data	0.601	0.560	0.379	0.000	-7.071	-6.042
Lower Trinity	0802_05	16998	89835	Summer	Raw Data	-1.830	-2.266	0.682	0.000	9.717	0.496
Lower Trinity	0802D_01	10688	00078	All	Raw Data	-0.467	-0.565	0.116	0.046	-2.076	-0.038
Lower Trinity	0802D_01	10688	00400	All	Raw Data	1.037	1.958	0.165	0.013	2.626	0.079
Lower Trinity	0802D_01	10688	00400	Winter	Raw Data	0.836	0.523	0.340	0.009	2.961	0.134
Lower Trinity	0802D_01	10688	00410	Winter	Raw Data	0.317	-0.457	0.229	0.052	2.113	1.078
Lower Trinity	0802D_01	10688	00665	Summer	Natural Log Data	1.051	-0.754	0.184	0.076	1.898	0.262
Lower Trinity	0802D_01	10688	00900	Summer	Natural Log Data	1.680	-0.089	0.428	0.003	3.460	0.074
Lower Trinity	0802D_01	10688	82079	Winter	Natural Log Data	1.207	1.630	0.773	0.001	-5.219	-0.271
Main Stem	0803_01	10899	01046	Winter	Natural Log Data	1.736	-1.182	0.142	0.069	1.910	0.133
Main Stem	0803_01	10899	01090	All	Natural Log Data	0.479	-2.633	0.188	0.002	-3.230	-0.158
Main Stem	0803_01	10899	01090	Summer	Raw Data	1.669	-0.554	0.288	0.008	-2.914	-0.591
Main Stem	0803_05	21562	00078	All	Natural Log Data	1.126	0.386	0.426	0.000	-5.774	-0.061
Main Stem	0803_05	21562	00078	Summer	Natural Log Data	0.730	-0.115	0.551	0.000	-5.428	-0.078
Main Stem	0803_05	21562	00078	Winter	Natural Log Data	0.608	0.992	0.260	0.018	-2.581	-0.040
Main Stem	0803_05	21562	00094	All	Raw Data	-1.329	0.857	0.140	0.015	-2.548	-6.985
Main Stem	0803_05	21562	00094	Summer	Raw Data	0.027	-0.528	0.291	0.010	-2.865	-9.729
Main Stem	0803_05	21562	00410	Summer	Raw Data	-0.323	0.244	0.169	0.037	-2.207	-1.196
Main Stem	0803_05	21562	00665	All	Natural Log Data	1.546	2.891	0.254	0.000	-3.997	-0.056
Main Stem	0803_05	21562	00665	Summer	Natural Log Data	1.333	2.663	0.182	0.030	-2.312	-0.055
Main Stem	0803_05	21562	00665	Winter	Raw Data	1.493	0.412	0.432	0.001	-3.993	-0.008
Main Stem	0803_05	21562	00945	Summer	Raw Data	0.466	-0.777	0.138	0.068	-1.916	-1.029
Main Stem	0803_05	21562	01065	All	Natural Log Data	1.930	-1.698	0.241	0.002	-3.282	-0.181
Main Stem	0803_05	21562	01065	Summer	Natural Log Data	0.732	-1.737	0.242	0.033	-2.327	-0.194
Main Stem	0803_05	21562	01090	All	Natural Log Data	0.829	-2.272	0.270	0.001	-3.548	-0.202
Main Stem	0803_05	21562	01090	Summer	Natural Log Data	1.209	-1.407	0.179	0.071	-1.926	-0.159
Main Stem	0803_05	21562	01090	Winter	Raw Data	1.113	-1.014	0.367	0.010	-2.950	-0.899
Main Stem	0803_05	21562	70300	Summer	Raw Data	-0.307	0.838	0.134	0.072	-1.883	-2.918

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Main Stem	0803_06	21563	00078	All	Natural Log Data	-0.526	-0.584	0.365	0.000	-5.201	-0.089
Main Stem	0803_06	21563	00078	Summer	Raw Data	1.828	-0.166	0.565	0.000	-5.700	-0.028
Main Stem	0803_06	21563	00078	Winter	Natural Log Data	0.434	-0.301	0.218	0.028	-2.364	-0.070
Main Stem	0803_06	21563	00094	All	Raw Data	-1.171	-0.826	0.154	0.009	-2.727	-6.363
Main Stem	0803_06	21563	00094	Summer	Raw Data	0.557	-1.027	0.297	0.007	-2.975	-7.277
Main Stem	0803_06	21563	00400	All	Raw Data	-1.074	-0.966	0.102	0.024	-2.334	-0.038
Main Stem	0803_06	21563	00400	Summer	Raw Data	-1.830	0.442	0.121	0.075	-1.859	-0.039
Main Stem	0803_06	21563	00400	Winter	Raw Data	-0.495	-0.932	0.174	0.048	-2.103	-0.040
Main Stem	0803_06	21563	00940	Summer	Raw Data	0.226	-0.515	0.234	0.012	-2.709	-1.492
Main Stem	0803_06	21563	00945	Summer	Raw Data	-0.396	-1.236	0.206	0.020	-2.494	-1.266
Main Stem	0803_06	21563	01046	Winter	Natural Log Data	0.205	-1.548	0.212	0.063	2.009	0.196
Main Stem	0803_06	21563	01065	All	Natural Log Data	1.940	-1.684	0.289	0.001	-3.714	-0.204
Main Stem	0803_06	21563	01065	Summer	Natural Log Data	0.715	-1.760	0.356	0.007	-3.067	-0.245
Main Stem	0803_06	21563	01090	All	Natural Log Data	0.323	-2.360	0.119	0.039	-2.148	-0.136
Main Stem	0803_06	21563	01090	Winter	Raw Data	1.029	-1.126	0.490	0.002	-3.794	-1.101
Main Stem	0803_06	21563	70300	Summer	Raw Data	0.422	-1.014	0.211	0.016	-2.587	-3.761
Main Stem	0803_06	21563	70953	Winter	Raw Data	0.590	-0.982	0.232	0.027	-2.398	-1.862
Main Stem	0803_07	10913	00078	All	Natural Log Data	-0.023	-0.827	0.353	0.000	-5.169	-0.092
Main Stem	0803_07	10913	00078	Summer	Raw Data	1.756	0.456	0.332	0.001	-3.664	-0.011
Main Stem	0803_07	10913	00078	Winter	Natural Log Data	1.126	-0.397	0.389	0.002	-3.568	-0.106
Main Stem	0803_07	10913	00094	All	Raw Data	1.213	-0.665	0.112	0.026	-2.302	-9.893
Main Stem	0803_07	10913	00094	Winter	Raw Data	0.054	-0.972	0.206	0.044	-2.161	-12.293
Main Stem	0803_07	10913	00300	All	Natural Log Data	0.513	-0.519	0.101	0.023	-2.342	-0.023
Main Stem	0803_07	10913	00300	Summer	Raw Data	1.868	-0.111	0.136	0.054	-2.022	-0.245
Main Stem	0803_07	10913	00400	Summer	Raw Data	0.000	-1.046	0.120	0.072	-1.878	-0.046
Main Stem	0803_07	10913	00900	Summer	Raw Data	0.823	0.434	0.119	0.067	1.911	2.582
Main Stem	0803_07	10913	00945	All	Raw Data	0.007	-1.288	0.104	0.022	-2.366	-1.390
Main Stem	0803_07	10913	00945	Winter	Raw Data	-0.740	-0.982	0.132	0.088	-1.787	-1.473
Main Stem	0803_07	10913	01065	Summer	Natural Log Data	1.289	-1.293	0.220	0.043	-2.190	-0.192
Main Stem	0803_07	10913	01065	Winter	Natural Log Data	1.752	-0.815	0.237	0.048	-2.158	-0.167
Main Stem	0803_07	10913	01090	All	Natural Log Data	0.219	-2.168	0.174	0.011	-2.675	-0.168
Main Stem	0803_07	10913	01090	Winter	Raw Data	1.113	-0.304	0.339	0.014	-2.773	-0.757
Main Stem	0803_10	10914	00020	Summer	Raw Data	-1.119	0.019	0.157	0.000	-3.961	-0.450
Main Stem	0803_10	10914	00610	Winter	Natural Log Data	1.814	-2.973	0.191	0.000	-4.288	-0.156
Main Stem	0803_10	10914	00665	Summer	Natural Log Data	-0.977	1.001	0.124	0.001	-3.432	-0.041

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Main Stem	0803_10	10914	01090	Summer	Natural Log Data	1.158	-1.935	0.125	0.055	-2.003	-0.139
Main Stem	0803_11	10917	01046	Summer	Natural Log Data	1.183	-1.678	0.176	0.021	2.446	0.170
Main Stem	0804_01	13690	01046	Winter	Natural Log Data	-1.125	-1.747	0.116	0.070	1.884	0.139
Main Stem	0804_01	13690	01065	Summer	Raw Data	1.830	-1.263	0.165	0.026	-2.354	-0.750
Main Stem	0804_01	13690	01065	Winter	Natural Log Data	1.932	-1.430	0.111	0.077	-1.840	-0.128
Main Stem	0804_04	10919	00615	Summer	Natural Log Data	1.349	-1.887	0.216	0.002	-3.281	-0.124
Main Stem	0804_04	10919	01046	All	Natural Log Data	1.345	-0.497	0.152	0.049	2.076	0.228
Main Stem	0804_04	10919	01046	Winter	Natural Log Data	0.683	0.363	0.204	0.091	1.825	0.247
Main Stem	0804_04	10919	01090	All	Natural Log Data	0.671	-1.928	0.139	0.080	-1.842	-0.184
Main Stem	0804_07	10922	00615	All	Natural Log Data	0.083	-2.220	0.135	0.001	-3.578	-0.095
Main Stem	0804_07	10922	00615	Summer	Natural Log Data	0.404	-1.285	0.353	0.000	-4.551	-0.151
Main Stem	0804_07	10922	00625	Winter	Natural Log Data	-0.930	1.217	0.103	0.036	-2.165	-0.030
Main Stem	0804_07	10922	01040	Winter	Raw Data	0.558	-0.964	0.375	0.034	-2.448	-0.245
Main Stem	0804_07	10922	01046	All	Natural Log Data	0.644	-1.891	0.122	0.080	1.826	0.160
Main Stem	0804_07	10922	01046	Summer	Raw Data	1.302	-0.370	0.291	0.087	1.923	6.430
Main Stem	0804G_01	10717	00535	Summer	Natural Log Data	1.191	0.358	0.113	0.081	-1.816	-0.117
Main Stem	0804G_01	10717	00620	Winter	Raw Data	0.862	0.412	0.132	0.052	2.030	0.004
Main Stem	0804G_01	10717	00940	All	Raw Data	0.059	-0.937	0.138	0.004	-2.994	-0.244
Main Stem	0804G_01	10717	00940	Summer	Raw Data	1.494	1.750	0.206	0.015	-2.599	-0.282
Main Stem	0804G_01	10717	00940	Winter	Raw Data	-1.066	-0.595	0.139	0.043	-2.122	-0.199
Main Stem	0804G_01	10717	00945	Summer	Natural Log Data	1.540	1.060	0.121	0.070	-1.891	-0.034
Main Stem	0804G_01	10717	01351	All	Raw Data	0.522	-2.259	0.147	0.000	3.638	0.088
Main Stem	0804G_01	10717	01351	Winter	Raw Data	-1.135	0.080	0.256	0.003	3.264	0.088
Main Stem	0804G_01	10717	31704	Winter	Raw Data	0.802	-0.608	0.287	0.048	-2.196	-0.281
Main Stem	0804G_01	10717	70300	All	Natural Log Data	1.271	1.274	0.203	0.000	-4.673	-0.018
Main Stem	0804G_01	10717	70300	Winter	Raw Data	0.174	-0.984	0.444	0.000	-5.135	-2.369
Main Stem	0804G_01	10717	70953	Winter	Raw Data	0.381	-1.133	0.371	0.001	3.761	0.284
Main Stem	0804G_01	10717	72053	Winter	Raw Data	0.776	-0.773	0.103	0.090	-1.760	-0.179
Main Stem	0804H_01	20771	00300	Summer	Raw Data	0.953	-0.754	0.211	0.073	-1.937	-0.255
Main Stem	0804H_01	20771	00530	All	Natural Log Data	0.486	-0.009	0.108	0.062	-1.933	-0.098
Main Stem	0804H_01	20771	00535	All	Natural Log Data	0.474	-2.035	0.277	0.002	-3.447	-0.312
Main Stem	0804H_01	20771	00535	Summer	Natural Log Data	-0.437	-1.386	0.446	0.005	-3.355	-0.376
Main Stem	0804H_01	20771	00535	Winter	Natural Log Data	1.131	-1.185	0.199	0.073	-1.928	-0.262
Main Stem	0804H_01	20771	00610	Winter	Raw Data	1.641	-0.147	0.225	0.063	2.019	0.010
Main Stem	0804H_01	20771	00680	All	Raw Data	1.301	-0.709	0.209	0.014	-2.625	-0.553

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Main Stem	0804H_01	20771	00680	Summer	Raw Data	0.836	-0.820	0.267	0.059	-2.090	-0.596
Main Stem	0804H_01	20771	00945	Summer	Raw Data	1.907	1.302	0.200	0.094	1.804	5.640
Main Stem	0804H_01	20771	01351	Summer	Raw Data	-1.538	-0.232	0.219	0.067	1.983	0.133
Main Stem	0804H_01	20771	70953	Winter	Natural Log Data	-0.253	0.453	0.344	0.022	-2.612	-0.279
Main Stem	0804H_01	20771	72053	Summer	Raw Data	0.998	-0.124	0.275	0.037	2.302	1.255
Main Stem	0804J_01	17951	00052	Winter	Raw Data	-0.746	-0.491	0.234	0.080	1.913	0.305
Main Stem	0804J_01	17951	00078	All	Natural Log Data	0.372	-0.711	0.183	0.001	3.381	0.027
Main Stem	0804J_01	17951	00078	Summer	Raw Data	1.483	-0.096	0.119	0.073	1.870	0.012
Main Stem	0804J_01	17951	00078	Winter	Raw Data	0.713	0.560	0.381	0.001	3.763	0.031
Main Stem	0804J_01	17951	00094	Summer	Raw Data	-0.684	-0.042	0.118	0.073	-1.868	-24.702
Main Stem	0804J_01	17951	00300	Winter	Raw Data	0.596	0.514	0.323	0.003	-3.310	-0.257
Main Stem	0804J_01	17951	00400	Winter	Raw Data	-1.616	1.008	0.349	0.002	-3.513	-0.045
Main Stem	0804J_01	17951	00530	All	Raw Data	-0.343	1.679	0.128	0.009	-2.736	-0.231
Main Stem	0804J_01	17951	00530	Winter	Raw Data	1.784	0.869	0.392	0.001	-3.854	-0.317
Main Stem	0804J_01	17951	00535	All	Raw Data	-0.964	-0.922	0.208	0.001	-3.665	-0.367
Main Stem	0804J_01	17951	00535	Winter	Raw Data	0.131	-0.286	0.562	0.000	-5.429	-0.554
Main Stem	0804J_01	17951	00625	All	Raw Data	1.034	-0.422	0.211	0.001	-3.548	-0.053
Main Stem	0804J_01	17951	00625	Summer	Raw Data	0.493	-0.513	0.109	0.099	-1.716	-0.039
Main Stem	0804J_01	17951	00625	Winter	Raw Data	0.210	-0.894	0.570	0.000	-5.274	-0.072
Main Stem	0804J_01	17951	00680	All	Raw Data	1.882	1.225	0.266	0.000	-4.254	-0.358
Main Stem	0804J_01	17951	00680	Summer	Raw Data	1.007	-0.295	0.301	0.003	-3.283	-0.430
Main Stem	0804J_01	17951	00680	Winter	Raw Data	-1.333	0.728	0.444	0.000	-4.285	-0.314
Main Stem	0804J_01	17951	00945	Summer	Raw Data	-1.424	-0.105	0.134	0.066	-1.924	-2.504
Main Stem	0804J_01	17951	00951	Summer	Raw Data	-1.873	0.335	0.228	0.012	-2.717	-0.050
Main Stem	0804J_01	17951	00951	Winter	Raw Data	-1.100	0.033	0.202	0.027	-2.362	-0.041
Main Stem	0804J_01	17951	70953	All	Natural Log Data	-1.819	0.424	0.137	0.009	-2.727	-0.071
Main Stem	0804J_01	17951	70953	Winter	Natural Log Data	-0.734	0.600	0.443	0.001	-4.087	-0.125
Main Stem	0804K_01	20382	00061	All	Natural Log Data	-1.488	-0.361	0.175	0.030	2.305	0.317
Main Stem	0804K_01	20382	00061	Winter	Raw Data	1.590	0.331	0.352	0.025	2.552	5.061
Main Stem	0804K_01	20382	00610	Summer	Natural Log Data	-0.879	0.140	0.315	0.046	-2.248	-0.395
Main Stem	0804K_01	20382	00610	Winter	Raw Data	0.749	-1.091	0.372	0.012	2.882	0.012
Main Stem	0804K_01	20382	00940	Winter	Raw Data	-0.270	-1.011	0.213	0.072	1.948	3.114
Main Stem	0804K_01	20382	01351	Winter	Raw Data	-0.522	-0.403	0.328	0.016	2.706	0.148
Main Stem	0804K_01	20382	72053	Summer	Raw Data	0.756	-0.385	0.335	0.019	2.654	1.631
Main Stem	0804L_01	10706	00010	Winter	Raw Data	-1.297	-0.318	0.301	0.081	1.967	1.643

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Main Stem	0804L_01	10706	00094	All	Raw Data	0.151	-0.363	0.452	0.001	3.962	54.347
Main Stem	0804L_01	10706	00094	Summer	Raw Data	-0.276	-1.066	0.868	0.000	7.260	66.107
Main Stem	0804L_01	10706	00094	Winter	Raw Data	-1.054	-0.146	0.328	0.065	2.097	36.730
Main Stem	0804L_01	10706	00400	Summer	Raw Data	-0.763	0.160	0.440	0.036	2.509	0.118
Main Stem	0804L_01	10706	00665	All	Raw Data	1.495	-0.806	0.735	0.000	7.059	1.454
Main Stem	0804L_01	10706	00665	Summer	Raw Data	0.462	-1.259	0.925	0.000	9.913	1.750
Main Stem	0804L_01	10706	00665	Winter	Raw Data	1.666	0.639	0.489	0.024	2.765	0.954
Main Stem	0804L_01	10706	00671	All	Raw Data	1.306	-0.895	0.698	0.000	6.446	1.318
Main Stem	0804L_01	10706	00671	Summer	Raw Data	0.449	-1.282	0.917	0.000	9.378	1.688
Main Stem	0804L_01	10706	00671	Winter	Raw Data	1.099	-0.101	0.497	0.023	2.810	0.850
Main Stem	0804L_01	10706	00900	All	Raw Data	1.052	-0.380	0.258	0.019	-2.569	-4.077
Main Stem	0804L_01	10706	00900	Summer	Raw Data	0.464	-0.864	0.549	0.014	-3.122	-5.461
Main Stem	0804L_01	10706	00940	All	Raw Data	-0.264	-0.748	0.276	0.014	2.693	4.567
Main Stem	0804L_01	10706	00940	Summer	Raw Data	-0.833	-0.655	0.484	0.025	2.742	4.737
Main Stem	0804L_01	10706	00940	Winter	Raw Data	-0.203	-0.165	0.275	0.098	1.848	3.959
Main Stem	0804L_01	10706	00945	Summer	Raw Data	0.164	-0.364	0.773	0.001	-5.217	-3.143
Main Stem	0804L_01	10706	31699	Summer	Natural Log Data	1.840	2.480	0.424	0.042	2.424	0.230
Main Stem	0804L_01	10706	70300	All	Raw Data	0.360	-0.560	0.428	0.001	3.771	31.411
Main Stem	0804L_01	10706	70300	Summer	Raw Data	-0.008	-0.772	0.844	0.000	6.574	38.784
Main Stem	0805_02	10925	00615	All	Natural Log Data	-0.245	-2.423	0.189	0.000	-4.376	-0.114
Main Stem	0805_02	10925	00615	Summer	Natural Log Data	-0.772	-1.744	0.217	0.002	-3.248	-0.109
Main Stem	0805_02	10925	00615	Winter	Natural Log Data	0.202	-1.793	0.171	0.005	-2.948	-0.120
Main Stem	0805_02	10925	01040	Winter	Raw Data	0.012	-1.283	0.327	0.066	-2.089	-0.214
Main Stem	0805_02	10925	01046	Winter	Natural Log Data	1.560	-0.577	0.341	0.028	2.492	0.185
Main Stem	0805_02	10925	01065	All	Natural Log Data	-0.102	-0.224	0.223	0.026	-2.399	-0.068
Main Stem	0805_02	10925	01065	Winter	Raw Data	1.699	1.508	0.468	0.014	-2.967	-0.518
Main Stem	0805_03	10934	00020	Summer	Raw Data	-1.195	-0.666	0.261	0.000	-3.991	-0.639
Main Stem	0805_03	20444	72053	All	Natural Log Data	0.189	-0.588	0.114	0.073	1.866	0.151
Main Stem	0805_03	20444	72053	Summer	Natural Log Data	0.525	0.052	0.301	0.034	2.366	0.245
Main Stem	0805_04	10937	00020	Summer	Raw Data	0.175	-1.259	0.107	0.028	-2.268	-0.339
Main Stem	0805_04	10937	00078	Summer	Natural Log Data	-1.722	0.228	0.110	0.028	2.274	0.053
Main Stem	0805_04	10937	00610	All	Natural Log Data	0.244	-1.820	0.110	0.002	3.224	0.139
Main Stem	0805_04	10937	00610	Summer	Natural Log Data	-0.128	-1.047	0.222	0.002	3.377	0.170
Main Stem	0805_04	10937	01040	All	Raw Data	1.241	0.035	0.250	0.013	-2.706	-0.124
Main Stem	0805_04	10937	01040	Winter	Raw Data	0.944	-0.202	0.577	0.007	-3.502	-0.223

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Main Stem	0805_04	10937	01065	Winter	Raw Data	0.346	-0.561	0.344	0.075	-2.046	-0.267
Main Stem	0805_04	10937	01090	Winter	Raw Data	0.130	-1.236	0.297	0.083	-1.952	-1.377
Main Stem	0805_04	20933	72053	All	Natural Log Data	0.091	-0.440	0.142	0.048	2.074	0.163
Main Stem	0805_04	20933	72053	Summer	Natural Log Data	0.525	0.052	0.301	0.034	2.366	0.245
Main Stem	0805_04	20934	00020	Summer	Raw Data	-0.841	0.122	0.344	0.058	2.175	2.839
Main Stem	0805_04	20934	72053	All	Natural Log Data	0.189	-0.588	0.114	0.073	1.866	0.151
Main Stem	0805_04	20934	72053	Summer	Natural Log Data	0.525	0.052	0.301	0.034	2.366	0.245
Main Stem	0806_01	10938	00400	Winter	Raw Data	0.755	1.160	0.144	0.000	4.327	0.039
Main Stem	0806_01	10938	01351	Winter	Raw Data	1.961	0.666	0.159	0.000	3.959	0.067
Main Stem	0806_01	16120	00094	Summer	Natural Log Data	-1.471	0.629	0.214	0.000	4.949	0.040
Main Stem	0806_01	16120	00094	Winter	Raw Data	-0.305	-0.827	0.103	0.002	3.165	10.413
Main Stem	0806_01	16120	01351	Winter	Natural Log Data	1.002	1.280	0.143	0.000	3.768	0.012
Main Stem	0806_01	16120	70300	Summer	Natural Log Data	-1.471	0.629	0.214	0.000	4.949	0.040
Main Stem	0806_01	16120	70300	Winter	Raw Data	-0.305	-0.827	0.103	0.002	3.165	6.769
Main Stem	0806_01	17368	00094	All	Raw Data	-1.306	-0.613	0.140	0.000	5.934	11.197
Main Stem	0806_01	17368	00094	Summer	Raw Data	-1.786	-0.332	0.208	0.000	5.331	11.049
Main Stem	0806_01	17368	01351	Winter	Raw Data	-1.574	2.785	0.115	0.001	3.331	0.065
Main Stem	0806_01	17368	70300	All	Raw Data	-1.306	-0.613	0.140	0.000	5.934	7.278
Main Stem	0806_01	17368	70300	Summer	Raw Data	-1.786	-0.332	0.208	0.000	5.331	7.182
Main Stem	0806_01	17863	00094	Summer	Raw Data	-0.906	1.348	0.111	0.062	1.940	9.628
Main Stem	0806_01	17863	00625	All	Natural Log Data	-0.042	1.258	0.180	0.001	-3.478	-0.062
Main Stem	0806_01	17863	00625	Summer	Natural Log Data	0.219	1.562	0.109	0.092	-1.750	-0.048
Main Stem	0806_01	17863	00625	Winter	Raw Data	1.739	0.592	0.253	0.005	-3.077	-0.057
Main Stem	0806_01	17863	72053	Summer	Natural Log Data	1.949	-0.493	0.150	0.031	2.263	0.159
Main Stem	0806_02	21558	00400	All	Raw Data	0.509	-0.466	0.226	0.001	-3.621	-0.089
Main Stem	0806_02	21558	00400	Summer	Raw Data	-0.189	-0.668	0.283	0.005	-3.077	-0.092
Main Stem	0806_02	21558	31699	Summer	Natural Log Data	1.567	1.446	0.110	0.098	1.720	0.551
Main Stem	0806_02	21558	72053	Winter	Natural Log Data	-0.300	-1.185	0.158	0.060	1.986	0.385
Main Stem	0806D_01	17370	00020	All	Raw Data	0.168	-1.359	0.130	0.077	1.853	5.521
Main Stem	0806D_01	17370	00020	Winter	Raw Data	-0.783	-0.252	0.543	0.006	3.445	5.833
Main Stem	0806D_01	17370	00094	Summer	Raw Data	1.762	1.122	0.105	0.004	2.963	15.452
Main Stem	0806D_01	17370	00400	Winter	Raw Data	0.549	-1.162	0.123	0.002	3.238	0.033
Main Stem	0806D_01	17370	01351	Winter	Raw Data	1.113	1.251	0.147	0.001	3.547	0.064
Main Stem	0806D_01	17370	70300	Summer	Raw Data	1.762	1.122	0.105	0.004	2.963	10.044
Main Stem	0806D_01	17370	72053	Summer	Natural Log Data	0.836	-1.502	0.107	0.004	2.997	0.099

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Main Stem	0806D_01	21801	00400	All	Raw Data	-0.637	-0.320	0.114	0.099	-1.719	-0.085
Main Stem	0806D_01	21801	01351	Winter	Raw Data	0.089	0.463	0.283	0.075	-1.985	-0.565
Main Stem	0806D_01	21801	31699	Winter	Natural Log Data	1.586	-0.161	0.433	0.020	-2.765	-2.600
Main Stem	0806D_01	21801	72053	Winter	Natural Log Data	-0.997	-0.498	0.329	0.051	2.215	1.280
Main Stem	0806E_01	17369	00094	Summer	Natural Log Data	-1.672	-0.958	0.102	0.002	3.178	0.032
Main Stem	0806E_01	17369	00300	Summer	Natural Log Data	1.232	-0.358	0.122	0.001	-3.492	-0.018
Main Stem	0806E_01	17369	01351	Winter	Raw Data	1.447	1.819	0.101	0.003	3.086	0.042
Main Stem	0806E_01	17369	70300	Summer	Natural Log Data	-1.672	-0.958	0.102	0.002	3.178	0.032
Main Stem	0813_01	10973	00078	All	Natural Log Data	0.004	-0.214	0.114	0.010	-2.679	-0.027
Main Stem	0813_01	10973	00078	Summer	Raw Data	1.950	1.259	0.142	0.040	-2.155	-0.043
Main Stem	0813_01	10973	00094	Summer	Raw Data	0.523	-0.967	0.101	0.092	1.746	0.973
Main Stem	0813_01	10973	00400	Winter	Raw Data	0.523	0.282	0.213	0.012	-2.701	-0.056
Main Stem	0813_01	10973	00410	All	Raw Data	-1.112	-0.300	0.225	0.000	3.963	0.787
Main Stem	0813_01	10973	00410	Summer	Raw Data	-1.192	0.477	0.132	0.052	2.029	0.528
Main Stem	0813_01	10973	00410	Winter	Raw Data	-0.330	-0.253	0.391	0.000	4.005	1.049
Main Stem	0813_01	10973	00625	All	Natural Log Data	1.050	-0.697	0.159	0.003	3.079	0.020
Main Stem	0813_01	10973	00625	Summer	Raw Data	0.828	-0.557	0.168	0.030	2.290	0.011
Main Stem	0813_01	10973	00625	Winter	Natural Log Data	1.544	0.369	0.145	0.067	1.931	0.020
Main Stem	0813_01	10973	00665	Winter	Natural Log Data	0.542	-1.758	0.282	0.008	2.937	0.125
Main Stem	0813_01	10973	00680	Summer	Natural Log Data	1.052	-0.280	0.303	0.002	3.429	0.027
Main Stem	0827_01	11038	00300	All	Raw Data	0.138	-0.029	0.108	0.041	-2.118	-0.293
Main Stem	0827_01	11038	00300	Summer	Raw Data	0.300	-0.037	0.158	0.075	-1.887	-0.314
Main Stem	0827_01	11038	00400	Summer	Raw Data	-0.028	-0.864	0.170	0.063	-1.975	-0.049
Main Stem	0827_01	11038	00410	Summer	Raw Data	0.789	-0.714	0.201	0.062	2.008	2.392
Main Stem	0827_01	11038	00620	Summer	Natural Log Data	1.863	-0.862	0.164	0.077	1.879	0.399
Main Stem	0827_01	11038	00665	All	Raw Data	-0.667	-0.765	0.204	0.007	2.905	0.006
Main Stem	0827_01	11038	00665	Summer	Raw Data	-0.979	-0.065	0.225	0.040	2.225	0.006
Main Stem	0827_01	11038	31699	All	Natural Log Data	0.068	-1.333	0.165	0.021	2.431	0.315
Main Stem	0827_01	11038	31699	Summer	Natural Log Data	0.687	-0.934	0.187	0.073	1.917	0.344
Main Stem	0827_01	11038	31699	Winter	Natural Log Data	-0.654	-0.324	0.284	0.050	2.183	0.401
Main Stem	0827_01	11038	31704	Summer	Raw Data	-0.145	-1.318	0.255	0.027	2.415	0.338
Main Stem	0827A_01	20289	00020	Summer	Raw Data	0.103	-0.615	0.138	0.062	-1.961	-0.482
Main Stem	0827A_01	20289	00620	Summer	Natural Log Data	-1.856	-0.123	0.126	0.089	-1.779	-0.182
Main Stem	0827A_01	20289	00625	Summer	Raw Data	0.560	1.113	0.140	0.072	-1.890	-0.022
Main Stem	0827A_01	20289	01040	All	Raw Data	0.171	0.064	0.167	0.047	-2.103	-0.077

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Main Stem	0827A_01	20289	01040	Summer	Raw Data	-0.066	-0.478	0.464	0.015	-2.944	-0.160
Main Stem	0827A_01	20289	01065	All	Raw Data	1.030	-0.423	0.265	0.014	-2.684	-0.138
Main Stem	0827A_01	20289	01065	Summer	Raw Data	1.163	0.237	0.314	0.073	-2.027	-0.158
Main Stem	0827A_01	20289	01351	Winter	Raw Data	0.168	0.893	0.139	0.051	2.048	0.052
Main Stem	0827A_01	20289	70300	Winter	Raw Data	-1.748	0.536	0.106	0.090	-1.759	-8.053
Main Stem	0827A_01	20289	89835	All	Natural Log Data	1.114	1.277	0.542	0.000	5.957	0.085
Main Stem	0827A_01	20289	89835	Summer	Natural Log Data	0.898	1.004	0.397	0.009	3.037	0.085
Main Stem	0827A_01	20289	89835	Winter	Natural Log Data	0.620	1.437	0.705	0.000	5.790	0.084
Main Stem	0841_01	11081	00020	Summer	Raw Data	-0.903	-0.975	0.221	0.002	-3.286	-0.594
Main Stem	0841_01	11081	00615	Summer	Natural Log Data	0.960	-1.743	0.323	0.000	-3.967	-0.124
Main Stem	0841_01	11081	00615	Winter	Natural Log Data	1.570	-1.173	0.149	0.020	-2.436	-0.110
Main Stem	0841_01	11081	00625	Winter	Natural Log Data	1.335	0.790	0.113	0.045	-2.085	-0.031
Main Stem	0841_01	11081	00665	Summer	Raw Data	1.752	-0.268	0.111	0.039	-2.145	-0.045
Main Stem	0841_01	11081	01046	All	Natural Log Data	1.766	-1.189	0.369	0.001	3.665	0.239
Main Stem	0841_01	11081	01046	Summer	Natural Log Data	1.173	-0.918	0.317	0.057	2.155	0.240
Main Stem	0841_01	11081	01046	Winter	Raw Data	1.849	-0.085	0.404	0.020	2.729	4.760
Main Stem	0841_01	11081	01065	Winter	Raw Data	-0.041	0.171	0.445	0.035	-2.535	-0.237
Main Stem	0841_01	17669	00665	All	Raw Data	1.500	-1.399	0.208	0.000	-3.726	-0.067
Main Stem	0841_01	17669	00665	Summer	Raw Data	0.772	-1.553	0.378	0.001	-3.821	-0.087
Main Stem	0841_01	17669	00665	Winter	Raw Data	1.362	-0.510	0.103	0.089	-1.761	-0.048
Main Stem	0841_01	17669	00671	All	Raw Data	1.671	-1.055	0.152	0.005	-2.929	-0.056
Main Stem	0841_01	17669	00671	Summer	Raw Data	0.870	-1.504	0.318	0.003	-3.347	-0.078
Main Stem	0841_01	17669	00900	All	Natural Log Data	1.247	0.535	0.143	0.003	-3.054	-0.011
Main Stem	0841_01	17669	00900	Summer	Raw Data	0.238	-1.285	0.102	0.091	-1.754	-1.415
Main Stem	0841_01	17669	00900	Winter	Natural Log Data	1.371	0.790	0.199	0.015	-2.592	-0.013
Main Stem	0841_01	17669	00945	All	Raw Data	-0.437	2.553	0.147	0.003	-3.076	-1.138
Main Stem	0841_01	17669	00945	Summer	Raw Data	-1.413	2.748	0.100	0.094	-1.734	-0.932
Main Stem	0841_01	17669	00945	Winter	Raw Data	0.821	0.646	0.221	0.012	-2.719	-1.337
Main Stem	0841B_01	10865	00300	Summer	Natural Log Data	-0.682	1.413	0.190	0.002	3.325	0.079
Main Stem	0841B_01	10865	00665	Winter	Natural Log Data	-1.578	-0.729	0.614	0.000	6.047	0.367
Main Stem	0841B_01	10865	82078	Winter	Raw Data	1.838	-0.916	0.132	0.038	-2.170	-1.929
Main Stem	0841B_01	10867	00625	Winter	Raw Data	0.957	0.736	0.505	0.001	-3.908	-0.062
Main Stem	0841B_01	10867	00900	Summer	Raw Data	0.140	-1.190	0.198	0.043	-2.167	-8.793
Main Stem	0841B_01	10867	00940	Summer	Raw Data	0.678	-0.615	0.141	0.093	-1.767	-1.851
Main Stem	0841B_01	10867	00940	Winter	Raw Data	0.609	0.108	0.146	0.096	1.755	2.303

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Main Stem	0841B_01	10867	31699	Winter	Natural Log Data	0.754	2.315	0.137	0.003	-3.140	-0.226
Main Stem	0841B_01	10869	00061	Winter	Natural Log Data	-0.780	0.726	0.175	0.084	1.845	0.247
Main Stem	0841B_01	10869	00300	Winter	Raw Data	1.753	0.478	0.314	0.001	3.642	0.382
Main Stem	0841B_01	10869	00400	Winter	Raw Data	0.198	1.160	0.123	0.046	-2.082	-0.030
Main Stem	0841B_01	10869	00610	Summer	Natural Log Data	-0.635	-1.691	0.161	0.021	2.436	0.145
Main Stem	0841B_01	10869	00665	All	Natural Log Data	-1.653	1.640	0.119	0.005	2.943	0.095
Main Stem	0841B_01	10869	00665	Winter	Natural Log Data	-0.682	0.771	0.161	0.021	2.442	0.124
Main Stem	0841B_01	10869	00900	Summer	Raw Data	0.124	-0.998	0.111	0.059	-1.963	-4.495
Main Stem	0841B_01	17663	FDNH3	Summer	Raw Data	0.907	-0.406	0.319	0.015	-2.737	-0.088
Main Stem	0841D_01	17089	00410	All	Raw Data	-0.500	-0.763	0.180	0.031	-2.294	-8.129
Main Stem	0841D_01	17089	00410	Winter	Raw Data	-1.632	1.766	0.240	0.090	-1.862	-8.472
Main Stem	0841D_01	17089	00620	Winter	Natural Log Data	-0.929	-0.572	0.241	0.075	1.950	0.646
Main Stem	0841E_01	17672	00610	Summer	Natural Log Data	-1.142	-0.600	0.137	0.090	1.781	0.149
Main Stem	0841E_01	17672	00625	Winter	Raw Data	1.944	2.682	0.373	0.012	-2.883	-0.025
Main Stem	0841E_01	17672	00665	All	Natural Log Data	-1.273	-1.652	0.248	0.001	3.587	0.208
Main Stem	0841E_01	17672	00665	Winter	Raw Data	1.037	-1.180	0.336	0.007	3.017	0.009
Main Stem	0841E_01	17672	00671	All	Natural Log Data	1.223	-2.137	0.107	0.048	2.048	0.203
Main Stem	0841E_01	17672	00671	Winter	Natural Log Data	0.991	-1.546	0.198	0.064	1.988	0.286
Main Stem	0841E_01	17672	00940	All	Raw Data	0.751	-0.046	0.163	0.010	2.724	1.543
Main Stem	0841E_01	17672	00940	Winter	Raw Data	-0.101	-0.757	0.274	0.022	2.530	1.670
Main Stem	0841E_01	17672	00945	Winter	Raw Data	-0.377	-0.116	0.152	0.089	1.799	3.332
Main Stem	0841E_01	17672	FDNH3	All	Raw Data	1.472	-1.100	0.163	0.020	2.454	0.058
Main Stem	0841E_01	17672	FDNH3	Winter	Raw Data	0.745	-1.290	0.336	0.015	2.753	0.090
Main Stem	0841F_01	17674	00625	Summer	Raw Data	0.738	1.859	0.160	0.035	-2.225	-0.020
Main Stem	0841F_01	17674	00665	Summer	Raw Data	1.815	0.258	0.173	0.028	2.328	0.005
Main Stem	0841F_01	17674	00665	Winter	Natural Log Data	-1.527	-0.926	0.437	0.000	4.491	0.189
Main Stem	0841F_01	17674	00671	Summer	Natural Log Data	1.492	-1.506	0.121	0.075	1.858	0.159
Main Stem	0841F_01	17674	00671	Winter	Natural Log Data	1.531	-1.411	0.138	0.067	1.921	0.157
Main Stem	0841F_01	17674	00900	Summer	Raw Data	1.616	0.036	0.192	0.020	-2.485	-3.518
Main Stem	0841F_01	17674	00940	Winter	Natural Log Data	1.558	1.772	0.108	0.094	-1.741	-0.041
Main Stem	0841F_01	17674	00945	Summer	Natural Log Data	-0.309	-0.784	0.114	0.074	-1.862	-0.043
Main Stem	0841F_01	17674	01351	Summer	Raw Data	-1.851	0.135	0.131	0.000	-3.636	-0.053
Main Stem	0841F_01	17676	00020	Summer	Raw Data	-1.114	0.855	0.141	0.000	-3.787	-0.468
Main Stem	0841F_01	17676	00610	Summer	Natural Log Data	1.951	-0.916	0.208	0.015	2.617	0.137
Main Stem	0841F_01	17676	00625	All	Raw Data	1.424	-0.179	0.176	0.002	-3.338	-0.026

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Main Stem	0841F_01	17676	00625	Summer	Raw Data	0.939	-0.196	0.253	0.008	-2.909	-0.029
Main Stem	0841F_01	17676	00625	Winter	Raw Data	1.004	-0.077	0.123	0.073	-1.874	-0.024
Main Stem	0841F_01	17676	00665	Summer	Raw Data	1.457	0.538	0.389	0.001	3.909	0.003
Main Stem	0841F_01	17676	00665	Winter	Natural Log Data	-1.992	-0.234	0.288	0.002	3.362	0.121
Main Stem	0841F_01	17676	00900	All	Raw Data	1.968	0.587	0.147	0.003	-3.080	-5.768
Main Stem	0841F_01	17676	00900	Summer	Raw Data	1.054	-0.052	0.504	0.000	-5.045	-8.723
Main Stem	0841F_01	17676	00945	Summer	Raw Data	1.951	0.658	0.110	0.085	-1.792	-5.363
Main Stem	0841F_01	20837	01351	Summer	Raw Data	-0.915	-0.134	0.111	0.058	-1.970	-0.267
Main Stem	0841F_01	20837	31699	Winter	Natural Log Data	1.210	0.136	0.171	0.021	-2.445	-0.432
Main Stem	0841F_01	20837	70300	Summer	Raw Data	1.085	-0.630	0.142	0.058	-1.990	-18.536
Main Stem	0841G_01	17671	00078	Summer	Raw Data	-0.895	-1.894	0.111	0.038	2.149	0.019
Main Stem	0841G_01	17671	00300	Summer	Raw Data	-1.713	-0.369	0.177	0.010	2.743	0.259
Main Stem	0841G_01	17671	00620	All	Natural Log Data	-1.314	-0.758	0.123	0.086	-1.794	-0.185
Main Stem	0841G_01	17671	00625	All	Natural Log Data	-0.322	2.089	0.144	0.062	-1.966	-0.128
Main Stem	0841G_01	17671	00625	Summer	Raw Data	1.408	0.786	0.514	0.009	-3.249	-0.104
Main Stem	0841G_01	17671	00945	Summer	Raw Data	-0.494	-0.513	0.353	0.054	-2.214	-30.780
Main Stem	0841G_01	17671	01351	Winter	Raw Data	-0.854	2.466	0.123	0.017	-2.479	-0.077
Main Stem	0841G_01	17671	70953	All	Natural Log Data	1.380	-1.634	0.137	0.069	-1.910	-0.557
Main Stem	0841G_01	17671	70953	Summer	Natural Log Data	1.205	-1.053	0.250	0.098	-1.826	-0.695
Main Stem	0841H_01	17178	00400	All	Raw Data	1.243	1.086	0.107	0.004	-2.977	-0.026
Main Stem	0841H_01	17178	00400	Winter	Raw Data	0.656	1.050	0.148	0.017	-2.496	-0.032
Main Stem	0841H_01	17178	01040	Summer	Raw Data	0.767	0.560	0.251	0.011	-2.779	-0.087
Main Stem	0841H_01	17178	01351	Summer	Raw Data	-1.734	-1.042	0.116	0.036	-2.175	-0.062
Main Stem	0841H_01	17178	31699	Summer	Natural Log Data	0.272	-0.935	0.117	0.036	-2.181	-0.160
Main Stem	0841J_01	17174	00300	All	Raw Data	0.981	-0.792	0.205	0.003	3.173	0.319
Main Stem	0841J_01	17174	00300	Summer	Raw Data	0.641	-0.661	0.300	0.007	2.998	0.209
Main Stem	0841K_01	10725	00094	Summer	Raw Data	1.903	0.094	0.380	0.019	-2.710	-73.910
Main Stem	0841K_01	10725	00300	All	Raw Data	1.120	-0.267	0.281	0.004	-3.184	-0.585
Main Stem	0841K_01	10725	00300	Summer	Raw Data	0.626	-1.295	0.422	0.016	-2.836	-0.728
Main Stem	0841K_01	10725	00400	Summer	Raw Data	0.532	-1.050	0.299	0.053	-2.165	-0.072
Main Stem	0841K_01	10725	00665	All	Natural Log Data	0.323	-1.404	0.225	0.014	2.641	0.207
Main Stem	0841K_01	10725	00665	Summer	Raw Data	1.806	0.675	0.498	0.010	3.148	0.008
Main Stem	0841K_01	10725	70300	Summer	Raw Data	1.903	0.094	0.380	0.019	-2.710	-48.041
Main Stem	0841K_01	10725	70953	All	Natural Log Data	1.379	-1.593	0.184	0.041	-2.176	-0.749
Main Stem	0841K_01	10725	70953	Winter	Natural Log Data	1.185	-1.096	0.279	0.078	-1.967	-0.875

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Main Stem	0841K_01	15294	00061	Summer	Natural Log Data	-0.988	0.502	0.233	0.015	2.641	0.433
Main Stem	0841K_01	15294	00300	Winter	Raw Data	1.605	1.296	0.114	0.009	2.702	0.182
Main Stem	0841K_01	15294	00400	Summer	Raw Data	-1.438	-0.168	0.234	0.000	4.212	0.057
Main Stem	0841K_01	15294	00671	All	Natural Log Data	-1.207	-2.013	0.393	0.000	4.957	0.384
Main Stem	0841K_01	15294	00671	Summer	Natural Log Data	-0.961	-1.507	0.480	0.001	4.073	0.428
Main Stem	0841K_01	15294	00671	Winter	Natural Log Data	-0.817	-1.419	0.314	0.010	2.873	0.341
Main Stem	0841K_01	15294	00900	All	Raw Data	-0.782	-0.524	0.148	0.016	-2.533	-14.343
Main Stem	0841K_01	15294	00900	Summer	Raw Data	0.088	-0.746	0.323	0.011	-2.851	-21.447
Main Stem	0841K_01	17679	00094	Winter	Raw Data	1.032	-1.119	0.165	0.000	-4.024	-25.061
Main Stem	0841K_01	17679	00610	All	Natural Log Data	-0.258	-1.727	0.121	0.008	2.756	0.125
Main Stem	0841K_01	17679	00610	Winter	Natural Log Data	0.919	-0.329	0.227	0.012	2.710	0.163
Main Stem	0841K_01	17679	00665	All	Raw Data	1.308	-1.045	0.122	0.007	2.790	0.004
Main Stem	0841K_01	17679	00665	Winter	Raw Data	0.409	-1.486	0.190	0.018	2.516	0.005
Main Stem	0841K_01	17679	00900	All	Natural Log Data	0.309	-1.244	0.259	0.000	-4.301	-0.042
Main Stem	0841K_01	17679	00900	Summer	Raw Data	1.995	0.266	0.320	0.002	-3.429	-9.919
Main Stem	0841K_01	17679	00900	Winter	Raw Data	1.328	-0.435	0.224	0.011	-2.738	-9.161
Main Stem	0841K_01	17679	00940	All	Raw Data	1.474	-1.409	0.213	0.000	-3.897	-1.563
Main Stem	0841K_01	17679	00940	Summer	Raw Data	0.930	-0.912	0.220	0.010	-2.763	-1.576
Main Stem	0841K_01	17679	00940	Winter	Raw Data	1.204	-1.046	0.205	0.014	-2.636	-1.545
Main Stem	0841K_01	17679	00945	All	Natural Log Data	-0.059	-1.209	0.367	0.000	-5.538	-0.069
Main Stem	0841K_01	17679	00945	Summer	Raw Data	1.835	0.134	0.374	0.000	-4.016	-8.757
Main Stem	0841K_01	17679	00945	Winter	Raw Data	1.830	-0.256	0.386	0.001	-3.884	-10.061
Main Stem	0841K_01	17679	01351	All	Raw Data	0.542	1.623	0.145	0.000	-5.319	-0.056
Main Stem	0841K_01	17679	01351	Summer	Raw Data	0.597	-0.353	0.173	0.000	-4.163	-0.060
Main Stem	0841K_01	17679	01351	Winter	Raw Data	0.097	2.793	0.113	0.002	-3.229	-0.050
Main Stem	0841K_01	17679	70300	Winter	Raw Data	1.248	-1.332	0.180	0.000	-4.243	-16.657
Main Stem	0841K_01	21530	00094	Summer	Raw Data	1.235	-0.449	0.347	0.073	-2.060	-163.307
Main Stem	0841K_01	21530	70300	Summer	Raw Data	1.235	-0.449	0.347	0.073	-2.060	-106.149
Main Stem	0841L_01	10718	00900	All	Raw Data	0.788	-0.003	0.188	0.044	-2.153	-13.572
Main Stem	0841L_01	10718	00900	Summer	Raw Data	0.406	-0.987	0.442	0.026	-2.668	-18.083
Main Stem	0841L_01	10718	00945	Summer	Raw Data	0.835	-0.533	0.361	0.050	-2.257	-13.170
Main Stem	0841L_01	10718	01351	Summer	Natural Log Data	0.284	1.471	0.199	0.007	-2.862	-0.041
Main Stem	0841L_01	10718	70953	Summer	Natural Log Data	0.319	-1.616	0.342	0.059	-2.162	-2.052
Main Stem	0841L_01	10718	82078	Winter	Natural Log Data	-0.001	-0.745	0.293	0.001	-3.588	-0.232
Main Stem	0841L_01	10721	00400	All	Raw Data	-0.994	0.713	0.163	0.037	-2.209	-0.043

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Main Stem	0841L_01	10721	00400	Winter	Raw Data	0.430	0.500	0.370	0.021	-2.654	-0.062
Main Stem	0841L_01	10721	01040	All	Natural Log Data	1.665	-1.311	0.175	0.033	2.257	0.125
Main Stem	0841L_01	10721	01040	Winter	Natural Log Data	1.038	-1.088	0.409	0.019	2.760	0.182
Main Stem	0841L_01	10721	01351	All	Raw Data	-0.391	1.098	0.144	0.035	-2.209	-0.144
Main Stem	0841L_01	10721	01351	Summer	Raw Data	0.220	-0.001	0.283	0.034	-2.348	-0.256
Main Stem	0841L_01	17664	00620	All	Natural Log Data	-1.462	-1.641	0.183	0.007	-2.876	-0.232
Main Stem	0841L_01	17664	00665	All	Natural Log Data	-1.309	-1.347	0.139	0.019	2.448	0.124
Main Stem	0841L_01	17664	00900	Summer	Raw Data	0.365	-0.720	0.449	0.001	-3.833	-8.001
Main Stem	0841L_01	17664	00945	Summer	Raw Data	0.117	-1.382	0.333	0.008	-2.996	-7.341
Main Stem	0841N_01	17675	00620	All	Raw Data	1.790	-0.850	0.292	0.000	-4.679	-0.046
Main Stem	0841N_01	17675	00620	Summer	Raw Data	1.395	-0.409	0.478	0.000	-4.877	-0.050
Main Stem	0841N_01	17675	00620	Winter	Raw Data	0.789	-1.003	0.193	0.022	-2.444	-0.041
Main Stem	0841N_01	17675	00625	Summer	Raw Data	1.183	0.401	0.411	0.000	-4.176	-0.032
Main Stem	0841N_01	17675	00665	Winter	Natural Log Data	-1.513	0.103	0.182	0.021	2.452	0.111
Main Stem	0841N_01	17675	00671	Summer	Natural Log Data	1.631	-1.259	0.228	0.012	2.721	0.201
Main Stem	0841N_01	17675	00671	Winter	Natural Log Data	1.210	-1.676	0.120	0.077	1.844	0.168
Main Stem	0841N_01	17675	00900	All	Raw Data	-0.564	-0.652	0.145	0.004	-3.025	-5.778
Main Stem	0841N_01	17675	00900	Summer	Raw Data	0.390	-0.691	0.259	0.007	-2.958	-8.277
Main Stem	0841N_01	17675	00940	All	Raw Data	-1.622	-0.557	0.246	0.000	-4.192	-1.380
Main Stem	0841N_01	17675	00940	Summer	Raw Data	-1.142	-0.921	0.216	0.013	-2.675	-1.410
Main Stem	0841N_01	17675	00940	Winter	Raw Data	-1.190	0.675	0.291	0.003	-3.267	-1.349
Main Stem	0841N_01	17675	00945	All	Raw Data	0.904	0.174	0.253	0.000	-4.232	-7.504
Main Stem	0841N_01	17675	00945	Summer	Raw Data	0.680	-1.140	0.340	0.001	-3.663	-8.568
Main Stem	0841N_01	17675	00945	Winter	Raw Data	0.635	1.637	0.181	0.027	-2.352	-6.425
Main Stem	0841N_01	17675	FDNH3	Winter	Raw Data	0.628	-0.949	0.296	0.024	-2.510	-0.069
Main Stem	0841O_01	10815	00310	Summer	Raw Data	1.290	-0.812	0.360	0.003	3.354	0.264
Main Stem	0841O_01	10815	00610	All	Natural Log Data	0.335	-1.841	0.303	0.000	4.275	0.416
Main Stem	0841O_01	10815	00610	Summer	Natural Log Data	0.558	-1.492	0.383	0.002	3.608	0.461
Main Stem	0841O_01	10815	00610	Winter	Natural Log Data	-0.032	-1.066	0.261	0.018	2.591	0.381
Main Stem	0841O_01	10815	00665	All	Natural Log Data	-0.700	-0.637	0.298	0.000	4.170	0.244
Main Stem	0841O_01	10815	00665	Winter	Natural Log Data	-0.746	-1.128	0.560	0.000	4.921	0.347
Main Stem	0841O_01	10815	31616	All	Natural Log Data	-0.814	0.556	0.148	0.001	3.494	0.492
Main Stem	0841O_01	10815	31616	Summer	Natural Log Data	0.562	0.352	0.116	0.046	2.078	0.402
Main Stem	0841O_01	10815	31616	Winter	Natural Log Data	-1.536	-0.333	0.171	0.011	2.688	0.538
Main Stem	0841O_01	10815	31673	Winter	Natural Log Data	-1.426	0.697	0.212	0.003	3.198	0.516

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Main Stem	0841O_01	10815	31699	All	Natural Log Data	0.454	-1.344	0.365	0.000	8.542	0.424
Main Stem	0841O_01	10815	31699	Summer	Natural Log Data	1.399	-1.186	0.283	0.000	4.942	0.337
Main Stem	0841O_01	10815	31699	Winter	Natural Log Data	-0.416	-0.884	0.457	0.000	7.285	0.516
Main Stem	0841O_01	17682	00301	Summer	Raw Data	-0.247	1.107	0.121	0.076	1.853	8.381
Main Stem	0841O_01	17682	00310	Summer	Natural Log Data	0.872	-1.213	0.202	0.047	2.137	0.083
Main Stem	0841O_01	17682	00620	All	Natural Log Data	-0.192	-1.647	0.103	0.040	-2.121	-0.170
Main Stem	0841O_01	17682	00620	Summer	Natural Log Data	-0.081	-1.548	0.145	0.089	-1.794	-0.185
Main Stem	0841O_01	17682	00625	All	Raw Data	1.885	0.242	0.103	0.056	-1.976	-0.022
Main Stem	0841O_01	17682	00665	Winter	Natural Log Data	-1.131	-0.566	0.177	0.058	2.022	0.159
Main Stem	0841O_01	17682	00900	All	Natural Log Data	0.652	0.017	0.103	0.043	-2.089	-0.020
Main Stem	0841O_01	17682	00900	Summer	Raw Data	0.608	-1.410	0.264	0.024	-2.470	-5.279
Main Stem	0841O_01	17682	00945	Summer	Raw Data	0.275	-0.929	0.148	0.094	-1.770	-4.072
Main Stem	0841O_01	17682	31699	Winter	Natural Log Data	0.976	1.133	0.171	0.001	-3.491	-0.204
Main Stem	0841P_01	20836	31699	Winter	Natural Log Data	0.437	0.694	0.167	0.022	-2.414	-0.535
Main Stem	0841P_01	20836	70953	Summer	Raw Data	1.176	-0.365	0.434	0.028	2.627	2.038
Main Stem	0841P_01	20836	82078	Winter	Natural Log Data	1.274	1.720	0.117	0.065	-1.922	-0.186
Main Stem	0841Q_01	10724	00300	All	Raw Data	-0.250	-0.591	0.436	0.000	-4.480	-0.891
Main Stem	0841Q_01	10724	00300	Summer	Raw Data	-0.470	-0.775	0.548	0.002	-3.814	-0.954
Main Stem	0841Q_01	10724	00300	Winter	Raw Data	-0.027	-0.222	0.378	0.019	-2.700	-0.831
Main Stem	0841Q_01	10724	00400	All	Raw Data	-0.142	0.170	0.279	0.004	-3.173	-0.106
Main Stem	0841Q_01	10724	00400	Summer	Raw Data	1.085	-0.154	0.314	0.046	-2.245	-0.116
Main Stem	0841Q_01	10724	00400	Winter	Raw Data	-1.540	-0.305	0.266	0.049	-2.170	-0.098
Main Stem	0841Q_01	10724	01056	Winter	Natural Log Data	1.637	-0.451	0.573	0.007	3.479	0.571
Main Stem	0841Q_01	10724	01351	Winter	Natural Log Data	1.025	2.833	0.345	0.035	2.409	0.030
Main Stem	0841Q_01	10724	31699	Summer	Natural Log Data	0.436	-0.100	0.254	0.066	-2.024	-0.189
Main Stem	0841Q_01	20838	00400	Summer	Raw Data	-1.869	-0.082	0.391	0.000	4.671	0.117
Main Stem	0841Q_01	20838	00940	Winter	Raw Data	-0.725	-0.289	0.373	0.061	2.181	3.954
Main Stem	0841R_01	17190	00400	All	Raw Data	-1.076	0.725	0.165	0.049	-2.083	-0.044
Main Stem	0841R_01	17190	00400	Summer	Raw Data	1.915	1.206	0.611	0.004	-3.761	-0.040
Main Stem	0841S_01	20794	00300	Winter	Raw Data	-0.306	-0.126	0.425	0.041	2.431	2.259
Main Stem	0841S_01	20794	00400	All	Raw Data	0.172	-0.663	0.492	0.000	-4.288	-0.205
Main Stem	0841S_01	20794	00400	Summer	Raw Data	-0.415	-0.654	0.685	0.002	-4.427	-0.225
Main Stem	0841S_01	20795	00400	All	Raw Data	-0.011	-0.613	0.147	0.086	-1.810	-0.200
Main Stem	0841S_01	20796	00094	Winter	Raw Data	-0.215	-0.842	0.304	0.099	-1.867	-98.440
Main Stem	0841S_01	20796	00400	All	Raw Data	-0.590	0.575	0.439	0.001	-3.853	-0.194

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Main Stem	0841S_01	20796	00400	Summer	Raw Data	-1.365	0.922	0.505	0.014	-3.028	-0.195
Main Stem	0841S_01	20796	70300	Winter	Raw Data	-0.215	-0.842	0.304	0.099	-1.867	-63.986
Main Stem	0841U_01	17179	00061	Winter	Natural Log Data	1.896	-0.803	0.197	0.050	2.104	0.577
Main Stem	0841U_01	17179	89835	All	Raw Data	1.595	-1.881	0.885	0.000	-15.184	-0.239
Main Stem	0841U_01	17179	89835	Winter	Raw Data	0.455	-1.812	0.918	0.000	-12.503	-0.251
Main Stem	0841V_01	17683	00094	Summer	Raw Data	0.881	1.903	0.105	0.002	3.142	24.272
Main Stem	0841V_01	17683	00620	All	Raw Data	1.808	-0.187	0.125	0.007	-2.780	-0.044
Main Stem	0841V_01	17683	00620	Summer	Raw Data	1.231	-0.365	0.315	0.002	-3.527	-0.060
Main Stem	0841V_01	17683	00671	Winter	Natural Log Data	0.188	-2.123	0.296	0.004	3.178	0.244
Main Stem	0841V_01	17683	00940	All	Raw Data	-0.594	-0.996	0.141	0.004	-3.009	-2.032
Main Stem	0841V_01	17683	00940	Summer	Raw Data	-1.132	-0.768	0.143	0.043	-2.119	-1.842
Main Stem	0841V_01	17683	00940	Winter	Raw Data	0.166	-0.516	0.146	0.045	-2.110	-2.266
Main Stem	0841W_01	17681	00094	All	Natural Log Data	1.569	0.496	0.258	0.000	6.945	0.028
Main Stem	0841W_01	17681	00094	Summer	Natural Log Data	0.893	0.912	0.120	0.003	3.071	0.018
Main Stem	0841W_01	17681	00094	Winter	Natural Log Data	1.343	0.069	0.432	0.000	7.187	0.038
Main Stem	0841W_01	17681	00620	All	Raw Data	1.816	-0.918	0.110	0.013	-2.581	-0.012
Main Stem	0841W_01	17681	00620	Summer	Natural Log Data	-0.903	-1.555	0.175	0.024	-2.397	-0.211
Main Stem	0841W_01	17681	00620	Winter	Raw Data	0.453	-0.692	0.114	0.085	-1.791	-0.011
Main Stem	0841W_01	17681	00665	All	Raw Data	1.282	-1.131	0.262	0.000	3.993	0.004
Main Stem	0841W_01	17681	00665	Summer	Raw Data	0.872	-1.109	0.532	0.000	5.002	0.006
Main Stem	0841W_01	17681	00940	Winter	Natural Log Data	1.249	1.013	0.377	0.001	3.963	0.041
Main Stem	0841W_01	17681	31616	Summer	Natural Log Data	-1.215	-0.083	0.168	0.018	2.502	0.520
Main Stem	0841W_01	17681	31673	Summer	Natural Log Data	-0.774	2.690	0.219	0.005	2.992	0.351
Mountain Creek	0838_02	17684	00078	Winter	Natural Log Data	0.941	0.299	0.199	0.038	2.227	0.198
Mountain Creek	0838_02	17684	FDNH3	Winter	Natural Log Data	-0.737	-1.177	0.355	0.041	2.347	3.355
Mountain Creek	0838B_01	17680	00078	Summer	Raw Data	-1.673	-2.206	0.326	0.000	5.433	0.036
Mountain Creek	0838B_01	17680	00078	Winter	Raw Data	0.858	-1.788	0.233	0.000	4.048	0.031
Mountain Creek	0838B_01	17680	00094	All	Natural Log Data	-0.100	1.377	0.102	0.000	-3.777	-0.038
Mountain Creek	0838B_01	17680	00094	Winter	Natural Log Data	-0.436	0.569	0.134	0.003	-3.102	-0.046
Mountain Creek	0838B_01	17680	00400	Winter	Raw Data	-1.056	0.261	0.129	0.004	3.002	0.038
Mountain Creek	0838B_01	17680	00610	All	Natural Log Data	-1.354	-1.305	0.122	0.025	2.333	0.172
Mountain Creek	0838B_01	17680	00620	All	Natural Log Data	-1.263	-1.022	0.218	0.002	-3.252	-0.282
Mountain Creek	0838B_01	17680	00620	Summer	Natural Log Data	-0.583	-0.615	0.393	0.002	-3.508	-0.318
Mountain Creek	0838B_01	17680	00900	All	Natural Log Data	-0.779	0.713	0.181	0.006	-2.899	-0.041
Mountain Creek	0838B_01	17680	00900	Summer	Raw Data	0.248	-1.157	0.426	0.002	-3.549	-6.358

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Mountain Creek	0838B_01	17680	00945	All	Natural Log Data	0.397	0.890	0.135	0.020	-2.435	-0.047
Mountain Creek	0838B_01	17680	00945	Summer	Natural Log Data	0.716	0.928	0.204	0.040	-2.206	-0.064
Mountain Creek	0838B_01	17680	31673	Summer	Natural Log Data	0.052	0.058	0.195	0.003	-3.194	-0.334
Mountain Creek	0838B_01	17680	31699	All	Natural Log Data	0.768	-0.716	0.180	0.000	-5.233	-0.253
Mountain Creek	0838B_01	17680	31699	Summer	Natural Log Data	0.764	-0.399	0.303	0.000	-5.190	-0.334
Mountain Creek	0838B_01	17680	70300	All	Natural Log Data	-0.442	1.476	0.117	0.000	-4.077	-0.041
Mountain Creek	0838B_01	17680	70300	Winter	Natural Log Data	-0.571	1.196	0.151	0.002	-3.318	-0.047
Mountain Creek	0838C_01	13621	00094	Summer	Raw Data	-0.485	-1.737	0.157	0.008	-2.793	-48.429
Mountain Creek	0838C_01	13621	70300	Summer	Raw Data	0.100	-1.698	0.121	0.020	-2.410	-29.390
Mountain Creek	0838C_01	13621	72053	Winter	Raw Data	0.369	-1.418	0.167	0.011	2.683	0.414
Mountain Creek	0838D_01	16433	00010	Summer	Raw Data	-1.581	0.009	0.241	0.028	2.390	0.917
Mountain Creek	0838D_01	16433	00094	Summer	Raw Data	0.679	-1.174	0.242	0.028	-2.397	-47.183
Mountain Creek	0838D_01	16433	00094	Winter	Natural Log Data	0.349	1.269	0.159	0.021	2.425	0.084
Mountain Creek	0838D_01	16433	00400	Summer	Raw Data	-0.900	0.198	0.327	0.008	2.957	0.117
Mountain Creek	0838D_01	16433	70300	Summer	Raw Data	0.354	-1.447	0.364	0.005	-3.209	-37.686
Mountain Creek	0838D_01	16433	70300	Winter	Natural Log Data	1.009	2.418	0.120	0.049	2.054	0.079
Mountain Creek	0838D_01	16433	82078	Summer	Natural Log Data	0.517	-0.070	0.232	0.031	-2.332	-0.251
Mountain Creek	0838E_01	16435	00400	Summer	Raw Data	-1.839	0.851	0.301	0.034	2.364	0.093
Mountain Creek	0838E_01	16435	01351	All	Raw Data	-0.423	-1.109	0.197	0.000	-3.773	-0.362
Mountain Creek	0838E_01	16435	01351	Summer	Raw Data	0.395	-1.898	0.163	0.030	-2.296	-0.319
Mountain Creek	0838E_01	16435	01351	Winter	Raw Data	-0.419	1.262	0.139	0.039	-2.161	-0.272
Mountain Creek	0838E_01	16435	72053	Winter	Natural Log Data	-0.466	-0.594	0.157	0.034	2.238	0.211
Mountain Creek	0838F_01	21123	72053	Summer	Raw Data	0.974	-0.553	0.298	0.083	-1.953	-3.421
Richland Chambers	0814_01	10975	00061	All	Natural Log Data	0.328	-2.063	0.307	0.000	-4.613	-0.430
Richland Chambers	0814_01	10975	00061	Winter	Natural Log Data	-1.216	-1.379	0.352	0.001	-3.610	-0.444
Richland Chambers	0814_01	10975	00535	All	Natural Log Data	-1.930	-0.941	0.110	0.001	-3.279	-0.136
Richland Chambers	0814_01	10975	31699	All	Natural Log Data	-0.535	-0.290	0.112	0.003	-3.091	-0.141
Richland Chambers	0814_01	10975	72053	Winter	Natural Log Data	-1.018	-0.280	0.130	0.043	2.117	0.064
Richland Chambers	0814_01	10975	82903	Winter	Natural Log Data	1.697	0.681	0.161	0.088	1.807	0.082
Richland Chambers	0814_01	10975	89835	All	Raw Data	0.405	-2.943	0.602	0.000	8.512	0.356
Richland Chambers	0814_01	10975	89835	Summer	Raw Data	-1.574	-1.477	0.552	0.000	5.210	0.331
Richland Chambers	0815_01	10979	00078	All	Natural Log Data	0.943	-0.054	0.288	0.000	-4.404	-0.050
Richland Chambers	0815_01	10979	00078	Summer	Natural Log Data	0.617	0.026	0.478	0.000	-4.386	-0.073
Richland Chambers	0815_01	10979	00078	Winter	Natural Log Data	0.766	0.133	0.176	0.029	-2.309	-0.036
Richland Chambers	0815_01	10979	00400	Summer	Raw Data	0.139	-0.771	0.101	0.082	-1.802	-0.025

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Richland Chambers	0815_01	10979	00530	Winter	Raw Data	-0.718	0.263	0.120	0.066	1.919	0.326
Richland Chambers	0815_01	10979	00625	Winter	Natural Log Data	0.779	1.581	0.123	0.073	-1.869	-0.015
Richland Chambers	0815_01	10979	00665	All	Raw Data	-0.360	-1.353	0.156	0.003	3.158	0.002
Richland Chambers	0815_01	10979	00665	Summer	Raw Data	-0.628	-1.187	0.403	0.000	4.109	0.003
Richland Chambers	0815_01	10979	00680	Summer	Natural Log Data	1.666	0.447	0.132	0.063	1.948	0.012
Richland Chambers	0815_01	10979	00940	All	Raw Data	1.426	-0.884	0.124	0.008	2.744	0.529
Richland Chambers	0815_01	10979	00940	Summer	Raw Data	0.854	-0.566	0.231	0.013	2.684	0.769
Richland Chambers	0815_01	10979	00945	Summer	Raw Data	0.821	-0.597	0.115	0.089	1.770	0.975
Richland Chambers	0815_01	10979	00951	All	Raw Data	-0.338	0.178	0.261	0.000	4.281	0.020
Richland Chambers	0815_01	10979	00951	Summer	Raw Data	0.123	0.295	0.278	0.007	2.973	0.021
Richland Chambers	0815_01	10979	00951	Winter	Raw Data	-0.444	0.076	0.237	0.007	2.899	0.019
Richland Chambers	0815_01	10979	72053	Winter	Natural Log Data	-0.032	-1.250	0.190	0.018	-2.520	-0.071
Richland Chambers	0815_01	10979	82903	All	Raw Data	0.487	-0.856	0.185	0.046	2.133	0.595
Richland Chambers	0815_01	10979	82903	Summer	Raw Data	0.397	-1.216	0.519	0.019	2.936	1.079
Richland Chambers	0816_01	10980	00078	All	Raw Data	1.474	-0.740	0.158	0.004	-3.032	-0.018
Richland Chambers	0816_01	10980	00078	Summer	Raw Data	0.699	-0.946	0.323	0.002	-3.519	-0.027
Richland Chambers	0816_01	10980	00094	All	Raw Data	1.948	-0.055	0.115	0.010	2.671	3.757
Richland Chambers	0816_01	10980	00094	Summer	Raw Data	1.918	-0.104	0.126	0.051	2.040	3.809
Richland Chambers	0816_01	10980	00665	All	Natural Log Data	-0.621	-2.668	0.506	0.000	7.304	0.164
Richland Chambers	0816_01	10980	00665	Summer	Raw Data	1.102	-1.352	0.485	0.000	4.948	0.003
Richland Chambers	0816_01	10980	00665	Winter	Raw Data	1.544	1.289	0.265	0.007	2.941	0.003
Richland Chambers	0816_01	10980	00940	All	Natural Log Data	0.609	-1.143	0.173	0.002	3.331	0.035
Richland Chambers	0816_01	10980	00940	Summer	Raw Data	1.828	-0.246	0.229	0.007	2.882	0.587
Richland Chambers	0816_01	10980	00945	Summer	Raw Data	1.854	-0.641	0.114	0.068	1.902	0.908
Richland Chambers	0816_01	10980	00951	Summer	Raw Data	-0.890	-0.888	0.141	0.045	2.105	0.012
Richland Chambers	0816_01	10980	72053	Winter	Natural Log Data	0.215	-1.237	0.217	0.016	-2.578	-0.080
Richland Chambers	0817_01	10981	00680	Winter	Raw Data	0.594	0.150	0.298	0.005	3.121	0.105
Richland Chambers	0817_01	10981	00945	All	Natural Log Data	-0.867	1.819	0.174	0.003	-3.182	-0.030
Richland Chambers	0817_01	10981	00945	Winter	Natural Log Data	-0.542	1.473	0.335	0.002	-3.474	-0.042
Richland Chambers	0836_01	15168	00620	Winter	Natural Log Data	1.992	2.067	0.387	0.000	4.348	0.044
Richland Chambers	0836_01	15168	00665	Summer	Natural Log Data	-1.305	-0.132	0.230	0.002	-3.327	-0.092
Richland Chambers	0836_01	15168	00671	All	Natural Log Data	-0.323	-2.673	0.119	0.004	-2.991	-0.102
Richland Chambers	0836_01	15168	00680	Summer	Natural Log Data	1.248	0.770	0.149	0.020	-2.442	-0.017
Richland Chambers	0836_01	15168	00680	Winter	Raw Data	-0.317	-0.873	0.324	0.002	-3.529	-0.057
Richland Chambers	0836_02	15169	00094	All	Raw Data	0.391	0.559	0.120	0.001	-3.317	-1.623

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Richland Chambers	0836_02	15169	00094	Summer	Raw Data	0.593	-1.055	0.123	0.011	-2.642	-1.373
Richland Chambers	0836_02	15169	00094	Winter	Raw Data	-1.325	2.093	0.118	0.059	-1.969	-1.715
Richland Chambers	0836_02	15169	00400	Winter	Raw Data	-0.315	-0.130	0.327	0.001	-3.755	-0.029
Richland Chambers	0836_02	15169	00610	All	Natural Log Data	1.500	-2.646	0.285	0.000	-5.211	-0.172
Richland Chambers	0836_02	15169	00610	Winter	Natural Log Data	-0.500	-1.986	0.197	0.014	-2.618	-0.142
Richland Chambers	0836_02	15169	00620	Winter	Natural Log Data	0.210	0.741	0.321	0.001	3.765	0.035
Richland Chambers	0836_02	15169	00665	Summer	Raw Data	1.848	0.696	0.129	0.021	-2.398	-0.002
Richland Chambers	0836_02	15169	00671	All	Natural Log Data	0.038	-2.940	0.245	0.000	-4.659	-0.141
Richland Chambers	0836_02	15169	00671	Summer	Natural Log Data	1.929	-1.545	0.316	0.000	-4.078	-0.156
Richland Chambers	0836_02	15169	00680	All	Natural Log Data	1.225	-0.983	0.132	0.003	-3.049	-0.013
Richland Chambers	0836_02	15169	00680	Summer	Raw Data	1.144	-0.596	0.123	0.036	-2.188	-0.067
Richland Chambers	0836_02	15169	00680	Winter	Raw Data	1.781	0.780	0.266	0.006	-3.011	-0.071
Richland Chambers	0836_02	15169	00940	All	Natural Log Data	-1.373	2.478	0.109	0.006	-2.843	-0.022
Richland Chambers	0836_03	15170	00094	Winter	Raw Data	-0.875	0.079	0.161	0.000	-3.845	-2.321
Richland Chambers	0836_03	15170	00610	All	Natural Log Data	1.793	-2.581	0.340	0.000	-5.967	-0.179
Richland Chambers	0836_03	15170	00610	Winter	Natural Log Data	0.227	-2.014	0.387	0.000	-4.208	-0.195
Richland Chambers	0836_03	15170	00620	Winter	Raw Data	0.663	-1.099	0.133	0.040	2.149	0.010
Richland Chambers	0836_03	15170	00665	Summer	Natural Log Data	-1.836	1.919	0.303	0.000	-4.174	-0.111
Richland Chambers	0836_03	15170	00671	All	Natural Log Data	0.747	-2.601	0.250	0.000	-4.791	-0.152
Richland Chambers	0836_03	15170	00671	Summer	Natural Log Data	1.728	-1.539	0.261	0.001	-3.661	-0.159
Richland Chambers	0836_03	15170	00671	Winter	Natural Log Data	-0.699	-1.358	0.214	0.009	-2.809	-0.129
Richland Chambers	0836_03	15170	00680	All	Raw Data	1.864	0.071	0.114	0.005	-2.934	-0.056
Richland Chambers	0836_03	15170	00680	Winter	Raw Data	1.007	-0.181	0.229	0.007	-2.931	-0.072
Richland Chambers	0836_03	15170	00681	Winter	Raw Data	-0.684	0.628	0.145	0.034	-2.222	-0.054
Richland Chambers	0836_03	15170	00900	Summer	Raw Data	1.797	1.876	0.126	0.034	-2.215	-0.953
Richland Chambers	0836_03	15170	00927	All	Natural Log Data	0.700	0.976	0.117	0.006	-2.860	-0.010
Richland Chambers	0836_03	15170	00927	Summer	Raw Data	1.971	1.758	0.214	0.003	-3.129	-0.051
Richland Chambers	0836_03	15170	00945	All	Raw Data	0.979	-0.231	0.152	0.001	-3.391	-0.410
Richland Chambers	0836_03	15170	00945	Summer	Raw Data	0.924	-0.613	0.167	0.011	-2.688	-0.401
Richland Chambers	0836_03	15170	00945	Winter	Raw Data	0.294	0.263	0.125	0.065	-1.929	-0.398
Richland Chambers	0836_03	15170	01002	Winter	Raw Data	0.045	0.391	0.138	0.061	1.963	0.076
Richland Chambers	0836_03	15170	01045	Summer	Natural Log Data	-0.688	-1.957	0.116	0.039	2.147	0.100
Richland Chambers	0836_03	15170	01055	All	Natural Log Data	-0.468	-2.154	0.130	0.005	2.913	0.062
Richland Chambers	0836_03	15170	01055	Summer	Natural Log Data	0.308	-1.576	0.135	0.030	2.273	0.065
Richland Chambers	0836_03	15170	70953	Summer	Raw Data	1.340	-0.971	0.126	0.019	-2.432	-1.000

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Richland Chambers	0836_03	15170	70953	Winter	Natural Log Data	-0.911	-0.225	0.338	0.000	-3.912	-0.098
Richland Chambers	0836_03	15170	95999	All	Natural Log Data	0.135	0.460	0.247	0.000	3.840	0.207
Richland Chambers	0836_04	15199	00078	All	Natural Log Data	1.114	-0.374	0.106	0.008	2.748	0.034
Richland Chambers	0836_04	15199	00078	Summer	Natural Log Data	1.330	-0.560	0.335	0.000	4.256	0.059
Richland Chambers	0836_04	15199	00094	All	Raw Data	1.750	-0.010	0.143	0.000	-3.632	-4.366
Richland Chambers	0836_04	15199	00094	Summer	Raw Data	1.758	-0.594	0.201	0.001	-3.515	-3.958
Richland Chambers	0836_04	15199	00094	Winter	Raw Data	-0.519	-0.129	0.121	0.060	-1.962	-4.655
Richland Chambers	0836_04	15199	00610	All	Natural Log Data	0.933	-2.284	0.131	0.011	-2.657	-0.125
Richland Chambers	0836_04	15199	00610	Summer	Natural Log Data	1.617	-0.839	0.383	0.004	-3.344	-0.208
Richland Chambers	0836_04	15199	00620	Summer	Natural Log Data	1.151	0.300	0.336	0.005	3.180	0.266
Richland Chambers	0836_04	15199	00625	All	Raw Data	-0.066	-0.655	0.272	0.000	-4.327	-0.065
Richland Chambers	0836_04	15199	00625	Summer	Raw Data	-0.675	-1.110	0.464	0.001	-4.058	-0.105
Richland Chambers	0836_04	15199	00625	Winter	Raw Data	0.970	0.033	0.196	0.013	-2.657	-0.048
Richland Chambers	0836_04	15199	00665	Winter	Natural Log Data	0.005	0.049	0.103	0.078	-1.827	-0.042
Richland Chambers	0836_04	15199	00680	All	Raw Data	0.800	-1.491	0.340	0.000	-4.813	-0.178
Richland Chambers	0836_04	15199	00680	Summer	Raw Data	0.044	-1.214	0.398	0.004	-3.352	-0.212
Richland Chambers	0836_04	15199	00680	Winter	Raw Data	0.900	-1.053	0.317	0.002	-3.472	-0.164
Richland Chambers	0836_04	15199	70953	Winter	Natural Log Data	-0.796	-0.999	0.488	0.000	-5.259	-0.143
Richland Chambers	0836_05	11068	00078	Winter	Raw Data	-0.463	-0.371	0.132	0.058	-1.986	-0.018
Richland Chambers	0836_05	11068	00610	All	Natural Log Data	1.455	-2.648	0.342	0.000	-5.946	-0.193
Richland Chambers	0836_05	11068	00610	Summer	Natural Log Data	1.993	-1.475	0.385	0.000	-4.873	-0.195
Richland Chambers	0836_05	11068	00610	Winter	Natural Log Data	0.036	-1.958	0.275	0.003	-3.259	-0.177
Richland Chambers	0836_05	11068	00620	Winter	Raw Data	1.644	-0.427	0.351	0.000	4.024	0.015
Richland Chambers	0836_05	11068	00625	All	Raw Data	-0.255	1.454	0.116	0.003	-3.035	-0.025
Richland Chambers	0836_05	11068	00625	Winter	Raw Data	0.608	0.337	0.157	0.027	-2.326	-0.034
Richland Chambers	0836_05	11068	00665	Summer	Raw Data	1.616	0.973	0.224	0.002	-3.356	-0.003
Richland Chambers	0836_05	11068	00671	All	Natural Log Data	0.272	-2.480	0.228	0.000	-4.421	-0.139
Richland Chambers	0836_05	11068	00671	Summer	Natural Log Data	0.848	-1.972	0.385	0.000	-4.742	-0.184
Richland Chambers	0836_05	11068	00680	Summer	Natural Log Data	1.488	-0.150	0.186	0.012	-2.660	-0.020
Richland Chambers	0836_05	11068	00680	Winter	Natural Log Data	1.749	0.393	0.234	0.008	-2.868	-0.016
Richland Chambers	0836_05	11068	70953	All	Natural Log Data	-1.969	-0.066	0.164	0.000	-3.763	-0.068
Richland Chambers	0836_05	11068	70953	Summer	Raw Data	1.190	-1.028	0.149	0.012	-2.646	-1.023
Richland Chambers	0836_05	11068	70953	Winter	Natural Log Data	-1.396	-0.269	0.309	0.001	-3.659	-0.090
Richland Chambers	0836_06	15172	00078	Winter	Natural Log Data	0.113	-0.774	0.147	0.044	-2.116	-0.046
Richland Chambers	0836_06	15172	00610	All	Natural Log Data	0.164	-2.340	0.218	0.003	-3.209	-0.162

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Richland Chambers	0836_06	15172	00610	Summer	Natural Log Data	1.519	-0.377	0.450	0.034	-2.559	-0.173
Richland Chambers	0836_06	15172	00625	All	Raw Data	-0.030	0.280	0.152	0.012	-2.643	-0.039
Richland Chambers	0836_06	15172	00625	Summer	Raw Data	-0.540	-0.906	0.432	0.039	-2.464	-0.076
Richland Chambers	0836_06	15172	00671	All	Natural Log Data	-0.134	-1.414	0.172	0.009	-2.774	-0.146
Richland Chambers	0836_06	15172	00671	Summer	Raw Data	1.597	0.282	0.684	0.003	-4.163	-0.001
Richland Chambers	0836_06	15172	70953	Winter	Raw Data	1.155	-0.239	0.261	0.005	-3.086	-1.089
Richland Chambers	0836_07	16721	00680	All	Natural Log Data	-0.109	-1.211	0.113	0.005	-2.915	-0.030
Richland Chambers	0836_07	16721	00680	Winter	Natural Log Data	0.737	-1.013	0.109	0.024	-2.343	-0.028
Richland Chambers	0836D_01	17847	00530	Summer	Raw Data	0.594	-0.972	0.438	0.001	3.849	8.479
Richland Chambers	0837_01	11070	00300	Summer	Natural Log Data	1.327	-0.038	0.523	0.001	4.185	0.070
Richland Chambers	0837_01	11070	00625	Summer	Raw Data	1.087	-0.727	0.367	0.013	-2.848	-0.100
Richland Chambers	0837_01	11070	00680	Summer	Natural Log Data	1.610	0.304	0.357	0.011	-2.886	-0.104
Richland Chambers	0837_01	11070	70953	All	Natural Log Data	-0.580	0.004	0.183	0.009	-2.762	-0.150
Richland Chambers	0837_01	11070	70953	Summer	Natural Log Data	-0.973	0.695	0.257	0.032	-2.353	-0.184
Richland Chambers	0837_01	11070	82903	All	Natural Log Data	1.503	1.345	0.108	0.050	2.033	0.096
Richland Chambers	0837_01	11070	82903	Summer	Natural Log Data	0.890	0.360	0.250	0.041	2.238	0.137
Village Creek	0828_02	13904	00078	Winter	Raw Data	0.448	0.077	0.387	0.000	-4.208	-0.021
Village Creek	0828_02	13904	00094	Winter	Raw Data	-0.226	-0.462	0.151	0.034	-2.236	-2.353
Village Creek	0828_02	13904	00625	Summer	Raw Data	-1.783	1.876	0.138	0.021	-2.406	-0.028
Village Creek	0828_02	13904	00680	Winter	Raw Data	-0.004	-0.403	0.169	0.030	-2.299	-0.066
Village Creek	0828_02	13904	00927	Winter	Raw Data	1.346	1.891	0.199	0.020	-2.492	-0.052
Village Creek	0828_02	13904	00929	Winter	Raw Data	0.165	-0.442	0.119	0.084	-1.803	-0.226
Village Creek	0828_02	13904	00945	All	Natural Log Data	1.419	2.584	0.150	0.001	-3.383	-0.018
Village Creek	0828_02	13904	00945	Winter	Raw Data	-0.088	-0.008	0.273	0.004	-3.187	-0.597
Village Creek	0828_02	13904	01002	Summer	Raw Data	0.397	-1.527	0.236	0.004	3.096	0.184
Village Creek	0828_02	13904	70953	All	Raw Data	1.523	-1.295	0.362	0.000	-6.125	-2.481
Village Creek	0828_02	13904	70953	Summer	Raw Data	0.804	-1.542	0.401	0.000	-4.973	-2.189
Village Creek	0828_02	13904	70953	Winter	Raw Data	0.498	-1.266	0.347	0.001	-3.790	-2.745
Village Creek	0828_02	13904	71870	Summer	Natural Log Data	1.881	-1.180	0.306	0.002	3.386	0.085
Village Creek	0828_02	13904	95999	All	Natural Log Data	-1.311	0.255	0.552	0.000	8.887	0.221
Village Creek	0828_02	13904	95999	Summer	Natural Log Data	-1.431	0.705	0.475	0.000	5.702	0.217
Village Creek	0828_02	13904	95999	Winter	Natural Log Data	0.168	-1.399	0.755	0.000	8.961	0.235
Village Creek	0828_05	13899	00078	Summer	Raw Data	0.084	-0.970	0.230	0.002	-3.278	-0.020
Village Creek	0828_06	11042	00078	Winter	Raw Data	1.044	2.857	0.170	0.023	-2.399	-0.013
Village Creek	0828_06	11042	00094	Winter	Raw Data	0.164	-0.622	0.128	0.052	-2.026	-2.364

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Village Creek	0828_06	11042	00530	Summer	Raw Data	1.587	0.174	0.107	0.045	-2.079	-0.195
Village Creek	0828_06	11042	00610	Winter	Natural Log Data	1.770	-1.277	0.259	0.006	-3.011	-0.157
Village Creek	0828_06	11042	00620	Winter	Raw Data	1.735	-0.816	0.175	0.021	2.438	0.014
Village Creek	0828_06	11042	00625	All	Raw Data	-1.621	1.959	0.152	0.001	-3.442	-0.027
Village Creek	0828_06	11042	00625	Summer	Raw Data	-0.783	1.099	0.216	0.003	-3.152	-0.037
Village Creek	0828_06	11042	00665	Summer	Raw Data	-0.551	-0.547	0.287	0.001	-3.755	-0.003
Village Creek	0828_06	11042	00665	Winter	Natural Log Data	0.364	-0.479	0.184	0.018	-2.510	-0.048
Village Creek	0828_06	11042	00680	All	Raw Data	1.163	0.087	0.117	0.006	-2.864	-0.060
Village Creek	0828_06	11042	00680	Winter	Raw Data	0.393	-0.640	0.219	0.016	-2.596	-0.076
Village Creek	0828_06	11042	70300	Winter	Raw Data	-1.678	1.295	0.109	0.074	-1.854	-2.094
Village Creek	0828_06	11042	70953	Summer	Raw Data	0.781	-1.242	0.306	0.000	-3.869	-2.167
Village Creek	0828_06	11042	70953	Winter	Raw Data	1.864	0.731	0.263	0.004	-3.163	-2.626
Village Creek	0828_07	13897	00610	All	Natural Log Data	1.395	-2.349	0.133	0.007	-2.829	-0.126
Village Creek	0828_07	13897	00665	Winter	Natural Log Data	1.000	-0.481	0.174	0.024	-2.383	-0.078
Village Creek	0828_07	13897	00671	Winter	Natural Log Data	-1.248	-0.678	0.136	0.063	-1.947	-0.132
Village Creek	0828_07	13897	00681	Winter	Natural Log Data	1.292	0.360	0.157	0.045	-2.111	-0.019
Village Creek	0828_07	13897	00940	Winter	Natural Log Data	0.108	0.354	0.118	0.080	-1.826	-0.042
Village Creek	0828A_01	10786	00061	Summer	Natural Log Data	-1.689	1.528	0.295	0.001	-3.714	-0.459
Village Creek	0828A_01	10786	00061	Winter	Natural Log Data	1.245	-0.953	0.111	0.031	-2.230	-0.170
Village Creek	0828A_01	10786	00094	Summer	Raw Data	0.306	-0.670	0.193	0.008	2.807	18.450
Village Creek	0828A_01	10786	00530	All	Natural Log Data	-1.746	-1.157	0.134	0.001	-3.340	-0.216
Village Creek	0828A_01	10786	00530	Summer	Natural Log Data	-0.650	-0.658	0.137	0.031	-2.252	-0.212
Village Creek	0828A_01	10786	00530	Winter	Natural Log Data	-1.745	-0.890	0.133	0.021	-2.410	-0.220
Village Creek	0828A_01	10786	00610	All	Natural Log Data	1.424	-2.546	0.396	0.000	-5.946	-0.232
Village Creek	0828A_01	10786	00610	Summer	Natural Log Data	1.209	-1.452	0.647	0.000	-6.353	-0.264
Village Creek	0828A_01	10786	00610	Winter	Natural Log Data	0.768	-2.229	0.292	0.001	-3.517	-0.211
Village Creek	0828A_01	10786	00620	Summer	Natural Log Data	-1.366	-1.290	0.147	0.023	-2.387	-0.197
Village Creek	0828A_01	10786	00665	All	Natural Log Data	-1.861	-0.021	0.211	0.000	-4.445	-0.132
Village Creek	0828A_01	10786	00665	Summer	Natural Log Data	-0.984	-0.359	0.225	0.005	-3.045	-0.142
Village Creek	0828A_01	10786	00665	Winter	Natural Log Data	-1.654	0.641	0.193	0.004	-3.091	-0.122
Village Creek	0828A_01	10786	00671	Summer	Natural Log Data	-1.400	-1.441	0.140	0.029	-2.285	-0.167
Village Creek	0828A_01	10786	00680	All	Natural Log Data	1.678	-0.485	0.175	0.001	-3.390	-0.046
Village Creek	0828A_01	10786	00680	Summer	Raw Data	1.789	-0.318	0.158	0.054	-2.036	-0.249
Village Creek	0828A_01	10786	00680	Winter	Natural Log Data	1.383	-0.522	0.203	0.010	-2.760	-0.052
Village Creek	0828A_01	10786	01351	All	Raw Data	-0.563	1.333	0.158	0.000	-3.794	-0.063

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Village Creek	0828A_01	10786	01351	Summer	Raw Data	-0.914	0.553	0.159	0.014	-2.576	-0.071
Village Creek	0828A_01	10786	01351	Winter	Raw Data	1.558	0.167	0.151	0.011	-2.669	-0.053
Village Creek	0828A_01	10786	70300	Summer	Raw Data	0.233	-0.592	0.182	0.011	2.708	11.003
West Fork	0807_01	10942	00078	All	Raw Data	1.719	0.755	0.132	0.002	-3.146	-0.017
West Fork	0807_01	10942	00078	Summer	Natural Log Data	-0.412	0.123	0.173	0.009	-2.742	-0.030
West Fork	0807_01	10942	00620	Winter	Natural Log Data	-1.491	-0.306	0.487	0.000	4.971	0.285
West Fork	0807_01	10942	00665	All	Raw Data	0.931	0.344	0.148	0.001	-3.338	-0.003
West Fork	0807_01	10942	00665	Summer	Raw Data	-0.053	0.535	0.247	0.002	-3.386	-0.004
West Fork	0807_01	10942	00665	Winter	Raw Data	1.207	0.698	0.142	0.044	-2.113	-0.002
West Fork	0807_01	10942	00927	All	Raw Data	-0.570	1.613	0.201	0.000	-3.986	-0.109
West Fork	0807_01	10942	00927	Summer	Raw Data	-1.177	0.995	0.108	0.047	-2.063	-0.080
West Fork	0807_01	10942	00927	Winter	Raw Data	0.361	1.227	0.322	0.002	-3.516	-0.132
West Fork	0807_01	10942	00940	All	Raw Data	-1.423	-0.627	0.158	0.001	-3.359	-0.726
West Fork	0807_01	10942	00940	Summer	Raw Data	-1.224	-0.403	0.142	0.026	-2.337	-0.731
West Fork	0807_01	10942	00940	Winter	Raw Data	-0.767	-0.380	0.194	0.021	-2.454	-0.758
West Fork	0807_01	10942	00945	Winter	Raw Data	-0.995	-0.412	0.136	0.054	-2.019	-0.420
West Fork	0807_01	10942	01002	Summer	Raw Data	-0.044	-0.143	0.222	0.007	2.925	0.201
West Fork	0807_01	10942	01002	Winter	Raw Data	-0.646	-0.655	0.539	0.000	5.070	0.094
West Fork	0807_01	10942	71870	All	Natural Log Data	1.547	-1.995	0.178	0.002	3.258	0.084
West Fork	0807_01	10942	71870	Summer	Natural Log Data	1.288	-1.550	0.323	0.001	3.716	0.118
West Fork	0807_01	10942	95999	All	Natural Log Data	0.167	-1.458	0.600	0.000	9.412	0.309
West Fork	0807_01	10942	95999	Summer	Natural Log Data	0.509	-1.347	0.672	0.000	8.222	0.282
West Fork	0807_01	10942	95999	Winter	Natural Log Data	0.960	-1.117	0.715	0.000	7.761	0.306
West Fork	0807_01	15163	00530	Winter	Natural Log Data	0.487	-0.384	0.146	0.054	-2.025	-0.051
West Fork	0807_01	15163	00625	Winter	Natural Log Data	1.079	-0.663	0.189	0.026	-2.368	-0.028
West Fork	0807_01	15163	00665	Summer	Raw Data	-0.359	-0.497	0.116	0.053	-2.012	-0.004
West Fork	0807_01	15163	00940	All	Raw Data	-0.439	-0.394	0.289	0.000	-4.593	-1.008
West Fork	0807_01	15163	00940	Summer	Raw Data	-0.776	-0.801	0.194	0.015	-2.598	-0.835
West Fork	0807_01	15163	00940	Winter	Raw Data	0.336	0.024	0.395	0.001	-3.792	-1.155
West Fork	0807_01	15163	31699	Summer	Natural Log Data	1.604	0.927	0.196	0.030	-2.316	-0.143
West Fork	0807_01	15163	70953	Summer	Raw Data	1.803	-0.156	0.200	0.010	-2.741	-1.505
West Fork	0807_01	15163	70953	Winter	Raw Data	0.268	-0.848	0.229	0.013	-2.672	-0.903
West Fork	0807_01	15166	00530	Winter	Natural Log Data	1.362	-0.235	0.299	0.006	-3.061	-0.053
West Fork	0807_01	15166	00620	All	Natural Log Data	-0.132	-1.830	0.258	0.000	3.909	0.223
West Fork	0807_01	15166	00620	Summer	Natural Log Data	0.247	-1.574	0.146	0.065	1.942	0.144

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West Fork	0807_01	15166	00620	Winter	Natural Log Data	-1.224	-0.828	0.486	0.000	4.350	0.301
West Fork	0807_01	15166	00625	Winter	Natural Log Data	1.814	1.079	0.166	0.048	-2.093	-0.019
West Fork	0807_01	15166	00940	All	Raw Data	-1.489	-0.396	0.100	0.034	-2.188	-0.539
West Fork	0807_01	15166	00940	Winter	Raw Data	-0.514	-0.504	0.230	0.024	-2.442	-0.781
West Fork	0807_01	15166	70953	Summer	Natural Log Data	-1.167	0.549	0.226	0.022	-2.478	-0.096
West Fork	0807_01	15167	00620	All	Natural Log Data	-0.076	-2.166	0.228	0.001	3.722	0.207
West Fork	0807_01	15167	00620	Summer	Natural Log Data	0.533	-1.831	0.155	0.047	2.095	0.158
West Fork	0807_01	15167	00620	Winter	Natural Log Data	-0.944	-1.072	0.478	0.000	4.384	0.287
West Fork	0807_01	15167	00665	Summer	Natural Log Data	-0.570	1.218	0.225	0.014	-2.643	-0.042
West Fork	0807_01	15167	00671	All	Natural Log Data	1.474	-2.132	0.151	0.006	-2.886	-0.091
West Fork	0807_01	15167	00671	Winter	Natural Log Data	0.483	-1.770	0.220	0.021	-2.493	-0.108
West Fork	0807_01	15167	00940	All	Raw Data	-0.592	-0.890	0.183	0.003	-3.172	-0.691
West Fork	0807_01	15167	00940	Summer	Raw Data	-0.537	-0.581	0.140	0.065	-1.937	-0.584
West Fork	0807_01	15167	00940	Winter	Raw Data	-0.285	-0.621	0.240	0.021	-2.513	-0.823
West Fork	0809_01	10944	00410	Winter	Raw Data	-1.789	0.658	0.107	0.072	-1.868	-1.132
West Fork	0809_01	10944	00610	Winter	Natural Log Data	1.381	-1.632	0.157	0.025	-2.362	-0.134
West Fork	0809_01	10944	00625	All	Raw Data	-0.465	2.029	0.109	0.003	-3.030	-0.021
West Fork	0809_01	10944	00625	Winter	Raw Data	0.779	1.967	0.259	0.002	-3.342	-0.029
West Fork	0809_01	10944	00927	Winter	Raw Data	-0.956	-0.363	0.201	0.015	-2.606	-0.107
West Fork	0809_01	10944	00940	All	Raw Data	-0.375	-1.122	0.137	0.001	-3.338	-0.589
West Fork	0809_01	10944	00940	Summer	Raw Data	-0.757	-0.926	0.180	0.006	-2.888	-0.731
West Fork	0809_01	10944	00945	Winter	Raw Data	-0.803	-0.298	0.174	0.022	-2.432	-0.397
West Fork	0809_01	10944	01002	All	Raw Data	0.681	-1.245	0.137	0.003	3.106	0.100
West Fork	0809_01	10944	01002	Summer	Raw Data	-1.620	-0.174	0.201	0.008	2.838	0.126
West Fork	0809_01	10944	01002	Winter	Raw Data	-0.986	-1.148	0.104	0.088	1.770	0.046
West Fork	0809_01	10944	01045	All	Natural Log Data	0.312	-2.695	0.129	0.003	3.058	0.114
West Fork	0809_01	10944	01045	Summer	Natural Log Data	1.189	-1.850	0.109	0.046	2.071	0.105
West Fork	0809_01	10944	01045	Winter	Natural Log Data	-0.865	-1.425	0.273	0.004	3.125	0.162
West Fork	0809_01	10944	01055	Winter	Raw Data	-0.018	-0.880	0.223	0.013	2.679	1.523
West Fork	0809_01	10944	70953	Summer	Raw Data	1.582	-0.148	0.129	0.019	-2.439	-1.232
West Fork	0809_01	10944	95999	All	Natural Log Data	-0.160	-1.341	0.583	0.000	9.464	0.236
West Fork	0809_01	10944	95999	Summer	Natural Log Data	0.172	-0.982	0.579	0.000	6.839	0.209
West Fork	0809_01	10944	95999	Winter	Natural Log Data	0.272	-1.539	0.706	0.000	8.200	0.241
West Fork	0809_05	10952	00078	All	Raw Data	0.942	1.405	0.154	0.001	-3.616	-0.019
West Fork	0809_05	10952	00078	Summer	Natural Log Data	0.293	0.275	0.128	0.022	-2.395	-0.019

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West Fork	0809_05	10952	00078	Winter	Raw Data	-0.741	0.481	0.240	0.004	-3.129	-0.024
West Fork	0809_05	10952	00625	Winter	Raw Data	-0.682	1.546	0.185	0.012	-2.656	-0.024
West Fork	0809_05	10952	00665	Summer	Raw Data	-1.089	0.379	0.328	0.000	-4.421	-0.003
West Fork	0809_05	10952	00940	All	Raw Data	-0.457	-1.418	0.143	0.001	-3.412	-0.620
West Fork	0809_05	10952	00940	Summer	Raw Data	-0.850	-1.167	0.171	0.008	-2.797	-0.708
West Fork	0809_05	10952	00940	Winter	Raw Data	0.308	-0.529	0.133	0.040	-2.146	-0.578
West Fork	0809_05	10952	70953	Summer	Natural Log Data	-0.724	0.710	0.109	0.033	-2.208	-0.048
West Fork	0809_05	10952	70953	Winter	Raw Data	0.618	-0.639	0.129	0.037	-2.180	-0.556
West Fork	0809_08	10956	00078	All	Raw Data	0.411	0.988	0.180	0.000	-4.029	-0.017
West Fork	0809_08	10956	00078	Summer	Raw Data	-1.018	-0.161	0.183	0.005	-2.989	-0.015
West Fork	0809_08	10956	00078	Winter	Raw Data	0.316	0.602	0.147	0.025	-2.350	-0.016
West Fork	0809_08	10956	00410	Winter	Raw Data	-0.792	-0.055	0.105	0.076	-1.842	-1.329
West Fork	0809_08	10956	00620	Winter	Natural Log Data	-0.305	-1.700	0.187	0.014	2.625	0.206
West Fork	0809_08	10956	00625	Winter	Raw Data	-1.254	1.647	0.420	0.000	-4.740	-0.041
West Fork	0809_08	10956	00665	Winter	Natural Log Data	-1.438	2.712	0.229	0.004	-3.083	-0.055
West Fork	0809_08	10956	00940	All	Raw Data	0.148	-0.551	0.126	0.002	-3.158	-0.584
West Fork	0809_08	10956	00940	Summer	Raw Data	-0.180	-1.172	0.182	0.007	-2.873	-0.688
West Fork	0809_08	10956	70953	All	Raw Data	1.651	-0.881	0.101	0.006	-2.859	-1.011
West Fork	0809_08	10956	70953	Summer	Raw Data	0.065	-0.960	0.143	0.015	-2.547	-1.163
West Fork	0809_08	10956	70953	Winter	Raw Data	0.538	-0.913	0.486	0.000	-5.496	-1.379
West Fork	0809_10	10960	00078	All	Raw Data	1.366	1.119	0.198	0.000	-4.250	-0.015
West Fork	0809_10	10960	00078	Summer	Raw Data	-0.642	-1.138	0.226	0.001	-3.420	-0.014
West Fork	0809_10	10960	00078	Winter	Raw Data	0.983	0.609	0.144	0.029	-2.285	-0.014
West Fork	0809_10	10960	00620	All	Natural Log Data	0.996	-2.120	0.157	0.000	3.660	0.179
West Fork	0809_10	10960	00620	Summer	Natural Log Data	1.164	-1.182	0.122	0.024	2.353	0.153
West Fork	0809_10	10960	00620	Winter	Natural Log Data	0.216	-1.711	0.256	0.003	3.217	0.242
West Fork	0809_10	10960	00625	All	Raw Data	0.771	1.646	0.108	0.004	-2.999	-0.025
West Fork	0809_10	10960	00625	Winter	Raw Data	1.456	0.640	0.214	0.006	-2.951	-0.027
West Fork	0809_10	10960	00665	Summer	Raw Data	0.905	1.471	0.192	0.005	-3.004	-0.004
West Fork	0809_10	10960	00940	All	Raw Data	0.388	-0.714	0.103	0.006	-2.810	-0.563
West Fork	0809_10	10960	00940	Summer	Raw Data	0.927	-0.328	0.170	0.009	-2.756	-0.688
West Fork	0809_10	10960	70953	Summer	Raw Data	1.511	-0.226	0.159	0.010	-2.716	-1.637
West Fork	0809_10	10960	70953	Winter	Raw Data	1.120	-0.608	0.361	0.000	-4.184	-1.187
West Fork	0809_12	10964	00078	All	Natural Log Data	-1.269	1.387	0.190	0.000	-3.873	-0.040
West Fork	0809_12	10964	00078	Summer	Natural Log Data	-1.972	2.624	0.190	0.007	-2.868	-0.035

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West Fork	0809_12	10964	00078	Winter	Raw Data	1.981	2.218	0.106	0.085	-1.789	-0.011
West Fork	0809_12	10964	00620	Winter	Natural Log Data	0.054	-1.747	0.183	0.026	2.367	0.237
West Fork	0809_12	10964	00665	Winter	Natural Log Data	-0.558	-0.165	0.107	0.083	-1.798	-0.044
West Fork	0809_12	10964	00940	All	Natural Log Data	-1.000	0.057	0.184	0.001	-3.678	-0.035
West Fork	0809_12	10964	00940	Summer	Natural Log Data	-0.182	-0.137	0.279	0.001	-3.571	-0.039
West Fork	0809_12	10964	70300	Summer	Natural Log Data	0.872	1.454	0.111	0.038	-2.150	-0.013
West Fork	0809_12	10964	70953	All	Natural Log Data	-1.094	-0.179	0.209	0.000	-4.047	-0.078
West Fork	0809_12	10964	70953	Summer	Natural Log Data	-0.331	-1.119	0.206	0.005	-2.968	-0.079
West Fork	0809_12	10964	70953	Winter	Raw Data	1.291	-0.454	0.230	0.010	-2.787	-1.355
West Fork	0809B_01	10854	00530	Summer	Natural Log Data	-0.757	-0.510	0.191	0.000	-4.128	-0.249
West Fork	0809B_01	10854	00610	Summer	Natural Log Data	0.907	-2.785	0.279	0.000	-5.282	-0.188
West Fork	0809B_01	10854	89835	Winter	Raw Data	1.762	-2.961	0.719	0.000	13.093	0.181
West Fork	0809C_01	10855	00530	Summer	Natural Log Data	-1.198	-0.429	0.209	0.100	-1.783	-0.217
West Fork	0809C_01	10855	00625	Summer	Raw Data	0.146	-0.201	0.243	0.087	-1.877	-0.044
West Fork	0809C_01	10855	00680	Summer	Raw Data	1.626	0.028	0.459	0.008	-3.190	-0.411
West Fork	0809C_01	10855	01351	Summer	Raw Data	0.105	-1.704	0.279	0.003	-3.236	-0.213
West Fork	0809C_01	10855	72053	Summer	Natural Log Data	0.565	-1.562	0.207	0.012	2.701	0.118
West Fork	0809C_01	10855	89835	All	Raw Data	0.555	-2.596	0.683	0.000	8.800	0.176
West Fork	0809C_01	10855	89835	Summer	Raw Data	-0.549	-1.600	0.843	0.000	7.332	0.179
West Fork	0809C_01	10855	89835	Winter	Raw Data	1.049	-1.976	0.624	0.000	6.314	0.172
West Fork	0809D_01	10858	00300	Summer	Raw Data	0.241	-0.834	0.211	0.063	-2.005	-0.193
West Fork	0809D_01	10858	00400	Summer	Raw Data	0.671	-0.622	0.504	0.002	-3.772	-0.080
West Fork	0809D_01	10858	01351	All	Raw Data	-0.955	-1.284	0.208	0.000	-4.126	-0.143
West Fork	0809D_01	10858	01351	Summer	Raw Data	0.214	-0.909	0.262	0.001	-3.472	-0.171
West Fork	0809D_01	10858	01351	Winter	Raw Data	-1.764	-0.077	0.134	0.043	-2.117	-0.103
West Fork	0809D_01	10858	72053	Summer	Natural Log Data	0.752	-1.860	0.126	0.037	2.178	0.102
West Fork	0810_01	10967	72053	Summer	Natural Log Data	-0.454	-1.108	0.217	0.008	2.839	0.095
West Fork	0810_01	10969	00078	Summer	Raw Data	1.689	0.586	0.269	0.033	2.347	0.024
West Fork	0810_01	10969	00400	Summer	Raw Data	-0.936	0.152	0.102	0.003	-3.082	-0.019
West Fork	0810_01	10969	00951	All	Raw Data	0.809	-2.131	0.296	0.002	-3.435	-0.028
West Fork	0810_01	10969	00951	Summer	Raw Data	-0.342	-1.764	0.355	0.015	-2.773	-0.030
West Fork	0810_01	10969	00951	Winter	Raw Data	1.830	-0.343	0.384	0.018	-2.736	-0.030
West Fork	0810_01	14246	00400	Summer	Raw Data	1.359	-0.881	0.144	0.035	-2.206	-0.021
West Fork	0810_01	14246	01351	Summer	Raw Data	-0.992	-0.696	0.143	0.036	-2.198	-0.051
West Fork	0810_01	14246	72053	Summer	Natural Log Data	-0.350	-1.156	0.212	0.010	2.748	0.093

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West Fork	0810_02	14904	31699	Summer	Natural Log Data	1.209	0.146	0.132	0.052	-2.029	-0.129
West Fork	0810_02	14904	72053	Summer	Natural Log Data	-0.716	-1.025	0.216	0.008	2.830	0.094
West Fork	0810_02	20840	00094	Winter	Raw Data	1.347	-1.579	0.160	0.029	-2.308	-29.425
West Fork	0810_02	20840	70300	Winter	Raw Data	1.347	-1.579	0.160	0.029	-2.308	-19.126
West Fork	0810_02	20840	72053	Summer	Natural Log Data	-0.716	-1.025	0.216	0.008	2.830	0.094
West Fork	0810B_01	16767	72053	Summer	Natural Log Data	-0.329	-1.328	0.189	0.013	2.645	0.095
West Fork	0810C_01	17848	31699	All	Natural Log Data	-0.035	-0.238	0.241	0.000	-4.643	-0.154
West Fork	0810C_01	17848	31699	Summer	Natural Log Data	0.960	0.586	0.341	0.000	-4.001	-0.185
West Fork	0810C_01	17848	31699	Winter	Natural Log Data	-0.564	0.029	0.169	0.011	-2.670	-0.116
West Fork	0810C_01	17848	72053	Summer	Natural Log Data	-0.431	-1.206	0.178	0.012	2.671	0.090
West Fork	0811_01	16762	00094	All	Raw Data	-1.480	1.737	0.188	0.000	-4.083	-3.481
West Fork	0811_01	16762	00094	Summer	Raw Data	-1.067	1.427	0.149	0.012	-2.643	-3.274
West Fork	0811_01	16762	00094	Winter	Raw Data	-1.187	1.303	0.273	0.002	-3.357	-3.915
West Fork	0811_01	16762	00410	All	Raw Data	-1.465	-1.081	0.326	0.000	-5.515	-1.668
West Fork	0811_01	16762	00410	Summer	Raw Data	-0.892	-0.768	0.228	0.003	-3.168	-1.481
West Fork	0811_01	16762	00410	Winter	Raw Data	-1.144	-0.825	0.456	0.000	-4.759	-1.811
West Fork	0811_01	16762	00665	Summer	Natural Log Data	-1.302	-0.877	0.329	0.000	-4.203	-0.130
West Fork	0811_01	16762	00665	Winter	Raw Data	1.922	0.592	0.185	0.018	-2.517	-0.002
West Fork	0811_01	16762	00681	Winter	Raw Data	1.100	-0.175	0.168	0.046	2.111	0.049
West Fork	0811_01	16762	00940	All	Raw Data	1.223	0.786	0.114	0.005	-2.921	-0.368
West Fork	0811_01	16762	00940	Summer	Raw Data	1.086	1.634	0.128	0.030	-2.269	-0.376
West Fork	0811_03	10970	00094	Winter	Raw Data	-0.996	1.334	0.278	0.002	-3.453	-3.951
West Fork	0811_03	10970	00410	All	Raw Data	-1.349	0.434	0.192	0.000	-3.899	-1.187
West Fork	0811_03	10970	00410	Summer	Raw Data	-1.460	1.865	0.102	0.058	-1.963	-0.911
West Fork	0811_03	10970	00410	Winter	Raw Data	-0.418	-1.595	0.308	0.001	-3.530	-1.417
West Fork	0811_03	10970	00665	All	Raw Data	0.613	-0.939	0.235	0.000	-4.470	-0.002
West Fork	0811_03	10970	00665	Summer	Raw Data	0.425	-0.595	0.231	0.002	-3.286	-0.002
West Fork	0811_03	10970	00665	Winter	Raw Data	0.517	-0.663	0.240	0.007	-2.922	-0.002
West Fork	0811_03	10970	00681	Winter	Raw Data	1.458	-0.218	0.146	0.060	1.980	0.049
West Fork	0811_03	10970	00900	All	Raw Data	-1.615	-0.952	0.301	0.000	-4.999	-1.680
West Fork	0811_03	10970	00900	Summer	Raw Data	-0.968	-0.569	0.271	0.002	-3.339	-1.790
West Fork	0811_03	10970	00900	Winter	Raw Data	-1.332	-0.836	0.332	0.001	-3.598	-1.566
West Fork	0811_03	10970	00916	All	Raw Data	-0.805	-1.204	0.275	0.000	-4.766	-0.483
West Fork	0811_03	10970	00916	Summer	Raw Data	-0.429	-0.813	0.280	0.001	-3.528	-0.534
West Fork	0811_03	10970	00916	Winter	Raw Data	-0.760	-0.931	0.272	0.004	-3.117	-0.433

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West Fork	0811_03	10970	00927	All	Raw Data	-0.657	-0.380	0.156	0.001	-3.355	-0.094
West Fork	0811_03	10970	00927	Winter	Raw Data	-0.203	-0.623	0.281	0.003	-3.251	-0.123
West Fork	0811_03	10970	00929	Winter	Raw Data	0.039	0.290	0.140	0.050	-2.057	-0.245
West Fork	0811_03	10970	00945	Winter	Raw Data	-0.158	-0.547	0.318	0.002	-3.480	-0.455
West Fork	0811_03	10970	01002	All	Raw Data	0.355	-1.408	0.188	0.001	3.573	0.092
West Fork	0811_03	10970	01002	Summer	Raw Data	0.429	-1.478	0.213	0.008	2.853	0.120
West Fork	0811_03	10970	01002	Winter	Raw Data	-0.840	-0.705	0.176	0.037	2.217	0.065
West Fork	0811_03	10970	01055	All	Natural Log Data	0.283	-0.910	0.145	0.003	3.084	0.086
West Fork	0811_03	10970	01055	Summer	Natural Log Data	0.413	-1.386	0.186	0.017	2.529	0.121
West Fork	0811_03	10970	71870	Summer	Natural Log Data	1.386	-1.344	0.289	0.003	3.248	0.079
West Fork	0811_03	10970	95999	All	Natural Log Data	-0.053	-1.521	0.390	0.000	6.250	0.255
West Fork	0811_03	10970	95999	Summer	Natural Log Data	-0.938	-0.670	0.345	0.000	4.173	0.228
West Fork	0811_03	10970	95999	Winter	Natural Log Data	1.115	-0.326	0.413	0.000	4.278	0.244
West Fork	0811_04	15164	00094	All	Raw Data	-1.867	1.832	0.121	0.002	-3.190	-2.764
West Fork	0811_04	15164	00094	Winter	Raw Data	-0.190	1.609	0.266	0.002	-3.355	-3.982
West Fork	0811_04	15164	00410	Winter	Raw Data	-1.649	-0.381	0.447	0.000	-4.755	-1.730
West Fork	0811_04	15164	00665	Summer	Natural Log Data	-0.989	-0.959	0.315	0.000	-4.067	-0.132
West Fork	0811_04	15164	00665	Winter	Raw Data	0.194	-0.656	0.137	0.044	-2.106	-0.001
West Fork	0811_04	15164	00680	Summer	Natural Log Data	1.423	1.190	0.123	0.039	2.150	0.014
West Fork	0811_04	15164	00681	Winter	Raw Data	1.473	-0.077	0.227	0.014	2.656	0.061
West Fork	0811_04	15164	00940	All	Raw Data	0.819	0.503	0.113	0.006	-2.850	-0.361
West Fork	0811_04	15164	00940	Summer	Raw Data	0.566	0.904	0.129	0.034	-2.214	-0.380
West Fork	0811A_01	16768	00400	All	Raw Data	-1.044	-0.367	0.145	0.046	2.100	0.030
West Fork	0811A_01	16768	00625	Winter	Natural Log Data	1.772	1.732	0.143	0.062	-1.962	-0.052
West Fork	0811A_01	16768	00665	All	Natural Log Data	-0.465	0.080	0.236	0.001	-3.562	-0.128
West Fork	0811A_01	16768	00665	Summer	Natural Log Data	-1.262	0.597	0.168	0.091	-1.797	-0.090
West Fork	0811A_01	16768	00665	Winter	Natural Log Data	0.525	0.750	0.315	0.004	-3.250	-0.151
West Fork	0811B_01	16737	00610	All	Natural Log Data	1.698	-2.051	0.133	0.010	-2.683	-0.129
West Fork	0811B_01	16737	00625	All	Natural Log Data	1.758	-0.609	0.205	0.002	-3.365	-0.073
West Fork	0811B_01	16737	00625	Summer	Natural Log Data	0.727	-0.281	0.162	0.097	-1.762	-0.060
West Fork	0811B_01	16737	00625	Winter	Natural Log Data	1.613	-0.526	0.233	0.009	-2.811	-0.082
West Fork	0811B_01	16737	00665	All	Natural Log Data	-0.368	0.094	0.287	0.000	-4.355	-0.173
West Fork	0811B_01	16737	00665	Summer	Natural Log Data	-0.754	-0.082	0.193	0.046	-2.132	-0.145
West Fork	0811B_01	16737	00665	Winter	Natural Log Data	0.267	0.498	0.390	0.000	-4.077	-0.201
West Fork	0811B_01	16737	00671	All	Natural Log Data	-1.535	-0.765	0.107	0.025	-2.324	-0.127

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West Fork	0811B_01	16737	00680	All	Natural Log Data	0.163	0.474	0.276	0.000	-4.234	-0.061
West Fork	0811B_01	16737	00680	Summer	Natural Log Data	-0.328	0.143	0.216	0.034	-2.287	-0.057
West Fork	0811B_01	16737	00680	Winter	Natural Log Data	1.459	-0.139	0.323	0.002	-3.523	-0.061
West Fork	0811B_01	16737	01351	Summer	Raw Data	-0.592	-0.656	0.316	0.012	-2.802	-0.131
West Fork	0812_01	10972	00530	Winter	Natural Log Data	-1.464	1.348	0.295	0.001	-3.540	-0.160
West Fork	0812_01	10972	00610	Summer	Natural Log Data	-1.190	-2.000	0.170	0.006	-2.896	-0.156
West Fork	0812_01	10972	00610	Winter	Natural Log Data	1.121	-2.015	0.165	0.019	-2.475	-0.160
West Fork	0812_01	10972	00625	Winter	Natural Log Data	-0.139	0.898	0.295	0.001	-3.717	-0.071
West Fork	0812_01	10972	00665	All	Natural Log Data	-1.642	2.369	0.204	0.000	-4.411	-0.110
West Fork	0812_01	10972	00665	Summer	Natural Log Data	-0.807	-0.569	0.132	0.017	-2.497	-0.079
West Fork	0812_01	10972	00665	Winter	Natural Log Data	-1.049	2.839	0.296	0.001	-3.724	-0.144
West Fork	0812_01	10972	00680	All	Natural Log Data	-0.703	-0.663	0.314	0.000	-5.855	-0.051
West Fork	0812_01	10972	00680	Summer	Natural Log Data	-0.587	-0.454	0.256	0.001	-3.706	-0.045
West Fork	0812_01	10972	00680	Winter	Raw Data	1.783	0.445	0.401	0.000	-4.704	-0.650
West Fork	0812_01	10972	00940	Winter	Natural Log Data	0.969	-1.208	0.155	0.019	2.459	0.112
West Fork	0812_01	10972	70300	Winter	Natural Log Data	0.409	-1.320	0.118	0.054	2.004	0.098
West Fork	0834_01	11063	00078	All	Raw Data	1.472	0.108	0.409	0.000	-4.325	-0.079
West Fork	0834_01	11063	00078	Summer	Raw Data	-0.175	-1.614	0.739	0.000	-6.068	-0.095
West Fork	0834_01	11063	00078	Winter	Natural Log Data	-0.261	1.625	0.374	0.020	-2.676	-0.055
West Fork	0834_01	11063	00300	All	Raw Data	0.222	-1.063	0.110	0.079	1.826	0.120
West Fork	0834_01	11063	00300	Summer	Raw Data	0.652	0.122	0.215	0.082	1.885	0.107
West Fork	0834_01	11063	00300	Winter	Raw Data	-0.216	-1.153	0.647	0.001	4.685	0.200
West Fork	0834_01	11063	00680	All	Raw Data	1.727	0.009	0.173	0.025	2.380	0.124
West Fork	0834_01	11063	00680	Summer	Raw Data	0.909	-0.758	0.281	0.042	2.253	0.153
West Fork	0834_01	11063	00945	All	Raw Data	-1.941	1.118	0.241	0.007	-2.930	-0.315
West Fork	0834_01	11063	00945	Summer	Raw Data	-1.551	1.787	0.212	0.084	-1.872	-0.304
West Fork	0834_01	11063	00945	Winter	Raw Data	-1.255	-0.045	0.270	0.057	-2.106	-0.324
West Fork	0834_01	11063	00951	All	Raw Data	-1.320	-1.315	0.141	0.045	-2.101	-0.009