Brazos River Basin
Highlights Report
2019

South Fork San Gabriel River—14May19

Brazos River Basin Highlights Report 2019

The Brazos River Authority, as a member of the Texas Clean Rivers Program, works to answer questions about the quality of our local streams, rivers and lakes in the *Brazos River Basin Highlights Report 2019*. This report is a standard report update that contains the information needed to answer questions about water quality in the lakes and streams of the Brazos River basin. It also summarizes the results of the ongoing water quality assessment activities in the Brazos River basin under the Texas Clean Rivers Program.

The Authority wishes to thank both the Texas Commission on Environmental Quality's Clean Rivers Program staff and the Surface Water Quality Monitoring Team for their hard work and significant contributions to the water quality in the Brazos River basin. Thanks also go out to the hundreds of individuals and organizations that are not named on these lists who have attended public meetings and other outreach events sponsored by the Authority and the Clean Rivers Program. Their input is the foundation of the watershed management process.

INTRODUCTION

The principal aim of the Texas Clean Rivers Program (CRP) is to ensure safe, clean water supplies for the future of Texans' drinking water needs, industry, agriculture, healthy ecosystems, recreation, and for all other uses of this valuable state resource. The CRP is managed by the Texas Commission on Environmental Quality (TCEQ), and funded entirely by fees assessed to wastewater discharge and water rights permit holders.

The goal of the CRP is to maintain and improve the quality of water resources within each river basin in Texas through an ongoing partnership involving the TCEQ, other agencies, river authorities, regional entities, local governments, industry and citizens. The program's watershed management approach aims to identify and evaluate water quality issues, establish priorities for corrective action, work to implement those actions, and adapt to changing priorities. The Brazos River Authority (BRA) carries out the water quality management efforts in the basin under contract with TCEQ.

This report primarily serves as an overview of basin water quality and steps taken to address water quality issues that occurred in Fiscal Year 2019 in the Brazos River Basin under the Clean Rivers Program. The Brazos River Authority (BRA) carries out the water quality management efforts in the basin under contract with TCEQ. Sections in this report include highlighted water quality projects, summaries of water quality monitoring results and scheduled monitoring for 2019 illustrated in watershed maps, a summary of the draft 2016 Integrated Report (IR) results, and information on how one can get involved in our water quality and Clean Rivers Program processes.

The digital version of this report is imbedded with hyperlinks so that you can easily access more detailed information on projects in the Brazos River Basin. So wherever you see a word that looks like this, just click and you will be directed to a website that will give you further information on the topic of interest. You can also click the Table of Contents to navigate to your desired section. After having been directed to another page in the document or to an internet page, you may press Alt+← to return to where you were previously in the document.

THIS YEARS HIGHLIGHTS

Limestone Riparian Restoration Project

Flood flow releases from the Sterling C. Robertson dam contribute to erosion of banks downstream of the spillway on BRA.owned property. Prior and current land management practices, such as land clearing and mowing, have likely exacerbated erosion problems. The intent of this project is to reduce erosion by restoring riparian areas (Figure. I-1). Native Texas Trees, shrubs, forbs,

and grasses adapted to riparian areas will be planted along the banks and in the flood plain areas. Overtime, as the restored riparian area becomes established, banks will become more stable, wildlife diversity will increase, and aesthetics of the area will improve.

Erosion impacts

Blackland and Post Oak soils that are cleared or do not have good stabilizing vegetation are susceptible to mass failures caused by cycles of wetting and drying. (Figure I-2).These mass failures decrease water quality by increasing suspended solids and attached nutrients; increased nutrients introduced in to streams may cause increased algal blooms and associated impacts on water quality. Suspended solids carried downstream may be deposited downstream effectively burying benthic habitats used by fresh water mussels and other aquatic species. Prolonged and intense release of water from the dam could erode structures put in place to prevent erosion. "Armoring" banks with native grasses, shrubs and trees is a cost effective way to protect against more resource intensive structural repairs. Riparian buffers prevent erosion by reducing water velocities and capturing sediment.

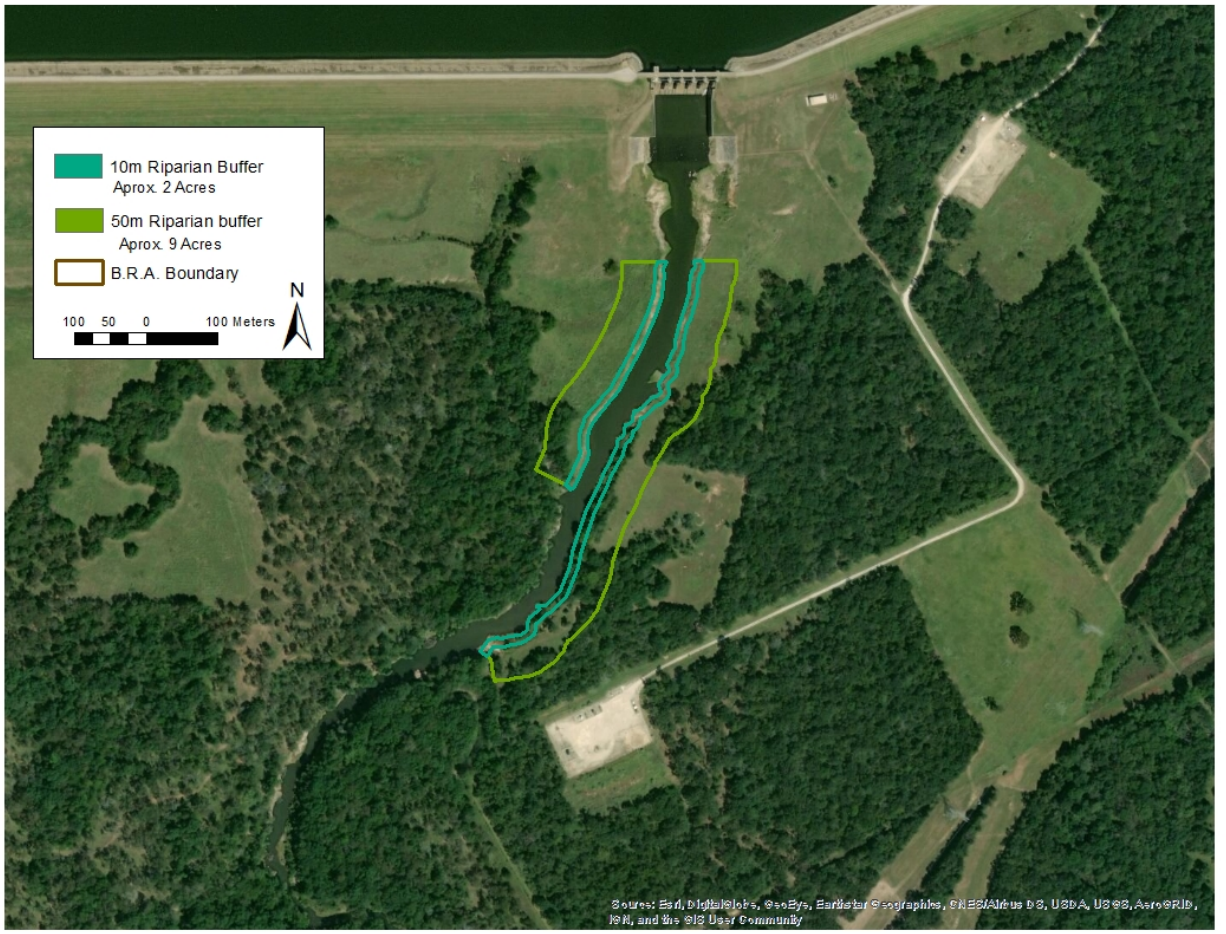


Figure I-1. 10m and 50m Riparian Buffer below Lake Limestone

Figure I-2. "Mass Failure" erosion on the Navasota River below Lake Limestone

Value of Healthy Riparian Zone

Riparian zones collect and store storm water in vegetation and soil, which helps to reduce property damage from flooding. Healthy riparian zones also dissipate the energy of flowing water, allow floodwaters to gradually recharge aquifers, and allow sediments to settle out without being transferred downstream.

Additionally, healthy riparian zones bolster instream aquatic communities by moderating temperatures and contaminant loading, thus helping them to be more resilient to the drought/flood cycle and other disturbances. Disturbance in aquatic communities can facilitate the spread and establishment of invasive species. Managing and controlling invasive species once they have established in an area is a daunting and expensive prospect as these species have no native predators to control their populations. Reestablishing a healthy riparian zone will increase ecological resiliency and help prevent the spread of invasive species.

Climate change is a major motivating factor in many federal regulatory actions. Maintaining and repairing riparian zones around streams and reservoirs is one way for the BRA to reduce its carbon footprint. Active conservation activities that impact some of the causative factors of climate change will be beneficial to any future activities that the BRA may undertake that require federal permitting or involve a response to threatened or endangered aquatic species.

Restoration vs. Engineering

Engineering solutions to mitigate erosion will come at significantly higher initial cost than riparian restoration without the added benefits of increased water quality, wildlife diversity, and aesthetics. In addition, costs to maintain engineered solutions continue whereas, once restored, a healthy natural system will maintain itself.

Proposed Plan

Primary Bank Restoration

Create a 10m buffer consisting of planted cut stakes of black willow, river birch, sycamore, and seedlings of bald cypress and others proposed by the Texas A&M Forest Service (TFS) adjacent to waterline. Planting Wild plum shrubs further up the bank as well as native species such as Eastern Gama grass, Alamo switchgrass, Virginia wildrye and Maximilian sunflower will be completed during the dormant season. The area of planting should be from the waterline up to the top bank on both sides of the channel.

Secondary bank restoration

Conversion of the coastal Bermuda to native vegetation including grasses, sedges, forbs, shrubs and trees within the floodplain might be a consideration for additional stability for the channel. One of two methods or both may be employed and will be determined as the project progresses. The passive method would be to cease mowing in areas within 50m of the stream bank. Within two years seedlings of woody plants will likely be present. Active conversion would require the application of Glyphosate (Roundup) two or three times during the growing season followed by winter planting of native grass and forb mix. Active and passive methods could be augmented with planting of native woody seedlings. Staggering seedling planting over two years may allow the Texas Forest service to offer a better diversity of species.

Proposed Schedule

FY2019

- November-December:
    - develop project plan
    - identify resources needed and sources for live stakes, grass and forb seeds, and seedling and saplings.
    - establish photo points
    - request seedling from TFS for planting next fall
    - check availability of sedges
- December- February:
    - cease mowing in the 50m buffer area
    - begin installation of live stakes sourced from mature trees on site near water's edge
    - begin reseeding in the 10m buffer area and sedge transplanting
    - work on TCEQ permit for pesticide application
- March- August:
    - let vegetation grow
    - monitor progress of plantings
    - continue seedling planting if desired.
    - if active restoration is pursued then start treating area with Glyphosate

FY2020

- September-October:
    - assess status of previous plantings.
    - apply riparian grass mix for active restoration
    - plant seedlings from TFS
    - transplant more sedges if necessary
- November-December
    - request seedlings from TFS for planting next fall
- December- March
    - live stake installation, reseeding, and seedling planting as needed
- March- August:
    - let vegetation grow
    - monitor progress of plantings
    - continue seedling planting if desired

FY 2021

- September-October:
    - assess status of previous plantings
    - apply riparian grass mix for active restoration
    - plant seedlings from Texas Forest Service
- November-December:
    - request seedlings from TFS for planting next fall
- December- March:
    - live stake installation, reseeding, and seedling planting as needed
- March- August:
    - let vegetation grow
    - monitor progress of plantings

Imitations / Difficulties

Climate may pose the most risk to the success of this project. Severe or persistent drought would have negative impacts on seed, seedling, and sapling survival. Conversely, if heavy rain events occurred, new plantings could be washed away before becoming established. Both situations would require restarting restoration efforts. The small scale of the project could provide proof of concept to larger restoration efforts in the basin.

Time Estimates

Primary and secondary bank restoration are estimated to take to take two or three years of seedling, forbs and grass planting. Depending on seedling mortality, weather impacts or high flow events, follow up planting may need to take place.

Success Monitoring Plan

Photo points: Photo points will be used to document restoration project using a repeat photography method. The objective will be to document restoration activity, vegetation change and growth, as well as illustrate stream ability to handle high flow events after restoration. Upstream, middle and downstream photo points will be established on the left and right banks and placed to capture areas of bank instability and vegetation growth. Upstream photo points will be oriented downstream. Middle photo point will have upstream and downstream oriented photos and downstream photos will be oriented up stream. Initially, photos will be event driven, capturing the area pre-restoration and after each planting effort. After planting efforts are completed, annual photos will be taken at a time to be determined. Frequency of photos will be assessed as needed in the future. Water quality will be monitored as well and improved water quality will be deemed successful.

Anticipated results

Erosion is a natural process of riverine systems and cannot be entirely avoided. The anticipated result is the creation of an intact riparian buffer, which will improve bank stability and mitigate the cumulative impact of erosion during high flow events thus minimizing infrastructure risk.

Brazos Basin Instream Flow Monitoring Program to Inform on Environmental Flow Standards

Senate Bill 2, enacted in 2001 by the 77th Texas Legislature, established the Texas Instream Flow Program (TIFP). The purpose of the TIFP is to perform scientific studies to determine flow conditions necessary to support a sound ecological environment in the rivers and streams of Texas. With passage of Senate Bill 3 (SB3) in 2007, the Texas Legislature restated the importance of maintaining the health and vitality of the State's surface-water resources and further created a stakeholder process that would result in science and policy based environmental flow regime recommendations to protect instream flows and freshwater inflows on a basin-by-basin basis. Instream flow studies function to provide scientific information that can be utilized during the adaptive management process within SB3 to inform environmental flow recommendations. These studies consist of multi-disciplinary assessments of biology, hydrology, water quality, geomorphology, and connectivity (where possible). Flow conditions are framed in the form of flow regimes comprising several components: subsistence, base flows, high flow pulses, and overbanking flows. As part of the TIFP process, the agency partners identified the middle and lower Brazos River as a priority sub-basin study area.

In 2012, the BRA initiated a program to perform extensive environmental studies at select locations (Figure I-3) in the Brazos River basin to gather data related to the TCEQ's adopted Senate Bill 3 (SB3) environmental flow baseline. The goal of these studies is to

develop a baseline data set documenting habitat and species present in the river and riparian zones across the range of adopted subsistence and base flows for each selected location. When the next review of the environmental flow standards commences, all data will be provided to the Brazos Basin and Bay Expert Science Team (BBEST) and Basin and Bay Area Stakeholder Committee (BBASC) for their consideration when determining whether revisions to the environmental flow standards are warranted.

Many of the control points, or study sites for the TIFP chosen are at established USGS gage locations because flow can easily be determined at these sites. Because many of the studies require access to private property and because some USGS gage locations may not have much variety in habitat, the BRA may not be able to complete all studies at the exact location of the USGS gage. On the sites where studies have begun, the BRA has made every effort to site the studies as close to the proposed gage locations as prudent and as close to each other as prudent.

Components of the studies performed at each site include:

- Discharge, velocity and depth point measurements
- Temperature, pH, Conductivity, and Dissolved Oxygen Concentration
- Fixed photography, instream cover, habitat types, and channel surveys
- Macroinvertebrates, mussels (if present), and fish assemblage
- Riparian tree surveys
- Channel cross-section surveys
- Sediment sampling at the cross-sections

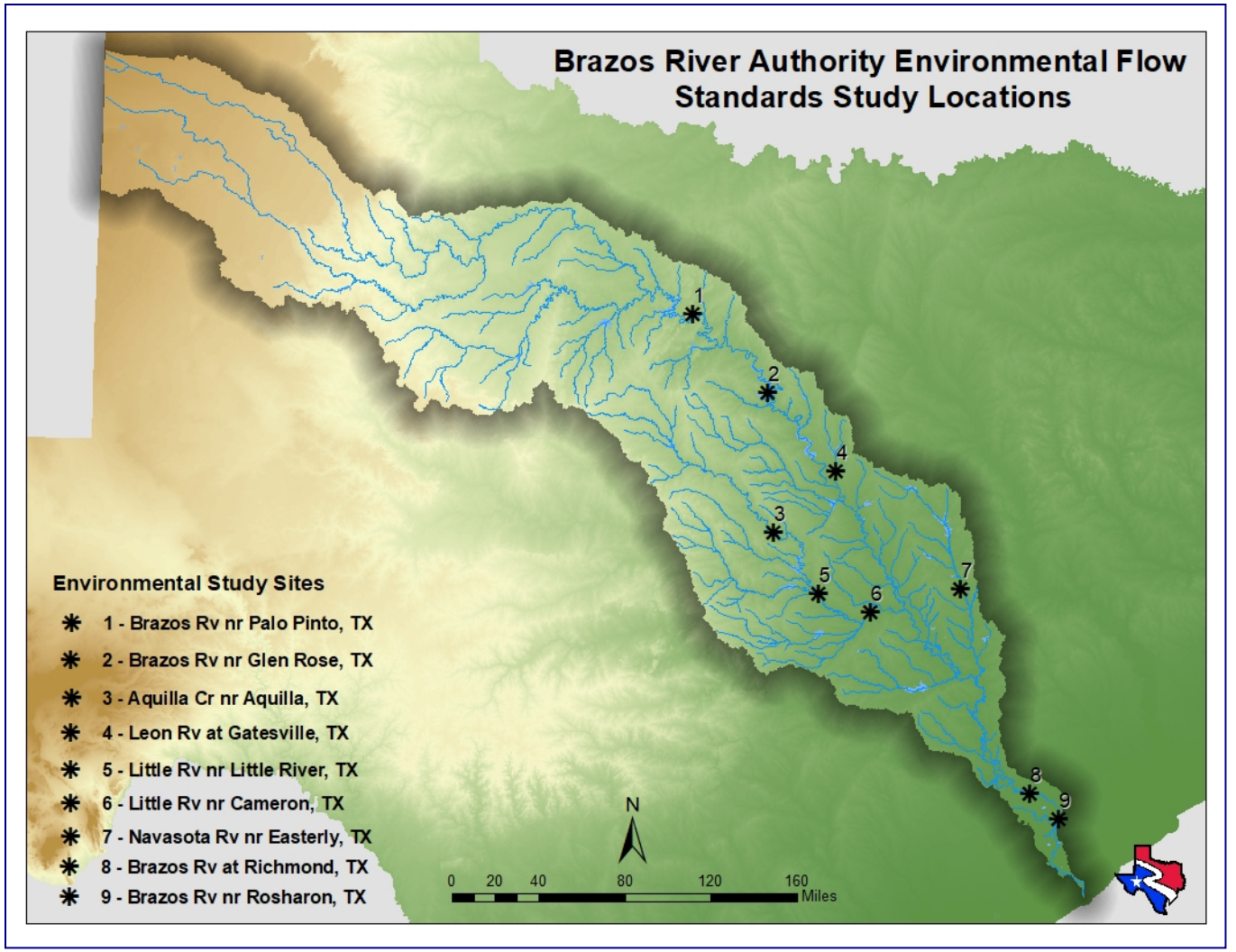


Figure I-3. Brazos River Authority Environmental Study Sites

It is the BRA's goal to complete 15 macroinvertebrate, mussel, and fish assessments and 5 riparian tree surveys and cross sections at each site within approximately 5 years of its start date and to develop a suitable number of sampling events to characterize conditions at each site. Sampling has been initiated at six sites thus far. Depending on the occurrence of targeted flows, this may

require more than 5 years to complete each study site. Table I-1 displays the number of each type of sampling event that BRA has completed to date.

Table I-1. Number and type of sampling event completed by BRA to date.

Site	Water Quality	Instream Habitat Mapping	Micro-Habitat Fish	Meso-Habitat Fish	Mussels	Invertebrates	Riparian Trees	Riparian Species	Riparian Seedlings	Channel Surveys	Sediment Samples
Brazos River near Palo Pinto	75	8	9	10	13	13	5	5	5	5	3
Brazos River near Glen Rose	75	5	4	5	5	7	5	5	5	5	3
Aquilla Creek near Aquilla	26	9	8	8	9	9	5	5	5	5	4
Leon River near Gatesville	68						1	1	1	1	1
Little River near Little River	14										
Little River near Cameron	74										
Navasota River near Easterly	21	4	4	6	5	6	3	3	3	3	3
Brazos River near Richmond	74	6	5	5	4	2	3	3	3	3	2
Brazos River near Rosharon	42	4	2	3	4	4	3	3	3	3	3

Weather events in 2018 again impeded our ability to conduct sampling events at the Brazos River near Richmond and Brazos River near Rosharon sites. Biological sampling at the Brazos River near Glen Rose site has not been conducted since 2016. Issues with reservoir dam gate maintenance continue to hamper the ability to maintain steady flow conditions required to achieve a stable aquatic condition. Despite environmental and mechanical setbacks, the Authority completed four biological and two riparian events in 2018.

Biological

The two June 2018 sampling events at the Brazos River near Palo Pinto resulted in Exceptional fish and macroinvertebrate Index of Biological Integrity (IBI)'s. The August 2018 assessment resulted in Exceptional fish and Intermediate macroinvertebrate IBI's. It's interesting to note the decrease in IBI from June to August for macroinvertebrates. Flows decreased in August from a range of 246-

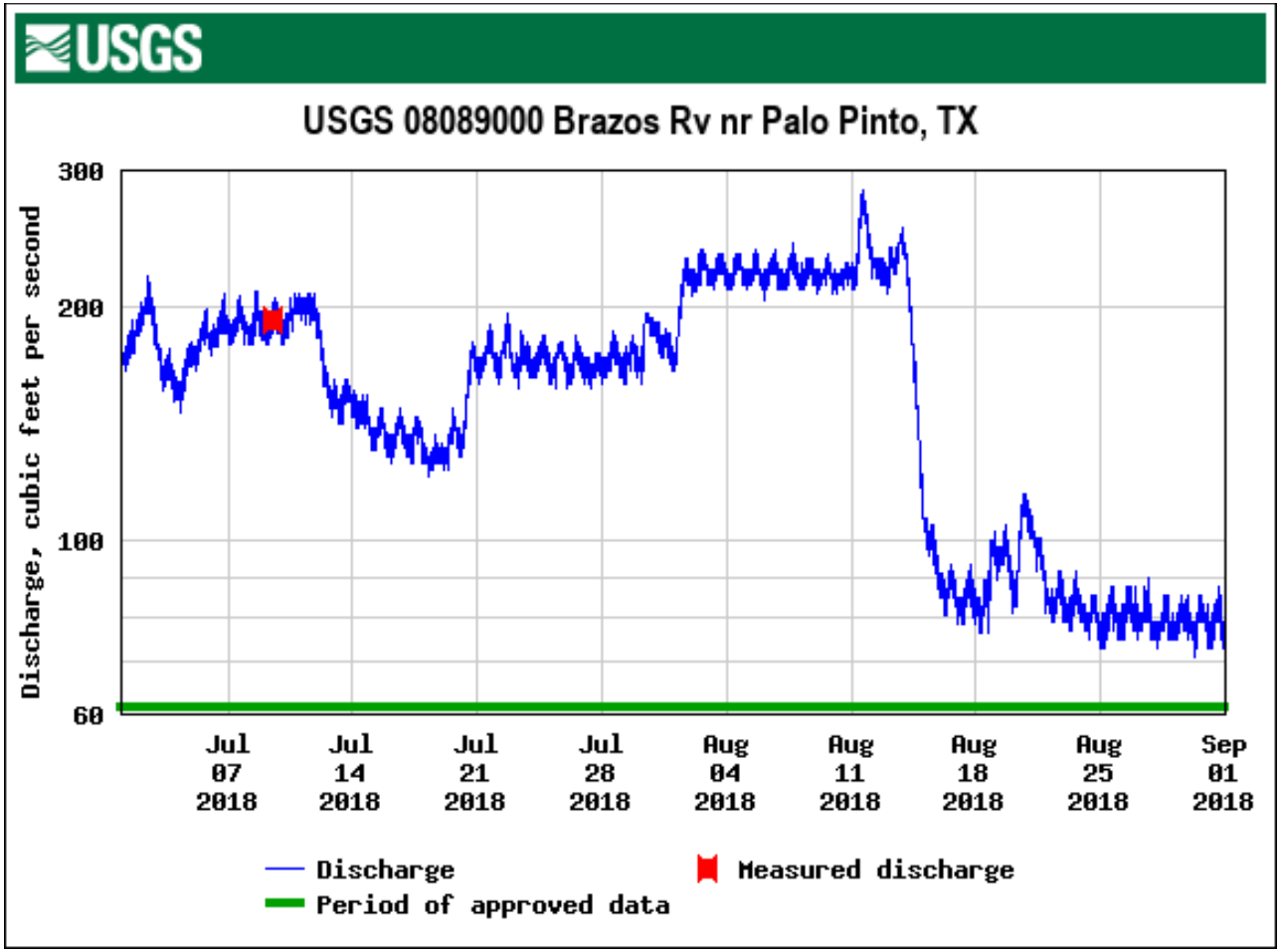


Figure I-4. USGS Discharge at Palo Pinto gauge July through August 2018.

204 cfs to a range of 61-75 cfs approximately two weeks before the assessments were conducted (Figure I-4). Speculatively, this result could involve the influence of rapid change in instream habitat dynamics related to depth and velocities.

Sampling efforts on the Navasota near Easterly yielded Exceptional fish and High macroinvertebrate, IBI's in July. May sampling resulted in High IBI's for both fish and macroinvertebrates.

2019 efforts will be sampling target flows at our Brazos River sites near Glen Rose, Richmond and Rosharon as well as the Navasota site. We are also hoping to begin or biological sampling at the new site on the Leon River near Gatesville.

Riparian

Riparian assessments were conducted at two sites in 2018, Navasota River near Easterly and a newly established site on the Leon River near Gatesville. Establishment of the new Leon river site required the unique opportunity of coordinating with entities at Fort Hood to gain access to training areas along the stream. Twenty-six riparian assessments at seven sites between April 2013 and September 2018 have been completed. Data is currently being processed for analysis. Efforts to collect riparian data at required flow targets to get a solid baseline data set will continue. This information will be used to guide and evaluate a long-term monitoring strategy for these riparian sites. In spring 2019, reconnaissance and establishment of two new sites: Little River near Little River and Little River near Cameron will begin.

Big Elm Creek Watershed Protection Plan

Big Elm Creek, 1213A_01, was first identified in the 2010 Texas Integrated Report (IR) as impaired for primary contact recreation due to excessive fecal bacteria. In addition to the contact recreation impairment, Little Elm Creek, a tributary to Big Elm Creek, has concerns for dissolved oxygen, nitrate, and habitat. The Texas Water Resources Institute (TWRI) identified potential sources of pollution, pollution loads, and possible management measures in a previous watershed characterization project.

This project will build on the existing watershed characterization project for the larger Little River watershed. Data produced under the watershed characterization will support the development of a watershed protection plan (WPP) for Big Elm Creek. Data from the characterization will also assist stakeholders in choosing management measures and determine load reductions in the watershed. This WPP project will build upon existing stakeholder involvement, surveys, and outreach that was initiated during the watershed characterization process. Stakeholder meetings will take place through September 2019. Agency review of the plan and follow-up meetings are anticipated for Fall 2019 - August 2020. Implementation may being by September 2020.

Watershed Protection Plan for the Leon River

The Leon River, Segment 1221, was placed on the State's 303(d) List in 1997 for having elevated bacteria levels. Placement of the Leon River on the List caused the TCEQ to initiate the development of a Total Maximum Daily Load (TMDL) on the portion of the river downstream of Lake Proctor and upstream of Hamilton in 2002. Upon completion of the TMDL modeling report, local stakeholders requested the BRA to facilitate the development of a WPP for the Leon River to assist the TCEQ in the selection of appropriate implementation strategies for the watershed. The BRA received funding for the project through the Texas State Soil and Water Conservation Board (TSSWCB) and began hosting stakeholder meetings in 2007. Stakeholders worked diligently toward the development of a WPP document and a draft WPP was completed and released for public comment in December 2011. The Plan was submitted to the EPA in 2012. The Leon River Watershed Protection Plan was approved by the EPA in early 2015 and is now in

the implementation phase. Several watershed implementation efforts have been implemented. You can also visit http://leonriver.tamu.edu/ for further information on the Leon Watershed and the WPP.

Watershed Protection Plan for the Lampasas River

The Lampasas River, Segment 1217, was identified for watershed protection plan development due to concerns about elevated levels of bacteria, as reported in the 2002 IR. In 2009, the Lampasas River Watershed Partnership, area residents and other stakeholders worked to develop a WPP to address water quality concerns within the watershed. The Partnership has evaluated water quality issues and made recommendations for voluntary pollutant load reductions and management measures. A draft Lampasas River Watershed Protection Plan was submitted to EPA in the Spring of 2013, approved by the EPA in May 2013 and by the Steering Committee in September 2013. The project is in the implementation phase. For more information visit the web site at Lampasas River Watershed Protection Plan.

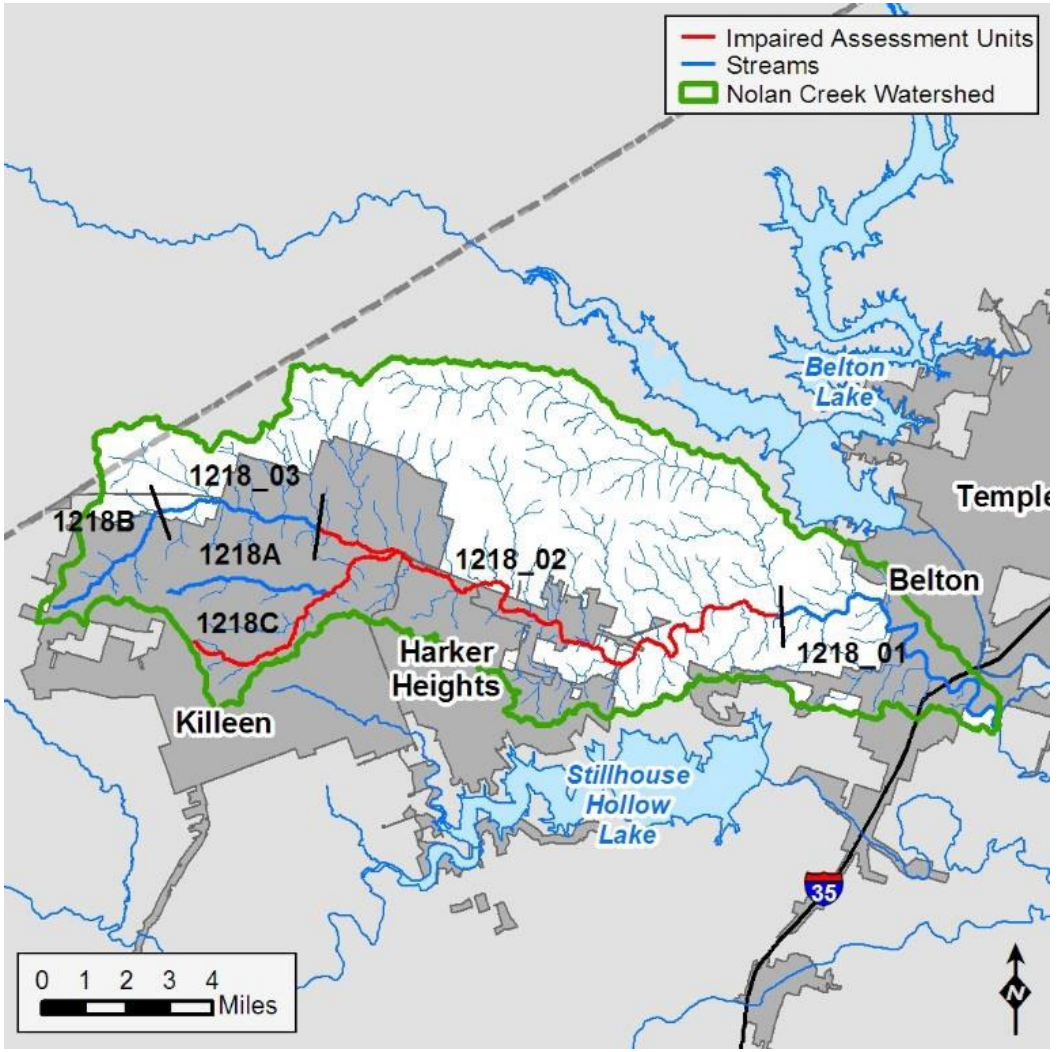
Watershed Protection Plan for Nolan Creek/South Nolan Creek

The full length of Nolan Creek/South Nolan Creek (Segment 1218), as defined by the TCEQ, stretches nearly 30 river miles from its headwaters in northern portion of Killeen to its confluence with the Leon River in Bell County below Belton. Segment 1218 was first included on the 303(d) list as impaired for elevated bacteria concentrations in 1996. While the 2014 Texas Integrated Report included only assessment units (AUs) 1218_02 along South Nolan Creek and 1218C_01 representing Little Nolan Creek, under the draft 2016 Texas Integrated Report, AU 1218_01 along Nolan Creek is also listed as impaired for recreational use. Concerns for Segment 1218 include elevated nitrate and total phosphorus concentrations for AUs 1218_01 and 1218_02 as well as concerns for bacteria concentrating along AU 1218A_01, an unnamed tributary to Little Nolan Creek.

Recreational use of South Nolan/Nolan Creek varies from its headwaters northwest of Killeen to its confluence with the Leon River southeast of Belton. Low flows often limit recreational use in the more upstream portions near Killeen and Harker Heights to noncontact activities, such walking or biking along trails near the creek, including the Community Center and Long Branch Parks in

Killeen, and the Booker Green Space and Summit Soccer Complex in Harker Heights. As flows increase, secondary contact recreation activities increase, such as fishing and wading, which have been observed below the US 190 in Nolanville. More downstream with higher flows, kayaking and canoeing are common activities, as well as fishing, swimming and wading. Parks in the lower portion of the watershed along Nolan Creek include the Lions, Harris Community, Yettie Polk, and Confederate Parks all within Belton.

The waters of South Nolan/Nolan Creek are an important feature in this region and planning efforts to protect and improve water quality have been on-going for a number of years. The Nolan Creek Partnership has been integral in providing local input for development of a Watershed Protection Plan (WPP), which is nearing completion. The Texas Institute for Applied Environmental Research (TIAER) is facilitating development of this WPP through Clean Water Act 319(h) project funding via the Texas Commission on Environmental Quality. The WPP was submitted to the Environmental Protection Agency (EPA) in October 2018. The Nolan Creek Partnership hopes the EPA to accept the WPP by spring 2019, which then provides a guide for implementing an educational program and improvement practices to improve water quality. Funding for implementation activities are available through the 319(h) program and other funding sources once the WPP is accepted by EPA. Stakeholder participation is key to developing and implementing a successful watershed protection plan. Public meetings are held regularly, and information on partnership meetings, reports, and the WPP elements can be found at http://www.nolancreekwpp.com/.



Map Source: TCEQ WPP Project Fact Sheet (https://www.tceq.texas.gov/assets/public/waterquality/nps/projects/60281_FS_NolanCreekWPP.pdf)

Watershed Protection Plan for the Navasota River Below Lake Limestone

The Navasota River watershed is located in East-Central Texas in the Brazos River basin. Lake Limestone impounds the River causing a hydrological divide in the watershed. The majority of the watershed is rural and urbanization is largely confined to the Bryan/College Station area in Brazos County. Land use/land cover in the watershed is dominated by hay/pasture land and hardwood forests.

The Navasota River and several tributaries were first listed as impaired on the 2002 Texas Integrated Report (Texas 303(d) List) for elevated *E. coli* concentrations. Low dissolved oxygen (DO) in Duck Creek also resulted in a water quality impairment in the 2012 IR. Concerns for elevated nutrients, chlorophyll-a and depressed DO exist in several other locations as well

To address this need, watershed stakeholders organized to develop the Navasota River Below Lake Limestone Watershed Protection Plan. Recommended management measures focus on reducing *E. coli* loading to waterbodies by retaining it on the landscape or removing the source in the case of feral hogs. Management recommendations focus on sources that are feasibly managed including feral hogs, livestock, on-site sewage facilities (OSSFs), pets, and wastewater. All management measures recommended is voluntary and when implemented, will reduce *E. coli* loading to the Navasota River and its tributaries.

The Navasota River Below Lake Limestone WPP was completed in early 2017 and accepted by EPA as a plan that meets the EPA Nine Elements for Watershed Based Plans. The WPP is currently being implemented and additional funding is being sought to further implementation efforts.

Navasota River watershed stakeholders also decided to pursue development of a total maximum daily load (TMDL) and a TMDL Implementation Plan in addition to the WPP. Pending drafts of the TMDL and its Implementation Plan include the same management measures in the WPP. The advantage of the TMDL is that once approved by EPA, the impairments are moved to category 4a on the CWA 303(d) List. The TMDL and I-Plan are currently undergoing final TCEQ review. It is anticipated that they will go before the TCEQ Commissioners in the summer of 2019 for adoption.
The Navasota River and several tributaries were first listed as impaired on the 2002 IR for elevated *E. coli* concentrations. Low dissolved oxygen (DO) in Duck Creek also resulted in a water quality impairment. Additionally, concerns for elevated nutrients, chlorophyll-a, and depressed DO exist in several locations. These impairments and concerns signify the need to improve water quality and protect the resource for future uses and users. For more information visit the web site at http://navasota.tamu.edu/.

WATER QUALITY MONITORING

The TCEQ assesses the condition of the state's waterbodies on a periodic basis under the Clean Water Act (CWA) Section 305(b). The results of the assessment are contained within the Texas Water Quality Inventory and 303(d) List and are comprised of a complete listing of all water quality concerns in the state. This report is referred to as the Integrated Report. As required by the CWA, the IR is updated every two years and includes the review of the past seven years of data (with a lag-time of two years) collected by many organizations statewide, including the BRA. The IR remains a draft document until approval by EPA. Specific assessment methodologies are described in the draft 2016 Guidance for Assessing and Reporting Surface Water Quality in Texas. The draft 2016 IR, on which the following information is based, provides an assessment of water quality results using data acquired from December 1, 2007 through November 30, 2014. Please click here for more information and to review the draft 2016 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d). The TCEQ adopted the draft 2016 Texas 303(d) List on October 17, 2018 and it has been submitted to the USEPA.

The draft 2016 IR provides an overview of surface water quality throughout the state, including issues relating to public health, fitness for use by aquatic species and other wildlife, and specific pollutants and their possible sources. These water quality issues are identified by comparing concentrations in the water to numerical criteria that represent the state's water quality standards or screening levels to determine if the waterbody supports its designated uses, such as suitability for aquatic life, for contact recreation, or for public water supply. Waterbodies that do not meet established water quality standards are placed on the 303(d) List and are referred to as "impaired," "not supporting," or "NS", all of which indicate that a waterbody does not meet established water quality standards. Once placed on the list the waterbody is targeted for special study and/or corrective action.

The TCEQ also identifies segments where the data indicates that the waterbody is close to violating water quality standards as having a "concern for near non-attainment of standards" or "CN." These CN segments are then targeted for increased monitoring to better understand the conditions in the stream.

Water quality standard numerical criteria are used by TCEQ as the maximum or minimum instream concentration that may result from permitted discharges and/or nonpoint sources and still meet designated uses. To resolve the issues of regional and geological diversity of the state, standards are developed for classified segments. Classified segments are defined segments of waterways that are unique from other segments. Each classified segment has been designated a four-digit code. The Brazos River Basin is designated by the number 12. Each classified segment is distinguished by the next two numbers, for example, Segment ID 1201 is the portion of the Brazos River that flows into the gulf and is referred to as the Brazos River Tidal segment. Appropriate water uses such as contact recreation, public water supply, and aquatic life are then applied to the segments. Site-specific water quality criteria

have been developed for water temperature, dissolved oxygen, pH, bacteria, chloride, sulfate and total dissolved solids for classified segments. Site-specific chlorophyll *a* has been developed for several reservoirs. Many streams that are not classified segments are still assessed by TCEQ and are considered unclassified waterbodies. This could be a small tributary of a classified segment, and they are coded with the four-digit Segment ID they flow into, followed by a letter, such as 1201A. These unclassified waterbodies do not have specific water quality standards developed for them. For assessment purposes, unclassified streams are assessed using the numeric criteria developed for the classified segment into which the stream flows unless site-specific criteria for certain parameters have been developed, which is the case for dissolved oxygen and bacteria in several unclassified waterbodies throughout the basin. Use support is reported at both the segment and assessment unit (AU). An AU is defined as the smallest geographic area of use support reported in the assessment. Support of criteria and uses are examined for each AU. To address water quality regulatory activity such as permitting, standards development, and remediation, use support information applies to the AU level. The 303(d) list is reported at the level of the AU for each waterbody. Each AU within a waterbody segment is given a number following an underscore after the segment designation, such as 1201_01. A segment may consist of one or more AU.

Numeric quality standards have not been developed for nutrients and chlorophyll *a* (although chlorophyll *a* criteria has been developed for certain reservoirs). Instead, the water quality standards for nutrients and chlorophyll *a* are expressed as narrative criteria. In the absence of segment-specific numeric water quality criteria, the state has developed screening levels for these parameters in order to identify areas where elevated concentrations may cause water quality concerns. These screening levels are applied to waterbodies statewide, and are based on the 85th percentile of nutrient values in the statewide water quality database. Waterbodies that exhibit frequent (>25% of the time) elevated concentrations of nutrients or chlorophyll *a* are referred to as having a “concern for screening level violations” or “CS” and are often targeted for continued and increased monitoring to better understand the effects of the elevated concentrations.

Descriptions of Water Quality Parameters and Terminology

Following are typical terms that are used when discussing water quality with descriptions of several water quality parameters and how they relate to achieving water quality standards. There are two groups of parameters:

Field parameters are those water quality constituents that can be obtained on-site and generally include:

PARAMETER	POTENTIAL IMPACTS WHEN STATE STANDARDS ARE NOT MET	POTENTIAL CAUSES OF STATE STANDARDS NOT BEING MET
Temperature	Water temperature affects the oxygen content of the water, with warmer water unable to hold as much oxygen. When water temperature is too cold, cold-blooded organisms may either die or become weaker and more susceptible to other stresses, such as disease or parasites.	Colder water can be caused by reservoir releases. Warmer water can be caused by removing trees from the riparian zone, soil erosion, or use of water to cool manufacturing equipment.
Specific Conductance	Specific conductance is a measure of the waterbody's ability to conduct electricity and indicates the approximate levels of dissolved salts, such as chloride, sulfate and sodium in the stream.	Elevated concentrations of dissolved salts can impact the water as a drinking water source and as suitable aquatic habitat.
pH	Most aquatic life is adapted to live within a narrow pH range. Different organisms can live at and adjust to differing pH ranges, but all fish die if pH is below four (the acidity of orange juice) or above 12 (the pH of ammonia).	Algal blooms produce diel swings in dissolved oxygen causing super-saturation during the day while respiration can cause night-time oxygen levels to crash. Chemical byproducts of this photosynthesis/respiration process cause swings also in pH, with lower levels (acidic conditions) during the day and higher levels (alkaline conditions) at night. Industrial and wastewater discharge, runoff from quarry operations and accidental spills can also be a cause.
Dissolved Oxygen (DO)	Organisms that live in the water need oxygen to live. In stream segments where DO is low, organisms may not have sufficient oxygen to survive.	DO levels may be low due to no primary productivity, stagnant, pooled or low-flow conditions. Modifications to the riparian zone, human activity that causes water temperatures to increase, increases in organic matter, bacteria and over abundant algae may also cause DO levels to decrease. Algal blooms produce diel swings in dissolved oxygen causing super-saturation during the day while respiration can cause night-time oxygen levels to crash.
Stream Flow	Flow is an important parameter affecting water quality. Low flow conditions common in the warm summer months create critical conditions for aquatic organisms.	At low flows, the stream has a lower assimilative capacity for waste inputs from point and nonpoint sources. DO concentrations can also decrease as flow decreases.
Transparency and Secchi Disk Depth	Transparency is a measure of the depth to which light is transmitted through the water column and thus the depth at which aquatic plants can grow.	Low transparency or secchi disc depth is an estimate of turbidity.

Conventional Parameters are typical water quality constituents that require laboratory analysis and generally include:

PARAMETER	POTENTIAL IMPACTS WHEN STATE STANDARDS ARE NOT MET	POTENTIAL CAUSES OF STATE STANDARDS NOT BEING MET
Turbidity	Turbidity is a measure of the water clarity or light transmitting properties.	Increases in turbidity are caused by suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms.
Hardness	Hardness is a composite measure of certain ions in the water, primarily calcium and magnesium. The hardness of the water is critical due to its effect on the toxicity of certain metals	Higher hardness concentrations in the receiving stream can result in reduced toxicity of heavy metals.
Chloride	Chloride is an essential element for maintaining normal physiological functions in all organisms. Elevated chloride concentrations can disrupt osmotic pressure, water balance and acid/base balances in aquatic organisms which can adversely affect survival, growth and/or reproduction.	Natural weathering and leaching of sedimentary rocks, soils and salt deposits can release chloride into the environment. Other sources can be attributed to oil exploration and storage, sewage and industrial discharges, run off from dumps and landfills and saltwater intrusion.
Sulfate	Effects of high sulfate levels in the environment have not been fully documented. However, sulfate contamination may contribute to the decline of native plants by altering chemical conditions in the sediment.	Due to abundance of elemental and organic sulfur and sulfide mineral, soluble sulfate occurs in almost all natural water. Other sources are the burning of sulfur containing fossil fuels, steel mills and fertilizers.
Total Dissolved Solids	High total dissolved solids may affect the aesthetic quality of the water, interfere with washing clothes and corrode plumbing fixtures. High total dissolved solids in the environment can also affect the permeability of ions in aquatic organisms.	Mineral springs, carbonate deposits, salt deposits and sea water intrusion are sources for natural occurring high concentration TDS levels. Other sources can be attributed to oil exploration, drinking water treatment chemicals, storm water and agricultural runoff and point/nonpoint wastewater discharges.
Total Suspended Solids (TSS) **Total Suspended Solids (TSS) (cont.)**	Suspended solids increase turbidity which reduces light penetration and decreases the production of oxygen by plants. They can also clog fish gills. Eventually, the suspended solids settle to the bottom of the stream or lake, creating sediment. Excessive sediment in the water column can also reduce growth of algae and can transport other contaminants such as nutrients and bacteria. Habitat for aquatic organisms can also be reduced.	Excessive TSS is the result of accelerated erosion and is often associated with high flows where river banks are cut or sediment is resuspended. It can also be the result of sheet erosion, where over land flow of water causes a thin layer of soil to be carried by the water to the stream. Disturbing vegetation without a proper barrier to slow down overland flow (such as construction sites or row cropping) increases TSS.
Bacteria • ***Escherichia coli* (*E. coli*)** • **Enterococcus**	Although certain species of bacteria may not themselves be harmful to human beings, their presence is an indicator of recent fecal matter contamination and that other pathogens dangerous to human beings may be present.	Present naturally in the digestive system of all warm blooded animals, these bacteria are in all surface waters. Poorly maintained or ineffective septic systems, overflow of domestic sewage or nonpoint sources and runoff from animal feedlots can elevate bacteria levels.

PARAMETER	POTENTIAL IMPACTS WHEN STATE STANDARDS ARE NOT MET	POTENTIAL CAUSES OF STATE STANDARDS NOT BEING MET
Ammonia Nitrogen	Elevated levels of ammonia in the environment can adversely affect fish and invertebrate reproductive capacity and reduce the growth of young.	Ammonia is excreted by animals and is produced during the decomposition of plants and animals. Ammonia is an ingredient in many fertilizers and is also present in sewage, storm water runoff, certain industrial wastewaters and runoff from animal feedlots.
Nutrients • **Total Kjeldahl Nitrogen** • **Nitrate Nitrogen** • **Nitrite Nitrogen** • **Total Phosphorus** • **Ortho-phosphate phosphorus**	Nutrients increase plant and algae growth. When plants and algae die, the bacteria that decompose them use oxygen. This reduces the dissolved oxygen in the water. High levels of nitrates and nitrites can produce nitrite toxicity, or "brown blood disease," in fish. This disease reduces the ability of blood to transport oxygen throughout the body.	Nutrients are found in effluent released from wastewater treatment plants (WWTPs), fertilizers and agricultural runoff carrying animal waste from farms and ranches. Soil erosion and runoff from farms, lawns and gardens can add nutrients to the water.
Chlorophyll *a* **Chlorophyll *a* (cont.)**	High levels of nutrients in relatively stable waters can cause algae blooms, decrease water clarity and cause swings in dissolved oxygen and pH due to photosynthesis. This is most commonly measured using chlorophyll *a* concentrations.	Algal blooms can result in elevated chlorophyll *a* concentrations indicating an increase in nutrients that increase growth and reproduction in algal species.

Biological and Habitat Assessment The three components evaluated during a biological assessment include: measurement of physical habitat parameters, collection of fish community and the benthic macroinvertebrate community data. Each component, depending on the nature of a particular waterbody and its biota, is classified as having limited, intermediate, high, or exceptional aquatic life. Assessments are conducted to provide baseline data on environmental conditions or to determine if the designated aquatic life use for the stream is being attained. Data collected as part of a biological assessment are used for the IR.

24-hr Dissolved Oxygen studies perform measurements of DO in frequent intervals in a 24-hr period. This type of monitoring is conducted to measure the diurnal variation of DO and its impacts on the biological community. This monitoring is frequently paired with biological and habitat assessments.

Metals in water or sediment, such as mercury or lead, typically exist in low concentrations but can be toxic to aquatic life or human health when certain levels are exceeded.

Organics in water or sediment, such as pesticides or fuels, can be toxic to aquatic life or human health when certain levels are exceeded.

Monitoring in the Brazos River Basin

The Brazos River Basin can be divided into 14 major watersheds that fall within the 42,000 square miles and portions of 70 counties that make up the basin. The 14 major watersheds include:

the Caprock watershed;
the Salt and Double Mountain Forks of the Brazos watershed;
the Clear Fork of the Brazos watershed;
the Upper Brazos River watershed;
the Aquilla Creek watershed;
the Bosque River watershed;
the Leon River watershed;
the Lampasas River watershed;
the Little River watershed;
the Central Brazos River watershed;
the Navasota River watershed;
the Yegua Creek watershed;
the Lower Brazos River watershed; and
the Oyster Creek watershed

The Caprock watershed is a non-contributing watershed to the Brazos River Basin due to lack of rainfall and high evaporative rates in northwest Texas. Precipitation in this area is either absorbed by area soils or is contained in the hundreds of playa lakes in this part of the state. Playa lakes are shallow, round depressions that fill after storms then rapidly dry due to evaporation. These temporary lakes provide water for wildlife and flood control for municipalities. However, due to their ephemeral natures, these lakes are not monitored or assessed as part of the CRP.

One of the key roles of the CRP is fostering coordination and cooperation in monitoring efforts. Coordinated monitoring meetings are held once a year to bring all the monitoring agencies together to discuss streamlining and coordinating efforts, and to eliminate duplication of monitoring efforts in the watersheds of the Brazos River Basin.

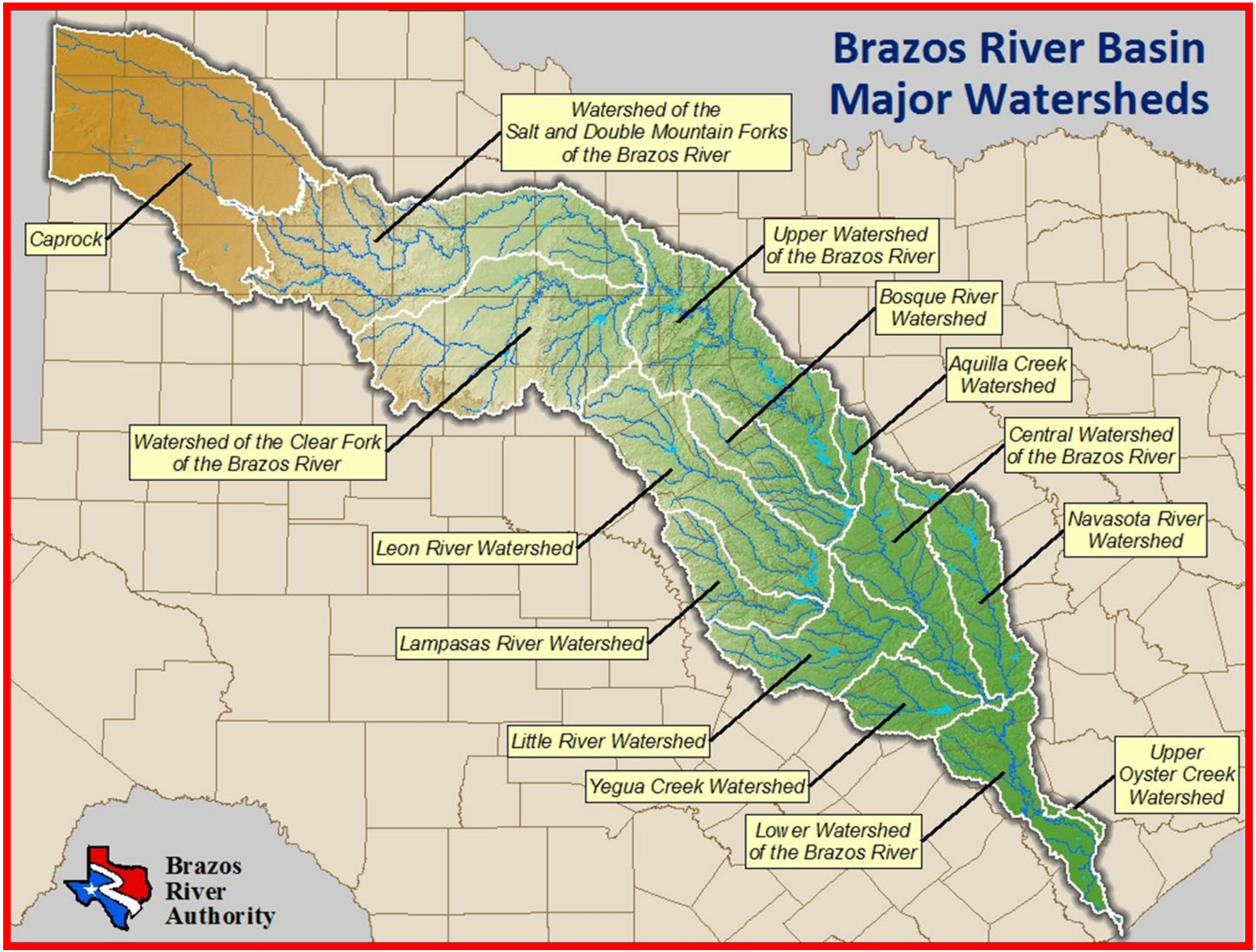

Brazos River Basin
Major Watersheds
Caprock
Watershed of the
Salt and Double Mountain Forks
of the Brazos River
Upper Watershed
of the Brazos River
Bosque River
Watershed
Aquilla Creek
Watershed
Central Watershed
of the Brazos River
Navasota River
Watershed
Watershed of the Clear Fork
of the Brazos River
Leon River Watershed
Lampasas River Watershed
Little River Watershed
Yegua Creek Watershed
Lower Watershed
of the Brazos River
Upper
Oyster Creek
Watershed
Brazos
River
Authority

Table WQM-1 outlines the type, frequency and number of stations in the Brazos Basin monitored by various entities as part of the Brazos Basin CRP for FY 2019 (September 2018 through August 2019).

Table WQM-1. FY 2019 Summary of Known Sampling for the Brazos River Basin (September 2018 through August 2019)

Sampling Entity	Field	Conventional	Bacteria	24-hr DO	Biological and Habitat	Metals in Water	Organics in Water	Metals in Sediment
BRA	30 monthly 71 quarterly 7 semi-annually			7 semi-annually	7 semi-annually			
TCEQ	81 quarterly 13 semi-annually			1 semi-annually	1 semi-annually	5 quarterly 3 semi-annually	2 semi-annually	1 annually 7 semi-annually
	1 quarterly 1 semi-annually		1 quarterly					
TIAER	7 semi-monthly			1 yearly	1 yearly			
USGS	6 bi-monthly			6 bi-monthly				

(Information compiled from the Clean Rivers Program Coordinated Monitoring website (http://cms.lcra.org/)

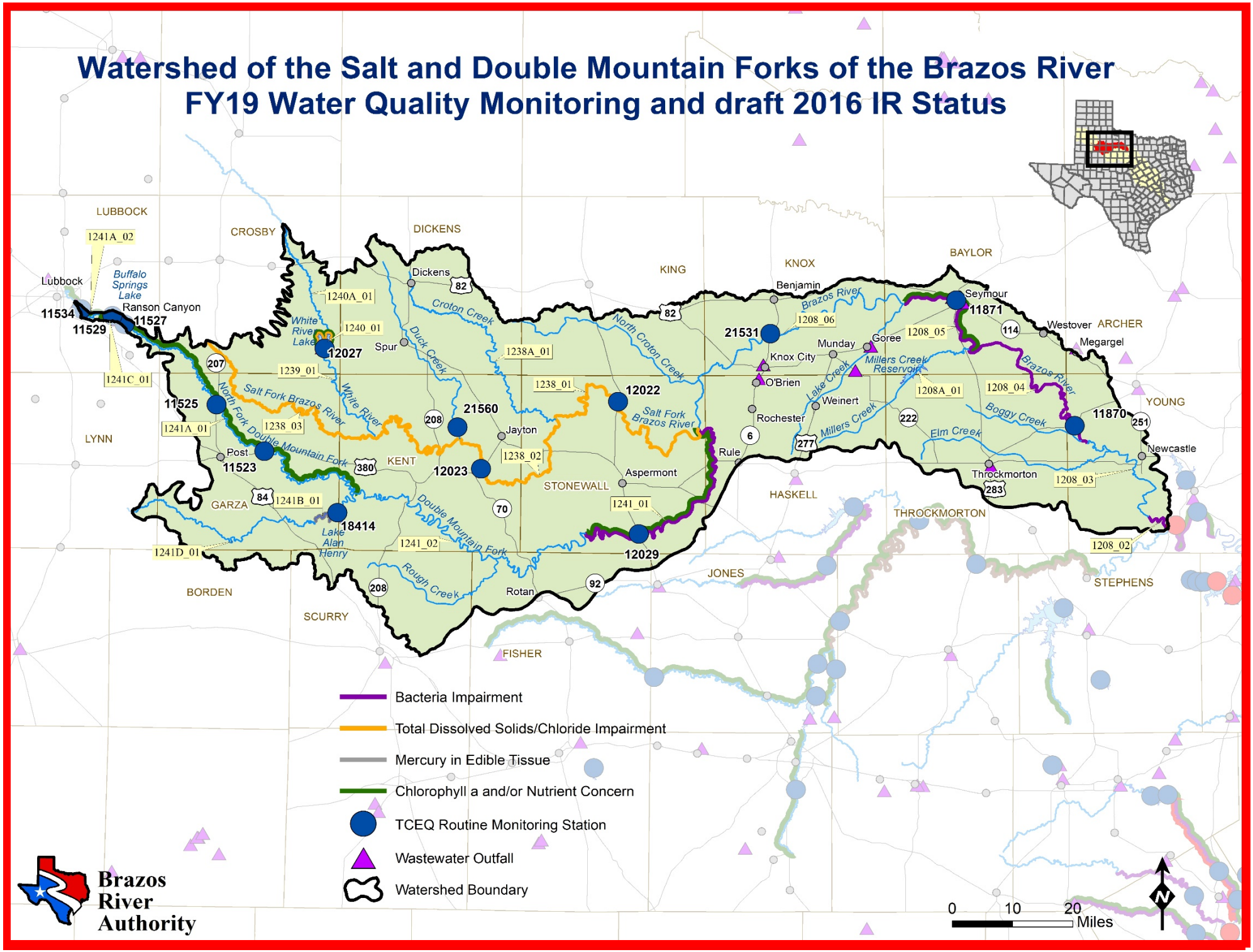
The remainder of this report contains summary water quality assessment results for each of the segments that were evaluated in the Brazos Basin Clean Rivers Program assessment area for the draft 2016 IR. It is important to remember that the information presented represents a snapshot in time and that water quality conditions are dynamic and can change over time. Furthermore, segments unmentioned or identified as having no impairments or concerns are not necessarily without problem. Rather, there may have been limited or no data available and all uses may not have been assessed.

Each major watershed is mapped separately and depicts watershed boundaries, segments with names and AUs, county boundaries, cities, major roads, monitoring locations, discharge locations, water quality impairments and selected water quality concerns. There are also tables summarizing segments in each watershed that are listed in the draft 2016 IR as possessing impairments or concerns,

what parameter was evaluated that contributed to the listing, and what actions are being taken to address the impairment or concern. For each table:

NS - indicates a segment is non-supporting for a designated use, or impaired
CS - indicates a segment has a concern for water quality based on screening levels
CN - indicates a segment has concern for near-nonattainment of applicable water quality standards
Entries in **BOLD** were newly listed in the draft 2016 IR
Strike throughs indicate listing removal from the draft 2016 IR
Chl *a* – chrorophyll *a*
DO – Dissolved Oxygen
Cl^- – Chloride
TDS – Total Dissolved Solids
SO_4 – Sulfate

Watershed of the Salt and Double Mountain Forks of the Brazos River
FY19 Water Quality Monitoring and draft 2016 IR Status



Watershed of the Salt Fork and Double Mountain Fork of the Brazos River

The Watershed of the Salt and Double Mountain Forks of the Brazos River begins with the formation of the Double Mountain Fork of the Brazos River near Tahoka in Lynn County. The Salt Fork of the Brazos River is formed in southeastern Crosby County and flows approximately 175 miles before joining with the Double Mountain Fork in Stonewall County to form the main stem of the Brazos River. The Double Mountain Fork and Salt Fork both flow through rural areas with very little development. The land use is primarily agricultural and rangeland. The North Fork of the Double Mountain Fork does have limited perennial flow immediately below the City of Lubbock where several wastewater outfalls create a continuous flow of water. However, this wastewater driven flow typically does not reach the Double Mountain Fork due to high evaporative rates in this arid part of the state. Both the Double Mountain and Salt Forks are shallow streams that meander within the stream bed. This watershed is underlain by geologic formations that are very high in salt content and contribute to the high levels of dissolved solids and chlorides in this watershed and over much of the remaining Brazos River main stem. There are 12 waterbodies assessed in the draft 2016 IR for this watershed and 7 waterbodies with either impairments or concerns (Table 1).

Table 1: Waterbodies of the Salt Fork and Double Mountain Fork Watersheds showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Brazos River Above Possum Kingdom Lake	1208_02 1208_04	Bacteria – NS
	1208_05	Bacteria – NS Nutrients and/or Chl *a* – CS
Miller's Creek Reservoir	1208A_01	Bacteria – CN DO – CS
Salt Fork Brazos River	**1238_01** **1238_03**	**Cl^-, TDS – NS** Bacteria – CN
	1238_02	**Cl^-, TDS – NS**
Croton Creek	1238A_01	Bacteria – CN
White River Lake	**1240_01**	Cl^-, **SO_4**, TDS – **NS** **Excessive algal growth – NS**
Double Mountain Fork Brazos River	1241_01	Bacteria – NS Nutrients and/or Chl a – CS

Water Body	Segment	Parameter(s) Impairment and/or Concern
North Fork Double Mountain Fork Brazos River	1241A_01	Nutrients and/or Chl *a* – CS
	1241A_02	Nutrients and/or Chl a – CS
Lake Alan Henry	1241B_01	Mercury in Edible Tissue

Brazos River above Possum Kingdom Reservoir (Segment 1208)

The Brazos River above Possum Kingdom is listed as impaired for recreational use due to elevated bacteria from the confluence with Boggy Creek upstream to confluence with Lake Creek (1208_04 and 1208_05). AU 1208_02 is also impaired due to bacteria in the portion from the confluence with Spring Branch upstream to the confluence with Fish Creek. Only a small portion of 1208_01 is in this watershed. The majority of 1208_01 is in the Upper Watershed of the Brazos River. The most downstream portion of 1208 is listed for bacteria as well; from the portion of the segment from the confluence with Possum Kingdom Reservoir headwaters upstream to the confluence with Spring Branch in Young County (1208_01). Elevated levels of bacteria are attributed to general nonpoint source pollution. AU 1208_01 and 1208_05 also have concerns foe chlorophyll *a*. An RUAA has been conducted in segment 1208 and results have led to the recommendation is that the segment remain classified as a Primary Contact Recreation (PCR) segment.

Miller's Creek Reservoir (Segment 1208A)

Miller's Creek Reservoir has a concern for both bacteria and DO. Potential source for bacteria loading is likely non-point sources due to the rural location of the reservoir with the shallow nature of the reservoir allowing for low DO concentrations.

Salt Fork of the Brazos River (Segment 1238)

The Salt Fork of the Brazos River is impaired for dissolved solids and chloride in the draft 2016 IR. Segment 1238 first appeared on the 2002 303d List as impaired for dissolved solids and chloride. 1238 was delisted for both impairments in years 2010 - 2014 of the IR. The high total dissolved solid concentrations are driven by the naturally occurring chloride concentrations in the watershed. AUs 1238_01 and 1238_03 have concerns for elevated bacteria.

Croton Creek (Segment 1238A)

Croton Creek has a concern for bacteria with no known source.

White River (Segment 1239)

This segment has been listed as fully supporting with no impairments.

White River Lake (Segment 1240)

White River Lake is newly listed in the 2016 draft IR as not supporting for sulfate and excessive algal growth. Previous impairments for chloride and TDS remain. As with this entire watershed the source of the dissolved solids are natural, due to the geology of the watershed.

White River above White River Reservoir (Segment 1240A)

White River above White River Reservoir is listed as fully supporting its uses with no impairments or concerns in the draft 2016 IR.

Double Mountain Fork of the Brazos River (Segment 1241)

The draft 2016 IR lists this segment as impaired for elevated bacteria and as having concern for chlorophyll *a*.

North Fork Double Mountain Fork of the Brazos River (Segment 1241A)

Throughout the segment (1241A_01 and 1241A_02), there is concern for chlorophyll *a*, nitrate and total phosphorus. A variety of point and non-point sources are likely contributors to the water quality issues in this segment.

Lake Alan Henry (Segment 1241B)

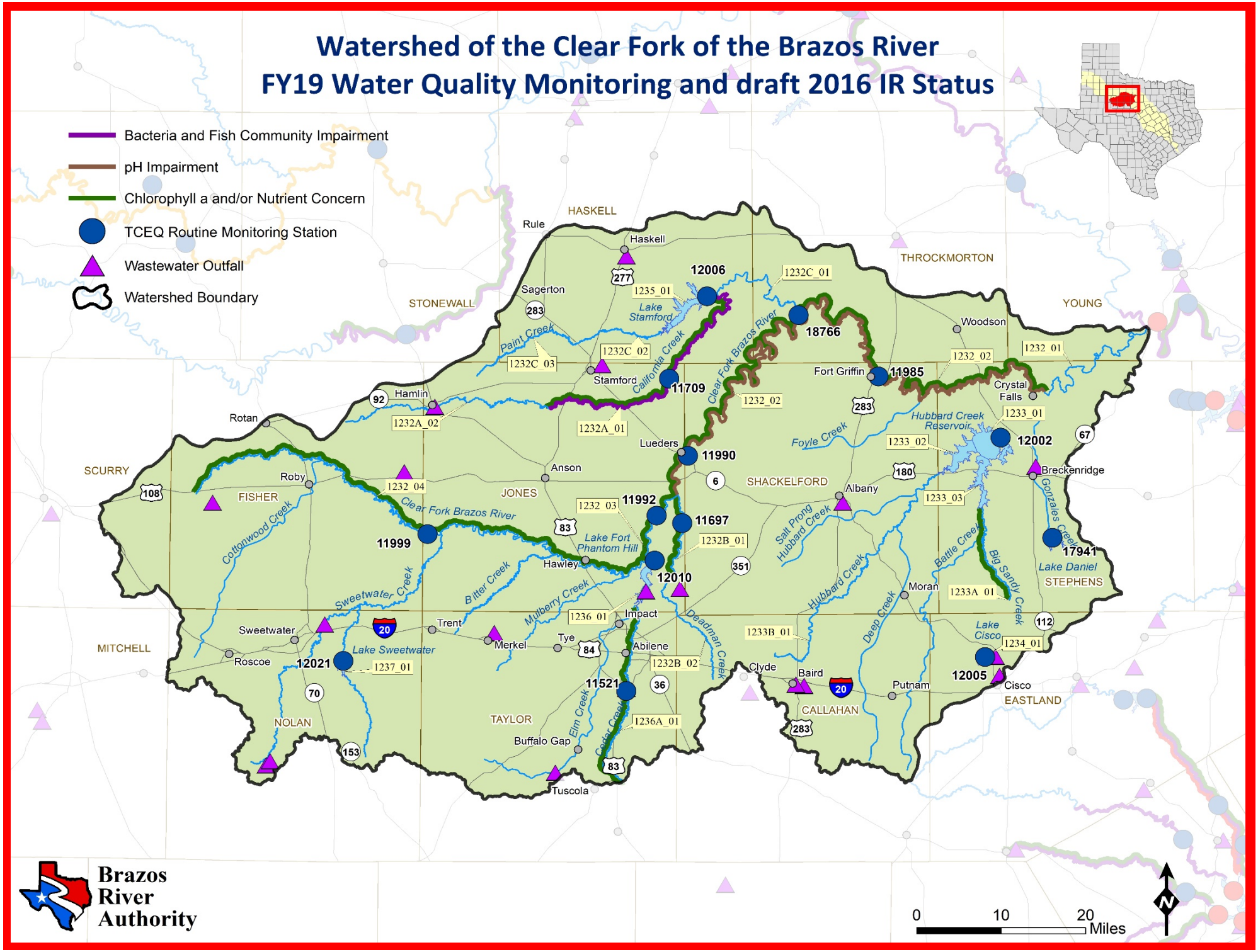
The 2010 IR found an impairment for mercury in edible fish tissue and this impairment remains for the draft 2016 assessment. A request has been made for re-sampling by the Texas Department of State Health Services (DSHS).

Buffalo Springs Lake (Segment 1241C)

South Fork Double Mountain Fork Brazos River upstream of confluence with North Fork Double Mountain Fork (Segment 1241D)

There are no impairments or concerns for Buffalo Springs Lake or the South Fork Double Mountain Fork Brazos River upstream of confluence with North Fork Double Mountain Fork in the draft 2016 IR.

Watershed of the Clear Fork of the Brazos River
FY19 Water Quality Monitoring and draft 2016 IR Status



Watershed of the Clear Fork of the Brazos River

The Clear Fork of the Brazos River begins in Fisher County and flows 284 miles east through Jones, Shackelford, Throckmorton, Stephens, and Young Counties, to its mouth on the Brazos River, near South Bend in southern Young County. The watershed drains approximately 5,728 square miles in the Central Great and Central Oklahoma/Texas plains (EPA Level III ecoregion). Land use is predominantly agricultural with Abilene representing the only urban area. There are five drinking water supply reservoirs within this watershed including Hubbard Creek Reservoir, Lake Cisco, Lake Stamford, Fort Phantom Hill Reservoir, and Lake Sweetwater. There are 12 waterbodies assessed in the draft 2016 IR for this watershed and 7 waterbodies with either impairments or concerns (Table 2).

Table 2: Waterbodies of the Clear Fork Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Clear Fork Brazos River	**1232_02**	**High pH - NS** Nutrients and/or Chl *a* – CS
	1232_03 1232_04	Nutrients and/or Chl *a* – CS
California Creek	**1232A_01**	Bacteria – NS **Impaired fish community – NS** Nutrients and/or Chl *a* – CS Macrobenthics – CN
Deadman Creek	1232B_01	Nutrients and/or Chl *a* – CS
	1232B_02	Bacteria – CN
Hubbard Creek Reservoir	1233_02	DO – CS
Big Sandy Creek	1233A_01	Bacteria – CN Nutrients and/or Chl *a* – CS
Cedar Creek	1236A_01	Nutrients and/or Chl *a* – CS
Lake Sweetwater	1237_01	TDS – CN

Clear Fork of the Brazos River (Segment 1232)

The middle portion of the Clear Fork of the Brazos River from the confluence with Hubbard Creek upstream to the confluence with Deadman Creek (1232_02) is newly listed in the draft 2016 IR as having an impairment for high pH and also has a concern for total phosphorus. There are concerns for chlorophyll *a* in the portion of the segment from the confluence with Hubbard Creek upstream to the end of the segment (1232_02, 1232_03 and 1232_04). From the confluence with Bitter Creek upstream to the end of the segment (1232_04) there is an additional concern for nitrate. Deadman Creek is an effluent dominated stream and municipal discharges are most likely the greatest contributor to the nutrient loading in the Clear Fork.

California Creek (Segment 1232A)

The portion of California Creek from the confluence with Paint Creek in Haskell County upstream to the confluence with Thompson's Creek in Jones County is listed as impaired for bacteria and for having a newly impaired fish community in the draft 2016 IR. There are also concerns for chlorophyll *a* nitrate and the macrobenthic community. Contributors to the nutrient enrichment concerns include municipal discharges, agricultural runoff and on-site sewage facilities.

Deadman Creek (Segment 1232B)

Deadman Creek has concerns for nitrate and total phosphorus in the portion of the segment from the confluence with the Clear Fork of the Brazos River, upstream to the City of Abilene WWTP receiving water (1232B_01). The portion of Deadman Creek upstream of the City of Abilene WWTP (1232B_02) is still in support of the recreational use, but there is concern for elevated bacteria concentrations.

Paint Creek (Segment 1232C)
Lake Daniel (Segment 1232D)

Neither Paint Creek nor Lake Daniel are listed for any concern or impairment in the draft 2016 IR.

Hubbard Creek Reservoir (Segment 1233)

Hubbard Creek Reservoir is currently listed as having a concern for DO in the Hubbard Creek Arm of the reservoir. Hubbard Creek Reservoir is frequently impacted by drought and low water levels which is most likely the cause of low DO concentrations.

Big Sandy Creek (Segment 1233A)

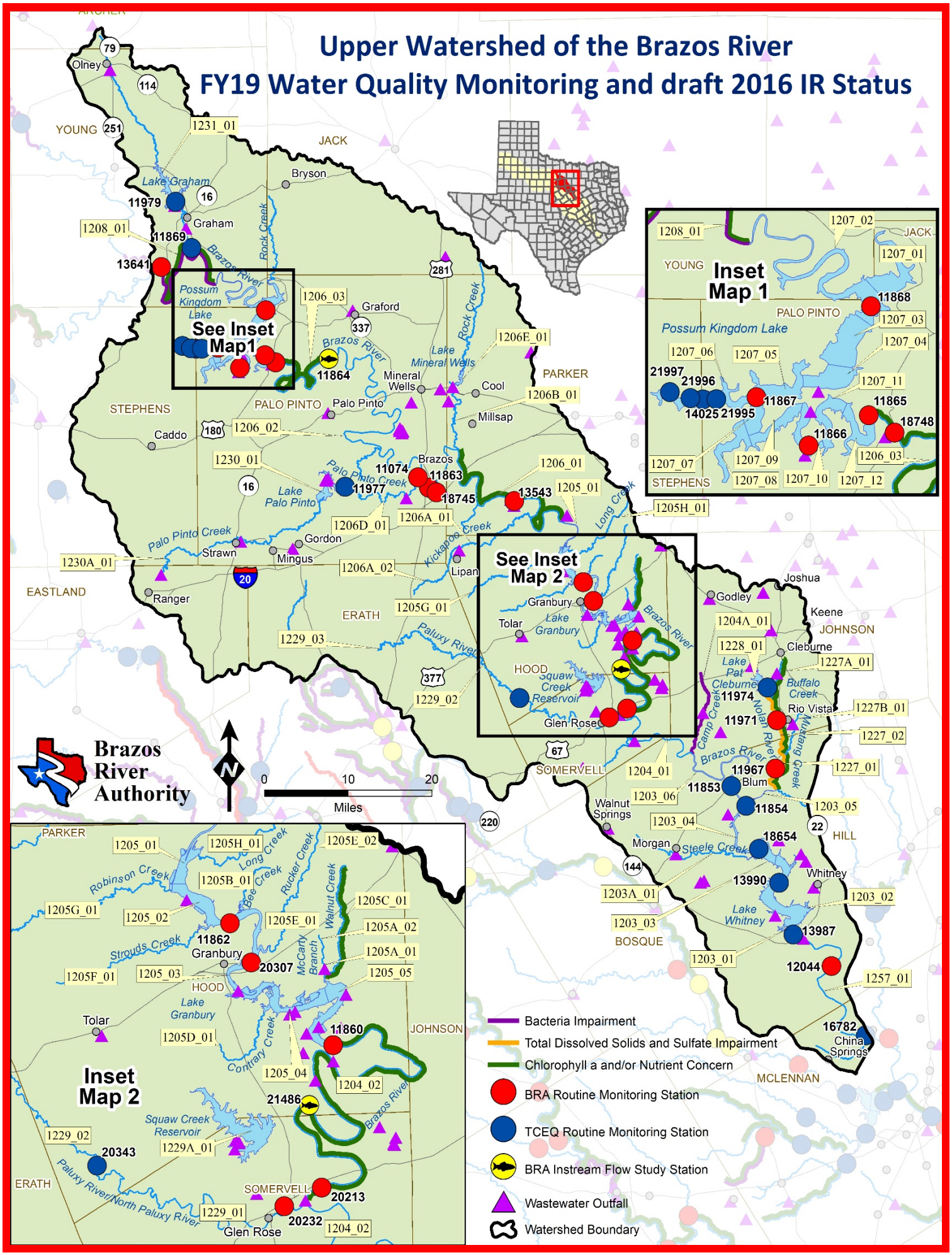
Big Sandy Creek has concerns for both bacteria and chlorophyll *a*.

Hubbard Creek (Segment 1233B)
Hubbard Creek is not listed for any concern or impairment in the draft 2016 IR.

Lake Cisco (Segment 1234)
Lake Stamford (Segment 1235)
Fort Phantom Hill Reservoir (Segment 1236)
Neither Lake Cisco, Lake Stamford nor Fort Phantom Hill Reservoir are listed for any concern or impairment.

Cedar Creek (Segment 1236A)
Cedar Creek has a concern for chlorophyll *a* in the draft 2016 IR.

Lake Sweetwater (Segment 1237)
Lake Sweetwater is listed as having a concern for total dissolved solids in the draft 2016 IR.


Upper Watershed of the Brazos River
FY19 Water Quality Monitoring and draft 2016 IR Status
Inset Map 1
Inset Map 2
See Inset Map1
See Inset Map 2
Brazos River Authority
0 10 20
Miles
Bacteria Impairment
Total Dissolved Solids and Sulfate Impairment
Chlorophyll a and/or Nutrient Concern
BRA Routine Monitoring Station
TCEQ Routine Monitoring Station
BRA Instream Flow Study Station
Wastewater Outfall
Watershed Boundary
Olney
Graham
Bryson
Graford
Mineral Wells
Palo Pinto
Strawn
Gordon
Mingus
Ranger
Lipan
Granbury
Tolar
Glen Rose
Cool
Millsap
Caddo
Godley
Cleburne
Rio Vista
Blum
Walnut Springs
Morgan
Whitney
China Springs
Keene
Joshua
Lake Graham
Lake Mineral Wells
Lake Palo Pinto
Possum Kingdom Lake
Lake Granbury
Lake Pat Cleburne
Lake Whitney
Squaw Creek Reservoir
Brazos River
Rock Creek
Palo Pinto Creek
Kickapoo Creek
Long Creek
Paluxy River
Camp Creek
Nolan River
Buffalo Creek
Steele Creek
Robinson Creek
Bee Creek
Rucker Creek
Walnut Creek
Strouds Creek
McCarty Branch
Contrary Creek
North Paluxy River
YOUNG
JACK
PARKER
STEPHENS
PALO PINTO
EASTLAND
ERATH
HOOD
SOMERVELL
JOHNSON
HILL
BOSQUE
MCLENNAN
11979
11869
13641
11864
11074
11977
11863
18745
13543
11862
20307
11860
21486
20343
20213
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21997
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11868
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12044
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1208_01
1206_03
1206_02
1230_01
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1206B_01
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1205H_01
1205E_02
1205B_01
1205E_01
1205C_01
1205A_02
1205A_01
1205_05
1205_04
1204_02
1205G_01
1205_02
1205F_01
1205_03
1205D_01
1229_02
1229A_01
1229_01
1204_02
1207_02
1207_01
1207_03
1207_04
1207_06
1207_05
1207_11
1207_07
1207_09
1207_08
1207_10
1207_12
1206_03
1205H_01
1206D_01
1206A_01
1205_01
1206A_02
1205G_01
1229_03
1229_02
1204A_01
1228_01
1227A_01
1227B_01
1227_02
1227_01
1204_01
1203_06
1203_04
1203_05
1203A_01
1203_02
1203_03
1203_01
1257_01

Upper Watershed of the Brazos River

The Upper Watershed of the Brazos River is one of the largest watersheds of the Brazos River, stretching from Salt and Double Mountain Fork confluence to the impoundment at the Lake Whitney Dam. Some of the most scenic country along the Brazos River is found in the stretch of river downstream of Possum Kingdom Reservoir, where canoeing and kayaking are activities. The river remains wide with heavily vegetated banks that consist of elm, willow, oak, and juniper trees. The land use is largely agricultural with row-crop agriculture, rangeland and pasture land. Urban areas in close proximity to the river include the cities of Granbury, Mineral Wells and Glen Rose. There are 32 waterbodies assessed in the draft 2016 IR for this watershed and 9 waterbodies with either impairments or concerns (Table 3).

Table 3: Waterbodies of the Upper Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Whitney Lake	1203_01	DO – CN
Brazos River Below Granbury	1204_02	Nutrients and/or Chl *a* – CS Habitat – CS
Camp Creek	1204A_01	Bacteria – NS
Lake Granbury	1205_05	DO – CS
Walnut Creek	1205C	Nutrients and/or Chl *a* – CS
Brazos River Below Possum Kingdom Lake	1206_01 1206_03	Nutrients and/or Chl *a* – CS
	1206_01 1206_02	Habitat – CS Macrobenthics – CN
Brazos River Above Possum Kingdom Lake	1208_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Nolan River	**1227_01**	**Cl^-**, SO_4, TDS – NS Nutrients and/or Chl *a* – CS
	1227_02	**Cl^-**, SO_4, TDS – NS Nutrients and/or Chl *a* – CS Bacteria – CN

Water Body	Segment	Parameter(s) Impairment and/or Concern
Buffalo Creek	1227A_01	Bacteria – CN Nutrients and/or Chl *a* – CS

Lake Whitney (Segment 1203)

Lake Whitney is listed as having a concern for DO near the dam (1203_01). The current cause for low DO is unknown but may be due to internal nutrient recycling.

Brazos River below Lake Granbury (Segment 1204)

The draft 2016 assessment found concern for chlorophyll *a* in the portion of the segment from the confluence with the Paluxy River upstream to DeCordova Bend Dam in Hood County (1204_02). There is also concern here for impaired habitat due to stream bank modification and destabilization. The nutrient sources causing the increased chlorophyll *a* are unknown.

Camp Creek (Segment 1204A)

Camp Creek is not supporting for bacteria. The source is unknown. An RUAA has been conducted in segment 1204A and results have led to the recommendation that the segment remain classified as a Primary Contact Recreation (PCR) segment.

Lake Granbury (Segment 1205)

There is a concern for depressed dissolved oxygen in the downstream portion of Lake Granbury, from DeCordova Bend Dam in Hood County to a point 100 meters (110 yards) upstream of FM 2580 in Parker County (1205_05).

McCarty Branch (Segment 1205A)
Bee Creek (Segment 1205B)
Contrary Creek (Segment 1205D)
Rucker Creek (Segment 1205E
Strouds Creek (Segment 1205F)
Robinson Creek (Segment 1205G)
Long Creek (Segment 1205H)

There are no impairments or concerns listed in the draft 2016 IR for these unclassified segments that are tributaries to Lake Granbury.

Walnut Creek (Segment 1205C)

Walnut Creek has a concern for nitrate listed in the draft 2016 IR.

Brazos River below Possum Kingdom Reservoir (Segment 1206)

The draft 2016 assessment lists the upstream portion of this segment, the Brazos River 100 meters (110 yards) upstream of FM 2580 in Parker County upstream to the confluence with Rock Creek in Parker County (1206_01), and the most downstream portion of this segment, the Brazos river from the confluence with Elm Creek in Palo Pinto County upstream to Possum Kingdom Reservoir in Palo Pinto county (1206_03) as having a concern for chlorophyll *a*. AU 1206_01 as well as the middle portion of the segment , the Brazos River from the confluence with Rock Creek upstream to the confluence with Elm Creek in Palo Pinto County (1206_02) have concerns for the macrobenthic community and habitat.

Kickapoo Creek (Segment 1206A)
Rock Creek (Segment 1206B)
Unnamed Tributary of Rock Creek (Segment 1206C)
Palo Pinto Creek (Segment 1206D)
Lake Mineral Wells (Segment 1206E)

These unclassified segments of the Brazos River below Possum Kingdom Reservoir support all of their designated uses with no impairments or concerns.

Possum Kingdom Lake (Segment 1207)

There are no impairments or concerns for the Possum Kingdom reservoir.

Brazos River above Possum Kingdom Reservoir (Segment 1208)

The majority of 1208_01 is in the Upper Watershed of the Brazos River. This most downstream portion of 1208 is listed for bacteria as well: from the portion of the segment from the confluence with Possum Kingdom Reservoir headwaters upstream to the confluence with Spring Branch in Young County (1208_01). Elevated levels of bacteria are attributed to general nonpoint source pollution. AU 1208_01 also has a concern for chlorophyll *a*. An RUAA has been conducted in segment 1208 and results have led to the recommendation is that the segment remain classified as a Primary Contact Recreation (PCR) segment.

Millers Creek Reservoir (Segment 1208A)

Miller's Creek Reservoir has no impairment but there are concerns for bacteria and depressed dissolved oxygen listed in the draft 2016 IR.

Nolan River (Segment 1227)

Nolan River was previously and remains listed as not supporting for sulfate and TDS. A new impairment, for chloride was added in the draft 2016 IR. There are also concerns in the segment for chlorophyll *a* nitrate and total phosphorus. AU 1227_02, the portion of the Nolan River from the confluence with Mustang Creek in Hill County upstream to the confluence with the Lake Pat Cleburne Dam in Johnson County, has an additional concern for elevated bacteria. The ground water in the watershed contains dissolved solids, this water is used by industry and the local municipal wastewater treatment can not remove the dissolved solids and thus discharges them to the Nolan River. Due to the naturally occurring nature of the increased solids concentrations, TCEQ has reevaluated the chloride, sulfate and TDS criteria for this segment and is awaiting EPA approval of the recommended standard change.

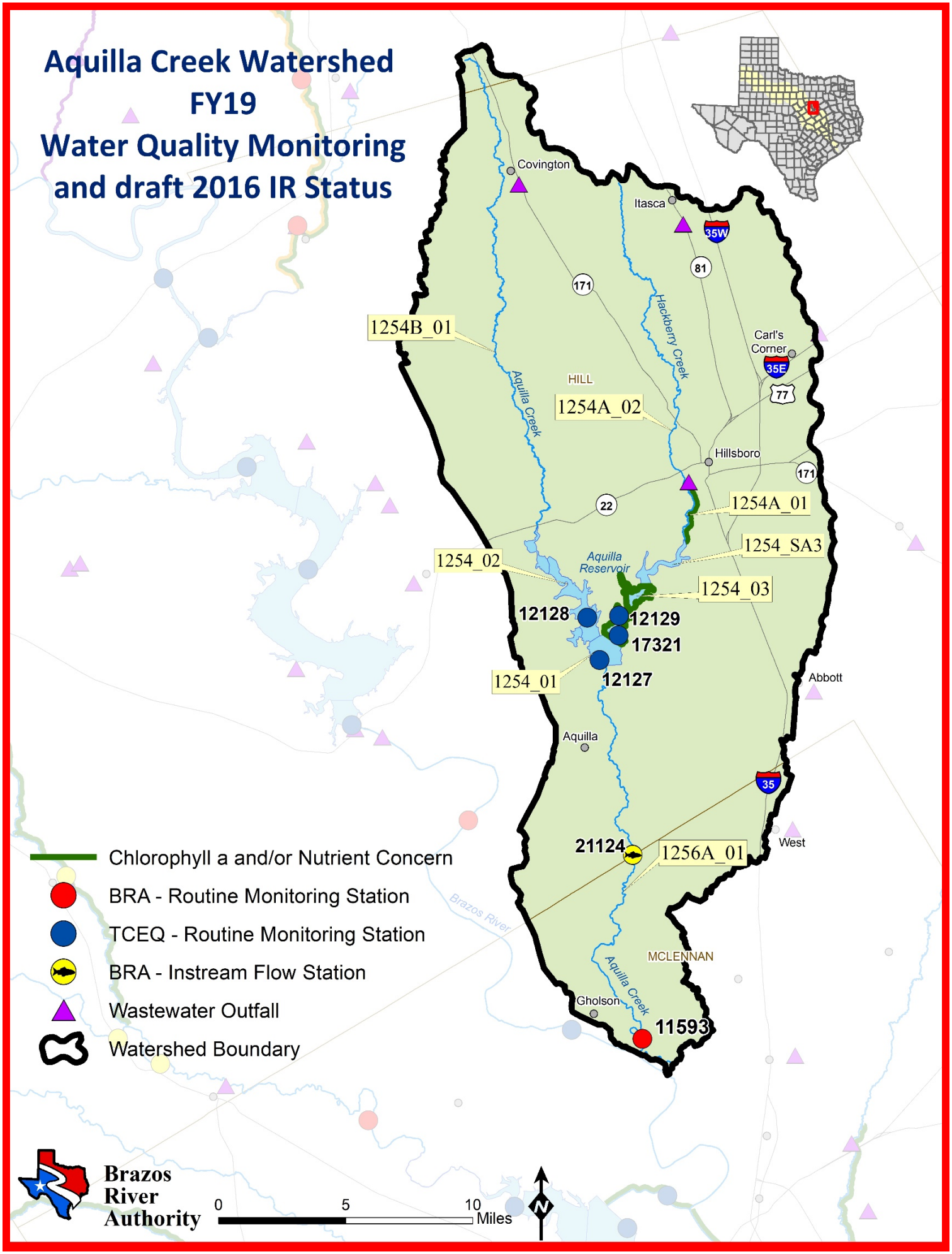
Buffalo Creek (Segment 1227A)

Buffalo Creek has concerns for bacteria, nitrate and total phosphorus in the draft 2016 IR.

Mustang Creek (Segment 1227B)
Lake Pat Cleburne (Segment 1228)
Paluxy River (Segment 1229)
Squaw Creek Reservoir (Segment 1229A)
Lake Palo Pinto (Segment 1230)
Palo Pinto Creek above Lake Palo Pinto (Segment 1230A)
Lake Graham (Segment 1231)
Brazos River below Lake Whitney (Segment 1257)

The above segments are in full support of all of their uses with no impairments or concerns listed in the draft 2016 IR.

Aquilla Creek Watershed
FY19
Water Quality Monitoring and draft 2016 IR Status



Aquilla Creek Watershed

The Aquilla Creek Watershed covers about 466 square miles, begins in Johnson County flows through Hill County then discharges into the Brazos River in McLennan County. Aquilla Reservoir, at 3,020 acres, is the major drinking water source for Hill County. A land-use analysis in the watershed showed approximately 60 percent is used for row crops and small grains; approximately 21 percent of the land is used for pasture, hay and grassland; approximately 13 percent is deciduous and evergreen forest; and approximately 6 percent is commercial, industrial, transportation, residential, and urban uses. Previous concerns over high atrazine levels were addressed by TCEQ and TSSWCB by means of a TMDL and cooperation of local producers in implementing BMPs for the application of atrazine. There are 5 waterbodies assessed in the draft 2016 IR for this watershed and 2 waterbodies with either impairments or concerns (Table 4).

Table 4: Waterbodies of the Aquilla Creek Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Aquilla Reservoir	1254_03	Sediment – CS
Hackberry Creek	1254A_01	Nutrients and/or Chl *a* – CS DO – CS

Aquilla Reservoir (Segment 1254)

The draft 2016 assessment lists Aquilla Reservoir as having a concern for arsenic in sediment. It is suspected that the arsenic came from the arsenic acid cotton defoliant used for decades in the highly agricultural area around Aquilla Reservoir.

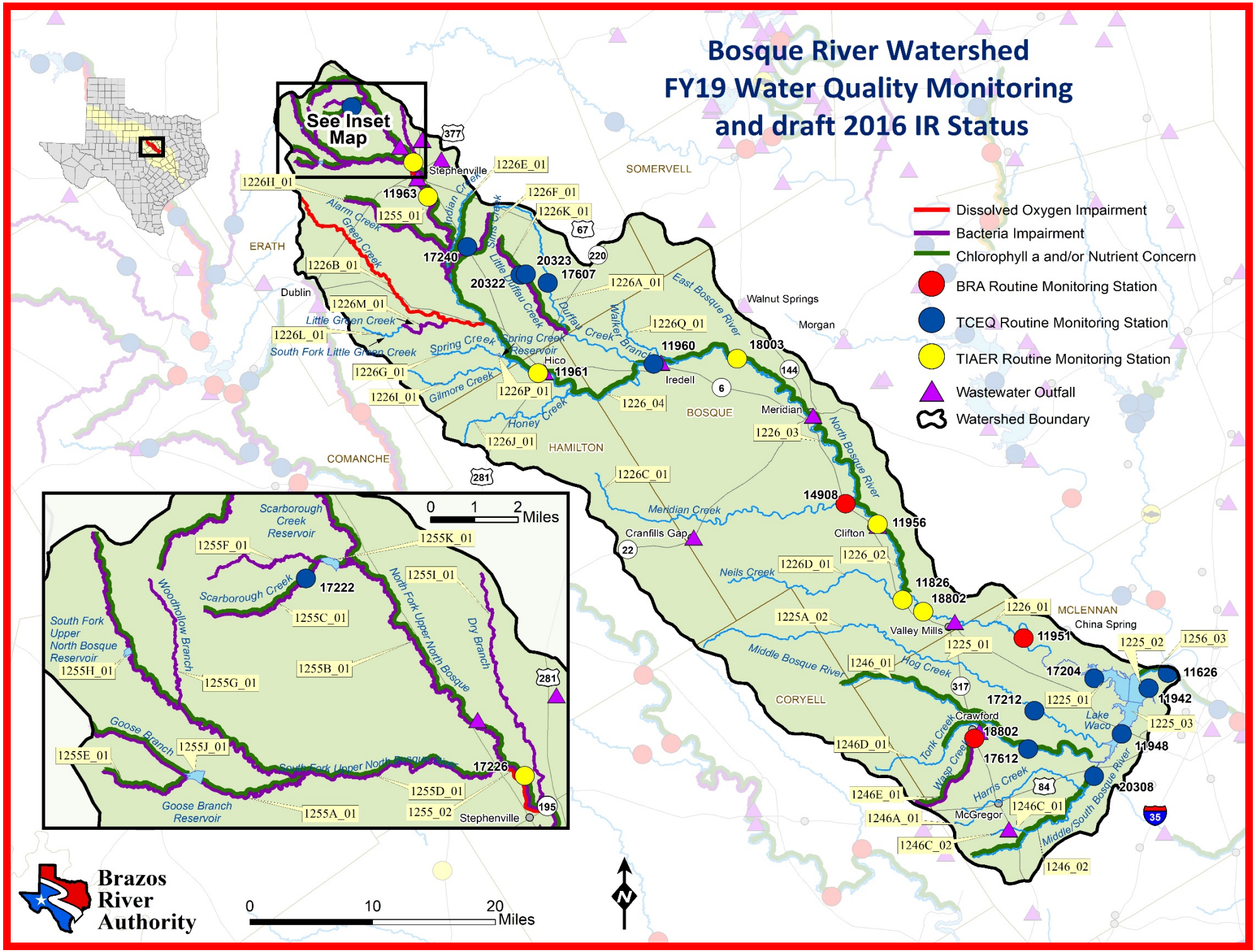
Hackberry Creek (Segment 1254A)

Hackberry Creek is listed as having concerns for DO, ammonia and nitrate in the draft 2016 assessment. Sources of the nitrate in the watershed may include permitted discharges, agricultural runoff and other non-point source runoff.

Aquilla Creek upstream of Aquilla Reservoir (Segment 1254B)

Aquilla Creek (Segment 1256A)

Aquilla Creek upstream of Aquilla Reservoir and Aquilla Creek are in full support of their uses with no impairments or concerns listed in the draft 2016 IR.


Bosque River Watershed
FY19 Water Quality Monitoring
and draft 2016 IR Status
See Inset Map
Dissolved Oxygen Impairment
Bacteria Impairment
Chlorophyll a and/or Nutrient Concern
BRA Routine Monitoring Station
TCEQ Routine Monitoring Station
TIAER Routine Monitoring Station
Wastewater Outfall
Watershed Boundary
Stephenville
SOMERVELL
ERATH
Dublin
COMANCHE
HAMILTON
Hico
Iredell
Walnut Springs
Morgan
BOSQUE
Meridian
Cranfills Gap
Clifton
Valley Mills
MCLENNAN
China Spring
CORYELL
Crawford
McGregor
Lake Waco
Alarm Creek
Green Creek
Little Green Creek
South Fork Little Green Creek
Spring Creek
Spring Creek Reservoir
Gilmore Creek
Honey Creek
Little Duffau Creek
Duffau Creek
Walker Branch
East Bosque River
North Bosque River
Meridian Creek
Neils Creek
Middle Bosque River
Hog Creek
Tonk Creek
Wasp Creek
Harris Creek
Middle/South Bosque River
Scarborough Creek Reservoir
Scarborough Creek
Woodhollow Branch
South Fork Upper North Bosque Reservoir
North Fork Upper North Bosque
Dry Branch
Goose Branch
Goose Branch Reservoir
11963
17240
20322
20323
17607
11960
18003
11961
14908
11956
11826
18802
11951
17204
11626
17212
11942
17612
11948
20308
17222
17226
1226H_01
1226E_01
1226F_01
1226K_01
1255_01
1226B_01
1226M_01
1226L_01
1226G_01
1226I_01
1226P_01
1226A_01
1226Q_01
1226_04
1226J_01
1226_03
1226C_01
1226D_01
1226_02
1225A_02
1226_01
1225_01
1256_03
1225_02
1246_01
1225_03
1246D_01
1246E_01
1246A_01
1246C_01
1246C_02
1246_02
1255F_01
1255K_01
1255I_01
1255C_01
1255B_01
1255G_01
1255H_01
1255J_01
1255E_01
1255D_01
1255_02
1255A_01
0 1 2 Miles
0 10 20 Miles
Brazos River Authority

Bosque River Watershed

The Bosque River watershed drains into Waco Lake before discharging into the Brazos River downstream of Waco Lake, in McLennan County. Approximately 74 percent of the drainage area of the Bosque watershed is comprised of the North Bosque River watershed. The predominant land use is agricultural, range and pasture land, and Confined Animal Feeding Operations (CAFO). A large amount of environmental and water quality research has been conducted in the North Bosque watershed to address elevated levels of phosphorus and bacteria, particularly in the North Bosque River segments 1226 and 1255. There are 39 waterbodies assessed in the draft 2016 IR for this watershed and 23 waterbodies with either impairments or concerns (Table 5).

Table 5: Waterbodies of the Bosque River Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
North Bosque River	1226_02	Nutrients and/or Chl *a* – CS DO – CN
	1226_03	Nutrients and/or Chl *a* – CS
	1226_04	Nutrients and/or Chl *a* – CS Macrobenthic Community – CN
Duffau Creek	~~1226A_01~~	~~Bacteria – NS~~ MEETS CRITERIA
Green Creek	1226B_01	DO – NS
Indian Creek	1226E_01	~~Bacteria – NS~~ MEETS CRITERIA Nutrients and/or Chl *a* – CS
Sims Creek	1226F_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Alarm Creek	1226H_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Little Duffau Creek	1226K_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Little Green Creek	1226M_01	Bacteria – NS
Sims Creek Reservoir	1226O_01	DO – CS
Middle Bosque/South Bosque River	1246_01 1246_02	Nutrients and/or Chl *a* – CS

Water Body	Segment	Parameter(s) Impairment and/or Concern
Tonk Creek	1246D_01	Nutrients and/or Chl *a* – CS
Wasp Creek	1246E_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Upper North Bosque River	1255_01	Bacteria – NS Nutrients and/or Chl *a* – CS
	1255_02	Bacteria – NS DO – NS Nutrients and/or Chl *a* – CS
Goose Branch	1255A_01	Bacteria – NS Nutrients and/or Chl *a* – CS
North Fork Upper North Bosque River	1255B_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Scarborough Creek	1255C_01	Bacteria – NS Nutrients and/or Chl *a* – CS
South Fork North Bosque River	1255D_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Unnamed Tributary of Goose Branch	1255E_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Unnamed Tributary of Scarborough Creek	1255F_01	Bacteria – NS
Woodhollow Branch	1255G_01	Bacteria – NS
South Fork Upper North Bosque River Reservoir	1255H_01	DO – CS
Dry Branch	1255I_01	Bacteria – NS
Brazos River/Lake Brazos	1256_03	Nutrients and/or Chl *a* – CS

Waco Lake (Segment 1225)

Hog Creek (Segment 1225A)

Waco Lake and Hog Creek are in full support of their uses having no impairments or concerns listed in the draft 2016 IR.

North Bosque River (Segment 1226)
The portion of the North Bosque River from the confluence with Neils Creek in Bosque County to a point immediately upstream of the Indian Creek confluence in Erath County (1226_04, 1226_03 and 1226_02) has a concern for chlorophyll *a*. The portion of the stream from the confluence with Neils Creek upstream to the confluence with Meridian Creek in Bosque County (1226_02) also has a concern for depressed dissolved oxygen. There is a concern for the macrobenthic community in the portion of the stream from confluence with Duffau Creek in Bosque County upstream to a point immediately upstream of Indian Creek confluence (end of segment) in Erath County (1226_04). Wastewater treatment plant effluent, agricultural runoff and the confined animal feeding operations (CAFOs) located in the watershed are potential contributors to the elevated nutrients. However, through implementation of the TMDL plan, reductions in nutrients have been achieved.

Duffau Creek (Segment 1226A)
Meridian Creek (Segment 1226C)
Neils Creek (Segment 1226D), Spring Creek (Segment 1226G)
Gilmore Creek (Segment 1226I)
Honey Creek (Segment 1226J)
South Fork Little Green Creek (Segment 1226L)
Indian Creek Reservoir (1226N)
(Spring Creek Reservoir (Segment 1226P)
Walker Branch (Segment 1226Q)
These unclassified segments of the North Bosque River have no impairments or concerns.

Green Creek (Segment 1226B)
Green Creek is not supporting its designated aquatic life use due to depressed dissolved oxygen.

Indian Creek (Segment 1226E)
Indian Creek has concerns for chlorophyll *a* and nitrate.

Sims Creek (Segment 1226F)
Alarm Creek (Segment 1226H)
Sims Creek and Alarm Creek are not supporting for bacteria have concerns for chlorophyll *a.* New bacteria criteria has been accepted by the EPA for these two segments. When the new criteria are applied, the bacterial impairment should be removed.

Little Duffau Creek (Segment 1226K)

Little Duffau Creek is not supporting for bacteria and has concerns for nitrate and total phosphorus.

Little Green Creek (Segment 1226M)

Little Green Creek is not supporting for bacteria. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied, the bacterial impairment should be removed.

Sims Creek Reservoir (Segment 1226O)

Sims Creek Reservoir has a concern for depressed dissolved oxygen.

Middle Bosque/South Bosque River (Segment 1246)

The Middle Bosque/South Bosque River has a concern for nitrate in the draft 2016 IR. The watershed ranges from undeveloped to moderate development with a mix of commercial, industrial, residential, and agricultural uses. Potential sources of nitrates include point source discharges along with both urban and agricultural runoff.

Harris Creek (Segment 1246A)
Commanche Springs Spring Brook (Segment 1246B)
Unnamed Tributary of South Bosque River (Segment 1245C)

These segments are in full support of their uses with no impairments or concerns listed in the draft 2016 IR.

Tonk Creek (Segment 1246D)

Tonk Creek is listed as having a concern for nitrate. The area ranges from undeveloped to moderate development with a mix of commercial, industrial, residential, and agricultural uses. Potential sources of nitrates include point source discharges along with both urban and agricultural runoff.

Wasp Creek (Segment 1246E)

Wasp Creek is listed in the draft 2016 assessment as impaired for recreational use due to elevated bacteria concentrations. New bacteria criteria is awaiting EPA approval for this segment. If the recommended criteria are approved and the new criteria are applied, the bacterial impairment should be removed. Potential sources of bacteria include on-site sewage systems and runoff from rangeland and agricultural lands. Like the Middle Bosque/South Bosque River and Tonk Creek, Wasp Creek has a concern for nitrate.

Upper North Bosque River (Segment 1255)

The Upper North Bosque River is listed as not supporting its recreational use due to elevated bacteria concentrations and has a concern for chlorophyll *a.* The portion of the Upper North Bosque River from the confluence with Indian Creek upstream to the confluence with Dry Branch in Erath County (1255_01) has an additional concern for nitrate. The portion of the Upper North Bosque River from the confluence with the North and South Forks of the North Bosque River to the confluence with Dry Branch (1255_02) is also listed as not supporting its aquatic life use due to depressed DO. Both wastewater treatment plant effluent and the CAFOs located in the watershed are potential contributors to the elevated bacteria and nutrients. And like Segment 1226, through implementation of the TMDL plan, pollutant reduction is being addressed.

Goose Branch (Segment 1255A)

Goose Branch is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations and as having concerns for ammonia, chlorophyll *a*, nitrate and total phosphorus. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied and more data is collected, the bacterial impairment may be removed.

North Fork Upper North Bosque River (Segment 1255B)

North Fork Upper North Bosque River is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations and as having a concern for chlorophyll *a*. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied, the bacterial impairment should be removed.

Scarborough Creek (Segment 1255C)

Scarborough Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations and as having concerns for chlorophyll *a* and total phosphorus. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied, the bacterial impairment should be removed.

South Fork North Bosque River (Segment 1255D)

South Fork North Bosque River is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations and as having a concern for chlorophyll *a*.

Unnamed Tributary to Goose Creek (Segment 1255E)

Unnamed Tributary to Goose Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations and as having concerns for ammonia, nitrate and total phosphorus. New bacteria criteria has been accepted

by the EPA for this segment. Although when the new criteria is applied using current data collected, the bacterial impairment will remain.

Unnamed Tributary to Scarborough Creek (Segment 1255F)

Segment 1255F is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for 1255F. Although when the new criteria is applied using current data collected, the bacterial impairment will remain.

Woodhollow Branch (Segment 1255G)

1255G listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied and more data is collected, the bacterial impairment may be removed.

South Fork Upper North Bosque River Reservoir (Segment 1255H)

South Fork Upper North Bosque River Reservoir has a concern for depressed dissolved oxygen.

Dry Branch (Segment 1255I)

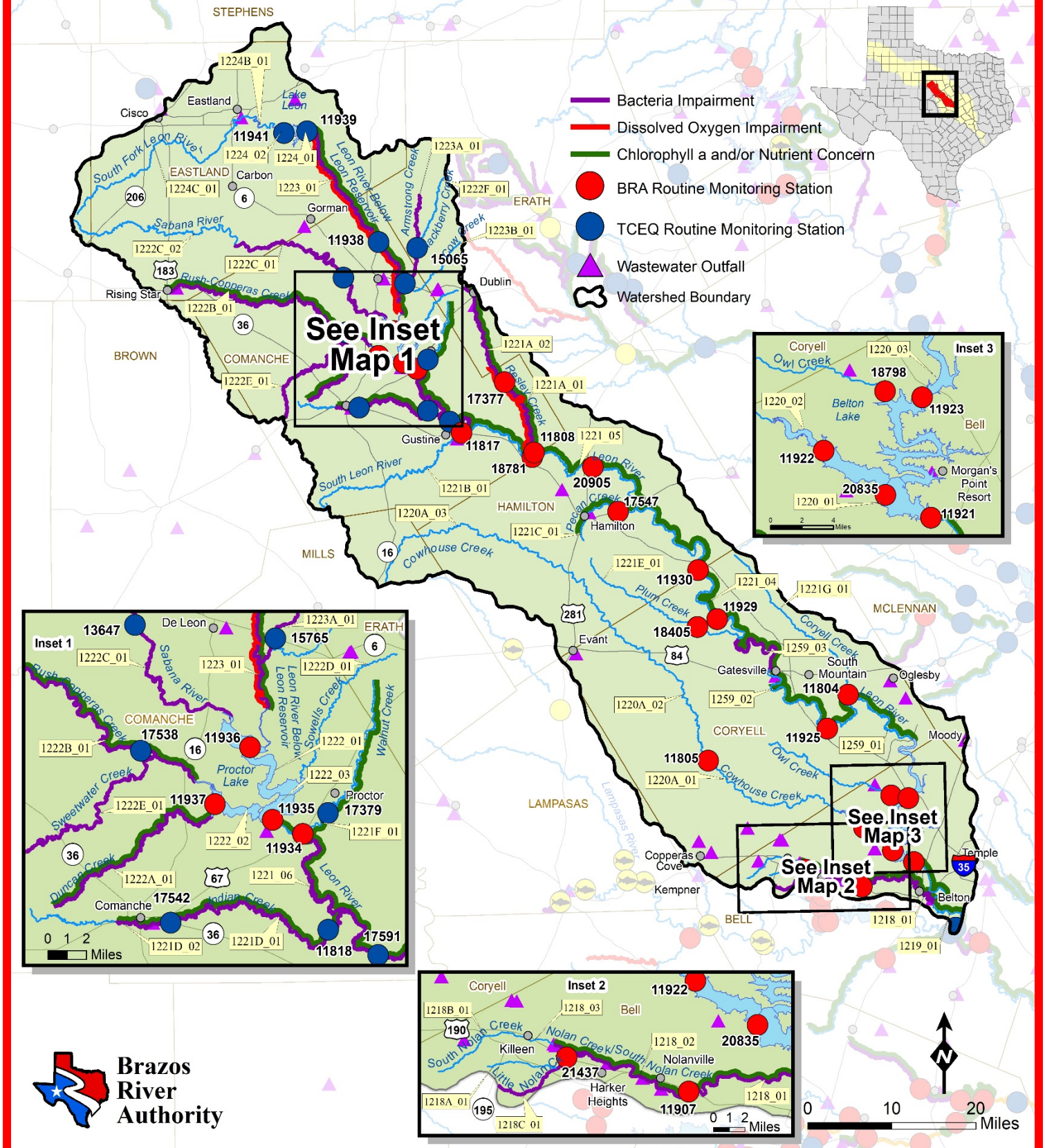
Dry Branch is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied, the bacterial impairment should be removed.

Goose Branch Reservoir (Segment 1255J)

Scarborough Creek Reservoir (Segment 1255K)

These two reservoirs are in full support of their designated uses with no impairments or concerns in the draft 2016 IR.

Leon River Watershed
FY19 Water Quality Monitoring and draft 2016 IR Status



Leon River Watershed

The northernmost tributaries of the Leon River watershed originate in the eastern portion of Callahan County and flows into the mainstem Leon River in Eastland County. From this confluence, the river courses through Comanche, Coryell, Hamilton, and finally reaches Bell, encompassing a total area of 3,533 square miles. There are three impoundments on the mainstem, Leon Reservoir, Proctor Lake, and Lake Belton. These waterbodies are used primarily for recreation, flood control and municipal water supply. Land use in the watershed is primarily rangeland and improved pastureland with areas of mixed forestland. The watershed also hosts a number of municipalities, approximately 50 confined animal feeding operations and row crop agriculture. There are 31 waterbodies assessed in the draft 2016 IR for this watershed and 20 waterbodies with either impairments or concerns (Table 6).

Table 6: Waterbodies of the Leon River Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Nolan Creek/South Nolan Creek	1218_01 1218_02	Bacteria – NS Nutrients and/or Chl a – CS
Unnamed Tributary to Little Nolan Creek	1218A_01	Bacteria – CN
Little Nolan Creek	1218C_01	Bacteria – NS
Leon River Below Belton Lake	1219_01	Nutrients and/or Chl a – CS
Leon River Below Proctor Lake	1221_04 1221_05 1221_07	DO – CS Nutrients and/or Chl *a* – CS
	1221_06	Bacteria – NS Nutrients and/or Chl *a* – CS
Resley Creek	1221A_01	Bacteria – NS DO – NS Nutrients and/or Chl *a* – CS
	1221A_02	Bacteria – NS Nutrients and/or Chl *a* – CS
South Leon River	1221B_01	Habitat – CS
Pecan Creek	1221C_01	Nutrients and/or Chl *a* – CS

Water Body	Segment	Parameter(s) Impairment and/or Concern
Indian Creek	1221D_01	Bacteria – NS Nutrients and/or Chl *a* – CS DO – CS
	1221D_02	Bacteria – NS Nutrients and/or Chl *a* – CS
Walnut Creek	1221F_01	~~Bacteria – NS~~ MEETS (new-1030CFU) CRITERIA Nutrients and/or Chl a – CS
Duncan Creek	1222A_01	Bacteria – NS Nutrients and/or Chl a – CS DO – CN
Rush-Copperas Creek	1222B_01	Bacteria – NS Nutrients and/or Chl a – CS
Sabana River	1222C_01	Bacteria – NS
Sowells Creek	1222D_01	Bacteria – CN
Sweetwater Creek	1222E_01	Bacteria – NS
Hackberry Creek	1222F_01	Bacteria – CN DO – CN
Leon River Below Leon Reservoir	1223_01	Bacteria – NS DO – NS Nutrients and/or Chl a – CS
Armstrong Creek	1223A_01	Bacteria – NS
Cow Creek	1223B_01	Bacteria – CN
Leon River Above Belton Lake	1259_01 1259_02 1259_03	Nutrients and/or Chl a – CS

Nolan Creek/South Nolan Creek (Segment 1218)

The portion of Nolan Creek from the confluence with the Leon River upstream to the confluence with Liberty Ditch in city of Killeen in Bell County (1218_01 and 1208_02) possesses a bacterial impairment and water quality concerns for nitrate and total phosphorus. The Nolan Creek/South Nolan Creek Watershed Protection Plan is addressing these issues.

Unnamed Tributary to Little Nolan Creek (Segment 1218A)

The Unnamed Tributary to Little Nolan Creek has a concern for elevated bacteria.

South Nolan Creek (Segment 1218B)

There are no impairments or concerns listed in the draft 2016 IR for this unclassified segment of Nolan Creek/South Nolan Creek.

Little Nolan Creek (Segment 1218C)

Little Nolan Creek is listed on the draft 2016 IR as not supporting its recreational use due to elevated bacteria concentrations.

Leon River Below Belton Lake (Segment 1219)

The portion of the Leon River from the Belton Dam in Bell County to the confluence with the Lampasas River (1219_01) possesses concerns for nitrate and total phosphorus, but is otherwise fully supporting of all assessed uses. The source of elevated nutrients in this segment is believed to be a result of point source discharges and urban runoff.

Belton Lake Segment (Segment 1220)

Water quality in Belton Lake is fully supporting of all uses assessed.

Cowhouse Creek (Segment 1220A)

Cowhouse Creek is fully supporting all uses assessed.

Leon River Below Proctor Lake (Segment 1221)

The portion of the Leon River from the confluence with South Leon Creek upstream to the confluence with Walnut Creek (1221_06) is listed as impaired for bacteria. The bacteria impairment is a result of the contribution of multiple sources, including: confined animal feeding operations, municipal waste water discharge, and stormwater runoff from rural sources. There are concerns for chlorophyll *a* in the portion of the Leon River from the confluence with Plum Creek, upstream to Lake Proctor (1221_04, _05,_06,_07). There is also a concern for depressed dissolved oxygen in the portion of the Leon River from the confluence with Plum Creek, upstream to the confluence with the South Leon Creek (1221_04,_05) and in the portion from the confluence with Walnut Creek upstream to Lake

Proctor (1221_07). Please click here for more information on the Leon River Watershed Protection Program that addresses issues in this segment.

Resley Creek (Segment 1221A)

Resley Creek is listed as having a bacteria impairment and a concern for chlorophyll *a*. There is also a depressed dissolved oxygen impairment in the portion of Resley Creek from confluence with Leon River upstream to the confluence with unnamed tributary, approximately 1.0 mi N. of Comanche County (1221A_01). New bacteria criteria is awaiting EPA approval for this segment. If the recommended criteria are approved and the new criteria are applied, the bacterial impairment should be removed.

South Leon River (Segment 1221B)

The South Leon River has a concern for habitat.

Pecan Creek (Segment 1221C)

Pecan Creek has a concern for chlorophyll *a*.

Indian Creek (Segment 1221D)

Indian Creek is listed as having a bacteria impairment and a concern for chlorophyll a. There is also an additional concern for depressed dissolved oxygen in the portion of Indian Creek from the confluence with Leon River, upstream to the confluence with Armstrong Creek (1221D_01). There is a concern for nitrate in the portion of Indian Creek from confluence with Armstrong Creek approximately 1.5 km downstream of SH 36 upstream to the confluence with an unnamed tributary approximately 0.1 km upstream of US 377 (1221D_02). New bacteria criteria is awaiting EPA approval for this segment. If the recommended criteria are approved and the new criteria are applied, the bacterial impairment should be removed.

Plum Creek (Segment 1221E)

Plum Creek is in full support of its designated uses having no impairments or concerns.

Walnut Creek (Segment 1221F)

Walnut Creek has a concern for chlorophyll *a*.

Coryell Creek (Segment 1221G)

Coryell Creek is in full support of its designated uses having no impairments or concerns.

Proctor Lake (Segment 1222)
Proctor Lake possesses no impairments or concerns.

Duncan Creek (Segment 1222A)
Duncan Creek is listed as having a bacteria impairment and concerns for chlorophyll *a* and depressed dissolved oxygen. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied using current data collected, the bacterial impairment will remain.

Rush-Copperas Creek (Segment 1222B)
Rush-Copperas Creek is listed as having a bacteria impairment and a concern for chlorophyll *a.*

Sabana River (Segment 1222C)
Sabana River is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. An RUAA has been completed for this segment, but no recommendation has been made.

Sweetwater Creek (Segment 1222E)
Sweetwater Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations.

Sowells Creek (Segment 1222D)
Sweetwater Creek has a concern for bacteria.

Hackberry Creek (Segment 1222F)
Hackberry Creek has concerns for bacteria and depressed dissolved oxygen.

Leon River Below Leon Reservoir (Segment 1223)
The Leon River below Leon Reservoir is listed in the draft 2016IR as impaired for recreational use due to elevated bacterial levels and depressed DO. There is a concern for increased chlorophyll *a*. This segment frequently experiences low water levels which hinder its ability to buffer against high ambient air temperatures in the summer and fall and are the likely cause for depressed DO levels.

Armstrong Creek (Segment 1223A)

Armstrong Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied, the bacterial impairment should be removed.

Cow Creek (Segment 1223B)

Cow Creek has a concern for bacteria.

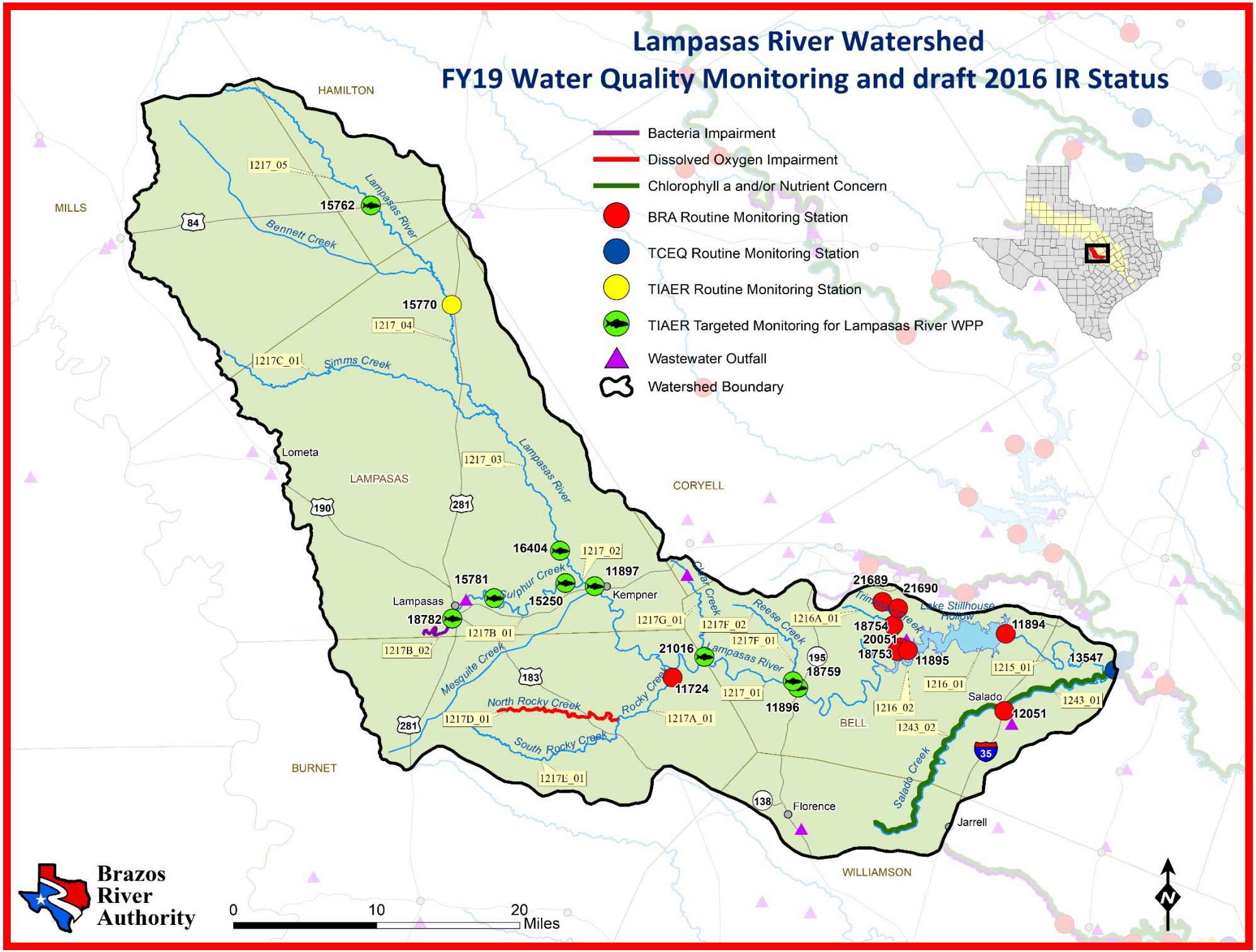
As in the case of the small tributary streams mentioned in the Bosque River Watershed, the tributary streams in the upstream portion of the Leon River Watershed are small, rural streams with little to no flow for most of the year whose water is primarily generated by storm events. This is potentially the cause of most bacteria impairments/concerns and depressed dissolved oxygen concerns in the unclassified segments of Leon River Below Proctor Lake (Segment 1221), Proctor Lake (Segment 1222), and Leon River Below Leon Reservoir (Segment 1223).

Leon Reservoir (Segment 1224)
Lake Olden (Segment 1224A)
Leon River Above Leon Reservoir (Segment 1224B)
South Fork Leon River (Segment 1224C)

The classified and three unclassified segments of the Leon Reservoir are in full support of all of their uses having no impairments or concerns.

Leon River Above Belton Lake (Segment 1259)

The Leon River Above Belton Lake listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. There is a concern for increased chlorophyll *a* throughout the segment. There is an additional concern for nitrate in the portion of the Leon River from confluence with Cottonwood Creek approximately 2.8 km south of Gatesville upstream to the confluence with Stillhouse Branch in Coryell County.


Lampasas River Watershed
FY19 Water Quality Monitoring and draft 2016 IR Status
Bacteria Impairment
Dissolved Oxygen Impairment
Chlorophyll a and/or Nutrient Concern
BRA Routine Monitoring Station
TCEQ Routine Monitoring Station
TIAER Routine Monitoring Station
TIAER Targeted Monitoring for Lampasas River WPP
Wastewater Outfall
Watershed Boundary
HAMILTON
MILLS
LAMPASAS
CORYELL
BELL
BURNET
WILLIAMSON
Lometa
Lampasas
Kempner
Florence
Salado
Jarrell
Lampasas River
Bennett Creek
Simms Creek
Sulphur Creek
Mesquite Creek
North Rocky Creek
Rocky Creek
South Rocky Creek
Reese Creek
Cedar Creek
Salado Creek
Lake Stillhouse Hollow
1217_05
1217_04
1217C_01
1217_03
1217_02
1217B_01
1217B_02
1217D_01
1217E_01
1217G_01
1217F_02
1217F_01
1216A_01
1217_01
1217A_01
1216_01
1216_02
1215_01
1243_01
1243_02
15762
15770
15781
15250
16404
11897
18782
21016
11724
11896
18759
21689
21690
18754
20051
18753
11895
11894
13547
12051
Brazos River Authority
0
10
20
Miles
N

Lampasas River Watershed

The headwaters of the Lampasas River are west of the City of Hamilton. The river drains approximately 1,502 square miles through Lampasas, Burnett, and Bell counties before being impounded by Stillhouse Hollow Dam. Salado Creek drains into the Lampasas below the dam, and then confluences with the Leon River to form the Little River. The Land use in the Lampasas River watershed is predominantly agricultural, although rapid development continues around Kempner, Coppers Cove, Killeen, and Harker Heights. Much of the Lampasas River has heavily vegetated banks and is characterized by low-flow conditions much of the time. There are 13 waterbodies assessed in the draft 2016 IR for this watershed and 4 waterbodies with either impairments or concerns (Table 7).

Table 7: Waterbodies of the Lampasas River Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Lampasas River Above Stillhouse Hollow Lake	1217_04	Nutrients and/or Chl *a* – CS
Sulphur Creek	**1217B_02**	**Bacteria – NS**
North Rocky Creek	1217D_01	DO – NS
Salado Creek	1243_01 1243_02	Nutrients and/or Chl *a* – CS

Lampasas River Below Stillhouse Hollow Lake (Segment 1215)

The Lampasas River below Stillhouse Hollow Lake is not listed for any concerns or impairment.

Stillhouse Hollow Lake (Segment 1216)

Water quality in Lake Stillhouse Hollow currently meets all water quality standard criteria and nutrient screening levels with no impairments.

Trimmier Creek (Segment 1216A)

Trimmier Creek is not listed for any concerns or impairment.

Onion Creek (Segment 1216B)

Onion Creek is not listed for any concerns or impairment in the draft 2016 IR.

Lampasas River Above Stillhouse Hollow Lake (Segment 1217)

The Lampasas River above Stillhouse Hollow Lake has no impairment; however the portion of the segment from the confluence with Simms Creek upstream to the confluence with Bennett Creek in Lampasas County (1217_04) has a concern for chlorophyll *a*. Please click here for more information on the Lampasas River Watershed Protection Plan that addresses issues in this segment.

Rocky Creek (Segment 1217A)
Sims Creek (Segment 1217C)

There are no impairments or concerns for Rocky Creek or Sims Creek listed in the draft 2016 IR.

Sulphur Creek (Segment 1217B)

The portion of the creek from the spring source located in the City of Lampasas upstream to the confluences with Bean Creek and East Fork Sulphur Creek west of Lampasas in Lampasas County (1217B_02) is newly impaired on the draft 2016 IR for bacteria.

North Rocky Creek (Segment 1217D)

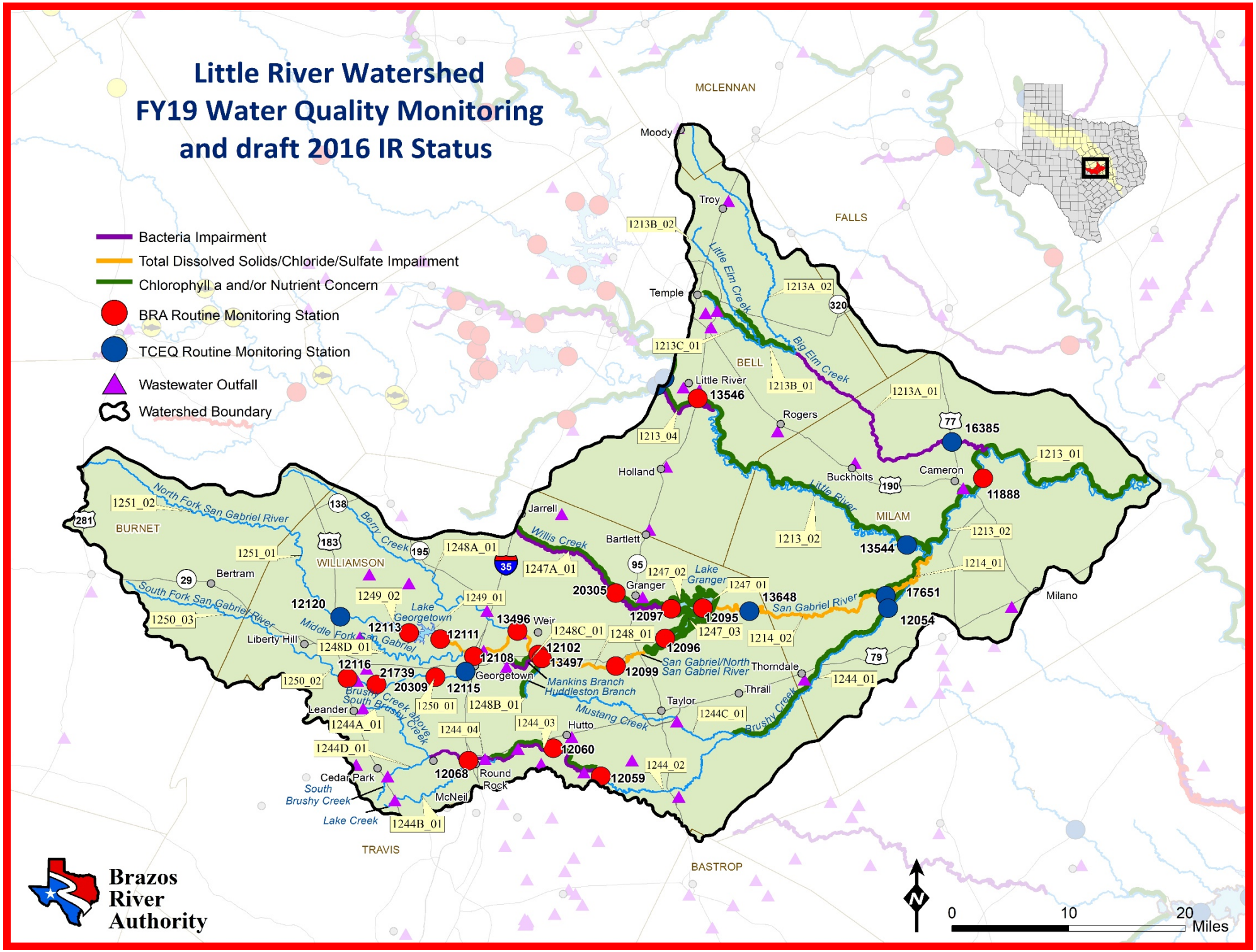
North Rocky Creek is impaired for depressed dissolved oxygen. This dissolved oxygen impairment is caused by frequent low water levels which hinder its ability to buffer against high ambient air temperatures in the summer and fall reducing the water's capacity to maintain dissolved oxygen levels. Biological data collected indicated that North Rocky Creek supports a relatively healthy biological community even with depressed DO levels. North Rocky Creek has been given site-specific criteria for 24-hr dissolved oxygen. With additional data collection and assessment against the new criteria, North Rocky Creek may be removed from the impaired list going forward. However, it has proven difficult to obtain the required dissolved oxygen data due to the frequent low water levels inherent to this segment.

South Rocky Creek (Segment 1217E)
Reese Creek (Segment 1217F)
Clear Creek (Segment 1212G)

None of these unclassified segments to the Lampasas River Above Stillhouse Hollow Lake are listed as having any impairment or concern in the draft 2016 IR.

Salado Creek (Segment 1243)

Salado Creek possesses a concern for nitrate but no impairments. Likely sources of nitrate include runoff from urban and agricultural areas and on-site sewage facilities.


Little River Watershed
FY19 Water Quality Monitoring
and draft 2016 IR Status
Bacteria Impairment
Total Dissolved Solids/Chloride/Sulfate Impairment
Chlorophyll a and/or Nutrient Concern
BRA Routine Monitoring Station
TCEQ Routine Monitoring Station
Wastewater Outfall
Watershed Boundary
MCLENNAN
FALLS
BELL
WILLIAMSON
BURNET
MILAM
TRAVIS
BASTROP
Moody
Troy
Temple
Little River
Rogers
Holland
Buckholts
Cameron
Milano
Jarrell
Bartlett
Granger
Weir
Georgetown
Liberty Hill
Bertram
Leander
Cedar Park
Round Rock
McNeil
Taylor
Hutto
Thrall
Thorndale
13546
16385
11888
13544
17651
12054
13648
20305
12097
12095
12096
12102
13497
12099
13496
12120
12113
12111
12108
12115
12116
21739
20309
12068
12060
12059
Little Elm Creek
Big Elm Creek
Little River
North Fork San Gabriel River
South Fork San Gabriel River
Middle Fork San Gabriel
Berry Creek
Willis Creek
Lake Granger
Lake Georgetown
San Gabriel River
San Gabriel/North San Gabriel River
Mankins Branch
Huddleston Branch
Mustang Creek
Brushy Creek
Brushy Creek above South Brushy Creek
South Brushy Creek
Lake Creek
1213B_02
1213A_02
1213C_01
1213B_01
1213A_01
1213_04
1213_01
1213_02
1214_01
1214_02
1251_02
1251_01
1250_03
1250_02
1250_01
1249_02
1249_01
1248A_01
1247A_01
1247_02
1247_01
1247_03
1248_01
1248C_01
1248D_01
1248B_01
1244A_01
1244D_01
1244_04
1244_03
1244_02
1244C_01
1244_01
1244B_01
281
138
183
195
35
95
29
190
77
320
79
Brazos River Authority
N
0
10
20
Miles

Little River Watershed

The Little River watershed drains approximately 2,349 square miles, includes Lake Georgetown and Lake Granger and crosses three ecoregions: the Central Texas Plateau, the Texas Blackland Prairie, and the East Central Texas Plains. The western portion of this watershed is experiencing rapid urban development while the eastern portion of the watershed remains fairly rural. Rapid urban development can bring additional land application of fertilizers, pesticides, pet waste, septic systems, and new sewage outfalls which can result in increased concentrations of nutrients, bacteria, and organic constituents in the waterbody. There are 21 waterbodies assessed in the draft 2016 IR for this watershed and 11 waterbodies with either impairments or concerns (Table 8).

Table 8: Waterbodies of the Little River Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Little River	1213_01 1213_02 1213_03	Nutrients and/or Chl *a* – CS
	1213_04	Bacteria – NS Nutrients and/or Chl *a* – CS
Big Elm Creek	1213A_01	Bacteria – NS
Little Elm Creek	1213B_01	Nutrients and/or Chl *a* – CS DO – CN
Unnamed Tributary of Little Elm Creek	1213C_01	Nutrients and/or Chl *a* – CS
San Gabriel River	1214_01	Cl^- – NS ~~SO_4 – NS~~ MEETS CRITERIA Nutrients and/or Chl *a* – CS
	1214_02	Cl^- – NS ~~SO_4 – NS~~ MEETS CRITERIA Bacteria - CN
Brushy Creek	1244_01	Nutrients and/or Chl *a* – CS
	1244_03	Bacteria – NS Nutrients and/or Chl *a* – CS
	1244_04	Bacteria – NS

Water Body	Segment	Parameter(s) Impairment and/or Concern
Willis Creek	1247A_01	Bacteria – NS Nutrients and/or Chl *a* - CS
San Gabriel/North Fork San Gabriel River	1248_01	Cl^- – NS ~~TDS – NS~~ MEETS CRITERIA Nutrients and/or Chl *a* - CS
Huddleston Branch	1248B_01	Bacteria – CN Nutrients and/or Chl *a* – CS
Mankins Branch	1248C_01	Bacteria – NS Habitat – CS Nutrients and/or Chl *a* – CS
South Fork San Gabriel River	1250_03	DO – CS

Little River (Segment 1213)

The upper portion of the Little River, from the confluence with Boggy Creek to the confluence with the Leon and Lampasas Rivers (1213_04) is on the draft 2016 IR for a bacterial impairment and possesses a concern for nitrate. The portion of the segment from the confluence with Brazos River upstream to the confluence with Boggy Creek (1213_01, _02 and _03) also have concerns for nitrate. The most downstream portion of the Little River from the confluence with the Brazos River upstream to the confluence with the City of Cameron WWTP receiving water (1213_01) has an additional chlorophyll *a* concern.

The immediate watershed to segment 1213 is dominated by agricultural activities. Nitrogen concerns in this segment are most likely from a combination of localized agricultural runoff and inflow from the San Gabriel River and Brushy Creek which both have nutrient concerns. The elevated bacteria count is likely a result of runoff from agricultural lands, wildlife waste, and municipal discharges.

Big Elm Creek (Segment 1213A)

The portion of Big Elm Creek from the confluence with the Little River to the confluence with Little Elm Creek (1213A_01) is impaired for elevated bacteria concentrations.

Little Elm Creek (Segment 1213B)

The portion of Little Elm Creek from the confluence with Big Elm Creek to the confluence with Williamson Branch (1213B_01) has concerns for depressed DO and elevated nitrate concentrations.

Unnamed tributary of Little Elm Creek (Segment 1213C)

The unnamed tributary of Little Elm Creek has a concern for nitrate.

San Gabriel River (Segment 1214)

The San Gabriel River is listed as impaired for chloride with concerns for nitrate in the portion from the confluence with the Little River upstream to the confluence with Alligator Creek (1214_01). The portion of the San Gabriel River from the confluence with Alligator Creek upstream to Lake Granger (1214_02) has a concern for bacteria. Bacteria and nutrient issues are most likely caused by a combination of agricultural runoff, municipal discharges and on-site sewage facilities. The source of the chloride impairment is currently unknown but may be a result of the high use of water softeners by residential properties in the upper portion of the San Gabriel's watershed. Most wastewater treatment systems in the state are not equipped to remove the high levels of dissolved solids generated by water softeners. When high levels of dissolved solids come to the treatment facility from residential properties they are passed through and discharged into lakes and streams.

Brushy Creek (Segment 1244)

The portion of Brushy Creek from the confluence of the San Gabriel River upstream to the confluence of Mustang Creek (1244_01) and the portion from the confluence of Cottonwood Creek upstream to the confluence of South Brushy Creek (1244_03,_04) are on the draft 2016 303(d) List for a bacterial impairment. 1244_01 of the San Gabriel River upstream to the confluence of Mustang Creek and 1244_03 from the confluence of Cottonwood Creek upstream to the confluence of Lake Creek have a concern for nitrate and total phosphorus. Both elevated bacteria levels and nutrient levels in Brushy Creek are attributed to municipal discharges and urban runoff**.**

Brushy Creek Above South Brushy Creek (Segment 1244A)
Lake Creek (Segment 1244B)
Mustang Creek (Segment 1244C)
South Brushy Creek (Segment 1244D)
Granger Lake (Segment 1247)

These segments are in full support of all of their designated uses with no impairments or concerns on the draft 2016 IR.

Willis Creek (Segment 1247A)

Willis Creek is identified on the draft 2016 IR as possessing a bacterial impairment and as having concern for elevated nitrate. The watershed in the immediate vicinity of Willis Creek is highly utilized for agriculture, and runoff from these fields is the most likely source of both bacteria and nutrients into the stream. New bacteria criteria has been accepted by the EPA for 1247A. Although when the new criteria is applied using current data collected, the bacterial impairment will remain.

San Gabriel/North Fork San Gabriel River (Segment 1248)

The San Gabriel/North Fork San Gabriel River is impaired for chloride and has a concern for both bacteria and nitrate. The source of chlorides in 1248 may be attributed to municipal discharges and urban runoff in the upstream portion of AU 1248_01.

Berry Creek (Segment 1248A)

Berry Creek is in full support of all designated uses with no impairments or concerns.

Huddleston Branch (Segment 1248B)

Huddleston Branch possesses a concern for elevated bacteria and nitrate.

Mankins Branch (Segment 1248C)

Mankins Branch is identified on the draft 2016 IR as impaired due to elevated bacteria concentrations. Concerns exist for habitat, nitrate and total phosphorus. Issues in these unclassified segments are most likely a combination of municipal discharges and urban runoff.

Middle Fork San Gabriel River (Segment 1248D)

Lake Georgetown (Segment 1249)

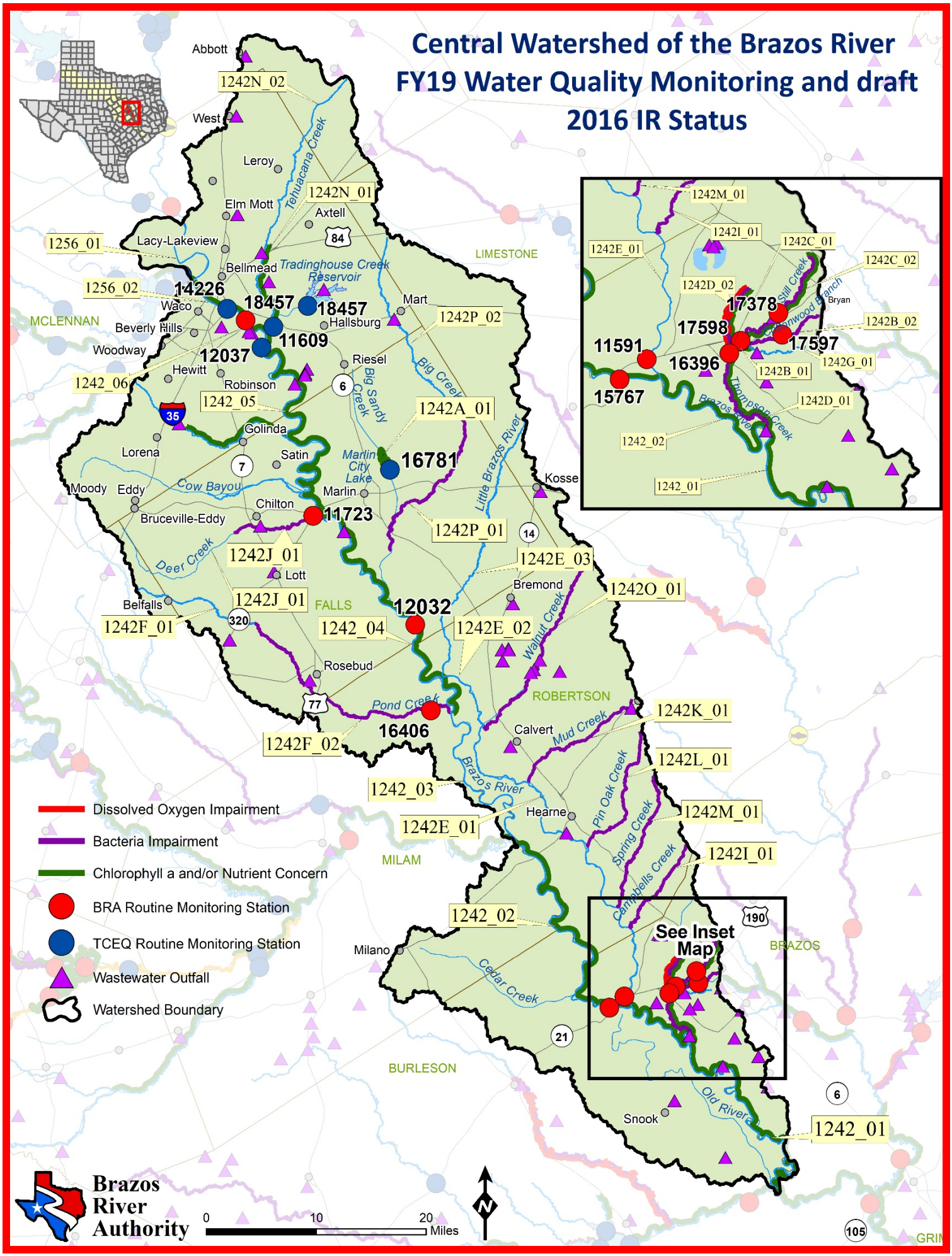
The Middle Fork San Gabriel River and Lake Georgetown are in full support of all designated uses with no impairments or concerns.

South Fork San Gabriel River (Segment 1250)

The portion of the segment from the confluence with unnamed tributary upstream to headwaters of water body has a concern for depressed dissolved oxygen. This DO concern is caused by frequent low water levels which hinder the water's ability to buffer against high ambient air temperatures in the summer and fall reducing the capacity to maintain DO levels.

North Fork San Gabriel River (Segment 1251)

The North Fork San Gabriel River is not listed for any concerns or impairment.


Central Watershed of the Brazos River
FY19 Water Quality Monitoring and draft 2016 IR Status
Abbott
1242N_02
West
Leroy
Tehuacana Creek
1242N_01
Elm Mott
Axtell
84
1256_01
Lacy-Lakeview
LIMESTONE
Bellmead
Tradinghouse Creek Reservoir
1256_02
14226
18457
18457
Mart
Waco
Hallsburg
1242P_02
MCLENNAN
Beverly Hills
11609
Woodway
12037
Riesel
Big Creek
Hewitt
Robinson
1242_06
6
Big Sandy Creek
1242_05
1242A_01
35
Golinda
Lorena
Satin
Marlin City Lake
16781
Little Brazos River
Kosse
7
Moody
Eddy
Cow Bayou
Marlin
Chilton
11723
Bruceville-Eddy
1242P_01
14
Deer Creek
1242J_01
1242E_03
Lott
Bremond
1242O_01
Belfalls
1242J_01
FALLS
12032
320
1242F_01
1242_04
1242E_02
Walnut Creek
Rosebud
ROBERTSON
77
Pond Creek
1242K_01
16406
Calvert
Mud Creek
1242F_02
1242L_01
Brazos River
1242_03
Pin Oak Creek
Hearne
1242M_01
1242E_01
Spring Creek
MILAM
1242I_01
Campbells Creek
1242_02
190
See Inset Map
Milano
BRAZOS
Cedar Creek
21
BURLESON
Old River
6
Snook
1242_01
105
GRIM
1242M_01
1242I_01
1242C_01
1242E_01
1242C_02
1242D_02
Still Creek
Bryan
17378
Greenwood Branch
1242B_02
17598
17597
11591
16396
1242G_01
1242B_01
15767
Brazos River
Thompson Creek
1242D_01
1242_02
1242_01
Dissolved Oxygen Impairment
Bacteria Impairment
Chlorophyll a and/or Nutrient Concern
BRA Routine Monitoring Station
TCEQ Routine Monitoring Station
Wastewater Outfall
Watershed Boundary
Brazos River Authority
0
10
20
Miles
N

Central Watershed of the Brazos River Basin

The Central Watershed of the Brazos River extends from Lake Brazos Dam in Waco to the mouth of the Navasota River southeast of College Station, and drains approximately 2,706 square miles. Land usage is primarily agricultural, with two sizeable urban areas, Waco and Bryan/College Station. There are 21 waterbodies assessed in the draft 2016 IR for this watershed and 16 waterbodies with either impairments or concerns (Table 9).

Table 9: Waterbodies of the Central Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Brazos River Above Navasota River	1242_01 1242_02 1242_04 1242_05 1242_06	Nutrients and/or Chl *a* – CS
Cottonwood Branch	1242B_01	Bacteria – NS Nutrients and/or Chl *a* – CS
	1242B_02	Bacteria – NS
Still Creek	~~1242C_01~~	~~Bacteria – NS~~ ERROR – moved to AU_02
	1242C_02	Bacteria – NS Nutrients and/or Chl *a* – CS
Thompson Creek	1242D_01	Bacteria – NS Nutrients and/or Chl *a* – CS Fish Community – CN
	1242D_02	Bacteria – NS DO – NS Nutrients and/or Chl *a* – CS Macrobenthic – CS
Pond Creek	1242F_01	Bacteria – NS
Tradinghouse Reservoir	1242H_01	Harmful Algal Bloom/Golden Algae – CN

Water Body	Segment	Parameter(s) Impairment and/or Concern
Campbells Creek	1242I_01	Bacteria – NS DO – CS
Deer Creek	1242J_01	Bacteria – NS Macrobenthic Community – CN
Mud Creek	1242K_01	Bacteria – NS
Pin Oak Creek	1242L_01	Bacteria – NS
Spring Creek	1242M_01	Bacteria – NS DO – CS
Tehuacana Creek	1242N_01	Bacteria – CN Nutrients and/or Chl *a* – CS Fish Kill Report – CN Macrobenthic – CN
Walnut Creek	1242O_01	Bacteria – NS
Big Creek	1242P_01	Bacteria – NS
Bullhide Creek	1242Q_01	Nutrients and/or Chl *a* – CS
Brazos River/Lake Brazos	1256_02	Nutrients and/or Chl *a* – CS

Brazos River above Navasota (Segment 1242)

In the draft 2016 assessment this segment has no impairments and all AUs except 1242_03, the portion of Brazos River from the confluence with the Little River upstream to the confluence with Pond Creek in Milam County, have a concern for chlorophyll *a*. 1242_05, the portion of the Brazos River from the confluence with Deer Creek in Falls County upstream to the confluence with Tehuacana Creek in McLennan County has an additional concern for nitrate.

Marlin City Lake System (Segment 1242A)

The Marlin City Lake System has no impairment or concern in the draft 2016 IR.

Cottonwood Branch (Segment 1242B)

Cottonwood Branch is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. There are also concerns for nitrate in the portion of Cottonwood Branch from the confluence with Still Creek upstream

to an unnamed tributary in Brazos County. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied and more data is collected, the bacterial impairment may be removed.

Still Creek (Segment 1242C)

Still Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations in the portion of Still Creek from confluence with Cottonwood Branch upstream to headwaters in Brazos County near US 190 (1242C_02). There are also concerns for nitrate and total phosphorus in 1242C_02.

Thompson Creek (Segment 1242D)

Thompson Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. The portion of Thompsons Creek from the confluence of Still Creek upstream to the confluence of Thompson's Branch, north of FM 1687 (1242D_02) is also listed as impaired for depressed dissolved oxygen with concerns for ammonia, chlorophyll *a*, macrobenthic community. Segment 1242D_01, Thompsons Creek from the confluence of the Brazos River upstream to the confluence of Still Creek in Brazos County, has concern for the fish community, nitrate and total phosphorus. New bacteria criteria has been accepted by the EPA for 1242D. Although when the new criteria is applied using current data collected, the bacterial impairment will remain.

Little Brazos River (Segment 1242E)

The Little Brazos River is in full support of all uses with no impairment or concern in the draft 2016 IR.

Pond Creek (Segment 1242F)

Pond Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations in the portion from the Brazos confluence upstream to the Live Oak Creek confluence (1242F_01).

Unnamed Tributary of Cottonwood Branch (Segment 1242G)

Unnamed Tributary of Cottonwood Branch is in full support of all uses with no impairment or concern in the draft 2016 IR.

Tradinghouse Reservoir (Segment 1242H)

Tradinghouse Reservoir has a concern for harmful algal blooms due to fish kills being reported.

Campbell's Creek (Segment 1242I)

Campbell's Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations and has a concern for depressed dissolved oxygen. New bacteria criteria has been accepted by the EPA for 1242I. Although when the new criteria is applied using current data collected, the bacterial impairment will remain.

Deer Creek (Segment 1242J)

Deer Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations and has a concern for the macrobenthic community.

Mud Creek (Segment 1242K)

Mud Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for 1242K, although when the new criteria is applied using current data collected the bacterial impairment will remain.

Pin Oak Creek (Segment 1242L)

Pin Oak Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for 1242L. Although when the new criteria is applied using current data collected, the bacterial impairment will remain.

Spring Creek (Segment 1242M)

Spring Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations and has a concern for depressed dissolved oxygen. New bacteria criteria has been accepted by the EPA for 1242M, although when the new criteria is applied using current data collected the bacterial impairment will remain.

Tehuacana Creek (Segment 1242N)

The portion of Tehuacana Creek from the confluence with the Brazos River in McLennan county upstream to the headwaters 2 mi south of Penelope in Hill County (1242N_02) there are concerns for bacterial, chlorophyll *a*, a fish kill report, the macrobenthic community, nitrate and total phosphorus.

Walnut Creek (Segment 1242O)

Walnut Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for 1242M. Although when the new criteria is applied using current data collected the bacterial impairment will remain.

Big Creek (Segment 1242P)

Big Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied and more data is collected the bacterial impairment may be removed.

Bullhide Creek (Segment 1242Q)

Bullhide Creek from the confluence with the Brazos River in Falls County upstream to the confluence with unnamed tributary in McLennan County (1242Q_01) has a concern for nitrate.

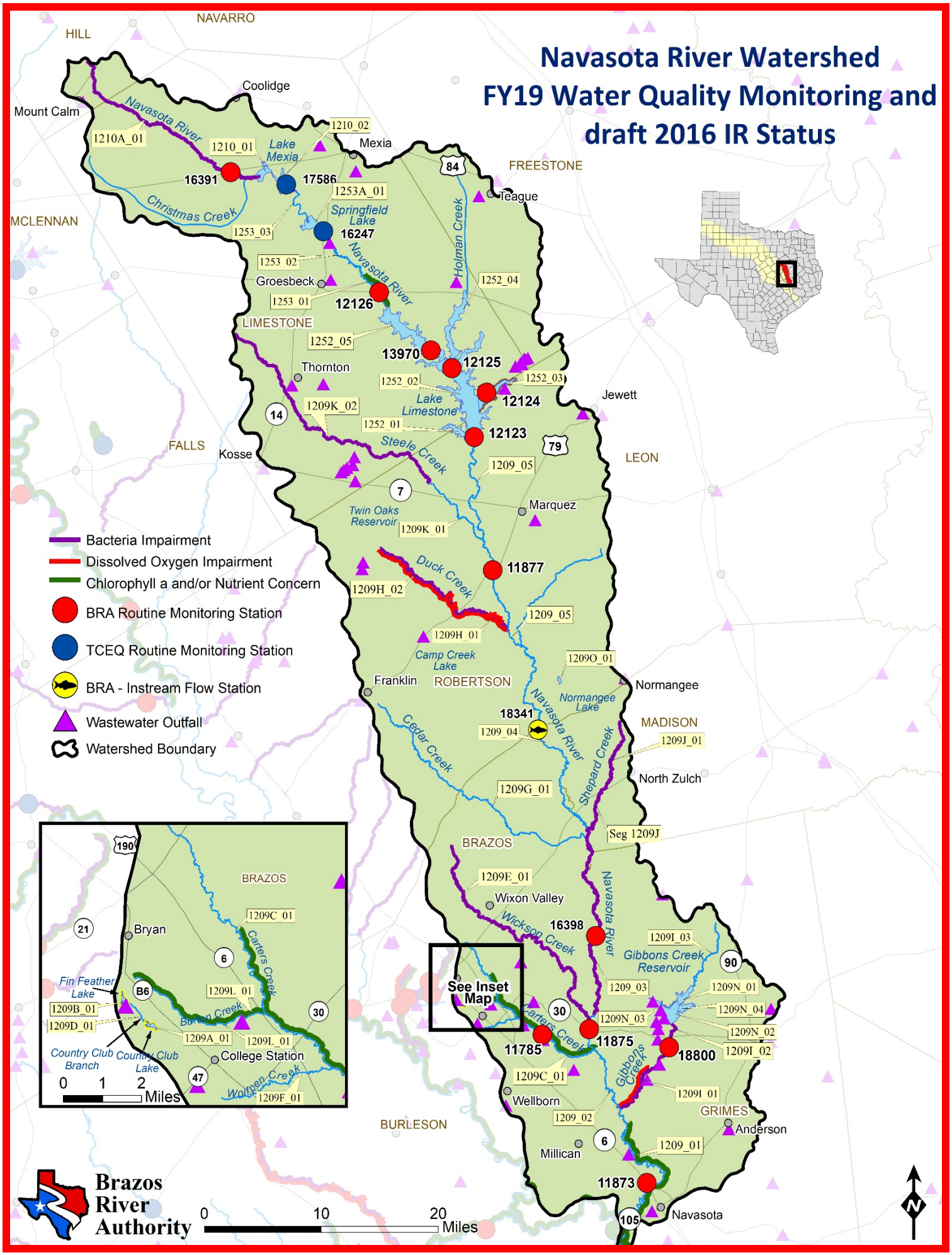
Cow Bayou (Segment 1242R)

Cow Bayou is in full support of all uses with no impairment or concern in the draft 2016 IR.

As in the case of the unclassified tributary streams in the Bosque and Leon Watersheds, many of the unclassified segments that are impaired or have concerns in 1242 are small, rural streams with little to no flow for most of the year whose water is primarily generated by storm events and the associated runoff.

Brazos River/Lake Brazos (Segment 1256)

The Brazos River/Lake Brazos is listed having concerns for chlorophyll *a* in the Lake Brazos (1256_02) and in the Bosque River (1256_03) portions of the segment. Elevated chlorophyll *a* levels are most likely a result of municipal discharges and urban runoff, both which can transport high levels of nutrients to waterbodies.


Navasota River Watershed
FY19 Water Quality Monitoring and draft 2016 IR Status
NAVARRO
HILL
Coolidge
Mount Calm
Navasota River
1210A_01
1210_01
Lake Mexia
1210_02
Mexia
16391
17586
1253A_01
Springfield Lake
16247
Christmas Creek
1253_03
MCLENNAN
84
FREESTONE
Teague
Holman Creek
1253_02
Groesbeck
1252_04
1253_01
12126
LIMESTONE
1252_05
13970
12125
Thornton
1252_02
1252_03
12124
Jewett
Lake Limestone
1209K_02
14
1252_01
12123
79
LEON
FALLS
Kosse
Steele Creek
1209_05
7
Marquez
Twin Oaks Reservoir
1209K_01
Bacteria Impairment
Dissolved Oxygen Impairment
Chlorophyll a and/or Nutrient Concern
BRA Routine Monitoring Station
TCEQ Routine Monitoring Station
BRA - Instream Flow Station
Wastewater Outfall
Watershed Boundary
11877
Duck Creek
1209H_02
1209_05
1209H_01
Camp Creek Lake
1209O_01
Franklin
ROBERTSON
Normangee
Normangee Lake
Navasota River
18341
1209_04
Cedar Creek
MADISON
1209J_01
Shepard Creek
North Zulch
1209G_01
Seg 1209J
BRAZOS
1209E_01
Wixon Valley
Navasota River
Wickson Creek
16398
1209I_03
Gibbons Creek Reservoir
90
See Inset Map
1209_03
1209N_01
30
1209N_04
1209N_03
1209N_02
11785
11875
18800
1209I_02
Carters Creek
Gibbons Creek
1209C_01
1209I_01
Wellborn
GRIMES
Anderson
1209_02
6
1209_01
Millican
11873
BURLESON
105
Navasota
Brazos River Authority
0 10 20 Miles
N
BRAZOS
190
1209C_01
21
Bryan
Carters Creek
6
Fin Feather Lake
B6
1209L_01
1209B_01
Burton Creek
30
1209D_01
1209A_01
1209L_01
Country Club Branch
Country Club Lake
College Station
47
0 1 2 Miles
Wolfpen Creek
1209F_01

Navasota River Watershed

The Navasota River Watershed drains approximately 2,247 square miles, originating in southeast Hill County and flows 125 miles south to its confluence with the Brazos River. The main stem of the river is impounded in three places in Limestone County creating Lake Mexia, Lake Springfield and Lake Limestone. Land use in this watershed is primarily agricultural land with one growing urban area, Bryan/College Station. The Navasota River runs through two eco-regions: the Texas Blackland Prairies in the northern portion and the East Central Texas Plains in the southern portion of the watershed. There are 21 waterbodies assessed in the draft 2016 IR for this watershed and 16 waterbodies with either impairments or concerns (Table 10).

Table 10: Waterbodies of the Navasota River Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Navasota River Below Lake Limestone	1209_01	Nutrients and/or Chl *a* – CS DO – CS
	1209_02	DO – CS
	1209_03 ~~1209_05~~	Bacteria – NS ~~Bacteria – NS~~ MEETS CRITERIA
Country Club Lake	1209A_01	Sediment – NS
Fin Feather Lake	1209B_01	Sediment – NS
Carters Creek	1209C_01	Nutrients and/or Chl *a* – CS
Wickson Creek	1209E_01	Bacteria – NS
Duck Creek	1209H_01 1209H_02	Bacteria – NS DO – NS
Gibbons Creek	1209I_01	Bacteria – NS **DO – NS**
	1209I_02	Bacteria – NS
Shepherd Creek	1209J_01	Bacteria – NS
Steele Creek	1209K_02	Bacteria – NS
Burton Creek	1209L_01	Nutrients and/or Chl *a* – CS

Water Body	Segment	Parameter(s) Impairment and/or Concern
Normangee Lake	1209O_01	Sediment – CS
Lake Mexia	1210_01 1210_02	DO – CS
Navasota River Above Lake Mexia	1210A_01	Bacteria – NS
Lake Limestone	1252_02	pH – CN
	1252_03	**pH – NS**
Navasota River Below Mexia	1253_01	Nutrients and/or Chl *a* – CS DO – CS
	1253_02	DO – CS
Springfield Lake	1253A_01	DO – CN

Navasota River Below Lake Limestone (Segment 1209)

The Navasota River below Lake Limestone is listed on the draft 2016 IR as impaired for contact recreation due to elevated bacteria levels in the portions from the confluence with Sandy Branch to the confluence with Shepherd Branch in Madison County (1209_03). The portion of the Navasota from the confluence with Brazos River upstream to the confluence with Sandy Branch in Grimes County has a concern for depressed dissolved oxygen (1209_01,_02). The portion from the confluence with the Brazos River upstream to the confluence with Rocky Creek in Grimes County (1209_01) has additional concerns for nitrate and total phosphorus. Sources of bacteria may include stormwater inflow from tributary streams, runoff from agricultural lands, municipal discharges, wildlife runoff and on-site sewage facilities. To address issues in 1209, the Navasota River Below Lake Limestone Watershed Protection Plan was created. For more information visit the web site at http://navasota.tamu.edu/

Country Club (Segment 1209A)
Fin Feather Lake (Segment 1209B)

Both of the segments have impairments for their aquatic use designation due to toxic sediments. These impairments are mostly a remnant from historically poor industrial practices. A TMDL was completed on these segments in 2003.

Carter's Creek (Segment 1209C)

Carter's Creek has concern for chlorophyll *a*, nitrate and total phosphorus. An implementation plan is currently funded and in process to address issues in Carter's Creek.

Country Club Branch (Segment 1209D)
Country Club Branch is in full support of all uses with no impairment or concern in the draft 2016 IR.

Wickson Creek (Segment 1209E)
Wickson Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria is awaiting EPA approval for this segment. If the recommended criteria are approved, applied and more data is collected, the bacterial impairment may be removed.

Wolfpen Creek (Segment 1209F)
Cedar Creek (Segment 1209G)
Wolfpen Creek and Cedar Creek are in full support of all uses with no impairment or concern in the draft 2016 IR.

Duck Creek (Segment 1209H)
Duck Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations or its aquatic life use designation due to depressed dissolved oxygen. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied, the bacterial impairment should be removed. An aquatic life assessment was conducted in 2015-2017 on Duck Creek to investigate past indications of use nonsupport, and to generate data for identifying an appropriate aquatic life use (ALU) and dissolved oxygen criteria. Benthic macroinvertebrate assemblages attained a high ALU in 1209H_01, and an intermediate ALU in 1209H_02, while fish assemblages attained a high ALU in both 1209H_01 and 1209H_02.

Gibbons Creek (Segment 1209I)
Gibbons Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria is awaiting EPA approval for this segment. If the recommended criteria are approved, the bacterial impairment should be removed. The portion of Gibbons Creek from the confluence with the Navasota River upstream to the confluence with Dry Creek in Grimes County (1209I_01) is also newly listed in the draft 2016 IR as being impaired for depressed dissolved oxygen.

Shepherd Creek (Segment 1209J)
Shepherd Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied, the bacterial impairment should be removed.

Steele Creek (Segment 1209K)

Steele Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations. New bacteria criteria is awaiting EPA approval for this segment. If the recommended criteria are approved, the bacterial impairment should be removed.

Burton Creek (Segment 1209L)

Burton Creek has a concern for nitrate in the draft 2016 IR.

Gibbons Creek Reservoir (Segment 1209N)

There are no impairments or concerns listed in the draft 2016 IR for Gibbons Creek Reservoir.

Normangee Lake (Segment 1209O)

There is a concern for arsenic in sediment for Normangee Lake in the draft 2016 IR.

Clear Creek (Segment 1209P)

There are no impairments or concerns for Clear Creek in the draft 2016 IR.

Lake Mexia (Segment 1210)

Lake Mexia has no impairment, but is listed as having a concern for depressed dissolved oxygen. Low dissolved oxygen levels are most likely attributable to elevated chlorophyll *a* levels and advanced sedimentation which has significantly reduced the reservoirs capacity.

The Navasota River above Lake Mexia (Segment 1210A)

The Navasota River above Lake Mexia is listed as impaired due to bacteria. Potential sources of bacteria include: on-site sewage facilities, wildlife wastes, and runoff from residential areas and agricultural lands. New bacteria criteria has been approved by EPA for this segment. If the new criteria are applied and more data is collected, the bacterial impairment may be removed.

Lake Limestone (Segment 1252)

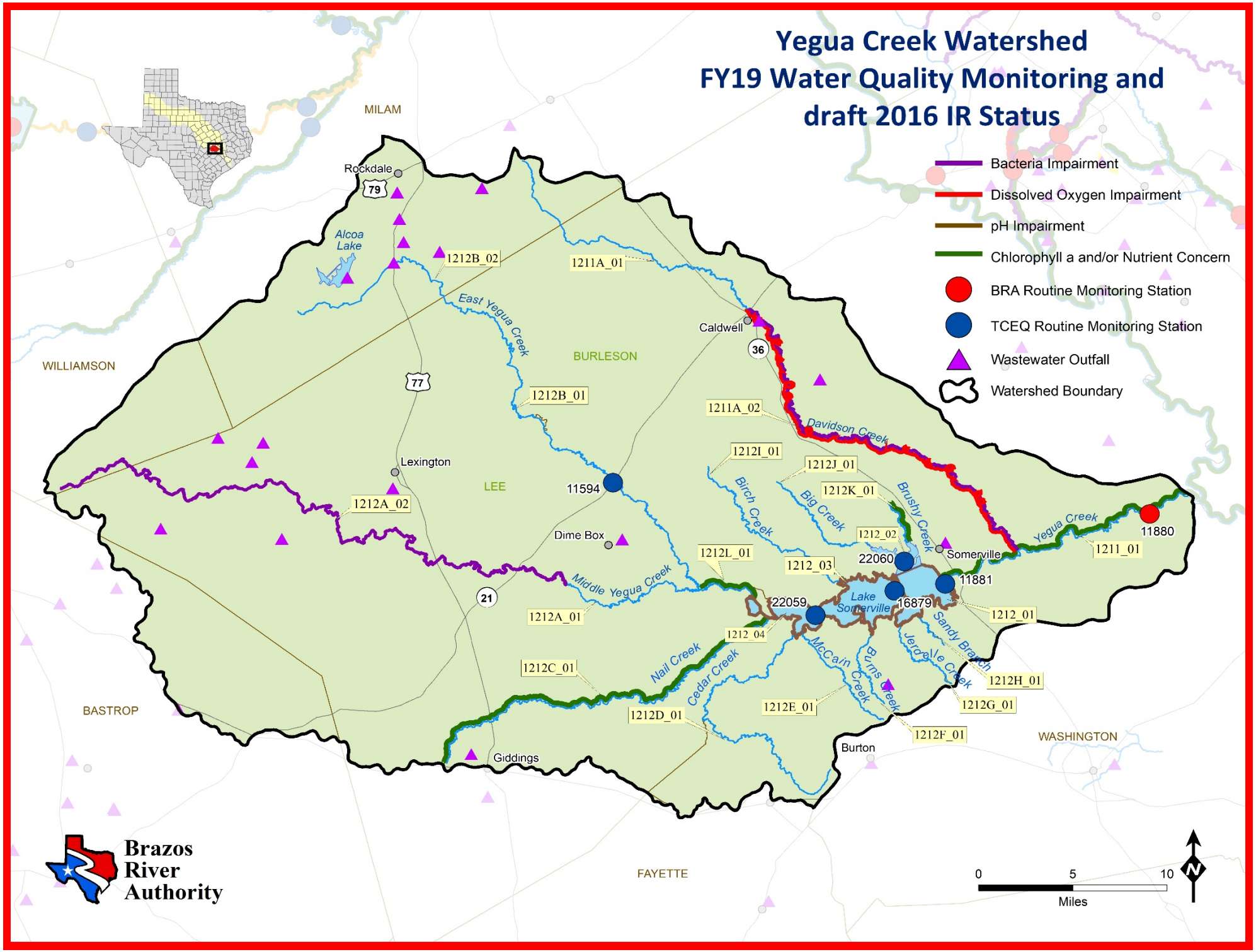
Lake Limestone is newly listed in the draft 2016 IR as not supporting its general use designation due to high pH in the Lambs Creek arm on east side of lake (1252_03). There is also a concern for high pH in the main body of the lake (1252_02).

Navasota River Below Lake Mexia (Segment 1253)

There are concerns for depressed dissolved oxygen in the portion of the river from the headwaters of Lake Limestone upstream to Springfield Lake (1252_01,_02). Low Dissolved oxygen may be caused by frequent low water levels which hinder its ability to buffer against high ambient air temperatures in the summer and fall reducing the water's capacity to maintain DO levels. There is a concern from the headwaters of Lake Limestone upstream to confluence with Plummer's Creek for chlorophyll *a* as well.

Springfield Lake (Segment 1253A)

Springfield Lake is in full support of all of its uses, but there is a concern for depressed dissolved oxygen.


Yegua Creek Watershed
FY19 Water Quality Monitoring and
draft 2016 IR Status
Bacteria Impairment
Dissolved Oxygen Impairment
pH Impairment
Chlorophyll a and/or Nutrient Concern
BRA Routine Monitoring Station
TCEQ Routine Monitoring Station
Wastewater Outfall
Watershed Boundary
MILAM
WILLIAMSON
BURLESON
LEE
BASTROP
FAYETTE
WASHINGTON
Rockdale
Alcoa Lake
Lexington
Dime Box
Giddings
Caldwell
Somerville
Burton
East Yegua Creek
Middle Yegua Creek
Nail Creek
Cedar Creek
Birch Creek
Big Creek
Brushy Creek
Davidson Creek
Yegua Creek
McCain Creek
Burns Creek
Jerdale Creek
Sandy Branch
Lake Somerville
1212B_02
1211A_01
1212B_01
1211A_02
1212I_01
1212J_01
1212K_01
1212A_02
1212A_01
1212L_01
1212_02
1212_03
1212_04
1211_01
1212_01
1212C_01
1212D_01
1212E_01
1212F_01
1212G_01
1212H_01
11594
11880
22060
11881
22059
16879
79
77
36
21
Brazos River Authority
0
5
10
Miles
N

Yegua Creek Watershed

The Yegua Creek Watershed drains approximately 1316 square miles through Milam, Lee, Burleson and Washington Counties. Land use in the Yegua Creek watershed is mainly rural and cattle production intensive with small urban areas and limited crop production areas. Oil and gas production has been, and is currently, a major operation in the watershed. The main channel is impounded for flood control, municipal water supply and recreation to create Lake Somerville. Lake Somerville's holdings are the main water supply for The City of Brenham. Rockdale, along with four other small, rural communities (Caldwell, Lexington, Somerville, and Giddings) are the largest in the watershed. There are 15 waterbodies assessed in the draft 2016 IR for this watershed and 8 waterbodies with either impairments or concerns (Table 11).

Table 11: Waterbodies of the Yegua Creek Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Yegua Creek	1211_01	Nutrients and/or Chl *a* – CS
Davidson Creek	1211A_02	Bacteria – NS DO – NS
Somerville Lake	1212_01 1212_03 1212_04	High pH – NS
Middle Yegua Creek	1212A_02	Bacteria – NS DO – CS Habitat – CS
East Yegua Creek	~~1212B_01~~	~~Bacteria – NS~~ MEETS(new-630 cfu) CRITERIA
Nail Creek	1212C_01	Nutrients and/or Chl *a* – CS DO – CS
Brushy Creek	1212K_01	Nutrients and/or Chl *a* – CS
Yegua Creek	1212L_01	Nutrients and/or Chl *a* – CS

Yegua Creek (Segment 1211)

Yegua Creek is listed as having a concern for chlorophyll *a*.

Davidson Creek (Segment 1211A)

Davidson Creek is impaired due to elevated bacteria levels and depressed dissolved oxygen in the portion from the confluence with Yegua Creek upstream to 0.2 km above SH 21 near the City of Caldwell (1211A_02). Reminiscent of the unclassified tributary streams in the Central Brazos and Navasota Watersheds, Davidson Creek is a small, rural stream with little to no flow for most of the year whose water is primarily generated by storm events and the associated runoff.

Somerville Lake (Segment 1212)

Somerville Lake is on the draft 2016 303(d) List as being impaired for high pH levels for all areas (1212_01, _03 and _04) of the reservoir except the northern arm near the town of Somerville (1212_02). A special study completed in 2013 identified no point sources as contributing to the pH impairment. Internal nutrient cycling within the lake appeared to be the most likely cause of the elevated pH in the reservoir.

Middle Yegua Creek (Segment 1212A)

The portion of Middle Yegua Creek from the confluence with West Yegua Creek to the headwaters in Williamson County (1212A_02) is on the draft 2016 IR as impaired for recreational use due to elevated bacteria levels and has concerns for dissolved oxygen and habitat.

East Yegua Creek (Segment 1212B)

East Yegua Creek is in full support of all uses with no impairment or concern in the draft 2016 IR.

Nail Creek (Segment 1212C)

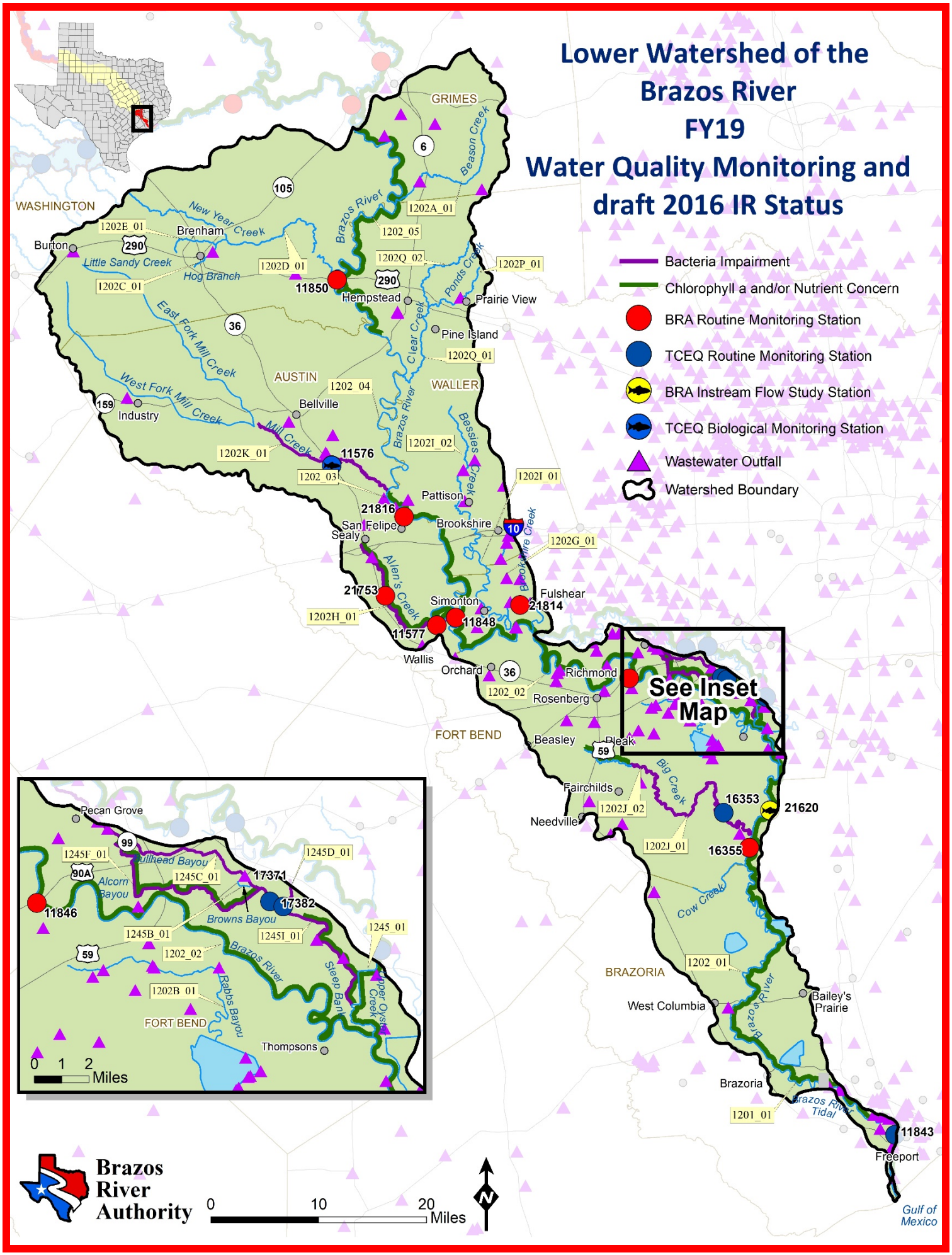
Nail Creek has concerns for chlorophyll *a*, depressed dissolved oxygen and total phosphorus in the draft 2016 IR.

Cedar Creek (Segment 1212D)
McCain Creek (Segment 1212E)
Burns Creek (Segment 1212F)
Jerdelle Creek (Segment 1212G)
Sandy Branch (segment 1212H)
Birch Creek (Segment 1212I)
Big Creek (Segment 1212J)

None of the unclassified segment of Somerville Lake have impairments or concerns listed in the 2016 IR.

Brushy Creek (Segment 1212K) and Yegua Creek (Segment 1212L)

Both Brushy Creek and Yegua Creek have concerns for chlorophyll *a* listed in the draft 2016 IR.


Lower Watershed of the Brazos River
FY19
Water Quality Monitoring and draft 2016 IR Status
Bacteria Impairment
Chlorophyll a and/or Nutrient Concern
BRA Routine Monitoring Station
TCEQ Routine Monitoring Station
BRA Instream Flow Study Station
TCEQ Biological Monitoring Station
Wastewater Outfall
Watershed Boundary
See Inset Map
WASHINGTON
GRIMES
AUSTIN
WALLER
FORT BEND
BRAZORIA
Burton
Brenham
Hempstead
Prairie View
Pine Island
Bellville
Industry
Pattison
San Felipe
Sealy
Brookshire
Simonton
Fulshear
Wallis
Orchard
Richmond
Rosenberg
Beasley
Fairchilds
Needville
West Columbia
Bailey's Prairie
Brazoria
Freeport
Gulf of Mexico
Brazos River
Beason Creek
New Year Creek
Little Sandy Creek
Hog Branch
East Fork Mill Creek
West Fork Mill Creek
Mill Creek
Clear Creek
Ponds Creek
Besides Creek
Allen's Creek
Brookshire Creek
Big Creek
Cow Creek
Brazos River Tidal
11850
11576
21816
21753
11577
11848
21814
16353
21620
16355
1202A_01
1202_05
1202Q_02
1202P_01
1202D_01
1202C_01
1202E_01
1202Q_01
1202_04
1202K_01
1202_03
1202I_02
1202I_01
1202G_01
1202H_01
1202_02
1202J_02
1202J_01
1202_01
1201_01
Recan Grove
Bullhead Bayou
Alcorn Bayou
Browns Bayou
Rabbs Bayou
Steep Bank Creek
Upper Oyster Creek
11846
17371
17382
1245F_01
1245D_01
1245C_01
1245B_01
1245I_01
1245_01
1202B_01
Thompsons
0 1 2 Miles
0 10 20 Miles
Brazos River Authority

Lower Watershed of the Brazos River Basin

The Lower Brazos watershed begins at the confluence of the Navasota River and the Brazos River and continues downstream where the Brazos River empties into the Gulf of Mexico. Encompassing 2,077 mi^2, the Lower Watershed is a combination of two classified water bodies, segment 1202, a freshwater portion of the Brazos River, and segment 1201, the tidal portion of the Brazos River.

Land use in this area of the Brazos River varies greatly from upstream to downstream. The Lower Watershed traverses land that includes agriculture, mining facilities, small municipalities, as well as the far southern portion of the Greater Houston area. Agriculture in this area ranges from livestock to row crops of sorghum, rice, corn, and cotton. Fort Bend County has experienced significant growth, which has led to sedimentation and runoff effects in the Brazos River. This runoff includes fertilizers, pesticides, sewage treatment effluent and even animal waste. All of these contribute to an increase in nutrients, bacteria and organic matter build-up. There are 20 waterbodies assessed in the draft 2016 IR for this watershed and 9 waterbodies with either impairments or concerns (Table 12).

Table 12: Waterbodies of the Lower Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Brazos River Tidal	1201_01	Nutrients and/or Chl *a* – CS
Brazos River Below Navasota River	1202_01 1202_02 1202_05	Nutrients and/or Chl *a* – CS
Allen's Creek	1202H_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Big Creek	1202J_01	Bacteria – NS Fish Community – CN Habitat – CS
	1202J_02	Bacteria – CN DO – CS Nutrients and/or Chl *a* – CS
Mill Creek	1202K_01	Bacteria – NS Habitat – CS
Bullhead Bayou	1245C_01	Bacteria – NS
Unnamed Tributary of Bullhead Bayou	1245D_01	Bacteria – NS

Water Body	Segment	Parameter(s) Impairment and/or Concern
Alcorn Bayou	1245F_01	Bacteria – NS Nutrients and/or Chl *a* – CS
Steep Bank Creek	1245I_01	Bacteria – NS DO – CS Nutrients and/or Chl *a* – CS

Brazos River Tidal (Segment 1201)

The Brazos River tidal segment differs from the rest of the Brazos River in that the Gulf of Mexico can have an effect on the water quality of that portion of the river. This segment does not have any water quality impairments, but there is a concern for increased chlorophyll *a*.

Brazos River Below Navasota River (Segment 1202)

The Brazos River below Navasota River is in full support of all of its designated uses but the portion of the river from the confluence with the Brazos River Tidal in Brazoria County upstream to the confluence with Bessie's Creek (1202_01, _02) and the portion of the Brazos River from the confluence with Lewisville Creek in Waller County upstream to the confluence with the Navasota River in Grimes County has a concern for chlorophyll *a*.

Beason Creek (Segment 1202A)
Rabbs Bayou (Segment 1202B)
Hog Branch (Segment 1202C)
New Year Creek (Segment 1202D)
Little Sandy Creek (Segment 1202E)
Unnamed Oxbow Slough (Segment 1202F)
Brookshire Creek (Segment 1202G)

These unclassified segments that are tributaries to the Brazos River Below Navasota River have no impairments or concerns.

Allen's Creek (Segment 1202H)

Allen's Creek possesses an impairment for not supporting contact recreation use due to elevated bacteria in the draft 2016 IR. There are also concerns for nitrate and total phosphorus. New bacteria criteria has been accepted by the EPA for this segment. When the new criteria is applied, the bacterial impairment should be removed.

Bessie's Creek (Segment 1202I)

Bessie's Creek has no impairments or concerns.

Big Creek (Segment 1202J)

The portion of Big Creek from the confluence of the Brazos River upstream to the confluence of an unnamed tributary 2.1 km downstream of FM 2977 south of Rosenberg (1202J_01) is impaired for not supporting contact recreation use due to elevated bacteria in the draft 2016 IR. There are also concerns for the fish community and habitat in 1202J_01. There are concerns for bacteria, dissolved oxygen, nitrate and total phosphorus in 1202J_02, the portion of Big Creek from the confluence with an unnamed tributary 2.1 km downstream of FM 2977 upstream to the confluence of Cottonwood Creek and Coon Creek. Bacteria issues and nutrient concerns in Big Creek are most likely a result of agricultural and wildlife runoff. Like Allen's Creek, this section of the creek is shallow, with muddy bottoms and low sloping banks. There is little habitat variety in this portion of the creek which leads to low diversity in the fish community.

Mill Creek (Segment 1202K)

Mill Creek has an impairment for not supporting contact recreation use due to elevated bacteria in the draft 2016 IR. There are also concerns for impaired habitat. In March 2016 the EPA approved the Mill Creek Watershed Protection Plan. It is in the implementation phase.

Pond Creek (Segment 1202P)
Clear Creek (Segment 1202O)
Brown's Bayou (Segment 1245B)

There are no impairments or concerns for Pond Creek, Clear Creek or Brown's Bayou in the draft 2016 IR.

Bullhead Bayou (Segment 1245C)
Unnamed Tributary to Bullhead Bayou (Segment 1245D)

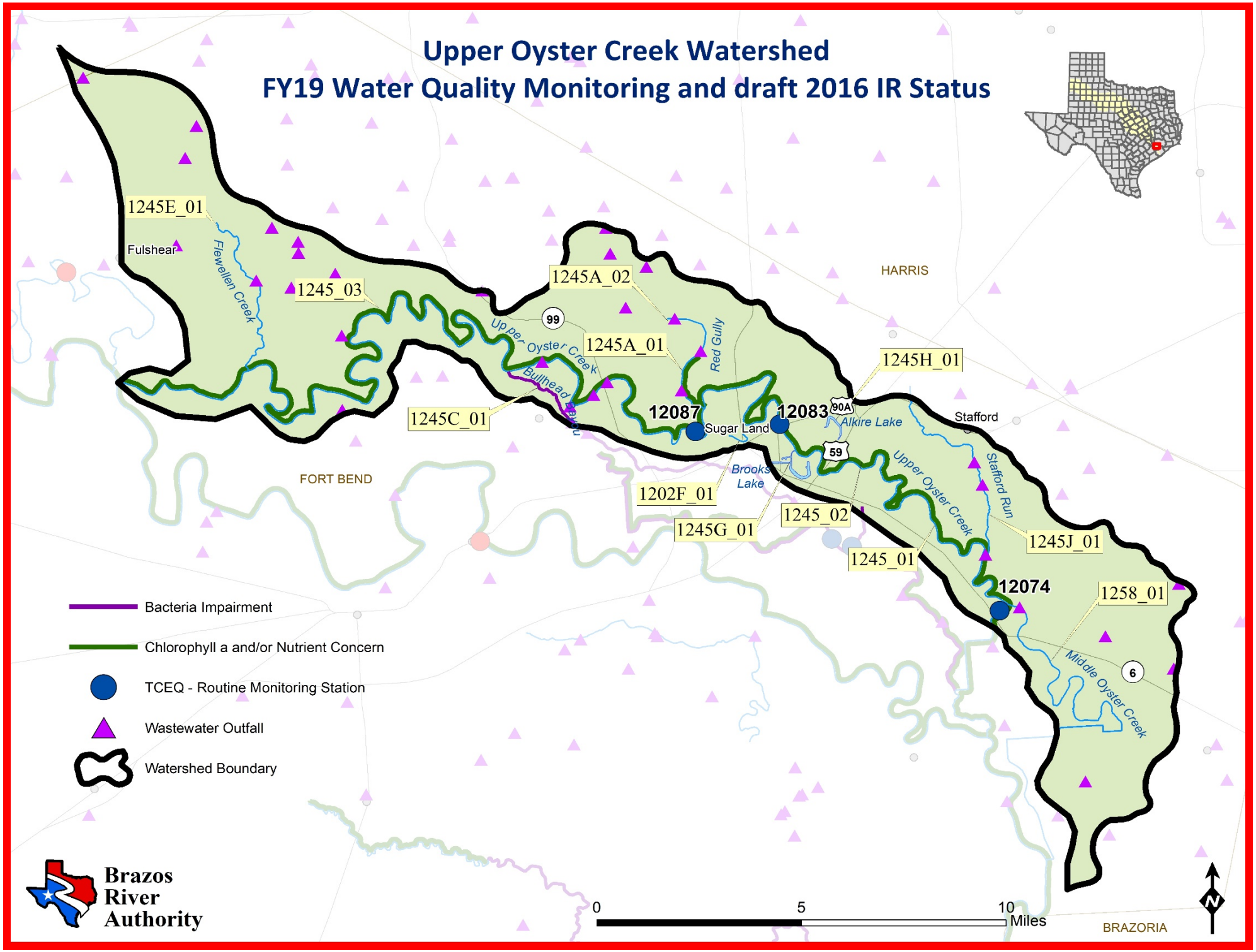
Both of these segments are not supporting for contact recreation use due to elevated bacteria. New bacteria criteria has been approved by EPA for this segment. If the new criteria are applied and more data is collected, the bacterial impairment may be removed.

Alcorn Bayou (Segment 1245F)

Alcorn Bayou has an impairment for not supporting contact recreation use due to elevated bacteria as well a concern for nitrate in the draft 2016 IR.

Steep Bank Creek (Segment 1245I)

Steep Bank Creek has an impairment for not supporting contact recreation use due to elevated bacteria as well as concerns for depressed dissolved oxygen and nitrate in the draft 2016 IR.


Upper Oyster Creek Watershed
FY19 Water Quality Monitoring and draft 2016 IR Status
1245E_01
Fulshear
Flewellen Creek
1245_03
1245A_02
1245A_01
Upper Oyster Creek
Bullhead Bayou
Red Gully
99
1245C_01
12087
Sugar Land
12083
90A
Alkire Lake
1245H_01
Stafford
59
Brooks Lake
1202F_01
1245G_01
1245_02
1245_01
Upper Oyster Creek
Stafford Run
1245J_01
12074
1258_01
Middle Oyster Creek
6
HARRIS
FORT BEND
BRAZORIA
Bacteria Impairment
Chlorophyll a and/or Nutrient Concern
TCEQ - Routine Monitoring Station
Wastewater Outfall
Watershed Boundary
Brazos River Authority
0
5
10
Miles
N

Upper Oyster Creek Watershed

The Upper Oyster Creek Watershed drains approximately 127 square miles in Fort Bend County. Upper Oyster Creek is located within the Brazos River Basin, southwest of Houston in northern Fort Bend County and varies from a natural stream course to a highly modified system of canals and dams which create impoundments that maintain nearly constant water levels for industrial, residential, recreational and drinking water supply. The canal system was dredged to serve as a conveyance for water pumped from the Brazos River into Jones Creek to be diverted into Upper Oyster Creek. There are 8 waterbodies assessed in the draft 2016 IR for this watershed and 5 waterbodies with either impairments or concerns (Table 13).

Table 13: Waterbodies of the Upper Oyster Creek Watershed showing draft 2016 IR impairments and concerns

Water Body	Segment	Parameter(s) Impairment and/or Concern
Upper Oyster Creek	1245_01 1245_02 1245_03	Nutrients and/or Chl *a* – CS
Red Gully	1245A_01	Bacteria – CN Nutrients and/or Chl *a* – CS
Bullhead Bayou	1245C	Bacteria – NS
Flewellen Creek	1245E_01	Bacteria – CN
Stafford Run	1245J_01	Bacteria – CN

Upper Oyster Creek (Segment 1245)

Upper Oyster Creek possesses concerns for chlorophyll *a* and an additional concern for nitrate from the confluence with the Brazos River upstream to Dam #3 (1245_01). A previous bacteria impairment in Upper Oyster Creek (**1245**) led to a bacteria TMDL that was approved by the EPA in 2007. TMDLs for DO were approved by the EPA in September 2010. The Implementation Plan for the two TMDLs was approved by the TCEQ in 2014.

Red Gully (Segment 1245A)

Red Gully has concerns for elevated bacteria and nitrate in the draft 2016 IR.

Flewellen Creek (Segment 1245E)
Flewellen Creek has a concern for elevated bacteria concentrations in the draft 2016 IR.

Brooks Lake (Segment 1245G)
Alkire Lake (Segment 1245H)
There are no impairments or concerns in the draft 2016 IR for Brooks Lake or Alkire Lake.

Steep Bank Creek (Segment 1245I)
Steep Bank Creek is listed in the draft 2016 IR as not supporting its recreational use designation due to elevated bacteria concentrations with concerns for depressed dissolved oxygen and nitrate.

Stafford Run (Segment 1245J)
Stafford Run has a concern for elevated bacteria concentrations.

Middle Oyster Creek (Segment 1258)
There are no impairments or concerns in the draft 2016 IR for Middle Oyster Creek.

PUBLIC INVOLVEMENT AND OTHER INFORMATION

Brazos River Basin Clean Rivers Program Steering Committee

The size and diversity of issues across the Brazos River basin presents a challenge for the large group of stakeholders in our basin. The Brazos River Clean Rivers Program Steering Committee participants represent diverse interests that are represented by government agencies, municipalities, industry, agriculture, organized local stakeholder groups, individuals, and environmental groups.

The BRA holds an annual meeting that provides the Steering Committee with an opportunity to hear results of water quality monitoring, CRP special studies, and gives them a forum where they may voice opinions, make recommendations and interact with other stakeholder participants and BRA staff. Steering Committee members also participate by providing input into planning water quality monitoring activities, prioritizing problems within the basin for prospective CRP special studies, identifying problem areas, developing actions to address potential problem areas in the basin and commenting on the current year's draft Basin Highlights Report.

How to get involved with the Brazos Basin CRP

BRA promotes communication and participation from the general public. If you are interested in serving on the Brazos River Basin CRP Steering Committee, you may visit the Brazos Basin CRP Website and click on CRP Public Outreach or send an email to jenna.olson@brazos.org . Please indicate what topics you are interested in and provide an email address so that you can receive electronic notices of meetings and reports. In addition, the information you provide will help us to develop more effective meetings and provide direction to the program. We highly encourage participation in our meetings and input on water quality issues in the basin.

Brazos River Authority and CRP Website

The BRA maintains both a **river authority website** with a dedicated **CRP webpage** as a mechanism to keep the public informed. These websites provide information on topics of interest in the basin and also provide links to a range of information, including:

Water Supply

Clickable buttons provide information on Drought, Conservation, Planning, Contracting, System Operations, and a Reservoir Accounting Summary.

Water Quality

Clickable buttons provide information on Water and Wastewater Treatment, the Texas Clean Rivers Program, and Watershed Protection Plans.

Clear Rivers Program

Clicking on the Texas Clean Rivers Program button will take you to the BRA hosted CRP webpage. There is a clickable map with water quality data generated by the BRA available in a searchable format that can be easily downloaded to an Excel file. This site is updated weekly. This is also where all of the required CRP information and documents can be found. Including:

CRP Public Outreach – Information on becoming a Steering Committee member
CRP Calendar of Events – Steering Committee Meeting are announced
Program Documents – Required program documents

- Current Work Plan
- Quality Assurance Project Plan
- Coordinated Monitoring Schedule
- TCEQ CRP Data Tool

Reports, Presentations and Meeting Minutes – Basin Highlights Reports and past Steering Committee Meeting agendas and presentations
Links to other CRP Resources – Links to other CRP partners and the TCEQ
CRP Data – Direct link to the searchable database of BRA collected CRP data
Watershed Action Planning – Link to the TCEQ hosted Watershed Action Planning webpage
The most current Basin Summary Report

Reservoirs

Clickable buttons provide information on Possum Kingdom Lake, Lake Granbury, Lake Limestone, Allen's Creek Reservoir (proposed), Federal Reservoirs, and Lake Safety.

Water Levels

Clickable buttons provide information on River and Reservoir Levels, Water Supply and Reservoir Data and River Safety.

News

Information is provided on current BRA news, the BRA newsletters and the BRA News Room.

Education

Information is provided on all things water (Water School), a Speakers Bureau, the Major Rivers Program, and a Resource Library.

Brazos River Basin Highlights Report 2019

Brazos River Authority

THE TEXAS CLEAN RIVERS PROGRAM

TCEQ

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Waco, TX 76710
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Prepared in cooperation with the Texas Commission on Environmental Quality under the authorization of the Texas Clean Rivers Act.