FALL CREEK BRAZOS RIVER WATERSHED SUMMARY REPORT

June 2026

Photo by Sam

The Meadows Center for Water and the Environment
Texas State University
Texas Stream Team

Texas Commission on Environmental Quality

EPA
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ACKNOWLEDGEMENTS

The Texas Stream Team encourages life-long learning about the environment and people's relationship to the environment through its multidisciplinary community science programs. We also provide hands-on opportunities for Texas State University students and inspire future careers and studies in natural resource related fields. Preparation of this report fulfills a contract deliverable for the granting entity, but it also serves as a valuable educational experience for the students that assisted in preparing the report. The Texas Stream Team staff values the student contributions and recognizes each individual for their role. The following staff and student workers assisted in the preparation of this report and are acknowledged for their contributions:

Aspen Navarro, Deputy Director of Watershed Studies
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Laura Parchman, GIS & Data Coordinator

EXECUTIVE SUMMARY

As of 2024, herbaceous cover is the dominant land use in the Fall Creek Brazos River watershed (the watershed), comprising 57.1% of the total area. Developed land accounts for 16.4%, followed by forest at 13.4% and open water at 4.1%. The remaining 9% consists of planted/cultivated land (3.4%), shrubland (2.5%), wetlands (1.7%), and barren land (1.4%).

From April 2011 through May 2026, trained community scientists conducted 579 monitoring events across seven watershed sites. After applying data quality and inclusion criteria (minimum of 10 valid observations per parameter and removal of incomplete records), 224 events were retained for analysis. Because not all parameters were measured at every visit or site, sample sizes vary by parameter. Parameters collected included air and water temperature, dissolved oxygen, pH, transparency, total depth, and *E. coli* bacteria, although *E. coli* data were collected only at Fall Creek at Langdon Ranch (site 80665). All data were collected and quality-controlled in accordance with Texas Stream Team procedures.

According to the 2026 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d) (Texas Commission on Environmental Quality, 2026), Segment 1204 is not currently listed as impaired. Historical records indicate that this segment has not been identified as impaired in previous assessments. Key findings include:

- Water Temperature: Discrete measurements ranged from approximately 1°C to 52°C; however, only a single outlier exceeded the water quality standard of 32.7°C.
- Dissolved Oxygen: Mean dissolved oxygen concentrations ranged from 6.7 to 8.2 mg/L, with all sites exceeding the minimum standard of 5.0 mg/L. The lowest mean (6.7 mg/L) occurred at site 81813, while the highest (8.2 mg/L) was observed at site 81827.
- Total Dissolved Solids: Mean total dissolved solids concentrations ranged from 367.14 mg/L to 1,752.40 mg/L, with several sites exceeding the water quality standard of 1,600 mg/L. The lowest mean concentration was recorded at site 80665, while the highest occurred at site 81827. Discrete measurements showed variability across sites, including elevated values flagged as potential outliers during quality control screening.
- *E. coli*: site 80665 where the arithmetic mean concentration was 154.99 CFU/100 mL, exceeding the applicable water quality standard. However, due to limited sampling frequency and spatial coverage, a geometric mean could not be calculated, and impairment status cannot be formally assessed.

Although most measured parameters met applicable water quality standards and the watershed is not currently listed as impaired, elevated total dissolved solids at several sites and limited *E. coli* data highlight areas for continued attention. We recommend prioritizing monitoring at sites with higher total dissolved solids concentrations and expanding sampling frequency during periods of low flow and following major rainfall events to better understand variability and potential sources. Increasing spatial and temporal coverage of *E. coli* sampling is also needed to support a more robust assessment of bacterial conditions. Continued engagement of community scientists and consistent long-term monitoring will support more effective identification of trends, inform management decisions, and help protect water quality in the watershed.

This report would not have been possible without sustained efforts from the Rio Brazos Master Naturalists and the Pecan River Ecology Program. These dedicated volunteers have conducted over 570 monitoring events across the watershed. Their commitment provides the robust dataset that underpins our analyses and supports informed management of local waterways. Texas Stream Team will continue to support these efforts by providing technical assistance and training new community scientists to expand, grow, and sustain water quality monitoring in this area and beyond.

For more details on the Texas Stream Team program or to find upcoming training opportunities, please email TxStreamTeam@txstate.edu or visit our events calendar at TexasStreamTeam.org.

INTRODUCTION

Texas Stream Team

Texas Stream Team is a volunteer-based community science water quality monitoring program. Water quality monitoring occurs at predetermined monitoring sites, at roughly the same time of day each month. The information that Texas Stream Team community scientists collect is covered under a Texas Commission on Environmental Quality-approved Quality Assurance Project Plan to ensure that a standard set of methods are used statewide. The data may be used by professionals to identify surface water quality trends, target additional data collection needs, identify potential pollution events and sources of pollution, and to test the effectiveness of water quality management measures. Texas Stream Team community scientist data can be used by the state to assess whether water bodies are meeting the designated surface water quality standards, however it is not a requirement. The data collected by Texas Stream Team provides valuable records, often collected in portions of a water body that professionals are not able to monitor frequently or monitor at all.

For additional information about water quality monitoring methods and procedures, including the differences between professional and volunteer community science monitoring, please refer to the following sources:

- Texas Stream Team Core Water Quality Community Scientist Manual
- Texas Stream Team Advanced Water Quality Community Scientist Manual
- Texas Stream Team Quality Assurance Project Plan
- Texas Commission on Environmental Quality Surface Water Quality Monitoring Procedures

The purpose of this report is to provide a summary of the data collected by Texas Stream Team community scientists under a specific watershed. The data presented in this report should be considered in conjunction with other relevant water quality reports for a holistic view of water quality. Such sources may include, but are not limited to, the following:

- Texas Surface Water Quality Standards
- Texas Water Quality Inventory and 303(d) List (Integrated Report)
- Texas Clean Rivers Program partner reports, such as Basin Summary and Highlight Reports
- Texas Commission on Environmental Quality Total Maximum Daily Load reports
- Texas Commission on Environmental Quality and Texas State Soil and Water Conservation Board Nonpoint Source Program funded reports, including watershed protection plans

To get involved with Texas Stream Team or for questions regarding this watershed data report contact us at TxStreamTeam@txstate.edu or at 512.245.1346. Visit our website for more information on our programs at www.TexasStreamTeam.org.

Recognition of Field Contributions

This report would not have been possible without the sustained commitment of the Rio Brazos Master Naturalists, who have conducted intermittent water quality monitoring since April 2011, and the Pecan River Ecology Program, which has maintained consistent monitoring efforts since September 2024, with a focused presence in the Pecan Plantation region. Together, these groups contribute long-term and high-resolution data that capture both baseline conditions and emerging trends across the watershed.

The Rio Brazos Master Naturalists are a volunteer-driven network dedicated to ecological stewardship, public education, and citizen science, engaging local communities in conservation awareness and hands-on stewardship. The Pecan River Ecology Program complements these efforts through targeted, site-specific monitoring and community outreach, serving residents within the Pecan Plantation area. Their combined efforts support the broader public on a large scale.

The Texas Stream Team is deeply grateful for their dedication, which has not only made this report possible but also contributed to the overarching mission of safeguarding and preserving Texas waterways. The data they have gathered remains an indispensable resource, guiding ongoing conservation efforts and shaping informed policy decisions for the future.

WATERSHED DESCRIPTION

Location and Physical Description

The Fall Creek Brazos River watershed (the watershed) is located in northwest Texas, spanning across four counties. Majority of the watershed lies across Johnson and Hood counties, with small portions in Somervell and Parker counties. The watershed is approximately 139 square miles with no major reservoirs. However, Lake Granbury lies just outside of the watershed. Fall Creek is a small tributary that feeds into the river after the Lake Granbury dam. The river empties into the Gulf of Mexico in Angleton, just south of Galveston.

The watershed lies within the Cross Timbers ecoregion of Texas and includes the Grand Prairie sub-ecoregion. The physiography in the region is described as having rolling plains with minor bedrock exposure. The streams in the area are meandering and incised. The substrate in this region is generally a stony calcareous clay solution with remnants of silty clay. Beneath the substrate is a limestone, marl, and claystone bedrock. The elevation of the watershed ranges from 450 feet to 1170 feet with a local relief of 50 feet to 300 feet. The flora in this area includes, but is not limited to, big bluestem, tall dropseed, Texas cupgrass, purple threeawn, juniper, elm, bur oak, and pecan. The fauna includes, but is not limited to, black-tailed jackrabbits, gray wolf, coyote, and scissortail flycatcher. Historically bison, red wolf, and black bears previously roamed the area (Griffith et al., 2007). The watershed is situated over the Trinity

aquifer and minor Brazos River Alluvium Aquifer, which supplies shallow groundwater (Brazos River Authority, n.d.; Texas Water Development Board, n.d.).

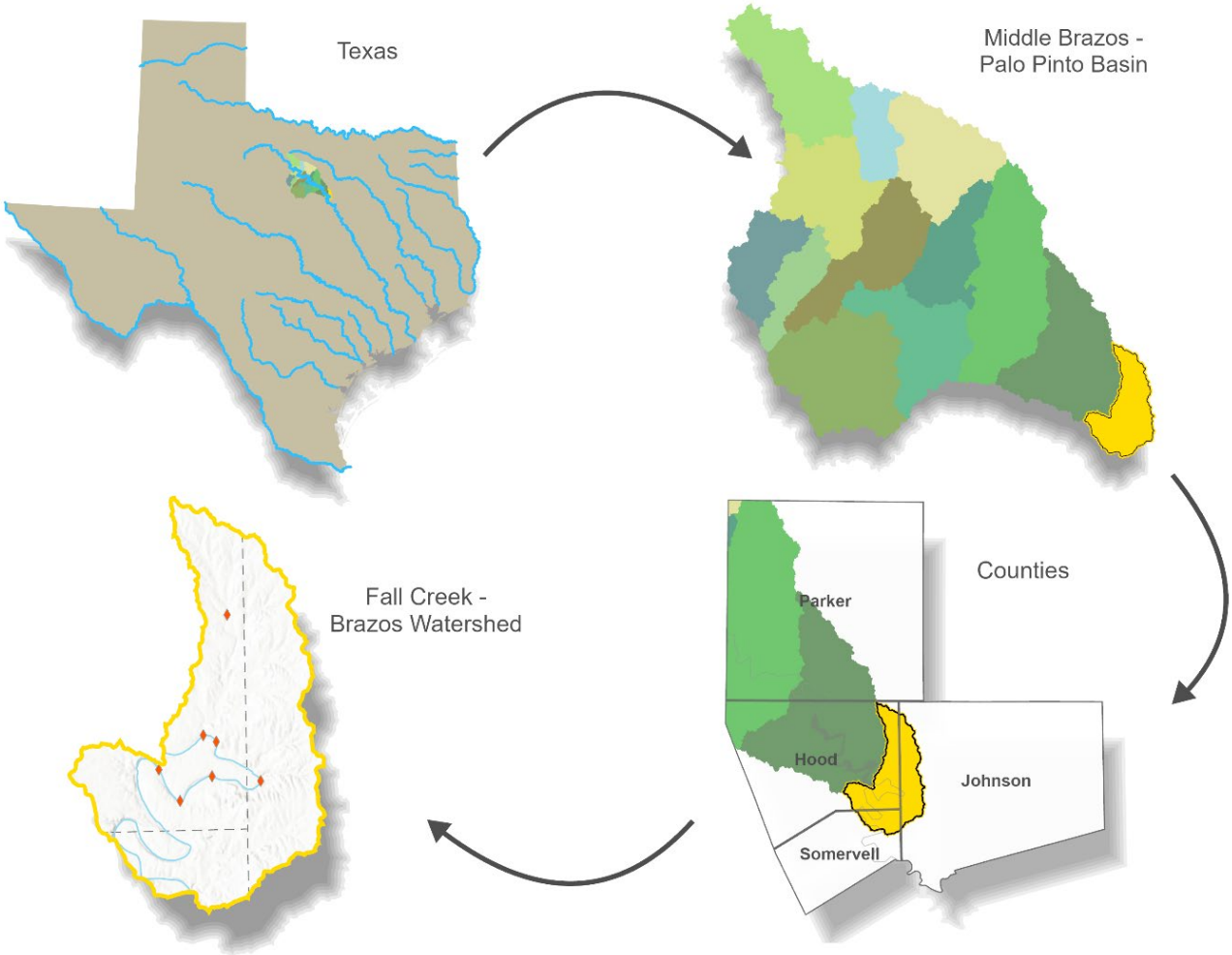

Figure 1. Watershed in Hood, Johnson, Somervell, and Parker counties, Texas.

The Texas Commission on Environmental Quality designates classifications for streams, rivers, lakes, and bays throughout Texas, including those within the watershed (Table 1). One classified freshwater stream was monitored by Texas Stream Team community scientists and is described in Table 1.

Table 1. Texas Commission on Environmental Quality segment classifications (Texas Commission on Environmental Quality, 2026).

Segment Number	Segment Name	Segment Description
1204	Brazos River Below Lake Granbury	From a point immediately upstream of the confluence of Camp Creek in Bosque/Johnson County to De Cordova Bend Dam in Hood County

History

Various Native Americans inhabited the area of what is now Hood County prior to Eastern settlers. The plains were home to primarily the Comanches with a minor presence of the Lipan Apaches and Kiowas. Anglo settlers began to inhabit the area roughly 10 to 15 years prior to the Civil War. Several Indian horse-stealing raids were carried out by the Comanches against the early settlers. The county was formally established by the Eleventh Texas Legislature in November 1866. Early towns at the turn of the 20th century included Granbury, Acton, Tolar, Lipan, and Cresson (Callaway, 2020).

Agriculture was the primary source of land use and economic development in Hood County. However, due to population declines in the early 1900s, roughly a third of farms closed between 1910 and 1920. This number continued to steadily decline until 1950. Once Lake Granbury was completed in 1969, population began to rapidly increase between 1960 and 1980. The lake established the county as a recreational and resort hotspot. This population boom shifted the primary economic sector to retail, with substantial growth in construction and real estate as well. Even with this shift towards tourism and recreation, farming and ranching still dominated the land use with 84% in 1982 (Callaway, 2020).

As for Johnson County, prior to Anglo settlers there were no permanent Native American villages in the area. Various tribes still hunted in the area, including Tonkawas, Kickapoos, Anadarkos, Caddos, and Wacos. Early permanent settlements were established by Anglo settlers in the mid-1840s. Several of these were burned by an uprising led by the Caddo Native Americans in 1851. Though the county was first marked off in 1854, Johnson County was first included in the federal census of 1860. The current boundaries were finally solidified in 1881 after a western portion was severed to form other counties and a section of Ellis County was added to Johnson County (Elam, 2024).

Johnson County's economy was heavily tied to agriculture up until the late 1900s. Major crops were corn and cotton. A large portion of the farms in the area were involved in the sharecropping system. This economic climate shifted with the development of railroads. Trade routes were opened and jobs were established for maintenance, construction, and switchyard facilities. The urban development of the Dallas-Fort Worth Metroplex trickled into Johnson County, and the population steadily increased into the 21st century, increasing urban development (Elam, 2024).

Land Use

Land cover types were determined by spatial datasets from the National land Cover Database and processed in Esri ArcGIS Pro for the watershed (Figures 2 and 3).

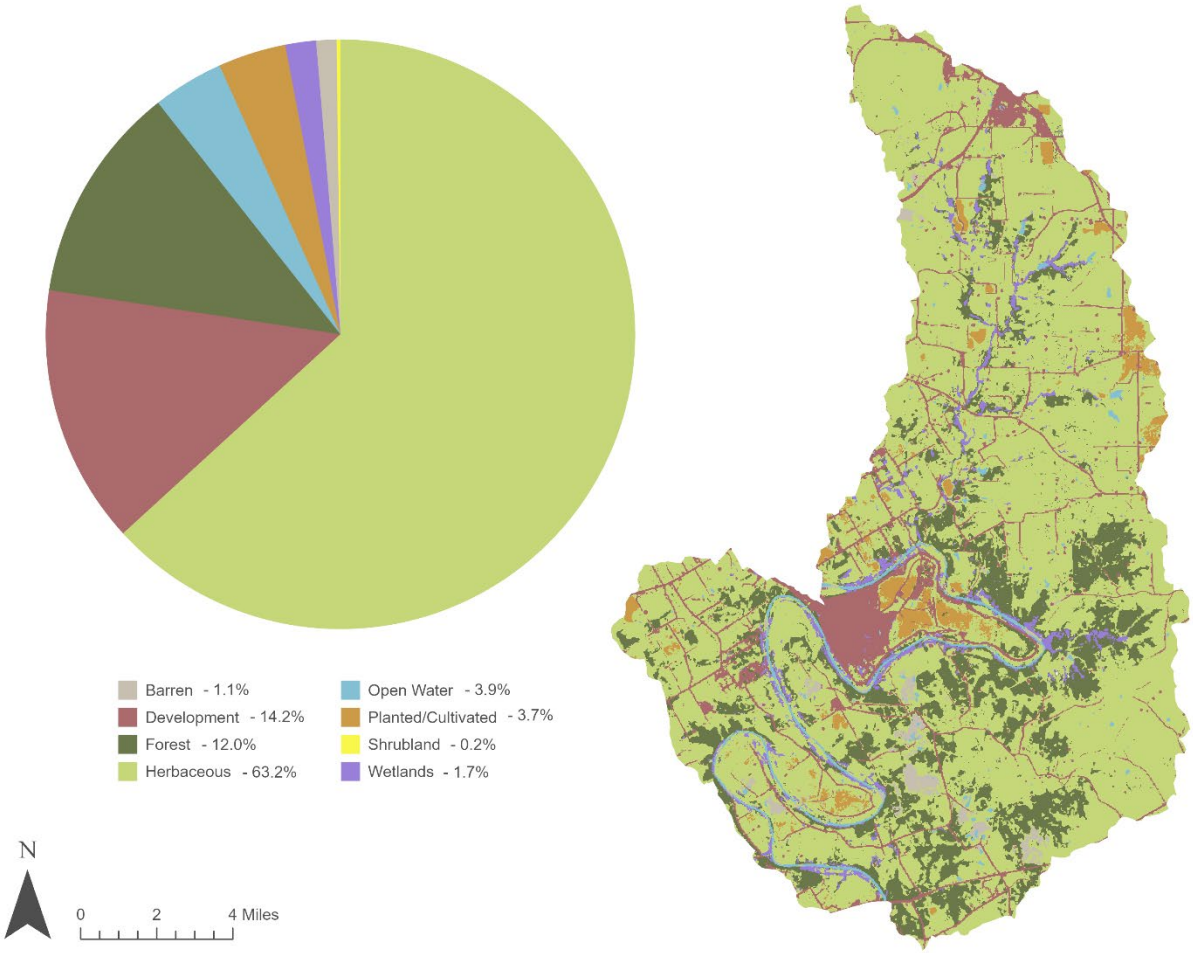

Figure 2. 2012 Land use and land cover for the watershed in Hood, Johnson Somervell, and Parker counties, Texas (U.S. Geological Survey, 2012).

In 2012, the watershed was primarily herbaceous, with herbaceous covering 63.2% of the area. Development made up 14.2% of the watershed, while forests accounted for 12.0%. The remaining 10.6% consisted of open water (3.9%), planted/cultivated (3.7%), wetlands (1.7%), barren land (1.1%), and shrubland (0.2%).

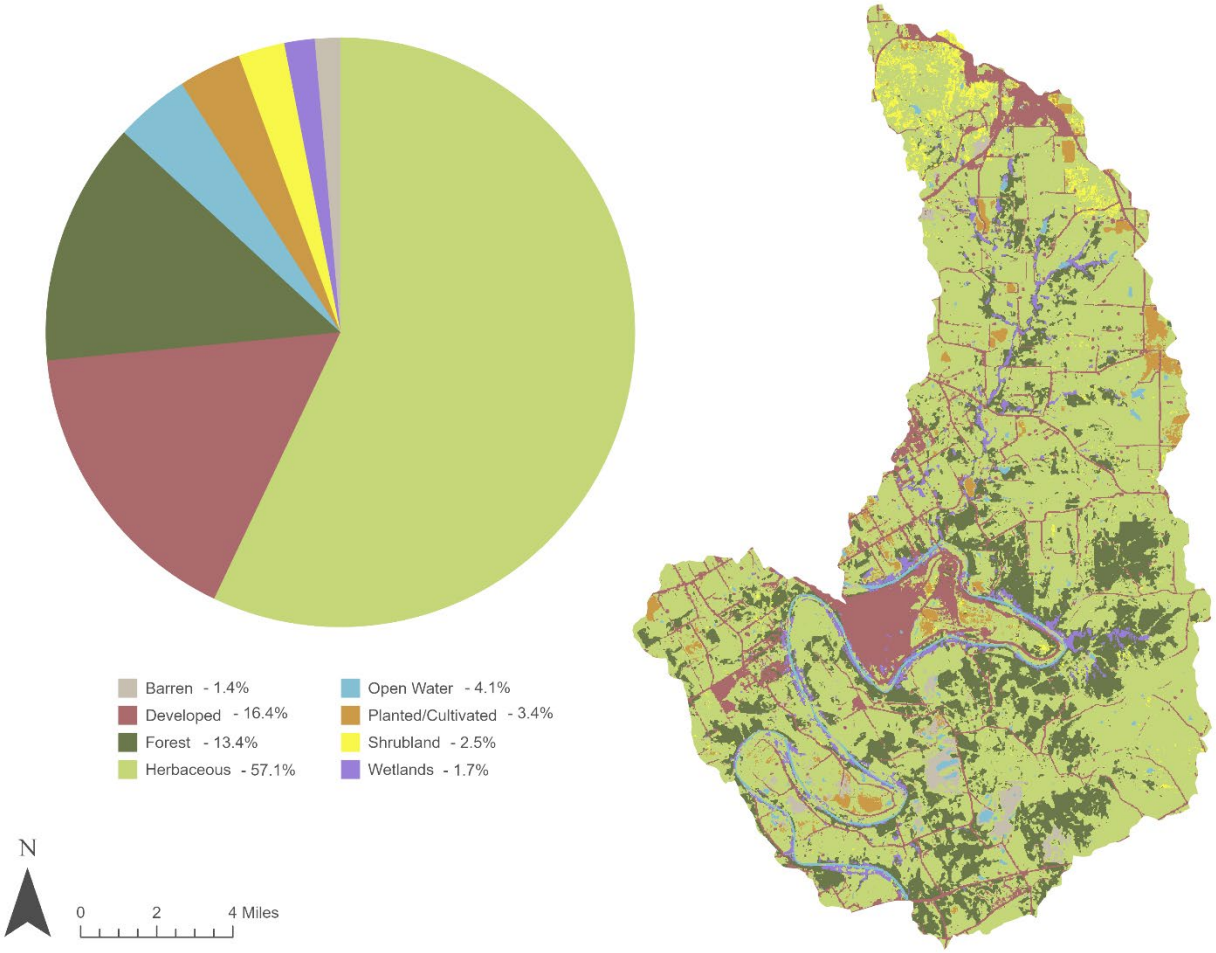

Figure 3. 2024 Land use and land cover for the watershed in Hood, Johnson Somervell, and Parker counties, Texas (National Land Cover Data, 2024).

In 2024, herbaceous cover remained the predominant land use, covering 57.1% of the watershed. Development slightly increased to 16.4%, and forests to 13.4%, while open water comprised 4.1% of the area. The remaining 9% of the watershed consisted of planted/cultivated cover (3.4%), shrubland (2.5%), wetlands (1.7%), and barren land (1.4%).

Table 2. Comparison of watershed land use categories by acreage and percentage in 2012 and 2024 (U.S. Geological Survey, 2012 and 2024).

Land Use	2012 Acreage	2012 Percentage	2024 Acreage	2024 Percentage	Change in Land Use
Open Water	6,718.54	3.9%	7,046.79	4.1%	+4.9%
Developed	24,522.77	14.2%	28,368.64	16.4%	+15.7%
Barren	1,915.71	1.1%	2,423.88	1.4%	+26.5%
Forest	20,690.92	12.0%	23,132.14	13.4%	+11.8%

Shrubland	363.62	0.2%	4,401.85	2.5%	+1110.6%
Herbaceous	109,180.58	63.2%	98,553.01	57.1%	-9.7%
Planted/Cultivated	6,434.76	3.7%	5,949.05	3.4%	-7.5%
Wetlands	2,918.48	1.7%	2,870.00	1.7%	-1.7%

Endangered Species and Conservation Needs

The common names of 13 species listed as threatened or endangered (under the authority of Texas state law and/or the United States Endangered Species Act) within the watershed are included in Appendix A. A summary of the number of species per taxonomic group listed as state or federally endangered, threatened, G1 or G2 (critically imperiled or imperiled), species of greatest conservation need, and/or endemic is provided in Table 3.

Table 3. State and federally listed species in the watershed (Texas Parks and Wildlife Department: Rare, Threatened, and Endangered Species of Texas, 2025).

Taxon	**Endangered (Federal or State) LE/E**	**Threatened (Federal or State) LT/T**	**G1 or G2 (Critically Imperiled/ Imperiled)**	**Species of Greatest Conservation Need (TPWD) (S1 or S2)**	**Endemic Total Count**
Amphibians	0	0	0	0	0
Birds	3	5	2	11	0
Fish	0	0	0	0	1
Mammals	0	0	0	5	0
Reptiles	0	2	1	3	1
Insects	0	0	2	2	1
Mollusks	0	2	1	1	2
Plants	0	1	5	7	6
Total	**3**	**10**	**11**	**29**	**11**

Climate

The climate in this area (Cfa) is described as humid and subtropical with hot, humid summers, mild winters, and no dry season (Köppen-Geiger climate classification). Climate data from the

National Oceanic and Atmospheric Administration was collected from a weather station in Somervell County, Texas and acquired from the National Data Center (National Oceanic and Atmospheric Administration, 2021). The average annual precipitation is 34.25 inches and typically occurs year-round (Figure 4). Long-term monthly precipitation shows a bimodal distribution, with peaks occurring in May and October, averaging 3.99 inches of rainfall during these months. The least amount of rainfall (1.79 inches) occurs in July, the dip in the bimodal curve. The warmest and coldest months of the year are July (29.2°C) and January (6.8°C), respectively.

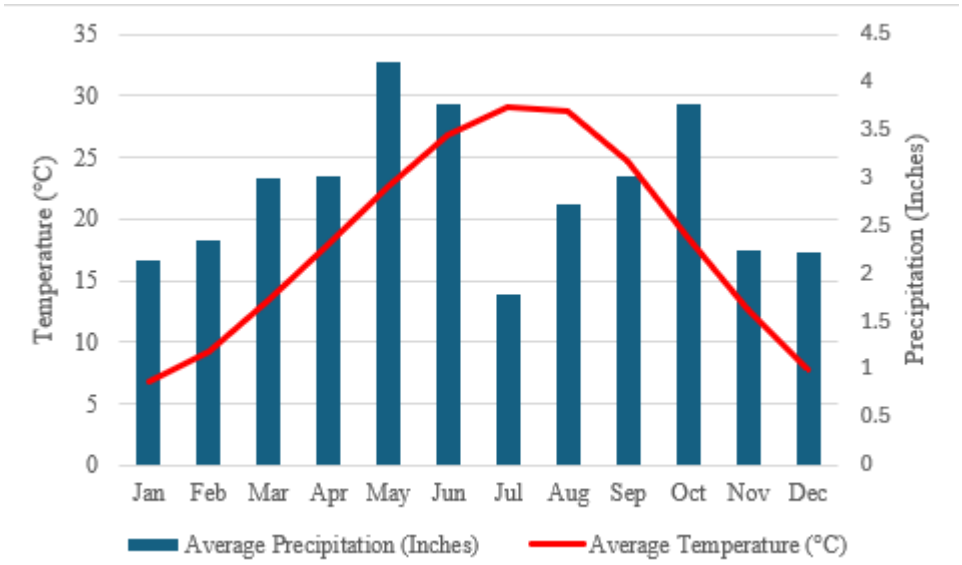

Figure 4. Long-term (1991-2020) monthly average precipitation (inches) and air temperature (°C) from the watershed (National Oceanic and Atmospheric Administration Climate Data, 2021).

Texas Water Quality Standards

The Texas Surface Water Quality Standards establish explicit goals for the quality of streams, rivers, lakes, and bays throughout the state. These standards are designed to maintain surface water quality in support of public health, aquatic life, and recreational uses, while remaining consistent with sustainable economic development. Water quality standards identify the appropriate uses of classified and unclassified water bodies, including aquatic life protection, recreation, and public water supply.

For monitoring sites located on tributaries feeding into segment 1204, the criteria used to assess support of these designated uses are summarized in Table 4. Unclassified water bodies are not defined individually in the state's standards but are associated with the classified segment because they lie within the same watershed. The dissolved oxygen criterion represents the minimum allowable mean concentration at any site within the segment. The

acceptable pH range applies to any monitoring location within the watershed. The total dissolved solids criterion represents the mean allowable concentration for the segment. The indicator bacteria criterion for freshwater systems is a geometric mean based on *E. coli* levels. The temperature criterion represents the maximum allowable value at any site within the segment.

Table 4. State water quality criteria for the watershed (Texas Commission on Environmental Quality, 2022).

Segment	Dissolved Oxygen (mg/L)	pH Range (s.u.)	Total Dissolved Solids (mg/L)	*E. coli* Bacteria (CFU/100 mL)	Temperature (°C)
1204 (Brazos River Below Lake Granbury)	5.0	6.5–9.0	1,600	126	32.8

Water Quality Impairments

The 2026 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d) includes an Index of Water Quality Impairments (Texas Commission on Environmental Quality, 2026). Per the report, segment 1204 is not currently impaired. Historically, this segment has not been impaired according to previous reports.

WATER QUALITY PARAMETERS

Conductivity

Conductivity (specific conductance) is a measure of the ability of a body of water to conduct electricity. It is measured in microsiemens per centimeter (µS/cm). A body of water is more conductive if it has more total dissolved solids such as nutrients and salts, which indicates poor water quality if they are overly abundant. High concentrations of nutrients can lead to eutrophication, which results in lower levels of dissolved oxygen. High concentrations of salt can inhibit water absorption and limit root growth for vegetation, leading to an abundance of more drought tolerant plants, and can cause dehydration of fish and amphibians. Sources of total dissolved solids can include agricultural runoff, domestic runoff, or discharges from wastewater treatment plants.

Dissolved Oxygen

Dissolved oxygen refers to the amount of oxygen gas present in water as tiny, dissolved molecules. It is typically measured in milligrams per liter (mg/L). Oxygen is necessary for the survival of organisms like fish and aquatic insects. The amount of oxygen needed for survival

and reproduction of aquatic communities varies according to species composition and adaptations to watershed characteristics like stream gradient, habitat, and available streamflow.

The dissolved oxygen concentrations can be influenced by other water quality parameters such as nutrients and temperature. High concentrations of nutrients can lead to excessive surface vegetation and algae growth, which may starve subsurface vegetation of sunlight and, therefore, reduce the amount of oxygen they produce via photosynthesis. This process is known as eutrophication. Low dissolved oxygen can also result from high groundwater inflows (which have low dissolved oxygen due to minimal aeration), high temperatures, or water releases from deeper portions of dams where dissolved oxygen stratification occurs. Supersaturation typically occurs underneath waterfalls or dams with water flowing over the top where aeration is abundant.

E. coli Bacteria

Escherichia coli *(E. coli)* bacteria, a member of the total coliform group of bacteria, originates in the digestive tracts of warm-blooded animals and enter water bodies through fecal contamination. For this reason, the presence of *E. coli* in water indicates fecal pollution and the potential presence of pathogens, which are disease-causing biological agents. The U.S. Environmental Protection Agency has identified *E. coli* as the primary indicator for assessing microbial contamination in freshwater systems.

pH

The pH scale measures the concentration of hydrogen ions in a range from zero to 14 and is reported in standard units (s.u.). The pH of water can provide information regarding acidity or alkalinity. The range is logarithmic; therefore, every one-unit change is representative of a 10-fold increase or decrease in acidity or alkalinity. Acidic sources, indicated by a low pH level, can include acid rain and runoff from acid-laden soils. Acid rain is predominantly caused by coal powered plants with minimal contributions from the burning of other fossil fuels and other natural processes, such as volcanic emissions. Soil-acidity can be caused by excessive rainfall leaching alkaline materials out of soils, acidic parent material, crop decomposition creating hydrogen ions, or high yielding fields that have drained the soil of all alkalinity. Sources of high pH (alkaline) include geologic composition, as in the case of limestone increasing alkalinity and the dissolving of carbon dioxide in water. Carbon dioxide is water soluble, and as it dissolves it forms carbonic acid. A suitable pH range for healthy organisms is between 6.5 and 9.0 s.u.

Water Temperature

Water temperature influences the physiological processes of aquatic organisms, and each species has an optimum temperature for survival. High water temperatures increase oxygen-demand for aquatic communities and can become stressful for fish and aquatic insects. Water temperature variations are most detrimental when they occur rapidly, leaving the aquatic community with no time to adjust. Additionally, the ability of water to hold oxygen in solution

(solubility) decreases as temperature increases. This effect is exacerbated in coastal water bodies influenced by tidal, saline waters. Warm water temperatures occur naturally with seasonal variation, as water temperatures tend to increase during summer and decrease in winter in the Northern Hemisphere. Daily (diurnal) water temperature changes occur during normal heating and cooling patterns. Man-made sources of warm water include power plant effluent after it has been used for cooling or hydroelectric plants that discharge warm water. Community scientist monitoring may not identify fluctuating patterns due to diurnal changes or events such as power plant releases because of the monthly sampling frequency. While community scientist data may not show diurnal temperature fluctuations, they could demonstrate the fluctuations over seasons and years when collected consistently at predetermined monitoring sites and monthly frequencies.

Water Transparency and Total Depth

Two instruments can be used by Texas Stream Team community scientists to measure water transparency, a Secchi disc or a transparency tube. Both instruments are used to measure water transparency or to determine the clarity of the water, a condition known as turbidity. The Secchi disc is lowered into the water until it is no longer visible, then raised until it becomes visible, and the average of the two depth measurements is recorded. A transparency tube is filled with sample water and water is released until the Secchi pattern at the bottom of the tube can be seen. The tube is marked with two-millimeter increments and is used to measure water transparency. Transparency measurements less than the total depth of the monitoring site are indicative of turbid water. Readings that are equal to total depth indicate clear water. Highly turbid waters pose a risk to wildlife by clogging the gills of fish, reducing visibility, and carrying contaminants. Reduced visibility can harm predatory fish or birds that depend on good visibility to find their prey. Turbid waters allow less light to penetrate deep into the water, which, in turn, decreases the density of phytoplankton, algae, and other aquatic plants. This reduces the dissolved oxygen in the water due to reduced photosynthesis. Contaminants are mostly transported in sediment rather than in the water. Turbid water can result from sediment runoff from construction sites, erosion of farms, or mining operations.

DATA ANALYSIS METHODOLOGIES

Data Collection

The field sampling procedures implemented by trained community scientists are documented in the Texas Stream Team Core Water Quality Community Scientist Manual and the Texas Stream Team Advanced Water Quality Community Scientist Manual. The sampling protocols in the manuals adhere closely to the Texas Commission on Environmental Quality Surface Water Quality Monitoring Procedures Manual, Volume 1 (August 2012). Additionally, all data collection adheres to Texas Stream Team's Texas Commission on Environmental Quality-approved Quality Assurance Project Plan.

Procedures documented in Texas Stream Team Water Quality Community Scientist Manuals or the Texas Commission on Environmental Quality Surface Water Quality Monitoring Procedures Manual, Volume 1 (August 2012) outlines the necessary steps to prevent contamination of samples, including direct collection into sample containers, when possible. Field quality control samples are collected and analyzed to detect whether contamination has occurred and to ensure data accuracy and precision. Field sampling activities are documented on Environmental Monitoring Forms. The following items are recorded for each field sampling event: station ID, location, sampling time, date, depth, sample collector's name/signature, group name, meter calibration information, and reagent expiration dates.

Conductivity values are converted to total dissolved solids using a conversion factor of 0.65 and are reported as mg/L. Values for measured parameters are recorded. If reagents or media are expired, it is noted, and data are flagged and communicated to Texas Stream Team staff. Sampling is not permitted with expired reagents or bacteria media; the corresponding values will be flagged in the database and excluded from data reports. Detailed observational data recorded include water appearance, weather, field observations (biological activity and stream uses), algae cover, unusual odors, days since last significant rainfall, and flow severity. Comments related to field measurements, number of participants, total time spent sampling, and total round-trip distance traveled to the sampling site are also recorded for grant reporting and administrative purposes.

Data Management

The community scientists collect field data and report the measurement results to Texas Stream Team, by submitting a hard copy of the Environmental Monitoring Form, entering the data directly into the online Waterways Dataviewer database, or by using the electronic Environmental Monitoring Form. All data are reviewed to ensure they are representative of the samples analyzed and locations where measurements were made. The measurements and associated quality control data are also reviewed to ensure they conform to specified monitoring procedures and project specifications as stated in the approved Quality Assurance Project Plan. Data review and verification is performed using a quality control checklist and self-assessments, as appropriate to the project task, followed by automated database functions that validate data as the information is entered into the database. The data are verified and evaluated against project specifications and are checked for errors, especially errors in transcription, calculations, and data input. Potential errors are identified by examination of documentation and by manual and computer-assisted examination of corollary or unreasonable data. Issues that can be corrected are corrected and documented. Once entered, the data can be accessed publicly through the online Texas Stream Team Datamap.

Data Analysis

Data was compiled, analyzed, summarized, and compared to state water quality standards and/or criteria to provide readers with a reference point for parameters that may be of concern. The statewide, biennial assessment performed by the Texas Commission on Environmental Quality involves more stringent monitoring methods and oversight than those used by community scientists and staff in this report. However, the Texas Stream Team data is intended to inform stakeholders about general characteristics and assist professionals in identifying areas of potential concern to plan future monitoring efforts. All data collected by community scientists in the watershed were exported from the Texas Stream Team database and grouped by site. Sites with 10 or more monitoring events were maintained in the dataset for analysis. Sites with fewer than 10 monitoring events were excluded from the analysis for this report but may be used in future watershed summary reports. Once compiled, data was sorted, and summary statistics were generated and reviewed. To ensure data quality and consistency, the data engineering tool in ArcGIS Pro was used to clean and standardize the dataset, including formatting attribute fields, removing or flagging incomplete or erroneous records, and preparing the data for subsequent statistical analysis and visualization.

Best professional judgement was used to verify outliers. Outlier boxes or scatter plots were prepared to provide a compact view of the distribution of the data for each parameter and site(s). The horizontal line within the box plots represents the median sample value, while the ends of the box represent the 25th and 75th quantiles or the interquartile range. The lines extending from each end of the box, or whiskers, are computed using the 25th/75th quartiles ± 1.5 x (interquartile range). Outliers are plotted as points outside the box plot.

Bacterial impairment is normally assessed using the geometric mean of *E. coli* measurements because *E. coli* concentrations are highly variable, ranging from zero to thousands of colony-forming units per 100 milliliters (CFU/100 mL). However, in this watershed, E. coli data were available from only one site and sampling was infrequent and temporally inconsistent, so a geometric mean could not be reliably calculated for the assessment period. Instead, E. coli conditions are described using the arithmetic mean, which provide supporting information but do not replace the geometric mean-based impairment determination.

DATA RESULTS

Water quality data from seven Texas Stream Team monitoring sites in the watershed were acquired for this report (Figure 5).

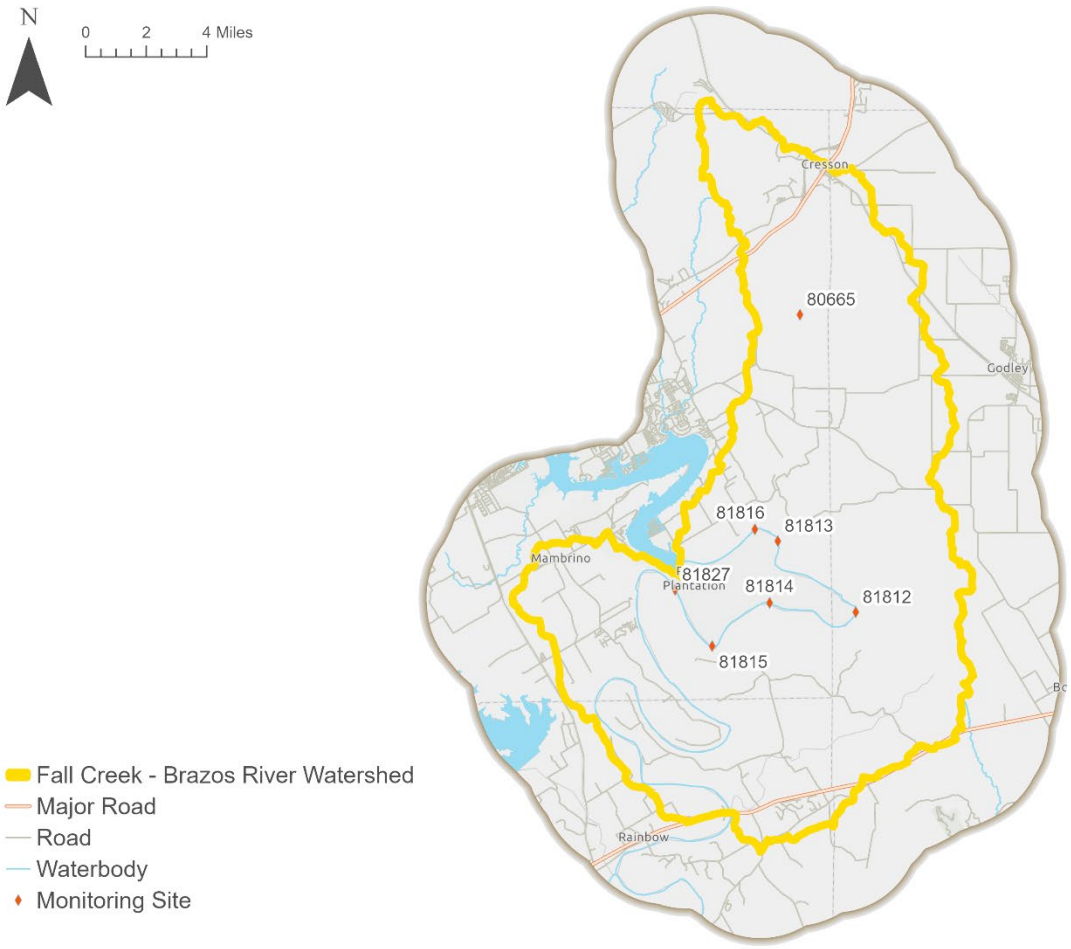

Figure 5. Texas Stream Team monitoring sites in the watershed in Hood, Johnson Somervell, and Parker counties, Texas.

Table 5. Texas Stream Team monitoring sites in the watershed.

Site ID	Description	Number of Events	Period of Record
80665	Fall Creek @ Langdon Ranch	387	April 28, 2011 – May 5, 2026
81812	Brazos River below Lake Granbury at Ravenswood Road/Plantation Beach	31	September 28, 2024 - April 16, 2026
81813	TCEQ site 11859 - Brazos River below Lake Granbury at Ravenswood Road/Falls Beach Park	36	September 28, 2024 – April 16, 2026
81814	TCEQ Site 11857 - Brazos River below Lake Granbury, near Ravenswood Rd/Headquarters Cir RV park	37	September 28, 2024 - April 16, 2026
81815	Brazos River below Lake Granbury, at Bellechase Road/Sandy Beach Park	35	September 28, 2024 - April 16, 2026

81816	Brazos River below Lake Granbury, off Monticello Circle	35	September 28, 2024 – April 16, 2026
81827	Brazos River @ Pecan Plantation Clubhouse	18	November 7, 2024 - June 17, 2025
	Total:	**579**	

Site Analysis

Quality controlled water quality monitoring data were analyzed and summarized to include the number of samples, mean (average), standard deviation, and range of values (Table 7). Only sites with 10 or more sampling events were included in the analysis. Additionally, not all water quality parameters were measured during every site visit, and some parameters were recorded for only a subset of sites. As a result, the number of valid measurements varies by parameter and by site, and sites with fewer than 10 valid observations for a given parameter were excluded from the statistical analysis. Site 80665 is the only site for which *E. coli* bacteria data were collected.

Community scientists monitored sites for standard core parameters, including air temperature, dissolved oxygen, *E. coli* bacteria, transparency, total depth, water temperature, and pH. A total of seven monitoring sites were included in this assessment (Table 7), encompassing 224 total monitoring events conducted between April 2011 and May 2026, after excluding records with incomplete data or parameters not consistently collected across sites. All available measurements were screened using Texas Stream Team quality control criteria.

Table 6. Texas Stream Team data summary for sites in the watershed (April 2011 to May 2026).

Parameter	Attribute	80665	81812	81813	81814	81815	81816	81827
Air Temperature (°C)	Mean	19.48	14.42	16.91	17.32	17.95	15.16	23.86
	Range	29.60	26.00	27.00	26.00	25.00	26.00	47.60
	Std Dev	7.53	9.13	8.81	8.50	8.05	8.53	14.87
Dissolved Oxygen (mg/L)	Mean	7.13	7.06	6.68	7.06	7.38	7.70	8.20
	Range	7.85	10.00	10.00	10.00	5.00	4.30	12.85
	Std Dev	1.63	2.85	2.54	2.70	1.59	1.35	3.15
E. coli (CFU)	Mean	154.99	ND	ND	ND	ND	ND	ND
	Range	1353.33	ND	ND	ND	ND	ND	ND
	Std Dev	267.27	ND	ND	ND	ND	ND	ND
pH (standard units)	Mean	7.04	8.21	8.28	8.27	8.31	8.40	8.44
	Range	1.00	1.50	1.50	1.50	1.50	1.50	1.00
	Std Dev	0.16	0.36	0.35	0.42	0.30	0.36	0.37
Secchi Disk (m)	Mean	1.00	ND	ND	ND	ND	ND	ND
	Range	11.00	ND	ND	ND	ND	ND	ND
	Std Dev	0.94	ND	ND	ND	ND	ND	ND
Total Depth (m)	Mean	1.03	0.96	0.58	0.56	0.63	1.08	0.71
	Range	3.30	1.70	0.70	0.90	0.70	2.70	0.80
	Std Dev	0.43	0.52	0.28	0.31	0.29	0.78	0.37
	Range	414.05	928.20	950.30	1539.20	1504.75	1019.85	1196.00
	Std Dev	43.05	266.92	296.00	396.60	348.70	340.87	359.94
Total Dissolved Solids (mg/L)	Mean	367.14	1487.9	1476.43	1550.59	1460.78	1506.4	1752.4
	Range	414.05	928.2	950.3	1539.2	1504.75	1019.85	1196
	Std Dev	43.05	266.92	296	396.6	348.7	340.87	359.94
Transparency Tube (m)	Mean	0.17	0.17	0.19	0.18	0.19	0.18	0.16
	Range	0.26	0.21	0.21	0.22	0.22	0.24	0.27
	Std Dev	0.06	0.06	0.05	0.07	0.06	0.07	0.08
	Mean	17.90	16.70	16.90	17.20	17.10	17.30	18.60

Water Temperature (°C)	Range	28.00	26.00	27.00	26.00	26.00	27.00	47.60
	Std Dev	7.20	6.20	6.30	6.50	6.40	6.60	10.20

ND = no data available.

Air and Water Temperature

Average air temperature across all sites ranged from 14.4°C to 23.9°C (Table 7). The lowest mean air temperature (14.4°C) was observed at Brazos River below Lake Granbury at Ravenswood Road/Plantation Beach (site 81812), whereas the highest mean air temperature (23.9°C) was observed at Brazos River @ Pecan Plantation Clubhouse (site 81827).

The average water temperature at all sites ranged from 16.7°C to 18.6°C (Table 7), falling within the water quality standard of 32.7°C. The lowest mean water temperature (16.7°C) was observed at Brazos River below Lake Granbury at Ravenswood Road/Plantation Beach (site 81812), while the highest mean water temperature (18.6°C) was observed at Brazos River @ Pecan Plantation Clubhouse (site 81827). Discrete water temperature measurements ranged from approximately) 0°C to 32°C and did not exceed the water quality standard of 32.7°C (91°F) (Figure 6).

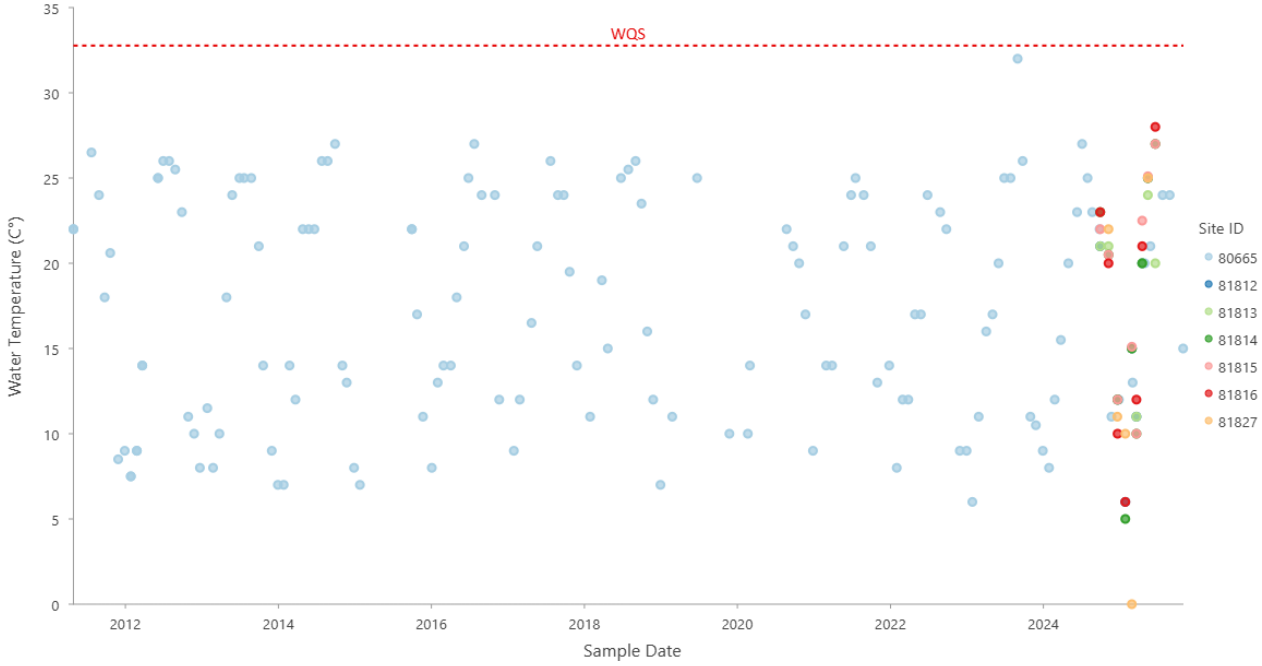

Figure 6. Water temperature for Texas Stream Team sites in the watershed (April 2011 – May 2026). WQS = Water Quality Standard.

Dissolved Oxygen

Average dissolved oxygen concentrations across all sites ranged from 6.7 to 8.2 mg/L (Table 7), all exceeding the water quality standard of 5.0 mg/L. The lowest mean dissolved oxygen concentration (6.7 mg/L) was observed at TCEQ site 11859 – Brazos River below Lake Granbury at Ravenswood Road/Falls Beach Park (site 81813), whereas the highest mean dissolved oxygen concentration (8.2 mg/L) was observed at Brazos River @ Pecan Plantation Clubhouse (site 81827). Discrete measurements exhibited a wider range of values, including several low

observations and occasional extreme values identified as potential outliers during quality control review (Figure 7).

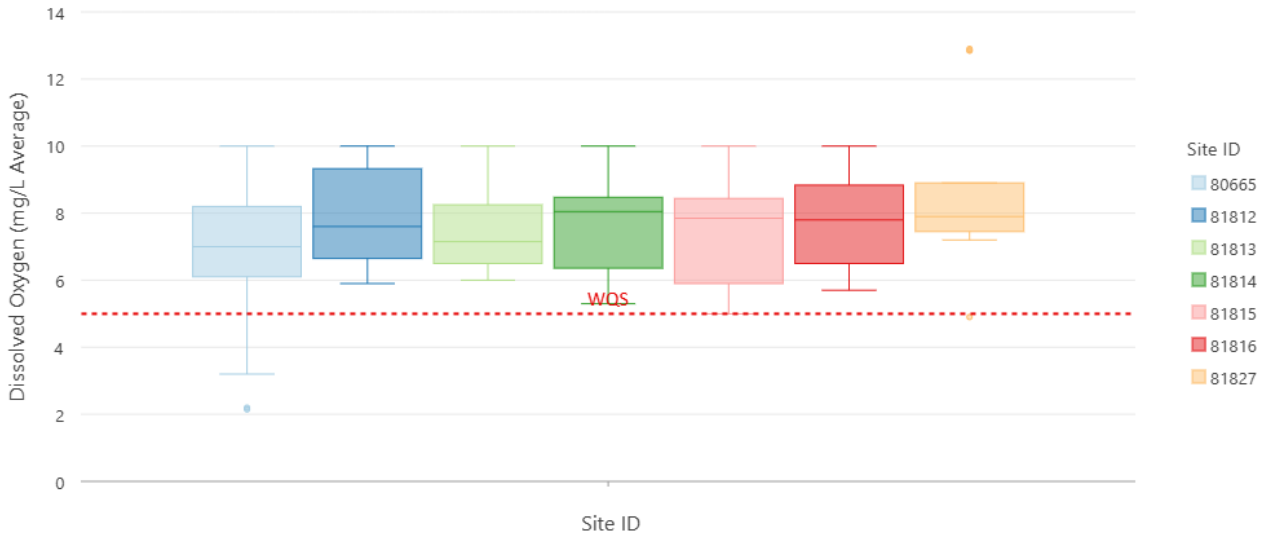

Figure 7. Dissolved Oxygen for Texas Stream Team sites in the watershed (April 2011 – May 2026). WQS = Water Quality Standard.

pH

Average pH values across all sites ranged from 7.0 to 8.4 standard units (Table 7), falling within the water quality standard of 6.5 to 9.0 standard units. The lowest mean pH (7.0) was observed at Fall Creek at Langdon Ranch (site 80665), whereas the highest mean pH (8.4) was observed at Brazos River @ Pecan Plantation Clubhouse (site 81827).

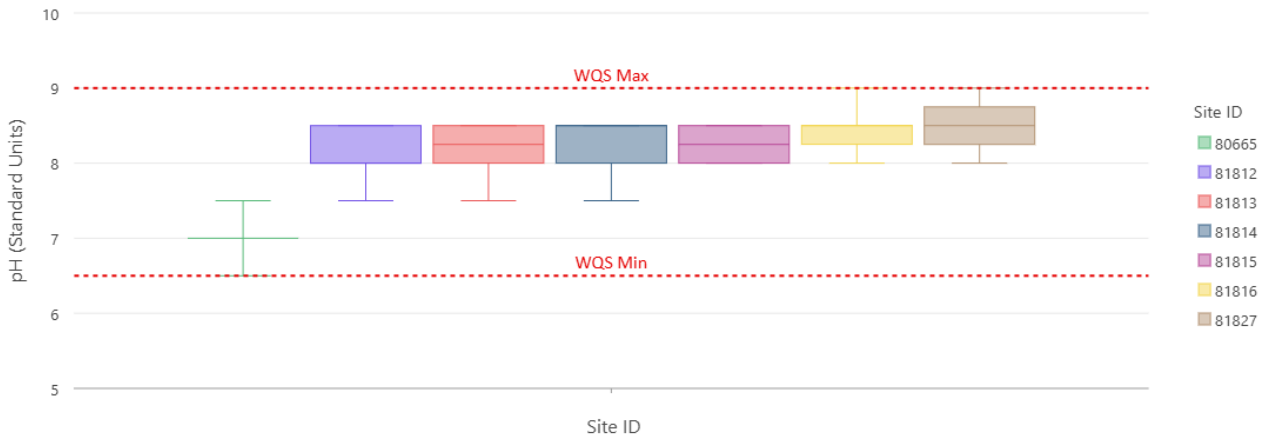

Figure 8. pH (Standard Value) for Texas Stream Team sites in the watershed (April 2011 – May 2026). WQS = Water Quality Standard.

Total Dissolved Solids

Average total dissolved solids concentrations across all sites ranged from 367.14 mg/L to 1,752.40 mg/L (Table 7), where majority of the sites exceeded the water quality standard of 1,600 mg/L. The lowest mean concentration (367.14 mg/L) was observed at Fall Creek at Langdon Ranch (site 80665), whereas the highest mean concentration (1,752.40 mg/L) was observed at Brazos River @ Pecan Plantation Clubhouse (site 81827). Discrete measurements showed variability across sites, including several elevated values identified as potential outliers during quality control screening.

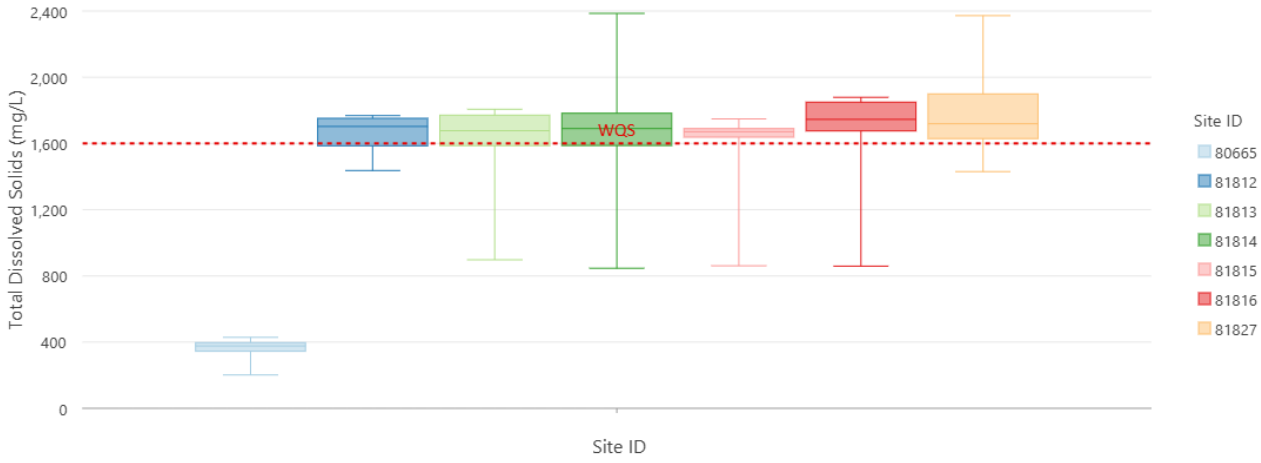

Figure 9. Total Dissolved Solids for sites in the watershed (April 2011 – May 2026). WQS = Water Quality Standard.

Transparency and Total Depth

Secchi disks and/or transparency tubes were used to measure water clarity at monitoring sites within the watershed. The Secchi disk was used at Fall Creek at Langdon Ranch (site 80665), while the transparency tube was used at the remaining sites (Figure 9).

Average transparency measured using the transparency tube ranged from 0.16 m to 0.19 m, with the lowest average observed at Brazos River @ Pecan Plantation Clubhouse (site 81827) and the highest at Brazos River below Lake Granbury at Bellechase Road/Sandy Beach Park (site 81815) (Table 7). Transparency measured using a Secchi disk was only recorded at site 80665, where the average depth was 1.00 m.

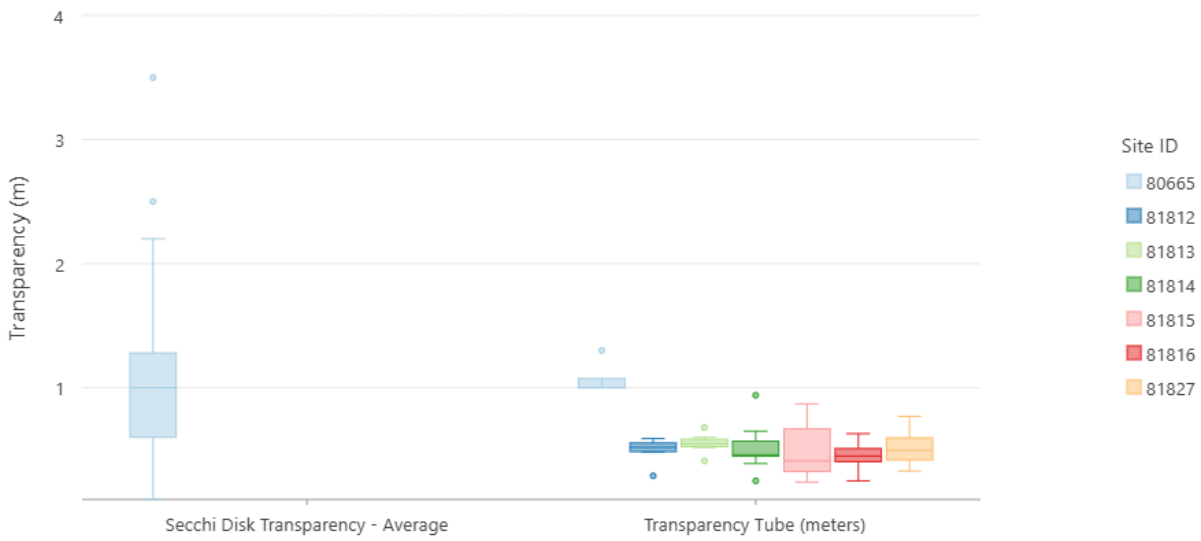

Figure 9. Transparency (Secchi Disk and Transparency Tube) for Texas Stream Team sites in the watershed (April 2011 – May 2026). WQS = Water Quality Standard.

The average total depth at all sites ranged from 0.56 to 1.08 m (Table 7). The smallest average depth (0.56 m) was observed at TCEQ Site 11857 – Brazos River below Lake Granbury near Ravenswood Rd/Headquarters Cir RV park (site 81814), whereas the largest average depth (1.08 m) was observed at Brazos River below Lake Granbury, off Monticello Circle (site 81816).

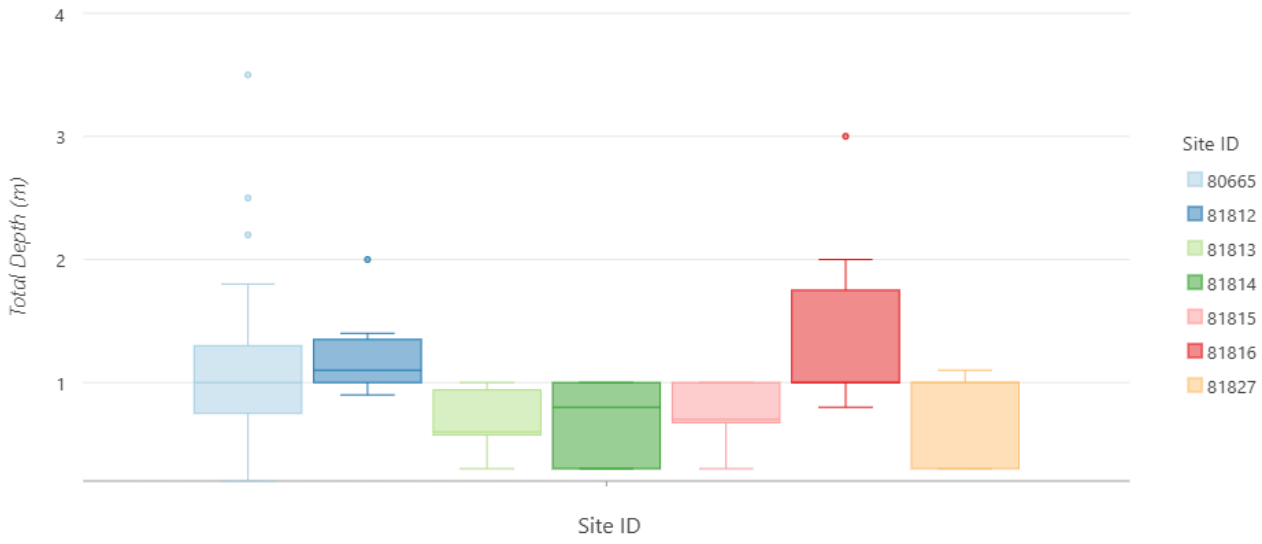

Figure 10. Total Depth for Texas Stream Team sites in the watershed (April 2011 – May 2026). WQS = Water Quality Standard.

E. coli

E. coli data were only available for Fall Creek at Langdon Ranch (site 80665), where the arithmetic mean concentration was 154.99 CFU (Table 7), which does exceed the water quality standard. However, a geometric mean was not calculated due to temporal inconsistency in *E. coli* sampling and limited spatial coverage.

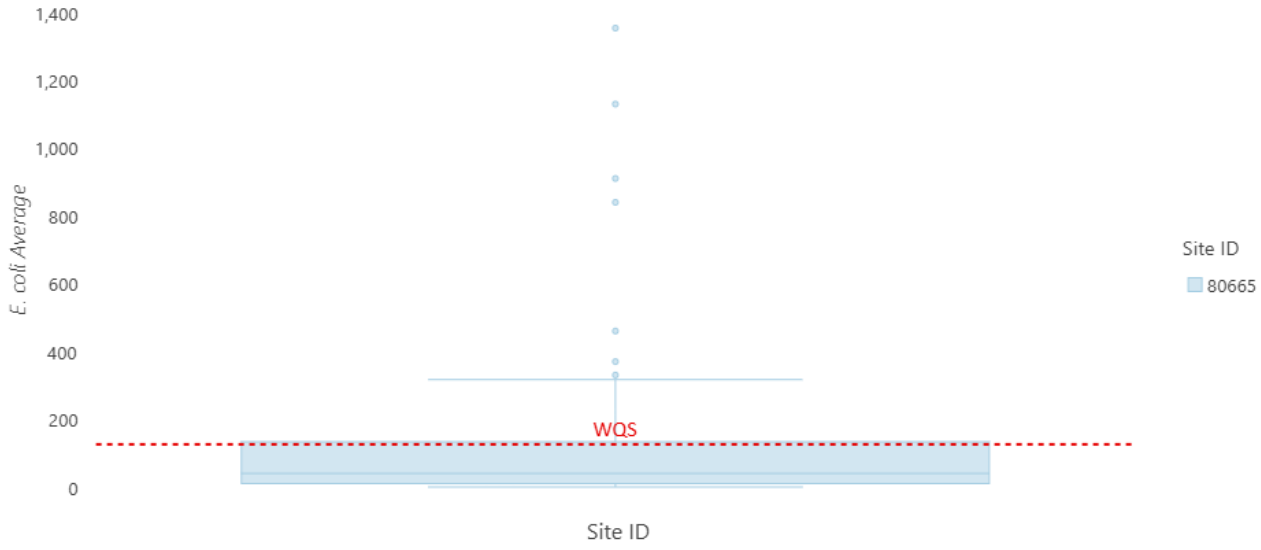

Figure 11. E. coli Average for Texas Stream Team sites in the watershed (April 2011 – May 2026). WQS = Water Quality Standard.

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APPENDIX A

Table 7. Endangered species within the watershed.

Species Type	Common Name	Federal/State Listing
Bird	Whooping crane	State Listed as Endangered
	Interior least tern	State Listed as Endangered
	Golden-cheeked warbler	State Listed as Endangered
Mammal	Tricolored bat	Federally Proposed as Endangered

Table 8. Threatened species within the watershed.

Species Type	Common Name	Federal/State Listing
Bird	White-faced ibis	State Listed as Threatened
	Black rail	State Listed as Threatened
	Piping plover	State Listed as Threatened
	Rufa red knot	State Listed as Threatened
	Yellow-billed cuckoo	State Listed as Threatened
Reptile	Texas horned lizard	State Listed as Threatened
	Brazos water snake	State Listed as Threatened
Mollusk	Brazos heelsplitter	State Listed as Threatened
	Texas fawnsfoot	State Listed as Threatened
Plants	Earth Fruit	State Listed as Threatened