

# GIBBONS CREEK-NAVASOTA RIVER WATERSHED SUMMARY REPORT

September 2025



*Photo Credit: Urvi Joshi*



This report was prepared in cooperation with, and financed through, grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.

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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:

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# 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](mailto:TxStreamTeam@txstate.edu) or at 512.245.1346. Visit our website for more information on our programs at [www.TexasStreamTeam.org](http://www.TexasStreamTeam.org).

## Recognition of Field Contribution

This report owes much to the Brazos Valley Master Naturalists and their partnership with the Texas Stream Team. Through regular sampling across the Gibbons Creek-Navasota River watershed (the watershed), the chapter has built a critical dataset that captures water quality trends and seasonal variability in the region.



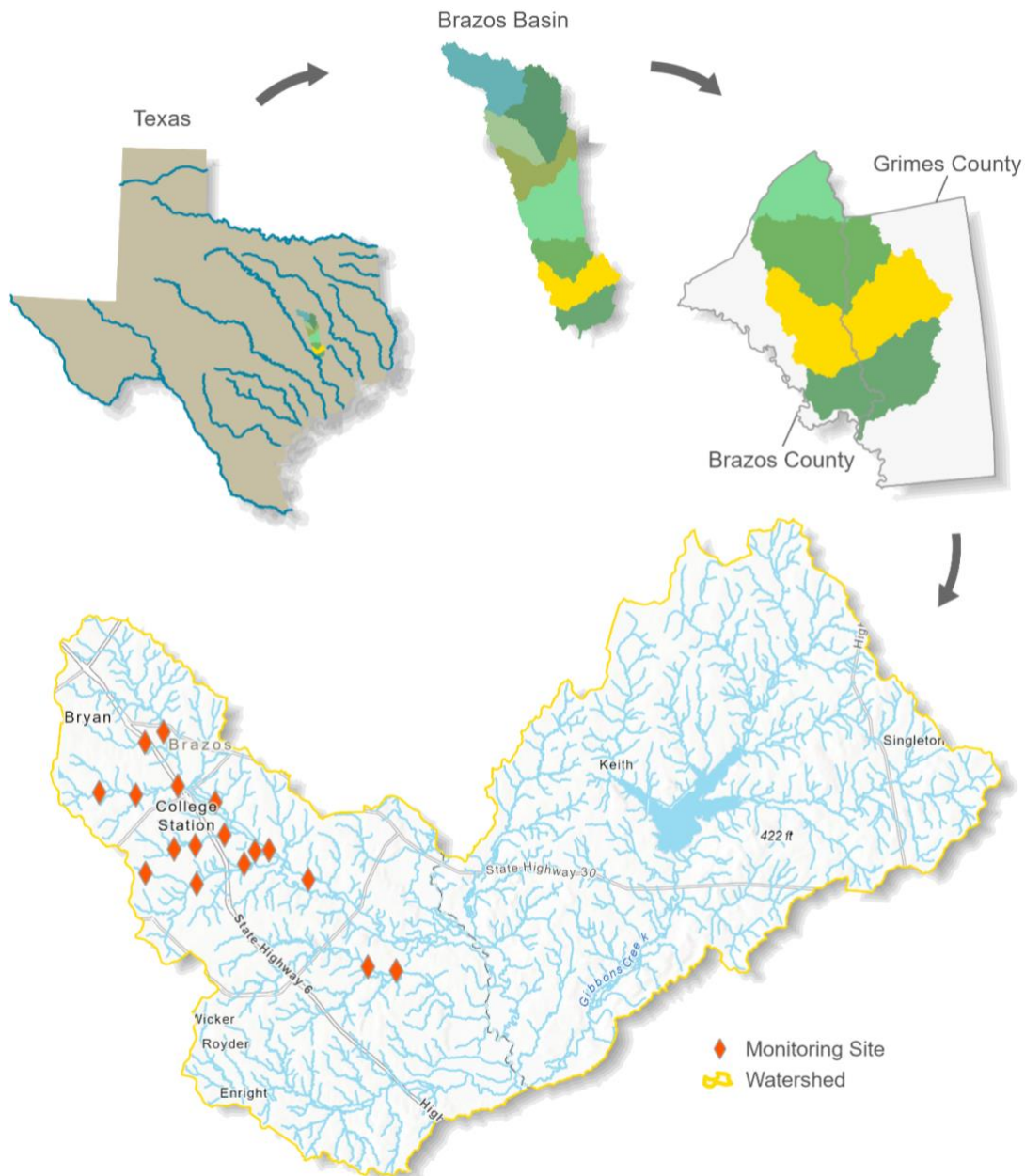
Beyond their fieldwork, members have strengthened community science by mentoring new monitors and raising awareness about watershed health. Their dedication has not only advanced this report but also furthered the broader mission of protecting Texas waterways.

The Texas Stream Team is deeply grateful for their sustained commitment, which continues to provide an invaluable resource for conservation efforts and future watershed management.

## WATERSHED DESCRIPTION

### Location and Physical Description

The watershed lies in east-central Texas spanning Brazos and Grimes counties and encompasses approximately 267.9 square miles. Gibbons Creek rises three miles southwest of Bédias in north-central Grimes County, flows through Gibbons Creek Reservoir, and continues southwest for twenty miles until it reaches the mouth of the Navasota River (Texas State Historical Association, 1995; Texas Water Development Board, n.d.). The Navasota River is a tributary of the Brazos River and serves as a county line boundary for Brazos and Grimes counties (Kleiner, 2019).



*Figure 1. Gibbons Creek Navasota River Watershed in Brazos and Grimes Counties, Texas.*

The watershed is located in Brazos and Grimes counties and is positioned within the Blackland Prairie and Post Oak Savanna ecoregions (Griffith et al., 2007). The physiography in this region is described as having nearly level or sloping plains with predominantly clay and loamy soil (Texas State Historical Association, 1995). The ecoregions within the watershed support a wide range of flora and fauna. The flora in this region historically consists of tall grasses, such as tall dropseed, yellow Indiangrass, big bluestem, and switchgrass, and woody vegetation like post oak, black hickory, elm, sugar hackberry, ash, cottonwood and pecan trees. Additionally, the endangered Navasota Ladies'-Tresses orchid occurs in this region, predominately in Brazos and Grimes counties, along the edges of post oak woodlands in



sandy loams along tributaries of the Brazos and Navasota Rivers (Griffith et al., 2007). The fauna in this region consists of American alligators, bobcats, white-tailed deer, fox squirrels, raccoons, gray foxes, opossums, and feral hogs (Jackson, 2020; Texas Parks and Wildlife Department, n.d.).

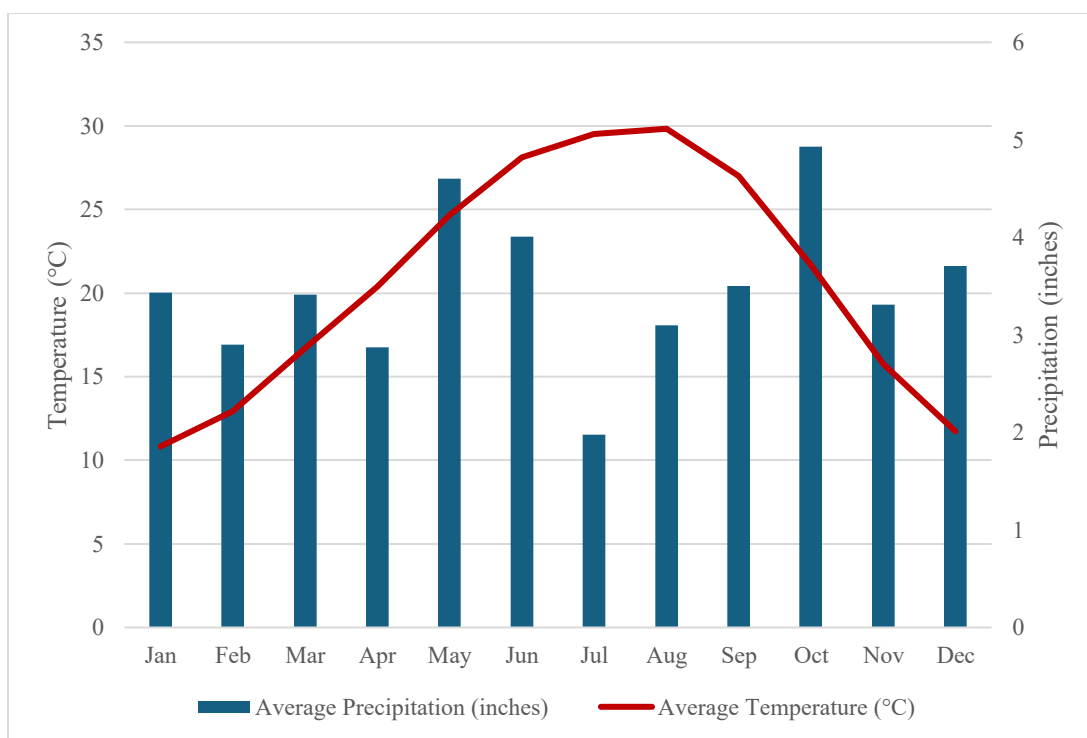
The Texas Commission on Environmental Quality designates classifications for streams, rivers, lakes, and bays throughout Texas, including those within the watershed (Table 1). One classified freshwater stream and five unclassified freshwater streams within the watershed were monitored by Texas Stream Team community scientists and are included in this report. Navasota River Below Lake Limestone (Segment 1209) is a classified freshwater stream and arises from the confluence with the Brazos River in Grimes County to Sterling C. Robertson Dam in Leon/Robertson County. Unclassified freshwater streams, segments 1209C, 1209D, 1209I, and 1209L, are described in Table 1.

*Table 1. Texas Commission on Environmental Quality surface water quality viewer (Texas Commission on Environmental Quality, 2022).*

| <b>Segment Number</b> | <b>Segment Name</b>                 | <b>Segment Description</b>                                                                                                                                      |
|-----------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1209                  | Navasota River Below Lake Limestone | From the confluence with the Brazos River in Grimes County to Sterling C. Robertson Dam in Leon/Robertson County                                                |
| 1209C                 | Carters Creek                       | Perennial stream from the confluence with the Navasota River southeast of College Station in Brazos County upstream to the headwaters 1.6 km upstream on US 190 |
| 1209D                 | Country Club Branch                 | From the confluence with Country Club Lake in Bryan in Brazos County to the dam at Fin Feather Lake in Bryan                                                    |
| 1209F                 | Wolfpen Creek                       | Intermittent stream with perennial pools from the confluence with Carter Creek to near Bizzell Street in College Station                                        |
| 1209I                 | Gibbons Creek                       | From confluence with Navasota River in Grimes County to SH 90 in Grimes County                                                                                  |
| 1209L                 | Burton Creek                        | From the confluence of Carters Creek in College Station upstream to the headwater 0.7 km northeast of Finfeather Lake in Bryan                                  |

## Climate

The climate in this area 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 at a weather station located in Brazos County and acquired from the National Data Center (National Oceanic and Atmospheric Administration, 2021). The average annual precipitation is 41.75 inches and typically occurs year-round (Figure 2). Long-term monthly precipitation shows a multimodal distribution, with peaks occurring in May and October, averaging 4.77 inches of rainfall during these months. The least amount of rainfall (1.98 inches) occurs in July. The warmest and coldest months of the year are August (29.8°C) and January (10.8°C).



*Figure 2. Long-term (1991-2020) monthly average precipitation (inches) and air temperature (°C) from Brazos, County, Texas (National Oceanic and Atmospheric Administration, 2021).*

## History

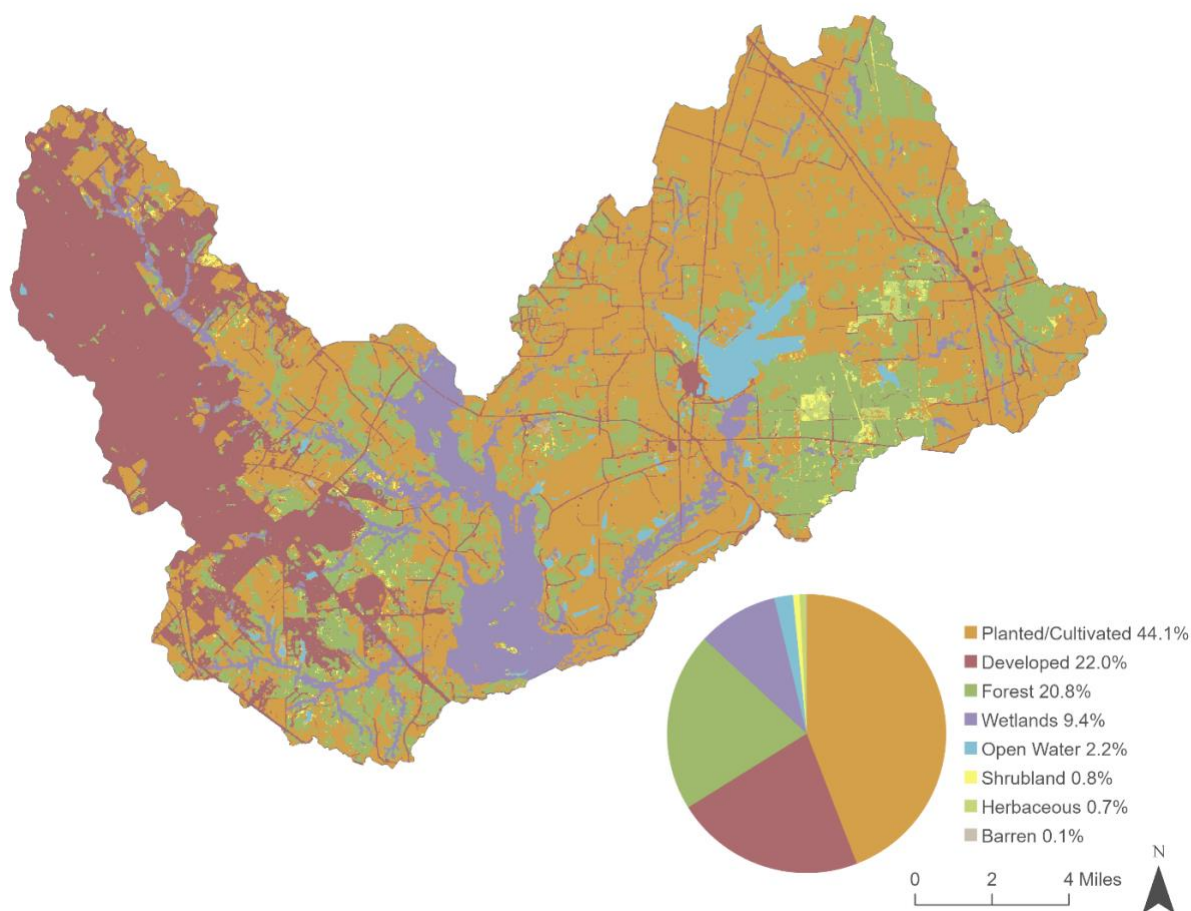
The Bidai and Tonkawa Native Americans were the earliest known inhabitants of this region, stewarding the land until the arrival of Anglo settlers in 1822 (Jackson, 2020; Odintz, 2020; Texas State Historical Association, 1995). Gibbons Creek was originally known as Ben Fort Creek after Benjamin Fort Smith, an early settler in the area who obtained the land grant for the upper portion of the stream. However, the name was later changed to Gibbons Creek to honor William Fitz Gibbons, who established the first settlement in the lower part of the creek in 1822 (Texas State Historical Association, 1995).

In 1860, the Houston and Texas Central Railway was built in the Gibbons Creek area, bringing substantial economic prosperity. This period of growth ultimately influenced the decision to select this area for the proposed Texas A&M College, where the institution officially commenced operations in 1876. The town received its official name of College Station in 1877, when the U.S. Postal Service opened a post office honoring the central train station that served Texas A&M College. College Station experienced steady growth in the decades that followed, but beginning in the 1960s, Texas A&M launched an expansion program that increased population size and development sixfold over the following forty years (Odintz, 2023).

In 1981, the Texas Municipal Power Agency dammed Gibbons Creek to create Gibbons Creek Reservoir. Originally constructed to supply cooling water for a power plant, the reservoir is now solely used for recreation purposes. The reservoir has a storage capacity of 26,171 acre-feet of water with a surface area of 2,576 acres and is located about 20 miles east of College Station (Texas Water Development Board, n.d). Today, College Station relies on leisure and hospitality, education and health services, and transportation sectors for economic stability (U.S. Bureau of Labor Statistics, 2025).

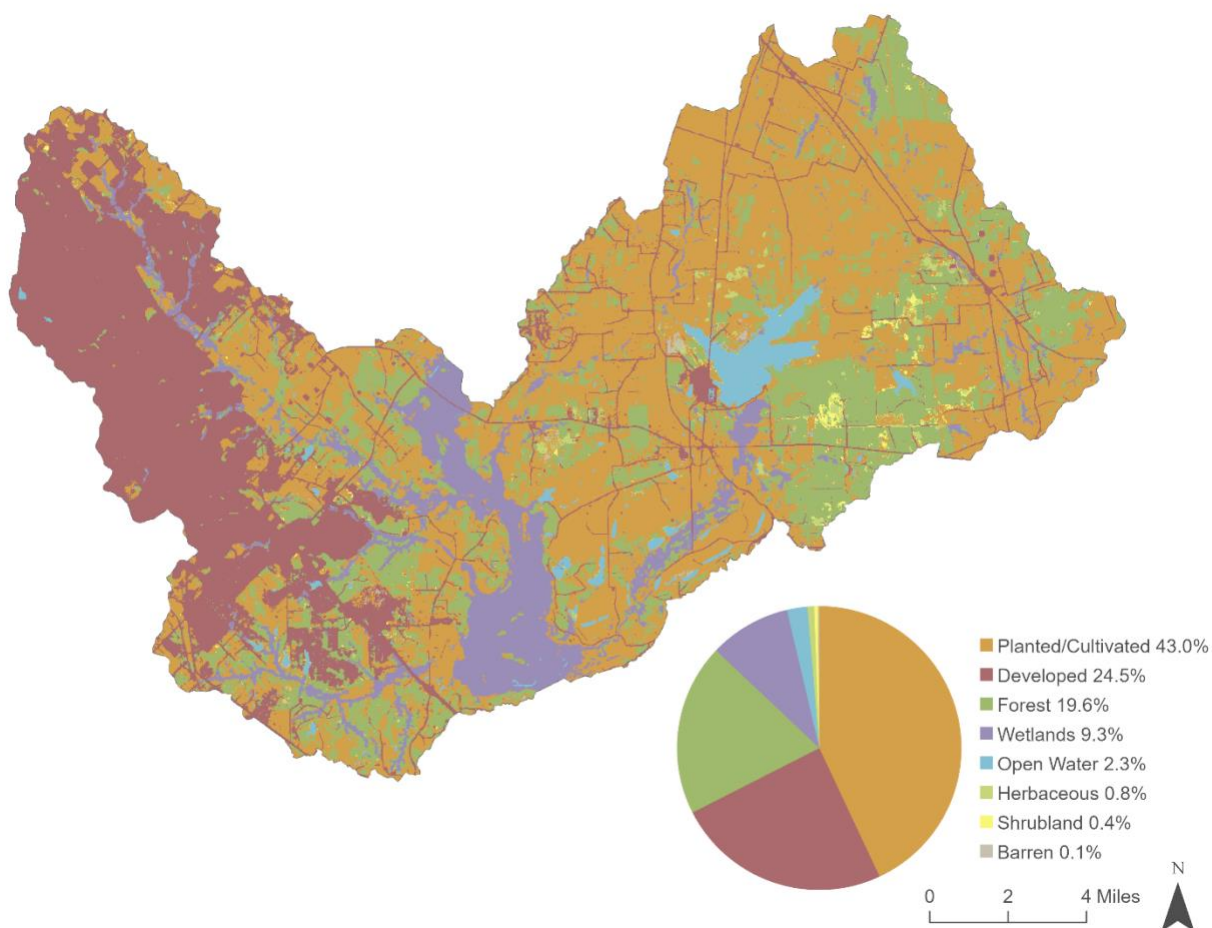
## Land Use

Land cover types were determined from spatial datasets from the National Land Cover Database and processed in Esri ArcGIS Pro for the watershed (Figures 3 and 4).



*Figure 3. 2013 land use and land cover for the watershed in Brazos and Grimes Counties, Texas (National Land Cover Data, 2013).*

In 2013, the majority of the watershed consisted of planted/cultivated land, at 44.1%. Developed land accounted for 22.0% of the watershed, followed by forest cover at 20.8%. Wetlands comprised 9.4% of land cover. The remaining 3.7% of the watershed consisted of open water (2.2%), shrubland (0.8%), herbaceous cover (0.7%), and barren land (0.1%).



*Figure 4. 2024 land use and land cover for the watershed in Brazos and Grimes Counties, Texas (National Land Cover Data, 2024).*

As of 2024, planted/cultivated land remains the dominant land cover type, comprising 43.2% of the watershed, a slight decrease of 0.9% from 2013. Developed land increased to 24.6%, a rise of approximately 2.6% from 2013. Forest and wetlands follow at 19.7% and 9.3%, respectively, each showing a slight decrease of about 1%. The remaining 3.7% of the watershed consists of open water (2.3%), herbaceous cover (0.8%), shrubland (0.4%), and barren land (0.2%). Of these categories, shrubland and barren land saw slight increases, while herbaceous cover and open water remained relatively stable.

*Table 2. Comparison of watershed land use categories by acreage and percentage in 2013 and 2024 (National Land Cover Data, 2013 and 2024).*

| Land Use           | 2013 Acres | 2013 Percentage | 2024 Acres | 2024 Percentage |
|--------------------|------------|-----------------|------------|-----------------|
| Planted/Cultivated | 12265.2    | 44.1%           | 12017.5    | 43.2%           |
| Developed          | 6119.3     | 22%             | 6837.6     | 24.6%           |
| Forest             | 5789.4     | 20.8%           | 5477.4     | 19.7%           |
| Wetlands           | 2619.3     | 9.4%            | 2589.6     | 9.3%            |
| Open Water         | 619.3      | 2.2%            | 639.1      | 2.3%            |
| Shrubland          | 223.2      | 0.8%            | 111.9      | 0.4%            |
| Herbaceous         | 195        | 0.7%            | 222.6      | 0.8%            |
| Barren             | 27.9       | 0.1%            | 55.6       | 0.2%            |

## Endangered Species and Conservation Needs

The common names of 25 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 in Brazos and Grimes counties, Texas.*

| Taxon       | Endangered<br>(Federal or<br>State)<br>LE/E | Threatened<br>(Federal or<br>State)<br>LT/T | G1 or G2<br>(Critically<br>Imperiled/<br>Imperiled) | Species of Greatest<br>Conservation Need<br>(TPWD) (S1 or S2) | Endemic<br>Total Count |
|-------------|---------------------------------------------|---------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------|------------------------|
| Amphibians  | 1                                           | 0                                           | 1                                                   | 1                                                             | 1                      |
| Birds       | 3                                           | 7                                           | 1                                                   | 12                                                            | 0                      |
| Fish        | 2                                           | 3                                           | 1                                                   | 3                                                             | 1                      |
| Mammals     | 1                                           | 1                                           | 0                                                   | 5                                                             | 0                      |
| Reptiles    | 0                                           | 2                                           | 0                                                   | 4                                                             | 0                      |
| Crustaceans | 0                                           | 0                                           | 1                                                   | 0                                                             | 0                      |
| Insects     | 0                                           | 0                                           | 3                                                   | 2                                                             | 1                      |



|              |    |    |    |    |    |
|--------------|----|----|----|----|----|
| Mollusks     | 2  | 2  | 3  | 2  | 3  |
| Plants       | 1  | 1  | 6  | 7  | 9  |
| <b>TOTAL</b> | 10 | 16 | 16 | 36 | 15 |

## 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. The standards are developed to maintain the quality of surface waters in Texas to support public health and protect aquatic life, while being consistent with the state's sustainable economic development. Water quality standards identify appropriate uses for the state's surface waters, including aquatic life, recreation, and sources of public water supply as drinking water.

The criteria for evaluating support of these uses at monitoring sites on tributaries feeding into the Navasota River (Segment 1209), included in this report, are provided in Table 4. Unclassified water bodies are not defined in the state's standards but are associated with a classified water body because they are in the same watershed. The dissolved oxygen criteria are for dissolved oxygen means at any site within the segment; the minimum and maximum values for pH apply to any site within the segment; the total dissolved solids criteria are for total dissolved solids means at any site within the segment; the *E. coli* indicator bacteria for freshwater is a geometric mean; and the temperature criteria are a maximum value at any site within the segment.

*Table 4. State water quality criteria for the watershed in Brazos and Grimes counties, Texas (Texas Commission on Environmental Quality, 2022).*

| Segment                                    | Dissolved Oxygen (mg/L) | pH Range (s.u.) | Total Dissolved Solids (mg/L) | <i>E. coli</i> Bacteria (CFU/100 mL) | Temperature (°C) |
|--------------------------------------------|-------------------------|-----------------|-------------------------------|--------------------------------------|------------------|
| 1209 (Navasota River below Limestone Lake) | 5                       | 6.5 - 9         | 600                           | 126                                  | 33.9             |

## Water Quality Impairments

The 2024 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d) (Integrated Report) includes an Index of Water Quality Impairments (Texas Commission on Environmental Quality, 2024). Table 5 summarizes the water quality impairments and Total Maximum Daily Load status for the watershed stream segments that were monitored by Texas Stream Team community scientists.

*Table 5. Water Quality Impairments and Total Maximum Daily Load Status of the Watershed (Texas Commission on Environmental Quality, 2024).*

| Segment Name                               | Impairment Parameter(s)                                           | Category | TMDL Status                |
|--------------------------------------------|-------------------------------------------------------------------|----------|----------------------------|
| 1209 – Navasota River Below Lake Limestone | Bacteria in water (Recreation Use)                                | 4a       | Approved                   |
| 1209C – Carters Creek                      | Bacteria in water (Recreation Use)                                | 4a       | Approved                   |
| 1209D – Country Club Branch                | Bacteria in water (Recreation Use)                                | 4a       | Approved                   |
| 1209I – Gibbons Creek                      | Bacteria in water (Recreation Use);<br>Depressed dissolved oxygen | 5b, 5r   | Needed / Under Development |
| 1209L – Burton Creek                       | Bacteria in water (Recreation Use)                                | 4a       | Approved                   |

The assessment of volunteer-monitored segments in the Gibbons Creek–Navasota River watershed shows that bacteria impairments in recreational waters are the most common issue. Segments 1209, 1209C, 1209D, and 1209L are all listed under Category 4a, meaning that Total Maximum Daily Loads (TMDLs) have already been developed and approved for these waterbodies. This suggests that bacteria contamination is a persistent concern, but regulatory frameworks are in place for management.

Gibbons Creek (1209I) stands out as the most impaired segment, with both bacteria and low dissolved oxygen (DO) issues. It is listed under Categories 5b and 5r, indicating that these impairments still require TMDL development or additional management actions. This makes Gibbons Creek a priority area for further water quality improvement efforts.

In contrast, Wolf Pen Creek (1209F) does not appear in the 2024 Impairment Index, which suggests that no official impairments have been identified for this segment. This does not necessarily mean the creek is free of issues, but rather that it was not listed as impaired during the 2024 assessment cycle.

Overall, the findings highlight that bacterial contamination is the primary concern in the watershed, and while several streams have approved TMDLs, Gibbons Creek remains a significant challenge for water quality management.

## WATER QUALITY PARAMETERS

The water quality parameters collected by Texas Stream Team community scientists specifically for this watershed are outlined and defined below.

### 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 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.

### Specific Conductance

Specific conductance is a measure of the ability of a body of water to conduct electricity. It is measured in microsiemens per centimeter ( $\mu\text{S}/\text{cm}$ ). 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

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.

## 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 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 COLLECTION, MANAGEMENT, AND ANALYSIS

## 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. Specific conductance 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

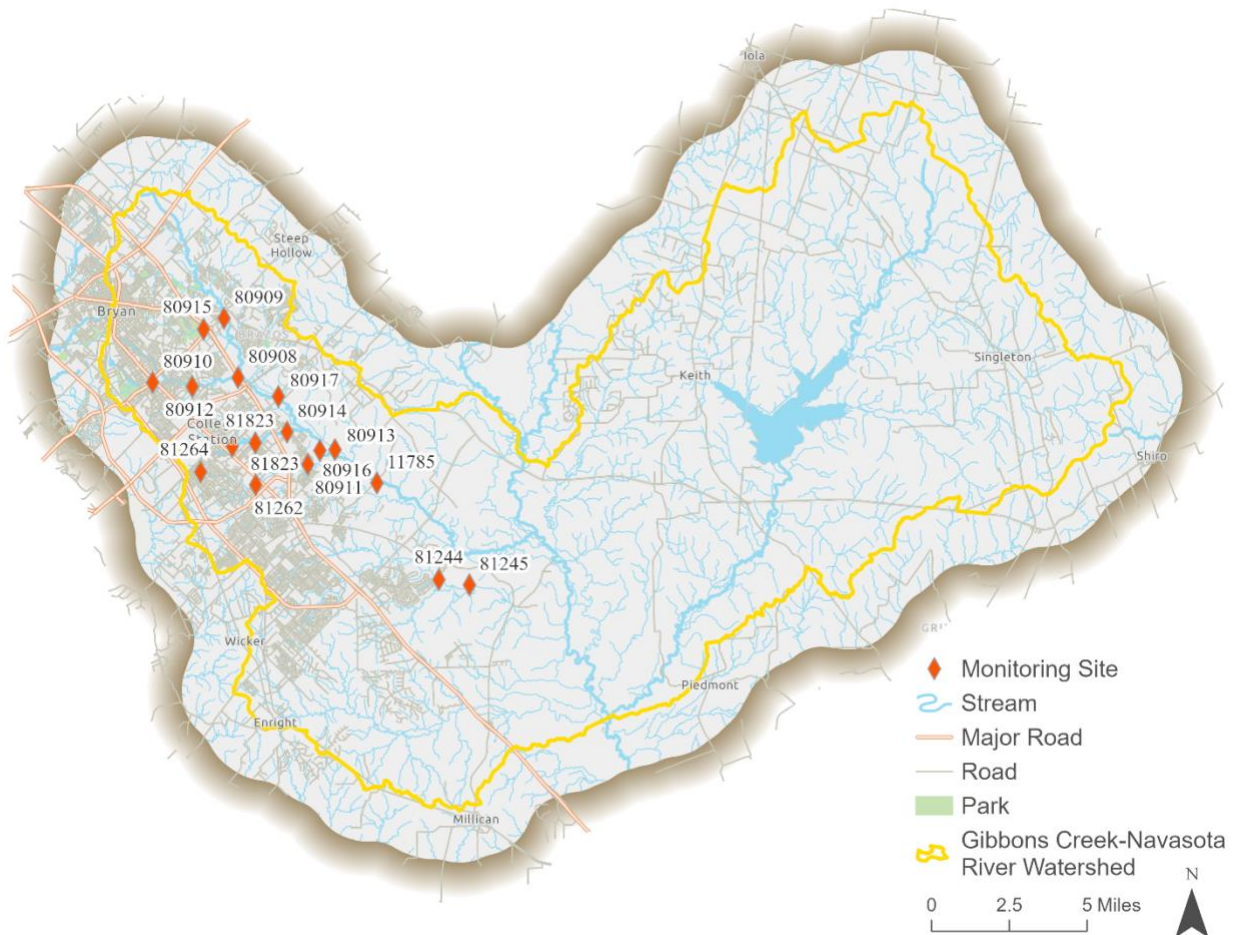
Data were compiled, analyzed, summarized, and compared to state water quality standards and/or criteria to provide readers with a reference point for parameters that may be of concern. The statewide, biennial assessment performed by the Texas Commission on Environmental Quality involves more stringent 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 study watersheds 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, a custom [Water Quality Data Validation App](#) was developed using Python (Streamlit) to automatically identify and correct range violations, outliers, and QA/QC issues across all parameter groups. Validated datasets were then visualized using a custom [Watershed Summary Report Graph Generator App](#), built with Python (Streamlit and Matplotlib), which reproduces the official graphing style used in JMP Pro 14.0.0 (SAS Institute Inc., 2018). This tool automatically generates standardized figures and summary tables based on user-defined water quality standards. Together, these automated tools enhanced data reliability, ensured graphical consistency, and reduced manual processing time.

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 plot 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  $\pm 1.5 \times$  (interquartile range). Outliers are plotted as points outside the box plot.



## DATA RESULTS

Water quality data from 14 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 Brazos and Grimes Counties, Texas.*

The period of record for the monitoring sites in the watershed ranged from February 2013 through July 2025. Many sites were monitored primarily between 2013 and 2015 and then experienced a long gap, while others such as Lick Creek, Bee Creek, and Wolf Pen Creek continued to be monitored through 2024 and 2025. This indicates that more recent monitoring data are concentrated in these sub-watersheds.

A total of 602 monitoring events were conducted across 14 different sites. The number of monitoring events per site ranged from two to 126. Some sites, such as Wolf Pen Creek Tributary (81263) and Lick Creek @ Lick Creek Park, Site 2 (81245), had the highest number of monitoring events (over 100), while Wolf Pen Creek @ Wolf Pen Creek Park, near the intersection of Holleman Dr and Dartmouth St (81823) had the fewest (two).



*Table 6. Texas Stream Team monitoring sites in the watershed.*

| <b>Site ID</b> | <b>Description</b>                                                                          | <b>Number of Events</b> | <b>Period of Record</b> |
|----------------|---------------------------------------------------------------------------------------------|-------------------------|-------------------------|
| 80908          | Burton Creek @ SH6                                                                          | 23                      | Feb 2013 – Feb 2015     |
| 80909          | Carters Creek @ Briarcrest Dr                                                               | 26                      | Feb 2013 – Apr 2024     |
| 80910          | Unnamed Tributary of Burton Creek @ Maloney Ave                                             | 22                      | Feb 2013 – Feb 2015     |
| 80911          | Bee Creek @ Appomattox                                                                      | 25                      | Feb 2013 – Feb 2015     |
| 80913          | Carters Creek Below CCWWTF                                                                  | 23                      | Feb 2013 – Feb 2015     |
| 80914          | Wolf Pen Creek @ Raintree Park                                                              | 24                      | Feb 2013 – Feb 2015     |
| 80916          | Carters Creek Above CCWWTF                                                                  | 24                      | Feb 2013 – Feb 2015     |
| 80917          | Hudson Creek @ SH30/ Harvey Rd                                                              | 23                      | Mar 2013 – Feb 2015     |
| 81244          | Lick Creek @ Lick Creek Park, Site 1                                                        | 36                      | Nov 2016 – Dec 2024     |
| 81245          | Lick Creek @ Lick Creek Park, Site 2                                                        | 105                     | Dec 2017 – Jul 2025     |
| 81262          | Bee Creek near College Station Cemetery                                                     | 98                      | Dec 2016 – Jun 2025     |
| 81263          | Wolf Pen Creek Tributary                                                                    | 126                     | Sep 2017 – Jun 2025     |
| 81264          | Bee Creek at Brison Park                                                                    | 45                      | Dec 2016 – Sep 2024     |
| 81823          | Wolf Pen Creek @ Wolf Pen Creek Park, near the intersection of Holleman Dr and Dartmouth St | 2                       | Oct 2024 – Dec 2024     |
| <b>Total</b>   |                                                                                             | <b>602</b>              |                         |

## 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, therefore, site 81823 was excluded from the analysis due to having only two sampling events. Additionally, any records not meeting Texas Stream Team quality control parameters were removed prior to analysis. Community scientists monitored all sites for standard core parameters, including air temperature, water temperature, conductivity (with total dissolved solids calculated from conductance values), dissolved oxygen, pH, transparency tube, and total depth. Secchi disk measurements were excluded from the summary because no site had at least 10 valid readings, whereas transparency tube data were consistently available across all locations. In total, 422 monitoring events were retained for analysis, spanning the period from February 2013 to July 2025.

Table 7. Texas Stream Team data summary for sites in the watershed (June 2013 to April 2025).

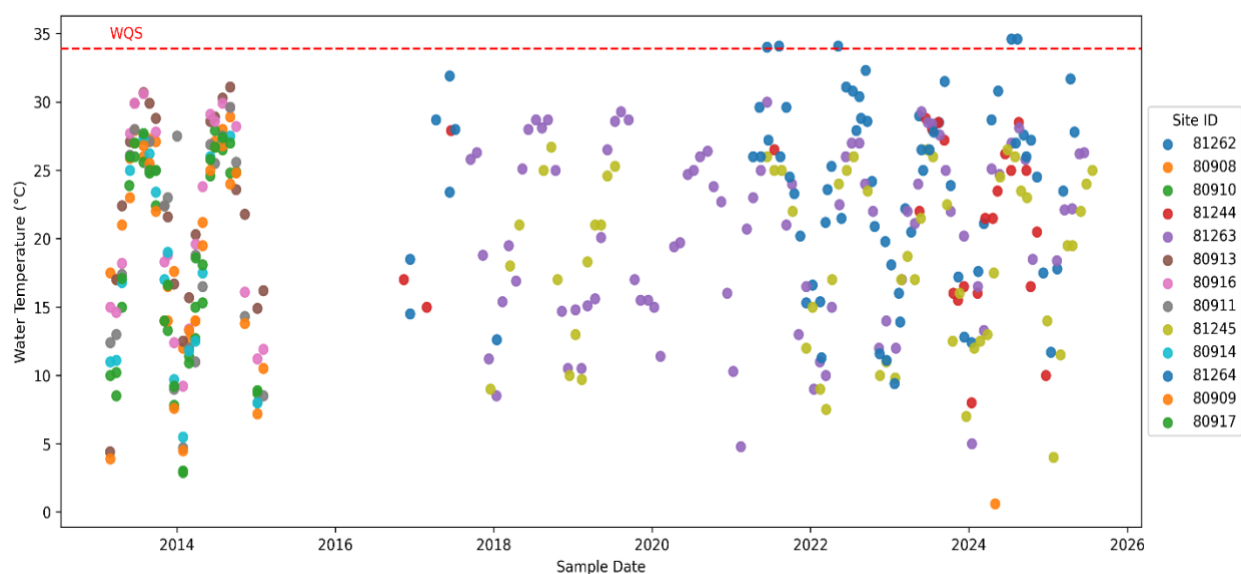
| Parameter                     | Statistic | 81262  | 80908   | 80910  | 81244  | 81263   | 80913   | 80916   | 80911  | 81245  | 80914   | 81264   | 80909  | 80917  |
|-------------------------------|-----------|--------|---------|--------|--------|---------|---------|---------|--------|--------|---------|---------|--------|--------|
| Air Temperature (°C)          | Mean      | 26.38  | 17.56   | 17.38  | 18.3   | 19.88   | 23.3    | 22.59   | 20.82  | 19.82  | 18.79   | 22.79   | 17.07  | 21.46  |
|                               | Std Dev   | 7.4    | 7.88    | 8.14   | 7.78   | 8.95    | 8.87    | 9.12    | 9.07   | 6.28   | 7.8     | 7.54    | 8.37   | 8.45   |
|                               | Range     | 24.3   | 24.7    | 23.8   | 30     | 36      | 27      | 27.2    | 28.5   | 26     | 23      | 28      | 26.3   | 27.5   |
| Water Temperature (°C)        | Mean      | 24.33  | 21.44   | 17.85  | 21.3   | 20.49   | 22.49   | 21.27   | 19.49  | 18.42  | 18.8    | 22.52   | 17.02  | 18.96  |
|                               | Std Dev   | 6.92   | 6.01    | 7.99   | 6.14   | 6.47    | 7.21    | 7.35    | 7.88   | 6.36   | 7.63    | 6.41    | 8.66   | 7.78   |
|                               | Range     | 22.9   | 16.9    | 25     | 20.8   | 25.2    | 26.7    | 21.4    | 24.9   | 22.7   | 22      | 19.4    | 26.4   | 24.7   |
| Dissolved Oxygen (mg/L)       | Mean      | 8.69   | 6.43    | 8.2    | 6.24   | 6.69    | 8.6     | 9.29    | 7.65   | 6.91   | 7.83    | 7.62    | 7.38   | 9.24   |
|                               | Std Dev   | 2.01   | 1.36    | 3.25   | 0.72   | 1.35    | 1.53    | 2.21    | 1.88   | 1.52   | 1.98    | 2.49    | 1.48   | 3.23   |
|                               | Range     | 8.8    | 4.1     | 6.5    | 2.6    | 5.4     | 6.2     | 8       | 6.5    | 4.9    | 6.8     | 9       | 4.3    | 8.6    |
| pH (standard units)           | Mean      | 8.2    | 7.08    | 7.2    | 7.32   | 7.7     | 8.12    | 8.27    | 7.35   | 6.91   | 7.52    | 8.2     | 7.13   | 7.2    |
|                               | Std Dev   | 0.56   | 0.15    | 0.24   | 0.32   | 0.72    | 0.32    | 0.38    | 0.42   | 0.23   | 0.42    | 0.43    | 0.27   | 0.27   |
|                               | Range     | 2      | 0.6     | 0.7    | 1      | 2.1     | 1.4     | 1.3     | 1.3    | 1.2    | 1.5     | 1.6     | 1.1    | 0.9    |
| Conductivity (µS/cm)          | Mean      | 939.48 | 1102.63 | 714.25 | 665.29 | 2006.63 | 1067.09 | 1095.08 | 882.72 | 476.23 | 1184.75 | 1221.92 | 411.21 | 641.58 |
|                               | Std Dev   | 362.62 | 375.41  | 274.3  | 228.18 | 883.99  | 278.12  | 267.1   | 266.1  | 208.66 | 562.39  | 361.56  | 142.22 | 207.54 |
|                               | Range     | 1720   | 1260    | 880    | 1020   | 3380    | 1697    | 1260    | 840    | 930    | 2685    | 1890    | 616    | 802    |
| Transparency Tube (m)         | Mean      | 0.56   | 0.72    | 0.69   | 0.54   | 0.82    | 0.55    | 0.47    | 0.4    | 0.36   | 0.3     | 0.39    | 0.39   | 0.24   |
|                               | Std Dev   | 0.27   | 0.24    | 0.32   | 0.25   | 0.32    | 0.25    | 0.23    | 0.2    | 0.19   | 0.22    | 0.26    | 0.15   | 0.15   |
|                               | Range     | 1.17   | 1.12    | 0.95   | 0.94   | 1.06    | 0.91    | 0.82    | 0.84   | 0.86   | 0.81    | 0.82    | 0.67   | 0.65   |
| Total Depth (m)               | Mean      | 0.44   | 0.23    | 0.19   | 0.64   | 0.13    | 0.44    | 0.88    | 0.26   | 0.39   | 0.31    | 0.2     | 0.59   | 0.16   |
|                               | Std Dev   | 0.08   | 0.34    | 0.15   | 0.14   | 0.04    | 0.26    | 0.28    | 0.23   | 0.16   | 0.23    | 0.1     | 0.26   | 0.09   |
|                               | Range     | 0.48   | 1.43    | 0.7    | 0.43   | 0.19    | 0.85    | 0.6     | 0.97   | 0.95   | 0.92    | 0.41    | 1.16   | 0.36   |
| Total Dissolved Solids (mg/L) | Mean      | 610.66 | 716.71  | 464.26 | 432.44 | 1304.31 | 693.61  | 711.8   | 573.77 | 309.55 | 770.09  | 794.25  | 267.29 | 417.03 |
|                               | Std Dev   | 235.7  | 244.02  | 178.29 | 148.31 | 574.59  | 180.78  | 173.62  | 172.96 | 135.63 | 365.55  | 235.01  | 92.44  | 134.9  |
|                               | Range     | 1118   | 819     | 572    | 663    | 2197    | 1103.05 | 819     | 546    | 604.5  | 1745.25 | 1228.5  | 400.4  | 521.3  |

## Air and Water Temperature

Average air temperatures across all sites ranged from 17.07°C to 26.38°C. The lowest average (17.07°C) occurred at Carters Creek at Briarcrest Drive (80909), whereas the highest (26.38°C) was recorded at Bee Creek near College Station Cemetery (81262).

Average water temperatures ranged from 17.02°C to 24.33°C, with the lowest value (17.02°C) observed at Carters Creek at Briarcrest Drive (80909) and the highest (24.33°C) at Bee Creek near College Station Cemetery (81262) (Table 7). Average water temperatures remained below the state water quality standard of 33.9°C. However, discrete water temperature measurements ranged from 0.6°C to 34.6°C, with five exceedances above the state standard recorded at a single site—Bee Creek near College Station Cemetery (81262) (Figure 6). This represents 8% of monitored sites and approximately 1.2% of all discrete observations.

Seasonal variation was evident, with elevated temperatures during summer and lower values during winter across the dataset, indicating natural climatic influence rather than widespread thermal exceedance concerns.



*Figure 6. Water Temperature for Texas Stream Team sites in the Gibbons Creek–Navasota River watershed (February 2013 through April 2025). WQS = Water Quality Standard.*

## Total Dissolved Solids

Average total dissolved solids concentrations across all sites ranged from 267 mg/L to 1,304 mg/L. The lowest average (267 mg/L) occurred at Carters Creek at Briarcrest Drive (80909), whereas the highest (1,304 mg/L) was recorded at Wolf Pen Creek Tributary (81263) (Table 7). Average total dissolved solids concentrations exceeded the state water quality standard of 600 mg/L at seven sites, including Burton Creek @ SH 6 (80908), Carters Creek below CCWWTF (80913), Wolf Pen Creek @ Raintree Park (80914), Carters Creek above CCWWTF (80916), Bee Creek near College Station Cemetery (81262), Wolf Pen

Creek Tributary (81263), and Bee Creek at Brison Park (81264) (Figure 7). Discrete exceedances occurred at 12 of 13 monitored sites (92%), with 239 of 415 measurements (58%) above the threshold. The only site consistently below the standard was Carters Creek at Briarcrest Drive (80909). These results indicate that elevated dissolved solids are a persistent concern across much of the watershed.

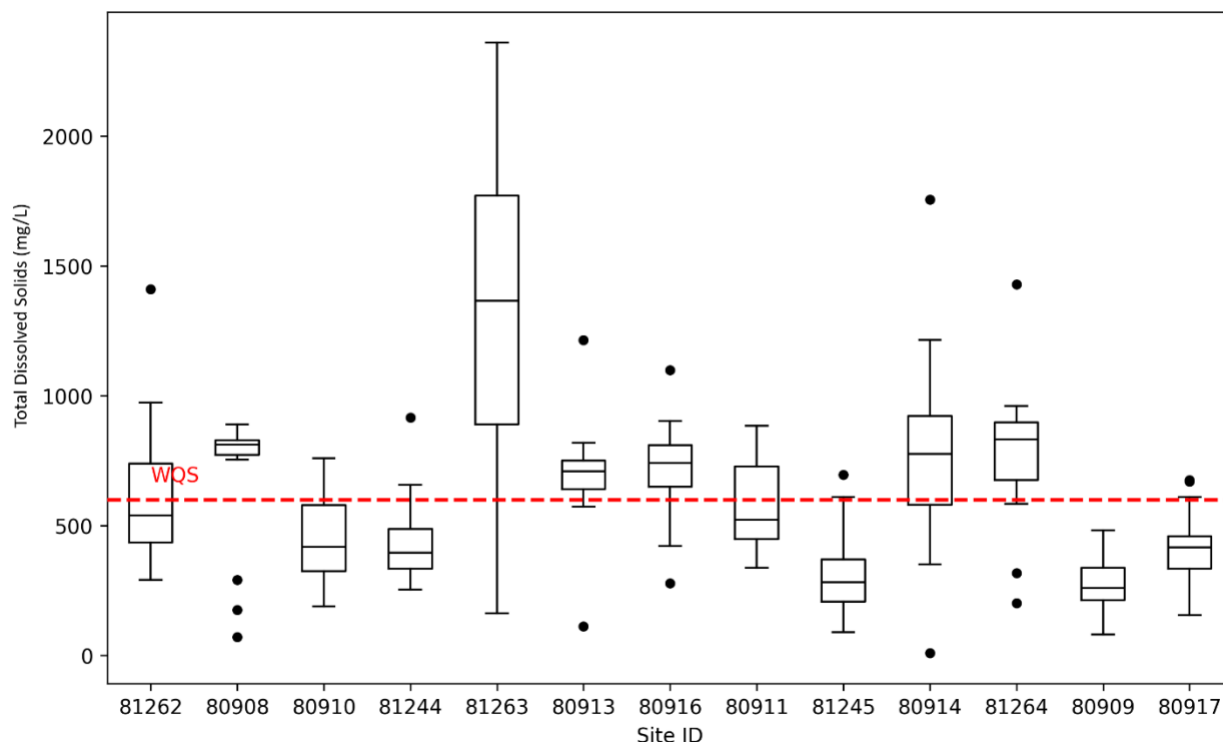


Figure 7. Total Dissolved Solids for sites in the Gibbons Creek–Navasota River watershed (2013 through 2025). WQS = Water Quality Standard.

## Dissolved Oxygen

Across monitoring sites, average dissolved oxygen concentrations ranged from 6.2 mg/L to 9.3 mg/L (Table 7). The lowest average (6.2 mg/L) occurred at Lick Creek at Lick Creek Park – Site 1 (81244) whereas the highest average (9.3 mg/L) occurred at Carters Creek above CCWWTF (80916) (Table 7). All site averages met or exceeded the water quality standard of 5.0 mg/L. Discrete measurements were also largely compliant with the standard: no values fell below 5.0 mg/L, and only seven readings (representing 3% of total measurements) were recorded exactly at the threshold at five of the 13 sites (38%): Unnamed Tributary of Burton Creek @ Maloney Ave (80910), Wolf Pen Creek @ Raintree Park (80914), Hudson Creek @ SH30/Harvey Rd. (80917), Wolf Pen creek Tributary (81263), and Bee Creek at Brison Park (site 81264) (Figure 8). Overall, dissolved oxygen levels generally remained within healthy ranges for aquatic life across the monitored sites, indicating stable oxygen conditions throughout the study period.

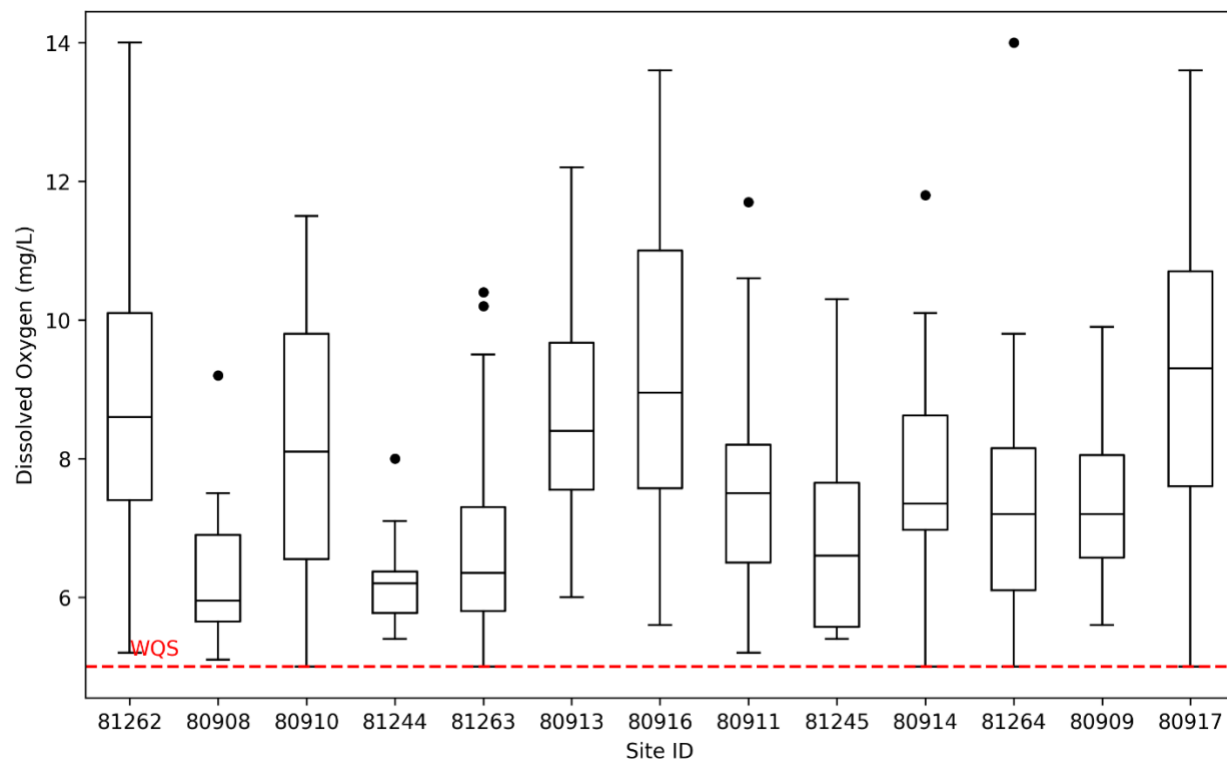


Figure 8. Dissolved Oxygen for sites in the Gibbons Creek–Navasota River watershed (2013 through 2025). WQS = Water Quality Standard.

## pH

Across monitoring sites, average pH values ranged from 6.9 to 8.3 standard units (s.u.) (Table 7), remaining comfortably within the state water quality standard range of 6.5–9.0 s.u. (Figure 9). The lowest average (6.9 s.u.) was recorded at Lick Creek at Lick Creek Park – Site 2 (81245), while the highest average (8.3 s.u.) occurred at Carters Creek above CCWWTF (80916). Additionally, all discrete measurements remained within the state water quality standard. All sites consistently met the state criterion, indicating stable and well-buffered conditions across the watershed during the monitoring period.



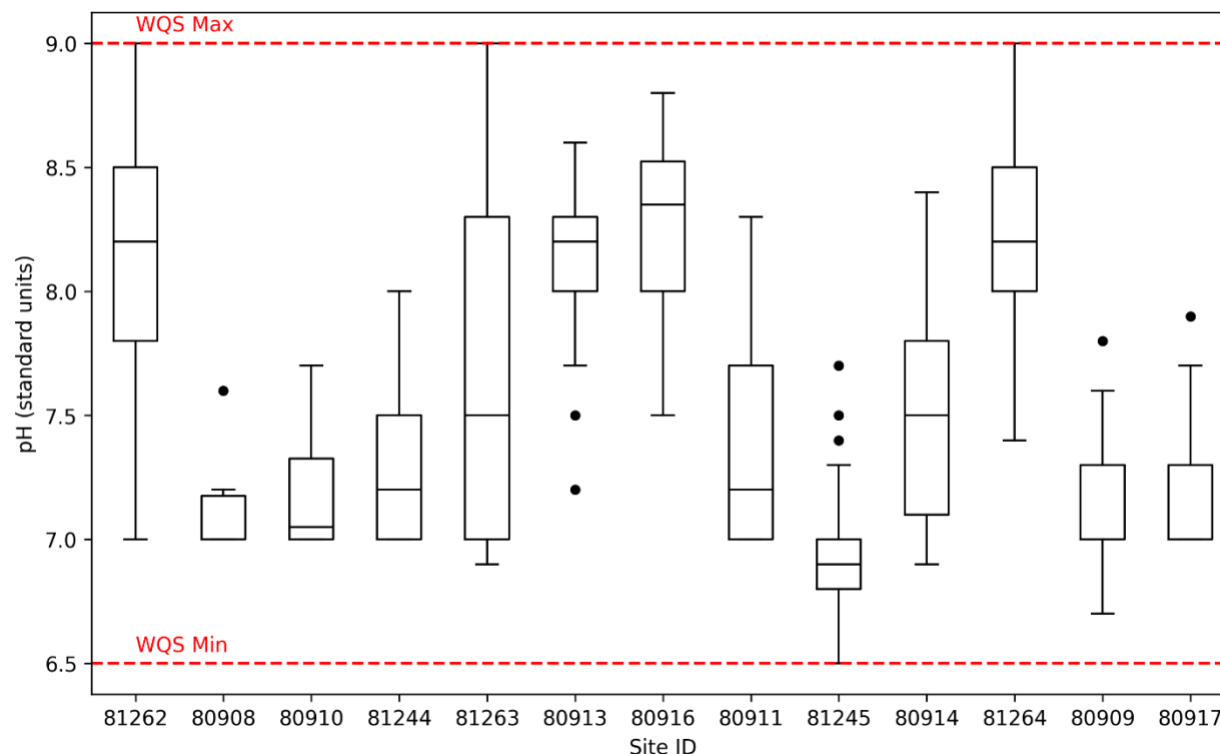
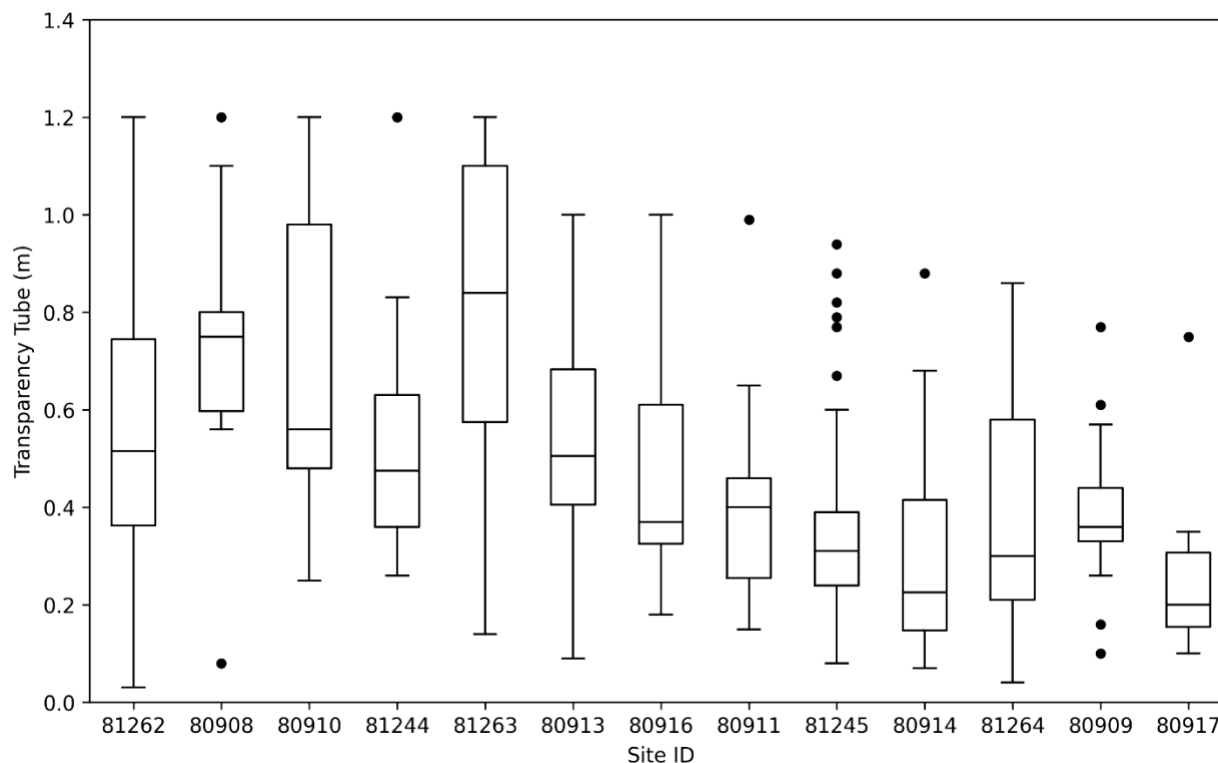


Figure 9. pH for Texas Stream Team sites in the Gibbons Creek–Navasota River watershed (2013 through 2025). WQS Max = Maximum Water Quality Standard; WQS Min = Minimum Water Quality Standard.

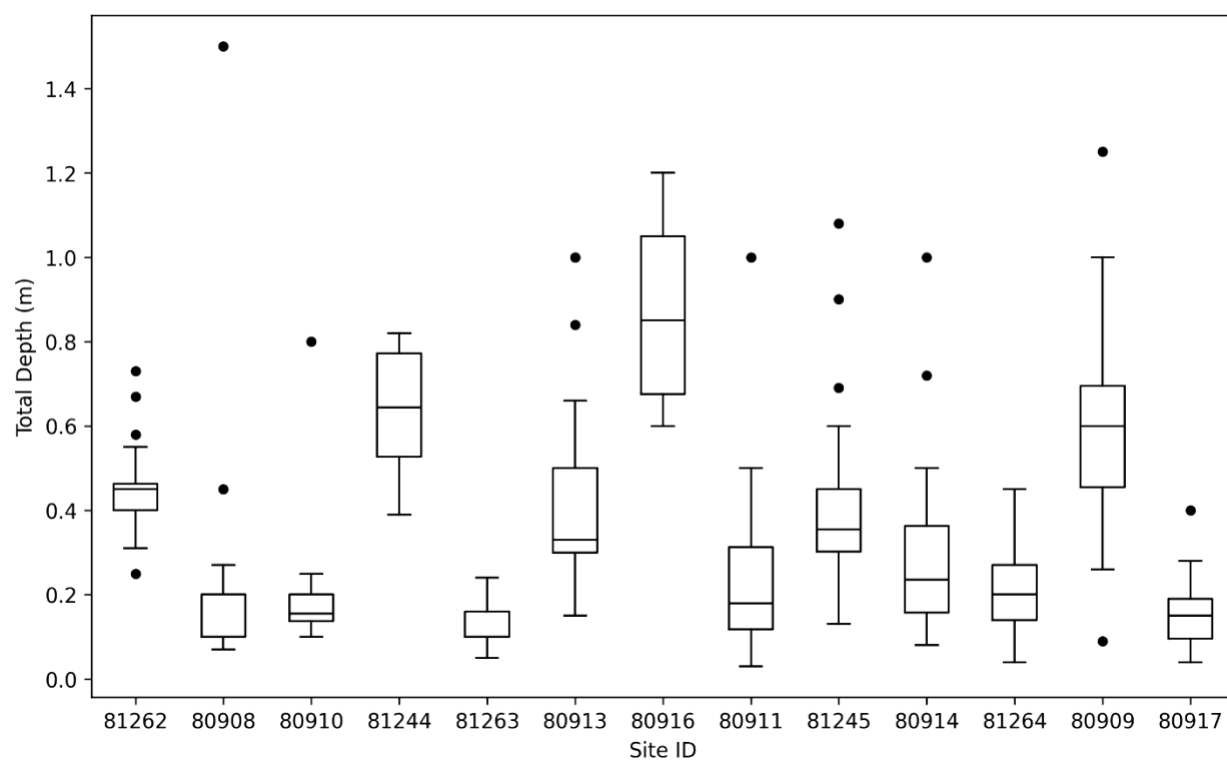
### Transparency and Total Depth

Across monitoring sites, water clarity was measured using transparency tubes, providing a direct indicator of transparency across the watershed. Site averages ranged from 0.24 m at Hudson Creek @ SH 30/Harvey Road (80917) to 0.82 m at Wolf Pen Creek Tributary (81263) (Table 7 and Figure 10). Following quality control screening, values greater than 1.2 m (the maximum measurable length of the transparency tube) were excluded to remove potential data entry errors and ensure data integrity.



*Figure 10. Transparency for Texas Stream Team sites in the Gibbons Creek–Navasota River watershed (2013 through 2025).*

Across monitoring sites, average total depth ranged from 0.13 m to 0.88 m. The lowest average depth (0.13 m) was observed at Wolf Pen Creek Tributary (81263) whereas the highest average depth (0.88 m) was observed at Carters Creek above CCWWTF (80916) (Table 7). Occasional high-water events produced isolated deeper measurements (approaching 1.5 m), but long-term averages remained within this observed range (Figure 11). These results indicate that most monitored sites typically maintained shallow flow conditions, with only temporary increases in depth during storm events.



*Figure 11. Total depth for Texas Stream Team sites in the Gibbons Creek–Navasota River watershed (2013 through 2025).*

## WATERSHED SUMMARY

As of 2024, the Gibbons Creek–Navasota River watershed (the watershed) is dominated by planted/cultivated land, comprising 43.2% of the area, a slight decrease of 0.9% from 2013. Developed land increased to 24.6%, a rise of approximately 2.6% from 2013. Forest and wetlands follow at 19.7% and 9.3%, respectively, each showing a slight decrease of about 1%. The remainder of the watershed consists of open water (2.3%), herbaceous cover (0.8%), shrubland (0.4%), and barren land (0.2%). Of these categories, shrubland and barren land saw slight increases, while herbaceous cover and open water remained relatively stable.

From February 2013 through July 2025, trained Brazos Valley Master Naturalist Texas Stream Team community scientists conducted 602 total monitoring events across 14 different sites in the watershed. Thirteen sites with 10 or more valid sampling events (after quality-control screening) were included in the core water-quality analysis. Standard parameters measured at each site included: air and water temperature, specific conductance (with total dissolved solids calculated), dissolved oxygen, pH, transparency tube depth, and total depth. All sites were monitored by Texas Stream Team-trained community scientists.

According to the 2024 Integrated Report of Surface Water Quality (Texas Commission on Environmental Quality, 2024), multiple segments of the watershed (Segment 1209 and its unclassified tributaries) are listed with impairments, primarily for bacteria and, in some tributaries, low dissolved oxygen. Water quality standards for designated uses were compared to the monitoring results to evaluate overall conditions. Key findings include:

- Water Temperature: Discrete exceedances of the 33.9°C standard occurred five times at site 81262 (Bee Creek near College Station Cemetery).
- Total Dissolved Solids: Seven sites had mean values exceeding the 600 mg/L water quality standard (80908, 80913, 80914, 80916, 81262, 81263, and 81264). Discrete exceedances occurred at 12 of the 13 sites (92%), accounting for 239 of 415 measurements.
- Dissolved Oxygen: All discrete and mean values were above the 5.0 mg/L standard, with only a handful of readings at the threshold.
- pH: All discrete and average values fell within the 6.5–9.0 s.u., water quality standard.

Although most water quality measures met the water quality standards, consistently high levels of total dissolved solids point to challenges that require community and management attention. We recommend prioritizing action at sites with repeated exceedances. Increasing sampling during hot summer months and after major rain events will provide a clearer picture of when and where problems occur. Adding monitoring for *E. coli* bacteria and nutrients will also help capture risks to public health and ecosystem balance that are not reflected in the current data. Especially with the area being listed for bacteria impairment. By involving community scientists in these expanded efforts and maintaining long-term tracking across all sites, decision makers can better identify pollution sources, protect local waterways, and adapt strategies to impacts in the area.

This report would not have been possible without the sustained efforts of the Brazos Valley Master Naturalist Texas Stream Team group. These dedicated volunteers have conducted over 600 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](mailto:TxStreamTeam@txstate.edu) or visit our events calendar at [www.TexasStreamTeam.org](http://www.TexasStreamTeam.org).

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## APPENDIX A

*Table 8. Endangered species located within the Gibbons Creek- Navasota River watershed in Brazos and Grimes counties, Texas.*

| Species Type | Common Name              | Federal/State Listing            |
|--------------|--------------------------|----------------------------------|
| Amphibian    | Houston toad             | State Listed as Endangered       |
| Bird         | Whooping crane           | State Listed as Endangered       |
|              | Red-cockaded woodpecker  | State Listed as Endangered       |
| Fish         | Smalleye shiner          | State Listed as Endangered       |
| Mammal       | Tricolored bat           | Federally Proposed as Endangered |
| Mollusk      | Balcones spike           | State Listed as Endangered       |
|              | False spike              | State Listed as Endangered       |
| Plant        | Navasota ladies'-tresses | State Listed as Endangered       |

*Table 9. Threatened species within the Gibbons Creek Navasota River watershed in Brazos and Grimes counties, Texas.*

| Species Type | Common Name                | Federal/State Listing                                        |
|--------------|----------------------------|--------------------------------------------------------------|
| Bird         | White-faced ibis           | State Listed as Threatened                                   |
|              | Wood stork                 | State Listed as Threatened                                   |
|              | Swallow-tailed kite        | 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                                   |
|              | Red-cockaded woodpecker    | Federally Proposed as Threatened                             |
| Fish         | Paddlefish                 | State Listed as Threatened                                   |
|              | Chub shiner                | State Listed as Threatened                                   |
|              | Western creek chubshiner   | State Listed as Threatened                                   |
| Mammal       | Rafinesque's big-eared bat | State Listed as Threatened                                   |
| Reptile      | Alligator snapping turtle  | Federally Proposed as Threatened, State Listed as Threatened |
|              | Texas horned lizard        | State Listed as Threatened                                   |
| Mollusk      | Brazos heelsplitter        | State Listed as Threatened                                   |
|              | Texas fawnsfoot            | State Listed as Threatened                                   |
| Plants       | Small-headed pipewort      | State Listed as Threatened                                   |