PECAN CREEK- LAKE LEWISVILLE WATERSHED SUMMARY REPORT

July 2025

Photo Credit: Jeff DeJong

United States Environmental Protection Agency

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

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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. Community scientist water quality monitoring occurs at predetermined monitoring sites, at roughly the same time of day each month. The information that Texas Stream Team citizen 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. 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 is not used by the state to assess whether water bodies are meeting the designated surface water quality standards. 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 citizens 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 Program Volunteer Water Quality Monitoring Program 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. 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 Contribution

This report would not have been possible without the sustained efforts of the City of Denton Texas Stream Team monitoring group. Since its founding in 2007—when local trainers first began leading water quality trainings for the Pecan Creek–Lake Lewisville watershed (the watershed)—the group's community scientists have provided the essential data underpinning every analysis in this document.

After a brief hiatus, the Denton team revived its activities in 2019 and has, ever since, maintained continuous monitoring at more than a dozen sites throughout the watershed. With over a dozen active volunteers conducting regular sampling events, the group has vastly expanded both the geographic reach and temporal depth of water quality observations in the region.

Their dedication has yielded critical insights into seasonal variability in the watershed. The Texas Stream Team is deeply grateful for their commitment—not only has it made this report possible, but it has also advanced our shared mission of safeguarding Texas waterways. The data they have collected remain an indispensable resource, guiding ongoing conservation efforts and informing policy decisions for years to come.

WATERSHED DESCRIPTION

Location and Climate

The watershed is located in Denton County and spans approximately 69 square miles. The Elm Fork of the Trinity River flows through the east central part of Denton County. The demand for water due to agriculture needs resulted in the damming of Elm Fork in the 1920s, forming Lake Dallas. However, Lake Dallas has since been joined with Garza-Little Elm Reservoir to form Lewisville Lake. Several major creeks flow through the western part of the county. Cleer Creek drains into the Elm Fork and Hickory Creek into Lewisville Lake. Additionally, Denton Creek and its tributaries are water sources for Grapevine Lake, which is situated partially in Denton County and Tarrant County (Odom, 2019).

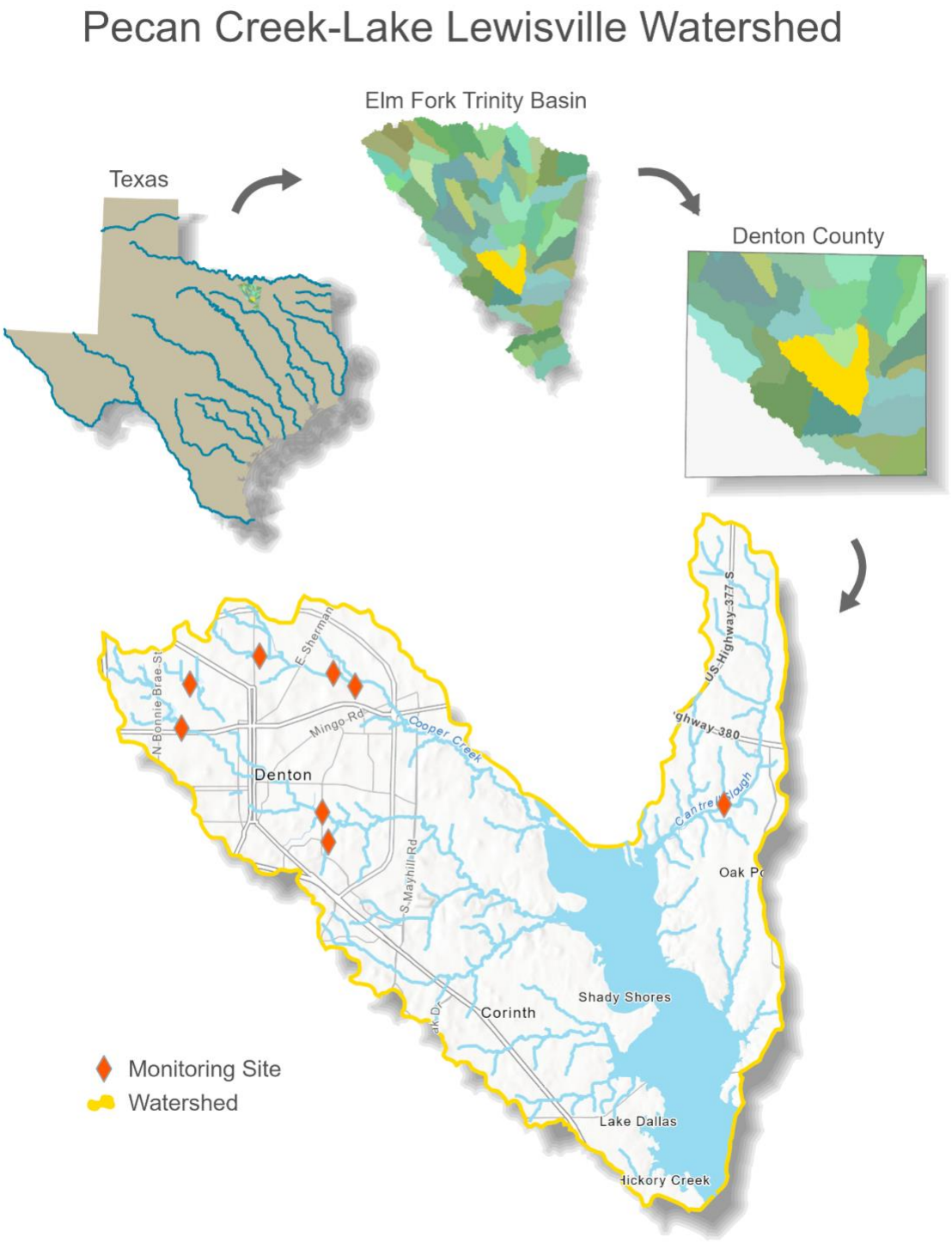

Figure 1. Pecan Creek-Lake Lewisville Watershed in Denton County, Texas.

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 within the watershed was monitored by Texas Stream Team community scientists and is included in this summary report. Lewisville Lake (Segment 0823) is a classified freshwater stream and arises from Lewisville Dam in Denton County to a point 200 meters (220 yards) upstream of FM 428 in Denton County, up to the normal pool elevation of 522 feet (impounds Elm Fork Trinity River).

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

Segment Number	**Segment Name**	**Segment Description**
0823	Lewisville Lake	From Lewisville Dam in Denton County to a point 200 meters (220 yards) upstream of FM 428 in Denton County, up to the normal pool elevation of 522 feet (impounds Elm Fork Trinity River)

The climate in this area is described as humid and subtropical with mild winters and hot summers (Köppen-Geiger climate classification). Climate data from the National Oceanic and Atmospheric Administration, was collected at a weather station in Denton County, Texas and acquired from the National Data Center (National Oceanic and Atmospheric Administration, 2021). The average annual precipitation is 38.26 inches and typically occurs year-round (Figure 2). Long-term monthly average precipitation shows a binomial distribution, with peaks occurring in May and October, averaging 4.66 inches of rainfall during these months. The least amount of rainfall (2.2 inches) occurs in January. The warmest and coldest months of the year are July (29.7°C) and January (7.2°C), respectively.

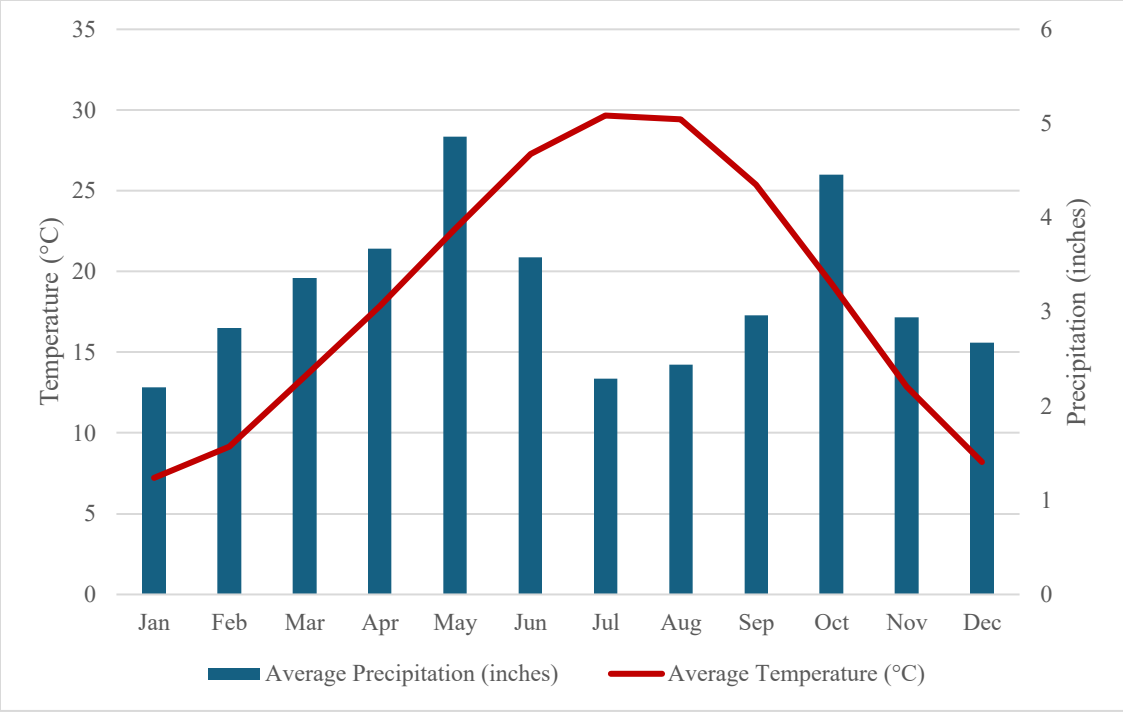

Figure 2. Long-term (1991-2020) monthly average precipitation (inches) and air temperature (°C) from Denton County, Texas (National Oceanic and Atmospheric Administration, 2021).

Physical Description

The watershed is located in Denton County and situated in the Eastern Cross Timbers ecoregion. The physiography in this region is described as having gently rolling plains and low hills (Griffith et al., 2007). The soil in this region is deep, fertile, sandy, allowing for tall trees and dense vegetation (Francaviglia, 2000). The predominant flora in this area consists of oak trees, pecan trees, cedar elm, bluestem grass, yellow Indiangrass, persimmon, sassafras, and Virginia creeper (Griffith et al., 2007). The fauna in this area consists of white-tailed deer, wild turkeys, prairie chickens, raccoons, squirrels, opossums, coyotes, javelinas, duck, geese, and alligators (Griffith et al., 2007 & Texas Parks and Wildlife Department, 2022).

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).

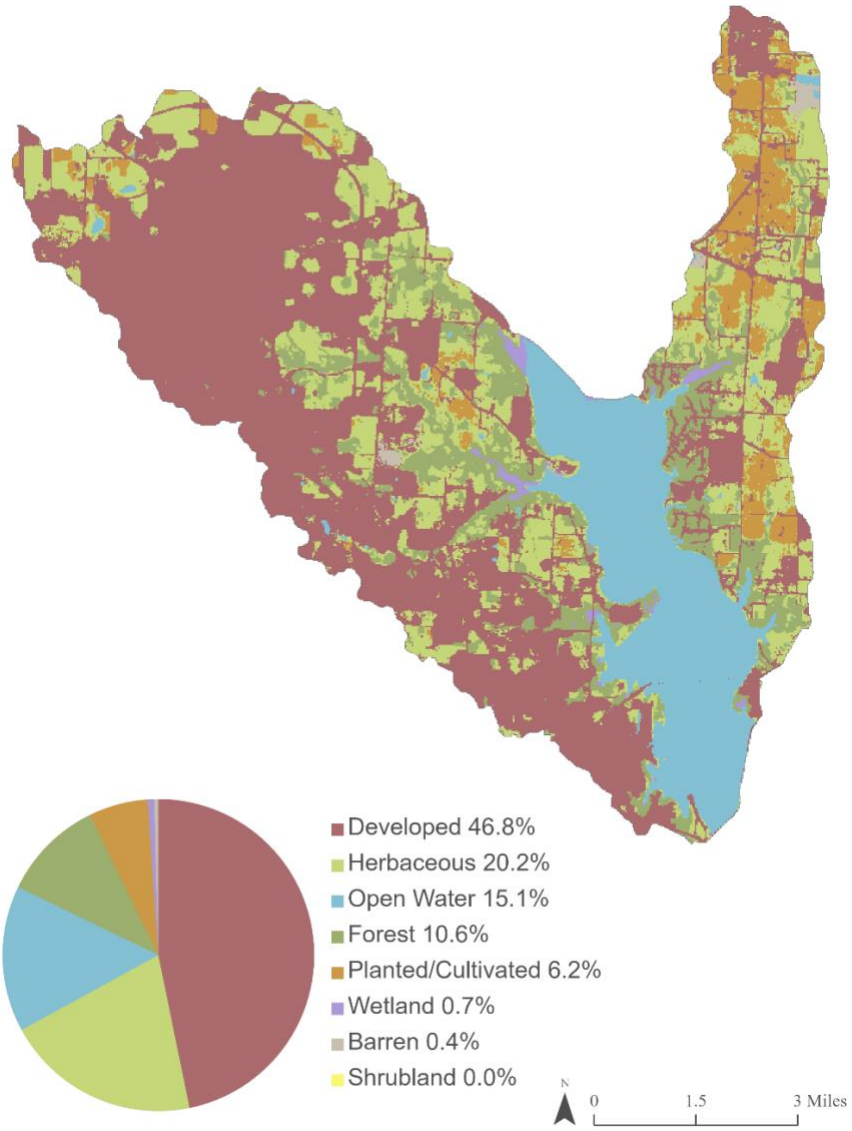

Figure 3. 2008 land use and land cover for the watershed in Denton County, Texas (National Land Cover Data, 2008).

In 2008, the majority of the watershed consisted of developed land, at 46.8%. Herbaceous cover accounted for 20.2% of the watershed, with open water at 15.1%. Forest cover comprised 10.6% of land cover. The remaining 7.2% of the watershed consisted of planted/cultivated cover (6.2%), wetlands (0.7%), barren (0.4%), and shrubland (0.003%).

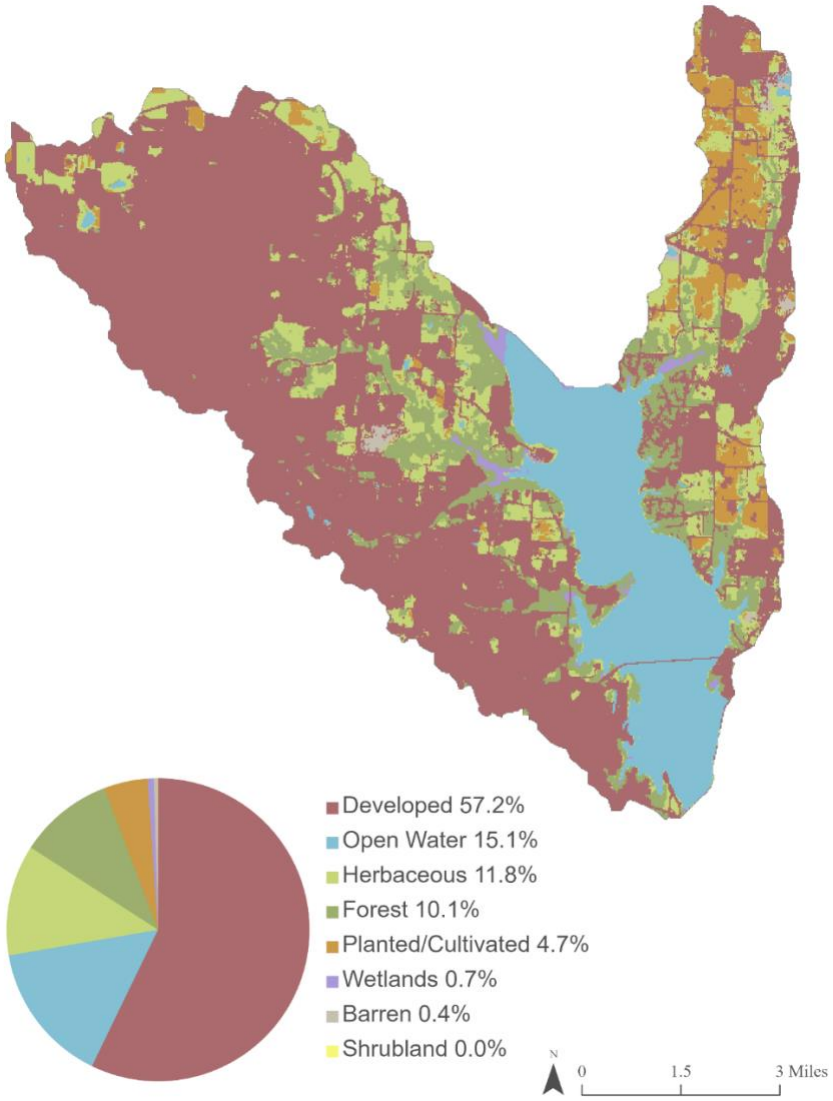

Figure 4. 2023 land use and land cover for the watershed in Denton County, Texas (National Land Cover Data, 2023).

As of 2023, a majority of the watershed consists of developed land, at 57.2%, an increase of 10.4% from 2008. Lake Lewisville and other areas of open water comprise 15.1% of the watershed (no change from 2008). Forest and herbaceous cover follow, at 11.8% and 10.1%, respectively. The remaining 5.8% of the watershed consists of planted/cultivated cover (4.7%), wetlands (0.7%), barren (0.4%), and shrubland (0.003%). Of these categories, only planted/cultivated changed from use in 2008 (decreased by 1.5%).

Table 2. 2008 and 2023 land use and land cover for the watershed in Denton County, Texas (National Land Cover Data, 2008, 2023).

Land Use	2008 Acres	2008 Percentage	2023 Acres	2023 Percentages
Developed	20754.47	46.8%	25356.09	57.2%
Open Water	6714.53	15.1%	6698.30	15.1%
Herbaceous	8983.51	20.2%	5254.29	11.8%
Forest	4706.12	10.6%	4474.80	10.1%
Planted/Cultivated	2728.60	6.2%	2071.83	4.7%
Wetlands	292.79	0.7%	292.67	0.7%
Barren	184.60	0.4%	193.26	0.4%
Shrubland	0.00	0.0%	1.11	0.003%

History

The land upon which Denton County sits was primarily used by small, transitory Native American camps until it was officially settled in 1841. The Texas Congress allowed Anglo settlers to purchase land grants, permitting them to purchase land in Texas and recruit more colonists (Odom, 2019). The population of Denton County consisted of mostly agricultural workers, with cattle outnumbering residents 4:1. However, after the completion of the railroad through Denton County in the late 19th century, the population began to steadily increase (Odom, 2019). Though still heavily dependent on agriculture, Denton County relies on electronics, higher education, and truck and missile manufacturing for local economic success (Denton County, n.d.).

Endangered Species and Conservation Needs

The common names of 12 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 listed as state, 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 Denton County, Texas.

Taxon	Endangered (Federal or State)	Threatened (Federal or State)	G1 or G2 (Critically Imperiled/Imperiled)	Species of Greatest Conservation Need (TPWD) (S1 or S2)	Endemic Total Count
Amphibia	0	0	0	0	0
Bird	2	5	1	10	0
Fish	0	0	0	0	0
Mammal	1	0	0	4	0

Reptile	0	1	0	3	0
Insect	0	0	0	0	0
Mollusk	1	3	3	3	0
Plant	0	0	3	2	2
TOTAL	4	9	7	22	2

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 Lake Lewisville (Segment 0823), 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 *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 Denton County, Texas (Texas Commission on Environmental Quality, 2022).

Segment	**Dissolved Oxygen (mg/L)**	**pH Range (s.u.)**	**Total Dissolved Solids (mg/L)**	***E. coli* Bacteria (#/100 mL)**	**Temperature (°C)**
0823 – Lake Lewisville	5.0	6.5 – 9.0	500	126	32.2

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. Lake Lewisville (Segment 0823) is not listed as impaired and meets the designated Texas Water Quality Standards (Texas Commission on Environmental Quality, 2024).

WATER QUALITY PARAMETERS

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 and Salinity

Specific conductance is a measure of the ability of a body of water to conduct electricity. It is measured in microsiemens per centimeter (µ S/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. Salinity is a measure of saltiness or the dissolved inorganic salt concentration in water. Salinity is often measured in ocean, estuarine, or tidal influenced waters, but in Texas there are some inland streams that have a high salt content due to the local geology and require salinity measurements. Some common ions measured as salinity include sodium, chloride, magnesium, sulfate, calcium, and potassium. Seawater typically has a salt content of 35 parts per thousand (ppt or ‰). Like other water quality parameters, salinity affects the homeostasis or the balance of water and solutes within both plants and animals. Too much or too little salt can affect plant and animal cell survival and growth, therefore salinity is an important measurement.

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 waters can result from sediment runoff from construction sites, erosion of farms, or mining operations.

E. coli and Enterococci Bacteria

E. coli bacteria originate in the digestive tract of endothermic organisms. The United States Environmental Protection Agency has determined *E. coli* to be the best indicator of the degree of pathogens in a freshwater system. A pathogen is a biological agent that causes disease. Enterococci bacteria are a subgroup of fecal streptococci bacteria (mainly Streptococcus faecalis and Streptococcus faecium) that are present in the intestinal tracts and feces of warm-blooded animals. It is used by the Texas Commission on Environmental Quality as an indicator of the potential presence of pathogens in tidally influenced saltwater along the Texas Gulf Coast. The standard for a bacteria impairment is based on the geometric mean (geomean) of the bacteria measurements collected. A geometric mean is a type of average that incorporates the high variability found in parameters such as *E. coli* and enterococci which can vary from zero to tens of thousands of colony forming units per 100 milliliters (CFU/100 mL). The standard for contact recreational use of a water body is 126 CFU/100 mL for *E. coli* in freshwater or 35 CFU/100 mL for enterococci in saltwater. A water body is considered impaired if the geometric mean is higher than the corresponding water quality standard. Texas Stream Team does not currently monitor water quality for enterococci in coastal waters. Instead, community scientists can get certified in *E. coli* bacteria monitoring, the indicator used by the Texas Commission on Environmental Quality for freshwater streams.

Nitrate-Nitrogen

Nitrogen is present in terrestrial or aquatic environments as nitrate-nitrogen, nitrites, and ammonia. Nitrate-nitrogen tests are conducted for maximum data compatibility with the Texas Commission on Environmental Quality and other partners. Just like phosphorus, nitrogen is a nutrient necessary for the growth of most living organisms. Nitrogen inputs into a water body may be from livestock and pet waste, excessive fertilizer use, failing septic systems, and industrial discharges that contain corrosion inhibitors. The effect excess nitrogen has on a water body is known as eutrophication and is described previously in the “Dissolved Oxygen” section. Nitrate-nitrogen dissolves more readily than orthophosphate, which attaches to sediment, and, therefore, can serve as a better indicator of possible sewage or manure pollution during dry weather.

Phosphate

Phosphorus almost always exists in the natural environment as phosphate continually cycles through the ecosystem as a nutrient necessary for the growth of most organisms. Testing for phosphate in the water excludes the phosphate bound up in plant and animal tissue. There are other methods to retrieve phosphate from the material to which it is bound, but they are too complicated and expensive to be conducted by community scientists. Testing for phosphate provides an idea of the

degree of phosphorus in a water body. It can be used for problem identification, which can be followed up with more detailed professional monitoring, if necessary. Phosphorus inputs into a water body may be caused by the weathering of soils and rocks, discharge from wastewater treatment plants, excessive fertilizer use, failing septic systems, livestock and pet waste, disturbed land areas, drained wetlands, water treatment, and some commercial cleaning products. The effect excess phosphate has on a water body is known as eutrophication and is described above in the "Dissolved Oxygen" section.

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. The Texas Stream Team community scientist water quality monitoring data are not currently used in the Texas Commission on Environmental Quality assessments mentioned above. 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 data summary reports. Once compiled, data were sorted, summary statistics were generated and reviewed, and results were graphed in JMP Pro 14.0.0 (SAS Institute Inc., 2018) using standard methods. Best professional judgement was used to verify outliers. Outlier box 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 ± 1.5 x (interquartile range). Outliers are plotted as points outside the box plot.

DATA RESULTS

Water quality data from eight 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 Denton County, Texas.

The period of record for the sampling events ranged from June 2008 through April 2025, with some sites experiencing temporal intermittent sampling. Trained community scientists conducted between three and 86 monitoring events at each site, for a total of 353 events. Of the eight sites, six of the sites had 10 or more monitoring events and were monitored sporadically from June 2008 through April 2025 (Table 5).

Table 5. Texas Stream Team monitoring sites in the watershed in Denton County, Texas.

Site ID	Description	Number of Events	Period of Record
80493	Pecan Creek @ Gay Street	86	June 2008 – Nov 2012, Feb 2022 – April 2025
80494	Pecan Creek @ Woodrow Street	81	June 2008 – Nov 2012, Feb 2022 – April 2025
80495	Cooper Creek @ Burning Tree	81	June 2008 – Nov 2012, Feb 2022 – April 2025
81167	Cooper Creek_@ N. Locust St.	36	March 2016, Feb 2022 – March 2025
81312	Cooper Creek @ Avondale Park near Nottingham Drive	31	Nov 2019, Feb 2022 – April 2025
81316	North Pond @ North Lakes Park near Fishing Platform	26	Sep 2017, Feb 2022 – April 2024
81583	Cantrell Slough @ Naylor Rd.	9	July 2019 – Feb 2020, Feb 2023
81717	Unnamed Tributary to Pecan Creek @ Shady Oaks Drive near Woodrow Park	3	Jan 2023 – March 2023
Total		**353**	

Site Analysis

Water quality monitoring data from sites with 10 or more sampling events were analyzed and summarized, including the number of samples, mean, standard deviation, and range of values (Table 6). Sites 81717 (3 monitoring events) and 81583 (9 monitoring events) were excluded from the analysis due to the limited number of monitoring events that took place at each. Additionally, monitoring events that did not meet Texas Stream Team quality control parameters were removed from the analysis as well. Community scientists monitored all sites for standard core parameters, including air and water temperature, specific conductance (total

dissolved solids were calculated based on conductance values), dissolved oxygen, pH, Secchi disk transparency, transparency tube, and total depth. Overall, 327 monitoring events remained for analysis.

Table 6. Texas Stream Team data summary for sites in the watershed in Denton County, Texas. (June 2008 to April 2025).

Parameter	Statistic	80493	80494	80495	81167	81312	81316
Air Temperature (°C)	Mean	22.17	22.09	20.51	19.25	19.50	17.21
	Std Dev	6.33	6.64	6.81	6.94	8.16	7.46
	Range	28.00	28.00	31.00	25.00	31.00	26.30
Water Temperature (°C)	Mean	18.35	19.09	17.43	18.29	16.81	16.62
	Std Dev	6.74	7.33	7.48	6.17	8.05	6.99
	Range	21.50	27.00	25.50	21.50	26.50	24.50
Dissolved Oxygen (mg/L)	Mean	7.23	8.70	8.55	7.72	8.20	7.60
	Std Dev	1.65	2.02	2.48	1.35	1.71	2.13
	Range	6.25	7.80	8.70	4.75	6.00	6.80
pH (standard units)	Mean	7.28	7.22	7.36	7.48	7.27	7.47
	Std Dev	0.25	0.25	0.27	0.32	0.31	0.29
	Range	0.50	0.75	1.00	1.40	1.00	1.00
Total Dissolved Solids (mg/L)	Mean	359.87	515.23	418.06	437.64	425.37	235.09
	Std Dev	98.97	134.33	153.92	143.84	131.94	53.54
	Range	513.50	677.30	578.50	546.00	486.85	246.35
Secchi Disk Transparency (m)	Mean	0.33	0.40	0.33	ND	ND	0.32
	Std Dev	0.12	0.09	0.10	ND	ND	0.07
	Range	0.33	0.30	0.39	ND	ND	0.31
Transparency Tube (m)	Mean	0.46	0.58	0.59	0.71	0.54	ND
	Std Dev	0.16	0.08	0.05	0.92	0.14	ND
	Range	0.45	0.45	0.31	5.83	0.49	ND
Total Depth (m)	Mean	0.48	0.42	0.35	0.36	0.34	1.00
	Std Dev	0.12	0.20	0.11	0.10	0.09	0.29
	Range	0.55	0.65	0.70	0.66	0.46	1.06

If a water quality parameter did not have at least 10 separate data points, the parameter was removed from the analysis. Therefore, the transparency tube values from site 81316 and the

Secchi disk values from site 81167 were removed from the analysis. Additionally, no data was included for Secchi disk values for site 81312 as only transparency tubes were used to measure transparency at this site.

Air and Water Temperature

Average air temperature for all sites ranged from 17.21°C to 22.17°C (Table 6). The lowest mean air temperature (17.21°C) was observed at North Pond @ North Lakes Park near Fishing Platform (site 81316) whereas the highest mean air temperature (22.17°C) was observed at Pecan Creek at Gary Street (site 80493).

The average water temperature at all sites ranged from 16.62°C to 19.09°C (Table 6). The lowest mean water temperature (16.62°C) was observed at North Pond at North Lakes Park near Fishing Platform (site 81316) whereas the highest mean water temperature (19.09°C) was observed at Pecan Creek at Woodrow Street (site 80494). Discrete water temperature measurements met the water quality standard of 32.2°C throughout the period of record with no exceedances (Figure 6).

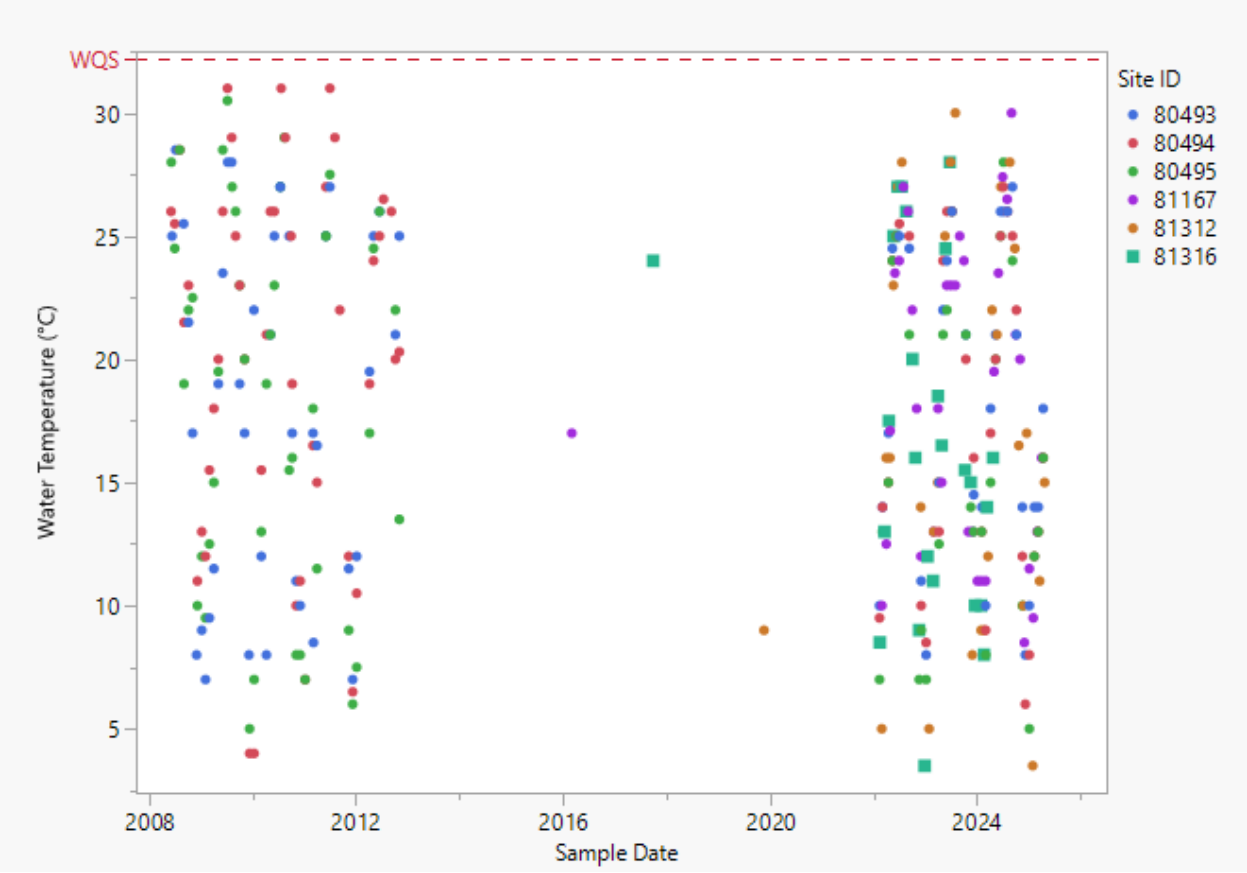

Figure 6. Water Temperature for Texas Stream Team sites in the watershed in Denton County, Texas (June 2008 through April 2025). WQS = Water Quality Standard.

Specific Conductance and Total Dissolved Solids

Total dissolved solids values were calculated from specific conductance measurements. The average total dissolved solids at all sites ranged from 235.09 to 515.23 mg/L (Table 6). The lowest average total dissolved solids (235.09 mg/L) was observed at North Pond at North Lakes Park near Fishing Platform (site 81316) whereas the highest average total dissolved solids (515.23 mg/L) was observed Pecan Creek at Woodrow Street (site 80494). Each of the six sites had discrete measurements of total dissolved solids that exceeded the water quality standard of 500 except for site 81316. However, the average total dissolved solids values for all sites remained below the water quality standard of 500 mg/L except for site 80494 which had an average Total Dissolved Solids value of 515.23 mg/L (Figure 7).

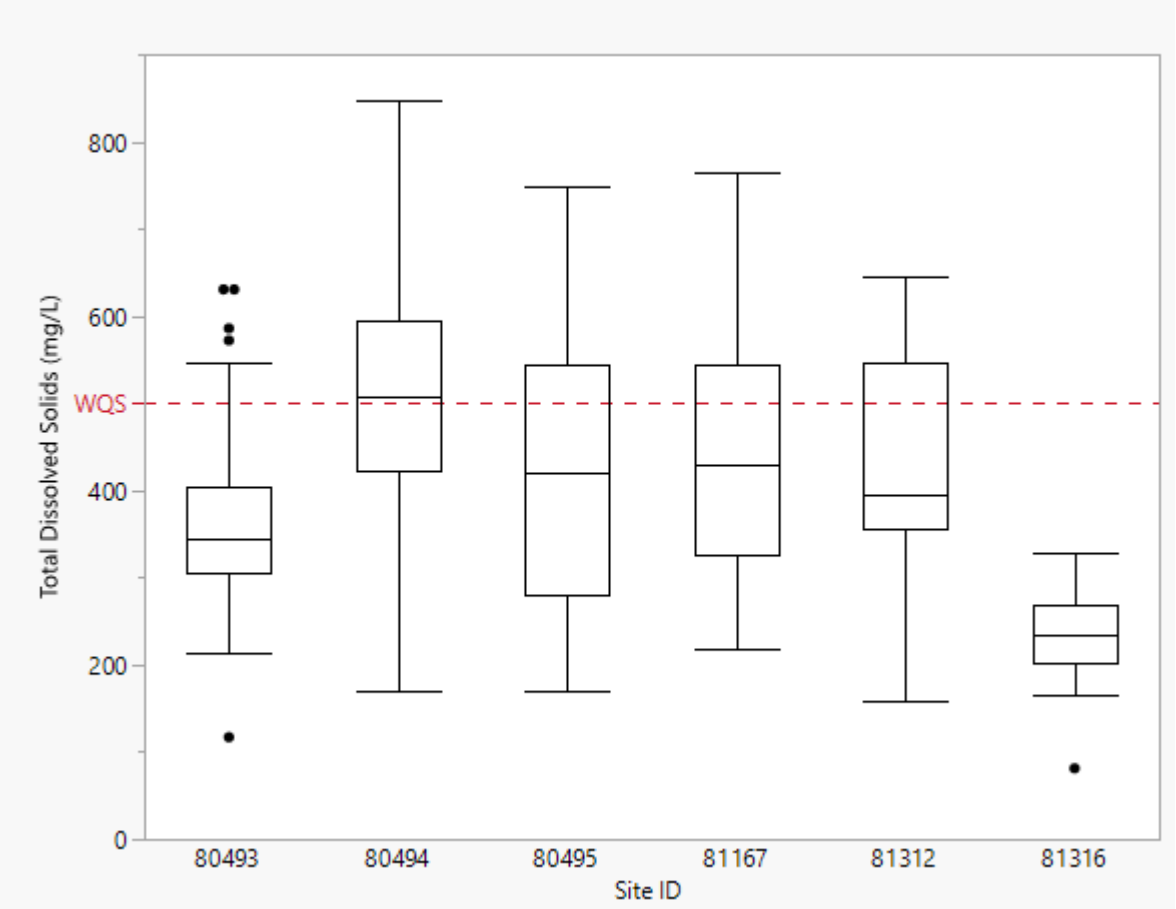

Figure 7. Total Dissolved Solids for Texas Stream Team sites in the watershed in Denton County, Texas (June 2008 through April 2025). WQS = Water Quality Standard.

Dissolved Oxygen

The average dissolved oxygen for all sites ranged from 7.23 to 8.70 mg/L (Table 6). The lowest average dissolved oxygen (7.23 mg/L) was observed at Pecan Creek at Gay Street (site 80493) whereas the highest average dissolved oxygen (8.70 mg/L) was observed at Pecan Creek at Woodrow Street (site 80494). All six of the sites had average dissolved oxygen values above the

standard of 5.0 mg/L. Additionally, all sites had discrete measurements above the standard with the lowest value (5.0 mg/L) being measured at site 80495 on April 6, 2012 (Figure 8).

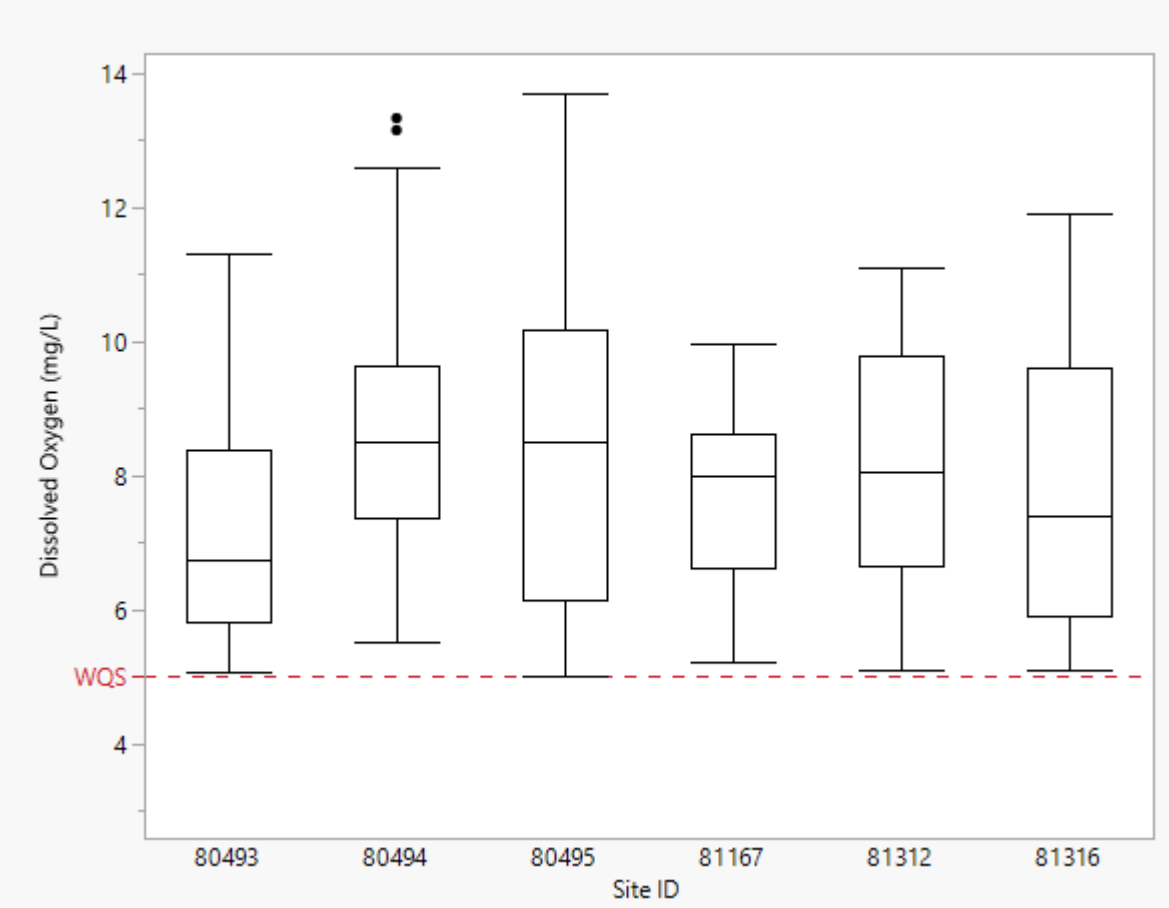

Figure 8. Dissolved Oxygen for Texas Stream Team sites in the watershed in Denton County, Texas (June 2008 through April 2025). WQS = Water Quality Standard.

pH

The average pH at all sites ranged from 7.22 to 7.48 standard units (Table 6). The lowest average pH value (7.22 s.u.) was observed at Pecan Creek at Woodrow Street (site 80494) whereas the highest average pH value (7.48 s.u.) was observed at Cooper Creek at N. Locust St. (site 81167). Additionally, averages and discrete measurements were found to be within the water quality standards minimum (6.5 s.u.) and maximum (9.0 s.u.) (Figure 9).

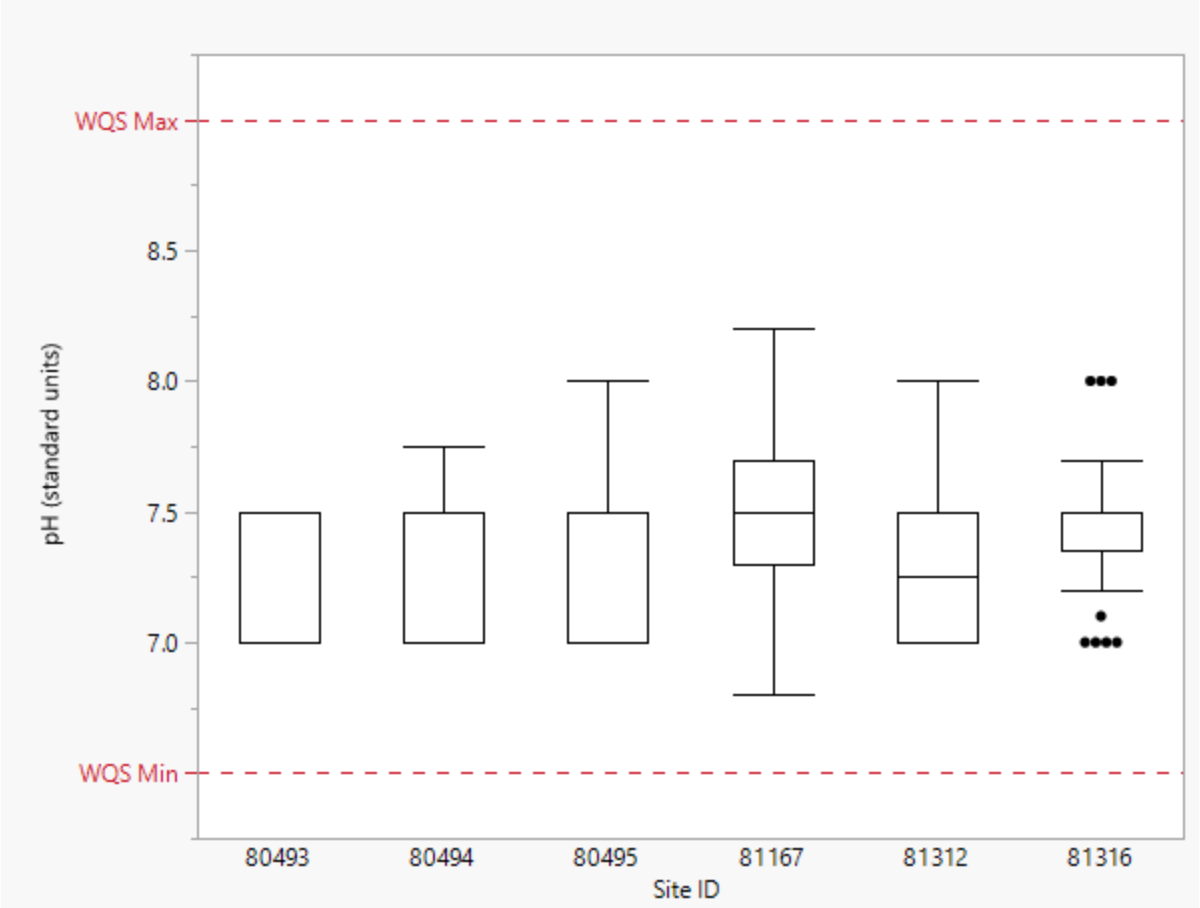

Figure 9. pH for Texas Stream Team sites in the watershed in Denton County, Texas (June 2008 through April 2025). WQS Max = Maximum Water Quality Standard; WQS Min = Minimum Water Quality Standard.

Transparency and Total Depth

The average total depth at all sites ranged from 0.34 to 1.00 m (Table 6). The largest average depth (1.00 m) was observed at North Pond at North Lakes Park near Fishing Platform (site 81316) whereas the smallest (0.34 m) was observed at Cooper Creek at Avondale Park near Nottingham Drive (site 81312).

Secchi disks and/or transparency tubes were used to measure transparency at all monitoring sites within the watershed (Figure 10). Average transparency gathered via the transparency tube ranged from 0.46 to 0.71 m with the lowest average (0.46 m) recorded at Pecan Creek at Gay Street (site 80493) and the highest (0.71 m) at Cooper Creek at N. Locust St. (site 81167) (Table 6). As for Secchi disk, the average transparency ranged from 0.32 to 0.4 m. The lowest average (0.32 m) was recorded at North Pond at North Lakes Park near Fishing Platform (site 81316) and the highest (0.40 m) was recorded at Pecan Creek at Woodrow Street (site 80494) (Table 6).

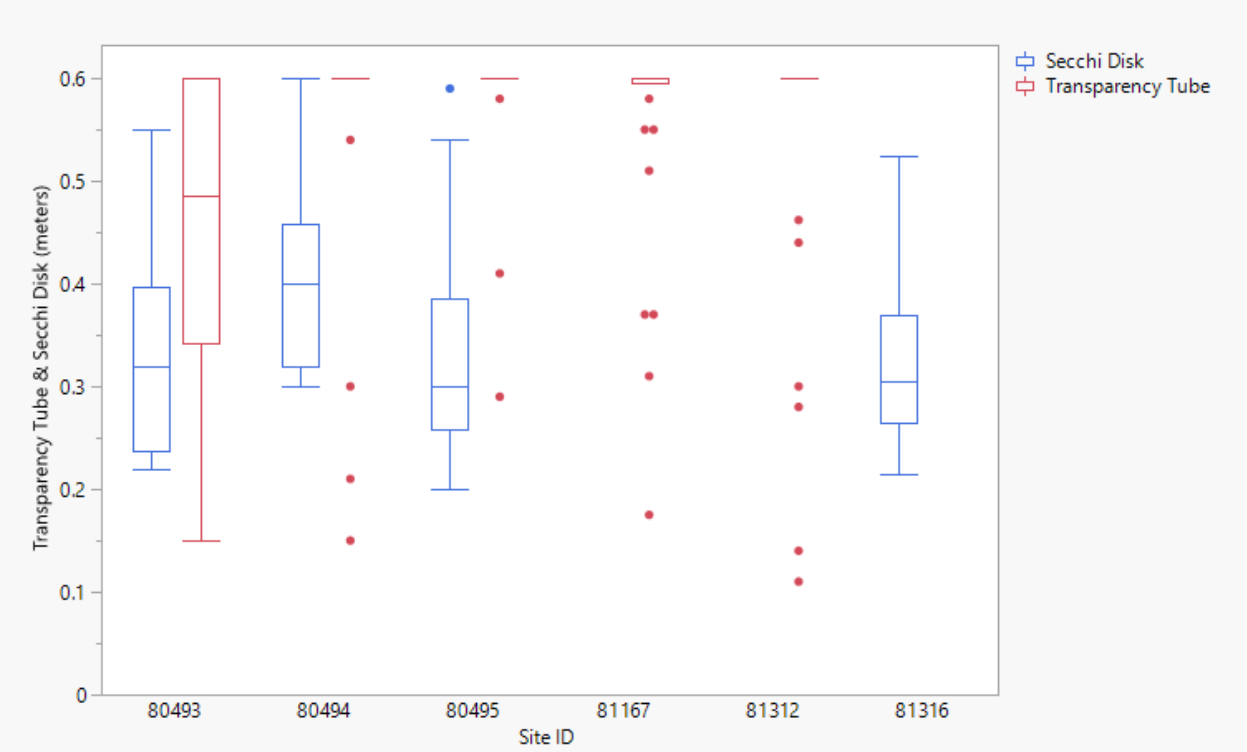

Figure 10. Transparency for Texas Stream Team sites in the watershed in Denton County, Texas (June 2008 through April 2025).

WATERSHED SUMMARY

As of 2023, the Pecan Creek–Lake Lewisville watershed (the watershed) is dominated by developed land, which comprises 57.2% of the area—up 10.4% since 2008. Open water (primarily Lake Lewisville) remains unchanged at 15.1%, while forest and herbaceous cover account for 11.8% and 10.1%, respectively. The remaining 5.8% is divided among planted/cultivated areas (4.7%), wetlands (0.7%), barren land (0.4%), and shrubland (<0.01%). Only the planted/cultivated category has shifted since 2008, decreasing by 1.5%.

From June 2008 through April 2025, trained City of Denton Texas Stream Team community scientists conducted 353 total monitoring events—ranging from 3 to 86 events per site—across eight locations in the watershed. Six 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, Secchi disk transparency, 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), Lake Lewisville (Segment 0823) is currently meeting all designated uses and is not listed as impaired. Water quality standards for designated uses in the watershed were compared to the monitoring results to evaluate overall water quality. Key findings include:

- Water Temperature: No discrete measurement exceeded the 32.2°C standard during the study period.
- Total Dissolved Solids: All sites except 81316 recorded discrete TDS exceedances above 500 mg/L, and site 80494's mean TDS slightly exceeded the standard at 515.2 mg/L.
- Dissolved Oxygen: Average Dissolved Oxygen at sites ranged between 7.23 mg/L (Pecan Creek at Gay Street, site 80493) and 8.70 mg/L (site 80494), well above the 5.0 mg/L standard. The lowest single reading was exactly 5.0 mg/L (site 80495 on April 6, 2012).
- pH: All discrete or mean measurements stayed within the 6.5–9.0 s.u. water-quality standard.

Although most overall averages meet Texas water quality criteria, periodic exceedances of total dissolved solids and isolated low dissolved-oxygen events underscore the need for continued vigilance and targeted improvements. To this end, we recommend expanding the parameter suite to include *E. coli* and advanced nutrient monitoring—thereby capturing bacterial risks and nutrient enrichment not addressed by core measurements—and increasing sampling frequency during hot summer periods and storm events to better characterize extremes in temperature, Total Dissolved Solids, and Dissolved Oxygen. In areas showing repeated standard exceedances, particularly at site 80494, detailed source-tracking investigations should be undertaken to distinguish point from nonpoint pollution inputs. Finally, sustaining long-term monitoring across the existing network will ensure that trends are accurately tracked in the face of ongoing development and climate variability.

This report would not have been possible without the sustained efforts of the City of Denton Texas Stream Team group. Established in 2007 and revitalized in 2019, their more than a dozen dedicated volunteers have conducted over 350 monitoring events across the watershed. Their commitment provides the robust dataset that underpins our analyses and supports informed management of local waterways.

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 **www.TexasStreamTeam.org**.

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Appendix A.

Table 7. Endangered species located within the Pecan Creek- Lake Lewisville watershed in Denton County, Texas.

Species Type	Common Name	Federal/State Listing
Bird	Whooping crane	State Listed as Endangered
	Interior least tern	State Listed as Endangered
Mammal	Tricolored bat	Federally Proposed as Endangered
Mollusk	Texas heelsplitter	Federally Proposed as Endangered

Table 8. Threatened species within the Pecan Creek-Lake Lewisville watershed in Denton County, Texas.

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
Mollusk	Sandbank pocketbook	State Listed as Threatened
	Louisiana pigtoe	State Listed as Threatened
	Texas heelsplitter	State Listed as Threatened