

Southeast Park Lake Data Report

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Introduction

Water Body Location: Southeast Park Lake spans 12 acres in southeast Amarillo roughly 3.5 miles east of IH-27.

Water Body Description: Southeast Park Lake is primarily fed by a small creek that runs south from the city into the lake, providing water only during periods of precipitation. The City of Amarillo channels storm water runoff directly into the lake. The City of Amarillo Osage Water Treatment Plant is nearby but does not discharge its water into the lake. Water was discharged from this plant into the lake prior to 2000, but it is no longer used for that purpose. A golf course is located to the north and a baseball field is to the west. The surrounding land is a dry lake bed known as a playa. With very little vegetation to slow and filter polluted storm water, this lake can be very influenced by nonpoint source pollution.



Texas Stream Team: Texas Stream Team is a volunteer based water quality monitoring program. In alignment with Texas Stream Team's core mission, monitors collect surface water quality data that may be used in decision-making processes to promote and protect a healthy and safe environment for

people and aquatic inhabitants. Citizen monitoring occurs at set monitoring sites roughly the same time of day once a month. Citizen monitoring data provides a valuable resource of information supplementing professional data collection efforts where resources are limited. The data may be used by professionals to identify water quality trends, target additional data collection, identify pollution events, identify sources and causes of pollution, and show effectiveness of management measures towards improving water quality.

Texas Stream Team volunteer data, however, is not used by the state to assess whether water bodies are meeting the designated surface water quality standards. The primary reason for this is that Texas Stream Team volunteers use different methods than the professional water quality monitoring community. Different methods are utilized by Texas Stream Team due to higher equipment costs, training requirements, and stringent laboratory procedures that are required of the professional community. The Texas Stream Team methods have been chosen because of relative ease of performing the methods in the field, while providing reliable results at low costs. As a result, Texas Stream Team data does not have the same accuracy or precision as professional data and is therefore not directly comparable. However, Texas Stream Team data are valuable records often collected in portions of water body that professionals are not able to monitor or monitor as frequently. This long-term data set is available to and may be considered by the surface water quality professional community to facilitate management and protection of Texas' water resources. For additional information about water quality monitoring methods and procedures, see:

- [Texas Stream Volunteer Water Quality Monitoring Manual](#)
- [Texas Commission on Environmental Quality \(TCEQ\) Surface Water Quality Monitoring Procedures](#) for professional monitors

Information collected by Texas Stream Team volunteers is covered under a TCEQ approved quality assurance project plan (QAPP) to ensure a standard set of methods of known quality are used. All data used in data reports are screened by the Texas Stream Team for completeness, precision and accuracy where applicable, and scrutinized with data quality objective and data validation techniques.

The purpose of this report is to provide analysis of data collected by Texas Stream Team volunteers. The data presented in this report should be considered in conjunction with other relevant water quality reports prepared by the following programs in order to provide a holistic view of water quality in this water body:

- Texas Surface Water Quality Standards;
- Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d) (or Texas Integrated Report; formerly the Texas Water Quality Inventory and 303(d) List);
- Texas Clean Rivers Program partners' reports such as Basin Summary Reports and Highlight Reports;
- TCEQ surface water quality special studies;
- TCEQ Total Maximum Daily Load reports;
- TCEQ and Texas State Soil and Water Conservation Board Nonpoint Source Program funded reports, including Watershed Protection Plans.

Questions about this report should be directed to the Texas Stream Team at (512) 245-1346.

Water Quality Terminology

The following paragraphs under this section provide general information about types of data collected by Texas Stream Team volunteers, along with the importance of these parameters for aquatic and human health.

Water Temperature

Water temperature, one of the simplest water quality measurements, is one of the most important to the health of an aquatic ecosystem (*A Guide to Freshwater Ecology*, TCEQ GI-034, August 2005). Water temperature influences physiological processes of aquatic organisms, and each species has optimum temperatures 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.

Natural sources of warm water are seasonal as water temperatures tend to increase during summer and decrease in winter. 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 which release warmer water. Citizen monitoring may not identify fluctuating patterns due to diurnal changes or events such as power plant releases. While citizen data does not show diurnal temperature fluctuations, it may demonstrate the fluctuations over seasons and years.

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 stream flow. The TCEQ Water Quality Standards list daily minimum dissolved oxygen criteria for specific water bodies, and presume criteria according to flow status (perennial, intermittent with perennial pools, and intermittent), aquatic life attributes, and habitat. These criteria are protective of aquatic life and can be used for general comparison purposes.

Aquatic Life Sub-category	Daily Minimum Dissolved Oxygen (mg/L)
Exceptional	4.0
High	3.0
Intermediate	3.0
Limited	2.0
Minimal	1.5

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 growth, which may starve subsurface vegetation of sunlight and limit the amount of dissolved oxygen in water produced as a product of photosynthesis. This process, known as eutrophication, is enhanced when the subsurface vegetation dies and is decomposed by oxygen-consuming bacteria.



Low dissolved oxygen levels may also result from high groundwater inflows as groundwater is typically low in dissolved oxygen, high temperatures which reduce oxygen solubility, or water releases from deeper portions of dams where conditions are anoxic.

Conductivity

Conductivity is measured to determine the amount of dissolved solids in the water. Conductivity is a measure of the ability of water to conduct electricity. The more dissolved solids a body of water has, such as inorganic salts (Ex. magnesium, calcium, chloride, and sulfate), the more electricity it conducts, or the more conductive it is. Conductivity is measured in microSiemens per centimeter ($\mu\text{S}/\text{cm}$). To determine total dissolved solids (TDS) in water, the Texas Surface Water Quality Monitoring Procedures call for a conversion of specific conductance by 65%. Sources of TDS can include agricultural runoff, domestic runoff, discharges from wastewater treatment plants, groundwater inflows, or naturally saline conditions resulting from the local geology and arid climate.

High concentrations of salt can inhibit water absorption and limit root growth for vegetation, lead to an abundance of more drought tolerant plants, and cause dehydration of fish and amphibians.

pH

pH is a measure of acidity or alkalinity. The scale measures the concentration of hydrogen ions on a range of 0 to 14 and is reported in standard units (su). The range is logarithmic; every 1 unit change means the acidity increased or decreased 10-fold. A pH of 7.0 is considered neutral. Values less than 7.0 are considered acidic; those greater than 7.0 are alkaline (basic).

The local geology in a watershed determines the general pH of water bodies. Underlying rock such as limestone dissolves and weathers easily, releasing minerals that buffer the water and cause a slight increase in pH (*A Guide to Freshwater Ecology*, TCEQ GI-034, August 2005). Harder, igneous bedrock tend to have less mineral content and lower pH. A typical pH range for buffered water bodies is 6.5 and 9. Regions of East Texas, with naturally acidic waters, have typical pH ranges from 5.5 to 9. Acidic contributions, indicated by a low pH level, can include runoff from acid-laden soils and acid rain. Sources that emit nitrogen oxide and sulphur dioxide into the atmosphere, such as car exhaust and coal power plants, contribute to acid rain.

Water Clarity

Water clarity is the ability of sunlight to penetrate the water column, and is measured by a Secchi disk. The ability of light to reach submerged plants is impeded by reduced clarity, and can effect populations of beneficial phytoplankton, algae, and aquatic plants. This reduces the dissolved oxygen in the water due to reduced photosynthesis. Reduced visibility can also harm predatory fish or birds that depend on good visibility to find their prey.

Water clarity can be affected by natural as well as human activities. Watershed characteristics such as the potential for flooding, and loose soils contribute to reductions in water clarity through increasing sedimentation. Sedimentation can result from sediment washing away from construction sites, erosion of farms, mining operations, and waterway (riparian) disturbance. Reduced water clarity can also occur during algae blooms, which can be episodic or part of a longer term aging process, particularly in reservoirs.

Data Analysis

Kathleen Green, a teacher of Pre-AP Aquatic Science at Caprock High School in Amarillo, has been monitoring the Southeast Park Lake with her students for about twenty years. This data covered in this report picks up where the last report left off. That report can be found on the Texas Stream Team website at <http://txstreamteam.rivers.txstate.edu/Data/Data-Reports.html>. The data in this report span from 2006 to 2009.

No drastic alternation of conductivity was observed, but the linear trendline on the graph indicates conductivity has been decreasing since 2006. Water temperature did not reach a level which could pose a threat to aquatic life, and dissolved oxygen values remained above the exceptional aquatic life standard used by the TCEQ. The linear trendlines shown on the graph show water temperature increasing and dissolved oxygen decreasing since 2006.

Secchi depth measurements are consistently 1/5 of total depth measurements, which indicates heavily turbid waters. This is to be expected in a small lake fed by stormwater runoff which is typically carrying high quantities of sediment. The pH values remained steady around 8.35 with a standard deviation of 0.22. This value is slightly alkaline but does not demonstrate an environment unsuitable for aquatic life.

Texas Stream Team staff identified no major water quality concerns based on the data. The high turbidity can hinder the ability of predators to hunt and may clog the gills of fish. The conductivity values are higher than water which could be used for irrigation of some crops if the high values are the result of salt.¹ However, water bodies in the western part of the state often exhibit higher conductivity values due to high evaporation rates and soil content.

¹ Mark McFarland, Robert Lemon and Charles Stichler, *Irrigation Water Quality*, available at <http://www.extension.org/mediawiki/files/7/71/Irrigationwaterquality.pdf>; accessed 12 April 2012.

Southeast Park Lake Amarillo						
Parameter	#	% Complete	Min.	Mean.	Max.	Std. Dev.
Sample Time	45	98	8:00	10:23	16:00	1:33
Specific Conductivity (µS/cm)	46	100	500	1023.7	1530	333.16
Total Depth (m)	45	98	1	1.59	2.55	0.33
Dissolved Oxygen (mg/L)	46	100	4.4	7.81	11.15	1.64
Secchi Depth (m)	45	98	0.1	0.32	1.6	0.29
Water Temperature (°C)	46	100	4	15	29	6.65
pH (su)	46	100	7.9	8.35	9	0.22

