Southeast Park Lake Data Report

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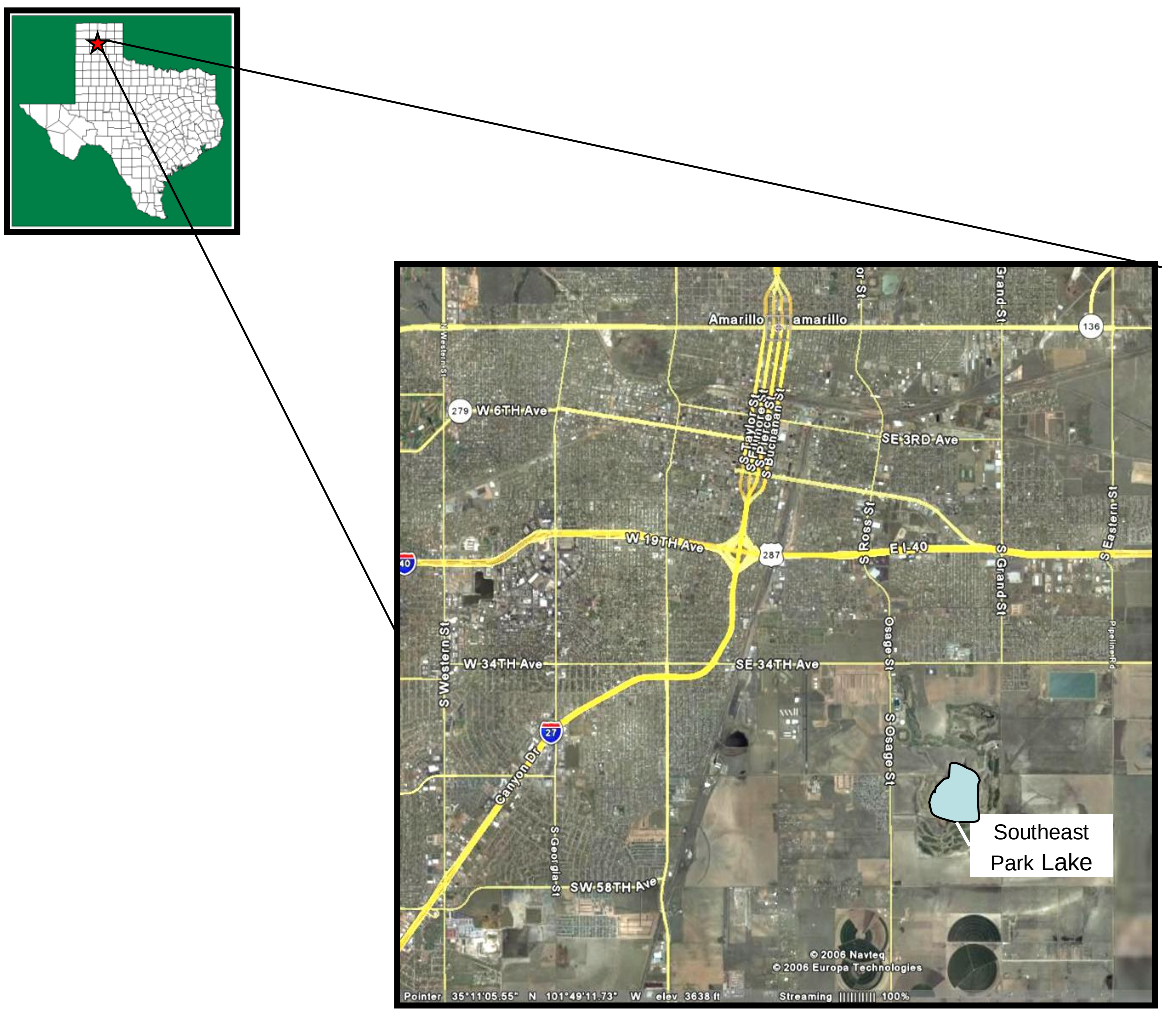
Kathleen Green, a teacher of Pre-AP Aquatic Science at Caprock High School, has been monitoring the lake with her students for about twenty years. This data covered in this report picks up where the last report left off. That report can be found on the Texas Stream Team website at http://txstreamteam.rivers.txstate.edu/Data/Data-Reports.html.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

Southeast Park Lake spans 12 acres in southeast Amarillo roughly 3.5 miles east of IH-27. It 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 lakebed 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.



In alignment with Texas Stream Team's core mission, monitors attempt to collect data that can be used in decision-making processes to promote a healthier and safer environment for people and aquatic inhabitants. While many assume it is the responsibility of Texas Stream Team to serve as the main advocate for volunteer monitor data use, it has become increasingly important for monitors to be accountable for their monitoring information and how it can be infused into the decision-making process, from “backyard” concerns to state or regional issues. To assist with this effort, Texas Stream Team coordinates with monitoring groups and government agencies to propagate numerous data use options.

Among these options, volunteer monitors can directly participate by communicating their data to various stakeholders. Some options include: participating in the Clean Rivers Program (CRP) Steering Committee Process; providing information during “public comment” periods; attending city council and advisory panel meetings; developing relations with local Texas Commission on Environmental Quality and river authority water specialists; and, if necessary, filing complaints with environmental agencies; contacting elected representatives and media; or starting organizing local efforts to address areas of concern.

The Texas Clean Rivers Act established a way for the citizens of Texas to participate in building the foundation for effective statewide watershed planning activities. Each CRP partner agency has established a steering committee to set priorities within its basin. These committees bring together the diverse interests in each basin and watershed. Steering committee participants include representatives from the public, government, industry, business, agriculture, and environmental groups. The steering committee is designed to allow local concerns to be addressed and regional solutions are recommended. For more information about participating in these steering committee meetings and to contribute your views about water quality, contact the appropriate CRP partner agency for your river basin at: http://www.tceq.state.tx.us/compliance/monitoring/crp/partners.html.

Currently, Texas Stream Team is working with various public and private organizations to facilitate data and information sharing. One component of this process includes interacting with watershed stakeholders at CRP steering committee meetings. A major function of these meetings is to discuss water quality issues and to obtain input from the general public. While participation in this process may not bring about instantaneous results, it is a great place to begin making institutional connections and to learn how to “work” the assessment and protection system that Texas agencies use to keep water resources healthy and sustainable.

In general, Texas Stream Team efforts to use volunteer data may include the following:

1. Assist monitors with data analysis and interpretation
2. Analyze watershed-level or site-by-site data for monitors and partners
3. Screen all data annually for values outside expected ranges
4. Network with monitors and pertinent agencies to communicate data
5. Attend meetings and conferences to communicate data
6. Participate in CRP stakeholder meetings
7. Provide a data viewing forum via the Texas Stream Team Data Viewer
8. Participate in professional coordinated monitoring processes to raise awareness of areas of concern

Information collected by Texas Stream Team volunteers utilizes a TCEQ and EPA approved quality assurance project plan (QAPP) to ensure data are correct and accurately reflects the environmental conditions being monitored. All data are screened for completeness, precision and accuracy where applicable, and scrutinized with data quality objective and data validation techniques. Sample results are intended to be used for education and research, local decision making, problem identification, and others uses deemed appropriate by the data user.

Water Quality Parameters

Water Temperature

Fish are cold-blooded and therefore depend on the temperature of water to be able to carry out processes such as metabolism and reproduction. Sources of warm water include powers plants' effluent after it has been used for cooling or hydroelectric plants which release warmer or cooler water (depending on the time of year) near the point of release. On a yearly scale, the amount of dissolved oxygen in the water decreases as temperatures increase, and vice versa, because warmer, less dense water can hold less oxygen molecules than cooler, more dense water. However, on a daily scale, the amount of dissolved oxygen in the water increases as temperatures increase, and vice versa, because of photosynthesis adding oxygen to the water body. Water temperature variations are most detrimental when they occur rapidly, leaving the biotic community no time to adjust. However, volunteer monitoring occurs at a particular time, so these variations are not covered in this report.

Dissolved Oxygen

Oxygen is necessary for the survival of most organisms. Too little oxygen will lead to asphyxiation of aquatic organisms. Too much oxygen (supersaturation) can cause bubbles to develop in cardiovascular systems, which could be fatal. Dissolved oxygen (DO) levels below 2 milligrams per liter (mg/L) can lead to asphyxiation, and levels above 20 mg/L can lead to supersaturation. The most suitable aquatic environment exhibits levels above 5 mg/L. High concentrations of nutrients can lead to excessive surface vegetation growth, which may starve subsurface vegetation of sunlight, and therefore limit the amount of dissolved oxygen in a water body due to limited photosynthesis. This process, known as eutrophication is enhanced when the subsurface vegetation dies and consumes oxygen when decomposing. Low dissolved oxygen levels may also result from high groundwater inflows as groundwater is typically low in dissolved oxygen due to minimal aeration or high temperatures which reduce oxygen solubility. Supersaturation typically only occurs underneath waterfalls or dams with water flowing over the top.

Specific Conductivity

Specific conductivity is a measure of the ability of a body of water to conduct electricity. It is measured in microSiemens per centimeter (µS/cm). A body of water is more conductive if it has more dissolved materials such as nutrients and salts, which indicate poor water quality if they are abundant. Nitrates and phosphates are specific nutrients for which tests are sometimes conducted. High concentrations of nutrients lower dissolved oxygen, the process of which was described in the previous section. 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. Sources of total dissolved solids (TDS) can include agricultural runoff, domestic runoff, or discharges from wastewater treatment plants.

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. Therefore, every 1 unit change means the acidity increased or decreased 10-fold. Sources of low pH (acidic) can include acid rain and runoff from acid-laden soils. Acid rain is mostly caused by coal power plants with minimal contributions from the burning of other fossil fuels and other 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 which 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, an alkaline molecule. The most suitable range for healthy organisms is 6.5-9.

Secchi Depth and Total Depth

The Secchi Disk is used to determine the clarity of the water, a condition known as turbidity. The disk shown on the right is lowered into the water until it is no longer visible, and the depth is recorded. 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 very little 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 most commonly transported in sediment rather than in the water. Turbid waters can result from sediment washing away from construction sites, erosion of farms, or mining operations. Average Secchi depth readings below total depth readings indicate highly turbid water. Readings that are equal to total depth indicate clear water. Low total depth observations have a potential to concentrate contaminants.

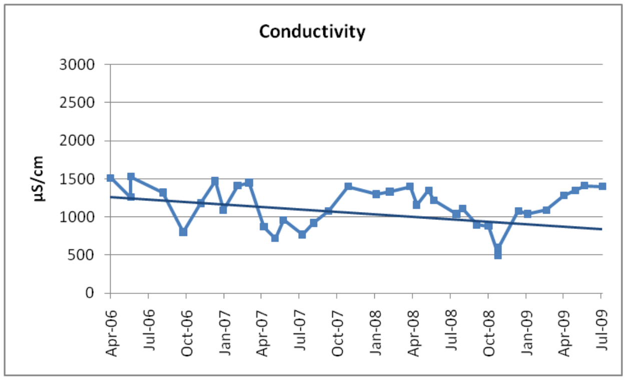
Data Analysis

Southeast Park Lake is too small to be regulated by the state according to water quality standards. 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 Texas Commission on Environmental Quality. 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.

The data show mostly good conditions for aquatic life. The only issue may be the high degree of turbidity which hinders 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 normal crops if the high values are the result of salt. However, given the observed turbidity, these high values most likely demonstrate the presence of large quantities of sediment.

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 (^oC)	46	100	4	15	29	6.65
pH (su)	46	100	7.9	8.35	9	0.22


Conductivity
µS/cm
3000
2500
2000
1500
1000
500
0
Apr-06
Jul-06
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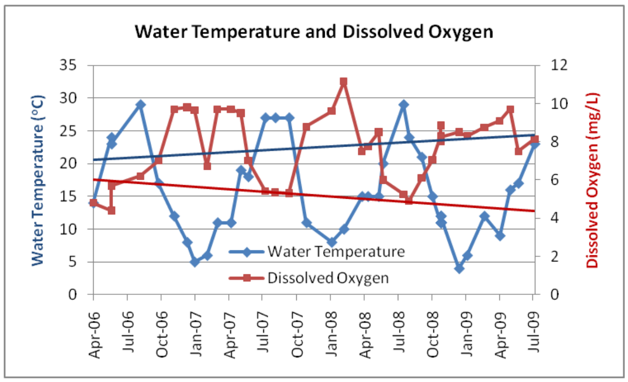
Jul-09


Water Temperature and Dissolved Oxygen
Water Temperature (°C)
Dissolved Oxygen (mg/L)
Water Temperature
Dissolved Oxygen
Apr-06
Jul-06
Oct-06
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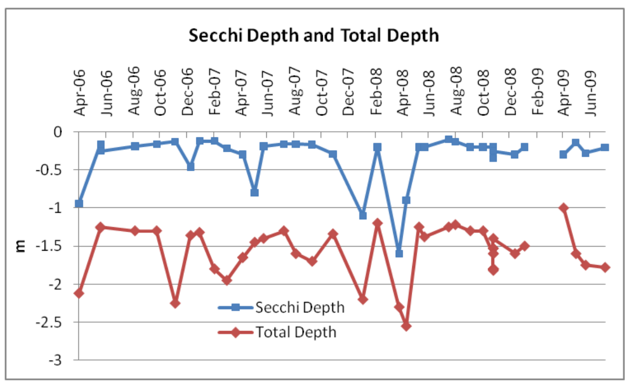
Secchi Depth and Total Depth
m
Secchi Depth
Total Depth
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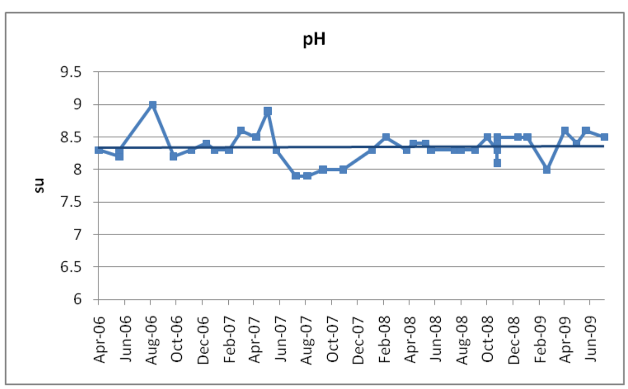
pH
su
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