Lake Livingston Data Report

August 2014

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Introduction

Texas Stream Team is a volunteer-based citizen water quality monitoring program. Citizen scientists collect surface water quality data that may be used in the decision-making process to promote and protect a healthy and safe environment for people and aquatic inhabitants. Citizen scientist water quality monitoring occurs at predetermined monitoring sites, at roughly the same time of day each month. Citizen scientist water quality monitoring data provides a valuable resource of information by 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 needs, identify potential pollution events and sources of pollution, and to test the effectiveness of water quality management measures.

Texas Stream Team citizen scientist data are not used by the state to assess whether water bodies are meeting the designated surface water quality standards. Texas Stream Team citizen scientists use different methods than the professional water quality monitoring community. These 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. As a result, Texas Stream Team data do not have the same accuracy or precision as professional data, and is not directly comparable. However, 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 at all, or monitor as frequently. This long-term data set is available, 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, including the differences between professional and volunteer monitoring, please refer to the following sources:

- Texas Stream Volunteer Water Quality Monitoring Manual
- Texas Commission on Environmental Quality (TCEQ) Surface Water Quality Monitoring Procedures

The information that Texas Stream Team citizen scientists collect is covered under a TCEQ approved Quality Assurance Project Plan (QAPP) to ensure that a standard set of methods are used. All data used in watershed data reports are screened by the Texas Stream Team for completeness, precision, and accuracy, in addition to being scrutinized for data quality objectives and with data validation techniques.

The purpose of this report is to provide analysis of data collected by Texas Stream Team citizen scientists. The data presented in this report should be considered in conjunction with other relevant water quality reports in order to provide a holistic view of water quality in this water body. Such sources include, but are not limited to, the following potential resources:

- Texas Surface Water Quality Standards
- Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)
- Texas Clean Rivers Program partner reports, such as Basin Summary Reports and Highlight Reports
- 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 regarding this watershed data report should be directed to the Texas Stream Team at (512) 245-1346.

Watershed Location and Physical Description

Location and Climate

Lake Livingston is a man-made lake on the Lower Trinity River in Polk, San Jacinto, Walker, and Trinity Counties. The lake is approximately 74 miles north of Houston and about 20 miles east of Huntsville. Lake Livingston impounds 1,750,000 acre feet of water, primarily from the Trinity River (Trinity River Authority). The watershed of Lake Livingston is situated in the Piney Woods, formally known as the South Central Plains ecoregion. This region is characterized by a mix of loblolly and shortleaf pine plantations with acid sands or sandy loam soils (TCEQ). Average temperatures on the lake range from 33.33°C in the summer to12.78°C in the winter (Lake Livingston Texas).

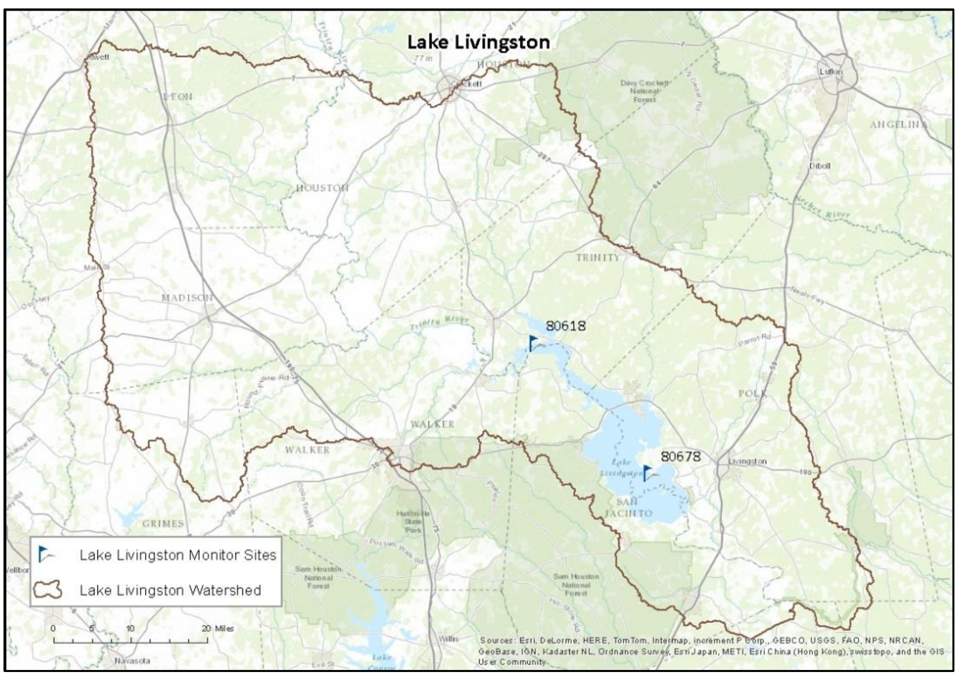

Figure 1: Lake Livingston Watershed with Texas Stream Team Monitor Sites

Physical Description and Land Use

Lake Livingston has a maximum depth of 90 feet with an average depth of 23 feet. Normal pool elevation is 131 feet above mean sea level (Trinity River Authority). The lake's 450-plus miles of shoreline accommodate a number of small communities and a variety of recreational activities. Parks with access to Lake Livingston include Sam Houston National Forest, Lake Livingston State Park, Wolf Creek Park, and Tigerville Park (Lake Livingston Texas). The lake is a popular fishing spot in Texas and is stocked with striped and Florida bass (Trinity River Authority) as well as catfish, crappie, and perch (TPWD).

History

Lake Livingston and Lake Livingston Dam completed construction in 1971 in an arrangement with the Trinity River Authority and the City of Houston. Lake Livingston has no flood control mechanisms or capacity for flood storage; as inflows into the lake increase, discharge also increases. The lake supplies water to the surrounding counties as well as the Houston-Galveston metropolitan area (Trinity River Authority).

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.

Natural sources of warm water are seasonal, 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 release warmer water. Citizen scientist monitoring may not identify fluctuating patterns due to diurnal changes or events such as power plant releases. While citizen scientist 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 document lists daily minimum Dissolved Oxygen (DO) criteria for specific water bodies and presumes 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.

The DO 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 and algae, which may starve subsurface vegetation of sunlight, and therefore limit the amount of DO in a water body due to reduced photosynthesis. This process, known as eutrophication, is enhanced when the subsurface vegetation and algae die and oxygen is consumed by bacteria during decomposition. Low DO levels may also result from high groundwater inflows due to minimal groundwater aeration, high temperatures that reduce oxygen solubility, or water releases from deeper portions of dams where DO stratification occurs. Supersaturation typically only occurs underneath waterfalls or dams with water flowing over the top.

Specific Conductivity and Total Dissolved Solids

Specific conductivity is a measure of the ability of a body of water to conduct electricity. It is measured in micro Siemens per cubic centimeter (µS/cm^3). A body of water is more conductive if it has more dissolved solids such as nutrients and salts, which indicates poor water quality if they are overly abundant. High concentrations of nutrients can lower the level of DO, leading to eutrophication. 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 (TDS) can include agricultural runoff, domestic runoff, or discharges from wastewater treatment plants. For this report, specific conductivity values have been converted to TDS using a conversion factor of 0.65 and are reported as mg/L.

pH

The pH scale measures the concentration of hydrogen ions on a range of 0 to 14 and is reported in standard units (su). The pH of water can provide useful information regarding acidity or alkalinity. The range is logarithmic; therefore, every 1 unit change is representative of a 10-fold increase or decrease in acidity. Acidic sources, indicated by a low pH level, 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 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. The most suitable pH range for healthy organisms is between 6.5 and 9.

Secchi disk and total depth

The Secchi disk is used to determine the clarity of the water, a condition known as turbidity. The disk 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 DO in the water due to reduced photosynthesis. Contaminants are most commonly transported in sediment rather than in the water. Turbid waters can results from sediment washing away from construction sites, erosion of farms, or mining operations. Average Secchi disk transparency (a.k.a. Secchi depth) readings that are less than the total depth readings indicate turbid water. Readings that are equal to total depth indicate clear water. Low total depth observations have a potential to concentrate contaminants.

E. coli Bacteria

E. coli bacteria originate in the digestive tract of endothermic organisms. The EPA has determined *E. coli* to be the best indicator of the degree of pathogens in a water body, which are far too numerous to be tested for directly, considering the amount of water bodies tested. A pathogen is a biological agent that causes disease. The standard for *E. coli* impairment is based on the geometric mean (geomean) of the *E. coli* measurements taken. A geometric mean is a type of average that incorporates the high variability found in parameters such as *E. coli* which can vary from zero to tens of thousands of CFU/100 mL. The standard for contact recreational use of a water body such as Lake Livingston is 126 CFU/100 mL. A water body is considered impaired if the geometric mean is higher than this standard.

Texas Surface 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 so that it supports public health and protects aquatic life, consistent with the sustainable economic development of the state.

Water quality standards identify appropriate uses for the state's surface waters, including aquatic life, recreation, and sources of public water supply (or drinking water). The criteria for evaluating support of those uses include DO, temperature, pH, TDS, toxic substances, and bacteria.

The Texas Surface Water Quality Standards also contain narrative criteria (verbal descriptions) that apply to all waters of the state and are used to evaluate support of applicable uses. Narrative criteria include general descriptions, such as the existence of excessive aquatic plant growth, foaming of surface waters, taste- and odor producing substances, sediment build-up, and toxic materials. Narrative criteria are evaluated by using screening levels, if they are available, as well as other information, including water quality studies, existence of fish kills or contaminant spills, photographic evidence, and local knowledge. Screening levels serve as a reference point to indicate when water quality parameters may be approaching levels of concern.

Data Analysis Methodologies

Data Collection

The field sampling procedures are documented in Texas Stream Team Water Quality Monitoring Manual and its appendices, or the TCEQ Surface Water Quality Monitoring Procedures Manual, Volume 1 (August 2012). Additionally, all data collection adheres to Texas Stream Team's approved Quality Assurance Project Plan (QAPP).

Table 1: Sample Storage, Preservation, and Handling Requirements

Parameter	Matrix	Container	Sample Volume	Preservation	Holding Time
E. coli	Water	Sterile Polystyrene (SPS)	100	Refrigerate at 4ºC*	6 hours
Nitrate/Nitrogen	Water	Plastic Test Tube	10 mL	Refrigerate at 4ºC*	48 hours
Orthophosphate/Phosphorous	Water	Glass Mixing Bottle	25 mL	Refrigerate at 4ºC*	48 hours
Chemical Turbidity	water	Plastic Turbidity Column	50 mL	Refrigerate at 4ºC*	48 hours

*Preservation performed within 15 minutes of collection.

Processes to Prevent Contamination

Procedures documented in Texas Stream Team Water Quality Monitoring Manual and its appendices, or the TCEQ Surface Water Quality Monitoring Procedures Manual, Volume 1 (August 2012) outline the necessary steps to prevent contamination of samples, including direct collection into sample containers, when possible. Field Quality Control (QC) samples are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities are documented on the field data sheet. For all field sampling events the following items are recorded: station ID, location, sampling time, date, and depth, sample collector's name/signature, group identification number, conductivity meter calibration information, and reagent expiration dates are checked and recorded if expired.

For all *E. coli* sampling events, station ID, location, sampling time, date, depth, sample collector's name/signature, group identification number, incubation temperature, incubation duration, *E. coli* colony counts, dilution aliquot, field blanks, and media expiration dates are checked and recorded if expired. Values for all measured parameters are recorded. If reagents or media are expired, it is noted and communicated to Texas Stream Team.

Sampling is still encouraged with expired reagents and bacteria media; however, the corresponding values will be flagged in the database. Detailed observational data are recorded, including 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 and administrative purposes.

Data Entry and Quality Assurance

Data Entry

The citizen monitors collect field data and report the measurement results on Texas Stream Team approved physical or electronic datasheet. The physical data sheet is submitted to the Texas Stream Team and local partner, if applicable. The electronic datasheet is accessible in the online DataViewer and, upon submission and verification, is uploaded directly to the Texas Stream Team Database.

Quality Assurance & Quality Control

All data are reviewed to ensure that they are representative of the samples analyzed and locations where measurements were made, and that the data and associated quality control data conform to specified monitoring procedures and project specifications. The respective field, data management, and Quality Assurance Officer (QAO) data verification responsibilities are listed by task in the Section D1 of the QAPP, available on the Texas Stream Team website.

Data review and verification is performed using a data management checklist and self-assessments, as appropriate to the project task, followed by automated database functions that will 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. If there are errors in the calibration log, expired reagents used to generate the sampling data, or any other deviations from the field or *E. coli* data review checklists, the corresponding data is flagged in the database.

When the QAO receives the physical data sheets, they are validated using the data validation checklist, and then entered into the online database. Any errors are noted in an error log and the errors are flagged in the Texas Stream Team database. When a monitor enters data electronically, the system will automatically flag data outside of the data limits and the monitor will be prompted to correct the mistake or the error will be logged in the database records. The certified QAO will further review any flagged errors before selecting to validate the data. After validation the data will be formally entered into the database. Once entered, the data can be accessible through the online DataViewer.

Errors, which may compromise the program's ability to fulfill the completeness criteria prescribed in the QAPP, will be reported to the Texas Stream Team Program Manager. If repeated errors occur, the monitor and/or the group leader will be notified via e-mail or telephone.

Data Analysis Methods

Data are compared to state standards and screening levels, as defined in the Surface Water Quality Monitoring Procedures, to provide readers with a reference point for amounts/levels of parameters that may be of concern. The assessment performed by TCEQ and/or designation of impairment involves more complicated monitoring methods and oversight than used by volunteers and staff in this report. The citizen water quality monitoring data are not used in the assessments mentioned above, but are intended to inform stakeholders about general characteristics and assist professionals in identifying areas of potential concern.

Standards & Exceedances

The TCEQ determines a water body to be impaired if more than 10% of samples, provided by professional monitoring, from the last seven years, exceed the standard for each parameter, except for *E. coli* bacteria. When the observed sample value does not meet the standard, it is referred to as an exceedance. At least ten samples from the last seven years must be collected over at least two years with the same reasonable amount of time between samples for a data set to be considered adequate. The 2010 Texas Surface Water Quality Standards report was used to calculate the exceedances for the Lake Livingston Watershed, as seen below in Table 2.

Table 2: Summary of Surface Water Quality Standards for Lake Livingston

Parameter	**Texas Surface Water Quality Standard 2014**
Water Temperature (°C)	33.9
Total Dissolved Solids (mg/L)	500
Dissolved Oxygen (mg/L)	5.0
pH (su)	6.5-9.0
E.coli (CFU/100 mL)	126 (geomean during sampling period)

Methods of Analysis

All data collected from Lake Livingston were exported from the Texas Stream Team database and were then grouped by site. Data was reviewed and, for the sake of data analysis, only one sampling event per month, per site was selected for the entire study duration. If more than one sampling event occurred per month, per site, the most complete, correct, and representative sampling event was selected.

Once compiled, data was sorted and graphed in Microsoft Excel 2010 using standard methods. Water quality trends over time were analyzed using a linear regression analysis in Minitab v 15. Statistically significant trends were added to Excel to be graphed. The cut off for statistical significance was set to a p-value of ≤ 0.05. A p-value of ≤ 0.05 means that the probability that the observed data matches the actual conditions found in nature is 95%. As the p-value decreases, the confidence that it matches actual conditions in nature increases.

For this report, specific conductivity measurements, gathered by volunteers, were converted to TDS using the TCEQ-recommended conversion formula of specific conductivity 0.65. This conversion was made so that volunteer gathered data could be more readily compared to state gathered data. Geomeans were calculated for *E. coli* data for trends and for each monitoring site.

Lake Livingston Watershed Data Analysis

Lake Livingston Maps

Numerous maps were prepared to show spatial variation of the parameters. The parameters mapped include DO, pH, TDS, and *E. coli*. There is also a reference map showing the locations of all active. For added reference points in all maps, layers showing monitoring sites, cities, counties, and major highways were included. All shapefiles were downloaded from reliable federal, state, and local agencies.

Lake Livingston Watershed Trends over Time

Sampling Trends over Time

Texas Stream Team water quality monitoring began in November of 2010 and continues to this day. A total of 88 monitoring events from November, 2010 to July, 2014 from 2 sites were analyzed for this report. The highest percent of samples (33%) were collected in 2011. Sampling occurred at a slightly higher rate during the summer months than the winter months. The time of sampling was consistently between 10:00 and 11:00.

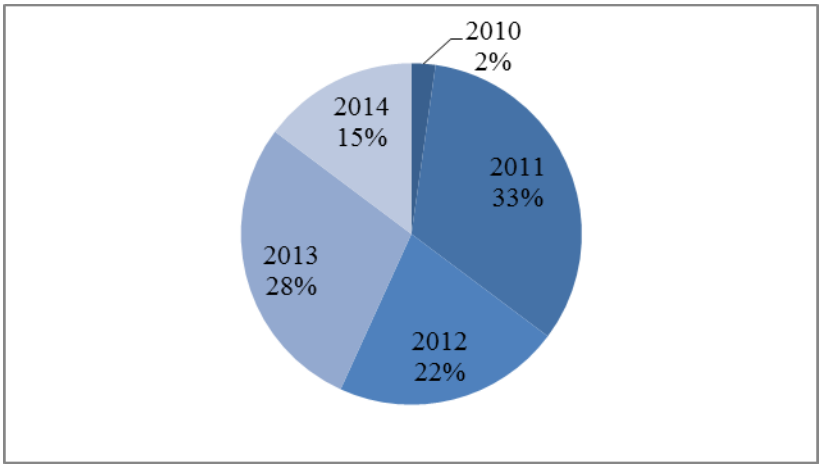

Figure 2: Samples by Year in Lake Livingston

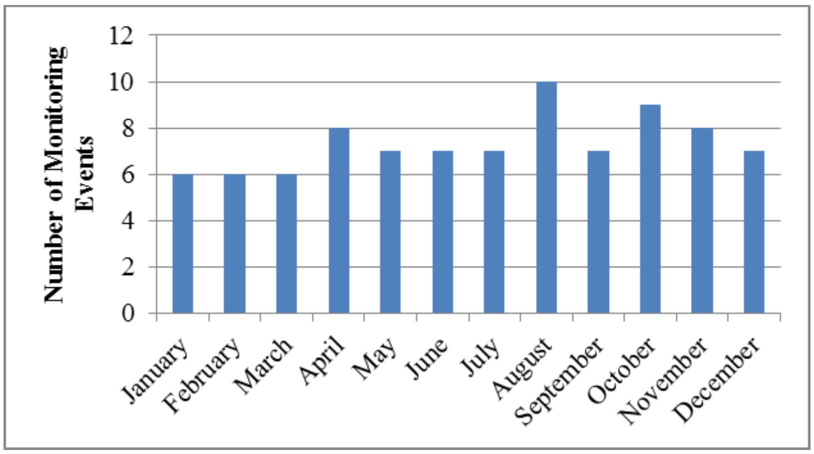

Figure 3: Breakdown of Sampling by Month for Lake Livingston

Table 3: Descriptive parameters for all sites at Lake Livingston

Lake Livingston November 2010 – July 2014				
Parameter	Number of Samples	Mean ± Standard Deviation	Min	Max
Total Dissolved Solids (mg/L)	85	306 ± 74	182	520
Water Temperature (°C)	88	21.8 ± 6.7	7.9	31.7
Dissolved Oxygen (mg/L)	85	7.5 ± 1.7	3.1	12
pH	88	7.7 ± 0.4	6.8	9.0
E. coli	37	10	0	640

There were a total of 88 sampling events between 11/18/2010 and 07/07/2014. Mean is listed for all parameters except for E. coli which is represented as the geomean.

Trend Analysis over Time

Air and water temperature

A total of 88 air and water temperatures were collected within the Lake Livingston Watershed between 2010 and 2014. Water temperatures never exceeded the TCEQ suggested optimal temperature of 32.2°C. Air temperature reached a high of 36.9°C in September of 2011, and a low of 0°C in January, 2014. Water and air temperature followed a seasonal pattern of increasing in the summer months and decreasing in the winter months.

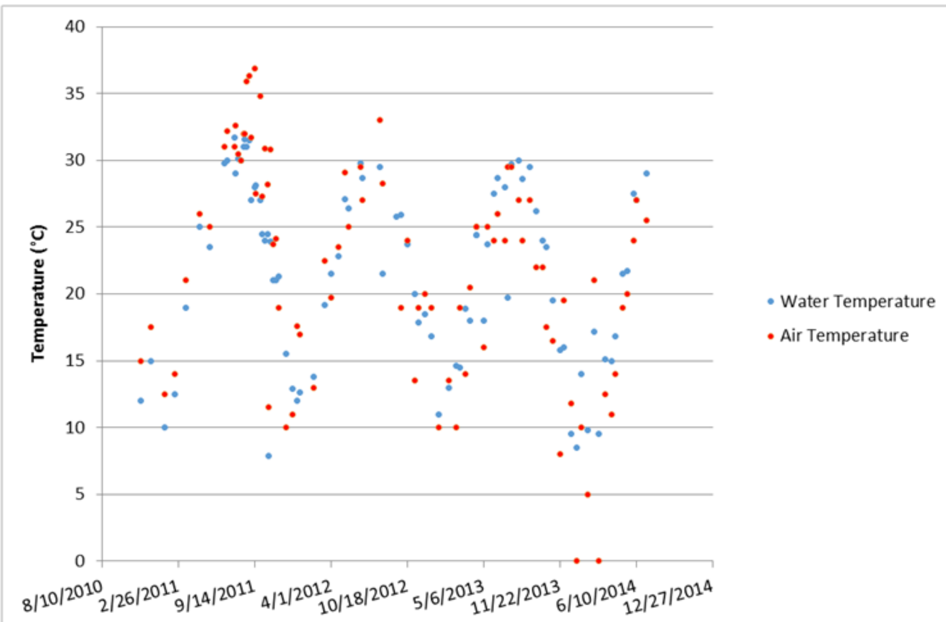

Figure 4: Air and water temperature over time at all sites within the Lake Livingston Watershed

Total Dissolved Solids

Citizen scientists collected 85 TDS samples at Lake Livingston. The TDS measurement was completed for 96.5% of all monitoring events. The mean TDS concentration for all sites on the lake was 306 mg/L. There was no significant trend in TDS concentrations over time observed during this time.

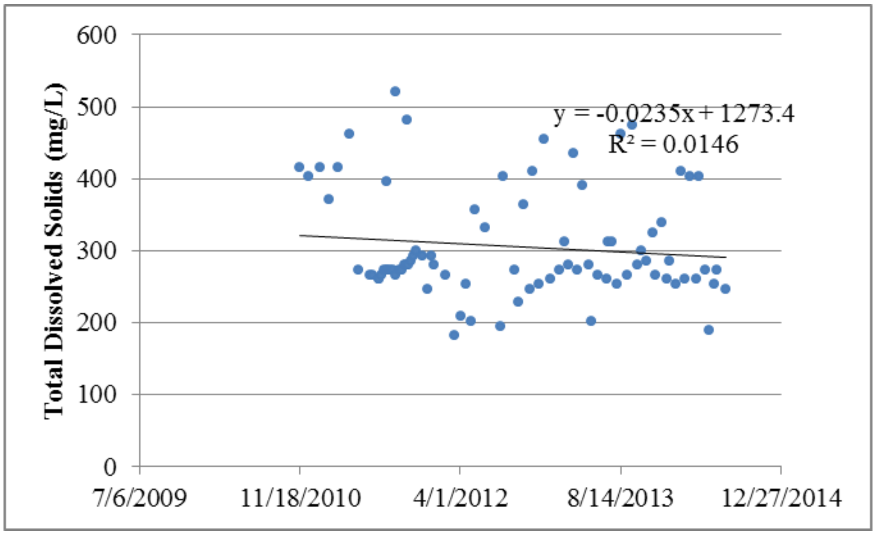

Figure 5: Total Dissolved Solids over time at all sites on Lake Livingston

Dissolved Oxygen

Citizen scientists collected a total of 85 DO samples at Lake Livingston representing 96.5% of all monitoring events. Dissolved oxygen fluctuated seasonally with the values increasing when the water was cooler and decreasing when the water was warmer. This is because colder water holds more dissolved gasses than warmer water. The mean DO was 7.5 mg/L and it ranged from a low of 3.1 mg/L in June, 2014, to a high of 12.0 mg/L in February of 2011.

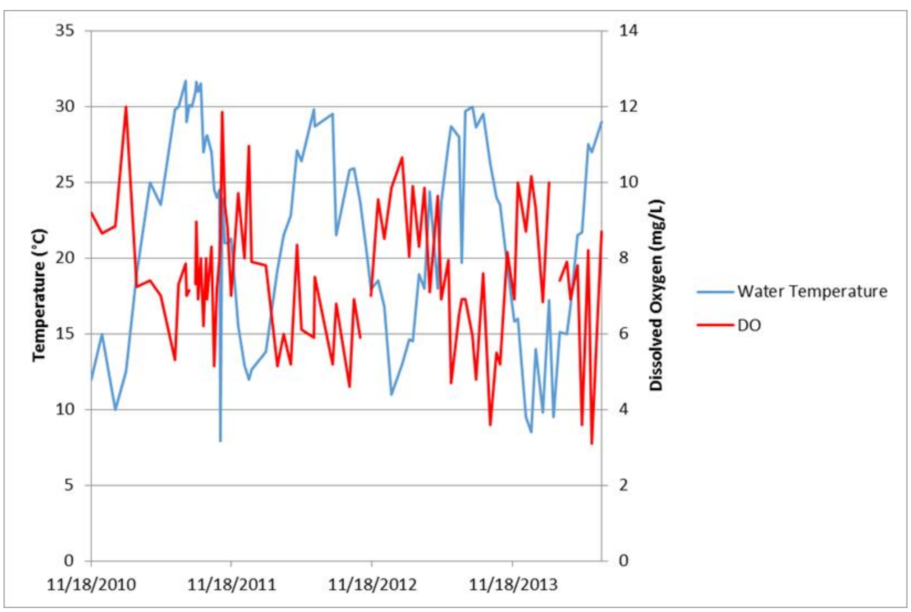

Figure 6: Dissolved oxygen and water temperature over time at all sites on Lake Livingston

pH

pH was completed for all 88 monitoring events. The mean pH was 7.7 and it ranged from 6.8 to 9.0. There was no significant trend in pH over time observed during this time.

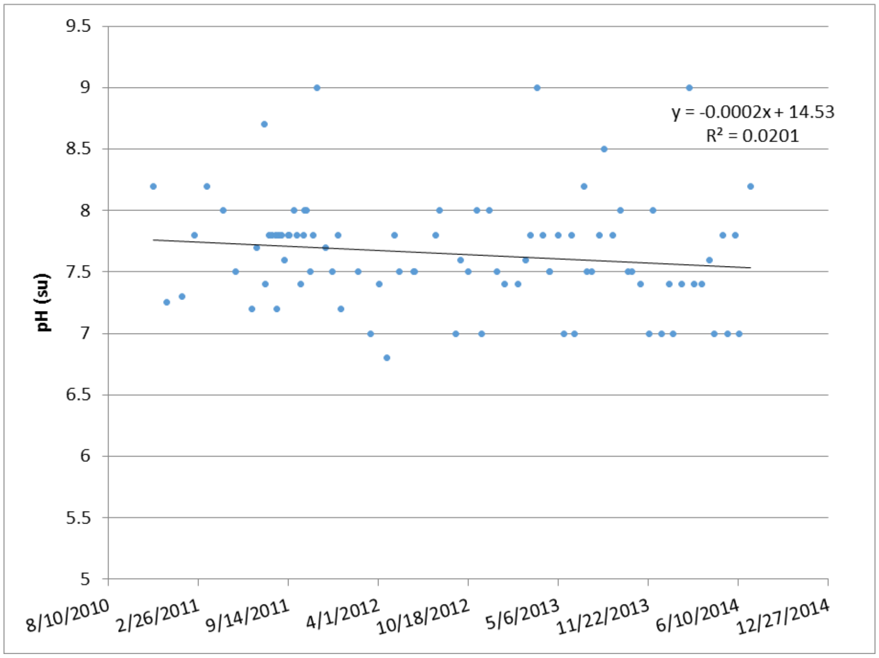

Figure 7: pH over time at all sites on Lake Livingston

Site 80618– Lake Livingston at Pier at end of Lakewood Dr.

Site Description

This site is a neighborhood pier on the north end of the lake where the Trinity River enters into the reservoir. The shoreline at this site faces due south. There are several houses on the water front with fairly large backyards that back up to the shoreline. To the west of the neighborhood is an undeveloped wooded area of pine trees.

Sampling Information

This site was sampled 68 times between September, 2010, and April, 2014. The site was typically monitored at 10:00.

Table 4: Descriptive parameters for Site 80618

Parameter	Number of Samples	Mean ± Standard Deviation	Min	Max
Total Dissolved Solids (mg/L)	65	317 ± 80	182	520
Water Temperature (°C)	68	20.6 ± 6.7	7.9	31.7
Dissolved Oxygen (mg/L)	66	7.4 ± 1.8	3.1	12
pH	68	7.6 ± 0.5	6.8	9.0
E. coli	37	10	0	640

Site was sampled 68 times between 9/14/2010 and 4/29/2014.

Air and water temperature

Air and water temperature were sampled 68 times during this period. Air temperatures fluctuated in a seasonal pattern with a minimum of 0°C in January and March of 2014, and a maximum of 33°C in August of 2012. The minimum water temperature was 7.9°C in October of 2011 and the maximum temperature was 31.7°C and was measured in July of 2011.

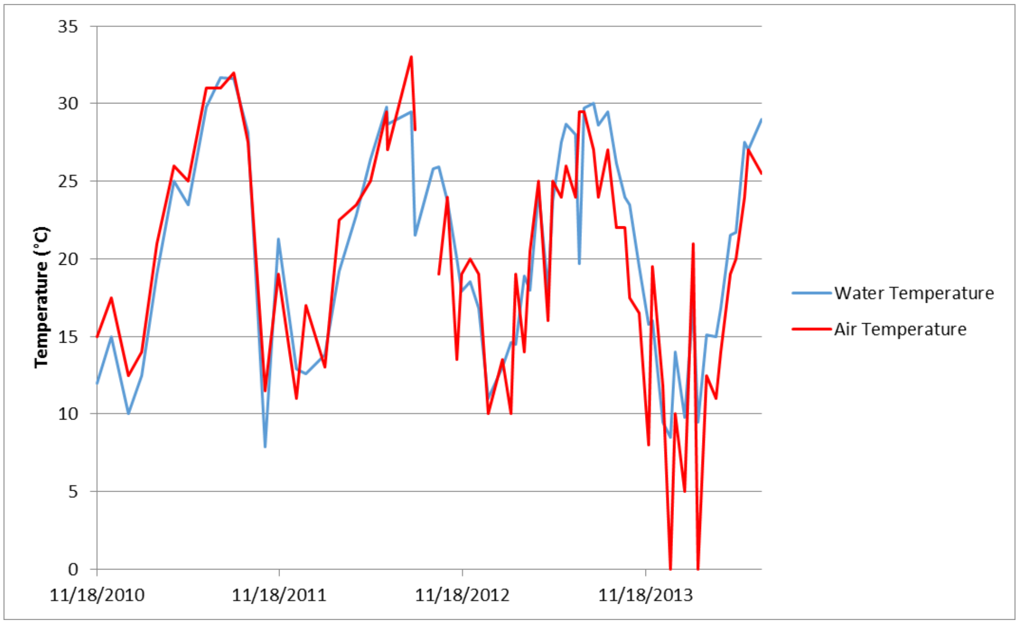

Figure 8: Air and water temperature at Site 80618

Total Dissolved Solids

Citizen scientists collected 65 TDS samples from this site during this time period. The mean value was 317 mg/L. The minimum concentration was 182 mg/L and was recorded in March of 2012. The maximum concentration was 520 mg/L and was recorded in September, 2011. There was a significant decrease in TDS concentrations over time observed at this site ($p = 0.016$). The R^2 value of 0.0907 indicates that this relationship explains about 9% of the variation in the data.

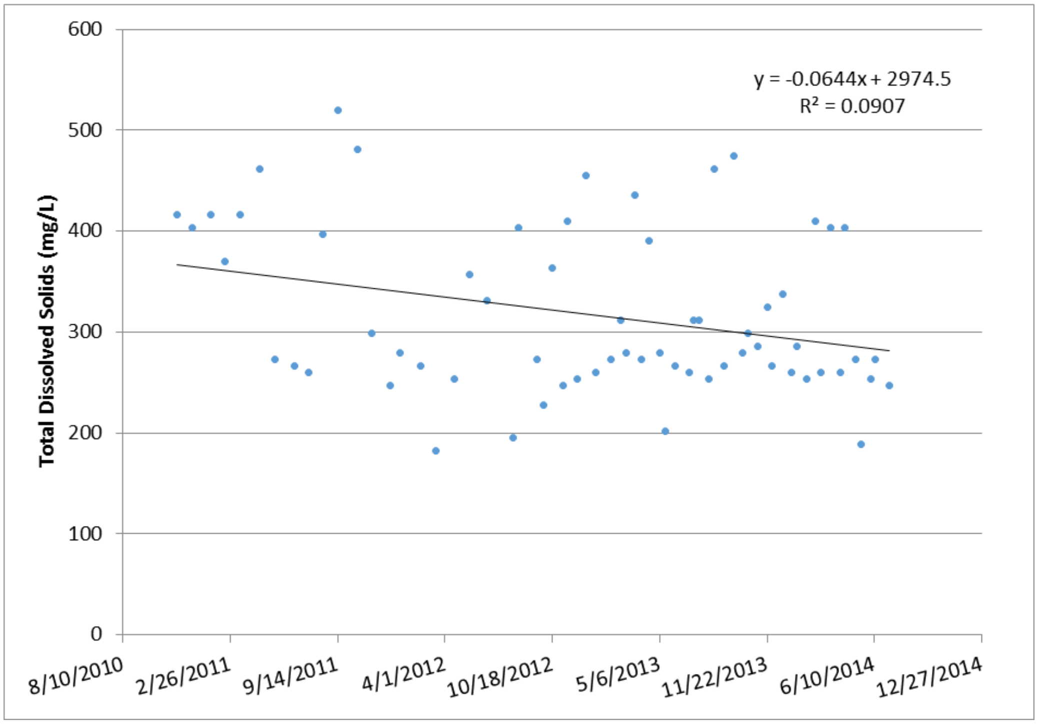

Figure 9: Total Dissolved Solids at Site 80618

Dissolved Oxygen

A total of 66 dissolved oxygen samples were taken at this site. The mean DO concentration was 7.4 mg/L. The minimum DO concentration was 3.1 mg/L and was recorded in June, 2014. The maximum DO concentration was 12.0 mg/L and was taken in February of 2011. There was no significant trend observed in DO concentrations over time.

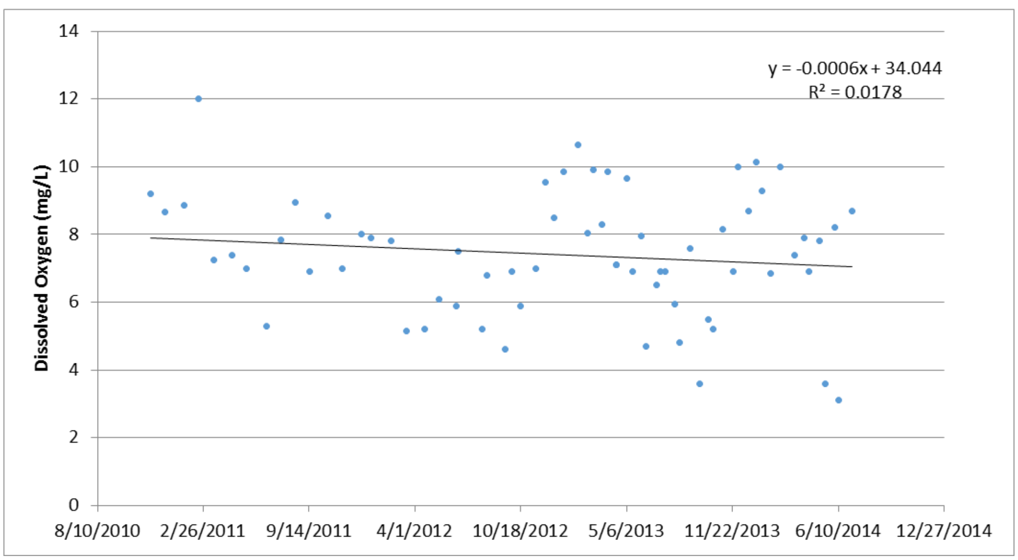

Figure 10: Dissolved Oxygen at Site 80618

pH

There were 68 pH measurements taken at this site. The mean pH was 7.6 and it ranged from a low of 6.8 in April, 2012 to a high of 9 on several occasions. There was no significant trend in pH over time observed for this site during this time.

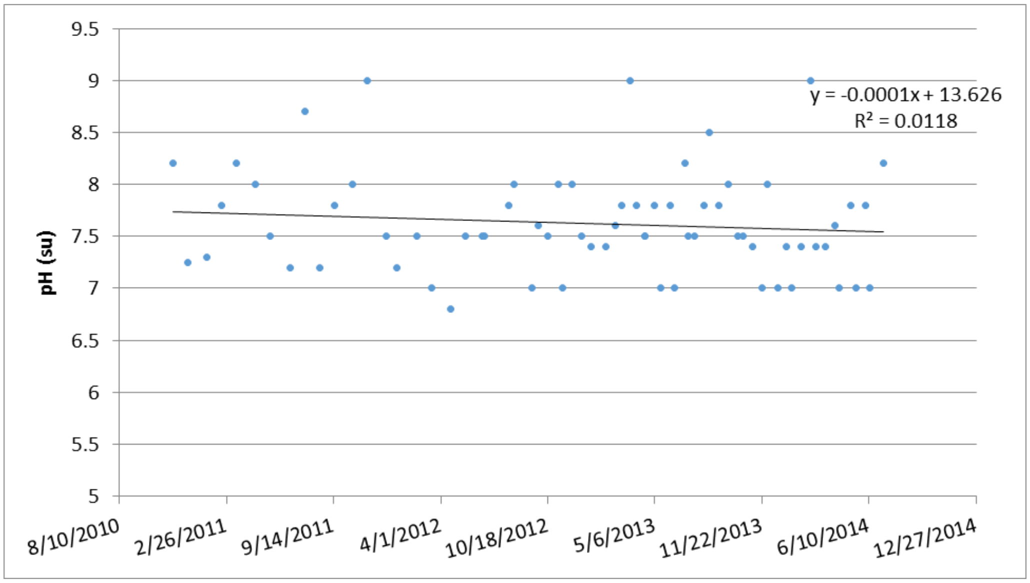

Figure 11: pH at Site 80618

Secchi disk and total depth

The mean total depth at this monitoring site was 1.94 m. The Secchi disk depth was always less than the total depth, indicating that the bottom of the lake was not visible at this site. The mean Secchi disk depth was 0.73 m at this site.

Field Observations

Algae cover was recorded as absent at this site. The water color was described as clear or light green. Water clarity ranged for clear to cloudy and was turbid on one occasion. The water had no distinguishable odor.

E. coli Bacteria

Citizen scientists collected 37 E. coli samples from this site. The geomean for E. coli was 10 CFU/100 mL. E. coli counts ranged from no E. coli to a high of 640 CFU/100 mL in August of 2013. There was no significant trend in E. coli observed for this site during this time.

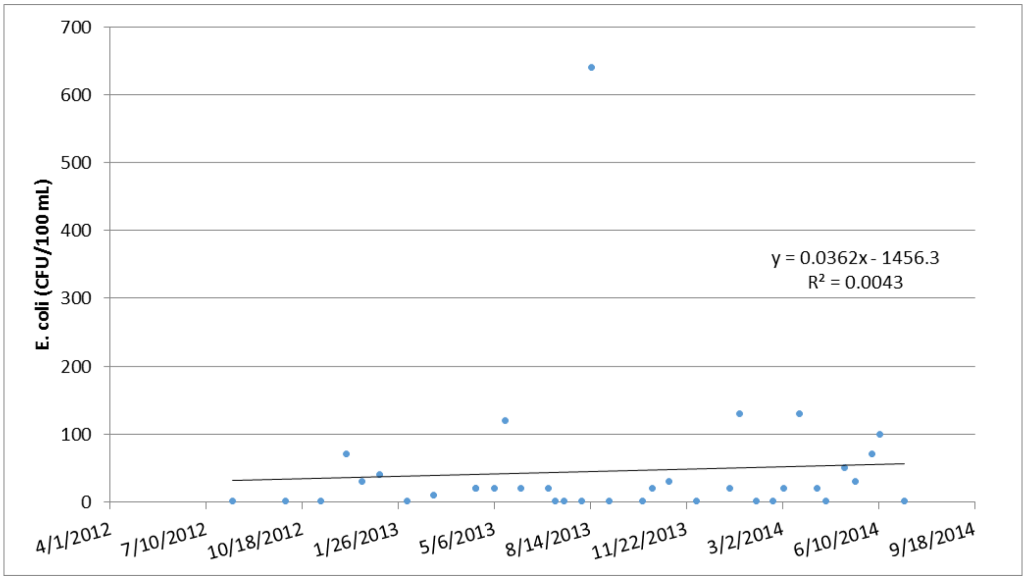

Figure 12: E. coli at Site 80618

Site 80678 – Lake Livingston at Pier off Edgewater Dr.

Site Description

This site is on a private pier in the backyard of a house on the south end of the lake. The shoreline faces the lake in a southwestern direction. There are a few houses with boat docks along the shoreline, and the grounds are manicured. There is a bulkhead along the shore protecting it from erosion.

Sampling Information

This site was sampled 20 times between July, 2011 and May of 2012. Sampling typically occurred in the morning hours between 10:00 and 11:00.

Table 5: Descriptive parameters for Site 80678

Parameter	Number of Samples	Mean ± Standard Deviation	Min	Max
Total Dissolved Solids (mg/L)	20	269 ± 23	202	293
Water Temperature (°C)	20	25.5 ± 5.1	12.0	31.5
Dissolved Oxygen (mg/L)	19	8.0 ± 1.6	5.2	11.9
pH	20	7.7 ± 0.2	7.4	8.0

Site was sampled 20 times between 7/4/2011 and 5/7/2012.

Air and water temperature

There were 20 air and water temperatures taken at this site during this period. Air temperatures fluctuated in a seasonal pattern with a minimum of 10°C in December of 2011, and a maximum of 28°C in September of 2011. The minimum water temperature was recorded in January of 2012 and was 12.0°C. The maximum water temperature was 31.5°C and was recorded in August of 2011. The mean water temperature was 25.5°C.

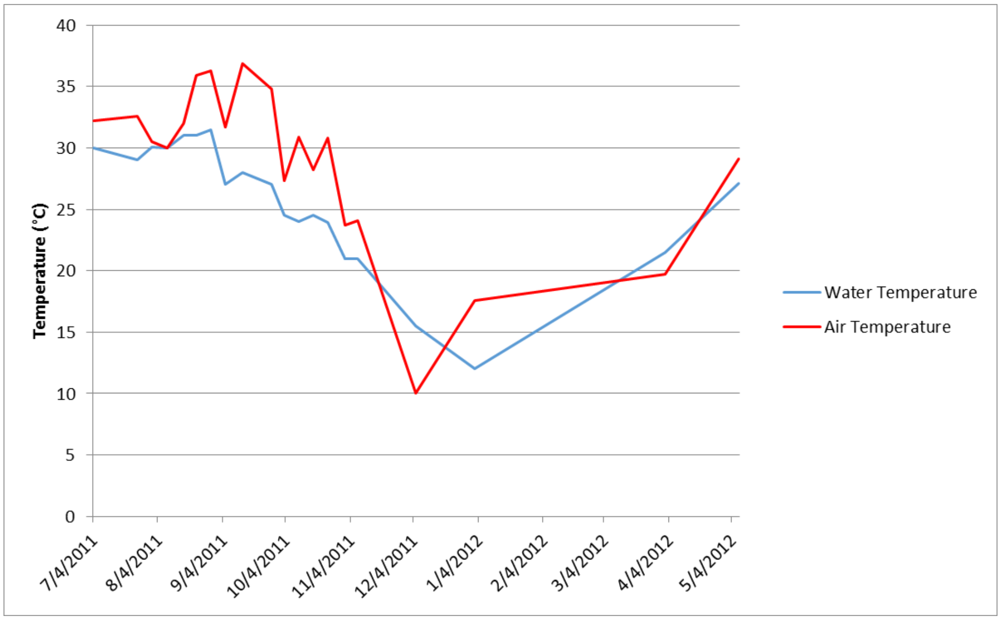

Figure 13: Air and water temperature at Site 80678

Total Dissolved Solids

There were 20 TDS measurements taken at this site. The mean TDS concentration was 269 mg/L. The minimum TDS concentration was 202 mg/L and occurred in May of 2012. The maximum TDS concentration was 450 mg/L and was recorded in November of 2011. There was a significant relationship between TDS concentrations and time with TDS decreasing over time ($p = 0.010$). The R^2 was 0.3155 indicating a somewhat strong relationship between TDS and time observed during this time.

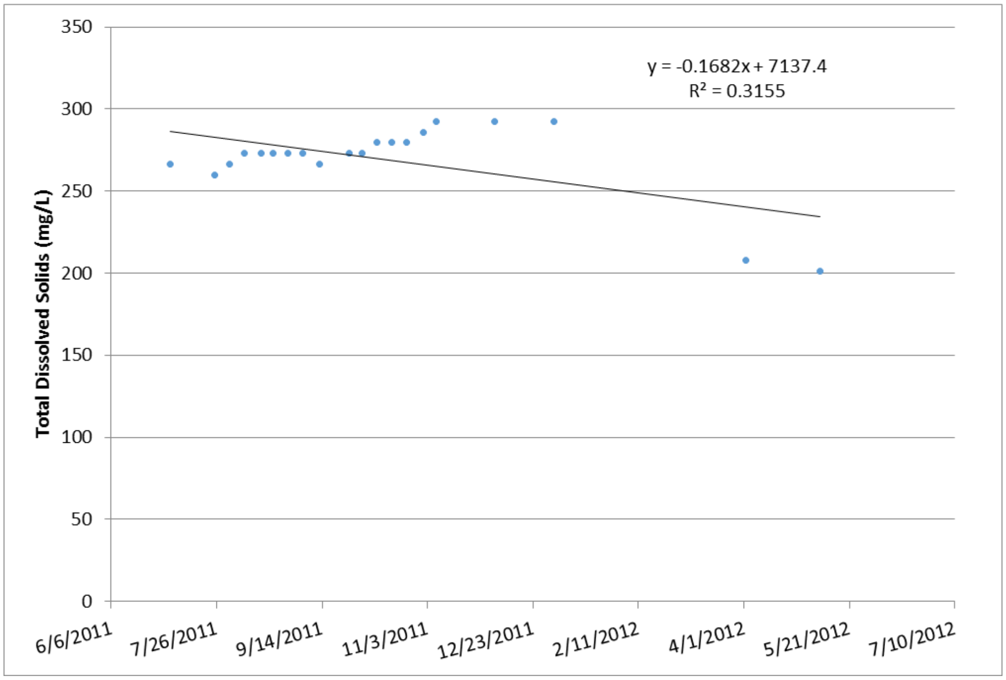

Figure 14: Total Dissolved Solids at Site 80678

Dissolved Oxygen

Citizen scientists collected 19 DO samples at this site. The mean DO concentration was 8.0 mg/L. The minimum DO concentration was 5.2 mg/L and was recorded in October of 2011. The maximum DO concentration was 11.9 mg/L and was recorded in October 2011. There was no significant trend in dissolved oxygen over time observed at this site.

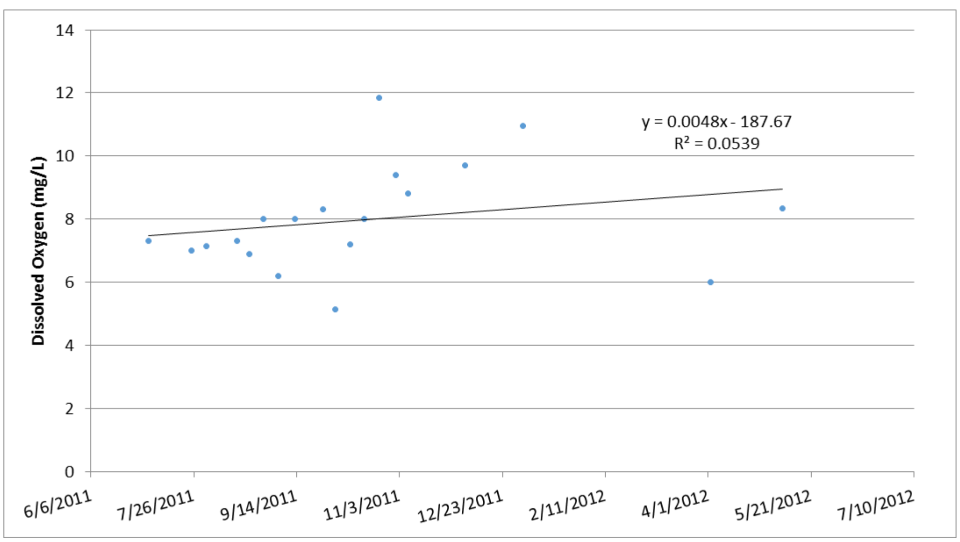

Figure 15: Dissolved Oxygen at Site 80678

pH

There were 20 pH samples taken at this site. The mean pH was 7.7 and it ranged from a low of 7.4 in July of 2011 to a high of 8.0 in September and October of 2011. There was no significant trend in pH over time observed at this site.

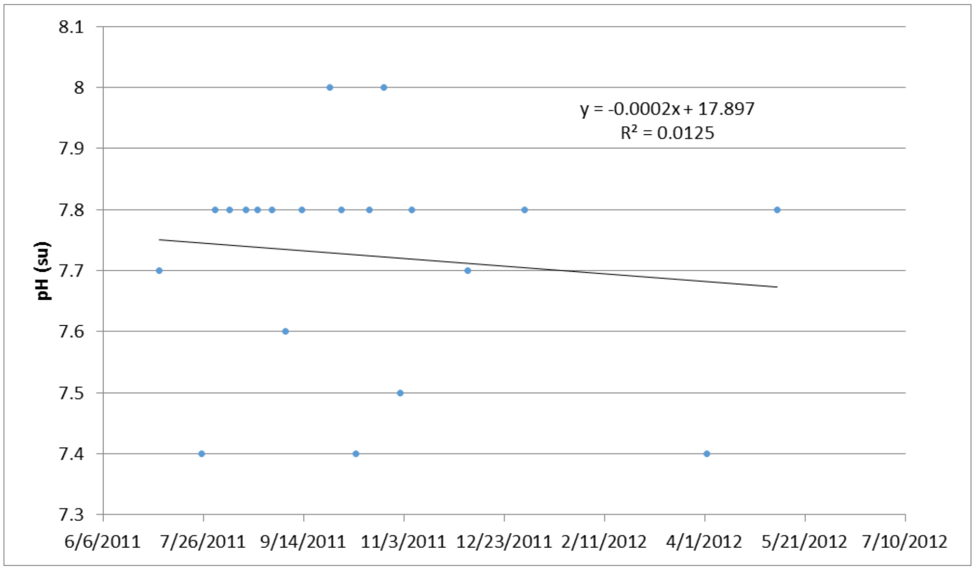

Figure 16: pH at Site 80678

Secchi disk and total depth

The mean total depth at this site was 0.88 m. The Secchi disk depth was never greater than the total depth indicating that the bottom of the lake was not visible at this location. The mean Secchi disk depth was 0.56 m.

Field Observations

This site had no algae cover during the sampling period. The water color was always described as light green. The water clarity alternated between clear and cloudy and there was no distinguishable odor.

Get Involved with Texas Stream Team!

Once trained, citizen monitors can directly participate in monitoring 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 (TCEQ) and river authority water specialists, and, if necessary, filing complaints with environmental agencies, contacting elected representatives and media, or starting organized 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 stakeholder 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 to be formulated. For more information about participating in these steering committee meetings, please 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 become involved in the assessment and protection system that Texas agencies use to keep water resources healthy and sustainable.

References

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Appendix A- List of Maps, Tables, and Figures

Tables

Figures