Texas Stream Team Volunteer Water Quality Monitoring Program
2008 Arroyo Colorado Data Summary

This data summary report includes general basin volunteer monitoring activity, general water quality descriptive statistics, tables and graphs, and comparisons to stream standards as related to "aquatic life use" criteria.

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 is coordinating 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 (see box insert on this page); 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.tnrcc.state.tx.us/water/quality/data/wmt/contract.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, baseline, local decision making, problem identification, and others uses deemed appropriate by the data user. Graphs are compiled and situated to assist the data user in obtaining information from the collected data. Where applicable, "time" is located on the "x" or horizontal axis and is chronologically listed from oldest to most recent sampling. The "y1" or "y2" axes contain the constituent(s) of interest. Note: pH values were not transformed for graphing purposes or for developing mean statistics; data collection events may not be evenly distributed over time (through seasons and years); sampling events may occur at different times of the day; sample collection and results documentation may have been completed by different monitors over time at each site; data collected by school groups should undergo additional scrutiny before use; data summary information is subject to change.

DATA

The following information summarizes key water quality information collected by five volunteer water quality monitors who were certified through Texas Stream Team. Each parameter will have a series of corresponding graphs and charts. For all graphs, site name or sample date is located on the "x" or horizontal axis. This axis represents the independent variable, location of site or time. The data points on the "x" axis progress from upstream to downstream or chronologically from oldest to most recent sampling. The "y1" or "y2" axes contain the constituent(s) of interest. There is also an "R" squared correlation coefficient equation accompanied by a trend line that indicates the strength and direction of a linear relationship between two variables. This coefficient is used to determine if an independent variable is related to a dependent variable. While correlation does not represent causation, there is sometimes a demonstrated cause and effect relationship.

Data collected by Texas Stream Team monitors include: pH, specific conductivity, water and air temperature, dissolved oxygen, flow severity, days since last precipitation, total depth, Secchi depth, field observations, and others.

pH Summary

pH levels measure how acidic or alkaline the water sample is. A reading is taken on a 0 – 14 scale measured in standard units (su). When pH levels fall out of the 5 – 9.5 su range, it begins to become a problem for aquatic life. In this data set, mean pH values stay within a fairly close range of 7.5 to 8.3 su. The high value of 8.3 su was observed at "Tidal upstream of Marker 36." This is possibly an indication of the saline water from the ocean bay. The low value of 7.5 su was observed at the monitoring site at FM 493. The minimum value of 5.2 and maximum of 9.9 su were both observed at the South Alamo Floodway. While the low value is within the acceptable range for pH values, the 9.9 su reading may be of concern for aquatic life use issues.

Specific Conductivity Summary

Specific Conductivity (SC) levels measure the amount of Total Dissolved Solids (TDS) that are present in a water sample. These can be a wide variety of inorganic substances such as sodium, chloride, nitrates, and phosphates. Generally, high SC values indicate salt water, while lower values are usually observed in fresh water. SC is measured using micro Siemens per centimeter (µs/cm). In this data set, mean SC values range from 4000 to 16720 µs/cm. The highest mean value of 16720µs/cm, taken from "Tidal upstream of Marker 36," is most likely an indication of saline water from the ocean bay mixing with the fresh water from the Arroyo Colorado. This relationship can be observed by the next highest mean value being 4700 µs/cm at FM 493. The minimum value in the data set was recorded at 1100 µs/cm at the South Alamo Floodway. The maximum value not at the Tidal site was recorded at 5300 µs/cm at FM 493. The maximum value at the Tidal site was recorded as 19900 µs/cm.

Water Temperature Summary

Water temperature affects many different aspects of water quality. It can effect feeding, reproduction, and the metabolism of aquatic animals as well as the rate of chemical reactions and solubility of compounds in the water. In this data set, mean water temperature falls within a range of 22.7º (C) to 25.7º. The low mean value was observed at FM 493 and the high mean value was observed at the Tidal upstream of Marker 36. The minimum recorded temperature of 15º was observed at FM 493 and the Tidal. The maximum recorded temperature of 31.5º was read at the South Alamo Floodway and the Tidal.

Dissolved Oxygen Summary

Dissolved Oxygen (DO) is the oxygen freely available to fish and other aquatic life. Traditionally, the level of DO has been accepted as the single most important indicator of a water body's ability to support desirable aquatic life. It is measured in mg/L. In this data set, mean DO values range from 5.4 at South Palm Court Dr. to 7.6 at "Tidal upstream of Marker 36." The minimum recorded value in the data set was 3.1, recorded at the South Alamo Floodway. This measurement is below the 5.0 mg/L standard for aquatic life use criteria and may be deemed to be threatening to aquatic life use conditions. The maximum recorded value in the data set was 10.9 at the Tidal site.

SITE BY SITE

Volunteers monitored three sites for a total of 24 current sampling events from June 3rd, 2007 to February 17th, 2008. The site at "Tidal Upstream of Marker 36" was monitored from October 26th, 1995 to October 4th, 1998.

Arroyo Colorado at South Alamo Floodway

There were 11 samples taken from the South Alamo Floodway from June 3rd, 2007 to February 17th, 2008. The data was collected by Texas Stream Team volunteer water quality monitors Rick Ramke and Sharon Slagle. Sampling times ranged from 10:00 am to 6:00 pm with the mean sampling time occurring at 1:58 pm. Secchi depth measurements ranged from 0.1 to 0.6 m with the average being 0.3 m. Total depth measurements were left incomplete, making it difficult to assess water transparency. Specific Conductivity ranged from 1100 to 4900 µs/cm, with an average of 4000 µs/cm. Dissolved Oxygen values ranged from 3.1 to 10 mg/L, with an average of 6.6 mg/L. One of 11 sampling events yielded DO values lower than the 5.0 mg/L standard, giving the site a 9% exceedence rate. pH values ranged from 5.2 to 9.9 su, with an average of 7.6 su. The recorded pH level of 9.9 su was the only out of the 5 – 9.5 su range acceptable for surface water bodies.

Arroyo Colorado at FM 493

There were 9 samples taken from the monitoring site at FM 493 from September 22nd, 2007 to February 17th, 2008. The data was collected by Texas Stream Team volunteer water quality monitors Rick Ramke and Sharon Slagle. Sampling times ranged from 9:00 am to 5:05 pm with the mean sampling time occurring at 12:55 pm. Secchi depth measurements ranged from 0.1 to 0.4 m with the average being 0.2 m. Total depth measurements were left incomplete, making it difficult to assess water transparency. Specific Conductivity ranged from 4400 to 5300 µs/cm, with an average of 4700 µs/cm. Dissolved Oxygen values ranged from 4.7 to 7.8 mg/L, with an average of 6.5 mg/L. One of 8 sampling events yielded DO values lower than the 5.0 mg/L standard, giving the site a 13% exceedence rate. pH values ranged from 5.6 to 7.8 su, with an average of 7.5 su.

Arroyo Colorado at South Palm Court Drive

There were 4 samples taken from the monitoring site at South Palm Court Drive from June 7th, 2007 to December 30th, 2007. The data was collected by Texas Stream Team volunteer water quality monitor William Moulder. Sampling times ranged from 8:30 am to 10:30 am with the mean sampling time occurring at 9:32 am. Secchi depth measurements ranged from 0.1 to 0.2 m with the average being 0.14 m. Total depth measurements were left incomplete, making it difficult to assess water transparency. Specific Conductivity ranged from 3900 to 4800 µs/cm, with an average of 4300 µs/cm. Dissolved Oxygen values ranged from 4.1 to 6.6 mg/L, with an average of 5.4 mg/L. One of 4 sampling events yielded DO values lower than the 5.0 mg/L standard, giving the site a 25% exceedence rate. The "R" squared coefficient when DO values are compared to water temperature is 0.92, indicating a strong statistical relationship. When water temperature is higher, DO levels tend to be lower, representing an inverse relationship. pH values stayed with an extremely tight range of 7.8 to 7.9 su, with an average of 7.9 su. These close values could, however, be a product of the lack of samples collected. More sampling could yield a wider range in pH values.

Arroyo Colorado Tidal Upstream of Marker 36

There were 29 samples taken from the monitoring site at "Tidal upstream of Marker 36" from October 26th, 1995 to October 4th, 1998. The data was collected by Texas Stream Team volunteer water quality monitor Christine Rakestraw. This data was collected over 9 years ago, making it subject to scrutiny. However, since it is the most extensive data set in this watershed, it is included in this report for comparison purposes. Sampling times ranged from 4:15 am to 6:15 pm with the mean sampling time occurring at 11:28 am. Secchi depth measurements ranged from 0.3 to 1.1 m with the average being 0.6 m. Total depth measurements ranged from 0.6 to 2 m, with an average of 1.5 m. Total depth exceeds Secchi depth by a significant amount, revealing a somewhat low water transparency. Specific Conductivity ranged from 10300 to 19900 µs/cm, with an average of 16720 µs/cm. These SC are high compared to the other values in this data set due to the salinity of the water at the Tidal site. Dissolved Oxygen values ranged from 3.8 to 10.9 mg/L, with an average of 7.6 mg/L. Since there were no recorded titrations in sequence with Texas Stream Team water sampling quality control checks, the DO data at this site must be viewed as a reference point, and should not be looked at on a rigorous scientific basis. With this in mind, 2 of 29 sampling events yielded DO values lower than

the 5.0 mg/L standard, giving the site a 7% exceedence rate. pH values ranged from 7.4 to 8.8 su, with an average of 8.3 su.

CHARTS AND GRAPHS

Arroyo Colorado at South Alamo Floodway
Site # 80426

	N	% Complete	Minimum	Mean	Maximum	Standard Deviation
Sample Time	10	91	10:00	13:58	18:00	3:12
Total Depth (m)	1	9	1	1	1	NA
Secchi Depth (m)	9	82	0.1	0.3	0.6	0.15
Specific Conductivity (S/cm)	9	82	1100	4000	4900	1.24
Air Temperature (ºC)	11	100	19	26.7	34	4.56
Water Temperature (ºC)	11	100	17	25.2	31.5	4.4
Dissolved Oxygen (mg/L)	11	100	3.1	6.6	10	1.76
pH (su)	10	91	5.2	7.6	9.9	1.12

Dissolved Oxygen Exceedence (< 5.0 mg/L) = 1 of 11 = 9%
pH Exceedence (> 9.5) = 1 of 11 = 9%

Arroyo Colorado at FM 493
Site # 80445

	N	% Complete	Minimum	Mean	Maximum	Standard Deviation
Sample Time	9	100	9:00	12:55	17:05	3:17
Total Depth (m)	0	0	0	0	0	0
Secchi Depth (m)	9	100	0.1	0.2	0.4	0.08
Specific Conductivity (S/cm)	9	100	4400	4700	5300	0.3
Air Temperature (ºC)	9	100	16	25.2	31	4.1
Water Temperature (ºC)	9	100	15	22.7	29.5	4.2
Dissolved Oxygen (mg/L)	8	89	4.7	6.5	7.8	1.02
pH (su)	7	78	5.6	7.5	7.8	0.8

Dissolved Oxygen Exceedence (< 5.0 mg/L) = 1 of 8 = 13%
pH Exceedence (> 9.5) = 0 of 7 = 0%

Arroyo Colorado at South Palm Court Drive
Site # 80423

	N	% Complete	Minimum	Mean	Maximum	Standard Deviation
Sample Time	4	100	8:30	9:32	10:30	0:49
Total Depth (m)	0	0	0	0	0	0
Secchi Depth (m)	4	100	0.1	0.14	0.2	0.05
Specific Conductivity (S/cm)	3	75	3900	4300	4800	0.46
Air Temperature (ºC)	4	100	17	23.1	28	5.7
Water Temperature (ºC)	4	100	16.5	22.6	28	5.7
Dissolved Oxygen (mg/L)	4	100	4.1	5.4	6.6	1.1
pH (su)	4	100	7.8	7.9	7.9	0.05

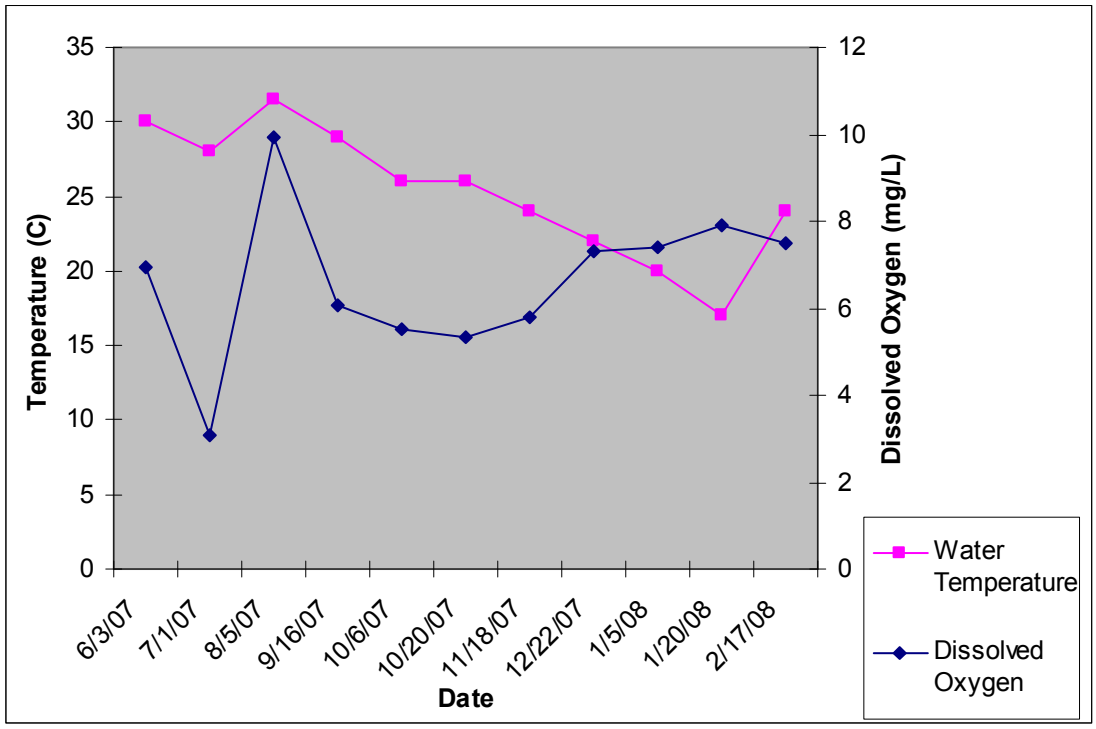
Dissolved Oxygen Exceedence (< 5.0 mg/L) = 1 of 4 = 25%
pH Exceedence (> 9.5) = 0 of 4 = 0%

Arroyo Colorado Tidal Upstream of Marker 36
Site # 15794

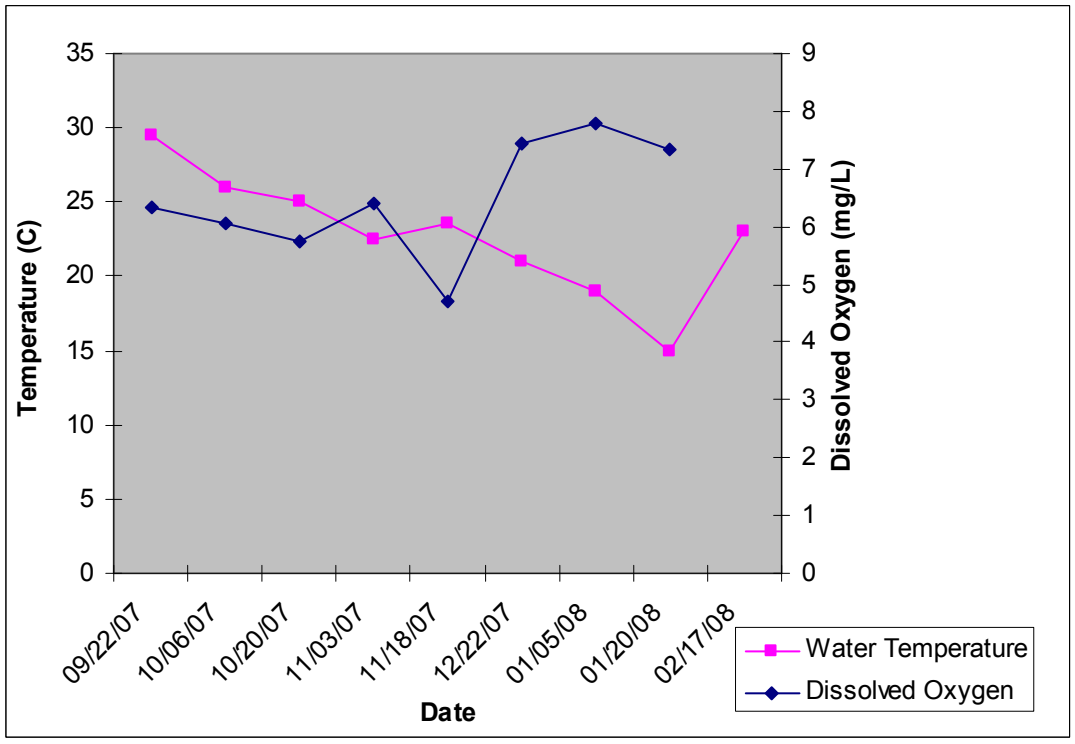
	N	% Complete	Minimum	Mean	Maximum	Standard Deviation
Sample Time	29	100	4:15	11:28	18:15	3:28
Total Depth (m)	29	100	0.6	1.5	2	0.36
Secchi Depth (m)	29	100	0.3	0.6	1.1	0.16
Specific Conductivity (S/cm)	5	17	10300	16720	19900	3916.9
Air Temperature (ºC)	29	100	14	25.8	33	4.9
Water Temperature (ºC)	29	100	15	25.7	31.5	5.02
Dissolved Oxygen (mg/L)	29	100???	3.8	7.6	10.9	1.93
pH (su)	29	100	7.4	8.3	8.8	0.3

Dissolved Oxygen Exceedence (< 5.0 mg/L) = 2 of 29 = 7%
pH Exceedence (> 9.5) = 0 of 29 = 0%

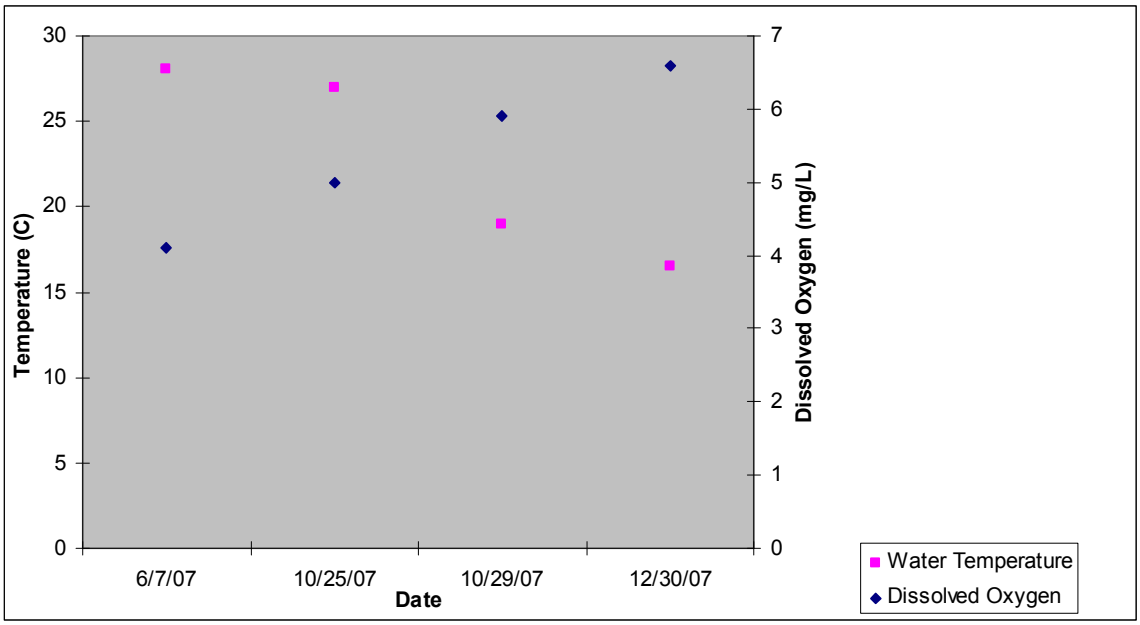
Water Temperature and Dissolved Oxygen at the South Alamo Floodway site



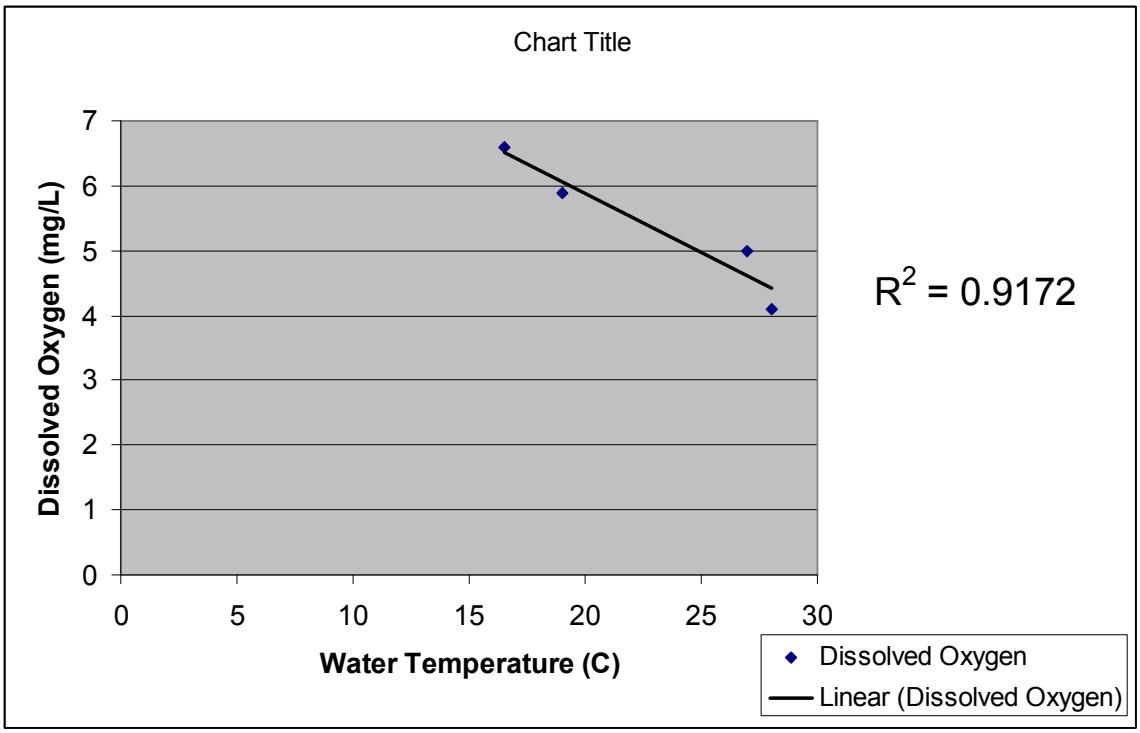
Water Temperature and Dissolved Oxygen at the FM 493 site



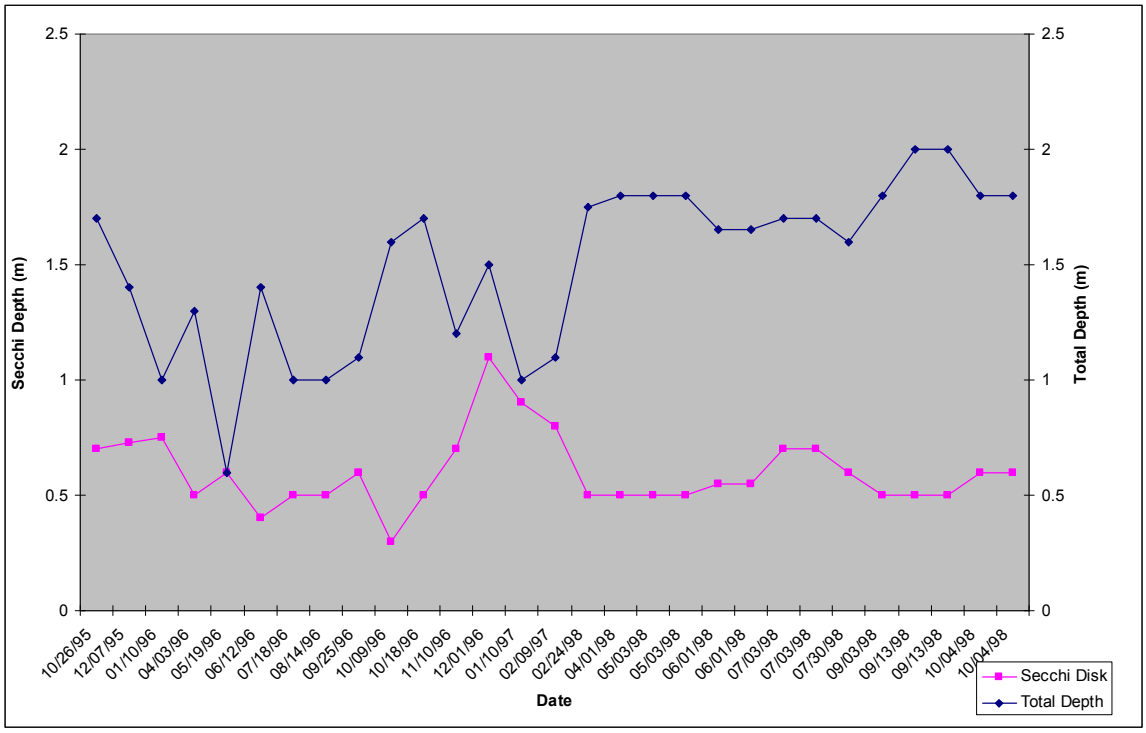
Water Temperature and Dissolved Oxygen at the South Palm Court Dr. site



Dissolved Oxygen and Water Temperature with "R" squared coefficient at the South Palm Court Dr. site



Total Depth and Secchi Disk Depth at the Tidal site Upstream of Marker 36



Water Temperature and Dissolved Oxygen at the Tidal site Upstream of Marker 36