DRAFT

Texas Stream Team Volunteer Water Quality Monitoring Program
2008 Lower Guadalupe River 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.

TCEQ Guadalupe River Basin Narrative Summary

The Texas Commission on Environmental Quality has provided the following summary information. The headwaters of the Guadalupe River form in southwestern Kerr County. The river flows southeasterly to Guadalupe Bay, part of the San Antonio Bay System. The Blanco and San Marcos Rivers are major tributaries to the Guadalupe. The total basin drainage area is 6,070 square miles.

The Guadalupe River Basin has been divided into 17 segments for monitoring purposes. The most recent standards revision provides for the creation of segment 1802, Guadalupe River below San Antonio River from existing segment 1803, Guadalupe River below San Marcos River to account for different hydrological conditions and dissolved minerals (total dissolved solids, chloride, and sulfate) gradients and different ambient concentrations. One reservoir (Canyon Lake) covering 8,230 surface acres and 749 stream miles are routinely monitored.

Due to the excellent water quality and abundant spring flow from the Edwards Aquifer, the entire Guadalupe River and its tributaries are used extensively for contact recreation and play a major role in the basin's economy. There are 84 active surface water quality monitoring stations in the Guadalupe River Basin.

This data report pertains to seven sites, all between Canyon Lake Dam and the last site: Gruene Crossing near New Braunfels, TX. These sites are useful in understanding ambient water conditions after Canyon Lake Dam and establishing baseline data for this stretch of the Guadalupe River. All sites reside upstream from the confluence of the Comal River, barely northwest of Interstate Highway 35.

DATA

The following information summarizes key water quality information collected by the Lindheimer Master Naturalists from 2004 to 2007. 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 su range, it begins to become a problem for aquatic life. In this data set, mean pH values stay within a range of 7.5 to 7.9 su. The minimum value of 7 su was observed at Gruene Crossing and the maximum value of 8.5 su was taken just below Canyon Lake Dam. These ranges of pH standard values are seen as desirable for all uses of water.

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, the mean SC values ranged from 421 to 488 µs/cm, indicating an extremely tight data set and very desirable water conditions. The minimum value came in at 360 µs/cm and the maximum at 606 µs/cm. The 606 reading was taken on January 27th, 2006 at the site just below Canyon Lake Dam. While this is a relatively high reading in the data set, the next highest reading was 490 µs/cm, indicating that the maximum reading was an anomaly occurring for various different possible reasons. It is not seen as a threat however, unless these high readings were to be observed more often.

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 readings ranged from 16º (C) to 19.8º. The maximum reading of 31º was taken at Gruene Crossing as well as the minimum of 4º. This minimum value is seen as an extreme outlier as the next lowest temperature at this site was 12º. Overall, temperatures were the lowest at the site below the dam. The three lowest values of 6º, 7º, and 10º indicate the more constant nature of this site to hold lower temperatures than those down stream. This is notably because Canyon Lake Dam releases water from the bottom of the reservoir to continue down the Guadalupe River. Water temperatures are observed to increase as the water flows down to Gruene with the exception of the extreme outlier observed in Gruene of 4º on November 30th, 2006.

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 ranged from 10.4 to 7 mg/L. The minimum value of 4.5 mg/L was observed at Deep Creek and the maximum value of 14.3 mg/L was observed below Canyon Lake Dam. This could possibly be attributed to the churning of the water as it flows out of the dam. There is also actually an aerator inside the dam that the water is run through. Since this procedure pumps air straight into the water, the DO levels should be very high as the water flows out of the dam. The same principle is applicable to the minimum value having been observed at Deep Creek. The water readings there are taken off of a dam before the water flows over it and is churned up by outflow over the dam. In these lower flowing conditions, it is logical that the DO levels would be observed as lower than in the rapidly flowing river.

SITE BY SITE

Volunteers monitored 7 sites for a total of 187 sampling events. Almost all monitoring was conducted by members of the Lindheimer Master Naturalists out of Comal County with the exception of Judy Lee's group out of Canyon Middle School. All data collected and reported in partnership with Guadalupe-Blanco River Authority.

Guadalupe River below Canyon Lake Dam

There were 44 samples taken from the site below Canyon Lake Dam from November 16th, 2004 to December 12th, 2007. Sampling event times ranged from 7:20 am to 7:40 pm with the average sample time occurring at 10:24 am. Total depth measurements varied from 0.3 to 1 m, the average being 0.7 m with Secchi depth almost identical. This indicates a high level of water transparency. Specific Conductivity values ranged from 370 to 606 µs/cm with an average of 428.9 µs/cm. The maximum value outlier of 606 µs/cm was observed on January 27th, 2006. This was far above the next highest reading

of 490 µs/cm. Dissolved Oxygen values ranged from 5.2 to 14.3 mg/L, with only one sample exceeding a value less than the 6.0 mg/L, giving the site an exceedence rate of 2%. pH values ranged from 7 to 8.5 su, with an average of 7.6 su.

Guadalupe River at 4th Crossing Bridge

There were 26 samples taken from the 4th Crossing Bridge from December 8th, 2004 to June 13th, 2007. Sampling event times ranged from 11:25 am to 3:30 pm with the average sample time occurring at 1:29 pm. Total depth measurements varied from 0.3 to 1 m, the average being 0.5 m with the average Secchi depth as 0.6 m. Since the average Secchi depth is greater than the total depth, this indicates a very high level of water transparency. Specific Conductivity values ranged from 360 to 520 µs/cm with an average of 445.4 µs/cm. Dissolved Oxygen values ranged from 6.7 to 11.1 mg/L with an average of 8.9 mg/L and a 0% exceedence rate. pH values ranged from 7.5 to 8.1 su, with an average of 7.6 su.

Guadalupe River below Ponderosa Crossing

There were 32 samples taken from Ponderosa Crossing from September 19th, 2004 to May 4th, 2007. Sampling event times ranged from 8:00 am to 4:13 pm with the average sample time occurring at 11:12 am. Total depth measurements varied from 0.5 to 2.4 m, the average being 1.2 m. The Secchi depth readings ranged from 0.5 to 1.5 m, making the average 1 m. These Secchi disk readings indicate a desirable water transparency. Specific Conductivity values ranged from 390 to 510 µs/cm with an average of 449.7 µs/cm. Dissolved Oxygen values ranged from 6.2 to 10.5 mg/L, with an average of 8.3 mg/L and a 0% exceedence rate. pH values ranged from 7.3 to 8 su, with an average of 7.8 su.

Guadalupe River at 3rd Crossing of River Road

There were 13 samples taken from the 3rd Crossing of River Road from December 12th, 2006 to December 11th, 2007. Sampling event times ranged from 9:00 am to 5:30 pm with the average sampling time occurring at 9:39 am. Total depth measurements varied from 0.4 to 1 m, the average being 0.8 m with the Secchi depth's ranges and averages identical to total depth. This indicates a high level of water transparency. Specific Conductivity values ranged from 360 to 520 µs/cm with an average of 421.5 µs/cm. Dissolved Oxygen values ranged from 5.9 to 13.6 mg/L, with an average of 9.3 mg/L. Only one sample yielded an exceeding value of less than 6.0 mg/L. This represents 8% of sampling events. pH values ranged from 7.1 to 8 su, with an average of 7.5 su.

Guadalupe River at Deep Creek

There were 14 samples taken from Deep Creek from June 30th, 2006 to October 26th, 2007. Sampling event times ranged from 8:58 am to 1:43 pm with the average sampling time occurring at 9:54 am. Total depth measurements had a minimum, maximum, and average values of 1 m. Secchi depth values kept a close resemblance to total depth, not deviating too far from it. Water transparency is high in these desirable conditions. Specific Conductivity values ranged from 410 to 550 µs/cm with an average of 488.6 µs/cm. Dissolved Oxygen values ranged from 4.5 to 9.1 mg/L. The sampling value of 4.5 mg/L is observed as the lowest value in this parameter in the data set presented here.

Only one sample revealed an exceeding value of less than 6.0 mg/L. This represents 7% of sampling events. pH values ranged from 7.4 to 8 su, with an average of 7.9 su.

Guadalupe River at 1st Crossing

There were 32 samples taken from the 1st Crossing from April 5th, 2005 to December 6th, 2007. Sampling event times ranged from 8:40 am to 1:35 pm with the average sampling time occurring at 10:44 am. Total depth measurements varied from 0.9 to 1.5 m, the average being 1 m. Secchi depth values stayed in a tight range from 0.9 to 1 m with the average at 0.9 m. Total and Secchi depth values remain close to each other indicating high water transparency. Specific Conductivity values ranged from 390 to 530 µs/cm with an average of 452.2 µs/cm. Dissolved Oxygen values ranged from 6.6 to 10.8 mg/L, the average being 8.2 mg/L. Out of these 32 sampling events, there was a 0% rate of dissolved oxygen values lower than 6.0 mg/L, giving the water an exceptional rating under these aquatic life criteria. pH values ranged from 7.4 to 7.9 su, with an average of 7.7 su.

Guadalupe River at Gruene Crossing

There were 26 sampling events taken from the river crossing at Gruene from January 28th, 2005 to October 25th, 2007. Sampling event times ranged from 9:05 am to 4:40 pm with the average sampling time occurring at 1:25 pm. Total depth measurements ranged from 0.8 to 10 m, the average depth reading 2.7 m. Secchi depth ranged from 0.7 to 1 m, the average at 0.9 m. Specific Conductivity values varied from 420 to 570 µs/cm with an average of 478.8 µs/cm. Dissolved Oxygen values ranged from 5.6 to 12.2 mg/L. Only one value exceeded the benchmark of less than 6.0 mg/L, representing only 4% of samples. pH values ranged from 7 to 8.4 su, with an average of 7.7 su.

Guadalupe River below Dam						
PARAMETER (ID# 80230)	**N**	**% complete**	**Min**	**Mean**	**Max**	**Std Dev.**
Sample Time	44	100	7:20	10:24	19:40	2:13
Total Depth (m)	43	98	0.3	0.7	1	0.32
Secchi Depth (m)	40	91	> 0.3	> 0.7	> 1	0.32
flow (cfs)	25	NA	53	584	5190	1007
SC (µS/cm)	42	95	370	428	606	39
Air Temp (C)	44	100	6	19.6	34	6
Water Temp (C)	44	100	9.5	16	25	3
DO (mg/L)	43	98	5.2	10.4	14.3	2
pH (su)	44	100	7	7.6	8.5	0.25
DO exceedence [< 6.0 mg/L]		1 of 43	2%			

Guadalupe River at 4th Crossing						
PARAMETER (ID# 80235)	**N**	**% complete**	**Min**	**Mean**	**Max**	**Std Dev.**
Sample Time	26	100	11:25	13:29	15:30	1:16
Total Depth (m)	26	100	0.28	0.5	1	0.19
Secchi Depth (m)	26	100	0.23	0.6	1	0.29
flow (cfs)	18	NA	50	652.2	5390	1285
SC (µS/cm)	26	100	360	445.4	520	38
Air Temp (C)	26	100	10	24.7	36	7
Water Temp (C)	26	100	11.5	19	29	5
DO (mg/L)	26	100	6.7	8.9	11.1	1
pH (su)	26	100	7.5	7.6	8.1	0.18
DO exceedence [< 6.0 mg/L]		0 of 26	0%			

Guadalupe River below Ponderosa Crossing						
PARAMETER (ID# 80227)	**N**	**% complete**	**Min**	**Mean**	**Max**	**Std Dev.**
Sample Time	32	100	8:00	11:12	16:13	2:13
Total Depth (m)	31	97	0.5	1.2	2.4	0.37
Secchi Depth (m)	32	100	0.5	1	1.5	0.3
flow (cfs)	25	NA	53	337.1	2010	402
SC (µS/cm)	32	100	390	449.7	510	35
Air Temp (C)	31	97	11.5	22.8	32	6
Water Temp (C)	32	100	11	19.6	30	6
DO (mg/L)	30	94	6.2	8.3	10.5	1
pH (su)	32	100	7.3	7.8	8	0.21
DO exceedence [< 6.0 mg/L]		0 of 30	0%			

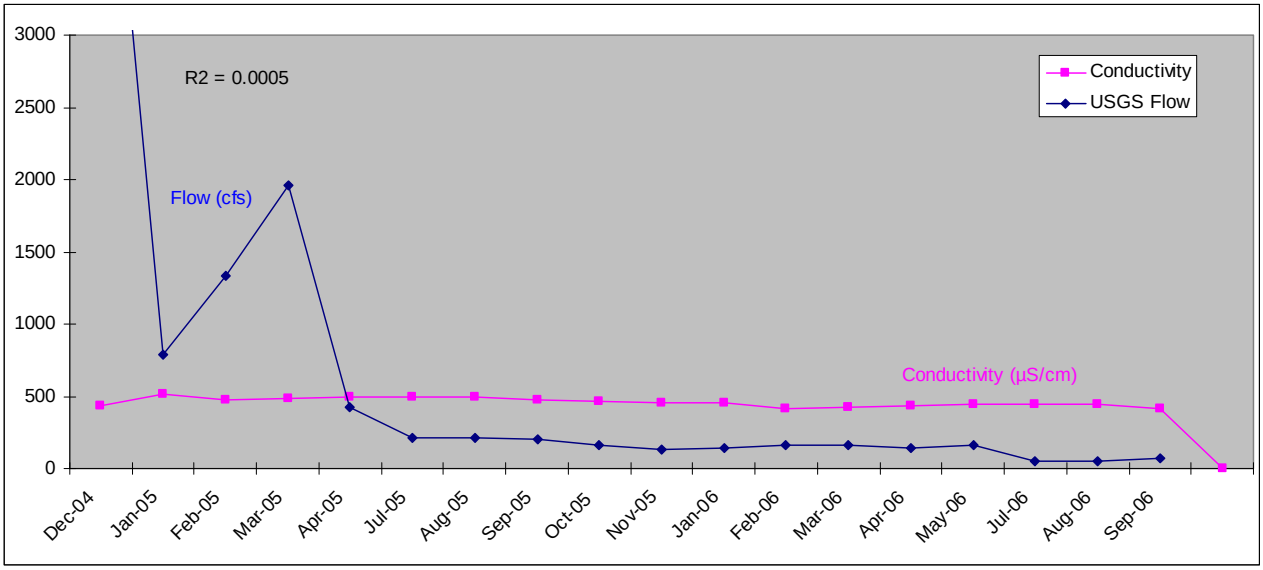
Guadalupe River at 3rd Crossing						
PARAMETER (ID# 80234)	**N**	**% complete**	**Min**	**Mean**	**Max**	**Std Dev.**
Sample Time	13	100	9:00	9:39	17:30	2:21
Total Depth (m)	13	100	0.4	0.8	1	0.26
Secchi Depth (m)	12	92	0.4	0.8	1	0.24
SC (µS/cm)	13	100	360	421.5	520	52
Air Temp (C)	13	100	11.5	20.5	29.5	5
Water Temp (C)	13	100	10.5	18.4	26	5
DO (mg/L)	13	100	5.9	9.3	13.6	2
pH (su)	13	100	7.1	7.5	8	0.26
DO exceedence [< 6.0 mg/L)		1 of 13	8%			

Guadalupe River at Deep Creek						
PARAMETER (ID# 80381)	**N**	**% complete**	**Min**	**Mean**	**Max**	**Std Dev.**
Sample Time	14	100	8:58	9:54	13:43	1:10
Total Depth (m)	14	100	1	1	1	0
Secchi Depth (m)	14	100	0.8	0.9	1	0.05
flow (cfs)	4	NA	61	64.8	69	3
SC (µS/cm)	14	100	410	488.6	550	49
Air Temp (C)	14	100	10	20.1	28	6
Water Temp (C)	14	100	11	18.9	25	5
DO (mg/L)	14	100	4.5	7	9.1	1
pH (su)	14	100	7.4	7.9	8	0.14
DO exceedence [< 6.0 mg/L]		1 of 14	7%			

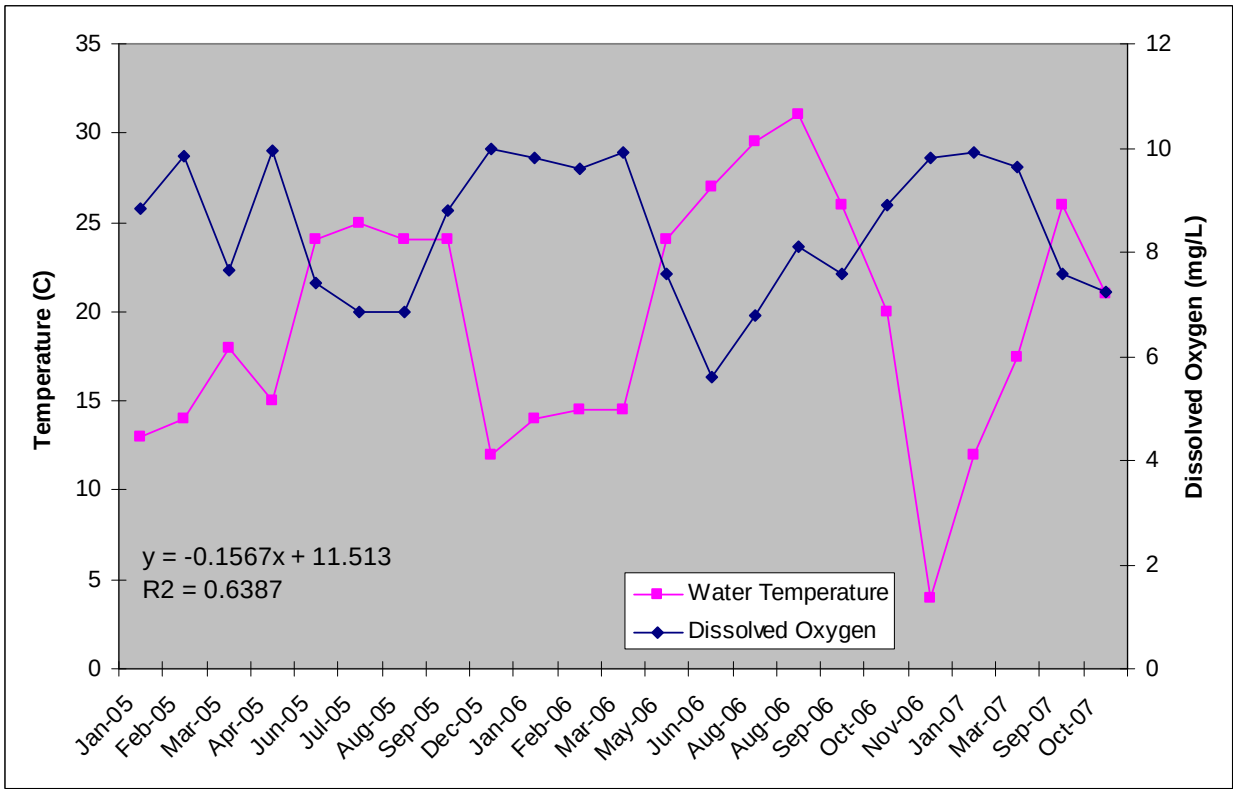
Guadalupe River near 1st Crossing						
PARAMETER (ID# 80237)	**N**	**% complete**	**Min**	**Mean**	**Max**	**Std Dev.**
Sample Time	32	100	8:40	10:44	13:35	1:03
Total Depth (m)	31	97	0.9	1	1.5	0.15
Secchi Depth (m)	32	100	0.9	0.9	1	0.04
flow (cfs)	19	NA	53	198.6	686	184
SC (µS/cm)	32	100	390	452.2	530	43
Air Temp (C)	31	97	11.6	23.1	32	5
Water Temp (C)	32	100	11.5	19.8	27	5
DO (mg/L)	32	100	6.6	8.2	10.8	1
pH (su)	31	97	7.4	7.7	7.9	0.12
DO exceedence [< 6.0 mg/L]		0 of 32	0%			

Guadalupe River at Gruene Crossing						
PARAMETER (ID# 80236)	**N**	**% complete**	**Min**	**Mean**	**Max**	**Std Dev.**
Sample Time	25	96	9:05	13:25	16:40	2:02
Total Depth (m)	23	92	0.8	2.7	10	3
Secchi Depth (m)	23	92	0.7	0.9	1	0.1
flow (cfs)	19	NA	48	280.5	979	291
SC (µS/cm)	25	96	420	478.8	570	42
Air Temp (C)	26	100	9	22.8	36.5	9
Water Temp (C)	26	100	4	18.8	31	7
DO (mg/L)	25	96	5.6	8.6	12.2	1
pH (su)	26	100	7	7.7	8.4	0.3
DO exceedence [< 6.0 mg/L]		1 of 25	4%			

Conductivity and Flow at 4th Crossing



Temperature and Dissolved Oxygen at Gruene, Texas



Specific Conductivity, Temperature, Dissolved Oxygen, and pH levels from the site just below Canyon Lake Dam downstream to Gruene, Texas