Texas Watch Volunteer Water Quality Monitoring Program
2006 Rowlett Creek 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. All sites have been sampled more than nine times within five-year periods as required by the Texas Commission on Environmental Quality (TCEQ).

In alignment with Texas Watch’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 Watch 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 Watch 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; 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.

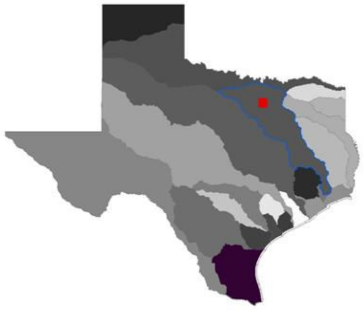
Currently, Texas Watch is working with various public and private organizations to facilitate data and information sharing. One component of this process includes interacting with watershed stakeholders at CRP steering committee meetings. A major function of these meetings is to discuss water quality 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.

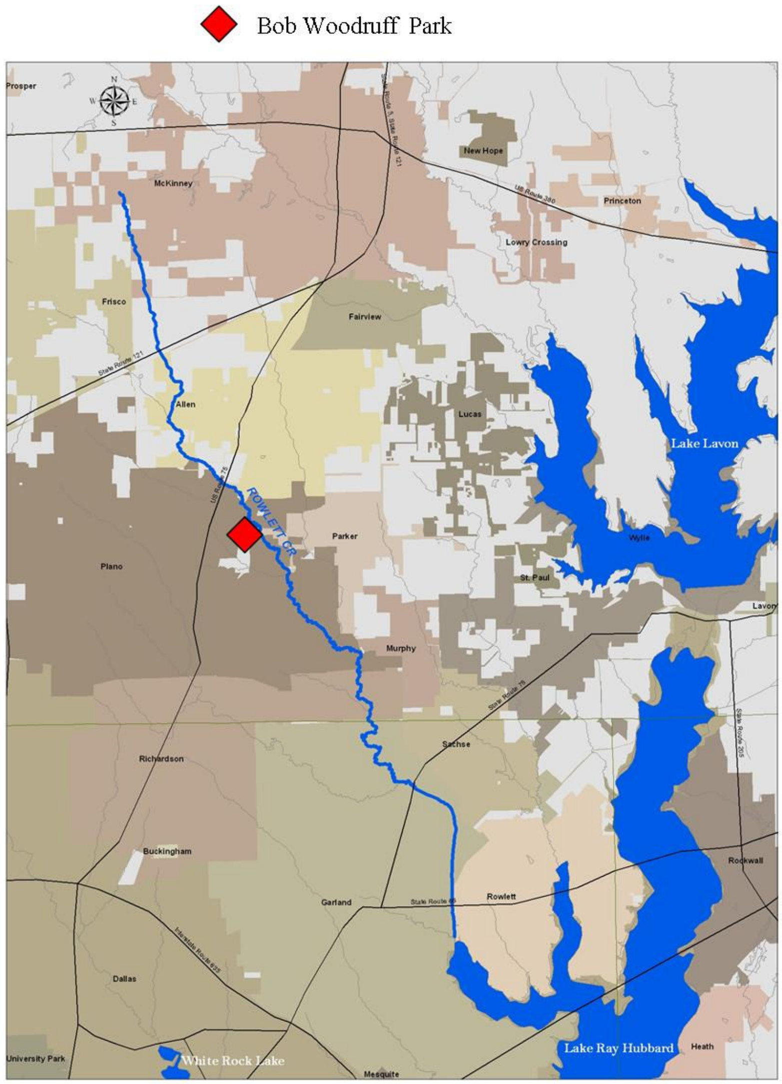
In general, Texas Watch efforts to use volunteer data may include the following:

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 Watch Data Viewer
8. Participate in professional coordinated monitoring processes to raise awareness of areas of concern

Information collected by Texas Watch 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.

SITE DESCRIPTION AND BACKGROUND SUMMARY





Rowlett Creek begins four miles west of McKinney in Collin County and flows southeast twenty-six miles before it empties into Lake Ray Hubbard. It is considered a perennial stream; however, parts of its upper reaches only have intermittent water flow. The creek makes up a watershed area of 137.6 square miles and includes the following cities: McKinney, Plano and Allen in Collin County; Richardson and Garland in Dallas County; and Rowlett in Rockland County. The land cover in the area is blackland clay with a moderate topography. Land use is highly urban, specifically because of the significant growth rate within the Plano area. The portion of the creek in this study is located in the eastern portion of Plano. Here, Rowlett Creek flows through Bob Woodruff Park and Los Rios Country Club golf course.

Rowlett Creek is located within the East Fork of the Trinity River Basin (segment 0820). According to the 2006 Basin Highlight Report, this area is fully supporting for all of its designated uses (i.e. aquatic life use, general use, fish consumption and public water supply.) Contact recreation was not assessed. This fork of the river is made up of mostly flat prairies and heavy urbanization. As a result, surface waters receive significant effluent. (Note: This portion of Rowlett Creek does not receive any effluent discharge). Furthermore, in recent months, this area has seen much drought. As of January 2006, the area was 17” below normal rainfall totals.

The area surrounding Rowlett Creek in east Plano is mostly green space. Just northwest of Los Rios Boulevard are two parks: 300 acre Bob Woodruff Park; and 800 acre Oak Point Park and Nature Preserve. These two highly wooded areas are acting as a buffer zone to the highly urbanized and populated neighborhoods that lie just on the outskirts of the two green spaces. These parks, not only protect the watershed, but act as a floodplain zone. Rowlett Creek has a fairly large floodplain that needs the extra boundary during heavy rain events.

DATA ASSESSMENT

All data included in this report was collected and analyzed by volunteer monitors. In this report, two sets of data are looked at and compared, both located on Rowlett Creek. Site #15615 is located at Bob Woodruff Park, one mile upstream from site #80336, located at Los Rios Boulevard. The Bob Woodruff Park site has been monitored more frequently and over a longer period of time than the Los Rios Boulevard site. The latter of the two sites is important in comparing upstream and downstream water quality; however, the former shows more trends in the data over time. The following tables show a summary of the data used for this report:

The subsequent information summarizes each water quality parameter collected and its significance to surface water quality. Data collected by Texas Watch monitors include: pH, specific conductivity, water and air temperature, dissolved oxygen, total depth, and secchi depth. Each parameter is followed by a set of graphs illustrating trends, exceedences and relationships within the data. 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.

Table 1. This table summarizes the water quality data collected from August 1995 to March 2006 for the upstream site at Woodruff Park.

Rowlett Creek at Woodruff Park – Plano, TX					
Site I.D. # 15615					
	# of samples	% complete	Mean	Min	Max
Sample Time	64	100	13:46	8:00	20:00
Conductivity (µS/cm)	64	100	538	300	760
pH (su)	64	100	8.0	7	8.5
Water Temperature (˚C)	64	100	17	3	27.5
Air Temperature (˚C)	64	100	18.9	2	32
Dissolved Oxygen (mg/L)	60	94	8.5	4.4	13.0
Secchi Depth (m)	64	100	0.4	0.1	0.8
Total Depth (m)	64	100	0.4	0.1	1.25
Dissolved oxygen exceedance [< 6.0 mg/L] 6 out of 64 **9.4%**					

Table 2. This table summarizes the water quality data collected from October 2005 to June 2006 for the downstream site at Los Rios Boulevard.

Rowlett Creek at Los Rios Boulevard – Plano, TX					
Site I.D. # 80336					
	# of samples	% complete	Mean	Min	Max
Sample Time	30	100	10:10	8:30	12:30
Conductivity (µS/cm)	30	100	738	530	880
pH (su)	29	97	7.48	7.0	7.5
Water Temperature (˚C)	30	100	13.5	5	24
Air Temperature (˚C)	30	100	16.5	4	27
Dissolved Oxygen (mg/L)	30	100	7.7	5	10.4

Secchi Depth (m)	N/A	N/A	N/A	N/A	N/A
Total Depth (m)	N/A	N/A	N/A	N/A	N/A
Dissolved oxygen exceedance [< 6.0 mg/L] 2 out of 30 **7%**					

Specific Conductivity

Conductivity is a measure of how well water can conduct electrical currents. It is measured in micro Siemens per centimeter (µS/cm). When dissolved solids, such as chloride, sulfate, nitrate, phosphate, sodium, magnesium, calcium and iron, are present in water, the conductivity increases. The breakdown of these ionic compounds allows the water to conduct electricity because positive and negative charges exist between the particles (ions). Factors causing a variation in conductivity levels include: geology and soils of the watershed; mine tailings; and runoff from roads and/or agricultural lands. Also important to consider is the amount of rainfall affecting the stream. During dry periods, when less water is present, the concentration of ions in the water increase, thus increasing the conductivity.

Conductivity levels for the upstream site show a significant increasing trend for the past ten years. The range of data is 300 µS/cm to 760µS/cm with a mean of 538 µS/cm. Referring to Charts 1 and Chart 2, the increase in conductivity levels begins near 400 and continuously rises into the 600's and higher. As for the Los Rios Boulevard site, no existing trend is illustrated, but that may be due to the diminutive size of the dataset for that site. Overall, lack of sufficient rainfall and excessive human activity in the area may be the cause of the increase in conductivity.

Chart 1. Conductivity levels sampled from Woodruff Park between 1995 and 2000.

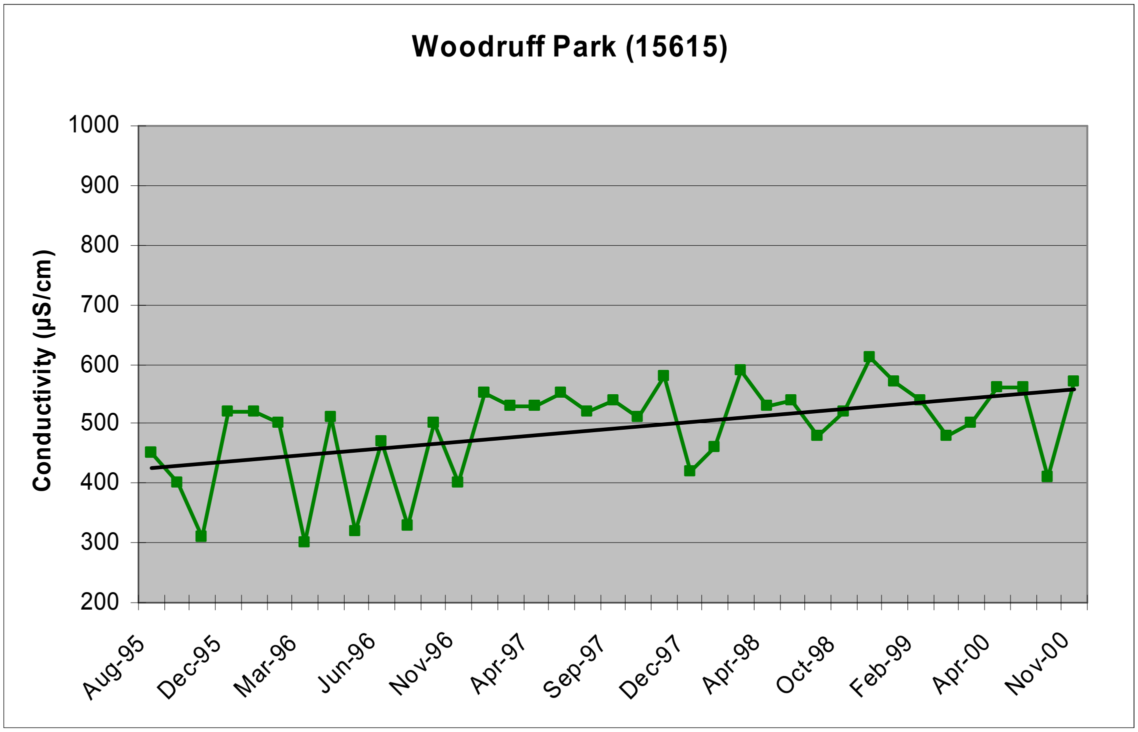


Chart 2. Conductivity levels sampled from Woodruff Park between 2001 and 2006.

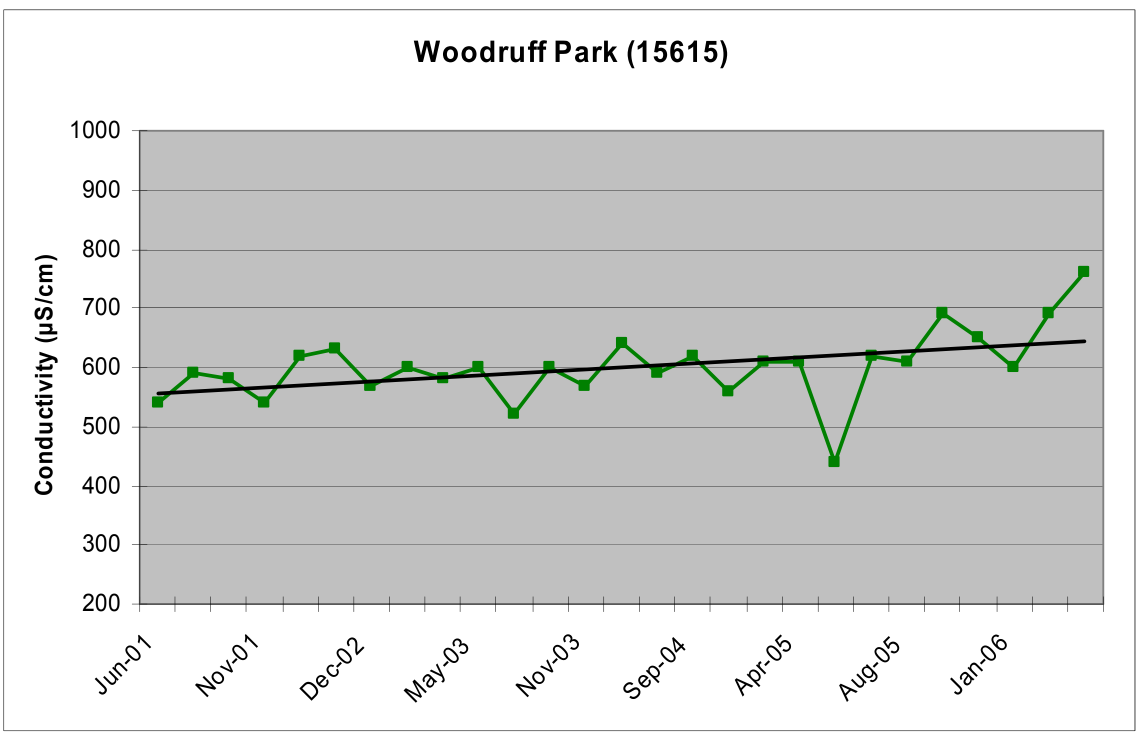
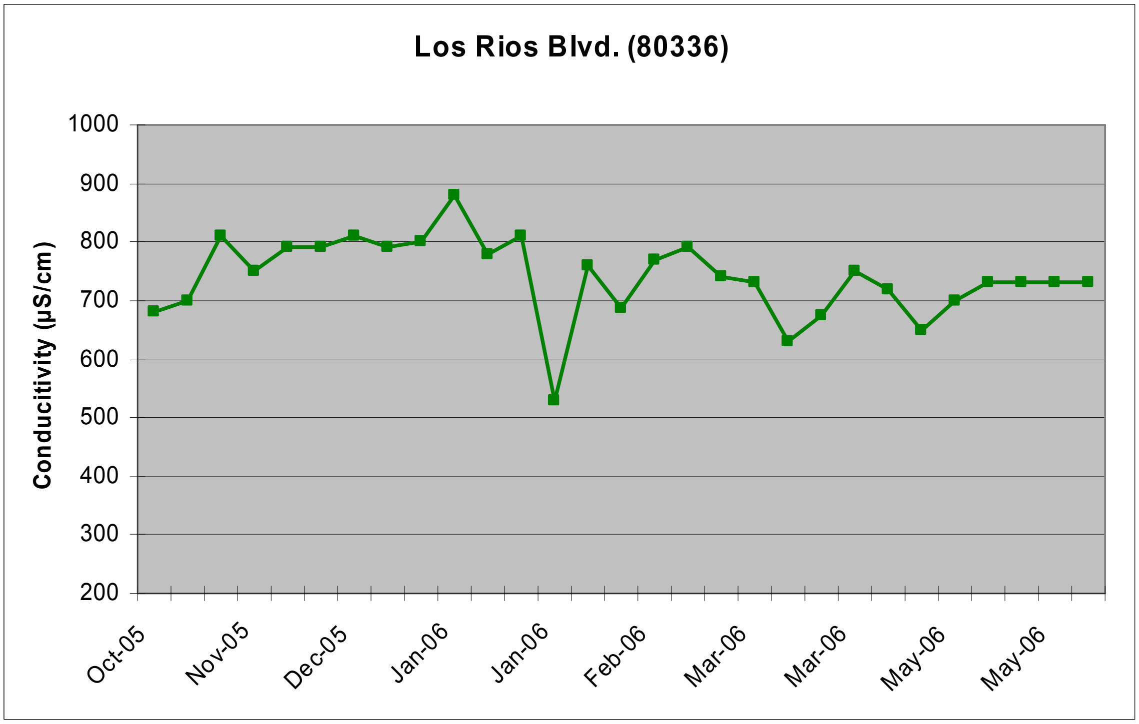


Chart 3. Conductivity levels sampled from Los Rios Boulevard between 2005 and 2006.



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pH

PH measures the concentration of hydrogen ions in water. Fluctuations in pH are a result of algal photosynthetic processes, the concentration of carbon dioxide in the water, the geology of the watershed and air pollution. Generally, pH levels decrease during the night and increase during daylight hours when photosynthesis peaks within the plants due to sunlight. Correspondingly, dissolved carbon dioxide (CO_2), which has lower concentration during the day, forms a weak acid changing the pH of the system. Furthermore, acidic and alkaline compounds from different types of rock and soil release minerals into the surrounding water, that also affect the pH of a water body. Lastly, air pollution from car exhaust and power plant emissions increase the concentrations of nitrates (NO_3) and sulfides (SO_2) in the air that react with the atmosphere and rain to form acids. When it rains, these acidic compounds combine with moisture in the air and fall into our streams and lakes.

PH levels along Rowlett Creek remain almost constant over the ten year sampling period for the upstream site. The levels range from 7.0 standard units (su) to 8.5, with an average pH level of 8.0. There is a slightly increasing trend for the earlier set of samples (Chart 4), but then the trend changes and falls back down (Chart 5). As for the Los Rios Boulevard site, the data is showing a 97% consistency for a pH level at 7.5 su.

Chart 4. This chart illustrates pH levels for the Woodruff Park site from 1995 to 2000.

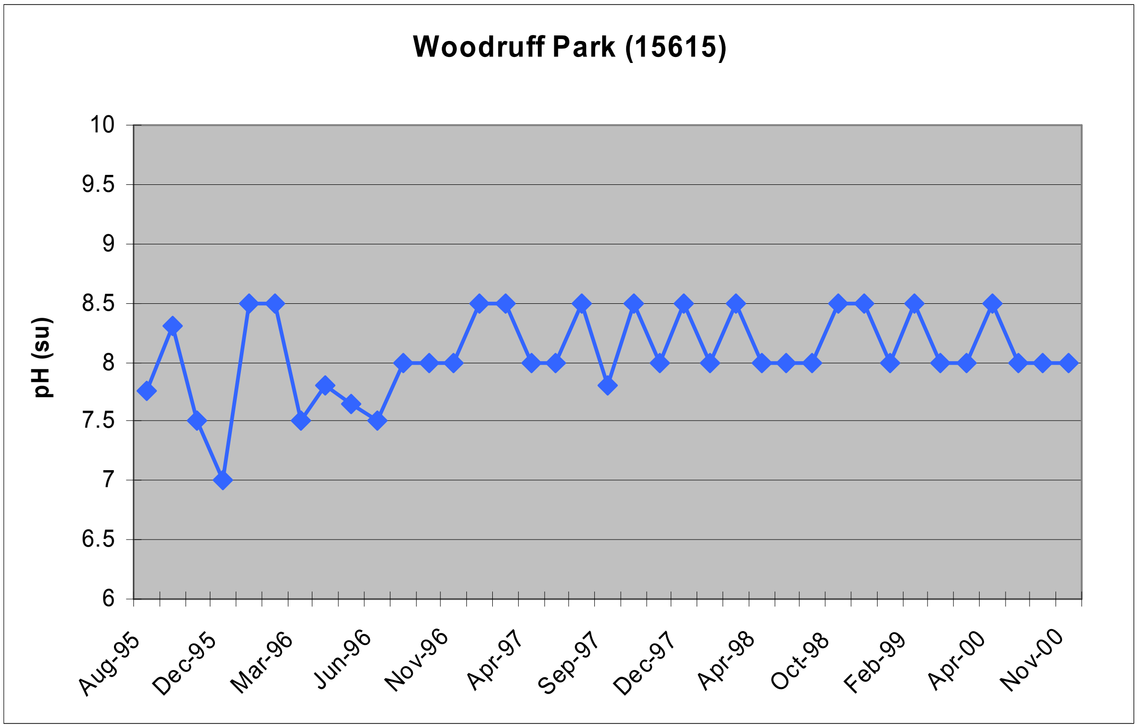


Chart 5. This chart illustrates pH levels for the Woodruff Park site from 2000 to 2006.

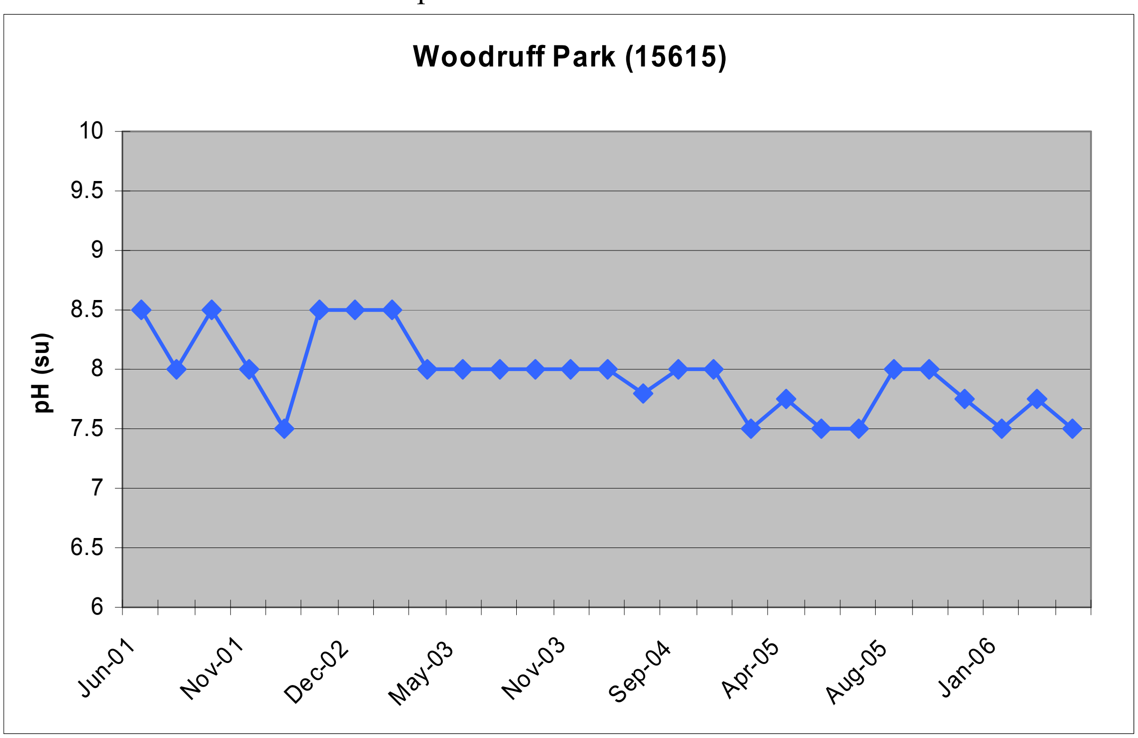
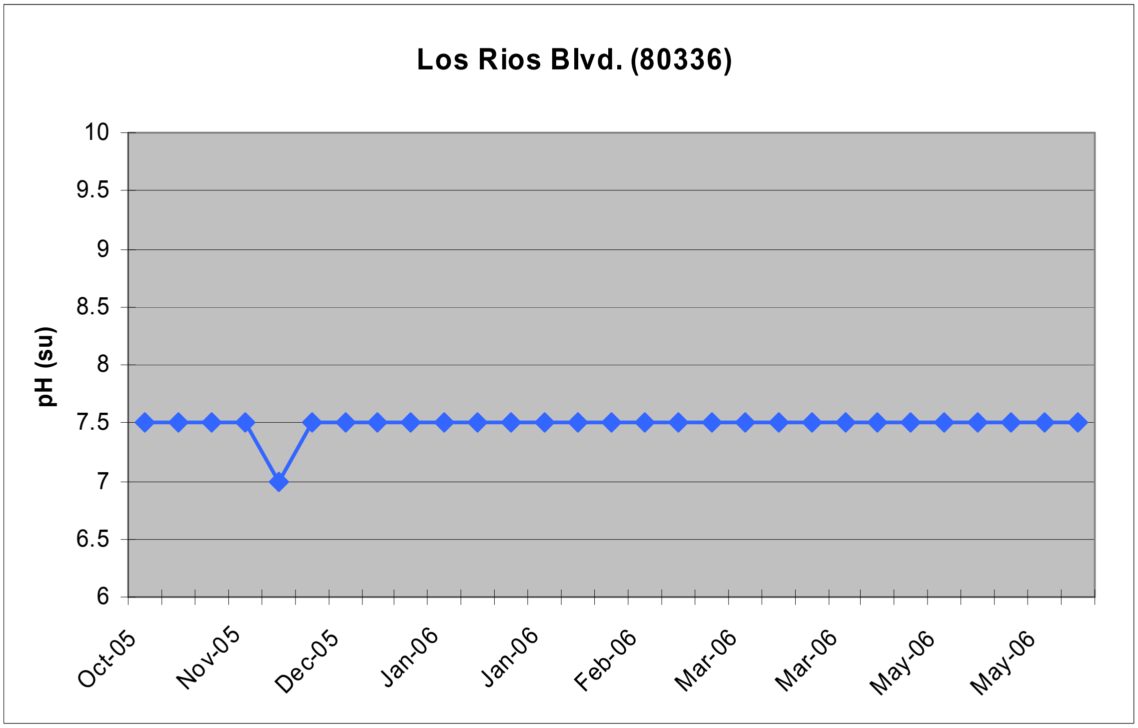


Chart 6. This chart illustrates pH levels for the Los Rios Boulevard site from 2005 to 2006.



Water Temperature

Water temperature is measured in degrees Celsius (˚C). Variations in temperature can result from air temperature changes that occur diurnally and seasonally. Furthermore, water temperature is affected by runoff from impervious cover, flow rates, and riparian vegetation. Greater amounts of impervious cover, less flow and less vegetation all cause the water temperature to increase. At the Woodruff Park site, the range of water temperature is 3˚C to 27.5˚C with a mean temperature of 17˚C; and for Los Rios Boulevard, the data shows a water temperature range from 5˚C to 24˚C with a mean temperature of 13.5˚C.

Dissolved Oxygen

Dissolved oxygen (DO) is an important indicator of the water body's overall ability to support aquatic life. DO are microscopic bubbles found in water and are measured in mg/L. Fish breathe by absorbing this dissolved oxygen, so a certain level of it is necessary in order to support aquatic life. Oxygen enters the water by aeration and plant photosynthesis and leaves the system by respiration and decomposition of organic matter. Characteristics of the water body affecting dissolved oxygen include: velocity of water flow; climate/season; variety of organisms in the water; dissolved solids; and the amount of nutrients in the water. In addition, dissolved oxygen has an inversely proportionate relationship with water temperature. This is because more oxygen can be dissolved in colder water. For Chart 7, Chart 8 and Chart 9, the red line indicates the dissolved oxygen exceedence of 6.0 mg/L needed for a fully supporting water body according to the designated aquatic life use.

At the Woodruff Park location, the dissolved oxygen values range from 4.4 mg/L to 13.0 mg/L, with an average of 8.5 mg/L. This range is quite a bit larger than the one seen for the downstream site. Downstream (Los Rios Boulevard) statistics show a range of 5.0 to 10.4 mg/L with a mean value of 7.7 mg/L. Furthermore, the correlation and inverse relationship for the Woodruff Park location is much stronger. The inverse relationship is exemplified in Chart 7 and Chart 8. The correlation (R^2 value) between dissolved oxygen and water temperature at the upstream location is 0.59, where for the downstream location it is only 0.38. In addition, Table 1 and Table 2 show dissolved oxygen exdeedances of only 9.4% and 7.0%, respectively for the two locations. Therefore, the dissolved oxygen levels are fully supporting for aquatic life use at both sites.

Chart 7. This chart shows the inverse relationship between dissolved oxygen and water temperature found at the Woodruff Park site (1995 and 2000).

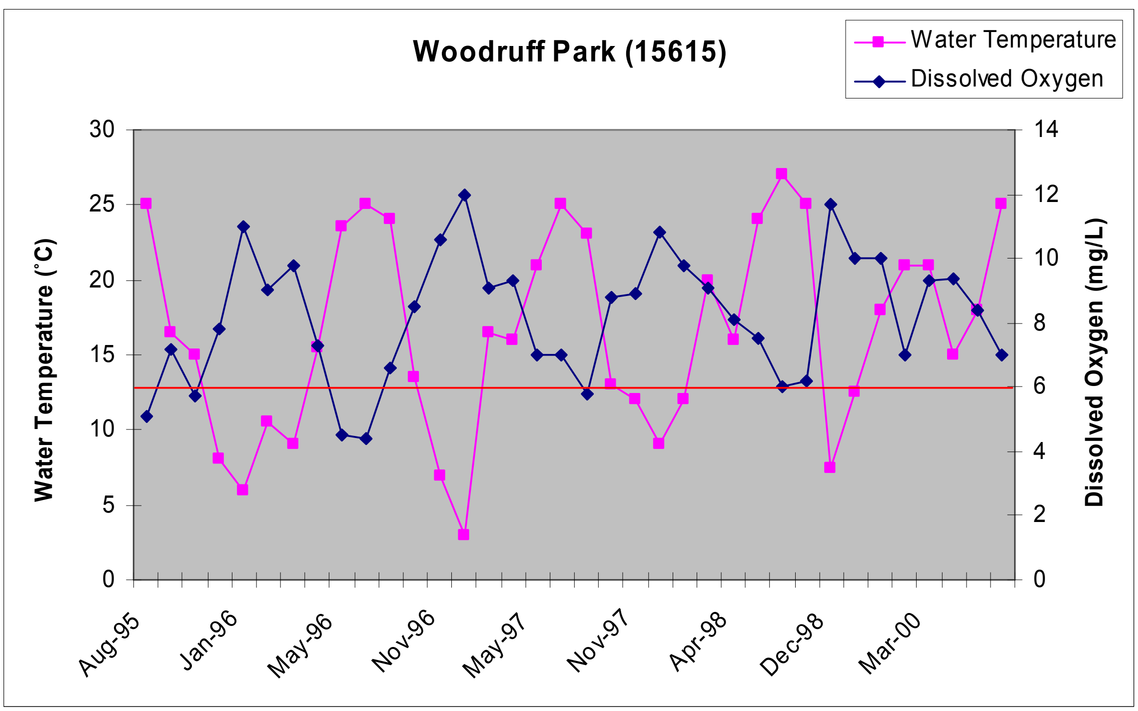


Chart 8. This chart shows the inverse relationship between dissolved oxygen and water temperature found at the Woodruff Park site (2001-2006).

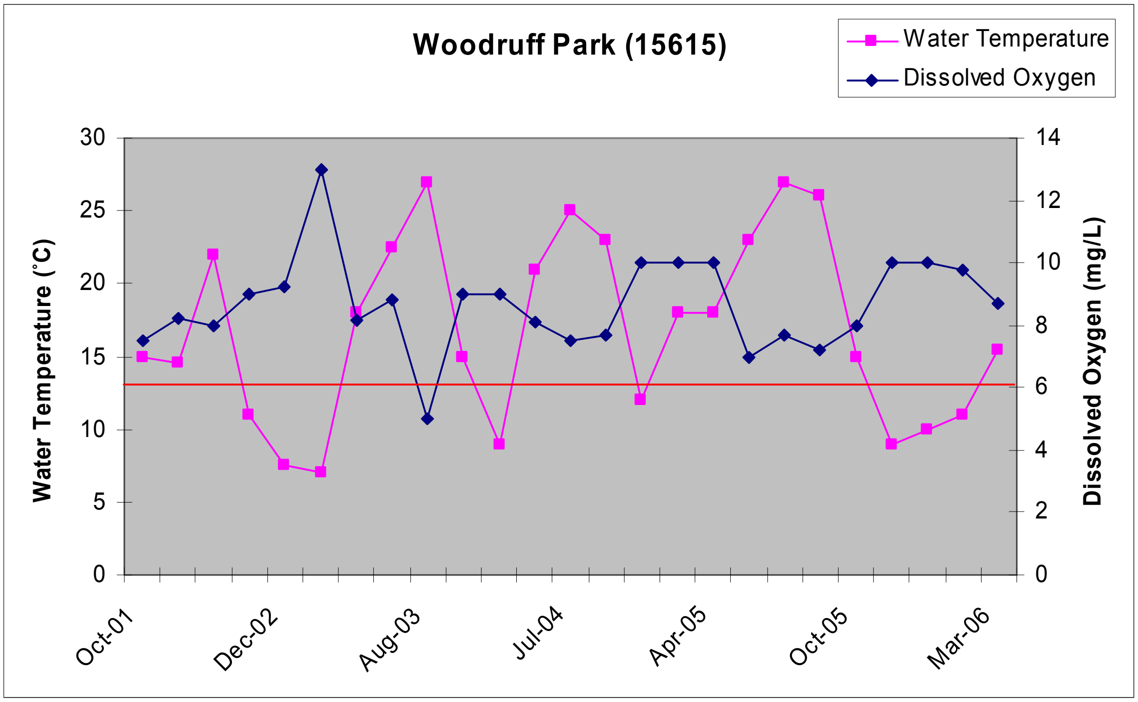
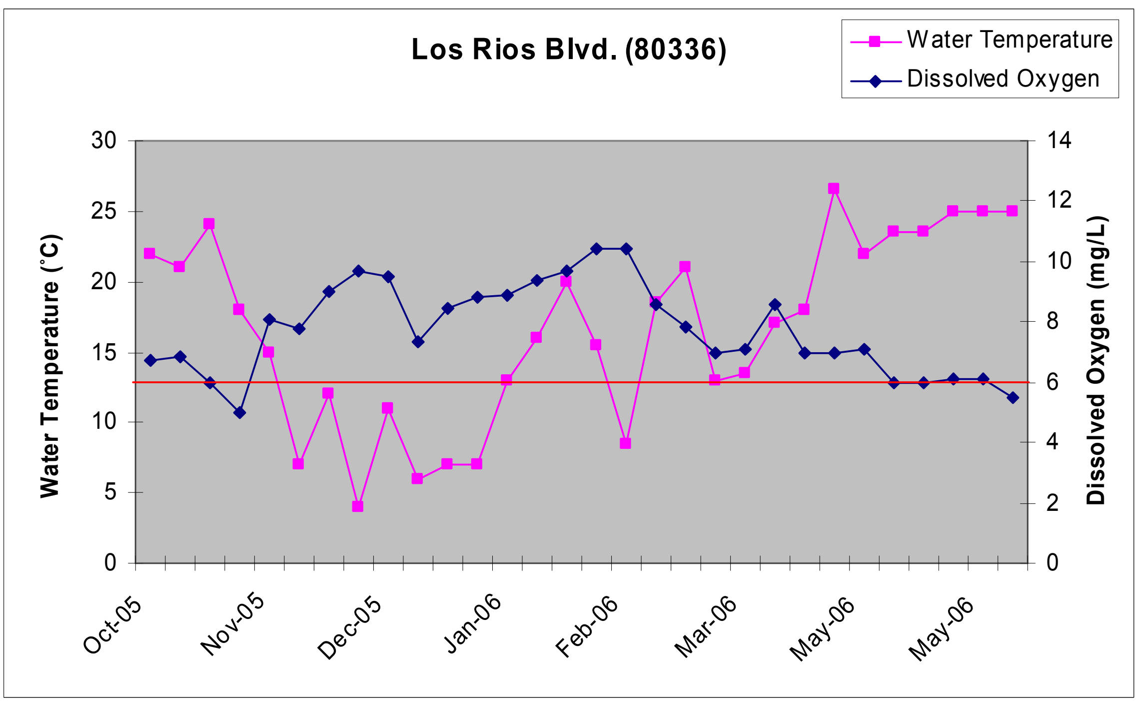


Chart 9. This chart shows the inverse relationship between dissolved oxygen and water temperature found at the Los Rios Boulevard site (2005-2006).



Secchi Depth and Total Water Depth

Total water depth is a measurement of how deep the water is where the sample was taken. Secchi depth is a measure of the clarity of the water. Higher Secchi depth readings indicate a greater clarity in the water, and thus, more sunlight is able to infiltrate down to greater depths. Lower Secchi depth readings indicate turbidity in the water which may identify water pollution or result from a rainfall episode. For Rowlett Creek, both the Secchi depths and total depths are going to remain low because the creek is typically shallow with low flow.

Chart 10 and Chart 11 indicate that the water within Rowlett Creek is predominantly clear. The Secchi depth matches up with the total depth 83% of the time for the Woodruff Park site. No data is available for this parameter at the Los Rios Boulevard site. The summary of data is as follows: the Secchi depth and total depth have the same minimum and mean value at 0.1 meters and 0.4 meters respectively; however, the maximum values are 0.8 meters for Secchi depth and 1.25 meters for total depth.

Chart 10. This chart compares Secchi depth and total depth measurements at Woodruff Park from 1995 to 2000.

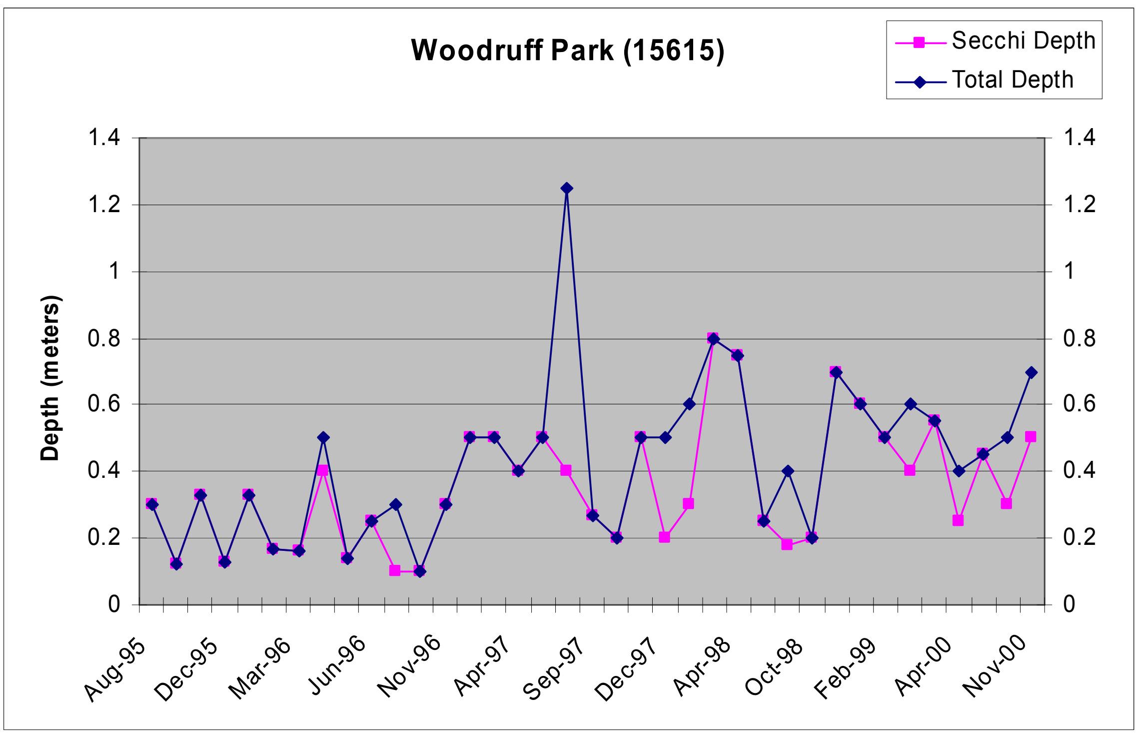
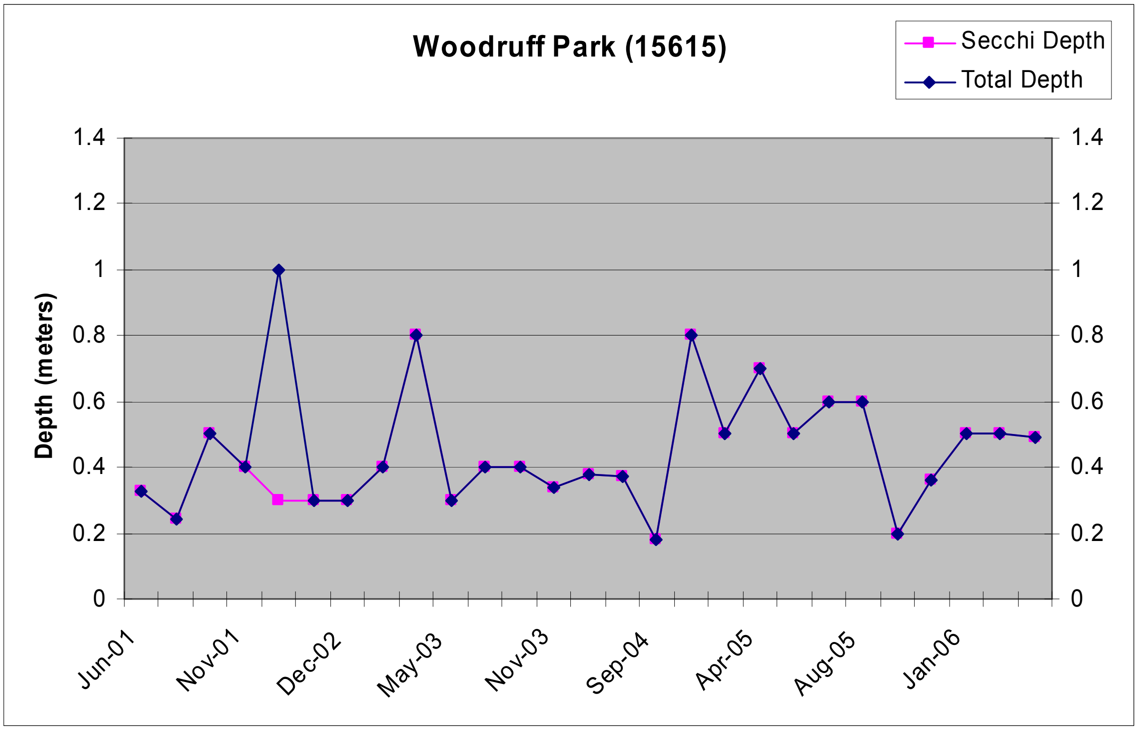


Chart 11. This chart compares Secchi depth and total depth measurements at Woodruff Park from 2001 to 2006.



DATA SUMMARY

Overall, the condition of Rowlett Creek is in good quality. The charts and tables show regularity over a ten year period with few exceedances or irregular numbers. As shown in Chart 10 and Chart 11, the clarity of the water remains good except for periods of heavy rainfall. Only a few dissolved oxygen exceedances exist throughout the data and they may be resulting from periods of low flow. The uniformity in the pH levels throughout the data set are also an indicator of good water quality; however, the pH values for the Los Rios Boulevard site show virtually no variation which may be an indication of monitor bias within the data collection process. Also, water temperatures for this site are considerably lower than those from the Woodruff Park site. This may be due to the bridge at Los Rios Boulevard that covers the creek where samples are taken. The only significant trend seen is in conductivity levels. With the exception of a few downward spikes due to rain events, there is a notable increase in conductivity values for the Woodruff Park site throughout the data set from 1995 to 2006. One explanation for this increase is human activity. An increase in sediment loads coming from the urban development in the Plano area and increase in chemicals from road runoff will directly affect the specific conductivity levels of the water. Both of these activities contribute dissolved solids into the creek and therefore enhance the conductance of the water. This is a good indicator of pollution within the water body.

The results of this data analysis suggest that Rowlett Creek is in good condition; nevertheless, it is important to continue data collection at this location in order to demonstrate its overall quality. For example, an extended amount of data is necessary to observe trends at the Los Rios Boulevard site and Secchi depth and total depth measurements could make the data set more valuable.