Texas Watch Volunteer Water Quality Monitoring Program
2006 Mary's Creek Data Summary

Narrative Summary of Mary's Creek

Mary's Creek is an unclassified, perennial stream flowing 6 miles southwest from Pearland, Texas. Within the San Jacinto-Brazos Coastal Basin, this freshwater stream makes its way southeast toward Clear Creek in Galveston County (Texas Water Quality Inventory, 2002), (Houston-Galveston Council, 2005). This stream has been identified by the state of Texas as Segment 1102B and is located within the Clear Creek Above Tidal watershed; here, it is surrounded by a mixture of residential and urban land uses (Houston-Galveston Council, 2005). Undeveloped land lies in the upper region of the basin. Mary's Creek, also known as North Fork Mary's Creek, stretches 10.9 miles from its beginning in northeastern Brazoria County to where it joins Clear Creek which empties into the Upper Galveston Bay (Texas Water Quality Inventory, 2002), (Houston-Galveston Council, 2005).

Past designated uses of Mary's Creek have included aquatic life support, contact recreation, and fish consumption. Past data, however, has reflected bacteria concentrations above the screening levels set by the Texas Commission on Environmental Quality (TCEQ) through the Texas Surface Water Quality Standards (TSWQS). These standards involve numerically based criteria that a water body in Texas must meet to be considered suitable for its designated uses (TCEQ, 2004). Accordingly, levels of bacteria in samples collected from 1998- 2002 proved too high for Mary's Creek to facilitate contact recreation use. High fecal coli form levels within the creek, specifically, have made Mary's Creek non-supporting of contact recreation use (TCEQ, 2002). Additionally, data collected from that same period indicated concern regarding ammonia-nitrogen enrichment throughout the stream (Texas Water Quality Inventory, 2002). In 2004, dissolved oxygen levels remained fairly consistent throughout the Clear Creek watershed, revealing low dissolved oxygen content during warmer months as one might expect (Houston-Galveston Council, 2005).

As of May 2005, Mary's creek is categorized as a 5a water segment for bacteria. This categorization warrants the creek for a scheduling of a Total Daily Maximum Load (TDMLs) carrying capacity. This would set an amount on the discharged pollutants that may enter the creek without the water within the creek loosing its capacity to fulfill its designated uses. A 5a waterbody is, furthermore, prioritized by its level of urgency for a TDML (TCEQ, 2005). In this case, a "u" as been issued to Mary's Creek, indicating that scheduling is underway. Included in the amount of pollutants that will be set by the state are point and non-point source pollutants. The 2004 Texas 303(d) List indicated both forms to be contributing to the exceeding levels of bacteria and thus factors affecting surface water quality of Mary's Creek (TCEQ, 2005).

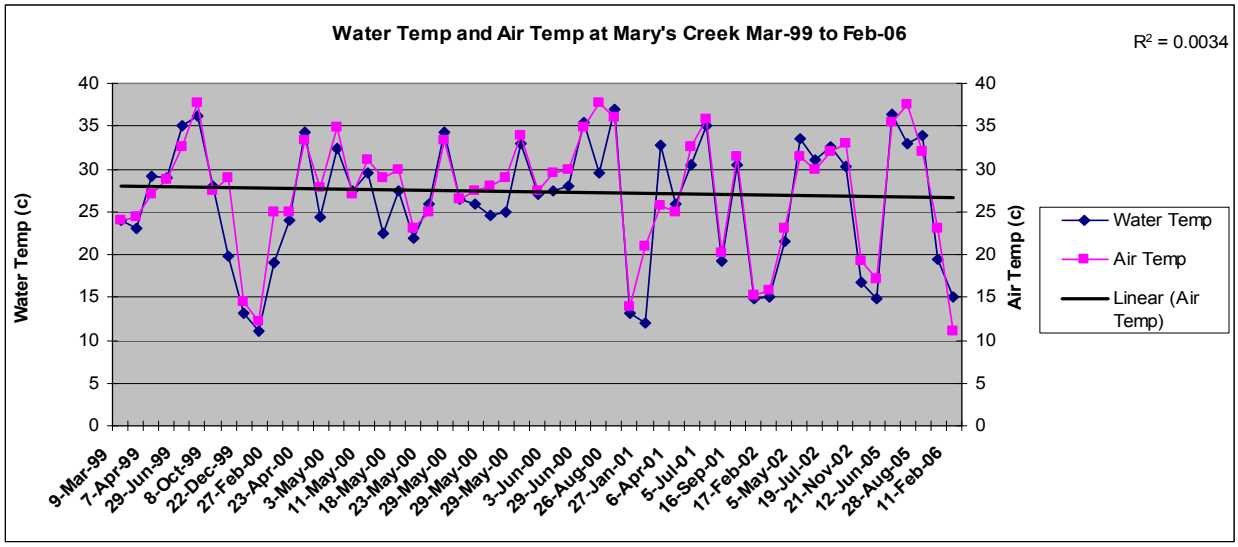
TDML projects for Mary's Creek began in 2005. The results from the October 2006 quarterly report concluded that all gauging stations except one recorded the E coli levels has preventing the creek from meeting water quality standards (Rafia, H. and Vargas, M., 2006).

The following report addresses recent data that indicate whether or not Mary's Creek is supporting of its uses and attempts to identify trends affecting surface water quality. Among the

uses of Mary's Creek are: aquatic life use, contact recreation, and fish consumption. For each of these uses, water temperature, dissolve oxygen levels (D.O.), ph, and conductivity serve as indications of water quality and will help determine if Mary's Creek is meeting state standards. Data was collected from Mary's Creek between March 1999 and February 2006. This data will be used to asses the trend of these variables over the seven year period. An analysis of the capacity of Mary's Creek to meet water quality standards based on the water temperature, dissolve oxygen levels (D.O.), ph, and conductivity will be taken.

Numeric criteria for surface water quality indicators are in accordance with the Texas Surface Water Standards, adopted by TCEQ in 2000 (TCEQ, 2003). The Texas Watch Program oversees the methods used to collect this data through the TCEQ and EPA approved Texas Watch Quality Assurance Program (Pinchback, J., 2002).

Temperature:

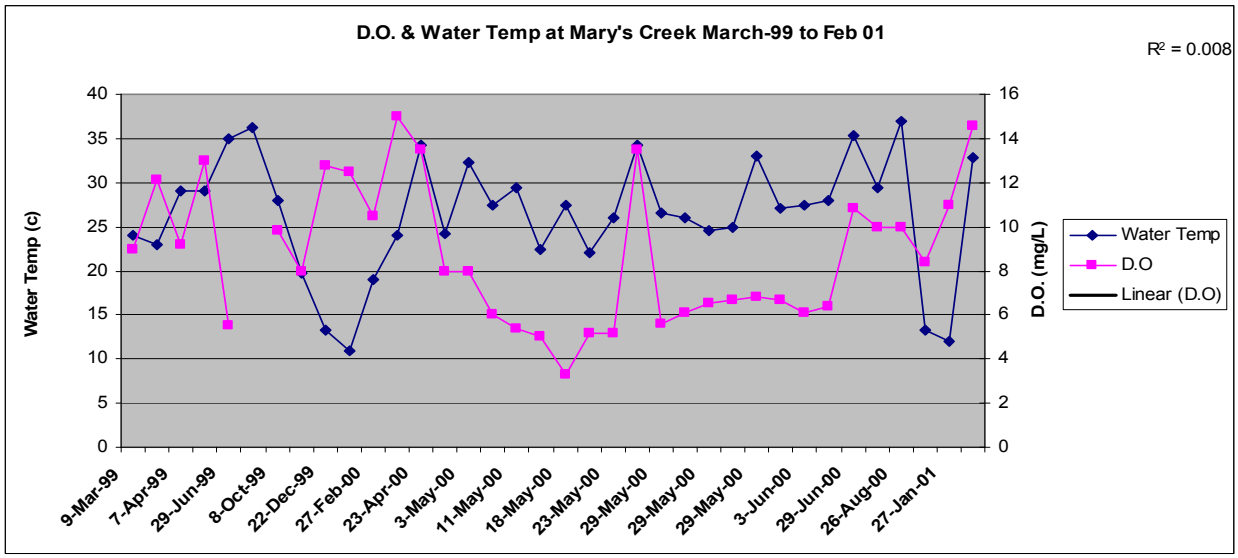


Water and air temperature measurements taken from Mary's Creek between May 1999 and February 2006 show to be fairly consistent with each other. In March of 1999 the temperatures were the same at 24 degrees Celsius. Temperature differences between water and air tended to remain insignificant thereafter, differing no more then 2.5 degrees until November. In November, the temperature of Mary's Creek measured 19.8 degrees while the surrounding air measured 28.9. This sudden change in temperature difference between water and air did not repeat itself the following two years which suggests factors, other than climatic, may have influenced the temperature at Mary's Creek during that time.

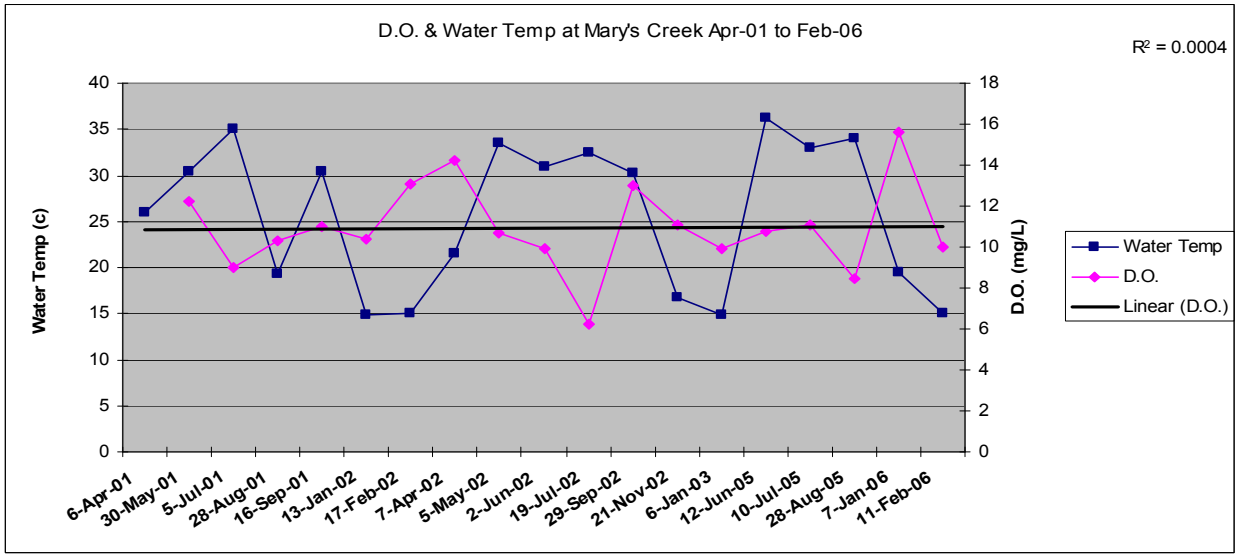
Samples collected multiple times in May revealed significant differences between temperatures as well, particularly toward the end of the month. In that month, temperature differences between water and air were as high as 4.5 degrees Celsius. This significant difference between temperatures was not repeated in the following years.

Overall, temperatures seemed to not vary much in difference, which suggests that air may be what primarily influences the water temperature at Mary's Creek and not some other factor.

Dissolved Oxygen



Dissolved oxygen levels from March 1999 to February 2001 did not show any significant correlation to water temperature, contrary to scientific belief. The correlation coefficient showed a 0.008 possibility that these two events were related. Looking at the graph, however, there are specific points where this correlation holds true. Along the X axis, the third May from the right of the graph showed an observable correlation between D.O. and water temperature. Typically, as water temperatures rise, D.O. levels drop; this was in fact the case for this sample. We also see this correlation occurring earlier in the data set during the December 1999 and February 2000 period.



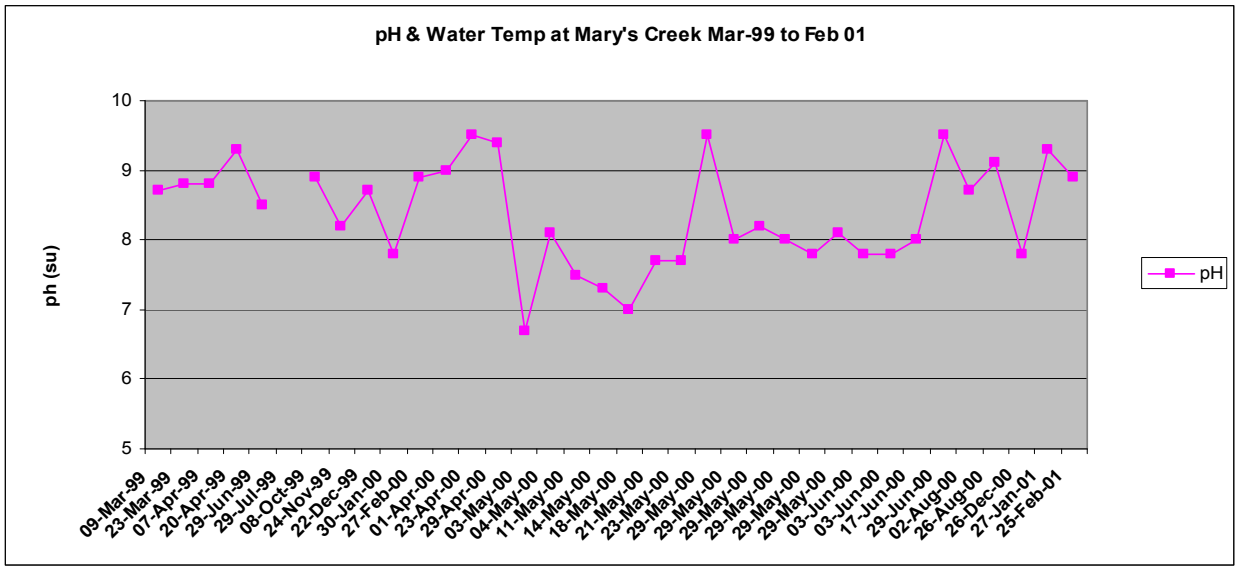
Data collected at Mary's Creek from April 2001 and February 2006, furthermore, showed no correlation between water temperature and dissolved oxygen levels. During the five year period, less frequent testing was administered which limits the observations of any strong correlations during this period. July 1, however, seems to indicate a correlation; any other correlation is difficult to determine.

Comparing the two graphs, it seems the more frequent the testing, the stronger possibility there is of a correlation between water temperature and oxygen levels within Mary's Creek. Nutrients delivered by runoff from residential areas nearby Mary's Creek may contribute to vegetation along the creek bed. Excessive growth of theses plants, as a result from these nutrients, may be taking in carbon and releasing large amounts of oxygen during the day only to regress during the evenings and periods without much sunlight. This may account for the lack of relationship between DO and water temperature at Mary's Creek.

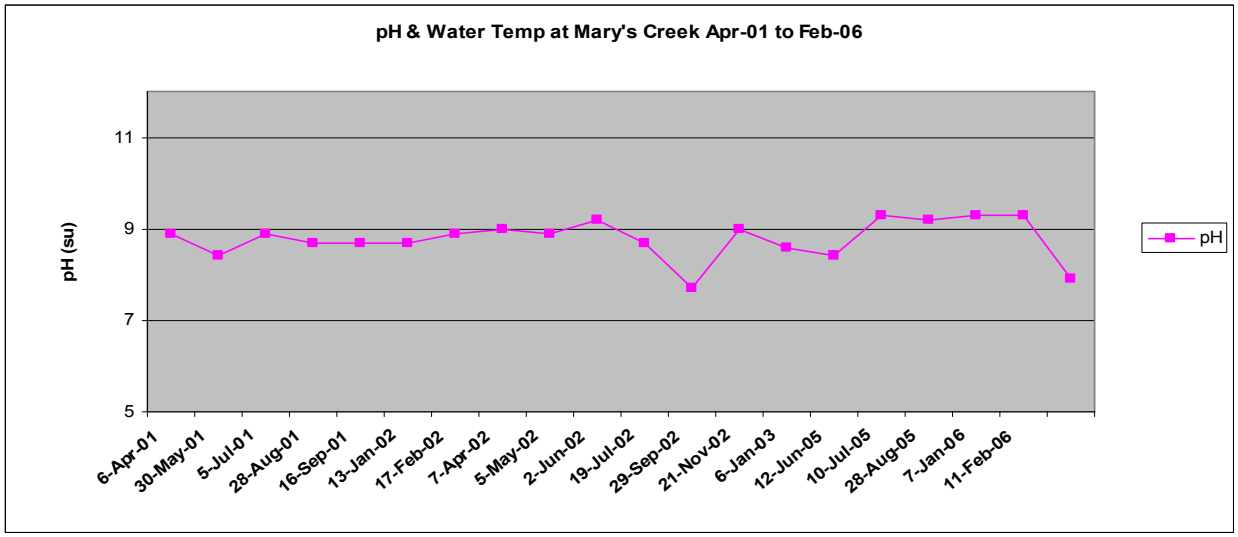
Inconsistent time patterns with the recording of water quality data may also account for the absence of a correlation. According to Table 1, the average time data was collected throughout Mary's Creek was at 14:51 with times ranging from as early as 6:15 to the evening at 18:51. The most frequent time data was collected occurred during the late afternoon at 16:10.

Out of the 53 dissolved oxygen samples taken throughout the seven year period, only six times was the DO level (< 6 mg/L) for aquatic life exceeded. These exceedences occurred during the first two years of the seven year data collection period. Thus Mary's Creek from March 1999 to February 2001 had only a 17% exceedence level for dissolved oxygen, rendering the creek capable to provide enough dissolved oxygen to sustain aquatic life. During the remaining five years the creek had no exceedence history. The highest recorded DO level was as at 15.6 mg/L during January 2006; the lowest, at 3.3 mg/L in May of 2000, before TCEQ implemented its TDML for Mary's Creek in 2005.

pH

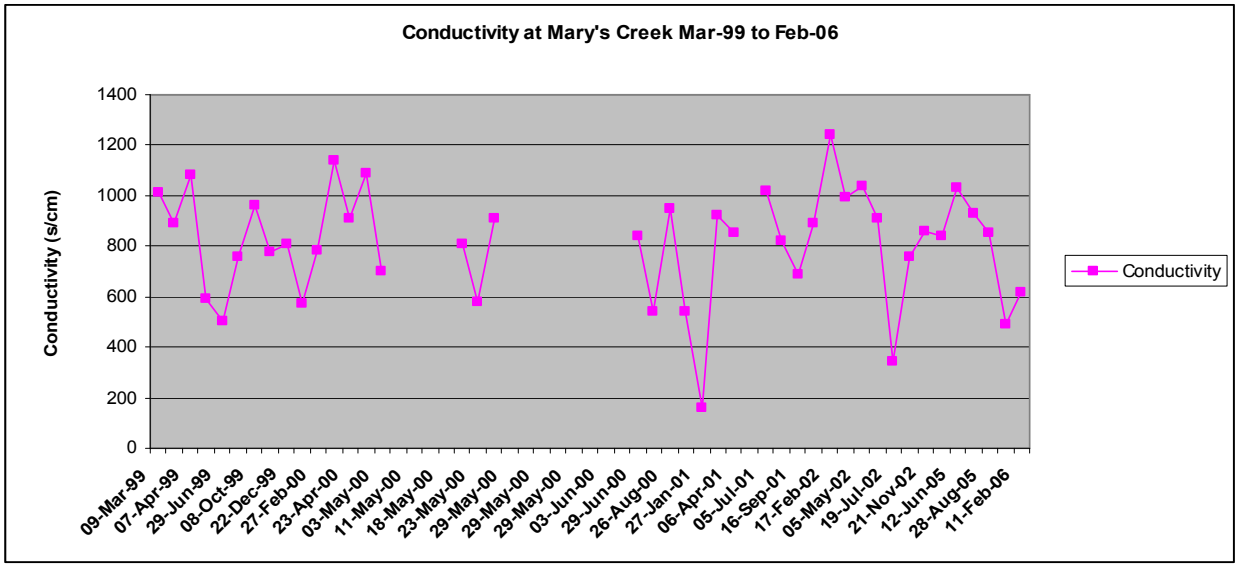


Mary's creek had an average 8.4 ph between March 1999 and February 2001 data collection. The ph for this period was outside the optimal range to support aquatic life (Pinchback, 2002). We see that the lowest ph values occurred during the month of May, where frequent samples were drawn. Considering this and the case with dissolved oxygen levels, the data tells us that frequent testing for a given month may result in extreme values that can skew the descriptive statistics of the water quality for a water body. Additionally, we also see two of the highest values occurring in May 2000 as well as in June 2000, where multiple sampling also occurred. Averaging the 13 samples in May we find the mean average to be 7.8 and the average of the four done June to be 8.3. Using these mean averages as representation for the ph values for May and June, we find that actually ph average for Mary's Creek between March 1999 and February 2001 to be raised to 8.6. Thus too much sampling over a water body can either under or over exaggerate the data collected.



Data collected between April 2001 and February 2006, revealed a more stable pH trend but with a much higher average. The mean average was 8.8 with a mode of 8.7. The stability of these numbers reflects an ongoing trend that is influencing the ph levels for Mary's Creek to be above the recommended range. Since Mary's Creek is near rural housing developments, nutrients from lawn fertilizers maybe continuously seeping into the creek from runoff during rainfall inducing vegetation growth along the creek bed. This may account for the low carbon dioxide levels and high oxygen content present within the creek.

Conductivity



The conductivity of Mary's Creek during this period was significantly high during the spring and summer months of each year and could not be correlated with air or water temperature. The mean conductivity of the creek was 809.33 s/cm while the median was at 845 s/cm. Eight of these samples were over 1,000 s/cm, the highest being 1240. Of the 42 conductivity samples available, 26 of them were above the average. All but 2 samples were collected in the afternoon after 14:57 pm, eight of which occurred in the evening after 17:00. Possibilities for these high values may be a result of many collections being taken in the latter parts of the evening.

Conclusion

Mary's Creek Descriptive Stats Table

		%					
Mary's Creek (Site ID# 80184)	**N**	**Complete**	**MIN**	**MEAN**	**MAX**	**MEDIAN**	**MODE**
Sample Time (central)	**54**	**98%**	**6:15**	**14:51**	**18:42**	**16:10**	**16:10**
Sample Depth (meters)	**50**	**91%**	**0.05**	**0.26**	**1.00**	**0.28**	**0.30**
Specific Conductivity (S/cm)	**42**	**76%**	**160**	**809.33**	**1240.00**	**845.00**	**810.00**
Air Temp (C)	**55**	**100%**	**11.00**	**27.35**	**37.80**	**28.00**	**25.00**
Water Temp (C)	**55**	**100%**	**11.00**	**26.14**	**36.90**	**27.50**	**27.50**
Dissolved Oxygen (mg/L)	**53**	**96%**	**3.30**	**9.49**	**15.60**	**9.90**	**8.00**
pH (s)	**54**	**98%**	**6.7**	**8.51**	**9.5**	**8.7**	**8.7**
Seccie Depth	**51**	**93%**	**0.10**	**0.32**	**0.66**	**0.30**	**0.25**
Total Depth	**54**	**98%**	**0.13**	**0.59**	**2.30**	**0.39**	**0.50**
DO Exceedence (Mar-99 to Feb-01) [<6.0 mg/L]			**6 of 35 =**	**17%**			
DO Exceedence (Apr-01 to Feb-06) [<6.0 mg/L]			**0 of 18 =**	**100%**			
pH Exceedence (Apr-01 to Feb-06) [>6.5 or <8.2]			**18 of 20 =**	**90%**			

Water temperatures at Mary's Creek show to be stable, the average throughout the seven year period being 26.14 degrees Celsius, while the median and mode were both at 27.5 degrees. The stability of water temperature is good for the aquatic life, as many species are weak to adapt to frequent, significant temperature changes. Dissolved oxygen levels are exceptionally well for all

of the designated uses at Mary's Creek with D.O. exceedence levels too infrequent to warrant the creek as partially or nonsupporting of aquatic life. The ph content of Mary's Creek, however, is a parameter that should warrant concern; 61% of the 54 ph samples collected over the seven year period were above the optimal range of 6.5 to 8.2 (Pinchback, J., 2002). The number of pH exceedences at Mary's Creek over the most recent five year period constituted 90 percent of the total samples taken from that period. This classifies the creek as nonsupporting of aquatic life with respect to pH. All conductivity samples from the seven year period were within the recommended range of values (Pinchback, J., 2002). The fluctuations of these values, however, may be a result from the inconsistency with times in which the samples were taken.

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