BASIN SUMMARY REPORT

JULY 2003

GUADALUPE RIVER BASIN

and the

LAVACA-GUADALUPE COASTAL BASIN

INTRODUCTION

The Texas Clean Rivers Program (CRP) was implemented to maintain and improve the quality of surface water resources within each river basin in Texas. The program is managed by the Texas Commission on Environmental Quality (TCEQ) and is funded entirely by fees assessed to wastewater discharge and water rights permit holders. The Guadalupe-Blanco River Authority (GBRA) and the Upper Guadalupe River Authority (UGRA) partner with the TCEQ to administer the CRP for the Guadalupe River and Lavaca-Guadalupe Coastal Basins. The two river authorities carry out the water quality management efforts in these basins under contract with TCEQ.

An important task of the CRP is the production of a Basin Summary Report every five years. The report presents a comprehensive analysis of water quality, considering possible changes over time and comparisons of data to fixed screening levels. It is based on quality assured data collected through the monitoring efforts of the CRP along with those of TCEQ and the U.S. Geological Survey (USGS).

In part of this report, trend analysis is used to identify those sites and parameters that show a potential change in water quality over time, even if their absolute concentrations are within screening levels. When the trend analysis indicates a water quality problem may be developing, more investigation is necessary to determine if the trend is real and if real, to find the reason. However, in many cases, the possible cause/reason of a change is not known and special studies may be needed to confirm the trend and identify a source. If the analysis suggests improving water quality, more investigation is needed for confirmation. If the trend is confirmed, monitoring may be reduced to free up resources for other locations or parameters with more urgent water quality issues.

This Basin Summary Report is a part of a larger overall effort at water quality assessment. The TCEQ assesses the state's water bodies on a periodic basis as mandated under the Clean Water Act (CWA) Section 305(b). The assessment is called the Water Quality Inventory. It is based on a comparison with a range of criteria and screening levels developed by the TCEQ, but it does not address trends. In this process, water bodies that are found by the TCEQ to not meet water quality standards are placed on a list required under Section 303(d) of the CWA. The Inventory is updated every two years by the TCEQ and consists of a review of the past five years worth of data.

These two types of water quality analyses, trends and comparisons with fixed levels of concentrations, are combined in this Basin Summary Report. A separately bound Basin Technical Support Document provides detailed information of the trend analysis such as data plots and numerical results, as well as a summary of toxics data and biological and habitat assessment.

This report also includes as Appendix A, a Water Quality Events Inventory. It is a listing of events that potentially affect water quality conditions in the area, starting in 1999 and continuing through May of 2003. Recent examples include a truck oil spill, a restaurant grease trap overflow, a hog farm with major water quality problems in the Peach Creek watershed, and completion of the Canyon Reservoir Water Quality and Wastewater Planning Study.

PROCEDURES

Trend Analysis

The purpose of the trend analysis is to determine if conditions are getting better, worse or staying the same. To determine this, simple linear regression analyses were performed. The analyses involved the following steps:

1. Preparing data sets.
2. Preparing time series plots for data sets.
3. Conducting simple regression analysis to identify sites and parameters that show a potential trend.
4. Conducting additional regression analysis to account for possible effects of stream flow and season.

Data from the TCEQ Regulatory Activity and Compliance System (TRACS) database starting from 1993 were retrieved. Table 1 shows the parameters selected. For the analysis to be meaningful, the number of samples should not be too small and the period of record should not be too short. For this study there must be at least 20 measurements in a six-year period with at least 3 measurements per year for five of the six years. Data sets were only prepared for the parameters and stations that satisfy these requirements. Figure 1 shows the stations with data sets for trend analysis.

Dissolved oxygen (DO) concentration is an important water quality parameter. The amount of DO is affected by temperature, so other things being equal, readings tend to be higher in winter than in summer. DO is also affected by depth of sample and time of day. To compensate for temperature, trend analyses were performed on the *DO deficit*. DO deficit is the difference between the amount of DO at saturation (that depends on temperature) and the actual measured DO level. To compensate for depth, only readings near the surface were considered. There was no way to adjust for the time of day a sample was collected. Composite data are a different category of measurements than grab samples and were also removed from the data set.

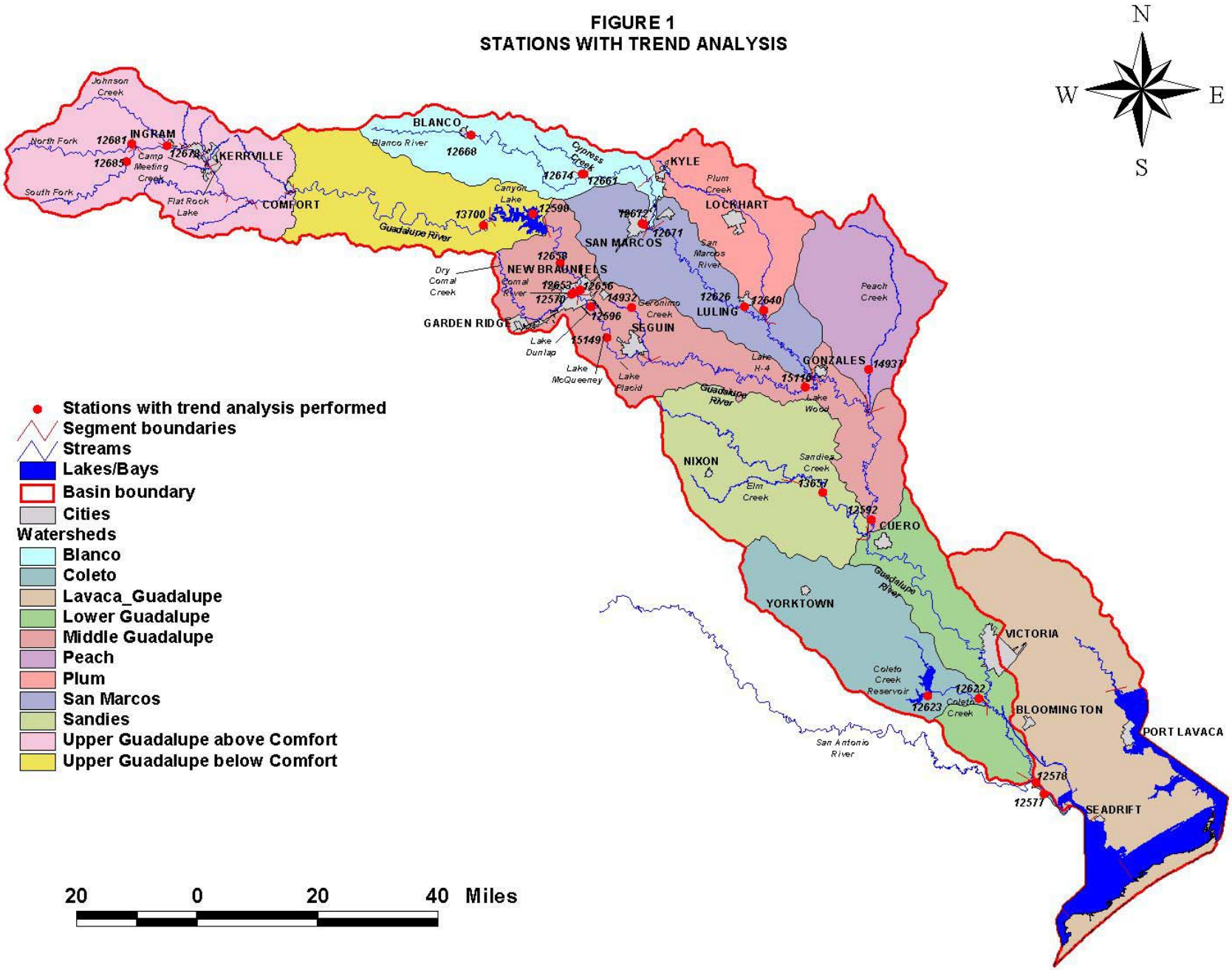
Flow data for each station were also retrieved. If instantaneous flow measurements were not available in the TRACS database, daily flow data were retrieved from the USGS web page. However, only some of the water quality monitoring stations are also USGS gage stations. Therefore, in many cases, flow data were not available.

For those data sets that show a potential trend, additional regressions were performed to account for flow (when available) and season. June through September was considered summer and October through May was considered winter. The log of flow was used due to the large range of flow values.

TABLE 1
SELECTED PARAMETERS FOR TREND ANALYSIS

Parameter	Unit	Comment
Water Temperature	degree C	Temperature of the water can impact the ability of the water to hold dissolved oxygen. It also has an impact on the biological functions of aquatic organisms.
Conductivity	μmhos/cm	Conductivity is a measure of the water body's ability to conduct electricity and it indicates the approximate levels of dissolved salts, such as chloride, sulfate and sodium in the stream. Elevated concentrations of dissolved salts can impact the water as a drinking water source and as a suitable aquatic habitat.
Dissolved Oxygen (DO)	mg/L	DO indicates the amount of oxygen available in the stream to support aquatic life. DO can be reduced by a number of factors such as elevated water temperatures and the decomposition of plant materials.
pH	standard unit	pH is a measure of the hydrogen ion concentration in an aqueous solution. It is a measure of the acidity or basic property of the water. Chemical and biological processes can be affected by the pH. pH can be influenced by dissolved constituents, such as carbon dioxide and by point and non-point source contributions to the stream.
Ammonia Nitrogen (NH_3-N)	mg/L	Nutrients include the various forms of nitrogen and phosphorus. Elevated nutrient concentrations may result in excessive aquatic plant growth and can make a water body unfit for its intended use(s).
Nitrate & Nitrite Nitrogen (NO_3+NO_2-N)	mg/L	
Total Phosphorus (TP)	mg/L	
Chloride	mg/L	Chloride and sulfate are major inorganic anions in water and wastewater. Numeric stream standards for chloride and sulfate have been set on all of the classified stream segments in the basin. Both inorganic constituents can impact the designated uses and can come from point and non-point sources, such as wastewater discharges, and abandoned flowing wells from groundwater with elevated concentrations.
Sulfate	mg/L	
Fecal Coliform (FC)	cfu/dL	These are used as indicators of possible fecal contamination and presence of disease-causing organisms such as pathogens and viruses.
E. Coli (EC)	cfu/dL	
Chlorophyll *a*	μg/L	Chlorophyll *a* is a plant pigment whose concentration is an indicator of the amount of algal biomass and growth in the water.

FIGURE 1
STATIONS WITH TREND ANALYSIS



Water Quality Inventory

Below is a description of the different types of categories used by the TCEQ to describe the water quality condition of a water body. These categories are typically based upon whether a certain percentage of measurements violated the surface water quality criteria or screening levels set by the TCEQ.

Impairments of Water Quality Standards

The term *Impairment* is assigned by TCEQ to a portion of a water body when certain water quality constituents reach threshold concentrations (as specified in the Texas Surface Water Quality Standards or screening procedure documents) for a minimum number of times over a period of five years. This designation indicates that TCEQ believes the uses of the water body (drinking water supply, recreation, aquatic life, etc.) may have been impaired. In other words, the fish may not be able to get enough oxygen to survive, the water may not be suitable for swimming, or the water may not be fit to be used as a public drinking water supply. Streams that are shown to have an *Impairment* for one or more constituents are placed on the TCEQ's CWA Section 303(d) list. Once a portion of a stream is placed on the list, a series of actions may be taken by the TCEQ, including, but not limited to: denial of increases in wastewater permit effluent limits; a Total Maximum Daily Load (TMDL) study to allocate pollutant loads to certain sources; and instituting a strategy for reducing loads from all sources.

Concerns for Use Attainment

Some water bodies are identified with *Concerns for Use Attainment (primary concerns)*. These concerns are identified for indicators such as dissolved oxygen which are directly tied to support of designated uses and criteria adopted in the Texas Surface Water Quality Standards.

• *Use Concerns-Limited Data* are identified for indicators where less than 10 samples were available for assessment and some exceedances of the water quality criteria were identified.

• *Use Concerns* are identified for indicators that support the designated use as determined by an adequate number of samples, but a few reported exceedances of the water quality criteria indicated a potential water quality problem.

Water Quality or Secondary Concerns

Water Quality or Secondary Concerns are identified for indicators such as nutrients that are not tied to support of a designated use with a quantitative criterion. Screening levels used to identify these concerns have generally not been adopted as standards with the exception of secondary drinking water standards.

BASINWIDE RESULTS

Water Bodies with Impairments and/or Concerns

Figure 2 shows the location of all the *Impaired* water bodies as well as those with *Concerns* in the Draft 2002 Water Quality Inventory. A complete listing of such water bodies is provided in Appendix B with information on criteria exceedances.

The reader should be aware that most of the waters so identified are small creeks, many of which are not designated water quality segments and therefore do not have water quality criteria developed for their unique hydrological conditions. They are assessed using the criteria applied to the nearest downstream designated segment. The nearest downstream segment is often the Guadalupe River which is significantly different in physical conditions from a small stream. Moreover, a small stream may be dry most of the time so that monitoring may be dominated by runoff samples. It is unclear how small streams should be assessed, but at the current time, the method used does not appear to reflect actual stream conditions.

Trend Analysis

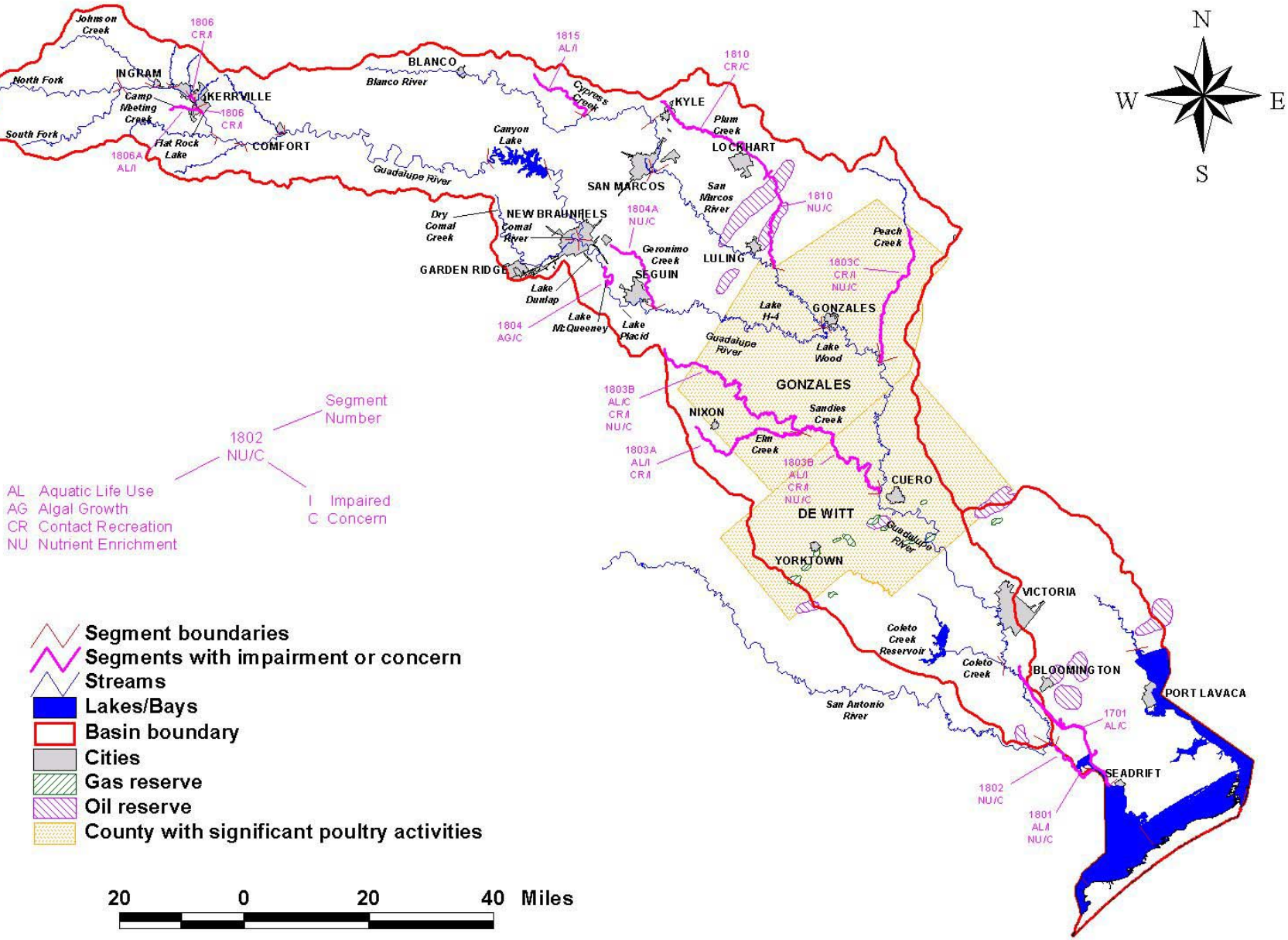
Table 2 shows a summary of the initial analysis. A total of 12 parameters were assessed for trends. Most parameters had suitable data at about 20 stations. There were only two parameters that showed no trends at all. One was chlorophyll *a* and the other was ammonia-N.

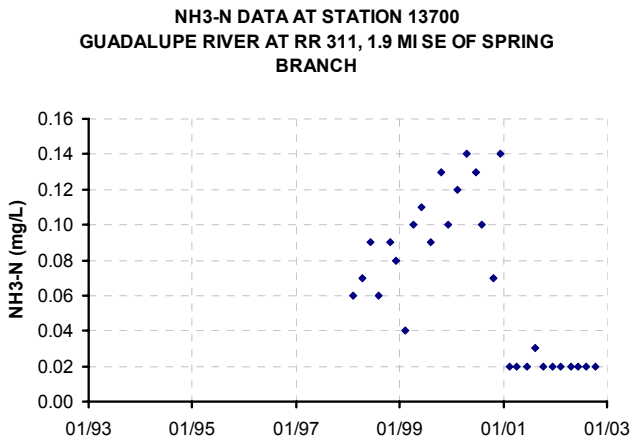
TABLE 2
SUMMARY OF INITIAL TREND ANALYSIS

Parameter	No. of data sets or stations	Decreasing trend	Increasing trend
Water Temperature	22		3
Conductivity	19		5
Dissolved Oxygen Deficit	22	14	
pH	21	2	2
Ammonia Nitrogen	20		
Nitrate & Nitrite Nitrogen	18	5	3
Total Phosphorus	23	7	1
Chloride	25	4	3
Sulfate	24	4	3
Fecal Coliform	19	5	1
E Coli	17	1	
Chlorophyll *a*	3		
TOTAL	233	42	21

Chlorophyll *a* is primarily analyzed in lake stations so only 3 data sets were available, with none indicating a trend. The ammonia-N data have no trends reported because they contain many non-detects that make it meaningless to perform a regression analysis. In most of the data sets, there appears to be an increasing trend (values increasing with time) in ammonia-nitrogen until 2000. Then the levels drop significantly in 2001 and 2002, with many of the data being non-detects. An example is shown in the figure on Page 6.

FIGURE 2
SEGMENTS WITH WATER QUALITY IMPAIRMENT OR CONCERN





In researching the change it was found that prior to 2001, ammonia-N had been analyzed with a distillation step that is required for wastewater samples. This distillation step is not required by the TCEQ for ambient water analyses that typically have much lower ammonia-N concentrations. In the interest of providing data that are comparable statewide, GBRA dropped the distillation step for ambient water samples in early 2001. Additionally, it was felt that false positives were a possibility during the distillation step due to absorption of ammonia from the lab atmosphere where wastewater influent and sample digestions are an everyday occurrence.

Table 3 on the next page presents a summary of the overall trend analysis. Except for DO deficit, the remaining parameters had most of the stations showing no trend, and a rough balance between decreasing and increasing trends.

Overall, it appears that there may be a slight trend towards dryer and warmer conditions in the data, suggested by 3 stations showing increasing temperature and 5 showing increasing conductivity. However, the increase in temperature might be due to a shift in more afternoon sampling. On the other hand, slightly more stations showed decreasing, rather than increasing trend for Nitrate-N, Total Phosphorus, chloride and sulfate. Overall, except for DO deficit, the dominant outcome for each station and parameter was no trend.

One significant finding of this analysis is that 14 of the 22 DO deficit data sets show a decreasing trend and none shows an increasing trend. A decrease in DO deficit is equivalent to an increase in DO. However, in some cases, a shift in sampling time from morning to afternoon might be a reason for the decreasing trend in deficit. Afternoon DO measurements are usually higher than morning measurements due to the diurnal cycle of respiration and photosynthesis. Five of the 14 data sets with decreasing DO deficit trend show correlation with flow and the correlations are all negative. One reason may be a higher reaeration rate during high flow.

In this analysis, a 90% confidence level has been used for assessing whether a potential trend exists. That means there is a 10% probability that the data will show a false trend when in fact there is no trend. With tests for trends on 233 data sets, there is a good chance that over 20 trends would be found even if there were no actual changes in the watershed, weather patterns or sampling and analysis procedures. While this may seem excessive, it does have the desirable attribute of making it unlikely that a real trend will be missed because it did not have a sufficiently clear manifestation. Regardless of the confidence level used, it is always possible for the statistical procedure to conclude that a trend exists even if there has been no actual change in water quality. Some false trends are results of outliers and these can sometimes be detected by visual inspection. Each trend observed is compared to known watershed changes such as new wastewater discharges and changes in monitoring. Two examples of monitoring changes noted are the method for NH_3-N analysis and the time of day for DO measurements. Many of the decreasing trends do not appear to have an obvious reason. Nevertheless, trends of decreasing concentration generally mean improving water quality, so that these trends are not a concern.

Overall, water quality conditions in the Guadalupe River basin are quite good. There are several reasons including the relatively low population density. Wastewater discharges tend to be small and the level of wastewater treatment is typically good. What effects there are from wastewater discharges tend to be masked by the strong influence of spring flows that are a major characteristic of the basin. Only a few creeks in the basin are dominated by wastewater flow, a situation that is quite common in the more urbanized portions of the state. While overall conditions are good and the trend analysis suggests conditions are improving, continued efforts at monitoring and management are needed to assure continued progress. The following section describes the results in more detail for each subbasin.

Toxics Data

Most of the toxics (organics and metals) data are non-detects. Therefore, it is not meaningful to perform trend analysis on these data sets. These data are reviewed and compared with standards or screening levels to identify significant problems in the watersheds. There are occasional exceedances of criteria or screening levels, but there appears to be no particular concern with toxics contamination in the basin. For further details, refer to the Technical Support Document.

Biological and Habitat Assessment

Fish community data were collected at six sites. These data were used to evaluate the fish community using the index of biotic integrity (IBI). In many cases, the results indicate that the fish communities scored lower than the aquatic life use criteria. This may be partially explained by the data used for the IBI metrics. Only electrofishing data were available for this analysis. It is possible that if seine data were included, additional fish abundance and diversity may have been reflected, resulting in higher IBI scores. However, it is also possible that the fish communities are reflective of their supporting habitat. The habitat quality was evaluated by measuring physical habitat parameters over a defined stream reach. In all cases, habitat ranked as Intermediate for aquatic life use. For further details, refer to the Technical Support Document.

TABLE 3
SUMMARY OF TREND ANALYSIS

Watershed	Segment	Station	Temperature			Conductivity			DO deficit			pH			NO2+NO3-N			TP			Cl			SO4			FC			EC			Chl *a*		
			All	Win	Sum	All	Win	Sum	All	Win	Sum	All	Win	Sum	All	Win	Sum	All	Win	Sum	All	Win	Sum	All	Win	Sum	All	Win	Sum	All	Win	Sum	All	Win	Sum
Upper Guadalupe River above Comfort	1816	12678	--			--			--			↓	↓	↓				↓	↓	↓	--			↑	↑	--	↓	--	↓						
	1818	12685																									↑	↑	--						
	1817	12681	--			--			--			--									--			--			--								
Upper Guadalupe River below Comfort	1805	12598	--			--			↓	↓	--	↓	--	--	--			--			↓	↓	--	--			--			↓	--	↓	--		
	1806	13700	--			↑	↑	↑	↓	↓	↓	--			↑	--	--	--			--			↑	↑	--				--					
Middle Guadalupe River	1803	12592	--			--			↓	↓	↓	--			--			--			--			--			--			--					
	1804	15110	--			--			--			--			--			--			--			--			--			--					
	1804	15149	--			--			--			↑	↑	--	↓	--	--	--			--			↓	--	↓				--			--		
	1804	12596	--			--			↓	↓	--	--			--			↓	--	--	--			↓	↓	--	↓	--	--	--			--		
	1812	12656																--			--			--			--								
	1812	12658	↑	--	↑	--			↓	↓	↓	--			--			↓	↓	↓	↓	↓	--	↓	↓	--	--			--					
	1811	12570	↑	--	↑	--			↓	↓	↓	--			↓	↓	↓	↓	--	↓	--			↑	↑	--	--			--					
	1811	12653	↑	↑	--	↑	↑	↑	↓	↓	↓	--			↓	--	--	--			--			--			↓	--	↓	--					
	1804	14932	--			--			↓	↓	↓	--			↑	↑	↑	--			↓	↓	--	↓	↓	↓	--			--					
Blanco River	1813	12661	--						--			--			↑	↑	--	--			↑	↑	--	--											
	1815	12674	--			↑	↑	↑	↓	↓	↓	--						↑	--	--	↑	↑	--	--											
	1813	12668	--			--			↓	--	--	--			--			--			--			--			--			--					
Plum Creek	1810	12640	--			--			↓	--	--	--			--			--			--			--			--			--					
San Marcos River	1808	12626	--			↑	--	--	↓	--	↓	--			--			↓	↓	↓	↑	--	↑	--			↓	↓	--	--					
	1814	12671																									↓	↓							
	1814	12672	--						--						--			--			↓									--					
Peach Creek	1803	14937	--			--			--			↑	↑	↑	--			--			--			--			--			--					
Sandies Creek	1803	13657	--						↓	↓	--	--									--			--											
Coleto Creek	1807	12622																--			--			--											
	1807	12623	--			↑	--	--	--			--			↓	↓	--	--			--			--			--			--					
Lower Guadalupe River	1801	12577																↓	↓	--	--			--											
	1802	12578	--			--			↓	↓	--	--			↓	↓	--	↓	↓	↓	--			--			--			--					

12678 Johnson Creek at SH 39 in Ingram
12685 S. Fork Guadalupe adjacent to Camp Arrowhead
12681 N. Fork Guadalupe River at FM 1340
12598 Canyon Lake south of Jacobs Creek Park 500 yards east of peninsula
13700 Guadalupe River at RR 311, 1.9 mi. SE of Spring Branch, 7.5 mi. downstream from Curry Creek
12592 Guadalupe River at Old San Antonio Road west of Cuero
15110 Guadalupe River immediately downstream of H-5 Dam at Wood Lake, SW of Gonzales, Tx
15149 Lake McQueeney, 0.5 mi. upstream of McQueeney Dam on SE Bank
12596 Lake Dunlap-Guadalupe River north bank at AC's Place at midpoint of Lone Star Drive
12656 Guadalupe River at the beginning of Cypress Bend Park in New Braunfels
12658 Guadalupe River at River Rd 2nd Crossing, upstream of New Braunfels
12570 Dry Comal Creek at Missouri-Kansas-Texas Railroad Crossing in New Braunfels
12653 Comal River below Clemons Dam in New Braunfels
14932 Geronimo Creek at SH 123 near Geronimo, Tx

12661 Blanco River at bridge on SH 12 at Wimberley
12674 Cypress Creek at FM 12 at Wimberley
12668 Blanco River at FM 165 1/2 mi. east of Blanco
12640 Plum Creek at Old Wooden Bridge on Caldwell CR 135, SE of Luling
12626 Lower San Marcos River at SH 80 south of Luling
12671 Upper San Marcos River 0.7 mi. downstream from IH 35
12672 Upper San Marcos River immediately upstream of IH 35 bridge at San Marcos
14937 Peach Creek at Gonzales CR 353, 14.0 km east of Gonzales
13657 Sandies Creek 100 ft. downstream of County Highway, 1.9 mi. upstream from Birds Creek, 2.0 mi. NE of Westhoff
12622 Coleto Creek at US 77 south of Victoria
12623 Coleto Creek at US 59 on Victoria-Goliad county line
12577 Guadalupe River Tidal bridge at SH 35 NE of Tivoli
12578 Guadalupe River at Lower Guadalupe Diversion Dam and Salt Water Barrier

-- No significant trend at 90% confidence level.
↑ Increasing trend at 90% confidence level.
↓ Decreasing trend at 90% confidence level.
↑ Increasing trend at 99% confidence level.
↓ Decreasing trend at 99% confidence level.
Trend apparently due to correlation with flow.
Blank Trend analysis not performed due to insufficient data.

All All data
Win Winter data (Oct to May)
Sum Summer data (Jun to Sep)

WATERSHED SUMMARIES

Upper Guadalupe River Watershed above Comfort

Drainage Area: 850 square miles

Ecoregions: Edwards Plateau

Population Centers: Kerrville

Major Land Cover Types:

Evergreen forest	46.9%
Shrublands	28.8%
Grasslands/Herbaceous	14.4%

Classified Stream Segments:

1806 Guadalupe River Above Canyon Lake
1816 Johnson Creek
1817 North Fork Guadalupe River
1818 South Fork Guadalupe River

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	5	4.6
Industrial	None	

Impairment/Concern

Water Body ID	Water Body Name	Location	Use/Water Quality Concern	Impairment/ Concern	Parameter
1806	Guadalupe River Above Canyon Lake	From 1 mile upstream Flat Rock Dam to confluence with Camp Meeting Creek	Contact Recreation Use	Impaired	Bacteria
1806	Guadalupe River Above Canyon Lake	From RR 394 1 mile downstream	Contact Recreation Use	Impaired	Bacteria
1806A	Camp Meeting Creek	Entire water body	Aquatic Life Use	Impaired	Depressed dissolved oxygen

Discussion

Impairment/Concern

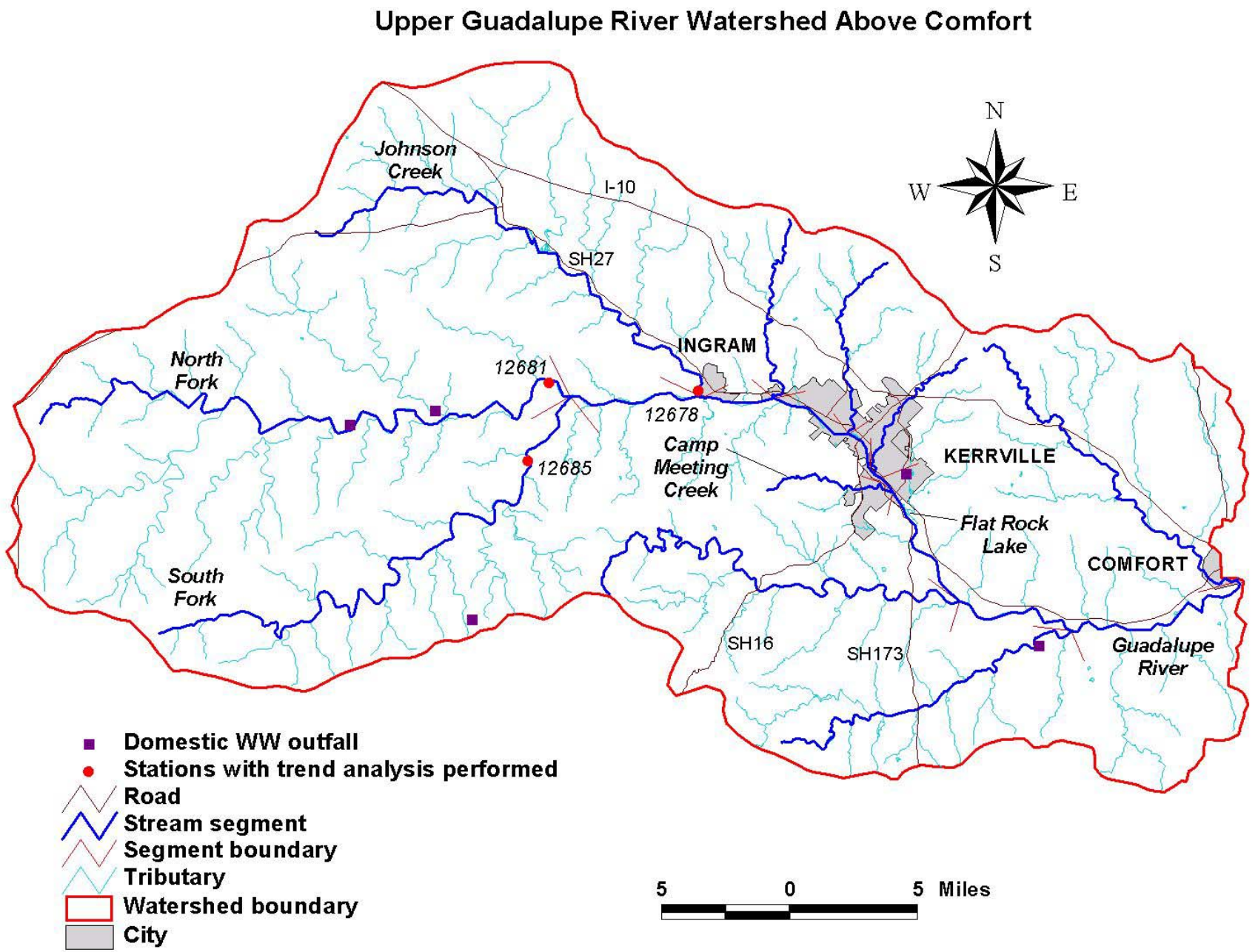
Camp Meeting Creek is on the draft 2002 303(d) List due to depressed DO. A TMDL contractor is collecting additional data to verify impairment. This verification monitoring is planned to conclude at the end of FY04.

There has been an issue of elevated bacteria level in the Kerrville area. UGRA has been monitoring the bacteria levels in the Upper Guadalupe River from May through August in approximately weekly intervals for a number of years. The few stations with consistently high bacteria levels are all located in parks in Kerrville. The elevated bacteria levels appear to be an urban phenomenon that requires further investigation to document the source of the bacteria. A potential source may be the large bird population at bridges that cross the stream.

Trend Analysis

There is a decreasing trend in pH, TP and FC at Station 12678 (Johnson Creek at SH 39 in Ingram). The decrease in pH appears to have stabilized at about 7.6 in the last 3 to 4 years. The trend in the TP data is probably an artifact of the use of a different analytical method in recent years that makes it possible to obtain results at lower levels. The trend in FC appears to be caused by a number of high values in the early 90s. There does not seem to be a trend in the more recent data. There is an increasing trend in sulfate at this station. Nevertheless, the values are well below the segment criterion of 50 mg/L and the sulfate level appears to have stabilized in recent years.

FC shows an increasing trend at Station 12685 (South Fork Guadalupe adjacent to Camp Arrowhead). Although the overall trend is increasing, it appears that the bacteria level is returning back to lower level in 2001.


Upper Guadalupe River Watershed Above Comfort
N
W
E
S
Johnson Creek
I-10
SH27
INGRAM
North Fork
12681
12678
12685
Camp Meeting Creek
KERRVILLE
Flat Rock Lake
COMFORT
South Fork
SH16
SH173
Guadalupe River
Domestic WW outfall
Stations with trend analysis performed
Road
Stream segment
Segment boundary
Tributary
Watershed boundary
City
5 0 5 Miles

Upper Guadalupe River Watershed below Comfort

Drainage Area: 596 square miles

Ecoregions: Edwards Plateau

Population Centers: None

Major Land Cover Types:

Evergreen forest	43.6%
Grasslands/Herbaceous	31.3%
Shrublands	11.0%

Classified Stream Segments:

1805 Canyon Lake
1806 Guadalupe River Above Canyon Lake

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	4	0.25
Industrial	None	

Areas around Canyon Lake currently are mainly served by on-site sewage facilities.

Impairment/Concern - None

Discussion

Trend Analysis

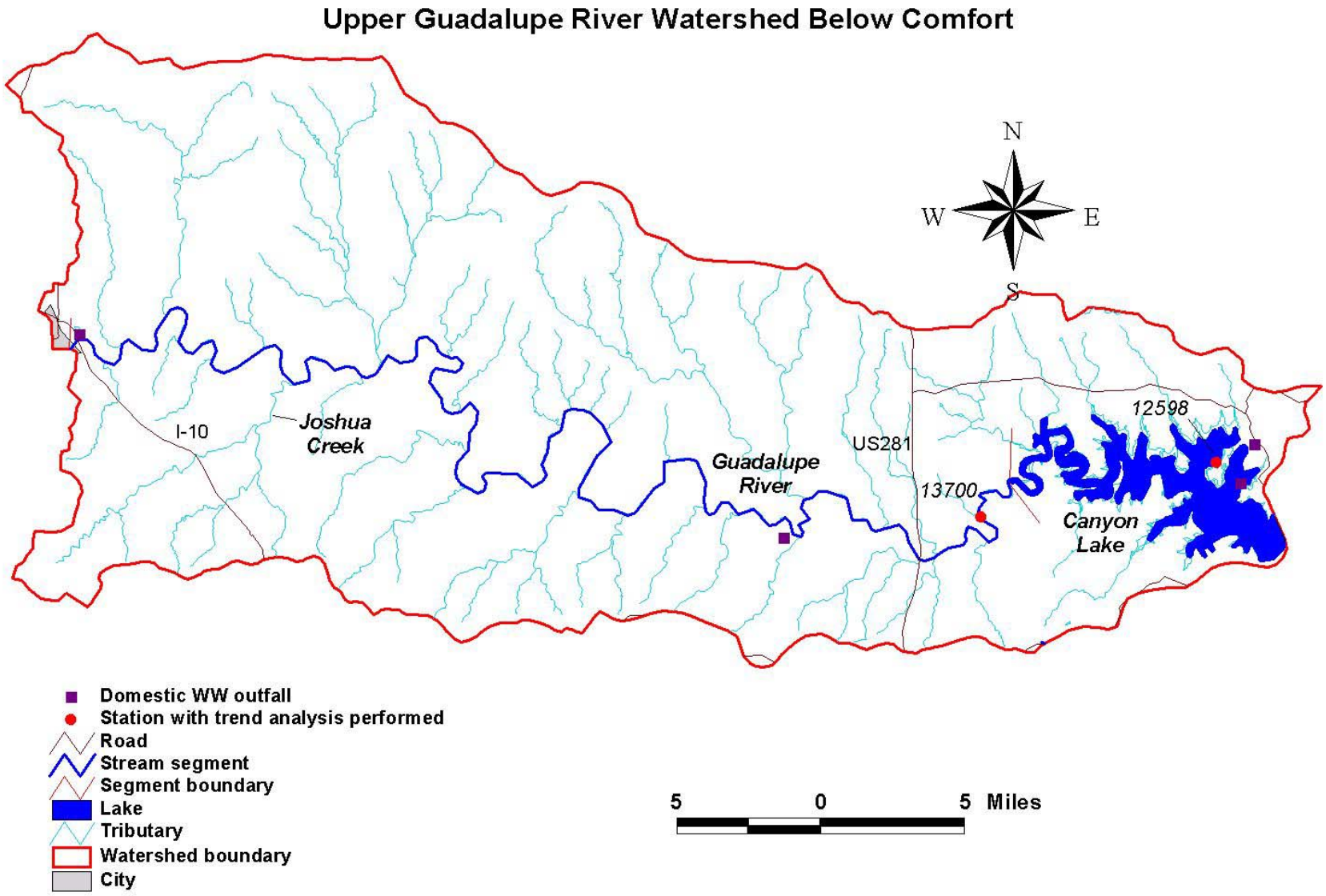
Station 12598 (Canyon Lake South of Jacobs Creek Park 500 Yards East of Peninsula) has seen decreasing trends in DO deficit, pH, chloride and EC over the years. The trend in pH data is weak and there is no trend in the winter or summer data. Therefore, the trend is probably not real. The other trends suggest improving water quality at this location.

DO deficit also shows a decreasing trend at Station 13700 (Guadalupe River at RR 311, 1.9 mi. SE of Spring Branch, 7.5 mi. Downstream from Curry Creek). There is a weak increasing trend in NO_3+NO_2-N. If one high value near the end of the data period is excluded, the trend is only marginally significant at the 90% confidence level. There is a strong positive correlation between NO_3+NO_2-N and flow.

Accounting for flow lowers the significance of the trend below the 90% level. Both conductivity and sulfate show increasing trends. There is no obvious reason for such trends. One possibility is that development in the Canyon Lake area has led to increased nonpoint source pollution. Further monitoring is needed.

Other/Special Studies

Because of concerns about an accumulation of lead shots from a shooting range that had been placed in the creek, a monitoring site (Station 17405) has been added on Joshua Creek. Metals have been sampled twice in 2002. Results are all below criteria.


Upper Guadalupe River Watershed Below Comfort
N
W
E
S
I-10
Joshua Creek
Guadalupe River
US281
12598
13700
Canyon Lake
Domestic WW outfall
Station with trend analysis performed
Road
Stream segment
Segment boundary
Lake
Tributary
Watershed boundary
City
5 0 5 Miles

Blanco River Watershed

Drainage Area: 440 square miles

Ecoregions: Edwards Plateau

Population Centers: Blanco

Major Land Cover Types:

Evergreen forest	42.9%
Grasslands/Herbaceous	32.2%
Shrublands	9.1%
Deciduous forest	7.7%

Classified Stream Segments:

1809 Lower Blanco River
1813 Upper Blanco River
1815 Cypress Creek

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	4	0.54
Industrial	None	

Impairment/Concern

Water Body ID	Water Body Name	Location	Use/Water Quality Concern	Impairment/ Concern	Paremeter
1815	Cypress Creek	Lower 7 miles of segment	Aquatic Life Use	Impaired	Depressed DO
1815	Cypress Creek	Upper 7 miles of segment	Aquatic Life Use	Impaired	Depressed DO

Discussion

Impairment/Concern

Intensive 24-hour DO monitoring has been conducted 10 times in 2001 and 2002 at Station 12674, Cypress Creek at FM 12 at Wimberley. The results meet the DO criteria and therefore the water body is scheduled for delisting.

Trend Analysis

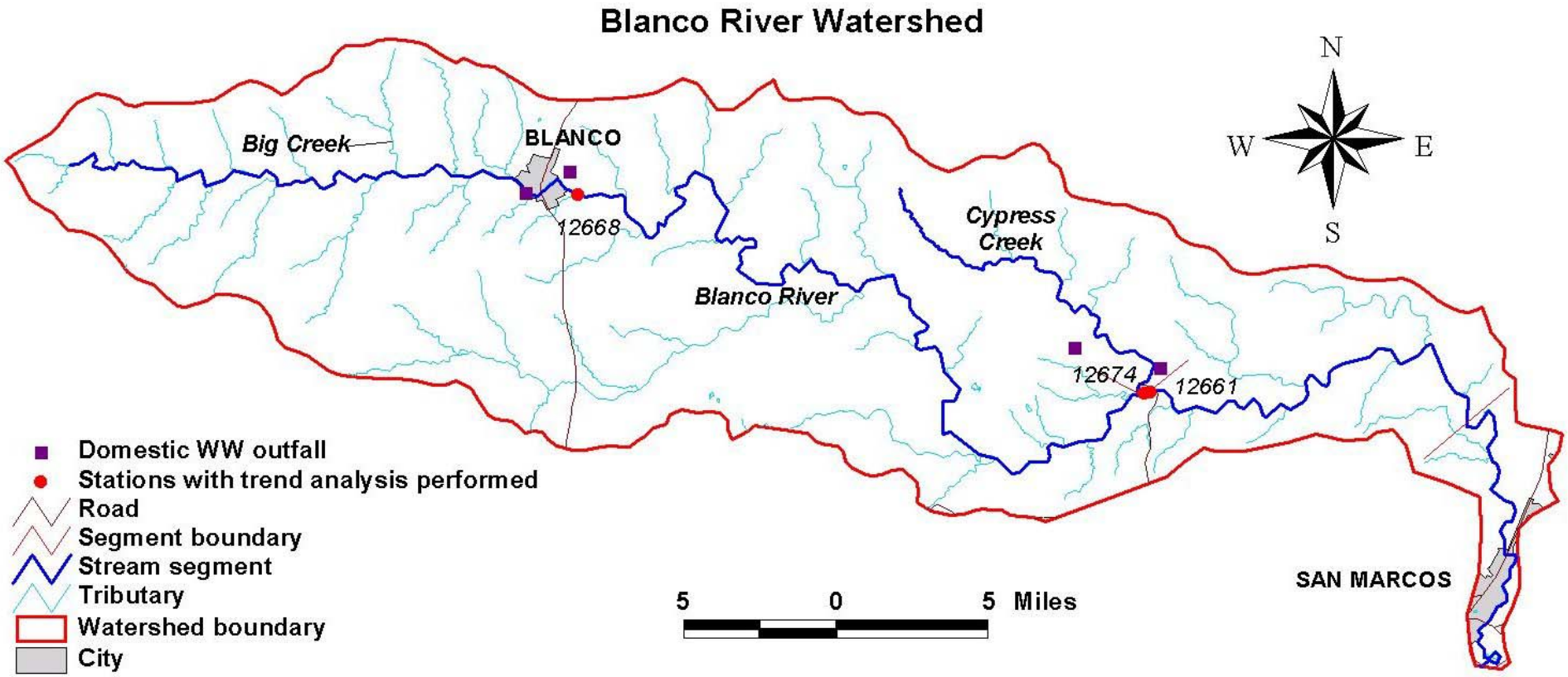
There is an increasing trend in chloride and NO_3+NO_2-N at Station 12661 (Blanco River at Bridge on SH 12 at Wimberley). However, monitoring was ended in 1998 and no information was available to determine if these trends have persisted in the recent years.

There is a decreasing trend in the DO deficit at Station 12674 (Cypress Creek at FM 12 at Wimberley). Since there has been no corresponding change in temperature, it appears that the DO level has been increasing. TP shows an increasing trend that is the result of one high value at the end of the data period. There is no trend when that data point is excluded. There is a strong increasing trend in conductivity that may be partially explained by an increasing trend in chloride. The reason for the trends in conductivity and chloride is unclear. Further monitoring is needed.

At Station 12668 (Blanco River at FM 165 1/2 mile East of Blanco), there is a marginally significant decreasing trend in DO deficit. There is a lot of scatter in the plot so that it is very questionable whether a trend really exists.

Other/Special Studies

A special study on the sub-watersheds of the upper Blanco River was conducted to investigate the occurrence of elevated sulfate concentrations observed during routine monitoring. The study was divided into two phases. A tributary, Big Creek, was identified as a potential source of sulfate concentrations in Phase 1 of the study. It was observed at the main stem sites and the Big Creek site that there is an inverse relationship between flow and sulfate concentrations. Phase 2 was conducted in the second year of the biennium and was developed to focus monitoring efforts in the Big Creek sub-watershed. One possible explanation for the elevated sulfate could be a contribution of groundwater to Big Creek. Groundwater in the area of the Big Creek watershed is very high in sulfate concentration. Because of the apparent link between the sulfate concentrations and low flow or drought conditions, further research into land practices and water usage should be done on the Big Creek watershed to determine if there are any discharges of groundwater into the stream during these periods of dry conditions.


Blanco River Watershed
N
W
E
S
Big Creek
BLANCO
12668
Cypress Creek
Blanco River
12674
12661
SAN MARCOS
Domestic WW outfall
Stations with trend analysis performed
Road
Segment boundary
Stream segment
Tributary
Watershed boundary
City
5 0 5 Miles

San Marcos River Watershed

Drainage Area: 522 square miles

Ecoregions: Texas Blackland Prairies
East Central Texas Plains

Population Centers: San Marcos
Luling

Major Land Cover Types:

Pasture/Hay	27.0%
Deciduous forest	19.0%
Grasslands/Herbaceous	16.3%
Evergreen forest	12.8%
Shrublands	12.2%
Row Crops	8.6%

Classified Stream Segments:
1808 Lower San Marcos River
1814 Upper San Marcos River

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	5	9.6
Industrial	1	not specified

Impairment/Concern - None

Discussion

Impairment/Concern

Part of the watershed is in Caldwell County that has a history of oil and gas activities. There has been historical monitoring of chloride and sulfate that may be contributed by improperly plugged oil and gas wells. Occasional spills occur in oil transportation and handling. To better document spill effects on water quality, monitoring of the major volatile and semi-volatile parameters that are components of crude oil is being conducted on the San Marcos River above Luling.

Upper San Marcos River was on the 2000 List due to elevated sulfate level. Since then, TCEQ has adjusted the criterion from 25 mg/L to 50 mg/L to reflect natural background conditions. Therefore, this segment has been removed from the 303(d) list.

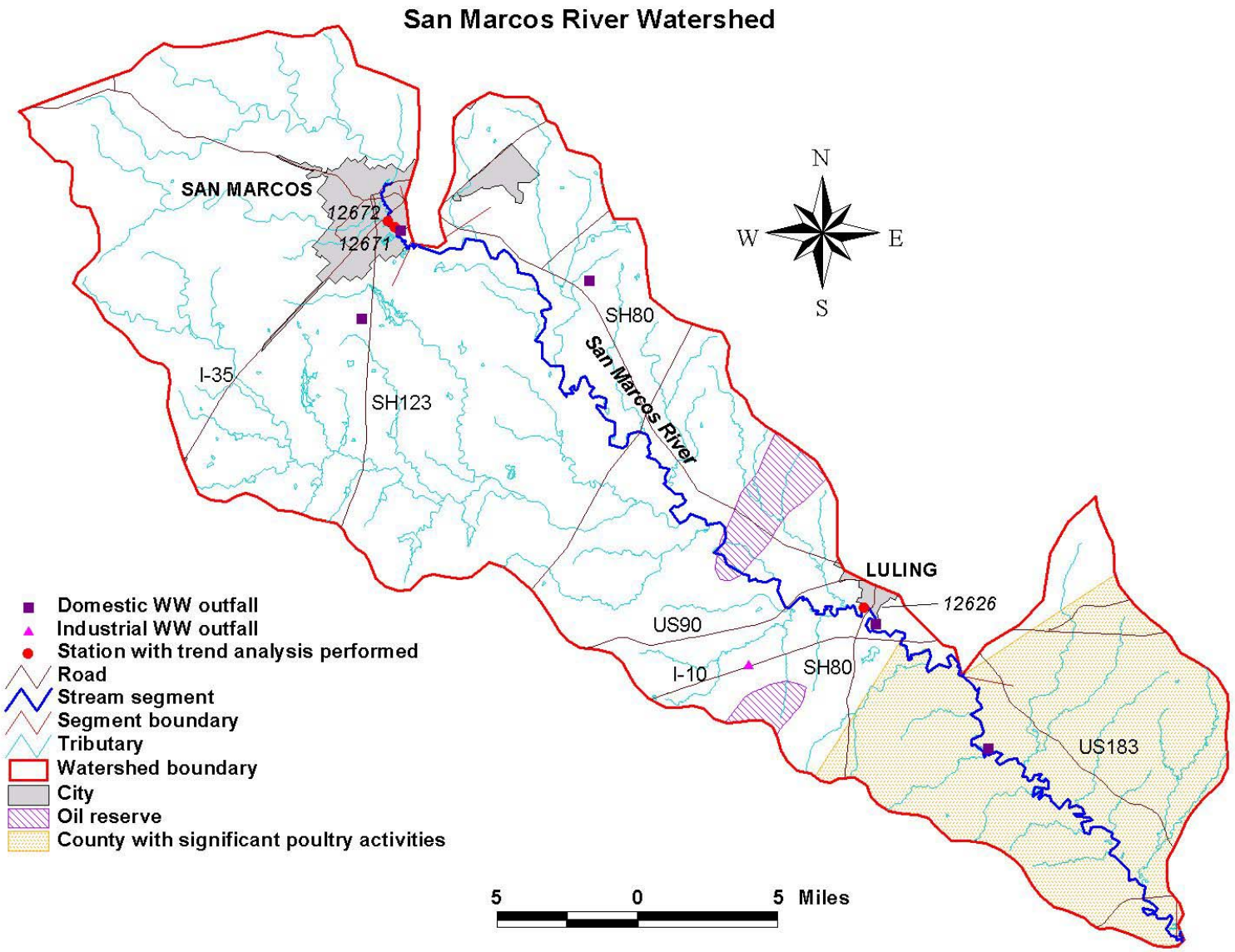
Trend Analysis

At Station 12626 (Lower San Marcos River at SH 80 South of Luling), conductivity and chloride show increasing trends. The trend in conductivity may be somewhat related to the trend in chloride, which could be a result of improperly plugged oil and gas wells. Further monitoring is needed. On the other hand, the DO deficit, TP and FC show decreasing trends, suggesting improvement in water quality.

The analysis suggested a decreasing trend in FC at Station 12671 (Upper San Marcos River 0.7 mile Downstream from IH 35) and chloride at Station 12672 (Upper San Marcos River Immediately Upstream of IH 35 Bridge at San Marcos). However, these trends were due to extreme values at the beginning of the data periods.

Other/Special Studies

A special study was conducted to investigate the impact of oil field activities on the water quality of the San Marcos River and Plum Creek in Caldwell County. Active oil wells and storage tanks are heavily concentrated in Caldwell County. These oil tanks and wells are often unmanned and leaks may go for extended periods of time without detection. Rainfall events can carry contaminated soil and oil deposits to the tributaries that feed the San Marcos River and Plum Creek. The study involved quarterly sampling of petroleum organic compounds at two sites, one on the San Marcos River and one on the Plum Creek. In addition, samples were collected for the organic compounds after three rainfall events. Sites were monitored upstream of the existing sites to establish background concentrations. The analysis resulted in no detection of the organic compounds. Nevertheless, it is apparent by the number and concentration of oil wells in the area that the potential for contamination from oil field activities still exists. Because this was a very limited study of only seven sampling events, additional monitoring may be warranted. It is recommended that the work plan for 2005, and all subsequent work plans, include analyses for the organic compounds on an annual basis.


San Marcos River Watershed
SAN MARCOS
12672
12671
SH80
I-35
SH123
San Marcos River
LULING
12626
US90
I-10
SH80
US183
N
W
E
S
Domestic WW outfall
Industrial WW outfall
Station with trend analysis performed
Road
Stream segment
Segment boundary
Tributary
Watershed boundary
City
Oil reserve
County with significant poultry activities
5 0 5 Miles

Plum Creek Watershed

Drainage Area: 397 square miles

Ecoregions: Texas Blackland Prairies
East Central Texas Plains

Population Centers: Lockhart
Kyle
Luling

Major Land Cover Types:

Deciduous forest	23.6%
Pasture/Hay	22.9%
Grasslands/Herbaceous	22.4%
Row Crops	14.4%
Shrublands	11.4%

Classified Stream Segments:
1810 Plum Creek

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	13	5.5
Industrial	None	

Impairment/Concern

Water Body ID	Water Body Name	Location	Use/Water Quality Concern	Impairment/ Concern	Paremeter
1810	Plum Creek	Confluence with San Marcos River to confluence with Clear Fork Plum Creek	Nutrient Enrichment Concern	Concern	Ammonia
1810	Plum Creek	Confluence with San Marcos River to confluence with Clear Fork Plum Creek	Nutrient Enrichment Concern	Concern	Nitrate+nitrite nitrogen
1810	Plum Creek	From approx. 1 mi downstream of Caldwell CR 202 to upper end of segment	Contact Recreation Use	Use Concern-Limited Data	Bacteria
1810	Plum Creek	Confluence Clear Fork Plum Creek to approx. 1 mi downstream of Caldwell CR 202	Nutrient Enrichment Concern	Concern	Nitrate+nitrite nitrogen
1810	Plum Creek	Confluence Clear Fork Plum Creek to approx. 1 mi downstream of Caldwell CR 202	Nutrient Enrichment Concern	Concern	Total phosphorus

Discussion

Impairment/Concern

This watershed is largely in Caldwell County that has a history of oil and gas activities. There has been historical monitoring of chloride and sulfate that may be contributed by improperly plugged oil and gas wells. Occasional spills occur in oil transportation and handling. To better document spill effects on water quality, monitoring of the major volatile and semi-volatile parameters that are components of crude oil is being conducted on Plum Creek near Lockhart.

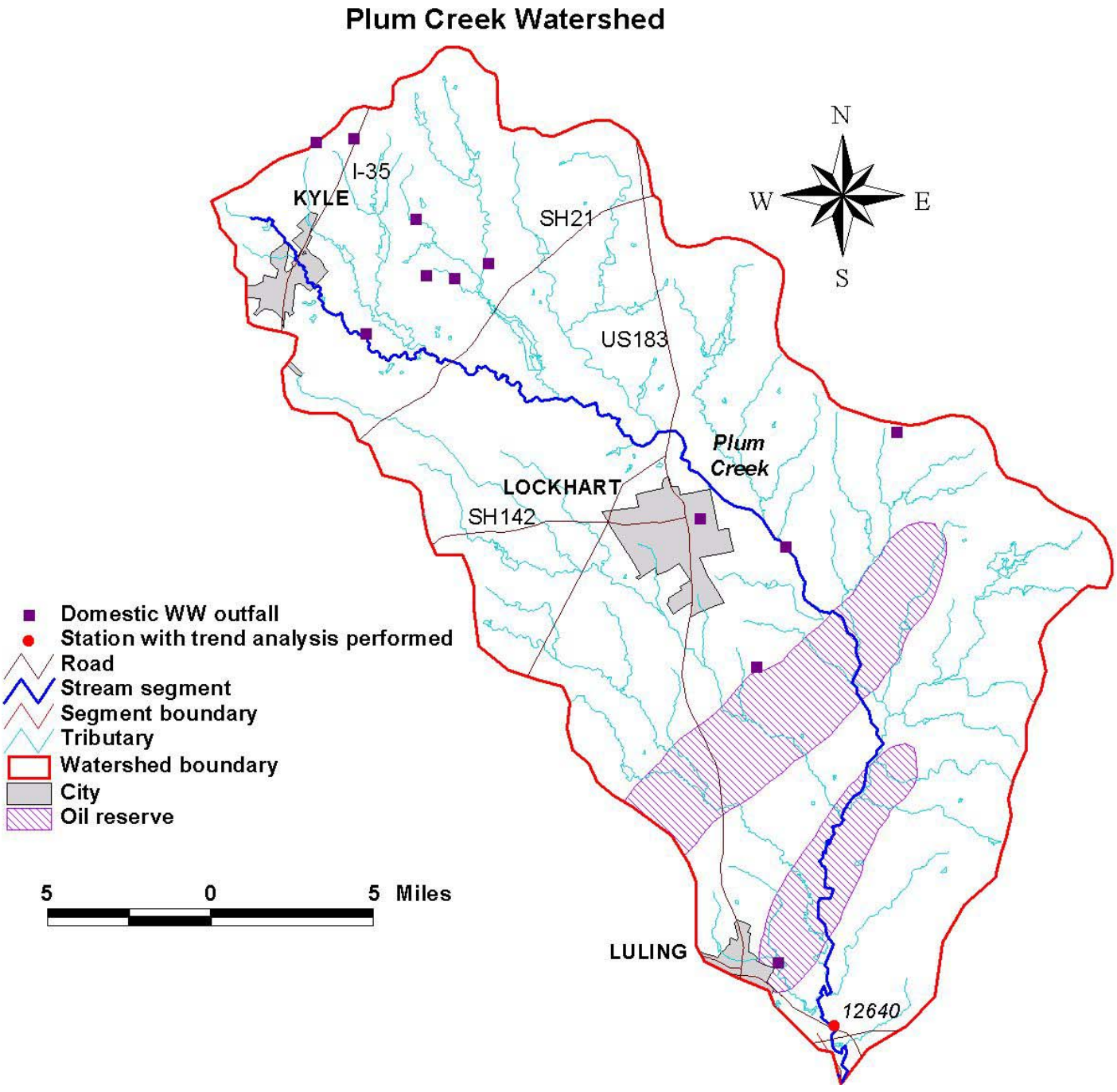
Plum Creek has been identified with nutrient enrichment concern, probably because it receives treated wastewater. This segment also has some higher bacteria observations. The number of data was not sufficient for assessment. Therefore, continued monitoring is required.

Trend Analysis

There is a decreasing trend in DO deficit at Station 12640 (Plum Creek at Old Wooden Bridge on Caldwell CR 135, SE of Luling). There is a strong negative correlation between flow and DO deficit, probably due to higher reaeration with higher flow. The flow data have an increasing trend, which apparently explains the decreasing trend in the DO deficit.

Other/Special Studies

A special study was conducted to investigate the impact of oil field activities on the water quality of the San Marcos River and Plum Creek in Caldwell County. For further details, see Watershed Summary of San Marcos River.


Plum Creek Watershed
N
W
E
S
I-35
KYLE
SH21
US183
Plum Creek
LOCKHART
SH142
LULING
12640
Domestic WW outfall
Station with trend analysis performed
Road
Stream segment
Segment boundary
Tributary
Watershed boundary
City
Oil reserve
5 0 5 Miles

Peach Creek Watershed

Drainage Area: 480 square miles

Ecoregions: Texas Blackland Prairies
East Central Texas Plains

Population Centers: None

Major Land Cover Types:

Deciduous forest	34.1%
Grasslands/Herbaceous	23.4%
Pasture/Hay	21.1%
Shrublands	13.9%

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	3	0.4
Industrial	2	0.6

Impairment/Concern

Water Body ID	Water Body Name	Location	Use/Water Quality Concern	Impairment/ Concern	Paremeter
1803C	Peach Creek	Lower 25 miles of water body	Contact Recreation Use	Impaired	Bacteria
1803C	Peach Creek	Lower 25 miles of water body	Nutrient Enrichment Concern	Concern	Ammonia

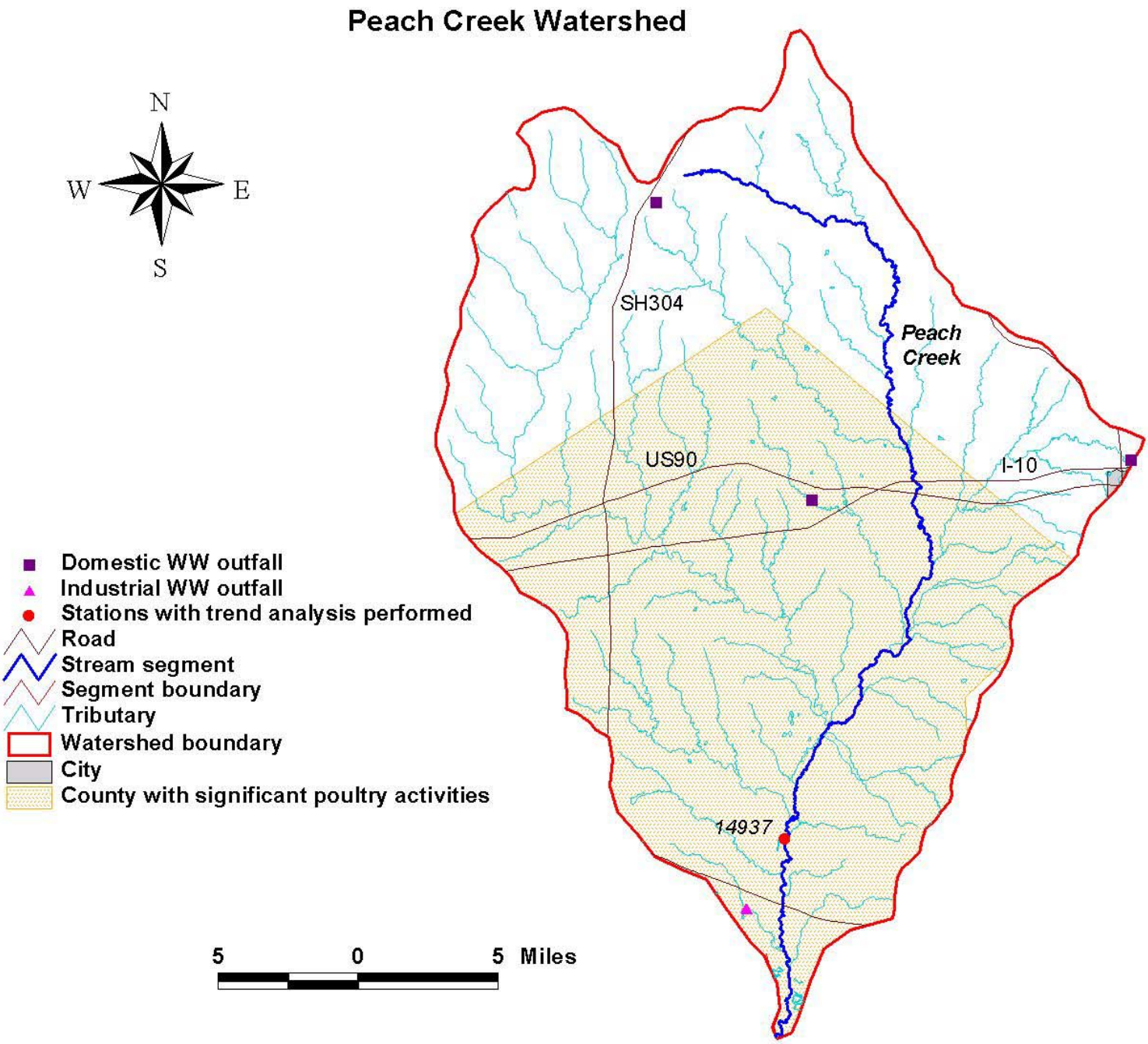
Discussion

Impairment/Concern

Peach Creek is a small system that is markedly different from the waters for which the criteria and screening levels were developed. The stream also has little anthropogenic influence, with no effect noted from poultry operations. This situation was documented in a CRP report "Unique Challenges Posed by Small Streams in Determining DO and Bacteria Water Quality Criteria Compliance" GBRA-PBS&J, 2001. A contractor is conducting additional monitoring to determine if an actual contact recreation use impairment exists from bacteria levels on the lower 25 miles of Peach Creek. If an impairment is determined to exist, the TCEQ will proceed with a TMDL study.

Trend Analysis

At Station 14937 (Peach Creek at Gonzales CR 353, 14.0 km East of Gonzales), there is an increasing trend in pH that is caused by generally lower pH level in the first two years of the data period. There does not seem to be a trend in the recent years.


Peach Creek Watershed
N
W
E
S
SH304
Peach Creek
US90
I-10
14937
Domestic WW outfall
Industrial WW outfall
Stations with trend analysis performed
Road
Stream segment
Segment boundary
Tributary
Watershed boundary
City
County with significant poultry activities
5
0
5 Miles

Middle Guadalupe River Watershed

Drainage Area: 939 square miles

Ecoregions: Texas Blackland Prairies
East Central Texas Plains

Population Centers: New Braunfels
Seguin
Gonzales

Major Land Cover Types:

Pasture/Hay	25.5%
Evergreen forest	18.0%
Deciduous forest	15.5%
Grasslands/Herbaceous	15.1%
Shrublands	12.0%
Row Crops	8.1%

Classified Stream Segments:

1803 Guadalupe River Below San Marcos River
1804 Guadalupe River Below Comal River
1811 Comal River
1812 Guadalupe River Below Canyon Dam

A series of small run-of-river hydro-electric reservoirs was constructed during the late 1920s and early 1930s. GBRA operates six of these reservoirs, the City of Gonzales has one, and there are two in private hands, one near Cuero and one on the San Marcos River. These facilities generate electricity and the pooled reaches of the river provide recreational and aesthetic amenities.

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	14	18.2
Industrial	6	3.5

Impairment/Concern

Water Body ID	Water Body Name	Location	Use/Water Quality Concern	Impairment/ Concern	Parameter
1806	Guadalupe River Below Comal River	From McQueeney Dam upstream approximately 7 miles	Algal Growth Concern	Concern	Excessive algal growth
1804A	Geronimo Creek	Entire water body	Nutrient Enrichment Concern	Concern	Nitrate+nitrite nitrogen

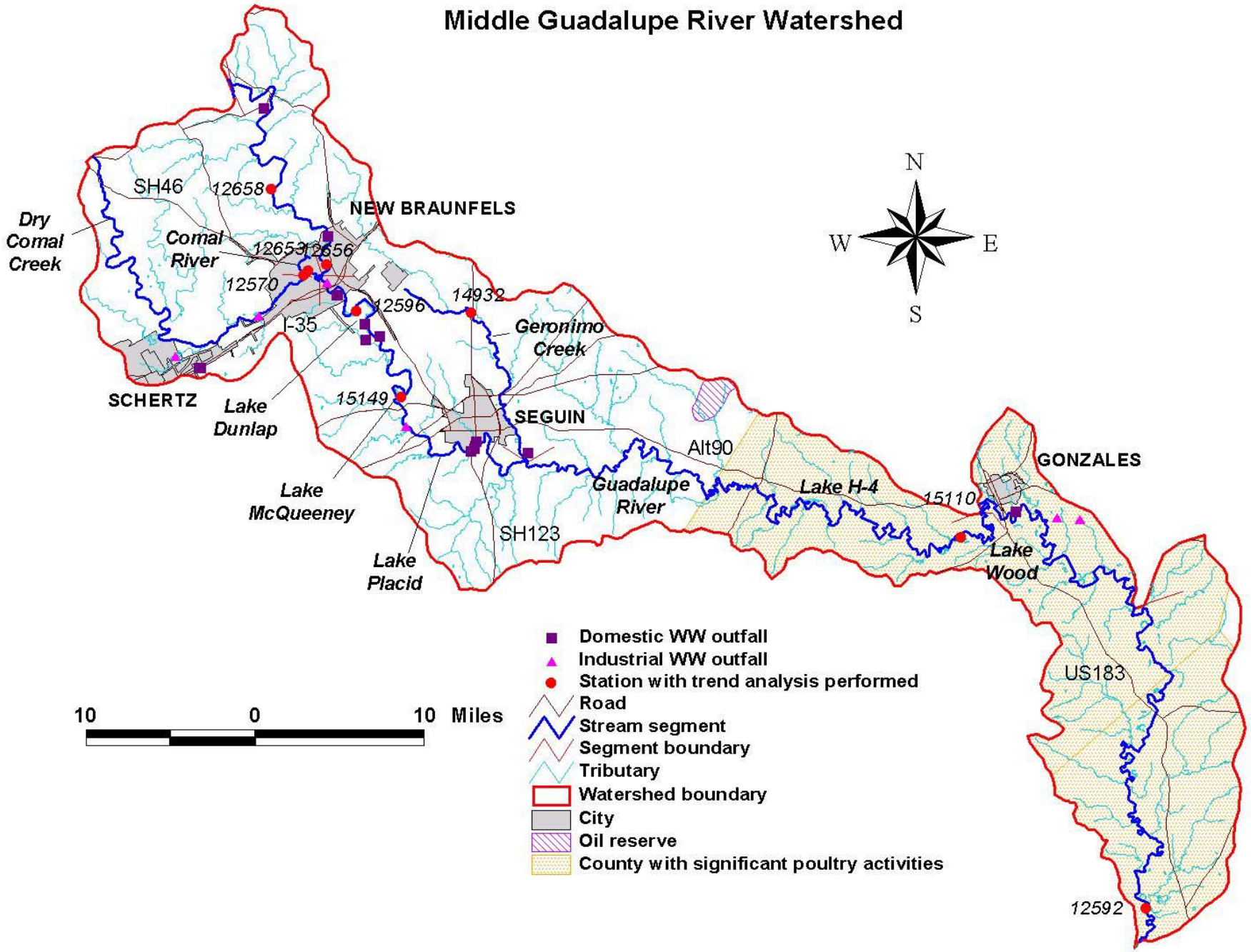
Discussion

Impairment/Concern

No water body in this part of the basin is listed on the Draft 2002 303(d) List. Dry Comal Creek (Segment 1811A) was on the 2000 List due to elevated bacteria level but has been removed from the list.

The Guadalupe River from McQueeney Dam upstream approximately 7 miles had been identified with excessive aquatic plant growth in the Draft 2002 Water Quality Inventory. However, more recent data do not confirm a concern.

Geronimo Creek has been identified with nutrient enrichment concern. The data record began in 1997 and all data since then have exceeded the screening criterion for NO_3+NO_2-N. There appears to be no significant difference between the summer and winter concentrations. Moreover, the data show an increasing trend. There is a strong positive correlation between summer NO_3+NO_2-N data and flow. The summer flow data show an increasing trend as well, which appears to explain the trend in the summer NO_3+NO_2-N data. GBRA has attributed the elevated nitrate-nitrogen at the Geronimo Creek site to seeps and springs from shallow ground water that have elevated nitrates (>20 mg/L), possibly from fertilizer application in the watershed. Land use in the watershed upstream of the sampling location is primarily row-crop agriculture. The most recent data show NO_3+NO_2-N levels of about 11 to 13 mg/L. The maximum contaminant level (MCL) for NO_3+NO_2-N in public drinking water supplies is 10 mg/L. Even though the NO_3+NO_2-N levels in Geronimo Creek have exceeded the MCL, the creek itself is not a drinking water source and the drinking water sources downstream do not appear to be affected. However, the high levels are a concern and this issue will be prioritized for future action.


Middle Guadalupe River Watershed
N
W
E
S
SH46
12658
NEW BRAUNFELS
Dry Comal Creek
Comal River
12653
12656
12570
12596
14932
I-35
Geronimo Creek
SCHERTZ
Lake Dunlap
15149
SEGUIN
Alt90
GONZALES
Lake McQueeney
Guadalupe River
Lake H-4
15110
SH123
Lake Placid
Lake Wood
US183
12592
10 0 10 Miles
Domestic WW outfall
Industrial WW outfall
Station with trend analysis performed
Road
Stream segment
Segment boundary
Tributary
Watershed boundary
City
Oil reserve
County with significant poultry activities

Trend Analysis

This watershed appears to be the most sampled area. Trend analyses were performed for the following nine stations:

12592 Guadalupe River at Old San Antonio Road West of Cuero
15110 Guadalupe River immediately downstream of H-5 Dam at Wood Lake, SW of Gonzales
15149 Lake McQueeney, 0.5 mi. Upstream of McQueeney Dam on Southeast Bank
12596 Lake Dunlap-Guadalupe River North Bank at AC's Place at Midpoint of Lone Star Drive
12656 Guadalupe River at the beginning of Cypress Bend Park in New Braunfels
12658 Guadalupe River at River Rd 2nd Crossing, Upstream of New Braunfels
12570 Dry Comal Creek at Missouri-Kansas-Texas Railroad Crossing in New Braunfels
12653 Comal River below Clemons Dam in New Braunfels
14932 Geronimo Creek at SH 123 near Geronimo

A majority of the data sets with trends show a decreasing level in the water quality parameter, suggesting an improving condition. These include DO deficit at Stations 12592, 12596, 12658, 12570, 12653 and 14932, NO3+NO2-N at Stations 15149, 12570 and 12653, TP at Stations 12596, 12658 and 12570, chloride at Stations 12658 and 14932, sulfate at Stations 15149, 12596, 12658 and 14932, and FC at Stations 12596 and 12653.

The DO deficit trends at Stations 12592, 12570 and 12653 may be due to higher proportion of data collected in the afternoon in recent years. The NO_3+NO_2-N trend at Station 12653 is apparently due to a low value in 2002.

All the increasing temperature trends in this report are observed in the New Braunfels area (Stations 12658, 12570 and 12653). A review of the monthly air temperature data at San Antonio (which is close to New Braunfels) does not show any trend in the air temperature. Therefore the increasing trends in water temperature at the three sites discussed above are not results of changing climate pattern. There appears to be somewhat higher proportion of afternoon samples at the three sites in recent years. This may be a reason for the increasing trend since water temperature is generally higher in the afternoon.

There appears to be a strong increasing trend in conductivity at Station 12653. The reason for the increase in conductivity is unclear and there is no corresponding increase in chloride or sulfate. Further monitoring is needed.

The regression analysis gave an increasing trend in pH at Station 15149. However, there is no trend when a low value in 1998 is excluded.

There is an increasing trend in NO_3+NO_2-N at Stations 14932. This issue has been discussed above.

The sulfate concentration may be increasing at Station 12570 but there is not a clear trend. The reason for this uncertainty is that the flow data show an increasing trend over time and there is a positive correlation between flow and sulfate. Apparently the weak trend in sulfate can be explained by the correlation between flow and sulfate. With this and substantial scatter in the data, it is difficult to conclude there is a real trend.

Coleto Creek Watershed

Drainage Area: 558 square miles

Ecoregions: Texas Blackland Prairies
East Central Texas Plains
Western Gulf Coastal Plain

Population Centers: Yorktown

Major Land Cover Types:

Grasslands/Herbaceous	33.2%
Shrublands	19.7%
Deciduous forest	18.7%
Pasture/Hay	15.3%
Row Crops	5.0%

Classified Stream Segment:
1807 Coleto Creek

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	4	0.31
Industrial	4	0.01

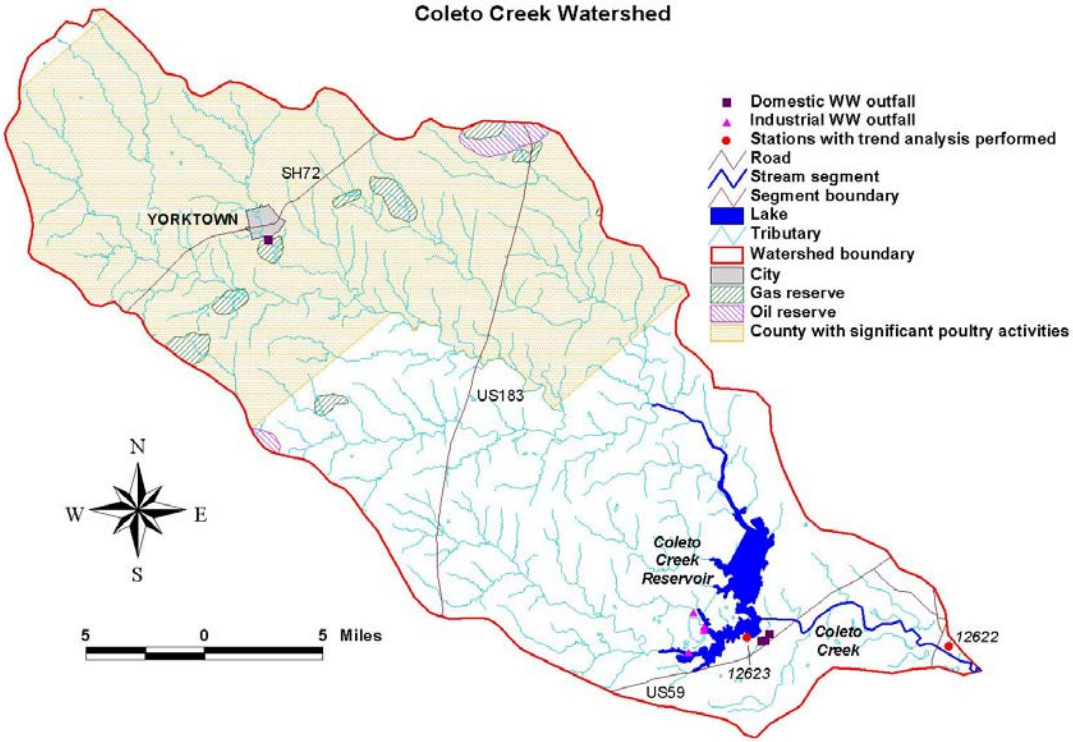
The Coleto Creek Reservoir is a cooling pond for a coal-fired power plant. Make up water for the reservoir is obtained from the Guadalupe River.

Impairment/Concern - None

Discussion

Trend Analysis

A marginally significant increasing trend is observed in conductivity at Station 12623 (Coleto Creek at US 59 on Victoria-Goliad County Line). Within the data period, there are upward and downward trends. Such intra-period trends are also noticed in the chloride and sulfate data. There is no trend in both sets of seasonal data. Judging from the data plot, there does not seem to be a real overall trend in conductivity. There is a decreasing trend in the NO_3+NO_2-N at this location.



Sandies Creek Watershed

Drainage Area: 711 square miles

Ecoregions: Texas Blackland Prairies
East Central Texas Plains

Population Centers: None

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	2	0.5
Industrial	2	0.5

Major Land Cover Types:

Pasture/Hay	24.9%
Grasslands/Herbaceous	24.3%
Shrublands	21.1%
Deciduous forest	19.6%
Evergreen forest	5.3%
Row Crops	3.4%

Impairment/Concern

Water Body ID	Water Body Name	Location	Use/Water Quality Concern	Impairment/ Concern	Paremeter
1803A	Elm Creek	Entire water body	Aquatic Life Use	Impaired	Depressed DO
1803A	Elm Creek	Entire water body	Contact Recreation Use	Impaired	Bacteria
1803A	Elm Creek	Entire water body	Narrative Criteria Concern	Concern	Depressed DO
1803B	Sandies Creek	From the confluence with the Guadalupe River to the confluence with Elm Creek	Aquatic Life Use	Impaired	Depressed DO
1803B	Sandies Creek	From the confluence with Elm Creek to upper end of water body	Contact Recreation Use	Impaired	Bacteria
1803B	Sandies Creek	From the confluence with Elm Creek to upper end of water body	Aquatic Life Use	Use Concern	Depressed DO
1803B	Sandies Creek	From the confluence with Elm Creek to upper end of water body	Nutrient Enrichment Concern	Concern	Ammonia
1803B	Sandies Creek	From the confluence with the Guadalupe River to the confluence with Elm Creek	Contact Recreation Use	Impaired	Bacteria
1803B	Sandies Creek	From the confluence with the Guadalupe River to the confluence with Elm Creek	Contact Recreation Use	Use Concern	Bacteria
1803B	Sandies Creek	From the confluence with the Guadalupe River to the confluence with Elm Creek	Aquatic Life Use	Use Concern	Depressed DO
1803B	Sandies Creek	From the confluence with the Guadalupe River to the confluence with Elm Creek	Nutrient Enrichment Concern	Concern	Ammonia

Discussion

Impairment/Concern

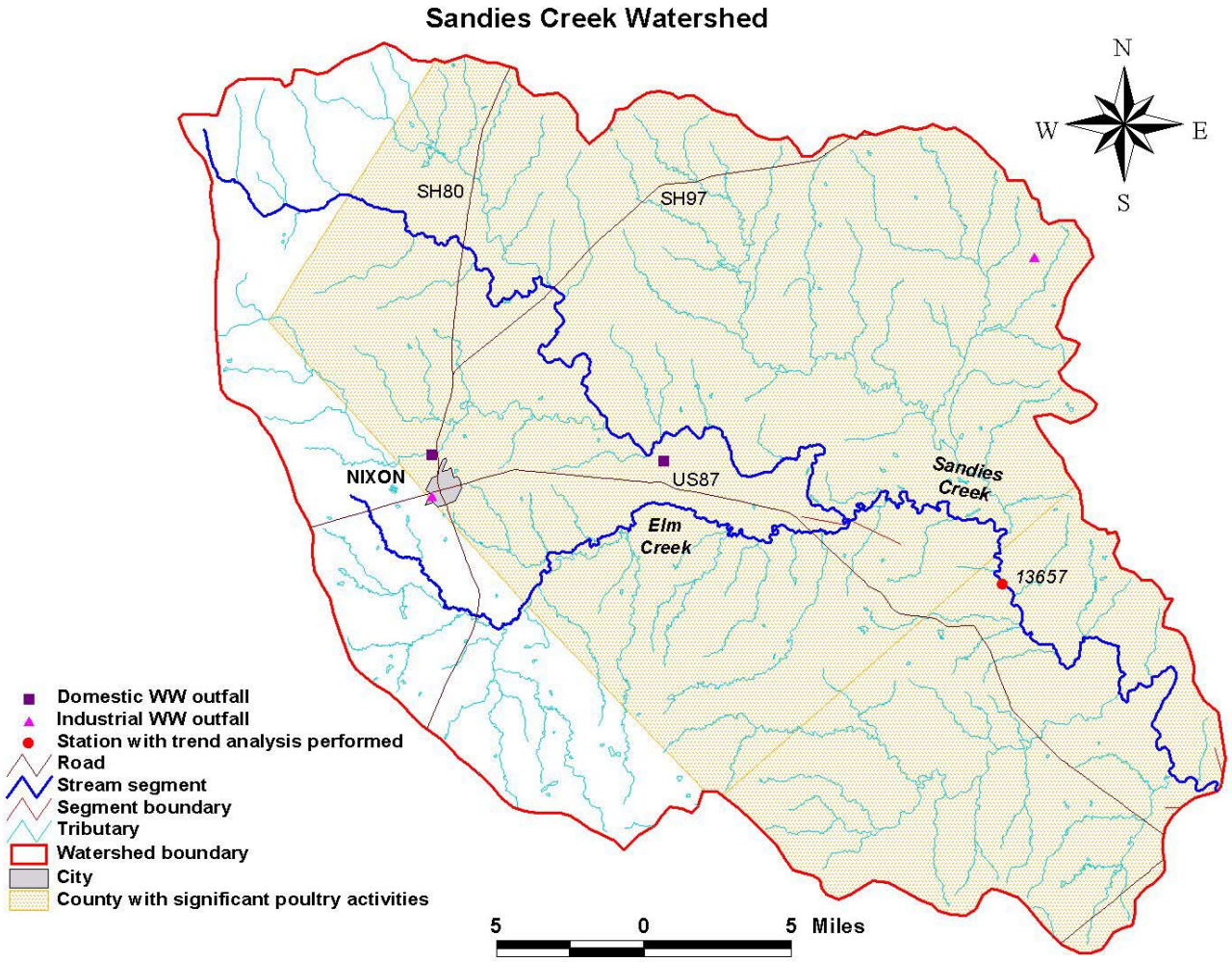
Both Sandies Creek and Elm Creek are on the draft 2002 303(d) List due to depressed DO and elevated bacteria level. In addition, there are also nutrient enrichment concerns for both creeks. These creeks are relatively small systems that are markedly different from the waters for which the criteria and screening levels were developed. The stream also has little anthropogenic influence. There are poultry activities in this watershed, but there was no detectable difference between this watershed and other nearby streams without poultry operations. This situation was documented in a CRP report "Poultry Operations Study Guadalupe River Basin" GBRA-PBS&J, 1998, and a similar report by the TCEQ.

GBRA attempted to collect diurnal DO data in Elm Creek in the summers of 2000 and 2001, but had limited success due to low flow at the site. No additional monitoring has been scheduled because of the sampling difficulty. There has also been diurnal DO monitoring in Sandies Creek. However, there are still insufficient data to determine if the criterion is supported.

A TMDL contractor is collecting additional data to verify the DO and bacteria impairments for both Sandies Creek and Elm Creek. This verification monitoring is planned to conclude at the end of FY04.

Trend Analysis

There is a decreasing trend in DO deficit at Station 13657 (Sandies Creek 100 ft. Downstream of County Highway, 1.9 mi. Upstream from Birds Creek, 2.0 mi. NE of Westhoff). There is also a strong negative correlation between flow and the winter DO deficit, probably due to higher reaeration with higher flow. The winter flow data have an increasing trend, which apparently explains the decreasing trend in the DO deficit.



Lower Guadalupe River Watershed

Drainage Area: 488 square miles

Ecoregions: Western Gulf Coastal Plain
East Central Texas Plains

Population Centers: Victoria
Cuero

Major Land Cover Types:

Grasslands/Herbaceous	22.6%
Shrublands	21.1%
Deciduous forest	15.2%
Pasture/Hay	14.8%
Wetlands	10.2%
Evergreen forest	5.7%
Row Crops	4.2%

Classified stream segments:

1801 Guadalupe River Tidal
1802 Guadalupe River Below San Antonio River
1803 Guadalupe River Below San Marcos River

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	4	13.8
Industrial	11	57.4

Impairment/Concern

Water Body ID	Water Body Name	Location	Use/Water Quality Concern	Impairment/ Concern	Parameter
1801	Guadalupe River Tidal	Entire segment	Aquatic Life Use	Impaired	Depressed DO
1801	Guadalupe River Tidal	Entire segment	Nutrient Enrichment Concern	Concern	Nitrate+nitrite nitrogen
1802	Guadalupe River Below San Antonio River	Entire segment	Nutrient Enrichment Concern	Concern	Nitrate+nitrite nitrogen

Discussion

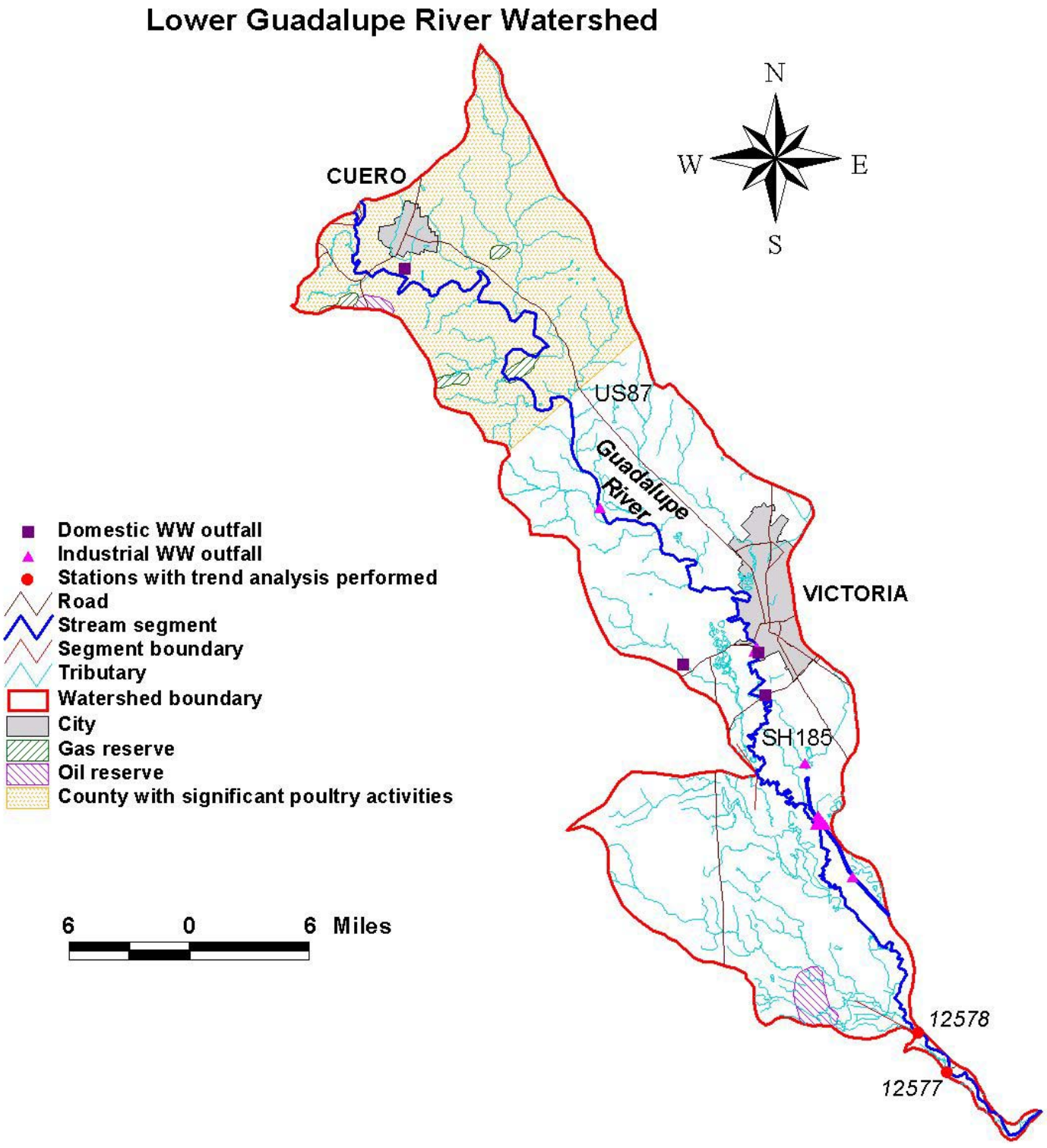
Impairment/Concern

Segment 1801 is on the Draft 2002 303(d) List due to depressed dissolved oxygen. Further monitoring has been scheduled for Station 12577, Guadalupe River Tidal Bridge at SH 35 NE of Tivoli.

Both Segments 1801 and 1802 are identified with nutrient enrichment concerns with elevated NO_3+NO_2-N levels. The San Antonio River may be a source of the nitrogen since treatment plant effluent is a significant component of the San Antonio River flow during dry weather.

Trend Analysis

Decreasing trends for TP are observed at Station 12577 (Guadalupe River Tidal Bridge at SH 35 NE of Tivoli) and Station 12578 (Guadalupe River at Lower Guadalupe Diversion Dam and Salt Water Barrier). There are also decreasing trends in the DO deficit and NO_3+NO_2-N at Station 12578. These trends suggest improvement in water quality in the Lower Guadalupe River.


Lower Guadalupe River Watershed
N
W
E
S
CUERO
US87
Guadalupe River
VICTORIA
SH185
12578
12577
Domestic WW outfall
Industrial WW outfall
Stations with trend analysis performed
Road
Stream segment
Segment boundary
Tributary
Watershed boundary
City
Gas reserve
Oil reserve
County with significant poultry activities
6 0 6 Miles

Guadalupe-Lavaca Coastal Basin

Drainage Area: 998 square miles

Ecoregions: Western Gulf Coastal Plain

Population Centers: Victoria
Port Lavaca

Major Land Cover Types:

Row Crops	21.4%
Wetlands	17.2%
Shrublands	16.9%
Pasture/Hay	15.1%
Grasslands/Herbaceous	13.7%
Deciduous forest	8.4%

Classified stream segments:
1701 Victoria Barge Canal

Wastewater Outfalls:

	Number	Permitted flow (MGD)
Domestic	4	1.5
Industrial	10	22.7

Impairment/Concern

Water Body ID	Water Body Name	Location	Use/Water Quality Concern	Impairment/ Concern	Parameter
1701	Victoria Barge Canal	Entire segment	Aquatic Life Use	Use Concern-Limited Data	Depressed DO

Discussion

Impairment/Concern

A use concern has been identified for Segment 1701 due to depressed dissolved oxygen. This segment has a limited amount of data, but has four fish kills, with three that were attributed to low DO since 1996. It appears to have been given a use concern based on 1 of 8 grab samples being below criterion. This appears to be a case of deeper water with limited circulation and/or dead end canal, where fish kills can occur in warm months. The 3 kills with low DO as the suspected cause were in warm weather at different locations, and the one with an unknown cause was in the winter in a cooling pond.

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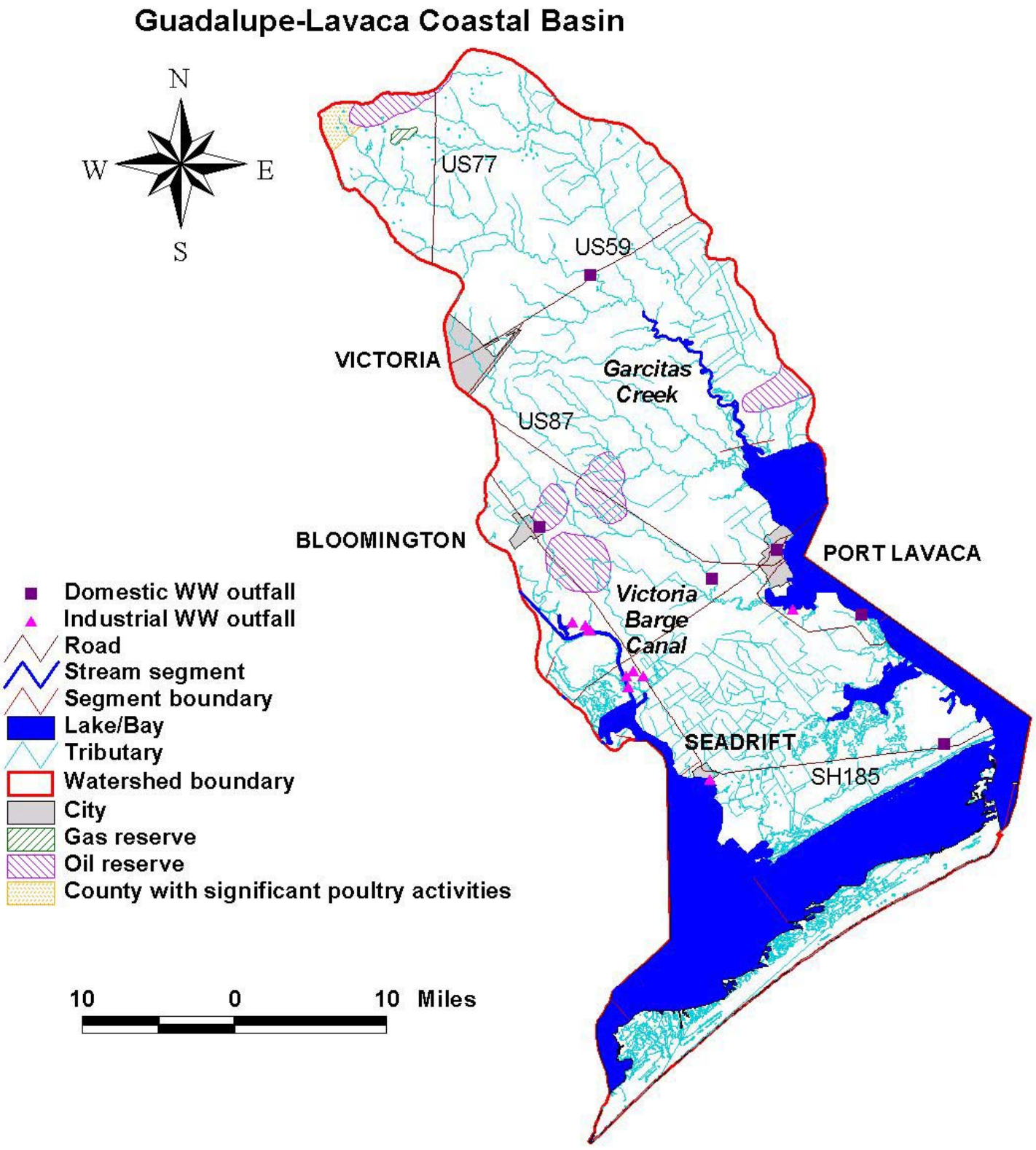
Trend Analysis

No data set in this basin meets the minimum number requirement for trend analysis


Guadalupe-Lavaca Coastal Basin
N
W
E
S
US77
US59
VICTORIA
Garcitas Creek
US87
BLOOMINGTON
PORT LAVACA
Victoria Barge Canal
SEADRIFT
SH185
Domestic WW outfall
Industrial WW outfall
Road
Stream segment
Segment boundary
Lake/Bay
Tributary
Watershed boundary
City
Gas reserve
Oil reserve
County with significant poultry activities
10 0 10 Miles

SIGNIFICANT ISSUES

This report documents two types of water quality data assessment, an inventory comparing observed data with previously established screening levels and criteria, and a trend analysis. Overall, basin waters are in good condition, due to relatively little human development and the strong role that spring flows and reservoir releases play in basin hydrology. The inventory documents a number of locations on small tributaries where DO and indicator bacteria criteria are not attained with the designated frequency. Additional studies are being performed by TCEQ to further understand these situations and possibly shed light on what might be appropriate criteria to employ for small streams. The trend analysis indicates that conditions may be improving overall.

While most of the waters are in good condition and support designated uses, there are several situations of particular concern. Starting in the upper end of the basin and working down, these are briefly noted.

Indicator Bacteria in Kerrville River Parks—Over the years monitoring by UGRA personnel has found elevated indicator bacteria concentrations at stations on river near bridge crossings. These are areas of high public use and finding the reason is important. All the investigations to date have indicated the cause is high bird populations under the bridges. UGRA staff are working with TxDOT personnel to install netting to limit the bird populations.

Nutrients in Lakes Dunlap and McQueeney—While the trend analysis indicated declines in nutrients in these waters, historically there has been concern with infestations of aquatic vegetation. In the past TCEQ has identified a chlorophyll *a* concern on Lake McQueeney, but recent data are lower. This is a complex situation with many sources of nutrients. Those sources include background concentrations of nutrients in spring flows, reservoir releases, nutrient-rich sediments and wastewater discharges. Because these are small run-of-river impoundments, the impacts of these sources can be intensified under low flow conditions. The Clean Rivers Program has studied these issues in the past and will remain vigilant in the coming years.

Sulfates in the Blanco River—Monitoring in 2002 indicated elevated concentrations of sulfates in the Blanco River at low flows were from Big Creek, a tributary to the Blanco River near FM 165. Data on groundwater levels in the area are being sought to better understand the processes for these unusually high concentration values in Big Creek.

Nitrates in Geronimo Creek—Monitoring has documented very high concentrations of Nitrate-N in Geronimo Creek at SH 123. Land use in the watershed upstream of the sampling location is primarily row-crop agriculture. The source appears to be groundwater seepage, but the reason for the high groundwater nitrate-N concentration is not known at this time. More investigation is required to understand this situation.

Effects of Oil and Gas activities in Caldwell County—Because of the large concentration of oil and gas wells and collection facilities in the vicinity of the San Marcos River and Plum Creek, a special sampling program was undertaken. The main thrust of the program was to analyze the routinely collected samples for organic parameters specific to petroleum hydrocarbons. Six sampling events (including three rain events and three quarterly samples) have been conducted since September 1, 2002 and there have been no detections of these parameters.

RECOMMENDATIONS

The following recommendations are provided:

- Many of the water bodies identified with depressed DO and elevated bacteria levels in the 305(b) Report are small creeks. These small stream systems are significantly different from the waters for which screening levels and criteria were developed and applied to the small creeks. Development of site-specific criteria for smaller waters is recommended, taking into account the unique physical conditions associated with such systems. Another step is to implement the recommendation in the Statewide Bacteria Indicator Study to screen bacteria data that were collected when conditions were actually suitable for contact recreation.
- Nutrient enrichment concerns have been determined with statewide screening criteria. Site-specific criteria should be developed and the issues re-evaluated.
- Additional investigation may be required to document the source of bacteria for the portion of Segment 1806 in Kerrville.
- Study is required to investigate the relationship between groundwater and the high sulfate concentration in Big Creek.
- Further study is required to understand the source of the high NO_3+NO_2-N concentrations observed at Geronimo Creek.
- Continued monitoring of petroleum organic compounds is required at the sites on San Marcos River and Plum Creek.
- Reduced monitoring may be considered for stations with trends suggesting improvement in water quality.
- Further monitoring is required at the following sites due to apparent increasing trends in the listed parameters:

Segment		Station ID	Parameters
1818	South Fork Guadalupe River	12685	Fecal Coliform
1806	Guadalupe River Above Canyon Lake	13700	Conductivity, Sulfate
1811	Comal River	12653	Conductivity
1804A	Geronimo Creek	14932	Nitrate and Nitrite Nitrogen
1815	Cypress Creek	12674	Conductivity, Chloride
1808	Lower San Marcos River	12626	Conductivity, Chloride

APPENDIX A
Clean Rivers Program Guadalupe River Basin
Water Quality Events Inventory

Date/Range	Event	Subwatershed/ Waterbody/River Segment	Comments
Feb 99-Dec-00	The turbine at the H-5 Dam in Gonzales County on the Guadalupe River taken out of service.	1804	Two separate repairs have been made on the turbines in the hydroelectric plant in the H-5 dam on the Guadalupe River. Repairs required the passing of water over the dam rather than the routine diversion through the turbines. After the first repair was completed and the system operations reinstated, it was found that the turbine was not operating correctly and the unit was taken off line again. As of December 2000, the unit was still offline.
Mar-99	Sampling in special study finds one viable Giardia cyst-Guadalupe River at Gonzales WTP intake	1803	Special study requested by Steering committee; sampling occuring bimonthy; contacted TNRCC water hygiene and City of Gonzales.
Apr-99	New discharge permit issued to Silverleaf	1805 (Canyon Lake)	0.16 MGD; discharge directly into lake, submerged 10 ft, 50 ft from bank.
Apr-99	Repairs on river begin in Comal, and Guadalupe Co.	1812, 1804	Repairs made to bank structures, clean up of debris left by flood waters.
Apr-99	Draft permit issued to Southern Livestock	1808	No discharge permit issued to concentrated animal feeding operation; land application of wastewater; off site disposal of solid waste.
May-99	Established committee made up of lake users that will serve to give public feedback concerning any vegetation control activities	1807 (Coleto Creek Reservoir)	Committee is apprised and can give comment on vegetation management plans for Coleto Creek Reservoir; meets two times a year or more often if necessary.
May-99	Contamination of surrounding soil by petroleum transmission line near Plum Creek (TNRCC site no. 12640)	1810	Repaired line; monitoring well required by TNRCC; TNRCC monitored Plum Creek.
Jan-2000	Contamination of soil by below ground storage tank diesel fuel spill, 4 mi from Comal Springs	1811	Edwards Aquifer Authority doing sampling of Comal Springs; have found low levels of naphthalene's and xylenes (ppb); Company has submitted corrective action plan to TNRCC.
Jan-00	Fish kill on Blanco River-San Marcos, Texas	1813	Unauthorized discharge of chlorinated water into the Blanco River by the City of San Marcos resulted in the death of a few dozen fish.

Feb-00	Established committee made up of lake users that will serve to give public feedback concerning any vegetation control activities	1804	Has met two times; approved of 2000 vegetation control plan for Lakes H-4 and H-5.
Feb-00	Waste field near Town Creek in Kerrville removed by homeowner	1806	A property owner removed a “field of human waste” from the banks of Town Creek in Kerrville. The 100 square foot patch was serving as a restroom for transients staying near site.
Feb-00, May-Aug-00	MTBE samples collected at potable water intakes on the Guadalupe and San Marcos Rivers	1804, 1808	The Guadalupe and San Marcos Rivers serve as sources of water for potable water treatment plants as well as experiencing high recreational pressure during the summer months. Samples for MTBE, a gasoline additive, were collected to assess the impact of recreational vehicles near the potable water intakes on Lakes Placid, Dunlap, Wood (Guadalupe River) and on the San Marcos River. No measurable amounts of MTBE were observed.
April-00	Gary Job Corps discontinues effluent discharge to San Marcos River	1814	Center is connected to the City of San Marcos collection system.
April-00	Five acres of water hyacinth were treated with 2,4-d on Lake Gonzales	1804	Less than five acres of waterhyacinth were treated with a 2,4-d aquatic herbicide. The treatment plan was developed with consultation with the advisory committee. Treatment was scheduled for additional acreage on H-4 and H-5 lakes but was cancelled due to weather conditions and turbine repairs.
April-00	Alternative poultry litter management workshop held in Victoria	1803	The TNRCC, Texas Ag Extension Service and the De-Go-La Resource Conservation and Development office held a workshop on alternative poultry litter management. Reaction by poultry operations not favorable.
May-Sept-00	Drought conditions drop river flows; intensified algal blooms; river behaves more as a lake than a riverine system in the hydroelectric impoundments	1803,1804,1813	Severe drought conditions have dropped the river flows to below 200 cfs at Lake Dunlap and to below measurable flow in the Blanco River at the City of Blanco; sampling at the Blanco site was suspended for three months. Algal blooms were reported on hydroelectric lakes.
May-00	City of Seguin has been granted a change in location of the discharge of Walnut Branch wastewater effluent	1804	The City of Seguin is diverting their effluent from Walnut Branch to the Guadalupe River. The new pipeline is under construction and will not be completed until 2001. The volume of the discharge is permitted for 4.9 MGD.
Aug-00	Notification of findings in investigation of unauthorized discharge into Joshua Creek; analytical results reported that a sample of the waste contained a total lead concentration of 133,000 milligrams per kilogram.	1806	TNRCC Region 13 investigated a complaint of unauthorized discharge of waste described as “an accumulation of lead gun shot pellets in an erosional pocket of the limestone creek bed” of Joshua Creek, a tributary of the Guadalupe River in Kendall County. An enforcement action has been instigated and the Joshua Creek Ranch has been instructed to begin to remove the lead shot and to take actions to prevent the future deposition of lead shot into the creek by shooting range activities. GBRA will request a monitoring site on Joshua Creek in the 2002-04 CRP monitoring program.

Dec-00	Proposed land disposal site in Victoria and Jackson Counties on Arenoso Creek	1803	Beneficial Land Management, Inc. has applied for a beneficial land disposal site for the disposal of sludge in Victoria and Jackson counties in the watershed of Arenoso Creek. GBRA has established a monthly monitoring site on the creek, beginning in December 2000. As of May 2001, the permit has not been issued.
Winter-00	GBRA, Comal and Guadalupe Counties and local lake associations removed large amounts of debris and objects deposited in the river beds after the flood of 1998	1804	Using funding from the NRCS, GBRA, Comal and Guadalupe Counties and the local lake associations did lake-wide cleanups of debris and large items, i.e. appliances, boats, trees, vehicles, deposited in the lakes after the flood of 1998. After identifying the safety hazards, the lakes were lowered to expose the debris. The homeowners, employees of GBRA and the counties, and contractors physically removed the debris.
00-02	Environmental coalitions formed to fight wastewater discharges and landfills	1804, 1805, 1806	Citizen groups are forming coalitions to fight discharge permits in the upper basin. The Northwest Comal County Environmental Coalition has formed to fight the issuance of the Rebecca Lake discharge permit. As of May '02, the permit is going to a contested case hearing. The group, Citizens Against River Pollution, made up of lake associations downstream of the New Braunfels Utilities Kuehler plants, has formed to push for nutrient limitations in the NBU's TPDES permits. A coalition in Seguin successfully defeated the sale and reopening of a landfill formerly operated by the city.
Jan-01	GBRA was notified by LCRA personnel of a oil field storage tank leak in Caldwell County	1808	An oil field storage tank was found to be leaking and slowly seeping into a small tributary of the San Marcos River in Caldwell County. The Railroad Commission was notified and they employed a clean up company to contain the spill and prevent further contamination of the watershed. Due to the high concentration of oil field activities, it is recommended that analysis for organic contaminants of the San Marcos River and Plum Creek in Caldwell County be done in the next biennium.
Feb-01	State Hwy 123 PCE Plume site (Hays County) designated superfund site by TNRCC	1814	Site, near the intersection of Hwy 123 and IH 35 in San Marcos has a contaminated groundwater plume of unknown origin. Sampling conducted by TNRCC in May 2000 showed detectable amounts of dichloroethane, PCE and trichloroethene. No detectable concentrations were found in Willow Springs Creek or the San Marcos River. TNRCC will be conducting a remedial investigation in the area.
March-01	Calls from residents in Wimberley area complaining of excessive aquatic vegetation in Cypress Creek and Blanco River	1815	Mike McCall investigated and found no excessive growth.
April-01	Regional composting feasibility study for Victoria and surrounding counties	1803	As a result of a workshop on alternative poultry litter management the TNRCC, Texas Ag Extension Service and the De-Go-La Resource Conservation and Development office has awarded project to the Foundation for Organic Resource Management, Fayetteville, Arkansas to study the feasibility of a regional composting facility in Victoria county. Sources of organic material include livestock, poultry, wood and shrimp.

April-01	The turbine at the H-5 Dam in Gonzales County on the Guadalupe River was put back into service.	1804	Two separate repairs have been made on the turbines in the hydroelectric plant in the H-5 dam on the Guadalupe River. Repairs required the passing of water over the dam rather than the routine diversion through the turbines. After the first repair was completed and the system operations reinstated, it was found that the turbine was not operating correctly and the unit was taken off line again. The system is now operating as design, passing river flows through the turbines to generate electricity.
May-01	Report of gray water discharge to Guadalupe River downstream of Boerne-Guadalupe River Ranch	1806	Notified TNRCC Region 11 for investigation.
May-01	Report of water quality problems in impounded 12-acre pond downstream of City of Buda wastewater effluent discharge on Andrews Branch of Porters Creek (tributary of Plum Creek)	1810	Andrews Branch is in Hays County and receives effluent from the City of Buda and an additional permit is being considered into the same watercourse. Susan Meckel, private landowner, has a 12-acre pond that impounds water in the Andrews Branch. She has observed numerous water quality problems, i.e. fish kills, algal blooms, bloodworms, in and above the impoundment. TNRCC has been notified and Mike McCall will investigate and take samples in the impoundment and in the Branch and at the city's discharge.
May-01	GBRA and local lake associations contracted to perform a dredging feasibility study on hydroelectric lakes	1804	Goldston Engineering, Inc. was hired to perform a feasibility study for the dredging of Lakes Dunlap, McQueeney, Placid, Nolte, Gonzales and Wood. The study will quantify costs associated with the project, evaluate methods available, and detail permitting required to complete the project. The consultant was asked to formulate a phased project based on priority areas identified by lake associatons.
May-01	The city of Buda was brought under an enforcement order due to violations of their wastewater discharge permit.	1810	In May 2001, the city of Buda contacted GBRA for assistance in bringing their operation into compliance. In October 2001, GBRA entered into a contract to operate the city's wastewater treatment facility. The plant has been in compliance since mid-May 2001 and the city agreed to fund the clean up and restoration of a downstream landowners stock pond that had been impacted by the city's improper handling of biosolids.
Jul-01	Fire in structure in downtown Seguin, large volume of water from fire control ran down street and entered Walnut Branch	1804	
Aug-01	City of Lockhart required to monitor Total Phosphorus; GBRA monitors creek concentrations for State Representative Rick Green	1810	As a requirement of their TPDES permit, the City of Lockhart, operated by GBRA, must monitor its effluent monthly for total phosphorus. In addition, GBRA agreed to monitor total phosphorus in Plum Creek, upstream and downstream of the city's discharge through the summer of 2002. State Representative Rick Green requested GBRA's help in responding to the concern of a local resident that the city's effluent is detrimentally impacting the Plum Creek.

Sept-01 – Aug-02	GBRA received a grant from the Texas Water Development Board to do a Water Quality and Regional Wastewater Feasibility Study of the area surrounding Canyon Reservoir	1806	Because of the importance of Canyon Reservoir for water supply in the Guadalupe Basin, GBRA applied for and received grant funding to perform an assessment of the impacts to water quality and the feasibility of regional wastewater treatment in the area surrounding the reservoir. GBRA partnered with Comal County and contracted with PBS&J to perform the study.
Nov-01 – Mar 02	New invasive species found in the San Marcos River	1814	The US Fish and Wildlife Service briefed interested parties on the new invasive species, *Cryptocoryne beckettii,* that has been found in the San Marcos River. It poses a serious threat to the endangered species, the Texas Wild Rice. USFWS has plans to remove some of the plant by dredging and creating a buffer zone between it and the wild rice. GBRA has committed funds toward the project and has written letter of support to Texas Parks and Wildlife for additional funding. The dredging would occur in the summer of 2002.
2001	Since its incorporation, the Village of Wimberley began working with GBRA to develop a master plan for the area to handle water and wastewater treatment and applying for a CCN for the area	1815	GBRA is working closely with the council of the Village of Wimberley as well as their Water and Wastewater Advisory Board to put into place the infrastructure necessary to protect the watersheds from the rapid growth and high density population of the area. Two important steps in these efforts are the establishment of a CCN for the area and the development of a master plan for water and wastewater treatment.
Mar-02	EAA performed a dye tracer study of the Comal Springs	1811	The Edwards Aquifer Authority, along with over 60 volunteers from basin entities and interested parties, conducted a dye tracer study on the Comal Springs. The purpose of the exercise was to determine groundwater velocities near the Comal Springs and identify flow paths from the artesian and water table portions of the aquifer. Eosine and uranine dyes were injected into the aquifer via the Panther Canyon and LCRA wells. Monitoring teams were stationed in Landa Park, over the springs and recorded the output of the springs to develop a breakthrough curve.
Mar-02	Due to HB 2912, class B land disposal sites will be permitted rather than registered	1804	GBRA has operated a Class B sludge land disposal operation in Guadalupe County since 1987. It is a partnership with a local farmer to dispose of stabilized biosolids as a soil amendment and fertilizer for his coastal Bermuda field. In May of 2002, a permit application was submitted for the 48-acre site in accordance with the new law requiring these sites be permitted rather than registered. The notice that the application has been declared administratively complete has been posted and we are awaiting a draft permit.

April-May 02	Aquatic vegetation treatments conducted in 2002	1804, 1807	Coleto Creek and the upper hydroelectric lakes were surveyed for aquatic vegetation and management plans were developed and presented to advisory committees. On Lakes Gonzales and Wood, the lower hydroelectric lakes, 47 acres of water hyacinth will be treated with diquat or 2,4-d products. On Coleto Creek, 16 acres of hydrilla and eurasion watermilfoil will be treated with endothol.
April-02	Cleanup on Lake Placid	1804	GBRA assisted members of the organization, Citizens United for Lake Placid, in removing an accumulation of debris and trash on a horseshoe canal off of Lake Placid.
June-02	Abandonment of 3 16-inch pipelines that go under the Guadalupe River in Victoria County and replace with 24" line	1803	The intent of the project is to replace three existing 16" pipelines that carry natural gas under the Guadalupe River with one 24" line that can be inspected in compliance with the new US DOT regulations. TGP has concluded, and GBRA concurs that abandonment in place is the least disruptive and most environmentally sound alternative. Currently, the three lines divide off of a 24" line and cross under the river approximately 100 feet apart. The new line will be installed by directional drilling under the river. Following installation of the new segment, the existing lines will be cleaned, grouted and capped prior to abandonment.
May-02	City of New Braunfels removed "can island" from Cypress Bend Park, Guadalupe River	1812	Over the years, there has been a large deposition of aluminum cans in the Guadalupe River in the Cypress Bend Park area located in New Braunfels. The city removed 40-50 cubic yards of cans mixed with debris. The deposition came from recreationists loosing their drinks or littering over the years and had accumulated to the point that it was blocking public access. The city consulted with the TNRCC, TPWD and GBRA before undertaking the project.
July-02	Historic flood event in Canyon Reservoir	1804, 1805, 1806, 1812	A low pressure system migrating westward from Florida combined with tropical moisture from the gulf and stalled over central Texas. For eight days as much as 35 inches of rain fell over the area. The largest peak stream flow from these floods represents the highest known peak gage height and discharge for 12 of the area USGS stations. For the first time since Canyon Dam was built, water passed over the emergency spillway. Because of this historic spill, a new gorge has been cut in the path of the water that flowed from the spillway to the river below Canyon Dam. Canyon Lake prevented flows of up to 125,000 cubic feet per second heading into New Braunfels. With Canyon Lake, the flow in New Braunfels was held at less than 70,000 cfs. Severe property damage did occur and recreation was suspended in the area surrounding the lake and downstream of the dam for the remainder of the summer and until clean up could occur. The flooding redirected the river flows in some areas as well as deposited large amounts of debris and sediment.

October-02	Oil wells in river	1804	Due to erosion and changes in the flow pattern of the river caused by flooding in July 2002, two oil wells are now located in midstream of the Guadalupe River. They are located approximately two miles downstream of FM 1117 in Guadalupe County. GBRA was notified by the Texas Railroad Commission (TRC) and assisted in the inspection of the wells by boat. One well is located in the main channel and extends 16 feet above the water surface. The second well is approximately forty feet further downstream. These wells were cased in the 50's and there was concern that the procedures used then would be insufficient to protect the river from contamination. The TRC employee was able to inspect the wells from the top of the casings for oil on the surface of residual water in the casings and found no evidence of oil or possible leakage. The TRC was not going to list the wells as high priority but was going to contact the Corp of Engineers for assistance with the cost of removing or recapping the wells at some time in the future.
Dec 2002	Complaint of construction along Blanco River, Blanco County	1813	GBRA received a complaint that construction activities associated with a new RV park going in along the banks of the Blanco River in Blanco County was causing the river to be diverted and materials to be deposited in the stream. GBRA investigated and found no diversion of the river but did notice the lack of erosion control and construction permits. TCEQ and EPA was notified by GBRA but it was felt that the construction was not doing any significant damage to the stream.
Jan 03	First phase of Blanco River Sulfate Study completed	1813	The first phase of the Blanco River Sulfate Study was completed and one tributary, Big Creek, was identified as a possible source of elevated sulfates. Five sites have been selected for monitoring in the second phase in order to isolate any possible source of sulfate. The second phase will consist of monthly monitoring of the selected sites through July 03.
Jan 03	Commercial/Industrial Metal Salvage Yard applies for permit to operate in Comfort	1806	Mr. Bill Markel is intending to operate a metal salvage business at #8 Old Comfort Road on approximately 1.3 acres. The property is in the drainage of Holiday Creek, a spring fed tributary of the Guadalupe River in Comal County. The surrounding homeowners contacted GBRA concerned about the potential of pollution from the storage of appliances, automobiles and scrap metal. It is unknown at this time what the status of the permit is.
April 03	Near miss from herbicide spill on the San Marcos River	1808	On Thursday, April 4, 2003, a tanker truck carrying 5000 gallons of concentrated Grazon P+D tried to cross the San Marcos River on Co. Rd. 266 (Hays County). The driver misjudged the turn and the back rear tires on the left side of the trailer left the bridge and became lodged on the bridge. The EPA, TPWD, and TCEQ were notified as well as the Hays County Environmental Office. Grazon P+D is an herbicide whose active ingredients are picloram and 2,4-D. An empty tanker was called to the scene so that the contents of the stranded tanker could be transferred. The area on the bridge was prepared to contain any leakage or spill. The only problem occurred when the tanker was being emptied and began to implode because the release valve wasn't opened. The valve was opened and the remaining 40 gallons was transferred. No spill or leakage occurred.

Feb-March 03	Lake Debris Cleanup Program	1804, 1812	Flood debris was deposited in area lakes as a result of the Flood of July 2002. Eight separate projects to remove major portions of the debris were managed by GBRA who served as the local contracting officer under the Natural Resources Conservation Service (NRCS) Emergency Watershed Protection Program. The program provided for a 75% federal funding of certain eligible costs. Local sponsors were GBRA, Guadalupe County, City of Seguin, and City of New Braunfels. The program is coordinated with representatives of area lake-wide associations.
Feb 03	Canyon Reservoir Water Quality and Regional Wastewater Planning Study completed	1805	GBRA and Comal County received a grant from the Texas Water Development Board to conduct a water quality and regional wastewater treatment facility feasibility study for the area surrounding Canyon Reservoir. Rapid population growth in the immediate watershed of the lake prompted the study to address the need for central wastewater collection and treatment facilities and also the need for controls of stormwater runoff in urbanized areas. The study was conducted under close coordination with a steering committee that represented a broad cross-section of study area residents and interests, including representatives from state and federal agencies. A specific aspect addressed the relative performance of on-site treatment versus regional facilities in protecting groundwater resources. The study team created a preferred regional water quality protection plan, including a facility plan to encourage centralization of wastewater treatment for new development, and a set of water quality protection alternatives considering the water quality effects and fiscal implications of the alternatives. The completed study is available on the GBRA website.
April 03	Runoff from Hog Farm in Peach Creek Watershed investigated by TCEQ and TPWD	1803	TCEQ was called to investigate a water quality complaint concerning a discharge from a hog farm into a tributary of the Peach Creek. The discharge was septic and dark in color. The hog farm had dead hogs piled up on the property. There is no containment of wastewater runoff. The farm is not permitted because there are less than 200 head on the site. TCEQ is sending the owner a notice of violation asking him to cease discharging and dispose of the dead animals properly. TPWD is also investigating the owner due to a large fish kill that resulted from the discharge.
April 03	Seguin restaurant had overflow of grease trap to Walnut Branch	1804	Church's Chicken (Seguin) had a grease trap overflow and cleaned it up by washing the grease down the parking lot into the Walnut Branch. The city has notified the owner that the clean up that was done was illegal and the city would take legal action if it occurred again. There was some damage to macrophytes in the area but there appeared to be no harm done to the fish populations.
May 03	Small diesel spill over Guadalupe River Bridge on IH 10, Seguin	1804	A semi-truck carrying a load of rolled sheet metal lost control on the IH 10 bridge over the Guadalupe River in Seguin. The truck lost approximately 5.5 gallons of crank case oil into the river. The prevailing winds coming from the south helped to contain the spill and it was removed before it traveled downstream.

APPENDIX B
SUMMARY OF DRAFT 2002 305(b) ASSESSMENT OF GUADALUPE RIVER BASIN AND LAVACA-GUADALUPE COASTAL BASIN

Water Body ID	Water Body Name	Impairment/Concern Location	Use/Water Quality Concern	Impairment/ Concern	Parameter of Impairment/Concern	Criterion exceedance
1701	Victoria Barge Canal	Entire segment	Aquatic Life Use	Use Concern-Limited Data	depressed dissolved oxygen	1 of 8 exceed criterion
1801	Guadalupe River Tidal	Entire segment	Aquatic Life Use	Impaired	depressed dissolved oxygen	Listed on 2000 303(d). Insufficient number of 24-hr DO values to determine if criterion supported.
1801	Guadalupe River Tidal	Entire segment	Nutrient Enrichment Concern	Concern	nitrate+nitrite nitrogen	11 of 20 exceed criterion
1802	Guadalupe River Below San Antonio River	Entire segment	Nutrient Enrichment Concern	Concern	nitrate+nitrite nitrogen	17 of 64 exceed criterion
1803A	Elm Creek (unclassified water body)	Entire water body	Aquatic Life Use	Impaired	depressed dissolved oxygen	Listed on 2000 303(d). Insufficient number of 24-hr DO values to determine if criterion supported.
1803A	Elm Creek (unclassified water body)	Entire water body	Contact Recreation Use	Impaired	bacteria	Listed on 2000 303(d). Insufficient data to evaluate changes in water
1803A	Elm Creek (unclassified water body)	Entire water body	Narrative Criteria Concern	Concern	depressed dissolved oxygen	
1803B	Sandies Creek (unclassified water body)	From the confluence with the Guadalupe River to the confluence with Elm Creek	Aquatic Life Use	Impaired	depressed dissolved oxygen	Listed on 2000 303(d). Insufficient number of 24-hr DO values to determine if criterion supported.
1803B	Sandies Creek (unclassified water body)	From the confluence with Elm Creek to upper end of water body	Contact Recreation Use	Impaired	bacteria	GM: EC=131, FC = 336. 10 of 25 single FC samples exceed criterion.
1803B	Sandies Creek (unclassified water body)	From the confluence with Elm Creek to upper end of water body	Aquatic Life Use	Use Concern	depressed dissolved oxygen	10 of 26 exceed criterion. Stream is perennial. High ALU.
1803B	Sandies Creek (unclassified water body)	From the confluence with Elm Creek to upper end of water body	Nutrient Enrichment Concern	Concern	ammonia	12 of 19 exceed criterion.
1803B	Sandies Creek (unclassified water body)	From the confluence with the Guadalupe River to the confluence with Elm Creek	Contact Recreation Use	Impaired	bacteria	GM: EC=174, FC = 311.
1803B	Sandies Creek (unclassified water body)	From the confluence with the Guadalupe River to the confluence with Elm Creek	Contact Recreation Use	Use Concern	bacteria	7 of 25 single FC samples exceed criterion.
1803B	Sandies Creek (unclassified water body)	From the confluence with the Guadalupe River to the confluence with Elm Creek	Aquatic Life Use	Use Concern	depressed dissolved oxygen	16 of 46 exceed criterion. Stream is perennial. High ALU.
1803B	Sandies Creek (unclassified water body)	From the confluence with the Guadalupe River to the confluence with Elm Creek	Nutrient Enrichment Concern	Concern	ammonia	5 of 13 exceed criterion.
1803C	Peach Creek (unclassified water body)	Lower 25 miles of water body	Contact Recreation Use	Impaired	bacteria	GM: EC=135, FC = 266. 17 of 54 single FC samples exceed criterion.
1803C	Peach Creek (unclassified water body)	Lower 25 miles of water body	Nutrient Enrichment Concern	Concern	ammonia	15 of 29 exceed criterion.

APPENDIX B (CONTINUED)
SUMMARY OF DRAFT 2002 305(b) ASSESSMENT OF GUADALUPE RIVER BASIN AND LAVACA-GUADALUPE COASTAL BASIN

Water Body ID	Water Body Name	Impairment/Concern Location	Use/Water Quality Concern	Impairment/ Concern	Parameter of Impairment/Concern	Criterion exceedance
1804	Guadalupe River Below Comal River	From McQueeney Dam upstream approximately 7 miles	Algal Growth Concern	Concern	excessive algal growth	12 of 41 exceed criterion.
1804A	Geronimo Creek (unclassified water body)	Entire water body	Nutrient Enrichment Concern	Concern	nitrate+nitrite nitrogen	54 of 54 exceed criterion.
1806	Guadalupe River Above Canyon Lake	From 1 mile upstream Flat Rock Dam to confluence with Camp Meeting Creek	Contact Recreation Use	Impaired	bacteria	GM: EC=238, FC = 423.
1806	Guadalupe River Above Canyon Lake	From RR 394 1 mile downstream	Contact Recreation Use	Impaired	bacteria	GM: EC=283, FC = 491. 5 of 8 single FC samples exceed criterion.
1806A	Camp Meeting Creek (unclassified water body)	Entire water body	Aquatic Life Use	Impaired	depressed dissolved oxygen	Listed on 2000 303(d). Insufficient number of 24-hr DO values to determine if criterion supported.
1810	Plum Creek	Confluence with San Marcos River to confluence with Clear Fork Plum Creek	Nutrient Enrichment Concern	Concern	ammonia	6 of 22 exceed criterion.
1810	Plum Creek	Confluence with San Marcos River to confluence with Clear Fork Plum Creek	Nutrient Enrichment Concern	Concern	nitrate+nitrite nitrogen	12 of 40 exceed criterion.
1810	Plum Creek	From approx. 1 mi downstream of Caldwell CR 202 to upper end of segment	Contact Recreation Use	Use Concern-Limited Data	bacteria	GM: FC = 268.
1810	Plum Creek	From confluence Clear Fork Plum Creek to approx. 1 mi downstream of Caldwell CR 202	Nutrient Enrichment Concern	Concern	nitrate+nitrite nitrogen	11 of 16 exceed criterion.
1810	Plum Creek	From confluence Clear Fork Plum Creek to approx. 1 mi downstream of Caldwell CR 202	Nutrient Enrichment Concern	Concern	total phosphorus	8 of 16 exceed criterion.
1815	Cypress Creek	Lower 7 miles of segment	Aquatic Life Use	Impaired	depressed dissolved oxygen	Listed on 2000 303(d). Insufficient number of 24-hr DO values to determine if criterion supported.
1815	Cypress Creek	Upper 7 miles of segment	Aquatic Life Use	Impaired	depressed dissolved oxygen	Listed on 2000 303(d). Insufficient number of 24-hr DO values to determine if criterion supported.

Notes:
GM = Geometric Mean
FC = Fecal Coliform
EC = E. Coli