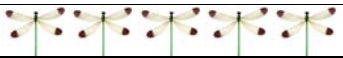






BASIN OVERVIEW

The Basin Overview section of this report contains water quality assessment information about each of the classified segments in the Brazos Basin Clean Rivers Program assessment area. This section is presented as a result of Texas Commission on Environmental Quality (TCEQ) and Brazos River Authority (BRA) screening. It is important to remember that the information presented represents a snapshot in time and that water quality conditions are dynamic and can change over time. Furthermore, segments identified as having “no known problems” are not necessarily without problem. Rather, there may have been limited or no data available and all uses may not have been assessed.

Each classified segment has been ranked according to the degree of water quality impairments or concerns and reflects the overall quality of each stream segment (Table 4).

Table 4. Ranking Key

Rank	NS ¹	CS ²	CN ³	Description
	0	0	0	No impairments or concerns.
	0	1	0	One concern for screening levels, or
	0	0	1	One concern for near non-attainment of standard
	1	0	0	One impairment, or
	0	1+	0	Multiple concerns for screening levels, or
	0	0	1+	Multiple concerns for near non-attainment of standard, or
	0	1	1	One concern for screening levels and one concern for near non-attainment of standard
	2	0	0	Two parameters impaired
	1	1	0	One impairment and one concern for screening levels, or
	1	0	1	One impairment and one concern for near non-attainment of standard, or
	0	1+	1+	Multiple concerns for screening levels and near non-attainment of standards, or
	1+	2+	2+	One or more impairments and multiple concerns for screening levels and near non-attainment of standards

¹NS indicates a segment is non-supporting or impaired; does not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants

²CS indicates a segment has a concern for water quality based on screening levels

³CN indicates a segment has concern for near-nonattainment of applicable water quality standards

WATERSHED OF THE SALT FORK AND DOUBLE MOUNTAIN FORK OF THE BRAZOS RIVER ([MAP](#))

The Watershed of the Salt and Double Mountain Forks of the Brazos River begins with the formation of the Double Mountain Fork of the Brazos River near Tahoka in Lynn County. The Salt Fork of the Brazos River is formed in southeastern Crosby County and flows approximately 175 miles before joining with the Double Mountain Fork in Stonewall County to form the main stem of the Brazos River. The Double Mountain Fork and Salt Fork both flow through rural areas with very little development. The land use is primarily agricultural and rangeland. The North Fork of the Double Mountain Fork does have limited perennial flow immediately below the City of Lubbock where several wastewater outfalls create a continuous flow of water. However, this wastewater driven flow typically does not reach the Double Mountain Fork due to high evaporative rates in this arid part of the state. Both the Double Mountain and Salt Forks are shallow streams that meander within the stream bed. This watershed is underlain by geologic formations that are very high in salt content and contribute to the high levels of dissolved solids and chlorides in this watershed and over much of the remaining Brazos River main stem.

Salt Fork of the Brazos River (Segment 1238) –



This segment is impaired for chloride. The source of chloride causing impairment in this segment is from underlying geologic formations that are very high in salt content and contribute to the high levels of dissolved solids and chlorides to the river via a series of brine springs. TCEQ is currently proposing to the United States Environmental Protection Agency (EPA) a revised chloride standard of 33,670 mg/L for this segment based on long-term data collection efforts. Should EPA approve the new standard, it is anticipated that the chloride impairment for this segment will be removed from the 2010 303(d) List.

The segment also has a concern for dissolved oxygen (DO) in the portion of the segment near Highway 83 and for high water temperature in the portion of the segment near Highway 380. Both of these concerns are most likely caused by low water levels and high ambient temperatures in the most arid part of the basin.

White River (Segment 1239) –



This segment has no impairments or concerns.

White River Lake (Segment 1240) –



White River Lake is listed as impaired for chloride and TDS. This segment was previously impaired for sulfates. This has been downgraded to a concern in the 2008 303(d) List. As with this entire watershed the source of dissolved solids are a result of the geology of the watershed. However, trend analysis indicates an increasing trend in chloride and TDS. TCEQ is currently proposing to the EPA

revised standards for chloride (210 mg/L), sulfate (110 mg/L) and TDS (870 mg/L) for this segment based on long-term data collection efforts. Should EPA approve these new standards, it is anticipated that the chloride and TDS impairments and the sulfate concern for this segment will be removed from the 2010 303(d) List.

Double Mountain Fork of the Brazos River (Segment 1241) –



This segment is listed as not supporting for Chloride. The previous impairment for TDS was removed from the 2008 303(d) List but remains a concern. Like the Salt Fork of the Brazos River and White River Lake, this segment is impacted by naturally occurring salt deposits that result in non-attainment of standards. TCEQ is currently proposing to the EPA a revised standard for chloride (3,270 mg/L) for this segment based on long-term data collection efforts. Should EPA approve this new standard, it is anticipated that the chloride impairment will be removed from the 2010 303(d) List.

Unclassified sub-segment 1241A, the North Fork Double Mountain Fork of the Brazos River, is listed as not supporting for *E. coli* and has concern for ammonia, nitrate, and chlorophyll *a*. The most likely source of nitrogen loading and bacteria in this segment is from point source municipal discharges. The nitrogen loading in this segment in turn is most likely stimulating the algal growth and leading to elevated chlorophyll *a* levels.

Lake Alan Henry (1241B) is not listed for any impairment or concerns.

Buffalo Creek Reservoir (1241C) is listed as having a concern for chlorophyll *a*. The most likely cause of the nutrient loading is point source municipal discharges and residential runoff.

WATERSHED OF THE CLEAR FORK OF THE BRAZOS RIVER

[\(MAP\)](#)

The Clear Fork Watershed begins in Fisher County and flows 284 miles east through Jones, Shackelford, Throckmorton, Stephens, and Young Counties, to its mouth on the Brazos River near South Bend in southern Young County. The predominant land use is agricultural with one major urban area, Abilene. Special studies on California Creek, Paint Creek, and Deadman Creek have identified agricultural non-point pollution and municipal discharges as possible sources of nutrient loadings.

Clear Fork of the Brazos River (Segment 1232) –



The Clear Fork is listed as having concerns for chlorophyll *a*, nitrate nitrogen, orthophosphate phosphorus and total phosphorous for the portion of the segment downstream from the confluence with Deadman Creek. Nutrient concentrations

and concerns in the Clear Fork generally are higher near the inflow of Deadman Creek but decrease downstream of the inflow. Deadman Creek is an effluent dominated stream and municipal discharges are most likely the greatest contributor to the nutrient loading in the Clear Fork.

There is also a DO and chlorophyll a concern in the portion of the segment upstream from the Deadman Creek inflow. The flow in this portion of the river is highly intermittent and the concerns are most likely a function of low flows, seasonal ambient air temperatures and high evaporative rates.

California Creek (1232A) is listed as having concerns for nitrate and chlorophyll a. Potential contributors to the nutrient enrichment concerns include: municipal discharges, agricultural runoff and on-site sewage facilities.

Deadman Creek (1232B), is listed as not supporting for *E. coli* and has concerns for nitrate nitrogen and orthophosphate phosphorus. Deadman Creek is an effluent dominated stream and municipal discharges are most likely the greatest contributor to the nutrient loading in the stream.

Hubbard Creek Reservoir (Segment 1233)



This segment is listed as having concerns for low DO against the grab sample screening level. Hubbard Creek Reservoir is frequently impacted by drought and low water levels which is most likely the cause of the DO concern.

The unclassified Big Sandy Creek (1233A) has a bacterial concern. Potential contributors to the bacteria concerns include: wildlife runoff, agricultural runoff and on-site sewage facilities.

Lake Cisco (Segment 1234) –



This segment has no listing for impairments or concerns.

Lake Stamford (Segment 1235) –



Lake Stamford is listed as having concerns for low DO against the grab sample screening. Like Hubbard Creek Reservoir, Lake Stamford frequently experiences drought conditions, low inflows, seasonal ambient air temperatures and high evaporative rate all of which contribute to the DO concern.

Fort Phantom Hill Reservoir (Segment 1236)



Fort Phantom Hill has a concern based on screening level for increased water treatment due to dissolved solids in the reservoir.

Lake Sweetwater (Segment 1237) –



Lake Sweetwater has no impairments or concerns.

UPPER WATERSHED OF THE BRAZOS RIVER ([MAP](#))

The Upper Watershed of the Brazos River drains approximately 4,725 square miles stretching from the Salt and Double Mountain Fork confluence to the impoundment at the Lake Whitney Dam. The river is generally wide with banks heavily vegetated with elm, willow, oak, and juniper trees. The land use is largely agricultural with row crops, rangeland, and pasture. There are three major urban areas in close proximity to the river.

Lake Graham (Segment 1231) –



Lake Graham has no concerns or impairments; TDS was removed from the 2008 303(d) List. The decline in TDS levels is most likely a result of the above normal precipitation observed in the watershed during in 2007 which had a diluting effect on TDS concentrations.

Brazos River above Possum Kingdom Reservoir (Segment 1208) –



The Brazos River above Possum Kingdom was placed on the 2008 303(d) List as non-supporting for bacteria. Elevated levels of bacteria are attributed to general non-point source pollution.

The lower portion of the segment upstream of Possum Kingdom to the confluence with Spring Creek and the uppermost portion between the confluences with Miller's Creek and Lake Creek both possess concerns chlorophyll *a* screening levels. The nutrient sources causing the excessive algal growth are unknown.

Millers Creek Reservoir (1208A) is listed as having a concern for DO and a concern for near non-attainment for *E. coli*. The DO concern is most likely a result of the shallow depths of the reservoir (ranging from 6 to 8 feet in depth) which leads to an insufficient quantity of water to buffer against high ambient air temperatures experienced in this region.

Possum Kingdom Lake (Segment 1207) –



PK is a large reservoir that is an important source of drinking water and recreation. The 2008 assessment found a concern for increased cost of treatment due to dissolved solids. TDS is a constant source of concern for Possum Kingdom Lake due the high saline conditions in the Watershed of the Salt Fork and Double Mountain Fork of the Brazos River. TDS in the reservoir fluctuates greatly with the drought/flood cycle and the reservoir is frequently being listed and de-listed due to this fluctuation. Due to the diluting effect of the 2007 flood on the reservoir is anticipated that the TDS concern will be removed in the 2010 assessment.

Brazos River below Possum Kingdom Reservoir (Segment 1206) –



The Brazos River below Possum Kingdom is listed as not supporting for chloride. The elevated chlorides in this segment are a result of the drought conditions observed from 2005 through early 2007 that resulted in chloride levels becoming even more concentrated than normal due to evaporation and reduced water levels. During the drought period, chloride levels in Possum Kingdom Reservoir reached unprecedented concentrations. As a result of these increased concentrations, abnormally high chloride levels were observed downstream of the Reservoir following water releases. Chloride in the segment fluctuates greatly with the drought/flood cycle and the segment is frequently being listed and de-listed due to this fluctuation. Due to the diluting effect of the 2007 flood on the segment is anticipated that the chloride impairment will be removed in the 2010 assessment. Additionally, TCEQ is currently proposing to the EPA a revised standard for chloride (1,0336 mg/L), sulfate (595 mg/L) and TDS (2,325 mg/L) for this segment based on long-term data collection efforts.

The segment is also listed as not supporting for the macrobenthic community and as having concerns for poor habitat. The Authority conducted biological assessments at three locations in this segment during fiscal years 2005 and 2006. At all three sites, dissolved oxygen criteria were achieved, but an intermediate aquatic life use was indicated by benthic macroinvertebrates and physical habitat. There were no obvious water quality factors which would account for aquatic life use nonattainment by benthic macroinvertebrates, suggesting that physical habitat limitations and hydrological characteristics may have been primarily responsible. Environmental attributes which create relatively harsh instream conditions for aquatic invertebrates include predominance of a shifting sand substrate, which is not conducive for invertebrate colonization, and frequent flow fluctuations resulting from hydroelectric releases from Possum Kingdom Lake.

Lake Palo Pinto (Segment 1230) –



Lake Palo Pinto has no surface water impairments or concerns.

Lake Granbury (Segment 1205) –



The lake is an important source of drinking water and recreation. Lake Granbury is impaired for chloride in the 2008 303(d) List. Lake Granbury serves as a sink for the high amount of dissolved solids that occur naturally in the upper reaches of the basin. Chloride in the segment fluctuates greatly with the drought/flood cycle and the segment is frequently being listed and de-listed due to this fluctuation. Due to the diluting effect of the 2007 flood on the segment is anticipated that the chloride impairment will be removed in the 2010 assessment.

Since May, 2002 there has been an ongoing study designed to monitor and assess water quality in the canals and coves of Lake Granbury. The canals are backwater areas that have little or no circulation and mix slowly with the main body of the reservoir. This data collection effort has identified bacteria impairments in many of these canals and concerns for dissolved oxygen and elevated nutrient levels in a few of the canals. This seems to be a result of the stagnant conditions in the canals and lack of mixing with the main body of the lake which are not observed in the main body of Lake Granbury. The on-site sewage facilities located along the many canals and coves of Lake Granbury may be a significant source of bacteria and nutrients to the reservoir. The sewage facility in combination with stormwater runoff, may be the cause of water quality concerns in many of the canals. To address the concerns that these canals present, the BRA, TCEQ and a dedicated stakeholder group are currently developing a Watershed Protection Plan (WPP) for Lake Granbury.

Brazos River below Lake Granbury (Segment 1204) –



The Brazos River below Lake Granbury is not listed as impaired or as having concerns.

Two biological assessments were conducted on the Brazos River at FM 200 northeast of Glen Rose in 2008, in response to public concerns over effects of golden algae and decline of the fishery in recent years. Despite less-than-optimal physical habitat, which scored intermediate, biological and dissolved oxygen components achieved the designated high aquatic life use, with one exception, when benthic macroinvertebrates rated intermediate in May. Predominance of a shifting sand substrate and frequent flow fluctuations create relatively harsh conditions for invertebrates. Fish scoring higher than invertebrates appears typical for the middle Brazos, as this pattern has previously been documented for sites in Segment 1206. Fish community characteristics indicated favorable water quality conditions during the study period, and did not reflect adverse effects from golden algae.

Paluxy River (Segment 1229) –



The Paluxy River is listed as not supporting for chloride, sulfate, and total dissolved solids. This listing was a result of an assessment error and will be removed from the 2010 303(d) List if current conditions persist.

Squaw Creek Reservoir (1229A) has concerns for orthophosphate and total phosphorus. The source of elevated phosphorus in Squaw Creek Reservoir is currently unknown.

Lake Pat Cleburne (Segment 1228) –



Lake Pat Cleburne did not have any concerns or impairments identified during the 2008 assessment.

Nolan River (Segment 1227) –



Nolan River is listed as not supporting for dissolved solids, and has concerns for chlorophyll *a*, nitrate, orthophosphate and total phosphorous. Groundwater in the area contains high concentrations of dissolved solids. This brackish ground water is the primary source of water for industrial and municipal uses in this area. After use, this brackish water is passed to the local municipal waste water treatment plants, which are not equipped to remove the dissolved solids. Thus the TDS passes through the wastewater systems and is discharged to the Nolan River. In light of the impact of the groundwater on surface water, the TCEQ is proposing to the EPA a revised standard for chloride (372 mg/L), sulfate (320 mg/L) and TDS (1,383 mg/L) for this segment based on long-term data collection efforts. Should EPA approve this new standard, it is anticipated that the dissolved solids impairment will be removed from the 2010 303(d) List.

In August and October of 2006, the BRA conducted biological assessments at two locations in this segment, FM 916 and FM 933. The October dataset reflected the existence of near-optimal fish community integrity at both collecting sites. Greatly improved integrity at FM 933 compared to August evidently resulted from the effects of two intervening high flow events, which flushed silt and filamentous algae from the system. The portions of Nolan River downstream from Buffalo Creek where physical habitat and physicochemical conditions are favorable are capable of supporting near-optimal fish community integrity. Such a level of integrity likely would not occur without inflow from Buffalo Creek, as Segment 1227 probably would be dry during the summer. Fish community and water quality data collected prior to the two October high flow events indicate that summertime conditions in the lower portion of Segment 1227 become stressful to aquatic life, due largely to the effects of elevated nutrient concentrations that promote excessive algal growth, which through photosynthesis produces stressful pH levels and wide dissolved oxygen fluctuations. Such conditions could be ameliorated through a reduction in nutrient inputs to the river.

Lake Whitney (Segment 1203) –



Lake Whitney has a concern for nitrate and chlorophyll *a* in the Nolan River Arm and chlorophyll *a* in the Brazos River Arm. Potential non-point sources of nitrate in the watershed include municipal discharges, on-site sewage facilities and municipal and agricultural runoff.

There is also a concern for DO (24-hr average) near the dam. The current cause for low DO is unknown.

Brazos River below Lake Whitney (Segment 1257) –



The Brazos River below Lake Whitney is not listed for any impairments or concerns in the 2008 Assessment.

AQUILLA CREEK WATERSHED ([MAP](#))

The Aquilla Creek Watershed covers about 466 square miles, begins in Johnson County flows through Hill County then discharges into the Brazos River in McLennan County. The Aquilla Reservoir is the major drinking water source for most of the estimated 35,424 residents in Hill County. A land-use analysis in the watershed showed approximately 21 percent of the land is used for pasture, hay and grassland; approximately 60 percent is used for row crops and small grains; approximately 13 percent is deciduous and evergreen forest; and approximately 6 percent is commercial, industrial, transportation, residential, and urban uses.

Aquilla Reservoir (Segment 1254) –



Aquilla Reservoir is the major drinking water source for Hill County. This segment has no impairments but continues to have concerns for atrazine in finished drinking water.

The Hackberry Creek portion of the segment has a concern for arsenic and nickel in sediment. It is suspected that the arsenic came from the arsenic acid cotton defoliant used for decades in the highly agricultural area around Aquilla Reservoir. The nickel is believed to be a historical remnant from industrial activities in the Hillsboro area.

Elevated nitrate concentrations are also a concern in Aquilla Reservoir; sources of elevated nutrients prevalent through much of the watershed have not been determined but may include permitted discharges, agricultural runoff and other non-point source runoff.

Brazos River/Lake Brazos (Segment 1256) –



The Lake Brazos portion of the segment is listed as having concern for elevated chlorophyll *a* on the 2008 assessment. Elevated chlorophyll *a* levels are most likely a result of municipal discharges and urban runoff, both which can transport high levels of nutrients to waterbodies.

BOSQUE RIVER WATERSHED ([MAP](#))

The Bosque River begins in Erath County and drains 1,652 square miles before emptying into Lake Waco in McLennan County. The predominant land use is agricultural, rangeland, and pasture. A great deal of research has been done in this watershed to address the elevated nutrients and bacteria.

Upper North Bosque River (Segment 1255) –



The Upper North Bosque River is listed as not supporting for *E. coli*, DO, and nutrient enrichment. Wastewater treatment plant effluent, agricultural runoff and the confined animal feeding operations (CAFOs) located in the watershed are potential contributors to the elevated bacteria and nutrients.

Goose Branch (1255A), North Fork Upper North Bosque River (1255B), Scarborough Creek (1255C), Unnamed Tributary to Goose Creek (1255E), Unnamed Tributary to Scarborough Creek (1255F), and Woodhollow Branch (1255G) are all impaired due to elevated *E. coli*.

Sub-segments 1255A-D, Goose Branch Reservoir (1255J) and Scarborough Creek Reservoir (1255K) have concerns for nutrients and/or chlorophyll *a*.

The South Fork Upper North Bosque River Reservoir (1255H) unclassified sub-segment has a concern for DO.

There is one commonality between the Upper North Bosque River and all the sub-segment streams that may be a significant contributor to their impairments, which leads to questions about the appropriateness of monitoring such streams in Texas and the efficacy of applying water quality standards meant for large river segments to small, ephemeral streams. The Upper North Bosque River and all of these sub-segment streams are small, prairie streams with no flow to low flow for most of the year, so when water is present in these streams, it is a result of storm events. Stormwater is known to accumulate high levels of both bacteria and nutrients as it travels over land. These pollutants are then deposited in the small streams where they can cause impairment and also contribute to other concerns such as excessive algal growth and low DO levels. As a result of little to no consistent flow (e.g. flow contributed by springs or other streams), the stormwater and its associated pollutants tend to stay and accumulate in the stream. In contrast these pollutants would be diluted and distributed throughout the system in a larger stream with constant flow.

North Bosque River (Segment 1226) –



The North Bosque River near Clifton is listed as impaired due to nutrient enrichment. There are also concerns in the portion of the segment near Meridian for near non-attainment of depressed dissolved oxygen and in the portion of the river upstream of Hico for chlorophyll *a* and orthophosphate. Wastewater treatment plant effluent, agricultural runoff and the confined animal feeding operations (CAFOs) located in the watershed are potential contributors to the elevated bacteria and nutrients.

The BRA conducted two biological assessments on the North Bosque River at Cooper's Crossing west of China Spring in 2008. The site is in the lower portion of the segment and should reflect cumulative impacts from most contaminant sources in the watershed upstream from Lake Waco. All components met, and generally exceeded, the designated high aquatic life use, indicating favorable environmental conditions. The 305(b) Assessment concerns for dissolved oxygen, orthophosphorus, chlorophyll *a*, and excessive algal growth did not translate to adverse effects on dissolved oxygen concentrations, fish, or benthic macroinvertebrates during the study period.

Duffau Creek (1226A), Meridian Creek (1226C), Neils Creek (1226D), Spring Creek (1226G), Alarm Creek (1226H), Gilmore Creek (1226I), Honey Creek (1226J), Spring Creek Reservoir (1226P) are all unclassified sub-segments with no impairments or concerns.

Green Creek (1226B) is not supporting for DO and has a concern for chlorophyll *a*.

Sims Creek (1226F) and Little Duffau Creek (1226K) are not supporting for *E. coli*. Little Duffau Creek also has a concern for phosphates.

Indian (1226E) and Little Green Creeks have a concern for *E. coli* with Indian Creek having an additional concern for nitrate and orthophosphate.

Indian Creek Reservoir (1226N) – this unclassified sub-segment has concerns for chlorophyll *a*, ammonia and phosphates.

Sims Creek Reservoir (1226O) has concerns for DO and chlorophyll *a*.

Like the unclassified tributary streams in Segment 1255, many of the impaired or concern sub-segments in 1226 are small, rural streams with little to no flow for most of the year whose water is primarily generated by storm events.

Middle Bosque / South Bosque River (Segment 1246) –



The Middle Bosque/South Bosque River segment as well as two sub-segments, Tonk Creek (1246D) and Wasp Creek (1246E), are listed as having concern for nitrate. The area ranges from undeveloped to moderate development with a mix of commercial, industrial, residential, and agricultural uses. Potential sources of nitrates include point source discharges along with both urban and agricultural runoff.

Wasp Creek is on the 2008 303(d) List as impaired for *E. coli*. Potential sources of bacteria include on-site sewage systems and runoff from rangeland and agricultural lands.

Waco Lake (Segment 1225) –



Waco Lake is listed as having concerns for nitrate and chlorophyll *a*. Along with nutrients provided by the North Bosque River and Middle/South Bosque Rivers, potential local sources of nutrients include: urban runoff and on-site sewage facilities.

LEON RIVER WATERSHED ([MAP](#))

The Leon River Watershed drains approximately 3,750 square miles through Bell, Hamilton, Coryell, Comanche, and Eastland Counties. There are three impoundments within the watershed forming the Leon Reservoir, Proctor Lake, and Lake Belton, providing flood control, municipal water supply, and recreation. Land use in the watershed is primarily rangeland and improved pastureland with areas of mixed forestland. The watershed also hosts a number of municipalities, CAFOs, row crop agriculture and an emerging produce industry.

Leon Reservoir (Segment 1224) -



The Leon Reservoir currently has no impairments. There is a concern for manganese in the sediment although there is limited data and it is recommended that additional data be collected prior to the next assessment.

Leon River below Leon Reservoir (Segment 1223) -



In 2008, the Leon River below Leon Reservoir remains on the 303(d) List as impaired for recreational use due to elevated bacterial levels and added the listing for depressed dissolved oxygen. The 2008 assessment continues to show a concern for chlorophyll *a*. This segment frequently experiences low water levels which hinder its ability to buffer against high ambient air temperatures in the summer and fall and are the likely cause for depressed dissolved oxygen levels.

Armstrong Creek, segment 1223A, an unclassified tributary is also listed as impaired for bacteria. This creek is plagued by low flow and dominated by stormwater runoff, which is most likely the source of the bacteria.

Proctor Lake (Segment 1222) -



Proctor Lake possesses no impairments; however, four tributaries to Lake Proctor possess impairments for bacteria: Duncan Creek, Rush-Copperas Creek, Sabana River and Sweetwater Creek. As in the case of the small tributary streams afore mentioned in the Bosque River Watershed, the tributary streams of Proctor Lake are also dominated by stormwater runoff. These similarities bring to light the need for discussion on whether applying ambient criteria to these streams is appropriate and whether using the high aquatic life use as a default is the best option to assess the waterways when Use Attainability Analyses are not available.

Proctor Lake also has concerns for total phosphorus and chlorophyll *a*. There is also a concern for chlorophyll *a* in Duncan Creek. Elevated chlorophyll *a* levels are most likely caused by increased nutrient inputs to the stream and reservoir from runoff from rural lands.

Leon River Below Proctor Lake (Segment 1221) -



The Leon River below Lake Proctor was first placed on the State's 303(d) List for bacteria levels not supporting contact recreation use in 1998 and is still listed as having non-supporting bacterial levels with additional concerns noted for chlorophyll *a* and depressed dissolved oxygen. The bacteria impairment is a result of the contribution of multiple sources, including: confined animal feeding operations, municipal waste water discharge, and stormwater runoff from rural sources. The chlorophyll *a* concern occurs in the upper portion of Segment 1221 and is most likely a result of low flow during summer months that allows for a concentration of algal cells in the water column.

Biological assessments were conducted on the Leon River at FM 1829 southeast of Gatesville in 2008. Local conditions reflect cumulative impacts from most contaminant sources in the watershed upstream from Belton Lake. The objectives were to evaluate the current condition of aquatic life, in light of 305(b) assessment concerns for bacteria, chlorophyll *a*, dissolved oxygen, and excessive algal growth, and to provide a baseline for monitoring the effectiveness of water quality improvement projects. Physical habitat, benthic macroinvertebrates, and dissolved oxygen concentrations met or exceeded the designated high aquatic life use. The fish community was impaired, scoring intermediate during both events. None of the water quality variables measured accounted for depressed fish index scores. Several factors related to instream flow may have been involved, but the basic cause remains unknown.

Five of the tributaries to this segment are non-supporting for bacteria: Resley Creek (1221A), South Leon River (1221B), Pecan Creek (1221C), Indian Creek (1221D), and Walnut Creek (1221F). Resley Creek's 303(d) listing also includes an impairment for depressed dissolved oxygen. Nutrients, chlorophyll *a*, and depressed dissolved oxygen levels are concerns for several of these creeks. The Special Studies section provides more information regarding the TCEQ initiated Total Maximum Daily Load (TMDL) that began in 2002 and the development of the Leon Watershed Protection Plan.

Like the small tributary streams in the Bosque River Watershed, the tributary streams of the Leon Watershed are also dominated by stormwater runoff which brings to light the need for discussion on whether applying ambient criteria to these streams is appropriate and whether using the high aquatic life use as a default is the best option when Use Attainability Analyses are not available.

Belton Lake (Segment 1220) -



Water quality in Belton Lake is fully supporting of all uses assessed; however, an increasing trend in nutrient concentrations, specifically nitrate, is a concern.

An unclassified tributary to Belton Lake, Cowhouse Creek is impaired for bacteria. Potential sources of bacteria in this stream include: runoff from

agricultural land and range land, on-site sewage facilities and municipal discharges.

Leon River Below Belton Lake (Segment 1219) -



The Leon River below Belton Lake possesses concerns for nitrate and orthophosphorus, but is otherwise fully supporting of all assessed uses. The source of elevated nutrients in this segment is currently unknown but may be a result of point source discharge and urban runoff.

Nolan Creek/South Nolan Creek (Segment 1218) -



The Nolan Creek/South Nolan Creek segment possesses a bacterial impairment and water quality concerns for nitrate, orthophosphorus, and total phosphorus. Sources of bacteria and nutrients include municipal discharges, on-site sewage facilities and urban runoff.

LAMPASAS RIVER WATERSHED ([MAP](#))

The Lampasas River Watershed drains approximately 1,502 square miles through Lampasas and portions of Mills, Burnet, Williamson and Bell Counties. Land use is predominantly agricultural, although development has increased around Stillhouse Hollow Lake. The majority of the Lampasas River watershed drains into Stillhouse Hollow Lake. Salado Creek drains into the Lampasas River below Stillhouse Hollow Lake before the confluence with the Leon River. Much of the Lampasas River has heavily vegetated banks and is characterized by low flow conditions much of the time.

Lampasas River Above Stillhouse Hollow Lake (Segment 1217) -



The portion of Segment 1217 from the crossing of FM 1690 up to the crossing of CR 117 remains listed as impaired for bacteria in the 2008 303(d) List. This portion of the river is strongly intermittent and only possesses flowing water immediately following a rain event, which is most likely the source of the bacteria.

The unclassified tributary of North Fork Rocky Creek possesses impairment for depressed dissolved oxygen. This DO impairment is caused by frequent low water levels which hinder its ability to buffer against high ambient air temperatures in the summer and fall reducing the water's capacity to maintain dissolved oxygen levels.

Stillhouse Hollow Lake (Segment 1216) -



Water quality in Lake Stillhouse Hollow currently meets all water quality standard criteria and nutrient screening levels and has no impairments or concerns at this time. However, Authority staff is becoming increasingly concerned about

Trimmier Creek, an unclassified tributary to Stillhouse Hollow Lake. The creek flows through an area experiencing rapid development and appears to be carrying a large sediment load caused by urban runoff into Stillhouse Hollow Lake. Because there are no State standards for sediment or suspended solids, assessing this issue is difficult but visual observations of the confluence of Trimmier Creek and the lake indicate that the lake is being impacted by the sediment load in the creek.

Lampasas River Below Stillhouse Hollow Lake (Segment 1215) -



The Lampasas River below Stillhouse Hollow Lake was removed from the 303(d) List as impaired for bacteria after the 2008 assessment.

Salado Creek (Segment 1243) -



Salado Creek possesses a concern for nitrate but no impairments. Likely sources of nitrate include runoff from urban and agricultural areas and on-site sewage facilities.

The Salado Creek Preservation Committee, a group of Salado residents concerned about bacteria levels in Salado Creek have actively participated with both the TCEQ and BRA in water quality monitoring efforts to characterize the concern. After several years of monitoring it appears that the bacteria issues in Salado Creek are localized to the area of the creek between the IH-35 frontage road and the low water dam just north of FM 2268. Water samples collected from upstream and downstream of this area do not indicate any concern for bacteria.

Two biological assessments were conducted on Salado Creek 418 m upstream of IH 35 near Salado in 2008. The purpose was to evaluate the current condition of aquatic life in the river, in relation to public concerns over the expansion of rock quarry operations in the watershed and the potential for instream impacts. Physical habitat achieved the designated high aquatic life use, while all biological and dissolved oxygen components achieved an exceptional aquatic life use, indicating healthy environmental conditions and lack of discernible impacts by rock quarries or other sources. The data identified the segment as a candidate for an aquatic life use upgrade.

LITTLE RIVER WATERSHED ([MAP](#))

The Little River Watershed drains approximately 2,349 square miles through Williamson, Bell, Milam and portions of Burnet Counties. This watershed includes Lake Georgetown and Lake Granger. The western portion of this watershed is experiencing rapid urban development and is considered one of the fastest growing areas in the State of Texas while the eastern portion of the watershed remains fairly rural.

North Fork San Gabriel River (Segment 1251), and Lake Georgetown (Segment 1249) -



Both segments are in full support of all designated uses and possess no water quality concerns.

South Fork San Gabriel River (Segment 1250)



The 2008 assessment revealed a concern for depressed dissolved oxygen from the Williamson CR 279 crossing to the upper end of the segment. This DO impairment is caused by frequent low water levels which hinder the water's ability to buffer against high ambient air temperatures in the summer and fall reducing the its' capacity to maintain dissolved oxygen levels.

Biological assessments were conducted on the South Fork San Gabriel River at the Weir Pit west of Georgetown during 2008 to evaluate the current condition of aquatic life in the river, in relation to concerns over the high rate of development and construction activities in the watershed and the potential for instream impacts. However, circumstances changed the focus to impacts of major sewer line installation activities along the streambed in the study area. Physical habitat, biological, and dissolved oxygen components achieved or exceeded the designated high aquatic life use, with the exception of habitat scoring intermediate in July. Whereas the early to middle installation phases, which coincided with the assessments, did not significantly impact the biota, habitat was affected. Effects included destruction of riparian vegetation, increased turbidity, deposition of large amounts of silt on the streambed, direct physical damage to the stream channel by trenching and heavy machinery traffic, and construction of low water dams used as vehicle crossings. Follow-up observations revealed progressive deterioration, and severe habitat disruption was evident by the end of September during advanced installation stages, with a high probability for significant aquatic life impacts. A follow-up is planned for 2010 to reassess environmental damage.

San Gabriel/North Fork San Gabriel River (Segment 1248) -



The San Gabriel/North Fork San Gabriel River is in full support of all of its designated uses and possesses no concerns. However, Authority staff is becoming increasingly concerned about this segment as well as segments 1249, 1250 and 1251 due to the high rate of development and construction activities occurring either in the river channel itself or immediately adjacent to the river. The river at times appears to be carrying a large sediment load caused by these construction activities. Due to a lack of State standards for sediment or suspended solids, assessing these issues are difficult but visual observations indicate that the river is being impacted by the sediment. Additionally, this segment is immediately upstream from Lake Granger which already possesses a

concern for increased sedimentation and additional sediment loading from the river will only hasten the rate of sedimentation.

Biological assessments were conducted twice during 2008 at three locations to evaluate the current condition of aquatic life in the river, in relation to concerns over the high rate of development and construction activities in the watershed and the potential for instream impacts. The first location sampled was the San Gabriel River at SH 29 east of Georgetown, which is upstream of the confluence with Mankins Branch. Despite less-than-optimal physical habitat, which scored intermediate, all biological and dissolved oxygen components achieved the designated high aquatic life use. A degree of nutrient enrichment was indicated by dense periphyton and filamentous algae growth, and fairly wide daily dissolved oxygen fluctuations. Currently, nutrient-associated effects were not severe enough to significantly degrade fish or benthic macroinvertebrate communities.

The second location was at the San Gabriel River at CR 366 east of Jonah, downstream of the confluence with Mankins Branch. All physical habitat, biological, and dissolved oxygen components met or exceeded the designated high aquatic life use, indicating favorable environmental conditions. In every instance, Index of Biotic Integrity scores were higher than at the SH 29 site. This was attributed to greater habitat suitability, flow augmentation from intervening springs and tributaries, and diminished nutrient effects with increased distance from primary sources in the Georgetown area, through dilution and assimilation.

The last set of biological assessments in the segment was conducted on Mankins Branch at CR 100 east of Georgetown. Despite less-than-optimal physical habitat, which scored intermediate, all biological and dissolved oxygen components achieved or exceeded a presumed high aquatic life use, indicating that present water quality conditions are favorable.

Huddleston Branch (1248B), an unclassified stream, possesses concerns for nitrate and bacteria. Mankins Branch (1248C), a tributary which flows into the Huddleston Branch above Lake Granger, is currently identified on the 2008 303(d) List for bacterial impairments. Concerns for elevated nitrate, orthophosphorus and total phosphorus also exist in Mankins Branch. Issues in these subsegments are most likely a combination of municipal discharges and urban runoff.

Granger Lake (Segment 1247) -



Lake Granger is in full support of all of its designated uses but a concern for elevated nitrate levels exists. Willis Creek, a tributary to Lake Granger, is currently identified on the 2008 303(d) List for bacterial impairments and recent data continues to support the impairment designation. Data collected also reveal a concern for nitrate. The watershed in the immediate vicinity of both Lake

Granger and Willis Creek is highly utilized for agriculture, and runoff from these fields is the most likely source of both bacteria and nutrients into the lake.

As segment 1248 flows into Lake Granger it deposits its large sediment load into the reservoir. Since there are no State standards for sediment or suspended solids, assessing this issue is difficult but Lake Granger is experiencing a reduction in storage capacity due to this accelerated sedimentation.

Brushy Creek (Segment 1244) -

Brushy Creek is currently listed on the 2008 303(d) List for bacterial impairment. Concerns for elevated nutrients including nitrate, orthophosphate and total phosphorus exist in Brushy Creek. Two tributaries to Brushy Creek also possess concerns for nutrients: Brushy Creek above South Brushy Creek (1244A) and South Brushy Creek (1244D). Both elevated bacteria levels and nutrient levels in Brushy Creek are attributed to municipal discharges and urban runoff.

San Gabriel River (Segment 1214) -

In 2008, the San Gabriel River was listed as impaired for bacteria, chloride, and sulfate with a concern for nitrate. Bacteria and nitrate issues are most likely caused by a combination of agricultural runoff, municipal discharges and on-site sewage facilities. The source of the dissolved solids impairment is currently unknown but may be a result of the high use of water softeners by residential properties in the upper portion of the San Gabriel's watershed. Most wastewater treatment systems in the state are not equipped to remove the high levels of dissolved solids generated by water softeners, so when high levels of dissolved solids come to the treatment facility from residential properties they are passed through and discharged into lakes and streams.

Little River (Segment 1213) -

The Little River is on the 2008 303(d) List for a bacterial impairment. The Little River also possesses a concern for nitrate and atrazine in finished drinking water. The immediate watershed to segment 1213 is dominated by agricultural activities. Runoff from the agricultural lands is the transport mechanism carrying atrazine to the river. Nitrogen concerns are most likely from a combination of localized agricultural runoff and inflow from the San Gabriel River and Brushy Creek which both have nutrient concerns. The elevated bacteria count is likely a result of runoff from agricultural lands, wildlife waste, and municipal discharges.

CENTRAL WATERSHED ([MAP](#))

The Central Brazos River Watershed drains approximately 2,710 square miles from Lake Brazos Dam in Waco to the mouth of the Navasota River southeast of College Station through Falls, Burleson, Robertson, and portions of McLennan

and Brazos Counties. Land usage is primarily agricultural, with two sizeable urban areas, Waco and Bryan/College Station.

Brazos River above Navasota (Segment 1242) -



There is a concern for the Public Water Supply use on this segment of the Brazos River above Navasota due to the possibility of incurring a higher cost for water treatment in the form of demineralizing the water. If chloride concentrations continue to increase in this segment, there will be a need for more advanced and costlier water treatment. Similar to the upper basin mainstem segments, the chloride concentrations in Segment 1242 are highly dependent on rainfall patterns in the upper basin. The elevated chlorides in this segment are a result of the drought conditions observed from 2005 through early 2007 that resulted in chloride levels becoming even more concentrated than normal due to evaporation, which reduced water levels while leaving chlorides in the remaining water. During this drought period, chloride levels in Possum Kingdom Lake reached high concentrations never previously observed in either lake. Water releases from Possum Kingdom then caused abnormally high chloride levels to be observed in the entire main stem. Due to the diluting effect of the 2007 flood on the segment and recent data that indicates that the segment has returned to normal concentrations it is anticipated that the chloride impairment will be removed in the 2010 assessment.

Segment 1242 is also listed as being impaired for bacteria. More recent data indicates that bacteria are no longer a concern for this segment and it is anticipated that the impairment will be removed during the 2010 assessment.

Eleven tributaries to the Brazos above Navasota possess bacterial impairments, including: Cottonwood Branch (1242B), Still Creek (1242C), Thompson Creek (1242D) (also with depressed dissolved oxygen impairment), Campbell's Creek (1242I), Deer Creek (1242J), Mud Creek (1242K), Pin Oak Creek (1242L), Spring Creek (1242M), Tehuacana Creek (1242N), Walnut Creek (1242O) and Big Creek (1242P). Nutrient enrichment is a concern for Cottonwood Branch, Still Creek, Thompson Creek, Pond Creek (1242F) and Deer Creek. As in the case of the unclassified tributary streams in the Bosque and Leon Watersheds, many of the impaired or concern sub-segments in 1242 are small, rural streams with little to no flow for most of the year whose water is primarily generated by storm events and the associated runoff.

For the Marlin City Lake System, total phosphorus and elevated chlorophyll a pose concerns. Currently, the source of phosphorus is unknown; however, the elevated phosphorous levels are likely influencing chlorophyll a concentrations.

NAVASOTA RIVER WATERSHED ([MAP](#))

The Navasota River Watershed drains approximately 2,235 square miles through Limestone, Robertson, Brazos, Grimes and portions of Madison, Leon and

Freestone Counties. The main stem of the river is impounded in three places in Limestone County creating Lake Mexia, Lake Springfield and Lake Limestone. Land use in this watershed is primarily agricultural with one growing urban area, Bryan/College Station.

Lake Mexia (Segment 1210) -



Lake Mexia is listed as having concerns for chlorophyll *a*, orthophosphorus and total phosphorus. Nutrient concerns are attributable to runoff from wildlife and agricultural lands.

The Navasota River above Lake Mexia (1210A), which is highly intermittent, is listed as impaired due to bacteria. Potential sources of bacteria include: on-site sewage facilities, wildlife wastes, and runoff from residential areas and agricultural lands.

Navasota River Below Lake Mexia (Segment 1253) -



There are concerns for chlorophyll *a* and depressed DO on the Navasota River from the headwaters of Springfield Lake to the Lake Mexia Dam. This DO impairment is caused by frequent low water levels which hinder its ability to buffer against high ambient air temperatures in the summer and fall reducing the water's capacity to maintain dissolved oxygen levels. The cause of elevated chlorophyll *a* levels is currently unknown, but may be a result of nutrient rich runoff entering the river and lake.

The unclassified Springfield Lake (1253A) is in full support of all of its uses, but there is a concern for elevated levels of chlorophyll *a* and depressed DO. The cause of elevated chlorophyll *a* levels is currently unknown, but may be a result of nutrient rich runoff entering the river and lake.

Lake Limestone (Segment 1252) -



This lake possesses concerns for depressed DO and chlorophyll *a*. The cause of the depressed DO is currently unknown and needs to be investigated further. The concern for chlorophyll *a* is most likely a result of elevated nitrate concentrations in the reservoir. However, the concern for nitrate was removed during the 2008 assessment.

Navasota River Below Lake Limestone (Segment 1209) -



The Navasota River below Lake Limestone is listed on the 2008 303(d) List as impaired for contact recreation due to elevated bacteria levels. Sources of bacteria may include stormwater inflow from tributary streams, runoff from agricultural lands, municipal discharges, wildlife runoff and on-site sewage facilities. Concerns also exist for nitrate and orthophosphorus, which are likely caused by runoff from agricultural lands and municipal discharges.

There are nine tributaries that likely contribute to this segment's impairments. Carter's Creek (1209C), Country Club Branch (1209D), Wickson (1209E), Cedar (1209G), Duck (1209H), Gibbons (1209I), Shepherd (1209J), Steele (1209K), and Burton (1209L) Creeks all have impairments for their recreation use designation due to elevated bacteria levels. Carter's Creek and Burton Creek both have concerns for nutrients, while Cedar, Duck and Shepherd Creeks have concerns for depressed dissolved oxygen. Carter's Creek and Burton Creek are both strongly influenced by municipal discharges that are most likely the source of both elevated bacteria and nutrients.

Country Club Branch, Wickson, Cedar, Duck, Gibbons, Shepherd, and Steele Creeks all have one commonality that may be a significant contributor to their impairments and leads to questions about the appropriateness of monitoring such streams in Texas. These creeks are small, prairie streams with no flow to low flow for most of the year, so when water is present in these streams it is a result of storm events. Stormwater is known to accumulate high levels of both bacteria and nutrients as it travels over land. These pollutants are then deposited in the small streams where they can cause impairment and also contribute to other concerns such as excessive algal growth and low DO levels. Since the streams have little to no consistent flow (e.g. flow contributed by springs), the stormwater and its associated pollutants tend to stay in the stream and accumulate, where in a larger stream with constant flow the pollutants would be diluted and distributed throughout the stream system.

Country Club (1209A) and Fin Feather Lake (1209B) both have impairments for their aquatic use designation due to toxic sediments. These impairments are mostly a remnant from historically poor industrial practices. Country Club Lake also possesses concerns for phosphates while Fin Feather Lake possesses an additional concern for ammonia.

YEGUA CREEK WATERSHED ([MAP](#))

The Yegua Creek Watershed drains approximately 1316 square miles through Milam, Lee, Burleson and Washington Counties. Land usage in the watershed is primarily agricultural. Oil and gas production has been, and is currently, a major operation in the watershed. Additionally, there is a large lignite mining operation located in the upper area near the City of Rockdale. Rockdale, along with four other small, rural communities (Caldwell, Lexington, Somerville, and Giddings) are the largest in the watershed.

Somerville Lake (Segment 1212) -

Somerville Lake is on the 2008 303(d) List as being impaired for depressed DO and has a concern for high pH levels at the eastern end of the reservoir near the dam. There is also concern for increased chlorophyll *a* concentrations. The extremes in pH are most likely a result of algal activity; the observed high concentrations of chlorophyll *a* may be a potential cause for fluctuations in pH.

Photosynthesis and respiration are two major factors that influence the amounts of carbon dioxide in the lake, which in turn affects pH levels and dissolved oxygen levels.

One tributary to the lake, East Yegua Creek, remains on the 2008 303(d) List as impaired for recreational use due to elevated bacteria levels. Sources of bacteria may include municipal discharges and runoff from agricultural lands and wildlife.

Yegua Creek (Segment 1211) -

Yegua Creek is in full support of all of its designated uses and exhibits no concerns. The unclassified tributary to Yegua Creek, Davidson Creek (1211A), is impaired due to elevated bacteria levels. Reminiscent of the unclassified tributary streams in the Central Brazos and Navasota Watersheds, Davidson Creek is a small, rural stream with little to no flow for most of the year whose water is primarily generated by storm events and the associated runoff.

LOWER WATERSHED ([MAP](#))

The Lower Brazos Watershed drains approximately 2,077 square miles through Washington, Grimes, Waller, Austin, Fort Bend, and Brazoria Counties before discharging into the Gulf of Mexico. Land uses include agriculture, oil and gas retrieval, chemical industry, and municipalities. Agricultural interests include row crops such as cotton, corn, and sorghum in the northern counties of the watershed, and rice and sorghum in Brazoria County with cattle and chicken farming throughout the watershed. Surface mining operations can be found in Grimes County. There is also a concentration of chemical industry activity in Brazoria County. Fort Bend County has experienced an explosion of growth with the sprawl of the Houston metropolitan area.

Brazos River Below Navasota River (Segment 1202) -

The Brazos River below Navasota River is in full support of all of its designated uses.

Allen's Creek (1202H) is non-supporting for contact recreation use due to bacteria and also possesses a concern for depressed dissolved oxygen and orthophosphate. These issues are most likely a function of the creek's size; it is a small, shallow stream with little flow except for immediately after rain events.

The upper portion of Big Creek (1202J) continues to be non-supporting for contact recreation use due to bacteria and concerns for phosphate and chlorophyll *a*. The bacteria and nutrient concerns in this portion of Big Creek are most likely a result of agricultural and wildlife runoff. Big Creek also is impaired for the fish community and has concern for habitat in the upper portion of the creek. The poor diversity in the fish community is a result of the poor habitat available. This section of the creek is shallow, with muddy bottoms and low

sloping banks. There is little variety in this portion of the creek which leads to low diversity in the fish community.

Mill Creek has a concern for an impaired fish community. Like Big Creek, Mill Creek most likely has an impaired fish community due to poor available habitat to support a large and diverse fish population.

Brazos River Tidal (Segment 1201) -



The Brazos River tidal segment differs from the rest of the Brazos River in that the Gulf of Mexico can have an effect on the water quality of that portion of the river. This segment does not have any water quality impairments, but there is a concern for nitrate. Potential sources of nitrates may include: industrial and municipal discharges, and stormwater runoff from urban and residential lands.

UPPER OYSTER CREEK WATERSHED ([MAP](#))

The Upper Oyster Creek Watershed drains approximately 127 square miles in Fort Bend County. This segment varies from a natural stream course to a highly modified system of canals and dams, which create impoundments that maintain nearly constant water levels for industrial, residential, recreational and drinking water supply. The canal system was dredged to serve as a conveyance for water pumped from the Brazos River into Jones Creek to be diverted into Upper Oyster Creek.

Upper Oyster Creek (Segment 1245) -



Upper Oyster Creek was originally listed on the 2000 303(d) List for dissolved oxygen and bacterial impairments and remains on the 2008 303(d) List. In response to these issues, a total maximum daily load (TMDL) project has been initiated to determine the pollution controls necessary to restore and maintain water quality in Upper Oyster Creek. The TMDL for bacteria was approved by the U.S. Environmental Protection Agency in September 2007 and recommended a 73 percent reduction in bacteria loading in each section to meet the contact recreation use. Currently the TCEQ and its stakeholders are developing an implementation plan that will outline the management strategies needed to restore water quality to Upper Oyster Creek. The TCEQ continues to work with stakeholders in developing a TMDL for dissolved oxygen.

Additional concerns that have been identified in Upper Oyster Creek include nutrients and chlorophyll *a*. The elevated nutrient levels are most likely stimulating algal growth and the elevated chlorophyll *a* concentrations. Potential sources of nitrates in the watershed include municipal and industrial discharges, wildlife contributions and urban runoff.

Bullhead Bayou (1245C) and an associated unnamed tributary (1245D) are also impaired due to elevated bacteria levels with Brown's Bayou (1245B) having a concern for bacteria.