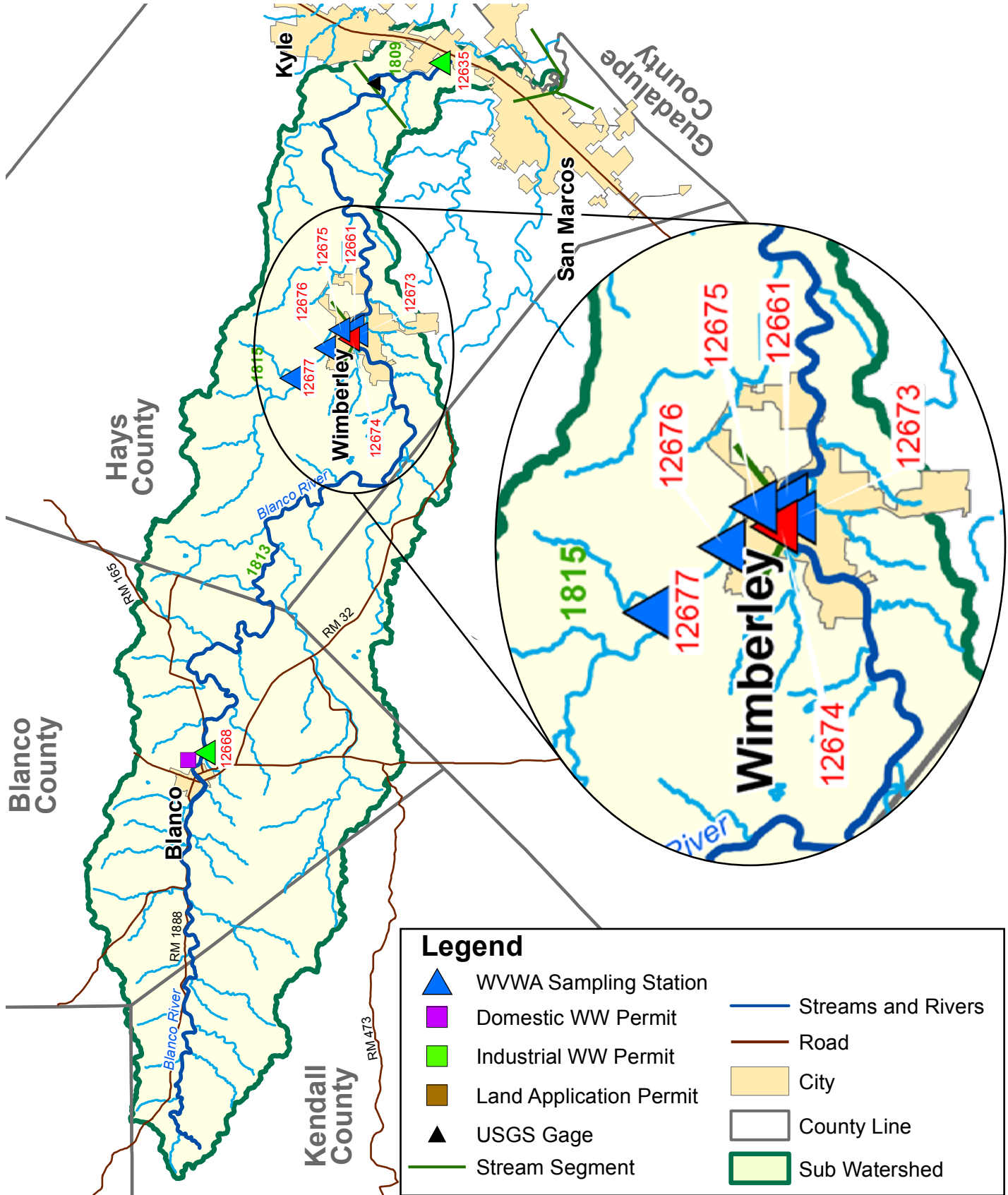


# Blanco River Watershed



# Blanco River Watershed

## River Segments, Descriptions and Concerns

**Segment 1813** (Upper Blanco River): Flowing 71 miles from northern Kendall County until Lime Kiln Road in Hays County, the upper Blanco is a spring-fed stream. Cypress Creek joins the river in the Village of Wimberley. The steep-sloped, intermittent, meandering stream is lined with baldcypress, oak and ashe juniper.

**Segment 1815** (Cypress Creek): The spring-fed creek flows 14 miles into the Village of Wimberley where it merges with the Blanco River in Hays County. A picturesque creek, lined with baldcypress trees, with good water quality.

**Segment 1809** (Lower Blanco River): This 15-mile lower stretch of the Blanco River from Lime Kiln Road until the confluence with the San Marcos River varies from a rapid moving stream as it crosses the Balcones Fault Zone to a shallow, slow moving stream, lined with scrub oaks as it enters the Blackland Prairies.

**Drainage Area:** 440 square miles

**Streams and Rivers:** Guadalupe River, Lower Blanco River, Upper Blanco River, Cypress Creek, Meier Creek, and Sycamore Creek

**Aquifers:** Edwards-Trinity, Trinity

**River Segments:** 1813, 1815, 1809

**Cities:** Blanco, Fischer, Wimberley, Kyle, San Marcos

**Counties:** Kendall, Comal, Blanco and Hays

**EcoRegions:** Edwards Plateau, Texas Blackland Prairies

**Vegetation Cover:** Evergreen Forest 42.9%, Shrublands 11.0%, Grass/Herbaceous 32.2%, Deciduous Forest 7.7%

**Climate:** Average annual rainfall 31 inches, Average annual temperature January 34°, July 94°

**Land Uses:** urban, agricultural crops (wheat, hay, oats, peaches and pecans), sheep, cattle, goats and turkey productions; light manufacturing and recreation

**Water Body Uses:** aquatic life, contact recreation, general use, fish consumption use, and public water supply use

**Soils:** Varies from thin limestone to black, waxy, chocolate, and grey loam, calcareous, stony, and clay loams

**Permitted Wastewater Treatment Facilities:** Domestic 1, Land Application 0, Industrial 0



Photo by Lee Gudgeon

# Blanco River Watershed

## River Segments, Descriptions and Concerns

### Blanco River Watershed - Upper Blanco River

The **Blanco River** is divided into two classified stream segments. Segment 1813, the **upper Blanco River**, extends for 71 miles from Lime Kiln Road in Hays County, through Blanco County, to the spring-fed headwaters in northern Kendall County. The lower segment is described later in this section. Segment 1813 consists of 355 square miles of drainage basin that is separated into five assessment units. Assessment unit 1813\_01 evaluates the 14.2 mile lower section of the segment, between Lime Kiln Road and Hays CR 314. Unit 1813\_02 assesses the 3.5 mile section below the City of Wimberley, between Hays CR 314 and Hays CR 1492. Unit 1813\_03 evaluates the 6.5 mile section, below the City of Blanco, between Blanco CR 406 and Highway 281 in Blanco County. Unit 1813\_04 assesses the 17.3 mile section between Highway 281 and the headwaters of the segment. Unit 1813\_05 assesses the 29.5 mile section between Hays CR 1492 and Blanco CR 406. This segment also receives the Cypress Creek tributary below the City of Wimberley. Cypress Creek has been designated as a separate segment, Segment 1815, and is discussed in a later section of this document. Segment 1809, the lower Blanco River, is described in the following section. GBRA has routinely monitored one station in Segment 1813 (station no. 12668), monthly, since October of 1996. The GBRA monitoring station is located at FM 165, ½ mile east of the city and 2 miles below the City of Blanco wastewater treatment plant discharge. The Wimberley Valley Watershed Association (WVWA) recognized the need for more assessment data in this segment of the Blanco River and partnered with the GBRA to initiate routine monitoring of three stations (station no. 12660, Station no. 12661, and station no. 12663) on the Blanco River, in February of 2003. The data collected by the WVWA, is quality-assured by the GBRA and submitted to the TCEQ under the GBRA QAPP. The WVWA station no. 12660 is a historical station originally monitored by TCEQ and located 3.1 miles downstream of the Cypress Creek confluence at the Fulton Ranch Road crossing. The WVWA station no. 12661 was initially sampled by the USGS in May of 1990 and is located 0.4 miles downstream of the Cypress Creek confluence, just below the Ranch Road 12 crossing. WVWA

station no. 12663 is a new station, located 1.2 miles upstream of the Cypress Creek confluence, at CR 1492, in the upper end of assessment unit 1813\_02. Hays County attempted to establish a monitoring program, taking over the monitoring of station no. 12660 and station no. 12663 monthly. Their program lost its funding in 2013, causing them to discontinue monitoring until the funding can be restored.

Segment 1813 is a spring-fed stream, on the Edwards Plateau. The majority of the segment exhibits limestone substrate with occasional gravel, silt, or clay strata. The limestone is known to contain gypsum deposits, which can contribute to high sulfate concentrations in groundwater. The stream has historically displayed exceptional water quality and usually exhibits extremely clear water. Generally, most water quality concerns in this segment of the Blanco River are linked to changes in stream flow. Upper portions of the river have been known to go dry during prolonged periods of drought and the banks and substrate of the entire segment exhibit significant scouring during extended wet periods. The 2012 Texas Water Quality Inventory lists a concern for dissolved oxygen for aquatic life use in assessment unit 1813\_05, and has persisted since 2006. The concern is most likely due to low base flow conditions that are common in that portion of the segment. The increasing population in this area has raised concerns about strains on the available water supply and increased stream erosion potential. As the population in this area continues to climb, so does the importance of maintaining the water quality of available surface water.

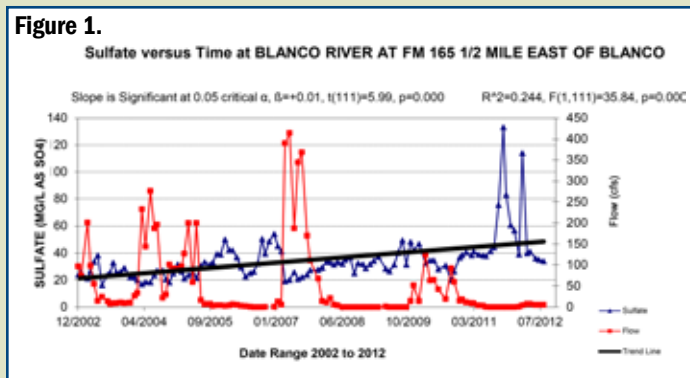
Currently, there are two domestic wastewater treatment plant discharges permitted in the upper Blanco River. Both discharges occur just outside of the City of Blanco, in assessment unit 1813\_03. The City of Blanco municipal plant is situated ½ mile east of central Blanco and discharges the majority of its effluent into irrigation ponds for fields of coastal bermuda. This plant is permitted to discharge excess effluent into the Blanco River at an average rate of 0.90 million gallons per day. The permitted discharge to the Blanco River rarely occurs, except during periods when the coastal bermuda irrigation fields are being harvested. The municipal effluent must meet water quality standards of 30 milligrams per liter (mg/L) biochemical oxygen demand, 30 mg/L total suspended solids, 1.0 mg/L

## Blanco River Watershed

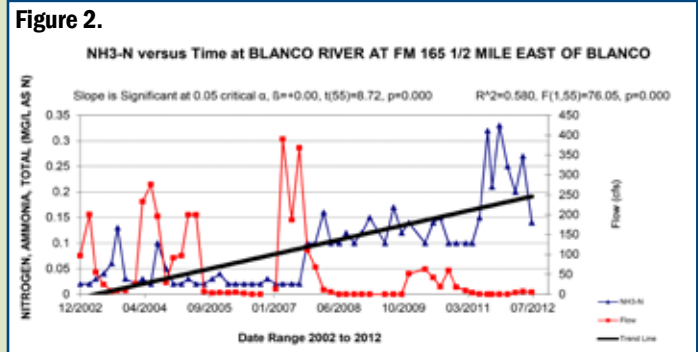
### River Segments, Descriptions and Concerns

chlorine residual, and a pH between 6.0 and 9.0. The City of Blanco Water Treatment plant is permitted for an average discharge of 0.050 million gallons per day, in the form of backwash water and settling sludge supernatant. The water treatment plant discharge is permitted to have a total suspended solids level of 20 mg/L and a pH of between 6.0 and 9.0 standard units.

Over the period of record, the **sulfate** concentration at the Blanco River at FM 165, station no. 12668 had a median value of 31.9 mg/L with a maximum value of 133 mg/L and a minimum value of 16.1 mg/L. **Sulfates** at this station exceeded the stream screening criteria of 50 mg/L fourteen times over the period of record, as seen in Figure 1. The sulfate concentration at this station appears to be exhibiting a significant downward trend with time. A significant portion of the variance in sulfate at this station appears to be explained by stream flow. Over the period of record there appears to be an inverse relationship between sulfate concentration and flow.



Nitrate nitrogen, ammonia nitrogen, total phosphorus, and chlorophyll *a* were also analyzed at this monitoring location. The median **nitrate nitrogen** concentration was 0.12 mg/L, with a maximum value of 1.17 mg/L and a minimum value of <0.01 mg/L. None of the samples exceeded the nitrate nitrogen screening criteria of 1.95 mg/L. The median **ammonia nitrogen** concentration of the GBRA monitoring location at FM 165 ranged from the Limit of Quantification (LOQ) to 0.33 mg/L. There appears to be an upward trend in ammonia concentration that can be attributed to the change in the LOQ from 0.02 mg/L to 0.1 mg/L and the prolonged period of low flows caused by the drought in 2008-09 and 2011 (Figure 2).



The median **total phosphorus** concentration was below the LOQ for the method and when total phosphorus was detected in a sample it did not exceed the screening concentration of 0.69 mg/L. The median **chlorophyll a** concentration was below the LOQ and there was never a measured value above the screening concentration of 14.1 microgram per liter.

Nitrate nitrogen, ammonia nitrogen total phosphorus, and chlorophyll *a* were analyzed at the WWA stations on Blanco River. The median **nitrate nitrogen** concentration ranged between 0.19 mg/L and 0.22 mg/L. None of the samples exceeded the nitrate nitrogen screening criteria of 1.95 mg/L. The **ammonia nitrogen** concentrations of the WWA monitoring locations showed the same upward trends tied to flow. The median **total phosphorus** concentration was below the LOQ for the method and when total phosphorus was detected in a sample it did not exceed the screening concentration of 0.69 mg/L.

Segment 1813 provides clear, spring water for contact recreational opportunities. The low base flows in the river often prevent canoeing and tubing, but many dammed pools exist in the segment, which attract campers and swimmers. The stream standard for contact recreation is a geometric mean of 126 colonies per 100 milliliters. The geometric mean for ***E. coli*** at the GBRA FM165 station (station no. 12668) is 24 MPN/100 mL. The geometric mean for ***E. coli*** at the WWA CR1492 station (station no. 12663) is 93 MPN/100 mL.



Photo by Lee Gudgell



# Blanco River Watershed

## River Segments, Descriptions and Concerns

The geometric mean for *E. coli* at the WYWA RR12 (station no. 12661) is 62 MPN/100 mL. The geometric mean for *E. coli* at the WYWA CR173 station (station no. 12660) is 41 MPN/100 mL. The geometric means for *E. coli* in the monitoring stations of this segment appear to be lowest in the upper reaches of the segment, highest before the Cypress Creek confluence in the City of Wimberley and begin declining after the confluence, as the water leaves the city.

The land use in the segment consists of increasingly urbanized areas above or near the City of Blanco and the City of Wimberley. In the long stretches above and below these two cities farm and ranch land is prevalent. Many family farms are being sold and subdivided, and this area is expected to continue to increase its residential land use over the next few years. The impervious cover that is created by residential land use and subdivisions, i.e. streets, rooftops and parking lots, can be a source of nonpoint source pollution. The impervious cover forces water that could be captured by the soil to runoff directly into the creeks and streams. This runoff can increase erosion and suspended sediment loading in the water bodies as well as carry other organic pollutants. The median **total suspended solids** (TSS) value at the Blanco River at FM165 monitoring station is 3.4 mg/L. The WYWA monitoring stations exhibited median TSS values of 1.7 mg/L with a maximum value of 43.3 mg/L at the CR1492 station, 1.7 mg/L with a maximum value of 40.2 mg/L at the RR12 station and 1.6 mg/L with a maximum value of 49.7 mg/L at the CR173 station. The highest TSS values occurred during high flow events.

The historical data from the two monitoring stations was reviewed for trends, comparing constituents over time and flow regimes. Statistically significant trends that were noted, either positive or negative, were not indicative of degrading water quality conditions.

### Cypress Creek

Segment 1815, the **Cypress Creek**, extends from the confluence of the Cypress Creek and the Blanco River in the City of Wimberley, to the Jacob's Well, its headwaters, north of the City. The entire segment lies within Hays County. GBRA monitors the Cypress Creek at Ranch Road 12 ("RR 12"; station no. 12674) quarterly. TCEQ monitored the RR 12 station quarterly from 1991 until

GBRA assumed the quarterly monitoring in 1998. The stations in the WYWA monitoring project include the Cypress Creek at Jacob's Well, the headwaters of the Cypress Creek; the Cypress Creek at Ranch Road 12, one mile north of the City of Wimberley; and the Cypress Creek at the confluence with the Blanco River. They added a new station, the Cypress Creek near the Blue Hole recreational area in late 2005.

Stakeholders in the Cypress Creek watershed have raised three issues that they feel are impacting water quality. The issues include the small, overloaded septic tanks used by the businesses along the creek in Wimberley which could be contributing bacteria to the stream. Another issue is the increased urbanization of previously unused areas which can bring in a variety of pollutants such as nutrients and suspended solids that can decrease oxygen in the stream, especially during periods of low flow. Finally, the stakeholders are concerned by the increasing demand on the groundwater resources in the area which reduces the flows from Jacob's well which in turn reduces the oxygen in the stream as well as the water becomes more stagnant during times of low flow. These concerns are not unfounded as the limited data set on Cypress Creek (dissolved oxygen, *E. coli* and nutrients) shows later in this section.

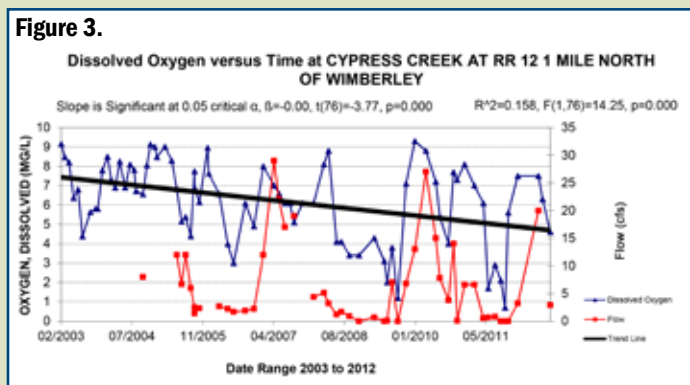
There is one wastewater plant in the watershed of the Cypress Creek. The Blue Hole wastewater plant is permitted to the City of Wimberley. The facility disposes of the treated waste by subsurface irrigation at a volume not to exceed 15,000 gallons per day and at a rate that does not exceed 0.16 gallons per square foot. The permit allows for surface irrigation when the plant is expanded to 50,000 gallons per day. There is no permitted discharge to the waters of the Cypress Creek in either phase of operation. The Blue Hole plant has only one customer, a 122 -bed rehabilitation facility.

The 2012 Texas Water Quality Inventory lists Cypress Creek with a concern for depressed dissolved oxygen. Out of 320 measurements, 108 fell below the screening criteria of 6.0 milligrams per liter (mg/L). The station located at Jacob's Well which is the headwaters of the creek has a median **dissolved oxygen** concentration of 5.9 mg/L, ranging from 3.8 mg/L to 9.8 mg/L. The water leaving the well, as expected for ground water, is low in dissolved oxygen.

## Blanco River Watershed

### River Segments, Descriptions and Concerns

The WYWA station that is on RR12, approximately 1 mile upstream of the City of Wimberley, has a median dissolved oxygen concentration of 6.6 mg/L, ranging from 0.7 mg/L to 9.3 mg/L. As the water in the creek travels downstream through the watershed it is aerated and the median concentration for dissolved oxygen goes up. The median concentration for dissolved oxygen at the GBRA RR12, in the City of Wimberley, is 8.8 mg/L, ranging from 1.4 to 11.7 mg/L. The median concentrations of dissolved oxygen rise as the creek flows downstream. However, the WYWA monitoring station at RR12 shows a significant decline in dissolved oxygen concentration over the past 10 years (Figure 3).



A fourth monitoring station is located on the Cypress Creek just upstream of the Blanco River confluence. This station has a median dissolved oxygen level of 8.0 mg/L with a range from 1.7 mg/L to 10.9 mg/L. This station has values slightly lower than the RR12 station in Wimberley, but this is most likely a result of the larger data set available at this station.

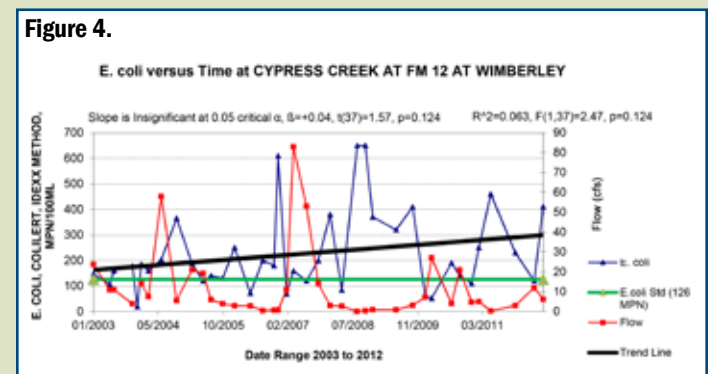
The new monitoring station located near the Blue Hole recreational facility on Cypress Creek has a median dissolved oxygen concentration of 5.3 mg/L, ranging from 1.5 mg/L and 9.2 mg/L, but it has a much smaller data set than the other two monitoring stations located downstream of Jacob's Well. This station was added by the WYWA in late 2005 after the park was purchased by the City of Wimberley. Jacob's Well is very important to the residents in the area, with historical, sentimental and ecological significance and warrants continued monitoring.

Considering all of the monitoring locations on the segment, the **temperature** varied between 8.4°C to

32.4°C, with a median temperature of 20.8°C. The **specific conductance** ranged between 369 umhos/cm and 916 umhos/cm, with a median conductivity of 557 umhos/cm. The median **pH** of all stations was 7.6, ranging from a low pH of 6.3 at the Jacob's Well station, to high pH of 8.3 at the GBRA RR12 location. The median concentrations for **chloride** and **sulfate** at the GBRA RR12 location were 14.2 mg/L and 17.3 mg/L respectively. At no time did the concentration of these dissolved constituents exceed the stream standard of 50 milligrams per liter.

Nitrate nitrogen, ammonia nitrogen and total phosphorus, were analyzed at all of the monitoring locations on the segment. The median concentrations of **nitrate nitrogen** for all the locations were 0.18 mg/L and ranged from 0.02 mg/L to 1.73 mg/L. At no time did the nitrate nitrogen concentration exceed the screening criteria of 1.95 milligrams per liter at any monitoring location. The median **ammonia nitrogen** concentration was 0.10 mg/L at all monitoring locations. The median **total phosphorus** concentration was below the LOQ for the method and when total phosphorus was detected in a sample, it did not exceed the screening concentration of 0.69 milligrams per liter.

Segment 1815 is a slow meandering stream with a bedrock substrate. The contact recreation stream standard, using **E. coli**, is a geometric mean of 126 colonies per 100 milliliters. The geometric mean for **E. coli** at the GBRA RR12 station is 178 MPN/100 mL, which exceeds the stream standard. Often, **E. coli** concentrations increase with rises in flow due to storm water runoff. At the GBRA RR12 station, there are periods where **E. coli** numbers are high without corresponding influences from flow (Figure 4). A possible explanation for this phenomenon could be

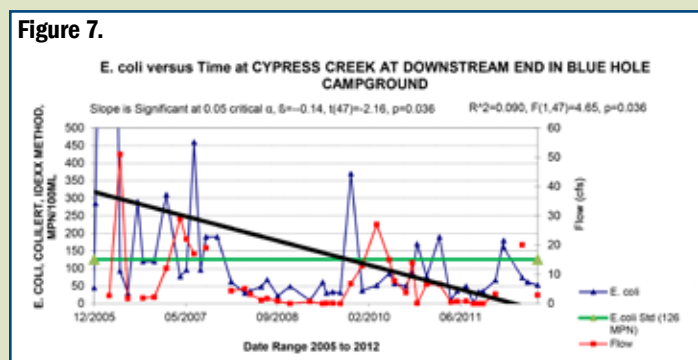
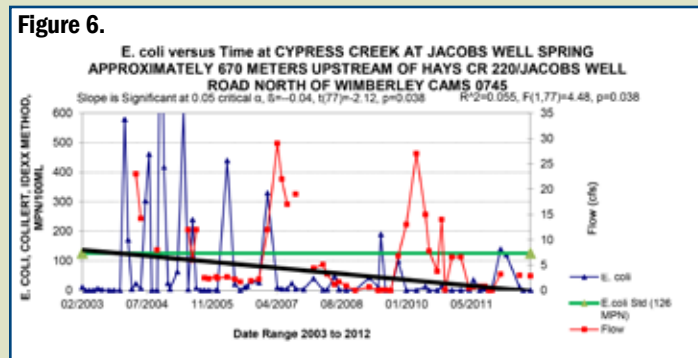
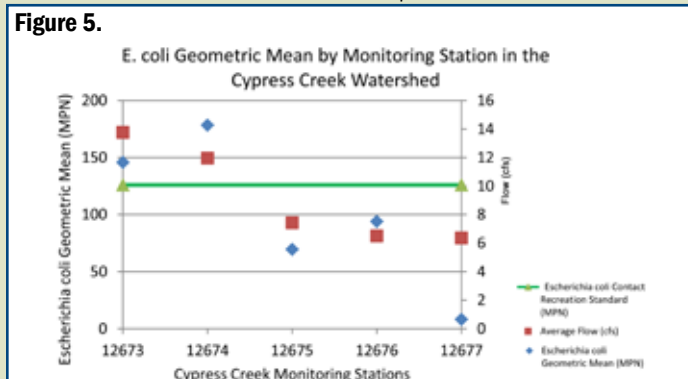


# Blanco River Watershed

## River Segments, Descriptions and Concerns

that the contributions of *E. coli* from failing septic tanks in the City of Wimberley are more easily detected when the base flow is not sufficient enough to dilute the bacteria. This theory is reinforced by the distribution of *E. coli* concentrations throughout the watershed. The most upstream monitoring station at Jacob's Well (station no. 12677) has a geometric mean of 8 MPN/100 mL with an average flow of 6.4 cfs. The next monitoring station downstream at RR12 (station no. 12676) has a geometric mean *E. coli* concentration of 94 MPN/100 mL with an average flow of 6.5 cfs. The Blue Hole monitoring station (station no. 12675) has a geometric mean of 70 MPN/100 mL with an average flow of 7.4 cfs. The GBRA RR12 monitoring station (station no. 12674) in downtown Wimberley exceeds the stream standard with a geometric mean of 178 MPN/100 mL and an average flow of 12.0 cfs. The *E. coli* concentrations remain above the stream standard at the most downstream station near the confluence with the Blanco River (station no. 12673) with a geometric mean of 146 MPN/100 mL and an average flow of 13.8 cfs. These *E. coli* values illustrate a stream that has very low *E. coli* at the headwaters and increases in concentration when it reaches an urbanized area, followed by a slight decline as it moves to a less densely populated portion of the watershed (Figure 5). There is also a significant decreasing trend in *E. coli* over time at the Jacob's Well and Blue Hole monitoring stations, which may be the result of decreasing flows in this segment (Figures 6 & 7).

The **suspended solids** ranged from 1 milligrams per liter (mg/L) to 35 mg/L, with a median of 1.3 mg/L. The median **chlorophyll a** concentration was below the LOQ and there was never a measured value above the screening concentration of 14.1 microgram per liter.



### Blanco River Watershed - Lower Blanco River

Segment 1809, the **lower Blanco River**, extends from the confluence of the Blanco and San Marcos Rivers, just outside the City of San Marcos, upstream to the Lime Kiln Road crossing in Hays County. The segment is 15 miles long and is separated into two assessment units. Assessment unit 1809\_01 consists of the segment from the confluence with the San Marcos River to seven miles upstream. Assessment unit 1809\_02 consists of the upper eight miles of the segment from seven miles upstream of the San Marcos River confluence, to Lime Kiln Road. The upper Blanco River, Segment 1813, includes the area upstream of Lime Kiln Road and is described in the preceding section. TCEQ has been monitoring the Blanco River at Hays CR 295/Old Martindale Road, east of San Marcos (station no. 12631) quarterly since May of 1994. The TCEQ monitoring station is located in the lower half of the segment, in assessment unit 1809\_01. TCEQ monitors this station four times per year. A statistical review of the data in this segment was performed on data collected between 2003 and 2012.

## Blanco River Watershed

### River Segments, Descriptions and Concerns

The 85 square mile drainage area of the lower Blanco River is primarily located on the Edwards Plateau, but enters the Blackland Prairies on the eastern edge of Hays County. This segment consists of limestone substrate with occasional stony and clay loams. The changes in elevation as the river crosses the Balcones fault increase the streamflow, but there are also several slow moving stretches throughout the segment. The water is primarily used for aquatic life, contact recreation and fish consumption. The land in the basin is used for farming, ranching, recreation, light manufacturing and urban development. The urban development of this segment is increasing at a rapid pace due to the river's location in the middle of the IH 35 corridor and its close proximity to the growing cities of San Marcos and Kyle. The rapidly increasing population in this area raises concerns about the increasing amount of impervious cover and subsequent potential for non-point source pollution.

The lower Blanco River has no major tributaries to contribute to flow and sediment loading of the stream. High flow events are almost exclusively associated with flow contributions from Segment 1813 or runoff from dry creeks within the segment. The median instantaneous flow of the CR 295 monitoring station, in Segment 1809, was 30 cubic feet per second (cfs). However, the stream experiences wide swings in flow, from 0 cfs to 1270 cfs, throughout the period of record, going dry or having no measureable flow from July 2008 through September 2009.

Due to the bedrock substrate of the lower Blanco River, **total suspended solid (TSS)** values are relatively low in this segment of the river. The median TSS value for the CR 295 station is 4.0 mg/L, with a maximum value of 83 mg/L during a high flow event. The stream standard for contact recreation is a geometric mean *E. coli* concentration

of 126 colonies/100mL. The CR 295 monitoring location has a geometric mean of 34 MPN/100 mL.

There are no permitted dischargers in Segment 1809 of the Blanco River. The 2012 Texas Water Quality Inventory Report has no impairments or concerns listed for Segment 1809. The TCEQ CR 295 monitoring station had median concentrations of **conductivity, chloride** and **sulfate** of 487 umhos/cm, 17.0 mg/L and 32.0 mg/L respectively. The TCEQ station never exceeded the stream standard for chlorides or sulfates of 50 mg/L. The median concentration for **dissolved oxygen** is 7.7 mg/L, ranging from a minimum of 5.0 mg/L to a maximum of 11.1 mg/L at the TCEQ station at CR 295. The median **pH** value at this station was 7.8 and ranged from a low of 7.10 to a high of 8.30, never falling outside the stream standard range of 6.5 to 9 standard pH units.

Nitrate nitrogen, ammonia nitrogen and total phosphorus, were analyzed at the TCEQ CR 295 location. Over the period of record, the median concentration of **nitrate nitrogen** was 0.22 mg/L, ranging from 0.04 mg/L to 1.75 mg/L never falling outside of the screening concentration of 1.95 mg/L. The median concentration for **ammonia nitrogen** was below the LOQ for the method and the maximum ammonia nitrogen value recorded at this station was 0.08 mg/L, well below the screening concentration of 0.33 mg/L. Median **total phosphorus** concentration at the TCEQ CR 295 station was below the LOQ for the method and had a maximum value of 0.07 mg/L, which was well below the screening concentration of 0.69 mg/L. The data from this monitoring station indicates that the quality of the water at this monitoring station is of excellent quality.

A trend analysis of all the data available in Segment 1809 showed no significant changes over time. 🐾

Blanco River Issues and Concerns			
Water Quality Issue	Affected Area	Possible Influences/Concerns	Possible Actions Taken/to be Taken
Urban and Suburban Growth	Upper Blanco River	Impervious cover; urban storm water	
Depressed Dissolved Oxygen	Cypress Creek	Urban storm water	Watershed Protection Plan under development
Impaired Aquatic Habitat and Communities	Cypress Creek	Reductions in flow; periods of dry conditions	Reassess stream use designation to intermittent stream, although many stakeholders are not in favor of the change in designation
Urban and Suburban Growth	Lower Blanco River	Construction and urban storm water	City of San Marcos, Texas State University and Hays County are developing storm water pollution prevention plans