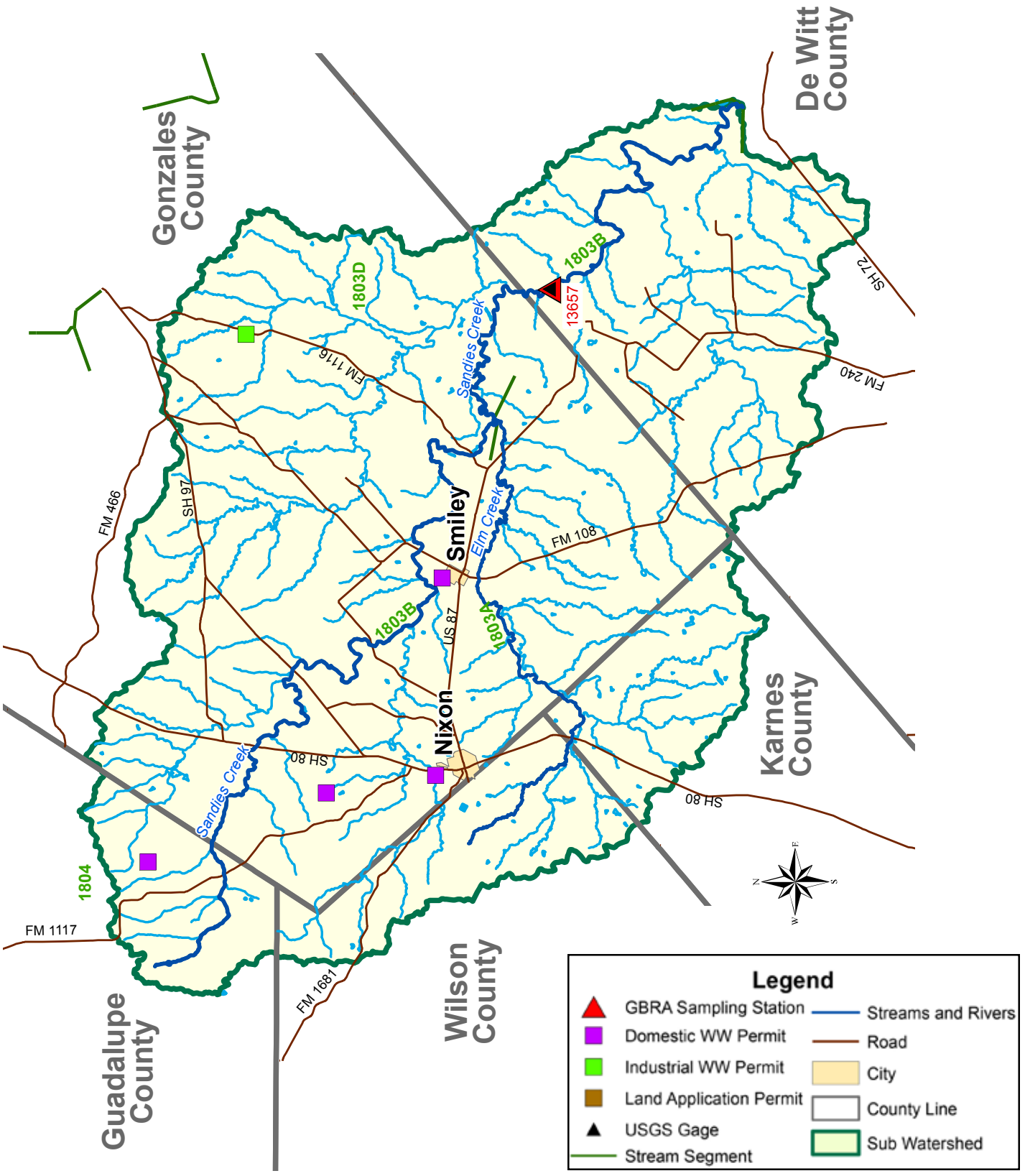
Sandies Creek Watershed



Sandies Creek Watershed

River Segments, Descriptions and Concerns

Segment 1803A (Elm Creek, unclassified water body): Elm Creek flows 24.3 miles before it confluences with Sandies Creek, east of Smiley in Gonzales County.

Segment 1803B (Sandies Creek, unclassified water body): Sandies Creek is a 65 mile long stream originating in Guadalupe County northwest of Nixon to the confluence of the Guadalupe River west of Cuero in DeWitt County.

Drainage Area: 711 square miles

Streams and Rivers: Guadalupe River, Elm Creek, Sandies Creek, Five Mile Creek, Salty Creek, Clear Creek, and O'Neil Creek

Aquifers: Carrizo-Wilcox, Gulf Coast

River Segments: 1803A, 1803B

Cities: Smiley, Nixon

Counties: Guadalupe, Karnes, Wilson, Gonzales, DeWitt

EcoRegions: Texas Blackland Prairies, Post Oak Savannah

Vegetation Cover: Pasture/Hay 24.9%, Deciduous Forest 19.6%, Row Crops 3.4%, Grass/Herbaceous 24.3%, Evergreen Forest 5.3%, Shrublands 21.1%

Climate: Average annual rainfall 31 inches, Average annual temperature January 39°, July 94°

Land Uses: Light manufacturing, extensive cattle production and poultry production, agricultural crops (hay, sorghum, etc.)

Water Body Uses: Aquatic life, contact recreation and fish consumption

Soils: Dark red sandstone, light tan and gray sandstone

Permitted Wastewater Treatment Facilities: Domestic 4, Land Application 0, Industrial 1

Photo by Elizabeth Aguilar

Sandies Creek Watershed

River Segments, Descriptions and Concerns

Sandies Creek Watershed

Sandies Creek, Segment 1803B, extends approximately 65 miles, from its confluence with the Guadalupe River in DeWitt County, near the City of Cuero, upstream, through Gonzales County, to its headwaters in Guadalupe County. The creek flows through a watershed that is made up of hardwoods, pines, mesquites and a variety of grasses. **Elm Creek**, Segment 1803A, is a tributary of Sandies Creek that flows from its headwaters in Wilson County through Gonzales County to converge with Sandies Creek, downstream of the City of Smiley. Elm Creek is approximately 24 miles long, in a watershed that is rural, and characterized by flat to rolling terrain, dominated by hardwoods, pines, mesquite and a variety of grasses. Both creeks are unclassified stream segments that were assessed as one assessment unit each, using the stream standards for the main stem Guadalupe River that receives their combined flow. GBRA has historical monitoring stations on Sandies Creek since 1996. The current station, monitored since 2000, is located at Westhoff (station no. 13657). The original station, located at FM 1116, was moved to the Westhoff station in order to more accurately record flow by using the USGS gaging station nearby. Also, there were safety considerations that made the Westhoff station a better long term station. GBRA does not maintain a routine station on Elm Creek. There was not enough long term data on Elm Creek to look for trends in water quality. Other stations on Sandies and Elm Creeks have been monitored for short periods of time for special studies, one of which was to determine the impacts of poultry operations if any on watersheds. The study collected monthly data from each creek from November 1997 to August 1998. It was because of this limited study that the creeks were suspected of being impaired. Other data collected in the watershed were for the TCEQ total maximum daily load study started in 2002.

The land use is primarily agricultural with row crops and poultry and livestock production. There are two wastewater treatment plants in the watershed, one for the City of Nixon and one for the City of Smiley. Both plants are permitted to discharge to small tributaries of Sandies Creek. The City of Nixon facility is permitted to discharge up to 0.45 million gallons per day, with quality limits of 10 milligrams per liter (mg/L) carbonaceous biochemical oxygen demand, 15 mg/L total suspended solids and 3 mg/L ammonia nitrogen. The facility uses chlorine to disinfect the effluent. The City of Smiley treats its wastewater in a lagoon system and is

authorized to use their effluent to irrigate a hay field in lieu of discharge. Beginning in 2010, the Sandies and Elm Creek watersheds have seen a significant growth in oil and natural gas extraction through hydrological fracturing technology in the Eagle Ford Shale deposits.

Sandies and Elm Creeks were both listed on the 2006 Texas Water Quality Inventory as impaired for depressed dissolved oxygen and for exceedence of the bacteria standard for contact recreation. Currently, a total maximum daily load (TMDL) study is being conducted by the TCEQ. Data was collected on the two tributaries in 2002 and 2004. TCEQ is analyzing the data to develop TMDLs for dissolved oxygen and for bacteria. The goal of the TMDL study is to determine the amount of a pollutant that a body of water can receive and still support its designated uses. The allowable load is then allocated among the potential sources of pollution within the watershed. Potential sources of pollutants include point sources such as wastewater discharges, and nonpoint sources, including agricultural land use activities, wildlife and septic tanks.

In Sandies and Elm Creeks, low dissolved oxygen levels indicate that existing conditions are not optimal for aquatic life support. To meet the aquatic life support standards, the creek must have better than a 5.0 mg/L median ***dissolved oxygen*** concentration. Also, the creek should not fall below 3.0 mg/L more than 25% of the time. Reviewing the historical data at the GBRA station at Westhoff on Sandies Creek, the median dissolved oxygen was 6.4 mg/L, ranging from 0.8 mg/L to 13.5 mg/L. The stream dropped below 3.0 mg/L 12 times out of 127 measurements, or 9.4%. As seen in Figure 1, there is a wide range of measured dissolved oxygen concentrations over the period of record. The variation in dissolved oxygen can be due to several factors, including time of day when photosynthesis adds oxygen during the sunlit hours, time of year when the colder water can hold more saturated dissolved oxygen, or early morning hours when dissolved oxygen drops due to respiration of algal cells overnight. Additionally, if the sediment load of the stream increases due to runoff, decomposition and bacterial respiration can cause a drop in the dissolved oxygen concentration. All of these factors are possible in Sandies Creek.

The ***temperature*** in Sandies Creek ranged from 8.5°C to 31.0°C, with a median temperature of 23.2°C. The median **pH** was 7.9, ranging from 6.71 to 8.9, and never fell outside of range of the stream standards of 6.5 to 9.0. The ***conductivity*** and dissolved constituents of Sandies Creek are also highly variable, as seen in Figure 2.

The stream is high in dissolved solids in comparison to the lower Guadalupe River. The median dissolved solids in Sandies Creek, based on conductivity, are approximately 976 mg/L, as compared to near 350 mg/L in the lower Guadalupe River. In Figure 3, increases in flow see Oelevated at low flows, indicating that the base flow is high in dissolved salts.

Figure 1.

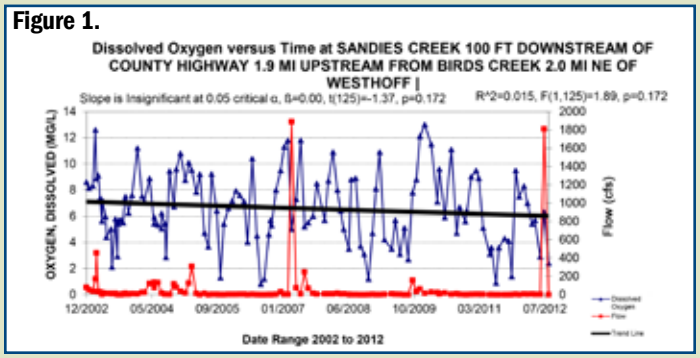


Figure 2.

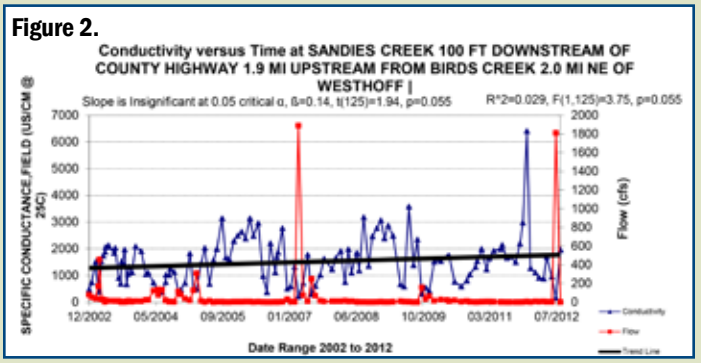
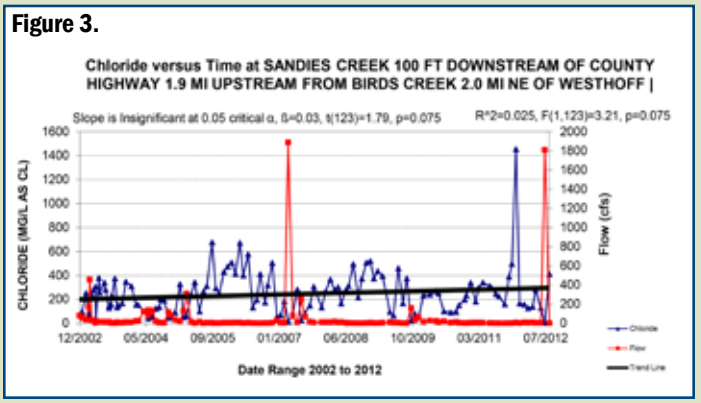


Figure 3.



Sandies Creek Watershed

River Segments, Descriptions and Concerns

Continuous water quality monitoring at Sandies Creek station.

Photos by Lee Gudgell

Chloride and **sulfate** concentrations ranged from 4.65 mg/L to 1455 mg/L and 3.48 mg/L to 206 mg/L, respectively, with median concentrations of 233 mg/L and 45.3 mg/L. The median concentration of **total suspended solids** was 31.9 mg/L, ranging from 8.0 mg/L to 766 mg/L.

Chlorophyll *a* concentrations have spiked in Sandies Creek and those spikes are associated with low flow periods. The median concentration is 4.5 micrograms per liter (ug/L), ranging from 0.25 ug/L to 125 ug/L. Twenty-three of the 126 sampling events had chlorophyll *a* concentrations that exceeded the screening concentration of 14.1 ug/L.

Nitrogen and phosphorus were analyzed at the GBRA Sandies Creek location. **Ammonia nitrogen** concentrations exceeded the screening concentration of 0.33 mg/L six times during the period of record and had a median concentration of 0.10 mg/L, ranging from the Limit of Quantification (LOQ) to 1.0 mg/L. The median concentration for **nitrate nitrogen**, combining all methods was 0.24 mg/L, ranging from 0.02 mg/L to 1.05 mg/L, never exceeding the screening concentration of 1.95 mg/L. The median concentration of **total phosphorus** was 0.41 mg/L, ranging from the LOQ to 1.59 mg/L, exceeding the screening concentration of 0.69 mg/L 15 times out of 124 measurements (12.1%). There was no correlation with rises in flow to explain the spikes in phosphorus concentration so the most likely source of the phosphorus is wastewater effluent, although, of the median flow in the creek of 9.9 cubic feet per second, the contribution of wastewater is less than 0.5 cubic feet per second on a daily basis. Total phosphorus levels and TKN levels are significantly increasing over time (Figures 4 & 5).

E. coli was analyzed and the bacterial impairment noted in the assessment was confirmed over the period of time that GBRA has monitored at the Westhoff location. The geometric mean for *E. coli*, is 200 MPN/100 mL, exceeding the stream standard for contact recreation of 126 colonies/100 mL.

Figure 4.

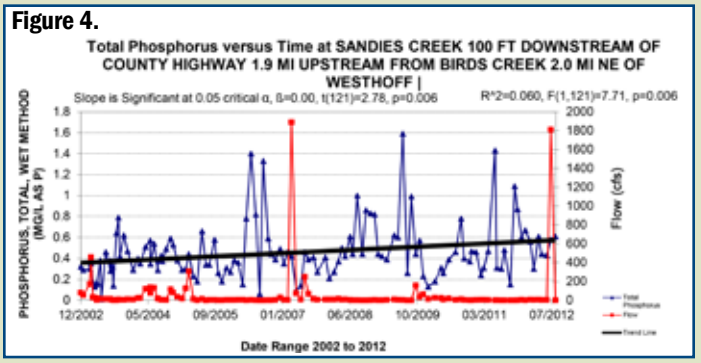
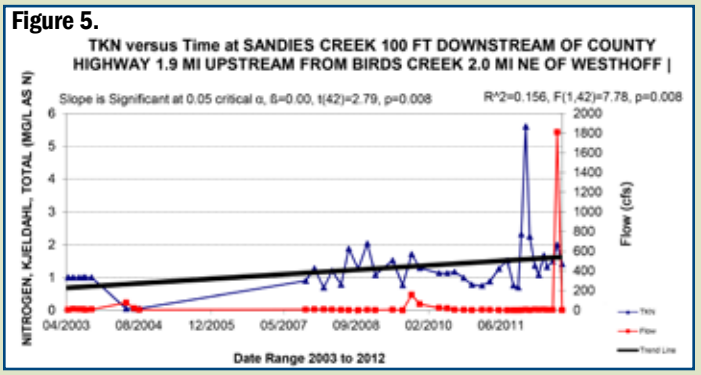


Figure 5.



It should be noted that the conditions in Sandies Creek and the lack of public access for contact recreation reduce the potential of human exposure to bacteria during contact recreation. The watershed is a major development area for oil and natural gas from the Eagle Ford Shale through hydrological fracturing techniques. Some stakeholders have expressed concerns about the impact these extraction activities have on ground and surface water in the watershed. Figure 6 show the increase in drilling activity from 2008 through April 2013. Figure 7 shows a map of the Eagle Ford Shale Play that underlies much of south central Texas with the wells permitted and completed through May 2013.

Figure 6.

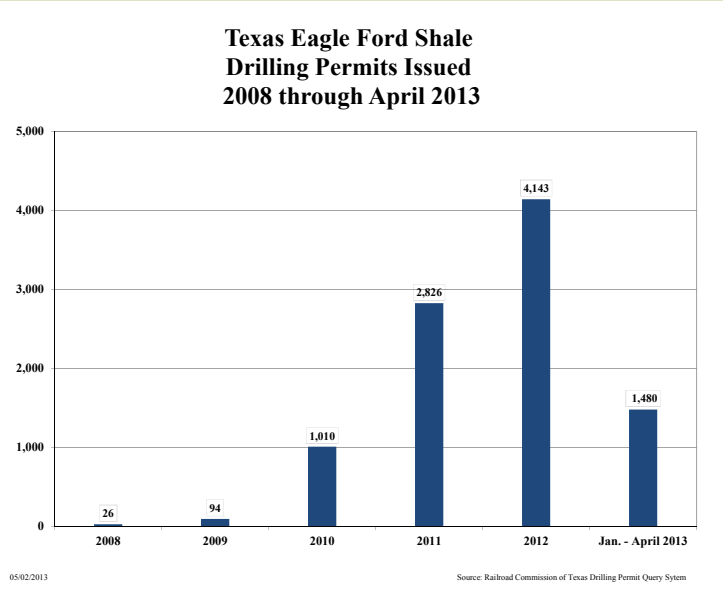
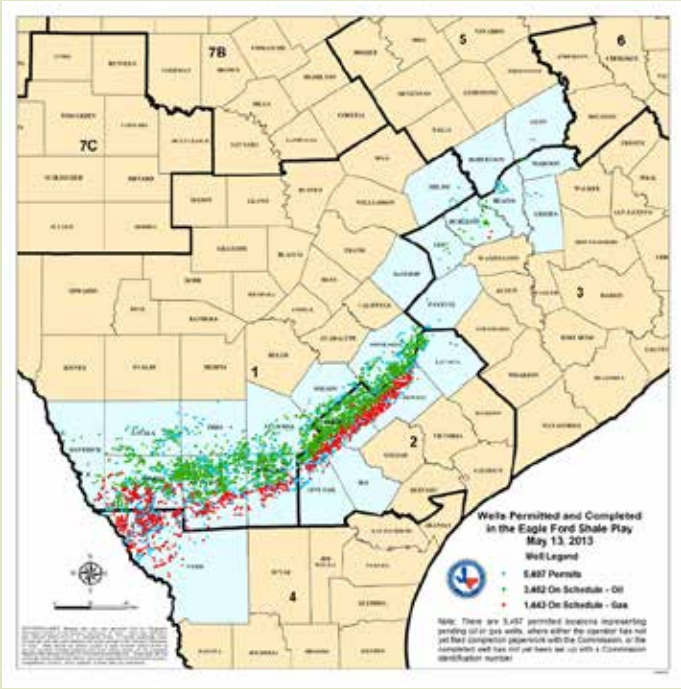


Figure 7.



Sandies Creek Issues and Concerns			
Water Quality Issue	**Affected Area**	**Possible Influences/Concerns**	**Possible Actions Taken/to be Taken**
Bacteria	Sandies Creek	Septic systems; livestock; wildlife and feral hogs	Review of water quality standards; completion of a total maximum daily load or watershed protection plan; bacterial source tracking
Impaired Biological Habitat and Communities		Illegal dumping	
Depressed Dissolved Oxygen	Elm Creek	Septic systems; livestock; wildlife and feral hogs	Review of water quality standards; completion of a total maximum daily load or watershed protection plan; bacterial source tracking