

Prepared in cooperation with the Louisiana Department of Transportation and Development

# Water Resources of Vernon Parish

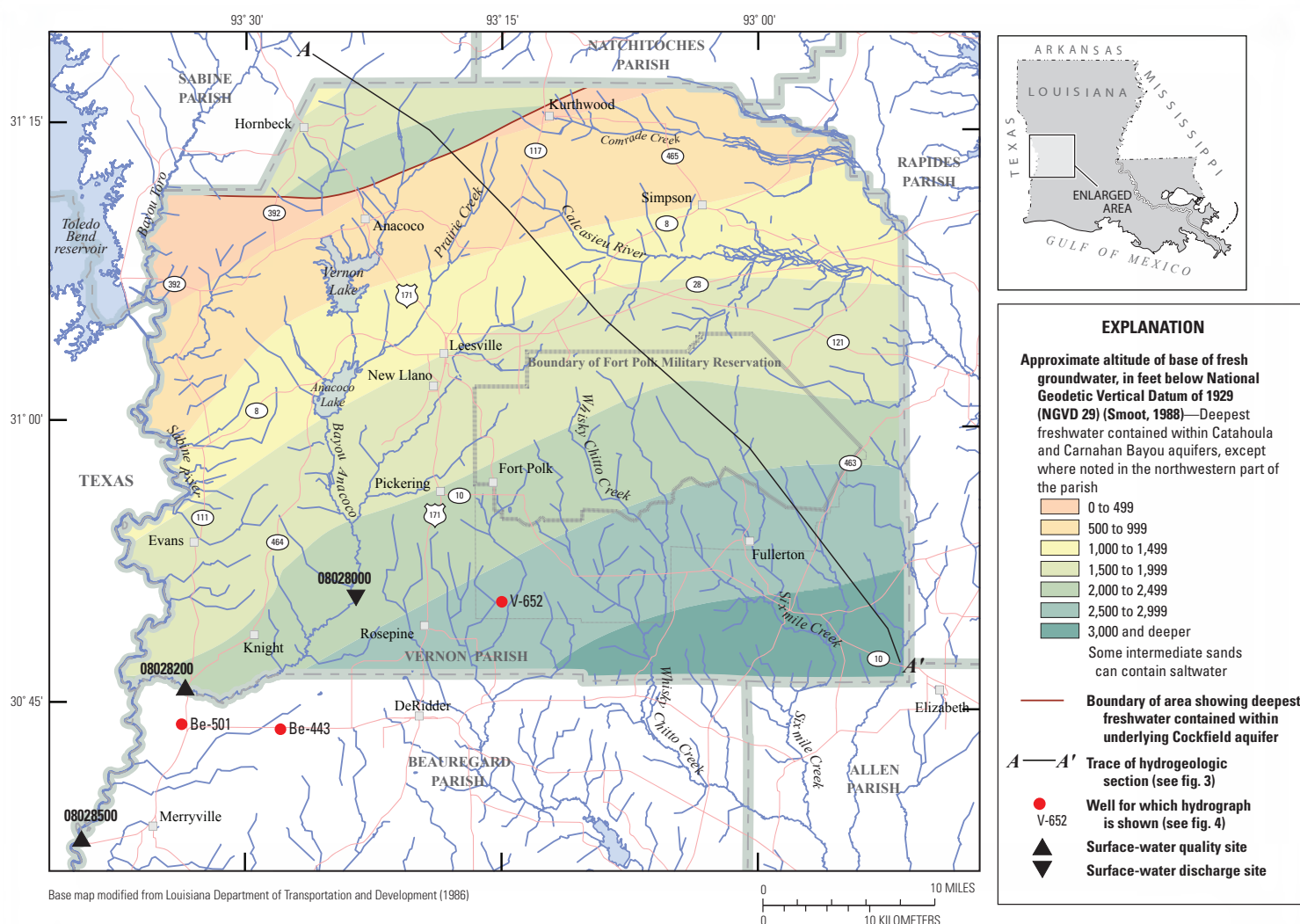
## Introduction

In 2005, about 6.67 million gallons per day (Mgal/d) of water were withdrawn in Vernon Parish, Louisiana (fig. 1), including about 6.46 Mgal/d from groundwater sources and 0.21 Mgal/d from surface-water sources<sup>1</sup> (table 1). Public-supply use accounted for about 76 percent (5.06 Mgal/d) of the

<sup>1</sup> Tabulation of numbers in text and tables may result in different totals because of rounding; nonrounded numbers are used for calculation of totals.

total water withdrawn. Other categories of use included rural domestic, livestock, general irrigation, and aquaculture (table 2). Based on water-use data collected at 5-year intervals from 1960 to 2005, water withdrawals in the parish peaked in 1990 at about 10.4 Mgal/d (fig. 2).

This fact sheet summarizes basic information on the water resources of Vernon Parish, La. Information on groundwater and surface-water availability, quality, development, use, and trends is based on previously published reports listed in the Selected References section.



**Figure 1.** Location of study area, Vernon Parish, Louisiana.

**Table 1.** Water withdrawals, in million gallons per day, by source in Vernon Parish, Louisiana, 2005 (modified from Sargent, 2007).

Aquifer, aquifer system, or surface-water body	Groundwater	Surface water
Upland terrace aquifer	0.09	
Chicot aquifer system	.55	
Castor Creek confining unit	.05	
Evangeline aquifer	.13	
Jasper aquifer system	5.49	
Catahoula aquifer	.12	
Cockfield aquifer	.04	
Miscellaneous streams		.21
<b>Total</b>	<b>6.46</b>	<b>.21</b>

**Table 2.** Water withdrawals, in million gallons per day, by category in Vernon Parish, Louisiana, 2005 (modified from Sargent, 2007).

Category	Groundwater	Surface Water	Total
Public-supply	5.06	0.00	5.06
Rural domestic	1.35	.00	1.35
Livestock	.02	.15	.16
General irrigation	.00	.06	.06
Aquaculture	.03	.00	.03
<b>Total</b>	<b>6.46</b>	<b>.21</b>	<b>6.67</b>

## Groundwater Resources

The primary groundwater resources of Vernon Parish are, from near surface to deepest, the Chicot aquifer system, Evangeline aquifer, and Jasper aquifer system (fig. 3). Secondary groundwater resources in the parish include the upland terrace aquifer, Castor Creek confining unit, Dough Hills confining unit, and the Catahoula and Cockfield aquifers. Although these secondary sources could be important locally, they are not discussed herein. Deeper aquifers in the parish contain only saltwater (water with chloride concentrations greater than 250 milligrams per liter [mg/L]) and are not discussed.

The depth to the base of fresh groundwater varies in Vernon Parish. In the northwestern part of the parish, it ranges in depth from less than 500 to about 2,500 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) (sea level). In northeastern areas of the parish, the base of fresh groundwater ranges in depth from about 500 to 1,500 ft below NGVD 29. In the southern part of the parish, the base of freshwater ranges in depth from about 1,500 to more than 3,000 ft below NGVD 29 (fig. 1).

Recharge to the aquifers in Vernon Parish typically is from infiltration of precipitation in outcrop areas, seasonal inflow from streams, and leakage from overlying aquifers. Discharge from the aquifers is by seasonal outflow to streams, leakage into underlying aquifers, and withdrawals from wells.

State well-registration records listed 2,190 active water wells in Vernon Parish in 2009. In 2005, various uses for groundwater withdrawals included public-supply, rural domestic, livestock, and aquaculture (table 2).

### Chicot Aquifer System

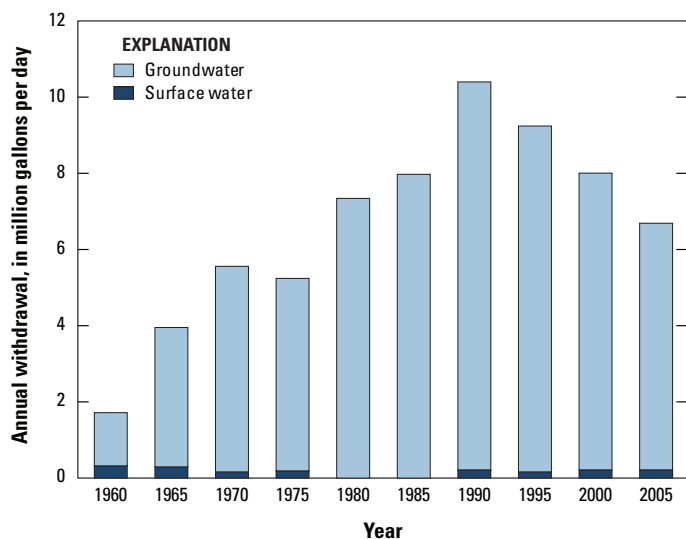
The Chicot aquifer system is present in the southern part of Vernon Parish, approximately south of a line extending through the towns of Evans and Fullerton. The aquifer system mostly consists of sand and gravel that is often exposed (outcrops) at land surface. Thickness of the system increases towards the south and is about 200 ft thick near the Vernon-Beauregard Parish line.

Water levels in the outcrop area of the Chicot aquifer system generally fluctuate 1–2 ft annually, as shown in the hydrograph of well Be-443 (fig. 4), which is located west of DeRidder in northern Beauregard Parish (fig. 1). During the 10-year period 1996–2005, water levels at well Be-443 declined at an average rate of 0.14 feet (ft) per year.

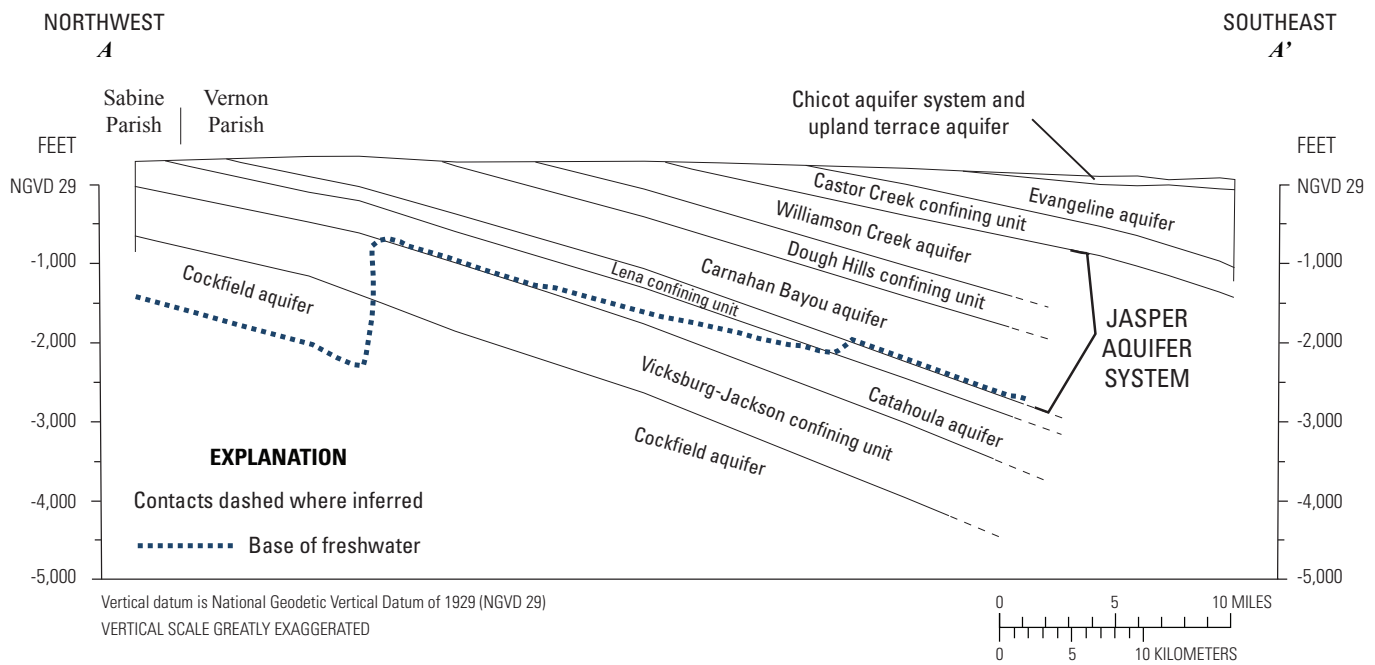
State well-registration records listed 524 active wells screened in the Chicot aquifer system in Vernon Parish in 2009. Depths of these wells ranged from 9 to 190 ft below land surface with a median depth of 105 ft. Yields from wells screened in the Chicot aquifer system in Vernon Parish reportedly range from 8 to 800 gallons per minute (gal/min). In 2005, water withdrawals from the Chicot aquifer system in Vernon Parish totaled about 0.55 Mgal/d and included about 0.14 Mgal/d for public supply, 0.40 Mgal/d for rural domestic use, 0.01 Mgal/d for livestock.

### Evangeline Aquifer

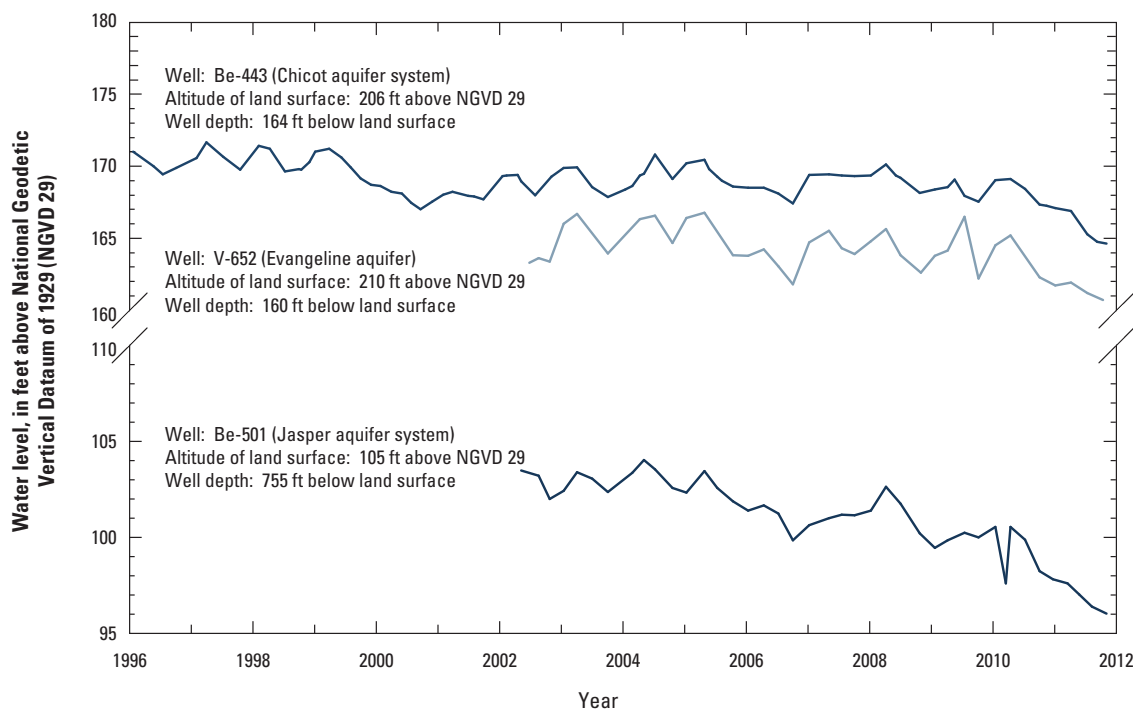
The Evangeline aquifer is present in the southern one-third to one-half of Vernon Parish (fig. 3). The Evangeline aquifer outcrops or subcrops in Vernon Parish from near Pickering, eastward through the southern half of the Fort Polk Military Reservation; the base of the aquifer reaches a maximum depth of about 1,000 ft below



**Figure 2.** Water withdrawals in Vernon Parish, Louisiana, 1960–2005.



**Figure 3.** Generalized northwest to southeast geologic section through Vernon Parish, Louisiana (modified from Rogers and Calandro, 1965). Trace of section shown on figure 1.



**Figure 4.** Water levels in well Be-443 screened in the Chicot aquifer system, well V-652 screened in the Evangeline aquifer, and well Be-501 screened in the Jasper aquifer system (see fig. 1 for well locations; U.S. Geological Survey, 2012a). Land surface is measured in feet above the National Geodetic Vertical Datum of 1929 (NGVD 29).

NGVD 29 and a maximum thickness of about 1,100 ft in the southeastern corner of the parish. The aquifer consists primarily of fine to medium sand interbedded with silt, clay, and coarse sand. Locally, sand beds within the aquifer are separated and confined by fairly extensive clays. Sand beds, many thicker than 80 ft, make up 35 to 45 percent of the aquifer in Vernon Parish.

In 2004, water levels in the aquifer ranged from about 260 ft above NGVD 29 in the outcrop area of east-central Vernon Parish to about 120 ft above NGVD 29 in the southeastern corner of the parish and 100 ft above NGVD 29 in the southwestern corner of the parish. Water levels generally fluctuate 2–3 ft annually, as shown in the hydrograph of well V-652 (fig. 4), located in south-central Vernon Parish, east-northeast of Rosepine (fig. 1).

State well-registration records listed 90 active wells screened in the Evangeline aquifer in Vernon Parish in 2009. Depths of these wells ranged from 35 to 840 ft below land surface with a median well depth of 208 ft. Yields from wells screened in the Evangeline aquifer in Vernon Parish reportedly range from 1 to 230 gal/min. In 2005, withdrawals from the Evangeline aquifer in Vernon Parish totaled about 0.13 Mgal/d.

## Jasper Aquifer System

The Jasper aquifer system consists of the Williamson Creek aquifer, Dough Hills confining unit, and Carnahan Bayou aquifer (fig. 3). Fresh water is present throughout the aquifer system in Vernon Parish, except possibly in the southeastern corner of the

parish, where saltwater could be present (fig. 1). The Williamson Creek and Carnahan Bayou aquifers consist of well sorted, light gray, very fine to medium sands with occasional traces of gravel and may be interbedded with clay and lignite.

The Williamson Creek aquifer underlies the southern two-thirds of the parish and outcrops diagonally across the parish in a 2–6 mile wide north-south band from the west-central parish line about 5 miles north of Evans, through Leesville, and towards the northeastern corner of the parish. The thickness of the aquifer ranges from 400 ft near the outcrop area to 900 ft in southeastern Vernon Parish. The base of the aquifer is about 2,200 ft below NGVD 29 in the southeastern part of the parish. Sand beds make up about 40 to 60 percent of the aquifer. In 2003, water levels in the aquifer generally ranged from about 200 ft above NGVD 29 in the outcrop area to about 80 ft above NGVD 29 near the town of Rosepine and were less than 60 ft above NGVD 29 in the southeastern corner of the parish. Water levels in well Be-501, screened in the Jasper aquifer system and located in northwestern Beauregard Parish (fig. 1), generally fluctuate 1–3 ft annually and declined by about 7 ft from 2004 to 2011 (fig. 4).

State well-registration records listed 384 active wells screened in the Williamson Creek aquifer in Vernon Parish in 2009. Depths of these wells ranged from 30 to 1,282 ft below land surface with a median well depth of 160 ft. Yields from wells screened in the Williamson Creek aquifer in Vernon Parish reportedly range from 4 to 900 gal/min. In 2005, withdrawals from the Williamson Creek aquifer in Vernon Parish were about 2.19 Mgal/d and included about

1.91 Mgal/d for public-supply, 0.26 Mgal/d for rural domestic use, and 0.02 Mgal/d for aquaculture.

A statistical summary of selected water-quality characteristics for samples collected from 81 wells screened in the Williamson Creek aquifer is listed in table 3. Freshwater in the aquifer is generally soft (60 mg/L or less as calcium carbonate) and does not exceed the U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels (SMCLs)<sup>2</sup> for drinking water included in table 3. Locally, pH may be less than 6.5 and iron and manganese concentrations may exceed their SMCLs.

The Carnahan Bayou aquifer outcrops in northern and northwestern Vernon Parish in a zone about 8 to 11 miles wide, extending northward and southwestward from a few miles south of the town of Anacoco and northeastward from a few miles south of the town of Kurthwood. The aquifer underlies the central and southern parts of the parish. The thickness of the aquifer ranges from about 540 ft near the outcrop to about 1,100 ft in southeastern Vernon Parish. The base of the aquifer is about 3,600 ft below NGVD 29 in the southeastern part of the parish. Sand beds make up about 25 percent of the unit. Some sand beds have a thickness of 70 ft or more, but most are thinner. In 2003, water levels in the aquifer generally ranged from about

<sup>2</sup>The SMCLs are nonenforceable Federal guidelines regarding cosmetic effects (such as tooth or skin discoloration) or aesthetic effects (such as taste, odor, or color) of drinking water. At high concentrations or values, health implications as well as aesthetic degradation might exist. SMCLs were established as guidelines for the States by the U.S. Environmental Protection Agency (1992).

**Table 3.** Summary of selected water-quality characteristics of freshwater in the Williamson Creek and Carnahan Bayou aquifers in Vernon Parish, Louisiana (U.S. Geological Survey, 2012b).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; PCU, platinum cobalt units; µS/cm, microsiemens per centimeter; SU, standard units; CaCO<sub>3</sub>, calcium carbonate; µg/L, micrograms per liter; <, less than; NA, not applicable; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2011)]

	Temper- ature (°C)	Color, (PCU)	Specific conduc- tance, field (µS/cm at 25°C)	pH, field (SU)	Hardness (as CaCO <sub>3</sub> )	Chloride, filtered (as Cl)	Iron, filtered (µg/L as Fe)	Man- ganese, filtered (µg/L as Mn)	Dissolved solids, filtered
Williamson Creek aquifer (1939–97) (81 wells)									
Median	23.5	5	253	6.8	52	16	100	30	206
10th percentile	21.0	0	94	6.0	19	8.0	10	14	110
90th percentile	26.3	12	455	7.8	140	36	480	85	305
Number of samples	35	28	37	47	81	81	21	16	37
Percentage of samples that do not exceed SMCLs	NA	93	NA	72	NA	100	71	62	97
Carnahan Bayou aquifer (1942–97) (68 wells)									
Median	23.5	10	352	7.1	66	20	180	87	250
10th percentile	21.0	2	168	6.3	13	9.4	12	<10	177
90th percentile	27.6	30	497	7.7	160	42	560	180	331
Number of samples	20	25	31	27	68	67	20	15	31
Percentage of samples that do not exceed SMCLs	NA	84	NA	85	NA	100	80	47	100
SMCLs									
	NA	15	NA	6.5–8.5	NA	250	300	50	500



300 ft above NGVD 29 in the outcrop area in north-central Vernon Parish to about 100 ft above NGVD 29 in east-central Vernon Parish near the border with Rapides Parish.

State well-registration records listed 590 active water wells screened in the Carnahan Bayou aquifer in Vernon Parish in 2009. Depths of these wells ranged from 25 to 1,574 ft below land surface with a median depth of 140 ft. Yields from wells screened in the aquifer in Vernon Parish reportedly range from 3 to 1,500 gal/min. In 2005, withdrawals from the Carnahan Bayou aquifer in Vernon Parish were about 3.19 Mgal/d, and included about 2.80 Mgal/d for public-supply and 0.39 Mgal/d for rural domestic use.

A statistical summary of selected water-quality characteristics for freshwater samples collected from 68 wells screened in the Carnahan Bayou aquifer is provided in table 3. Freshwater in the aquifer system is generally moderately hard (61–120 mg/L as calcium carbonate) and, with the exception of manganese, generally does not exceed SMCLs for drinking water included in table 3.

## Surface-Water Resources

In 2005, about 0.21 Mgal/d of surface water was withdrawn in Vernon Parish, including about 0.15 Mgal/d for livestock and 0.06 Mgal/d for general irrigation (table 2). Major streams in

the parish include the Sabine River, Bayou Anacoco, Calcasieu River, Sixmile Creek, and Whisky Chitto Creek. Anacoco Lake and Vernon Lake are engineered reservoirs located on Bayou Anacoco (fig. 1).

Some streams in the southern and western parts of the parish, such as the Sabine River, Bayou Anacoco, and Whisky Chitto Creek (fig. 1), are underlain by permeable soils or sediments that have a large capacity for surface-water and groundwater interaction, and streamflow in these basins is sustained by base flow during dry periods. Streams in the northeastern part of the parish, such as the Calcasieu River and Comrade Creek, are underlain by relatively impermeable rocks or poorly drained subsoils. Streamflows in these areas recede rapidly from flood peaks to rates of low flow or even to no flow.

The mean discharge for the Sabine River near Bon Wier (station number 08028500), Texas (fig. 1), from 1961–2009, was 6,680 cubic feet per second (ft<sup>3</sup>/sec) (U.S. Geological Survey, 2009). The drainage area of the Sabine River at this site, located about 9 miles south of Vernon Parish on U.S. Highway 190 west of Merryville, La., is about 8,230 square miles (mi<sup>2</sup>). Water samples from this site, analyzed during the period 1969–2009 indicate that water in the Sabine River (fig. 1) is generally soft (table 4) and generally does not exceed SMCLs for drinking water included in table 3. Dissolved oxygen is generally greater than 5 mg/L, which is considered the minimum value for a diversified population of fresh,

**Table 4.** Summary of selected water-quality characteristics for the Sabine River near Bon Wier, Texas, and Bayou Anacoco near Knight, Louisiana.

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; µS/cm, microsiemens per centimeter; SU, standard units; µg/L, micrograms per liter; CaCO<sub>3</sub>, calcium carbonate; —, no data; NA, not applicable; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2011)]

	Specific conduc- tance, field (µS/cm at 25°C)	Oxygen, dis- solved	pH, field (SU)	Hard- ness (as CaCO <sub>3</sub> )	Calcium, filtered (as Ca)	Mag- nesium, filtered (as Mg)	Sodium, filtered (as Na)	Chlor- ide, filtered (as Cl)	Sulfate, filtered (as SO <sub>4</sub> )	Iron, non- filtered (µg/L as Fe)	Iron, fil- tered (µg/L as Fe)
Sabine River near Bon Wier, Tex., 1969–2009 <sup>1</sup>											
Median	153	8.4	7.2	38	9.7	2.7	22	17	18	50	—
10th percentile	112	6.7	6.6	26	7.4	1.6	12	12	11	20	—
90th percentile	213	9.9	7.5	46	13	3.9	30	27	28	160	—
Number of samples	1,696	37	57	33	33	33	33	1,684	1,684	30	—
Percentage of samples that do not exceed SMCLs	NA	NA	96	NA	NA	NA	NA	100	100	93	—
Bayou Anacoco near Knight, La., 1969–2009 <sup>2</sup>											
Median	310	7.6	7.0	25	8.1	1.2	52	21	56	—	250
10th percentile	76	6.0	6.4	13	4.1	0.6	9.2	5.9	10	—	140
90th percentile	676	9.8	7.5	43	15	2.0	120	58	150	—	410
Number of samples	206	195	209	200	200	200	200	206	205	—	90
Percentage of samples that do not exceed SMCLs	NA	NA	88	NA	NA	NA	NA	100	100	—	70
SMCLs											
	NA	NA	6.5–8.5	NA	NA	NA	NA	250	250	300	300

<sup>1</sup>Station number 08028500 (U.S. Geological Survey, 2012c; specific data at [http://nwis.waterdata.usgs.gov/tx/nwis/qwdata/?site\\_no=08028500](http://nwis.waterdata.usgs.gov/tx/nwis/qwdata/?site_no=08028500)).

<sup>2</sup>Station number 08028200 (U.S. Geological Survey, 2009b; specific data at [http://nwis.waterdata.usgs.gov/la/nwis/qwdata/?site\\_no=08028200](http://nwis.waterdata.usgs.gov/la/nwis/qwdata/?site_no=08028200)).

warm-water biota, including sport fish (Louisiana Department of Environmental Quality, 2008).

The mean discharge for Bayou Anacoco near Rosepine, La. (fig. 1) from 1952–2008 was 483 ft<sup>3</sup>/sec (station number 08028000). The drainage area at this site is about 365 mi<sup>2</sup> (U.S. Geological Survey, 2008). Water samples from Bayou Anacoco near Knight, La. (station number 08028200) (fig. 1) that were analyzed during the period 1969–2009 indicate that the water is soft (table 4) and generally does not exceed SMCLs for drinking water included in table 3. Dissolved oxygen is generally greater than 5 mg/L.

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This fact sheet was published by the U.S. Geological Survey, in cooperation with the Louisiana Department of Transportation and Development (DOTD). Thanks are given to Zahir “Bo” Bolourchi, Director, Water Resources Programs, Louisiana Department of Transportation and Development, who contributed to the content and design of the fact sheet.