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LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

Prepared in cooperation with the Louisiana Department of Transportation and Development

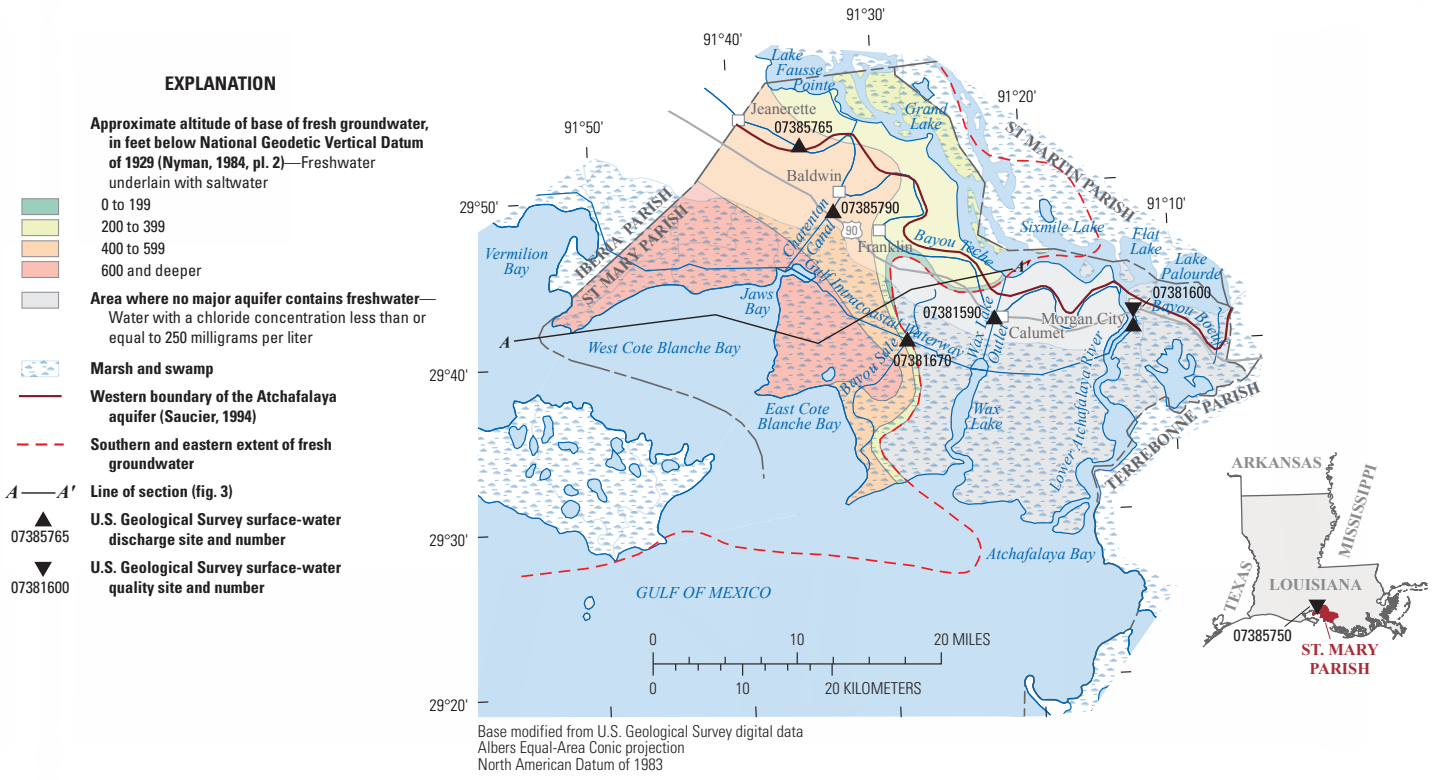
Water Resources of St. Mary Parish, Louisiana

Introduction

Information concerning the availability, use, and quality of water in St. Mary Parish, Louisiana (fig. 1), is critical for proper water-supply management. The purpose of this fact sheet is to present information that can be used by water managers, parish residents, and others for management of this vital resource. Information on the availability, past and current use, use trends, and water quality from groundwater and surface-water sources in the parish is presented. Previously published reports (see References Cited section) and data stored in the U.S. Geological Survey's National Water Information System (http://waterdata.usgs.gov/nwis) are the primary sources of the information presented here.

In 2010, about 121 million gallons per day (Mgal/d) of water were withdrawn in St. Mary Parish, including about 112 Mgal/d from surface sources and 8.31 Mgal/d from groundwater sources[1] (table 1). Withdrawals for power generation accounted for about 87 percent (105 Mgal/d) of the total water withdrawn (table 2). Other categories of use included public supply, industrial, rural domestic, livestock, and general irrigation. Water-use data collected at 5-year intervals since 1960 indicated that water withdrawals greatly increased between 1970 and 1975 (fig. 2). This increase was largely due to additional surface-water withdrawals for power generation, which increased from 40 Mgal/d in 1970 to 202 Mgal/d in 1975. Water withdrawals in the parish peaked in 1975 at about 239 Mgal/d. Groundwater withdrawals in St. Mary Parish declined from 1990 to 2010 primarily because of decreasing withdrawals for petroleum refining and power generation.

[1]Tabulation of numbers in text and tables may result in different totals because of rounding; nonrounded numbers are used for calculation of totals.



Base modified from U.S. Geological Survey digital data
Albers Equal-Area Conic projection
North American Datum of 1983

Figure 1. Location of study area, St. Mary Parish, Louisiana.

Table 1. Water withdrawals, in million gallons per day, by source in St. Mary Parish, Louisiana, 2010 (modified from Sargent, 2011).

Aquifer, aquifer system, or surface-water body	Groundwater	Surface water
Atchafalaya aquifer	0.03	
Chicot aquifer system, upper sand	8.28	
Atchafalaya River		2.48
Bayou Boeuf		0.71
Bayou Teche		4.27
Charenton Canal		99.44
Gulf Intracoastal Waterway		3.55
Sixmile Lake		1.17
Miscellaneous streams		0.29
Other water bodies		0.45
Total	8.31	112.37

Table 2. Water withdrawals, in million gallons per day, by use category in St. Mary Parish, Louisiana, 2010 (modified from Sargent, 2011).

Use category	Groundwater	Surface water	Total
Public supply	0.42	10.29	10.71
Industrial	1.73	2.74	4.47
Power generation	5.99	99.04	105.04
Rural domestic	0.15	0.00	0.15
Livestock	0.00	0.04	0.04
General irrigation	0.03	0.25	0.28
Total	8.31	112.37	120.69

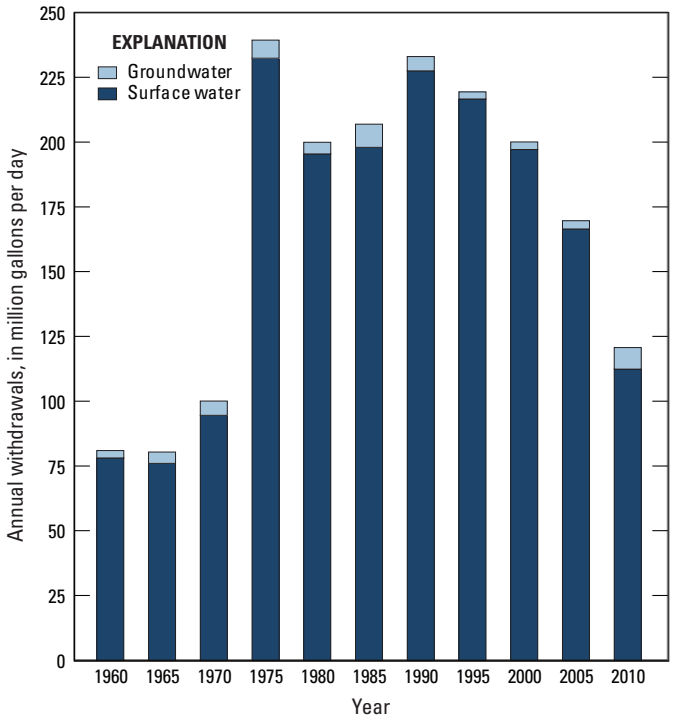


Figure 2. Water withdrawals in St. Mary Parish, Louisiana, 1960–2010 (Sargent, 2011).

Groundwater Resources

The primary sources of fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) in St. Mary Parish are the Chicot aquifer system and the partially overlying Atchafalaya aquifer (fig. 3). The Chicot aquifer system consists of an upper and lower sand in St. Mary Parish; however, the lower sand contains only saltwater in the parish (water with chloride concentrations greater than 250 mg/L). The base of fresh groundwater in St. Mary Parish generally ranges from about 200 to 700 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) (fig. 1). Fresh groundwater is not available in the southeastern corner of the parish as indicated by the freshwater-saltwater interface in figure 1 (Nyman, 1984).

The principal source of recharge to the Atchafalaya aquifer is the Atchafalaya River (Jones and others, 1956), although during low stage the aquifer discharges into the river. Well withdrawals and seepage into the Chicot aquifer system also contribute to discharge from the aquifer, although interconnections between the Atchafalaya aquifer and the Chicot aquifer system are poor in St. Mary Parish (Jones and others, 1956). Much of the recharge to the Chicot aquifer system in St. Mary Parish is from vertical leakage through surficial clays and, to a lesser extent, from the Atchafalaya aquifer (Nyman, 1984). Discharge from the Chicot aquifer system is by natural flow into rivers, canals, and lakes and withdrawals from wells.

State well-registration records listed 219 active water wells in St. Mary Parish in 2009, including 158 domestic, 26 public supply, 19 industrial, 14 irrigation, and 2 power generation. Although an aquifer designation had not been assigned to several of the wells, the well depths indicate that almost all of the active wells are screened in either the Atchafalaya aquifer or the upper sand of the Chicot aquifer system. In 2010, categories of use for groundwater withdrawals in St. Mary Parish included public supply, industrial, power generation, rural domestic, and general irrigation (table 2). Groundwater withdrawals totaled 0.03 Mgal/d from the Atchafalaya aquifer and 8.28 Mgal/d from the upper sand of the Chicot aquifer system.

Atchafalaya Aquifer

The Atchafalaya aquifer consists of highly permeable sands and gravels that partly fill scour channels formed by the Atchafalaya and Mississippi Rivers (Jones and others, 1956). Overlying the aquifer is a 50- to 100-ft thick deposit of clay (Fisk, 1944). In St. Mary Parish, the aquifer generally is present north of Louisiana Highway 90 from the St. Mary-Iberia Parish line to Morgan City (fig. 1). The approximate area where the Atchafalaya aquifer contains freshwater in St. Mary Parish is shown on figure 1 (Nyman, 1984).

Because of its origin as a channel-fill deposit, the thickness of the aquifer is variable, generally ranging from 50 to 150 ft (Jones and others, 1956), although it can be as much as 250 ft thick in some areas (Saucier, 1994). Near the southern end of Sixmile Lake (fig. 1), the aquifer is about 140 ft thick (Jones and others, 1956), and the base of the aquifer is about 250 ft below NGVD 29 (Saucier, 1994) (fig. 3). The maximum depth of the aquifer in St. Mary Parish is about 375 ft below NGVD 29 near the northern St. Mary-Iberia Parish line (Saucier, 1994).

The Atchafalaya River cuts into the Atchafalaya aquifer, and water levels in the aquifer generally fluctuate in response

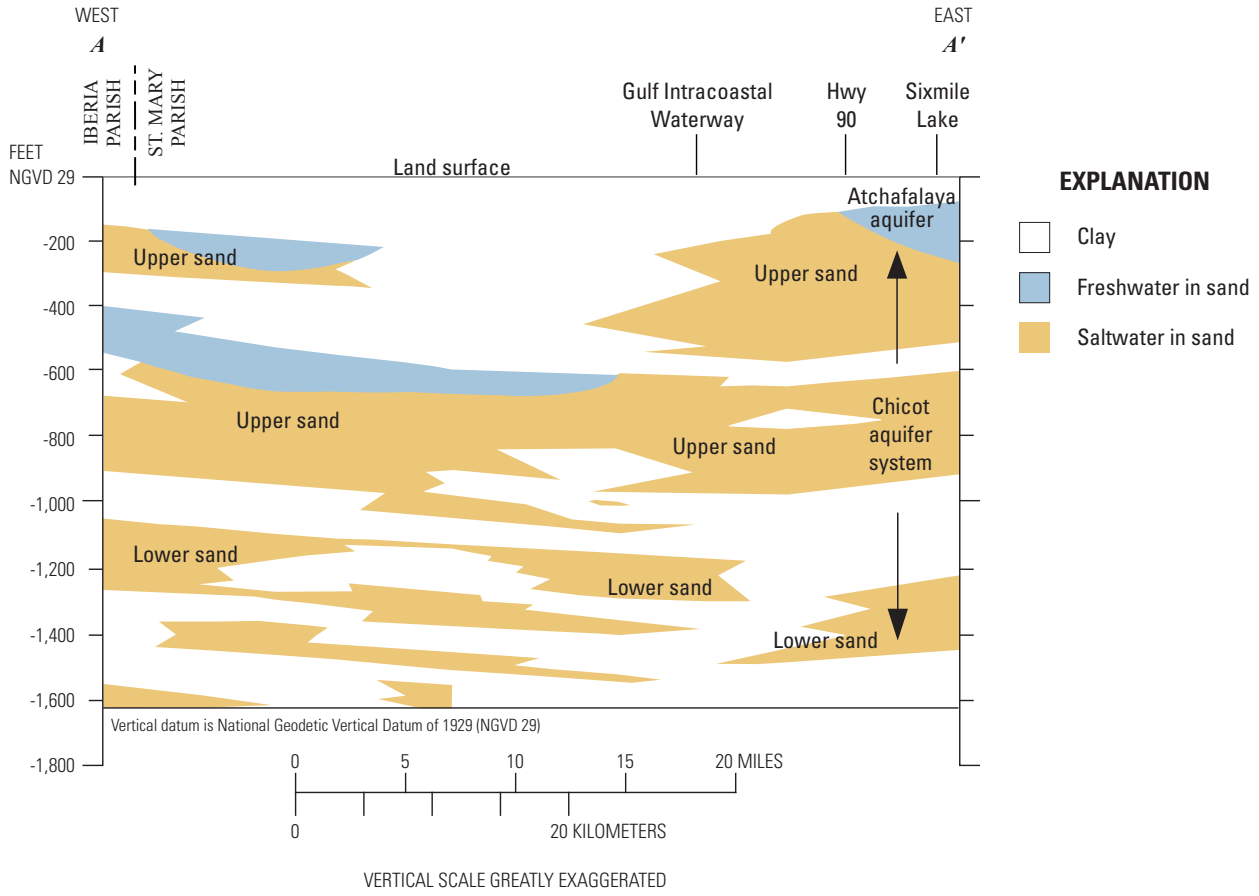


Figure 3. Generalized west-to-east hydrogeologic section through St. Mary Parish, Louisiana (modified from Nyman, 1984). Trace of section shown on figure 1.

to river stage. Prior to its development as a water supply during the early 1900s, the direction of groundwater flow in the Chicot aquifer system was primarily southward towards the Gulf of Mexico and eastward towards the Atchafalaya River (Nyman and others, 1990). Since development, however, groundwater withdrawals in southwestern Louisiana have reversed the hydraulic gradient; consequently, water in the Atchafalaya aquifer now moves westward into the Chicot aquifer system (Nyman, 1984).

State well-registration records listed 42 active wells screened in the Atchafalaya aquifer in St. Mary Parish in 2009, including 35 domestic, 3 irrigation, 3 industrial, and 1 public supply. Depths of these wells range from 70 to 340 ft below land surface, with a median depth of 190 ft. Reported yields from wells screened in the Atchafalaya aquifer in St. Mary Parish have ranged from 16 to 2,500 gallons per minute (gal/min). In 2010, withdrawals from the Atchafalaya aquifer in St. Mary Parish were categorized as rural-domestic use. In St. Mary Parish, active wells screened in the Atchafalaya aquifer generally are located on the north side of U.S. Highway 90 (fig. 1).

Water in the Atchafalaya aquifer typically is poorly suited for domestic purposes because of water-quality concerns. In St. Mary Parish, iron concentrations generally exceed 5,000 micrograms per liter (µg/L) and, at some locations, may exceed 10,000 µg/L. The water typically is very hard[2] (Nyman, 1989).

Upper Sand of the Chicot Aquifer System

In St. Mary Parish, the upper sand of the Chicot aquifer system consists mostly of coarse sand grading to gravel near the base of individual beds (Nyman and others, 1990). The top of the upper sand ranges from about 200 ft below NGVD 29 to more than 400 ft below NGVD 29, and the base extends to 1,000 ft or more below NGVD 29 within the parish (Nyman, 1984). The upper sand contains freshwater underlain by saltwater in most of the parish. In the southeastern half of the parish (generally southeast of Franklin), the upper sand contains no freshwater (fig. 3). The general direction of groundwater flow in the upper sand in St. Mary Parish is towards the northwest (Lovelace and others, 2004).

State well-registration records listed 141 active wells screened in the upper sand in St. Mary Parish in 2009, including 97 domestic, 23 public supply, 11 industrial, 9 irrigation, and 1 power generation. Depths of these wells ranged from about 210 to 699 ft below land surface, with a median depth of 320 ft. Reported yields from wells screened in the upper sand in St. Mary Parish have ranged from 3 to 1,562 gal/min. In 2010, about 8.28 Mgal/d were withdrawn from the upper sand unit in St. Mary Parish, including 0.42 Mgal/d for public supply, 1.73 Mgal/d for

[2]Hardness ranges, expressed as milligrams per liter of calcium carbonate, are as follows: 0–60, soft; 61–120, moderately hard; 121–180, hard; greater than 180, very hard (Hem, 1985).

industrial use, 5.99 Mgal/d for power generation, 0.11 Mgal/d for domestic use, and 0.03 Mgal/d for general irrigation.

A statistical summary of selected water-quality characteristics for samples from 23 wells screened in freshwater areas of the upper sand of the Chicot aquifer system underlying St. Mary Parish is listed in table 3. Freshwater in the upper sand is very hard, and iron and manganese concentrations generally exceed the U.S. Environmental Protection Agency's (USEPA) Secondary Maximum Contaminant Levels[3] (SMCLs) for drinking water (table 3). The pH of the water is generally within the SMCL range of 6.5 to 8.5 standard units. The median concentration of dissolved solids for 16 samples, 543 mg/L, exceeds the SMCL for drinking water of 500 mg/L.

Surface-Water Resources

In 2010, about 112 Mgal/d of surface water were withdrawn in St. Mary Parish. Power generation accounted for about 88 percent of the total water withdrawn. Other uses included public supply, industrial, livestock, and general irrigation (table 2). All surface-water withdrawals for power generation came from the Charenton Drainage and Navigation Canal near Baldwin (fig. 1). Surface-water withdrawals for industrial use came directly or indirectly from the Gulf Intracoastal Waterway (GIWW) or Bayou Teche. Most surface water withdrawn for industrial and power-generation purposes was used for cooling and returned to its source after use (Sargent, 2011). Surface-water withdrawals for public supply came from various sources, including the Atchafalaya River, Bayou Boeuf, Bayou Teche, the Charenton Drainage and Navigation Canal, the GIWW, and Sixmile Lake.

[3]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).

Grand Lake, Sixmile Lake, Flat Lake, and Lake Palourde are located within the Atchafalaya River Basin on or near the St. Mary Parish border (fig. 1). The approximate areas of these lakes are as follows: Grand Lake, 64 square miles (mi^2); Sixmile Lake, 30 mi^2; Flat Lake, 5.2 mi^2; and Lake Palourde, 18 mi^2 (Shampine, 1971). Grand Lake and Sixmile Lake have characteristics that resemble rivers more than lakes. Water from the Atchafalaya River flows into and through these lakes with short retention times (hours or days). Flat Lake, however, is partially isolated from the surface-water flow by islands and resembles a lake; chemical or thermal stratification can become established, and algae blooms can develop (Shampine, 1971). Water from Lake Palourde has a moderately high (200–250 mg/L) dissolved-solids content, and pH and concentrations of chloride and sulfate do not exceed the SMCLs. The dissolved-oxygen concentration generally is high (greater than or equal to 10 mg/L) throughout the year. Some chemical and thermal stratification develops, but this stratification is short lived (hours or days) and not appreciable (Shampine, 1971).

Flow and salinity in the water bodies of St. Mary Parish are strongly influenced by the interactions between waterway stage, strong winds, tides, and hurricanes. These factors can result in flow reversals as indicated by negative discharges (table 4). These flow reversals can change salinity significantly and may impact the availability of freshwater in the parish. In particular, the GIWW is affected by differences in stage in the waterway and adjacent surface-water bodies, including the Lower Atchafalaya River, Wax Lake Outlet, and the Gulf of Mexico. During much of the year, freshwater from the Atchafalaya River Basin discharges through the Lower Atchafalaya River and Wax Lake Outlet into the GIWW, inducing flow in the GIWW (Swarzenski, 2003). During periods of low Atchafalaya River stage and wind-driven flow events, saltwater from the Gulf of Mexico can enter the GIWW through several connections with the Gulf, including the Charenton Drainage and Navigation Canal, Wax Lake Outlet, and the Lower Atchafalaya River.

Table 3. Summary of selected water-quality characteristics for freshwater in the Chicot aquifer system upper sand in St. Mary Parish, Louisiana, 1948–96 (U.S. Geological Survey, 2009).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; PCU, platinum cobalt units; µS/cm, microsiemens per centimeter; SU, standard units; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2012); NA, not applicable]

	Temperature (°C)	Color, (PCU)	Specific conductance, field (µS/cm at 25 °C)	pH, field (SU)	Hardness (as $CaCO_3$)	Chloride, filtered (as Cl)	Iron, filtered (µg/L as Fe)	Manganese, filtered (µg/L as Mn)	Dissolved solids, filtered
Chicot aquifer system upper sand (23 wells)									
Median	22.1	5	1,010	7.5	280	120	870	75	543
10th percentile	21.9	0	674	7.2	180	26	120	60	390
90th percentile	23.1	16	1,310	8.5	350	210	1,300	110	699
Number of samples	9	9	20	19	20	22	8	4	16
Percentage of samples that do not exceed SMCLs	NA	89	NA	95	NA	100	25	0	38
SMCLs									
	NA	15	NA	6.5–8.5	NA	250	300	50	500

Water samples collected from the Lower Atchafalaya River at Morgan City during the period 2006–9 indicated that the water is hard and based on median values usually does not exceed the SMCLs for pH and concentrations of chloride, sulfate, and iron. Dissolved-oxygen concentrations are generally greater than 5 mg/L. Water samples collected from Bayou Teche near Oliver during the period 1958–80 indicated that the water is moderately hard and based on median values usually does not exceed the SMCLs for pH and concentrations of chloride, sulfate, and iron. Dissolved-oxygen concentrations are generally below 5 mg/L for Bayou Teche (table 5); for a diversified population of fresh, warmwater biota, including sport fish, 5 mg/L is considered the minimum value (Louisiana Department of Environmental Quality, 2008).

Table 4. Minimum, maximum, and mean daily discharges recorded at selected surface-water discharge sites in St. Mary Parish, Louisiana (U.S. Geological Survey, 2013).

[GIWW, Gulf Intracoastal Waterway. Negative values indicate that water is flowing opposite its normal direction[1]]

		Daily mean discharge, in cubic feet per second		
Surface-water discharge site and number	**Period of record**	**Mean**	**Maximum**	**Minimum**
GIWW at Bayou Sale Ridge near Franklin (station 07381670)	2000–13	8,227	29,800	-6,790
Charenton Drainage Canal at Baldwin (station 07385790)	1999–2013	2,419	17,000	-29,200
Wax Lake Outlet at Calumet (station 07381590)	1986–2013	91,746	255,000	17,400
Lower Atchafalaya River at Morgan City (station 07381600)	1976–2013	126,077	487,000	6,320
Bayou Teche near Jeanerette (station 07385765)	1996–2013	415	3,270	-198

[1]The normal direction of flow is generally southward towards the Gulf of Mexico at all of the surface-water discharge sites listed with the exception of the GIWW at Bayou Sale Ridge near Franklin, where the normal direction of flow is towards the west.

Table 5. Summary of selected water-quality characteristics for the Lower Atchafalaya River at Morgan City and Bayou Teche near Oliver, Louisiana.

[Values are in milligrams per liter, except as noted. µS/cm, microsiemens per centimeter; °C, degrees Celcius; SU, standard units; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; E, estimated; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2012); NA, not applicable]

	Specific conductance, field (µS/cm at 25 °C)	**Oxygen, dissolved**	**pH, field (SU)**	**Hardness (as $CaCO_3$)**	**Calcium, filtered (as Ca)**	**Magnesium, filtered (as Mg)**	**Sodium, filtered (as Na)**	**Chloride, filtered (as Cl)**	**Sulfate, filtered (as SO_4)**	**Iron, filtered (µg/L as Fe)**
Lower Atchafalaya River at Morgan City, 2006–9[1]										
Median	356	7.7	7.8	130	34	10	18	25	35	20
10th percentile	299	5.3	7.6	100	28	7.4	13	18	28	E6
90th percentile	470	11.2	8.1	170	43	15	30	42	54	70
Number of samples	53	52	53	53	53	53	53	53	53	53
Percentage of samples that do not exceed SMCLs	NA	NA	98	NA	NA	NA	NA	100	100	100
Bayou Teche near Oliver, 1958–80[2]										
Median	206	4.8	6.9	65	19	5.0	13	19	6.2	125
10th percentile	130	1.6	6.6	41	11	3.0	7.2	9	2.6	72
90th percentile	337	8.5	7.3	110	27	8.7	22	31	11	157
Number of samples	33	17	31	31	31	30	31	31	31	4
Percentage of samples that do not exceed SMCLs	NA	NA	90	NA	NA	NA	NA	100	100	100
SMCLs										
	NA	NA	6.5–8.5	NA	NA	NA	NA	250	250	300

[1]Site number 07381600 (U.S. Geological Survey, 2009; specific data at http://nwis.waterdata.usgs.gov/la/nwis/qwdata/?site_no=07381600).

[2]Site number 07385750 (U.S. Geological Survey, 2009; specific data at http://nwis.waterdata.usgs.gov/la/nwis/qwdata/?site_no=07385750).

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