

Prepared in cooperation with the Louisiana Department of Transportation and Development

Water Resources of Franklin Parish, Louisiana

Introduction

Information concerning the availability, use, and quality of water in Franklin 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 stewardship of this vital resource. In 2014, about 41.79 million gallons per day (Mgal/d) of water were withdrawn in Franklin Parish: 37.73 Mgal/d from groundwater sources and 4.06 Mgal/d from surface-water sources¹ (table 1).

¹Water-withdrawal data are based on estimated or reported site-specific data and aggregated data, which are distributed to sources. For a full description of water-use estimate methodology, see “Data Collection” in Sargent (2011). Tabulation of numbers in text and tables may result in different totals because of rounding; nonrounded numbers are used for calculation of totals.

Withdrawals for agricultural use—composed of general irrigation, rice irrigation, aquaculture, and livestock—accounted for about 89 percent (37.16 Mgal/d) of the total water withdrawn (table 2). Public-supply use accounted for about 3 percent (1.07 Mgal/d); industry accounted for about 7 percent (2.92 Mgal/d); and rural domestic use accounted for about 2 percent (0.64 Mgal/d). Water-use data collected at 5-year intervals from 1960 to 2010 and again in 2014 indicated that water withdrawals peaked in 2005 at more than 50 Mgal/d (fig. 2).

Groundwater Resources

The primary freshwater-bearing aquifer underlying Franklin Parish is the Mississippi River alluvial aquifer (figs. 1, 3). The

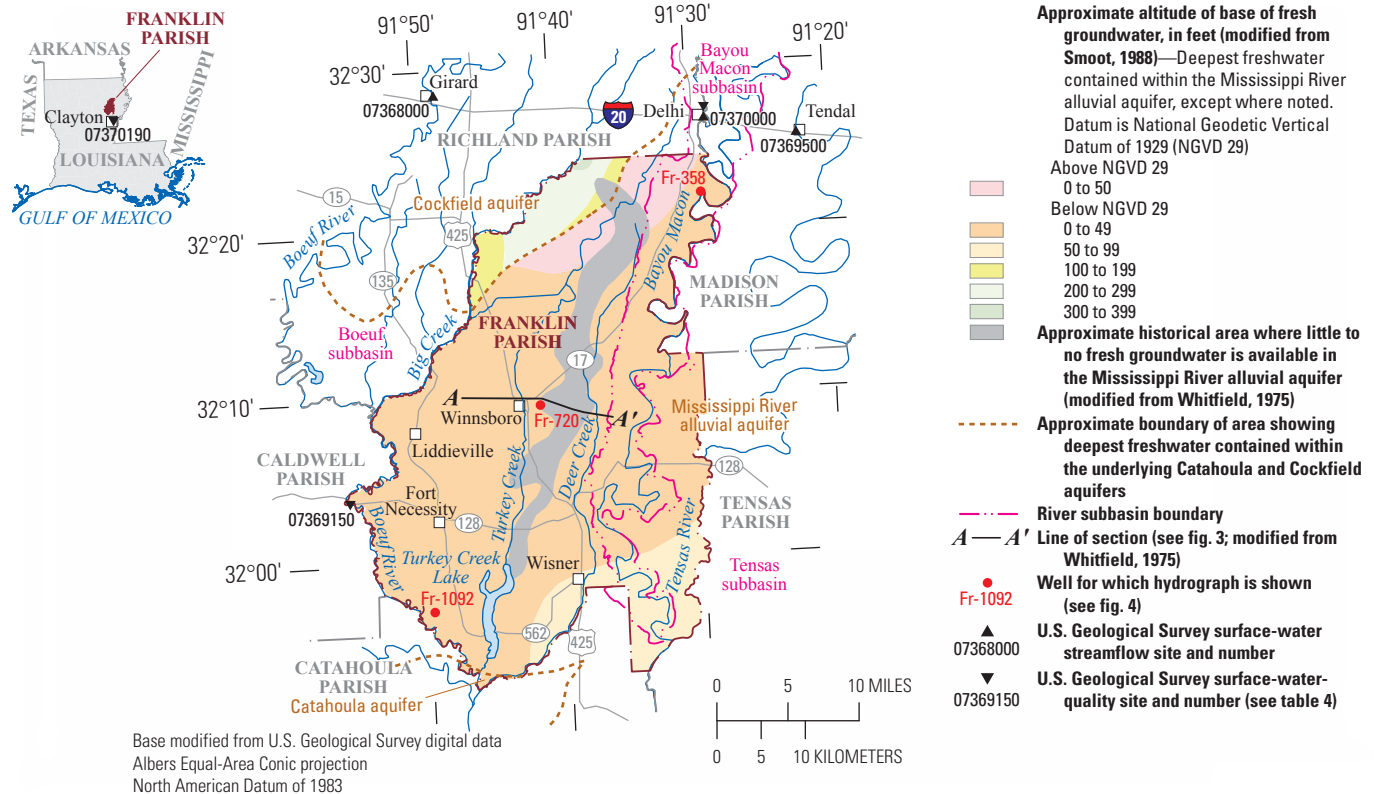


Figure 1. Location of study area, Franklin Parish, Louisiana.

Table 1. Water withdrawals, in million gallons per day, by source in Franklin Parish, Louisiana, 2014 (Collier, 2018).

Aquifer or surface-water body	Groundwater	Surface water
Mississippi River alluvial aquifer	37.73	
Bayou Macon		2.12
Boeuf River		0.43
Miscellaneous surface waters		1.51
Total	37.73	4.06

Table 2. Water withdrawals, in million gallons per day, by use category in Franklin Parish, Louisiana, 2014 (Collier, 2018).

Use category	Groundwater	Surface water	Total
Public supply	1.07	0.00	1.07
Industrial	2.92	0.00	2.92
Rural domestic	0.64	0.00	0.64
Livestock	0.18	0.00	0.18
Rice irrigation	0.11	0.46	0.57
General irrigation	32.41	3.60	36.01
Aquaculture	0.40	0.00	0.40
Total	37.73	4.06	41.79

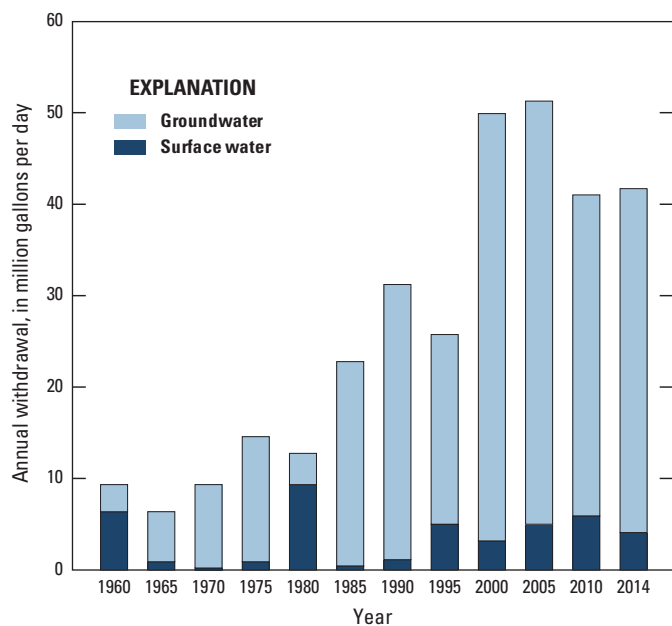


Figure 2. Water withdrawals in Franklin Parish, Louisiana, 1960–2014 (U.S. Geological Survey, 2016a; Collier, 2018).

Cockfield aquifer also contains freshwater in a limited area in the northwestern corner of the parish, and the Catahoula aquifer contains freshwater in a very limited area of the southern tip of the parish (fig. 1). The altitude of the base of fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) ranges from greater than 300 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) along the border in the northwestern corner of the parish in the Cockfield aquifer to greater than the NGVD 29 in the north-central part of the parish in the Mississippi River alluvial aquifer (Smoot, 1988). Generally, little to no fresh groundwater is available in a large area in the central part of the parish in the Mississippi River alluvial aquifer (fig. 1; Whitfield, 1975; Smoot, 1988).

Mississippi River Alluvial Aquifer

The Mississippi River alluvial aquifer, which extends across Franklin Parish, is a large regional aquifer present in various States and is also called the Mississippi River Valley alluvial aquifer in some publications (Saucier, 1994). The Mississippi River alluvial aquifer is composed of the sand and gravel component of sediments deposited primarily by the Mississippi River. These deposits generally grade from silt and clay at land surface to coarse sand and gravel at the base. The thickness of the Mississippi River alluvial deposit ranges from less than 80 ft in the southwestern part of the parish to greater than 140 ft in the northeastern part (Whitfield, 1975). The altitude of the base of the aquifer ranges from less than 20 ft below NGVD 29 to the north of Winnsboro to greater than 60 ft below NGVD 29 south of Wisner.

The primary source of recharge for the alluvial aquifer is the infiltration of precipitation, with secondary sources of recharge from streams and rivers during high stage. Groundwater discharges by way of flow into streams and rivers, evapotranspiration, and well withdrawals (Whitfield, 1975). Water generally moves southward in the alluvial aquifer but also moves westward towards Big Creek and the Boeuf River in the western part of the parish and eastward towards the Tensas River in the eastern part of the parish.

In 2001, the altitude of water levels in wells screened in the Mississippi River alluvial aquifer ranged from greater than 60 ft above NGVD 29 in the northern part of the parish to less than 40 ft above NGVD 29 in the southwestern and southeastern parts of the parish (Seanor and Kress, 2004). Water levels measured in wells Fr-358, Fr-720, and Fr-1092 (U.S. Geological Survey [USGS] site numbers 322210091290901, 320941091411301, and 315716091493001, respectively) screened in the Mississippi River alluvial aquifer generally fluctuated annually and declined less than 10 ft at Fr-358 from 1975 to 2016, less than 5 ft at Fr-720 from 1989 to 2016, and less than 5 ft at Fr-1092 from 1992 to 2016 (fig. 4).

State well-registration records listed 1,898 active water wells screened in the Mississippi River alluvial aquifer in Franklin Parish in 2016: 1,309 irrigation wells, 548 domestic wells, 28 public-supply wells, and 13 industrial wells. Depths of these wells ranged from 16 to 146 ft below land surface, and reported yields ranged from 5 to 3,000 gallons per minute (gal/min) (Louisiana Department of Natural Resources, 2016). In 2014, about 37.73 Mgal/d were withdrawn from the Mississippi River alluvial aquifer: 0.40 Mgal/d for aquaculture, 0.64 Mgal/d for rural domestic, 32.41 Mgal/d for general irrigation, 0.18 Mgal/d for

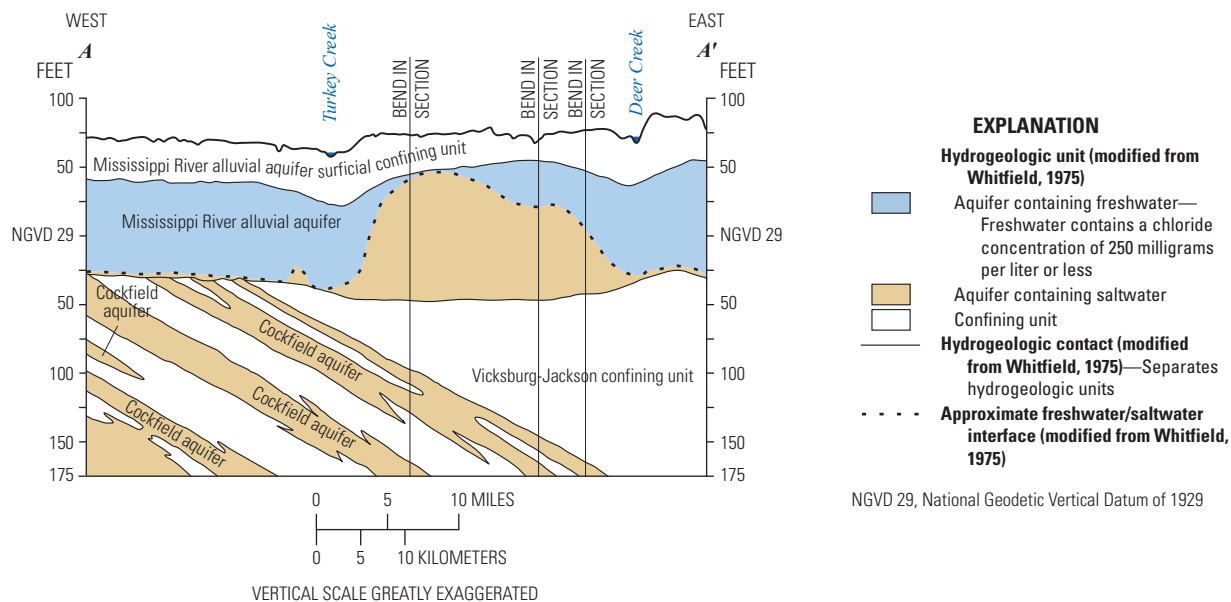


Figure 3. Generalized west-to-east hydrogeologic section through Franklin Parish, Louisiana, showing aquifer and confining unit intervals (individual sand and clay layers not shown). Modified from Whitfield (1975). Trace of section shown on figure 1.

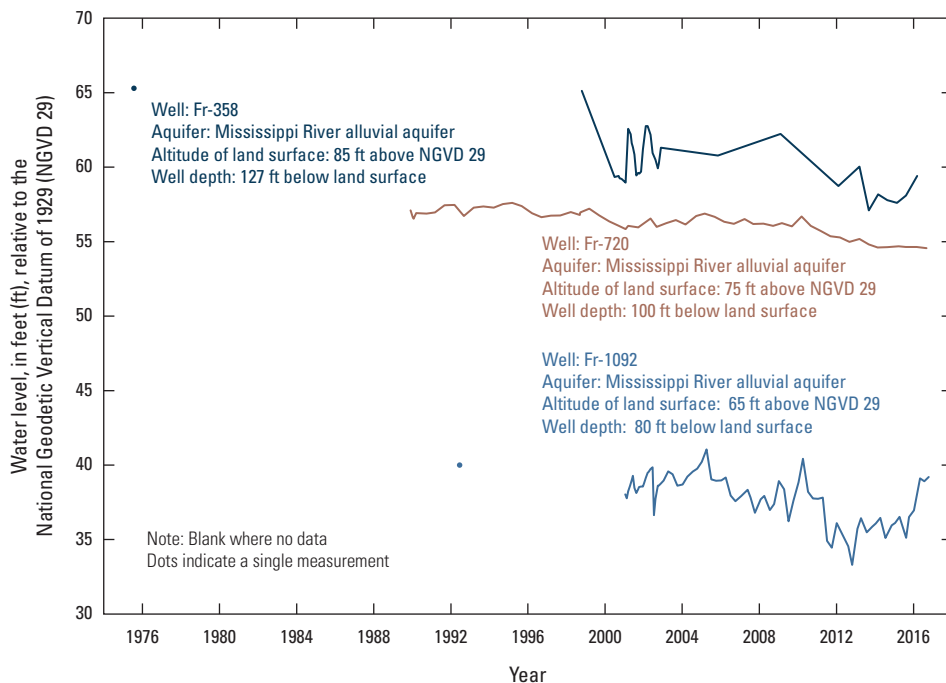


Figure 4. Water levels in wells Fr-358, Fr-720, and Fr-1092 screened in the Mississippi River alluvial aquifer in Franklin Parish, Louisiana (see figure 1 for well locations; U.S. Geological Survey, 2016b).

livestock, 0.11 Mgal/d for rice irrigation, 2.92 Mgal/d for industry, and 1.07 Mgal/d for public supply (Collier, 2018).

Cockfield Aquifer

The Cockfield aquifer underlies much of Franklin Parish but contains freshwater only in the northwestern corner of the parish (fig. 1). In that area, the altitude of the base of the Cockfield aquifer ranges from less than 300 ft below NGVD 29 near the border with Richland Parish to greater than 600 ft below NGVD 29 farther into the interior of the parish. Aquifer thickness in the

freshwater area ranges from 0 to 600 ft, with the deeper portions of the aquifer likely containing saltwater (Ryals, 1984). State well-registration records listed no active water wells screened in the Cockfield aquifer in 2016 (Louisiana Department of Natural Resources, 2016).

Groundwater Quality

Groundwater samples were collected in Franklin Parish during 1939–2016 from 250 wells screened in the freshwater areas and 119 wells screened in the saltwater areas of the Mississippi

River alluvial aquifer as part of an ongoing program to monitor the State's groundwater resources. These samples were found to be generally within the U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels² (SMCLs) for pH and sulfate (table 3). The median hardness values of 240 mg/L and 530 mg/L, respectively, as calcium carbonate, were within the veryhard³ range. Iron concentrations exceeded the SMCL in more than 60 percent of freshwater samples and in more than 80 percent of saltwater samples. Manganese concentrations exceeded the SMCL in more than 80 percent of freshwater samples and in more than 90 percent of saltwater samples. The median values for color (5 platinum cobalt units [PCU] for freshwater and saltwater) were well below the SMCL of 15 PCU.

²The SMCLs are Federal guidelines regarding cosmetic effects (such as tooth or skin discoloration), aesthetic effects (such as taste, odor, or color), or technical effects (such as damage to water equipment or reduced effectiveness of treatment for other contaminants) of potential constituents of drinking water. SMCLs were established as guidelines by the U.S. Environmental Protection Agency (2016).

³Hardness 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).

Although most of the Mississippi River alluvial aquifer that underlies Franklin Parish contains freshwater, a large area of saltwater has historically been present in the central part of the parish. The median chloride concentration in freshwater parts of the aquifer was 88 mg/L, whereas the median chloride concentration in saltwater parts of the aquifer was 510 mg/L, well above the SMCL of 250 mg/L. The 90th percentile chloride concentration in saltwater areas (3,170 mg/L) was more than 12 times the SMCL (table 3). During the period of record, a small number of wells have changed from freshwater to saltwater or vice versa and thus have samples in each group. Chloride concentrations in well samples may change over time as a result of groundwater movement.

Surface-Water Resources

Numerous surface-water resources in Franklin Parish are present in three drainage subbasins and flow in a general southerly direction. The Boeuf subbasin (Hydrologic Unit Code [HUC] 08050001) drains the majority of the western part of the parish, the Bayou Macon subbasin (HUC 08050002) drains the land adjacent to the northeastern border of the parish and extends southward, and

Table 3. Summary of selected water-quality characteristics for wells screened in the freshwater and saltwater areas of the Mississippi River alluvial aquifer in Franklin Parish, Louisiana, 1939–2016 (U.S. Geological Survey, 2016b).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; µS/cm, microsiemens per centimeter; SU, standard unit; CaCO₃, calcium carbonate; µg/L, micrograms per liter; <, less than; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2016); NA, not applicable]

	Temperature (°C)	Color (platinum cobalt units)	Specific conductance, field (µS/cm at 25 °C)	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, in µg/L (as Fe)	Manganese, filtered, in µg/L (as Mn)	Dissolved solids, filtered
Mississippi River alluvial aquifer freshwater (250 wells)													
Median	20	5	729	7.2	240	57	24	46	88	7.6	1,750	400	391
10th percentile	19	0	347	6.6	100	26	13.2	14.8	18	<1.0	<10	<10	230
90th percentile	20.5	10.8	1,430	7.8	368	90	37.4	120	220	28.4	7,660	1,300	749
Number of samples	113	57	169	112	280	97	97	67	387	89	98	84	85
Percentage of samples that do not exceed SMCLs	NA	96	NA	96	NA	NA	NA	NA	100	100	34	14	72
	Temperature (°C)	Color (platinum cobalt units)	Specific conductance, field (µS/cm at 25 °C)	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, in µg/L (as Fe)	Manganese, filtered, in µg/L (as Mn)	Dissolved solids, filtered
Mississippi River alluvial aquifer saltwater (119 wells)													
Median	20.6	5	3,460	7.3	530	120	47	280	510	5	3,700	283	1,380
10th percentile	19.5	0	1,630	7	348	70	32	178	270	<0.2	162	120	911
90th percentile	22.7	20	10,000	7.8	962	260	100	1,610	3,170	25	12,000	784	5,860
Number of samples	92	19	115	36	139	37	37	29	225	31	39	34	27
Percentage of samples that do not exceed SMCLs	NA	84	NA	97	NA	NA	NA	NA	0	100	13	6	0
SMCLs	NA	15	NA	6.5–8.5	NA	NA	NA	NA	250	250	300	50	500

the Tensas subbasin (HUC 08050003) drains the area adjacent to the southeastern border of the parish (fig. 1). In 2014, 4.06 Mgal/d were withdrawn from Bayou Macon (2.12 Mgal/d), Boeuf River (0.43 Mgal/d), and miscellaneous surface waters (1.51 Mgal/d) and used for general irrigation (3.60 Mgal/d) and rice irrigation (0.46 Mgal/d) purposes (tables 1–2) (Collier, 2018).

Boeuf Subbasin

The Boeuf subbasin covers the majority of the central and western parts of Franklin Parish. In this area, Big Creek flows along much of the northwestern boundary of Franklin Parish with Richland Parish and empties into the Boeuf River northwest of Liddieville (fig. 1). The Boeuf River then flows along much of the southwestern border with Caldwell Parish and then Catahoula Parish. The annual average streamflow during 1938–2015 was 268 cubic feet per second (ft³/s) at Boeuf River near Girard (USGS site number 07368000), which is upstream in Richland Parish. During this same period, the highest monthly average flow was 504 ft³/s in February, and the lowest was 85 ft³/s during August (USGS, 2016b). In the central part of the parish, Turkey Creek

empties into Turkey Creek Lake at the southern end of the parish (fig. 1).

Turkey Creek Lake covers approximately 3,080 acres. The lake was created in 1953 as a State Fish and Game Preserve. The lake has about 33 miles of shoreline, an average depth of 8 ft, and a maximum depth of 22 ft. Although the major tributaries to the lake are Turkey Creek and other small streams, backflow from the Boeuf River across the spillway occurs frequently. In addition to supporting fishing, boating, and hunting, the lake is also used as a local source of irrigation water (Louisiana Department of Wildlife and Fisheries, 2016).

Bayou Macon and Tensas Subbasins

The primary drainage of the Bayou Macon subbasin in Franklin Parish is Bayou Macon, which flows along the northeastern border of the parish and is fed by many small streams. Bayou Macon eventually discharges into the Tensas River southeast of Wisner. The average streamflow during 1934–92 was 975 ft³/s at Bayou Macon near Delhi (USGS site number 07370000; fig. 1) (USGS, 2016b). The Tensas River flows along the southeastern

Table 4. Summary of selected water-quality characteristics for the Boeuf River near Fort Necessity, the Tensas River at Clayton, and Bayou Macon near Delhi, Louisiana (U.S. Geological Survey, 2016b).

[Values are in milligrams per liter, except as noted. $\mu\text{S}/\text{cm}$, microsiemens per centimeter; $^{\circ}\text{C}$, degrees Celsius; SU, standard unit; CaCO_3 , calcium carbonate; $\mu\text{g}/\text{L}$, micrograms per liter; <, less than; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2016); NA, not applicable]

	Color (platinum cobalt units)	Specific conductance, field ($\mu\text{S}/\text{cm}$ at 25 $^{\circ}\text{C}$)	Oxygen, dissolved	pH, field (SU)	Hardness (as CaCO_3)	Chloride, filtered (as Cl)	Iron, filtered, in $\mu\text{g}/\text{L}$ (as Fe)	Manganese, filtered, in $\mu\text{g}/\text{L}$ (as Mn)	Dissolved solids, filtered
Boeuf River near Fort Necessity (1975–91) ¹									
Median	60	395	7.7	7.2	100	53	100	80	222
10th percentile	10	87	4.9	6.4	25	7	10	20	60
90th percentile	160	1,040	10.6	7.8	200	210	280	262	569
Number of samples	93	95	93	96	96	96	40	39	92
Percentage of samples that do not exceed SMCLs	24	NA	NA	88	NA	96	90	41	84
Tensas River at Clayton (1968–91) ²									
Median	30	292	7.9	7.3	110	18	25	30	168
10th percentile	10	123	5.6	6.5	42	4	<10	<10	87
90th percentile	120	525	10.8	8.2	210	45	51	80	313
Number of samples	57	58	35	58	58	58	10	10	58
Percentage of samples that do not exceed SMCLs	32	NA	NA	90	NA	100	100	70	100
Bayou Macon near Delhi (1952–98) ³									
Median	20	298	8.2	7.3	120	15	100	125	174
10th percentile	10	105	5.2	6.8	42	3.5	58	113	81
90th percentile	60	556	10.1	7.8	225	36	184	137	336
Number of samples	51	75	33	73	66	66	5	2	48
Percentage of samples that do not exceed SMCLs	45	NA	NA	97	NA	100	100	0	100
SMCLs	15	NA	NA	6.5–8.5	NA	250	300	50	500

¹U.S. Geological Survey site number 07369150 (see fig. 1).

²U.S. Geological Survey site number 07370190 (see fig. 1).

³U.S. Geological Survey site number 07370000 (see fig. 1).

parish border and is fed by many small streams. Upstream of Franklin Parish in Madison Parish, the annual average streamflow of the Tensas River at Tendal (USGS site number 07369500; fig. 1) was about 358 ft³/s during 1935–2015. During this period, the highest monthly average flow occurred during February (666 ft³/s), and the lowest monthly average flow occurred during August (83.9 ft³/s) (USGS, 2016b).

Surface-Water Quality

Water samples were collected from the Boeuf River near Fort Necessity (USGS site number 07369150) during 1975–91, Tensas River at Clayton (USGS site number 07370190) during 1968–91, and Bayou Macon near Delhi (USGS site number 07370000) during 1952–98 (fig. 1) as part of an ongoing program to monitor the State's surface-water resources. These samples were found to be generally within SMCLs for pH and concentrations of chloride and iron (table 4). Median hardness values were within the moderately hard range. Median values for dissolved-oxygen concentrations were greater than 7.5 mg/L; 5 mg/L is considered the minimum value for a diverse population of fresh, warmwater biota, including sport fish (Louisiana Department of Environmental Quality, 2008). Median values for color exceeded the SMCL (15 PCU).

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This fact sheet has been prepared by the USGS, in cooperation with the Louisiana Department of Transportation and Development (DOTD), as part of a program to document water use, availability, and quality in the parishes of Louisiana. Information on the availability, past and current water use, use trends, and water quality from groundwater and surface-water sources in the parish is presented here. Previously published reports (see References Cited section) and data stored in the USGS National Water Information System (USGS, 2016b) are the primary sources of the information presented here. Special thanks are given to Doug Taylor, Director, and Zahir “Bo” Bolourchi (retired), DOTD Cooperative Program with the USGS.

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