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LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

Prepared in cooperation with the Louisiana Department of Transportation and Development

Water Resources of Morehouse Parish, Louisiana

Introduction

Information concerning the availability, use, and quality of water in Morehouse 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 In 2014, 109.84 million gallons per day (Mgal/d) of water were withdrawn in Morehouse Parish: 78.05 Mgal/d from groundwater sources and 31.79 Mgal/d from surface-water sources[1] (table 1). Withdrawals for agricultural use—including general irrigation, rice irrigation, and livestock—accounted for about 97 percent (106.29 Mgal/d) of the total water withdrawn (table 2). Other categories of use included public supply, rural domestic, and industrial. Water-use data collected at 5-year intervals from 1960 to 2010 and again in 2014 indicated that water withdrawals peaked in 1975 at 167.82 Mgal/d (fig. 2).

[1]Water-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.

Groundwater Resources

The most heavily pumped freshwater-bearing aquifers in Morehouse Parish are the alluvial aquifers and the Upland terrace aquifer (fig. 3). The Sparta and Cockfield aquifers (figs. 1 and 3) also are important sources of groundwater. The Cook Mountain aquifer, composed of thin sand lenses within the clay of the Cook Mountain confining unit, can supply limited amounts of freshwater, but this aquifer is not discussed further in this report. The base of fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) is present in the Cockfield aquifer in the eastern part of the parish and within the Sparta aquifer in the western part of the parish. In the Cockfield aquifer, the altitude of the base of fresh groundwater ranges from less than 100 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) to greater than 300 ft below NGVD 29. In the Sparta aquifer, the altitude of the base of fresh groundwater ranges from less than 400 ft below NGVD 29 to greater than 700 ft below NGVD 29 (fig. 1; Smoot, 1988).

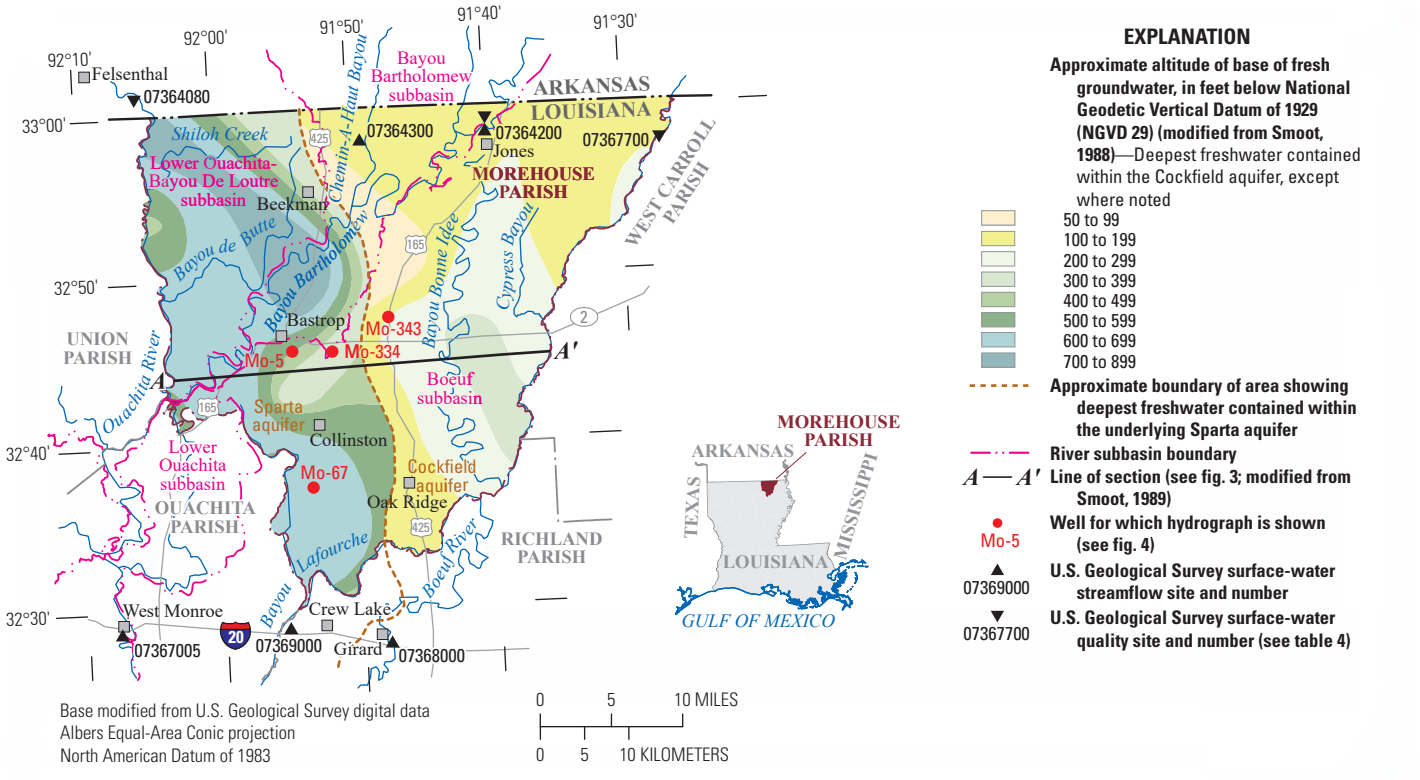

Figure 1. Location of study area, Morehouse Parish, Louisiana.

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

Aquifer or surface-water body	Groundwater	Surface water
Mississippi River alluvial aquifer	69.30	
Cockfield aquifer	0.27	
Upland terrace aquifer	8.24	
Sparta aquifer	0.24	
Ouachita River		14.39
Boeuf River		2.61
Miscellaneous surface waters		14.79
Total	**78.05**	**31.79**

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

[<, less than]

Use category	Groundwater	Surface water	Total
Public supply	3.38	0.00	3.38
Rural domestic	0.16	0.00	0.16
Livestock	0.01	<0.01	<0.01
Industrial	<0.01	0.00	<0.01
Rice irrigation	42.31	28.21	70.52
General irrigation	32.18	3.58	35.76
Total	**78.05**	**31.79**	**109.84**

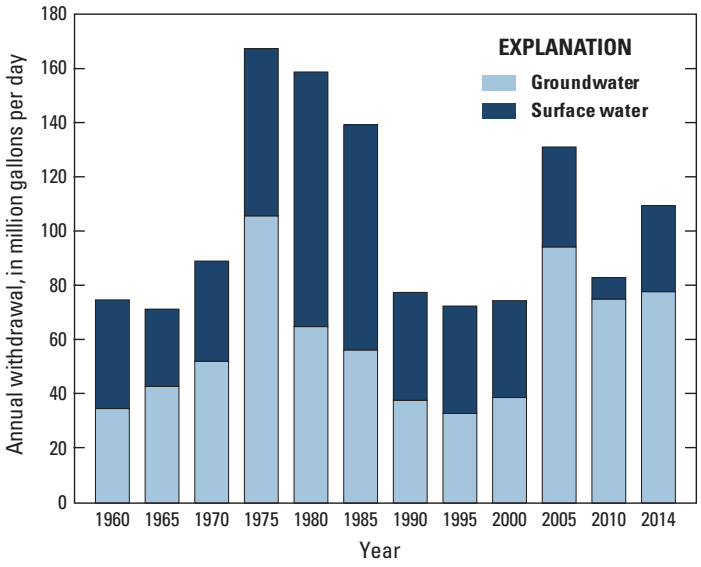

Figure 2. Water withdrawals in Morehouse Parish, Louisiana, 1960–2014 (U.S. Geological Survey, 2016; Collier, 2018).

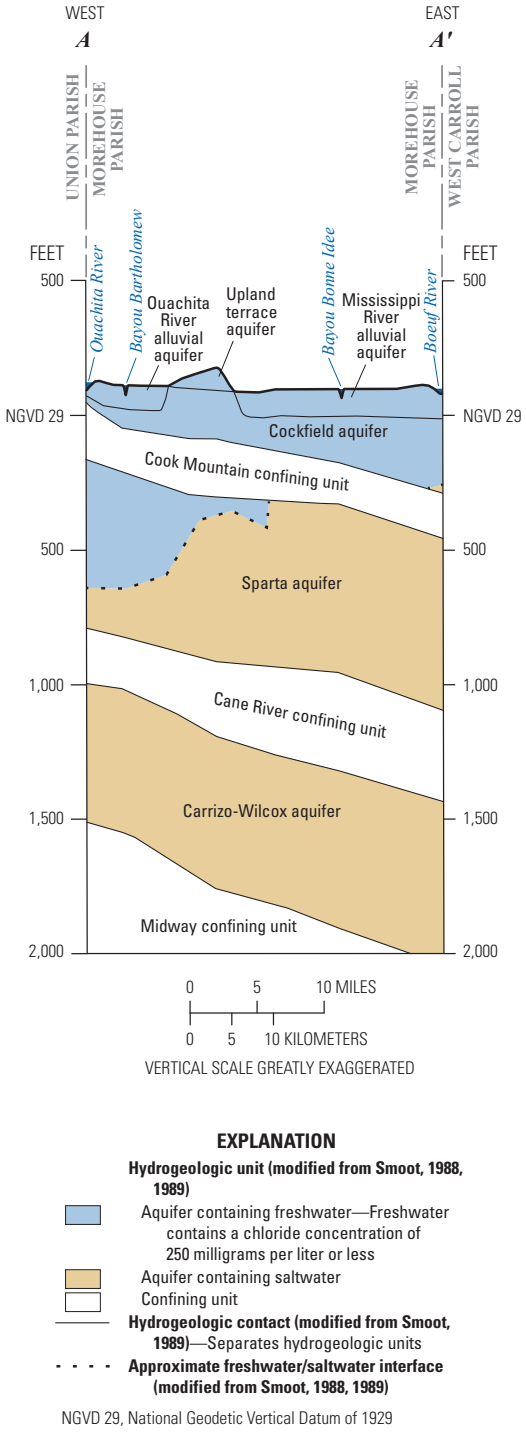

Figure 3. Idealized west-to-east hydrogeologic section through Morehouse Parish, Louisiana, showing aquifer and confining unit intervals (individual sand and clay layers not shown). Trace of section shown on figure 1.

Alluvial Aquifers

The alluvial aquifers include the Mississippi River alluvial aquifer (called the Mississippi River Valley alluvial aquifer in many publications) on the eastern side of the parish and the much smaller Ouachita River alluvial aquifer in the vicinity of the valleys of the Ouachita River and Bayou Bartholomew. The alluvial aquifers are hydraulically connected to one another and to the Upland terrace aquifer, where present, and the underlying Cockfield aquifer (Sanford, 1972; Seanor and Smoot, 1995).

The Mississippi River alluvial aquifer is composed of the sand and gravel part of the alluvial sediments deposited primarily by the Mississippi River, and the alluvial deposit thickness generally ranges from less than 80 ft in the south-central part of the parish to greater than 120 ft in the southern part (Whitfield, 1975). The altitude of the base of the aquifer ranges from greater than NGVD 29 in the northeastern part of the parish to greater than 40 ft below NGVD 29 in the central part and along the southeastern border of the parish (Whitfield, 1975).

In 1990, water levels in wells screened in the alluvial aquifers ranged from greater than 90 ft above NGVD 29 in the northern part of the parish to less than 60 ft above NGVD 29 in the southern part of the parish (Seanor and Smoot, 1995). Water levels at well Mo-67, located south of Collinston and screened in the Mississippi River alluvial aquifer (fig. 1), have fluctuated seasonally but show little overall trend from the mid-1950s to 2016 (fig. 4).

State well-registration records listed 1,259 active water wells screened in the alluvial aquifers in Morehouse Parish in 2016: 1,147 irrigation wells, 97 domestic wells, 4 industrial wells, and 11 public-supply wells. Well depths ranged from 25 to 155 ft below land surface with reported yields ranging from 5 to 3,800 gallons per minute (gal/min) (Louisiana Department of Natural Resources, 2016). In 2014, about 69.30 Mgal/d were withdrawn from the Mississippi River alluvial aquifer: 40.62 Mgal/d for rice irrigation, 28.64 Mgal/d for general irrigation, 0.03 Mgal/d for rural domestic, less than 0.01 Mgal/d for industrial, and less than 0.01 Mgal/d for livestock (Collier, 2018).

Upland Terrace Aquifer

The Upland terrace aquifer is present from west of Bayou Bartholomew in the northern part of the parish to west of Collinston in the southern part of the parish, except in the valleys of Bayou Bartholomew and the Ouachita River (Seanor and Smoot, 1995). The aquifer is composed of sand and gravel beds that alternate with clay and silt (Sanford, 1972). Water levels at well Mo-334, located east of Bastrop and screened in the Upland terrace aquifer (fig. 1), declined about 5 ft between 1967 and 2016 (fig. 4).

State well-registration records listed 285 active water wells screened in the Upland terrace aquifer in Morehouse Parish in 2016: 178 domestic wells, 68 irrigation wells, 33 public-supply wells, and 6 industrial wells. Depths of these wells ranged from 41 to 197 ft below land surface with reported yields ranging from 5 to 3,000 gal/min (Louisiana Department of Natural Resources, 2016). In 2014, about 8.24 Mgal/d were withdrawn from the Upland terrace aquifer: 3.54 Mgal/d for general irrigation, 2.91 for public supply, 1.69 Mgal/d for rice irrigation, and 0.10 Mgal/d for rural domestic (Collier, 2018).

Cockfield and Sparta Aquifers

The Cockfield and Sparta aquifers contain freshwater to various extents in Morehouse Parish (figs. 1 and 3) (Smoot, 1988; Brantly and Seanor, 1996). The altitude of the base of the Cockfield aquifer ranges from greater than 200 ft below NGVD 29 to less than 100 ft below NGVD 29; the aquifer is up to 400 ft thick. In the freshwater area of the Sparta aquifer (fig. 1), the altitude of the base of the aquifer ranges from greater than 1,100 ft below NGVD 29 to less than 800 ft below NGVD 29 (Ryals, 1984).

In 1993, water levels in wells screened in the Cockfield aquifer ranged from greater than 80 ft above NGVD 29 to about 60 ft above NGVD 29, with groundwater flow generally to the south (Brantly and Seanor, 1996). In 2012, water levels in wells screened in the Sparta aquifer in Morehouse Parish ranged from greater than NGVD 29 to about 40 ft below NGVD 29 with groundwater flow generally to the west-southwest (McGee and Brantly, 2015). Water levels at well Mo-343, located northeast of Bastrop and screened in the Cockfield aquifer (fig. 1), declined about 15 ft from 1969 to 2016 (fig. 4). Water levels at well Mo-5, located in Bastrop and screened in the Sparta aquifer (fig. 1), increased by about 50 ft from 1955 to 2016 (fig. 4).

State well-registration records listed 82 active water wells screened in the Sparta and Cockfield aquifers in Morehouse Parish in 2016: 51 domestic wells, 15 public-supply wells, 5 irrigation wells, and 11 industrial wells. Well depths ranged from 70 to 940 ft below land surface with reported yields ranging from 8 to 1,500 gal/min (Louisiana Department of Natural Resources, 2016). In 2014, about

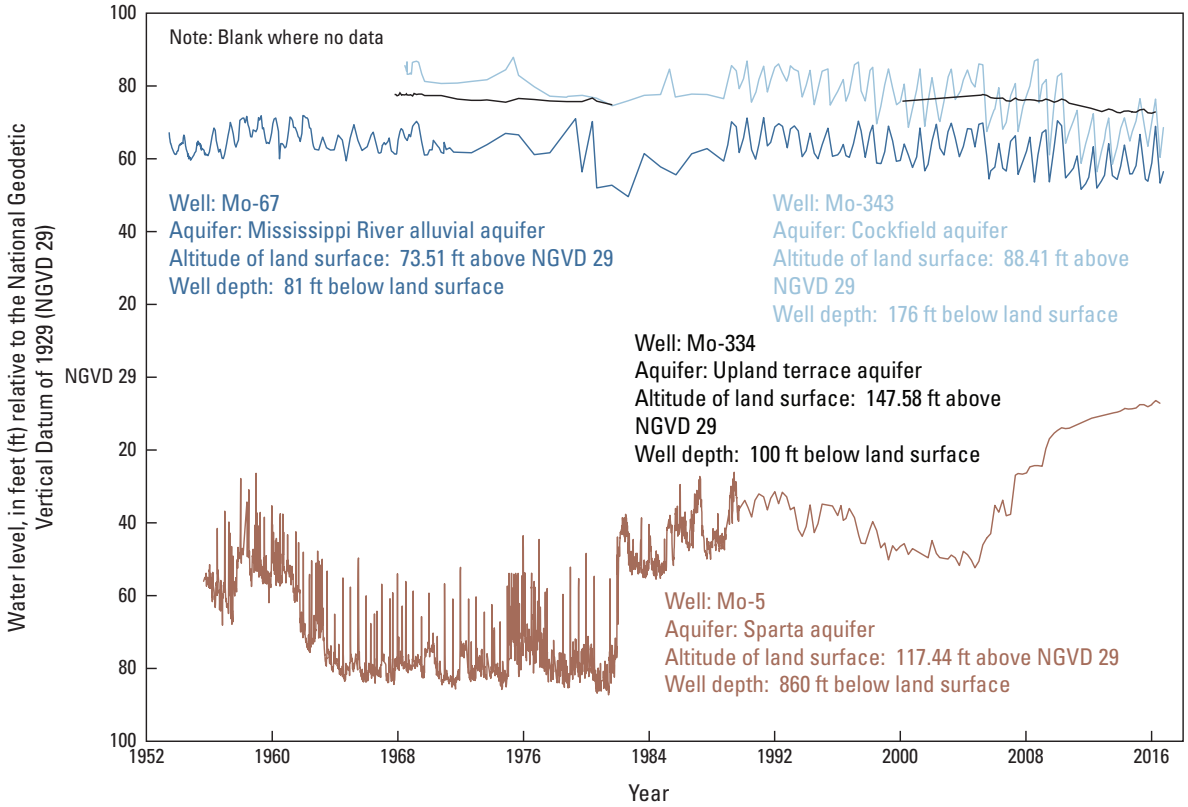

Figure 4. Water levels in well Mo-334 screened in the Upland terrace aquifer, Mo-343 screened in the Cockfield aquifer, Mo-67 screened in the Mississippi River alluvial aquifer, and well Mo-5 screened in the Sparta aquifer in Morehouse Parish, Louisiana (see fig. 1 for well location; U.S. Geological Survey, 2017).

Table 3. Summary of selected water-quality characteristics for freshwater from 96 wells screened in the alluvial aquifers, 61 wells screened in the Upland terrace aquifer, and 27 wells screened in the Cockfield aquifer in Morehouse Parish, Louisiana (U.S. Geological Survey, 2017).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; µS/cm, microsiemens per centimeter; SU, standard unit; $CaCO_3$, 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)	Dissolved oxygen	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
Alluvial aquifers (1941–2013; 96 wells)														
Median	19.2	5	968	2.3	7.1	242	72.5	17	27.1	36	15.5	2,400	470	329
10th percentile	18	0	416	2.3	6.2	75.6	9.7	2.6	9.2	9.4	<1	28.4	60.4	103
90th percentile	20.5	15	1,580	2.3	7.3	458	110	38	96.2	187	99.2	7,240	1,190	710
Number of samples	108	11	84	1	39	98	44	44	37	153	40	39	33	39
Percentage of samples that do not exceed SMCLs	NA	91	NA	NA	82	NA	NA	NA	NA	100	100	28	9	79
Upland terrace aquifer (1945–2014; 61 wells)														
Median	19.5	0	304	5.3	6.3	80	21	6	14	20	5	90	15	189
10th percentile	18.9	0	74	5.2	5.7	18.6	5	1	8	7	<0.2	11	<9.6	83
90th percentile	21	10	539	5.3	7.3	172	53.6	10	42	52.2	69.2	384	1,880	296
Number of samples	43	46	31	2	69	99	65	64	51	99	57	32	20	51
Percentage of samples that do not exceed SMCLs	NA	93	NA	NA	41	NA	NA	NA	NA	100	100	88	80	98
Cockfield aquifer (1941–1998; 27 wells)														
Median	20	10	428	0.2	6.9	140	38	9.5	28	14	1	980	215	261
10th percentile	19.3	0	230	0.2	6.7	53	19.6	5.7	11	2	0	140	<55	162
90th percentile	21	19	656	0.2	7.4	220	68.8	17.6	100	92.4	6.9	3,300	274	359
Number of samples	17	22	21	1	24	37	23	23	21	37	26	21	10	22
Percentage of samples that do not exceed SMCLs	NA	86	NA	NA	100	NA	NA	NA	NA	100	100	19	10	95
SMCLs	NA	15	NA	NA	6.5–8.5	NA	NA	NA	NA	250	250	300	50	500

0.51 Mgal/d were withdrawn from these aquifers in Morehouse Parish: 0.48 Mgal/d for public supply, 0.03 Mgal/d for rural domestic, and less than 0.01 Mgal/d for livestock (Collier, 2018).

Groundwater Quality

In Morehouse Parish, groundwater samples were collected from 96 wells screened in the alluvial aquifers during 1941–2013, 61 wells screened in the Upland terrace aquifer during 1945–2014, and 27 wells screened in the Cockfield aquifer during 1941–98 as part of an ongoing program to monitor the State's groundwater resources. These samples had median hardness[2] values ranging from moderately hard to very hard. Samples from the alluvial aquifers had a median chloride concentration of 36 mg/L, and median values of sulfate concentrations and color were within the U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels[3] (SMCLs) (table 3). At least 80 percent of samples from the Upland terrace aquifer were within SMCLs for color and for concentrations of chloride, sulfate, iron, manganese, and dissolved solids. Samples from the Cockfield aquifer were generally within SMCLs for color and concentrations of chloride, sulfate, and dissolved solids.

Surface-Water Resources

Surface-water resources in Morehouse Parish are present in four drainage subbasins (fig. 1). The Lower Ouachita-Bayou De Loutre subbasin (Hydrologic Unit Code [HUC] 08040202) drains the northwestern part of the parish, the Bayou Bartholomew subbasin

[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).

[3]The 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).

Table 4. Summary of selected water-quality characteristics for samples from the Boeuf River near the Arkansas-Louisiana State line; Bayou Bartholomew near Jones, La.; and Ouachita River near Felsenthal, Ark., in the Morehouse Parish area, Louisiana (U.S. Geological Survey, 2017).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; µS/cm, microsiemens per centimeter; SU, standard unit; $CaCO_3$, 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)	Dissolved oxygen	pH, field (SU)	Hardness (as $CaCO_3$)	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
Boeuf River near the Arkansas-Louisiana State line (1957–98)[1]											
Median	20	30	309	7.9	7.3	100	34	18	30	40	206
10th percentile	8	10	96	5.7	6.7	37	5.3	8	<8.6	9.2	96
90th percentile	30	120	706	10.7	8	240	97	38	164	72	420
Number of samples	145	114	132	92	153	97	131	120	9	9	103
Percentage of samples that do not exceed SMCLs	NA	33	NA	NA	92	NA	100	100	100	67	95
Bayou Bartholomew near Jones, La. (1908–92)[2]											
Median	19	50	100	6.4	6.8	37	7.7	6.6	95	145	91
10th percentile	8	5	51	4.3	6.2	15	2.8	3	<9.7	58	52
90th percentile	28	100	273	9.1	7.6	100	20	11	213	300	169
Number of samples	137	130	147	84	157	123	146	136	10	8	119
Percentage of samples that do not exceed SMCLs	NA	25	NA	NA	82	NA	100	100	90	13	100
Ouachita River near Felsenthal, Ark. (1949–81)[3]											
Median	24	17	583	7.2	6.8	78	155	9.2	230	90	369
10th percentile	8.8	5	146	5.5	6.3	28	29	5.4	112	28	105
90th percentile	29.6	45	1830	10.4	7.3	210	529	15	396	274	1,110
Number of samples	105	965	1,080	98	1,052	1,029	1,067	1,066	9	9	997
Percentage of samples that do not exceed SMCLs	NA	49	NA	NA	84	NA	69	100	67	33	63
SMCLs	NA	15	NA	NA	6.5–8.5	NA	250	250	300	50	500

[1]U.S. Geological Survey site number 07367700 (see fig. 1).

[2]U.S. Geological Survey site number 07364200 (see fig. 1).

[3]U.S. Geological Survey site number 07364080 (see fig. 1).

(HUC 08040205) drains the north-central part, the Boeuf subbasin (HUC 08050001) drains the eastern part, and the Lower Ouachita subbasin (HUC 08040207) drains a small area in the west-southwestern part (U.S. Geological Survey [USGS], 2017).

In 2014, 31.79 Mgal/d were withdrawn from surface-water bodies in the parish for agricultural purposes: 28.21 Mgal/d for rice irrigation, 3.58 Mgal/d for general irrigation, and less than 0.01 Mgal/d for livestock (table 2) (Collier, 2018).

Lower Ouachita-Bayou De Loutre and Lower Ouachita Subbasins

The Ouachita River is the primary stream draining the Lower Ouachita-Bayou De Loutre and Lower Ouachita subbasins in Morehouse Parish. The Ouachita River enters Louisiana from Arkansas and flows in a southerly direction along much of the western border of the parish. Various tributaries flow into the Ouachita River within these subbasins, including Bayou de Butte, Shiloh Creek, and other small streams (fig. 1). The annual average streamflow for the Ouachita River at West Monroe (USGS site number 07367005), located downstream of Morehouse Parish (fig. 1), was about 19,480 cubic feet per second (ft^3/s) during 2007–15 from a drainage area of 15,298 square miles (mi^2). During this same period, the highest monthly average flow occurred during April (34,030 ft^3/s) and the lowest during August (6,453 ft^3/s) (USGS, 2017). Flow in the Ouachita River is affected by reservoirs and control structures located north of Morehouse Parish in Arkansas.

Bayou Bartholomew Subbasin

Bayou Bartholomew enters Louisiana from Arkansas and flows in a general southwesterly direction, entering Morehouse Parish near Jones and discharging into the Ouachita River southwest of Bastrop (fig. 1). Various tributaries flow into Bayou Bartholomew, including

Chemin-A-Haut Bayou, and numerous other small streams. The average streamflow for Bayou Bartholomew near Jones (USGS site number 07364200) was 1,373 ft^3/s during 1982–2016 from a drainage area of 1,187 mi^2. The average streamflow for Chemin-A-Haut Bayou near Beekman (USGS site number 07364300) was 294 ft^3/s during 1955–80 from a drainage area of 271 mi^2 (USGS, 2017).

Boeuf Subbasin

The Boeuf River originates north of Morehouse Parish and flows along the eastern parish border in a general south-southwesterly direction. East of Oak Ridge, the river splits into Bayou Lafourche and a much smaller Boeuf River. Other streams in the subbasin include Bayou Bonne Idee and Cypress Bayou. The annual average streamflow for Bayou Lafourche near Crew Lake (USGS site number 07369000), located just south of the southern tip of Morehouse Parish (fig. 1), was 1,922 ft^3/s during 1938–2016. The annual average streamflow for the Boeuf River near Girard (USGS site number 07368000) (fig. 1) was 267 ft^3/s during 1939–2016 (USGS, 2017).

Surface-Water Quality

Water samples were collected from the Boeuf River near the Arkansas-Louisiana State line (USGS site number 07367700) during 1957–98, Bayou Bartholomew near Jones, La. (USGS site number 07364200) during 1908–92, and Ouachita River near Felsenthal, Ark. (USGS site number 07364080) during 1949–81 as part of an ongoing program to monitor Louisiana's surface-water resources (fig. 1). Median values for pH and concentrations of chloride, sulfate, iron, and dissolved solids were within SMCLs (table 4). Median hardness values were within the soft to moderately hard ranges for all three sites. Median values for dissolved-oxygen concentration were greater than 6.0 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).

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This fact sheet has been prepared by the U.S. Geological Survey (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, 2017) 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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