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LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

Prepared in cooperation with the Louisiana Department of Transportation and Development

Water Resources of Livingston Parish, Louisiana

Introduction

Information concerning the availability, use, and quality of water in Livingston Parish, Louisiana (fig. 1), is critical for proper water-resource 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. 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In 2010, about 13.6 million gallons per day (Mgal/d) of water were withdrawn in Livingston Parish, almost all from groundwater sources[1] (table 1). Withdrawals for public-supply use accounted for nearly 87 percent (11.76 Mgal/d) of the total water withdrawn (table 2). Other categories of use included industrial, rural domestic, livestock, general irrigation, and aquaculture. Water-use data collected at 5-year intervals from 1960 to 2010 (fig. 2) indicated that water withdrawals peaked in 2005 at about 13.9 Mgal/d. The general rise in groundwater withdrawals since 1975 is largely attributable to increasing withdrawals for public supply from 0.82 Mgal/d in 1960 to 11.76 Mgal/d in 2010 (U.S. Geological Survey, 2016).

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

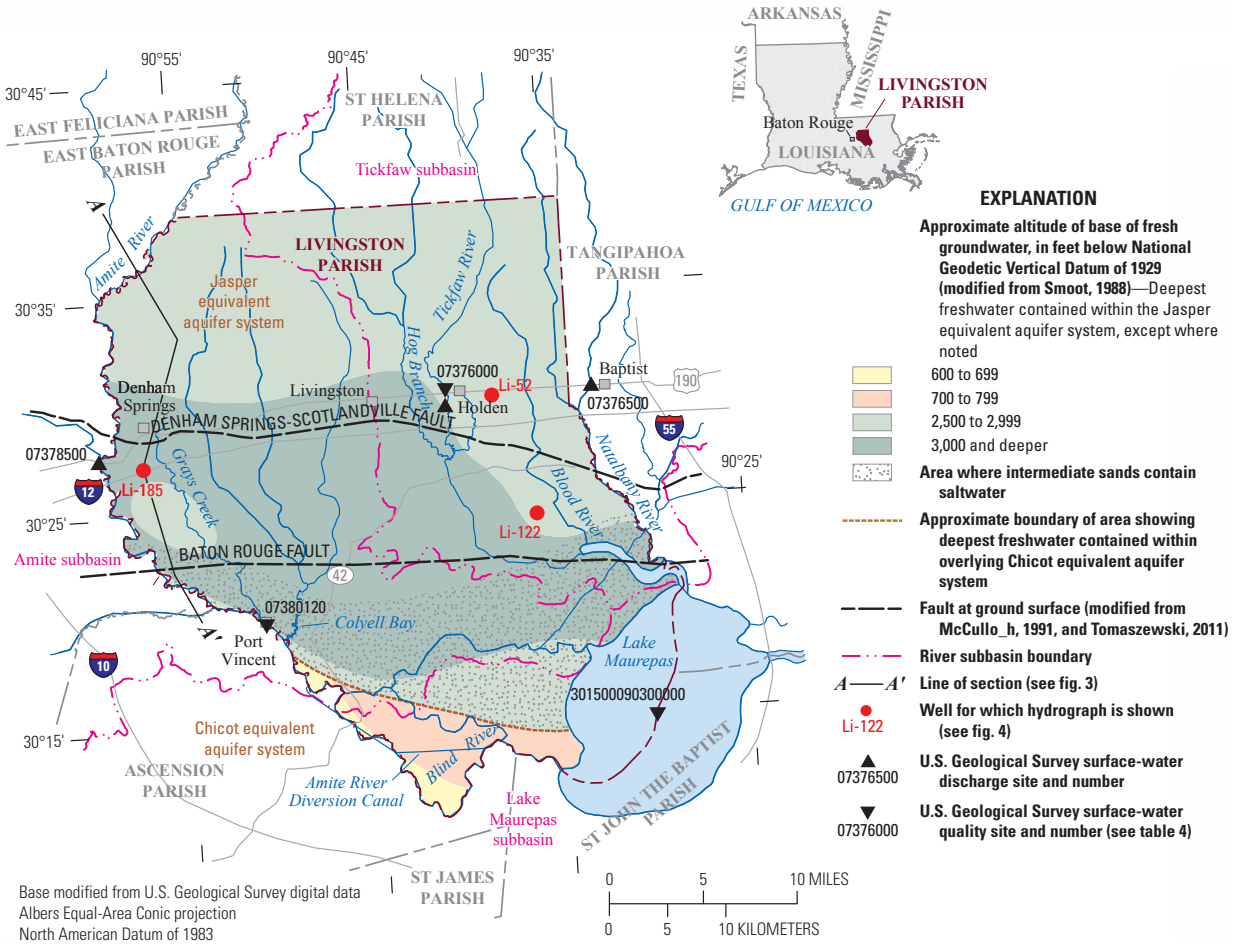

Figure 1. Location of study area, Livingston Parish, Louisiana.

Table 1. Water withdrawals, in million gallons per day, by source in Livingston Parish, Louisiana, 2010 (Sargent, 2011; B.P. Sargent, U.S. Geological Survey, written commun., 2011).

Aquifer system or surface-water body	Groundwater	Surface water
Chicot equivalent aquifer system	2.17	
Evangeline equivalent aquifer system	4.92	
Jasper equivalent aquifer system	6.46	
Miscellaneous streams		0.04
Total	**13.55**	**0.04**

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

Use category	Groundwater	Surface water	Total
Public supply	11.76	0.00	11.76
Industrial	0.10	0.00	0.10
Rural domestic	1.40	0.00	1.40
Livestock	0.05	0.04	0.09
General irrigation	0.06	0.00	0.06
Aquaculture	0.18	0.00	0.18
Total	**13.55**	**0.04**	**13.59**

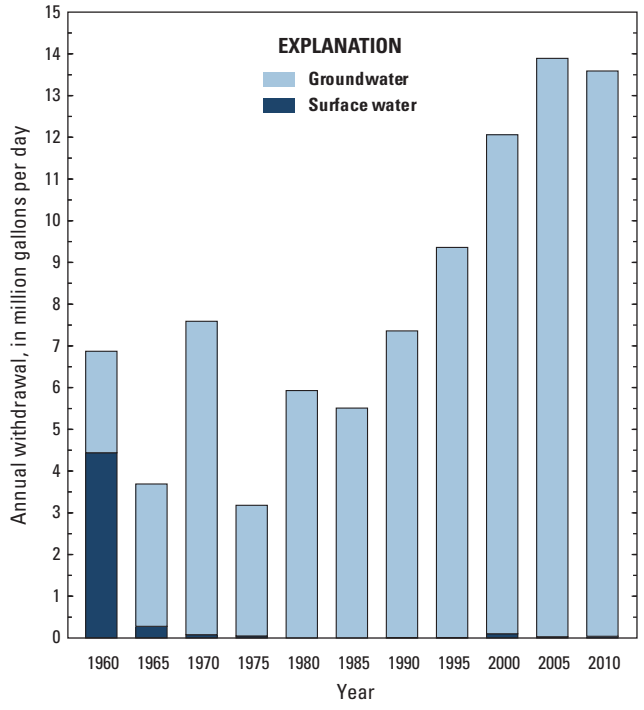

Figure 2. Water withdrawals in Livingston Parish, Louisiana, 1960–2010 (Sargent, 2011).

Groundwater Resources

The primary sources of fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) in Livingston Parish are, from shallowest to deepest, the Chicot equivalent, Evangeline equivalent, and Jasper equivalent aquifer systems (fig. 3). The aquifer systems have similar characteristics: southerly dipping and thickening unconsolidated deposits of silt, sand, and gravel separated by discontinuous layers of clay and sandy clay. Recharge to the aquifer systems results primarily by infiltration of precipitation in a regional area that extends northward from northern Livingston Parish into southwestern Mississippi about 100 miles (mi) (Griffith, 2003). The Denham Springs-Scotlandville Fault and the Baton Rouge Fault are east-west trending growth faults that extend

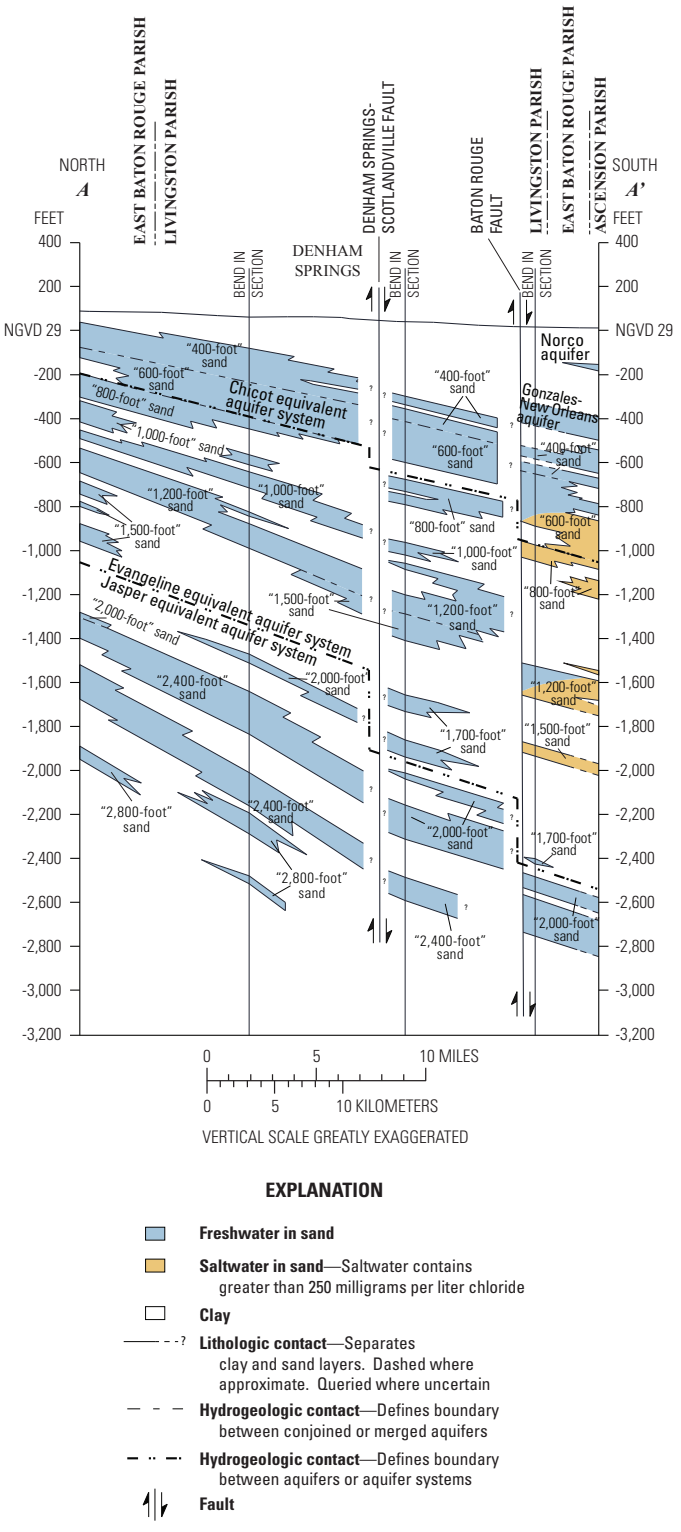

Figure 3. Generalized north-to-south hydrogeologic section through parts of western Livingston Parish, Louisiana (modified from Griffith, 2003). Trace of section shown on figure 1.

across the parish (fig. 1). There is little evidence that the Denham Springs-Scotlandville Fault affects groundwater hydrology in the parish, but the Baton Rouge Fault generally coincides with an abrupt change in water quality and potential changes in water levels in aquifers underlying the parish. North of the fault, freshwater is found consistently from the shallowest aquifers to the base of freshwater; south of the fault, many intermediate aquifers contain saltwater (water with a chloride concentration greater than 250 mg/L) (Griffith, 2003).

Chicot Equivalent Aquifer System

The primary aquifers composing the Chicot equivalent aquifer system in Livingston Parish are, from shallowest to deepest, the shallow sands of the Baton Rouge area, the Gonzales-New Orleans aquifer, the Upland terrace aquifer, and the "400-foot" and "600-foot" sands of the Baton Rouge area (Griffith, 2003). A clay layer is generally present at or near land surface in Livingston Parish (Tomaszewski, 1988). The bottom of the aquifer system reaches depths of about 1,200 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) near the southern parish line (Griffith, 2003).

In 2014–15, water levels in the Chicot equivalent aquifer system in Livingston Parish ranged from a high of about 75 ft above NGVD 29 along the northern parish line to a low of near the NGVD 29 south of the Baton Rouge Fault. The general direction of groundwater flow was southward (R.B. Fendick, U.S. Geological Survey, written commun., 2015). Water levels in the "400-foot" sand declined about 8 ft during 1990–2015 at well Li-122 (fig. 4), which is located in east-central Livingston Parish (fig. 1).

State well-registration records listed 2,638 active water wells screened in the Chicot equivalent aquifer system in Livingston Parish in 2015, including 2,410 domestic, 115 public supply wells, 98 irrigation wells, and 15 industrial wells. Depths of these wells ranged from 11 to 928 ft below land surface, with reported yields ranging from 2 to 500 gallons per minute (gal/min) (Louisiana Department of Natural Resources, 2015). In 2010, withdrawals from the Chicot equivalent aquifer system in Livingston Parish totaled about 2.17 Mgal/d (table 1) and included about 0.49 Mgal/d for public supply, 0.09 Mgal/d for industry, 1.40 Mgal/d for rural-domestic use, 0.04 Mgal/d for livestock, 0.05 Mgal/d for general irrigation, and 0.10 Mgal/d for aquaculture (B.P. Sargent, U.S. Geological Survey, written commun., 2015).

The Evangeline Equivalent Aquifer System

The Evangeline equivalent aquifer system in Livingston Parish comprises the "800-foot," "1,000-foot," "1,200-foot," "1,500-foot," and "1,700-foot" sands of the Baton Rouge area (fig. 3). These aquifers are generally composed of fine- to coarse-grained sand, with the altitude of the base of the aquifer system ranging from about 1,200 ft below NGVD 29 near the northern parish line to about 2,800 ft below NGVD 29 near the southern parish line (Griffith, 2003).

The "1,500-foot" and "1,700-foot" sands typically have similar water levels, indicating that these sands are hydraulically connected. In 2003, water levels in the "1,500-foot" and "1,700-foot" sands north of the Baton Rouge Fault ranged from about 115 ft above NGVD 29 in the extreme northeastern corner of the parish to about 45 ft below NGVD 29 in western Livingston Parish. The direction of groundwater flow was generally to the southwest (Prakken, 2004). Water levels in the "1,700-foot" sand declined about 14 ft during 1990–2015 at well Li-52 (fig. 4), located north of Highway I-12 in eastern Livingston Parish (fig. 1).

State well-registration records listed 74 active water wells screened in the Evangeline equivalent aquifer system in Livingston Parish in 2015, including 39 domestic, 28 public supply, 5 irrigation, and 2 industrial wells. Depths of these wells ranged from 315 to 2,300 ft below land surface, with reported yields ranging from about 10 to 1,900 gal/min (Louisiana Department of Natural Resources, 2015). In 2010, withdrawals from the Evangeline equivalent aquifer system in Livingston Parish were about 4.92 Mgal/d (table 1) and included about 4.89 Mgal/d for public supply, 0.01 Mgal/d for industrial use, 0.01 Mgal/d for livestock, and less than 0.01 Mgal/d for general irrigation (B.P. Sargent, U.S. Geological Survey, written commun., 2015).

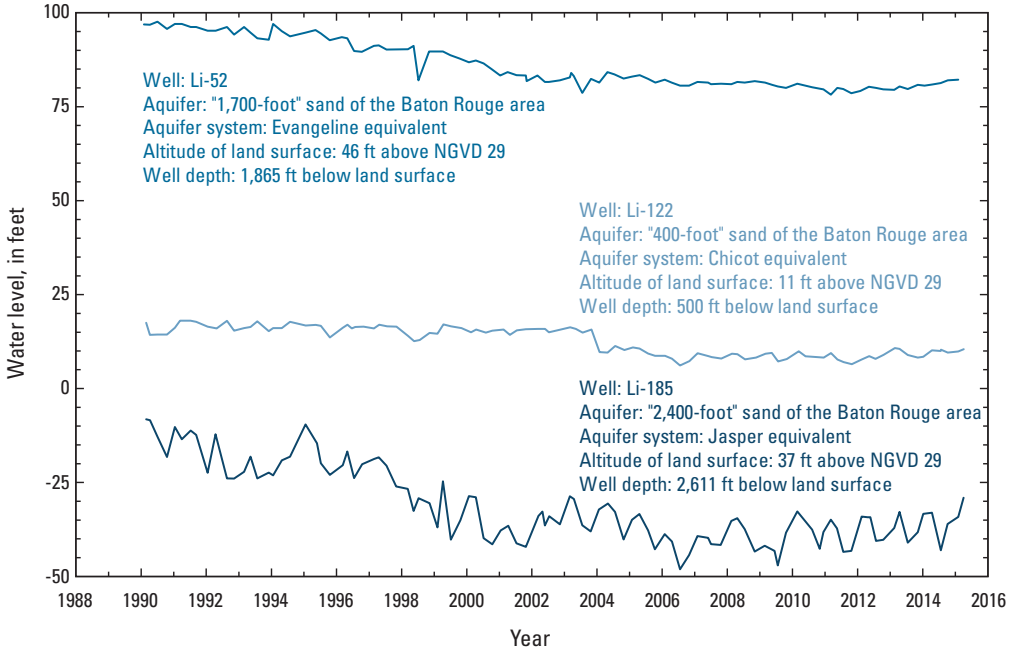

Figure 4. Water levels in well Li-122 screened in the Chicot equivalent aquifer system, well Li-52 screened in the Evangeline equivalent aquifer system, and well Li-185 screened in the Jasper equivalent aquifer system in Livingston Parish, Louisiana (see fig. 1 for well locations; U.S. Geological Survey, 2015a). Altitudes of land surface and water level are measured in feet (ft) relative to the National Geodetic Vertical Datum of 1929 (NGVD 29).

The Jasper Equivalent Aquifer System

The Jasper equivalent aquifer system in Livingston Parish comprises the "2,000-foot," "2,400-foot," and "2,800-foot" sands of the Baton Rouge area (fig. 3), which are generally composed of fine- to coarse-grained sand (Griffith, 2003). The altitude of the base of the aquifer system is not well defined but is probably about 2,000 ft below NGVD 29 near the northern parish line to over 3,400 ft below NGVD 29 near the southern parish line (Griffith, 2003). Saltwater is present in the lower sands of the aquifer system in the southern part of the parish.

Groundwater in the "2,000-foot," "2,400-foot," and "2,800-foot" sands in Livingston Parish generally flows westward towards withdrawal centers at or near the city of Baton Rouge in neighboring East Baton Rouge Parish (fig. 1) (Martin and others, 1988). In 2006, water levels in the "2,800-foot" sand north of the Baton Rouge Fault ranged from about 60 ft above NGVD 29 in the northeastern corner of the parish to less than 10 ft below NGVD 29 near Denham Springs (Fendick, 2007). Water levels in the "2,400-foot" sand declined about 20 ft during 1990–2015 at well Li-185 (fig. 4), located in western Livingston Parish (fig. 1).

State well-registration records listed 49 active water wells screened in the Jasper equivalent aquifer system in Livingston Parish in 2015, including 33 public supply, 10 domestic, 4 irrigation, and 2 industrial. Depths of these wells ranged from 1,540 to 3,081 ft below land surface, with reported yields ranging from about 10 to 1,934 gal/min (Louisiana Department of Natural Resources, 2015). In 2010, withdrawals from the Jasper equivalent aquifer system in Livingston Parish were about 6.46 Mgal/d (table 1) and included about 6.39 Mgal/d for public supply and 0.08 Mgal/d for industrial use (B.P. Sargent, U.S. Geological Survey, written commun., 2015).

Groundwater Quality

Analyses of water samples from the Chicot, Evangeline, and Jasper equivalent aquifer systems in Livingston Parish indicated that freshwater from these aquifer systems is generally soft,[2] with median values within U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels (SMCLs)[3] for color, pH, chloride, and dissolved solids (table 3). Median values for temperature generally increased with depth, whereas median color values remained constant. Locally, concentrations of iron and manganese can greatly exceed SMCLs.

Surface-Water Resources

Surface-water resources in Livingston Parish are present in the regional Lake Maurepas Basin, which is divided into three subbasins in Livingston Parish. The Lake Maurepas Basin (Hydrologic Unit Code [HUC] 080702) comprises the Amite subbasin (HUC 08070202) which drains much of the western half of the parish (fig. 1), the Tickfaw subbasin (HUC 08070203) which drains much of the eastern half of the parish, and the Lake Maurepas subbasin (HUC 08070204) which drains the southern tip of the parish. Streams in Livingston Parish generally flow in a southerly or easterly direction, receive flow from groundwater discharge and runoff, and eventually discharge into Lake Maurepas. In 2010, about 0.04 Mgal/d of surface water were withdrawn from miscellaneous streams (table 1) in Livingston Parish for livestock (table 2).

Amite Subbasin

The Amite subbasin extends from southern Livingston Parish northward into Mississippi about 30 mi. The Amite River forms near the border of St. Helena and East Feliciana Parishes and the State of Mississippi and flows along the majority of the western borders of St. Helena and Livingston Parishes. Amite River tributaries in Livingston Parish include Grays Creek, Colyell Bay, and other small streams (fig. 1). During 1913–2013, the annual average streamflow for the Amite River near Denham Springs (site number 07378500; fig. 1) was 2,069 cubic feet per second (ft^3/s) from a drainage area of 1,280 square miles (mi^2) (U.S. Geological Survey, 2015b).

Tickfaw Subbasin

The Tickfaw subbasin extends from the northern shore of Lake Maurepas northward into Mississippi about 11 mi. The Tickfaw subbasin is drained primarily by the Tickfaw River (fig. 1), which originates in Mississippi. Tributaries of the Tickfaw River in Livingston Parish include Hog Branch, Blood River, Natalbany River, and other small streams. The annual average streamflow of the Tickfaw River at Holden (site number 07376000) was 373 ft^3/s during 1941–2014 from a drainage area of about 247 mi^2. The annual average streamflow of the Natalbany River at Baptist (site number 07376500) was 116 ft^3/s during 1943–2014 from a drainage area of about 80 mi^2 (U.S. Geological Survey, 2015b).

Lake Maurepas Subbasin

The Lake Maurepas subbasin is mostly composed of wetlands and Lake Maurepas in Livingston Parish. Water in this subbasin drains into Lake Maurepas through Blind River, which receives flow from the Amite River Diversion Canal (fig. 1), and other small creeks. Lake Maurepas is a shallow lake with mild tidal effects, a surface area of 91 mi^2, and an average depth of about 7 ft (Shampine, 1971).

Surface-Water Quality

Analyses of water samples from the Amite River at Port Vincent (site number 07380120) and from the Tickfaw River at Holden (site number 07376000) (fig. 1) indicated that samples from these rivers are generally soft with respect to hardness (table 4) and median values do not exceed SMCLs for concentrations of chloride, sulfate, and iron. Dissolved-oxygen concentrations were generally greater than 5 mg/L, which is considered the minimum value for a diverse population of fresh, warmwater biota, including sport fish (Louisiana Department of Environmental Quality, 2008).

[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 nonenforceable 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 drinking water. SMCLs were established as guidelines by the U.S. Environmental Protection Agency (2016).

Table 3. Summary of selected water-quality characteristics for freshwater in the Chicot, Evangeline, and Jasper equivalent aquifer systems in Livingston Parish, Louisiana (U.S. Geological Survey, 2015c).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; PCU, platinum cobalt unit; µS/cm, microsiemen per centimeter; SU, standard unit; $CaCO_3$, calcium carbonate; µg/L, microgram per liter; <, less than; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2016); 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 equivalent aquifer system, 1940–2005 (46 wells)									
Median	21.5	5	234	6.8	38	6.4	400	180	167
10th percentile	20.0	0	99	5.9	14	4.5	20	<10	77
90th percentile	23.4	23	387	7.7	57	13	2,000	450	285
Number of samples	39	18	37	34	38	44	27	22	23
Percentage of samples that do not exceed SMCLs	NA	83	NA	68	NA	100	41	23	100
Evangeline equivalent aquifer system, 1940–2005 (52 wells)									
Median	27.0	5	253	7.9	5	3.9	120	30	193
10th percentile	25.0	0	191	7.0	0.5	2.0	20	20	173
90th percentile	30.4	10	287	8.5	20	6.1	1,100	260	212
Number of samples	32	37	41	43	46	50	34	28	36
Percentage of samples that do not exceed SMCLs	NA	95	NA	91	NA	100	65	54	100
Jasper equivalent aquifer system, 1949–2005 (50 wells)									
Median	31.5	5	261	8.2	7	4.0	150	40	197
10th percentile	28.0	0	216	7.2	0.6	2.7	10	<10	172
90th percentile	34.8	27	648	8.9	21	10	850	230	345
Number of samples	31	34	39	34	37	50	23	17	30
Percentage of samples that do not exceed SMCLs	NA	79	NA	71	NA	100	74	59	90
SMCLs									
	NA	15	NA	6.5–8.5	NA	250	300	50	500

Water samples analyzed during 1975–81 indicated that samples from the center of Lake Maurepas (site number 301500090300000; fig. 1) generally do not exceed SMCLs for pH and concentrations of chloride, sulfate, and iron (table 4). Although generally below SMCLs, the maximum chloride concentration of these samples was 1,200 mg/L (U.S. Geological Survey, 2015c). There are areal variations in the salinity of the lake because of the influx of brackish water at the eastern end of the lake and inflows of freshwater at the western and northern ends of the lake (Shampine, 1971).

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Table 4. Summary of selected water-quality characteristics for the Amite and Tickfaw Rivers and Lake Maurepas, Livingston Parish, Louisiana (U.S. Geological Survey, 2015c).

[Values are in milligrams per liter, except as noted. µS/cm, microsiemen per centimeter; °C, degrees Celsius; SU, standard unit; $CaCO_3$, calcium carbonate; µg/L, microgram per liter; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2016); 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)
Amite River at Port Vincent, 1958–98[1]										
Median	105	7.8	6.8	19	5.0	1.8	11	14	3.8	270
10th percentile	68	5.1	6.1	13	3.4	0.8	6.6	7.0	1.6	150
90th percentile	265	9.9	7.3	33	9.1	2.7	37	65	7.8	430
Number of samples	76	41	83	76	76	76	75	82	81	35
Percentage of samples that do not exceed SMCLs	NA	NA	69	NA	NA	NA	NA	100	100	69
Tickfaw River at Holden, 1955–76[2]										
Median	35	8.5	6.4	8	1.7	0.8	3.5	4.5	1.0	110
10th percentile	32	7.2	5.9	6	1.1	0.5	3.2	3.9	0.2	9
90th percentile	40	10.2	6.9	9	2.3	1.0	4.0	5.4	2.4	290
Number of samples	44	16	44	44	44	44	43	44	44	14
Percentage of samples that do not exceed SMCLs	NA	NA	39	NA	NA	NA	NA	100	100	86
Lake Maurepas in middle near Manchac, 1975–81[3]										
Median	281	7.8	7.2	44.5	7.2	5.8	25	59.5	17	140
10th percentile	109.2	6.8	6.8	22	4.3	2.6	10.6	17	6.8	20
90th percentile	1,676	10.2	7.5	160	17.1	31.1	174	464	65	320
Number of samples	139	134	140	140	140	140	87	140	139	140
Percentage of samples that do not exceed SMCLs	NA	NA	99	NA	NA	NA	NA	84	100	88
SMCLs										
	NA	NA	6.5–8.5	NA	NA	NA	NA	250	250	300

[1]Site number 07380120.

[2]Site number 07376000.

[3]Site number 301500090300000.

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