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Prepared in cooperation with the Louisiana Department of Transportation and Development

Water Resources of St. Landry Parish, Louisiana

Introduction

Information concerning the availability, use, and quality of water in St. Landry 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 In 2014, about 116.75 million gallons per day (Mgal/d) of water were withdrawn in St. Landry Parish: about 98.13 Mgal/d from groundwater sources and 18.62 Mgal/d from surface-water sources[1] (table 1). Withdrawals for agricultural use, composed of general irrigation, rice irrigation, aquaculture, and livestock uses, accounted for about 90 percent (105.31 Mgal/d) of the total water withdrawn (table 2). Other categories of use included public supply, which accounted for about 8 percent of the total water withdrawn (9.77 Mgal/d), industry which accounted for about 1 percent (1.03 Mgal/d), and rural domestic which accounted for about 1 percent (0.65 Mgal/d). Water-use data collected at 5-year intervals from 1960 to 2010 and again in 2014 indicated that water withdrawals peaked in 1965 at 194.57 Mgal/d due to a large reported surface-water withdrawal of 144.00 Mgal/d for power generation that was not reported for other years (fig. 2; Sargent, 2011; Collier, 2018).

[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 three primary freshwater-bearing aquifers or aquifer systems in St. Landry Parish are the Atchafalaya aquifer, the Chicot aquifer system, and the Evangeline aquifer (figs. 1 and 3). The Atchafalaya aquifer truncates or overlies the Chicot aquifer system and is present across an area that includes the approximate eastern half of St. Landry Parish (Milner and Fisher, 2009). The Evangeline aquifer underlies the Chicot aquifer system. A surficial confining unit consisting of clay, silt, and interbedded sand is present across St. Landry Parish and ranges in thickness from 40 to 160 feet (ft) (figs. 1 and 3; Sargent, 2004). The surficial confining unit restricts downward leakage to underlying aquifers and makes the area ideal for rice farming (Lovelace, 1999).

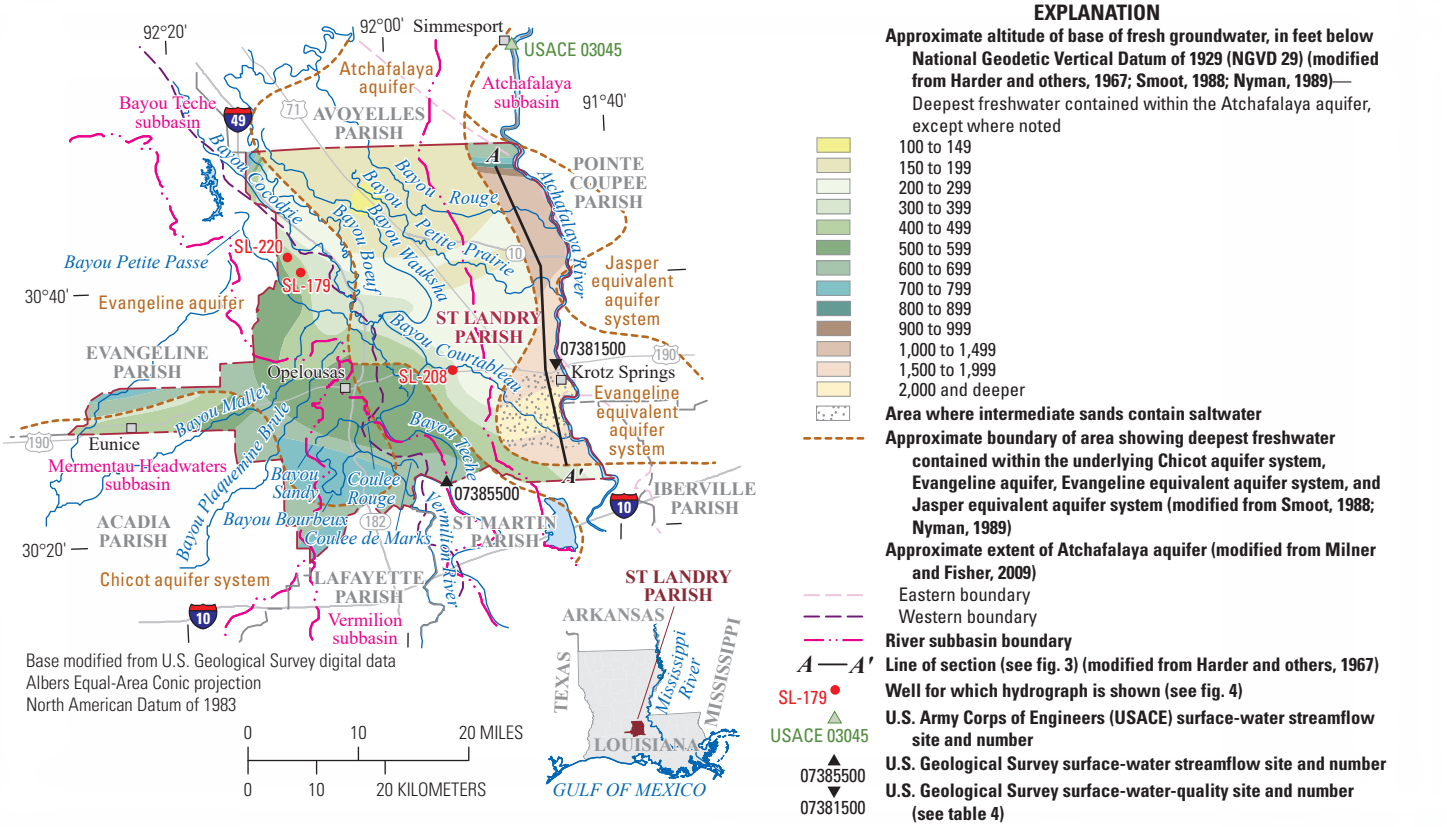

Figure 1. Location of study area, St. Landry Parish, Louisiana.

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

Aquifer or surface-water body	Groundwater	Surface water
Chicot aquifer system	59.98	
Evangeline aquifer system	2.33	
Atchafalaya aquifer[1]	35.82	
Bayou Boeuf		4.83
Bayou Teche		4.83
Miscellaneous streams		8.97
Total	**98.13**	**18.62**

[1]Grouped with Mississippi River alluvial aquifer in water-use data (Collier, 2018).

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

Use category	Groundwater	Surface water	Total
Public supply	9.77	0.00	9.77
Industry	1.03	0.00	1.03
Rural domestic	0.65	0.00	0.65
Livestock	0.14	0.03	0.17
Rice irrigation	41.53	7.33	48.86
General irrigation	15.84	3.96	19.80
Aquaculture	29.19	7.30	36.48
Total	**98.13**	**18.62**	**116.75**

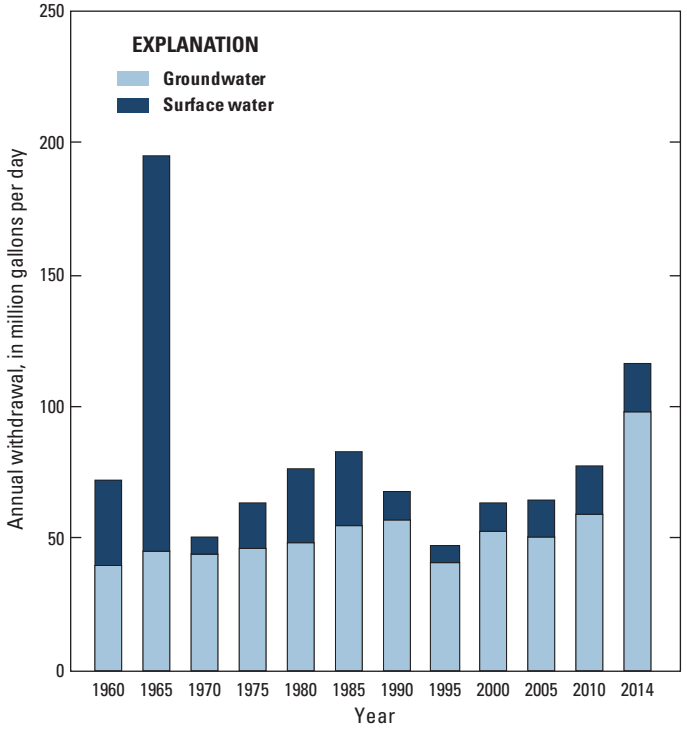

Figure 2. Water withdrawals in St. Landry Parish, Louisiana, 1960–2014 (Sargent, 2011; Collier, 2018).

The base of fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) is present to depths as great as 2,000 ft below the National Geodetic Vertical Datum of 1929 (NGVD 29) along the eastern margin of the parish, where fresh groundwater extends into the Evangeline aquifer or the Evangeline equivalent aquifer system of southeast Louisiana (fig. 1). In most of the rest of the parish, fresh groundwater is only present at shallower depths, and the base of fresh groundwater ranges from 150 ft below NGVD 29 in the northern and central parts of the parish to approximately 700 ft below NGVD 29 in the southern parts of the parish.

Atchafalaya Aquifer

The Atchafalaya aquifer is composed of gravelly deposits that filled scours made on the Mississippi River floodplain (figs. 1 and 3) (Milner and Fisher, 2009). The Atchafalaya aquifer is difficult to separate from the adjacent or underlying Chicot aquifer system because of their similar sediment composition, and the two are often considered as one hydrogeologic unit (Harder and others, 1967; Hosman and others, 1970; Milner and Fisher, 2009). The top of the Atchafalaya aquifer is defined by the base of the surficial confining unit.

Water levels in the Atchafalaya aquifer are affected by the stage of the Atchafalaya River and are generally higher towards the river (Fendick and others, 2011). Seasonal water-level fluctuations may occur in some areas because of withdrawals for aquaculture and rice irrigation (30.75 Mgal/d in 2014) from the Atchafalaya aquifer in St. Landry Parish (Collier, 2018). Well SL-208, which is screened in the Atchafalaya aquifer, shows short-term water-level fluctuations and a slight downward trend (figs. 1 and 4). Within St. Landry Parish, 24 water-level measurements taken during January 1990–March 1993 at 22 monitoring wells screened in the Atchafalaya aquifer ranged from 3 ft below to 25 ft above NGVD 29 (U.S. Geological Survey [USGS], 2018). Because of increased withdrawals of groundwater since 1990, these water levels may not reflect current conditions. A lack of groundwater-level data precludes analysis of water-level trends.

State well-registration records listed 907 active water wells screened in the Atchafalaya aquifer in St. Landry Parish in 2017: 589 for domestic use, 277 for irrigation, 25 for public supply, and 16 for industrial use. Well depths ranged from 60 to 316 ft below land surface, and reported yields ranged from 3 to 5,904 gallons per minute (gal/min) (Louisiana Department of Natural Resources, 2017). A total of 35.82 Mgal/d were withdrawn from the Atchafalaya aquifer in 2014 in St. Landry Parish: about 17.03 Mgal/d for rice irrigation, 4.43 Mgal/d for general irrigation, 13.72 Mgal/d for aquaculture, and a combined amount of 0.64 Mgal/d in other use categories including industry, rural domestic, and livestock (Collier, 2018).

Chicot Aquifer System

The Chicot aquifer system underlies all of St. Landry Parish and is composed of coarse sand and gravel. At the southern tip of the parish, the aquifer forms two discrete sandy units separated by a clayey confining unit (Nyman, 1984). Where this confining unit is present, the Chicot aquifer system is differentiated into an "upper" and "lower" sand unit; where the confining unit is not present, it is undifferentiated. The base of the Chicot aquifer system ranges from approximately 200 ft below NGVD 29 in northern St. Landry Parish to 900 ft below NGVD 29 in the southern part of the parish (Whitfield, 1975). The Chicot aquifer system contains fresh groundwater in St. Landry Parish west of the approximate western extent of the Atchafalaya aquifer, and in some areas below the Atchafalaya aquifer (fig. 1). Declining water levels in the Chicot aquifer system have resulted in saltwater encroachment from the

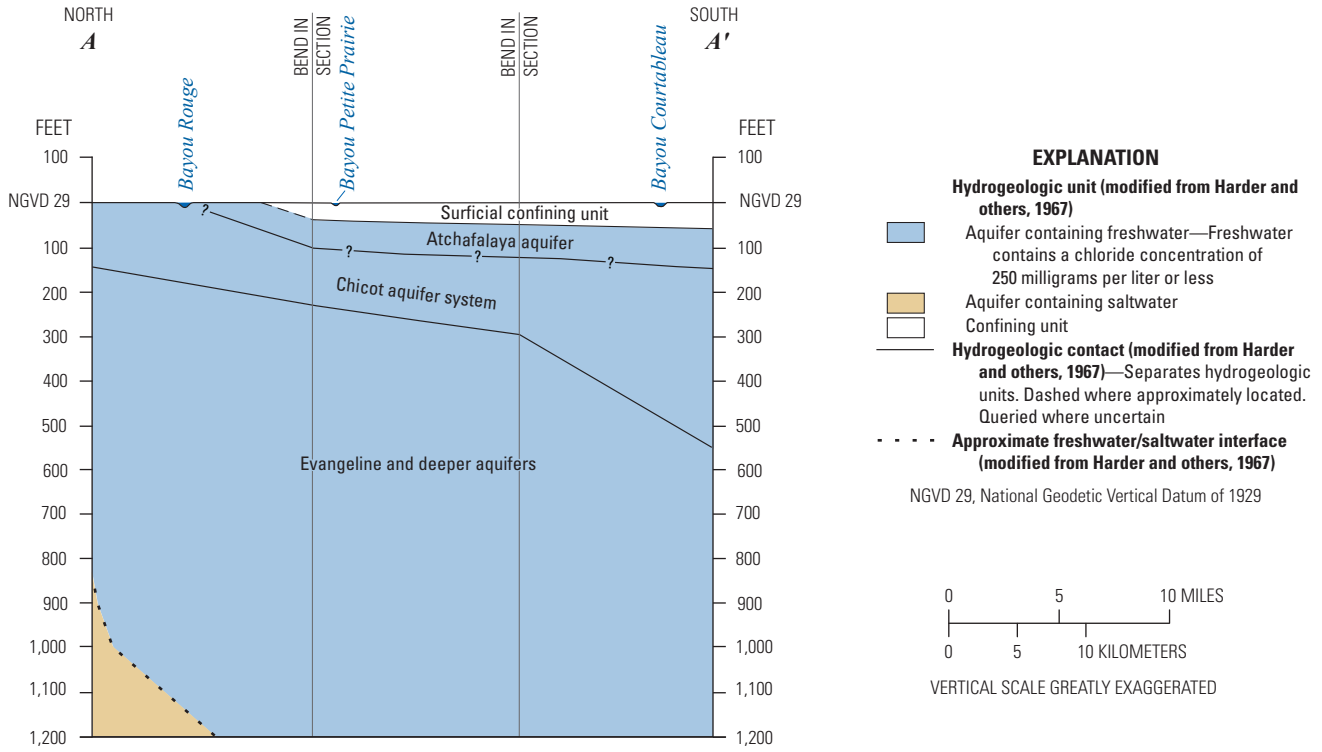

Figure 3. Idealized north-to-south hydrogeologic section through St. Landry Parish, Louisiana, showing aquifer and confining unit intervals (individual sand and clay layers not shown). Trace of section shown on figure 1.

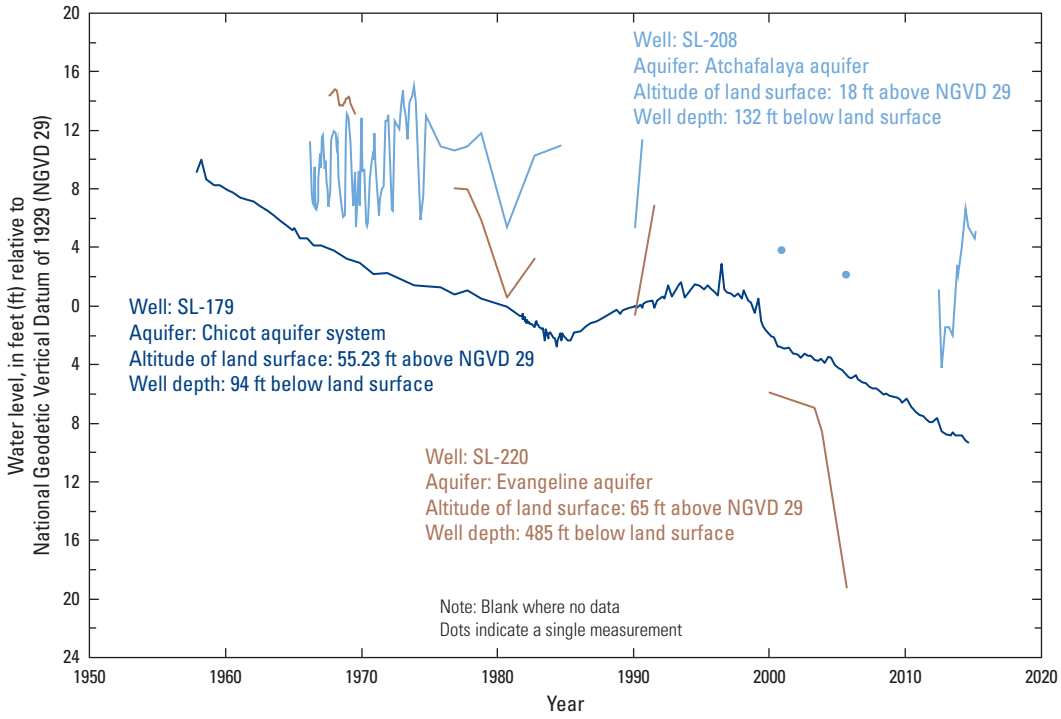

Figure 4. Water levels in well SL-208 screened in the Atchafalaya aquifer, well SL-179 screened in the Chicot aquifer system, and well SL-220 screened in the Evangeline aquifer in St. Landry Parish, Louisiana (see fig. 1 for well locations; U.S. Geological Survey, 2018).

underlying Evangeline aquifer or other sources in parts of southwest Louisiana (Nyman, 1984). Saltwater encroachment began affecting some irrigation wells screened in the Chicot aquifer system in St. Landry Parish beginning in the late 1990s (Milner and Fisher, 2009).

Water levels in wells screened in the Chicot aquifer system vary across St. Landry Parish because of localized withdrawals, heavy pumping in neighboring parishes, and its connection with the overlying Atchafalaya aquifer in the eastern part of the parish. Groundwater in the Chicot aquifer system generally flows from east to west towards an area of lower groundwater levels in adjacent southern Evangeline and Acadia Parishes (Lovelace and others, 2001). Water levels show a trend of declines at several wells in St. Landry Parish, including SL-179, which shows a decline of approximately 20 ft between 1957 and 2015 (fig. 4).

In 2014, about 59.98 Mgal/d were withdrawn from the Chicot aquifer system in St. Landry Parish: 24.50 Mgal/d for rice irrigation, 15.47 Mgal/d for aquaculture, 11.40 Mgal/d for general irrigation, 8.20 Mgal/d for public supply, and a combined amount of 0.40 Mgal/d for industrial, rural domestic, and livestock uses (Collier, 2018). State well-registration records listed 1,092 active water wells screened in the Chicot aquifer system in St. Landry Parish in 2017: 623 wells for domestic use, 380 for irrigation, 77 for public supply, 11 for industry, and 1 for power generation. Well depths ranged from 70 to 740 ft below land surface, and reported yields ranged from 3 to 4,700 gal/min (Louisiana Department of Natural Resources, 2017).

Evangeline Aquifer

The Evangeline aquifer underlies the Chicot aquifer system (fig. 3) and comprises hundreds of feet of interbedded sand, silt, and clay of Pliocene to Miocene age. The Chicot aquifer system and Evangeline aquifer are often separated by thin clay beds in southwestern Louisiana, but in some places, the upper sands of the Evangeline aquifer are in direct connection with the Chicot aquifer system (Whitfield, 1975). The Evangeline aquifer forms a southward-dipping and thickening wedge of sediment, with the upper beds dipping about 20–40 feet per mile. The sands of the aquifer are fine grained, discontinuous, and thin, but are thought to be sufficiently interconnected to function as an aquifer unit at a regional scale. The top of the Evangeline aquifer ranges from about 200 ft below NGVD 29 in northern St. Landry Parish to 900 ft below NGVD 29 in the south, while the base ranges from 2,000 ft below NGVD 29 in the north to 4,000 ft below NGVD 29 in the south (Whitfield, 1975). The aquifer contains some freshwater in its upper sands in western St. Landry Parish, but contains no freshwater in the north-central part of the parish. Along the eastern margin of the parish, where the Evangeline aquifer transitions into the Evangeline equivalent aquifer system, the base of freshwater deepens and ranges from 700 ft below NGVD 29 in the north to about 2,000 ft below NGVD 29 in the south (fig. 1).

Water levels in well SL-220, which is screened in the Evangeline aquifer, declined by about 34 ft during 1967–2006 (fig. 4), possibly in response to nearby pumping in Evangeline Parish where withdrawals from the aquifer are greater. State well-registration records listed 39 active water wells screened in the Evangeline aquifer in St. Landry Parish in 2017: 20 for public supply, 10 for domestic use, 8 for industrial use, and 1 for irrigation. Well depths ranged from 300 to 1,905 ft below land surface, and reported yields ranged from 15 to 2,000 gal/min (Louisiana Department of Natural Resources, 2017).

About 2.33 Mgal/d were withdrawn from the Evangeline aquifer in St. Landry Parish in 2014, with about 67 percent of that amount used for public supply. Individual sands can supply from 100 to 1,000 gal/min, compared to a rate of 500 to 2,500 gal/min for the overlying combined Chicot aquifer system and Atchafalaya aquifer (Hosman and others, 1970).

Groundwater Quality

Groundwater samples were collected in St. Landry Parish during 1940–2001 from 274 wells screened in the Chicot aquifer system, including the upper and lower sand units and undifferentiated sands, and during 1942–80 from 25 wells screened in the Atchafalaya aquifer as part of an ongoing program to monitor the State's groundwater resources (USGS, 2018). Measurements of pH and color

Table 3. Summary of selected water-quality characteristics for groundwater samples from 274 wells screened in the Chicot aquifer system, including wells screened in the upper and lower sand units and undifferentiated sands, and 25 wells screened in the Atchafalaya aquifer in St. Landry Parish, Louisiana (U.S. Geological Survey, 2018).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; PCU, platinum cobalt units; µS/cm, microsiemens per centimeter; SU, standard unit; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; 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 $CaCO_3$)	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
Chicot aquifer system—Upper and lower sand units and undifferentiated sands (1940–2001)													
Median	21	5	518.5	7.4	170	41	13	40	31	0.6	520	125	337
10th percentile	21	0	189.5	6.5	52	14	4.12	10	7.1	0	45	20	145.7
90th percentile	23	15	846	8.1	257	70.2	22	180	89.6	6.4	2,250	390	564.9
Number of samples	131	97	184	127	202	113	113	109	283	114	114	84	96
Percentage of samples that do not exceed SMCLs	NA	92	NA	88	NA	NA	NA	NA	98	100	34	23	81
Atchafalaya aquifer (1942–80)													
Median	21	5	632	7.2	290	61	28	23	22	1	840	420	396
10th percentile	20.3	0	309.4	5.9	42	7.2	3.9	10.8	3	0.2	40	108	197.6
90th percentile	21.4	104	1,200	8.2	468	105.2	63.6	116	110	13.4	9,200	602	681.6
Number of samples	15	11	23	18	21	13	13	13	29	17	9	5	11
Percentage of samples that do not exceed SMCLs	NA	82	NA	83	NA	NA	NA	NA	100	100	22	0	73
SMCLs	NA	15	NA	6.5–8.5	NA	NA	NA	NA	250	250	300	50	500

and concentrations of chloride and sulfate were generally within the U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels[2] (SMCLs; table 3; U.S. Environmental Protection Agency, 2016). The median hardness values of 290 mg/L for the Atchafalaya aquifer and 170 mg/L for the Chicot aquifer system were within the very hard[3] range and the hard range, respectively. Manganese and iron concentrations in the Chicot aquifer system and Atchafalaya aquifer exceeded the SMCLs of 50 and 300 micrograms per liter (µg/L), respectively, for most samples.

Surface-Water Resources

Surface-water resources in St. Landry Parish are present in four drainage subbasins and generally flow towards the south. The Bayou Teche subbasin (Hydrologic Unit Code [HUC] 08080102) is the largest and drains the central area of the parish. The Atchafalaya subbasin (HUC 08080101) drains the eastern side, and the Vermilion (HUC 08080103) and the Mermentau Headwaters (HUC 08080201) subbasins drain the southwestern corner (fig. 1) (USGS, 2018). In 2014, 18.62 Mgal/d of surface water were withdrawn in St. Landry Parish: 7.30 Mgal/d for aquaculture, 3.96 Mgal/d for general irrigation, 7.33 Mgal/d for rice irrigation, and 0.03 Mgal/d for livestock (table 2) (Collier, 2018).

Bayou Teche Subbasin

The primary drainage of the Bayou Teche subbasin is Bayou Teche. Several streams that flow into the northwestern corner of the parish ultimately flow into Bayou Teche, including Bayou Boeuf, Bayou Cocodrie, and Bayou Wauksha (fig. 1). The annual average streamflow for Bayou Teche at Arnaudville (USGS site number 07385500) was about 1,047 cubic feet per second (ft^3/s) during 1983–2004. During this period, the highest monthly average streamflow was 1,164 ft^3/s in February, and the lowest was 944 ft^3/s in October. In 2014, a total of 4.83 Mgal/d of water was withdrawn from Bayou Teche, and an additional 4.83 Mgal/d was withdrawn from Bayou Boeuf in St. Landry Parish, with about half of those withdrawals used for rice irrigation and the other half for aquaculture (Collier, 2018).

Atchafalaya Subbasin

The primary drainage of the Atchafalaya subbasin is the Atchafalaya River, which defines the eastern edge of the subbasin as well as the eastern border of St. Landry Parish. The Atchafalaya River and its associated swampland support various commercial and recreational activities, including fishing and hunting. Additionally, its floodplain provides an outlet for the floodwaters of the Mississippi River by way of a series of locks, pumping stations, and drainage structures. An average of 25 percent of the Mississippi River streamflow was diverted to the Atchafalaya River through the Old River Control Structure during 1984–2007 (Kroes and Kraemer, 2013). Springtime flooding of the river maintains the habitats of diverse plant and wildlife that live in the subbasin's wetlands and swamps (U.S. Army Corps of Engineers, 2007). Streams that drain into the Atchafalaya River within the subbasin include Bayou Cortableau and Bayou Rouge. The daily average streamflow of the Atchafalaya River for the period from January 1, 1963, through January 1, 2016, was 225,520 ft^3/s at Simmesport, La. (U.S. Army Corps of Engineers gage number 03045, fig. 1). During this period, the highest monthly average streamflow was 342,173 ft^3/s in May, and the lowest was 108,526 ft^3/s in September.

Vermilion and Mermentau Headwaters Subbasins

The southwestern corner of St. Landry Parish lies within the Vermilion and Mermentau Headwaters subbasins. The Vermilion subbasin is drained primarily through the Vermilion River, which originates near the southern border of St. Landry Parish at the confluence of various streams, including Bayou Bourbeux, Coulee Rouge, Coulee de Marks, and Bayou Sandy.

The Mermentau Headwaters subbasin drains the far western area of the parish. Most drainage of this area of the parish and subbasin is by way of Bayou Mallet and Bayou Plaquemine Brule, which flow in a southwestern direction.

[2]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).

[3]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).

Table 4. Summary of selected water-quality characteristics for samples from the Atchafalaya River at Krotz Springs, Louisiana (U.S. Geological Survey, 2018).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; PCU, platinum cobalt units; µS/cm, microsiemens per centimeter; SU, standard unit; $CaCO_3$, calcium carbonate; 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 $CaCO_3$)	Calcium, filtered (as Ca)	Magnesium, filtered (as Mg)	Sodium, filtered (as Na)	Chloride, filtered (as Cl)	Sulfate, filtered (as SO_4)	Dissolved solids, filtered
Atchafalaya River at Krotz Springs (1952–72)[1]											
Median	20.8	15	396	7.7	130	37	9.5	23	36	48	251
10th percentile	9.8	5	280.2	6.9	94.7	28	5.6	14	18	27	169
90th percentile	29.5	40	540.8	8.1	180	49.6	14	40	70	71	357.2
Number of samples	68	194	113	203	116	113	113	87	203	203	196
Percentage of samples that do not exceed SMCLs	NA		NA	99	NA	NA	NA	NA	100	100	99
SMCLs	NA	15	NA	6.5–8.5	NA	NA	NA	NA	250	250	500

[1]U.S. Geological Survey site number 07381500 (see fig. 1).

Surface-Water Quality

Water samples were collected from the Atchafalaya River at Krotz Springs (USGS site number 07381500) during 1952–72 as part of an ongoing program to monitor the State's surface-water resources (USGS, 2018) (fig. 1). Measurements of pH and concentrations of chloride, sulfate, and dissolved solids generally did not exceed SMCLs (table 4). The median hardness value of 130 mg/L was within the moderately hard range.

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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, 2018) 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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