USGS
science for a changing world

DOTD
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

Prepared in cooperation with the Louisiana Department of Transportation and Development

Water Resources of Cameron Parish, Louisiana

Introduction

This fact sheet presents a brief overview of groundwater and surface-water resources in Cameron Parish, Louisiana. Information on the availability, use, and quality of water from groundwater and surface-water sources in the parish is discussed. 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 this information.

In 2010, about 26.9 million gallons per day (Mgal/d) of water were withdrawn in Cameron Parish (fig. 1), including about 19.2 Mgal/d from surface-water sources and about 7.74 Mgal/d from groundwater sources[1] (table 1). Withdrawals for rice irrigation accounted for about 81 percent of the total water withdrawn. Water was also withdrawn for public supply, industrial, rural domestic, livestock, and aquaculture uses (table 2). Water withdrawals for rice irrigation are highly variable in Cameron Parish. Water-use data collected at 5-year intervals from 1960 to 2010 indicated that water withdrawals in the parish peaked in 1975 (fig. 2) at about 65.8 Mgal/d when withdrawals for rice irrigation were about 60.0 Mgal/d. In 1995, water withdrawals for rice irrigation had declined to approximately 17.3 Mgal/d.

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

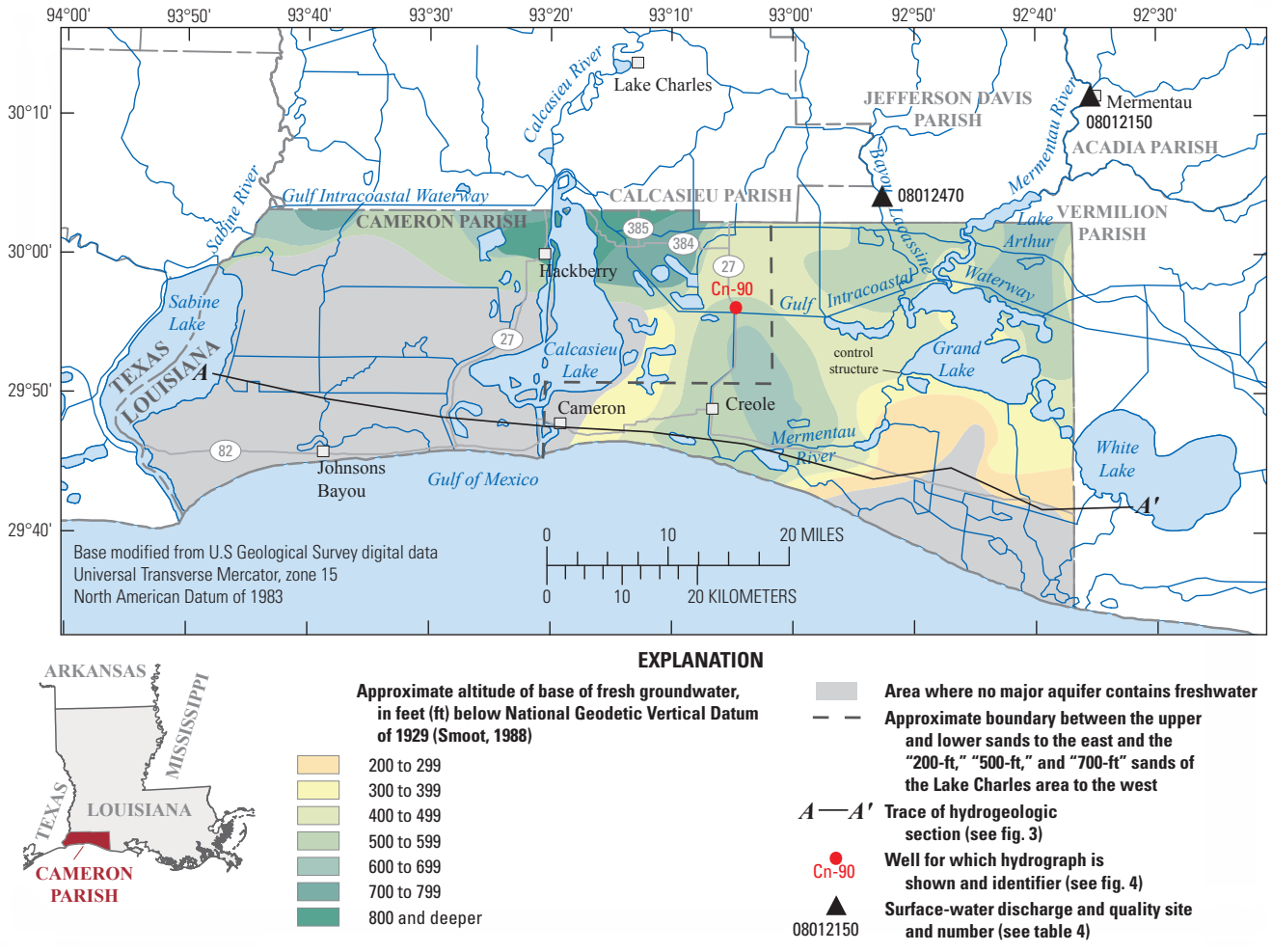

Figure 1. Location of study area, Cameron Parish, Louisiana.

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

Aquifer system or surface-water body	Groundwater	Surface water
Chicot aquifer system	7.74	
Bayou Lacassine		0.92
Calcasieu River		0.56
Gulf Intracoastal Waterway		2.03
Mermentau River		9.43
Miscellaneous streams		6.22
Total	7.74	19.17

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

Use category	Groundwater	Surface water	Total
Public supply	1.72	0.00	1.72
Industrial	2.45	0.58	3.03
Rural domestic	0.07	0.00	0.07
Livestock	0.04	0.13	0.17
Rice irrigation	3.45	18.42	21.87
Aquaculture	0.01	0.04	0.05
Total	7.74	19.17	26.90

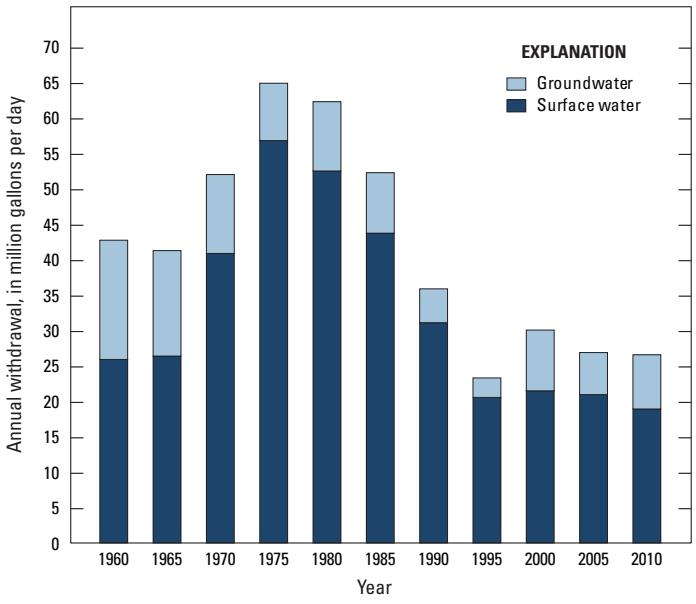

Figure 2. Water withdrawals in Cameron Parish, Louisiana, 1960–2010.

Groundwater Resources

All fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) withdrawals in Cameron Parish come from the Chicot aquifer system (fig. 3). Underlying aquifers contain only saltwater (water with a chloride concentration of greater than 250 mg/L) in Cameron Parish (Smoot, 1986). The base of fresh groundwater in the Chicot aquifer system in Cameron Parish generally ranges from about 300 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) in the southeastern part of the parish to about 800 ft below NGVD 29 in the north-central part (Smoot, 1988); however, no fresh groundwater is present in the southwestern part of the parish or along the southeastern coastline (fig. 1).

The Chicot aquifer system is composed of silt, sand, and gravel separated by units of clay and sandy clay. The system dips and thickens towards the south and southeast (Lovelace and others, 2004). Recharge to the aquifer system is from infiltration of precipitation, vertical leakage, and lateral groundwater flow. Recharge from precipitation occurs north of Cameron Parish in areas where the system outcrops. Discharge from the aquifer system is predominantly by water withdrawals from wells (Nyman and others, 1990).

In January 2003, water levels in the Chicot aquifer system ranged from about 17 ft below NGVD 29 near the coastline to about 30 ft below NGVD 29 near the northern parish line (Lovelace and others, 2004). Water levels in the aquifer system are affected by withdrawals for public supply, industry, and irrigation in parishes north and northeast of Cameron Parish. Because of these withdrawals, the general direction of groundwater flow in the Chicot aquifer system in Cameron Parish in 2003 was to the north and northeast (Lovelace and others, 2004). Prior to development of the aquifer system in the early 1900s, groundwater flow was primarily from northern recharge areas toward southern and southeastern discharge areas (Nyman and others, 1990).

In Cameron Parish, water levels in the Chicot aquifer system generally fluctuate from 3 to 5 ft or more seasonally in response to seasonal water withdrawals, primarily for irrigation. Water levels in observation well Cn-90 fluctuated seasonally but did not appreciably change from 1996 to 2005 although this period included a drought during 1999–2000 (Prakken and Wright, 2009) (fig. 4).

In Cameron Parish, the Chicot aquifer system is composed of six locally named sand units (aquifers); the shallow sand, upper sand, lower sand, and “200-ft,” “500-ft,” and “700-ft” sands of the Lake Charles area (fig. 3), which are named for their general depth of occurrence in the Lake Charles area north of Cameron Parish (fig. 1). A surficial clay confining unit restricts infiltration of precipitation into the Chicot aquifer system throughout much of the parish and is generally present from land surface to depths ranging from 120 to 360 ft below land surface (Sargent, 2004). The shallow sand of the Chicot aquifer system consists of scattered sand streaks, lenses, and layers within the surficial confining clay (Sargent, 2004).

The upper and lower sands are present in the eastern part of the parish. The upper sand contains freshwater underlain by saltwater in Cameron Parish (Nyman, 1984) except along the southeastern coast where no freshwater is present (Smoot, 1988).

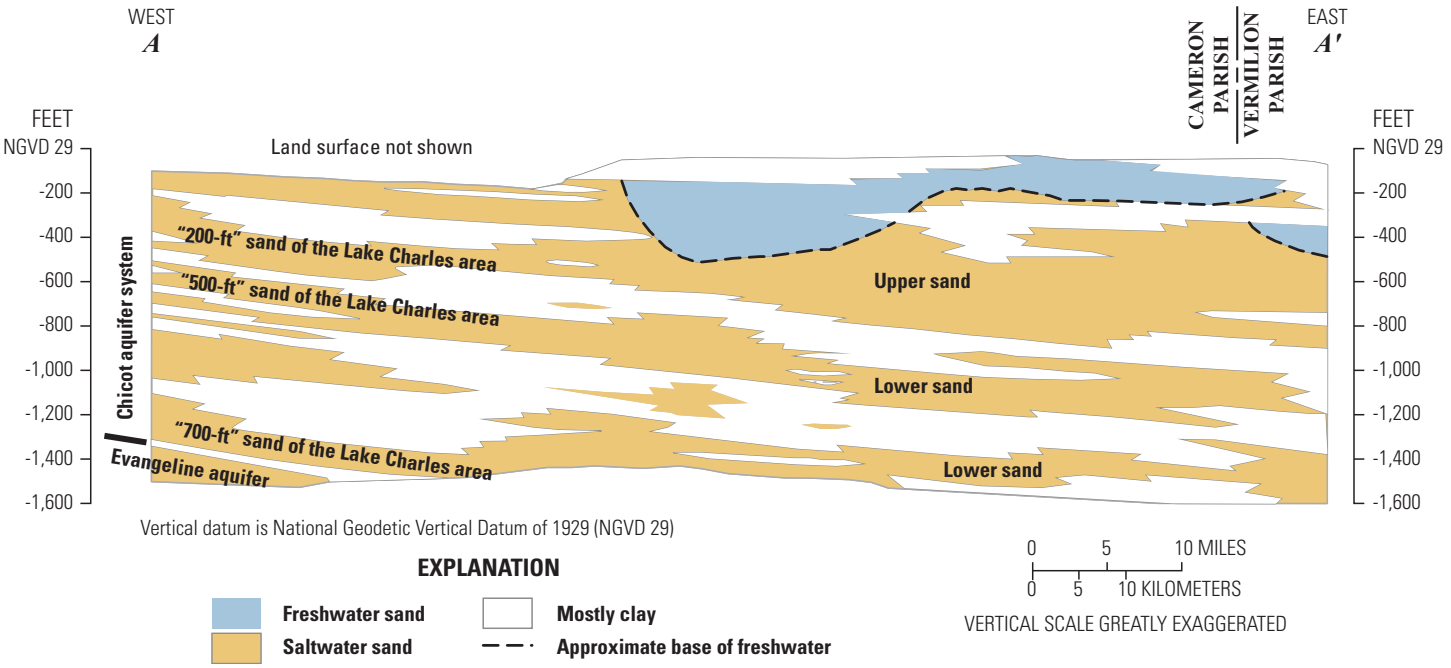

Figure 3. Generalized west-to-east hydrogeologic section through southern Cameron Parish, Louisiana (modified from Nyman, 1984). Trace of section shown on figure 1.

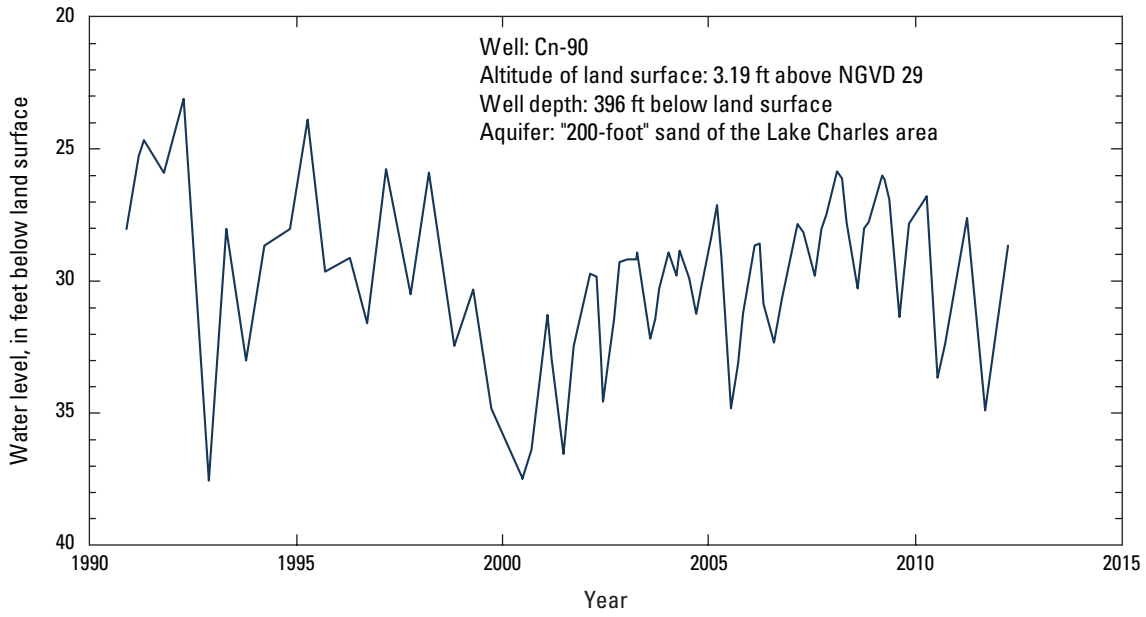

Figure 4. Water levels in well Cn-90 screened in the Chicot aquifer system in Cameron Parish, Louisiana, 1990–2012 (see fig. 1 for well location; U.S. Geological Survey, 2012). Land surface is measured in feet (ft) above the National Geodetic Vertical Datum of 1929).

The lower sand of the Chicot aquifer system does not contain freshwater in Cameron Parish (Nyman, 1989).

The "200-ft," "500-ft," and "700-ft" sands are present in the central and western areas of the parish (Lovelace, 1999). In Cameron Parish, the "200-ft" sand is stratigraphically equivalent to, and continuous with, the upper sand (Lovelace and others, 2004) and generally contains freshwater underlain by saltwater in the northern and eastern areas of the parish (Nyman, 1984). The "200-ft" sand generally contains saltwater in areas west of Calcasieu Lake. The "500-ft" sand is present beneath the "200-ft" sand and also contains freshwater underlain by saltwater in north and central areas of the parish. Throughout most of the rest of the parish, the aquifer contains only saltwater. The "500-ft" sand thins and pinches out or becomes lenticular in east-central Cameron Parish where it is largely isolated from the lower sand to the east (Harder and others, 1967; Nyman, 1984), though the "500-ft" sand merges with the lower sand south of Calcasieu Lake (fig. 1) (Nyman, 1984). The "700-ft" sand is present beneath the "500-ft" sand and is stratigraphically equivalent to the lower sand (Lovelace and others, 2004) but contains saltwater throughout Cameron Parish except at the extreme northwestern tip of the parish (Lovelace, 1999).

State well-registration records listed 354 active water wells screened in the Chicot aquifer system in Cameron Parish in 2010, including 204 domestic, 67 public supply, 46 irrigation, and 37 industrial (Louisiana Department of Natural Resources, 2012). Depths of these wells ranged from 80 to 968 ft below land surface, with a median depth of 252 ft. State well-registration records for Cameron Parish indicated that yields from wells screened in the Chicot aquifer system range from 3 to 5,310 gallons per minute. In 2010, groundwater withdrawals from the Chicot aquifer system in Cameron Parish totaled about 7.74 Mgal/d (tables 1 and 2).

A statistical summary of selected water-quality characteristics for freshwater samples collected from 60 wells in the Chicot aquifer system is listed in table 3. Based on median values of chemical constituents, freshwater from the aquifer system is moderately hard[2] and generally does not exceed the U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels (SMCLs)[3] for drinking water color, pH, and iron. Locally, iron concentrations can exceed the SMCL of 300 micrograms per liter (µg/L). The median concentration of dissolved solids in 29 samples, 517 mg/L, is slightly above the SMCL for drinking water of 500 mg/L. The median concentration of manganese in 19 samples was 73 µg/L, which exceeds the SMCL for drinking water of 50 µg/L.

[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) or aesthetic effects (such as taste, odor, or color) of drinking water. At high constituent concentrations or values, health implications as well as aesthetic degradation may be present. SMCLs were established as guidelines for the States by the U.S. Environmental Protection Agency (1992).

Surface-Water Resources

In 2010, about 19.2 Mgal/d of surface water were withdrawn in Cameron Parish for industrial use, livestock, rice irrigation, and aquaculture (table 2). Primary surface-water sources in the parish include the Calcasieu and Mermentau Rivers, Bayou Lacassine, and the Gulf Intracoastal Waterway (GIWW) (fig. 1; table 1). The Sabine River forms the western parish line, but there were no reported water withdrawals from the river in 2010. Major lakes within or bordering the parish include Calcasieu Lake, Lake Arthur, Grand Lake, and Sabine Lake (fig. 1).

The Calcasieu River flows into Calcasieu Lake north of Cameron Parish, then from the lake to the Gulf of Mexico along a 5-mile (mi) reach. The river and lake generally contain saltwater (water with a chloride concentration greater than 250 mg/L) in Cameron Parish (U.S. Geological Survey, 2010). In 2010, about 0.56 Mgal/d were withdrawn from the Calcasieu River in Cameron Parish for industrial use, primarily fish processing (table 1). There were no reported water withdrawals from Calcasieu Lake.

The Mermentau River flows through Lake Arthur in the northeastern corner of Cameron Parish, then through Grand Lake and much smaller lakes before entering the Gulf of Mexico. The Mermentau River below Grand Lake is tidally affected and fluctuates between freshwater and highly saline water. A control structure, located on the Mermentau River at the southwestern end of Grand Lake (fig. 1), reduces upstream movement of saltwater (Shampine, 1971). Grand Lake is fed and drained primarily by the Mermentau River. The lake is large and shallow with a surface area of 50 square miles (mi^2), an average volume of 147,000 acre-feet, and an average depth of 4.5 ft (Shampine, 1971).

Table 3. Summary of selected water-quality characteristics for freshwater in the Chicot aquifer system in Cameron Parish, Louisiana, 1948–2009 (U.S. Geological Survey, 2010).

[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; <, less than; 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 (60 wells)									
Median	23.5	5	909	7.8	90	130	180	73	517
10th percentile	22.1	0	591	7.4	73	51	120	<10	399
90th percentile	30.0	10	1,220	8.2	140	230	450	110	662
Number of samples	43	20	56	31	37	60	23	19	29
Percentage of samples that do not exceed SMCLs	NA	100	NA	100	NA	100	70	37	34
SMCLs									
	NA	15	NA	6.5–8.5	NA	250	300	50	500

During 1989–2003, the average discharge of the Mermentau River at Mermentau, (station number 08012150) located about 15 mi upstream of Cameron Parish, was about 2,243 cubic feet per second (ft^3/s) (U.S. Geological Survey, 2013). Wind and tide affect this station at medium and low stages, and reverse (negative) flow occurs at times during the year.

Water samples collected from the Mermentau River at Mermentau during 1979–2011 indicated that the water is generally soft. The pH of the water and concentrations of chloride, sulfate, and iron are generally below the SMCLs for drinking water (table 4). Dissolved oxygen concentration is generally less than 5 mg/L, which is considered the minimum value for a diversified population of fresh, warmwater biota, including sport fish (Louisiana Department of Environmental Quality, 2008). In 2010, about 9.43 Mgal/d were withdrawn from the Mermentau River (table 1), primarily for rice irrigation.

Lake Arthur is a shallow lake formed by a widening of the Mermentau River, which feeds and drains the lake. The lake stage varies during the year, but the average elevation of the lake surface is estimated to be about 4 ft above NGVD 29. At this elevation, the lake has a surface area of about 6 mi^2 and an average depth of about 7 ft. The water quality of Lake Arthur generally is similar to the water quality of the Mermentau River (table 4) (Shampine, 1971).

Bayou Lacassine is located in northeastern Cameron Parish and flows into the northwestern corner of Grand Lake. During 1987–2005, the average discharge of Bayou Lacassine near Lake Arthur (station number 08012470) located about 2 mi upstream of Cameron Parish (fig. 1), was about 545 ft^3/s (U.S. Geological Survey, 2013). Water samples collected from Bayou Lacassine near Lake Arthur during 1989–2004 indicated that the water is generally soft. The pH of the water and concentrations of chloride, sulfate, and iron are generally below the SMCLs for drinking water (table 4). Dissolved oxygen concentration is generally below 5 mg/L. In 2010, about 0.92 Mgal/d were withdrawn from Bayou Lacassine in Cameron Parish (table 1), primarily for rice irrigation.

The GIWW is a navigation channel that extends roughly eastward across the northeastern part of the parish (fig. 1) from the Calcasieu River to the Mermentau River at the northern end of Grand Lake and into Vermilion Parish. Locks on the GIWW at the Calcasieu River (about 3 mi north of the Cameron-

Table 4. Summary of selected water-quality characteristics for Mermentau River at Mermentau and Bayou Lacassine near Lake Arthur, Louisiana.

[Values are in milligrams per liter, except as noted. µS/cm, microsiemens per centimeter; °C, degrees Celsius; SU, standard units; $CaCO_3$, calcium carbonate; SO_4, sulfate; µg/L, micrograms per liter; Fe, iron; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2012); NA, not applicable; <, less than]

	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)
Mermentau River at Mermentau, 1979–2011[1]										
Median	163	4.0	7.1	40	10	3.6	15	17	4.2	170
10th percentile	70	1.1	6.2	17	4.5	1.6	5.7	6.7	2.3	20
90th percentile	329	7.0	7.6	77	18	7.6	39	37	8.4	340
Number of samples	192	176	192	126	126	126	124	188	187	103
Percentage of samples that do not exceed SMCLs	NA	NA	84	NA	NA	NA	NA	100	100	79
Bayou Laccassine near Lake Arthur, 1989–2004[2]										
Median	169	4.0	7.2	43	9.6	4.3	21	22	4.6	110
10th percentile	103	0.8	6.7	28	6.8	2.6	12	9.6	2.3	<30
90th percentile	371	7.0	7.8	66	14	7.7	62	76	11	290
Number of samples	72	62	72	46	46	47	47	69	69	47
Percentage of samples that do not exceed SMCLs	NA	NA	96	NA	NA	NA	NA	97	100	91
SMCLs										
	NA	NA	6.5–8.5	NA	NA	NA	NA	250	250	300

[1]Station number 08012150 (U.S. Geological Survey, 2010; specific data at http://nwis.waterdata.usgs.gov/la/nwis/qwdata/?site_no=08012150).

[2]Station number 08012470 (U.S. Geological Survey, 2010; specific data at http://nwis.waterdata.usgs.gov/la/nwis/qwdata/?site_no=08012470).

Calcasieu Parish line) and in Vermilion Parish (about 25 mi east of Cameron Parish) restrict the flow of saltwater into the GIWW and protect the freshwater resources of the Mermentau River. In 2010, about 2.03 Mgal/d were withdrawn from the GIWW in Cameron Parish (table 1), primarily for rice irrigation.

References Cited

Harder, A.H., Kilburn, Chabot, Whitman, H.M., and Rogers, S.M., 1967, Effects of ground-water withdrawals on water levels and saltwater encroachment in southwestern Louisiana: Department of Conservation, Louisiana Geological Survey, and Louisiana Department of Public Works Water Resources Bulletin no. 10, 56 p.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water (3d ed.): U.S. Geological Survey Water-Supply Paper 2254, 264 p., accessed February 20, 2013, at http://pubs.er.usgs.gov/publication/wsp2254.

Louisiana Department of Environmental Quality, 2008, Environmental Regulatory Code, Title 33, Part IX, Subpart 1, accessed June 9, 2009, at http://www.deq.louisiana.gov/portal/tabid/1674/Default.aspx.

Louisiana Department of Natural Resources, 2012, Strategic Online Natural Resources Information System (SONRIS): Louisiana Department of Natural Resources database, accessed August 13, 2012, at http://sonris.com/.

Lovelace, J.K., 1999, Distribution of saltwater in the Chicot aquifer system of southwestern Louisiana, 1995-96: Louisiana Department of Transportation and Development Water Resources Technical Report no. 66, 61 p.

Lovelace, J.K., Fontenot, J.W., and Frederick, C.P., 2004, Withdrawals, water levels, and specific conductance in the Chicot aquifer system in southwestern Louisiana, 2000–03: U.S. Geological Survey Scientific Investigations Report 2004-5212, 56 p., accessed July 25, 2012, at http://pubs.er.usgs.gov/publication/sir20045212.

Nyman, D.J., 1984, The occurrence of high concentrations of chloride in the Chicot aquifer system of southwestern Louisiana: Louisiana Department of Transportation and Development, Office of Public Works Water Resources Technical Report no. 33, 75 p.

Nyman, D.J., 1989, Quality of water in freshwater aquifers in southwestern Louisiana: Louisiana Department of Transportation and Development Water Resources Technical Report no. 42, 22 p., 28 pls.

Nyman, D.J., Halford, K.J., and Martin, Angel, Jr., 1990, Geohydrology and simulation of flow in the Chicot aquifer system of southwestern Louisiana: Louisiana Department of Transportation and Development Water Resources Technical Report no. 50, 58 p.

Prakken, L.B., and Wright, L.S., 2009, Water withdrawals and trends in ground-water levels and stream discharge in Louisiana, 1996-2005: Louisiana Department of Transportation and Development Water Resources Technical Report no. 79, 49 p.

Sargent, B.P., 2004, Thickness of the Chicot aquifer system surficial confining unit and location of shallow sands, southwestern Louisiana: Louisiana Department of Transportation and Development Water Resources Technical Report no. 73, 29 p.

Sargent, B.P., 2011, Water use in Louisiana, 2010: Louisiana Department of Transportation and Development Water Resources Special Report no. 17, 135 p.

Shampine, W.J., 1971, Chemical, biological, and physical data for the major lakes and reservoirs in Louisiana: Louisiana Department of Public Works Basic Records Report no. 5, 98 p.

Smoot, C.W., 1986, Louisiana hydrologic atlas map no. 2: Areal extent of freshwater in major aquifers of Louisiana: U.S. Geological Survey Water-Resources Investigations Report 86-4150, 1 sheet, accessed January 18, 2012, at http://pubs.er.usgs.gov/publication/wri864150.

Smoot, C.W., 1988, Louisiana hydrologic atlas map no. 3: Altitude of the base of freshwater in Louisiana: U.S. Geological Survey Water-Resources Investigations Report 86-4314, 1 sheet, accessed November 2, 2011, at http://pubs.er.usgs.gov/publication/wri864314.

U.S. Environmental Protection Agency, 1992, Secondary Drinking Water Regulations—Guidance for nuisance chemicals: U.S. Environmental Protection Agency publication EPA 810/K-92-001, 4 p., accessed July 29, 2009, at http://water.epa.gov/drink/contaminants/secondarystandards.cfm.

U.S. Environmental Protection Agency, 2012, 2012 Edition of the drinking water standards and health advisories: U.S. Environmental Protection Agency publication EPA 822-S-12-001, Office of Water, 12 p., accessed August 7, 2012, at http://water.epa.gov/action/advisories/drinking/upload/dwstandards2012.pdf.

U.S. Geological Survey, 2010, Water quality samples for Louisiana: National Water Information System Web Interface, accessed May 22, 2010, at http://nwis.waterdata.usgs.gov/la/nwis/qwdata/.

U.S. Geological Survey, 2012, Groundwater levels for Louisiana [data for USGS 295611093044801 Cn- 90]: National Water Information System Web Interface, accessed August 13, 2012, at http://nwis.waterdata.usgs.gov/la/nwis/gwlevels/?site_no=295611093044801.

U.S. Geological Survey, 2013, USGS Surface-Water Daily Statistics for the Nation: National Water Information System: Web Interface, accessed November 19, 2013 at http://waterdata.usgs.gov/nwis.

This fact sheet was published by the U.S. Geological Survey, in cooperation with the Louisiana Department of Transportation and Development (DOTD). Thanks are given to Zahir "Bo" Bolourchi, Director, Water Resources Programs, Louisiana Department of Transportation and Development, who contributed to the content of the fact sheet.

By Lawrence B. Prakken

For additional information, contact:

Director, USGS Louisiana Water Science Center
3535 S. Sherwood Forest Blvd., Suite 120
Baton Rouge, LA 70816
E-mail: dc_la@usgs.gov
Fax: (225) 298–5490
Telephone: (225) 298–5481
Home Page: http://la.water.usgs.gov

ISSN 2327–6916 (print)
ISSN 2327–6932 (online)

http://dx.doi.org/10.3133/fs20133076