Introduction

Information concerning the availability, use, and quality of water in St. Mary 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 management 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In 2010, about 121 million gallons per day (Mgal/d) of water were withdrawn in St. Mary Parish, including about 112 Mgal/d from surface sources and 8.31 Mgal/d from groundwater sources1 (table 1). Withdrawals for power generation accounted for about 87 percent (105 Mgal/d) of the total water withdrawn (table 2). Other categories of use included public supply, industrial, rural domestic, livestock, and general irrigation. Water-use data collected at 5-year intervals since 1960 indicated that water withdrawals greatly increased between 1970 and 1975 (fig. 2). This increase was largely due to additional surface-water withdrawals for power generation, which increased from 40 Mgal/d in 1970 to 202 Mgal/d in 1975. Water withdrawals in the parish peaked in 1975 at about 239 Mgal/d. Groundwater withdrawals in St. Mary Parish declined from 1990 to 2010 primarily because of decreasing withdrawals for petroleum refining and power generation.

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1 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 primary sources of fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) in St. Mary Parish are the Chicot aquifer system and the partially overlying Atchafalaya aquifer (fig. 3). The Chicot aquifer system consists of an upper and lower sand in St. Mary Parish; however, the lower sand contains only saltwater in the parish (water with chloride concentrations greater than 250 mg/L). The base of fresh groundwater in St. Mary Parish generally ranges from about 200 to 700 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) (fig. 1). Fresh groundwater is not available in the southeastern corner of the parish as indicated by the freshwater-saltwater interface in figure 1 (Nyman, 1984).

The principal source of recharge to the Atchafalaya aquifer is the Atchafalaya River (Jones and others, 1956), although during low stage the aquifer discharges into the river. Well withdrawals and seepage into the Chicot aquifer system also contribute to discharge from the aquifer, although interconnections between the Atchafalaya aquifer and the Chicot aquifer system are poor in St. Mary Parish (Jones and others, 1956). Much of the recharge to the Chicot aquifer system in St. Mary Parish is from vertical leakage through surficial clays and, to a lesser extent, from the Atchafalaya aquifer (Nyman, 1984). Discharge from the Chicot aquifer system is by natural flow into rivers, canals, and lakes and withdrawals from wells.

State well-registration records listed 219 active water wells in St. Mary Parish in 2009, including 158 domestic, 26 public supply, 19 industrial, 14 irrigation, and 2 power generation. Although an aquifer designation had not been assigned to several of the wells, the well depths indicate that almost all of the active wells are screened in either the Atchafalaya aquifer or the upper sand of the Chicot aquifer system. In 2010, categories of use for groundwater withdrawals in St. Mary Parish included public supply, industrial, power generation, rural domestic, and general irrigation (table 2). Groundwater withdrawals totaled 0.03 Mgal/d from the Atchafalaya aquifer and 8.28 Mgal/d from the upper sand of the Chicot aquifer system.

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

<table>
<thead>
<tr>
<th>Aquifer, aquifer system, or surface-water body</th>
<th>Groundwater</th>
<th>Surface water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atchafalaya River</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>ChREATCHOT, aquifer system, upper sand</td>
<td>8.28</td>
<td></td>
</tr>
<tr>
<td>Bayou Boeuf</td>
<td>2.48</td>
<td></td>
</tr>
<tr>
<td>Bayou Teche</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>ChARENTON Canal</td>
<td>4.27</td>
<td></td>
</tr>
<tr>
<td>Gulf Intracoastal Waterway</td>
<td>99.44</td>
<td></td>
</tr>
<tr>
<td>Sixmile Lake</td>
<td>3.55</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous streams</td>
<td>1.17</td>
<td></td>
</tr>
<tr>
<td>Other water bodies</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8.31</strong></td>
<td><strong>112.37</strong></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Use category</th>
<th>Groundwater</th>
<th>Surface water</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public supply</td>
<td>0.42</td>
<td>10.29</td>
<td>10.71</td>
</tr>
<tr>
<td>Industrial</td>
<td>1.73</td>
<td>2.74</td>
<td>4.47</td>
</tr>
<tr>
<td>Power generation</td>
<td>5.99</td>
<td>99.04</td>
<td>105.04</td>
</tr>
<tr>
<td>Rural domestic</td>
<td>0.15</td>
<td>0.00</td>
<td>0.15</td>
</tr>
<tr>
<td>Livestock</td>
<td>0.00</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>General irrigation</td>
<td>0.03</td>
<td>0.25</td>
<td>0.28</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8.31</strong></td>
<td><strong>112.37</strong></td>
<td><strong>120.69</strong></td>
</tr>
</tbody>
</table>

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

For explanation, see table 1. For explanation, see table 2.

Atchafalaya Aquifer

The Atchafalaya aquifer consists of highly permeable sands and gravels that partly fill scour channels formed by the Atchafalaya and Mississippi Rivers (Jones and others, 1956). Overlying the aquifer is a 50- to 100-ft thick deposit of clay (Fisk, 1944). In St. Mary Parish, the aquifer generally is present north of Louisiana Highway 90 from the St. Mary–Iberia Parish line to Morgan City (fig. 1). The approximate area where the Atchafalaya aquifer contains freshwater in St. Mary Parish is shown on figure 1 (Nyman, 1984).

Because of its origin as a channel-fill deposit, the thickness of the aquifer is variable, generally ranging from 50 to 150 ft (Jones and others, 1956), although it can be as much as 250 ft thick in some areas (Saucier, 1994). Near the southern end of Sixmile Lake (fig. 1), the aquifer is about 140 ft thick (Jones and others, 1956), and the base of the aquifer is about 250 ft below NGVD 29 (Saucier, 1994) (fig. 3). The maximum depth of the aquifer in St. Mary Parish is about 375 ft below NGVD 29 near the northern St. Mary–Iberia Parish line (Saucier, 1994).

The Atchafalaya River cuts into the Atchafalaya aquifer, and water levels in the aquifer generally fluctuate in response...
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).

Prior to its development as a water supply during the early 1900s, the direction of groundwater flow in the Chicot aquifer system was primarily southward towards the Gulf of Mexico and eastward towards the Atchafalaya River (Nyman and others, 1990). Since development, however, groundwater withdrawals in southwestern Louisiana have reversed the hydraulic gradient; consequently, water in the Atchafalaya aquifer now moves westward into the Chicot aquifer system (Nyman, 1984).

State well-registration records listed 42 active wells screened in the Atchafalaya aquifer in St. Mary Parish in 2009, including 35 domestic, 3 irrigation, 3 industrial, and 1 public supply. Depths of these wells range from 70 to 340 ft below land surface, with a median depth of 190 ft. Reported yields from wells screened in the Atchafalaya aquifer in St. Mary Parish have ranged from 16 to 2,500 gallons per minute (gal/min). In 2010, withdrawals from the Atchafalaya aquifer in St. Mary Parish were categorized as rural-domestic use. In St. Mary Parish, active wells screened in the Atchafalaya aquifer generally are located on the north side of U.S. Highway 90 (fig. 1).

Water in the Atchafalaya aquifer typically is poorly suited for domestic purposes because of water-quality concerns. In St. Mary Parish, iron concentrations generally exceed 5,000 micrograms per liter (µg/L) and, at some locations, may exceed 10,000 µg/L. The water typically is very hard2 (Nyman, 1989).

Upper Sand of the Chicot Aquifer System

In St. Mary Parish, the upper sand of the Chicot aquifer system consists mostly of coarse sand grading to gravel near the base of individual beds (Nyman and others, 1990). The top of the upper sand ranges from about 200 ft below NGVD 29 to more than 400 ft below NGVD 29, and the base extends to 1,000 ft or more below NGVD 29 within the parish (Nyman, 1984). The upper sand contains freshwater underlain by saltwater in most of the parish. In the southeastern half of the parish (generally southeast of Franklin), the upper sand contains no freshwater (fig. 3). The general direction of groundwater flow in the upper sand in St. Mary Parish is towards the northwest (Lovelace and others, 2004).

State well-registration records listed 141 active wells screened in the upper sand in St. Mary Parish in 2009, including 97 domestic, 23 public supply, 11 industrial, 9 irrigation, and 1 power generation. Depths of these wells ranged from about 210 to 699 ft below land surface, with a median depth of 320 ft. Reported yields from wells screened in the upper sand in St. Mary Parish have ranged from 3 to 1,562 gal/min. In 2010, about 8.28 Mgal/d were withdrawn from the upper sand unit in St. Mary Parish, including 0.42 Mgal/d for public supply, 1.73 Mgal/d for

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2Hardness 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).

Figure 3. Generalized west-to-east hydrogeologic section through St. Mary Parish, Louisiana (modified from Nyman, 1984). Trace of section shown on figure 1.
industrial use, 5.99 Mgal/d for power generation, 0.11 Mgal/d for
domestic use, and 0.03 Mgal/d for general irrigation.

A statistical summary of selected water-quality characteristics
for samples from 23 wells screened in freshwater areas of the
upper sand of the Chicot aquifer system underlying St. Mary
Parish is listed in table 3. Freshwater in the upper sand is very
hard, and iron and manganese concentrations generally exceed
the U.S. Environmental Protection Agency’s (USEPA) Secondary
Maximum Contaminant Levels (SMCLs) for drinking water (table
3). The pH of the water is generally within the SMCL range of
6.5 to 8.5 standard units. The median concentration of dissolved
solids for 16 samples, 543 mg/L, exceeds the SMCL for drinking
water of 500 mg/L.

**Surface-Water Resources**

In 2010, about 112 Mgal/d of surface water were withdrawn
in St. Mary Parish. Power generation accounted for about
88 percent of the total water withdrawn. Other uses included public
supply, industrial, livestock, and general irrigation (table 2). All
surface-water withdrawals for power generation came from the
Charenton Drainage and Navigation Canal near Baldwin (fig. 1).
Surface-water withdrawals for industrial use came directly or
indirectly from the Gulf Intracoastal Waterway (GIWW) or Bayou
Teche. Most surface water withdrawn for industrial and power-
generation purposes was used for cooling and returned to its source
after use (Sargent, 2011). Surface-water withdrawals for public
supply came from various sources, including the Atchafalaya
River, Bayou Boeuf, Bayou Teche, the Charenton Drainage and
Navigation Canal, the GIWW, and Sixmile Lake.


<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Color (PCU)</th>
<th>Specific conductance, field (µS/cm at 25 °C)</th>
<th>pH, field (SU)</th>
<th>Hardness (as CaCO₃)</th>
<th>Chloride, filtered (as Cl)</th>
<th>Iron, filtered (µg/L as Fe)</th>
<th>Manganese, filtered (µg/L as Mn)</th>
<th>Dissolved solids, filtered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>22.1</td>
<td>1,010</td>
<td>7.5</td>
<td>280</td>
<td>120</td>
<td>870</td>
<td>75</td>
<td>543</td>
</tr>
<tr>
<td>10th percentile</td>
<td>21.9</td>
<td>674</td>
<td>7.2</td>
<td>180</td>
<td>26</td>
<td>120</td>
<td>60</td>
<td>390</td>
</tr>
<tr>
<td>90th percentile</td>
<td>23.1</td>
<td>1,310</td>
<td>8.5</td>
<td>350</td>
<td>210</td>
<td>1,300</td>
<td>110</td>
<td>699</td>
</tr>
<tr>
<td>Number of samples</td>
<td>9</td>
<td>9</td>
<td>19</td>
<td>20</td>
<td>22</td>
<td>8</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Percentage of samples that do not exceed SMCLs</td>
<td>NA</td>
<td>89</td>
<td>NA</td>
<td>95</td>
<td>NA</td>
<td>100</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>

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 concentrations or values, health
implications as well as aesthetic degradation might exist. SMCLs were
established as guidelines for the states by the U.S. Environmental Protection

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Grand Lake, Sixmile Lake, Flat Lake, and Lake Palourde
are located within the Atchafalaya River Basin on or near
the St. Mary Parish border (fig. 1). The approximate areas of
these lakes are as follows: Grand Lake, 64 square miles (mi²);
Sixmile Lake, 30 mi²; Flat Lake, 5.2 mi²; and Lake Palourde,
18 mi² (Shampine, 1971). Grand Lake and Sixmile Lake have
characteristics that resemble rivers more than lakes. Water
from the Atchafalaya River flows into and through these
lakes with short retention times (hours or days). Flat Lake,
however, is partially isolated from the surface-water flow by
islands and resembles a lake; chemical or thermal stratification
can become established, and algae blooms can develop
(Shampine, 1971). Water from Lake Palourde has a moderately
high (200–250 mg/L) dissolved-solids content, and pH and
concentrations of chloride and sulfate do not exceed the SMCLs.
The dissolved-oxygen concentration generally is high (greater
than or equal to 10 mg/L) throughout the year. Some chemical
and thermal stratification develops, but this stratification is short
lived (hours or days) and not appreciable (Shampine, 1971).

Flow and salinity in the water bodies of St. Mary Parish are
strongly influenced by the interactions between waterway stage,
strong winds, tides, and hurricanes. These factors can result
in flow reversals as indicated by negative discharges (table 4).
These flow reversals can change salinity significantly and may
impact the availability of freshwater in the parish. In particular,
the GIWW is affected by differences in stage in the waterway
and adjacent surface-water bodies, including the Lower
Atchafalaya River, Wax Lake Outlet, and the Gulf of Mexico.
During much of the year, freshwater from the Atchafalaya River
Basin discharges through the Lower Atchafalaya River and
Wax Lake Outlet into the GIWW, inducing flow in the GIWW
(Swarzenski, 2003). During periods of low Atchafalaya River
stage and wind-driven flow events, saltwater from the Gulf of
Mexico can enter the GIWW through several connections with
the Gulf, including the Charenton Drainage and Navigation
Canal, Wax Lake Outlet, and the Lower Atchafalaya River.

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**Table 3.** Summary of selected water-quality characteristics for freshwater in the Chicot aquifer system upper sand in St. Mary Parish, Louisiana, 1948–96 (U.S. Geological Survey, 2009).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; PCU, platinum cobalt units; µS/cm, microsiemens per centimeter; SU, standard units; CaCO₃, calcium carbonate; µg/L, micrograms per liter; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2012); NA, not applicable]
Water samples collected from the Lower Atchafalaya River at Morgan City during the period 2006–9 indicated that the water is hard and based on median values usually does not exceed the SMCLs for pH and concentrations of chloride, sulfate, and iron. Dissolved-oxygen concentrations are generally greater than 5 mg/L. Water samples collected from Bayou Teche near Oliver during the period 1958–80 indicated that the water is moderately hard and based on median values usually does not exceed the SMCLs for pH and concentrations of chloride, sulfate, and iron. Dissolved-oxygen concentrations are generally below 5 mg/L for Bayou Teche (table 5); for a diversified population of fresh, warmwater biota, including sport fish, 5 mg/L is considered the minimum value (Louisiana Department of Environmental Quality, 2008).

### Table 4. Minimum, maximum, and mean daily discharges recorded at selected surface-water discharge sites in St. Mary Parish, Louisiana (U.S. Geological Survey, 2013).

<table>
<thead>
<tr>
<th>Surface-water discharge site and number</th>
<th>Period of record</th>
<th>Daily mean discharge, in cubic feet per second</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIWW at Bayou Sale Ridge near Franklin (station 07381670)</td>
<td>2000–13</td>
<td>Mean</td>
</tr>
<tr>
<td>Charenton Drainage Canal at Baldwin (station 07385790)</td>
<td>1999–2013</td>
<td>2,419</td>
</tr>
<tr>
<td>Wax Lake Outlet at Calumet (station 07381590)</td>
<td>1986–2013</td>
<td>91,746</td>
</tr>
<tr>
<td>Lower Atchafalaya River at Morgan City (station 07381600)</td>
<td>1976–2013</td>
<td>126,077</td>
</tr>
<tr>
<td>Bayou Teche near Jeanerette (station 07385765)</td>
<td>1996–2013</td>
<td>415</td>
</tr>
</tbody>
</table>

1The normal direction of flow is generally southward towards the Gulf of Mexico at all of the surface-water discharge sites listed with the exception of the GIWW at Bayou Sale Ridge near Franklin, where the normal direction of flow is towards the west.

### Table 5. Summary of selected water-quality characteristics for the Lower Atchafalaya River at Morgan City and Bayou Teche near Oliver, Louisiana.

<table>
<thead>
<tr>
<th>Specific conductance, field (µS/cm at 25 °C)</th>
<th>Oxygen, dissolved (µS/cm at 25 °C)</th>
<th>pH, field (SU)</th>
<th>Hardness (as CaCO₃)</th>
<th>Calcium, filtered (as Ca)</th>
<th>Magnesium, filtered (as Mg)</th>
<th>Sodium, filtered (as Na)</th>
<th>Chloride, filtered (as Cl)</th>
<th>Sulfate, filtered (as SO₄)</th>
<th>Iron, filtered (µg/L as Fe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Atchafalaya River at Morgan City, 2006–9¹</td>
<td>Median</td>
<td>356</td>
<td>7.7</td>
<td>7.8</td>
<td>130</td>
<td>34</td>
<td>10</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>10th percentile</td>
<td>299</td>
<td>5.3</td>
<td>7.6</td>
<td>100</td>
<td>28</td>
<td>7.4</td>
<td>13</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td>90th percentile</td>
<td>470</td>
<td>11.2</td>
<td>8.1</td>
<td>170</td>
<td>43</td>
<td>15</td>
<td>30</td>
<td>42</td>
<td>54</td>
</tr>
<tr>
<td>Number of samples</td>
<td>53</td>
<td>52</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Percentage of samples that do not exceed SMCLs</td>
<td>NA</td>
<td>NA</td>
<td>98</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

| Lower Atchafalaya River at Morgan City, 2006–9¹ | NA | 6.5–8.5 | NA | NA | NA | NA | 250 | 250 | 300 |

| Bayou Teche near Oliver, 1958–80² | Median | 206 | 4.8 | 6.9 | 65 | 19 | 5.0 | 13 | 19 | 6.2 | 125 |
| 10th percentile | 130 | 1.6 | 6.6 | 41 | 11 | 3.0 | 7.2 | 9 | 2.6 | 72 |
| 90th percentile | 337 | 8.5 | 7.3 | 110 | 27 | 8.7 | 22 | 31 | 11 | 157 |
| Number of samples | 33 | 17 | 31 | 31 | 31 | 31 | 31 | 31 | 4 |
| Percentage of samples that do not exceed SMCLs | NA | NA | 90 | NA | NA | NA | 100 | 100 | 100 |

| Bayou Teche near Oliver, 1958–80² | NA | NA | 6.5–8.5 | NA | NA | NA | 250 | 250 | 300 |

References Cited


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