



STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
OFFICE OF PUBLIC WORKS



WATER RESOURCES
SPECIAL REPORT
NO. 3

PUMPAGE OF WATER IN LOUISIANA, 1980

Prepared by
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
In cooperation with
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
OFFICE OF PUBLIC WORKS
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By
W. H. Walter
U.S. Geological Survey

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STATE OF LOUISIANA
DAVID C. TREEN, Governor

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

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CONTENTS

	Page
Abstract-----	1
Introduction-----	1
Acknowledgements-----	2
Collection of data-----	2
Use categories-----	3
Public supply-----	3
Industrial-----	3
Power generation-----	3
Mining-----	3
Irrigation-----	4
Aquaculture-----	4
Rural-----	4
Recreation-----	5
Compilation, storage, and availability of data-----	5
Water use-----	5
Ground-water withdrawals-----	8
Surface-water withdrawals-----	8
Water-use trends-----	9
Selected references-----	11

ILLUSTRATIONS

	Page
Figure 1. Map showing water use in Louisiana, by parish, 1980-----	6
2. Map showing water use in major hydrologic units in Louisiana, 1980-----	7
3. Graph showing pumpage in Louisiana by use categories, 1950-80-----	10

TABLES

	Page
Table 1. Withdrawal of ground water, by aquifer, 1980-----	8
2. Withdrawal of surface water, by source, 1980-----	9
3. Pumpage of water in Louisiana by parish, source, and principal use, 1980-----	14

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM (SI)
OF METRIC UNITS

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
foot (ft)	0.3048	meter (m)
gallon per day (gal/d)	0.003785	cubic meter per day (m ³ /d)
gallon per minute (gal/min)	3.785x10 ⁻³	cubic meter per minute (m ³ /min)
	0.06309	liter per second (L/s)
million gallons per day (Mgal/d)	3.785x10 ³	cubic meter per day (m ³ /d)
	3.785x10 ⁶	liter per day (L/d)
	43.81	liter per second (L/s)

Other conversion factors that may be helpful in using this report:

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
million gallons per day (Mgal/d)	3.069	acre-foot per day
Do.	1,120	acre-foot per year
	1.547	cubic foot per second (ft ³ /s)
Do.	694.4	gallon per minute (gal/min)
	0.1337	million cubic feet per year (M ³ ft/yr)

PUMPAGE OF WATER IN LOUISIANA, 1980

W. H. Walter

ABSTRACT

In 1980 an estimated 12,500 million gallons per day of water was pumped for various uses in Louisiana; 10,700 million gallons per day was pumped from surface-water sources and 1,780 million gallons per day from ground water. Two-thirds of the surface-water withdrawals were from the Mississippi River, mainly for industrial use; and about 56 percent of the ground water was pumped from the Chicot aquifer in southwestern Louisiana, mainly for irrigation.

Total withdrawal use of water in the State increased by 6 percent from 1975 to 1980. Use of surface water increased by 5 percent, whereas use of ground water increased by 14 percent during this 5-year period.

INTRODUCTION

An inventory of use of water in Louisiana is essential to appraise current and future water resources needs of Louisiana and in assessing the impact of planned development on the natural environment. The Geological Survey has collected and published water-use data on a five-year basis since 1950 as part of the cooperative program of water-resources studies in Louisiana in cooperation with the Louisiana Department of Transportation and Development, Office of Public Works. Data have been collected in more detailed use categories each time. This report documents results of the 1980 water-use inventory.

The study included an inventory of water withdrawn from ground- and surface-water sources. The Louisiana Office of Public Works participated in the data-collection activities, accounting for some 30 percent of the data collected. Future data collection is anticipated on a continuing basis.

Acknowledgements

Nine people in the Geological Survey's Louisiana District were involved in the data-collection effort, some of which was done as part of the work on various other projects within the State. The Louisiana Office of Public Works also had nine people involved in the data-collection activities. The Data Processing Section of the Department of Transportation and Development was responsive to the need for setting up a computer data base for data storage and to programming needs for data manipulation. Appreciation is especially due Thomas Payment, Louisiana Office of Public Works, for coordinating data collection between Louisiana Office of Public Works personnel and the U.S. Geological Survey, and for providing liaison with the Data Processing Section. The Capital Area Ground Water Conservation Commission, the U.S. Agricultural Stabilization and Conservation Service, county agents, municipalities, industries, and many individuals cooperated by supplying data for the water-use program.

COLLECTION OF DATA

Data were collected for this report during 1980 and 1981, inventorying water withdrawn during 1980. Water use is defined as water withdrawn (pumped or diverted) from a source for use. This "use" is separated into several categories: public supply, industrial, power generation, mining, irrigation, aquaculture, rural, and recreation. Hydroelectric power generation does not involve withdrawal from a source, although it is considered water use. Other nonwithdrawal uses include navigation and waste dilution. Of the nonwithdrawal uses, only hydroelectric power generation use was inventoried for this report. The point and (or) source of withdrawal from the hydrologic system is considered to be of greater importance, compared to where the water is used. Therefore, water withdrawn in one parish and used in another is counted in the parish (and basin) of origin.

Most of the data for this inventory was obtained by individual field interviews with public suppliers, industries, and county agents. Phone interviews and letter requests were also utilized. County agents supplied livestock populations, irrigated crop and aquaculture acreages, and some information on application rates. U.S. Geological Survey and Louisiana Office of Public Works personnel were assigned certain areas of the State to be inventoried, generally by parish. In some parishes, work was shared by both agencies.

Use data were collected in two general categories: (1) individual, and (2) aggregated. Each "individual" user--including public suppliers, self-supplied industries, power plants, and mines--was contacted for information. "Aggregated" data include information collected from county agents plus rural domestic uses. A small amount of irrigation, livestock, and aquaculture data was collected individually, and is included in the "individual" category.

Use Categories

Public Supply

This category includes water withdrawn by privately and publicly owned water suppliers and waterworks districts. Water supplied by a water system for commercial uses and water used for firefighting, line flushing, and lost through leakage is also included in this category. Although classified as commercial use in the National Water Use Data System, use by self-supplied institutions--schools, hospitals, penal facilities, and military installations--is included in the public-supply category in this report. Data for the facilities that maintain pumpage records were obtained directly from them. For others, pumpage was estimated from the population served, using a per-capita use figure that varied somewhat throughout the State but was calculated to average about 70 gallons per person per day.

Industrial

This category includes self-supplied water used by industries and commercial establishments. Some industries in the Lake Charles area have routinely reported pumpage to the Geological Survey periodically. Pumpage data for the major users in the five parishes of the Capital Area Ground Water Conservation Commission was supplied by the Commission. Large industries generally maintain good pumpage records. Each was inventoried. For those that did not maintain records of pumpage, use was estimated from pumping time and yield. Water recirculated for cooling is counted only upon withdrawal from the source, not each time it is circulated.

Power Generation

There were two types of power-generating plants operating in Louisiana at the time of the 1980 study: hydroelectric and fossil-fueled. The one hydroelectric plant in the State uses water from the Sabine River (Toledo Bend Reservoir) for power generation. Because the Sabine River forms the Louisiana-Texas boundary, half of the water flowing through the power plant is counted in Louisiana's water-use inventory. Most fossil-fueled plants utilize both ground and surface water; all supplied pumpage data. Cooling water was counted only upon withdrawal from the source.

Mining

Use of water for mining in Louisiana is mainly for solution mining of salt and mining of sulfur using the Frasch process. Use data was obtained from each operator. Testing for lignite mining is being done in northern Louisiana; but, through 1980, mining had not become a significant factor in water use. Water used in oil- and gas-well injection and salt-water produced with oil and gas extraction was not inventoried and was not judged to represent a significant local or regional use.

Although mining use has been established as a use category in the National Water Use Data System, it is currently included in the industrial category in the State system (and in this report).

Irrigation

Rice irrigation is the principal use of water in this category. Most occurs in the southwestern part of the State, although acreage in the northeastern part of the State has increased substantially since 1975. Acreage data was obtained through the cooperation of the U.S. Agricultural Stabilization and Conservation Service. The average seasonal application rate for rice fields irrigated by ground water in southwestern Louisiana (3.0 ft) was determined from measuring pumpage from selected wells irrigating representative acreages throughout the area. The surface-water application rate for southwestern Louisiana was estimated to be 5 ft/yr. Surface-water use is higher because farmers generally let the surface water run through fields continuously to reduce plant diseases. Application rates for rice grown in northern Louisiana were based on discussions with county agents and on previous experience; the rates ranged from 2 1/2 to 4 ft/yr. Other irrigation in the State is applied to vegetable crops, strawberries, and to relatively small acreages of cotton, corn, soybeans, and sugar cane. Estimated application rates ranged from 1/4 to 3/4 ft/yr.

Aquaculture

This category consists of water used for aquatic food production, principally catfish and crawfish farming, and water used by fish hatcheries. Reported application rates were applied to acreage figures obtained from county agents. This usage was included in the "Irrigation" category in 1975.

Rural

Two principal uses of water in areas not supplied by a public-supply system are for rural domestic and livestock consumption. Rural domestic pumpage is computed from the population in each parish minus the population served by public-supply systems multiplied by estimated per-capita-use rates. All rural domestic use is assumed to be from ground water. Surface-water supplied cisterns are becoming rare and account for only negligible use. The term "livestock" refers to all farm animals--beef cattle, milk cows, horses and mules, hogs, sheep and goats, and poultry. Daily water needs for each livestock type, the 1980 population of each type, and the percentage supplied by ground and surface water were reported by county agents and used to compute figures for this category.

Recreation

This category includes self-supplied water used for gardens and golf courses, parks (government and privately owned), and water flowing to waste from flowing artesian wells. These uses were included in the "Rural Domestic" (flowing waste) and "Irrigation" categories in 1975 and in 1980.

COMPILATION, STORAGE, AND AVAILABILITY OF DATA

All water-use data collected during the 1980 inventory were entered into a computer data base set up by the Data Processing Section of the Louisiana Department of Transportation and Development. Storage, maintenance, and retrievals of water-use data--including information from individual users in the State--are accomplished through this system. Aggregated data from this State system is compiled by the Louisiana District and transmitted to the National Water Use Data System. The National System stores and disseminates summary information about withdrawal, return, and usage of water throughout the Nation.

The Louisiana Department of Transportation and Development, Data Processing Section, developed a data-base-management system in COBOL, using a computer software system called EASYTRIEVE^{1/} to generate necessary data tabulations. EASYTRIEVE was used to sort and total data by categories. The "individual" data was sorted separately from the "aggregated" data. Printouts generated from the data base were compared to 1975 water-use data for consistency and were checked for accuracy.

WATER USE

Values given in the water-use tables (tables 1-3) and illustrations (figs. 1-3) are in terms of average daily pumpage during 1980. Pumpage for seasonal industries, such as sugar mills and seafood processors, and for irrigation (mostly rice) is prorated for the entire year. Thus, the listed rates are substantially less than seasonal daily rates. Values are listed to two significant figures in most instances--three where pumpage exceeds 1,000 Mgal/d (million gallon per day). Values are not listed where pumpage totals less than 0.01 Mgal/d (10,000 gal/d).

Parish totals for ground and surface water are shown in figure 1, and hydrologic unit (drainage basin) totals are shown in figure 2. A detailed breakdown by parish is given in table 3, which shows ground- and surface-water pumpage for the major use categories.

Total water use in 1980 was about 12,500 Mgal/d, a 6-percent increase since 1975. Ground-water pumpage accounted for 14 percent of the total use.

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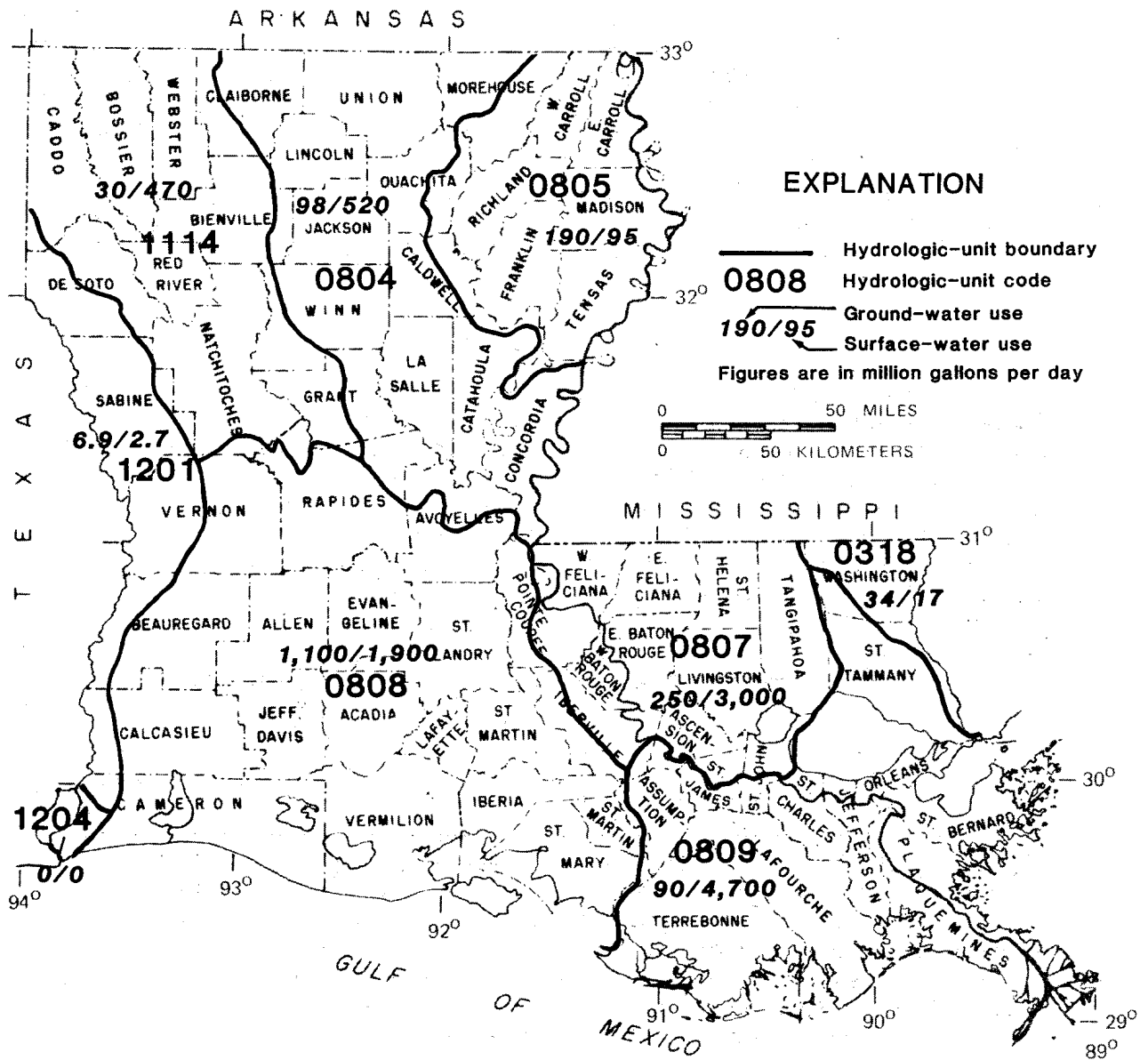


Figure 2.--Water use in major hydrologic units in Louisiana, 1980.

Ground-Water Withdrawals

Ground water withdrawn in 1980 was about 1,780 Mgal/d, a 14-percent increase since 1975. Of this, 56 percent was used for irrigation and aquaculture, 23 percent was used for industry, and 15 percent was used for public supply. Compared to 1975 figures, withdrawal increases were 22 percent for irrigation and aquaculture and 32 percent for public supply; withdrawal decreased 14 percent for industrial uses, 1975-80.

The Chicot aquifer supplied 56 percent of the total ground water withdrawn; 71 percent of the pumpage from the Chicot was for rice irrigation. Table 1 shows pumpage by aquifer or major aquifer system.

Surface-Water Withdrawals

Surface water withdrawn in 1980 was about 10,700 Mgal/d, a 5-percent increase since 1975. Of this, 54 percent was used by power generating plants for cooling, 31 percent was used by industry, and 12 percent was used for irrigation and aquaculture. Compared to 1975, use for power generation increased 6 percent, irrigation and aquaculture use increased 9 percent, and industrial use remained essentially the same. Water used for power generation at Toledo Bend Reservoir, some 2,840 Mgal/d, is not included in these figures.

Table 1.--Withdrawal of ground water, by aquifer, 1980

Aquifer or aquifer group	Million gallons per day
Chicot aquifer (Pleistocene)-----	995
Miocene-Pliocene aquifers-----	299
Mississippi River alluvial aquifer (Pleistocene)---	264
Pleistocene aquifers exclusive of Chicot-----	126
Sparta (Eocene)-----	72
Wilcox-Carrizo (Paleocene and Eocene)-----	9.9
Red River alluvial aquifer (Pleistocene)-----	5.9
Cockfield Formation (Eocene)-----	4.1
Ouachita River alluvial aquifer (Pleistocene)-----	1.2
Total (rounded)-----	1,780

The Mississippi River supplied 66 percent of the total surface water withdrawn. Power generating plants used 57 percent of this, industry used 39 percent, and the remaining 4 percent was used for public supply. The 1980 withdrawals from major surface-water sources in the State are listed in table 2.

Table 2.--Withdrawal of surface water, by source, 1980

Source	Million gallons per day
Mississippi River (main stem)-----	<u>a/7,000</u>
Intracoastal Waterway and associated canals-----	<u>b/810</u>
Ouachita River-----	580
Mermentau River-----	580
Calcasieu River-----	440
Red River (including 109 Mgal/d from Caddo Lake and Twelvemile Bayou)-----	390
Atchafalaya River-Bayou Teche-----	370
Vermilion River-----	290
Bayou Lafourche-----	67
Pearl River-----	17
Miscellaneous streams, lakes, and ponds in south- eastern Louisiana-----	3
Sabine River-----	<u>c/1</u>
Total withdrawals (rounded)-----	<u>10,500</u>

a/ Includes 99 Mgal/d of saline water.

b/ Mostly saline water.

c/ Excludes 2,840 Mgal/d used for hydroelectric-power generation.

WATER-USE TRENDS

Withdrawal totals since 1950 are shown, by major use category, in figure 3. Although the total pumpage has increased since 1975, it is evident that the steeply rising trend that prevailed through 1975 has slacked off. Pumpage increased slightly in all use categories except industrial; that total was slightly lower than in 1975.

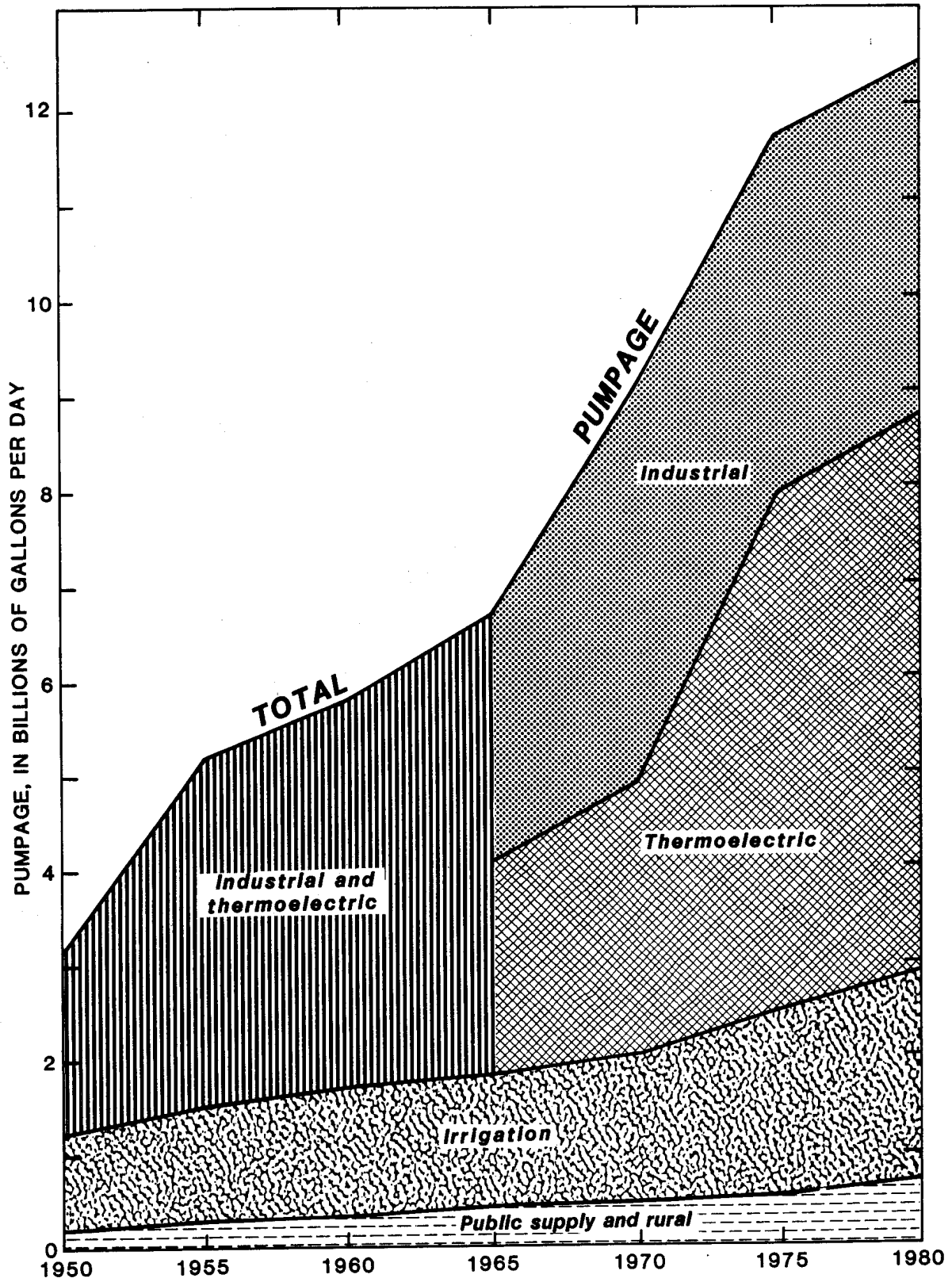


Figure 3.--Pumpage in Louisiana by use categories, 1950-80.

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TABLE 3.--PUMPAGE OF WATER IN LOUISIANA BY
[In millions of

PARISH	PUBLIC SUPPLY		INDUSTRIAL		POWER GENERATION		RURAL		
	GROUND	SURFACE	GROUND	SURFACE	FOSSIL FUELED		DOMESTIC	LIVESTOCK	
					GROUND	SURFACE		GROUND	GROUND
ACADIA	4.16		1.47	.01			1.60	.12	.12
ALLEN	1.55		.40				.32	.11	.11
ASCENSION	.72	1.40	4.20	202.			2.17		
ASSUMPTION		1.65	4.60	18.9				.01	.01
AVOUELLES	3.65		.34	.11			.10	.17	
BEAUREGARD	3.09		27.9				.58	.10	.10
BIFNVILLE	.66		.66				.35	.19	.11
BOSSIER	.97	6.24	.44				1.88	.18	.09
CADDO	1.23	35.9	.23	.52		199.	1.11	.41	.29
CALCASTEU	22.6		109.	311.	8.00	7.52	1.84	.49	.49
CALDWELL	.63						.12		.07
CAMERON	2.95		2.96	1.45			.08		.40
CATAHOULA	.70						.13		.08
CLAIBORNE	2.04		1.05				.25	.19	.14
CONCORDIA	2.26								.09
DESOTO	1.59	.54	.02				.33	.29	.22
E BATON ROUGE	53.9		86.5	69.0	7.07	4.03	1.73	.14	.02
E CARROLL	.70		.02				.16	.01	.02
E FELICIANA	1.05		.03				.42	.12	.12
EVANGELINE	2.76		1.54	.00		279.	.71	.26	.26
FRANKLIN	1.98								.43
GRANT	.91	2.12	.06	1.30			.26	.04	
IBERIA	8.56		4.45	11.5				.07	.02
IBERVILLE	1.99		36.9	655.	2.20	730.	.16	.15	
JACKSON	1.26		12.9				.28	.40	
JEFFERSON		67.8	6.05	20.6	3.31	1500.	.70	.06	.02
JEFF DAVIS	2.66		.11				1.75	.21	.02
LAFAYETTE	13.8				.04				
LAFOURCHE		14.9		15.6				.05	.29
LASALLE	1.49						.19		.07
LINCOLN	5.66		.68				.11	.30	
LIVINGSTON	2.92		.03				2.82	.12	
MADISON	1.35		.06				.03	.06	
MORFHOUSE	3.21		11.9	23.0			.44	.12	
NATCHITOCHE	.48	5.40	.00	1.55			.87	3.02	
ORLEANS		143.	14.7		20.7	672.			
OUACHITA	7.29	9.36	11.9	21.6	.02	449.	.68	.08	
PLAQUEMINES		5.19		152.			.04		
POINTE COUPEE	1.04		.13		4.04		.52	.13	.08
RAPIDES	31.6		1.51	1.11	.22	210.	.23	.21	.05
RED RIVER	.47		.27				.25	.02	.16
RICHLAND	1.76		.05				.77	.10	
SARINE	.39	.65	.12	.10			.96	.36	
ST BERNARD		10.5	1.38	654.			.15		
ST CHARLES		7.17	8.27	712.		1570.			.05
ST HELENA	.21						.52	.49	.06
ST JAMES		2.39	7.47	264.			.03	.00	.00
ST JOHN	1.52	3.25	4.03	93.7			.33	.00	.00
ST LANDRY	9.92		1.05				.91	.14	.04
ST MARTIN	5.11		5.46	1.29			.52	.02	.00
ST MARY	.17	9.37	2.17	1.78	.14	181.		.00	.00
ST TAMMANY	9.00		.16				14.5	.16	.10
TANGIPAROA	7.93		.30				4.91	.93	.50
TENSAS	.51	.54					.11		.04
TERREBONNE		9.69	.16	.07					.11
UNION	2.25		.07				.28	.33	
VERMILION	4.82		5.87				1.24	.56	.06
VERNON	5.61						1.28	.42	
WASHINGTON	9.46		20.1	17.0			2.67	.85	.03
WERSTER	4.40		2.38				.18	.10	.16
W BATON ROUGE	5.22		3.99				.31	.03	.01
W CARROLL	1.20		.07				.23	.17	
W FELICIANA	1.51		5.48	29.8			.40	.09	.16
WINN	1.40		1.24				.45	.08	
TOTAL BY SOURCE	266.17	337.00	412.47	3279.81	45.72	5795.78	54.02	12.65	5.22
TOTAL BY CATEGORY	603.17		3692.27		5841.50		17.87		
TOTAL BY GROUP							71.89		

PARISH, SOURCE, AND PRINCIPAL USE, 1980
gallons per day]

IRRIGATION				AQUACULTURE		TOTAL USE			PARISH
RICE		OTHER		GROUND	SURFACE	GROUND	SURFACE	TOTAL	
GROUND	SURFACE	GROUND	SURFACE						
172.	123.	4.32		15.0	15.0	198.60	137.93	336.53	ACADIA
79.8	16.4					82.18	16.55	98.73	ALLEN
				.44	.36	7.10	203.69	210.79	ASCENSION
					2.22	5.05	22.81	27.86	ASSUMPTION
7.66	17.9	.01				11.93	17.99	29.92	AVOUELLES
6.95	4.05					38.58	4.15	42.73	BEAUREGARD
						1.86	.11	1.97	BIENVILLE
.53		.01				4.01	6.33	10.34	BOSSIER
.41		.80				4.20	235.55	239.75	CADDO
44.4	102.					185.96	421.12	607.09	CALCASIEU
9.78						10.54	.07	10.61	CALDWELL
3.92	52.8					9.91	54.65	64.55	CAMERON
.54					1.61	1.37	1.69	3.06	CATAHOULA
						3.52	.14	3.66	CLAIBORNE
18.2	2.79			.38		20.80	2.89	23.68	CONCORDIA
						2.23	.76	2.99	DESOTO
		.14		.06		149.61	73.05	222.67	E BATON ROUGE
41.1	3.58	2.37				44.37	3.60	47.97	E CARROLL
		.03		.03		1.67	.12	1.79	E FELICIANA
123.	20.3	.49		12.5	12.5	141.22	312.48	453.69	E ANGELINE
	5.66	.40	3.27	1.06		3.45	9.37	12.81	FRANKLIN
			.01			1.28	3.43	4.71	GRANT
6.60	6.67	6.27	.89	4.82	1.21	30.77	20.32	51.09	IBERIA
					3.38	41.41	1388.37	1429.78	IBERVILLE
		.19	.89			14.81	.00	14.81	JACKSON
175.	144.					9.55	1586.25	1595.80	JEFFERSON
19.9	4.09					178.95	144.90	323.85	JEFF DAVIS
						35.61	4.11	39.73	LAFAYETTE
					6.88	.05	37.69	37.74	LAFOURCHE
				.01		1.69	.07	1.76	LASALLE
		.13				6.88	.00	6.88	LINCOLN
		.04				5.93	.00	5.93	LIVINGSTON
3.12		.25				4.87	.00	4.87	MADISON
44.7	67.1	4.84	3.86			65.23	93.91	159.14	MOREHOUSE
	3.68		.30		1.40	4.37	12.32	16.69	NATCHITOCHE
		.11	.05			35.50	814.77	850.26	ORLEANS
	11.2	.89	1.10	.15	.11	21.04	492.03	513.08	OUACHITA
						.04	157.65	157.69	PLAQUEMINES
4.72						10.59	.08	10.67	POINTE COUPEE
	8.44		.85	.05		33.78	220.45	254.23	RAPIDES
1.28						2.30	.16	2.46	RED RIVER
50.0		3.84	.80	4.11		60.67	.80	61.47	RICHLAND
			.07			1.82	.81	2.64	SARINE
						1.53	664.48	666.01	ST BERNARD
					.63	8.27	2285.45	2293.72	ST CHARLES
						1.22	.06	1.28	ST HELENA
		.01		22.3		7.52	288.84	296.35	ST JAMES
				.16		5.89	97.11	103.00	ST JOHN
36.2	28.0			.43	.11	48.68	28.12	76.80	ST LANDRY
13.0	3.20		1.50	5.63	22.5	29.69	28.49	58.19	ST MARTIN
	1.26		.03	2.01	2.01	4.50	195.83	200.33	ST MARY
		.08	.04	.02		23.96	.14	24.10	ST TAMMANY
		2.58	.22	.10		16.75	.73	17.48	TANGIPAHOA
4.87						5.49	.58	6.07	TENSAS
						.16	9.86	10.02	TERRERONNE
.31						3.23	.00	3.23	UNION
29.9	494.			2.25	8.99	44.64	503.22	547.86	VERMILION
				.02		7.33	.00	7.33	VERNON
		.18				33.22	17.07	50.30	WASHINGTON
						7.06	.16	7.22	WERSTER
	.34					9.54	.35	9.89	W RATON ROUGE
7.78	3.35	1.39	.67	1.50		12.34	4.02	16.35	W CARROLL
1.40						8.88	29.97	38.85	W FELICIANA
						3.17	.00	3.17	WINN
907.36	1123.92	29.37	14.55	50.59	101.40	1778.36	10657.67	12436.02	TOTAL BY SOURCE
2031.28		43.93		151.99					TOTAL BY CATEGORY
2075.21									TOTAL BY GROUP

CORRECTIONS AND ADDITIONS TO SPECIAL REPORT NO. 3

CORRECTIONS TO TABLE 3 (p. 14-15)

[Pumpage totals in table 3 will change accordingly]

Ascension Parish: Pumpage for rural use, livestock, should be 0.07 Mgal/d (ground water) and 0.01 Mgal/d (surface water).

Bienville Parish: Industrial pumpage (ground water) should be 10.4 Mgal/d (not 0.66).

Jackson Parish: Industrial pumpage (ground water) should be 3.22 Mgal/d (not 12.9).

Lafayette Parish: Pumpage for power generation (ground water) should be 1.41 Mgal/d (not 0.04).

ADDITION TO SELECTED REFERENCES (p. 11)

Cardwell, G. T., and Walter, W. H., 1979, Pumpage of water in Louisiana, 1975: Louisiana Department of Transportation and Development, Office of Public Works, Special Report 2, 15 p.