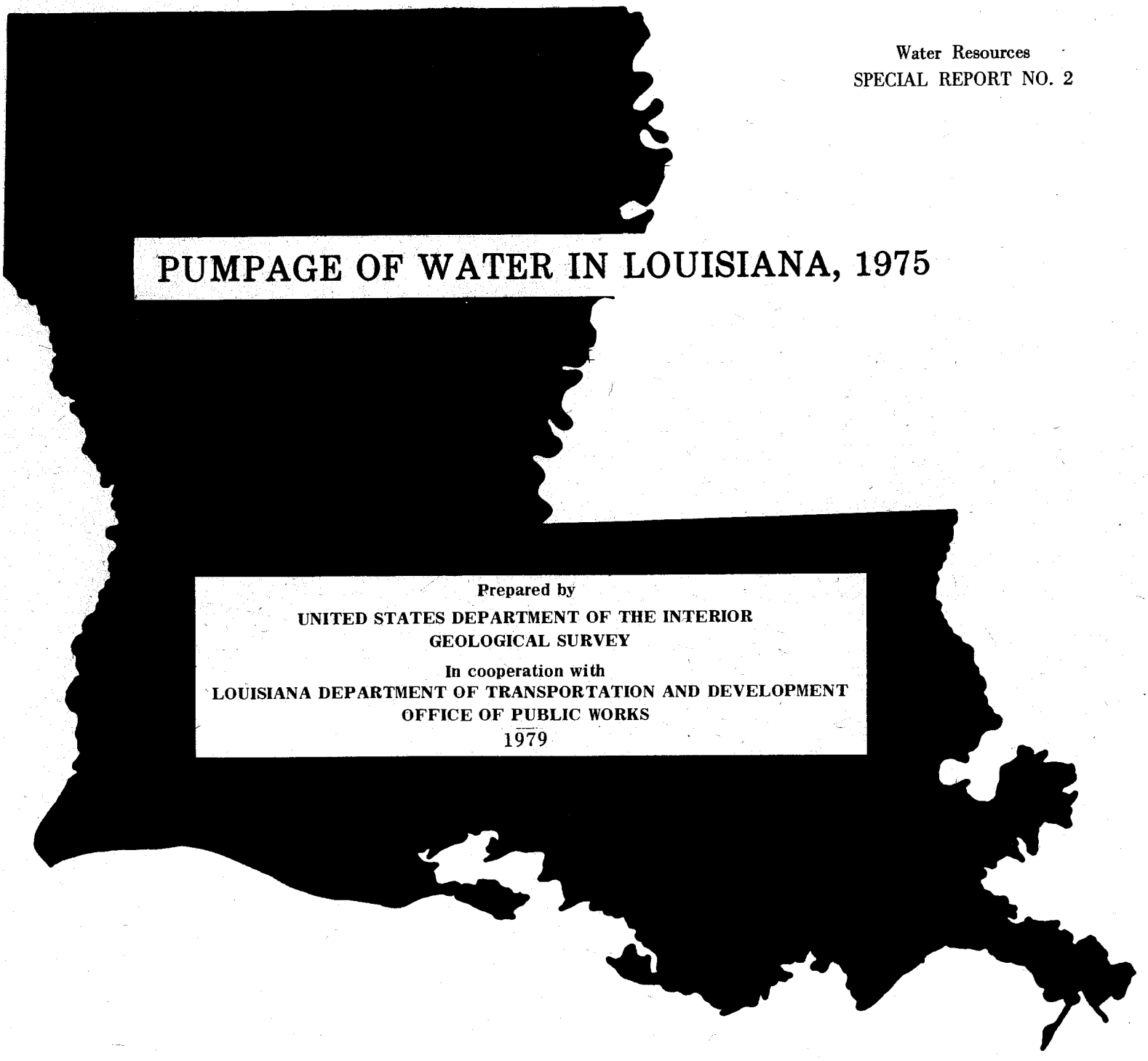
STATE OF LOUISIANA

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

OFFICE OF PUBLIC WORKS

Water Resources
SPECIAL REPORT NO. 2

PUMPAGE OF WATER IN LOUISIANA, 1975



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In cooperation with
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
OFFICE OF PUBLIC WORKS

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PUMPAGE OF WATER IN LOUISIANA, 1975

By

G. T. Cardwell and W. H. Walter
U.S. Geological Survey

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STATE OF LOUISIANA

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DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

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OFFICE OF PUBLIC WORKS

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Louisiana District

A. N. CAMERON, Chief

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Multiply inch-pound units	By	To obtain SI units
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)	0.003785	cubic meter per minute (m^3/min)
	0.06309	liter per second (L/s)
million gallons per day (Mgal/d)	3,785	cubic meter per day (m^3/d)
	3.785×10^6	liter per day (L/d)
	43.81	liter per second (L/s)

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

Unit	Multiply by	To obtain
million gallons per day (Mgal/d)	3.069	acre-foot per day
	1,120	acre-foot per year
	1.547	cubic foot per second (ft^3/s)
	694.4	gallon per minute (gal/min)
	0.1337	million cubic feet per year

PUMPAGE OF WATER IN LOUISIANA, 1975

By G. T. Cardwell and W. H. Walter

ABSTRACT

In 1975 an estimated 11,700 million gallons per day of water was pumped for various uses in Louisiana; 10,200 million gallons per day was pumped from surface-water sources and 1,560 from ground water. Two-thirds of the surface-water withdrawals were from the Mississippi River, mainly for industrial use; and about one-half 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 29 percent, 1970-75. Use of surface water increased by 35 percent while use of ground water increased by only 2 percent.

INTRODUCTION

Water is one of Louisiana's most valuable natural resources. The availability of reliable information on water use is important in many phases of water-resources planning and in assessing the impact of planned development on the natural environment. Beginning in 1955, relatively detailed data on water use in the State have been collected every 5 years by the U.S. Geological Survey and published by Louisiana cooperating agencies. The purpose of this report is to document results of the "1975" (1974-76) water-use study. The scope of the study included collection and compilation of information on significant withdrawals of both ground and surface water. Results are compiled by principal use categories, by geographic and demographic units, and by source. The work was done by the U.S. Geological Survey as part of a continuing program of water-resources studies in cooperation with the Louisiana Office of Public Works, Department of Transportation and Development.

Previous work.--The first detailed estimates of water use in the United States were made in 1950 (MacKichan, 1951) and included only State totals for rural, municipal, industrial, and irrigation uses for both ground and surface water. In 1955 more detailed data were assembled for inclusion in "Water--A Special Report to the Louisiana Legislature" (Louisiana Department of Public Works, 1956). Formal publication of detailed water-use information began with the 1960 report (Snider and Forbes, 1961). Data for 1965 and 1970 were published in the Louisiana Water Resources Pamphlet series as Pamphlets 20 and 26. State water-use totals for 1950-75 were published in the Geological Survey Circular series (Circulars 115, 398, 456, 556, 676, and 765).

Acknowledgments.--Many of the personnel in the Geological Survey's Louisiana District were involved in collection of the data, much of which was collected as part of the various areal studies in progress within the State. Appreciation is expressed to the numerous agencies, municipalities, industries, and individuals who cooperated by supplying vital information. The contributions by numerous county agents, the Agricultural Stabilization and Conservation Service, and the Capital Area Groundwater Conservation Commission are especially acknowledged.

COLLECTION AND COMPILATION OF DATA

Most data included in this report were collected during the period 1974-76 and nominally for the 1975 calendar year. However, for areas in which areal studies had been completed since 1970, available data were used unless significant changes had occurred.

Water use (or pumpage), as used in this report, is water withdrawn (or diverted) from a source for use. Thus, nonwithdrawal uses such as recreation, navigation, and waste dilution were not considered, although hydroelectric use is listed in table 2. Water withdrawn in one parish for use in another is counted in the parish of origin. For example, the public-supply source for the city of Plaquemine, Iberville Parish, is ground water from wells in West Baton Rouge Parish. Therefore the pumpage total is tabulated under West Baton Rouge Parish.

Ground-water use is considered "consumptive use," as virtually none of the water is returned to the source, although some becomes return flow to surface sources. Much of the surface water withdrawn is returned to the source; although some is consumed through evaporation or incorporation in a product, it is mostly "nonconsumptive use."

Following are notes, by use category, on sources and procedures used in collection of data.

Public supply.--This category includes water pumped by private and publicly owned systems and waterworks districts. It includes residential and commercial uses and water used in firefighting and flushing lines, as well as leakage from distribution lines. Pumpage figures for most larger

municipalities and water systems were obtained from them or compiled from their records. For many of the smaller systems, pumpage estimates were based on population or number of connections, applying use factors considered valid for the area.

Industrial use.--This category includes mainly self-supplied pumpage for industries and businesses, but also includes self-supplied pumpage for military bases, schools, hospitals, and other public institutions. Many of the major industries in the State maintain good pumpage records, and some have routinely reported this information to the Geological Survey periodically. Pumpage for major users in the five-parish area of the Capital Area Groundwater Conservation Commission was supplied by the Commission. For many of the small industries, use was estimated on the basis of reported average pumping time and estimated well yields. Water recirculated for cooling is counted only once.

Thermoelectric-power use.--Most water in this category is used for cooling. Only withdrawal use is counted, regardless of how many times the water is recirculated within the cooling system.

Rural use.--Rural-domestic pumpage is based on the population not served by public supplies and estimated per capita use rates. Rural-domestic use is abnormally high in the parishes of Livingston, St. Tammany, Tangipahoa, and Washington because of water flowing to waste from uncapped wells. Although much of the water is not beneficially used, it is discharged through wells and is theoretically available for use. Waste flow was estimated to be nearly 20 Mgal/d in 1975. Use for livestock was based on livestock populations furnished by county (parish) agents and standard rate-of-use factors. The percentage of stock using ground and surface water was based on field experience and information from county agents.

Irrigation use.--Over 95 percent of the irrigation in the State is for propagation of rice, mainly in southwestern Louisiana. Irrigation pumpage in that area was based on 1974 acreage data obtained through the cooperation of the ASCS (Agricultural Stabilization and Conservation Service). A questionnaire, prepared by the Geological Survey and completed at parish ASCS offices when farmers certified their rice acreage, identified acreages irrigated by wells and by surface sources. The average application of ground water, in feet per year (including conveyance losses), was determined by indirect measurements of pumpage from selected wells irrigating representative farm acreages, scattered throughout the rice-growing area. The average figure for 1974 was 1.91 ft. The average seasonal requirement for the acreage supplied from surface sources was estimated to be 4.15 ft. This figure included conveyance losses and return flows. (The canal companies that supply surface water charge a flat rate--generally one-fifth of the crop--so there is no incentive for conservative use.)

Much of the information on irrigation pumping in the remainder of the State was based on information obtained from the county agents in the respective parishes or, in some instances, from irrigators. Application rates were based on discussions with county agents and previous experience. All types of fish farming were included with "irrigation," a change from the 1970 report when it was included in the industrial category. In future reports it is planned to include all agriculture-related use under the broader term "agricultural use."

WATER USE

The figures listed in the water-use tables are in terms of the average daily pumpage for the year. Thus pumpage for seasonal industries and (or) irrigation is prorated for the entire year and is substantially less than the seasonal rate. Water-use totals by parish and by principal use categories are listed in table 4. A maximum of three significant figures are shown in parish totals for individual use categories. However, because the cutoff point for listing pumpage is 0.01 Mgal/d (10,000 gal/d or 7 gal/min), totals in some parish categories are rounded to one or two significant figures. Grand totals were not rounded.

Parish totals for ground and surface water are shown in figure 1, and total use by major hydrologic units is shown in figure 2. Total water use in 1975 was 11,700 Mgal/d, an increase of 29 percent since 1970. Of this total, 13 percent was pumped from wells, and the remainder from streams and lakes.

Per capita use of water in the State, including all withdrawal uses, was 3,100 gal/d in 1975. Per capita use for public supply was 152 gal/d compared to 144 gal/d in 1970.

Ground-Water Withdrawals

Ground-water withdrawals in the State in 1975 were about 1,560 Mgal/d. About 52 percent of the ground water pumped was for irrigation use, 30 percent for industrial use, and 13 percent for public supply. Although use of ground water increased by nearly 83 percent, 1950-70, it increased by only 2 percent, 1970-75. Only public-supply use increased substantially, 43 percent, 1970-75. Part of that increase resulted from the development of rural water systems, 1970-75. Irrigation pumpage increased slightly, and use in other categories declined slightly.

Over one-half of the ground-water withdrawals in the State were from the Pleistocene Chicot aquifer in southwestern Louisiana; an average of 803 Mgal/d (table 1) was pumped in 1975, mainly for rice irrigation. Most of the remaining pumpage was from Pleistocene, Pliocene, and Miocene aquifers in the central and southeastern parts of the State. About 65 Mgal/d (4 percent of the total ground water withdrawn) was pumped from the Sparta Sand, the principal aquifer in northern Louisiana.

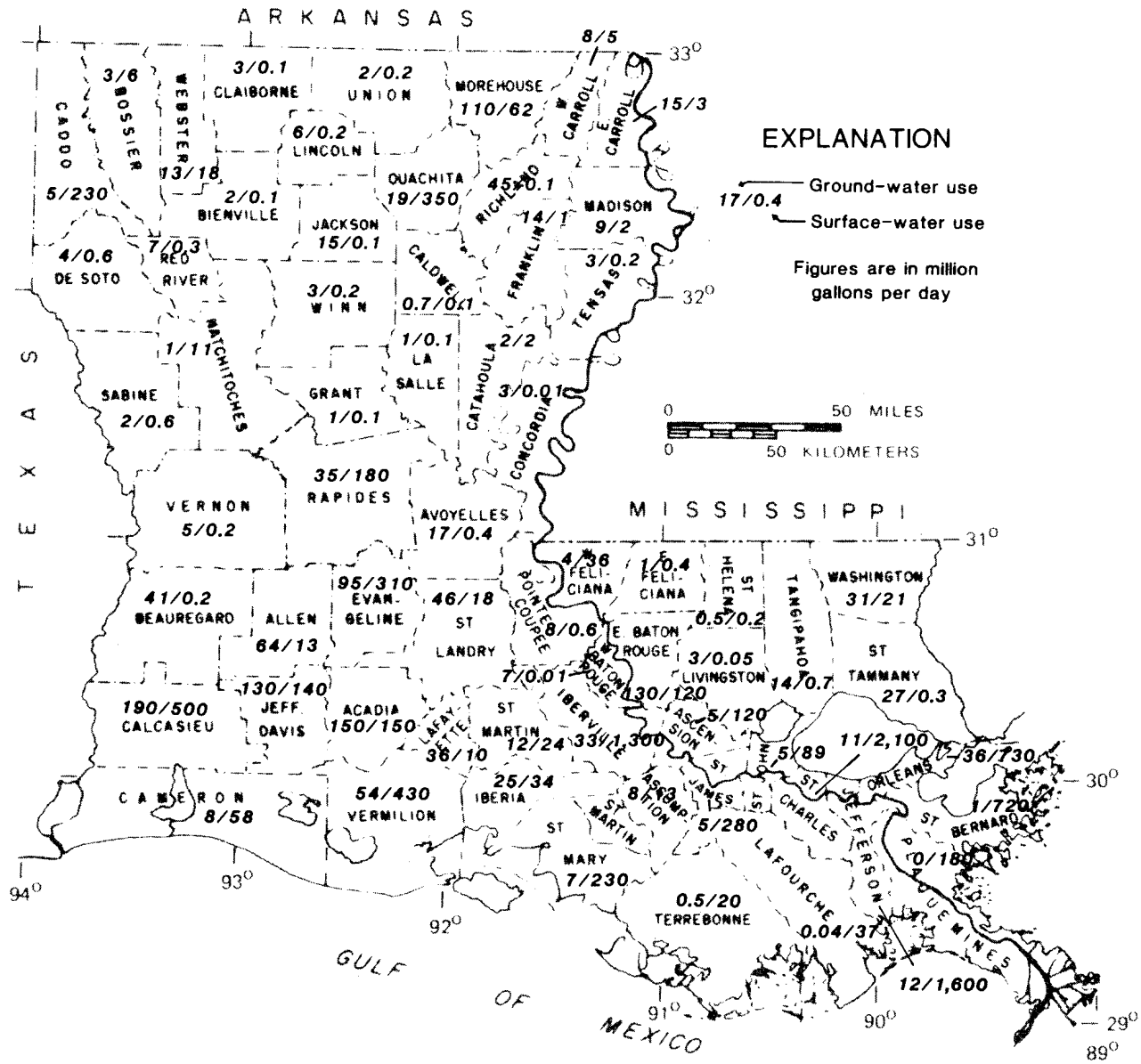

Figure 1.--Water use in Louisiana by parish, 1975.

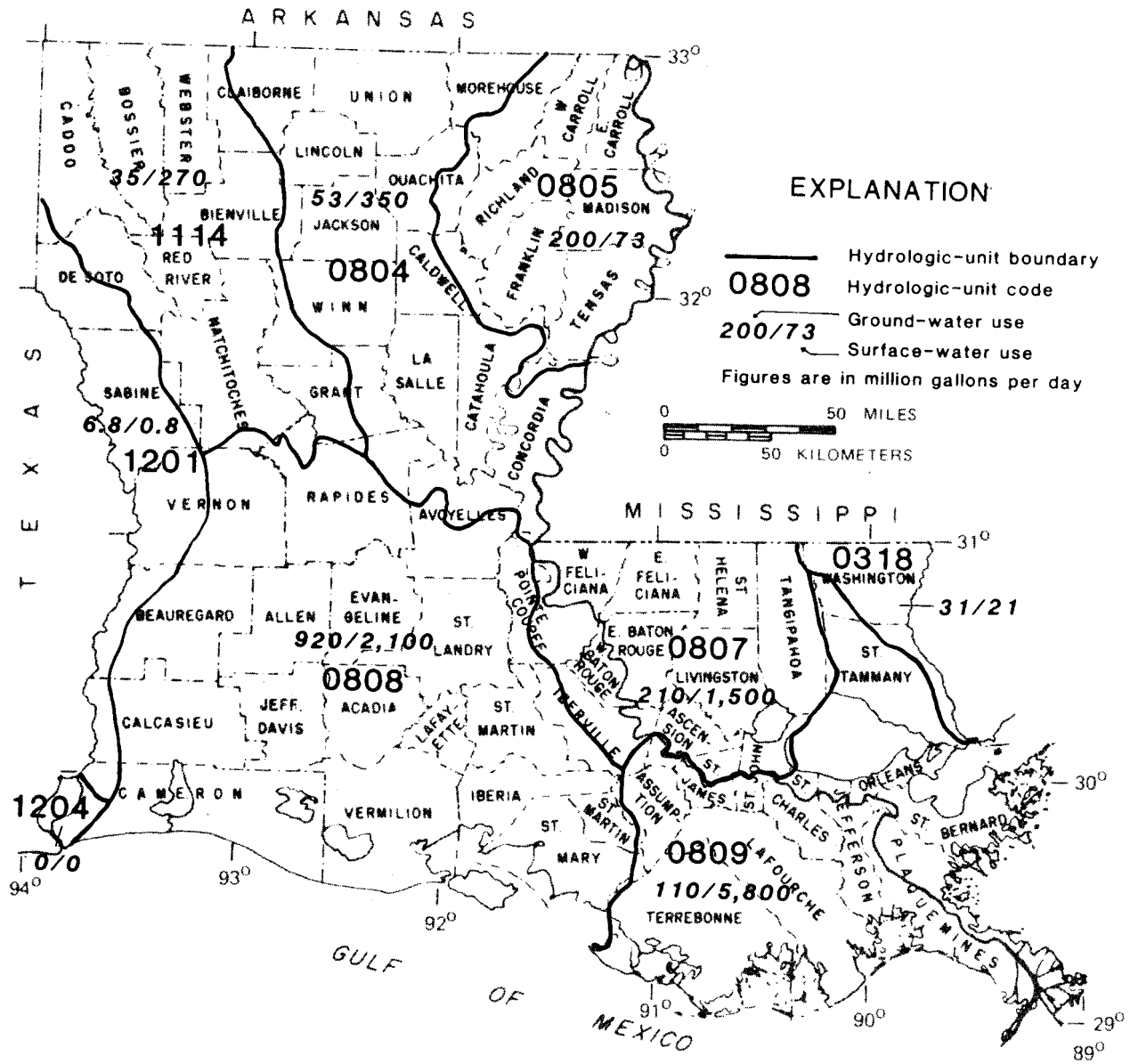

Figure 2.--Water use in major hydrologic units in Louisiana, 1975.

Table 1.--Withdrawal of ground water, by aquifer, 1975

Aquifer or aquifer group	Million gallons per day
Chicot aquifer	803
Pleistocene aquifers, exclusive of Chicot	219
Miocene-Pliocene aquifers	212
Mississippi River alluvial aquifer	214
Sparta Sand (Eocene)	64.8
Red River alluvial aquifer	33.4
Wilcox Formation (Paleocene and Eocene)	7.7
Cockfield Formation (Eocene)	4.3
Ouachita River alluvial aquifer	2.6
Total (rounded)	1,560

Surface-Water Withdrawals

Surface-water withdrawals, about 10,200 Mgal/d in 1975, increased about 35 percent, 1970-75. Public-supply use increased by 23 percent, irrigation use increased by 45 percent, and industrial use decreased by 10 percent. Principal users of surface water are industry and powerplants (thermoelectric); together, these categories account for 86 percent of the surface water withdrawn. About two-thirds of the surface water used in Louisiana (6,600 Mgal/d, table 2) is withdrawn from the Mississippi River. Streams in the southern part of the State supply much of the other surface water used.

USE TRENDS AND DATA NEEDS

The trends in water use in Louisiana, 1950-75 are shown in figure 3. Cumulative totals were plotted so that the top curve depicts total pumpage. This illustration is based on table 3, which includes pumpage totals for major use categories since 1950. (Note that, prior to 1965, thermoelectric use was included in the industrial category.) In general, the trends indicate gradual increases in pumpage for public-supply and irrigation uses and dramatic increases in pumpage for industrial and thermoelectric uses. Table 3 reveals that much of the increase in pumpage since 1950 has come from surface sources. In 1950, 27 percent of the pumpage in the State was from ground water; in 1975, only 13 percent was from ground water.

Local areas in the State, particularly the extreme southern part, have shortages of freshwater; however, the use of saline[1/] water in

1/Water having a concentration of total solids exceeding 1,000 milligrams per liter.

Table 2.--Withdrawal of surface water, by source, 1975

Source	Million gallons per day
Mississippi River (main stem)	[a]/6,600
Intracoastal Waterway and associated canals	[b]/720
Bayou Teche	590
Calcasieu River	510
Red River (including 140 Mgal/d from Caddo Lake)	440
Ouachita River	420
Mermentau River	410
Vermilion River	360
Bayou Lafourche	62
Sabine River	[c]/44
Pearl River	20
Lakes, streams, and ponds in southeastern Louisiana	18
Total withdrawals (rounded)	10,200

[a]/ Includes 120 Mgal/d of saline water.

[b]/ Mostly saline water.

[c]/ Excludes 4, 800 Mgal/d used for hydroelectric-power generation.

these areas (generally available in large quantities) is not yet significant. In 1975, 38 Mgal/d of saline ground water (2 percent of total ground water pumped) and 264 Mgal/d of saline surface water (3 percent of total surface water pumped) were withdrawn.

Although total pumpage continues to increase, it is notable that the increases, 1970-75, fell far short of projections made by planning agencies. This is especially true for total ground-water pumpage, which was essentially the same in 1975 as in 1970, and pumpage of ground water by industry, which declined significantly.

Conservation trends in uses of water are developing, particularly in use of ground water, where declining water levels and increasing costs of development and pumping are of concern in local areas of the State. The conservation efforts have resulted in less wastage by many users and more reuse and recirculation of water used by industries. Many irrigators in the southwestern part of the State have installed underground pipe to minimize conveyance losses. Water-user groups and water-management districts have had a significant impact by educating users to conserve. Implementation of effluent standards by the U.S. Environmental Protection Agency and the Louisiana Stream Control Commission have also resulted in more conservative practices in water use.

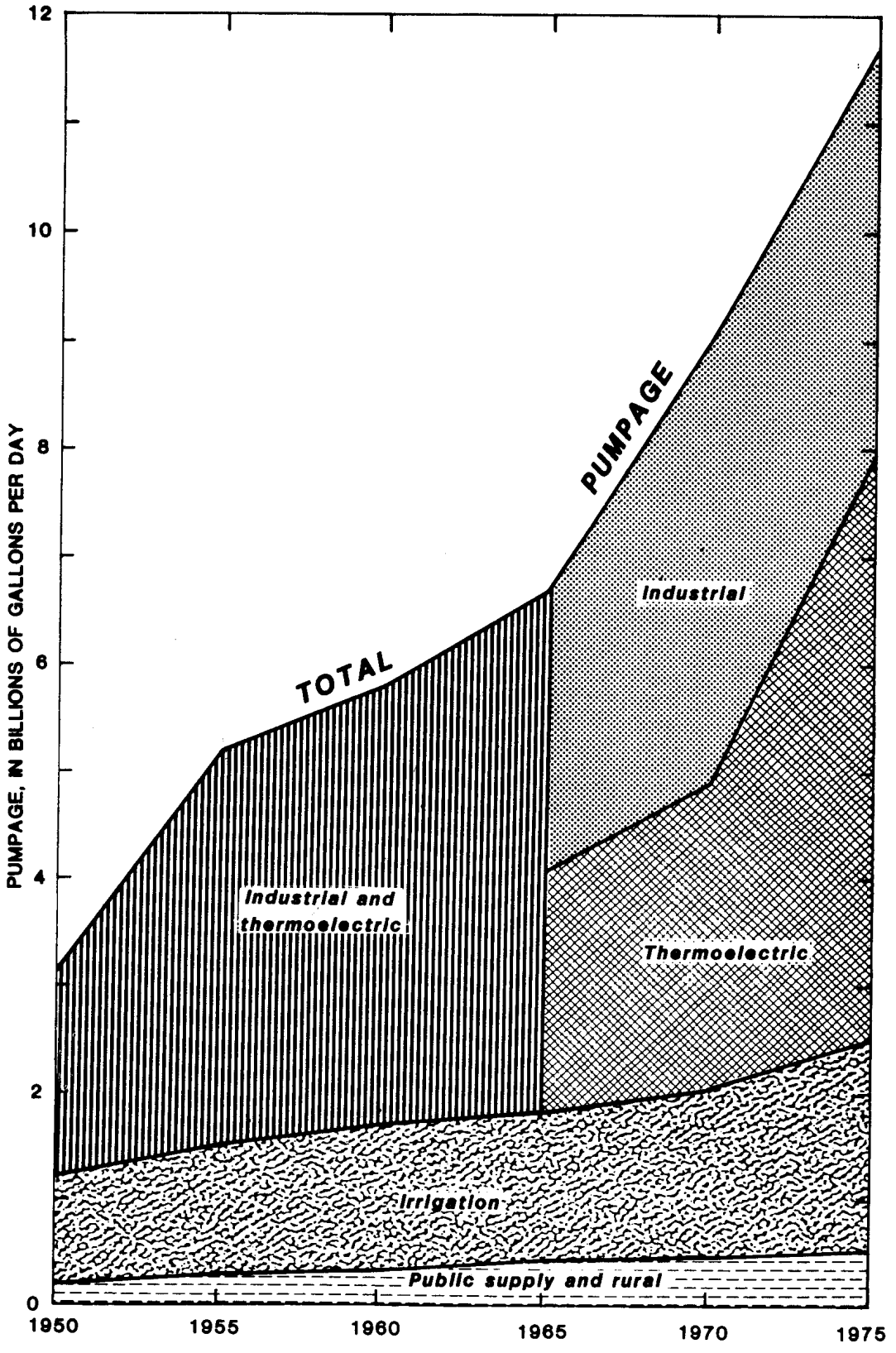

Figure 3.--Pumpage in Louisiana by use categories, 1950-75.

Table 3.--Total pumpage by principal use and source, 1950-75

[In millions of gallons per day]

Year		Public supply	Industrial	Thermoelectric	Rural	Irrigation	Total
1950[a]	Ground water----	55	340	(b)	40	400	835
	Surface water---	95	1,600	(b)	7	590	2,292
	Total-----	150	1,940	(b)	47	990	3,127
1955[c]	Ground water----	83	480	(b)	22	380	965
	Surface water---	160	3,200	(b)	17	830	4,207
	Total-----	243	3,680	(b)	39	1,210	5,172
1960[d]	Ground water----	93	381	(b)	53	594	1,121
	Surface water---	174	3,705	(b)	16	773	4,668
	Total-----	267	4,086	(b)	69	1,367	5,789
1965[e]	Ground water----	121	387	27	58	580	1,173
	Surface water---	237	2,236	2,218	11	829	5,531
	Total-----	358	2,623	2,245	69	1,409	6,704
1970[f]	Ground water----	141	496	36	78	774	1,525
	Surface water---	243	3,657	2,847	11	783	7,541
	Total-----	384	4,153	2,883	89	1,557	9,066
1975	Ground water----	201	471	31	52	807	1,563
	Surface water---	300	3,277	5,445	9	1,136	10,167
	Total-----	501	3,748	5,476	61	1,943	11,730

[a] MacKichan, 1951, table 1.
[b] Included with industrial.
[c] MacKichan, 1957, table 9.
[d] Snider and Forbes, 1961.
[e] Bieber and Forbes, 1966.
[f] Dial, 1970.

In the future, to facilitate water-resources studies and planning, more detailed and more precise water-use information will be needed. In addition, more frequent reporting will be desirable, particularly for major users and in problem areas. However, more precise estimates

must be obtained to justify increased frequency of reporting. Thus, the need for more metering or development of better indirect methods of estimation is indicated, particularly for large users.

Specific data needs are more information on how rates of use vary seasonally and monthly, including data on peak demands. Also needed is information on consumptive use and return flows, particularly for surface water. In addition, it is probable that planners will ultimately need information for many more use categories than are presently inventoried.

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TABLE 4.--PUMPAGE OF WATER IN LOUISIANA BY PARISH, SOURCE, AND PRINCIPAL USE, 1975
(IN MILLIONS OF GALLONS PER DAY)

PARISH	PUBLIC SUPPLY		INDUSTRIAL		THERMOELECTRIC		RURAL			IRRIGATION				TOTAL USE		
							DOMESTIC	LIVESTOCK		RICE		OTHER				
	GROUND	SURFACE	GROUND	SURFACE	GROUND	SURFACE	GROUND	GROUND	SURFACE	GROUND	SURFACE	GROUND	SURFACE	GROUND	SURFACE	TOTAL
ACADIA	4.01		8.93				0.85	0.15	0.07	136.	147.	2.56	0.60	152.50	147.67	300.17
ALLEN	1.35		10.0				.08	.10	.10	52.0	12.5	.10		63.63	12.60	76.23
ASCENSION	.67	1.14	2.50	115.			.66	.14	.02			1.23		5.20	116.16	121.36
ASSUMPTION		1.55	8.26	10.1			.02		.01				1.34	8.28	13.00	21.28
AVOYELLES	2.41		.47	.14			.07	.51	.22	11.8		1.33		16.59	.36	16.95
BEAUREGARD	2.35		29.0				.46	.15	.15	9.17				41.13	.15	41.28
BIENVILLE	.64		.69	.02			.22	.04	.07			.08		1.67	.09	1.76
BOSSIER	.99	6.00	1.48	.06			.42	.01	.06					2.90	6.12	9.02
CADDO	.98	30.6	1.70	.35		200.	.39	.14	.42			1.80		5.01	231.37	236.38
CALCASIEU	16.2		119.	314.			1.37	.35	.15	56.6	188.	1.40	1.40	194.92	503.55	698.47
CALDWELL	.64						.06	.02	.10			.01		.73	.10	.83
CAMERON	2.69		2.40				.20	.44	.05	2.47	57.5			8.20	57.55	65.75
CATAHOULA	.83			1.50			.12	.01	.06	.40		.36	.28	1.72	1.84	3.56
CLAIBORNE	1.22		1.26				.18	.07	.13					2.73	.13	2.86
CONCORDIA	1.90						.06	.22	.01			.38		2.56	.01	2.57
DESOTO	1.11	.24	.13				.21	.23	.34	1.88				3.56	.58	4.14
EAST BATON ROUGE	39.9		84.7	114.	7.14	5.29	.31	.14	.14			.19	.11	132.38	119.54	251.92
EAST CARROLL	1.09		.02	.30			.07	.03		12.9	2.89	.50		14.61	3.19	17.80
EAST FELICIANA	.88		.03				.19	.02	.35			.05		1.17	.35	1.52
EVANGELINE	2.15		1.95	.14		288.	.52	.18	.18	88.1	19.3	1.79		94.69	307.62	402.31
FRANKLIN	1.58						.37	.06	.33	2.68		9.07	.67	13.76	1.00	14.76
GRANT	.64	.02	.15				.10	.09	.09					.98	.11	1.09
IBERIA	7.05		10.9	17.3			.48	.13	.03	3.76	14.1	2.41	2.41	24.73	33.84	58.57
IBERVILLE	1.35		30.1	643.	1.32	632.	.01	.26					1.40	33.04	1,276.40	1,309.44
JACKSON	1.08		13.6				.08	.06	.12			.32		15.14	.12	15.26
JEFFERSON		58.4	8.30	34.1	3.31	1,500		.01	.02			.34		11.96	1,592.52	1,604.48
JEFFERSON DAVIS	2.19		.06				.43	.29	.10	131.	138.	.53	.13	134.50	138.23	272.73
LAFAYETTE	10.8		1.42				1.02	.44	.14	21.1	10.1	1.47	.13	36.25	10.37	46.62
LAFOURCHE		7.63		29.0				.04	.18				.03	.04	36.84	36.88
LASALLE	1.02		.06				.08	.01	.12					1.17	.12	1.29
LINCOLN	3.50		1.67				.38	.13	.14			.11	.04	5.79	.18	5.97
LIVINGSTON	.97		1.16				.65	.16	.05			.19		3.13	.05	3.18
MADISON	1.00		.03				.09	.08	.01	6.56	2.19	1.28		9.04	2.20	11.24
MOREHOUSE	2.20		15.2	20.6			.19	.14	.02	81.2	40.6	7.17	.50	106.10	61.72	167.82
NATCHITOCHES	.42	2.70		6.58			.33	.11	.63	.31	.62		.40	1.17	10.93	12.10
ORLEANS		131.	19.0	.01	16.4	594.	.35					.07	.02	35.82	725.03	760.85
OUACHITA	5.55	9.43	12.8	25.9		309.	.21	.09	.09		2.75	.18	1.29	18.83	348.46	367.29
PLAQUEMINES		6.40		171.									.03	.00	177.43	177.43
POINTE COUPEE	.80		2.96	.48	2.51		.17	.24	.16	.83				7.51	.64	8.15
RAPIDES	25.5	1.53	1.93		.36	175.	.02	.45	.11	6.25		.01		34.52	176.64	211.16
RED RIVER	.43		.47				.13	.04	.34	3.12		2.85		7.04	.34	7.38
RICHLAND	1.40		.04				.32	.17	.14	33.5		9.94		45.37	.14	45.51
SABINE	.95		.25	.02			.33	.25	.58					1.78	.60	2.38
ST BERNARD		9.00	1.43	710.										1.43	719.00	720.43
ST CHARLES		5.00	11.0	604.		1,540	.06	.04	.04				.30	11.10	2,149.34	2,160.44
ST HELENA	.16						.21	.11	.22					.48	.22	.70
ST JAMES		1.66	5.15	275.			.04	.02				.11	7.91	5.32	284.57	289.89
ST JOHN THE BAPTIST	1.03	1.37	3.88	87.7			.05	.01	.01				.35	4.97	89.43	94.40

ST LANDRY	7.06		.96				.99	.42	.11	36.1	17.7	.27	.08	45.80	17.89	63.69
ST MARTIN	3.06		6.40	3.30			.50	.17	.04	2.04	20.2	.09		12.26	23.54	35.80
ST MARY		9.35	4.84	17.1		202.		.01	.01	1.22	2.99	.92	.92	6.99	232.37	239.36
ST TAMMANY	6.04		2.48				18.3	.09	.21			.54	.06	27.45	.27	27.72
TANGIPAHOA	5.50		1.14				4.70	.87	.58			1.82	.09	14.03	.67	14.70
TENSAS	.64	.02	.48	.14			.09	.04		1.61		.17		3.03	.16	3.19
TERREBONNE		17.0	.54	3.36					.05				.09	.54	20.50	21.04
UNION	1.25		.02				.25	.22	.22			.10		1.84	.22	2.06
VERMILION	2.86		4.60				.95	.76	.08	42.7	434.	2.40		54.27	434.08	488.35
VERNON	4.19						.62	.12	.18			.11		5.04	.18	5.22
WASHINGTON	6.85		20.9	20.0			3.10	.43	.43			.11	.11	31.39	20.54	51.93
WEBSTER	4.01		8.53	17.6				.06	.03					12.60	17.63	30.23
WEST BATON ROUGE	4.16		3.02				.09	.05	.01			.02		7.34	.01	7.35
WEST CARROLL	.78		.06				.13	.10	.03	4.69	4.69	2.42		8.18	4.72	12.90
WEST FELICIANA	1.82		1.78	35.5			.06	.03	.24			.21		3.90	35.74	39.64
WINN	1.41		1.13				.09	.03	.25			.27		2.93	.25	3.18

TOTAL BY SOURCE	201.26	300.04	470.96	3,277.30	31.04	5,445.29	42.43	9.78	8.77	749.99	1,115.13	57.28	20.69	1,562.74	10,167.22	11,729.96
TOTAL BY CATEGORY	501.30		3,748.26		5,476.33		42.43	18.55		1,865.12		77.97		11,729.96		