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

WATER RESOURCES
TECHNICAL REPORT
NO. 31

HYDROLOGY, WATER QUALITY, AND BIOLOGY OF BAPTISTE COLLETTE BAYOU IN RELATION TO THE LOWER MISSISSIPPI RIVER AT VENICE, LOUISIANA

Prepared by
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
In cooperation with
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
OFFICE OF PUBLIC WORKS
1983

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Water Resources

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HYDROLOGY, WATER QUALITY, AND BIOLOGY OF BAPTISTE COLLETTE BAYOU IN RELATION TO THE LOWER MISSISSIPPI RIVER AT VENICE, LOUISIANA

By

Charles R. Demas
U.S. Geological Survey

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STATE OF LOUISIANA

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DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

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Total-coliform-bacteria counts ranged from 40 colonies per 100 milliliters to 5,000 colonies per 100 milliliters in the Mississippi River at Venice and in Baptiste Collette Bayou. Total-coliform counts exceeded 70 colonies per 100 milliliters 95 percent of the time for all stations. Fecal-coliform and fecal-streptococci bacteria were also monitored. Pathogenic bacteria were isolated at all sites and possible sources of bacterial input were identified.

Corophium, Nereis, Asebellides, and Carinoma were the organisms that occurred most frequently and in greatest numbers in samples collected from the Mississippi River at Venice and Baptiste Collette Bayou. Rangia was the most numerous organism collected but occurred in only one set of samples from one site. Saltwater intrusion and substrate type appear to be the dominant factors influencing the kinds of organisms present and their distribution within the study area.

Data collected during the study indicates that, although the Mississippi River is the major factor influencing the quality of the aquatic environment in the Baptiste Collette Bayou distributary system, factors within the bayou system--such as saltwater intrusion, local wildlife, and cattle populations--can significantly affect the water quality of the distributary.

INTRODUCTION

Downstream from New Orleans the Mississippi River is the factor controlling water quality in its distributaries and adjacent wetlands. These areas, of great importance to the commercial food industry of Louisiana, function as breeding, nursery, and feeding grounds to many of the important local commercial fish and benthic invertebrate species. The Mississippi River may also serve as a major source of enteric bacteria to the wetlands and the nearshore oyster reefs. Distributaries of the river also serve as major thoroughfares for ship and barge traffic to the Gulf of Mexico.

Purpose and Scope

As part of the ongoing evaluation of the Mississippi River by the U.S. Geological Survey in cooperation with the Louisiana Office of Public Works, a study was conducted on Baptiste Collette Bayou (fig. 1), the first major distributary of the Mississippi River downstream from New Orleans, to determine the factors that affect water quality, suspended sediment, and benthic-invertebrate and bacterial populations in the distributary. Samples for benthic invertebrates, water quality, and grain size of bed material were collected quarterly starting in July 1980 at four sites on Baptiste Collette Bayou and one site on the Mississippi River at Venice. Samples for bacterial analyses were collected and in-situ measurements of dissolved oxygen, specific conductance, pH, and temperature were made on a monthly basis at these sites. Discharge data and suspended-sedment samples were collected on three occasions. Data

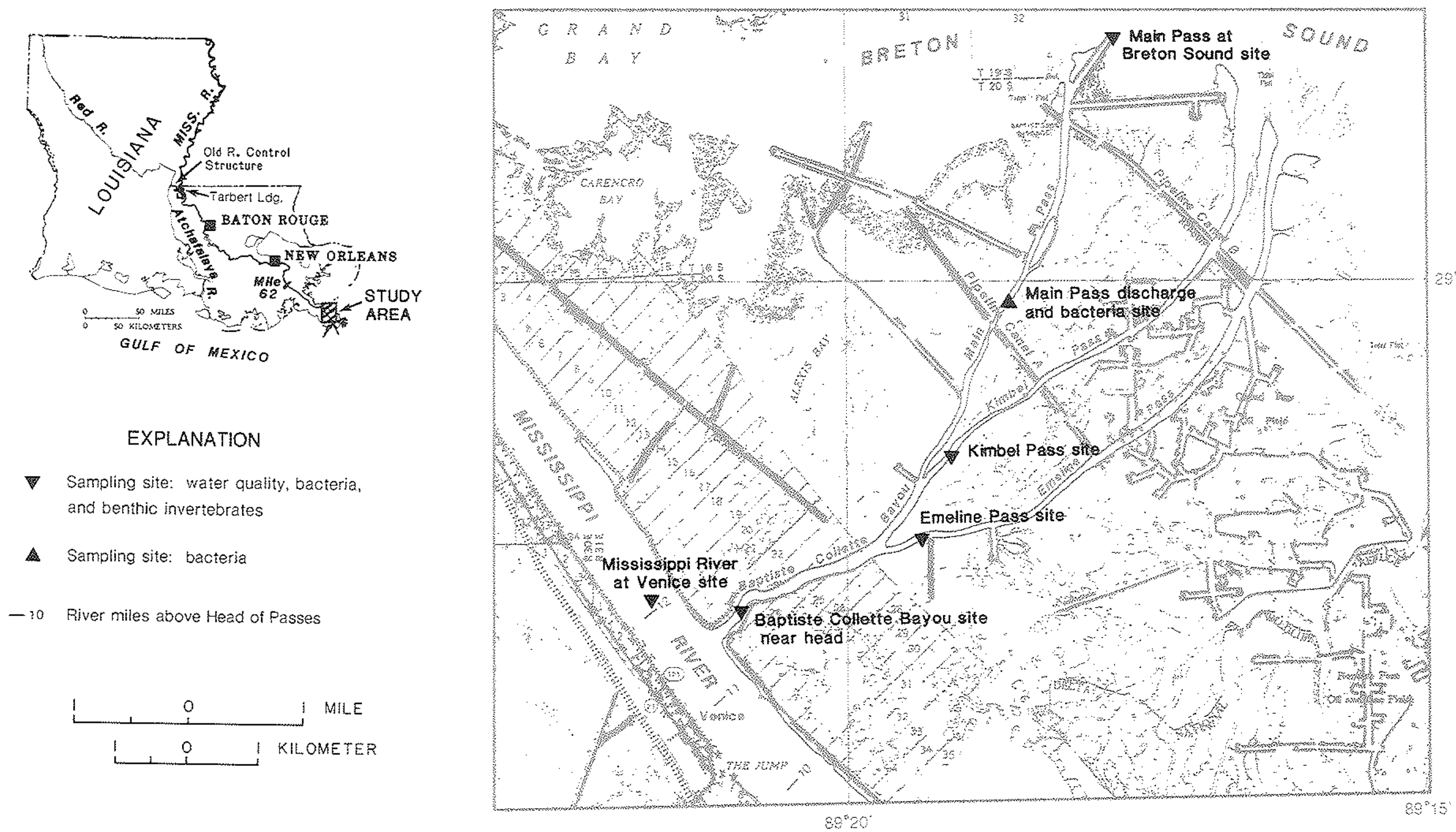

Figure 1.--Location of study area: Baptiste Collette Bayou and the lower Mississippi River at Venice, Plaquemines Parish.

during low flows were discarded because salt contamination was not accounted for during analysis. Suspended-sediment data collected from Baptiste Collette Bayou at discharges of 530,000 ft^3/s and 342,000 ft^3/s in the Mississippi River at Tarbert Landing show a decrease in concentration as the water flowed from the Mississippi River (fig. 2). The suspended-sediment concentration decreased by 31 and 54 percent, respectively, between samples collected near the head of Baptiste Collette Bayou and the Main Pass at Breton Sound for two different discharges. Suspended-sediment concentrations decrease as distance away from the Mississippi River at Venice increases, except in Kimbel Pass (3.2 mi from the Mississippi River). The increase in suspended-sediment concentration at this site is probably due to wave action caused by the large volume of ship traffic that passes near this site.

Suspended-sediment concentrations measured during the study period ranged from 167 to 435 mg/L near the head of Baptiste Collette Bayou to 73 to 354 mg/L for Main Pass at Breton Sound. Kimbel Pass consistently had the highest suspended-sediment concentrations, ranging from 162 to 842 mg/L.

The composition of suspended-sediment samples collected during the study was approximately 95 percent clay and silt and 5 percent sand. Major deposition of sediment at both of the aforementioned flows occurred as the bayou entered Breton Sound.

TIME OF TRAVEL

Longitudinal dispersion and time of travel in Baptiste Collette Bayou and its passes were determined to aid in the study of pathogenic and fecal bacteria die off, flow patterns, and to provide information necessary for the development of plans to minimize effects of contaminants spilled in the study area. This information was collected by injecting a dye tracer near the head of Baptiste Collette Bayou (0.3 mi distance from the Mississippi River) in August 1981 at a discharge of 22,700 ft^3/s in Baptiste Collette Bayou and 342,000 ft^3/s in the Mississippi River at Tarbert Landing. The dye-tracer study was conducted during an ebbing-tide cycle. The location of the leading edge, peak, and trailing edge of the tracer cloud (for any elapsed time after injection of the dye) in Baptiste Collette Bayou and its passes is shown in figures 3, 4, and 5. Traveltime for the leading edge of the tracer cloud through Baptiste Collette Bayou and Main Pass (fig. 3) and out into Breton Sound was 4.9 hours. The duration of the tracer cloud in Baptiste Collette Bayou and Main Pass was 7.6 hours (also shown in fig. 3), and the peak concentration passed into Breton Sound 5.7 hours after injection at the head of Baptiste Collette Bayou. Similar information on traveltimes through Baptiste Collette Bayou and Kimbel and Emeline Passes is shown in figures 4 and 5. Traveltimes for the leading edge of the tracer cloud through Baptiste Collette Bayou and through Kimbel Pass and Emeline Pass were 4.9 and 5.8 hours, respectively. Similarly, the peak concentration passed through Kimbel Pass and Emeline Pass into Breton Sound in 5.4 and 6.2 hours, respectively. Total duration of the dye cloud in Kimbel Pass was 6.8 hours and in Emeline Pass duration was 7.2 hours.

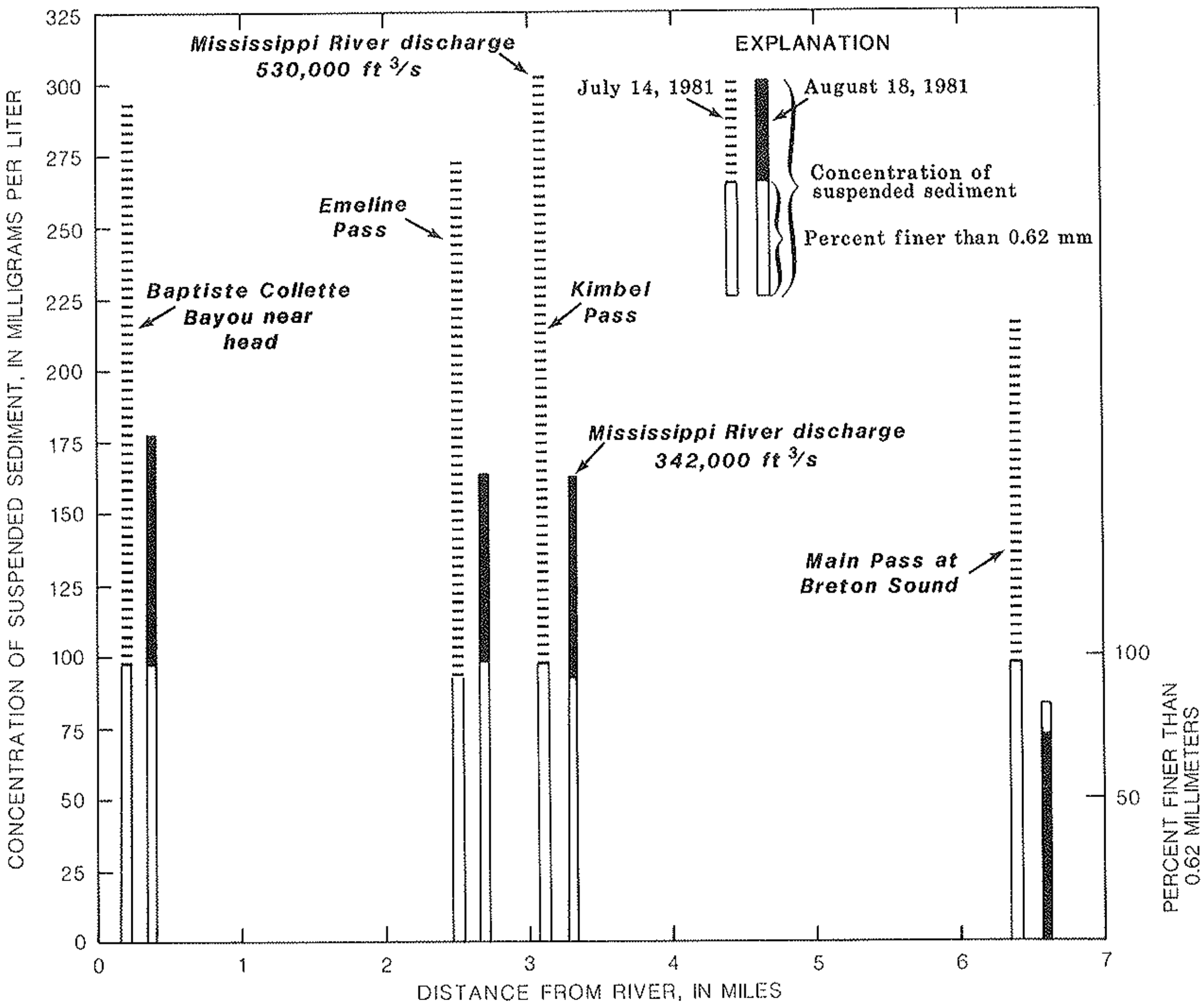

Figure 2.--Changes in suspended-sediment concentration and percent of sediment samples finer than 0.62 millimeter in Baptiste Collette Bayou as distance from the Mississippi River at Venice increased.

Longitudinal-dispersion information can be useful in developing plans to minimize the effects of a contaminant. It enables estimation of the time it takes a contaminant to arrive at a site and how long the contaminant remains at the site. The longitudinal dispersion of the leading edge, peak, and trailing edge of the dye cloud at three different locations for the tracer injected into Baptiste Collette Bayou are shown in figures 6, 7, and 8. Figure 6 shows the longitudinal dispersion of a

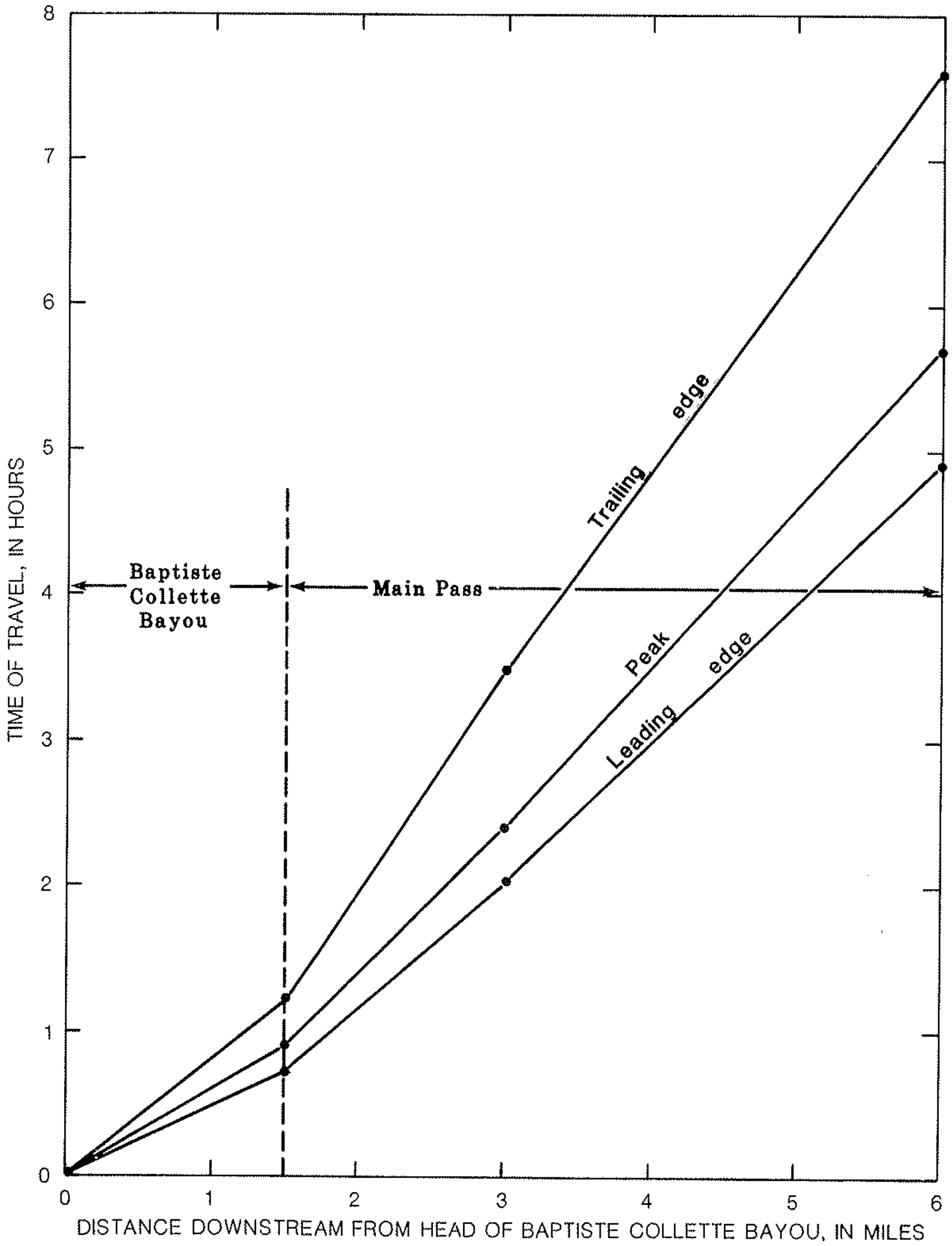

Figure 3.--Time of travel of the leading edge, peak, and trailing edge of a tracer cloud at downstream locations along Baptiste Collette Bayou and Main Pass at a discharge of 22,700 ft^3/s (cubic feet per second) in Baptiste Collette Bayou and 9,530 ft^3/s in Main Pass.

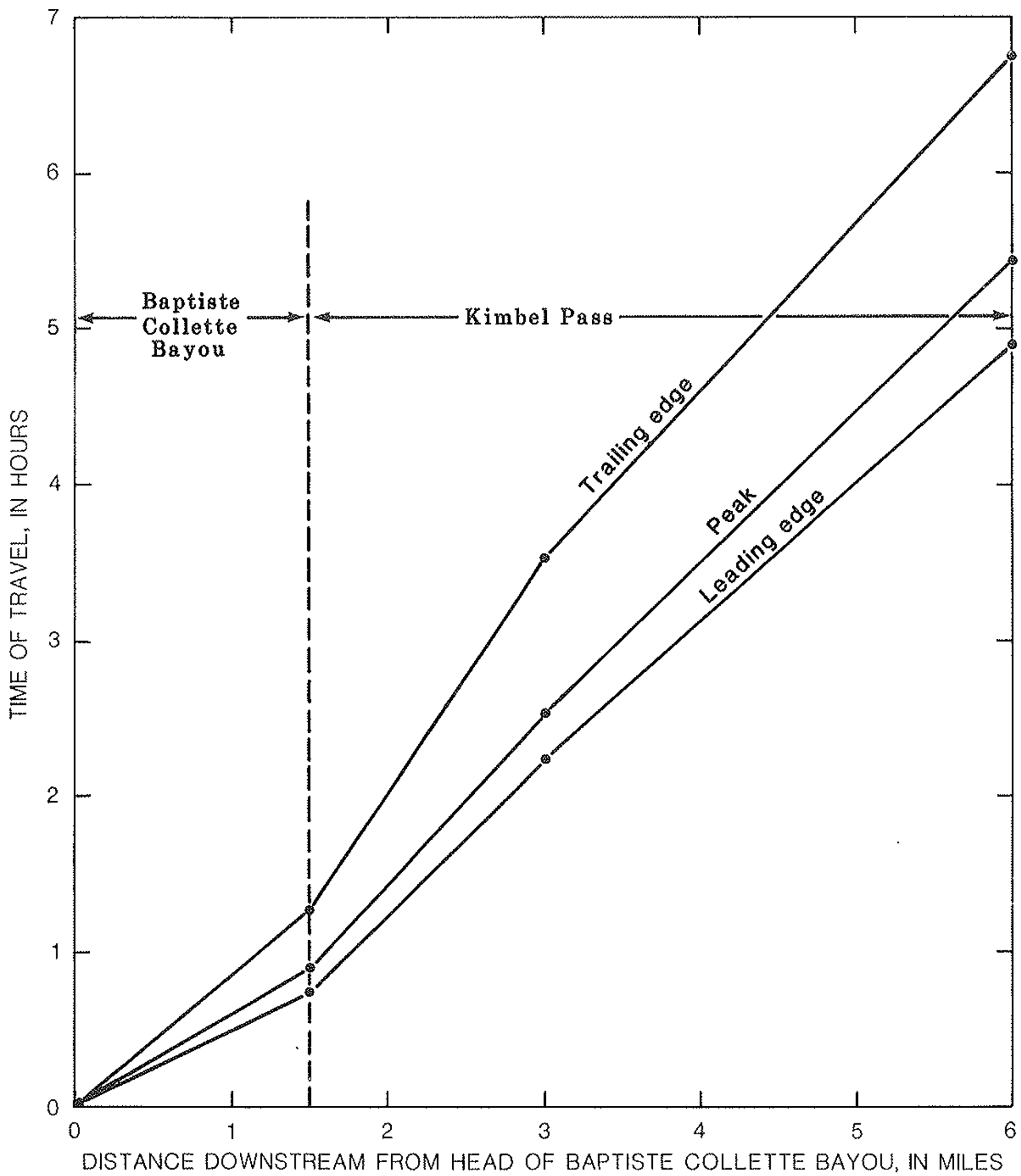

Figure 4.--Time of travel of the leading edge, peak, and trailing edge of a tracer cloud at downstream locations along Baptiste Collette Bayou and Kimbel Pass at a discharge of 22,700 ft^3/s (cubic feet per second) in Baptiste Collette Bayou and 5,980 ft^3/s in Kimbel Pass.

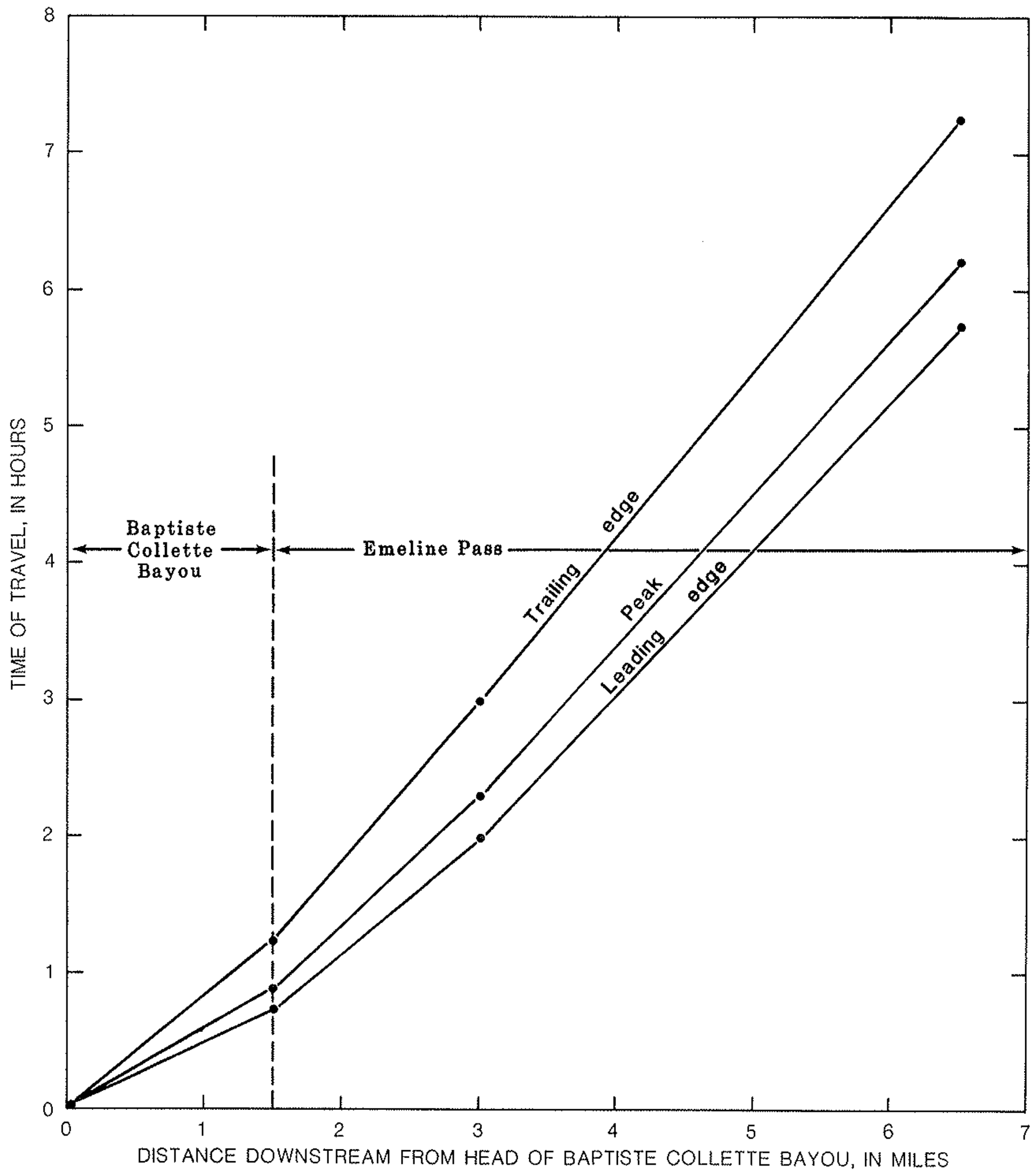

Figure 5.--Time of travel of the leading edge, peak, and trailing edge of a tracer cloud at downstream locations along Baptiste Collette Bayou and Emeline Pass at a discharge of 22,700 ft^3/s (cubic feet per second) in Baptiste Collette Bayou and 7,190 ft^3/s in Emeline Pass.

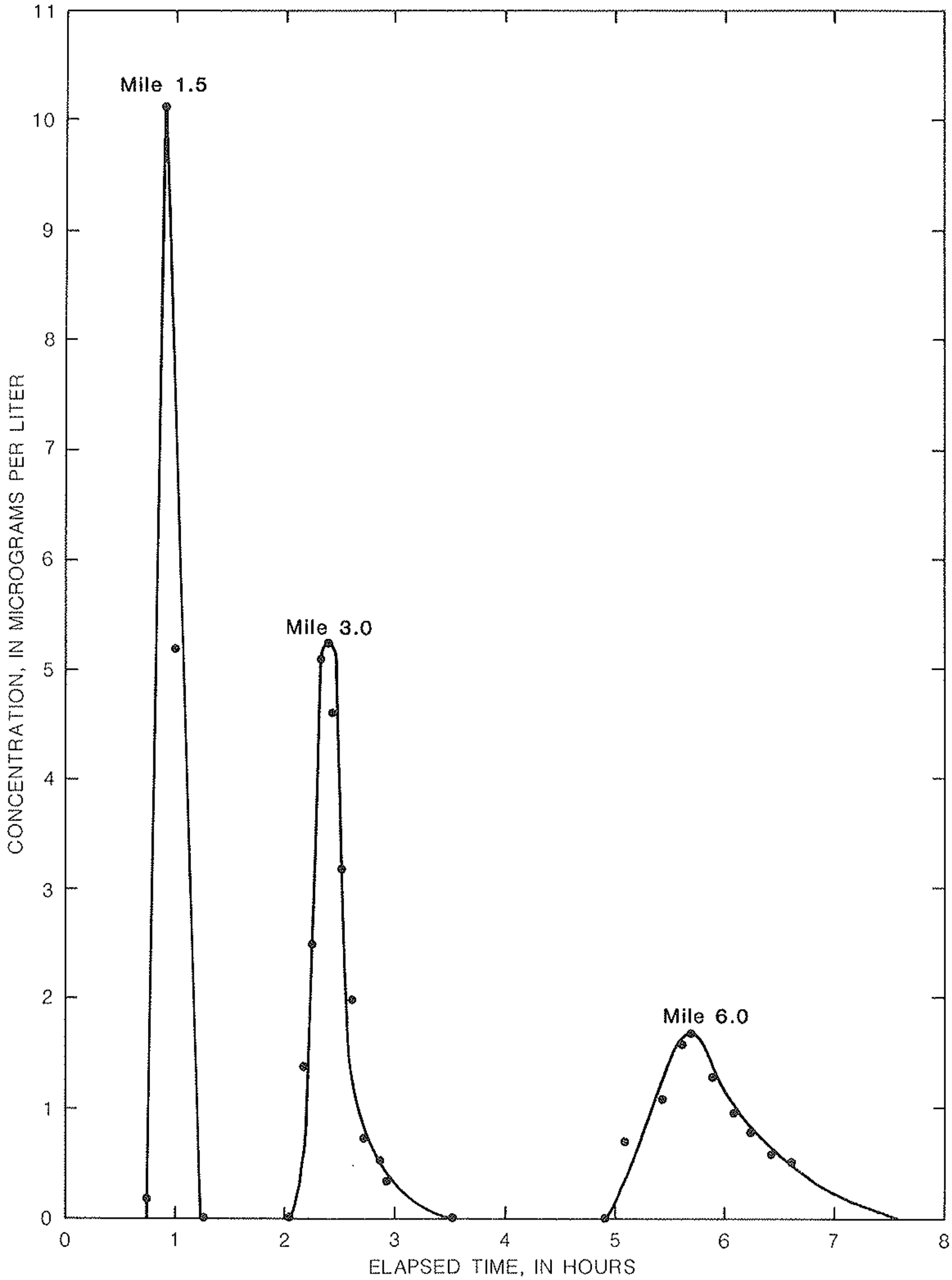

Figure 6.--Longitudinal dispersion of a conservative contaminant released into Baptiste Collette Bayou when discharge was 22,700 ft^3/s (cubic feet per second) in Baptiste Collette Bayou and 9,530 ft^3/s in Main Pass.

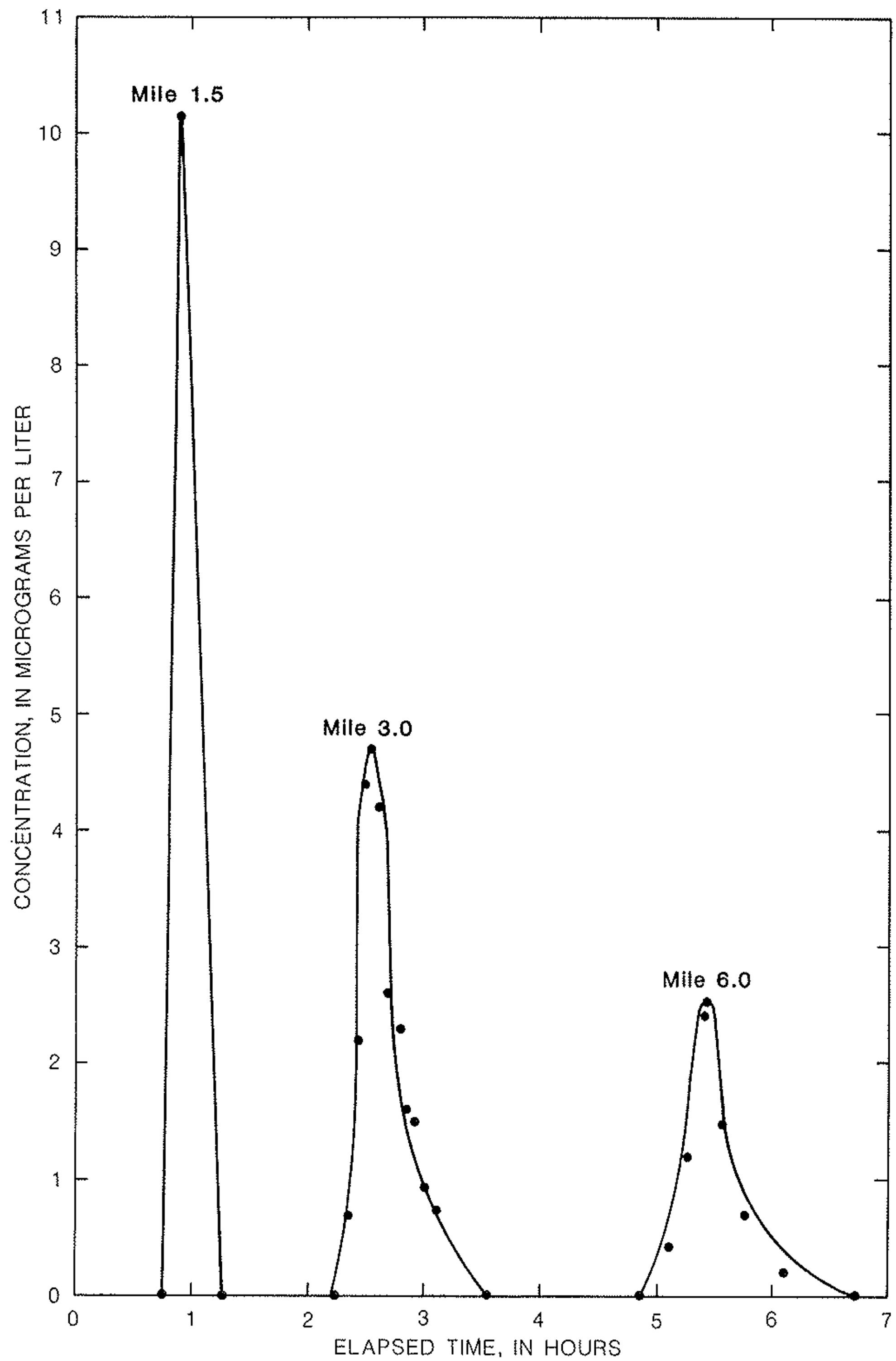

Figure 7.--Longitudinal dispersion of a conservative contaminant released into Baptiste Collette Bayou when discharge was 22,700 ft^3/s (cubic feet per second) in Baptiste Collette Bayou and 5,980 ft^3/s in Kimbel Pass.

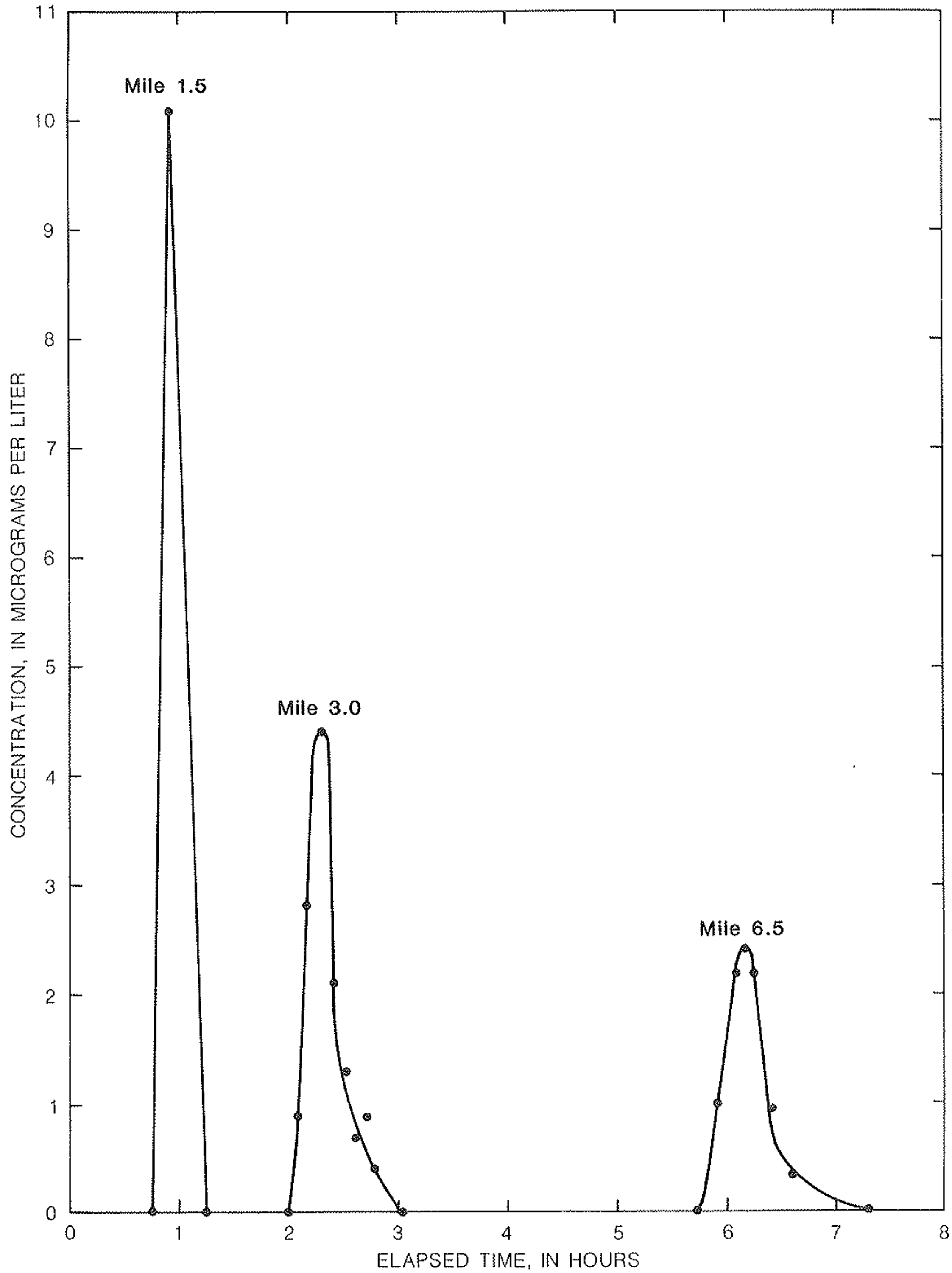

Figure 8.--Longitudinal dispersion of a conservative contaminant released into Baptiste Collette Bayou when discharge was 22,700 ft^3/s (cubic feet per second) in Baptiste Collette Bayou and 7,190 ft^3/s in Emeline Pass.

tracer in Baptiste Collette Bayou and Main Pass at a discharge of 22,700 ft^3/s and 9,530 ft^3/s, respectively. The duration of the tracer cloud in Baptiste Collette Bayou increased as distance downstream from the injection point increased. For example, the tracer cloud arrived at a site 1.5 mi downstream from the injection point 0.8 hour after the tracer was injected into the bayou. It remained at this site for 0.5 hour after the leading edge was detected. At a site 6.0 mi downstream in Main Pass, the leading edge of the tracer arrived 4.9 hours after the injection was made. The peak arrived at this site 5.7 hours after the injection and was still present 2.7 hours after it was first detected. Thus, if a toxic substance was dumped into Baptiste Collette Bayou, the water at the Main Pass site 6.0 mi downstream would be affected for a period of 2.7 hours, while at the site 1.5 mi downstream from the head, the water would be affected only 0.5 hour.

In addition to knowledge of when a contaminant will arrive at a given point, it is also important to know the peak concentration of the contaminant as it passes that point. This information can be used to determine if the concentration of the contaminant will be hazardous so the appropriate action can be taken. Peak concentration can be determined from the following equation.

$$\text{Peak concentration} = \frac{\text{unit concentration times weight of contaminant spilled}}{\text{discharge at sampling site,}}$$

where unit concentration is the peak concentration resulting from 1 lb of tracer in 1 ft^3 of water, assuming 100-percent recovery.

If the elapsed time that a contaminant has been in the water, the unit concentration (determined from fig. 9), and the discharge are known, the maximum peak concentration can be computed. For example, if 1,000 lb of contaminant were spilled at the head of Baptiste Collette Bayou at a discharge of 22,700 ft^3/s, the unit concentration at mile 6 of Main Pass would be 5,570 mg/L. The contaminant could be expected to reach this site in 4.9 hours and peak in 5.7 hours (fig. 3). The peak concentration would be:

$$\text{Peak concentration} = \frac{5{,}570 \times 1{,}000 \text{ lb}}{9{,}530 \text{ ft}^3/\text{s}} = 582 \text{ mg/L}$$

It should be noted that the unit-concentration curve for Main Pass was slightly lower than would be expected when compared to Emeline Pass and Kimbel Pass due to inflow at two pipeline canals just above the lower Main Pass site. Inflow appears to be tide dependent as both canals are dammed off approximately 1.5 mi away from their entrance into Main Pass. No tracer was found in these canals; and it appears that these canals receive inflow during high tide, serving as a storage area, and drain during low tide. This would account for the slight dilution that was observed for the unit-concentration curve for Main Pass.

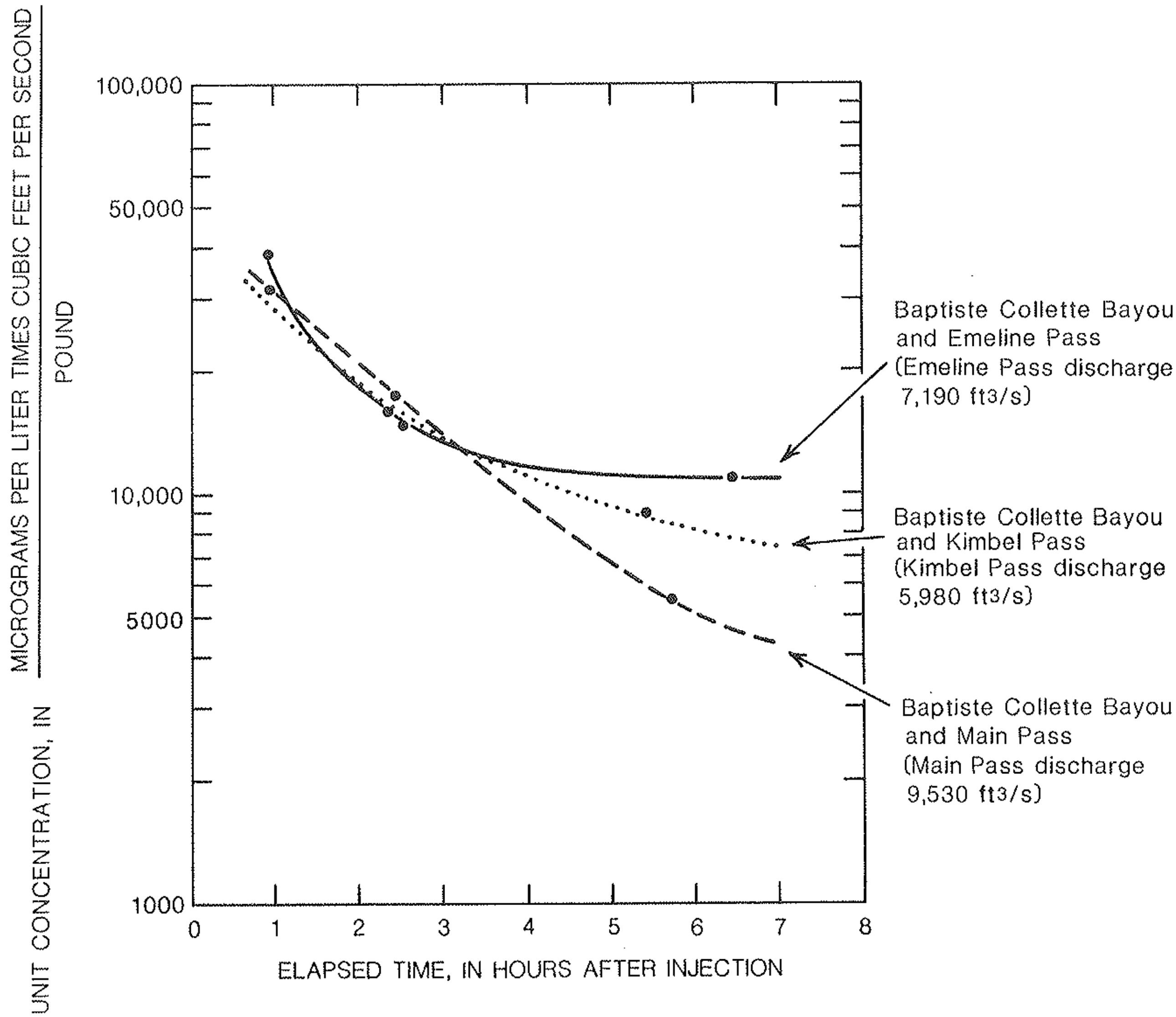

Figure 9.--Unit-concentration attenuation curves for Baptiste Collette Bayou and its passes at a discharge of 22,700 cubic feet per second in Baptiste Collette Bayou.

WATER QUALITY

Inorganic Chemical Quality

Maximum, minimum, and mean concentrations of inorganic chemical constituents and physical characteristics of water samples collected from the Mississippi River at Venice and Baptiste Collette Bayou are listed in table 2. Mean concentrations of major ions increased as distance away from the river increased. For example, the mean concentration of calcium

Table 2.--Variations in chemical and physical characteristics of the Mississippi River at Venice and of Baptiste Collette Bayou, September 1980 to February 1982

[Chemical constituents are in milligram per liter except as indicated; N, number of samples; DS, dissolved constituents]

Inorganics parameter	Mississippi River at Venice				Baptiste Collette Bayou near head				Emeline Pass				Kimbel Pass				Main Pass at Breton Sound			
	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean
Specific conductance[1/]	6	2,790	362	944	6	6,060	362	1,670	6	6,330	356	1,800	6	9,250	363	2,310	6	15,400	361	5,240
Hardness	5	400	140	220	5	740	140	310	6	760	130	290	6	980	130	330	5	1,800	140	750
Calcium-DS	5	57	39	47	5	81	37	51	6	79	37	49	6	97	37	53	5	140	37	77
Magnesium-DS	5	62	11	25	5	130	11	44	6	140	10	42	6	180	10	49	5	360	11	140
Sodium-DS	-	-------	------	------	4	990	18	340	4	1,000	16	370	4	1,600	19	530	4	3,000	17	1,000
Potassium-DS	-	-------	------	------	4	34	3	14	4	44	3	17	4	52	3	19	4	90	3	34
Alkalinity-field	6	135	94	112	5	118	94	102	6	135	88	107	6	138	94	107	6	138	91	107
Sulfate-DS	5	160	52	95	5	310	51	130	6	310	38	120	6	420	40	140	5	870	52	350
Chloride-DS	5	760	22	180	5	1,900	21	510	6	1,900	21	460	6	2,900	22	640	5	5,200	21	2,000
Nitrogen NO_2+NO_3-total	6	2.4	.53	1.5	6	2	.43	1.4	6	2	.83	1.5	6	2	.83	1.4	5	2.2	.88	1.5
Nitrogen NH_4+Org-DS	5	1.5	.81	1.1	6	1.2	.66	.98	6	1.3	.45	.95	6	1.4	.45	.92	6	1.2	.360	.89
Nitrogen NO_3, total	6	2.4	.53	1.5	5	2	1.1	1.6	6	2	.80	1.5	6	2	.8	1.4	5	2.2	.87	1.5
Phosphorus, total (as PO_4)	6	1.7	.25	.68	6	2	.25	.95	6	1.4	.34	.82	6	1.6	.37	.85	5	1.3	.34	.79
Phosphorus, total	6	.55	.08	.22	6	.66	.08	.31	6	.47	.11	.27	6	.51	.12	.27	5	.41	.11	.25
Suspended solids, residue at 105°C	4	220	7	113	5	422	4	172	6	282	11	114	6	205	10	87	5	217	29	97
Color[2/]	6	20	5	8	6	20	5	10	6	15	5	7	6	15	5	7	6	10	0	7

1/Micromho per centimeter at 25°C (µmho/cm).
2/Units of platinum-cobalt scale.

at the Mississippi River at Venice sampling site was 47 mg/L. Mean calcium concentrations increased to 51 mg/L near the head of Baptiste Collette Bayou, then to 53 mg/L at Kimbel Pass, and finally to 77 mg/L at Baptiste Collette Bayou Main Pass at Breton Sound. Data for magnesium, sodium, potassium, sulfate, and chloride show similar changes. Water at the Main Pass at Breton Sound site was predominantly saltwater, which explains the increases in concentrations of major ions at this site. Table 3 shows changes in specific conductance and calcium, magnesium, and chloride concentrations for different sampling dates, discharges, and sites. All parameters show increased concentrations away from the river at discharges of less than 250,000 ft^3/s at Tarbert Landing. Concentrations of calcium, magnesium, and chloride, and specific-conductance values in the Mississippi River at Venice for the September 1980, May and July 1981, and February 1982 sampling trips were similar in the Baptiste Collette distributary system with the exception of Main Pass at Breton Sound. Discharges in the Mississippi River exceeded 250,000 ft^3/s during these sampling periods and freshwater was overriding the effects of saltwater from the gulf in much of the reach sampled. The higher values of the major ions and specific conductance at Main Pass at Breton Sound are due to the influence of gulf saltwater.

The data in table 3 indicate that the effects of gulf saltwater on the fresh river water at Main Pass at Breton Sound are inversely related to discharges in the Mississippi River. In September 1980 specific-conductance values for the Mississippi River at Venice and for the upper Baptiste Collette Bayou sites (table 3) were similar, ranging from 499 μmhos/cm at the river site to 492 μmhos/cm at Kimbel Pass. In contrast, Main Pass at Breton Sound had a specific conductance of 8,050 μmhos/cm. Discharge in the Mississippi River was 270,000 ft^3/s at this time. In July 1981, when the discharge in the Mississippi River had increased to 518,000 ft^3/s, specific-conductance values were similar for the Mississippi River and all Baptiste Collette Bayou sites, including the Main Pass at Breton Sound site. Specific conductance values ranged from 338 μmhos/cm at the river to 346 μmhos/cm at the Main Pass at Breton Sound site. Concentrations of calcium, magnesium, and chloride varied in a similar manner for these sampling dates.

During periods of low flow and saltwater intrusion into the Mississippi River, specific-conductance values and calcium, magnesium, and chloride concentrations were higher for the Baptiste Collette Bayou sites than for the river site. Samples collected in January and October 1981 (table 3) show this quite clearly. Discharges in the Mississippi River were 159,000 ft^3/s and 231,000 ft^3/s, respectively, during these sampling periods.

Increases in major ion concentrations and specific conductance from river to bayou sites can be explained by the manner in which saltwater moves up the Mississippi River and then back down Baptiste Collette Bayou. Figure 10 shows specific-conductance profiles for the Mississippi River at Venice and for Baptiste Collette Bayou during a period of saltwater intrusion in the Mississippi River. The Mississippi River is 45-75 ft deep at the Venice cross section, with similar depths at the head of

Table 3.--Chemical and physical characteristics of the Mississippi River at Venice and Baptiste Collette Bayou at five different discharges

[ft^3/s, cubic foot per second; µmho/cm at 25°C, micromho per centimeter at 25°C; mg/L, milligram per liter]

Date	Discharge of Mississippi River at Tarbert Landing (ft^3/s)	Mississippi River at Venice				Baptiste Collette Bayou near head			
		Specific conductance (µmho/cm at 25°C)	Calcium (mg/L)	Magnesium (mg/L)	Chloride (mg/L)	Specific conductance (µmho/cm at 25°C)	Calcium (mg/L)	Magnesium (mg/L)	Chloride (mg/L)
Sept. 1980--	270,000	499	44	15	39	474	42	14	35
Jan. 1981---	159,000	2,790	57	62	760	6,060	81	130	1,900
May 1981----	459,000	455	43	13	28	440	39	13	28
July 1981---	518,000	338	39	11	22	362	37	11	21
Oct. 1981---	231,000	1,170	52	26	---	2,320	57	52	560
Feb. 1982---	642,000	394	38	11	30	391	37	10	29

Date	Emeline Pass				Kimbel Pass				Main Pass at Breton Sound			
	Specific conductance (µmho/cm at 25°C)	Calcium (mg/L)	Magnesium (mg/L)	Chloride (mg/L)	Specific conductance (µmho/cm at 25°C)	Calcium (mg/L)	Magnesium (mg/L)	Chloride (mg/L)	Specific conductance (µmho/cm at 25°C	Calcium (mg/L)	Magnes ium (mg/L)	Chloride (mg/L)
Sept. 1980--	483	40	13	32	492	42	14	37	8,050	87	170	2,500
Jan. 1981---	6,330	79	140	1,900	9,250	97	180	2,900	15,400	140	360	5,200
May 1981----	438	41	14	34	439	42	13	26	1,500	50	32	340
July 1981---	353	37	11	21	363	38	11	22	361	37	11	21
Oct. 1981---	2,800	60	62	740	2,930	62	65	800	5,320	71	110	1,600
Feb. 1982---	387	37	10	30	393	37	10	29	812	39	18	150

Baptiste Collette Bayou. Baptiste Collette Bayou is 45-63 ft deep at its head, and river water coming into it at this depth had a specific conductance of approximately 1,000 µmhos/cm. River water at the surface had a specific conductance of 511 µmhos/cm. Specific-conductance values in Baptiste Collette Bayou near its head were somewhat higher at the surface and bottom when compared to river water due to mixing of the river water caused by turbulence at the head of the bayou. As the water progresses further into Baptiste Collette Bayou, it mixes more and more until a uniform density is reached as is shown by the constant specific conductance from surface to bottom (fig. 10).

Specific-conductance values were uniform from the surface to the bottom at Emeline, Kimbel, and Main Pass. The specific conductance remains relatively constant as water moves down the bayou and stratifies again at Breton Sound. This is shown by the specific-conductance values for Main Pass at Breton Sound, which ranged from 22,600 µmhos/cm at the surface to 45,800 µmhos/cm at the bottom. Discharge in the Mississippi River at Tarbert Landing was 296,000 ft^3/s at this time and the toe of the saltwater wedge in the river was between river mile 18 and 20 and receding.

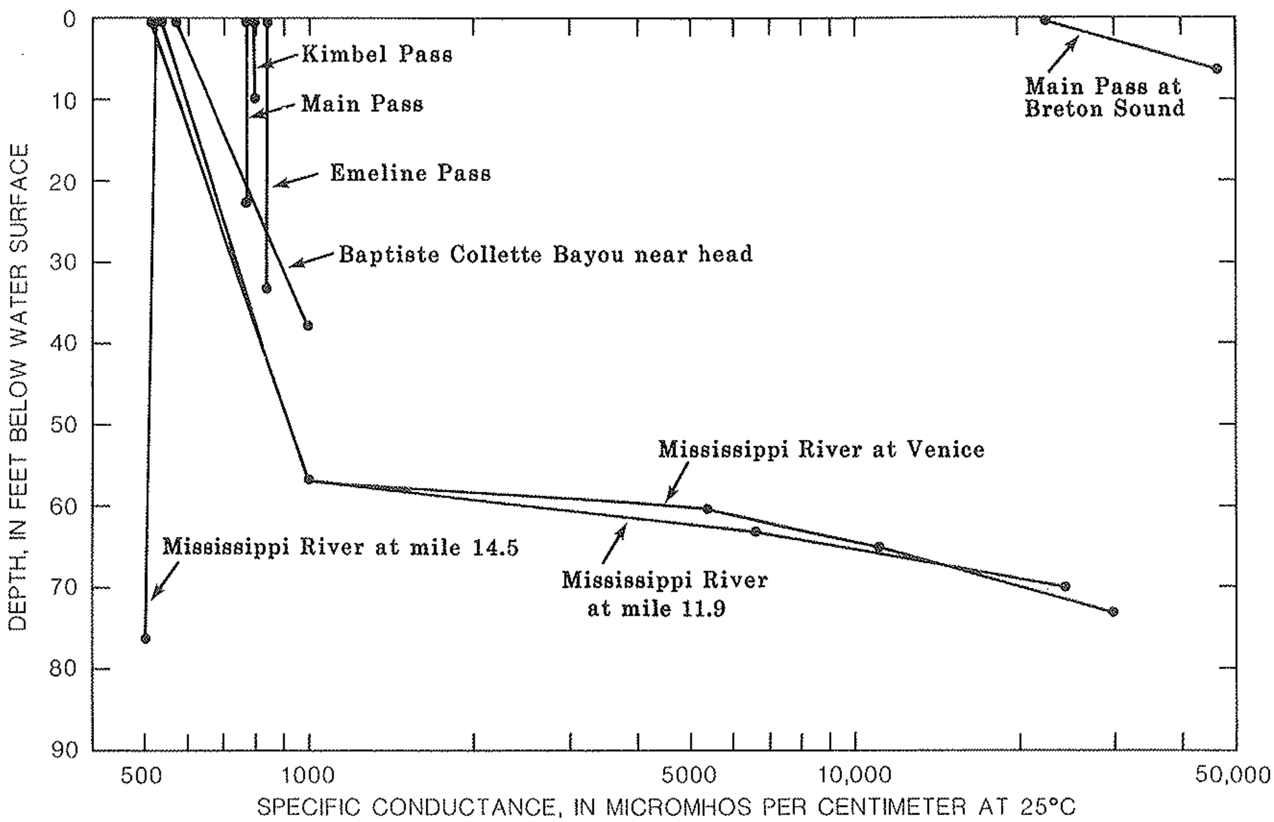

Figure 10.--Specific-conductance profiles for Baptiste Collette Bayou and the lower Mississippi River near Venice during a period of saltwater intrusion in the Mississippi River, February 1981, at a discharge of 296,000 cubic feet per second at Tarbert Landing.

The amount of mixing that occurs in the bayou is influenced by (1) the magnitude of density differences between the different layers of river water entering the bayou, (2) wind direction and speed, and (3) tide. In some cases density differences are so large that complete mixing does not occur within the bayou (fig. 11). This is shown in the specific-conductance profile for Baptiste Collette Bayou and the lower Mississippi River for February 1981, during a prolonged period of saltwater intrusion in the river. Discharge in the Mississippi River was 170,000 ft^3/s and the toe of the salt wedge was near river mile 62. Specific-conductance values were stratified at Baptiste Collette Bayou near its head, ranging from 6,400 μmhos/cm at the surface to 21,000 μmhos/cm at the bottom. Significant mixing of water in Baptiste Collette Bayou did not occur until it reached the Main Pass site. Even here, specific-conductance values ranged from 11,100 μmhos/cm at the surface to 14,700 μmhos/cm on the bottom. Stratification was minor at Main Pass at Breton Sound due to moderately strong winds (10-15 mi/h) and an ebbing tide, which reduced the effects of the gulf water on the water coming out of Baptiste Collette Bayou.

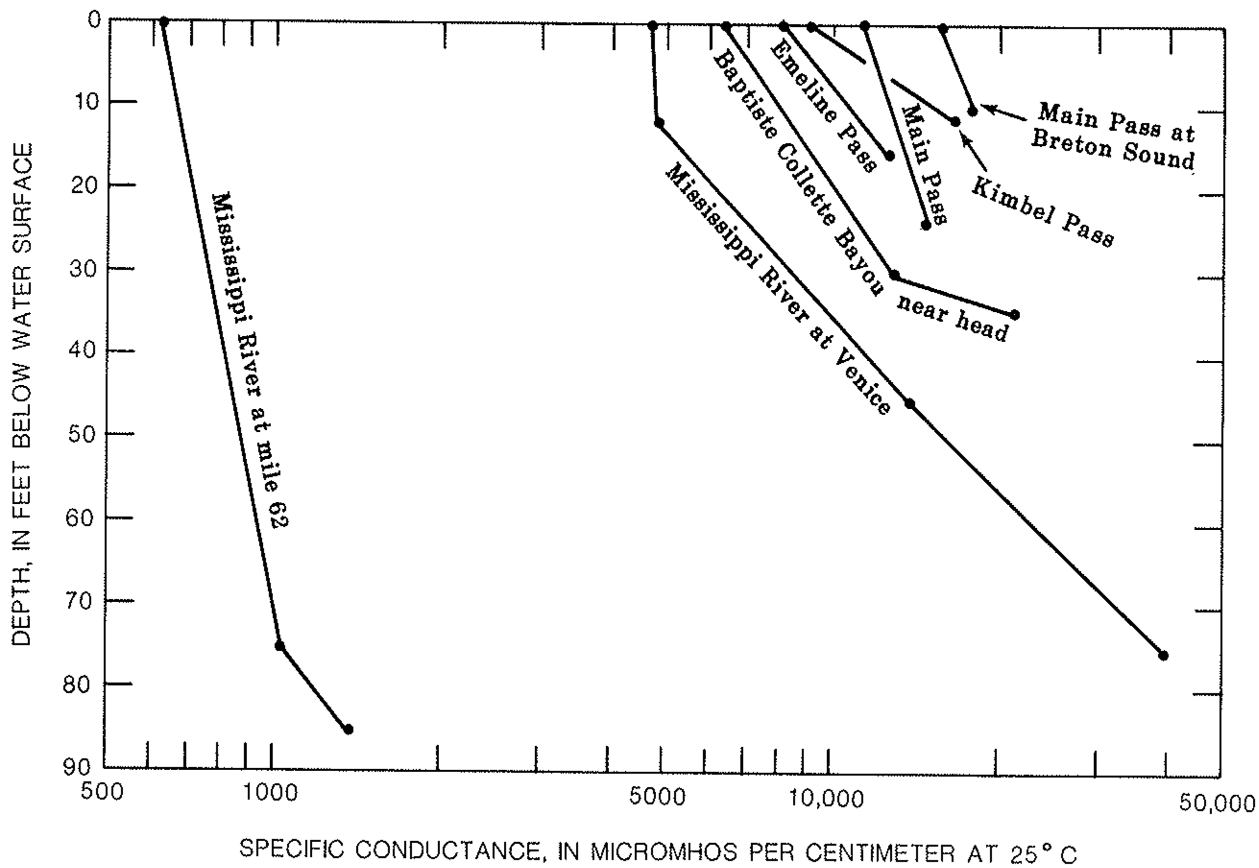

Figure 11.--Specific-conductance profiles for Baptiste Collette Bayou and the lower Mississippi River during a period of prolonged saltwater intrusion in the Mississippi River, February 1981, at a discharge of 170,000 cubic feet per second.

Minor Elements

Tables 4 and 5 show concentrations of minor elements in water samples and bed samples collected from Baptiste Collette Bayou and from the Mississippi River at Venice. Concentrations in water and bed samples at all sites were below EPA (U.S. Environmental Protection Agency) criteria limits for freshwater-aquatic life (U.S. Environmental Protection Agency, 1976) with the possible exception of mercury in water. Laboratory analytical methods used cannot measure less than 0.1 µg/L mercury in water. In most cases mean concentrations of minor elements in water were about the same for the river as for the bayou sites. For example, the mean total arsenic concentration ranged from 3.0 µg/L at the river site to 2.0 µg/L at Main Pass at Breton Sound. Mean concentrations of minor elements in bed material tended to increase as distance from the river increased due to increased deposition. For example, iron in bed material increased from a mean concentration of 2,500 µg/L at the river site to 6,100 µg/L at Main Pass at Breton Sound. Zinc in bed material increased (mean concentration) from 14 µg/g at the river site to 26 µg/g at the gulf site. Arsenic, chromium, and copper in bed material also increased as distance from the river increased but all levels were low. There were no differences in the mean concentrations of cadmium, lead, and mercury in bed samples between river and bayou sites. Comparisons of bed-material samples collected in June 1977 (Dupuy and Couvillion, 1979) with samples collected during 1981-82 indicate a decrease in concentrations of arsenic, chromium, zinc, and mercury in bed material between the two sampling periods (table 6). Arsenic in bed material ranged from 6 to 12 µg/g for Baptiste Collette Bayou samples collected in 1977 and from 1 to 6 µg/g for samples collected in 1981-82. Mercury in bottom material showed the largest decrease in concentration between the two sampling periods. It ranged from 0.1 µg/g to 1.0 µg/g in 1977 and was 0.01 µg/g (0.01 µg/g is minimum detection limit) in 1981-82. Decreases in zinc and chromium were similar to the decreases in arsenic between the two sampling periods. This decrease in concentrations of minor elements in bed material may be due to dredging operations that took place in Baptiste Collette Bayou after the 1977 sampling and the subsequent removal of bed material from the channel.

Pesticides

Pesticide and organic-compound concentrations in water and insecticide and organic-compound concentrations in bed material from samples collected from the Mississippi River at Venice and Baptiste Collette Bayou are shown in tables 7 and 8. Insecticides such as DDT, (including its breakdown products DDD and DDE), dieldrin, endosulfan, and endrin were found in mean concentrations ranging from 0.003 µg/L to 0.001 µg/L. For other insecticides--such as chlordane, toxaphene, and malathion--and PCB the mean concentrations ranged from 0.1 µg/L for samples collected from the Mississippi River to 0.08 µg/L for samples from Baptiste Collette Bayou. All other insecticides and herbicides were found in equally low concentrations in water samples from both the river and the bayou. In general, values for all water pesticides rarely exceeded 0.1 µg/L and

Table 4.--Variations in concentrations of minor elements in water samples collected from the Mississippi River at Venice and from Baptiste Collette Bayou

[Chemical constituents are in microgram per liter; DS, dissolved constituents; N, number of samples]

Parameter	Mississippi River at Venice				Baptiste Collette Bayou near head				Emeline Pass				Kimbel Pass				Main Pass at Breton Sound			
	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean
Arsenic-DS-------	5	2	1	1	5	2	1	1	6	2	1	2	6	2	1	2	5	2	0	1
Arsenic-total----	5	8	1	3	5	4	1	2	6	4	1	2	6	4	1	2	5	4	1	2
Beryllium-DS-----	5	1	0	1	5	10	0	2	6	10	0	2	6	1	0	0	5	10	0	2
Beryllium-total-	5	10	0	2	5	10	0	4	6	10	0	3	6	10	0	3	5	10	0	6
Cadmium-DS-------	5	1	0	1	5	1	0	1	6	1	0	0	6	2	0	1	5	2	0	1
Cadmium-total----	5	3	0	1	5	1	0	0	6	1	0	0	6	1	0	0	5	1	0	1
Hexavalent chromium-DS-----	5	1	0	0	5	1	0	0	6	1	0	0	6	1	0	0	5	2	0	1
Hexavalent chromium-total-	1	2	2	2	5	20	0	14	6	60	10	26	6	30	0	13	5	30	10	16
Copper-DS--------	5	14	4	8	5	12	3	6	6	18	3	6	6	21	3	8	5	6	3	5
Copper-total-----	5	17	10	14	5	38	7	19	6	28	7	14	6	16	7	12	5	17	6	9
Iron-DS----------	5	70	8	30	5	50	10	30	6	55	10	40	6	50	10	30	5	50	10	30
Lead-DS----------	5	4	0	2	5	4	0	2	6	3	0	1	6	2	0	1	5	2	0	1
Lead-total-------	5	17	4	10	5	16	3	8	6	19	3	8	6	9	2	6	5	23	3	10
Nickel-DS--------	5	15	1	6	5	4	1	2	6	3	0	2	6	5	0	2	5	2	1	1
Nickel-total-----	5	18	4	9	5	17	3	11	6	12	4	8	6	11	4	8	5	12	3	7
Zinc-DS----------	5	10	5	9	5	30	9	20	6	20	8	13	6	10	6	9	5	30	10	20
Zinc-total-------	5	70	20	50	4	80	40	60	5	60	30	50	6	70	30	50	5	80	20	50
Selenium-DS------	5	1	0	0	5	1	0	0	6	1	0	0	6	1	0	3	5	1	0	0
Selenium-total---	5	0	0	0	4	1	0	0	4	0	0	0	6	1	0	1	5	0	0	0
Mercury-DS-------	5	.1	.0	.0	5	.2	0	.1	6	.6	0	.2	6	.5	0	.1	5	.4	0	.1
Mercury-total----	5	.4	0	.2	5	3.8	0	.9	6	.8	0	.2	5	.5	0	.1	5	3.2	.1	.8

Table 5.--Variations in concentrations of minor elements in samples of bed material collected from the Mississippi River at Venice and Baptiste Collette Bayou

[Chemical constituents are in microgram per gram; N, number of samples]

Metals parameter	Mississippi River at Venice				Baptiste Collette Bayou near head				Emeline Pass				Kimbel Pass				Main Pass at Breton Sound			
	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean
Arsenic----	3	1	1	1	3	2	1	1	3	2	1	1	3	5	1	3	3	6	4	5
Cadmium----	3	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1	3	1	1	1
Chromium---	3	3	2	3	3	6	1	4	3	3	2	3	3	5	3	4	3	9	6	7
Copper-----	3	7	1	4	3	11	1	7	3	4	3	4	3	9	5	8	3	10	7	8
Iron-------	3	3,300	1,200	2,500	3	7,100	1,100	4,400	3	2,600	2,100	2,300	3	6,300	3,000	4,700	3	7,100	5,500	6,100
Lead-------	3	10	10	10	3	10	10	10	3	10	10	10	3	10	10	10	3	10	10	10
Zinc-------	3	18	7	14	3	28	7	18	3	14	10	13	3	27	16	22	3	33	21	26
Mercury[1/] --	3	.01	.01	.01	3	.01	.01	.01	3	.01	.01	.01	3	.01	.01	.01	3	.01	.01	.01

[1/] Analytical detection limit for mercury is 0.01 microgram per gram.

Table 6.--Comparisons of selected minor elements and organic compounds in bed material collected from Baptiste Collette Bayou, 1977 and 1981-82

[μg/g, microgram per gram; μg/kg, microgram per kilogram; N, number of samples]

Parameter	Baptiste Collette Bayou at mile 1.6			Baptiste Collette Bayou at mile 3.8			Baptiste Collette Bayou at mile 8.0			Emeline Pass at mile 2.7			Kimbel Pass at mile 3.2			Main Pass at Gulf at mile 6.4		
	N	Max	Min	N	Max	Min	N	Max	Min	N	Max	Min	N	Max	Min	N	Max	Min
	1977									1981-82								
Arsenic μg/g----	2	6	6	2	9	6	2	12	11	3	2	1	3	5	1	3	6	4
Chromium μg/g---	2	10	10	2	10	10	2	20	20	3	3	2	3	5	3	3	9	6
Mercury μg/g[1/] --	2	.3	.0	2	.3	.1	2	1.0	.5	3	.01	.01	3	.01	.01	3	.01	.01
Zinc μg/g-------	2	30	30	2	30	30	2	50	50	3	14	10	3	27	16	3	33	21
Chlordane μg/kg-	2	7	6	2	0	0	2	11	4	2	10	1	3	3	1	3	6	4
DDD μg/kg-------	2	5.4	4.4	2	.6	.5	2	9.8	4.3	2	3.1	.1	3	1	.1	3	6.6	2.1
DDE μg/kg-------	2	1.6	1.1	2	.3	.0	2	4.4	1.7	2	2.3	.1	3	.7	.1	3	3.4	.1
PCB μg/kg-------	2	80	76	2	0	0	2	120	34	2	31	1	3	7	1	3	20	8

[1/] Analytical detection limit for mercury is 0.01 microgram per gram.

Table 7.--Variations in water-pesticide and organic-compound concentrations from the Mississippi River at Venice and Baptiste Collette Bayou samples

[Chemical constituents are in micrograms per liter; N, number of samples]

Parameter	Mississippi River at Venice				Baptiste Collete Bayou near head				Emeline Pass				Kimbel Pass				Main Pass at Breton Sound			
	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean
Phenols	5	5	0	2	6	3	0	2	5	3	0	1	6	3	0	1	6	13	0	3
Perthane	3	.01	.01	.01	4	.01	0	.01	4	.01	0	.01	4	.1	0	.01	4	.01	0	.01
PCN	3	.1	.1	.1	5	1	0	.3	4	.1	0	.1	4	.1	0	.1	4	.1	0	.1
Aldrin	3	.001	.001	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001
Lindane	3	.001	.001	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001
Chlordane	3	.1	.1	.1	4	.1	0	.08	4	.1	0	.1	4	.1	0	.1	4	.01	0	.1
DDD	3	.001	.001	.001	4	.001	0	.001	4	.001	6	.001	4	.001	0	.001	4	.001	0	.001
DDE	3	.001	.001	.001	4	.001	0	.001	4	.001	6	.001	4	.001	0	.001	4	.001	0	.001
DDT	3	.003	.001	.002	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001	4	.002	0	.001
Dieldrin	3	.001	.001	.001	4	.003	.001	.002	4	.002	.001	.002	4	.003	.001	.002	4	.002	.001	.001
Endosulfan	3	.001	.001	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001
Endrin	3	.008	.001	.003	4	.009	0	.003	4	.01	0	.003	4	.01	0	.003	4	.001	0	.001
Ethion	3	.01	.01	.01	4	.01	0	.01	4	.1	0	.01	4	.01	0	.01	4	.01	0	.01
Toxaphene	3	.1	.1	.1	4	.1	0	.1	4	.1	0	.1	4	.1	0	.1	4	.1	0	.1
Heptachlor epoxide	3	.001	.001	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001
Heptachlor	3	.001	.001	.001	4	.002	0	.001	4	.001	0	.001	4	.001	0	.001	4	.001	0	.001
Methoxychlor	3	.01	.01	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01
PCB	3	.1	.1	.1	4	.1	0	.1	4	.1	0	.1	4	.1	0	.1	4	.1	0	.1
Malathion	3	.1	.1	.1	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01
Parathion	3	.01	.01	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01
Diazinon	3	.05	.01	.03	4	.08	.02	.04	4	.6	.01	.02	4	.07	.01	.03	4	.02	.01	.02
Methylparathion	3	.01	.01	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01
2-4-D	3	.03	.01	.02	4	.03	0	.01	4	.02	0	.01	4	.03	0	.01	4	.02	0	.01
2,4,5-T	3	.01	.01	.01	4	.01	0	.01	4	.01	0	.00	4	.01	0	.01	4	.01	0	.01
Mirex	3	.01	.01	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01
Silvex	3	.01	.01	.01	4	.01	0	0	4	.01	0	0	4	.01	0	0	4	.01	0	0
Trithion	3	.01	.01	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01
Methyltrithion	3	.01	.01	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01	4	.01	0	.01
2,4-DP	3	.01	.01	.01	4	.01	0	.00	4	.001	0	.00	4	.01	0	.00	4	.01	0	.00

Table 8.--Variations in insecticides in bed-material samples collected from the Mississippi River at Venice and Baptiste Collette Bayou

[Chemical constituents are in microgram per kilogram; N, number of samples]

Parameter	Mississippi River at Venice				Baptiste Collette Bayou at head				Emeline Pass				Kimbel Pass				Main Pass at Breton Sound			
	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean	N	Max	Min	Mean
PCN-------------	3	1	0	1	2	1	1	1	1	1	1	--	3	1	1	1	3	1	1	1
Aldrin----------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Lindane---------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Chlordane-------	3	3	1	2	2	2	1	2	2	10	1	--	3	3	1	2	3	6	4	5
DDD-------------	3	1.5	.5	1.1	2	.7	.1	.4	2	3.1	.1	--	3	1	.1	.7	3	6.6	2.1	3.7
DDE-------------	3	1.6	.2	1.1	2	.4	.3	.4	1	2.3	---	--	3	.7	.1	.3	3	3.4	.1	1.7
DDT-------------	3	.1	0	.1	2	.2	.1	.2	2	.1	.1	--	3	.1	.1	.1	3	8.8	.1	3
Dieldrin--------	3	.4	0	.2	2	.3	.1	.2	1	2.2	2.2	--	3	.8	.1	.3	3	1.4	.1	.8
Endosulfan------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Endrin----------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Ethion----------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Toxaphene-------	3	1	0	1	2	1	1	1	1	1	1	--	3	10	1	4	3	1	1	1
Heptachlor------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Methoxychlor----	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
PCB-------------	3	7	3	6	2	3	1	2	2	31	1	--	3	7	1	3	3	20	8	14
Malathion-------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Parathion-------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Diazinon--------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Methylparathion-	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Mirex-----------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Trithion--------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Methyltrithion--	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1
Perthane--------	3	.1	0	.1	2	.1	.1	.1	1	.1	.1	--	3	.1	.1	.1	3	.1	.1	.1

were usually in the range of 0.001 µg/L. Water-pesticides data indicate very little change in concentrations between the river and bayou sites. Phenolic compounds were found in mean concentrations ranging from 2.2 µg/L at the Mississippi River site to 3 µg/L at Main Pass at Breton Sound. Pesticides and organic compounds in water do not appear to be a problem in the study area.

Bed-insecticide concentrations (table 8) were low for all study sites, rarely exceeding 1 µg/kg. Chlordane, DDD, DDT, and the organic compound PCB were exceptions to this observation. These four compounds generally showed increases in concentrations in samples collected from bayou sites compared to river samples. Maximum concentrations for these compounds in the Mississippi River at Venice were: chlordane 3 µg/kg, DDD 1.5 µg/kg, DDT 0.1 µg/kg, DDE 1.6 µg/kg, and PCB 7 µg/kg. Samples from Emeline Pass and Main Pass at Breton Sound contained the highest concentrations of these compounds. Maximum concentrations for Emeline Pass samples were 10 µg/kg for chlordane, 3.1 µg/kg for DDD, 2.3 µg/kg for DDE, and 31 µg/kg for PCB. Maximum concentrations for Main Pass at Breton Sound samples were 6 µg/kg for chlordane, 6.6 µg/kg for DDD, 3.4 µg/kg for DDE, 8.8 µg/kg for DDT, and 20 µg/kg for PCB.

Bed-pesticide data showed a decrease in concentrations similar to that noted for minor elements in bed material between the 1977 and 1981-82 sampling periods (table 6). The decrease in bed PCB values between the two sampling periods was the most dramatic. Bed PCB concentrations ranged from 0 to 120 µg/kg for bayou samples collected in 1977 to 1 to 31 µg/kg for samples collected in 1981-82. Concentrations of DDD and DDE also decreased between 1977 and 1981-82. Removal of dredged material between sampling periods may be the major reason for decreases in bed-pesticide concentrations.

Bacteria

Bacteria samples were collected periodically from the Mississippi River at Venice and Baptiste Collette Bayou from September 1980 to April 1982. Samples were analyzed for total-coliform, fecal-coliform, and fecal-streptococci bacteria. Pathogenic bacteria were sampled from July 1981 to April 1982. Results of all bacterial analyses are presented in table 9.

Total-coliform bacteria ranged from 60 colonies/100 mL to 3,200 colonies/100 mL for the Mississippi River at Venice. Total-coliform colonies in the Baptiste Collette Bayou system ranged from 40 colonies/100 mL to 5,000 colonies/100 mL. Counts for the Mississippi River at Venice exceeded 70 colonies/100 mL 93 percent of the time, and counts for Baptiste Collette Bayou exceeded 70 colonies/100 mL approximately 95 percent of the time. This is significant because Louisiana water-quality criteria for type four shellfish production state that the median monthly total-coliform concentration shall not exceed 70 colonies/100 mL and not more than 10 percent of the samples shall ordinarily exceed a concentration of 230 colonies/100 mL (Louisiana Stream Control Commission, 1977, p. 18).

Table 9.--Variations in concentrations of total-coliform, fecal-coliform, and fecal-streptococci bacteria, fecal-coliform/fecal-streptococci ratio, and presence of pathogenic bacteria from five sites along Baptiste Collette Bayou and one site on the Mississippi River from May 1980 to April 1982

[TC, total-coliform bacteria; FC, fecal-coliform bacteria; FS, fecal-streptococci bacteria; FC/FS, fecal-coliform/fecal-streptococci ratio; P, pathogenic bacteria; B, potentially pathogenic bacteria--Proteus spp., Providencia spp., etc.; S, Salmonella, Shigella. Pathogenic bacteria sampling began in July 1981. Units are in colonies per 100 milliliters]

Date	Mississippi River at Venice					Baptiste Collette Bayou at head					Emeline Pass					Kimbel Pass					Main Pass					Main Pass at Breton Sound				
	TC	FC	FS	FC/FS	P	TC	FC	FS	FC/FS	P	TC	FC	FS	FC/FS	P	TC	FC	FS	FC/FS	P	TC	FC	FS	FC/FS	P	TC	FC	FS	FC/FS	P
9- 9-80	1800	900	-----	------	-	980	420	20	21/1	-	520	340	40	8.5/1	-	480	420	20	21/1	-	700	20	20	1/1	-	740	240	20	12/1	-
11- 7-80	3000	240	580	0.41/1	-	3000	210	30	7.0/1	-	1000	120	80	1.5/1	-	960	110	30	3.67/1	-	790	180	----	--------	-	780	110	50	2.2/1	-
1-16-81	700	72	4	18/1	-	280	64	8	8/1	-	760	52	4	13/1	-	300	24	16	1.5/1	-	----	---	----	--------	-	160	4	8	.5/1	-
2- 3-81	320	50	10	5/1	-	870	80	10	8/1	-	80	50	50	1/1	-	70	50	50	1/1	-	530	40	50	.80/1	-	640	150	150	1/1	-
2-26-81	500	60	30	2/1	-	590	70	20	3.5/1	-	400	70	20	3.5/1	-	400	80	60	1.3/1	-	640	60	40	1.5/1	-	460	90	10	9/1	-
5- 6-81	2000	1900	1200	1.58/1	-	1100	500	1100	.45/1	-	1200	1000	960	1.04/1	-	1900	400	840	.48/1	-	1200	400	480	.83/1	-	1400	860	640	1.3/1	-
6- 4-81	900	380	50	7.6/1	-	2000	280	180	1.56/1	-	2200	380	120	3.17/1	-	2200	380	240	1.58/1	-	----	---	----	--------	-	1100	420	220	1.91/1	-
7-14-81	200	50	400	.12/1	-	1800	200	1300	.15/1	B	1700	100	1300	.08/1	-	1600	250	750	.33/1	B	----	---	----	--------	-	1400	300	500	.6/1	-
8-19-81	1000	220	560	.39/1	B	840	100	440	.23/1	-	----	200	680	.29/1	B	1100	460	1400	.30/1	S	1000	240	800	.30/1	B	1200	200	380	.53/1	-
10-21-81	60	10	50	.20/1	-	60	20	30	.67/1	-	200	160	80	2/1	S	340	220	150	1.47/1	B	----	---	----	--------	-	250	190	140	1.36/1	-
11-17-81	750	160	440	.36/1	-	1500	360	880	.41/1	-	1800	300	220	1.36/1	-	1300	230	240	.96/1	B	1500	350	350	1/1	-	1800	230	340	.68/1	-
12-10-81	600	80	200	.40/1	B	320	60	70	.86/1	-	400	140	120	1.17/1	B	120	180	120	1.5/1	-	220	160	80	2/1	-	40	70	50	1.4/1	B
2- 1-82	2200	620	1300	.48/1	B	5000	320	1700	.19/1	B	4800	640	1500	.49/1	B	2200	680	1400	.49/1	B	----	---	----	--------	-	4200	460	1500	.31/1	B
3-23-82	2000	320	750	.43/1	-	4200	530	2200	.24/1	-	4000	570	1700	.34/1	B	4600	530	2900	.18/1	B	3600	320	7400	.004/1	B	1800	350	750	.47/1	B
4- 5-82	3200	230	800	.29/1	-	2100	150	800	.19/1	B	3000	310	700	.44/1	B	2000	300	1200	.25/1	B	----	300	1200	.25/1	B	2000	190	720	.26/1	B

Fecal-coliform bacteria ranged from 10 colonies/100 mL to 1,900 colonies/100 mL for the Mississippi River at Venice and from 4 colonies/100 mL to 1,000 colonies/100 mL for the Baptiste Collette Bayou sites. Fecal-coliform bacteria counts exceeded State criteria for primary contact recreation (200 colonies/100 mL) 53 percent of the time for the Mississippi River at Venice and 54 percent of the time for the Baptiste Collette Bayou samples. No counts for the river or bayou sites exceeded State criteria for public-water supply (2,000 colonies/100 mL).

Counts for fecal-streptococci bacteria ranged from 4 colonies/100 mL to 1,300 colonies/100 mL for the Mississippi River at Venice and from 4 colonies/100 mL to 7,400 colonies/100 mL for the Baptiste Collette Bayou system. The effects of bacterial die-off on differences in bacteria counts between river and bayou sites are negligible due to the short travel time through the system.

Numbers of total-coliform, fecal-coliform, and fecal-streptococci bacteria varied between the Mississippi River at Venice and the Baptiste Collette Bayou system. Forty-six percent of the samples showed an increase in bacterial concentrations as distance away from the river increased. Fifty-four percent showed no change or a decrease in bacterial numbers as distance from the river increased. It appears from these findings that the river is responsible for most, but not all, of the indicator bacteria present in the Baptiste Collette Bayou system. At times, however, significant numbers of these bacteria are derived from sources within the distributary itself.

Fecal-coliform to fecal-streptococci (FC/FS) ratios are possible indicators of bacterial sources. Geldreich (1970) found that, for certain conditions in freshwater, FC/FS ratios indicate the following:

Ratio	Source
≥ 4	Human waste
≥ 2 -4	Mixed, mainly human
≥ 1 -2	Uncertain
$\geq .7$-1	Mostly animal
$< .7$	Livestock or poultry

Twenty percent of the 83 river and bayou samples analyzed had FC/FS ratios greater than 4. Ratios for the Mississippi River at Venice were greater than two 21 percent of the time. Baptiste Collette Bayou had the greatest number of samples for which the FC/FS ratio exceeded two (five out of 15 samples). The occurrence of ratios greater than two decreased as distance downstream in Baptiste Collette Bayou increased, with the exception of the station, Main Pass at Breton Sound, which showed a slight increase. The number of samples with FC/FS ratios greater than two (17) and the number with FC/FS ratios of one or lower (43) indicate that cattle and waterfowl are probably major sources of enteric bacteria in the Mississippi River at Venice and the Baptiste Collette Bayou system. This is further substantiated from field observations of numerous cattle grazing along the distributary and the left bank of the river and a large resident waterfowl population, which increases greatly during the winter migratory period. Ratios for samples collected during the winter of 1981-82 were predominantly less than one (19 of 23 samples); however, ratios for the same period 1-year earlier were predominantly greater than one, 3 of 22 samples having ratios less than one. Both sampling periods were during peak waterfowl-migration periods and would be expected to show similar results. The major difference was due to the abnormally low discharge during the winter of 1980-81, which allowed salty gulf water to intrude into the river and infiltrate the distributary system. The following year, the river discharge was greater and saltwater intrusion was not significant.

The FC/FS ratio in relation to source that Geldreich found for freshwater may not hold for saltwater. Differences in salt tolerances of coliforms and streptococci could dramatically change ratios in brackish environments. This is an area that needs further research before any conclusions concerning FC/FS ratios in saltwater can be made.

Pathogenic bacteria were isolated from all five sites during the study period. Sixty-two percent of the pathogenic bacteria found in Baptiste Collette Bayou samples were found when the Mississippi River water at Venice had none. Potentially pathogenic bacteria were present in 75 and 88 percent of the samples from Emeline Pass and Kimbel Pass, respectively. These were also the only two sites where *Salmonella* and *Shigella* were isolated. The Mississippi River at Venice and Baptiste Collette Bayou near head had an incidence rate of 38 percent. Baptiste Collette Bayou at Breton Sound had an incidence rate of 50 percent, while Main Pass had a rate of 60 percent. Potentially pathogenic bacteria isolated at these sites were *Proteus mirabilis*, *Providencia rettgeri*, and *P stuartti*, *Citrobacter freundii*, *Pseudomonas aeruginosa*, *Enterobacter sakazakii*, and *E cloacae*, *Serratia liquefaciens*, and *Morganella morganii* (Youmans and others, 1975, Joklic and Smith, 1972). *Salmonella* and *Shigella* species were also isolated and serologically identified.

All samples in which pathogenic bacteria were found had FC/FS ratios less than four with most pathogens (86 percent) occurring in samples with FC/FS ratios less than one. This indicates that human wastes are not the major source of pathogenic bacteria within the study area. Numerous authors have found pathogens occurring in wildlife, domestic animals, and even in fish, amphibians, and reptiles (Lofton and others, 1962; Faddoul and others, 1966; Janssen and Meyers, 1968; Geldreich, 1970; Lawton and Morse, 1980; Morse and others, 1980). The low FC/FS ratios, along with the observations of large resident wildlife and cattle populations within the study area, would indicate that cattle and wildlife are possible sources of pathogenic bacteria in the Baptiste Collette Bayou area. This conclusion should be qualified, as human-source pathogens may be ingested by native fishes and can remain viable in the gut of fish for as long as 100 days (Lawton and Morse, 1980; Morse and others, 1980). Pathogenic bacteria may also persist in bottom sediments, even when overlying water is low in indicator organisms (Geldreich, 1970). Pathogenic bacteria have been demonstrated to have variable survival rates when compared to indicator organisms. The survival rates are dependent upon temperature, waste composition, and abundance of bacterial predators (Ahmed, 1975; Mitchell and Starzyk, 1975; Dutka and Kwan, 1980; McCambridge and McMeekin, 1980). Because of this, it is not possible to entirely rule out human waste as a source of pathogenic bacteria.

Geldreich (1970) found the following correlation between fecal-coliforms and pathogenic bacteria:

Numbers of fecal coliform	Percentage of samples in which Salmonella were detected
1-200	27.6 positive
201-2,000	85.2 positive
over 2,000	98.1 positive

Data for Baptiste Collette Bayou and the Mississippi River at Venice showed a lower incidence rate for fecal coliforms and pathogens: 69 percent of the samples which had fecal-coliform counts greater than 200/100 mL also had pathogenic bacteria present.

Lin and others (1974) reported no correlation between total-coliform numbers in water and fecal coliforms. Figure 12 also shows a lack of correlation between total-coliform numbers in water and FC/FS ratios of samples collected from the Mississippi River and Baptiste Collette Bayou. Total-coliform bacteria also appear to be poor indicators of pathogenic bacteria (Geldreich, 1970; Bagdasaryan and others, 1975). However, data from the study area showed that total-coliform bacteria was almost as good an indicator of pathogenic bacteria as fecal-coliform bacteria. Sixty-two percent of the samples that had total-coliform counts greater than 70/100 mL also had pathogenic bacteria present, and 63 percent of the samples that had fecal-streptococci counts greater than 200 had pathogenic bacteria present. All three of the indicator bacteria correlated poorly with the presence of pathogenic bacteria. Because of this, future sampling should include data on pathogens to determine the extent of pathogenic-bacterial contamination in this important shell-fish producing area.

Benthic Invertebrates

Composition of benthic-invertebrate communities by taxa and numbers of individuals can yield useful information about the hydrology and water quality of aquatic habitats (Mackenthun and Ingram, 1966). Because benthic invertebrates form resident communities of organisms that move very little throughout their aquatic existence, significant changes in the hydrology or water quality of their habitat will be reflected in changes in the composition of those benthic-invertebrate communities.

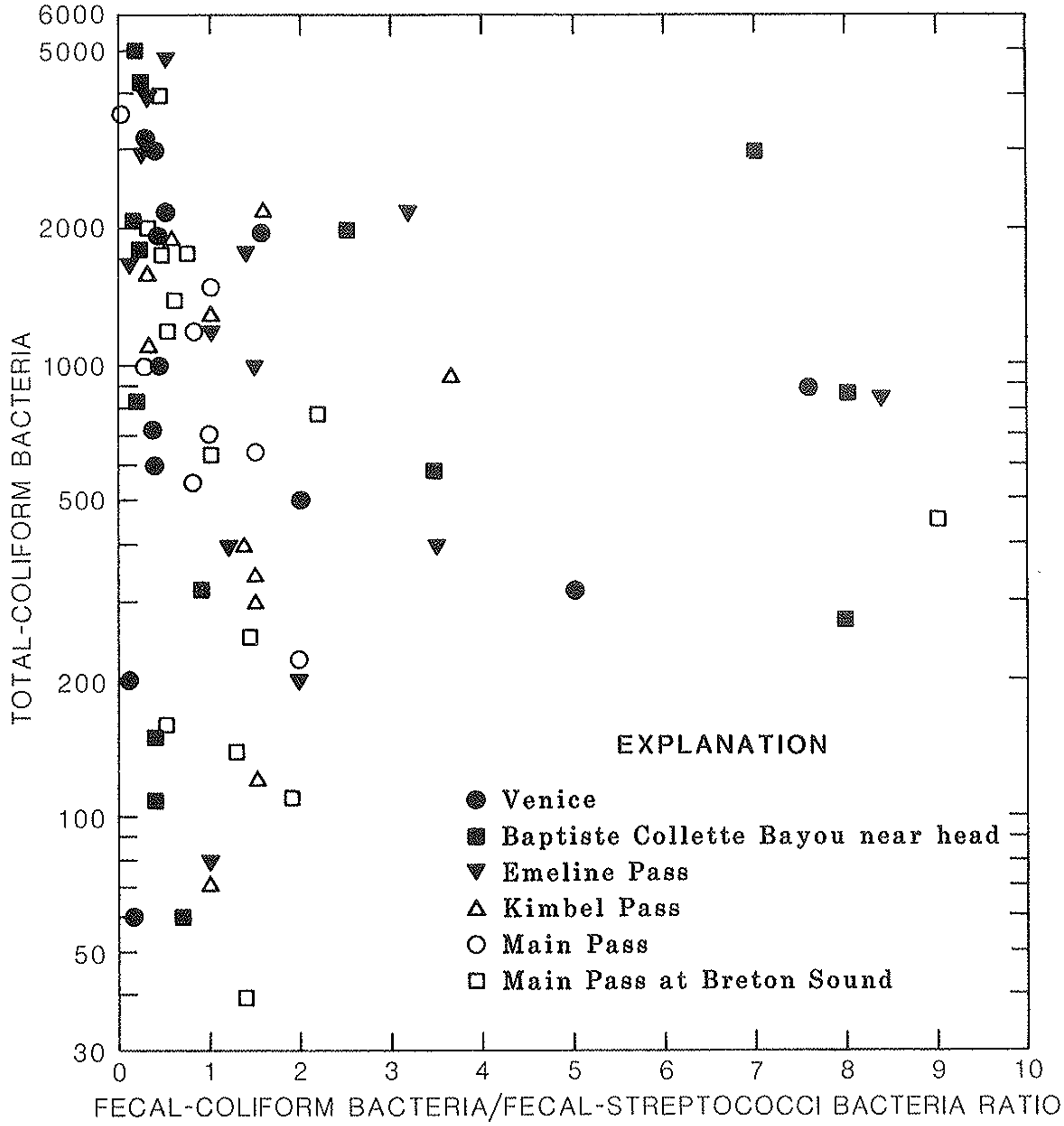

Figure 12.--Total-coliform bacteria versus fecal-coliform bacteria/fecal-streptococci bacteria ratio from the Mississippi River at Venice and Baptiste Collette Bayou, September 1980 to April 1982.

Benthic invertebrates were collected from the Mississippi River at Venice and from four sites in the Baptiste Collette Bayou distributary system from May 1980 to February 1982. Table 10 lists all organisms collected during the study period. Rangia, a brackish water clam, was the most abundant organism collected. The next most abundant organisms collected were Corophium, an amphipod, the polychaete worms Nereis and

Table 10.--Total number of benthic organisms identified from four sites on Baptiste Collette Bayou and one site on the Mississippi River at Venice, Louisiana, May 1980 to February 1982

[List compiled from one sample collected at three stations in the cross section at each site on six different sampling dates. Numbers in table represent total number of organisms identified at each sampling section for all seven sampling dates. X indicates presence of colonial-type organisms]

Benthic organisms identified	Mississippi River at Venice	Baptiste Collette Bayou near head	Emeline Pass	Kimbel Pass	Main Pass at Breton Sound
Ciliatea					
Peritrichida					
Vorticellidae-----	---	-----	--	---	X
Vorticella------	---	X	X	---	-----
Anthozoa					
Actiniaria					
Unidentified individuals-----	---	-----	--	---	1
Hydrozoa					
Hydroida					
Unidentified individuals-----	---	-----	--	---	1
Rhynchocoela---------					
Unidentified individuals-------	---	-----	--	1	-----
Anopla					
Paleonemertini					
Carinomidae					
Carinoma--------	12	6	28	24	11
Polychaeta					
Unidentified individuals-------	25	5	4	4	15
Amphinomida					
Amphinomidae					
Pareurythoe-----	---	-----	--	---	1
Capitellida					
Opheliidae					
Ophelia---------	---	-----	--	---	4
Cirratulida					
Cirratulidae					
Cossura---------	3	-----	--	---	-----
Phyllodocida					
Nereidae					
Nereis----------	37	4	94	38	25
Pilargidae					
Sigambra--------	6	-----	--	---	-----

Table 10.--Total number of benthic organisms identified from four sites on Baptiste Collette Bayou and one site on the Mississippi River at Venice, Louisiana, May-1980 to February 1982--Continued

Benthic organisms identified	Mississippi River at Venice	Baptiste Collette Bayou near head	Emeline Pass	Kimbel Pass	Main Pass at Breton Sound
Polychaeta--Continued					
Spionida					
Spionidae					
Streblospiro----	4	-----	10	1	15
Terebellida					
Ampharetidae					
Asebellides-----	7	6	74	33	4
Hypaniola-------	---	-----	--	---	1
Hirudinea					
Pharyngobdellida					
Erpobdellidae					
Unidentified individuals---	---	-----	1	1	-----
Oligochaeta					
Opisthopora					
Haplotaxidae					
Unidentified individuals---	---	-----	--	---	1
Plesiopora					
Lumbriculidae					
Unidentified individuals---	---	-----	--	---	1
Tubificidae					
Aulodrilus------	8	-----	--	---	3
Branchiura------	2				
Limnodrilus-----	1	-----	2	8	-----
Peloscolex------	2	2	--	1	-----
Unidentified individuals---	1	-----	5	13	1
Crustacea					
Amphipoda					
Corophiidae					
Corophium-------	163	2,255	32	422	3
Gammaridae					
Gammarus--------	8	4	1	---	1
Hyalellidae					
Parhyalella-----	---	-----	2	---	-----
Decapoda					
Unidentified individuals------	---	-----	1	---	-----
Grapsidae/ Ocypodidae-------	---	-----	--	1	-----

Table 10.--Total number of benthic organisms identified from four sites on Baptiste Collette Bayou and one site on the Mississippi River at Venice, Louisiana, May 1980 to February 1982--Continued

Benthic organisms identified	Mississippi River at Venice	Baptiste Collette Bayou near head	Emeline Pass	Kimbel Pass	Main Pass at Breton Sound
Crustacea--Continued					
Decapoda--Continued					
Palaemonidae					
Palaemonetes	---	-----	--	1	-----
Portunidae					
Callinectes	1	2	--	3	3
Upogebiidae					
Upogebia	---	-----	--	---	1
Xanthidae					
Rhithropanopeus	---	1	--	---	-----
Harpacticoida					
Unidentified individuals	---	-----	--	1	-----
Isopoda					
Idoteidae					
Chiridotea	---	-----	--	---	2
Edotea	---	-----	--	---	1
Thoracica					
Balanidae					
Balanus	---	1	1	2	1
Insecta					
Coleoptera					
Hydrophilidae					
Berosus	---	1	--	---	-----
Collembola					
Isotomidae					
Isotomurus	---	1	--	---	-----
Diptera					
Ceratopogonidae					
Palpomyia	---	-----	--	1	-----
Chironomidae					
Cryptochironomus	3	-----	1	4	-----
Dicrotendipes	---	1	--	2	-----
Polypedilum	---	-----	1	---	-----
Ephemeroptera					
Ephemeridae					
Pentagenia	1	1	--	---	-----
Polymitarcidae					
Tortopus	11	25	1	30	-----
Odonata					
Gomphidae					
Gomphus	1	-----	--	---	-----

Table 10.--Total number of benthic organisms identified from four sites on Baptiste Collette Bayou and one site on the Mississippi River at Venice, Louisiana, May 1980 to February 1982--Continued

Benthic organisms identified	Mississippi River at Venice	Baptiste Collette Bayou near head	Emeline Pass	Kimbel Pass	Main Pass at Breton Sound
Gastropoda					
Mesogastropoda					
Hydrobiidae					
Hydrobia--------	1	2	--	1	-----
Neogastropoda					
Columbellidae					
Anachis---------	---	-----	--	---	19
Bivalvia					
Heterodonta					
Corbiculidae					
Corbicula-------	1	2	--	---	-----
Heterodontida					
Dreissenidae					
Congeria--------	1	-----	--	---	-----
Mactridae					
Rangia----------	1	-----	14	16	4,822
Sipuncula					
Unidentified individuals-----	---	-----	--	---	1
Teleostomi					
Perciformes					
Gobiidae----------	---	-----	--	---	1

Asebellides, the nemertean Carinoma, and other polychaete worms. These organisms also occurred most frequently and were found at all five sites. The burrowing mayfly Tortopus was relatively widespread and numerous. It was found at four of the five sampling sites, but only in samples collected during the July sampling trips. Decapods, especially the blue crab, Callinectes, were ubiquitous but in low numbers. Cross-sectional profiles of each site showing substrate type and dominant organisms at three verticals are shown in figures 13-15.

The most abundant organisms present at the Mississippi River at Venice site were (in descending order) Corophium, Nereis, unidentified polychaetes, Carinoma, and Tortopus (fig. 13A). The substrate in the center was predominantly fine sand, which is very difficult to colonize. Polychaetes were the dominant organism found at this vertical. These worms are tube dwellers that use fine sand particles in construction of their cases. Corophium was the dominant organism found at the two bank verticals. The composition of the bank substrates ranged from fine sand and silt to medium silt and clay. The organisms found at these stations are burrowers requiring a relatively stable substrate to exist. Tortopus was found only in the July 1980 samples; however, their burrows were found throughout the study. Tortopus has a relatively long nymphal period in the water and its presence in various stages of nymphal development would tend to rule out upstream areas as the source of these organisms. Not collecting Tortopus during the other sampling periods indicates that either the Shipek bottom grab was not penetrating deep enough into the substrate or that Tortopus has a negative response to saltwater, which had intruded to a point upriver from the sampling site. This response may be in the form of burrowing deeper into the substrate and becoming quiescent or evolvement of a shorter time period in the nymphal stage, which would decrease the chances of collecting them.

Corophium was the most abundant organism collected at the site near the head of Baptiste Collette Bayou (fig. 13B) and was present at all three verticals in the cross section. It was present at the right bank vertical 70 percent of the time and was present 14 percent of the time at the other two verticals. Tortopus was collected in the center, and its presence there coincided with its presence in the Mississippi River samples. Some polychaete worms were collected at this site but not in great numbers. The substrate ranged from fine sand and silt to fine silt and clay.

The polychaete worms Nereis and Asebellides and the nemertean Carinoma were the most numerous organisms captured at the Emeline Pass site (fig. 14A). Nereis and Carinoma also occurred more frequently than other forms. Corophium was present at this site, occurring frequently but in low numbers. A single Tortopus was captured at this site. This organism probably drifted in from an upstream area, because the substrate at the Emeline Pass site did not appear suitable for colonization by Tortopus. Polychaetes were the dominant organisms at all three verticals, probably because the substrate type (fine sand and silt) favored colonization by these organisms.

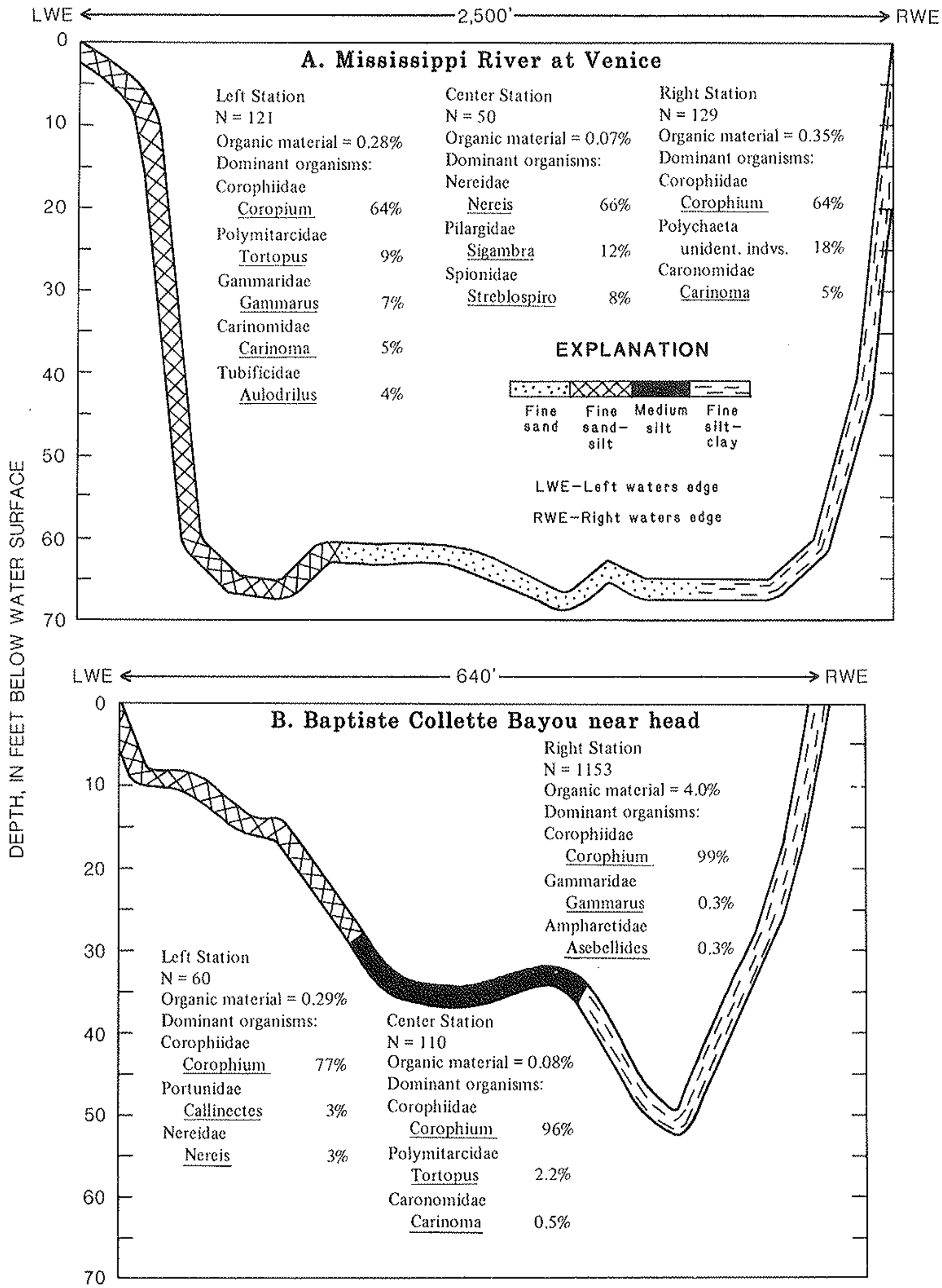

Figure 13.--Channel profiles of sampling sites listing the percentages of dominant organisms and organic material and showing particle size of bed materials at (A) Mississippi River at Venice and (B) Baptiste Collette Bayou near head.

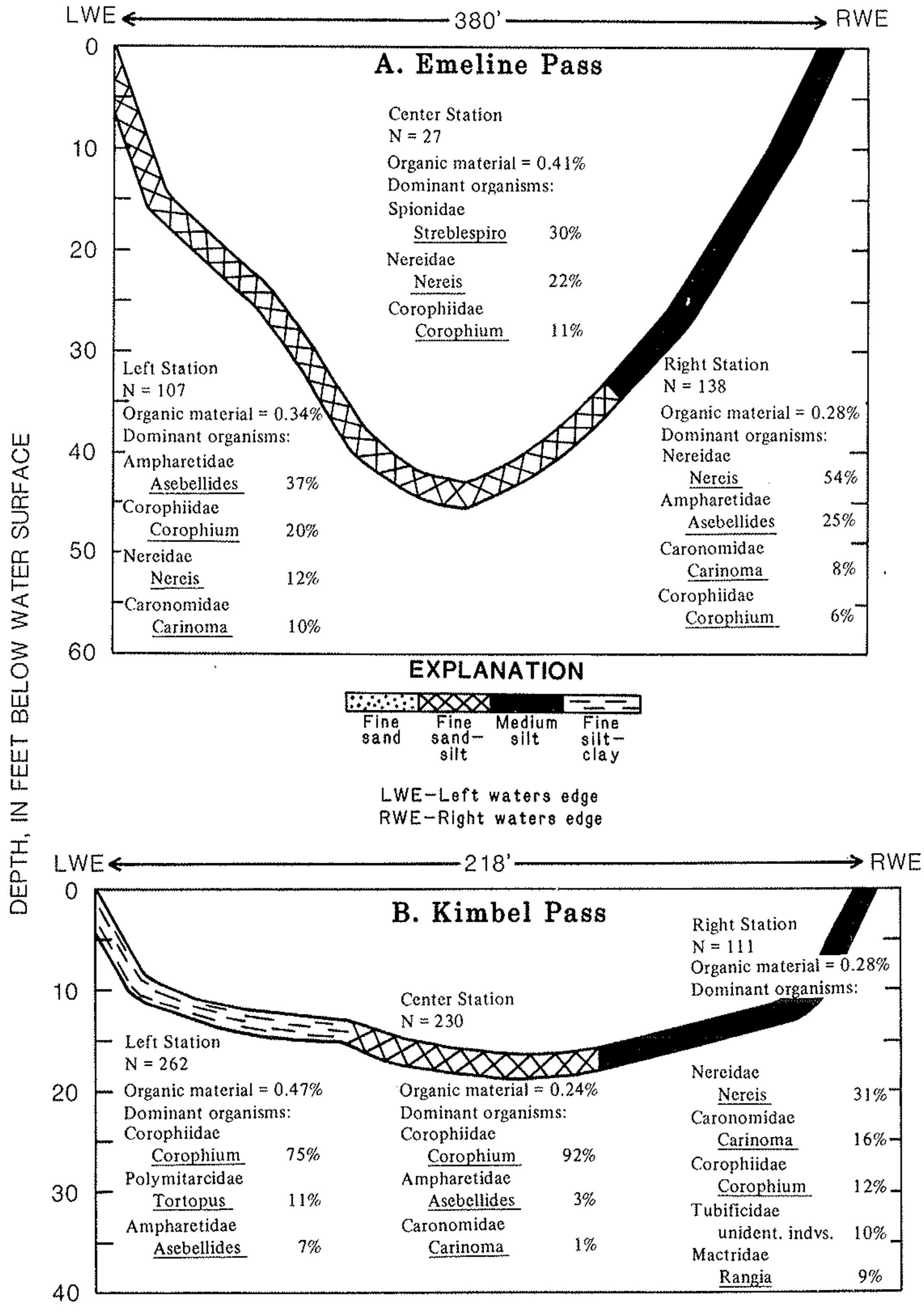

Figure 14.--Channel profiles of sampling sites listing the percentages of dominant organisms and organic material and showing particle size of bed materials at (A) Emeline Pass and (B) Kimbel Pass.

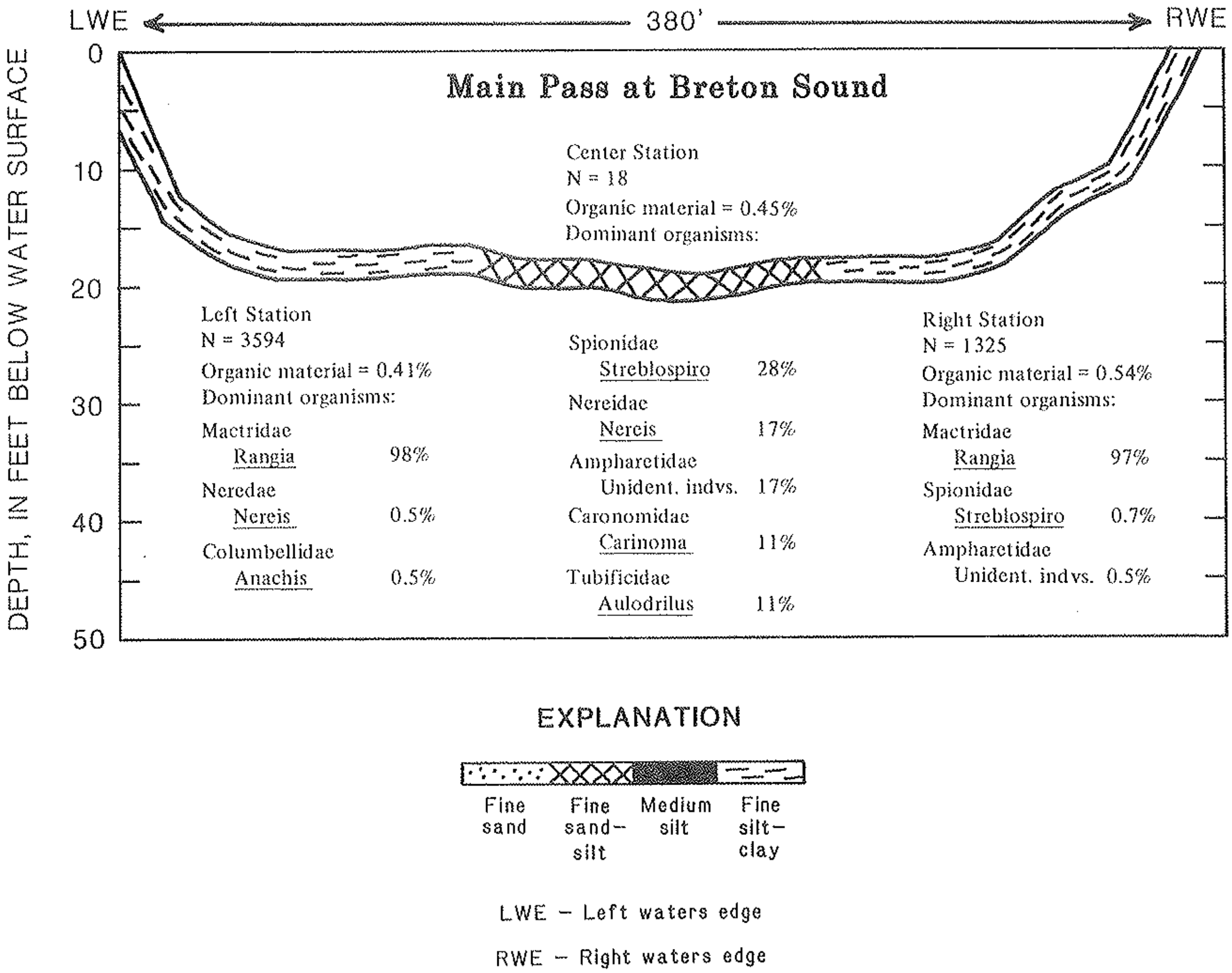

Figure 15.--Channel profiles of sampling sites listing the percentages of dominant organisms and organic material and showing particle size of bed materials, Main Pass at Breton Sound.

Dominant organisms present at the Kimbel Pass site (fig. 14B) were Corophium, Nereis, Asebellides, Tortopus, Carinoma, Rangia, and unidentified tubificid worms. The substrate was variable, ranging from hard clay on the left bank to fine sand and silt on the right bank. Tortopus was found in relatively large numbers on the clay substrate but was completely absent from the silt substrate. Corophium showed a similar distribution. Nereis and tubificid worms were found on the right bank in relatively large numbers and in small numbers on the left bank.

Rangia was the most abundant organism found at Main Pass at Breton Sound (fig. 15). It was present during only one sampling trip and its great numbers masked the importance of the more frequently occurring organisms. Nereis, Streblospiro, unidentified polychaetes, and Carinoma were the most numerous and frequently occurring organisms at this site, excluding Rangia. These organisms were evenly distributed across the channel. Corophium and Callinectes were also present but in low numbers. This was the only site where Tortopus was not found. The substrate at the site ranged from soft clay at the banks to fine sand and silt at center channel. Although this site was dredged by the U.S. Army Corps of Engineers in November 1981, samples collected 1 month before and 3 months after dredging were similar in composition and numbers (table 11). Population densities were low in both samples. The relatively rapid recolonization was probably due to (1) drift of organisms into the area from upstream reaches of Main Pass and also from Breton Sound via tidal action and (2) the relatively small area dredged.

Table 11.--Benthic invertebrates present in Baptiste Collette Bayou, Main Pass at Breton Sound, 1 month before and 3 months after dredging activities

Before dredging		After dredging	
Carinoma---	5	Carinoma----	4
Nereis-----	2	Nereis------	3
Upogebia---	1	Corophium---	1
Aulodrilus-	3	Edotea------	1
		Callinectes-	1

Distribution and abundance of benthic invertebrates are dependent upon stream velocity, substrate type, organic detritus, salinity, and water-quality conditions (Hynes, 1970). The benthic communities of the lower Mississippi River at Venice and the Baptiste Collette Bayou distributary system are euryhaline, being tolerant of large variations in salinity. The presence of saltwater at these sites for extended periods of time restricts the kinds of organisms that are able to colonize these areas. In this respect, salinity has a major impact on the benthic communities. Organisms such as Nereis, Corophium, Carinoma, and Asebellides are tolerant of large changes in salinity and were present year round at all sites. Other organisms, such as Tortopus and Corbicula (which are intolerant of high salinities) and Parhyalella (which is intolerant of low salinities), are stenohaline, being intolerant of large variations in salinity, and are present only during those periods when conditions were favorable. This is apparent when comparisons are made between benthic samples collected in 1976-77 and 1980-82 for the Mississippi River at Venice. Wells and Demas (1979) reported Corophium, the chironomid Cladotanytarsus, unidentified tubificids, Nereis, and Corbicula as the most numerous organisms collected during the 1976-77 study. These samples were collected following the 1973-75 high-water years. Initially, samples contained primarily freshwater organisms. As the 1976-77 study progressed, saltwater intruded upstream from Venice for a period of 4 months. Polychaetes, crabs, and some tubificids began to appear in the sampling program as the duration of the saltwater wedge lengthened. Unlike Corbicula these organisms were able to survive when changes in salinity occurred and continued to exist after the saltwater wedge was moved downstream by higher flows. It was predicted in the earlier study (Wells and Demas, 1979) that the "typical" benthic community at Venice was euryhaline and was just beginning to re-establish itself after the high-water years of 1973-75. Organisms collected during the 1980-82 study verify this. Corophium, Nereis, Carinoma, and Streblospiro were the dominant organisms collected. Corbicula, unable to tolerate high salinities, was almost completely absent from the 1980-82 samples.

Hynes (1970) stated that the major factor controlling the occurrence of benthic invertebrates is the substratum. This appears to be true for the study area. Figures 16-18 show the variation in total number of organisms, total number of genera, and specific conductance at each of three verticals in a cross section for each sampling date. Variation in numbers and types of organisms between the verticals within a cross section was considerable. Variations in total numbers and types of organisms between sites do not appear to be caused by differences in water quality, except for salinity and related variables. Specific-conductance values and water-quality parameters were similar for the Mississippi River at Venice site and for the three upstream Baptiste Collette Bayou sites. Major differences in taxa between sites were found at the Main Pass at Breton Sound site (fig. 18) where specific-conductance values were much different. The mayfly Tortopus was never collected at this site where saltwater was present much of the time, and it was not found at the other sites when saltwater was present. All other dominant organisms were found at all five sites during all ranges in specific conductance. Variations in species composition within and between sites appears to be governed more by substrate preference by organisms than any other factor. Table 12 lists the seven most numerous organisms collected and the substrates they were collected from. Samples from fine sand and medium silt were the least populated. Fine silt and clay substrates contained the greatest number of organisms indicating it is the most suitable of the substrates in the study area for colonization.

Table 12.--Occurrence in different substrates of the seven most abundant organisms collected from the Mississippi River at Venice and Baptiste Collette Bayou, May 1980 to February 1982

Organism	Total number	Fine sand	Fine sand/ silt	Medium silt	Fine silt/ clay
Carinoma	82	2	31	14	35
Nereis	198	33	22	10	133
Asebellides	124	--	49	3	72
Unidentified Polychaetes	53	2	5	3	43
Corophium	2,878	1	213	41	2,623
Tortopus	67	--	2	1	64
Rangia	4,853	--	17	--	4,836
Totals	8,255	38	339	72	7,806

The species that exist at a particular site can be indicative of the water quality at that site. Certain organisms are more tolerant of pollutants and poor water quality than others. The tolerance of benthic invertebrates collected from Baptiste Collette Bayou and the Mississippi River at Venice area range from moderate tolerance to total intolerance of poor water-quality conditions (Weber, 1973). Tortopus and many of the decapods collected are indicative of good water quality. The low organic content found in the substrate (figs. 13-15) indicates little or no organic deposition in the study area.

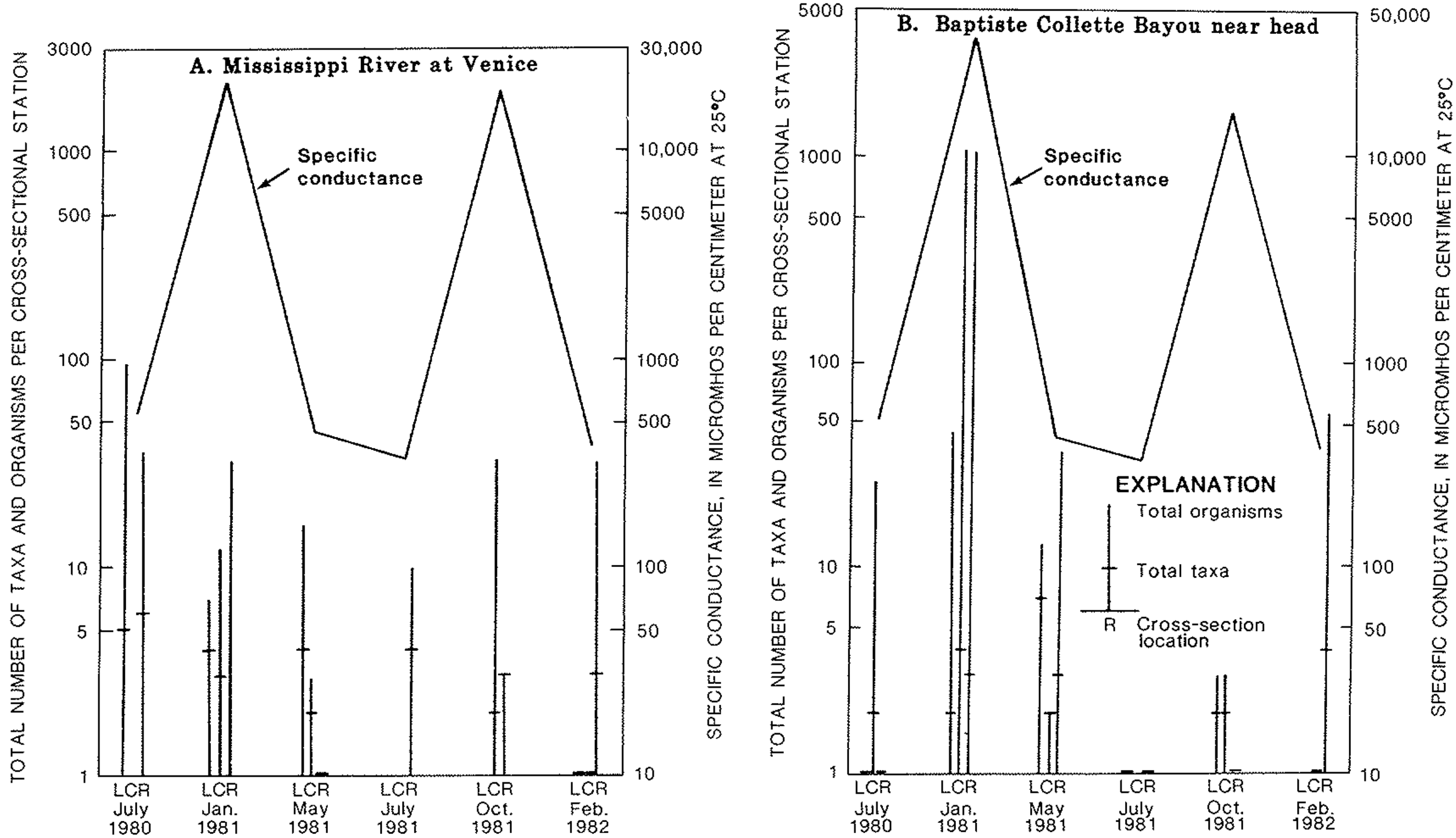

Figure 16.--Total number of organisms and genera present at each cross-sectional station by site, sampling date, and specific conductance for (A) Mississippi River at Venice and (B) Baptiste Collette Bayou near head.

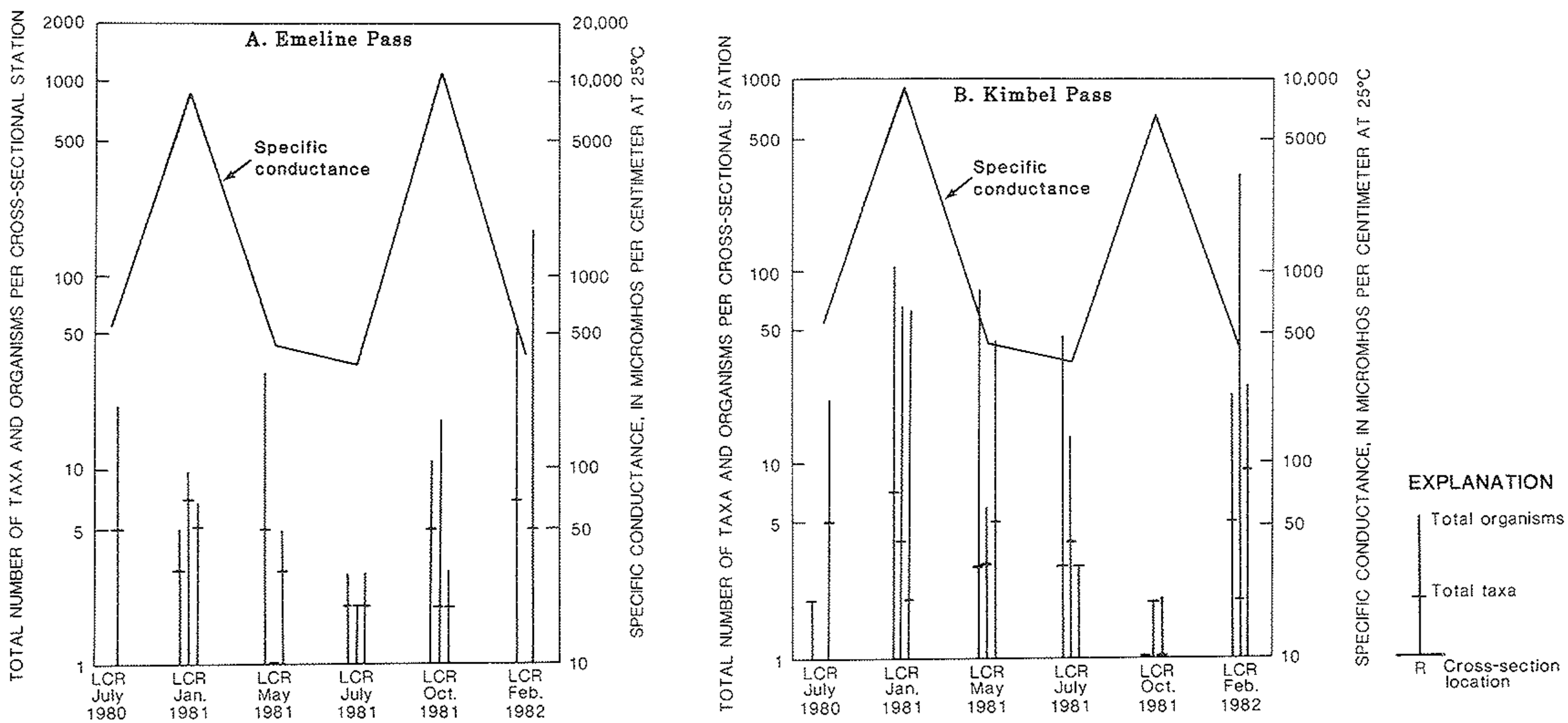

Figure 17.--Total number of organisms and genera present at each cross-sectional station by site, sampling date, and specific conductance for (A) Emeline Pass and (B) Kimbel Pass.

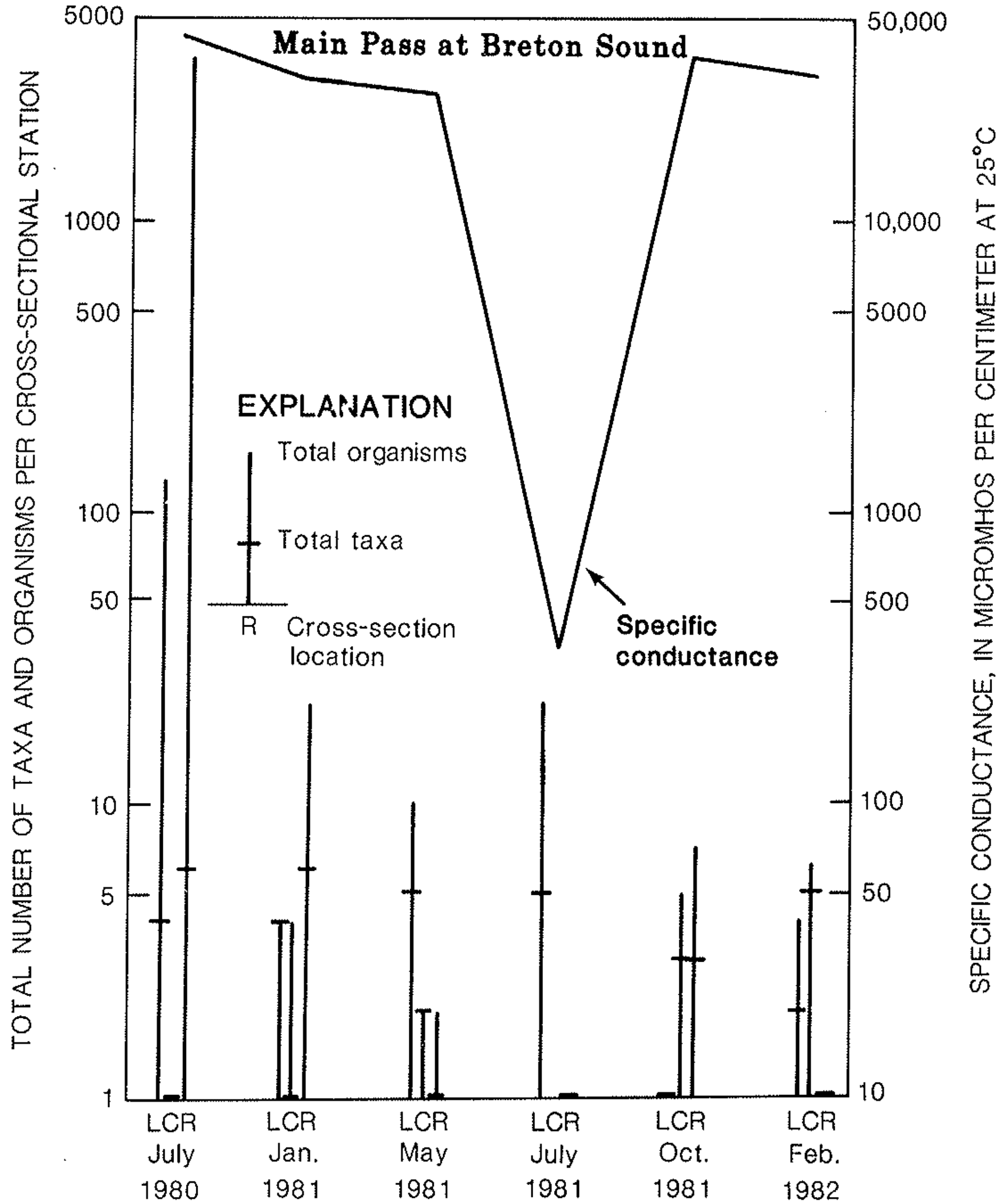

Figure 18.--Total number of organisms and genera present at each cross-sectional station by site, sampling date, and specific conductance for Main Pass at Breton Sound.

SUMMARY AND CONCLUSIONS

Discharges in Baptiste Collette Bayou are affected by winds and tides. Discharge was relatively constant during the study, ranging from 22,700 ft^3/s to 26,600 ft^3/s at the head of Baptiste Collette Bayou for corresponding flows of 342,000 ft^3/s to 530,000 ft^3/s in the Mississippi River at Tarbert Landing. Flow in Baptiste Collette Bayou is distributed unequally between the three passes, with approximately 42 percent of the discharge going down Main Pass, 24 percent down Kimbel Pass, and 34 percent down Emeline Pass. Major pipeline canals transecting these passes are dammed off and have little interchange with the passes except for one location between Kimbel and Main Pass.

Suspended sediment was approximately 95 percent silt and clay in Baptiste Collette Bayou. Suspended-sediment concentrations decreased by 31 and 51 percent between the heads of Baptiste Collette Bayou and Breton Sound during flows of 530,000 ft^3/s and 342,000 ft^3/s in the Mississippi River. Major deposition of sediment at both flows occurred where the bayou enters Breton Sound.

Time of travel for peak concentration of a tracer at a discharge of 22,700 ft^3/s in Baptiste Collette Bayou was 5.7 hours from the heads of Baptiste Collette Bayou through Main Pass into Breton Sound. Peak travel-times through Kimbel Pass and Emeline Pass to Breton Sound were 5.4 and 6.2 hours, respectively.

Water quality in Baptiste Collette Bayou was very similar to the Mississippi River water at Venice when discharge was greater than 250,000 ft^3/s. At discharges of less than 250,000 ft^3/s in the Mississippi River, concentrations of major ions such as calcium, magnesium, and chloride increased in the bayou as distance away from the river increased due to saltwater intrusion. Minor-element and pesticide concentrations in water samples from Baptiste Collette Bayou were below EPA criteria for freshwater aquatic life (U.S. Environmental Protection Agency, 1976), with the possible exception of mercury, and generally mirrored concentrations found in the Mississippi River at Venice. Concentrations of minor elements, insecticides, and organic compounds in bed material in Baptiste Collette Bayou were low, with the exception of chlordane, DDD, DDT, and PCB. Bed PCB values exceeded 19 µg/kg at two sites, Emeline Pass and Main Pass at Breton Sound. Concentrations of some minor elements and organic compounds in bed material decreased between samples collected in 1977 and 1981-82 from Baptiste Collette Bayou. Removal of dredged material between sampling periods may to be the major reason for these decreases.

Bacteria data compiled from samples collected from Baptiste Collette Bayou and the Mississippi River at Venice indicate that the Mississippi River is responsible for most, but not all, of the indicator bacteria present in the Baptiste Collette Bayou system. At times, however, significant numbers of these bacteria are derived from sources within the distributary itself. Total-coliform bacteria counts for Baptiste Collette Bayou exceeded Louisiana water-quality criteria for type four shellfish production in 95 percent of the samples (Louisiana Stream Control Commission, 1977). However, no relation was found between total-coliform counts and FC/FS ratios. Fecal-coliform/fecal-streptococci ratios of two or greater indicate human-waste products as sources of bacterial populations. Eighty percent of the river and bayou samples analyzed had FC/FS ratios less than two. Forty-three percent of the river and bayou samples analyzed had FC/FS ratios less than 1, indicating cattle and waterfowl as the probable major sources of enteric bacteria in the Mississippi River at Venice and the Baptiste Collette Bayou system. Pathogenic bacteria were isolated from the Mississippi River at Venice site and all of the Baptiste Collette Bayou sites during the course of the study. Sixty-two percent of the pathogenic bacteria found in Baptiste Collette Bayou samples were found when the Mississippi River water at Venice had none. Also, no pathogenic bacteria were isolated when FC/FS ratios exceeded two, indicating cattle and waterfowl within the Baptiste Collette Bayou system as the probable sources of pathogenic bacteria in the bayou.

Benthic invertebrate populations from the Mississippi River at Venice and Baptiste Collette Bayou were similar. *Corophium*, an amphipod, the polychaete worms *Nereis* and *Asebellides*, the nemertean *Carinoma*, and other polychaete worms were the organisms that occurred most frequently and in greatest numbers. *Tortopus*, a mayfly, and the blue crab, *Callinectes* were also present at most sites. Saltwater intrusion into the Mississippi River and Baptiste Collette Bayou is the dominant factor affecting the kinds of organisms that can exist in the study area. Substrate type determined organism distribution within the system. Benthic organisms collected from Baptiste Collette Bayou and the Mississippi River at Venice range from moderate tolerance to total intolerance of poor water-quality conditions. Low-organic content found in the substrate indicates little or no organic deposition in the study area.

Benthic-invertebrate, water-quality, and bacteria data indicate that, although the Mississippi River is the major factor influencing the quality of the aquatic environment of the study area, factors from within the system--such as saltwater intrusion and local wildlife and cattle populations--can significantly affect the water quality of the distributary.

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