Time-of-Travel of Solute Data for Mississippi Streams

U.S. GEOLOGICAL SURVEY
Open-File Report 02-292

Prepared in cooperation with the
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY,
OFFICE OF POLLUTION CONTROL

USGS
science for a changing world

Time-of-Travel of Solute Data for Mississippi Streams

By J. Kerry Arthur

U.S. GEOLOGICAL SURVEY
Open-File Report 02-292

Prepared in cooperation with the

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY,
OFFICE OF POLLUTION CONTROL

Pearl, Mississippi
2002

U.S. DEPARTMENT OF THE INTERIOR
GALE A. NORTON, Secretary

U.S. GEOLOGICAL SURVEY
Charles G. Groat, DIRECTOR

For additional information write to:

District Chief
U.S. Geological Survey
308 S. Airport Road
Pearl, MS 39208-6649

Copies of this report can be purchased from:

U.S. Geological Survey
Branch of Information Services
Box 25286
Denver, CO 80225-0286

CONTENTS

Abstract 1
Introduction 1
Presentation of data 2

FIGURES

1-8. Maps showing location of:
1. Drainage basins in Mississippi 4
2. Tombigbee River Basin and stream reaches with time-of-travel information 5
3. Pascagoula River Basin and stream reaches with time-of-travel information 6
4. Coastal streams and stream reaches with time-of-travel information 7
5. Pearl River Basin and stream reaches with time-of-travel information 8
6. Yazoo River Basin and stream reaches with time-of-travel information 9
7. Big Black River Basin and stream reaches with time-of-travel information 10
8. Independent Streams Basin and stream reaches with time-of-travel information 11

TABLE

1. Time-of-travel of solute data collected for streams in Mississippi 12

CONVERSION FACTORS

Multiply	By	To obtain
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
cubic foot per second (ft3/s)	0.02832	cubic meter per second
mile per hour (mi/hr)	1.609	kilometer per hour

Time-of-travel of Solute Data for Mississippi Streams

By J. Kerry Arthur

ABSTRACT

This report summarizes the time-of-travel of solutes information for Mississippi streams that is available in the files of the U.S. Geological Survey. The time-of-travel information was tabulated for 926 miles of stream reaches in seven of the ten major drainage basins in the State. The data were collected during studies conducted from 1963 through 1980. Estimation of time-of-travel of solutes is important for environmental studies of streams and may be critical in the event of accidental or other spills of contaminants into a waterway.

INTRODUCTION

The U.S. Geological Survey (USGS) collaborated with the Mississippi Department of Environmental Quality, Office of Pollution Control (MDEQ-OPC), in a project to compile all the time-of-travel of solute information on Mississippi streams located in the files of the USGS. The purpose of the report is to present all the available time-of-travel information for Mississippi streams in a single document in order to facilitate the use of the data.

The possibility of accidental or intentional (bio-terrorism) spills of contaminants into Mississippi steams is of concern to those using water from the rivers in the State. Estimating solute travel time in streams is important in the event of spills of contaminants and for pollution studies. A tabulation of all the time-of-travel information for Mississippi streams in one publication will be beneficial to the public and to local, State, and Federal agencies.

The time-of-travel information in Mississippi was collected from 1963 through 1980 along 926 miles of stream reaches in seven of the ten major drainage basins in the State (fig. 1). The time-of-travel information presented in this report was collected by the USGS. Exceptions are the information on Red Creek and part of the data collected on Tallahalla Creek. The U.S. Public Health Service collected the information presented for these two streams.

Although time-of-travel data were collected as part of various USGS studies having a wide range of objectives, scopes, and cooperators, all these studies used similar procedures to determine solute time-of-travel. The time-of-travel data were determined by injecting known amounts of fluorescent dye into streams at selected sites and measuring the travel time of the dye to downstream sampling points. Rhodamine B or Rhodamine WT fluorescent dye was used as the tracer in all the studies. The dye concentrations in the water samples collected were measured in the field by using a fluorometer. The final analysis to determine relative dye concentration of each water sample was made under uniform temperature conditions. The travel time of the dye was determined by using the time of collection of the water sample containing the peak concentration of dye. In some of the studies, the time-of-travel of the leading and trailing edges of the dye cloud was determined. The leading edge of the dye plume is the first detection of a dye concentration greater than background fluorescence. The trailing edge is the time when the dye concentration decreased to about 10 percent of the peak concentration. Most of the studies were made during

periods with little or no surface runoff or during periods when the streams were at or near base flow conditions. Stream discharge measurements using Price current meters were made during most of the studies, and where measurements were not available, stream discharge was estimated.

PRESENTATION OF DATA

Time-of-travel of solute information was compiled from the individual project files at the USGS. In instances where the information was in field form, the data were reduced, checked, and tabulated. Time-of-travel information was tabulated for the following drainage basins and stream groups in Mississippi (fig. 1).

- Tombigbee River Basin (fig. 2)
- Pascagoula River Basin (fig. 3)
- Coastal streams Basin (fig. 4)
- Pearl River Basin (fig. 5)
- Yazoo River Basin (fig. 6)
- Big Black River Basin (fig. 7)
- Independent streams Basin (fig. 8)

The stream reaches in each basin with time-of-travel of solute information are shown in figures 2-8. The drainage basin names are consistent with the names used by the MDEQ-OPC.

The time-of-travel of solute information for Mississippi streams is presented in table 1. The data tabulated for each stream consist of the following parameters:

- **Date of study--**Month and year of study**.**
- **Reach**--Location of beginning and end of reach.
- **County**--Name of county of reach.
- **Latitude**--Degrees, minutes, and seconds of latitude at beginning and end of reach.
- **Longitude**--Degrees, minutes, and seconds of longitude at beginning and end of reach.
- **Length of reach**--Length of reach in miles.
- **Solute time-of-travel, in hours**--Elapsed travel time of dye cloud from the beginning to the end of the reach.
    - **Lead edge**--Leading edge of dye cloud.
    - **Peak**--Peak concentration in dye cloud.
    - **Trail edge**--Trailing edge off dye cloud.
- **Solute rate of travel, in miles per hour**—Rate of travel time of dye cloud from the beginning to the end of the reach.
    - **Lead edge**--Leading edge of dye cloud.
    - **Peak**--Peak concentration in dye cloud.
- **Stream discharge, in cubic feet per second**

The Pascagoula River Basin (fig. 3) has the greatest total miles (336 miles) of river reaches with time-of-travel of solute information. The basin with the next greatest miles (280 miles) of river reaches with time-of-travel information is the Pearl River Basin (fig. 5). Of the remaining basins with time-of-travel data, the Yazoo River Basin (fig. 6) has the least miles (32.0 miles) of time-of-travel information.

The Pearl River has the greatest miles (222 miles) of river reaches with time-of-travel of solute information. The Chickasawhay River in the Pascagoula Basin has the next greatest miles (84.5 miles) of river reaches with time-of-travel information. The Big Black River has the

third greatest miles (73.0 miles) of river reaches with data. All the river reach mileage (51.3 miles) with time-of-travel information on the independent streams is on the Homochitto River. Within the Yazoo River Basin, the Tillatoba Creek Basin has all the stream reach mileage (32.0 miles) with time-of-travel information. For the coastal streams, Wolf River has most of the stream reach mileage (51.7 miles) with time-of-travel information. Most of the river reach mileage (43.0 miles) with time-of-travel information in the Tombigbee River Basin is on the Tombigbee River. The remainder of the time-of-travel information on stream reaches in the Tombigbee Basin (27.4 miles) is on Town Creek near Tupelo.

Several of the streams have time-of-travel of solute information at more than one flow rate for an individual stream reach. Stream reaches of the Tallahala Creek Basin have time-of-travel information for four stream discharges. The streams in the Tillatoba Creek Basin within the larger Yazoo River Basin have time-of-travel information for three stream discharges. The Pearl River, the Leaf River, and Red Creek have stream reaches with time-of-travel information at two stream discharges.

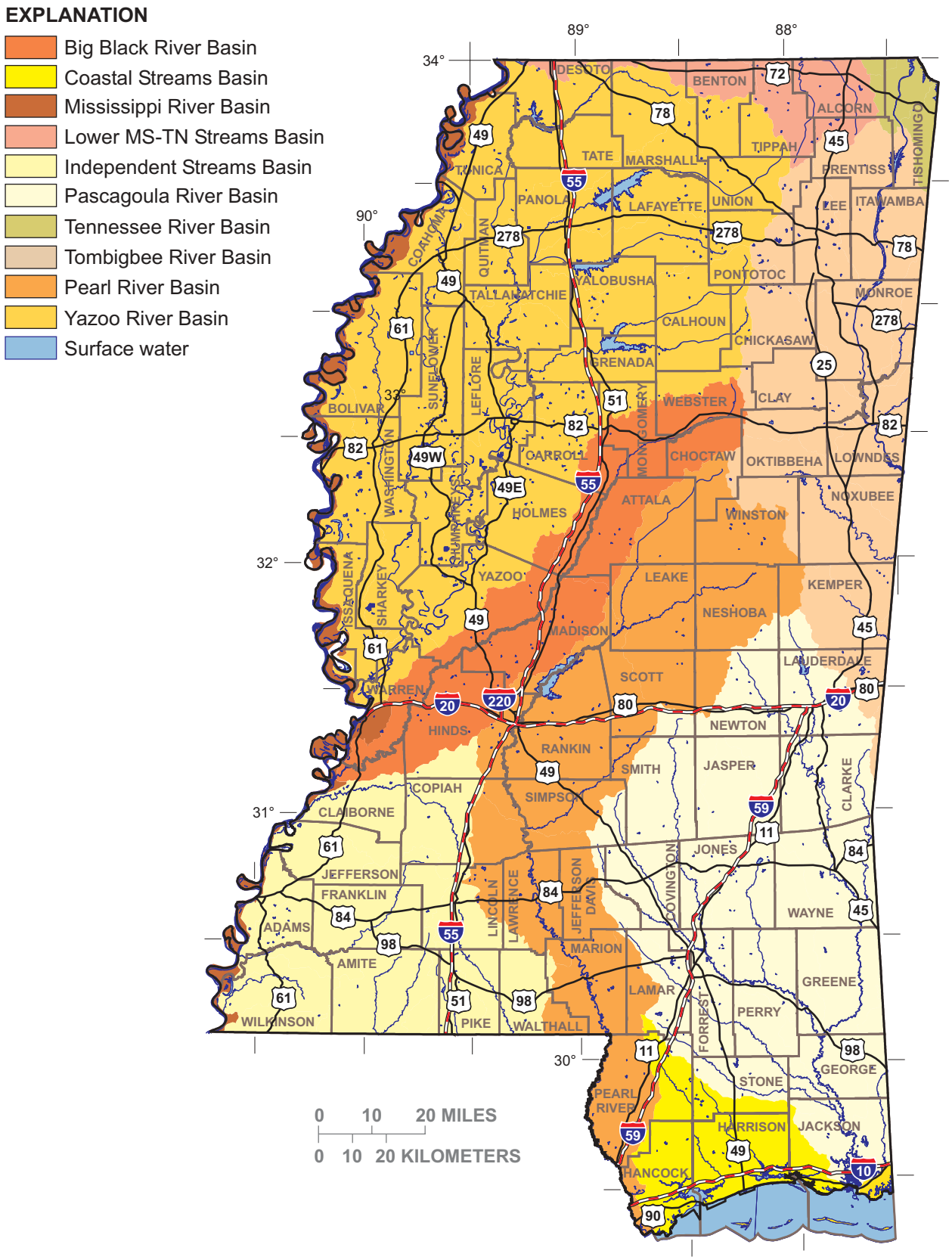

Figure 1. Location of drainage basins in Mississippi.

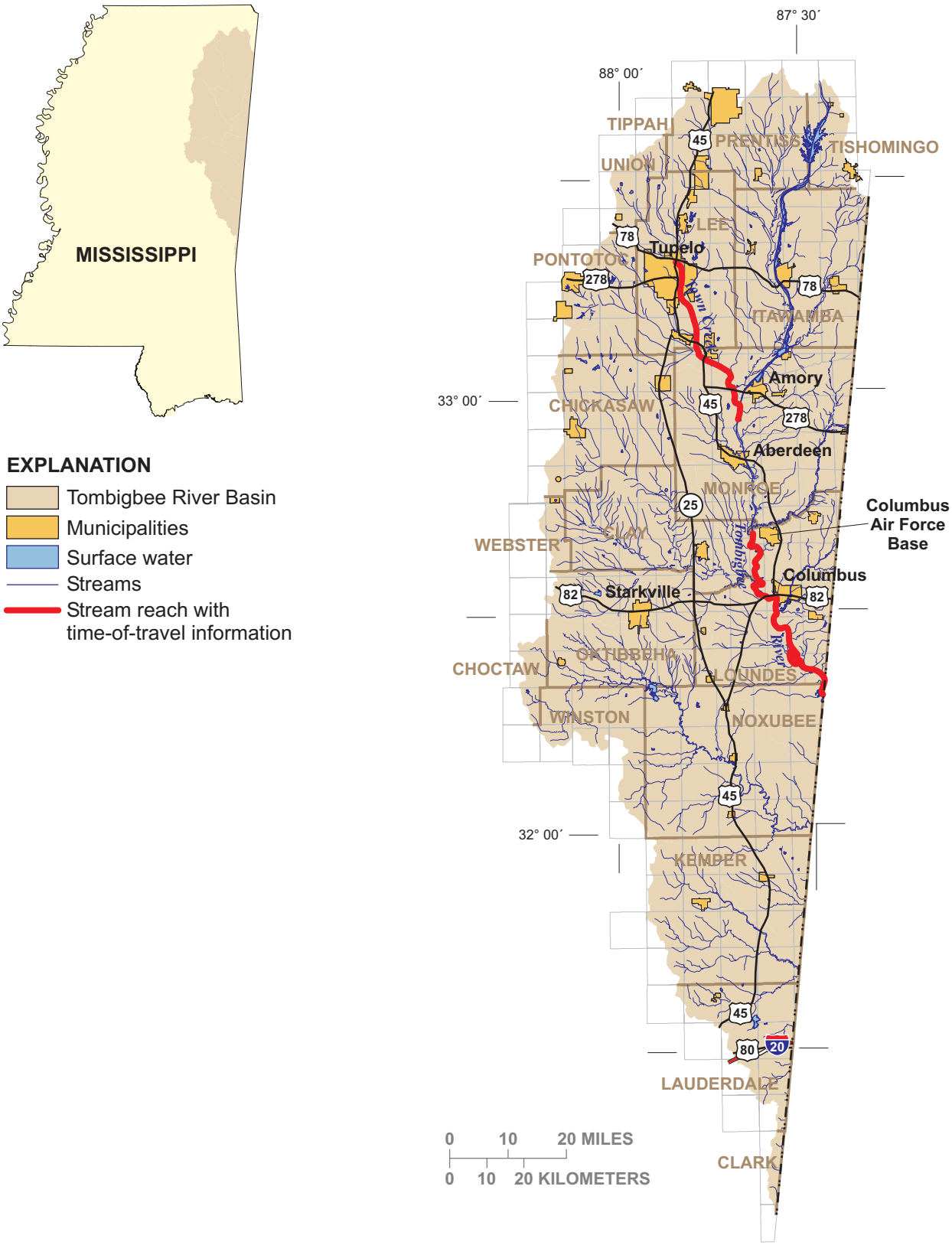

Figure 2. Location of Tombigbee River Basin and stream reaches with time-of-travel information.

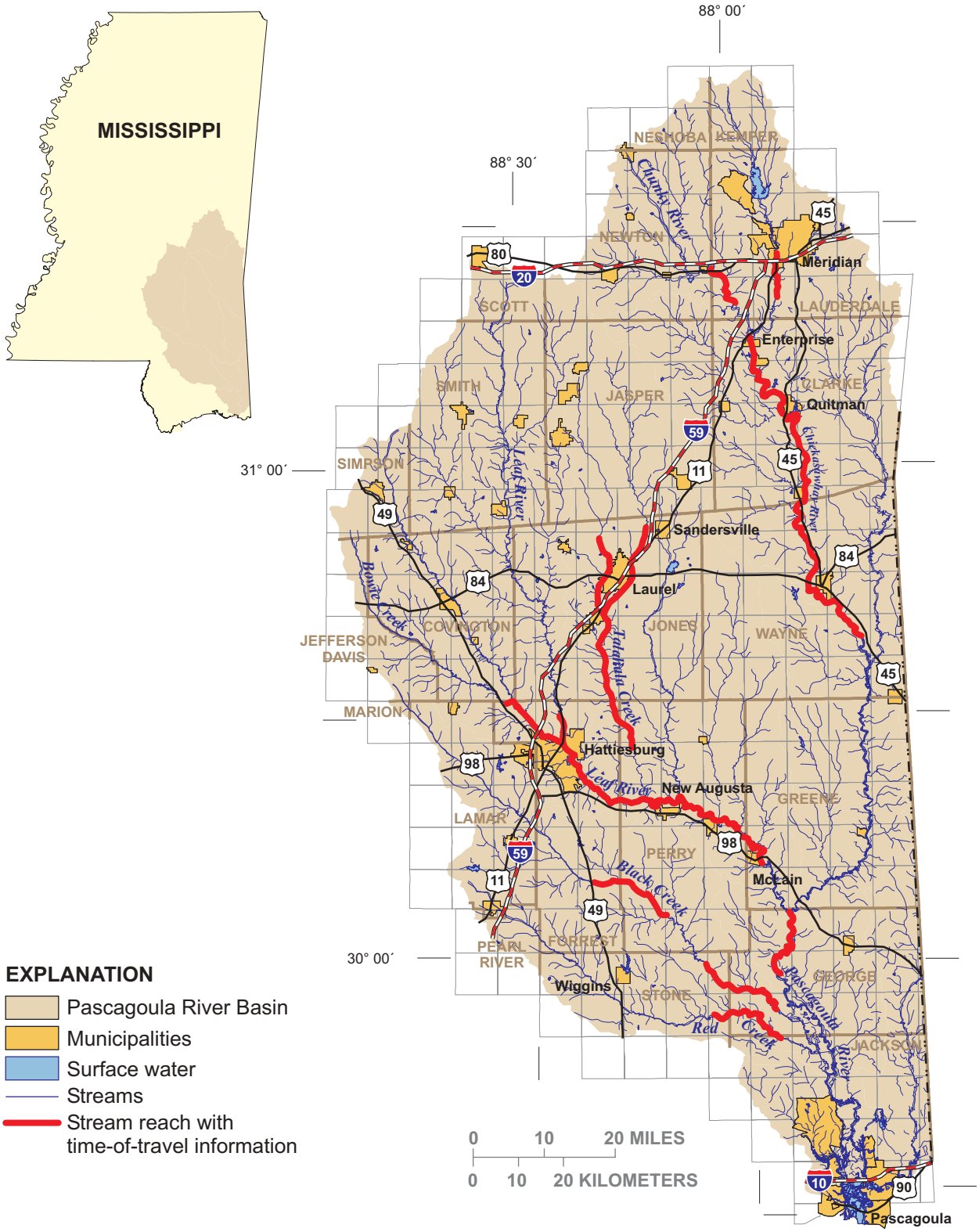

Figure 3. Location of Pascagoula River Basin and stream reaches with time-of-travel information.

Figure 4. Location of Coastal Streams River Basin and stream reaches with time-of-travel information.

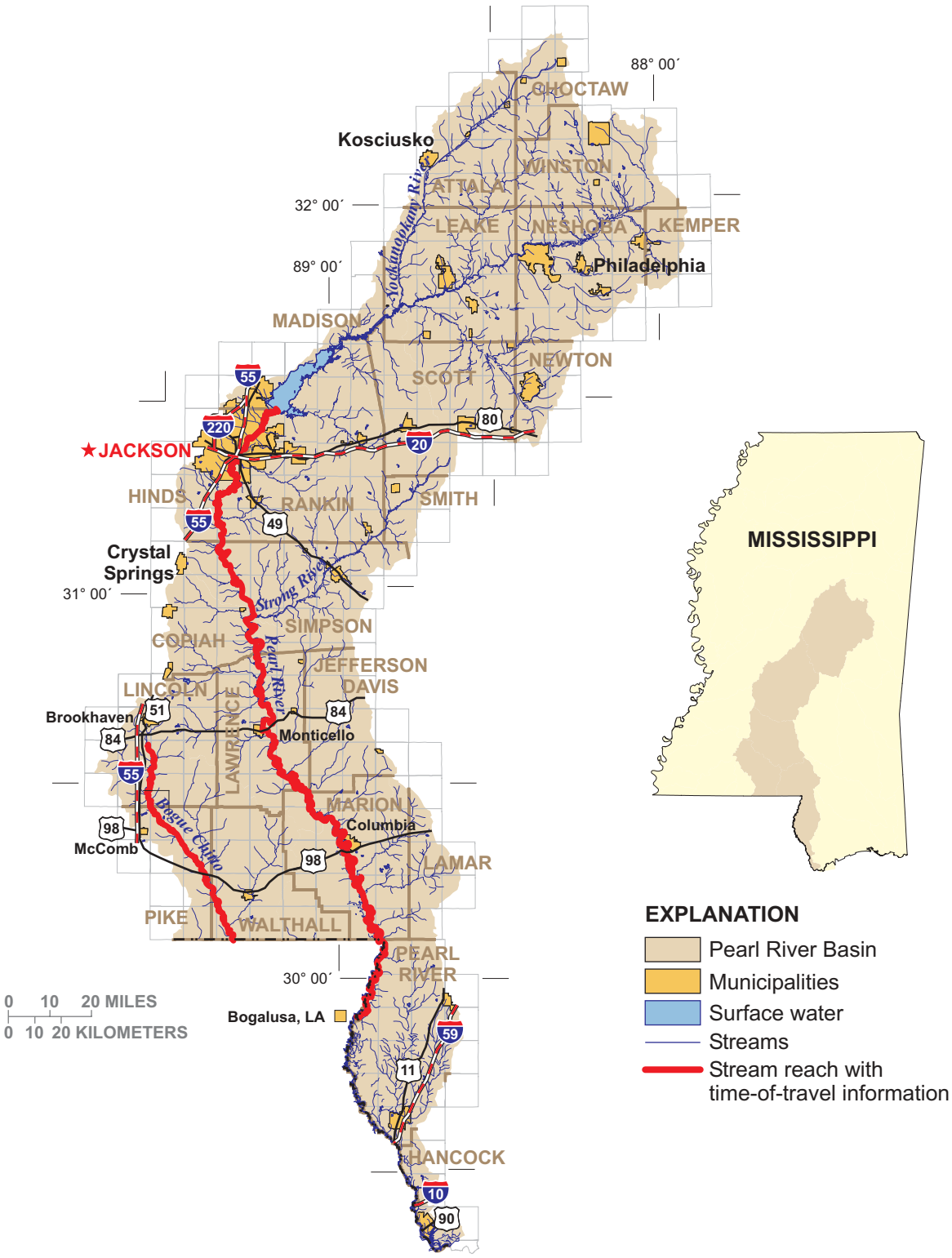

Figure 5. Location of Pearl River Basin and stream reaches with time-of-travel information.

Figure 6. Location of Yazoo River Basin and stream reaches with time-of-travel information.

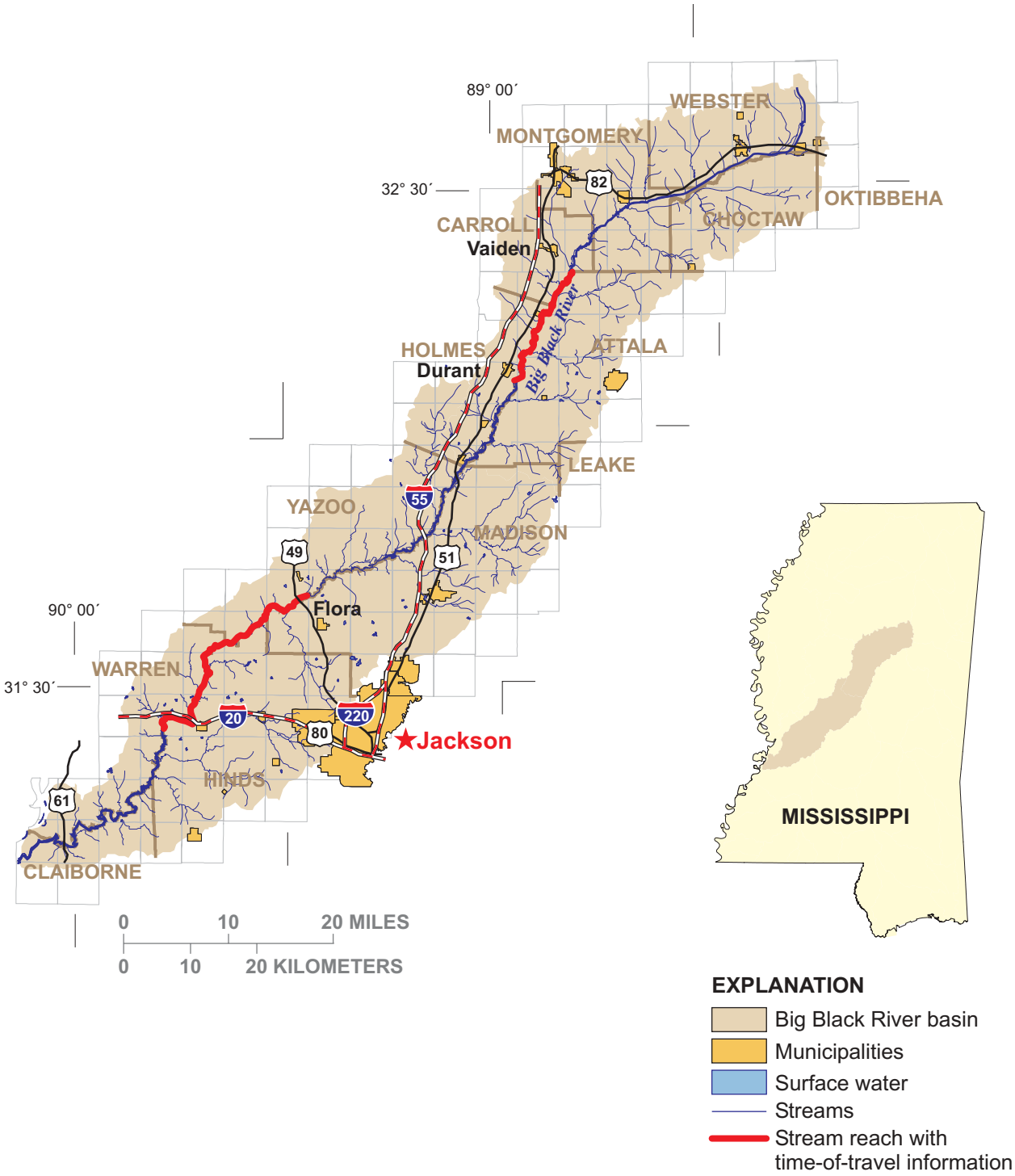

Figure 7. Location of Big Black River Basin and stream reaches with time-of-travel information.

Figure 8. Location of Independent Streams Basin and stream reaches with time-of-travel information.

Table 1. Time-of-travel of solute data collected for streams in Mississippi

[hr, hour; mi/hr, miles per hour; ft^3/s, cubic foot per second; --, indicates not applicable or unknown, *, indicates gravel pits; USPHS, United States Public Health Service; est., estimated. Stream discharge is the average discharge in reach unless otherwise indicated; ** indicates measured discharge at the beginning or end of reach.]

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
TOMBIGBEE RIVER BASIN											
Tombigbee River											
October 1969	Bartons Ferry	Clay	333750	882955	--	--	Injection	--	--	--	
	to										--
	Hwy 50	Clay	333504	882914	6.4	12.25	14.5	--	0.52	0.44	
	to										615
	Nash St.	Lowndes	333124	882837	5.1	6.5	8	--	0.78	0.64	
	to										645
	Hwy 82	Lowndes	332912	882701	6.8	17.25	19	--	0.39	0.36	
	to										750
	Road (sec. line 8&17)	Lowndes	332604	882628	4.5	13	15.5	--	0.35	0.29	
	Road (sec. line 8&17)	Lowndes	332604	882628	--	--	Injection	--	--	--	
	to										822
	Hooker Chem. Plant	Lowndes	332516	882414	3.0	7.5	9.25	--	0.4	0.32	
	to										848
	Road (sec. line 2&3)	Lowndes	332214	882333	3.5	10.75	11.5	--	0.33	0.30	
	to										903
	Camp Pratt	Lowndes	332039	882356	4.9	7.5	10	--	0.65	0.49	
	to										988
	Nashville Ferry	Lowndes	331920	881930	5.3	8	8	--	0.66	0.66	
	to										1,050
	State Line	Lowndes	331813	881811	3.5	6	7	--	0.58	0.50	
August 1969	Bartons Ferry	Clay	333750	882955	--	--	Injection	--	--	--	
	to										870
	Hwy 50	Clay	333504	882914	6.4	10.25	12.25	16.75	0.62	0.52	
	to										1,060
	Nash St.	Lowndes	333124	882837	5.1	5	5.5	--	1.02	0.93	
	to										1,500
	Hwy 82	Lowndes	332912	882701	6.8	10.75	11	--	0.63	0.62	
	to										2,000
	Road (sec. Line 8&17)	Lowndes	332604	882628	4.5	6	7	--	0.75	0.64	
	to										2,280
	Hooker Chem. Plant	Lowndes	332516	882414	3.0	4.5	5.75	--	0.67	0.52	
	Hooker Chem. Plant	Lowndes	332516	882414	--	--	Injection	--	--	--	
	to										2,220
	Road (sec. Line 2&3)	Lowndes	332214	882333	3.5	4	4.5	6.5	0.88	0.78	
	to										2,020
	Camp Pratt	Lowndes	332039	882356	4.9	3.75	4	8.5	1.31	1.22	
	Camp Pratt	Lowndes	332039	882356	--	--	Injection	--	--	--	
	to										1,840
	Nashville Ferry	Lowndes	331920	881930	5.3	4	4.75	--	1.32	1.16	
	to										2,130
	State Line	Lowndes	331813	881811	3.5	2.75	4	--	1.27	0.88	

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
Town Creek											
August 1972	Hwy 45	Lee	341740	884233	--	--	Injection	--	--	--	
	to										2.5
	Eason Blvd.	Lee	341406	884140	4.5	66	111.5	--	0.07	0.04	
	Eason Blvd.	Lee	341406	884140	--	--	Injection	--	--	--	
	to										21
	County Road (Verona)	Lee	341150	884057	3.0	--	31	55	--	0.10	
	County Road (Verona)	Lee	341150	884057	--	--	Injection	--	--	--	
	to										11
	County Road (sec. 3)	Lee	340918	883940	3.3	20.25	27.25	45.25	0.16	0.12	
	to										10
	Hwy 45 & 278	Lee	340600	883912	3.9	52	63.5	--	0.08	0.06	
	Hwy 45 & 278	Lee	340600	883912	--	--	Injection	--			
	to								--	--	13
	Hwy 45	Monroe	340333	883743	3.5	24.75	27.75	33.75	0.14	0.13	
	to										145
	Tombigbee River	Monroe	335922	883254	9.2	19	21	28	0.48	0.44	
PASCAGOULA RIVER BASIN											
Black Creek											
October 1972	Hwy 49	Forrest	310307	891202	--	--	Injection	--	--	--	
	to										92
	Hwy 29	Perry	305937	890303	18.0	48.25	54.25	68.25	0.37	0.33	
	Hwy 26	Stone	305112	885450	--	--	Injection	--	--	--	
	to										166
	Hwy 57	George	304648	884546	20.2	41.5	46.5	61.5	0.49	0.43	

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr) Lead edge	Peak	Trail edge	Rate of travel (mi/hr) Lead edge	Peak	Stream discharge (ft^3/s)
Bowie River											
October 1973	Hwy 49	Forrest	312533	892453	--	--	Injection	--	--	--	
	to										365
	County Road (sec. 14)	Forrest	312343	892156	5.7	6.25	7.25	10.25	0.91	0.74	
	to										410
	Glendale Road (sec. 33)	Forrest	312057	891822	8.0	18.25*	--	--	0.44*	--	
Chickasawhay River											
September 1965	Hwy 84	Wayne	314045	884101	--	--	Injection	--	--	--	426**
	to										
	Hwy 63	Wayne	313824	883908	5.4	6	6.75	--	0.9	0.80	
	to										
	County Road (Buckatunna)	Wayne	313316	883308	14.0	19	22.75	--	0.74	0.62	
August 1965	Hwy 84	Wayne	314045	884101	--	--	Injection	--	--	--	1,L271150**
	to										
	Hwy 63	Wayne	313824	883908	5.4	3.75	4.75	--	1.44	1.14	
	to										
	County Road (Buckatunna)	Wayne	313316	883308	14.0	13.25	14.25	--	1.06	0.98	
September 1967	Enterprise	Clarke	321033	884911	--	--	Injection	--	--	--	
	to										65
	Stonewall	Clarke	320748	884842	3.3	9	13	--	0.37	0.25	
	to										100
	County Road (Quitman)	Clarke	320232	884439	16.8	--	37.5	--	--	0.45	
	County Road (Quitman)	Clarke	320232	884439	--	--	Injection	--	--	--	
	to										120
	Hwy 45 (Quitman)	Clarke	320038	884346	5.0	--	8			0.62	
	Hwy 45 (Quitman)	Clarke	320038	884346	--	--	Injection	--	--	--	
	to										
	Desoto	Clarke	315819	884214	5.6	19	22.25	--	0.29	0.25	134**
	to										
	County Road (Shubuta)	Clarke	315253	884115	10.2	32	34	--	0.32	0.30	
	to										
	Hwy 45 (Shubuta)	Clarke	315056	884122	4.0	8.5	8.5	--	0.47	0.47	
	Hwy 45 (Shubuta)	Clarke	315056	884122	--	--	Injection	--	--	--	
	to										
	Hwy 84	Wayne	314045	884101	20.2	--	44.5	--	--	0.45	
	to										
	Hwy 63	Wayne	313824	883908	5.4	--	11	--	--	0.49	242**

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
Chunky Creek											
October 1967	Hwy 80	Lauderdale	321934	885433	--	--	Injection	--	--	--	
	to										14
	County Road (sec. 22)	Lauderdale	321521	885118	9.0	--	144.75	--	--	0.06	
Goodwater Creek at Magee											
August 1980	Hwy 49	Simpson	315112	894313	--	--	Injection	--	--	--	
	to										
	County Road (sec. 10)	Simpson	315036	894204	1.9	4.37	5.08	6.63	0.43	0.37	21.7**
Leaf River											
October 1973	Sec. 22, 23, 27, 26 corner	Forrest	312232	891647	--	--	Injection	--	--	--	
	to										350
	Bowie River	Forrest	312035	891639	3.3	3.25	4.25	6.25	1.02	0.78	
	Hwy 11	Forrest	312035	891639	--	--	Injection	--	--		433**
	to										
	Mahned	Perry	311337	890514	23.2	20.5	25	--	1.13	0.93	
	to										
	Beaumont (Hwy 15)	Perry	311056	885508	18.8	17.5	21	--	1.07	0.90	
	to										
	McLain	Greene	310610	884821	11.9	14.5	14.5	--	0.82	0.82	
August 1965	Hwy 11	Forrest	312035	891639	--	--	Injection	--	--	--	1,400**
	to										
	Mahned	Forrest	311337	890514	23.2	14.75	16.75		1.57	1.38	
	Mahned	Perry	311337	890514	--	--	Injection	--	--	--	
	to										
	McLain	Greene	310610	884821	30.7	--	26.25	--	--	1.17	
Okatibbee Creek											
October 1967	Hwy 80	Lauderdale	322112	884523	--	--	Injection	--	--	--	12**
	to										
	Arundel	Lauderdale	321554	884513	5.2	20	30	--	0.26	0.17	
	Arundel	Lauderdale	321554	884513	--	--	Injection	--	--	--	
	to										
	County Road (sec. 22)	Lauderdale	321529	884520	4.9	16.5	21	--	0.3	0.23	28**

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
Pascagoula River											
August 1965	Merrill	George	305840	884328	--	--	Injection	--	--	--	1,680**
	to										
	Hwy 26	George	305241	884621	14.0	15.75	17.25	--	0.89	0.81	
September 1965	Merrill	George	305840	884328	--	--	Injection	--	--	--	3,040**
	to										
	Hwy 26	George	305241	884621	14.0	11	13	--	1.27	1.08	
Tallahala Creek											
Date unknown. Data collected by USPHS.	Hwy 15	Jones	314051	890657	--	--	Injection	--	--	--	26**
	to										
	Paulding Road (Ellisville)	Jones	313634	891053	9.6	--	24	--	--	0.40	
	to										
	Moselle-Ovett Road	Jones	312845	891018	16.6	--	32	--	--	0.52	
	to										
	Runnelstown	Perry	311958	890644	16.2	--	32 est.	--	--	0.51	244**
	Hwy 15	Jones	314051	890657	--	--	Injection	--	--		261**
	to										
	Paulding Road (Ellisville)	Jones	313634	891053	9.6	--	16	--	--	0.60	
	to										
	Moselle-Ovett Road	Jones	312845	891018	16.6	--	21	--	--	0.79	
	to										
	Runnelstown	Perry	311958	890644	16.2	--	20 est.	--	--	0.81	1,100**
	Hwy 15	Jones	314051	890657	--	--	Injection	--	--	--	1,140**
	to										
	Paulding Road (Ellisville)	Jones	313634	891053	9.6	--	9	--	--	1.07	
	to										
	Moselle-Ovett Road	Jones	312845	891018	16.6	--	13	--	--	1.28	
	to										
	Runnelstown	Perry	311958	890644	16.2	--	13 est.	--	--	1.25	2,200**

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
					Tallahala Creek						
June 1974	County Road nr. Sharon (sec. 35)	Jones	314707	890433	--	--	Injection	--	--	--	151 est.
	to										
	Hwy 11	Jones	314318	890645	8.5	22.18	23.72	--	0.38	0.36	120 est.
	Hwy 11	Jones	314318	890645	--	--	Injection	--	--	--	130 est.
	to										
	Hwy 84	Jones	314148	890632	2.7	6.17	6.93	--	0.44	0.39	142 est.
	to										
	Hwy 15	Jones	314050	890655	2.1	5.11	5.4	--	0.41	0.39	125 est.
	Hwy 15	Jones	314050	890655	--	--	Injection	--	--	--	152 est.
	to										
	County Road (sec. 8)	Jones	314016	890723	1.1	--	1.87	3.07	--	0.59	165 est.
	to										
	County Road (sec. 18)	Jones	313920	890822	2.3	--	5.05	5.51	--	0.46	222 est.
	County Road (sec. 18)	Jones	313920	890822	--	--	Injection	--	--	--	230 est.
	to										
	Paulding Road (Ellisville))	Jones	313634	891053	6.1	10.15	11.25	12.67	0.6	0.54	350 est.
	Paulding Road (Ellisville))	Jones	313634	891053	--	--	Injection	--	--	--	510 est.
	to										
	Hwy 29	Jones	313530	891000	2.1	2.13	2.38	3.18	0.98	0.88	495 est.
	to										
	County Road (sec. 22)	Jones	313336	891106	4.3	5.14	5.65	6.39	0.84	0.76	475 est.
	to										
	Moselle-Ovett Road	Jones	312845	891018	10.1	12.51	13.95	14.61	0.81	0.72	452 est.
	Moselle-Ovett Road	Jones	312845	891018	--	--	Injection	--	--	--	540 est.
	to										
	County Road (sec. 1)	Forrest	312526	890923	5.9	8.08	8.78	10.92	0.73	0.67	580 est.
	County Road (sec. 1)	Forrest	312526	890923	--	--	Injection	--	--	--	900 est.
	to										
	County Road (sec. 19)	Perry	312306	890801	4.7	4.38	4.78	6.38	1.07	0.98	890 est.
	to										
	Runnelstown	Perry	311958	890644	5.5	5.29	6.22		1.04	0.88	920 est.
	Runnelstown	Perry	311958	890644	--	--	Injection	--	--	--	1,210 est.
	to										
	Mahned	Perry	311352	890450	11.4	8.33	9	10.33	1.37	1.27	965 est.

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
Tallahoma Creek											
June 1974	County Road (sec. 10)	Jones	314605	891114	--	--	Injection	--	--	--	73 est.
	to										
	County . Road (sec.15,22 nr. Shady Grove)	Jones	314426	891052	3.6	10.72	12.15	--	0.33	0.30	70 est.
	County . Road (sec.15,22 nr. Shady Grove)	Jones	314426	891052	--	--	Injection	--	--	--	74 est.
	to										
	County Road (sec. 26)	Jones	314245	890952	3.7	8.93	9.7	11.97	0.41	0.38	72 est.
	to										
	Hwy 84	Jones	314134	891015	2.4	6.49	7.15	7.75	0.37	0.34	110 est.
	Hwy 84	Jones	314134	891015	--	--	Injection	--	--	--	120 est.
	to										
	County Road (sec. 15)	Jones	313945	891123	4.2	8.9	10.1	11.33	0.47	0.42	230 est.
	County Road (sec. 15)	Jones	313945	891123	--	--	Injection	--	--	--	219 est.
	to										
	County Road (sec. 22 at Walters)	Jones	313832	891131	2.3	3.62	4.42	--	0.64	0.52	250 est.
	to										
	Hwy 11	Jones	313718	891102	2.6	--	4.01	10.03	--	0.65	270 est.
	Hwy 11	Jones	313718	891102	--	--	Injection	--	--	--	293 est.
	to										
	Tallahala Cr. (sec. 34,3)	Jones	313634	891052	1.5	--	2.03	2.8	--	0.74	358 est.
Red Creek											
Date unknown.	Hwy 15	Stone	304626	885451	--	--	Injection	--	--	--	
Data collected by	to										
USPHS.	Vestry	George	304408	884641	16.0	31	33.75	--	0.52	0.47	202**
	to										
	Hwy 57	Jackson	304348	884419	4.2	8.5	8.75	--	0.49	0.48	
	Hwy 15	Stone	304626	885451	--	--	Injection	--	--	--	
	to										
	Vestry	George	304408	884641	16.0	17	18	--	0.94	0.89	382**

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
COASTAL STREAMS BASIN											
Biloxi River											
September 1972	County Road (sec. 11)	Harrison	303746	891008	--	--	Injection	--	--	--	4
	to										
	County Road (sec. 22)	Harrison	303556	891058	3.4	97.5	111.5	147.5	0.03	0.03	
	County Road (sec. 22)	Harrison	303556	891058	--	--	Injection	--	--	--	4
	to										
	Hwy 49	Harrison	303330	890710	6.0	173.5	200.5	234.5	0.03	0.03	
	Hwy 49	Harrison	303330	890710	--	--	Injection	--	--	--	10
	to										
	Little Biloxi River	Harrison	302952	890246	8.4	55.75	69.75	114.75	0.15	0.12	
Tuxachanie Creek											
September 1972	County Road	Harrison	303603	885820	--	--	Injection	--	--	--	1.1
	to										
	2.5 mi. N. White Plain (sec. 25)	Harrison	303514	885653	3.2	2.7.0	323	494	0.016	0.01	
	2.5 mi. N. White Plain (sec. 25)	Harrison	303514	885653	--	--	Injection	--	--	--	1.7
	to										
	White Plain	Harrison	303240	885705	3.2	195	245	--	0.016	0.01	
	White Plain	Harrison	303240	885705	--	--	Injection	--	--	--	6
	to										
	Hwy 15	Harrison	303036	885432	4.8	110	137	221	0.044	0.04	
Wolf River											
October 1972	Hwy 26	Pearl River	305050	892821	--	--	Injection	--	--	--	12
	to										
	Cowpen Cr.	Pearl River	304638	892410	10.3	105.5	121.5	148.5	0.1	0.08	
	Cowpen Cr.	Pearl River	304638	892410	--	--	Injection	--	--	--	28
	to										
	Silver Run	Pearl River	304328	892109	6.6	33.75	43.75	59.75	0.2	0.15	
	Silver Run	Pearl River	304328	892109	--	--	Injection	--	--	--	44
	to										
	Hwy 53	Harrison	303542	892022	12.8	45.75	53.25	68.75	0.28	0.24	
	Hwy 53	Harrison	303542	892022	--	--	Injection	--	--	--	58
	to										
	Landon	Harrison	302901	891619	13.2	35.5	43.5	60	0.37	0.30	
	Landon	Harrison	302901	891619	--	--	Injection	--	--	--	160
	to										
	I-10	Harrison	302453	891212	8.8	13	15	20	0.68	0.59	

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr) Lead edge	Solute time of travel (hr) Peak	Solute time of travel (hr) Trail edge	Rate of travel (mi/hr) Lead edge	Rate of travel (mi/hr) Peak	Stream discharge (ft^3/s)
PEARL RIVER BASIN											
Bogue Chitto											
August 1968	Bogue Chitto	Lincoln	312616	902647	--	--	Injection	--	--	--	
	to										30
	County Road (sec.13)	Lincoln	312351	902706	3.6	25.5	28.25	--	0.14	0.12	
	to										75
	Johnsons Station	Pike	312012	902604	4.7	--	--	--	--	--	
	Johnsons Station	Pike	312012	902604	--	--	Injection	--	--	--	
	to										50
	County Road (sec. 6)	Pike	311928	902514	1.2	5.75	7	--	0.21	0.17	
	to										70
	Hwy 570	Pike	311751	902342	4.4	19.75	23.5	--	0.22	0.19	
	to										200
	Holmesville	Pike	311225	901819	10.2	32	32	--	0.32	0.32	
	to										320
	Hwy 98	Pike	311036	901646	3.8	6.5	6.5	--	0.58	0.58	
	Hwy 98	Pike	311036	901646	--	--	Injection	--	--	--	
	to										250
	Hwy 48	Walthall	310701	901505	6.2	13.5	17	--	0.59	0.36	
	to										300
	La. Hwy 38	Washington	305518	901216	20.1	--	33	--	--	0.61	
Little Copiah Creek at Crystal Springs											
August 1980	Sewage treatment outfall (sec. 25,36)	Copiah	315836	902119	--	--	Injection	--	--	--	
	to										
	County Road (sec. 1,6)	Copiah	315732	902052	1.3	--	20.67	--	--	0.06	0.84**
	to										
	County Road (sec. 8)	Copiah	315633	901939	1.9	--	19.5	--	--	0.10	2.59**
Pearl River											
October 1968	Pelahatchie Cr.	Rankin	322339	900355	--	--	Injection	--	--	--	
	to										330
	Diversion ditch	Hinds	322327	900502	1.5	4.25	5	9	0.35	0.30	
	to										330
	Purple Cr.	Hinds	322200	900617	4.2	7.25	8.5	11	0.58	0.49	
	to										330
	Hanging Moss Cr.	Hinds	322139	900616	1.3	4.5	4.5	--	0.29	0.29	
	to										330
	Hwy 25	Hinds	321954	900845	1.9	10	12	--	0.19	0.16	
	to										330
	Water Works	Hinds	321923	900909	2.3	7	13	--	0.33	0.18	

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
Pearl River--Continued											
October 1968	Water Works	Hinds	321923	900909	--	--	Injection	--	--	--	
	to										330
	Haul bridge	Hinds	321800	900932	1.6	1.67	1.75	--	0.96	0.91	
	to										330
	Woodrow Wilson	Hinds	321721	901045	1.6	--	1.25	--	--	1.28	
	to										330
	Conway Slough	Hinds	321558	901103	2.1	--	3.33	--	--	0.63	
October 1963	Hwy 80	Hinds	321653	901044	--	--	Injection	--	--	--	
	to										75
	Byram	Hinds	321035	901436	16.7	71.75	81.5	108.75	0.23	0.20	
	Byram	Hinds	321035	901436	--	--	Injection	--	--	--	
	to										80
	Rosemary	Hinds	320540	901336	11.0	72	82.75	--	0.15	0.13	
	Rosemary	Hinds	320540	901336	--	--	Injection	--	--	--	
	to										85
	Moncure	Hinds	320303	901350	4.4	29.25	37.25	55.25	0.15	0.12	
	to										80
	Gatesville	Copiah	315946	901326	8.7	64.5	82	--	0.13	0.11	
	Gatesville	Copiah	315946	901326	--	--	Injection	--	--	--	
	to										80
	Hopewell	Copiah	315718	901126	4.8	46	49.5	--	0.1	0.10	
	to										80
	Georgetown	Copiah	315231	900817	9.7	71.25	75	--	0.14	0.13	
July 1966	Hwy 80	Hinds	321653	901044	--	--	Injection	--	--	--	
	to										320
	Byram	Hinds	321035	901436	16.7	29	33.33	--	0.58	0.50	
	to										320
	Moncure	Hinds	320303	901350	15.4	38	42.25	--	0.41	0.36	
	Moncure	Hinds	320303	901350	--	--	Injection	--	--	--	
	to										315
	Georgetown	Copiah	315231	900817	23.2	76.5	83.5	--	0.3	0.28	
August 1972	Woodrow Wilson	Hinds	321721	901045	--	--	Injection	--	--	--	
	to										350
	Byram	Hinds	321035	901436	17.3	26	29.5	39.5	0.67	0.59	
	to										370
	Rosemary	Hinds	320540	901336	11.0	23	26.25	30.5	0.48	0.42	
	to										380
	Gatesville	Copiah	315946	901326	13.0	29	32.75	47	0.45	0.40	
	to										250
	Georgetown	Copiah	315231	900817	14.5	103	118	--	0.14	0.12	

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
Pearl River--Continued											
May 1972	Woodrow Wilson	Hinds	321721	901045	--	--	Injection	--	--	--	
	to										3,250
	Byram	Hinds	321035	901436	17.3	11.75	13.25	15.75	1.47	1.30	
	to										3,500
	Rosemary	Hinds	320540	901336	11.0	8	8.5	9	1.57	1.29	
	to										3,250
	Gatesville	Copiah	315946	901326	13.0	9.25	9.25	10.25	1.4	1.40	
	to										3,300
	Georgetown	Copiah	315231	900817	14.5	12.5	14.25	14.75	1.16	1.02	
October 1966	Georgetown	Copiah	315231	900817	--	--	Injection	--	--	--	
	to										670
	Rockport	Copiah	314728	900833	10.0	20.25	24.25	32.25	0.49	0.41	
	to										990
	Wanilla	Lawrence	313820	900632	16.4	27	30	35	0.62	0.55	
	to										1,180
	Monticello	Lawrence	313313	900516	13.6	25	27	28	0.54	0.50	
	Monticello	Lawrence	313313	900516	--	--	Injection	--	--	--	
	to										900
	Tilton	Lawrence	312511	900058	14.8	--	31 est.	41	--	0.48 est.	
	to										1,220
	Morgantown	Marion	311901	895442	21.9	--	38	46	--	0.58	
	to										1,560
	Columbia	Marion	311417	895048	14.6	--	20	30	--	0.73	
	Columbia	Marion	311417	895048	--	--	Injection	--	--	--	
	to										1,760
	Bogalusa	Washington	304733	894917	58.9	65	72.5	91	0.91	0.81	
June 1967	Georgetown	Copiah	315231	900817	--	--	Injection	--	--	--	
	to										1,890
	Rockport	Copiah	314728	900833	10.0	9.5	11.5	16.5	1.05	0.87	
	to										1,980
	Wanilla	Lawrence	313820	900632	16.4	16.5	18.5	21	0.99	0.89	
	to										1,860
	Monticello	Lawrence	313313	900516	13.6	18.5	18.5	25	0.74	0.74	
	Monticello	Lawrence	313313	900516	--	--	Injection	--	--	--	
	to										2,630
	Tilton	Lawrence	312511	900058	14.8	14.5	17	24	1.02	0.87	
	to										2,600
	Morgantown	Marion	311901	895442	21.9	21.5	24.5	26	1.02	0.90	
	to										2,850
	Columbia	Marion	311417	895048	14.6	15	15	20	0.97	0.97	
	Columbia	Marion	311417	895048	--	--	Injection	--	--	--	
	to										3,260
	Spring Cottage	Marion	310514	894620	23.4	15.25	18	26	1.51	1.30	
	to										3,720
	Bogalusa	Washington	304733	894917	35.5	29	30.5	35.5	1.22	1.16	

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr) Lead edge	Solute time of travel (hr) Peak	Solute time of travel (hr) Trail edge	Rate of travel (mi/hr) Lead edge	Rate of travel (mi/hr) Peak	Stream discharge (ft^3/s)
YAZOO RIVER BASIN											
Tillatoba Creek Basin											
April 1975	County Road 2.5 mi. us Hwy 51 (sec. 22)	Yalobusha	340134	895152	--	--	Injection	--	--	--	8.8**
	to										
	County Road .5 mi. ds Hwy 51 (sec. 19)	Yalobusha	340102	895500	3.5	5.42	6.92	12.92	0.65	0.51	13.7**
	County Road .5 mi. ds Hwy 51 (sec. 19)	Yalobusha	340102	895500	--	--	Injection	--	--	--	14.2**
	to										
	County Road (sec. 35)	Tallahatchie	335939	895710	3.5	9	10.43	16.17	0.39	0.34	18.5**
	County Road (sec. 35)	Tallahatchie	335939	895710	--	--	Injection	--	--	--	22.5**
	to										
	Confluence Tillatoba and S. Fork	Tallahatchie	335921	895932	3.8	9.13	10.63	14.38	0.42	0.36	28.5**
	Confluence Tillatoba and S. Fork	Tallahatchie	335921	895932	--	--	Injection	--	--	--	51**
	to										
	S. Fork Tillatoba at Charleston	Tallahatchie	340002	900346	5.8	9.6	11	15.9	0.6	0.53	62**
	Simmons Cr. At County Road (sec. 3)	Yalobusha	335826	895155	--	--	Injection	--	--	--	4.3**
	to										
	Simmons Cr. At Hwy 51	Yalobusha	335808	895408	2.3	8.92	10.42	16	0.26	0.22	7.5**
	Simmons Cr. At Hwy 51	Yalobusha	335808	895408	--	--	Injection	--	--	--	7.5**
	to										
	Mouth at S. Fork Tillatoba Cr.	Tallahatchie	335654	895658	4.2	16.92	19.12	25.5	0.25	0.22	9**
	Davis Cr. County Road (sec. 30)	Yalobusha	335524	895511	--	--	Injection	--	--	--	4.3**
	to										
	S. Fork Tillatoba County Road (sec.23)	Tallahatchie	335554	895638	1.8	5.53	6.27	11	0.33	0.29	4.9**
	to										
	S. Fork Tillatoba County Road (sec. 10/11)	Tallahatchie	335735	895736	2.7	9.67	11.18		0.28	0.24	14.4**
	S. Fork Tillatoba County Road (sec. 10/11)	Tallahatchie	335735	895736	--	--	Injection	--	--	--	16.7**
	to										
	Confluence Tillatoba and S. Fork	Tallahatchie	335921	895932	4.4	8.65	10	14.8	0.51	0.44	22.5**
August 1976	County Road 2.5 mi. us Hwy 51 (sec. 22)	Yalobusha	340134	895152	--	--	Injection	--	--	--	0.28**
	to										
	County Road .5 mi. ds Hwy 51 (sec. 19)	Yalobusha	340102	895500	3.5	33	46.45	--	0.11	0.08	0.97**
	County Road .5 mi. ds Hwy 51 (sec. 19)	Yalobusha	340102	895500	--	--	Injection	--	--	--	0.97**
	to										
	County Road (sec. 35)	Tallahatchie	335939	895710	3.5	25.08	32.97	--	0.14	0.11	1.2**
	County Road (sec. 35)	Tallahatchie	335939	895710	--	--	Injection	--	--	--	1.36**
	to										
	Confluence Tillatoba and S. Fork	Tallahatchie	335921	895932	3.8	25.17	30.03	--	0.15	0.13	2.3**

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr)			Rate of travel (mi/hr)		Stream discharge (ft^3/s)
						Lead edge	Peak	Trail edge	Lead edge	Peak	
				Tillatoba Creek Basin--Continued							
August 1976	Confluence Tillatoba and S.Fork	Tallahatchie	335921	895932	--	--	Injection	--	--	--	6.45**
	to										
	S. Fork Tillatoba at Charleston	Tallahatchie	340002	900346	5.8	18.67	23.33	--	0.31	0.25	8.52**
	Simmons Cr. at County Road (sec. 3)	Yalobusha	335826	895155	--	--	Injection	--	--	--	0.09**
	to										
	Simmons Cr. at Hwy 51	Yalobusha	335808	895408	2.3	--	110 est.	--	--	0.02	0.44**
	Simmons Cr. at Hwy 51	Yalobusha	335808	895408	--	--	Injection	--	--	--	0.44**
	to										
	Mouth at S. Fork Tillatoba Cr.	Tallahatchie	335654	895658	4.2	--	160 est.	--	--	0.03	0.55**
	Davis Cr. County Road (sec. 30)	Yalobusha	335524	895511	--	--	Injection	--	--	--	0.81**
	to										
	S. Fork Tillatoba County Road (sec. 23)	Tallahatchie	335554	895638	1.8	13.58	15.58	--	0.13	0.12	1.27**
	S. Fork Tillatoba County Road (sec. 23)	Tallahatchie	335554	895638	--	--	Injection	--	--	--	1.27**
	to										
	S. Fork Tillatoba County Road (sec. 10/11)	Tallahatchie	335735	895736	2.7	25.6	31.9	--	0.11	0.08	2.3**
	S. Fork Tillatoba County Road (sec. 10/11)	Tallahatchie	335735	895736	--	--	Injection	--	--	--	2.4**
	to										
	Confluence Tillatoba and S. Fork	Tallahatchie	335921	895932	4.4	38.48	46.58	--	0.11	0.09	4.0**
August 1979	County Road .5 mi. ds Hwy 51 (sec. 19)	Yalobusha	340102	895500	--	--	Injection	--	--	--	3.27**
	to										
	County Road (sec. 35)	Tallahatchie	335939	895710	3.5	11.5	13.25	20	0.3	0.26	5.24**
	County Road (sec. 35)	Tallahatchie	335939	895710	--	--	Injection	--	--	--	5.24**
	to										
	Confluence Tillatoba and S. Fork	Tallahatchie	335921	895932	3.8	17.25	20.75	30	0.22	0.18	5.74**
	Simmons Cr. at Hwy 51	Yalobusha	335808	895408	--	--	Injection	--	--	--	1.63**
	to										
	Mouth at S. Fork Tillatoba Cr.	Tallahatchie	335654	895658	4.2	66.25	74.25	--	0.06	0.06	2.0**
	Davis Cr. County Road (sec. 30)	Yalobusha	335524	895511	--	--	Injection	--	--	--	4.56**
	to										
	S. Fork Tillatoba County Road (sec. 23)	Tallahatchie	335554	895638	1.8	6	7	13	0.3	0.26	4.5**
	S. Fork Tillatoba County Road (sec. 23)	Tallahatchie	335554	895638	--	--	Injection	--	--	--	2.43**
	to										
	S. Fork Tillatoba County Road (sec. 10/11)	Tallahatchie	335735	895736	2.7	17	19.25	24	0.16	0.14	8.0**
	S. Fork Tillatoba County Road (sec. 10/11)	Tallahatchie	335735	895736	--	--	Injection	--	--	--	5.62**
	to										
	Confluence Tillatoba and S. Fork	Tallahatchie	335921	895932	4.4	16	19	25.25	0.28	0.23	

Table 1. Time-of-travel of solute data collected for streams in Mississippi--Continued

Date of study	Reach	County	Latitude (north)	Longitude (west)	Length of reach (miles)	Solute time of travel (hr) Lead edge	Solute time of travel (hr) Peak	Solute time of travel (hr) Trail edge	Rate of travel (mi/hr) Lead edge	Rate of travel (mi/hr) Peak	Stream discharge (ft^3/s)
BIG BLACK RIVER BASIN											
Bakers Creek near Clinton											
September 1980	Sewage pond outfall (sec. 5)	Hinds	321834	901906	--	--	Injection	--	--	--	
	to										
	County Road (sec. 5)	Hinds	321828	901933	0.5	3.85	5.85	--	0.12	0.09	1.7 est.
	to										
	Railroad Bridge (sec. 5)	Hinds	321828	901939	0.1	3.87	7.5	--	0.03	0.01	
	to										
	Gas pipeline crossing (sec. 6)	Hinds	321832	902029	1.7	--	44	--	--	0.04	0.8 est.
Big Black River											
October 1964	Hayes Creek	Carroll	331741	894210	--	--	Injection	--	--	--	
	to										53
	West	Holmes	331139	894615	16.0	41	46	74	0.39	0.35	
	to										82
	Durant-Hwy 12	Holmes	330345	895000	18.0	70	80	117	0.26	0.22	
October 1964	Hwy 49	Yazoo	322610	902149	--	--	Injection	--	--	--	
	to										191
	Hwy 80	Warren	322051	904148	39.0	102	113	157	0.38	0.34	
INDEPENDENT STREAMS BASIN											
Homochitto River											
July 1968	Hwy 84	Franklin	313019	904641	--	--	Injection	--	--	--	
	to										80
	County Road	Franklin	312934	904722	1.2	0.75	1	--	1.6	1.20	
	to										170
	Hwy 98	Franklin	312624	905120	5.8	6.25	6.5	--	0.93	0.89	
	to										190
	County Road	Franklin	312534	905352	4.0	3.5	4.25	--	1.14	0.94	
	to										285
	Hwy 33	Franklin	311929	910634	21.2	--	11 est.	--	--	1.90 est.	
	Hwy 33	Franklin	311929	910634	--	--	Injection	--	--	--	
	to										360
	Hwy 61	Adams	311954	912137	19.1	22.5	27	--	0.85	0.71	