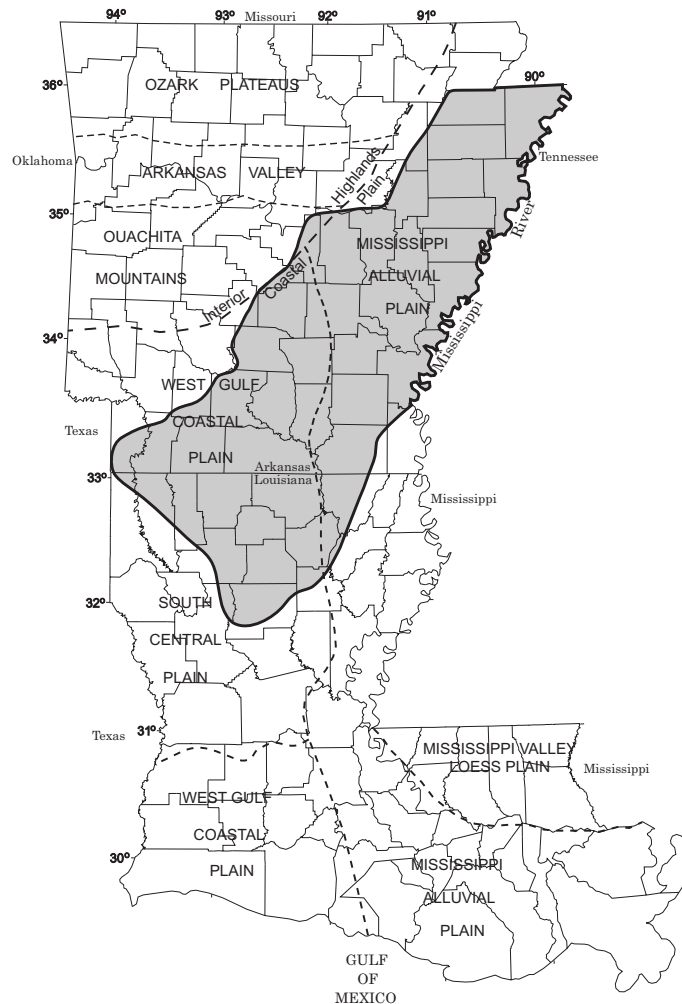


Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001



Prepared in cooperation with the
ARKANSAS SOIL AND WATER CONSERVATION COMMISSION, the
ARKANSAS GEOLOGICAL COMMISSION, and the
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

Scientific Investigations Report 2004-5055

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By T.P. Schrader

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CONTENTS

Abstract.....	1
Introduction	1
Description of Aquifers	3
Potentiometric-Surface Map.....	4
Long-Term Water-Level Changes.....	17
Potentiometric-Surface Change Map from 1997 to 2001.....	17
Long-Term Hydrographs	29
Specific Conductance and Dissolved Chloride in Arkansas.....	44
Summary.....	51
Selected References	52

PLATES

Plate	1. Map showing potentiometric surface of the Sparta-Memphis aquifer	In pocket
	2. Map showing potentiometric-surface change from 1997 to 2001	In pocket
	3. Map showing specific conductance of the Sparta-Memphis aquifer.....	In pocket

ILLUSTRATIONS

Figure	1. Map showing location of study area.....	2
	2. Diagram showing well numbering system	3
	3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer	30

TABLES

Table	1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifers in Arkansas and Louisiana.....	4
	2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.....	18
	3. Range and median of annual rise/decline in water level for wells in the Sparta-Memphis aquifer for the period 1976-2001	29
	4. Water-quality data collected during the spring and summer 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas	45

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ABSTRACT

During the spring of 2001, water levels were measured in 427 wells in the Sparta-Memphis aquifer in Arkansas and the Sparta aquifer in Louisiana. Water-quality samples were collected for temperature and specific-conductance measurements during the spring and summer of 2001 from 150 wells in Arkansas in the Sparta-Memphis aquifer. Dissolved chloride samples were collected and analyzed for 87 of the 150 wells. Water-quality samples were not collected in Louisiana. Maps of areal distribution of potentiometric surface, difference in water-level measurements from 1997 to 2001, and specific conductance generated from these data reveal spatial trends across the study area. The highest water-level altitude measured in Arkansas was 328 feet above National Geodetic Vertical Datum of 1929 (NGVD of 1929) in Grant County; the lowest water-level altitude was 197 feet below NGVD of 1929 in Union County. The highest water-level altitude measured in Louisiana was 235 feet above NGVD of 1929 in Bienville Parish; the lowest water-level altitude was 218 feet below NGVD of 1929 in Ouachita Parish.

The regional direction of ground-water flow in the Sparta-Memphis aquifer in Arkansas generally is to the south-southwest in the northern half of Arkansas and to the east and south in the southern half of Arkansas; the ground-water flow in the Sparta aquifer in northern Louisiana generally is in an easterly direction toward the Mississippi River. Four cones of depression are shown in the 2001 potentiometric-surface map, centered in Columbia, Jefferson, and Union Counties in Arkansas and Ouachita Parish in Louisiana as a result of large withdrawals for industrial and public supplies. A broad depression exists in western Poinsett, Cross, and St. Francis Counties in Arkansas.

A map for water-level changes from 1997 to 2001 was constructed using water-level measurements from 278 wells. The largest rise in water level measured in Arkansas was about 35 feet in Prairie County. The largest decline in water level measured in Arkansas was about 93 feet in Columbia County. The largest rise in water level measured in Louisiana was about 23 feet in Jackson Parish. The largest decline in water level measured in Louisiana was about 33 feet in Claiborne Parish.

Hydrographs were constructed for wells with a minimum of 25 years of water-level measurements. A trend line using a linear regression was calculated for the period of record from spring of 1976 to spring of 2001 to determine the annual decline or rise in feet per year for water levels in each well. The hydrographs were grouped by county or parish. The median values for county and parish annual water-level decline or rise ranged from -1.57 to 0.29 foot per year.

Specific conductance ranged from 16.8 microsiemens per centimeter at 25 degrees Celsius in Ouachita County to about 1,470 microsiemens per centimeter at 25 degrees Celsius in Lee County. The median specific conductance was 340 microsiemens per centimeter at 25 degrees Celsius. Dissolved chloride concentrations ranged from 1.4 milligrams per liter at a well in Lincoln County to 250 milligrams per liter at a well in Lee County. The median dissolved chloride concentration was 7.7 milligrams per liter.

Introduction

The study area (fig. 1, plate 1) includes most of the Coastal Plain physiographic province in Arkansas and Louisiana. In Arkansas, the area is bounded on the north by the Missouri State line, and on the east by the Tennessee and Mississippi State lines. The western boundary is defined as the western extent of the outcrop and subcrop (Hosman, 1982) of the Sparta Sand and the Memphis Sand. In Louisiana, the area is bounded on the south and east by the approximate downdip limit of freshwater (Payne, 1968) and the western boundary is defined by the western extent of the Sparta aquifer.

The U.S. Geological Survey in cooperation with the Arkansas Soil and Water Conservation Commission, the Arkansas Geological Commission, and the Louisiana Department of Transportation and Development has monitored water levels in the Sparta-Memphis aquifer since the 1920's. During the spring of 2001, 338 water levels in Arkansas and 89 water levels in Louisiana were measured in wells completed in the Sparta-Memphis aquifer. The purpose of these measurements was to provide information describing the potentiometric surface of the Sparta-Memphis aquifer. During the spring and sum-

2 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

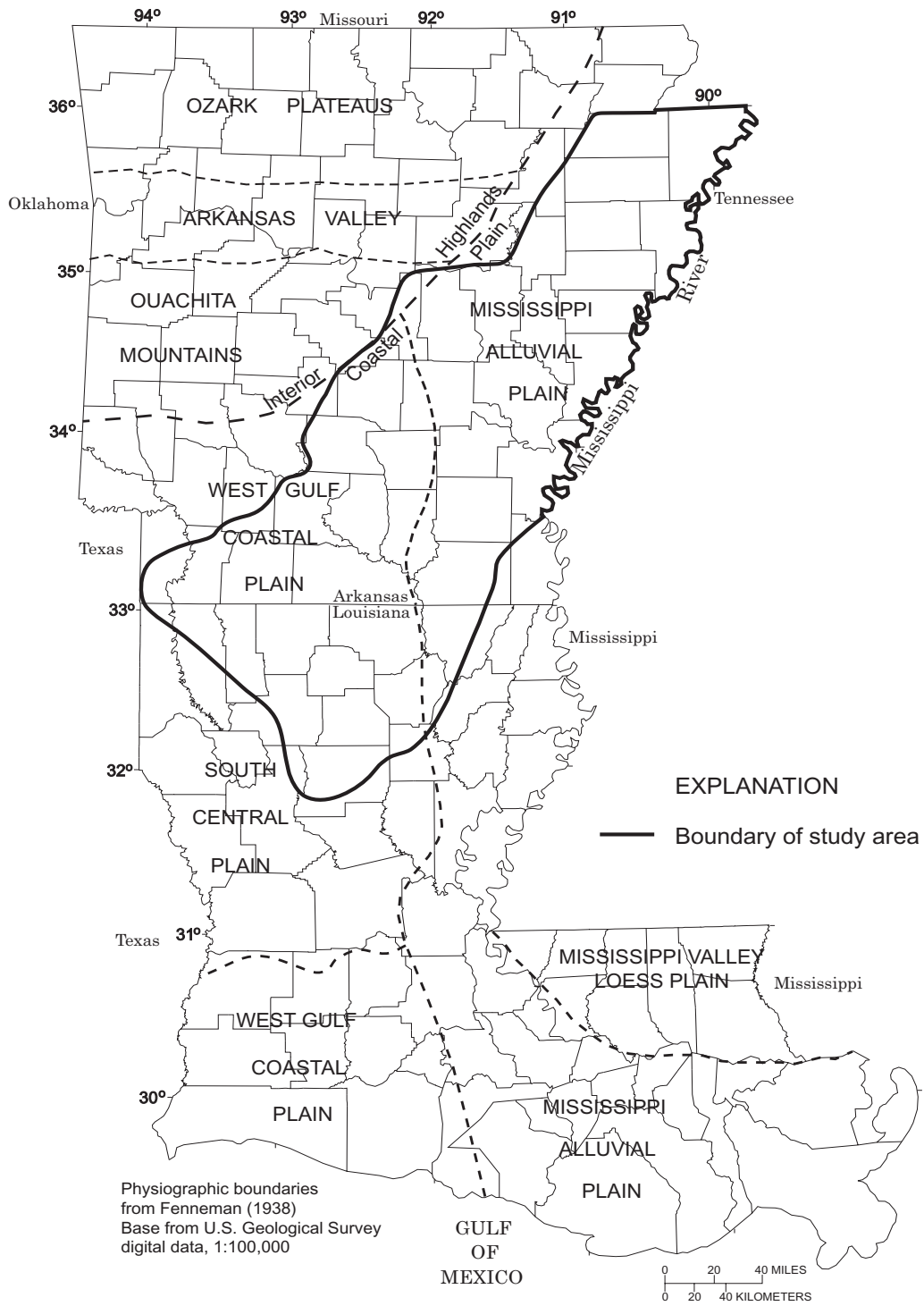


Figure 1. Location of study area.

mer of 2001, 150 water-quality samples were measured for temperature and specific conductance from wells completed in the Sparta-Memphis aquifer in Arkansas. During the same period, water-quality samples were collected from 87 wells in Arkansas for chloride analysis. Water-quality data were not available for Louisiana. This report presents results as a potentiometric-surface map, a water-level change map comparing water levels from 1997 to 2001, water-level hydrographs, a specific-conductance map of Arkansas, and water-level and water-quality data tables.

The well-numbering system used in this report is based upon the location of the wells according to the Federal land survey used in Arkansas. The component parts of a well number are the township designation; the range designation; the section number; three letter designation which indicates, respectively, the quarter section, the quarter-quarter section, and the quarter-quarter-quarter section in which the well is located; and the sequence number of the well in the quarter-quarter-quarter section. The letters are assigned counterclockwise, beginning with "A" in the northeast quarter or quarter-quarter or quarter-quarter-quarter section in which the well is located. For example, well 01S03W04BBD16 (fig. 2) is located in Township 1 South, Range 3 West, and in the southeast quarter of the northwest quarter of section 4. This well is the 16th well in this quarter-quarter-quarter section of section 4 from which data were collected. The latitude and longitude of the wells in Arkansas were recorded from a global positioning system accurate to one-tenth of a second of latitude and longitude (approximately 10-20 feet (ft)).

The author acknowledges the contribution of data from the Louisiana District, U.S. Geological Survey, and the technical assistance of their staff, particularly Jeffery A. Brantly, in the publication of this report.

Description of Aquifers

The Sparta Sand and Memphis Sand of Eocene age are part of the Claiborne Group and mainly consist of fine to medium sand. Some silt, clay, and lignite occur in the upper portion of the Sparta and Memphis Sands. Sands in the Sparta Sand were deposited by shifting streams on a deltaic-fluvial flood plain (Payne, 1968). These sands mostly are interconnected, but separately identifiable sands can be traced for short distances (Snider and others, 1972). The Cook Mountain Formation overlies the Sparta Sand and Memphis Sand and serves as an upper confining unit. The permeable units of the Sparta Sand and the Memphis Sand compose the respective aquifers. Water levels in the Sparta aquifer generally correlate with those in the Memphis aquifer; therefore, the water-bearing formations are considered to be one hydrologic unit (Stanton, 1997).

The Sparta Sand is composed of a sequence of alternating sand and clay beds between the massive clays of the overlying Cook Mountain and the underlying Cane River confining units (Hosman and others, 1968). The Sparta Sand is in the southern

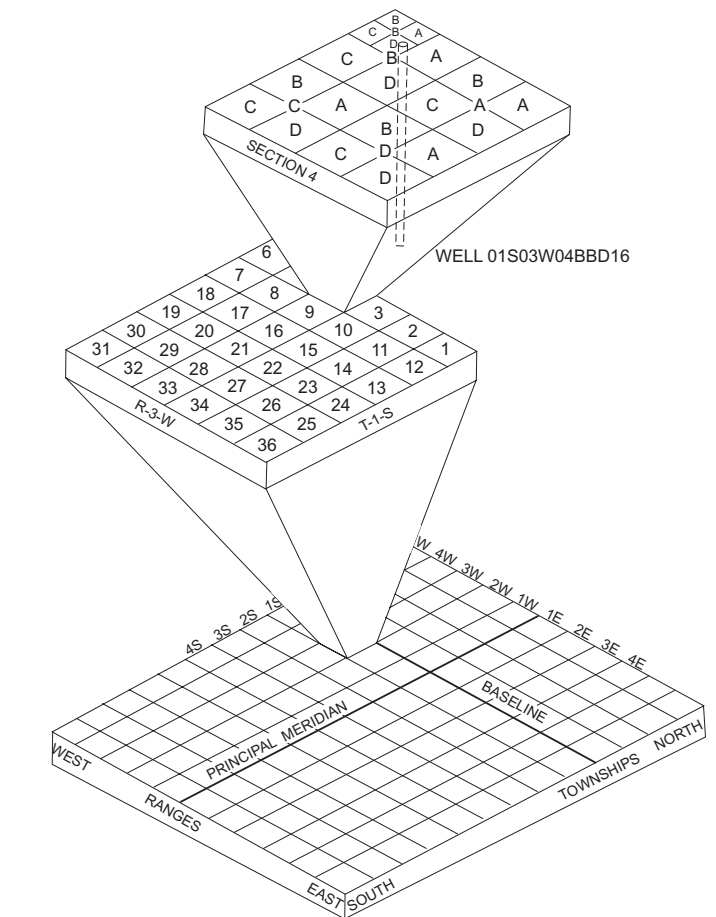


Figure 2. Well numbering system.

part of the study area (south of about 35 degrees latitude), plate 1. In the northern part of the study area (north of about 35 degrees latitude), the Cane River Formation predominantly is composed of sand. In the southern area, the Claiborne Group is subdivided into the Sparta Sand, Cane River Formation, and Carrizo Sand, but the equivalent section in the northern area is a single formation known as the Memphis Sand. The Memphis Sand is underlain by a thick layer of clay in the upper part of the Wilcox Group.

In Arkansas, the Sparta Sand generally thickens and begins to contain saltwater as depth of occurrence increases to the southeast. The Sparta Sand is 50 to 200 ft thick within the outcrop area (along the western limit) and thickens easterly to nearly 900 ft. The Sparta Sand contains freshwater throughout most of its extent in Arkansas. However, saltwater is present in the extreme southeastern part of the State in parts of Ashley, Chicot, and Union Counties.

4 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

In Louisiana, the Sparta Sand generally dips to the east and southeast. Near the Sabine uplift (plate 1), the dip in northwestern Louisiana is northeasterly. The Sparta Sand is 50 to 300 ft thick within the outcrop area and thickens easterly to nearly 700 ft near the down-dip limit of freshwater. The approximate down-dip limit of freshwater is shown on plate 1. Down-dip from the limit of freshwater, all sands in the Sparta aquifer contain saltwater; up-dip from the freshwater limit, sands in the upper part of the aquifer contain freshwater but some sands in the lower part of the aquifer contain saltwater. A more detailed description of the Sparta-Memphis aquifer (upon which the preceding descriptions are based) is given in Edds and Fitzpatrick (1989), Hosman and others (1968), Payne (1968), Petersen and others (1985), and Ryals (1980).

Potentiometric-Surface Map

The potentiometric-surface map shows the altitude to which water would have stood in tightly cased wells screened in the aquifers (plate 1). The map is based upon water-level data collected in 427 wells (table 1), 338 in Arkansas and 89 in Louisiana, in the Sparta-Memphis aquifer in the spring of 2001. The surface is mapped by determining the altitude of the water lev-

els measured in the wells and is represented on the map by contours that connect points of equal water-level altitude. The general direction of ground-water flow in the Sparta-Memphis aquifer is perpendicular to the contours in the direction of decreasing hydraulic gradient.

The natural direction of flow, which historically was eastward from the outcrop area and then southward, is now altered in areas by large ground-water withdrawals. The regional direction of ground-water flow in the Sparta-Memphis aquifer in Arkansas is generally to the south-southwest in the northern half of Arkansas and to the east and south in the southern half of Arkansas, away from the outcrop area except where affected by large ground-water withdrawals (Joseph, 1997; Joseph, 2000). The natural ground-water flow in the Sparta aquifer in northern Louisiana generally is in an easterly direction from the outcrop area toward the Mississippi Alluvial Plain (Ryals, 1980). The highest water-level altitude measured in Arkansas was 328 ft above NGVD of 1929, located in Grant County in the recharge zone of the outcrop and subcrop area; the lowest water-level altitude was 197 ft below NGVD of 1929 in Union County (table 1). The highest water-level altitude measured in Louisiana was 235 ft above NGVD of 1929, located in Bienville Parish, in the recharge zone of the outcrop and subcrop area; the lowest water-level altitude was 218 ft below NGVD of 1929 in Ouachita Parish (table 1).

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
State of Arkansas							
Arkansas County							
343312	912849	02S04W06CDB1	45	166.52	212	4/25/2001	Sparta
343044	912355	02S04W23DAA1	60	148.40	208	4/25/2001	Sparta
342922	912703	02S04W33BBB1	42	162.98	205	4/25/2001	Sparta
343143	913318	02S05W16CBC1	25	188.12	213	4/25/2001	Sparta
342925	913148	02S05W34BDA1	30	185.61	216	4/25/2001	Sparta
342930	913035	02S05W35AAB1	32	183.88	216	4/25/2001	Sparta
342748	912458	03S04W02CCB1	46	155.58	202	4/25/2001	Sparta
342421	912438	03S04W26CDA1	60	143.20	203	3/30/2001	Sparta
342407	912639	03S04W33BAA1	37	163.52	201	3/30/2001	Sparta
342842	913034	03S05W02AAB1	31	179.14	210	4/25/2001	Sparta
342631	913005	03S05W13BDC1	33	176.69	210	4/25/2001	Sparta
342633	913229	03S05W15CBB1	30	176.48	206	4/25/2001	Sparta
342629	913525	03S05W18CAB1	27	168.68	196	4/24/2001	Sparta
342447	913240	03S05W28DAB1	28	175.51	204	4/25/2001	Sparta

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
342516	914216	03S06W30BBD1	29	161.63	191	4/25/2001	Sparta
342225	910808	04S01W04CBD1	82	114.00	196	4/24/2001	Sparta
341927	910748	04S01W28BAA1	83	106.76	190	4/24/2001	Sparta
342157	912502	04S04W11BCC1	41	156.8	198	4/24/2001	Sparta
342004	912929	04S04W19CBB1	30	164.74	195	3/29/2001	Sparta
342007	912515	04S04W22DAA1	36	158.78	195	4/24/2001	Sparta
342322	912956	04S05W01BAA1	29	167.05	196	4/24/2001	Sparta
342303	913413	04S05W05ACC1	24	161.60	186	4/24/2001	Sparta
342132	913133	04S05W15AAA1	31	169.67	201	4/24/2001	Sparta
341752	913004	04S05W36DCC1	31	164.56	196	3/29/2001	Sparta
341551	910745	05S01W17BAA1	82	94.23	176	4/24/2001	Sparta
341734	912006	05S03W04ADB1	29	157.88	187	3/30/2001	Sparta
341358	912435	05S04W26ACA1	57	131.10	188	4/24/2001	Sparta
341245	912947	05S05W36DAA1	38	142.27	180	4/24/2001	Sparta
341228	911620	06S02W06ABB1	66	115.23	181	4/24/2001	Sparta
341023	911453	06S02W17ADA1	75	113.19	188	4/24/2001	Sparta
340904	911331	06S02W22CDB1	74	112.29	186	3/29/2001	Sparta
340859	912009	06S03W27BAA1	61	120.06	181	3/29/2001	Sparta
340340	911411	07S02W28ABA1	76	105.26	181	3/29/2001	Sparta
340702	912248	07S03W06ABC1	58	126.85	185	3/29/2001	Sparta
340031	911448	08S02W09BCC1	74	99.70	174	3/29/2001	Sparta
Ashley County							
332118	915101	15S07W32CDD1	56	133.55	190	4/18/2001	Sparta
331334	920116	17S09W15ACC1	79	21.24	100	4/18/2001	Sparta
Bradley County							
334108	920807	12S10W10BCA1	106	121.07	227	4/18/2001	Sparta
333647	920417	13S09W06ACB2	74	178.77	253	4/19/2001	Sparta
333649	920406	13S09W06BDC1	90	162.00	252	4/19/2001	Sparta
333454	921607	13S11W17BCD1	59	190.61	250	4/18/2001	Sparta
331839	922052	16S12W21CAA1	26	73.62	100	4/18/2001	Sparta
Calhoun County							
334630	922928	11S14W12CAC3	168	144.73	313	4/18/2001	Sparta
333227	922742	13S13W32CDA1	39	169.49	208	4/18/2001	Sparta
333227	923532	13S15W36CBD1	77	80.62	158	4/18/2001	Sparta
333040	922404	14S13W12CCB1	37	168.01	205	4/18/2001	Sparta
333055	923912	14S15W16BAA1	49	97.04	146	4/18/2001	Sparta
Chicot County							
333312	912308	13S03W22DAD1	67	68.25	135	4/18/2001	Sparta

6 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
Cleveland County							
340131	921639	08S12W13CAA2	115	145.98	261	4/19/2001	Sparta
335820	920237	09S09W04BBD1	91	217.41	308	4/19/2001	Sparta
335729	921134	09S11W01DCA1	25	204.82	230	4/19/2001	Sparta
335623	921251	09S11W11CDB1	73	160.12	233	4/19/2001	Sparta
334918	920021	10S09W23CDC1	60	160.02	220	4/19/2001	Sparta
335133	921743	10S12W12BDD1	103	116.91	220	4/19/2001	Sparta
334543	921423	11S11W16AAB1	109	194.21	303	4/19/2001	Sparta
Columbia County							
332453	931215	15S20W20CCB1	150	222.24	372	4/02/2001	Sparta
332114	931141	16S20W08DCC1	115	287.14	402	4/02/2001	Sparta
332053	931237	16S20W18ACD1	52	285.21	337	4/02/2001	Sparta
332049	931517	16S21W14CBB1	66	214.66	281	4/02/2001	Sparta
332043	931621	16S21W15CBC1	77	210.99	288	4/02/2001	Sparta
331948	932225	16S22W22CCD1	192	148.26	340	4/02/2001	Sparta
331545	930318	17S19W15AAB1	22	295.57	318	4/04/2001	Sparta
331538	930536	17S19W17ACA1	10	265.38	275	4/04/2001	Sparta
331517	930656	17S19W18CBD1	30	274.65	305	4/04/2001	Sparta
331433	930705	17S19W19BCA1	26	274.90	301	4/04/2001	Sparta
331406	930650	17S19W30ABB1	28	219.93	248	4/04/2001	Sparta
331532	930807	17S20W13CB1	-13	325.48	312	4/04/2001	Sparta
331520	931201	17S20W17CDA1	17	308.34	325	4/04/2001	Sparta
331307	930755	17S20W36ABC1	38	297.47	335	4/04/2001	Sparta
331743	931424	17S21W01BBC1	-5	309.53	305	4/04/2001	Sparta
331613	931758	17S21W08DCA1	79	218.65	298	4/02/2001	Sparta
331609	931449	17S21W11DCC2	16	287.45	303	4/04/2001	Sparta
331607	931818	17S21W17BAA1	104	207.05	311	4/03/2001	Sparta
331521	932209	17S22W22ABC1	176	141.98	318	5/30/2001	Sparta
331519	932136	17S22W23BBB1	178	139.66	318	5/30/2001	Sparta
331143	931249	18S20W06DDC1	1	298.84	300	4/03/2001	Sparta
331115	931227	18S20W08CBC1	-10	272.62	263	4/03/2001	Sparta
331054	931016	18S20W10CAA1	13	277.20	290	4/03/2001	Sparta
331223	931339	18S21W01ACC1	2	293.34	295	4/04/2001	Sparta
331034	931759	18S21W17ACD1	168	146.73	315	4/03/2001	Sparta
330835	932159	18S22W27DDD1	175	137.34	312	4/03/2001	Sparta
330919	932747	18S23W26BAC1	265	21.20	286	4/02/2001	Sparta
330555	931149	19S20W08DAD1	65	255.30	320	4/03/2001	Sparta
330556	931129	19S20W09CAC1	65	267.13	332	4/03/2001	Sparta
330239	931031	19S20W34BDD1	80	209.65	290	4/03/2001	Sparta

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
330644	932833	19S23W10ABD1	196	45.85	242	4/02/2001	Sparta
330609	932744	19S23W11CDA2	195	53.33	248	4/02/2001	Sparta
330605	932722	19S23W11DDB1	191	55.16	246	4/02/2001	Sparta
330555	932752	19S23W14BAB2	202	42.45	244	4/03/2001	Sparta
330138	932236	20S22W03DCC1	161	52.98	214	4/03/2001	Sparta
330109	932133	20S22W11ACD1	163	108.05	271	4/03/2001	Sparta
Craighead County							
354404	904433	13N03E23CDD1	162	86.13	248	5/08/2001	Memphis
354642	904115	13N04E05DCC1	200	140.02	340	5/08/2001	Memphis
354929	903921	14N04E22CBD1	197	58.68	256	5/07/2001	Memphis
354837	903953	14N04E28DBD1	193	61.04	254	5/07/2001	Memphis
354917	903414	14N05E28BBB1	210	19.67	230	5/07/2001	Memphis
354748	903414	14N05E34ADD1	210	19.82	230	5/07/2001	Memphis
354751	903100	14N05E36CBC1	206	14.42	220	5/07/2001	Memphis
355615	904306	15N03E13ABA1	327	1.93	329	5/07/2001	Memphis
355314	904807	15N03E31ADA1	211	59.26	270	5/07/2001	Memphis
355506	904043	15N04E20ADB1	317	120.71	438	5/07/2001	Memphis
355360	903433	15N05E29DBB1	228	30.21	258	5/07/2001	Memphis
355544	902858	15N06E18ACA1	211	19.48	230	5/07/2001	Memphis
Crittenden County							
350345	901300	05N08E11CCA2	182	28.56	211	5/09/2001	Memphis
350958	901738	06N07E01DAD2	183	25.73	209	5/09/2001	Memphis
350850	900922	06N09E08DCC1	207	8.19	215	5/09/2001	Memphis
350745	900553	06N09E23AAB1	161	60.98	222	5/09/2001	Memphis
Cross County							
351004	904238	06N04E06ACA1	155	202.82	358	5/09/2001	Memphis
351538	903330	07N05E04ADD1	176	33.43	209	5/09/2001	Memphis
352405	905951	09N01E16CAC1	156	77.76	234	5/08/2001	Memphis
352403	904512	09N03E22AAD1	150	127.62	278	5/08/2001	Memphis
352404	904518	09N03E22ABD1	152	124.71	277	5/08/2001	Memphis
352232	904218	09N04E30DCA1	168	261.66	429	5/08/2001	Memphis
Dallas County							
340431	923360	07S14W30DCC1	215	119.63	335	4/23/2001	Sparta
340425	923334	07S14W31AAA1	220	109.72	330	4/23/2001	Sparta
340555	924545	07S16W20CAB1	297	25.34	322	4/23/2001	Sparta
335859	923730	08S15W34BDC1	214	25.52	240	4/23/2001	Sparta
340152	924639	08S16W18ACC1	237	15.16	252	4/23/2001	Sparta
335935	924307	08S16W27DDD1	239	33.19	272	4/23/2001	Sparta
335309	922413	09S13W35CCD1	129	70.59	200	4/23/2001	Sparta

8 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
335754	922919	09S14W01BDC1	187	78.31	265	4/23/2001	Sparta
335605	924701	09S16W19CAA1	254	5.61	260	4/23/2001	Sparta
334829	922458	10S13W34ACA2	123	149.50	272	4/24/2001	Sparta
335120	924120	10S15W18BCC1	250	77.56	328	4/23/2001	Sparta
Desha County							
335346	911521	09S02W26AAC1	82	71.32	153	4/19/2001	Sparta
335310	913007	09S04W28DDD1	49	115.73	165	4/20/2001	Sparta
334750	911624	10S02W26CCC2	77	70.99	148	4/19/2001	Sparta
335034	912905	10S04W11CBC1	70	90.86	161	4/20/2001	Sparta
334616	911711	11S02W03CCA1	71	68.18	139	4/19/2001	Sparta
333749	912259	12S03W26CBB1	47	91.08	138	4/19/2001	Sparta
333643	912305	12S03W34DAD1	46	100.82	147	4/19/2001	Sparta
Drew County							
334632	912827	11S04W02ACA2	62	90.82	153	4/19/2001	Sparta
334249	912707	11S04W25CB2	65	82.78	148	4/19/2001	Sparta
334607	914122	11S06W11DBC1	55	148.29	203	4/19/2001	Sparta
333807	914543	12S06W30BBD1	82	220.42	302	4/19/2001	Sparta
333649	914402	12S06W32DAD1	67	159.68	227	4/18/2001	Sparta
333151	913408	13S05W36ACB1	80	88.83	169	4/18/2001	Sparta
332429	912724	15S04W12DDA1	64	60.90	125	4/18/2001	Sparta
Grant County							
342846	922106	03S13W12AAA1	230	131.16	361	4/24/2001	Sparta
342601	923447	03S15W26DAA1	328	8.93	337	4/24/2001	Sparta
342201	922931	04S14W14DCD1	175	81.68	257	4/24/2001	Sparta
341839	922402	05S13W03CDA4	166	114.68	281	4/24/2001	Sparta
341845	922359	05S13W03DBC1	170	89.53	260	4/24/2001	Sparta
341812	922653	05S13W07ADB1	199	59.32	258	4/24/2001	Sparta
341550	922650	05S13W30AAA1	210	120.00	330	4/24/2001	Sparta
341843	923327	05S14W06DCC1	202	90.82	293	4/24/2001	Sparta
341924	923827	05S15W05ABD1	219	16.61	236	4/24/2001	Sparta
341341	921414	06S11W05ACA1	75	204.63	280	4/25/2001	Sparta
341022	923538	06S15W26ACA1	212	68.14	280	4/24/2001	Sparta
340447	921836	07S12W27DBC1	133	102.33	235	4/24/2001	Sparta
Hot Spring County							
341460	924151	05S16W35ACA1	306	35.74	342	4/23/2001	Sparta
Jefferson County							
342624	915444	03S08W19BAD1	31	185.55	217	4/27/2001	Sparta
342628	915505	03S08W19BBD1	40	175.43	215	4/27/2001	Sparta
342619	915455	03S08W19BDB1	35	179.68	215	4/27/2001	Sparta

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
342626	915713	03S09W23BCA1	44	177.68	222	4/27/2001	Sparta
342659	920330	03S10W14CAD1	101	120.13	221	4/27/2001	Sparta
342502	920434	03S10W27AAD1	74	147.81	222	4/27/2001	Sparta
342651	921058	03S11W22ABC1	140	169.86	310	4/25/2001	Sparta
342537	920831	03S11W25ADC4	82	230.98	313	4/25/2001	Sparta
342140	914742	04S07W17BCC1	14	186.39	200	4/27/2001	Sparta
341909	915056	04S08W35BBD1	-16	216.48	200	4/27/2001	Sparta
342309	915702	04S09W11BAA1	69	140.82	210	4/27/2001	Sparta
341925	920017	04S09W32BDA1	78	130.75	209	4/27/2001	Sparta
342212	920646	04S10W17BDA1	74	191.34	265	4/25/2001	Sparta
342109	920442	04S10W22BDD1	49	195.21	244	4/25/2001	Sparta
342025	920623	04S10W29ADB1	58	209.17	268	4/25/2001	Sparta
342220	921000	04S11W14BAD1	90	309.76	400	4/25/2001	Sparta
341452	915440	05S08W30ADB1	-55	275.99	221	4/26/2001	Sparta
341446	915527	05S08W30CBA1	-87	294.55	207	4/26/2001	Sparta
341530	915556	05S09W24DBD1	-73	281.09	208	4/26/2001	Sparta
341337	920109	05S09W31DDC1	-56	282.54	227	4/26/2001	Sparta
341420	915653	05S09W35AAB1	-81	286.26	205	4/26/2001	Sparta
341741	920322	05S10W11ACA1	64	170.57	235	4/25/2001	Sparta
341700	920549	05S10W16BAD1	32	245.42	277	4/25/2001	Sparta
341635	920543	05S10W16DBB1	21	294.27	315	4/25/2001	Sparta
341634	920534	05S10W16DBD1	20	279.79	300	4/25/2001	Sparta
341053	914134	06S06W18DAB1	24	163.79	188	4/27/2001	Sparta
341143	915517	06S08W16CCC1	-54	256.20	202	6/02/2001	Sparta
341143	915517	06S08W16CCC1	-55	257.79	202	4/26/2001	Sparta
341143	915517	06S08W16CCC1	-56	258.00	202	3/31/2001	Sparta
341143	915517	06S08W16CCC1	-57	259.10	202	3/06/2001	Sparta
341143	915517	06S08W16CCC1	-57	259.10	202	2/01/2001	Sparta
341025	915116	06S08W25ADC1	-23	226.17	203	4/26/2001	Sparta
341159	920207	06S09W17CAD1	-40	273.06	233	4/26/2001	Sparta
341152	920221	06S09W17CCA1	-45	279.17	234	4/26/2001	Sparta
341123	920504	06S10W23ACA2	-1	236.03	235	4/26/2001	Sparta
341116	920508	06S10W23ACD1	0	231.92	232	4/26/2001	Sparta
341105	920506	06S10W23DBA1	-17	246.87	230	4/26/2001	Sparta
340633	914523	07S07W24BAB1	23	165.44	188	4/26/2001	Sparta
340402	915917	07S09W35CCB1	28	241.58	270	4/26/2001	Sparta
340549	920421	07S10W24CAC1	8	303.45	311	4/26/2001	Sparta
Lafayette County							
332143	932609	16S23W12CAD1	250	71.72	322	3/14/2001	Sparta

10 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
331950	933303	16S24W26AAC1	215	51.86	267	3/14/2001	Sparta
331520	933128	17S23W19ACC1	239	52.49	291	3/13/2001	Sparta
331526	933403	17S24W23BBD1	229	31.68	261	3/13/2001	Sparta
330911	933039	18S23W29ACC1	245	10.36	255	3/13/2001	Sparta
330352	933103	19S23W29BDB1	209	40.81	250	3/13/2001	Sparta
330555	933922	19S25W13CAB1	219	35.52	255	3/13/2001	Sparta
330223	933036	20S23W05ADB1	202	39.85	242	3/13/2001	Sparta
Lee County							
344208	904120	01N04E09DCC4	149	54.98	204	4/26/2001	Sparta
344743	905925	02N01E10CAD1	153	48.30	201	4/26/2001	Sparta
345006	904749	03N03E28CDB1	153	53.55	207	4/26/2001	Sparta
Lincoln County							
340444	915043	07S07W30CDC1	29	179.24	208	4/23/2001	Sparta
340105	912753	08S04W22AAA1	51	116.14	167	4/20/2001	Sparta
340310	913454	08S05W03BAA2	39	141.34	180	4/23/2001	Sparta
335907	913333	08S05W35ACC1	31	133.71	165	4/20/2001	Sparta
335850	914358	08S06W31DCC1	51	129.67	181	4/23/2001	Sparta
335858	915222	08S08W35DBB1	82	202.77	285	4/23/2001	Sparta
335851	915217	08S08W35DCB1	76	216.48	292	4/23/2001	Sparta
335634	915128	09S07W07DAD1	29	259.80	289	4/23/2001	Sparta
Lonoke County							
344425	914503	01N07W03BCC1	96	127.07	223	5/17/2001	Sparta
343855	914960	01S08W02DBD1	114	95.94	210	5/17/2001	Sparta
344939	914737	02N07W06ACD1	121	119.84	241	5/17/2001	Sparta
344906	914500	02N07W09AAA1	103	129.14	232	5/17/2001	Sparta
344651	914426	02N07W22DBA1	104	123.48	227	5/15/2001	Sparta
344720	914328	02N07W23BAA1	101	134.91	236	5/15/2001	Sparta
344650	914209	02N07W24DAC1	92	139.42	231	5/15/2001	Sparta
344453	914619	02N07W32DDD1	102	123.57	226	5/23/2001	Sparta
343228	915232	02S08W16BDA1	92	123.80	216	5/17/2001	Sparta
345445	914426	03N07W03CAA1	158	76.91	235	5/17/2001	Memphis
345144	914350	03N07W23CCC1	137	90.51	228	5/23/2001	Sparta
345403	914935	03N08W11ACD1	165	82.54	248	5/01/2001	Memphis
345403	914935	03N08W11ACD1	164	83.70	248	3/26/2001	Memphis
345403	914935	03N08W11ACD1	161	87.50	248	2/23/2001	Memphis
345205	915024	03N08W22DAD1	141	91.51	233	5/01/2001	Memphis
345205	915024	03N08W22DAD1	143	90.30	233	2/23/2001	Memphis
345205	915024	03N08W22DAD2	141	92.00	233	5/01/2001	Memphis
345205	915024	03N08W22DAD2	141	91.92	233	2/23/2001	Memphis

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
345152	915025	03N08W22DDD1	138	96.85	235	5/01/2001	Memphis
345152	915025	03N08W22DDD2	138	96.85	235	5/01/2001	Memphis
Miller County							
331605	934402	17S25W18CDB1	214	6.41	220	3/13/2001	Sparta
330759	940109	19S28W05BDA1	319	1.27	320	3/13/2001	Sparta
Monroe County							
344144	911801	01N03W14CCB1	100	71.57	172	4/26/2001	Sparta
345446	910635	03N01W33CDD1	145	65.25	210	4/26/2001	Sparta
345043	911026	03N02W26DAB1	145	47.04	192	4/26/2001	Sparta
345535	911221	04N02W28DDD4	161	30.60	192	4/26/2001	Memphis
345617	911504	04N02W30BAC1	165	14.81	180	4/26/2001	Memphis
345617	911515	04N02W30BAD1	172	10.18	182	4/26/2001	Memphis
Nevada County							
333251	931708	14S21W04CCB1	301	59.12	360	3/14/2001	Sparta
333050	931723	14S21W20AAB1	261	115.93	377	3/14/2001	Sparta
Ouachita County							
334441	923726	11S15W27ABD1	132	68.03	200	3/15/2001	Sparta
334631	924927	11S17W14CAC1	130	16.35	146	3/15/2001	Sparta
334341	924834	11S17W36CCA1	128	5.03	133	3/15/2001	Sparta
334614	925759	11S18W20AAA1	259	42.18	301	3/15/2001	Sparta
334223	923922	12S15W09BBA1	118	94.74	213	3/15/2001	Sparta
334014	925951	12S18W19CDC1	198	36.69	235	3/15/2001	Sparta
333937	925442	12S18W25CAB1	111	76.46	187	3/15/2001	Sparta
334251	930352	12S19W09BAB1	283	6.77	290	3/15/2001	Sparta
334143	930105	12S19W14AAA1	234	2.81	237	3/14/2001	Sparta
333901	930146	12S19W35BDD1	193	156.62	350	3/14/2001	Sparta
333416	924451	13S16W28ADD1	51	54.56	106	3/16/2001	Sparta
333343	925956	13S18W31BDD1	176	66.47	242	3/15/2001	Sparta
333434	930418	13S19W28BCD1	194	36.04	230	3/14/2001	Sparta
333238	925255	14S17W05CAD1	120	36.73	157	3/16/2001	Sparta
332803	925251	14S17W32CAD1	134	85.56	220	3/16/2001	Sparta
332941	930513	14S19W29ABB1	193	87.04	280	3/14/2001	Sparta
332234	924027	15S15W32DBB2	-57	175.61	119	3/16/2001	Sparta
332417	924314	15S16W23DAC1	41	129.16	170	3/16/2001	Sparta
332311	925436	15S18W36ADD1	64	95.72	160	3/16/2001	Sparta
332618	930318	15S19W10DCC1	146	63.53	210	3/15/2001	Sparta
332438	930432	15S19W21CDD2	88	192.44	280	3/15/2001	Sparta
Phillips County							
343324	905455	01S02E32DDC1	130	80.88	211	5/09/2001	Sparta

12 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
343323	905056	02S02E01ADC1	137	38.81	176	5/09/2001	Sparta
343243	903907	02S04E02DBA1	144	106.26	250	5/10/2001	Sparta
343108	903526	02S05E16BCB1	151	38.58	190	5/10/2001	Sparta
342851	903635	02S05E29CCC1	148	31.09	179	5/10/2001	Sparta
342403	904915	03S03E30DAA1	129	43.43	172	5/09/2001	Sparta
342755	903621	03S05E05BAB1	134	46.04	180	5/10/2001	Sparta
341824	905121	04S02E25CCC1	130	35.65	166	5/10/2001	Sparta
Poinsett County							
353026	905630	10N01E12BDC1	143	91.39	234	5/08/2001	Memphis
352931	905825	10N01E15DBB1	139	93.26	232	5/08/2001	Memphis
352725	905924	10N01E33ABA1	147	73.99	221	5/08/2001	Memphis
353139	904447	10N03E02BCD1	133	117.94	251	5/08/2001	Memphis
352850	904432	10N03E23CAC1	149	108.56	258	5/08/2001	Memphis
353448	905321	11N02E16CCC1	141	101.67	243	5/08/2001	Memphis
353325	904323	11N03E25BDD1	137	131.56	269	5/08/2001	Memphis
354104	904928	12N02E12DDC1	139	109.07	248	5/08/2001	Memphis
354137	904340	12N03E12BBB1	153	93.07	246	5/08/2001	Memphis
353745	904456	12N03E35BCC1	148	96.44	244	5/08/2001	Memphis
353727	904353	12N03E35DDA1	148	98.74	247	5/08/2001	Memphis
Prairie County							
344113	913505	01N05W19CDC1	45	166.94	212	5/24/2001	Sparta
344440	913658	01N06W02ABB1	80	142.82	223	5/15/2001	Sparta
343943	913846	01N06W34CBB1	56	169.88	226	5/15/2001	Sparta
343904	913532	01S05W06BCB1	53	166.88	220	5/15/2001	Sparta
343640	913352	01S05W20ABB1	45	175.23	220	5/15/2001	Sparta
343859	913613	01S06W01BDD2	52	174.24	226	5/15/2001	Sparta
343749	913654	01S06W11DBD1	47	178.84	226	5/15/2001	Sparta
344649	912802	02N04W19ACB1	118	92.94	211	5/16/2001	Sparta
344718	914050	02N06W19AAB1	96	139.85	236	5/16/2001	Sparta
344707	914033	02N06W20BCB1	97	138.88	236	5/15/2001	Sparta
344654	913801	02N06W22BDD1	85	148.04	233	5/15/2001	Sparta
345452	913043	03N05W03ADA2	142	63.08	205	5/16/2001	Memphis
345145	913356	03N05W20CCC1	144	69.39	213	5/16/2001	Memphis
345140	914004	03N06W20CDD1	142	82.66	225	5/16/2001	Memphis
Pulaski County							
330105	932641	23N10W06BBC1	179	73.46	252	5/30/2001	Sparta
St. Francis County							
345743	904319	04N04E18BAB1	152	68.29	220	5/09/2001	Memphis

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
Union County							
331944	923218	16S14W15CAB1	-62	155.71	94	4/18/2001	Sparta
331860	923958	16S15W20DAA1	-96	286.15	190	4/16/2001	Sparta
331717	924129	16S15W31ACC1	-142	309.60	168	4/16/2001	Sparta
332205	924330	16S16W02ABC1	-57	173.24	116	4/16/2001	Sparta
331805	925709	16S18W34ABC2	36	211.82	248	4/16/2001	Sparta
331206	922225	17S12W31AAA1	-14	235.50	222	4/18/2001	Sparta
331203	922218	17S12W32BBC1	-20	249.84	230	4/18/2001	Sparta
331200	922916	17S13W31BAC1	-78	294.40	216	4/16/2001	Sparta
331505	924027	17S15W08DCC1	-174	348.64	175	4/17/2001	Sparta
331439	924129	17S15W18DBB1	-178	360.82	183	4/17/2001	Sparta
331246	923910	17S15W28DBA1	-177	406.71	230	4/17/2001	Sparta
331233	923924	17S15W28DCC1	-176	460.82	285	4/17/2001	Sparta
331229	924039	17S15W29CDC1	-192	412.08	220	4/17/2001	Sparta
331145	924117	17S15W31DCA1	-179	450.84	272	4/17/2001	Sparta
331144	924105	17S15W31DDA1	-178	438.58	261	4/17/2001	Sparta
331649	924253	17S16W01ABB1	-143	332.22	189	4/17/2001	Sparta
331559	924403	17S16W02CCC1	-167	345.47	178	4/17/2001	Sparta
331602	924326	17S16W02DCD1	-180	397.80	218	4/17/2001	Sparta
331506	924232	17S16W12DCC1	-184	405.40	222	4/17/2001	Sparta
331357	924248	17S16W24BDB1	-197	401.68	205	4/17/2001	Sparta
331300	925356	17S17W30DCD1	-36	316.28	280	4/16/2001	Sparta
330651	922120	18S12W33BBB1	-24	136.18	112	4/16/2001	Sparta
331040	923531	18S14W06CCA1	-156	380.87	225	4/16/2001	Sparta
330659	923858	18S15W33ADA1	-125	377.80	253	4/16/2001	Sparta
330636	923707	18S15W35DAC1	-102	303.26	201	4/16/2001	Sparta
331000	924445	18S16W10CDD1	-148	330.09	182	4/17/2001	Sparta
331041	924314	18S16W11AAB1	-164	388.56	225	5/29/2001	Sparta
331041	924314	18S16W11AAB1	-165	389.81	225	5/02/2001	Sparta
331011	924317	18S16W11DAB1	-165	431.40	266	4/13/2001	Sparta
331029	924232	18S16W12ACB1	-196	426.23	230	4/13/2001	Sparta
330809	924611	18S16W28BBB1	-111	336.26	225	4/13/2001	Sparta
330856	925056	18S17W22BDD1	-88	373.00	285	4/12/2001	Sparta
331057	925559	18S18W11ACA1	-40	284.76	245	4/17/2001	Sparta
330329	920904	19S10W16CBC1	-2	83.80	82	4/16/2001	Sparta
330255	921229	19S11W23ACA1	-5	146.78	142	4/16/2001	Sparta
330219	921113	19S11W25AAA1	-18	153.34	135	4/16/2001	Sparta
330110	924326	19S16W35DDC1	-72	247.48	175	4/13/2001	Sparta

14 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
Woodruff County							
350426	910407	05N01W11ABA1	155	55.99	211	5/10/2001	Memphis
350311	910727	05N01W17DBB1	165	44.73	210	5/10/2001	Memphis
350027	911456	05N02W31DCB3	179	13.55	193	5/10/2001	Memphis
351442	910326	07N01W12BCB1	160	62.02	222	5/10/2001	Memphis
351934	910311	08N01W12CDA1	149	75.52	225	5/10/2001	Memphis
State of Louisiana							
Bienville Parish							
321733	930350	BI- 76	232	48.40	280	04/20/01	Sparta
321709	925239	BI- 112	121	93.83	215	04/12/01	Sparta
323505	925350	BI- 144	82	238.22	320	04/02/01	Sparta
322436	925005	BI- 166	78	182.21	260	04/02/01	Sparta
321101	925221	BI- 186	140	39.92	180	03/20/01	Sparta
321538	930016	BI- 192	210	75.05	285	03/20/01	Sparta
322119	925723	BI- 216	184	16.32	200	04/26/01	Sparta
323246	925502	BI- 245	82	258.34	340	03/20/01	Sparta
323241	930318	BI- 284	157	101.73	259	03/14/01	Sparta
321551	930040	BI- 288	221	58.81	280	03/20/01	Sparta
321944	924902	BI- 308	42	248.04	290	03/20/01	Sparta
322620	931255	BI- 310	235	80.00	315	04/30/01	Sparta
Caldwell Parish							
320154	921646	CA- 86B	80	79.96	160	03/12/01	Sparta
Claiborne Parish							
325752	930827	CL- 9	92	267.55	360	04/11/01	Sparta
324707	930250	CL- 58	107	142.56	250	04/11/01	Sparta
324817	925125	CL- 111	12	288.47	300	04/12/01	Sparta
325228	924902	CL- 116	-18	263.11	245	04/11/01	Sparta
323943	925736	CL- 136	81	324.27	405	04/11/01	Sparta
325437	925033	CL- 148	-10	199.74	190	04/02/01	Sparta
330002	924459	CL- 149	-67	296.68	230	04/02/01	Sparta
324809	930712	CL- 154	142	197.65	340	03/21/01	Sparta
325122	930242	CL- 224	81	159.01	240	03/21/01	Sparta
Jackson Parish							
321709	924524	JA- 49	-18	177.86	160	04/04/01	Sparta
322357	923417	JA- 147	-33	252.59	220	04/04/01	Sparta
321338	923458	JA- 148	16	228.70	245	04/12/01	Sparta
322433	924121	JA- 149	5	189.90	195	04/12/01	Sparta
321459	922329	JA- 166	-13	212.85	200	03/08/01	Sparta

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
Lincoln Parish							
324141	923905	L- 26	-32	186.82	155	04/02/01	Sparta
323458	922751	L- 68	-76	256.34	180	04/10/01	Sparta
323013	924820	L- 113	35	319.65	355	04/02/01	Sparta
323325	923827	L- 136	-67	330.42	263	04/18/01	Sparta
323319	923920	L- 137	-63	303.25	240	04/17/01	Sparta
323136	924317	L- 142	-39	368.85	330	03/22/01	Sparta
322900	924041	L- 152	-45	333.97	289	04/27/01	Sparta
324018	924822	L- 153	51	228.99	280	04/10/01	Sparta
322951	923823	L- 160	-84	383.87	300	04/27/01	Sparta
Morehouse Parish							
324626	915439	MO- 5	-46	163.72	117	04/10/01	Sparta
324753	914712	MO- 342	-8	96.67	88	03/14/01	Sparta
325526	915305	MO- 345	2	111.73	114	04/10/01	Sparta
325707	915747	MO- 350	2	109.96	112	04/10/01	Sparta
Natchitoches Parish							
320607	925944	NA- 512	217	22.60	240	03/22/01	Sparta
320608	925946	NA- 519	212	27.62	240	03/22/01	Sparta
320009	925436	NA- 534	119	28.29	147	03/30/01	Sparta
Ouachita Parish							
322843	920844	OU- 80	-218	278.09	60	04/17/01	Sparta
323155	920211	OU- 163	-59	139.20	80	03/07/01	Sparta
322422	920207	OU- 401A	-50	112.55	62	04/13/01	Sparta
321714	920414	OU- 402	5	58.64	63	03/13/01	Sparta
323030	915548	OU- 404	-26	86.61	61	04/10/01	Sparta
322531	920539	OU- 405	-67	133.26	67	03/13/01	Sparta
323100	921658	OU- 444	-121	238.97	118	04/13/01	Sparta
322437	922431	OU- 488	-61	341.45	280	04/10/01	Sparta
324150	920422	OU- 520	-61	140.95	80	03/07/01	Sparta
322451	921408	OU- 541	-135	274.60	140	03/08/01	Sparta
323116	921507	OU- 563	-131	321.06	190	03/07/01	Sparta
321929	921330	OU- 580	-93	262.92	170	03/08/01	Sparta
Union Parish							
324415	920902	UN- 26	-60	194.23	134	04/05/01	Sparta
325028	921133	UN- 78	-28	203.09	175	04/10/01	Sparta
324955	920840	UN- 79	-44	161.70	118	04/10/01	Sparta
325550	923916	UN- 82	-56	177.65	122	04/02/01	Sparta
325550	923916	UN- 83	-53	174.84	122	04/02/01	Sparta
325647	922415	UN- 84	-49	259.06	210	04/10/01	Sparta

16 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 1. Water-level data collected during spring 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

[NGVD of 1929, National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929]

Latitude	Longitude	Station name	Water-level altitude (feet above NGVD of 1929)	Depth to water (feet below land-surface datum)	Land-surface datum (feet above NGVD of 1929)	Date of measurement	Aquifer
325929	921140	UN- 86	-15	105.95	90	04/10/01	Sparta
323655	922117	UN- 134	-99	318.56	220	04/13/01	Sparta
324056	921212	UN- 135	-86	246.08	160	03/13/01	Sparta
324707	922925	UN- 138	-81	301.04	220	03/13/01	Sparta
324708	922310	UN- 157	-89	254.32	165	03/13/01	Sparta
325436	922934	UN- 162	-115	299.91	185	03/21/01	Sparta
325409	923357	UN- 206	-75	284.77	210	03/13/01	Sparta
Webster Parish							
324919	932507	WB- 164	142	78.47	220	04/19/01	Sparta
323220	931659	WB- 219	185	5.26	190	04/18/01	Sparta
325938	932753	WB- 241	170	59.82	230	03/14/01	Sparta
323221	931404	WB- 271	196	82.34	278	04/16/01	Sparta
323553	931411	WB- 285	159	180.62	340	04/16/01	Sparta
325200	931517	WB- 326	147	112.86	260	04/02/01	Sparta
330040	931900	WB- 338	135	94.74	230	04/02/01	Sparta
323423	931459	WB- 359	205	75.01	280	04/16/01	Sparta
324116	931438	WB- 362	141	228.86	370	04/16/01	Sparta
325518	932219	WB- 399	161	44.06	205	04/02/01	Sparta
323534	932005	WB- 415	146	14.50	160	04/16/01	Sparta
323634	931726	WB- 430	164	76.08	240	03/14/01	Sparta
323540	932132	WB- 467	173	36.58	210	04/19/01	Sparta
Winn Parish							
315527	923708	W- 28	47	58.11	105	03/06/01	Sparta
315549	923735	W- 46	44	56.40	100	03/06/01	Sparta
315354	924657	W- 76	146	171.83	318	03/22/01	Sparta
315450	923101	W- 144B	88	51.90	140	03/12/01	Sparta
320541	922916	W- 172	42	97.78	140	04/04/01	Sparta
315948	923003	W- 179	75	119.86	195	03/12/01	Sparta
315746	924031	W- 188	40	99.73	140	03/06/01	Sparta
315927	924539	W- 189	89	70.81	160	03/06/01	Sparta

The potentiometric surface indicates that large withdrawals have altered or reversed the natural direction of flow in some areas. Flow in these areas is toward the cone of depression at the center of pumping. Four large cones of depression are shown in the 2001 potentiometric-surface map, centered in Columbia, Jefferson, and Union Counties in Arkansas and Ouachita Parish in Louisiana as a result of large withdrawals for industrial and public supplies (Terrance W. Holland, U.S. Geological Survey, written commun., 2001). A broad depression exists in western Poinsett and Cross Counties in Arkansas. The cone of depression centered in Jefferson County deepened and expanded in recent years into Arkansas and Prairie Counties where there are increased withdrawals for agricultural uses and public supplies (Terrance W. Holland, U.S. Geological Survey, written commun., 2001). The cones of depression in Columbia and Union Counties are elongated east to west because of large industrial withdrawals and coalesce at or near the Columbia and Union County line. The cone of depression in Union County has expanded southeast into Union Parish. The cone of depression in Ouachita Parish is elongated to the northwest and coalesces with the Union County cone of depression in Union Parish.

Four smaller depressions are evident in the 2001 Sparta-Memphis potentiometric-surface map but all were not evident in the 1999 potentiometric-surface map (Joseph, 2000). These depressions are located in western Lincoln County in Arkansas, and western Jackson, southern Lincoln, and Winn Parishes in Louisiana. The depression in western Jackson Parish in Louisiana is shown in the 1997 potentiometric-surface map. The depressions in western Lincoln County in Arkansas and southern Lincoln and Winn Parishes in Louisiana were not evident on the 1997 potentiometric-surface map (Joseph, 1997). The depressions in southern Lincoln and Winn Parishes are shown on the 1989 and 1980 potentiometric-surface maps (Smoot and Seanor, 1991; Ryals, 1980). The distribution of water levels collected in 1997 show insufficient data in southern Lincoln and Winn Parishes to indicate depressions. This suggests that the depressions probably existed in 1997, but were not indicated by the distribution of the collected data. The depression located in western Lincoln County in Arkansas is a new feature in the potentiometric surface. Short-term variations in climate and withdrawals may account for these smaller depressions. Local increases in water withdrawals may result in the formation of long-term cones of depression. Continued monitoring of the Sparta-Memphis aquifer potentiometric surface should determine if these are related to climate variations or withdrawals.

A potentiometric-surface map is constructed using water-level measurements from wells that are represented by control points on the map. Hydrologic principles, water-use data, and historical information are interpreted with the control point data to delineate the potentiometric-surface contours. The number and location of control points will vary for potentiometric-surface maps from different years. The combined information will result in both variations and similarities in potentiometric contours that define the surface depicted on the maps produced in different years.

Long-Term Water-Level Changes

Potentiometric-Surface Change Map from 1997 to 2001

A map of changes in potentiometric surface between 1997 and 2001 (plate 2) was constructed by calculating the difference between intersections of the 2001 potentiometric-surface (plate 1) and the 1997 potentiometric-surface (Joseph, 1997) contours, using the difference between water-level measurements from 278 wells (227 in Arkansas and 51 in Louisiana), reported in this report (table 2) and the 1997 Sparta-Memphis aquifer report (Joseph, 1997), and analyzing hydrographs of well water levels. The potentiometric-surface contours from 1997 and 2001 were digitized and used to create a data set of locations and difference values at the intersection of contour lines when the potentiometric surfaces were overlain. The differences at the intersections of contour lines were used to create a 30-meter spaced grid of data points for the study area. The changes in water levels at wells measured in 1997 and 2001 were used at control points (table 2) in conjunction with the 30-meter spaced grid. Rises in the potentiometric surface are indicated on plate 2 with blue colors; declines in the potentiometric surface are indicated with yellow and red colors.

A direct overlay of the two potentiometric-surface maps produces areas of extreme rises and declines in the potentiometric-surface change map. The most extreme of these areas showed declines in excess of 100 feet and rises in excess of 80 feet in a 4-year period. Evaluation of differences in measured water levels from 1997 to 2001 and hydrographs of wells near these extreme areas of decline and rise, ground-water withdrawals from 1997 through 2001, and potentiometric-surface maps from publications by Joseph (2000), Smoot and Seanor (1991), and Ryals (1980) showed that some of the areas of extreme declines and rises were not the result of changes in the potentiometric surface, but the effect of another cause or factor.

The cause or factor was determined to be the difference in the number of water levels measured in 1997 and 2001. The 2001 potentiometric-surface map was constructed from 338 water levels collected in Arkansas and 89 water levels collected in Louisiana. The 1997 potentiometric-surface map was constructed from 274 water levels collected in Arkansas and 55 water levels collected in Louisiana (Joseph, 1997). The additional water levels collected in 2001 increased the understanding and detail of the potentiometric-surface of the Sparta-Memphis aquifer. Comparison of the location of water levels collected in 1997 and 2001 showed that the increase in measurements and distribution of water levels for the 2001 potentiometric-surface map caused some areas of extremes rises and declines in the potentiometric-surface change map where the 1997 and 2001 potentiometric contours intersect. Evaluation of differences in measured water levels, hydrographs, ground-water withdrawals, and potentiometric-surface maps from publications was used to evaluate, and modify as appropriate, the change in the potentiometric surface for Calhoun, northern Ouachita, and Union Counties in Arkansas and Lincoln, Ouachita, northeastern Natchitoches, and southwestern Winn Parishes

18 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

in Louisiana. Changes in water levels are most accurate in areas near wells (control points) where water levels were measured each year. As distance from control points lengthen, the accuracy of the differences is diminished just as are the water-level contours on the original maps.

The range for the difference in water levels between 1997 and 2001 exceeded 120 feet. The largest rise in water level measured in Arkansas was about 35 feet in Prairie County. The largest decline in water level measured in Arkansas was about 93 feet in Columbia County. The largest rise in water level measured in Louisiana was about 23 feet in Jackson Parish. The largest decline in water level measured in Louisiana was about 33 feet in Claiborne Parish.

In Arkansas, the potentiometric-surface change map shows a large area of decline extending north from Drew County to Craighead County, west to Saline County, and east to near the Mississippi River with declines as large as 39 feet. Calhoun and Ouachita Counties show declines as large as 41 feet. An area in northern Columbia County shows declines up to 93 feet. Between 1997 and 2001 two commercial facilities began withdrawing water from wells and discontinued use of water

from the public water supply. The majority of Union County shows declines of 0 to 20 ft, with some areas having declines ranging from 20 to 40 ft.

Parts of Ashley, Bradley, Cleveland, Drew, and Lincoln Counties compose an area in southeastern Arkansas with a rise in potentiometric surface in excess of 20 feet. The center of the cone of depression in Union County showed a rise of 0 to 10 ft.

In Louisiana, the potentiometric-surface change map shows areas of rise and decline. In south Columbia County, Arkansas, extending south-southeast to Winn Parish in Louisiana is an area showing a rise in the potentiometric surface. Part of Ouachita Parish shows a rise of 0 up to 40 feet. The area of decline in southern Union County and extending southeast into Louisiana is the expansion of the cone of depression in Union County, Arkansas. Also, between 1997 and 2001 a commercial facility began withdrawing water from wells in this area. These two factors explain this area of decline in northern Louisiana. Western Caldwell, eastern Jackson, Lincoln, Morehouse, most of Ouachita, and eastern Winn Parishes show declines of 0 to 40 feet.

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
State of Arkansas						
Arkansas County						
343312	912849	02S04W06CDB1	148.34	166.52	-18.2	Sparta
343044	912355	02S04W23DAA1	124.09	148.40	-24.3	Sparta
342922	912703	02S04W33BBB1	147.28	162.98	-15.7	Sparta
343143	913318	02S05W16CBC1	191.86	188.12	3.7	Sparta
342930	913035	02S05W35AAB1	181.03	183.88	-2.8	Sparta
342748	912458	03S04W02CCB1	140.97	155.58	-14.6	Sparta
342421	912438	03S04W26CDA1	145.52	143.20	2.3	Sparta
342407	912639	03S04W33BAA1	141.34	163.52	-22.2	Sparta
342842	913034	03S05W02AAB1	144.58	179.14	-34.6	Sparta
342631	913005	03S05W13BDC1	170.59	176.69	-6.1	Sparta
342633	913229	03S05W15CBB1	162.33	176.48	-14.2	Sparta
342629	913525	03S05W18CAB1	149.82	168.68	-18.9	Sparta
342447	913240	03S05W28DAB1	167.37	175.51	-8.1	Sparta
342516	914216	03S06W30BBD1	143.77	161.63	-17.9	Sparta

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
342225	910808	04S01W04CBD1	103.25	114.00	-10.8	Sparta
341927	910748	04S01W28BAA1	95.66	106.76	-11.1	Sparta
342157	912502	04S04W11BCC1	143.58	156.80	-13.2	Sparta
342004	912929	04S04W19CBB1	147.48	164.74	-17.3	Sparta
342007	912515	04S04W22DAA1	138.08	158.78	-20.7	Sparta
342132	913133	04S05W15AAA1	162.24	169.67	-7.4	Sparta
341752	913004	04S05W36DCC1	148.09	164.56	-16.5	Sparta
341551	910745	05S01W17BAA1	99.27	94.23	5.0	Sparta
341734	912006	05S03W04ADB1	123.98	157.88	-33.9	Sparta
341358	912435	05S04W26ACA1	122.97	131.10	-8.1	Sparta
341245	912947	05S05W36DAA1	126.99	142.27	-15.3	Sparta
341228	911620	06S02W06ABB1	106.76	115.23	-8.5	Sparta
341023	911453	06S02W17ADA1	105.42	113.19	-7.8	Sparta
340859	912009	06S03W27BAA1	106.98	120.06	-13.1	Sparta
340340	911411	07S02W28ABA1	86.78	105.26	-18.5	Sparta
340702	912248	07S03W06ABC1	114.14	126.85	-12.7	Sparta
340031	911448	08S02W09BCC1	95.31	99.70	-4.4	Sparta
Ashley County						
332118	915101	15S07W32CDD1	153.28	133.55	19.7	Sparta
Bradley County						
334108	920807	12S10W10BCA1	117.61	121.07	-3.5	Sparta
333647	920417	13S09W06ACB2	186.36	178.77	7.6	Sparta
333649	920406	13S09W06BDC1	170.00	162.00	8.0	Sparta
333454	921607	13S11W17BCD1	195.69	190.61	5.1	Sparta
331839	922052	16S12W21CAA1	71.56	73.62	-2.1	Sparta
Calhoun County						
334630	922928	11S14W12CAC3	141.43	144.73	-3.3	Sparta
333227	923532	13S15W36CBD1	53.24	80.62	-27.4	Sparta
333040	922404	14S13W12CCB1	170.22	168.01	2.2	Sparta
333055	923912	14S15W16BAA1	75.39	97.04	-21.7	Sparta

20 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
Cleveland County						
340131	921639	08S12W13CAA2	166.06	145.98	20.1	Sparta
335729	921134	09S11W01DCA1	191.50	204.82	-13.3	Sparta
335623	921251	09S11W11CDB1	155.70	160.12	-4.4	Sparta
334918	920021	10S09W23CDC1	157.08	160.02	-2.9	Sparta
335133	921743	10S12W12BDD1	116.02	116.91	-0.9	Sparta
334543	921423	11S11W16AAB1	212.09	194.21	17.9	Sparta
Columbia County						
332453	931215	15S20W20CCB1	213.92	222.24	-8.3	Sparta
332049	931517	16S21W14CBB1	221.45	214.66	6.8	Sparta
332043	931621	16S21W15CBC1	212.32	210.99	1.3	Sparta
331948	932225	16S22W22CCD1	130.78	148.26	-17.5	Sparta
331517	930656	17S19W18CBD1	293.88	274.65	19.2	Sparta
331406	930650	17S19W30ABB1	217.97	219.93	-2.0	Sparta
331532	930807	17S20W13CB1	312.76	325.48	-12.7	Sparta
331520	931201	17S20W17CDA1	308.69	308.34	0.4	Sparta
331307	930755	17S20W36ABC1	300.08	297.47	2.6	Sparta
331743	931424	17S21W01BBC1	326.37	309.53	16.8	Sparta
331613	931758	17S21W08DCA1	148.10	218.65	-70.7	Sparta
331609	931449	17S21W11DCC2	300.52	287.45	13.1	Sparta
331607	931818	17S21W17BAA1	113.88	207.05	-93.2	Sparta
331521	932209	17S22W22ABC1	138.10	141.98	-3.9	Sparta
331519	932136	17S22W23BBB1	137.68	139.66	-2.0	Sparta
331223	931339	18S21W01ACC1	295.23	293.34	1.9	Sparta
331034	931759	18S21W17ACD1	119.17	146.73	-27.6	Sparta
330555	931149	19S20W08DAD1	250.68	255.30	-4.6	Sparta
330556	931129	19S20W09CAC1	260.62	267.13	-6.5	Sparta
330239	931031	19S20W34BDD1	213.16	209.65	3.5	Sparta
330609	932744	19S23W11CDA2	53.38	53.33	0.1	Sparta
Craighead County						
354404	904433	13N03E23CDD1	86.54	86.13	0.4	Memphis

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
354929	903921	14N04E22CBD1	54.28	58.68	-4.4	Memphis
354837	903953	14N04E28DBD1	54.15	61.04	-6.9	Memphis
354751	903100	14N05E36CBC1	10.69	14.42	-3.7	Memphis
355544	902858	15N06E18ACA1	15.44	19.48	-4.0	Memphis
Crittenden County						
350345	901300	05N08E11CCA2	19.97	28.56	-8.6	Memphis
350958	901738	06N07E01DAD2	18.58	25.73	-7.2	Memphis
350745	900553	06N09E23AAB1	22.56	60.98	-38.4	Memphis
Cross County						
352405	905951	09N01E16CAC1	76.68	77.76	-1.1	Memphis
352403	904512	09N03E22AAD1	114.18	127.62	-13.4	Memphis
352232	904218	09N04E30DCA1	256.97	261.66	-4.7	Memphis
Dallas County						
340425	923334	07S14W31AAA1	122.94	109.72	13.2	Sparta
340555	924545	07S16W20CAB1	25.56	25.34	0.2	Sparta
335859	923730	08S15W34BDC1	27.67	25.52	2.2	Sparta
335935	924307	08S16W27DDD1	31.05	33.19	-2.1	Sparta
335309	922413	09S13W35CCD1	67.41	70.59	-3.2	Sparta
334829	922458	10S13W34ACA2	148.07	149.50	-1.4	Sparta
Desha County						
335346	911521	09S02W26AAC1	63.59	71.32	-7.7	Sparta
335310	913007	09S04W28DDD1	109.09	115.73	-6.6	Sparta
334750	911624	10S02W26CCC2	62.84	70.99	-8.1	Sparta
334616	911711	11S02W03CCA1	57.13	68.18	-11.1	Sparta
333643	912305	12S03W34DAD1	75.76	100.82	-25.1	Sparta
Drew County						
334249	912707	11S04W25CB2	79.67	82.78	-3.1	Sparta
334607	914122	11S06W11DBC1	142.48	148.29	-5.8	Sparta
333649	914402	12S06W32DAD1	160.03	159.68	0.3	Sparta
333151	913408	13S05W36ACB1	89.13	88.83	0.3	Sparta
332429	912724	15S04W12DDA1	57.03	60.90	-3.9	Sparta

22 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
Grant County						
342846	922106	03S13W12AAA1	129.05	131.16	-2.1	Sparta
342201	922931	04S14W14DCD1	90.62	81.68	8.9	Sparta
341839	922402	05S13W03CDA4	106.64	114.68	-8.0	Sparta
341845	922359	05S13W03DBC1	102.47	89.53	12.9	Sparta
341812	922653	05S13W07ADB1	90.78	59.32	31.5	Sparta
341843	923327	05S14W06DCC1	90.47	90.82	-0.3	Sparta
341924	923827	05S15W05ABD1	15.49	16.61	-1.1	Sparta
341341	921414	06S11W05ACA1	196.12	204.63	-8.5	Sparta
341022	923538	06S15W26ACA1	68.99	68.14	0.8	Sparta
340447	921836	07S12W27DBC1	98.84	102.33	-3.5	Sparta
Hot Spring County						
341460	924151	05S16W35ACA1	35.68	35.74	-0.1	Sparta
Jefferson County						
342624	915444	03S08W19BAD1	161.36	185.55	-24.2	Sparta
342628	915505	03S08W19BBD1	156.35	175.43	-19.1	Sparta
342619	915455	03S08W19BDB1	153.45	179.68	-26.2	Sparta
342502	920434	03S10W27AAD1	111.55	147.81	-36.3	Sparta
342651	921058	03S11W22ABC1	166.92	169.86	-2.9	Sparta
342537	920831	03S11W25ADC4	192.87	230.98	-38.1	Sparta
342140	914742	04S07W17BCC1	167.57	186.39	-18.8	Sparta
341909	915056	04S08W35BBD1	198.45	216.48	-18.0	Sparta
342109	920442	04S10W22BDD1	193.33	195.21	-1.9	Sparta
342025	920623	04S10W29ADB1	203.98	209.17	-5.2	Sparta
342220	921000	04S11W14BAD1	299.33	309.76	-10.4	Sparta
341452	915440	05S08W30ADB1	275.82	275.99	-0.2	Sparta
341446	915527	05S08W30CBA1	270.10	294.55	-24.5	Sparta
341530	915556	05S09W24DBD1	261.90	281.09	-19.2	Sparta
341420	915653	05S09W35AAB1	276.00	286.26	-10.3	Sparta
341700	920549	05S10W16BAD1	239.20	245.42	-6.2	Sparta
341635	920543	05S10W16DBB1	282.31	294.27	-12.0	Sparta

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
341634	920534	05S10W16DBD1	268.20	279.79	-11.6	Sparta
341053	914134	06S06W18DAB1	153.34	163.79	-10.5	Sparta
341143	915517	06S08W16CCC1	242.60	257.79	-15.2	Sparta
341025	915116	06S08W25ADC1	209.80	226.17	-16.4	Sparta
341152	920221	06S09W17CCA1	261.44	279.17	-17.7	Sparta
341116	920508	06S10W23ACD1	233.83	231.92	1.9	Sparta
341105	920506	06S10W23DBA1	216.17	246.87	-30.7	Sparta
340633	914523	07S07W24BAB1	152.57	165.44	-12.9	Sparta
340402	915917	07S09W35CCB1	232.62	241.58	-9.0	Sparta
340549	920421	07S10W24CAC1	278.01	303.45	-25.4	Sparta
Lafayette County						
332143	932609	16S23W12CAD1	67.29	71.72	-4.4	Sparta
331526	933403	17S24W23BBD1	21.61	31.68	-10.1	Sparta
330911	933039	18S23W29ACC1	10.72	10.36	0.4	Sparta
330352	933103	19S23W29BDB1	40.24	40.81	-0.6	Sparta
330555	933922	19S25W13CAB1	27.03	35.52	-8.5	Sparta
330223	933036	20S23W05ADB1	38.42	39.85	-1.4	Sparta
Lee County						
345006	904749	03N03E28CDB1	47.57	53.55	-6.0	Sparta
Lincoln County						
340444	915043	07S07W30CDC1	170.58	179.24	-8.7	Sparta
340105	912753	08S04W22AAA1	80.57	116.14	-35.6	Sparta
340310	913454	08S05W03BAA2	129.73	141.34	-11.6	Sparta
335907	913333	08S05W35ACC1	112.64	133.71	-21.1	Sparta
335850	914358	08S06W31DCC1	122.98	129.67	-6.7	Sparta
335858	915222	08S08W35DBB1	205.58	202.77	2.8	Sparta
335634	915128	09S07W07DAD1	265.91	259.80	6.1	Sparta
Lonoke County						
344425	914503	01N07W03BCC1	117.19	127.07	-9.9	Sparta
344939	914737	02N07W06ACD1	116.86	119.84	-3.0	Sparta
344906	914500	02N07W09AAA1	94.04	129.14	-35.1	Sparta

24 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
344651	914426	02N07W22DBA1	117.47	123.48	-6.0	Sparta
344720	914328	02N07W23BAA1	134.51	134.91	-0.4	Sparta
344650	914209	02N07W24DAC1	128.22	139.42	-11.2	Sparta
344453	914619	02N07W32DDD1	118.37	123.57	-5.2	Sparta
342728	915233	02S08W16BDA1	117.06	123.80	-6.7	Sparta
345445	914426	03N07W03CAA1	75.34	76.91	-1.6	Memphis
345152	915025	03N08W22DDD1	113.93	96.85	17.1	Memphis
Miller County						
331605	934402	17S25W18CDB1	10.03	6.41	3.6	Sparta
Monroe County						
344144	911801	01N03W14CCB1	64.00	71.57	-7.6	Sparta
345043	911026	03N02W26DAB1	42.05	47.04	-5.0	Sparta
345535	911221	04N02W28DDD4	26.47	30.60	-4.1	Memphis
345617	911504	04N02W30BAC1	18.11	14.81	3.3	Memphis
Ouachita County						
334441	923726	11S15W27ABD1	66.22	68.03	-1.8	Sparta
334341	924834	11S17W36CCA1	3.66	5.03	-1.4	Sparta
334614	925759	11S18W20AAA1	30.86	42.18	-11.3	Sparta
334223	923922	12S15W09BBA1	54.20	94.74	-40.5	Sparta
334014	925951	12S18W19CDC1	30.56	36.69	-6.1	Sparta
334251	930352	12S19W09BAB1	13.95	6.77	7.2	Sparta
334143	930105	12S19W14AAA1	10.54	2.81	7.7	Sparta
333434	930418	13S19W28BCD1	37.24	36.04	1.2	Sparta
333238	925255	14S17W05CAD1	35.83	36.73	-0.9	Sparta
332803	925251	14S17W32CAD1	84.97	85.56	-0.6	Sparta
332941	930513	14S19W29ABB1	86.18	87.04	-0.9	Sparta
332311	925436	15S18W36ADD1	94.09	95.72	-1.6	Sparta
332618	930318	15S19W10DCC1	65.58	63.53	2.1	Sparta
332438	930432	15S19W21CDD2	190.19	192.44	-2.3	Sparta
Phillips County						
343324	905455	01S02E32DDC1	77.46	80.88	-3.4	Sparta

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
343323	905056	02S02E01ADC1	34.92	38.81	-3.9	Sparta
343243	903907	02S04E02DBA1	123.54	106.26	17.3	Sparta
343108	903526	02S05E16BCB1	28.25	38.58	-10.3	Sparta
342851	903635	02S05E29CCC1	21.52	31.09	-9.6	Sparta
342403	904915	03S03E30DAA1	34.65	43.43	-8.8	Sparta
342755	903621	03S05E05BAB1	36.99	46.04	-9.1	Sparta
341824	905121	04S02E25CCC1	35.24	35.65	-0.4	Sparta
Poinsett County						
352931	905825	10N01E15DBB1	84.99	93.26	-8.3	Memphis
353139	904447	10N03E02BCD1	102.09	117.94	-15.9	Memphis
352850	904432	10N03E23CAC1	104.08	108.56	-4.5	Memphis
353448	905321	11N02E16CCC1	94.29	101.67	-7.4	Memphis
353325	904323	11N03E25BDD1	123.03	131.56	-8.5	Memphis
354104	904928	12N02E12DDC1	94.67	109.07	-14.4	Memphis
353727	904353	12N03E35DDA1	101.34	98.74	2.6	Memphis
Prairie County						
344113	913505	01N05W19CDC1	128.16	166.94	-38.8	Sparta
344440	913658	01N06W02ABB1	106.14	142.82	-36.7	Sparta
343904	913532	01S05W06BCB1	144.04	166.88	-22.8	Sparta
343640	913352	01S05W20ABB1	146.34	175.23	-28.9	Sparta
343749	913654	01S06W11DBD1	148.90	178.84	-29.9	Sparta
344649	912802	02N04W19ACB1	85.33	92.94	-7.6	Sparta
344707	914033	02N06W20BCB1	129.65	138.88	-9.2	Sparta
344654	913801	02N06W22BDD1	120.77	148.04	-27.3	Sparta
345452	913043	03N05W03ADA2	97.66	63.08	34.6	Memphis
345145	913356	03N05W20CCC1	99.92	69.39	30.5	Memphis
345140	914004	03N06W20CDD1	95.22	82.66	12.6	Memphis
St. Francis County						
345743	904319	04N04E18BAB1	63.57	68.29	-4.7	Memphis
Union County						
331944	923218	16S14W15CAB1	150.04	155.71	-5.7	Sparta

26 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
331860	923958	16S15W20DAA1	264.87	286.15	-21.3	Sparta
332205	924330	16S16W02ABC1	170.83	173.24	-2.4	Sparta
331805	925709	16S18W34ABC2	189.50	211.82	-22.3	Sparta
331203	922218	17S12W32BBC1	236.98	249.84	-12.9	Sparta
331200	922916	17S13W31BAC1	284.13	294.40	-10.3	Sparta
331439	924129	17S15W18DBB1	359.74	360.82	-1.1	Sparta
331229	924039	17S15W29CDC1	418.44	412.08	6.4	Sparta
331357	924248	17S16W24BDB1	403.57	401.68	1.9	Sparta
331300	925356	17S17W30DCD1	309.28	316.28	-7.0	Sparta
330651	922120	18S12W33BBB1	125.47	136.18	-10.7	Sparta
331040	923531	18S14W06CCA1	371.00	380.87	-9.9	Sparta
330659	923858	18S15W33ADA1	368.00	377.80	-9.8	Sparta
330636	923707	18S15W35DAC1	305.39	303.26	2.1	Sparta
330809	924611	18S16W28BBB1	339.88	336.26	3.6	Sparta
330856	925056	18S17W22BDD1	362.67	373.00	-10.3	Sparta
330329	920904	19S10W16CBC1	74.86	83.80	-8.9	Sparta
330219	921113	19S11W25AAA1	136.00	153.34	-17.3	Sparta
330110	924326	19S16W35DDC1	222.96	247.48	-24.5	Sparta
Woodruff County						
350426	910407	05N01W11ABA1	51.46	55.99	-4.5	Memphis
350311	910727	05N01W17DBB1	40.81	44.73	-3.9	Memphis
350027	911456	05N02W31DCB3	15.13	13.55	1.6	Memphis
351934	910311	08N01W12CDA1	70.18	75.52	-5.3	Memphis
State of Louisiana						
Bienville Parish						
321733	930350	BI- 76	50.46	48.40	2.1	Sparta
321709	925239	BI- 112	115.82	93.83	22.0	Sparta
323505	925350	BI- 144	236.42	238.22	-1.8	Sparta
322436	925005	BI- 166	181.43	182.21	-0.8	Sparta
321101	925221	BI- 186	41.97	39.92	2.1	Sparta
321538	930016	BI- 192	74.49	75.05	-0.6	Sparta

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
322119	925723	BI- 216	16.70	16.32	0.4	Sparta
Caldwell Parish						
320154	921646	CA- 86B	79.28	79.96	-0.7	Sparta
Claiborne Parish						
325752	930827	CL- 9	270.01	267.55	2.5	Sparta
324707	930250	CL- 58	140.01	142.56	-2.6	Sparta
324817	925125	CL- 111	255.46	288.47	-33.0	Sparta
325228	924902	CL- 116	259.73	263.11	-3.4	Sparta
325437	925033	CL- 148	196.80	199.74	-2.9	Sparta
330002	924459	CL- 149	294.36	296.68	-2.3	Sparta
Jackson Parish						
321709	924524	JA- 49	201.19	177.86	23.3	Sparta
322357	923417	JA- 147	246.47	252.59	-6.1	Sparta
321338	923458	JA- 148	225.15	228.70	-3.5	Sparta
Lincoln Parish						
324141	923905	L- 26	180.27	186.82	-6.5	Sparta
323458	922751	L- 68	249.60	256.34	-6.7	Sparta
323013	924820	L- 113	317.56	319.65	-2.1	Sparta
Morehouse Parish						
324626	915439	MO- 5	153.52	163.72	-10.2	Sparta
324753	914712	MO- 342	89.85	96.67	-6.8	Sparta
325707	915747	MO- 350	105.56	109.96	-4.4	Sparta
Ouachita Parish						
322843	920844	OU- 80	283.76	278.09	5.7	Sparta
322422	920207	OU- 401A	106.13	112.55	-6.4	Sparta
321714	920414	OU- 402	58.98	58.64	0.3	Sparta
321714	920414	OU- 403	64.34	67.14	-2.8	Sparta
323030	915548	OU- 404	80.32	86.61	-6.3	Sparta
322531	920539	OU- 405	128.66	133.26	-4.6	Sparta
323100	921658	OU- 444	229.09	238.97	-9.9	Sparta
322437	922431	OU- 488	332.73	341.45	-8.7	Sparta

28 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 2. Difference in water level from 1997 to 2001 in the Sparta-Memphis aquifer in Arkansas and Louisiana.—Continued

Latitude	Longitude	Station name	1997 depth to water (feet below land-surface datum)	2001 depth to water (feet below land-surface datum)	Difference in water level from 1997 to 2001 (feet)	Aquifer
Union Parish						
324415	920902	UN- 26	184.00	194.23	-10.2	Sparta
325028	921133	UN- 78	208.60	203.09	5.5	Sparta
324955	920840	UN- 79	153.40	161.70	-8.3	Sparta
325550	923916	UN- 83	174.00	174.84	-0.8	Sparta
325647	922415	UN- 84	248.70	259.06	-10.4	Sparta
325929	921140	UN- 86	100.63	105.95	-5.3	Sparta
323655	922117	UN- 134	307.13	318.56	-11.4	Sparta
Webster Parish						
324919	932507	WB- 164	64.32	78.47	-14.2	Sparta
323220	931659	WB- 219	5.17	5.26	-0.1	Sparta
323221	931404	WB- 271	84.25	82.34	1.9	Sparta
323553	931411	WB- 285	180.68	180.62	0.1	Sparta
325200	931517	WB- 326	114.51	112.86	1.7	Sparta
330040	931900	WB- 338	94.89	94.74	0.2	Sparta
323423	931459	WB- 359	79.68	75.01	4.7	Sparta
325518	932219	WB- 399	45.24	44.06	1.2	Sparta
323534	932005	WB- 415	17.20	14.50	2.7	Sparta
Winn Parish						
315527	923708	W- 28	52.14	58.11	-6.0	Sparta
315450	923101	W- 144B	37.55	51.90	-14.4	Sparta
320541	922916	W- 172	91.21	97.78	-6.6	Sparta
315948	923003	W- 179	108.70	119.86	-11.2	Sparta

Long-Term Hydrographs

Hydrographs were constructed for wells with a minimum of 25 years of water-level measurements. A trend line using linear regression was calculated for the period from spring 1976 to spring 2001 to determine the slope in feet per year (ft/yr) for water levels in each well. The slope of the trend line represents the annual decline or rise in water level during the 25-year

period. The minimum 25-year period is used to show long-term trends not dominated by variations in climate and localized pumping rates on water levels in a single well. The hydrographs were grouped by county or parish. Table 3 shows the number of wells, the range of values for the annual rise or decline in water level, and the median value for each county or parish. Negative values denote a decline in water level. Selected hydrographs are shown in figure 3 for the period from 1962 to 2001.

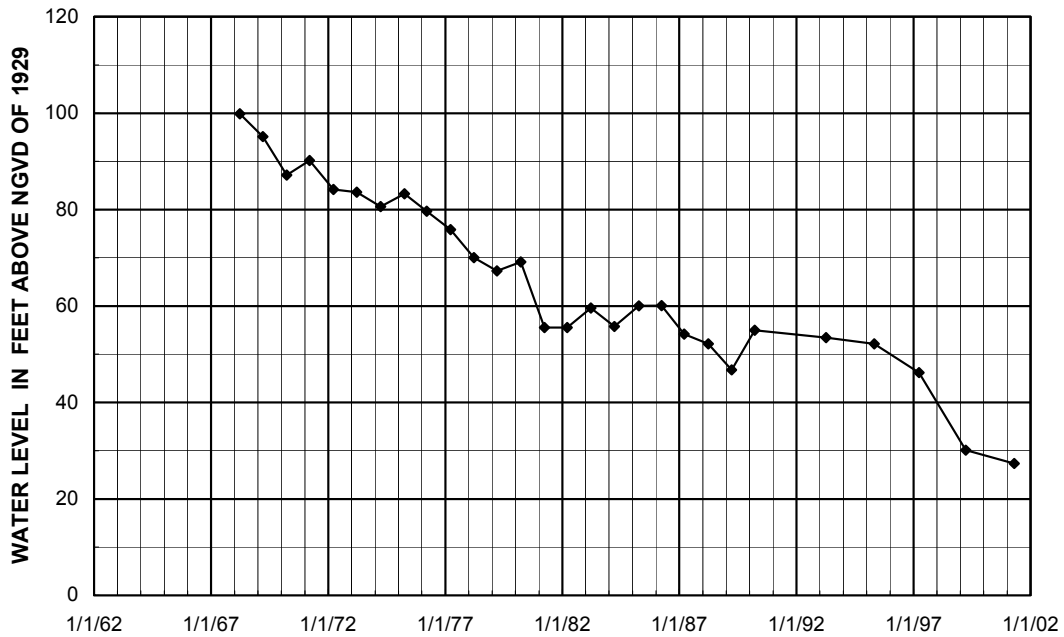
Table 3. Range and median of annual rise/decline in water level for wells in the Sparta-Memphis aquifer for the period 1976-2001.

[Negative values denote a decline]

County or Parish	Number of wells	Range or value of average annual rise/decline in water level (feet/year)	Median average annual rise/decline in water level (feet/year)
State of Arkansas			
Arkansas	21	-2.01 to -0.73	-1.57
Bradley	3	-1.57 to -0.91	-0.95
Calhoun	2	-1.02 to -0.95	-0.98
Cleveland	3	-1.93 to -0.84	-1.02
Columbia	9	-1.53 to +1.13	-0.69
Craighead	2	-0.99 to to 0.80	-0.89
Cross	4	-1.17 to -0.69	-0.97
Dallas	2	-0.58 ¹	-0.58 ¹
Desha	5	-1.57 to -0.88	-1.10
Drew	5	-1.10 to -0.29	-0.58
Grant	6	-1.42 to -0.01	-0.47
Jefferson	16	-1.72 to +0.01	-1.10
Lafayette	2	+0.11 to +0.47	+0.29
Lee	1	-0.44	-0.44
Lincoln	5	-1.61 to -1.28	-1.46
Lonoke	1	-1.31	-1.31
Ouachita	4	-0.11 to +0.62	+0.08
Phillips	6	-0.73 to +1.53	-0.40
Poinsett	2	-1.28 ¹	-1.28 ¹
Prairie	7	-1.72 to -0.77	-1.46
Union	16	-2.48 to +0.04	-1.28
Woodruff	1	+0.07	+0.07
State of Louisiana			
Bienville	4	-1.13 to +0.04	-0.57
Claiborne	4	-1.61 to -0.33	-0.78
Lincoln	4	-2.12 to -0.69	-1.48
Morehouse	4	-0.15 to +1.53	+0.02
Ouachita	9	-2.30 to -0.40	-1.02
Union	8	-1.83 to -0.55	-0.97
Webster	4	-0.33 to +0.04	-0.16
Winn	4	-0.58 to -0.26	-0.42

¹Data for this county comprises hydrographs for two wells with the same annual average rise/decline in water level.

AA. ARKANSAS COUNTY, WELL 03S05W18CAB1



AB. BRADLEY COUNTY, WELL 16S12W21CAA1

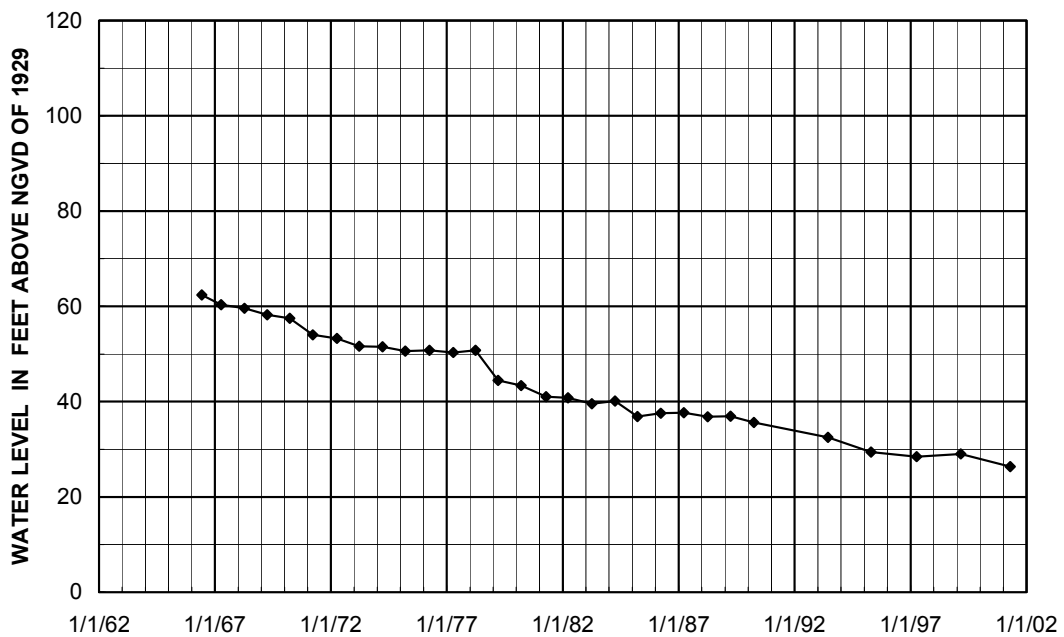


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.

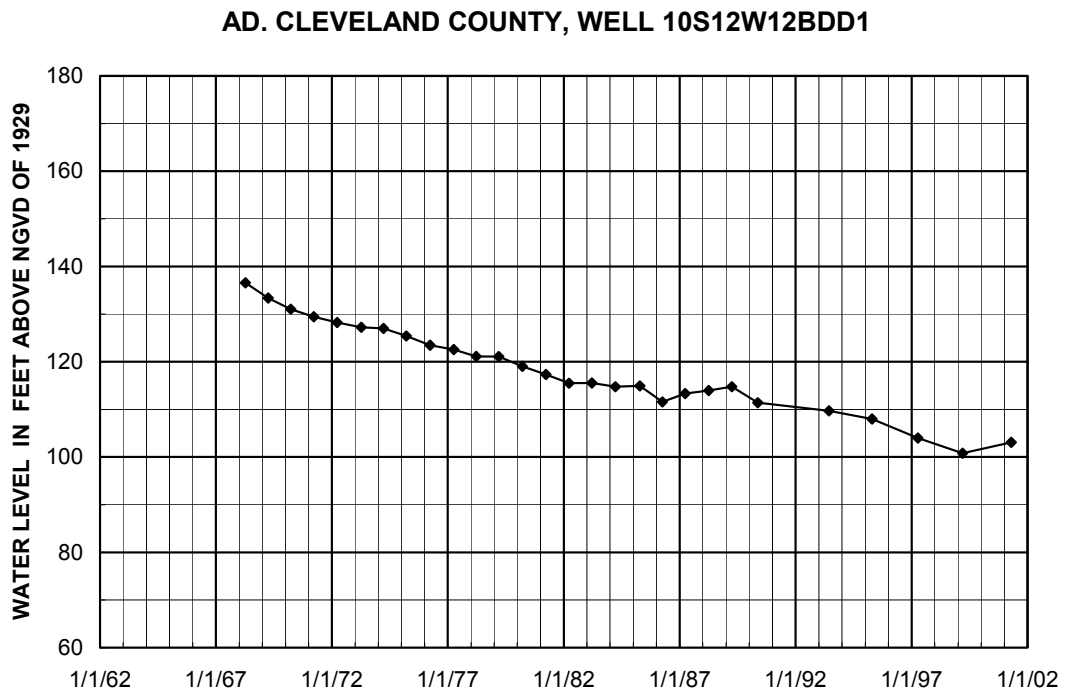
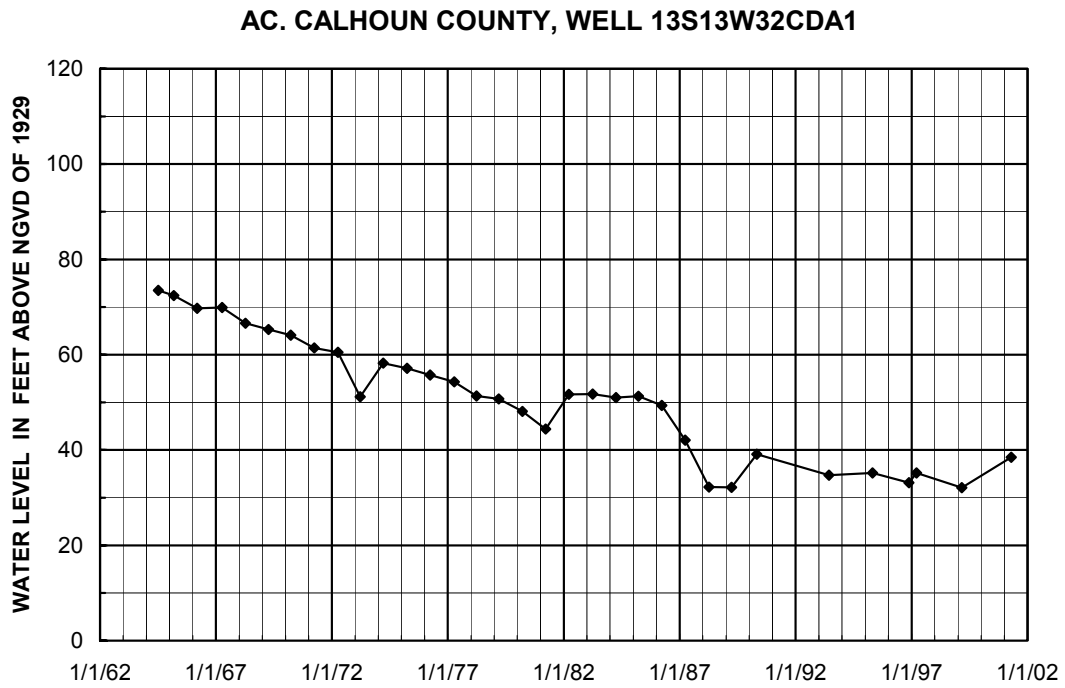


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

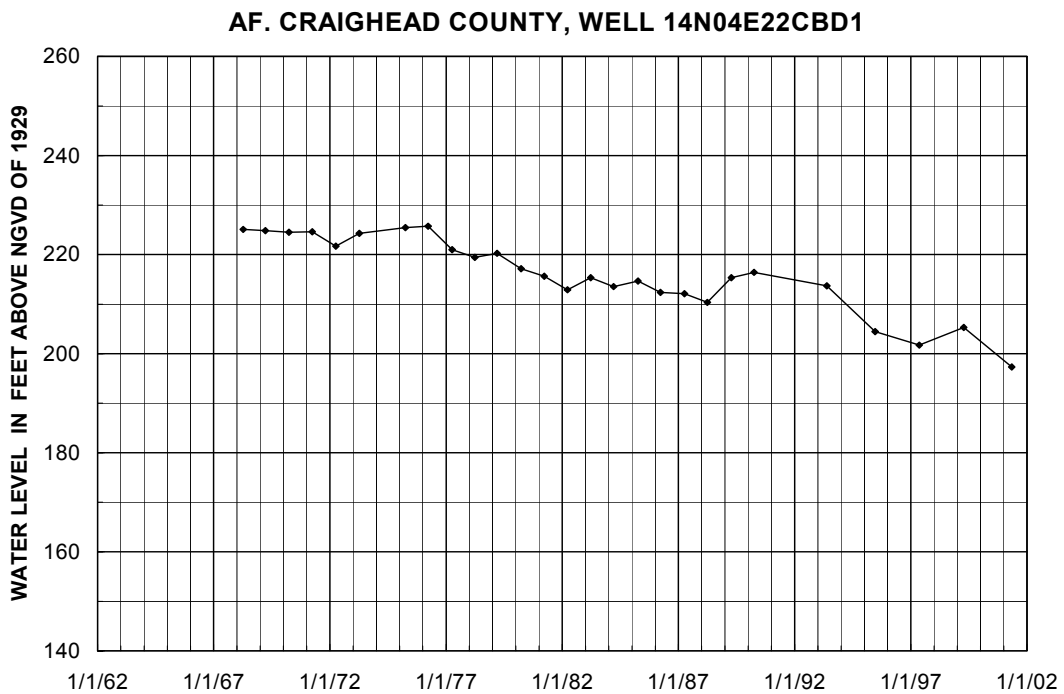
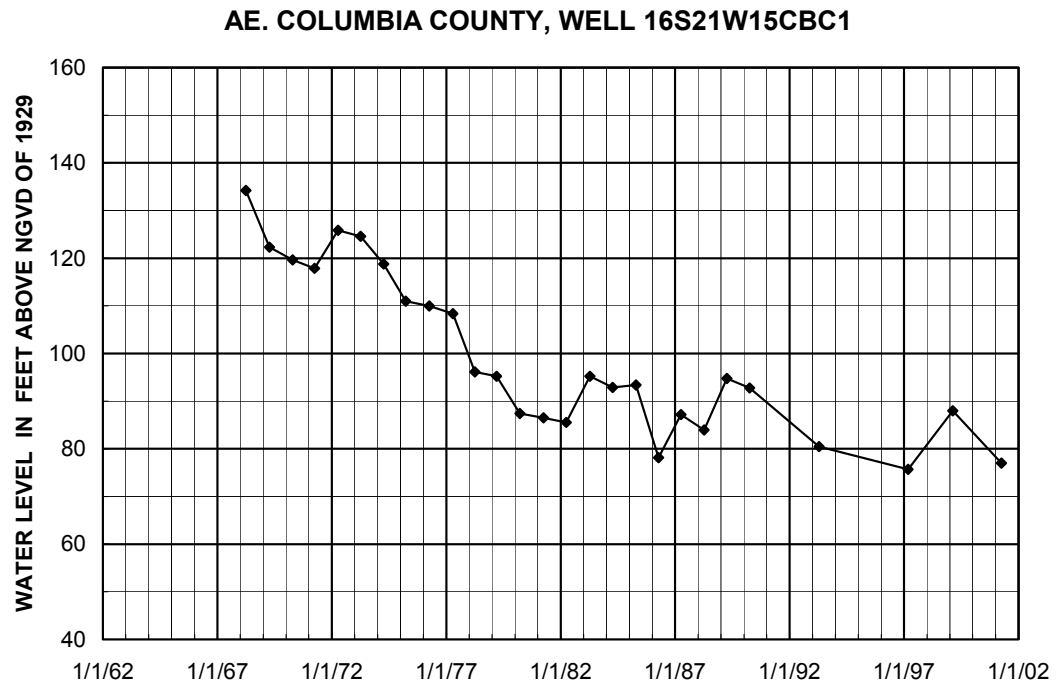


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

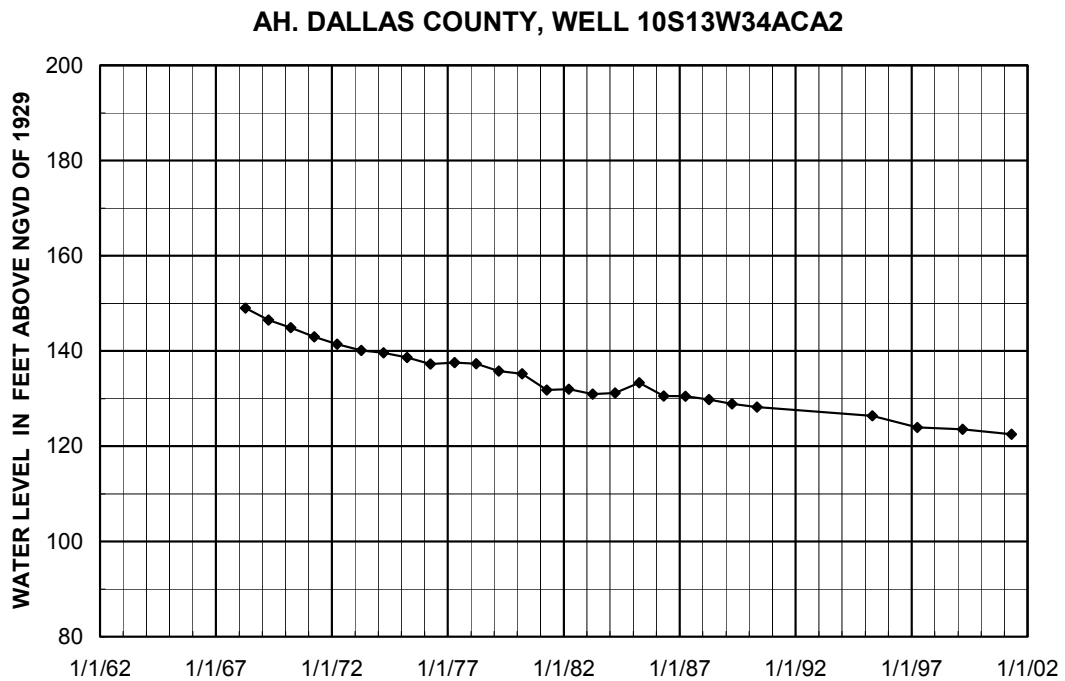
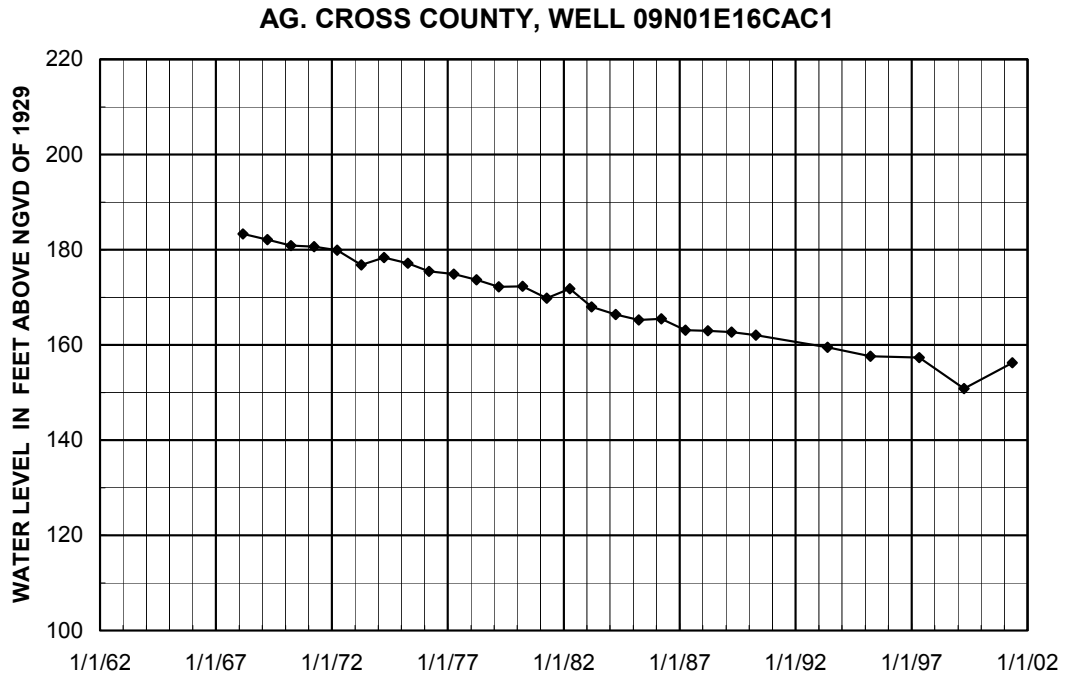


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

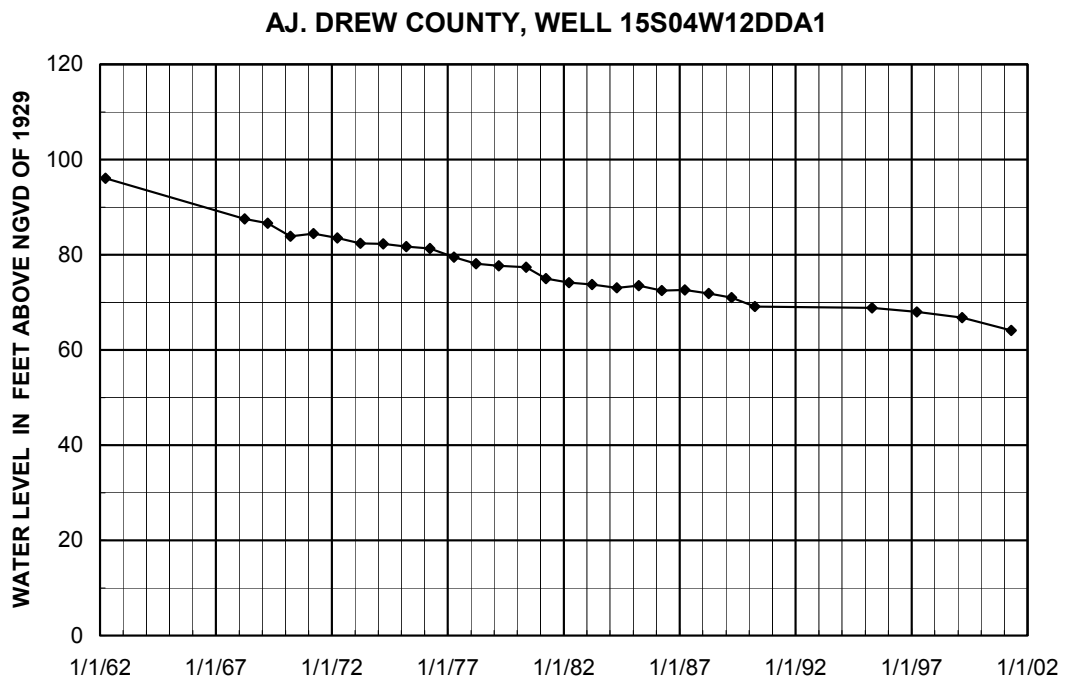
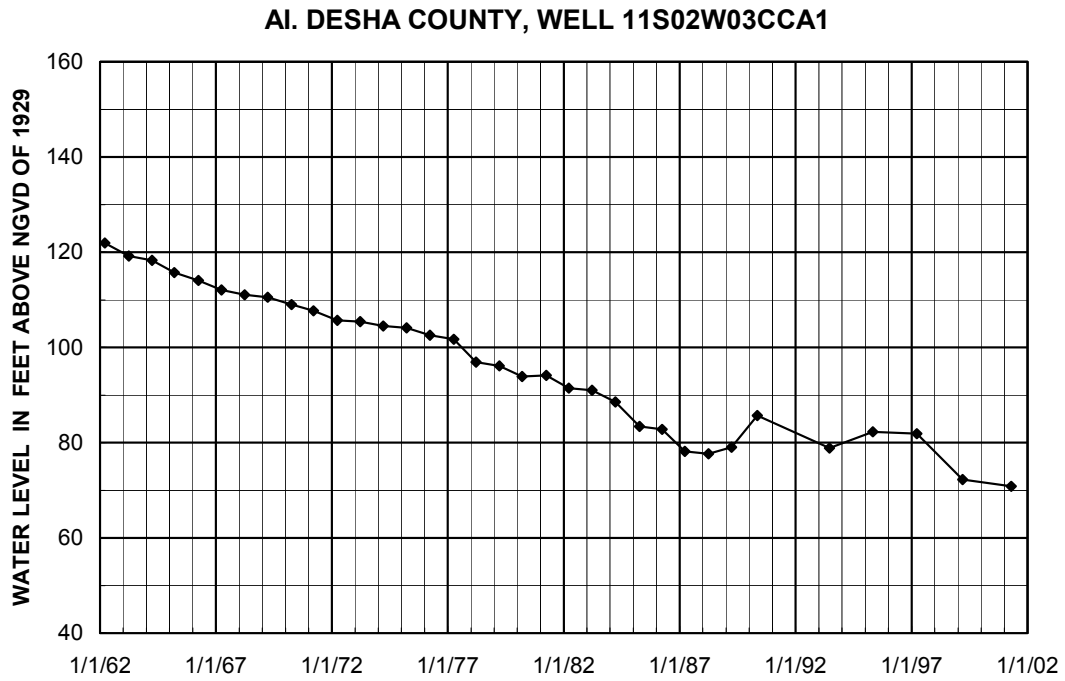


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

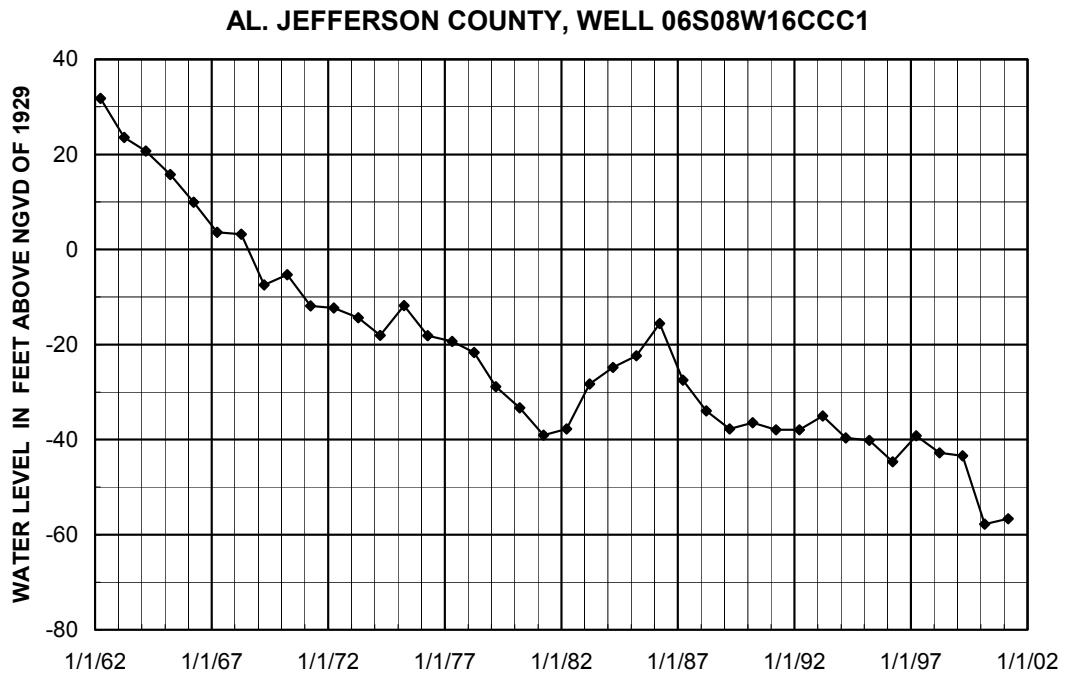
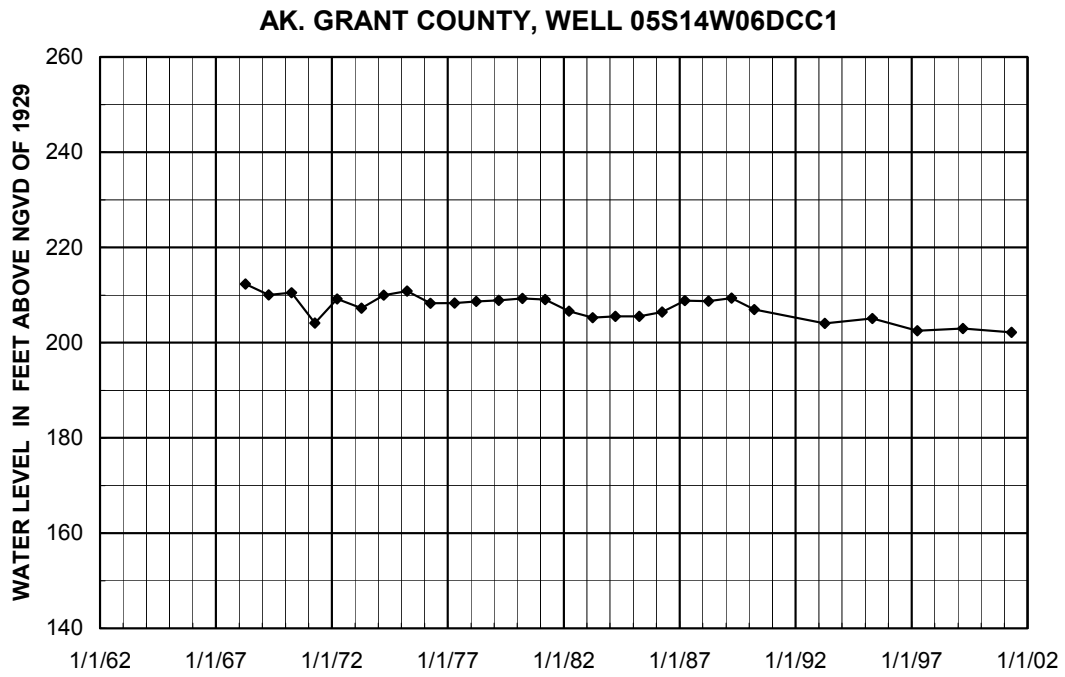
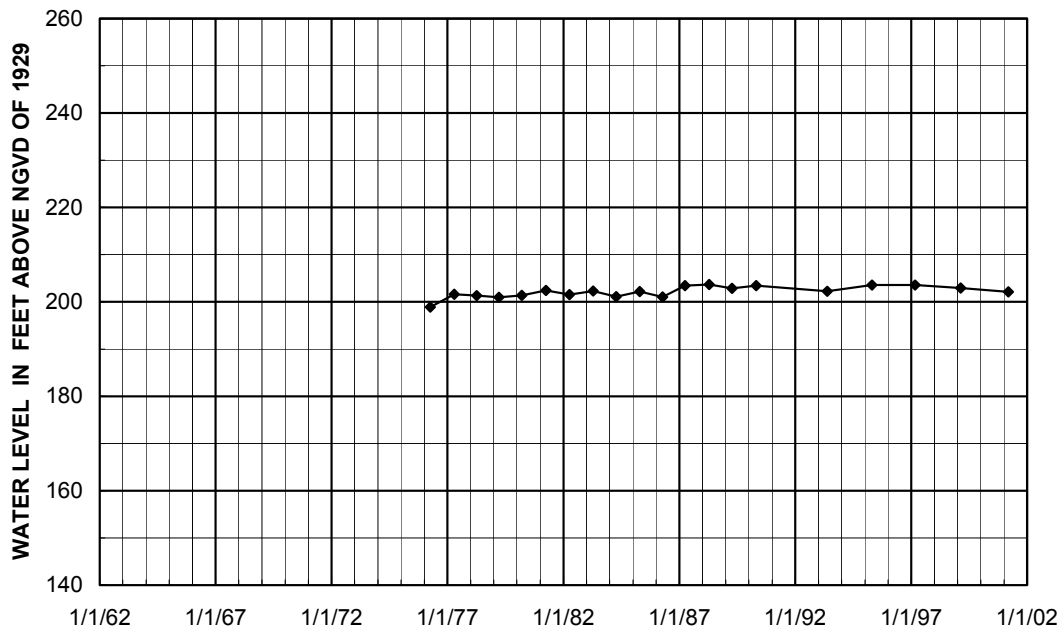


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

AM. LAFAYETTE COUNTY, WELL 20S23W05ADB1



AN. LEE COUNTY, WELL 03N03E28CDB1

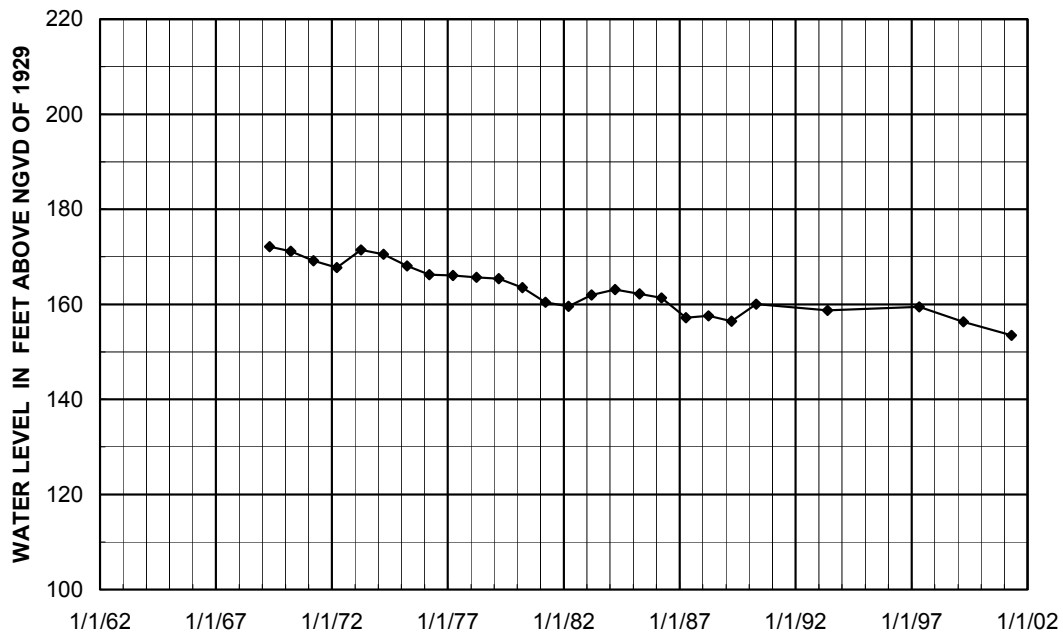


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

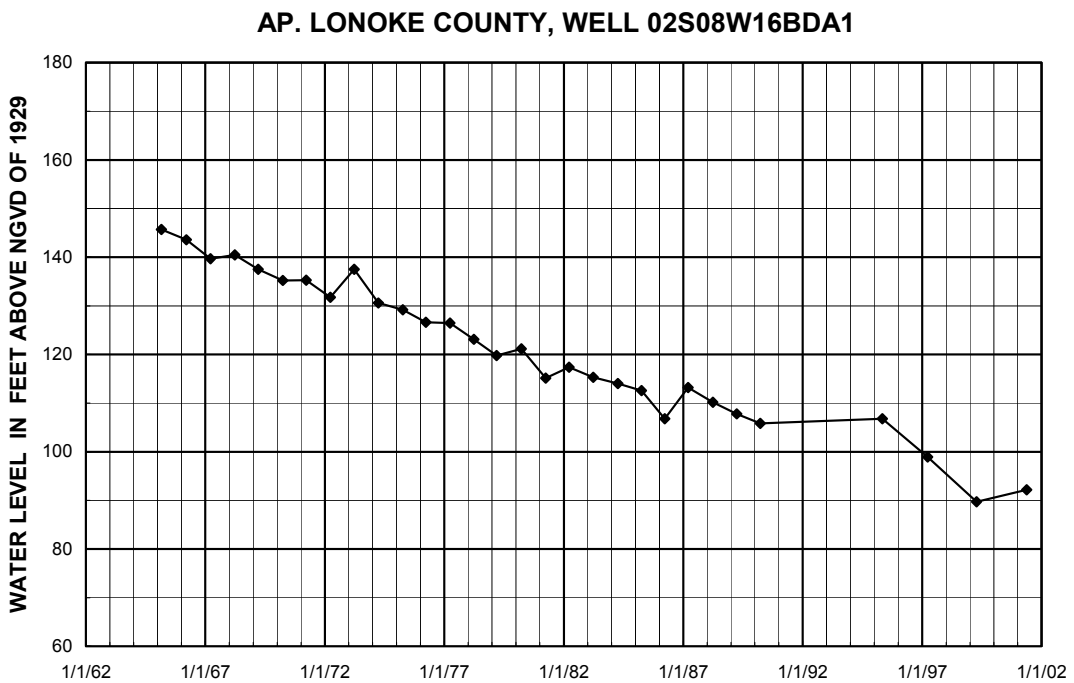
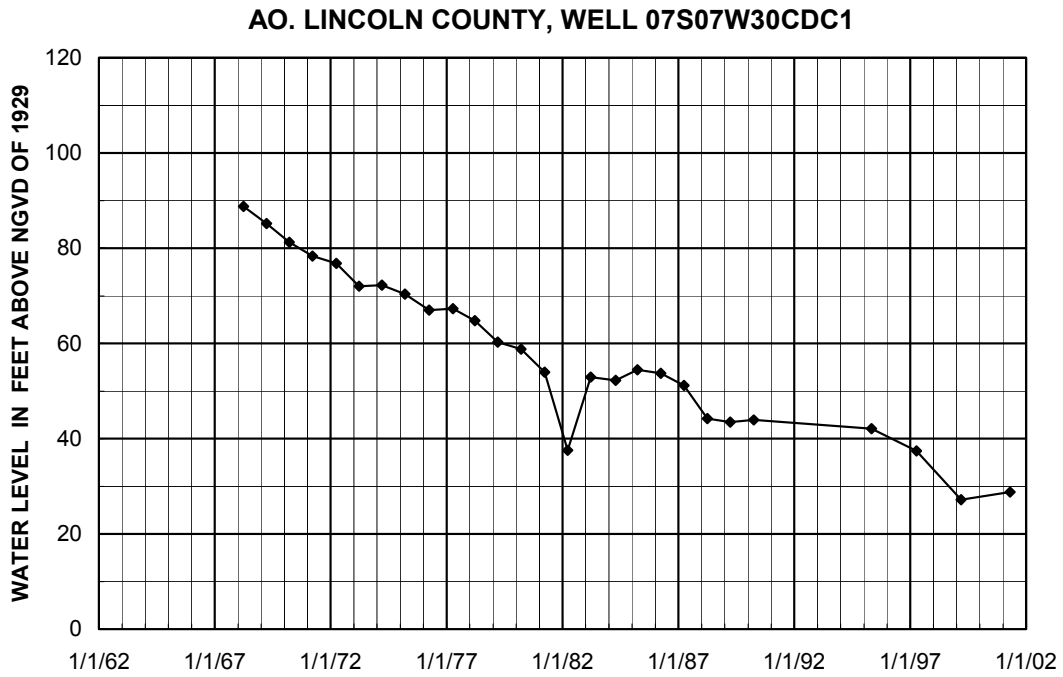


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

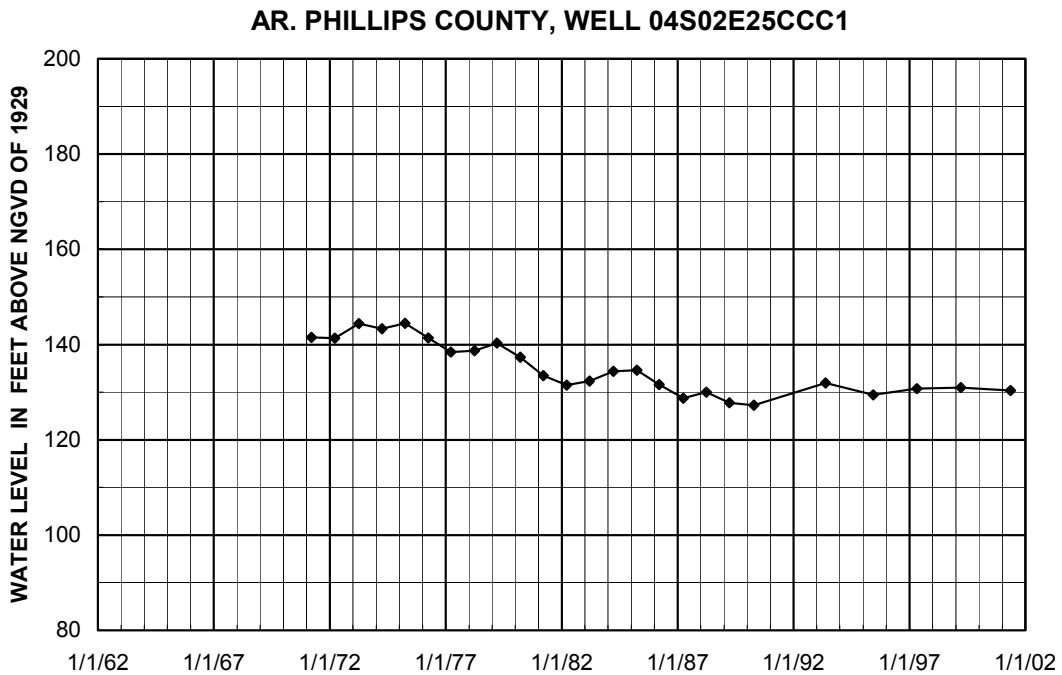
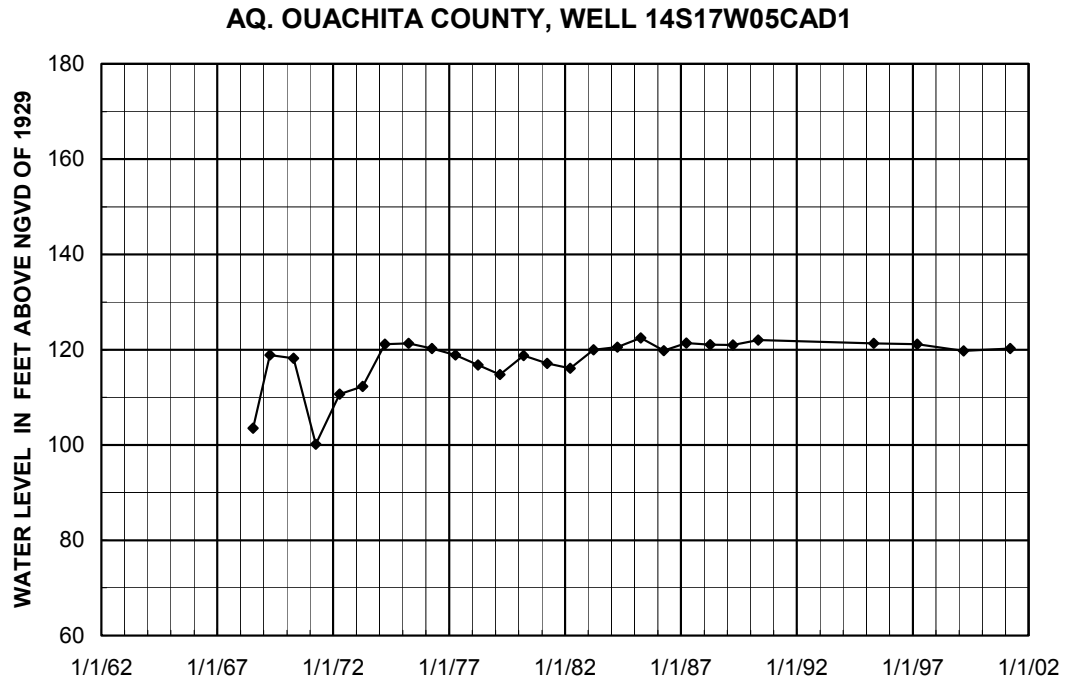


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

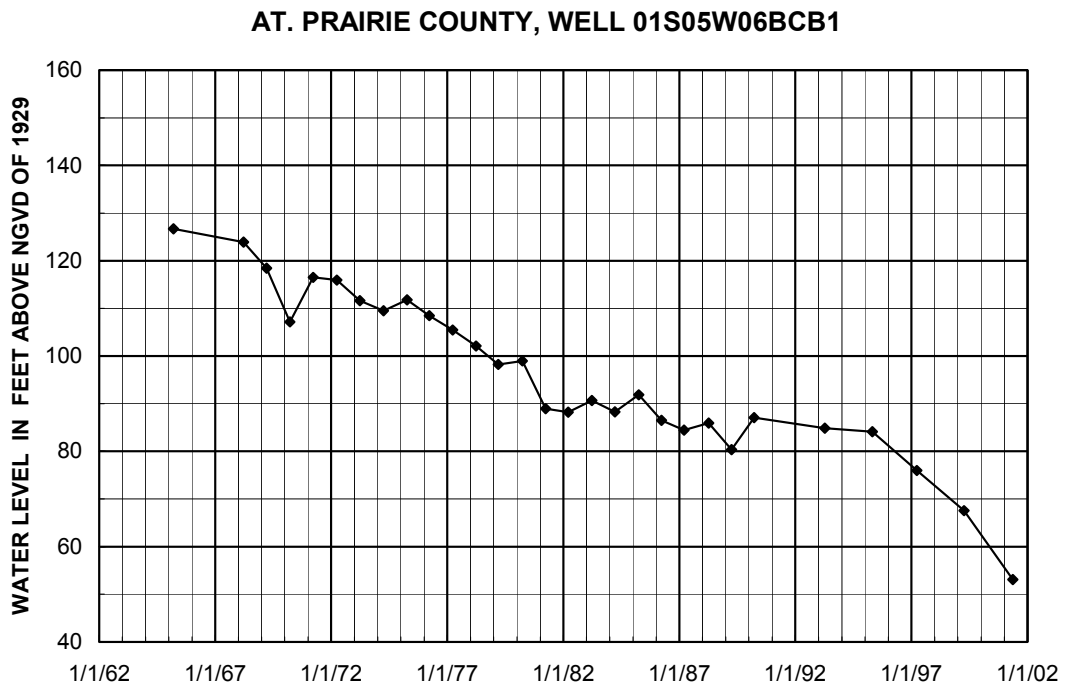
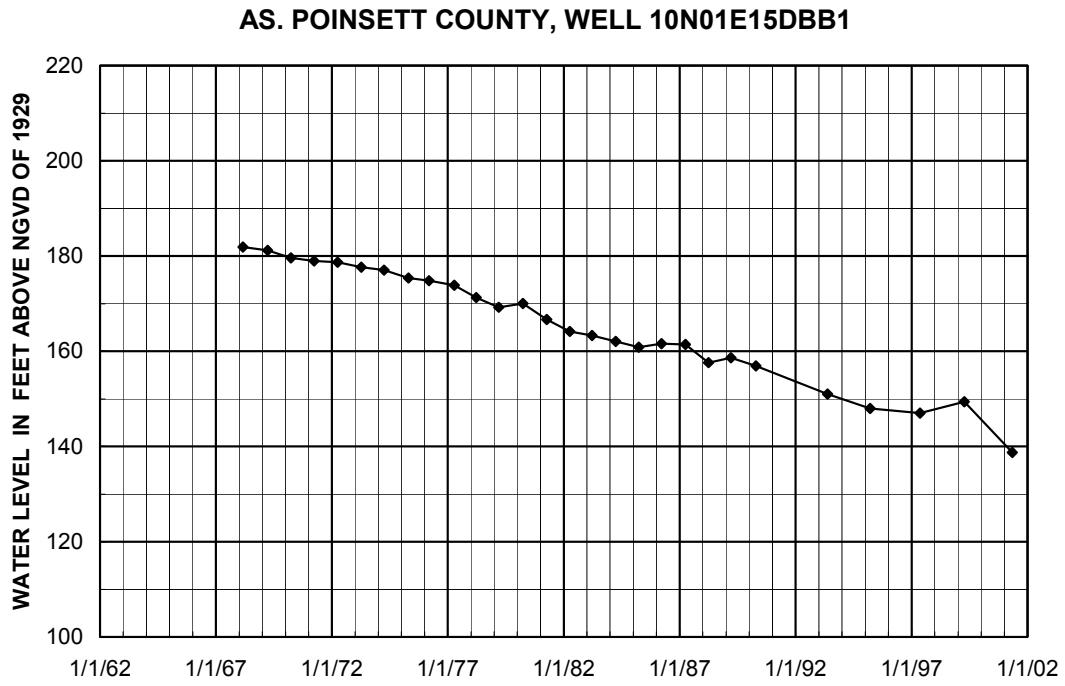


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

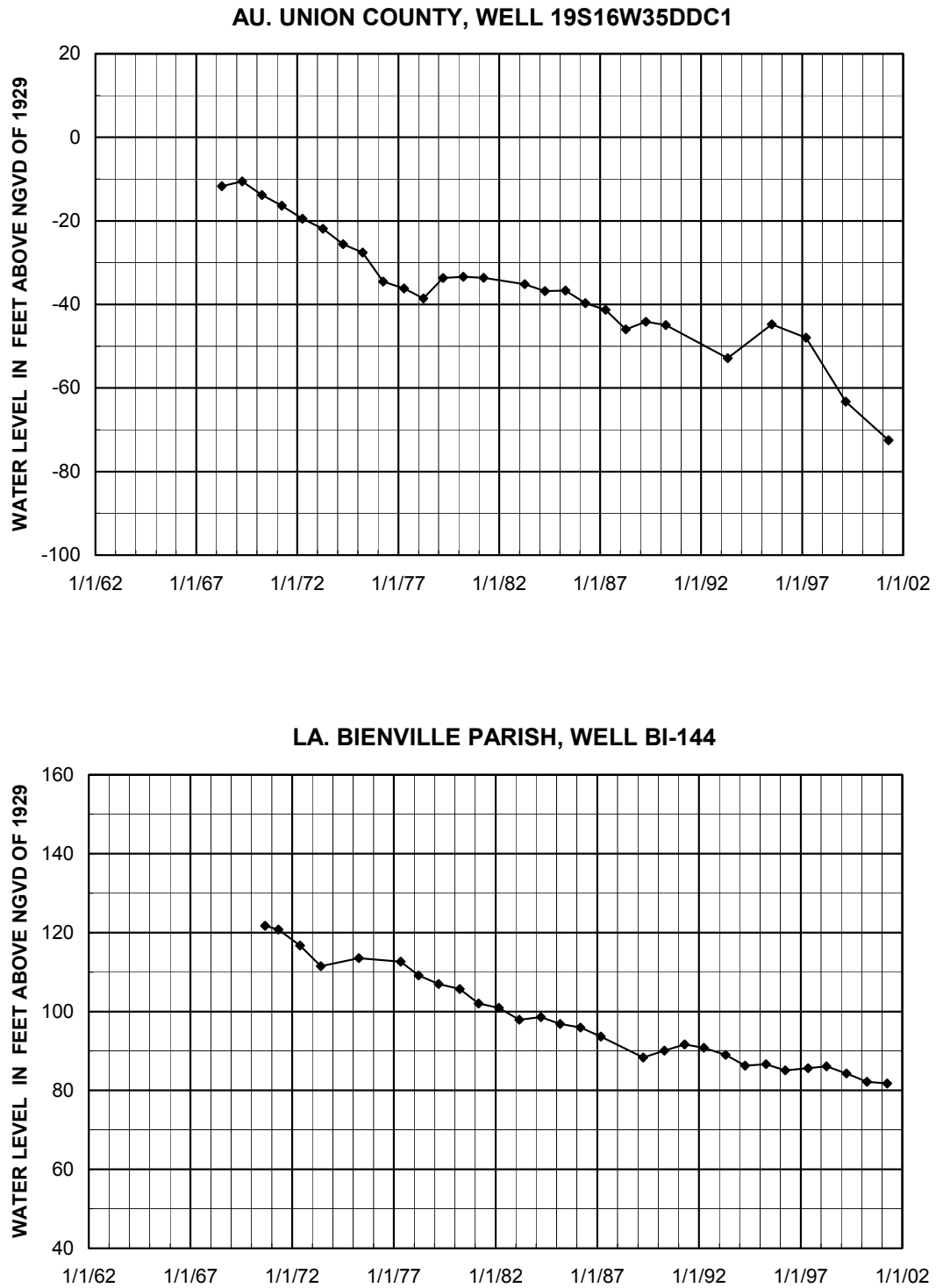


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

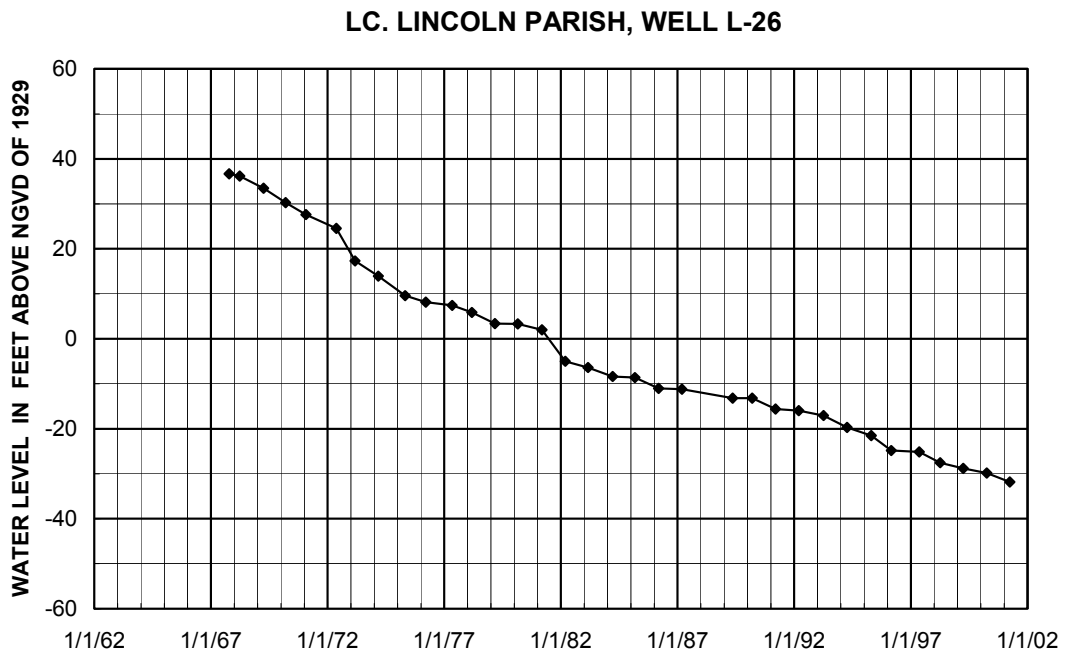
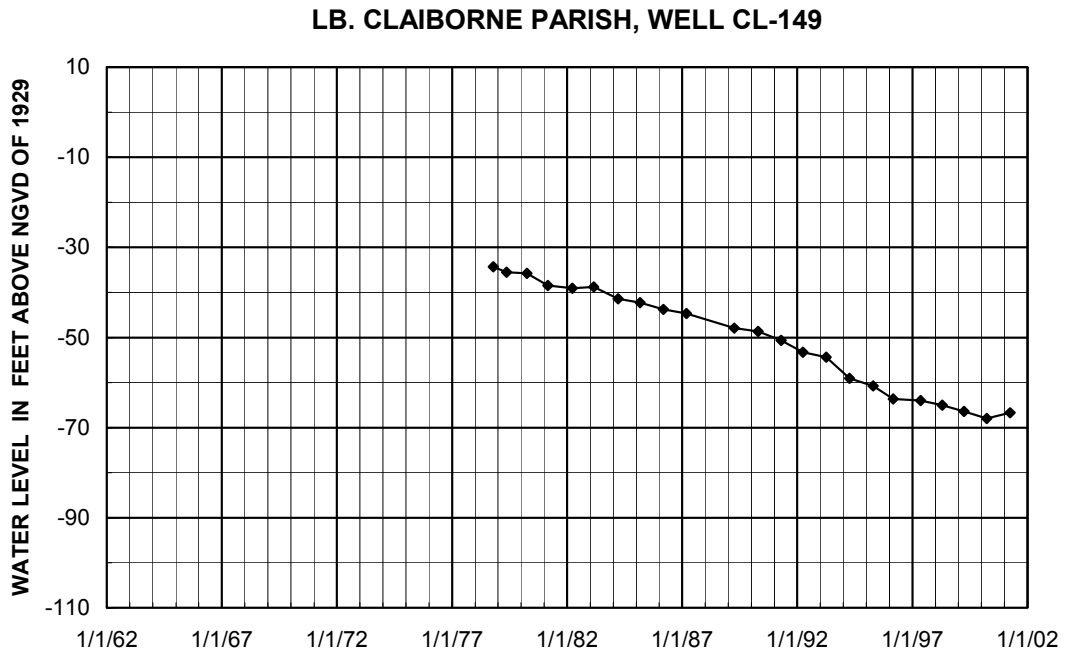
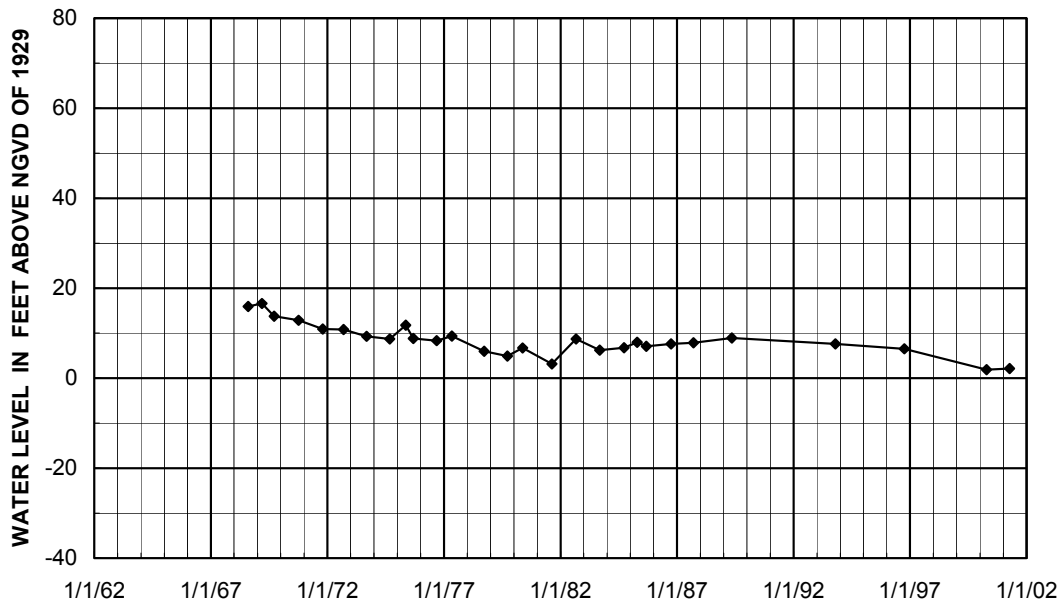


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

LD. MOREHOUSE PARISH, WELL MO-350



LE. OUACHITA PARISH, WELL OU-444

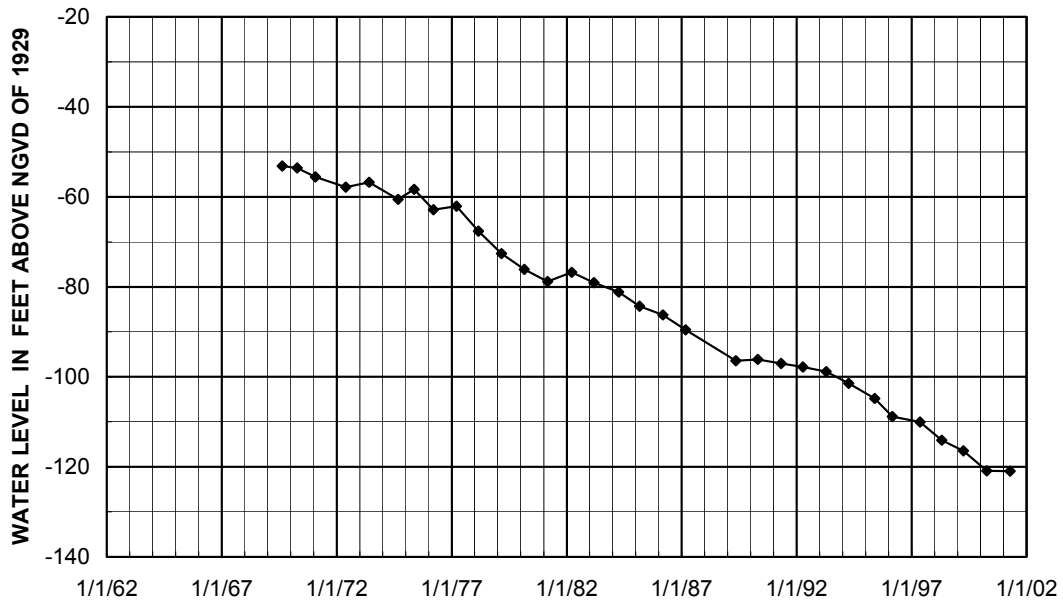


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

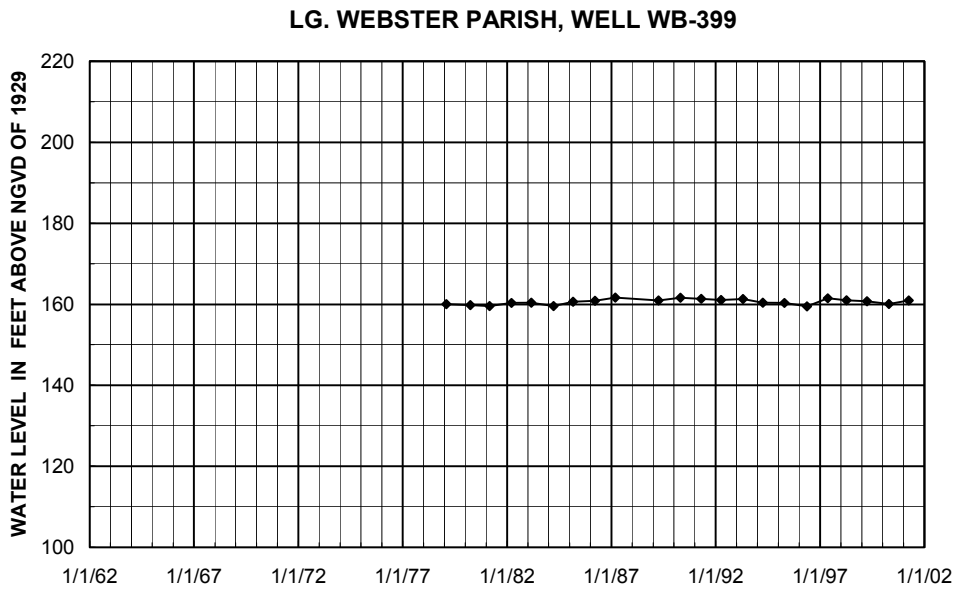
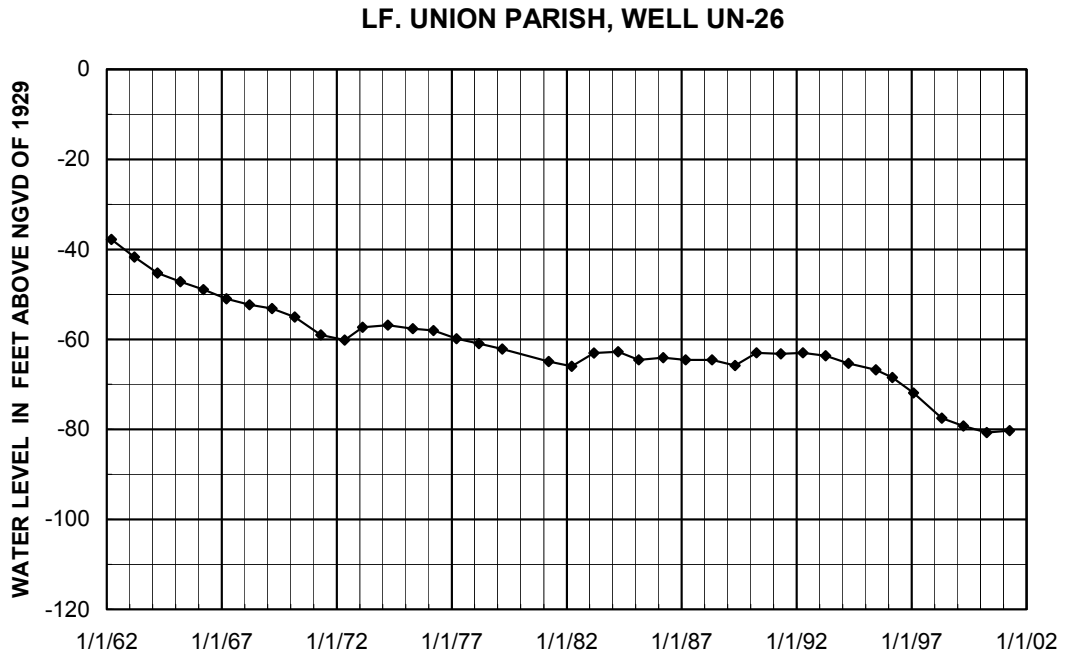


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

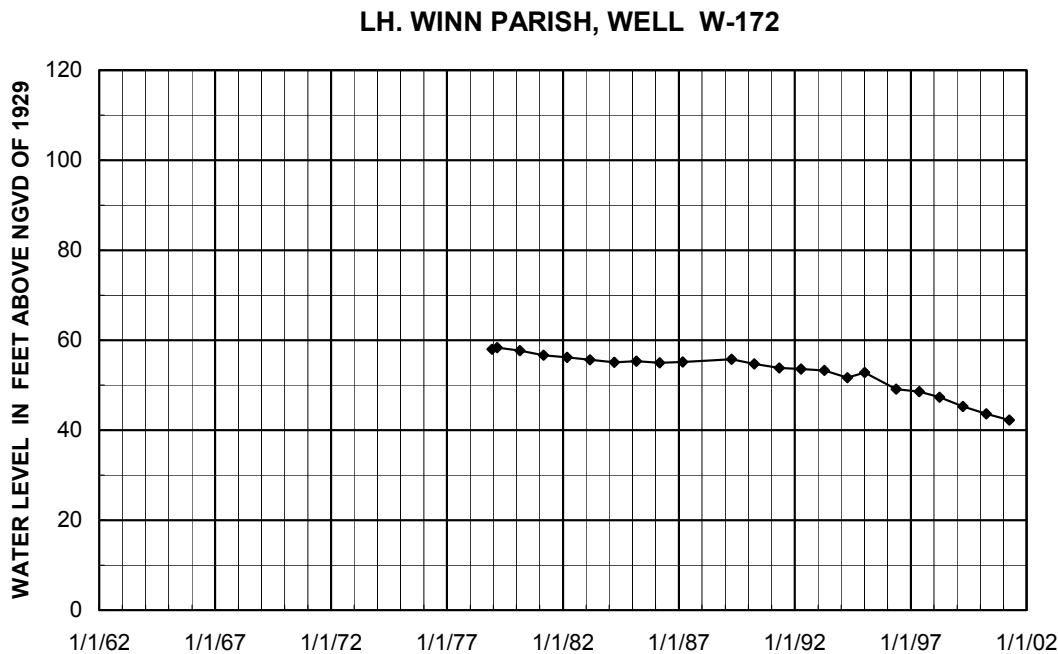


Figure 3. Water-level hydrographs for selected wells completed in the Sparta-Memphis aquifer.—Continued

During the period 1976-2001, the median values for the annual water-level rise were between 0.0 ft/yr and 0.3 ft/yr in Lafayette, Ouachita, and Woodruff Counties in Arkansas and Morehouse Parish in Louisiana. Median values for the annual declines were between -0.5 ft/yr and 0.0 ft/yr in Grant, Lee, and Phillips Counties in Arkansas and Webster and Winn Parishes in Louisiana. Median values for the annual declines were between -1.0 ft/yr and -0.5 ft/yr in Bradley, Calhoun, Columbia, Craighead, Cross, Dallas, and Drew Counties in Arkansas and Bienville, Claiborne, and Union Parishes in Louisiana. Median values for the annual declines were between -1.6 ft/yr and -1.0 ft/yr in Arkansas, Cleveland, Desha, Jefferson, Lincoln, Lonoke, Poinsett, Prairie, and Union Counties in Arkansas and Lincoln and Ouachita Parishes in Louisiana.

Specific Conductance and Dissolved Chloride In Arkansas

Water samples were collected from 150 wells and measured on-site for specific conductance and temperature and analyzed for dissolved chloride in 87 wells in Arkansas (table 4). Wells were pumped until the water temperature stabilized before samples were collected. Water-quality samples were not collected at well sites in Louisiana.

The specific conductance map (plate 3) shows lines of equal specific conductance of ground water in the Sparta-Mem-

phis aquifer, in microsiemens per centimeter at 25 degrees Celsius ($\mu\text{S}/\text{cm}$). Specific conductance data indicate regionally diverse zones of mineralized water within the aquifers across the study area. Specific conductance ranged from 16.8 $\mu\text{S}/\text{cm}$ in Ouachita County to about 1,470 $\mu\text{S}/\text{cm}$ in Lee County (table 4). The median specific conductance was 340 $\mu\text{S}/\text{cm}$. Along the western border of the Sparta-Memphis aquifer in Arkansas near the outcrop area, ground water has low specific conductance—generally less than 200 $\mu\text{S}/\text{cm}$. Specific conductance increases to the east and south. This gradual increase of specific conductance to the south continues to the Louisiana State line with a greater increase corresponding to the cones of depression in Union and Columbia Counties. This increase in specific conductance may be because of leakage of water with greater conductance from an underlying aquifer. A previous study documented several specific conductance values greater than 2,000 $\mu\text{S}/\text{cm}$ for ground water from the Sparta aquifer in Union County in 1984 (Broom and others, 1984).

Elevated levels of specific conductance occur in Arkansas, Lee, Phillips, and Union Counties where values exceeded 1,000 $\mu\text{S}/\text{cm}$. “Historic” data recorded anomalous highs in specific conductance ranging from 1,500 to 4,000 $\mu\text{S}/\text{cm}$ near Brinkley, Arkansas, in Monroe County (Morris and Bush, 1986). Morris and Bush (1986) cited upward leakage of saltwater from the Nacatoch aquifer into the Sparta aquifer through a fault or abandoned oil and gas wells as possible explanations for these anomalies.

Table 4. Water-quality data collected during the spring and summer 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas.

[μ S/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; Cl, chloride; --, no data]

Latitude	Longitude	Station name	Aquifer	Date sampled	Specific conductance (μ S/cm)	Temperature (degrees Celsius)	Chloride, dissolved (mg/L as Cl)
Arkansas County							
343312	912849	02S04W06CDB1	Sparta	5/24/2001	411	23.2	--
343044	912355	02S04W23DAA1	Sparta	5/24/2001	575	21.0	--
342900	912852	02S04W31CAB1	Sparta	8/24/2001	427	24.0	--
342933	913016	02S05W25CCC1	Sparta	5/24/2001	401	24.7	--
343028	913230	02S05W27BBB1	Sparta	4/23/2001	492	23.4	--
342930	913035	02S05W35AAB1	Sparta	5/24/2001	418	22.7	--
343018	912350	02W04W26AAA2	Sparta	8/24/2001	489	24.4	--
342821	912454	03S04W02BBC1	Sparta	6/06/2001	681	24.8	--
342748	912458	03S04W02CCB1	Sparta	7/05/2001	437	23.7	--
342421	912438	03S04W26CDA1	Sparta	3/30/2001	441	23.1	7.8
342842	913034	03S05W02AAB1	Sparta	5/24/2001	428	25.0	--
342633	913229	03S05W15CBB1	Sparta	6/06/2001	355	24.2	--
342629	913525	03S05W18CAB1	Sparta	5/24/2001	360	24.3	--
342516	914216	03S06W30BBD1	Sparta	4/25/2001	358	22.6	--
342225	910808	04S01W04CBD1	Sparta	4/24/2001	904	19.2	130
341927	910748	04S01W28BAA1	Sparta	4/24/2001	1,046	18.5	--
342157	912502	04S04W11BCC	Sparta	8/24/2001	412	24.3	--
341821	913123	04S05W35CBA2	Sparta	6/06/2001	194	24.2	--
341752	913004	04S05W36DCC1	Sparta	8/11/2001	205	25.1	--
341734	912006	05S03W04ADB1	Sparta	3/30/2001	412	23.3	12
340904	911331	06S02W22CDB1	Sparta	3/29/2001	418	22.5	14
340859	912009	06S03W27BAA1	Sparta	3/29/2001	221	18.4	4.8
340340	911411	07S02W28ABA1	Sparta	8/24/2001	285	24.1	--
340702	912248	07S03W06ABC1	Sparta	3/29/2001	195	23.5	3.8
340031	911448	08S02W09BCC1	Sparta	8/24/2001	230	24.0	--
Ashley County							
332118	915101	15S07W32CDD1	Sparta	4/18/2001	897	21.1	35
331334	920116	17S09W15ACC1	Sparta	4/18/2001	718	18.7	110

46 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 4. Water-quality data collected during the spring and summer 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas.—Continued

[μ S/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; Cl, chloride; --, no data]

Latitude	Longitude	Station name	Aquifer	Date sampled	Specific conductance (μ S/cm)	Temperature (degrees Celsius)	Chloride, dissolved (mg/L as Cl)
Bradley County							
333649	920406	13S09W06BDC1	Sparta	4/19/2001	354	23.1	--
332931	920218	14S09W16AAC1	Sparta	6/11/2001	621	24.2	--
Calhoun County							
334633	922929	11S14W12CAC1	Sparta	6/11/2001	193	22.7	--
334630	922928	11S14W12CAC3	Sparta	4/18/2001	191	22.0	--
332627	922742	13S13W32CDA1	Sparta	4/18/2001	424	22.9	11
333227	923532	13S15W36CBD1	Sparta	4/18/2001	285	20.5	8.6
333040	922404	14S13W12CCB1	Sparta	4/18/2001	448	23.5	14
333055	923912	14S15W16BAA1	Sparta	4/18/2001	708	18.3	--
Chicot County							
335820	920237	09S09W04BBD1	Sparta	4/19/2001	185	25.2	1.9
335729	921134	09S11W01DCA1	Sparta	4/19/2001	284	22.9	3.8
334918	920021	10S09W23CDC1	Sparta	4/19/2001	191	24.2	1.9
334543	921423	11S11W16AAB1	Sparta	4/19/2001	371	24.3	5.9
Columbia County							
332453	931215	15S20W20CCB1	Sparta	4/02/2001	300	17.4	--
332053	931237	16S20W18ACD1	Sparta	4/02/2001	371	21.6	--
331545	930318	17S19W15AAB1	Sparta	4/04/2001	443	22.6	9.6
331520	931201	17S20W17CDA1	Sparta	4/04/2001	233	21.8	9.6
331143	931249	18S20W06DDC1	Sparta	4/03/2001	294	22.9	12
331039	931255	18S20W18ABD1	Sparta	4/03/2001	266	23.9	--
331034	931759	18S21W17ACD1	Sparta	4/03/2001	240	22.7	--
330835	932159	18S22W27DDD1	Sparta	4/03/2001	140	22.0	3.1
330556	931129	19S20W09CAC1	Sparta	4/03/2001	231	23.1	3.5
330605	932722	19S23W11DDB1	Sparta	4/02/2001	204	23.1	7.6
Craighead County							
354929	903921	14N04E22CBD1	Memphis	5/07/2001	147	17.2	12
354837	903953	14N04E28DBD1	Memphis	5/07/2001	171	17.2	11

Table 4. Water-quality data collected during the spring and summer 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas.—Continued

[μ S/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; Cl, chloride; --, no data]

Latitude	Longitude	Station name	Aquifer	Date sampled	Specific conductance (μ S/cm)	Temperature (degrees Celsius)	Chloride, dissolved (mg/L as Cl)
Crittenden County							
350745	900553	06N09E23AAB1	Memphis	5/09/2001	295	21.2	25
Cross County							
351538	903330	07N05E04ADD1	Memphis	5/09/2001	224	19.4	--
352405	905951	09N01E16CAC1	Memphis	5/08/2001	528	18.5	9.3
352403	904512	09N03E22AAD1	Memphis	5/08/2001	368	20.5	--
352404	904518	09N03E22ABD1	Memphis	5/08/2001	368	17.9	3.6
352232	904218	09N04E30DCA1	Memphis	5/08/2001	507	22.6	6.3
Dallas County							
340425	923334	07S14W31AAA1	Sparta	4/23/2001	134	21.3	5.7
340152	924639	08S16W18ACC1	Sparta	4/23/2001	51	14.5	6.3
335605	924701	09S16W19CAA1	Sparta	4/23/2001	66	18.4	2.1
334829	922458	10S13W34ACA2	Sparta	4/11/2001	269	23.8	5.8
334908	923138	10S14W27CDB1	Sparta	4/23/2001	193	22.0	14
Desha County							
335346	911521	09S02W26AAC1	Sparta	4/19/2001	248	22.9	10
335034	912905	10S04W11CBC1	Sparta	4/20/2001	255	25.3	2.8
334225	911415	11S01W31BBB1	Sparta	4/19/2001	302	23.4	8
333629	911244	12S01W32CDB1	Sparta	4/19/2001	376	21.9	16
333749	912259	12S03W26CBB1	Sparta	4/19/2001	422	24.3	--
333643	912305	12S03W34DAD1	Sparta	4/19/2001	378	24.3	9.4
Drew County							
334249	912707	11S04W25DAA1	Sparta	4/19/2001	349	21.3	--
334352	913724	11S05W21CDC1	Sparta	4/19/2001	303	15.4	--
334450	914905	11S07W22BBC1	Sparta	4/18/2001	207	27.0	--
333807	914543	12S06W30BBD1	Sparta	4/19/2001	268	21.6	4.0
333151	913408	13S05W36ACB1	Sparta	4/18/2001	340	24.3	--
Grant County							
342201	922931	04S14W14DCD1	Sparta	4/24/2001	117	19.0	7.5
341845	922359	05S13W03DBC1	Sparta	4/24/2001	71	21.5	4.7

48 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 4. Water-quality data collected during the spring and summer 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas.—Continued

[μ S/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; Cl, chloride; --, no data]

Latitude	Longitude	Station name	Aquifer	Date sampled	Specific conductance (μ S/cm)	Temperature (degrees Celsius)	Chloride, dissolved (mg/L as Cl)
341843	923327	05S14W06DCC1	Sparta	4/24/2001	94	20.4	5.2
341924	923827	05S15W05ABD1	Sparta	4/24/2001	94	19.7	5.8
341341	921414	06S11W05ACA1	Sparta	4/25/2001	132	26.3	2.6
341022	923538	06S15W26ACA1	Sparta	4/24/2001	94	18.4	4.9
Jefferson County							
342502	920434	03S10W27AAD1	Sparta	4/27/2001	87	21.8	--
342651	921058	03S11W22ABC1	Sparta	4/25/2001	100	21.5	2.0
342140	914742	04S07W17BCC1	Sparta	4/27/2001	149	23.5	1.7
341909	915056	04S08W35BBD1	Sparta	4/27/2001	150	23.8	--
342220	921000	04S11W14BAD1	Sparta	4/25/2001	96	24.0	3.2
341337	920109	05S09W31DDC1	Sparta	8/11/2001	160	24.3	--
341635	920543	05S10W16DBB1	Sparta	4/25/2001	95	24.6	2.7
341634	920534	05S10W16DBD1	Sparta	4/25/2001	123	23.0	2.9
341159	920207	06S09W17CAD1	Sparta	4/26/2001	148	25.9	--
341123	920504	06S10W23ACA2	Sparta	4/26/2001	170	26.5	--
341116	920508	06S10W23ACD1	Sparta	4/26/2001	180	25.6	--
341105	920506	06S10W23DBA1	Sparta	4/26/2001	177	25.8	--
Lafayette County							
330352	933103	19S23W29BDB1	Sparta	3/13/2001	376	18.8	--
330223	933036	20S23W05ADB1	Sparta	3/13/2001	278	19.0	--
Lee County							
345006	904749	03N03E28CDB1	Sparta	4/26/2001	1,474	21.2	250
Lincoln County							
340445	914140	07S06W33BAA1	Sparta	4/23/2001	198	24.7	1.7
340444	915043	07S07W30CDC1	Sparta	4/23/2001	210	29.2	1.5
340105	912753	08S04W22AAA1	Sparta	4/20/2001	238	17.3	4.3
340310	913454	08S05W03BAA2	Sparta	4/23/2001	206	25.1	2.9
335907	913333	08S05W35ACC1	Sparta	4/20/2001	236	23.3	6.4
335858	915222	08S08W35DBB1	Sparta	5/29/2001	199	27.6	2.3
335851	915217	08S08W35DCB1	Sparta	4/23/2001	200	27.4	1.4

Table 4. Water-quality data collected during the spring and summer 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; Cl, chloride; --, no data]

Latitude	Longitude	Station name	Aquifer	Date sampled	Specific conductance ($\mu\text{S/cm}$)	Temperature (degrees Celsius)	Chloride, dissolved (mg/L as Cl)
335634	915128	09S07W07DAD1	Sparta	4/23/2001	204	20.4	--
Lonoke County							
344906	914500	02N07W09AAA1	Sparta	6/25/2001	385	20.9	--
344453	914619	02N07W32DDD1	Sparta	6/04/2001	461	20.2	--
344710	915330	02N08W20BCA1	Sparta	6/04/2001	378	20.6	--
344708	915335	02N08W20BCD1	Sparta	6/25/2001	382	19.9	--
343235	914700	02S07W08DCC1	Sparta	5/23/2001	404	22.4	4.6
345152	915025	03N08W23DDD1	Memphis	8/15/2001	281	20.3	--
Miller County							
330311	935156	19S27W35DDA1	Sparta	3/13/2001	108	19.0	--
Monroe County							
344144	911801	01N03W14CCB1	Sparta	4/26/2001	938	19.8	140
343601	911158	01S02W22ADB1	Sparta	4/26/2001	866	21.8	70
345617	911504	04N02W30BAC1	Memphis	4/26/2001	197	17.4	--
345617	911515	04N02W30BAD1	Memphis	4/26/2001	483	17.3	110
Nevada County							
333251	931708	14S21W04CCB1	Sparta	3/14/2001	148	15.1	7.6
333050	931723	14S21W20AAB1	Sparta	3/14/2001	206	19.4	9.9
Ouachita County							
334143	930105	12S19W14AAA1	Sparta	3/14/2001	35.0	16.7	3.1
333434	930418	13S19W28BCD1	Sparta	3/14/2001	46.0	13.9	3.3
332553	924716	15S16W07DDC1	112TRRC	3/16/2001	16.8	31.0	1.8
332311	925436	15S18W36ADD1	Sparta	3/16/2001	382	10.9	12
332618	930318	15S19W10DCC1	Sparta	3/15/2001	191	20.8	5.3
Phillips County							
343323	904621	01S03E34DDC1	Sparta	6/07/2001	732	20.6	--
343323	905056	02S02E01ADC1	Sparta	5/09/2001	988	20.6	71
342755	903621	03S05E05BAB1	Sparta	5/10/2001	814	19.4	29
341824	905121	04S02E25CCC1	Sparta	5/10/2001	1,228	22.6	160

50 Status of Water Levels and Selected Water-Quality Conditions in the Sparta-Memphis Aquifer in Arkansas and the Sparta Aquifer in Louisiana, Spring-Summer 2001

Table 4. Water-quality data collected during the spring and summer 2001 from wells completed in the Sparta-Memphis aquifer in Arkansas.—Continued

[μ S/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; Cl, chloride; --, no data]

Latitude	Longitude	Station name	Aquifer	Date sampled	Specific conductance (μ S/cm)	Temperature (degrees Celsius)	Chloride, dissolved (mg/L as Cl)
Poinsett County							
353325	904323	11N03E25BDD1	Memphis	5/08/2001	466	18.5	5.1
Prairie County							
344649	912802	02N04W19ACB1	Sparta	6/05/2001	549	21.8	--
344707	914033	02N06W20BCB1	Sparta	6/04/2001	350	21.6	--
344644	913829	02N06W21DAD1	Sparta	5/15/2001	495	20.8	16
344654	913801	02N06W22BDD1	Sparta	6/25/2001	582	21.4	--
Union County							
331944	923218	16S14W15CAB1	Sparta	4/18/2001	608	20.9	61
331860	923958	16S15W20DAA2	Sparta	4/16/2001	511	23.5	32
331805	925709	16S18W34ABC2	Sparta	4/16/2001	331	22.5	5.9
331203	922218	17S12W32BBC1	Sparta	4/18/2001	894	20.6	--
331203	922218	17S12W32BBC1	Sparta	6/14/2001	882	26.3	--
331200	922916	17S13W31BAC1	Sparta	4/16/2001	680	20.0	73
331233	923924	17S15W28DCC1	Sparta	4/17/2001	456	23.4	--
331358	924243	17S16W24BD2	Sparta	4/17/2001	427	23.7	23
331357	924248	17S16W24BDB1	Sparta	6/11/2001	433	21.7	--
331300	925356	17S17W30DCD1	Sparta	4/16/2001	333	23.5	9.6
331040	923531	18S14W06CCA1	Sparta	4/16/2001	728	25.1	80
330659	923858	18S15W33ADA1	Sparta	4/16/2001	661	24.2	91
330636	923707	18S15W35DAC1	Sparta	4/16/2001	727	23.5	100
331011	924317	18S16W11DAB1	Sparta	4/13/2001	546	22.1	34
331029	924232	18S16W12ACB1	Sparta	4/13/2001	585	21.8	32
330809	924611	18S16W28BBB1	Sparta	4/13/2001	552	21.8	26
331057	925559	18S18W11ACA1	Sparta	4/17/2001	399	21.4	12
330219	921113	19S11W25AAA1	Sparta	4/16/2001	1,155	23.1	220
330535	923645	19S15W01CCA1	Sparta	4/17/2001	330	18.7	--
330057	924327	20S16W02AAC1	Sparta	4/13/2001	426	20.7	--
Woodruff County							
350027	911456	05N02W31DCB3	Memphis	5/10/2001	225	18.5	1.6

Dissolved chloride concentrations (table 4) ranged from 1.4 mg/L at a well in Lincoln County to 250 mg/L at a well in Lee County. The median dissolved chloride concentration of the 88 samples collected was 7.7 mg/L. Dissolved chloride concentrations greater than 30 mg/L generally coincided with water samples that had specific conductance measurements greater than 700 $\mu\text{S}/\text{cm}$. Elevated dissolved chloride and specific conductance values generally were associated with wells located in areas where previous studies have documented elevated specific conductance values.

Summary

During the spring of 2001, water levels were measured in 427 wells, 338 in Arkansas and 89 in Louisiana, in the Sparta-Memphis aquifer in Arkansas and the Sparta aquifer in Louisiana. Water-quality samples were collected for temperature and specific conductance during the spring and summer of 2001 from 150 wells in Arkansas in the Sparta-Memphis aquifer. Dissolved chloride samples were collected and analyzed for 87 of the 150 wells. Water-quality samples were not collected in Louisiana. Maps of areal distribution of potentiometric surface, difference in water-level measurements from 1997 to 2001, and specific conductance reveal spatial trends across the study area. The highest water-level altitude measured in Arkansas was 328 feet above NGVD of 1929 in Grant County; the lowest water-level altitude was 197 feet below NGVD of 1929 in Union County. The highest water-level altitude measured in Louisiana was 235 feet above NGVD of 1929 in Bienville Parish; the lowest water-level altitude was 218 feet below NGVD of 1929 in Ouachita Parish.

The regional direction of ground-water flow in the Sparta-Memphis aquifer in Arkansas generally is to the south-southwest in the northern half of Arkansas and to the east and south in the southern half of Arkansas; the ground-water flow in the Sparta aquifer in northern Louisiana generally is in an easterly direction toward the Mississippi River. The 2001 potentiometric surface indicates that large ground-water withdrawals have altered or reversed the natural direction of flow in some areas. Flow in these areas is toward the cone of depression at the center of pumping. Four cones of depression are shown in the 2001 potentiometric-surface map, centered in Columbia, Jefferson, and Union Counties in Arkansas and Ouachita Parish in Louisiana as a result of large withdrawals for industrial and public supplies. The cones of depression in Columbia and Union Counties are elongated to the east and west because of large industrial withdrawals and coalesce at or near the Columbia and Union County line. The cone of depression in Ouachita Parish is elongated to the northwest and coalesces with the Union County cone of depression near the Arkansas-Louisiana State line. A broad depression exists in western Poinsett, Cross, and St. Francis Counties in Arkansas. Four smaller depressions are evident in the 2001 Sparta-Memphis potentiometric-surface map but all were not evident in the 1997 potentiometric-surface

map. These depressions are located in western Lincoln County in Arkansas and western Jackson, southern Lincoln, and Winn Parishes in Louisiana.

The map for water-level changes from 1997 to 2001 was constructed using water-level measurements from 278 wells, 227 in Arkansas and 51 in Louisiana. The largest rise in water level measured in Arkansas was about 35 ft in Prairie County. The largest decline in water level measured in Arkansas was about 93 ft in Columbia County. The largest rise in water level measured in Louisiana was about 23 ft in Jackson Parish. The largest decline in water level measured in Louisiana was about 33 ft in Claiborne Parish. Areas showing substantial declines from 1997 to 2001 are located in an area extending north from Drew County to Craighead County, west to Saline County, and east to near the Mississippi River; northern Columbia County; eastern Calhoun, Ouachita, and Union Counties in Arkansas; and northern Union, Lincoln, Jackson, Ouachita, and Caldwell Parishes in Louisiana. Areas showing substantial rises in water level from 1997 to 2001 are located in an area extending from Cleveland County to Ashley County in Arkansas, and an area from south Columbia County, Arkansas, south-southeast to Winn Parish, Louisiana.

Hydrographs were constructed for wells with a minimum of 25 years of water-level measurements. A trend line using a linear regression was calculated for the period of record from spring 1976 to spring 2001 to determine the annual decline or rise in feet per year for water levels in each well. The hydrographs were grouped by county or parish. The median value for the annual water-level rise was between 0.0 ft/yr and 0.3 ft/yr in Lafayette, Ouachita, and Woodruff Counties in Arkansas and Morehouse Parish in Louisiana. Median values for the annual declines were between -0.5 ft/yr and 0.0 ft/yr in Grant, Lee, and Phillips Counties in Arkansas and Webster and Winn Parishes in Louisiana. Median values for the annual declines were between -1.0 ft/yr and -0.5 ft/yr in Bradley, Calhoun, Columbia, Craighead, Cross, Dallas, and Drew Counties in Arkansas and Bienville, Claiborne, and Union Parishes in Louisiana. Median values for the annual declines were between -1.6 ft/yr and -1.0 ft/yr in Arkansas, Cleveland, Desha, Jefferson, Lincoln, Lonoke, Poinsett, Prairie, and Union Counties in Arkansas and Lincoln and Ouachita Parishes in Louisiana.

Specific conductance ranged from 16.8 $\mu\text{S}/\text{cm}$ in Ouachita County to about 1,470 $\mu\text{S}/\text{cm}$ in Lee County. The median specific conductance was 340 $\mu\text{S}/\text{cm}$. Elevated levels of specific conductance occur in Arkansas, Lee, Phillips, and Union Counties. Dissolved chloride concentrations ranged from 1.4 mg/L at a well in Lincoln County to 250 mg/L at a well in Lee County. The median dissolved chloride concentration was 7.7 mg/L. Elevated dissolved chloride and specific conductance values generally were associated with wells located in areas where previous studies have documented elevated specific conductance values.

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