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Ground- and Surface-Water Relations in the Eleven Point and Current River Basins, South-Central Missouri

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Exploration for lead-zinc deposits in the Eleven Point River Basin has prompted hydrologic studies in south-central Missouri (fig. 1) because of the potential for future mining activities. These studies were performed by the U.S. Geological Survey (USGS) in cooperation with the U.S. Department of Agriculture, Forest Service, the U.S. Department of the Interior, Bureau of Land Management, and the Missouri Department of Conservation. The first of several consecutive studies was started in 1990 and since then, baseline hydrologic information has been collected in the area to help understand the natural flow rates of streams, water quality in local surface and ground water, ground-water-level fluctuations, and ground-water flow in the aquifers (Kleeschulte and Sutley, 1995). Also, ground-water level mapping and dye-trace studies have shown the presence of a ground-water trough between Hurricane Creek and Big Spring (Imes and Kleeschulte, 1995). This fact sheet summarizes the results of investigations performed to determine if an interbasin transfer of water occurs between the Eleven Point and Current Rivers (fig. 1).

Introduction

South-central Missouri is a region of well-developed karst terrane. Karst describes a type of topography that forms when carbonate or other soluble rocks are dissolved by precipitation and ground water. Karst terrane is characterized by the presence of springs, caves, closed depressions or sinkholes, and discrete underground conduit drainage.

Ground- and surface-water exchange is typical in karst areas. During the formation of karst terrane, water percolating underground enlarges subsurface openings by dissolving the rock. With time, some of these enlarged subsurface openings cause the movement of water in the aquifer to change from diffuse flow through small scattered openings in the rock to discrete flow that is concentrated in a few well-developed conduits. As the openings continue to enlarge, caves can be formed and the ground-water level might decline below the level of surface streams. Surface streams may then begin to lose water to the subsurface (U.S. Geological Survey, 1985). When stream-surface elevations exceed the ground-water levels flow is lost to the shallow aquifer. These streams are called losing streams. Streams in which flow increases because of discharge of ground water to the channel are called gaining streams. Two common methods by which flow can increase are diffuse seepage of ground water through the streambed and spring inflow. Several large springs are present in the Eleven Point and Current River Basins, including the two largest springs in Missouri—Big Spring and Greer Spring (fig. 1).

Flow of water from one surface-water basin to another is common in karst terrane. The USGS has been monitoring the discharge of the Eleven Point River near Bardley (07071500, fig. 1; Eleven Point River site 41, table 1, at the back of this fact sheet) since 1922. The average daily mean discharge for the period of record is 786 ft^3/s (cubic feet per second) and the drainage area is 793 mi^2 (square miles). The ratio of average daily mean discharge to drainage area (unit runoff) is 0.99 $ft^3/s/mi^2$ (cubic foot per second per square mile). Another gaging station has been operated for a similar period of record (since 1912) in the adjacent Current River Basin at Van Buren (07067000, fig. 1; Current River site 1, table 1). This site has a drainage area of 1,667 mi^2 and an average daily mean discharge for the period of record of 2,003 ft^3/s (Hauck and others, 1999). The unit runoff is 1.20 $ft^3/s/mi^2$.

Because the two basins have similar characteristics and are adjacent to each other, the respective unit runoff values are expected to be similar. However, the difference in unit runoff at these two gaging stations suggests an interbasin transfer of water was occurring from the Eleven Point River Basin to the Current River Basin. To test whether or not interbasin water transfers were occurring, the USGS conducted a series of stream discharge measurements made in a short period of time (seepage run) to identify gaining and losing stream reaches. During August 14 to 24, 1995, synoptic seepage runs were con-

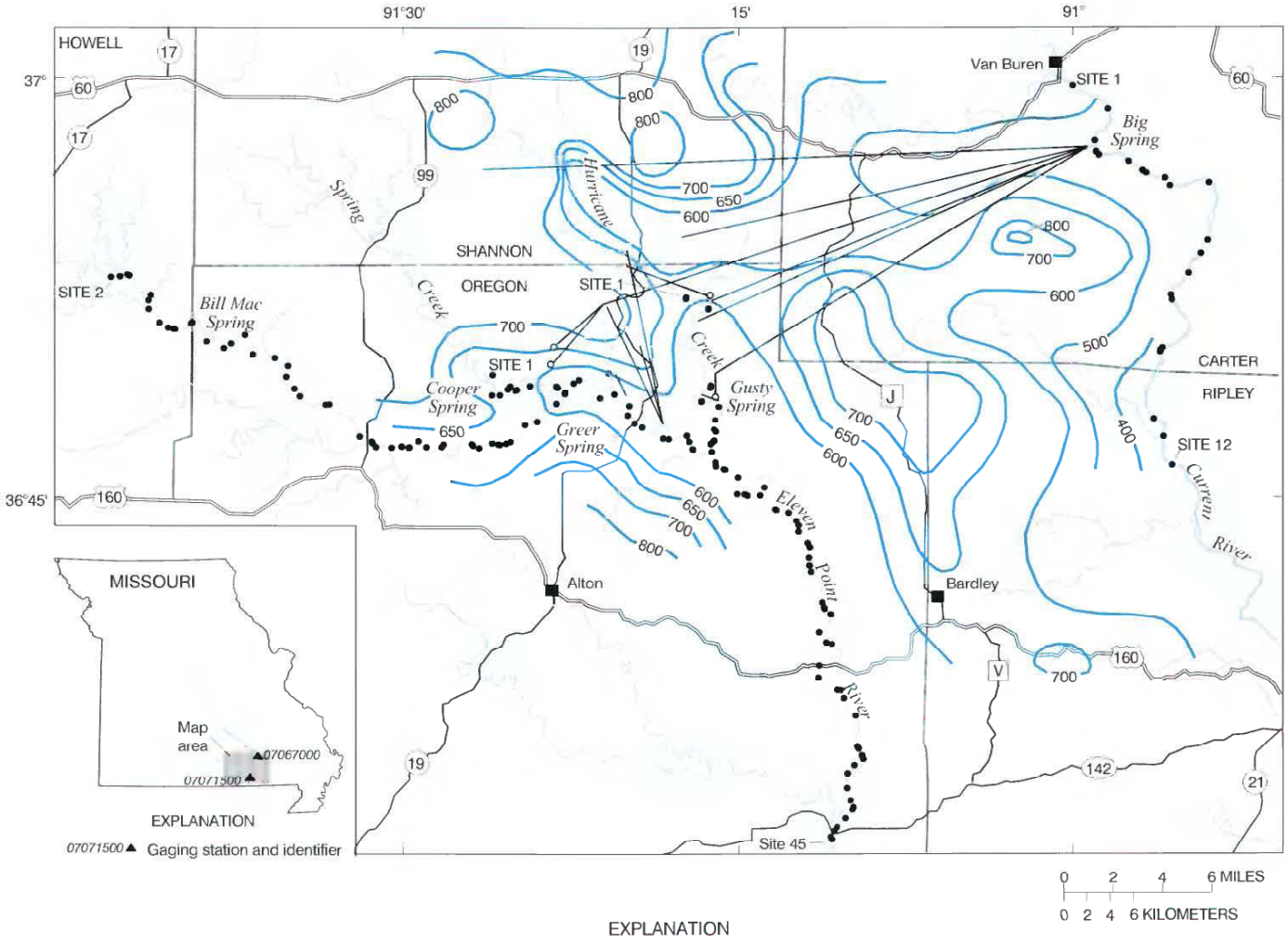

Figure 1. Potentiometric surface, seepage run sites, and dye-trace results.

ducted on a 70-mi (mile) reach of the Eleven Point River and a 24-mi reach of the Current River. Seepage runs also were conducted on two tributaries (Spring and Hurricane Creeks) of the Eleven Point River in November 1995.

Seepage Runs

Seepage runs are designed to be made during periods of minimum streamflow and minimum daily fluctuations (base flow). Base flow is sustained by diffuse groundwater inflow and spring inflow, not by surface runoff. The discharge measurements were made in consecutive downstream order at sites where stream channel morphology and velocity were conducive to accurate discharge measurements. The methods used to make discharge measurements are described by Rantz and others (1982). The measurements were rated according to stream channel conditions and uniformity of flow. The rated measurement accuracies are defined as follows: "good" means that the measured discharge is estimated to be within 5 percent of the true discharge; "fair" between 5 and 8 percent; "poor"

more than 8 percent. Where channel conditions were not adequate for making discharge measurements, either because of insufficient water depths or minimal flow velocities, discharge was estimated. The estimated discharges are all rated poor. Specific conductance and temperature of the water were typically measured at the seepage-run site. Specific conductance was measured with a temperature compensating meter calibrated to read in microsiemens per centimeter at 25 °C (degrees Celsius). Water temperature was measured with a thermistor to the nearest 0.1 °C.

A discharge measurement was made at the beginning of each day at the same section that was measured at the conclusion of the previous day. This was done to document and account for changes in flow that occurred overnight or during the weekend. For quality control purposes, additional measurements were made at selected measuring sections. This consisted of independent stream discharge measurements made by two technicians at the same measuring section. The two measurements were within the degree of accuracy defined by the rated measuring conditions.

Observations of flow or wading discharge measurements were made at 45 sites on the mainstem of the Eleven Point River (fig. 1; table 1). One hundred nineteen tributaries and springs also were checked for flow and if flow was observed, the discharge was estimated or measured near the mouth of the tributary or spring branch. A good measuring section could not be found to measure the flow from Bill Mac or Greer Spring Branch, so the flows from these springs were calculated by measuring the mainstem of the Eleven Point River upstream and downstream from the orifice of the springs. The upstream discharge measurements were subtracted from the downstream measurements and the differences were assumed to be the flow from the springs.

Seepage run results for the Eleven Point River are shown graphically in figure 2. Each mainstem measurement is plotted along with the error bars that represent the rating accuracy. The cumulative tributary and spring inflow that entered the river upstream from each mainstem measuring location was calculated and plotted directly beneath the appropriate mainstem measurement. The cumulative diffuse ground-water inflow represents the streamflow component that enters the stream as seepage through the streambed. This diffuse inflow was calculated at each mainstem measuring location by subtracting the cumulative tributary and spring inflow upstream from the mainstem measurement site from the measured mainstem discharge. The river miles on the Eleven Point River represent distances downstream from the State Highway 17 bridge (located 3.1 mi northwest of site 2).

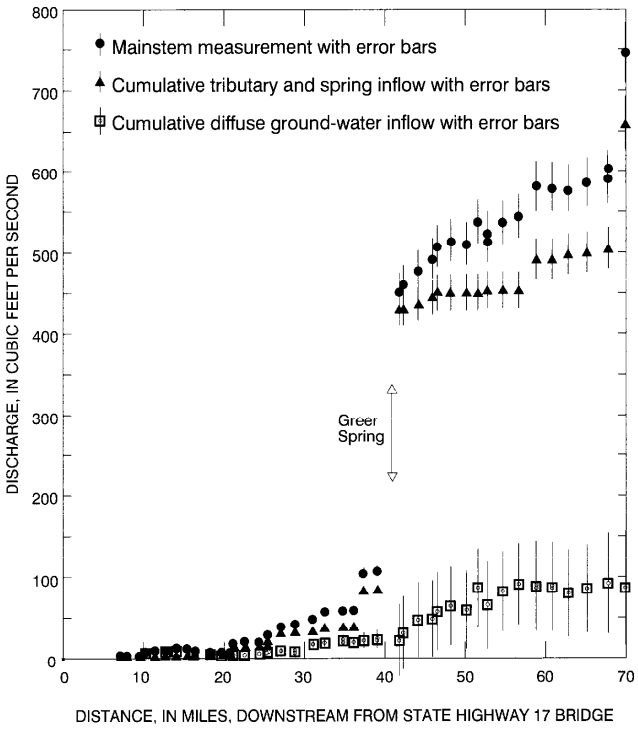

Figure 2. Seepage-run results for the Eleven Point River.

Overall, the Eleven Point River gained flow throughout most of the investigated reach. A 7-mi reach of the river between sites 10 and 16 (table 1) lost 6.1 ft^3/s. Downstream from this reach beginning at Bill Mac Spring (between sites 15 and 16), the river continued to gain flow both from tributary and spring inflow and from diffuse ground-water inflow. The single largest flow contribution to the river was from Greer Spring (346 ft^3/s; between sites 28 and 29, table 1). Downstream from Greer Spring between river mile 42 and 55, figure 2 shows the cumulative diffuse ground-water inflow increased significantly. Downstream from river mile 55 this component of inflow stabilized. About 90 of the 747 ft^3/s measured at the downstream-most measuring site (fig. 2; site 45, table 1) is considered diffuse ground-water inflow to the river because it cannot be attributed to tributary or spring inflow.

Two tributaries of the Eleven Point River (Spring and Hurricane Creeks) also were investigated using seepage runs. Spring Creek has a drainage area of about 140 mi^2. There was no flow in the creek except for the lower 4.9 mi (river miles for these tributaries begin at their mouths), where flow began at Cooper Spring (0.09 ft^3/s; fig. 1). Flow was continuous and increased from that point to the mouth of Spring Creek (13.2 ft^3/s). Hurricane Creek has a drainage area of about 110 mi^2 and is a losing stream throughout most of its length. Water from several springs located in the upstream reaches of Hurricane Creek

flowed only short distances in the creek before disappearing into the subsurface. Flow began downstream from Gusty Spring (0.11 ft^3/s; fig. 1) and was continuous to the mouth of Hurricane Creek (4.82 ft^3/s). Comparing the drainage area and flow at the mouths of both Spring and Hurricane Creeks indicates a relative lack of flow in Hurricane Creek for the size of the basin.

On the mainstem of the Current River, the river miles represent distances downstream from the U.S. Highway 60 bridge over the Current River. Wading discharge measurements were made at 12 sites on the mainstem of the river. Twenty-five tributaries and springs also were checked for flow and if flow was observed, the discharge was measured. Whereas the measured discharge along the mainstem of the river appeared to fluctuate, after considering the measurement rating accuracy, the discharge in the river appears to increase throughout the stream reach investigated. This increased flow results from both tributary and spring inflow (table 1), and it also is assumed diffuse ground-water inflow occurs.

Interbasin Transfer of Water

The results of the seepage runs indicate that the difference in unit runoff between the Eleven Point and Current River Basins cannot be explained by losing stream reaches in the Eleven Point River that contribute flow to the Current River. Consequently, ground-water-level measurements and historical dye-trace data also were analyzed to help explain the ground- and surface-water flow system in the Eleven Point River Basin. Water-level measurements were made in 57 area wells during the spring and fall from 1990 to 1993 to assess seasonal variations in ground-water levels and flow patterns. Water-level fluctuations ranged from less than 1 to 205 ft (feet) in these wells (Kleeschulte and Sutley, 1995). The water-level data also were used to draw potentiometric maps for the area (Imes and Kleeschulte, 1995) that are useful in determining potential ground-water recharge and discharge areas and ground-water flow directions. Water-level altitudes were calculated by subtracting the depth to water in the well from the land surface altitude of the wellhead. Land-surface altitudes were determined from USGS 7.5-minute topographic maps. These maps generally have 20-ft contour intervals because of the steep topography of the area. The land-surface altitudes are accurate to within 10 ft, one-half of the contour interval.

The potentiometric surface shown on figure 1 is representative of the potentiometric maps drawn from the water-level data collected from 1990 to 1993. A prominent feature shown by the potentiometric surface is the trough that extends from Hurricane Creek Basin to Big Spring near the Current River (fig. 1). The pattern of the 500- and 600-ft potentiometric contours is typical for a stream that receives inflow from ground water; however, no stream exists along the axis of the trough. This trough suggests the presence of a network of subsurface fractures and conduits that extend from Hurricane Creek Basin to Big Spring and forms the primary pathway for movement of ground water to Big Spring from the Hurricane Creek area in the Eleven Point River Basin (Imes and Kleeschulte, 1995).

Dye-trace results (Aley (1975), Gann and others (1976), and data on file at the USGS, Rolla, Missouri; fig. 1) indicate the subsurface hydrology in the Eleven Point River Basin is complex. Some dye traces indicated a southerly flow of ground water from Hurricane Creek Basin to the Eleven Point River, while other traces indicate an eastward flow to Big Spring near the Current River. The easterly flowing traces support the potentiometric data showing interbasin ground-water flow to the Current River. Ground water in the Eleven Point River Basin flows eastward out of the basin to the Current River. This interbasin flow decreases the ground-water-sustained base-flow component of the Eleven Point River, and increases the base-flow component of the Current River. This flow also suggests that the size of the drainage areas for both the Eleven Point and Current Rivers cannot be derived by delineating drainage areas from land surface topography. Therefore, when considering the base-flow component of these streams that is sustained by ground-water inflow, the drainage area of the Eleven Point River is smaller, and the Current River Basin is larger, than that determined from topographic maps.

Table 1. Seepage run results for Eleven Point River, Current River, Spring Creek, and Hurricane Creek, August 14–November 30, 1995

[Date measured during 1995; Q, discharge in cubic feet per second; SpK, specific conductance, in microsiemens per centimeter at 25 degrees Celsius; Temp, temperature in degrees Celsius, <, less than; lb, left bank; Est, estimate; G, good, F, fair; P, poor; rb, right bank; Calc, calculated; us, upstream; ds, downstream; --, no data available; meas, measurement

Site no.	Location[a]	River mile	Date	Q	SpK	Temp	Measure rated
	Eleven Point River						
1	Mainstem, State Highway 17	0 000	08-14	0.0			
2	Mainstem	7 003	08-14	< 01			Flow begins
	Kenaga Hollow, lb	7.114	08-14	0			
3	Mainstem	7.192	08-14	05	305	28.4	Est
4	Mainstem	7.517	08-14	07	327	25.5	Est
	Lee Hollow, lb	7.597	08-14	.0			
	Unnamed spring, lb	7.836	08-14	.09	337	15.8	G
5	Mainstem	7.927	08-14	.56	335	18 7	G-F
	Webb Hollow, lb	9.384	08-14	.0			
6	Mainstem	9.566	08-14	2.01	342	22.0	F
	Mainstem	9.566	08-14	1.99			F
	Unnamed spring, lb	9 837	08-14	.11	341	13.5	P
7	Mainstem	10.222	08-14	6.65	361	19.3	F
	County Hollow, rb	10 671	08-14	.0			
	Blowing Springs, lb	10.995	08-14	71	351	13.4	F
8	Mainstem, Highway W	11.422	08-14	10.9	345	23.1	G
	Mainstem, Highway W	11.422	08-15	11.4	349	20.6	G
	Unnamed spring, rb	11.665	08-15	.6	--	--	Est
	Unnamed spring, lb	11.711	08-15	.49	362	15.0	P

Table 1. Seepage run results for Eleven Point River, Current River, Spring Creek, and Hurricane Creek, August 14–November 30, 1995—Continued

[Date measured during 1995; Q, discharge in cubic feet per second; SpK, specific conductance, in microsiemens per centimeter at 25 degrees Celsius; Temp, temperature in degrees Celsius, <, less than; lb, left bank, Est, estimate, G, good; F, fair, P, poor, rb, right bank; Calc, calculated; us, upstream, ds, downstream, --, no data available; meas, measurement

Site no.	Location[a]	River mile	Date	Q	SpK	Temp	Measure rated
	Eleven Point River —Continued						
9	Mainstem	12.569	08-15	11.5	352	22.8	G
	Mainstem	12.569	08-15	11.0			G
	Cane Hollow, lb	12.636	08-15	.0			
10	Mainstem	14.028	08-15	11.8	344	25.8	G
	Unnamed tributary, rb	15.043	08-15	.04	--	--	Est
11	Mainstem	15.436	08-15	11.4	347	26.3	G
12	Mainstem	16.210	08-15	7.59	347	26.2	G
	Mainstem	16.210	08-15	7.37	347	26.3	F
	Rough Hollow, lb	16.285	08-15	.0			
	Bluegrass Hollow, rb	16.652	08-15	.0			
	Unnamed tributary, rb	17.229	08-15	.03	442	18.1	P
	Panther Hollow, lb	17.763	08-15	.0			
13	Mainstem	18.282	08-15	7.44	341	26.4	F
	DePriest Hollow, lb	18.991	08-15	< 01	--	--	Est
14	Mainstem	19.683	08-15	5.94	325	28.2	F
	Mainstem	19.683	08-15	5.83			F
	Mainstem	19.683	08-16	5.69	339	25.1	G
15	Mainstem	20.686	08-16	6.50	307	26.4	G
	Bill Mac Spring			11.7	--	--	Calc
16	Mainstem	21.140	08-16	18.2	350	24.4	G
	Unnamed spring, lb	22.418	08-16	.1	398	24.1	Est
17	Mainstem	22.563	08-16	18.3	376	23.2	G
	Mainstem	22.563	08-16	17.9			F
	Mainstem	22.563	08-16	18.4			F
18	Mainstem	24.498	08-16	20.2	365	24.3	F
19	Mainstem	25.296	08-16	20.6	361	23.7	G
	Mainstem	25.296	08-17	22.3			G
	Middle Fork, rb	25.352	08-17	6.82	--	--	F
20	Mainstem	25.579	08-17	29.3	354	26.1	
	Barren Fork, rb	26.329	08-17	7.74	328	24.8	F
	Unnamed spring, rb	26.752	08-17	.64	460	18.3	F
	Unnamed spring, lb	26.764	08-17	.83	421	16.8	F
	Unnamed spring, lb	27.055	08-17	.72	426	17.3	F
21	Mainstem	27.099	08-17	40.0	359	27.5	G
	Mainstem	27.099	08-17	40.2			G
	Unnamed spring, lb	27.613	08-17	.01	--	--	Est
	Posy Spring, lb	28.020	08-17	1.71	347	13.8	
22	Mainstem	28.800	08-17	39.2	360	27.5	F
	Mainstem	28.800	08-17	42.6	354	24.8	G-F
	Round Hollow, lb	28.932	08-17	.02	--	--	Est
	Blubbering Hollow, lb	30.178	08-17	.0			
	Blowing Spring, lb	30.973	08-17	.2	279	13.5	Est
23	Mainstem	31.050	08-17	50.1	355	26.7	G
	Roaring Spring, rb	31.346	08-17	1.5-3.0	357	13.5	Est
	Upper Graham Spring, rb	31.941	08-17	1.67	310	18.3	G
	Lower Graham Spring, rb	32.017	08-17	1.03	307	18.7	F
	Orchard Hollow, lb	32.198	08-17	.0			
	Denny Hollow, rb	32.281	08-17	.2	320	23.8	Est
24	Mainstem	32.542	08-17	57.1	357	26.2	G-F
	Unnamed spring, lb	32.746	08-17	.2	--	--	Est
	Unnamed tributary, lb	33.793	08-17	2	327	18.1	Est
25	Mainstem, Cane Bluff	34.825	08-17	61.3	351	27.3	F
	Mainstem, Cane Bluff	34.825	08-18	57.5	361	25.2	F
26	Mainstem	36.132	08-18	58.2	360	26.2	
	Dead Mans Cave Spring, rb	36.698	08-18	3.17	350	14.3	
	Spring Creek, lb	36.797	08-18	42.8	498	18.0	
27	Mainstem	37.414	08-18	106	352	22.8	G
	Becky Hollow, lb	37.706	08-18	.13	505	21.1	Est
28	Mainstem	39.073	08-18	109	351	22.1	G
	Mainstem us Greer Spring	39.073	08-21	106	343	23.8	G
	McCormack Hollow, lb	39.617	08-21	.0			
	Unnamed tributary, rb	39.745	08-21	.73	--	--	G
	Duncan Hollow, lb	40.591	08-21	.1	479	25.2	Est
	Greer Spring, rb	41.010	08-21	346	331	16.0	Calc
	Unnamed tributary, rb	41.474	08-21	.1	510	18.0	Est
29	Mainstem ds Greer Spring	41.837	08-21	453	334	17.6	G-F
	Graveyard Hollow, lb	42.312	08-22	.0			

Table 1. Seepage run results for Eleven Point River, Current River, Spring Creek, and Hurricane Creek, August 14–November 30, 1995—Continued

[Date measured during 1995; Q, discharge in cubic feet per second; SpK, specific conductance, in microsiemens per centimeter at 25 degrees Celsius; Temp, temperature in degrees Celsius, <, less than, lb, left bank, Est, estimate; G, good; F, fair, P, poor; rb, right bank; Calc, calculated; us, upstream; ds, downstream; --, no data available; meas, measurement

Site no.	Location[a]	River mile	Date	Q	SpK	Temp	Measure rated
	Eleven Point River —Continued						
30	Mainstem	42.345	08-22	462	335	16.5	F
	Dennig Spring Series, lb	42.862	08-22	56	358	15.4	G
	Dennig Spring Series, lb	43.080	08-22	5	--	--	Est
	Hackleton Hollow, lb	43.474	08-22	0			
	Unnamed tributary, lb	43.903	08-22	.05	514	22.1	Est
31	Mainstem	44.179	08-22	479	334	17.4	G
	Unnamed spring, rb	44.417	08-22	.05	338	23.8	Est
	Little Hurricane Creek, rb	44.439	08-22	89	386	23.1	P
	Hurricane Creek, lb	45.456	08-22	6.89	395	22.8	F
	Bill Deckard Hollow, rb	45.699	08-22	.0			
32	Mainstem	45.959	08-22	493	381	19.6	G
	Buck Bay Hollow, rb	46.124	08-22	.1	337	20.8	Est
	Turners Spring, lb	46.536	08-22	6.02	375	14.2	G
33	Mainstem	46.558	08-22	508	338	16.6	G
	Stinking Pond Hollow, lb	47.216	08-22	.05	516	21.6	Est
	Unnamed tributary, rb	47.939	08-22	.05	446	22.3	Est
34	Mainstem	48.246	08-22	515	339	17.0	G
	Unnamed spring, rb	48.386	08-22	.77	359	14.6	F
	Tumbling Shoal Hollow, lb	49.721	08-22	0			
35	Mainstem	50.211	08-22	511	338	18.0	G
	Unnamed tributary, lb	50.642	08-22	.03	409	32.5	Est
	Barn Hollow, lb	51.566	08-22	.1	417	17.7	Est
36	Mainstem	51.621	08-22	538	333	19.4	G
	Bliss Spring, lb	52.147	08-22	1.8	340	16.4	P
	Unnamed tributary, rb	52.632	08-22	.85	337	18.8	P
37	Mainstem	52.832	08-22	514	332	19.8	G-F
	Mainstem	52.832	08-23	524	340	16.9	G
	Orchard Hollow, lb	52.912	08-23	.0			
	Panther Spring Hollow, rb	53.092	08-23	.1	421	18.8	Est
	Whites Creek, lb	53.414	08-23	.0			
	School House Hollow, rb	53.717	08-23	.1	217	20.3	Est
	Stillhouse Hollow, lb	53.902	08-23	.02	420	15.4	Est
	Slash Bay Hollow, lb	54.355	08-23	.03	483	18.1	Est
38	Mainstem	54.695	08-23	537	337	18.3	G
	Old River Hollow, rb	54.956	08-23	.07	388	23.8	Est
	Freeman Hollow, lb	55.362	08-23	.0			
	Powder Mill Spring, rb	55.802	08-23	0			
	Walker Hollow, rb	55.834	08-23	0			
	Graveyard Hollow, lb	56.390	08-23	.3	429	17.8	Est
	Bat Cave Hollow, rb	56.612	08-23	.5	413	19.2	Est
39	Mainstem	56.668	08-23	546	334	20.0	G
	Conner Spring, lb	57.034	08-23	1.5	424	19.3	Est
	Turtle Island Spring, rb	58.018	08-23	1.0	363	15.7	Est
	Boze Mill Spring, lb	58.603	08-23	35.2	403	14.8	P
40	Mainstem	58.865	08-23	579	343	20.0	G-F
	Mainstem	58.865	08-24	583	348	17.9	G-F
	Couch Hollow, rb	60.442	08-24	.0			
41	Mainstem, Highway 160	60.838	08-24	579	344	19.2	G
	Mainstem, Highway 160	60.838	08-23	582	344	18.9	G
	Unnamed tributary, rb	61.318	08-23	6.35	341	19.5	F
	Unnamed tributary, lb	62.405	08-23	.05	240	23.6	Est
	Unnamed tributary, lb	62.528	08-23	.01	376	21.2	Est
42	Mainstem	62.874	08-23	579	292	20.2	F
	Sibkey Spring Branch, rb	63.500	08-23	.0			
	Piney Creek, lb	63.839	08-23	2.5	462	20.6	Est
43	Mainstem	65.195	08-23	587	341	21.4	G
	Hurricane Creek, lb	65.302	08-23	1.0	406	25.1	Est
	Unnamed spring, lb	65.615	08-23	<.01	286	26.5	Est
	Unnamed tributary, lb	65.767	08-23	2.5	456	17.8	Est
	Unnamed tributary, rb	66.268	08-23	<.01	454	24.8	Est
	Unnamed tributary, rb	66.720	08-23	.1	351	21.1	Est
	Unnamed tributary, lb	67.328	08-23	<.01	--	--	Est
44	Mainstem	67.832	08-23	605	342	22.0	G
	Mainstem	67.832	08-24	591	348	18.4	G
	Rush Creek, lb	68.150	08-24	1.5	421	21.1	Est
	Spring Branch, rb	68.266	08-24	12.0	382	23.5	P
	Morgan Spring, rb	68.768	08-24	59.1	435	15.6	F

Table 1. Seepage run results for Eleven Point River, Current River, Spring Creek, and Hurricane Creek, August 14–November 30, 1995—Continued

[Date measured during 1995, Q, discharge in cubic feet per second; SpK, specific conductance, in microsiemens per centimeter at 25 degrees Celsius; Temp, temperature in degrees Celsius; <, less than; lb, left bank, Est, estimate, G, good, F, fair, P, poor, rb, right bank; Calc, calculated, us, upstream, ds, downstream; --, no data available, meas, measurement

Site no.	Location[a]	River mile	Date	Q	SpK	Temp	Measure rated
	Eleven Point River —Continued						
	Jones and Blue Springs, rb	69 314	08-24	78 6	438	15 3	F
	Unnamed tributary, lb	69 521	08-24	2 5	425	22.6	Est
	Big Branch, rb	69 811	08-24	5	466	22.9	Est
45	Mainstem	69.930	08-24	747	364	19.9	F
	Spring Creek						
1	Mainstem	5.152	11-30	0.0			Pool begins
	Cooper Spring, lb	5.035	11-30	--	449	12.7	Pool no meas
2	Mainstem	4 922	11-30	.09	427	8.4	G-F
	Piedmont Hollow, rb	4 531	11-30	.0			
3	Mainstem	4 040	11-30	.75	380	7 8	G-F
	Thompson Spring, rb	3 693	11-30	.08	365	13 2	Est
4	Mainstem	3 273	11-30	.97	373	5 2	G-F
	Mainstem	3 273	11-29	1.10	354	5 4	G-F
	Unnamed spring, lb	3.251	11-29	7.92	371	13.8	P
	Unnamed spring, rb	3 109	11-29	2.8	368	13.8	P
	Unnamed spring, rb	2.706	11-29	.02	389	11.8	Est
	Buck Hollow, lb	2.121	11-29	.0			
5	Mainstem	1.547	11-29	12 6	357	10.8	G-F
	Unnamed tributary, rb	1.047	11-29	0			Flow begins
	Wolfpen Hollow, lb	0.941	11-29	0			
	Unnamed spring, lb	0.447	11-29	14	383	13.1	G-F
6	Mainstem	0.370	11-29	13.2	360	9.3	G-F
	Hurricane Creek						
1	Mainstem	10.066	11-08	0.0			
	Falling Spring, rb	10.031	11-08	.2	370	11.9	Est
2	Mainstem	10.002	11-08	.0			
3	Mainstem	8.902	11-08	0			
	Barrett Spring, lb	8.887	11-08	.02	294	12.4	Est
4	Mainstem	8.874	11-08	.0			
5	Mainstem	4.153	11-08	.0			
	Walter Spring, lb	4.115	11-08	.56	364	9.9	F-P
6	Mainstem	4.055	11-08	.0			Flow ends
7	Mainstem	3.235	11-08	.0			
	Gusty Spring, rb	3.209	11-08	.11	478	10.8	F
8	Mainstem	2.478	11-08	1.17	395	11.6	G
	Kelley Hollow, lb	2.438	11-08	.0			
	Unnamed spring, rb	1.225	11-08	.01	292	11 8	Est
	Fox Hollow, lb	1.120	11-08	.0			
9	Mainstem	1.107	11-08	1.00	391	12 4	G
	Unnamed spring, rb	1.088	11-08	<.01	--	--	Est
	Unnamed spring, rb	0.539	11-08	.07	391	15 1	Est
	Unnamed spring, rb	0.479	11-08	.02	279	9 8	Est
10	Mainstem near mouth	0.328	11-08	4.82	395	12 3	G
	Current River						
	Mainstem, U S. Highway 60	0.000		Not measured			
1	Mainstem	0.629	08-15	1,170	319	26 3	G-F
2	Mainstem	1.950	08-15	1,150	319	26.8	G
	Carter Creek, lb	2.840	08-15	.0			
	Sweezie Hollow, rb	3.753	08-15	.0			
3	Mainstem	4.070	08-15	1,140	--	--	G-F
	Big Spring, rb	4.548	08-15	393	346	14 2	F-P
	Chub Hollow, rb	4.718	08-15	<.1	--	--	
4	Mainstem	6.062	08-15	1,500	327	24 0	G
	Mainstem	6.062	08-15	1,470	327	24.0	G
	Mainstem	6.062	08-16	1,550	327	22 0	G
	Long Bay, rb	6.159	08-15	<.1	--	--	
	Unnamed tributary, lb	6.921	08-16	6.48	320	19 5	F
5	Mainstem	7.765	08-16	1,520	328	23 0	G
	Unnamed spring, rb	8.254	08-16	12.1	338	17 3	F
	Aldrich Valley, lb	9.078	08-16	.0			

Table 1. Seepage run results for Eleven Point River, Current River, Spring Creek, and Hurricane Creek, August 14–November 30, 1995—Continued

[Date measured during 1995, Q, discharge in cubic feet per second; SpK, specific conductance, in microsiemens per centimeter at 25 degrees Celsius; Temp, temperature in degrees Celsius; <, less than; lb, left bank, Est, estimate; G, good; F, fair, P, poor; rb, right bank, Calc, calculated; us, upstream; ds, downstream, --, no data available; meas, measurement

Site no.	Location[a]	River mile	Date	Q	SpK	Temp	Measure rated
	Current River —Continued						
6	Mainstem	9 952	08-16	1,610	328	25.5	G
	Cooper Mine Hollow, lb	10 788	08-16	.0			
7	Mainstem	12.590	08-16	1,560	327	25.1	G
	Shelton Hollow, lb	13.207	08-16	25 1	371	18.0	P
	Round Pond Hollow, rb	13.965	08-16	.0			
8	Mainstem	14.043	08-16	1,680	327	25.0	G
	Mainstem	14.043	08-16	1,610	327	25.0	G
	Mainstem	14 043	08-17	1,620	330	22.8	G-F
	Possum Hollow, lb	14 239	08-17	<.1	--	--	Est
	Hooper Hollow, rb	15 217	08-17	.0			
	Panther Spring, rb	15 500	08-17	.45	--	--	Est
9	Mainstem	15 713	08-17	1,620	329	23 3	G
	Bedell Hollow, lb	16 958	08-17	.0			
	Kelley Hollow, lb	18 055	08-17	.0			
	Hall Hollow, rb	18 603	08-17	22.8	347	17 5	P
10	Mainstem	18 731	08-17	1,670	326	25 5	G
	Spring Creek, rb	18 811	08-17	.68	--	--	Est
11	Mainstem	21 926	08-17	1,640	327	25 5	G
	Jakes Valley, lb	22 438	08-17	0			
	Big Barren Creek, rb	22 940	08-17	13.0	328	20 4	F
12	Mainstem	24 310	08-17	1,600	327	25 5	G-F
	Mainstem near mouth	24 310	08-17	1,600	327	25 5	G-F

[a]There were 36 unnamed tributaries observed with no flow

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