UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

WATER-QUALITY RECONNAISSANCE OF THE LARKIN CREEK WATERSHED, LEE AND ST. FRANCIS COUNTIES, ARKANSAS

By James C. Petersen

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U.S. SOIL CONSERVATION SERVICE

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UNITED STATES DEPARTMENT OF THE INTERIOR

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Multiply inch-pound units	By	To obtain metric units
inch	25.40	millimeter
foot	.3048	meter
mile	1.609	kilometer
foot per mile	.1894	meter per kilometer
cubic foot per second	.02832	cubic meter per second
acre	.4047	hectare

WATER-QUALITY RECONNAISSANCE OF THE LARKIN CREEK WATERSHED, LEE AND ST. FRANCIS COUNTIES, ARKANSAS

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ABSTRACT

A reconnaissance of the Larkin Creek watershed was made during April through September 1980 to assess the water-quality of streams in the watershed. Streamflow was measured and water samples were collected three times during the study period. Samples of bottom material were collected in September. The streams were turbid, and in April, June, and early July, suspended-sediment concentrations ranged from 45 to 236 milligrams per liter. Concentrations of dissolved solids ranged from 45 to 391 milligrams per liter. Water hardness ranged from 31 milligrams per liter (soft) to 280 milligrams per liter (very hard). Fecal-coliform bacteria densities ranged from 40 to an estimated 540 colonies per 100 milliliters and may have exceeded the U.S. Environmental Protection Agency criterion for bathing waters. Total nitrogen concentrations ranged from 0.90 to 2.2 milligrams per liter. Total phosphorus concentrations (ranging from 0.08 to 0.46 milligrams per liter) often exceeded the State standard. Low dissolved-oxygen concentrations (2.5 to 5.4 milligrams per liter at midday) were measured in Larkin Creek and a major tributary. Iron (290 to 9,800 micrograms per liter), manganese (60 to 3,100 micrograms per liter), and mercury (0.0 to 0.2 micrograms per liter) concentrations at times exceeded Environmental Protection Agency criteria for domestic use or freshwater aquatic life. High concentrations of toxaphene (20 to 170 micrograms per kilogram dry weight) were present in

all bottom-material samples. In two water samples, concentrations of dieldrin (0.01 micrograms per liter) exceeded the Environmental Protection Agency criterion for freshwater aquatic life. Polychlorinated biphenyls, several insecticides, and several herbicides (including 2, 4, 5-T) were detected in water or bottom-material samples.

INTRODUCTION

Purpose and Scope

This report documents the results of a water-quality study of the Larkin Creek watershed conducted prior to the beginning of proposed land- and water-improvement measures by the U.S. Soil Conservation Service. To assess the existing water quality of streams in the watershed, the U.S. Geological Survey measured streamflow and collected water samples for analysis of common ions, nutrients, metals, bacteria, and pesticides (in water and bottom-material). The report was prepared by the Geological Survey in cooperation with the Soil Conservation Service.

Description of Project Area

The Larkin Creek watershed is in eastern Arkansas, in Lee and St. Francis Counties. The watershed has an area of 37,863 acres (Soil Conservation Service Watershed Planning Staff, Little Rock, Ark., written commun., 1980). Larkin Creek and its tributaries originate at altitudes of 210 feet (National Geodetic Vertical Datum of 1929) or less. Larkin Creek flows into the L'Anguille River at an altitude of about 165 feet.

Land within the watershed is used almost entirely for agricultural purposes. Soybeans (47 percent of acreage), rice (15 percent), cotton (9 percent), and wheat (5 percent) are the major crops grown within the watershed.

Woodlands (14 percent), minor crops (3 percent), and land used for other purposes (7 percent) comprise the rest of the watershed (Soil Conservation Service Watershed Planning Staff, Little Rock, Ark., written commun., 1980).

National Weather Service records (National Oceanic and Atmospheric Administration, 1980; National Weather Service Forecast Office, North Little Rock, Ark., written commun., 1981) indicate that the normal mean air temperature in the Larkin Creek area is about 62°F (17°C). Normal annual precipitation is about 49 inches. Total precipitation during April through September was near normal, but approximately 5.8 inches of this precipitation occurred on June 22, 1980. Mean air temperatures were higher than normal each month and in July through September mean air temperatures were 4° to 6°F (2° to 3°C) higher than normal.

The Larkin Creek watershed lies within the Mississippi Alluvial Plain. Quaternary alluvium and terrace deposits, averaging about 100 feet thick and consisting of silt, clay, sand, and gravel, underlie the Larkin Creek watershed (Boswell and others, 1968, p. 4). The sand and gravel of the alluvium form a major aquifer, the alluvial aquifer.

Larkin Creek and its tributaries may be hydraulically connected with the alluvial aquifer. However, data provided by the Soil Conservation Service indicate that the rate of water movement between the surface water and the aquifer is probably very low because of the fine-grained character of soils in the bottom material and ditch banks. Core samples from the streambed and ditch banks generally contained approximately 6 percent sand and 94 percent materials finer than 0.074 millimeters.

Return flow of irrigation water has a great effect on flow and water quality in the watershed. The alluvial aquifer supplies almost all the water used for irrigation in St. Francis and Lee Counties (Halberg, 1977, tables 2

and 7). In this area, the aquifer typically yields hard to very hard, calcium bicarbonate water that is moderately mineralized (Halberg and Reed, 1964, p. 22), and some of the water contains 7 to 8 milligrams per liter of iron (calculated from Boswell and others, 1968, pl. 2).

The water quality of streams and rivers within or near the Larkin Creek watershed has been studied previously (Bryant and others, 1979). Water-quality analyses of tributaries of the L'Anguille River in Lee and St. Francis Counties typically indicated nutrient enrichment and pesticide contamination.

DATA COLLECTION

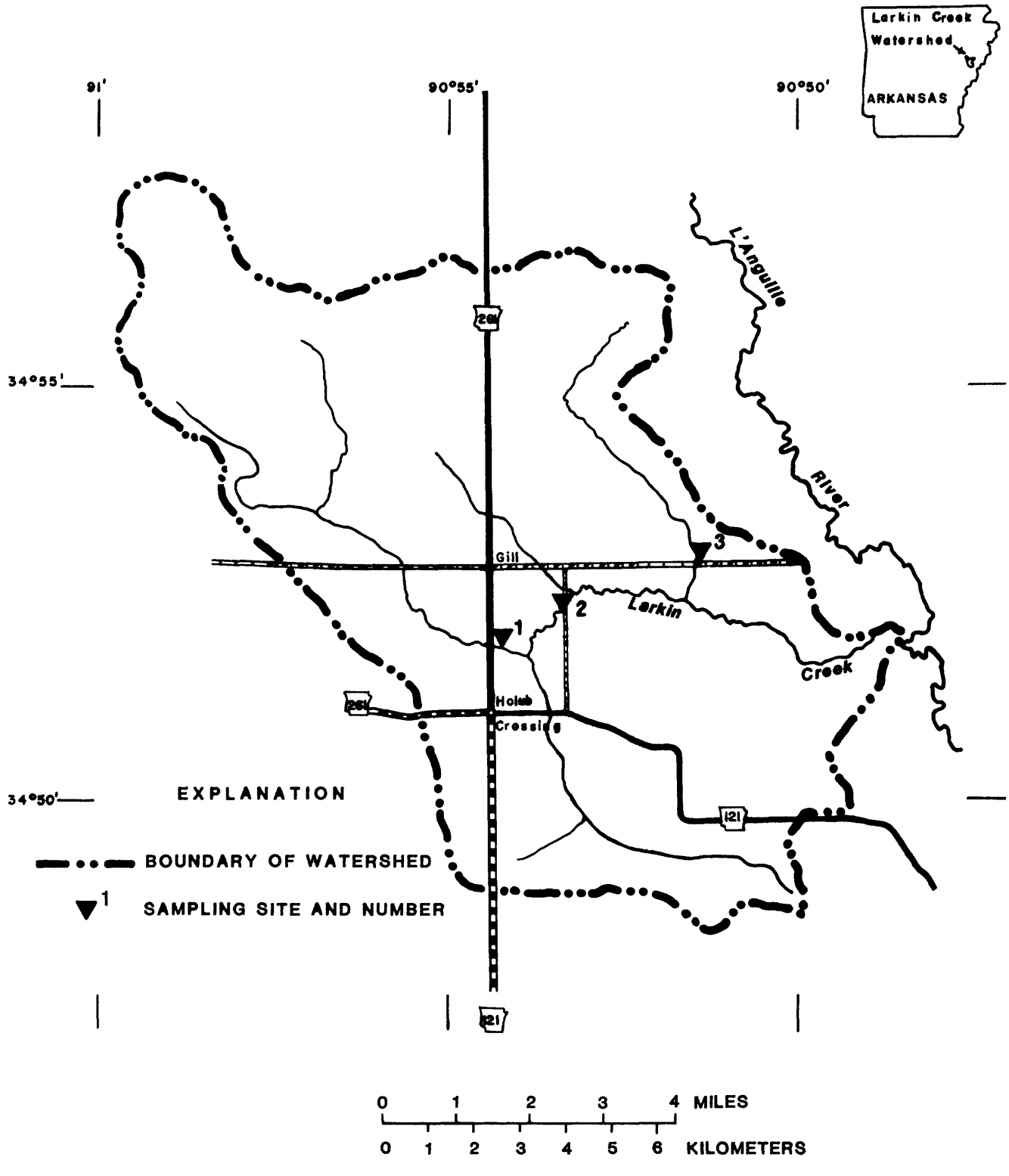
One sampling site on Larkin Creek and two sampling sites on its tributaries were selected for study (fig. 1). These stations were assigned the following Geological Survey numbers and names:

Site 1--07047955 Unnamed tributary to Larkin Creek, near Holub Crossing, Ark.

Site 2--07047957 Larkin Creek near Gill, Ark.

Site 3--07047959 Unnamed tributary to Larkin Creek, near Gill, Ark.

At these sites, streamflow was measured and water samples were collected in April, in June or July, and in September 1980. Analyses included specific conductance, common ions, nutrients, suspended-sediment concentration (except in September when low flows prevented the use of correct sediment-sampling techniques), iron, manganese, bacteria, pH, and dissolved oxygen. In April and September, samples were collected and analyzed for pesticides, polychlorinated biphenyls (PCB's), polychlorinated naphthalenes (PCN's), and metals. Samples of the upper 1 to 2 inches of bottom material were collected



Base from Arkansas Highway Department county maps

Figure 1.--Larkin Creek watershed.

Table 1.--Chemical, physical, and bacteriological analyses, Larkin Creek watershed

[CFS, cubic feet per second; (5-digit number) National Water Data Storage and Retrieval System parameter code number; DEG C, degrees Celsius; MG/L milligrams per liter; BIOCHEM UNINHIB, biochemical uninhibited; UM micrometer; MF membrane filter; COLS., colonies; ML milliliters; K plate count outside ideal range; NTU, nephelometric turbidity unit; CACO3 calcium carbonate; AC-FT, acre-foot; T/DAY, tons per day; SED. SUSP., sediment suspended; DIAM. diameter; MM, millimeter; UG/L, micrograms per liter]

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS) (00095)	PH FIELD (UNITS) (00400)	TEMPER-ATURE, WATER (DEG C) (00010)	TEMPER-ATURE, AIR (DEG C) (00020)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	OXYGEN DEMAND, BIOCHEM UNINHIB 5 DAY (MG/L) (00310)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)										
APR , 1980											
21...	1215	7.5	72	7.0	22.0	28.0	4.2	48	2.9	83	K610
JUN											
30...	1315	12	194	7.7	31.5	35.0	2.5	34	4.4	100	230
SEP											
22...	1100	2.1	642	8.2	27.0	28.0	5.4	67	2.6	K40	430
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)										
APR , 1980											
21...	1430	12	79	7.2	24.0	31.0	5.3	62	3.2	84	200
JUL											
01...	0900	8.0	202	7.5	29.5	31.0	3.6	47	5.5	100	312
SEP											
22...	1215	2.4	633	8.3	26.0	29.0	5.3	65	2.8	200	200
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)										
APR , 1980											
22...	0945	.23	98	7.2	19.5	29.0	5.7	62	1.9	160	K110
JUL											
01...	1020	.57	211	7.6	29.0	31.5	6.6	85	3.7	K540	1300
SEP											
22...	1300	.00	434	8.0	27.0	33.0	8.6	107	2.1	220	K540

Table 1.--Chemical, physical, and bacteriological analyses, Larkin Creek watershed--Continued

DATE	TURBIDITY (NTU) (00076)	HARDNESS (MG/L AS CACO3) (00900)	HARDNESS, NONCARBONATE (MG/L CACO3) (00902)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	SODIUM PERCENT (00932)	SODIUM ADSORPTION RATIO (00931)	BICARBONATE (MG/L AS HCO3) (00440)	CARBONATE (MG/L AS CO3) (00445)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)										
APR , 1980											
21...	170	32	0	8.0	2.8	2.5	2.5	14	.2	42	0
JUN											
30...	46	76	3	19	7.0	3.4	7.3	16	.4	95	0
SEP											
22...	5.6	280	9	62	30	3.9	30	19	.8	330	0
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)										
APR , 1980											
21...	210	31	0	8.0	2.7	2.6	2.2	12	.2	41	0
JUL											
01...	44	79	0	19	7.7	3.6	6.5	14	.3	110	0
SEP											
22...	13	270	0	60	29	3.7	28	18	.7	330	0
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)										
APR , 1980											
22...	54	45	0	11	4.3	3.4	2.8	11	.2	61	0
JUL											
01...	15	82	0	20	7.7	5.8	7.7	16	.4	110	0
SEP											
22...	12	200	0	42	22	6.3	16	15	.5	270	0

Table 1.--Chemical, physical, and bacteriological analyses Larkin Creek watershed--Continued

DATE	ALKALINITY (MG/L AS CACO3) (00410)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L) (70301)	SOLIDS, DISSOLVED (TONS PER AC-FT) (70303)	SOLIDS, DISSOLVED (TONS PER DAY) (70302)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)										
APR , 1980											
21...	35	1.9	.1	3.2	1.4	55	43	.07	1.11	190	122
JUN											
30...	78	9.3	.1	8.0	10	97	108	.13	3.17	279	92
SEP											
22...	271	59	.3	16	1.7	391	365	.53	2.17	--	5
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)										
APR , 1980											
21...	34	2.1	.2	3.7	4.5	45	26	.06	1.46	216	262
JUL											
01...	90	5.2	.2	8.3	5.4	122	109	.17	2.64	243	88
SEP											
22...	271	58	.3	15	3.2	375	360	.51	2.38	--	14
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)										
APR , 1980											
22...	50	1.8	.2	3.5	3.6	63	61	.09	.04	150	50
JUL											
01...	90	7.8	.1	7.2	2.5	129	113	.18	.20	191	43
SEP											
22...	220	24	.3	6.5	2.7	254	253	.35	.00	--	22

Table 1.--Chemical, physical and bacteriological analyses Larkin Creek watershed--Continued

DATE	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	NITROGEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRATE TOTAL (MG/L AS N) (00620)	NITROGEN, TOTAL (MG/L AS N) (00600)	PHOSPHORUS, ORTHOPHOSPHATE TOTAL (MG/L AS P) (70507)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)										
APR , 1980											
21...	162	3.3	98	1.4	.280	.060	.09	1.9	.260	.390	14
JUN											
30...	141	4.6	82	1.5	.610	.020	.00	2.1	.130	.130	--
SEP											
22...	--	--	--	.90	.000	.010	.00	.90	.060	.110	10
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)										
APR , 1980											
21...	236	7.6	99	1.6	.290	.060	.14	2.1	.250	.460	15
JUL											
01...	114	2.5	94	1.4	.590	.090	.07	2.2	.120	.110	16
SEP											
22...	--	--	--	1.0	.000	.010	.00	1.0	.070	.130	10
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)										
APR , 1980											
22...	53	.03	100	1.0	.260	.040	.14	1.5	.180	.290	11
JUL											
01...	45	.07	95	1.4	.050	.010	.00	1.4	.070	.080	16
SEP											
22...	--	--	--	.90	.010	.010	.00	.91	.050	.100	9.2

Table 1.--Chemical, physical, and bacteriological analyses Larkin Creek watershed--Continued

DATE	ARSENIC TOTAL (UG/L AS AS) (01002)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD) (01027)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR) (01034)	COBALT, TOTAL RECOV-ERABLE (UG/L AS CO) (01037)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU) (01042)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE) (01045)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN) (01055)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG) (71900)	SELE-NIUM, TOTAL (UG/L AS SE) (01147)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)										
APR , 1980											
21...	3	1	0	2	2	6400	10	1200	.2	0	30
JUN											
30...	--	--	--	--	--	3700	--	3100	--	--	--
SEP											
22...	3	0	0	0	2	290	0	1000	.0	0	20
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)										
APR , 1980											
21...	4	3	0	4	6	9800	15	1100	.2	0	50
JUL											
01...	--	--	--	--	--	3300	--	2600	--	--	--
SEP											
22...	4	0	10	0	3	390	0	60	.0	0	20
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)										
APR , 1980											
22...	3	0	0	1	2	4900	7	990	.1	0	20
JUL											
01...	--	--	--	--	--	1300	--	1500	--	--	--
SEP											
22...	2	0	10	0	4	760	1	1300	.0	0	20

Table 2.--Analyses of polychlorinated biphenyls, polychlorinated naphthalenes, and pesticides in whole-water and bottom-material samples Larkin Creek watershed

[UG/L micrograms per liter; (5-digit number) National Water Data Storage Retrieval System parameter code number; UG/KG micrograms per kilogram; TOT., total; MATL., material; POLYCHLOR., polychlorinated]

DATE	TIME	ALDRIN, TOTAL (UG/L) (39330)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG) (39333)	CHLORDANE, TOTAL (UG/L) (39350)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG) (39351)	DDD, TOTAL (UG/L) (39360)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG) (39363)	DDE, TOTAL (UG/L) (39365)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG) (39368)	DDT, TOTAL (UG/L) (39370)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG) (39373)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)										
APR , 1980											
21...	1215	.00	--	.0	--	.00	--	.00	--	.00	--
SEP											
22...	1100	.00	.0	.0	--	.00	<16	.00	<16	.00	--
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)										
APR , 1980											
21...	1430	.00	--	.0	--	.00	--	.00	--	.00	--
SEP											
22...	1215	.00	--	.0	--	.00	<38	.00	<24	.00	--
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)										
APR , 1980											
22...	0945	.00	--	.0	--	.00	--	.00	--	.00	--
SEP											
22...	1300	.00	.0	.0	0	.00	5.3	.00	.0	.00	1.9

Table 2.--Analyses of polychlorinated biphenyls polychlorinated naphthalenes, and pesticides in whole-water and bottom-material samples Larkin Creek watershed--Continued

DATE	DI-AZINON, TOTAL (UG/L) (39570)	DI-AZINON, TOTAL IN BOT-TOM MA-TERIAL (UG/KG) (39571)	DI-ELDRIN TOTAL (UG/L) (39380)	DI-ELDRIN, TOTAL IN BOT-TOM MA-TERIAL (UG/KG) (39383)	ENDO-SULFAN, TOTAL (UG/L) (39388)	ENDRIN, TOTAL (UG/L) (39390)	ENDRIN, TOTAL IN BOT-TOM MA-TERIAL (UG/KG) (39393)	ETHION, TOTAL (UG/L) (39398)	ETHION, TOTAL IN BOT-TOM MA-TERIAL (UG/KG) (39399)	HEPTA-CHLOR, TOTAL (UG/L) (39410)	HEPTA-CHLOR, TOTAL IN BOT-TOM MA-TERIAL (UG/KG) (39413)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)										
APR , 1980											
21...	.00	--	.01	--	.00	.00	--	.00	--	.00	--
SEP											
22...	.00	.0	.00	1.6	.00	.00	.2	.00	.0	.00	.0
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)										
APR , 1980											
21...	.00	--	.01	--	.00	.00	--	.00	--	.00	--
SEP											
22...	.00	.0	.00	1.0	.00	.00	.6	.00	.0	.00	.0
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)										
APR , 1980											
22...	.00	--	.00	--	.00	.00	--	.00	--	.00	--
SEP											
22...	.00	.0	.00	.2	.00	.00	.0	.00	.0	.00	.0

Table 2.--Analyses of polychlorinated biphenyls, polychlorinated naphthalenes and pesticides in whole-water and bottom-material samples, Larkin Creek watershed--Continued

DATE	HEPTACHLOR EPOXIDE TOTAL (UG/L) (39420)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG) (39423)	LINDANE TOTAL (UG/L) (39340)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG) (39343)	MALATHION, TOTAL (UG/L) (39530)	MALATHION, TOTAL IN BOTTOM MATERIAL (UG/KG) (39531)	METHOXYCHLOR, TOTAL (UG/L) (39480)	METHOXYCHLOR, TOT. IN BOTTOM MATL. (UG/KG) (39481)	METHYL PARATHION, TOTAL (UG/L) (39600)	METHYL PARATHION, TOT. IN BOTTOM MATL. (UG/KG) (39601)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)									
APR , 1980										
21...	.00	--	.00	--	.00	--	.00	--	.00	--
SEP										
22...	.00	.0	.00	.0	.00	.0	.00	.0	.00	.0
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)									
APR , 1980										
21...	.00	--	.00	--	.00	--	.00	--	.00	--
SEP										
22...	.00	.0	.00	.0	.00	.0	.00	.0	.00	.0
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)									
APR , 1980										
22...	.00	--	.00	--	.00	--	.00	--	.00	--
SEP										
22...	.00	.0	.00	.1	.00	.0	.00	.0	.00	.0

Table 2.--Analyses of polychlorinated biphenyls, polychlorinated naphthalenes, and pesticides in whole-water and bottom-material samples, Larkin Creek watershed--Continued

DATE	METHYL TRI-THION, TOTAL (UG/L) (39790)	METHYL TRI-THION, TOT. IN BOTTOM MATL. (UG/KG) (39791)	MIREX, TOTAL (UG/L) (39755)	MIREX, TOTAL IN BOT-TOM MA-TERIAL (UG/KG) (39758)	PARA-THION, TOTAL (UG/L) (39540)	PARA-THION, TOTAL IN BOT-TOM MA-TERIAL (UG/KG) (39541)	PER-THANE TOTAL (UG/L) (39034)	PER-THANE IN BOTTOM MATERIL (UG/KG) (81886)	PCB TOTAL (UG/L) (39516)	PCB, TOTAL IN BOT-TOM MA-TERIAL (UG/KG) (39519)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)									
APR , 1980										
21...	.00	--	.00	--	.00	--	.00	--	.00	--
SEP										
22...	.00	.0	.00	.0	.00	.0	.00	.00	.00	3
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)									
APR , 1980										
21...	.00	--	.00	--	.00	--	.00	--	.00	--
SEP										
22...	.00	.0	.00	.0	.00	.0	.00	.00	.00	5
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)									
APR , 1980										
22...	.00	--	.00	--	.00	--	.00	--	.00	--
SEP										
22...	.00	.0	.00	.0	.00	.0	.00	.00	.00	0

Table 2.--Analyses of polychlorinated biphenyls, polychlorinated naphthalenes and pesticides in whole-water and bottom-material samples Larkin Creek watershed--Continued

DATE	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L) (39250)	PCN, TOTAL IN BOTTOM MATERIAL (UG/KG) (39251)	TOXAPHENE, TOTAL (UG/L) (39400)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG) (39403)	TOTAL TRITHION (UG/L) (39786)	TRITHION, TOTAL IN BOTTOM MATERIAL (UG/KG) (39787)	SEVIN, TOTAL (UG/L) (39750)	SILVEX, TOTAL (UG/L) (39760)	2,4,5-T TOTAL (UG/L) (39740)	2,4-D, TOTAL (UG/L) (39730)
SITE 1	07047955 - UN-NAMED TRIB. TO LARKIN CR NR HOLUB CROSSING,AR (LAT 34 51 44 LONG 090 54 28)									
APR , 1980										
21...	.0	--	0	--	.00	--	--	.00	.00	.11
SEP										
22...	.0	--	0	30	.00	.0	.00	.20	.09	.11
SITE 2	07047957 - LARKIN CREEK NR GILL, ARK (LAT 34 52 11 LONG 090 53 24)									
APR , 1980										
21...	.0	--	0	--	.00	--	--	.00	.00	.13
SEP										
22...	.0	--	0	170	.00	.0	.00	.00	.00	.00
SITE 3	07047959 - UN-NAMED TRIBUTARY TO LARKIN CR NR GILL, ARK (LAT 34 52 40 LONG 090 51 32)									
APR , 1980										
22...	.0	--	0	--	.00	--	--	.00	.01	1.3
SEP										
22...	.0	.0	0	20	.00	.0	.00	.01	.02	.00

(using a US BMH-60 sampler) from each site in September and analyzed for pesticides, PCB's, and PCN's. All sampling and analyses conform to standard Survey methods. Results are presented in tables 1 and 2.

RESULTS AND INTERPRETATION OF DATA

Streamflow was low to moderate (12 cubic feet per second or less) on each of the sampling dates with the lowest flows occurring in September. On each date, a large part of the streamflow at site 2 (Larkin Creek) was from the tributary sampled at site 1. On each date, flow at site 3 was very low (less than 1 cubic foot per second), and on September 22, the tributary was pooled and there was no flow. During periods of "no flow" in this or other tributaries, the water quality of Larkin Creek will not be altered by that tributary. As flows decreased, specific conductance increased, and concentrations of dissolved solids increased from low (less than 100 milligrams per per liter) to moderate (122 to 391 milligrams per liter), and hardness increased from soft (less than 60 milligrams per liter) to very hard (200 to 280 milligrams per liter). Calcium, magnesium, and bicarbonate were the most common ions present.

Streams were turbid and suspended-sediment concentrations were quite high (45 to 236 milligrams per liter) when sampled in April and on June 30 and July 1. Silt and clay (diameter less than 0.062 millimeters) were the principal components of the suspended sediment.

Numbers of fecal-coliform colonies (40 to an estimated 540 colonies per 100 milliliters) found indicate that the water at all sites met State standards (Arkansas Department of Pollution Control and Ecology, 1975) for Class B waters (which all tributaries of the L'Anguille River are classified as). Although too few samples were taken for an adequate evaluation, water at

Table 3.--Selected water-quality criteria

[From U.S. Environmental Protection Agency, 1976]

Parameter	Water use	Criteria
Fecal coliform bacteria	Bathing	Based on a minimum of 5 samples taken over a 30-day period, the fecal coliform level should not exceed a log mean of 200 colonies per 100 milliliters
Dissolved oxygen	Freshwater aquatic life	5.0 milligrams per liter (minimum)
Iron	Domestic water supplies (welfare)	0.3 milligrams per liter (maximum)
	Freshwater aquatic life	1.0 milligrams per liter (maximum)
Manganese	Domestic water supplies (welfare)	50 micrograms per liter (maximum)
Mercury	Freshwater aquatic life	0.05 micrograms per liter (maximum)
Aldrin/dieldrin	Freshwater aquatic life	0.003 micrograms per liter (maximum)

sites 2 and 3 may not always meet the U.S. Environmental Protection Agency criterion for bathing waters (table 3). Activities involving immersion in these waters may be detrimental to human health.

Low dissolved-oxygen concentrations (2.5 to 5.4 milligrams per liter) were common at sites 1 and 2. Concentrations near or lower than the Environmental Protection Agency criterion (table 3) and the State standard (Arkansas Department of Pollution Control and Ecology, 1975) of 5.0 milligrams per liter were measured on all sampling dates. Moderately-high biochemical oxygen demand values (1.9 to 5.5 milligrams per liter) were at least partially responsible for the low dissolved-oxygen concentrations. Streambed oxygen demand (SOD), caused by respiration of fungi, bacteria, invertebrates, and periphyton, and by chemical oxidation of bed deposits, may account for a large part of the low dissolved-oxygen concentrations. In the L'Anguille River, more than 70 percent of the oxygen deficit is caused by SOD (Bryant and others, 1979, p. 48).

Concentrations of organic nitrogen, ammonia, nitrite, nitrate, orthophosphate, and total phosphorus indicate that streams in the Larkin Creek watershed are nutrient enriched. High concentrations of ammonia (approximately 0.6 milligrams per liter as nitrogen) were occasionally present. Concentrations of nutrients were somewhat lower at site 3. Total phosphorus concentrations at sites 1 and 2 always exceeded the concentration of 100 micrograms per liter recommended by the National Technical Advisory Committee (1968, p. 56) to limit nuisance levels of plant growth. The State standard is also 100 micrograms per liter (Arkansas Department of Pollution Control and Ecology, 1975). Spring and midsummer concentrations of total nitrate (or total ammonia) and total orthophosphate were high enough to cause "blooms"

of algae. Although no measurements of phytoplankton populations were made, the low concentrations of dissolved oxygen indicate either that no "bloom" was occurring at the times of sampling or that photosynthetic oxygen was rapidly being used by SOD. Suspended sediment reduces the amount of light available for photosynthesis and may have limited photosynthesis.

Iron and manganese concentrations almost always exceeded Environmental Protection Agency criteria (table 3). High concentrations of iron (as much as 11,000 micrograms per liter) and manganese (as much as 430 micrograms per liter) are present in ground water used for irrigation in St. Francis and Lee Counties (Bryant and others, 1979, p. 59). In April concentrations of mercury also exceeded the Environmental Protection Agency criterion (table 3). Detrimental concentrations of other metals were not detected.

Several pesticides were present in water and bottom-material samples. Many concentrations exceeded concentrations found in the L'Anguille River basin in 1978 by Bryant, Morris, and Terry (1979). Concentrations of dieldrin in excess of the Environmental Protection Agency criterion (table 3) were present in April at sites 1 and 2. Toxaphene concentrations in bottom-material samples were high (20 to 170 micrograms per kilogram), particularly at site 2. Significant concentrations of PCB's were also present in bottom-material samples from sites 1 and 2. Endrin, lindane, DDT, DDD, DDE, silvex, 2, 4-D, and 2, 4, 5-T were also present in the water or bottom-material samples.

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