WATER QUALITY IN THE PROPOSED PROSPERITY RESERVOIR AREA, CENTER CREEK BASIN, MISSOURI

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Water in Center Creek about 2.5 miles downstream from the proposed damsite is similar in quality to that upstream from the damsite except for higher concentrations of sodium, sulfate, chloride, fluoride, nitrogen, and phosphorus. These are caused by fertilizer industry wastes that enter Center Creek about 1.0 mile downstream from the proposed damsite.

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CONTENTS

ILLUSTRATION

TABLES

CONVERSION FACTORS

For use of those readers who may prefer to use the International System of Units (SI) rather than inch-pound units, the conversion factors for the terms used in this report are listed below.

Multiply inch-pound units	By	To obtain SI units
acres	0.4047	hectares (ha)
feet (ft)	.3048	meters (m)
cubic feet per second (ft^3/s)	.02832	cubic meters per second (m^3/s)
inches (in.)	25.40	millimeters (mm)
miles (mi)	1.609	kilometers (km)
square miles (mi^2)	2.590	square kilometers (km^2)

(To convert temperature in °C (Celsius) to °F (Fahrenheit), multiply by 1.8 and add 32.

Water Quality in the Proposed Prosperity Reservoir Area,
Center Creek Basin, Missouri

By James H. Barks and Wayne R. Berkas

ABSTRACT

Water in Center Creek basin upstream from the proposed Prosperity Reservoir damsite is a calcium bicarbonate type that is moderately mineralized, hard, and slightly alkaline. Ammonia and organic nitrogen, phosphorus, total organic carbon, chemical oxygen demand, and bacteria increased considerably during storm runoff, probably due to livestock wastes. Nitrogen and phosphorus concentrations are probably high enough to cause the proposed lake to be eutrophic. Minor-element concentrations were at or near "background" levels in the dissolved, total, and bottom phases. The only pesticides detected were 0.01 micrograms per liter of 2, 4, 5-T in one base-flow sample and 0.02 to 0.04 micrograms per liter of 2, 4, 5-T and 2, 4-D in all storm-runoff samples. Fecal coliform and fecal streptococcus densities ranged from 2 to 650 and 2 to 550 colonies per 100 milliliters, respectively, during base flow, but were 17,000 to 45,000 and 27,000 to 70,000 colonies per 100 milliliters, respectively, during storm runoff.

Water in Center Creek about 2.5 miles downstream from the proposed damsite is similar in quality to that upstream from the damsite except for higher concentrations of sodium, sulfate, chloride, fluoride, nitrogen, and phosphorus. These higher concentrations are caused by fertilizer industry wastes that enter Center Creek about 1.0 mile downstream from the proposed damsite.

INTRODUCTION

The Corps of Engineers has proposed construction of a dam on Center Creek in southwestern Missouri that would impound water from 207 mi², or the upper two-thirds of the basin. The impoundment would be called Prosperity Lake and would have a surface area of 1,880 acres and a maximum depth of about 44 ft at conservation pool, and a surface area of 3,260 acres and a maximum depth of about 60 ft at flood pool. The upper part of the lake would be "two-fingered" with Center Creek forming one finger and Jones Creek (71-mi² drainage area) forming the other. Major benefits that may be derived from the impoundment are flood control, water supply, and recreation.

Center Creek begins near Monett and flows west about 60 mi before entering Spring River near the Missouri-Kansas state line (fig. 1). It drains about 302 mi^2 amd flows past several cities including Sarcoxie, Carthage, Carterville, Webb City, Oronogo, Carl Junction, and Joplin. Land upstream from the proposed lake site is rural and is used primarily for pasture. Downstream, much of the land is used for industrial and residential purposes and some is covered with abandoned lead and zinc mines and tailings piles.

A report by Feder and others (1969) describes the water resources of the Joplin area but contains only general information and little water-quality data for the upper part of Center Creek. Barks (1977) made a detailed study of the effects of abandoned lead and zinc mines and tailings piles on the quality of water in the lower part of Center Creek, but the resulting report also contains little information about water quality in the upper part of the basin. Harvey and Emmett (1978) describe the hydrology of the Mississippian limestone aquifer that underlies the proposed Prosperity Reservoir area.

PURPOSE AND SCOPE

Prosperity Lake is in the preconstruction planning phase and one step in the planning process is to assess the quality of water in the upstream part of Center Creek basin. The U.S. Geological Survey was requested to make this assessment. Time restraints limited the data-collection period to about 6 months.

Although the study was of short duration, it was designed to determine water quality at selected sites during base flow in the winter and summer and during a major storm event. The data were collected to indicate the type of water that could be expected in the impoundment and to identify existing pollution problems.

Sampling sites were selected near the upstream ends of the planned conservation pool at Center Creek above Fidelity and Jones Creek near Fidelity, and about 2.5 mi downstream from the proposed damsite at the gaging station, Center Creek near Carterville. Each site was sampled five times (December 1977, and February, May, June, July 1978) during base-flow conditions. The December samples included bottom material. In May the sites were sampled during the rise, peak, and recession of a storm event that caused about a 6-ft rise at the gaging station near Carterville. Streamflow was determined each time samples were collected and all water samples were analyzed for common inorganic constituents, major nutrients, minor elements, pesticides, and bacteria. The bottom material samples were analyzed for metals only.

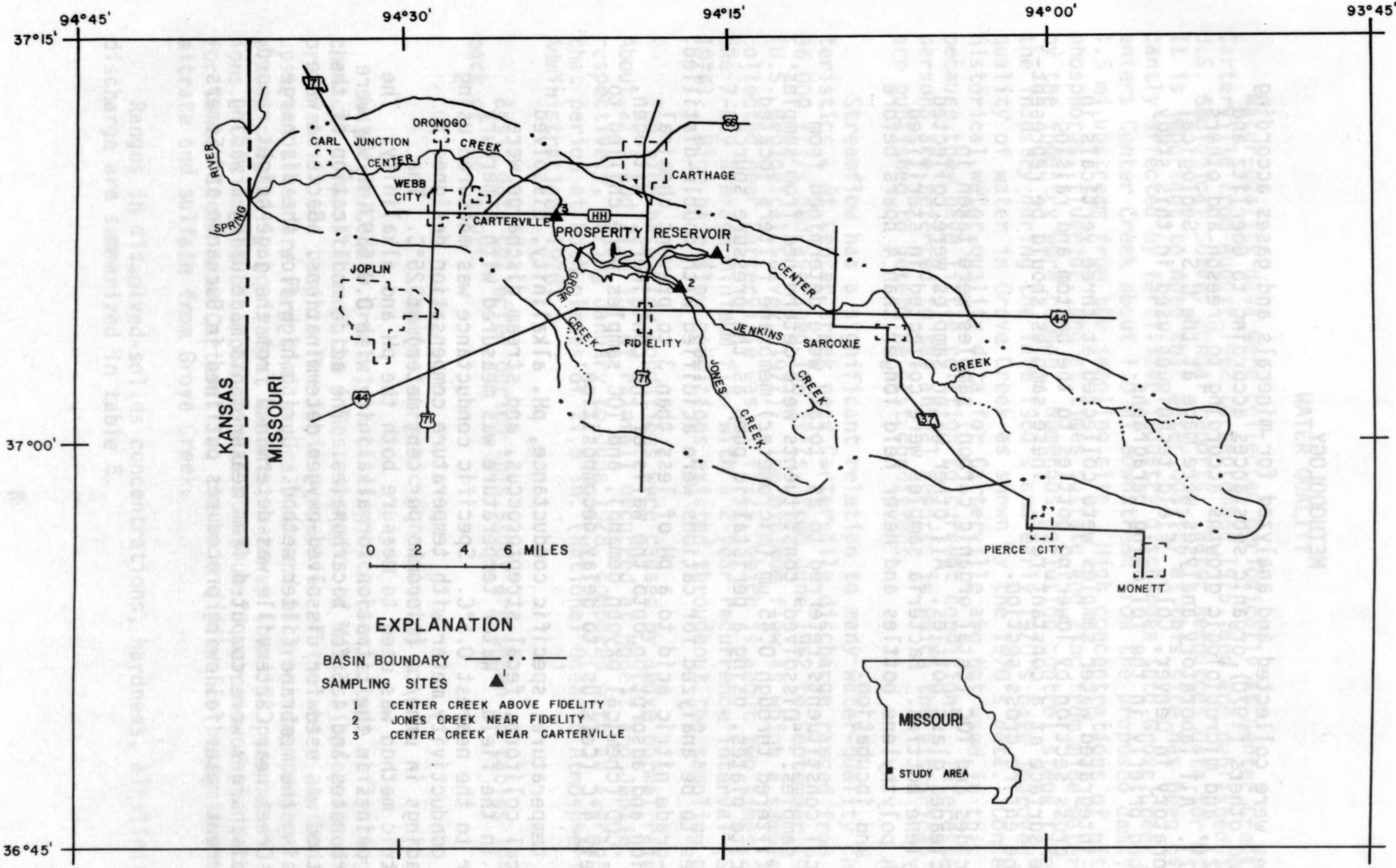

FIGURE 1.--LOCATION OF THE PROPOSED PROSPERITY RESERVOIR AND ASSOCIATED WATER-SAMPLING SITES.

METHODOLOGY

Samples were collected and analyzed for minerals and gases according to Brown and others (1970), organic substances according to Goerlitz and Brown (1972), and microbiologic growths according to Greeson and others, eds., (1977). All laboratory analyses were made at the U.S. Geological Survey laboratory in Denver, Colo. Field techniques used in this study are described briefly in the following paragraphs.

Depth-integrated water samples were collected at three verticals in the stream cross section by lowering bottles to the bottom and raising them to the surface at a constant rate. These samples should be representative of the entire cross section.

Pesticides and TOC (total organic carbon) samples were taken in specially cleaned glass bottles. All other water samples were collected in polyethylene bottles. Bacteria samples were collected in sterilized large-mouth polythylene bottles and never held longer than 4 hours before filtration and incubation.

Chemical constituents referred to as "total" were determined from unfiltered samples. "Dissolved" constituents were determined from samples that were filtered through 0.45 μm (micrometer) membrane filters located between lucite plates, using a peristaltic pump as the pressure source.

Samples to be analyzed for cations were acidified with double-distilled, analytical-grade nitric acid to a pH of less than 3 to prevent chemical precipitation and adsorption onto the walls of the containers. Nitrogen, phosphorus, COD (chemical oxygen demand), and TOC samples were chilled to approximately 4°C (Celsius) to delay decomposition.

Water temperature, specific conductance, pH, alkalinity, dissolved oxygen, fecal coliform, fecal streptococcus, and stream discharge were determined in the field. Water temperature was measured with a mercury thermometer to the nearest 0.5°C. Specific conductance was measured using a portable conductivity meter with temperature compensation designed to express readings in μmho/cm (micromho per centimeter) at 25°C. The potentiometric method was used to measure both the pH and alkalinity. The inflection points in the titration for alkalinity with 0.01639 N H_2SO_4 were 8.3 for carbonates and 4.5 for bicarbonates. The azide modification of the Winkler method was used for dissolved-oxygen determinations. Bacteria were measured using the membrane filter method. During high flow the discharge for Center Creek near Carterville was determined from the gage-height record. All other discharges were computed from measurements made using a wading rod and current meter following procedures outlined in Buchanan and Somers (1969).

WATER QUALITY

Water-quality data were collected periodically at Center Creek near Carterville from August 1962 to September 1975, and are published in the U.S. Geological Survey annual reports, "Water Resources Data for Missouri." It is important to note that water quality at this site has been significantly affected by fertilizer industry discharges into Grove Creek which enters Center Creek about 1.0 mi downstream from the proposed damsite and 1.5 mi upstream from the sampling site. High concentrations of nitrogen, phosphorus, fluoride, and at times sulfate and zinc from mine water used by the industry were common. Numerous pollution control steps taken by the industry during the late 1960's and early 1970's have improved the quality of water in Grove Creek as shown by the 1970's data. Consequently, historical water-quality data for Carterville are not used in this report because they have little relation to current conditions. Interested persons are referred to the annual reports in which the historical data are published to determine past conditions.

Streamflow has a significant relation to many water-quality characteristics. At Center Creek near Carterville discharge ranged from 9.4 to 36,000 ft^3/s and averaged 196 ft^3/s, from June 1962 to September 1977 (U.S. Geological Survey, 1977). The minimum flow at which a sample was collected near Carterville was 51 ft^3/s, which is about two times 26 ft^3/s, the 7-day average minimum flow with a 2-year recurrence interval (Skelton, 1976). High base-flow conditions existed throughout the sampling period.

The high base-flow conditions were caused by above normal rainfall. About 27.5 and 21.4 in. of rainfall occurred at Monett and Joplin, respectively, during January to June 1978, compared with an average for that period at both places of 21.5 in. (National Oceanic Atmospheric Administration, 1978).

Basic data collected during this study are shown in tables 1-4 in the back of the report.

Common Inorganic Constituents

Water in Center Creek is a calcium bicarbonate type reflecting the chemical composition of the limestone rocks of Mississippian age that are prevalent in the basin. The ionic properties of the water at the two upstream sites are very similar; calcium and bicarbonate, present in almost chemically equivalent amounts, make up about 83 percent of the total ions. Calcium and bicarbonate make up about 78 percent of the total ions for Center Creek near Carterville, the main difference being increased nitrate and sulfate from Grove Creek.

Ranges in dissolved-solids concentrations, hardness, alkalinity, and discharge are summarized in table 5.

Table 5.--Dissolved-solids concentrations, hardness, alkalinity, and discharge for Center Creek and Jones Creek (December 1977-July 1978)

[Results in milligrams per liter, except as indicated]

Station name	Number of samples	Dissolved solids			Hardness as $CaCO_3$			Alkalinity as $CaCO_3$			Discharge, in ft^3/s		
		Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
Center Creek above Fidelity------------	8	174	112	148	150	78	121	135	72	107	935	30	296
Jones Creek near Fidelity------------	7	169	62	130	150	33	108	135	33	98	2,250	13	423
Center Creek near Carterville---------	8	208	71	159	160	57	121	133	56	105	2,930	51	837

The dissolved-solids concentration and specific conductance of water are closely related, and either can be used to express the degree of mineralization of the water. The relation between dissolved solids (DS) and specific conductance (SC) for water in Center Creek is DS=(0.51 X SC)+20; the standard error of estimate is 40 mg/L (milligrams per liter) DS. The dissolved-solids concentrations in table 5 indicate that water in Center Creek is moderately mineralized.

Hardness of water has been classified with respect to calcium carbonate according to the following (Brown and others, 1970, p. 95):

Hardness (mg/L $CaCO_3$)	Classification
0-60	Soft
61-120	Moderately hard
121-180	Hard
>180	Very hard

Water in Center Creek generally can be classified as hard, although during periods of low flow it may be very hard and during floods it may be soft.

In Center Creek as in most streams, concentration of dissolved minerals varies inversely with discharge. During periods of low discharge, concentrations are higher because most of the flow is contributed by ground water that has been in contact with mineral material for a long time. At higher flows the concentrations are diluted by surface runoff.

Major Nutrients

Although many elements are nutrients, nitrogen and phosphorus are commonly referred to as the major nutrients and have an important effect on many water uses, either directly or indirectly.

Nitrate is significant in water supplies, so a standard of 10 mg/L as N has been set for drinking water (U.S. Environmental Protection Agency, 1975). The standard is about four times greater than the nitrite plus nitrate concentrations measured in water from Jones Creek and upper Center Creek and two times greater than the concentrations measured in water from Center Creek near Carterville (table 1). Dissolved and total nitrite plus nitrate concentrations were about equal indicating that the nitrite plus nitrate is nearly all in solution and very little is associated with suspended sediment. The nitrite plus nitrate concentrations decreased during storm runoff due to dilution. Conversely, ammonia and organic nitrogen increased to relatively high concentrations during storm runoff indicating organic pollution from nonpoint sources such as scattered animal wastes, and animal wastes produced near dairy operations and feedlots.

Increasing concentrations of phosphorus may be the main reason for increasing standing crops of aquatic plants which often interfere with water uses and become nuisances to man. Such phenomena are associated with a condition of accelerated eutrophication or aging of water bodies. Although phosphorus is not the sole cause of eutrophication, it may be the key element of all the elements required by freshwater plants and generally it is present in the least amount relative to need. Therefore, an increase in phosphorus allows use of other already present nutrients, such as nitrogen, for plant growth. To prevent the development of biological nuisances and to control accelerated eutrophication, total phosphate as P should not exceed 0.05 mg/L in any stream where it enters any lake or reservoir (U.S. Environmental Protection Agency, 1976 [1977]). At the two upstream sites total orthophosphorus (total phosphate) concentrations were less than 0.05 mg/L during base-flow conditions, but exceeded 0.05 mg/L by two or three times during storm runoff. Also, during storm runoff total phosphorus concentrations were about two to four times higher than total orthophosphorus concentrations. The higher total phosphorus concentrations are attributed to organic wastes derived mainly from nonpoint sources in the upper part of the basin. The total orthophosphorus concentrations were often higher than the dissolved concentrations, especially during storm runoff, indicating association of some orthophosphorus with the suspended sediment. Phosphorus concentrations generally were about two times greater near Carterville than at the two upstream sites due to contributions from Grove Creek.

Chemical oxygen demand furnishes an approximation of the minimum amount of organic and reducing material present in the water and total organic carbon gives an accurate measurement of the organic matter present (Goerlitz and Brown, 1972). Maximum COD and TOC concentrations observed during storm runoff indicate mildly polluted waters at all three sampling sites.

Minor Elements

Many minor elements are essential to life in small amounts, but all are considered toxic when ingested in sufficient quantity under certain conditions. In some instances, the difference between what is necessary for life and what is toxic is small.

The subject of minor-element requirements and minor-element toxicity is complex. In lieu of a lengthy discussion of these topics, a simple comparison of the maximum minor-element concentrations observed for the three sites with drinking water standards and criteria for freshwater aquatic life are made in table 6. Standards and (or) criteria for some of the elements shown in the table are not established, generally because those elements are not considered harmful to man or aquatic life at low concentrations. The maximum dissolved and total values for Center and Jones

Table 6.--*Comparison of maximum concentrations of minor elements in Center Creek basin with drinking water standards and criteria for freshwater aquatic life*

[Results in micrograms per liter]

Element	Drinking water standard (U.S. Environmental Protection Agency, 1975) Total	Criteria for freshwater aquatic life (Committee on Water Quality Criteria, 1972) Total	Maximum observed Dissolved	Maximum observed Total
Cadmium------	10	30	2	9
Chromium-----	50	50	20	30
Copper-------	------	[1]20	7	32
Iron---------	------	----	360	9,200
Lead---------	50	30	32	74
Manganese----	------	----	40	720
Mercury------	2	.2	.1	.1
Nickel-------	------	[1]100	4	15
Selenium-----	10	----	3	3
Zinc---------	------	[1]140	30	90

[1]Estimated.

Creeks are generally less than the standard or criteria and are considered to be at or near the "natural" or "background" levels for most streams. Copper, lead, and zinc did exceed the criteria and (or) standard in some samples, but were mostly associated with suspended sediment. Because most of the suspended sediment on which the copper, lead, and zinc are adsorbed would settle to the bottom of a reservoir, concentrations of these metals should remain below the standard and criteria in reservoir water. Iron and manganese are common in many rocks and soils, and neither are considered toxic to man or aquatic life at low concentrations. Because they are closely associated with soils, particularly clays, total concentrations of iron and manganese are much higher than dissolved concentrations, especially during storm runoff when the streams are laden with suspended sediment.

Minor elements in the bottom material (table 3) generally are low in concentration and probably at natural levels (unaffected by man) except for the zinc in the bottom material near Carterville. A small amount of tailings from the abondoned lead and zinc mines enter Center Creek upstream from the Carterville sampling site, primarily through Grove Creek, and account for the increased zinc in the bottom material. About 100 µg/g (micrograms per gram) are considered background for upper Center Creek (Barks, 1977). Although the concentrations of iron and manganese are much higher than the other elements, they are considered background because of the close association of iron and manganese with soils and rocks.

The minor-element data collected during this study compare closely with that collected for upper Center Creek by Barks (1977).

Pesticides

The only pesticide detected during base-flow conditions was 0.01 µg/L of 2, 4, 5-T at the upper Center Creek site (table 4). Low concentrations (0.02-0.04 µg/L) of 2, 4-D and 2, 4, 5-T were present in the May 23-24 storm-runoff samples from all three stations. These herbicides probably came from spraying fence rows to control brush. The relative absence of the pesticides listed in table 4 indicates that Center and Jones Creeks are nearly free of pesticides.

Bacteria

The sanitary significance of fecal coliforms in the environment has been well documented by Geldriech (1966). Fecal streptococci are also being used as indicators of significant contamination of water because, like fecal coliforms, the normal habitat of these organisms is the intestine of man and animals. Fecal streptococcal data supplement fecal coliform data by providing additional information concerning the recency and probable origin of pollution (Greeson, and others, eds., 1977, p. 59). The origin of contamination can be interpreted from fecal coliform to fecal streptococcus ratios (Geldriech, 1966, p. 103) as follows:

Greater than 4------	Pollution derived entirely or predominantly from human origin.
Less than 0.6-------	Pollution derived entirely or predominantly from animal origin.
Four to 0.6---------	Uncertain; higher ratios suggestive of predominantly human origin and lower ratios suggestive of predominantly animal origin.

Because of differences in the rates of die-off of the two bacterial groups, the original numerical relationships may be obscured if the source of pollution is too remote. Ratios with the greatest reliability are for samples taken not more than 24 hour's flow time from the origin of pollution.

Fecal colifrom and fecal streptococcus densities were similar at all three sites (table 1). During base-flow conditions fecal coliform densities ranged from less than 2 to 650 col/100 ml. Fecal coliform to fecal streptococcus ratios ranged from 0.1 to 5.0, but probably have little significance during base flow because samples may have been taken more than 24-hour's flow time from the source and because some counts were too low to be statisitcally reliable. There was above-normal rainfall during the period, and this probably resulted in above-normal bacteria densities.

During storm runoff fecal coliform densities ranged from 17,000 to 45,000 col/100 ml and fecal streptococcus densities ranged from 27,000 to 70,000 col/100 ml for the three stations. The low fecal coliform to fecal streptococcus ratios suggest that the significant increase in bacteria densities during storm runoff was caused primarily by animal wastes.

Water Temperature, Dissolved Oxygen, and pH

Water temperatures that were measured during the study are shown in table 1 and indicate that the temperature regime at the three sites is comparable. Extremes for continuous water temperature record for Center Creek near Carterville for 1968 to 1975 include a maximum of 31.5°C and a minimum of the freezing point, 0.0°C, (U.S. Geological Survey, 1976). These data show that diurnal fluctuations of 3.0°C are common during summer months.

Oxygen is added to water by reaeration (transfer of oxygen from the air through the surface, particularly in turbulent reaches such as riffles) and by photosynthesis. Oxygen in the water is used by plant and animal respiration and by bacterial respiration and decomposition of organic matter. These processes usually result in a diurnal fluctuation of dissolved oxygen in the stream with maximum concentrations occurring during late afternoon and minimum concentrations occurring just before sunrise. The dissolved oxygen concentrations in table 1 are highest during the winter and lowest during the summer, a phenomenon resulting from the inverse relation between water temperature and the amount of oxygen that can be dissolved in the water. The saturation of the water by oxygen at the three sampling stations ranged from 69 to 113 percent, indicating a biochemical condition in which fish and other clean-water biota that require relatively high dissolved oxygen levels can live.

The pH is a measure of the acidity of the water. A pH of 7 is considered neutral, whereas a pH less than 7 indicates acid water, and a pH greater than 7 indicates alkaline water. Photosynthesis, respiration, and decomposition affect the pH and produce a diurnal change similar to that for dissolved oxygen. The pH values in table 1 ranged from 7.0 to 8.2, indicating that water in the upper part of Center Creek basin is slightly alkaline.

SUMMARY AND CONCLUSIONS

Water in Center Creek basin upstream from the proposed Prosperity Reservoir damsite is generally of good quality. It is a calcium bicarbonate type that is moderately mineralized, hard, and slightly alklaine. Nitrite plus nitrate concentrations as N were about one-fourth the drinking water standard of 10 mg/L for nitrate as N and decreased during storm runoff. Ammonia and organic nitrogen increased to relatively high concentrations during storm runoff, indicating organic pollution from nonpoint sources such as animal wastes. This pollution is substantiated by increases in phosphorus, total organic carbon, chemical oxygen demand, and bacteria during storm runoff. The nitrogen and phosphorus concentrations are probably high enough in Jones Creek and upper Center Creek to cause the proposed lake to be eutrophic. Minor-element concentrations were at or near "background" levels in the dissolved, total, and bottom material phases. Some of the minor elements were associated with suspended sediment, particularly copper, lead, and zinc. Iron and manganese were strongly associated with suspended sediment and the bottom material. The maximum dissolved and total minor-element concentrations were generally less than drinking water standards and criteria for freshwater aquatic life. The only pesticides detected, other than 0.01 µg/L (micrograms per liter) 2, 4, 5-T during base flow, were 2, 4-D and 2, 4, 5-T that ranged from 0.02 to 0.04 µg/L in all the storm-runoff samples. The main source of these herbicides is probably fence-row spraying to control brush. Fecal coliform and fecal streptococcus densities ranged from less than 2 to 650 and 2 to 550 col/100 ml, respectively, during base flow, but increased to 17,000 to 45,000 and 27,000 to 70,000 col/100 ml, respectively, during storm runoff. The low fecal coliform to fecal streptococcus ratios during storm runoff indicate a probable animal origin. The temperature of water in Center and Jones Creeks can be expected to range from near the freezing point in the winter to about 30°C in the summer and have maximum summer diurnal fluctuations of about 3.0°C. Dissolved oxygen saturation ranged from 69 to 113 percent indicating that the streams are presently capable of assimilating the organic wastes present and maintaining a dissolved oxygen level at which fish and other clean-water biota can live.

Water in Center Creek near Carterville, which is about 2.5 mi downstream from the proposed damsite, is similar in quality to that upstream from the damsite with a few exceptions which are caused primarily by fertilizer industry wastes that enter Center Creek via Grove Creek 1.0 mi downstream from the proposed damsite. The exceptions include increases in sodium, sulfate, chloride, fluoride, nitrite plus nitrate, ammonia nitrogen, total phosphorus, and total orthophosphorus. The small increase in zinc in the bottom material is attributed to small amounts of tailings that have been transported from abandoned lead and zinc mines down Grove Creek and into Center Creek. Based upon historical data published in U.S. Geological Survey annual reports, water-quality conditions have improved considerably at Center Creek near Carterville as a result of pollution abatement steps taken by the fertilizer industry in recent years.

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BASIC DATA

TABLE 1.--WATER-QUALITY DATA FOR CENTER CREEK AND JONES CREEK

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	OXYGEN DEMAND, CHEM-ICAL (LOW LEVEL) (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD-NESS (MG/L AS CACO3)
07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)											
DEC , 1977											
20...	1130	78	300	7.8	6.0	10.2	82	9	60	280	150
FEB , 1978											
08...	1245	30	308	8.2	1.0	14.2	100	4	<2	20	150
MAY											
16...	1145	102	285	8.0	17.5	8.9	93	12	110	44	140
23...	1105	655	183	7.2	18.0	--	--	70	25000	47000	85
23...	1430	935	149	7.2	20.5	6.2	69	78	32000	53000	78
24...	0945	360	195	7.3	19.5	--	--	59	24000	27000	96
JUN											
01...	1735	155	272	7.5	21.0	--	--	16	650	450	130
JUL											
12...	1200	56	290	8.0	26.0	6.6	80	19	130	125	140
07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)											
DEC , 1977											
20...	1000	33	273	7.8	6.5	9.2	75	9	110	170	130
FEB , 1978											
08...	1350	13	268	7.9	3.0	15.3	113	2	10	4	140
MAY											
16...	1330	42	267	7.8	17.5	10.3	107	9	64	56	130
23...	1040	2250	83	7.0	20.0	6.3	68	120	45000	70000	33
23...	1615	520	112	7.0	20.5	--	--	70	20000	50000	50
JUN											
01...	1705	82	248	7.4	17.0	--	--	5	650	550	120
JUL											
12...	1115	21	295	8.0	24.5	5.8	69	14	80	210	150
07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)											
DEC , 1977											
20...	0850	129	338	7.9	5.5	9.0	71	9	86	170	150
FEB , 1978											
08...	1515	51	359	8.1	2.0	14.0	101	6	10	2	160
MAY											
16...	1500	209	300	7.8	19.0	9.2	102	12	48	44	140
23...	1130	1990	180	7.2	18.0	--	--	89	17000	50000	76
23...	1720	2930	142	7.1	20.5	7.6	84	81	29000	56000	57
24...	0900	1020	197	7.3	19.5	--	--	120	20000	32000	93
JUN											
01...	1810	281	292	7.4	20.0	--	--	7	350	250	140
JUL											
12...	1030	85	338	7.8	25.5	5.8	71	9	120	160	150

TABLE 1.--WATER-QUALITY DATA FOR CENTER CREEK AND JONES CREEK--CONTINUED

DATE	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	ALKALINITY (MG/L AS CACO3)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	SULFATE DISSOLVED (MG/L AS SO4)
07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)										
DEC , 1977										
20...	14	53	3.2	4.2	1.6	160	0	131	4.1	6.6
FEB , 1978										
08...	15	56	3.0	5.3	1.0	164	0	135	1.7	6.7
MAY										
16...	38	50	2.6	3.4	1.3	124	0	102	2.0	6.6
23...	5	31	1.9	2.9	2.8	98	0	80	9.9	4.9
23...	6	28	1.9	2.7	3.2	88	0	72	8.9	5.7
24...	10	35	2.0	2.7	2.8	104	0	85	8.3	5.5
JUN										
01...	8	48	2.7	3.8	1.5	150	0	123	7.6	7.2
JUL										
12...	10	52	2.7	4.4	1.5	160	0	131	2.6	4.5
07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)										
DEC , 1977										
20...	14	47	3.2	3.5	1.3	142	0	116	3.6	6.5
FEB , 1978										
08...	19	50	3.7	4.2	.9	148	0	121	3.0	8.0
MAY										
16...	10	47	2.9	2.9	1.1	146	0	120	3.7	8.6
23...	0	11	1.3	1.3	3.5	40	0	33	6.4	4.1
23...	0	17	1.8	2.8	1.9	64	0	52	10	5.1
JUN										
01...	16	43	3.6	4.4	1.3	130	0	107	8.3	8.0
JUL										
12...	15	54	3.5	4.1	1.5	164	0	135	2.6	4.9
07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)										
DEC , 1977										
20...	18	55	2.9	6.1	1.4	160	0	131	3.2	14
FEB , 1978										
08...	27	57	3.5	13	1.3	162	0	133	2.1	21
MAY										
16...	13	50	2.7	4.7	1.4	150	0	123	3.8	8.3
23...	2	27	2.0	2.9	2.7	90	0	74	9.1	8.4
23...	1	20	1.6	2.3	3.5	68	0	56	8.6	6.0
24...	16	34	2.0	3.1	2.9	94	0	77	7.5	7.9
JUN										
01...	17	50	3.0	5.3	1.5	146	0	120	9.3	12
JUL										
12...	22	53	3.3	8.6	1.7	156	0	128	4.0	13

TABLE 1.--WATER-QUALITY DATA FOR CENTER CREEK AND JONES CREEK--CONTINUED

07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)

DATE	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L)	SOLIDS, VOLATILE ON IGNITION, TOTAL (MG/L)
DEC , 1977										
20...	7.1	.1	9.1	166	176	.23	35.0	18	--	82
FEB , 1978										
08...	8.3	.1	3.2	167	176	.23	13.5	26	176	176
MAY										
16...	7.5	.1	8.6	174	152	.24	47.9	13	206	71
23...	5.4	.1	7.2	120	106	.16	212	204	317	68
23...	4.9	.0	8.0	112	103	.15	283	154	364	77
24...	4.9	.1	9.9	119	120	.16	116	96	223	71
JUN										
01...	6.7	.0	9.8	156	164	.21	65.3	23	190	64
JUL										
12...	7.7	.1	9.8	172	172	.23	26.0	27	188	183

07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)

DATE	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L)	SOLIDS, VOLATILE ON IGNITION, TOTAL (MG/L)
DEC , 1977										
20...	5.5	.1	9.4	142	158	.19	12.7	16	151	73
FEB , 1978										
08...	5.4	.1	6.4	155	164	.21	5.44	25	163	163
MAY										
16...	7.6	.1	9.0	159	162	.22	18.0	5	169	30
23...	2.9	.1	4.1	62	49	.08	377	668	794	110
23...	3.1	.1	7.3	85	74	.12	119	152	236	58
JUN										
01...	4.9	.0	9.9	139	150	.19	30.8	27	142	63
JUL										
12...	5.3	.1	11	169	177	.23	9.58	3	176	88

07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)

DATE	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	SOLIDS, DISSOLVED (TONS PER DAY)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L)	SOLIDS, VOLATILE ON IGNITION, TOTAL (MG/L)
DEC , 1977										
20...	8.9	.2	11	205	198	.28	71.4	17	199	93
FEB , 1978										
08...	10	.3	3.8	208	224	.28	28.6	30	223	101
MAY										
16...	5.4	.2	8.7	179	173	.24	101	10	204	183
23...	4.8	.4	7.0	120	103	.16	645	298	429	84
23...	3.6	.2	7.1	71	85	.10	562	298	403	77
24...	5.1	.2	9.8	119	121	.16	328	117	248	76
JUN										
01...	6.5	.2	10	171	179	.23	139	921	205	79
JUL										
12...	9.4	.3	11	199	193	.27	45.7	28	218	102

TABLE 1.--WATER-QUALITY DATA FOR CENTER CREEK AND JONES CREEK--CONTINUED

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)
07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)										
DEC , 1977										
20...	2.7	2.7	.00	.22	.22	2.9	.04	.04	.04	.7
FEB , 1978										
08...	2.6	2.4	.02	.07	.09	2.5	.02	.00	.01	3.6
MAY										
16...	2.5	2.3	.06	.41	.47	2.8	.06	.02	.01	1.0
23...	.29	1.6	.01	1.3	1.3	2.9	.28	.12	.07	11
23...	1.1	1.2	.06	1.5	1.6	2.8	.24	.14	.02	12
24...	1.3	1.3	.05	1.2	1.2	2.5	.15	.13	.01	8.2
JUN										
01...	2.4	2.4	.03	.60	.63	3.0	.04	.03	.00	1.4
JUL										
12...	2.3	2.2	.00	.39	.39	2.6	.04	.04	.00	1.6
07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)										
DEC , 1977										
20...	2.6	2.7	.00	.17	.17	2.9	.04	.03	.03	.6
FEB , 1978										
08...	2.7	2.7	.02	.11	.13	2.8	.01	.00	.01	.8
MAY										
16...	2.5	2.3	.05	.25	.30	2.6	.03	.01	.01	.7
23...	.08	.97	.06	2.8	2.9	3.9	.48	.15	.17	23
23...	.81	1.0	.10	1.3	1.4	2.4	.17	.13	.01	4.1
JUN										
01...	2.4	2.3	.03	.32	.35	2.7	.00	.01	.00	1.6
JUL										
12...	2.6	2.5	.00	.50	.50	3.0	.02	.02	.01	1.3
07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)										
DEC , 1977										
20...	4.4	4.5	.75	.00	.74	5.2	.08	.07	.07	.9
FEB , 1978										
08...	7.6	7.8	2.3	.30	2.6	10	.08	.07	.07	1.2
MAY										
16...	4.0	3.8	.49	.81	1.3	5.1	.09	.05	.05	1.2
23...	.59	2.8	.01	1.9	1.9	4.7	.79	.36	.09	12
23...	1.4	1.4	.30	1.6	1.9	3.3	.38	.27	.11	13
24...	2.1	2.1	.44	1.2	1.6	3.7	.31	.27	.04	6.6
JUN										
01...	4.1	4.3	.49	.50	.99	5.3	.09	.08	.03	1.4
JUL										
12...	3.6	5.0	.30	.57	.87	5.9	.09	.08	--	1.7

TABLE 2.--MINOR-ELEMENT CONCENTRATIONS IN WATER FROM CENTER CREEK AND JONES CREEK

DATE	TIME	CADMIUM DIS-SOLVED (UG/L AS CD)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, DIS-SOLVED (UG/L AS CU)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)											
DEC , 1977											
20...	1130	2	1	0	0	2	32	30	140	12	14
FEB , 1978											
08...	1245	1	0	0	0	3	6	30	50	0	6
MAY											
16...	1145	2	3	0	0	0	5	20	350	10	13
23...	1105	1	3	0	20	1	8	70	3000	12	20
23...	1430	1	3	5	0	2	11	60	3600	10	30
24...	0945	1	1	5	0	1	7	60	2000	5	16
JUN											
01...	1735	2	2	0	5	0	6	50	640	0	2
JUL											
12...	1200	1	1	0	10	1	4	70	160	2	9
07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)											
DEC , 1977											
20...	1000	2	9	0	0	0	20	30	90	6	74
FEB , 1978											
08...	1350	1	1	0	30	1	6	30	80	0	20
MAY											
16...	1330	1	3	0	0	0	6	10	160	6	29
23...	1040	1	3	0	10	2	17	150	9200	10	33
23...	1615	2	3	0	0	7	18	100	3100	11	34
JUN											
01...	1705	2	1	10	0	0	5	10	170	0	2
JUL											
12...	1115	1	0	0	0	2	4	20	70	0	3
07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)											
DEC , 1977											
20...	0850	2	4	0	0	2	13	30	90	32	33
FEB , 1978											
08...	1515	1	1	20	20	3	7	30	40	0	11
MAY											
16...	1500	1	4	0	20	0	5	0	210	8	58
23...	1130	1	3	0	10	2	11	80	4300	12	33
23...	1720	2	2	5	0	3	12	360	4000	15	28
24...	0900	1	2	5	0	2	10	110	1700	9	18
JUN											
01...	1810	2	2	5	15	1	4	30	430	0	1
JUL											
12...	1030	1	1	10	0	2	5	10	260	0	4

TABLE 2.--MINOR-ELEMENT CONCENTRATIONS IN WATER FROM CENTER CREEK AND JONES CREEK--CONTINUED

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	NICKEL, DISSOLVED (UG/L AS NI)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SELENIUM, TOTAL (UG/L AS SE)	ZINC, DISSOLVED (UG/L AS ZN)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)
07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)										
DEC , 1977										
20...	20	50	.0	.0	2	6	0	0	20	30
FEB , 1978										
08...	10	20	.0	.0	0	4	3	3	10	10
MAY										
16...	20	40	.0	.0	0	2	0	0	5	30
23...	20	230	.0	.1	0	5	0	0	20	20
23...	0	310	.0	.1	1	6	0	0	10	80
24...	10	110	.1	.1	0	1	0	0	10	40
JUN										
01...	10	50	.0	.0	0	2	0	0	10	30
JUL										
12...	20	40	.0	.0	1	7	0	0	10	20
07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)										
DEC , 1977										
20...	20	20	.0	.0	2	10	0	0	30	20
FEB , 1978										
08...	10	10	.0	.0	0	6	1	0	10	10
MAY										
16...	20	30	.0	.0	0	3	0	0	5	20
23...	0	720	.0	.1	0	10	0	0	5	90
23...	0	160	.0	.1	1	15	0	0	20	60
JUN										
01...	20	20	.0	.0	0	0	0	0	10	10
JUL										
12...	20	30	.0	.0	1	4	0	0	10	10
07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)										
DEC , 1977										
20...	30	30	.0	.0	4	6	0	0	30	30
FEB , 1978										
08...	40	40	.0	.0	1	8	1	2	20	20
MAY										
16...	20	50	.0	.0	0	8	0	0	10	30
23...	40	420	.0	.1	1	10	0	0	30	40
23...	20	340	.1	.1	0	13	0	0	20	90
24...	20	160	.1	.1	0	9	0	0	20	60
JUN										
01...	20	60	.0	.0	0	2	0	0	10	40
JUL										
12...	20	40	.0	.0	1	10	0	0	20	30

TABLE 3.--MINOR-ELEMENT CONCENTRATIONS IN BOTTOM MATERIAL FROM CENTER CREEK AND JONES CREEK

DATE	TIME	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/L AS HG)	NICKEL, RECOV. FM BOTTOM MATERIAL (UG/G AS NI)	SELENIUM, TOTAL IN BOTTOM MATERIAL (UG/G)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)
		07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)									
DEC , 1977											
20...	1130	1	20	0	5700	20	1000	.0	10	0	120
		07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)									
DEC , 1977											
20...	1000	1	20	4	5000	10	1600	.0	10	0	36
		07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)									
DEC , 1977											
20...	0850	4	30	6	7900	30	1500	.0	15	1	460

TABLE 4.--PESTICIDE CONCENTRATIONS IN WATER FROM CENTER CREEK AND JONES CREEK

DATE	TIME	ALDRIN, TOTAL (UG/L)	CHLOR-DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DI-ELDRIN TOTAL (UG/L)	ENDO-SULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	HEPTA-CHLOR, TOTAL (UG/L)
07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)										
DEC , 1977										
20...	1130	.00	.0	.00	.00	.00	.00	--	.00	.00
FEB , 1978										
08...	1245	.00	.0	.00	.00	.00	.00	--	.00	.00
MAY										
16...	1145	.00	.0	.00	.00	.00	.00	--	.00	.00
23...	1105	.00	.0	.00	.00	.00	.00	.00	.00	.00
23...	1430	.00	.0	.00	.00	.00	.00	.00	.00	.00
24...	0945	.00	.0	.00	.00	.00	.00	.00	.00	.00
JUN										
01...	1735	.00	.0	.00	.00	.00	.00	.00	.00	.00
JUL										
12...	1200	.00	.0	.00	.00	.00	.00	.00	.00	.00
07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)										
DEC , 1977										
20...	1000	.00	.0	.00	.00	.00	.00	--	.00	.00
FEB , 1978										
08...	1350	.00	.0	.00	.00	.00	.00	--	.00	.00
MAY										
16...	1330	.00	.0	.00	.00	.00	.00	--	.00	.00
23...	1040	.00	.0	.00	.00	.00	.00	.00	.00	.00
23...	1615	.00	.0	.00	.00	.00	.00	.00	.00	.00
JUN										
01...	1705	.00	.0	.00	.00	.00	.00	.00	.00	.00
JUL										
12...	1115	.00	.0	.00	.00	.00	.00	.00	.00	.00
07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)										
DEC , 1977										
20...	0850	.00	.0	.00	.00	.00	.00	--	.00	.00
FEB , 1978										
08...	1515	.00	.0	.00	.00	.00	.00	--	.00	.00
MAY										
16...	1500	.00	.0	.00	.00	.00	.00	--	.00	.00
23...	1130	.00	.0	.00	.00	.00	.00	.00	.00	.00
23...	1720	.00	.0	.00	.00	.00	.00	.00	.00	.00
24...	0900	.00	.0	.00	.00	.00	.00	.00	.00	.00
JUN										
01...	1810	.00	.0	.00	.00	.00	.00	.00	.00	.00
JUL										
12...	1030	.00	.0	.00	.00	.00	.00	.00	.00	.00

TABLE 4.--PESTICIDE CONCENTRATIONS IN WATER FROM CENTER CREEK AND JONES CREEK--CONITINUED

DATE	HEPTA-CHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MIREX, TOTAL (UG/L)	TOX-APHENE, TOTAL (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	PCB, TOTAL (UG/L)	NAPH-THA-LENES, POLY-CHLOR. TOTAL (UG/L)
07186180 - CENTER CREEK ABOVE FIDELITY, MO (LAT 37 07 07 LONG 094 15 28)									
DEC , 1977									
20...	.00	.00	.00	0	--	--	--	.0	.00
FEB , 1978									
08...	.00	.00	.00	0	.00	.00	.00	.0	.00
MAY									
16...	.00	.00	.00	0	.00	.00	.00	.0	.00
23...	.00	.00	.00	0	.03	.02	.00	.0	.00
23...	.00	.00	.00	0	.02	.02	.00	.0	.00
24...	.00	.00	.00	0	.03	.04	.00	.0	.00
JUN									
01...	.00	.00	.00	0	.00	.00	.00	.0	.00
JUL									
12...	.00	.00	.00	0	.00	.01	.00	.0	.00
07186195 - JONES CREEK NEAR FIDELITY, MO (LAT 37 05 49 LONG 094 17 11)									
DEC , 1977									
20...	.00	.00	.00	0	.00	.00	.00	.0	.00
FEB , 1978									
08...	.00	.00	.00	0	.00	.00	.00	.0	.00
MAY									
16...	.00	.00	.00	0	.00	.00	.00	.0	.00
23...	.00	.00	.00	0	.02	.03	.00	.0	.00
23...	.00	.00	.00	0	.02	.02	.00	.0	.00
JUN									
01...	.00	.00	.00	0	.00	.00	.00	.0	.00
JUL									
12...	.00	.00	.00	0	.00	.00	.00	.0	.00
07186400 - CENTER CREEK NEAR CARTERVILLE, MO. (LAT 37 08 26 LONG 094 22 57)									
DEC , 1977									
20...	.00	.00	.00	0	.00	.00	.00	.0	.00
FEB , 1978									
08...	.00	.00	.00	0	.00	.00	.00	.0	.00
MAY									
16...	.00	.00	.00	0	.00	.00	.00	.0	.00
23...	.00	.00	.00	0	.02	.04	.00	.0	.00
23...	.00	.00	.00	0	.02	.04	.00	.0	.00
24...	.00	.00	.00	0	.03	.04	.00	.0	.00
JUN									
01...	.00	.00	.00	0	.00	.00	.00	.0	.00
JUL									
12...	.00	.00	.00	0	.00	.00	.00	.0	.00

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