TURBIDITY AND SUSPENDED SEDIMENT IN THE JORDAN RIVER, SALT LAKE COUNTY, UTAH

By Jay F. Weigel

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CONTENTS

ILLUSTRATIONS

TABLES

CONVERSION FACTORS

For readers who prefer to use metric units, conversion factors for inch-pound units used in this report are listed below:

Multiply inch-pound units	By	To obtain metric units
acre-foot	1233	cubic meter
cubic foot per second per mile	0.01760	cubic meter per second per kilometer
foot	0.3048	meter
foot per mile	0.1894	meter per kilometer
mile	1.609	kilometer
square mile	2.59	square kilometer

National Geodetic Vertical Datum of 1929 (NGVD of 1929): A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level." NGVD of 1929 is referred to as sea level in this report.

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ABSTRACT

A 1980 survey of Federal, State, and local agencies conducted by the U.S. Geological Survey indicated that toxic substances, dissolved oxygen, sanitary quality, and turbidity were the four most serious water-quality problems in the Jordan River, Utah. Samples were collected at five sites on the Jordan River from January 1981 through August 1982 and analyzed for turbidity, suspended-sediment concentration, suspended-organic carbon, and other properties. This report describes the degree and sources of turbidity in the river.

Correlation coefficients ranging from 0.71 to 0.83 indicated significant relationships between suspended-organic carbon and turbidity at each of the five sites during June through October. A correlation coefficient of 0.75 was computed using combined data for suspended-organic carbon and turbidity from all five sites for June through October. A correlation coefficient of 0.46 was computed using combined data for suspended-sediment concentration and turbidity from the five sites for November through May. The Jordan Narrows was the only site where there was significant relationship between suspended-sediment concentration and turbidity during November through May, with a correlation coefficient of 0.77. At the 1700 South Street site, which was affected by discharges from wastewater-treatment plants, a correlation coefficient of 0.74 between suspended-organic carbon and turbidity was determined for November through May. This was the only significant correlation between suspended-organic carbon and turbidity determined for November through May at the five sites.

The primary sources of turbidity in the Jordan River are clay-size particles and organic material, which probably originate in Utah Lake, and organic material discharged from wastewater-treatment plants. Control of algal growth in Utah Lake and the Jordan River during the summer and reduction in the quantity of organic material discharged from wastewater-treatment plants could reduce turbidity in the Jordan River.

INTRODUCTION

An investigation of the water quality in the Jordan River in Salt Lake County, Utah (fig. 1), was conducted by the U.S. Geological Survey in cooperation with the Salt Lake County Division of Flood Control and Water Quality to address the problems of toxic substances, dissolved oxygen, sanitary quality, and turbidity. These factors had been identified as the most serious water-quality problems in the river by a survey of Federal, State, and local agencies conducted by the U.S. Geological Survey in July 1980. This report describes the results of the turbidity investigation and is one in a series of four reports and a summary that document the water-quality studies of the Jordan River between 1980 and 1982.

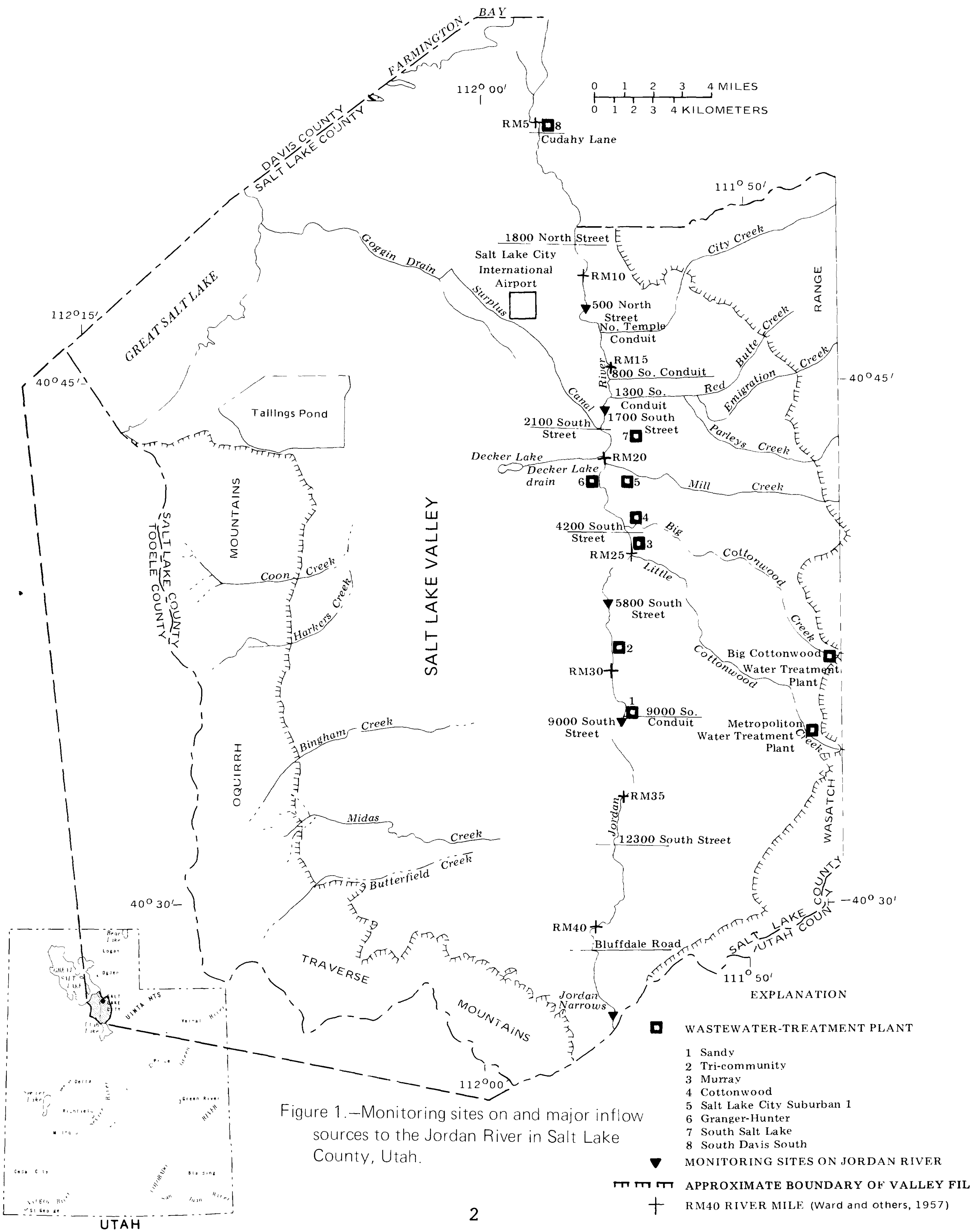

Figure 1.–Monitoring sites on and major inflow sources to the Jordan River in Salt Lake County, Utah.

Turbidity is the optical property of a suspension with reference to the extent to which the penetration of light is inhibited by the presence of insoluble material. Turbidity is a function of both the concentration and particle size of the suspended sediment (U.S. Geological Survey, 1969, p. 17). Turbidity thus is a measure of the cloudiness or murkiness of water, and as such it is primarily an aesthetic problem because the Jordan River is rated for recreational use by the Utah Board of Health (1978, p. 13). In addition, the settling of sediment associated with turbidity can clog irrigation canals, which is of concern to the canal companies and also the county because the canals are used as storm drains. Sprinkler-irrigation systems also may be clogged by sediment, and the sediment may cover crop surfaces (Mutlak and others, 1980, p. 12).

The investigation of turbidity had three objectives:

1. To quantify the degree of turbidity and concentrations of suspended sediment within four reaches of the Jordan River between the Jordan Narrows and 500 North Street.
2. To identify the specific components and sources of the turbidity.
3. To describe potential remedial measures that could be undertaken to reduce the turbidity in the river.

PREVIOUS STUDIES

Few earlier studies of water quality of the Jordan River specifically discussed turbidity or its causes. Coburn (1972, p. 91-93) collected turbidity data and estimated suspended sediment by collecting suspended-solids data from January 1970 to May 1972 downstream from 2100 South Street. Coburn's data show a mean turbidity of 36 Jackson Turbidity Units and a mean suspended-solids concentration of 59 milligrams per liter. Reports by the U.S. Environmental Protection Agency (1972, p. 35) and Salt Lake County Water Quality and Water Pollution Control (1978, sec. II, p. 22) indicate that the Jordan River is most turbid between Utah Lake and the Jordan Narrows. The turbidity is reported to decrease downstream from the Jordan Narrows to about 12400 South Street (river mile 36.9 as defined by Ward and others, 1957, map) due to ground-water inflow, but no quantitative data are given. Comparison of data collected between 1976 and 1979 with data from 1979 through 1981 (Gunnell and others, 1982, p. 62-63) indicated that turbidity was a problem between Utah Lake and the confluence of Little Cottonwood Creek and that there was no change in the magnitude of values between the two data sets. The U.S. Geological Survey has collected a considerable quantity of water-quality data, including turbidity, at 5800 South and 1700 South Streets on the Jordan River since 1974. (See table 1.)

PHYSICAL SETTING

Topography and General Hydrology

The Jordan River originates as outflow from Utah Lake, and it flows north approximately 55 miles before it is diverted into marshlands south of Farmington Bay, which is part of Great Salt Lake (fig. 1). Great Salt Lake serves as the terminal receiving body for the Jordan Hydrologic Accounting Unit, a drainage area of 3,825 square miles within the Great Basin Region (U.S. Geological Survey, 1974). Two-thirds of the river's length is within Salt Lake County, the area of this study. All river miles referenced in this

Table 1.--Turbidity, chlorophyll, and suspended-organic carbon in the Jordan River, October 1974 to September 1980

Mean: JTU, Jackson Turbidity Unit, a measure of the ratio of the light transmitted through the water in a straight line to the intensity of the incident light.

NTU, Nephelometric Turbidity Unit, a measure of the ratio of intensity of light scattered at right angles by the suspended matter to the intensity of the incident light. Nephelometric Turbidity Units closely approximate the Jackson Turbidity Units.

mg/L, milligrams per liter.

μg/L, micrograms per liter.

Location	Property	Date	Number of samples	Mean
5800 South Street	turbidity	10-74 to 9-78	98	25 JTU
		10-78 to 10-79	22	16 NTU
	chlorophyll a	7-78 to 10-79	16	25.0 μg/L
	chlorophyll b	7-78 to 10-79	16	2.69 μg/L
1700 South Street	turbidity	10-74 to 5-78	45	24 JTU
		6-78 to 6-80	28	31 NTU
	suspended-organic carbon	1-78 to 8-80	13	2.8 mg/L

report are taken from the map in Ward and others (1957), with the initial reference being the Great Salt Lake at an altitude of 4,202.9 feet above sea level.

The Jordan River enters Salt Lake County at the Jordan Narrows, a gap in the Traverse Mountains, 10 river miles downstream from Utah Lake (fig. 1). The flow into the river at the lake is controlled by gates or by pumps. The altitude of the river channel decreases from 4,470 feet at the Jordan Narrows to about 4,200 feet at Great Salt Lake. The mean gradient of the Jordan River through Salt Lake County is 6 feet per mile; although the gradient from the Jordan Narrows to 4200 South Street is 11 feet per mile, and from 4200 South Street to Great Salt Lake it is only 1.9 feet per mile.

Salt Lake Valley, through which the river flows, includes a densely-populated urban area. The valley is bordered by mountains on three sides. The Wasatch Range to the east rises to more than 11,000 feet, the Oquirrh Mountains on the west rise to more than 9,000 feet, and the Traverse Mountains on the south rise to more than 6,000 feet. The population of Salt Lake County in July 1981 was estimated to be 641,000 (Marvin Levy, Utah State Health Department, Bureau of Statistical Services, oral commun., 1982), which is 42 percent of the total population of Utah. The Jordan River is the primary drain for most of the urban area; and it receives inflows from various sources, including seven municipal wastewater-treatment plants in Salt Lake County (fig. 1) and one plant in Davis County to the north.

The seven major tributaries to the Jordan River in the study area originate in the Wasatch Range. Little Cottonwood Creek flows into the Jordan River at about 4900 South Street (river mile 25.3), Big Cottonwood Creek enters at about 4200 South Street (river mile 24), and Mill Creek enters at 3000 South Street (river mile 20.2). Parleys, Emigration, and Red Butte Creeks are diverted to a storm conduit, which discharges into the Jordan River near 1300 South Street. City Creek is diverted to a storm conduit, which discharges into the Jordan River at North Temple Street. Streams on the west side of the valley are intercepted by canals or in most years run dry before reaching the Jordan River.

During the irrigation season, large quantities of water are diverted from the river at or near the Jordan Narrows into seven large canals. Several east-side canals terminate in smaller canals and interchange water with some of the tributaries from the Wasatch Range. Return flows from the west-side canals typically reach the Jordan River less directly through nonpoint source runoff. The only major diversion north of 9000 South Street is at 2100 South Street where the Surplus Canal, a flood-control structure, is used to convey excess water directly to Great Salt Lake.

Ground-water inflow to the Jordan River averages about 170,000 acre-feet per year (Hely and others, 1971, p. 135). A study by Ward and others (1957, p. 4) during a period of low flow in November 1957 determined that there was an average gain of 7.6 cubic feet per second per river mile for the reach from the Jordan Narrows to 6400 South Street (river mile 28.5), an average gain of 6.7 cubic feet per second per river mile from 6400 South to 3300 South Streets (river mile 21.5), and no gain north of 3300 South Street. Summary data reported by Hydroscience, Inc. (1976, p. 23) indicate a mean gain of 3 cubic feet per second per river mile from 9400 South (river mile 32.6) to 5800 South Streets and 6.3 cubic feet per second per river mile from 5800 South to 2100 South Streets during July through September 1966-68.

Precipitation

The study area ranges from semiarid in parts of Salt Lake Valley to humid in parts of the Wasatch Range. Precipitation during 1981 at the Salt Lake City International Airport was 16.59 inches (National Oceanic and Atmospheric Administration, 1981, p. 4). This was 0.69 inch greater than the 93-year mean of 15.9 inches reported for Salt Lake City by Hely and others (1971, p. 16). Precipitation in the lower parts of the Salt Lake Valley is generally slight and infrequent during the warmer part of the year, so most agriculture is dependent on irrigation.

DATA COLLECTION

Five sites on the Jordan River were selected for monitoring of water quality and stream discharge (fig. 1). They were the Jordan Narrows (U.S. Geological Survey station 10167001), 9000 South Street (10167230), 5800 South Street (10167300), 1700 South Street (10171000), and 500 North Street (10172550).

Monthly water samples were collected at each site from January 1981 through August 1982, and additional samples were collected during storms as part of a Salt Lake County urban-runoff project. The samples were chilled immediately after collection, filtered when necessary, and preserved within 5 hours of collection. Storm samples collected during 1981 were composited using a discharge-weighted method (U.S. Geological Survey, written commun., 1980). All water-quality analyses were made by standard U.S. Geological Survey methods (Guy and Norman, 1970; Goerlitz and Brown, 1972; Greeson, 1979; Skougstad and others, 1979), and sediment and particle-size analyses also were made by standard U.S. Geological Survey methods (Guy, 1969). Turbidity was measured with a nephelometer and Formazin standards; therefore, it is reported in Nephelometric Turbidity Units (NTU). Turbidity measured by this method is sometimes reported in Formazin Turbidity Units (FTU) that are numerically equivalent to NTU. All the data are included in a report by McCormack and others (1983).

DATA ANALYSIS

The turbidity and suspended-sediment data were analyzed for three different time periods--the entire study period, June through October, and November through May. June is approximately the end of the spring-runoff period and October is approximately the end of the irrigation season. November through May includes that part of the year when little or no water is diverted for irrigation and most of the spring-runoff period.

Two values for turbidity and one value for suspended-sediment concentration were eliminated from further analysis. Comparison of these values with other properties from the same sample and samples from upstream and downstream sites collected the same day indicated that these values were in error. A Z statistic was used to determine if the questionable values were within a normal distribution at a 95-percent confidence interval. They were not, therefore they were eliminated from further analysis.

Turbidity

The greatest turbidity usually was observed at the Jordan Narrows. This was particularly true during June through October when the mean turbidity at the narrows was more than three times greater than at the other sites (table 2). The mean turbidities at the four downstream sites were similar during the time periods June through October and November through May, but the mean at the narrows was twice as much during June through October than during November through May. During the entire study period, the mean turbidity at the Jordan Narrows was twice that at the other sites, but during November through May it was only one-third greater.

During November through May, turbidity at all four sites on the Jordan River seemed to have the same generally synchronous pattern with 1700 South Street the exception (fig. 2). During June through October, the turbidity at all sites had a generally synchronous pattern, but the turbidity at the Jordan Narrows was much greater than at the other sites.

Suspended Sediment

Inorganic-Suspended Sediment

The quantity of inorganic-suspended sediment was estimated by analysis of water samples for suspended-sediment concentration. This analysis includes both inorganic- and organic-suspended sediment. More than 90 percent of the samples contained less than 10 percent of suspended-organic carbon; therefore, organic-suspended sediment was not considered to be a significant part of the values obtained for suspended-sediment concentration.

There was no significant variation (based on a student's t-test[1] at the 95-percent-confidence level) in the means for suspended-sediment concentration between sites (table 2); but for some sample runs, suspended-sediment concentration could have a fairly significant variation between sites (fig. 3). A decreasing trend downstream, except at 1700 South Street, is evident during July through October and for the entire study period (table 2). There seemed to be a generally synchronous pattern of variations in the quantity of suspended-sediment concentration during the entire study period for all sites (fig. 3).

From April through August 1982, samples were collected and analyzed for particle size. From 13 to 94 percent of the particles in the samples were silt size or finer (less than 62 micrometers in diameter), with a mean of 76 percent (18 samples); and from 7 to 74 percent of the particles were clay size (less than 4 micrometers in diameter), with a mean of 46 percent (16 samples).

Organic-Suspended Sediment

The quantity of organic-suspended sediment was estimated by analysis of water samples for suspended-organic carbon. The suspended-organic carbon had a greater mean value at the Jordan Narrows during June through October than at the other sites (table 2). The four downstream sites had no significant variation in the means during June through October. The means for November through May had no significant variation between all sites, but there was a slight increase downstream. The mean value at the Jordan Narrows during June

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[1] The t-test is a statistical test to see if one number is significantly different than a group of numbers (Snedecor and Cochran, 1980, p. 184-185).

Table 2.--Variations in the means for turbidity, suspended-sediment concentration, suspended-organic carbon, and chlorophyll in the Jordan River

[NTU, Nephelometric Turbidity Units; mg/L, milligrams per liter; µg/L, micrograms per liter]

Location	Turbidity		Suspended-sediment concentration		Suspended-organic carbon (as C)		Chlorophyll a and b		
	Number of samples	Mean (NTU)	Number of samples	Mean (mg/L)	Number of samples	Mean (mg/L)	Number of samples	Mean (µg/L) a	Mean (µg/L) b
Entire study period (January 1981-August 1982)									
Jordan Narrows	27	61	19	193	24	2.3	--	--	--
9000 South Street	26	30	19	189	20	1.4	--	--	--
5800 South Street	25	30	21	174	20	1.7	--	--	--
1700 South Street	22	29	17	181	20	2.0	--	--	--
500 North Street	25	29	19	169	21	1.9	--	--	--
June-October									
Jordan Narrows	11	88	10	228	11	3.5	9	42	1.2
9000 South Street	11	27	10	199	10	1.6	9	17	1.4
5800 South Street	11	27	11	170	11	2.0	9	19	1.3
1700 South Street	10	27	10	191	9	2.3	8	11	.46
500 North Street	10	26	10	153	10	2.1	7	9.2	.31
November-May									
Jordan Narrows	16	43	9	154	13	1.2	--	--	--
9000 South Street	15	32	9	179	10	1.3	--	--	--
5800 South Street	14	32	10	179	9	1.4	--	--	--
1700 South Street	12	31	6	166	11	1.8	--	--	--
500 North Street	15	32	9	187	11	1.7	--	--	--

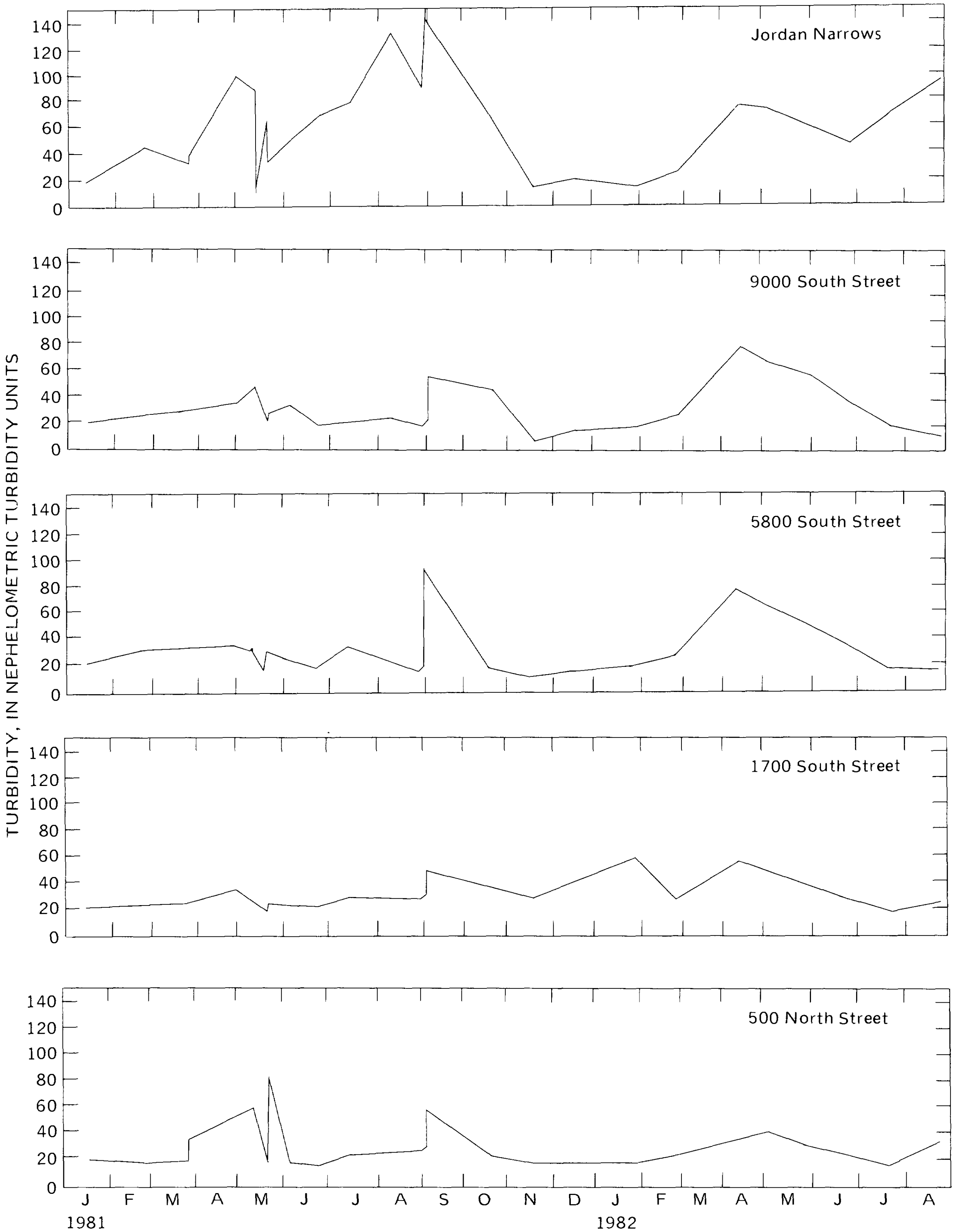

Figure 2.—Variations in turbidity at five sites on the Jordan River, January 1981 to August 1982.

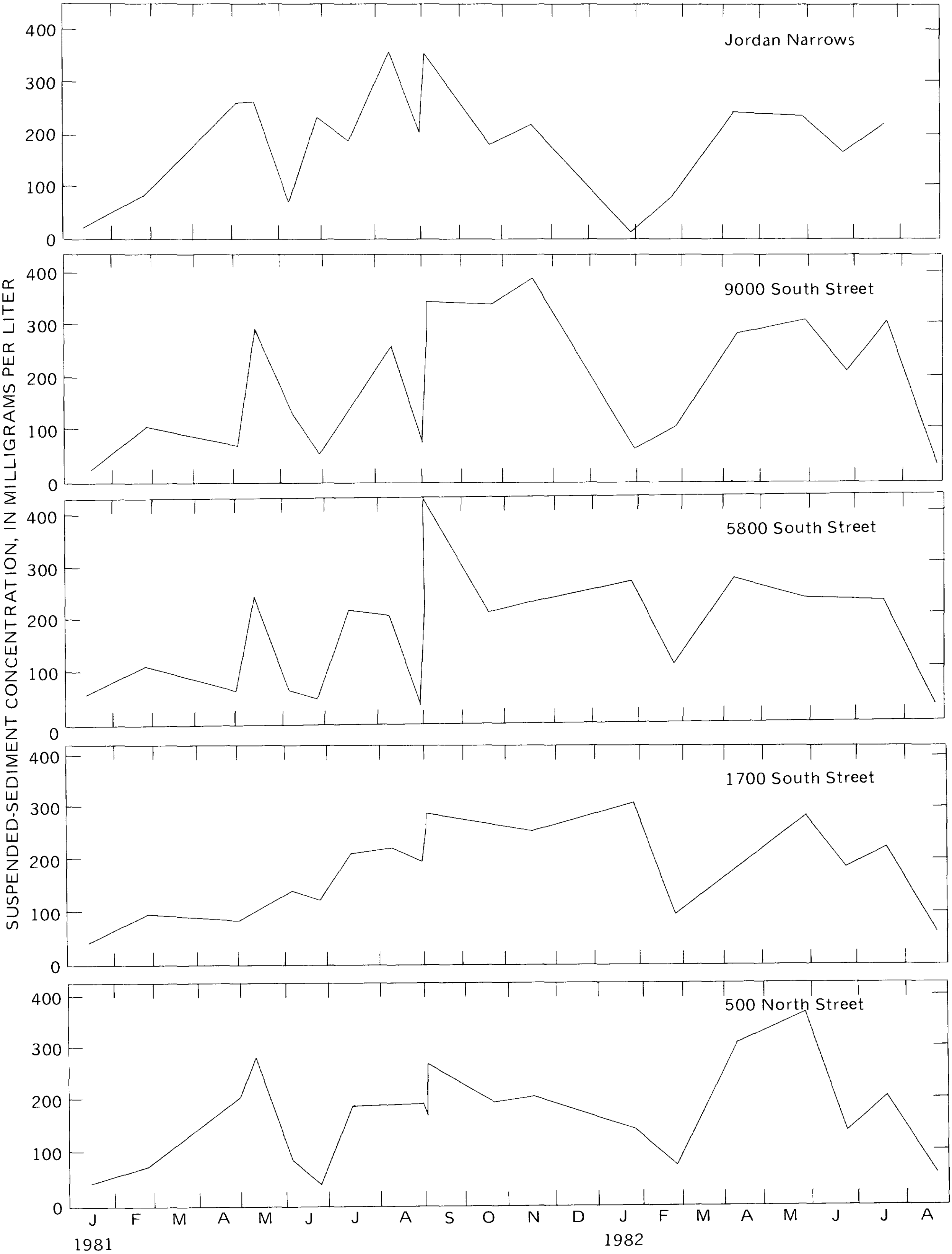

Figure 3.--Variations in suspended-sediment concentration at five sites on the Jordan River, January 1981 to August 1982.

through October was about three times greater than that during November through May. The means for the four downstream sites increased from about 23 to 43 percent from November through May to June through October.

The suspended-organic carbon at the four downstream sites had a generally synchronous pattern of variation during the entire study period (fig. 4). The pattern for the Jordan Narrows was similar to that at the other sites during November through May, but values tended to be greater during June through October.

Analyses for chlorophyll a and b were made during June through October to show possible effects of phytoplankton on turbidity in the water. The means for chlorophyll a had a general decrease downstream, with the mean at the Jordan Narrows being more than twice that of the next largest value. The means for chlorophyll b had no significant variation between the three upstream sites, but they were 3 to 4 times greater than the means for the two downstream sites. This likely is due to the reduction in blue-green algae, which lacks chlorophyll b, as the river flows northward. Phytoplankton samples were collected on August 24, 1982. The counts were 99,000 cells per milliliter (96,600 were blue-green algae) at the Jordan Narrows and a range of 23,000 cells per milliliter (19,300 were blue-green algae) to 67,000 cells per milliliter (64,000 were blue-green algae) at the four downstream sites.

Correlation between Suspended Sediment and Turbidity

Correlation coefficients[1] were calculated to show the relationship between suspended sediment and turbidity (table 3). The correlation coefficients were tested at the 0.05-percent level of significance by using the t-test (Snedecor and Cochran, 1980, p. 184-185). Only correlation coefficients at the 95-percent-confidence level or greater were considered significant. A correlation coefficient greater than 0.70 would mean that variations in suspended sediment explained 50 percent or more of the variation in turbidity.

Correlations were made for each site on the Jordan River and for the five sites combined in order to identify any site-specific relationships and general relationships for the river. Correlations were made for the entire study period and for June through October and November through May.

The only correlation coefficient for the entire study period that exceeded 0.70 was for the Jordan Narrows. That correlation coefficient of 0.86 between suspended-sediment concentration and turbidity indicates that a variation in inorganic-suspended sediment could account for more than 50 percent of the variation in turbidity at the narrows.

During June through October, correlation coefficients between suspended-organic carbon and turbidity for each of the sites and the combined sites all

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[1] A correlation coefficient is a measure of the closeness of linear relationship between two variables. Values range from minus 1.0 to plus 1.0. Values close to plus 1.0 indicate a correlation with positive slope and values close to minus 1.0 indicate a correlation with negative slope. Values close to 0.0 indicate little or no linear correlation.

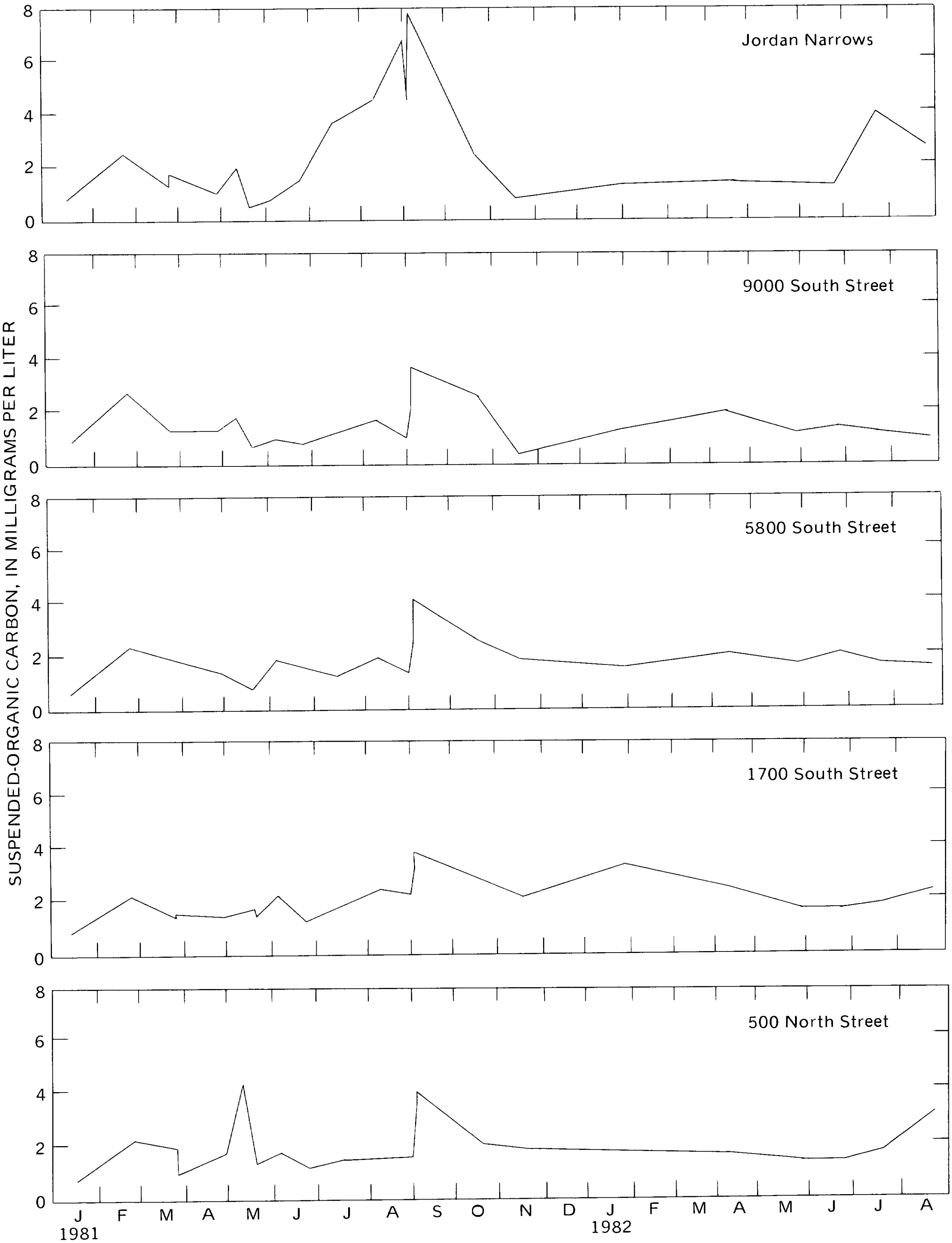

Figure 4.—Variations in suspended-organic carbon at five sites on the Jordan River, January 1981 to August 1982.

Table 3.--Correlation coefficients between turbidity and two components of suspended sediment in the Jordan River

Location	Suspended-sediment concentration		Suspended-organic carbon (as C)	
	Number of samples	Correlation coefficient	Number of samples	Correlation coefficient
		Entire study period (January 1981-August 1982)		
Jordan Narrows	19	0.86	24	0.69
9000 South Street	19	([1]).44	20	.53
5800 South Street	21	.61	20	.57
1700 South Street	17	.63	20	.63
500 North Street	19	.53	21	([1]).37
Combined sites	95	.54	105	.60
		June-October		
Jordan Narrows	10	0.92	11	0.71
9000 South Street	10	.67	10	.81
5800 South Street	11	.78	11	.81
1700 South Street	10	([1]).60	9	.83
500 North Street	10	([1]).49	10	.81
Combined sites	51	.59	51	.75
		November-May		
Jordan Narrows	9	0.77	13	([1])0.06
9000 South Street	9	([1]).35	10	([1]) .45
5800 South Street	10	([1]).30	9	([1]) .42
1700 South Street	7	([1]).74	11	.74
500 North Street	9	([1]).54	11	([1]) .27
Combined sites	44	.46	54	([1]) .23

([1]) Correlation coefficient less than the 95-percent-confidence level.

were greater than 0.70. Thus, at all sites and for the river as a whole, the variation in organic-suspended sediment could account for more than 50 percent of the variation in turbidity. During June through October, however, only at the Jordan Narrows and 5800 South Street were the correlation coefficients between suspended-sediment concentration and turbidity greater than 0.70.

During November through May, only three correlation coefficients were significant. The correlation coefficient between suspended-sediment concentration and turbidity for the Jordan Narrows was greater than 0.70, indicating that variation in organic-suspended sediment could account for more than 50 percent of the variation in turbidity at the narrows. The correlation coefficient between suspended-sediment concentration and turbidity for the combined sites was significant, although less than 0.70. This could indicate that the correlations for the four downstream sites are significant, but the data are insufficient to prove this. The correlation coefficient between suspended-organic carbon and turbidity at 1700 South Street was greater than 0.70, indicating that variation in organic-suspended sediment could account for more than 50 percent of the variation in turbidity.

Comparison of figures 3 and 4 with figure 2 shows that during November through May the peaks and troughs for suspended-sediment concentration were at approximately similar times to those for turbidity. An exception was 1700 South Street, where the turbidity compared more favorably with suspended-organic carbon. During June through October, however, the peaks and troughs for turbidity compared most favorably with those for suspended-organic carbon at all sites.

Curtiss (1982, p. 11) reported that a major cause of turbidity during the summer is phytoplankton and other micro-organisms, especially in water that has been released from lakes or reservoirs. Utah Lake contributes large quantities of phytoplankton to the Jordan River during the summer. The ponding of water by diversion dams in the upper reaches of the river also could contribute phytoplankton by providing a desirable environment for reproduction. Downstream from 5800 South Street, there is little ponding in the river due to diversions; but five wastewater-treatment plants discharge secondary effluent into the river upstream from 1700 South Street. This combination of circumstances could explain the significant correlation of turbidity with suspended-organic carbon during June through October. It also would explain the relatively stable mean concentrations of suspended-organic carbon downstream from 5800 South Street, although the mean chlorophyll concentrations decreased (table 2).

Turbidity during November through May likely is due to inorganic-suspended sediment. During November through May, the correlation between suspended-sediment concentration and turbidity for the five sites combined indicates an inorganic-sediment source for the turbidity (table 3). Clay-sized sediment in suspension has been reported to cause persistent turbidity in other western rivers (Curtiss, 1982, p. 11). Utah Lake has been described as turbid (Fuhriman and others, 1981, p. 59) and particle-size analyses at the Jordan Narrows of samples obtained during November through May indicate that at least 67 percent of the suspended sediment is clay size or finer. Thus, Utah Lake undoubtedly is a source of clay-size sediment for the Jordan River during November through May.

The only site where suspended-organic carbon had a significant correlation with turbidity during November through May was 1700 South Street. Five wastewater-treatment plants discharge organic wastes into the Jordan River between 5800 South and 1700 South Streets (fig. 1). These wastes could attach to the clay particles in the river and cause the particles to precipitate, thereby causing a decrease in the correlation between turbidity and suspended-sediment concentration. Irwin and Stevenson (1951, p. 115) found that the addition of organic material to a clay suspension resulted in the precipitation of the clay particles. Van Olphen (1977, p. 171-172) has shown that organic cations attach to clay particles and cause the particles to precipitate. The correlation between suspended-organic carbon and turbidity at 1700 South Street during November through May indicates that this mechanism could be affecting the source of turbidity in this reach of the Jordan River.

Concentrations for clay-size sediment were computed for two sets of particle-size analyses which were available for the sites at 5800 South and 1700 South Streets. Comparison of the concentrations showed a decrease in clay-size sediment from 5800 South to 1700 South Streets. Although this is an indication that the organic material in the river is causing clay to precipitate, more particle-size data would be needed to confirm this occurrence.

No wastewater-treatment plants discharge to the reach of the Jordan River between 1700 South and 500 North Streets, but there is inflow from four major tributaries through the 1300 South Street and North Temple Street conduits (fig. 1). The dilution of the water owing to inflow from the tributaries appears to decrease the correlation between turbidity and organic-suspended sediment at 500 North Street except during June through October (table 3).

Significant correlations existed between suspended-sediment concentration and turbidity during June through October at the Jordan Narrows and 9000 South and 5800 South Streets. The absence of significant correlations at 1700 South and 500 North Streets also could have resulted from the precipitation of clay particles due to the inflow of organic material from wastewater-treatment plants.

CONCLUSIONS

No dominant source of turbidity was identified in the Jordan River at most sites during November through May. There are indications, however, that clay-size particles could be a source of the turbidity because at least 67 percent of the suspended sediment at the Jordan Narrows was clay size or finer during November through May. A significant correlation existed between suspended-sediment concentration and turbidity in the combined data from the five sampling sites on the Jordan River. Organic-suspended sediment appears to be the dominant source of turbidity at 1700 South Street during November through May. This may be due to the organic material discharged from wastewater-treatment plants along the reach of the Jordan River upstream from 1700 South Street. Organic cations in the waste water could be causing the precipitation of clay particles, thereby materially affecting the source of turbidity in the river.

During June through October, organic-suspended sediment appears to be the dominant source of turbidity in the Jordan River. The probable source of the organic-suspended sediment (phytoplankton) in the upstream reaches (upstream from 9000 South Street) of the Jordan River is Utah Lake. Downstream from 9000 South Street, another source of organic-suspended sediment is the discharge from wastewater-treatment plants.

Turbidity does not appear to be significantly affected by inorganic-suspended sediment during June through October at 1700 South and 500 North Streets. This could be due to the precipitation of clay particles by large quantities of organic material present in the inflow from wastewater-treatment plants.

The reduction of turbidity in Utah Lake could reduce turbidity in the Jordan River upstream from 5800 South Street. Control of algal growth in Utah Lake and the Jordan River could reduce the turbidity during June through October in the river. A reduction in the quantity of organic material discharged from the wastewater-treatment plants into the Jordan River could reduce the turbidity in the river downstream from 5800 South Street. Further studies specifically to identify sources of turbidity in the Jordan River would benefit from additional particle-size and phytoplankton analyses. Studies of turbidity and suspended sediment in tributary streams and canals possibly could identify additional sources of turbidity.

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