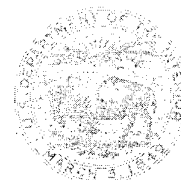


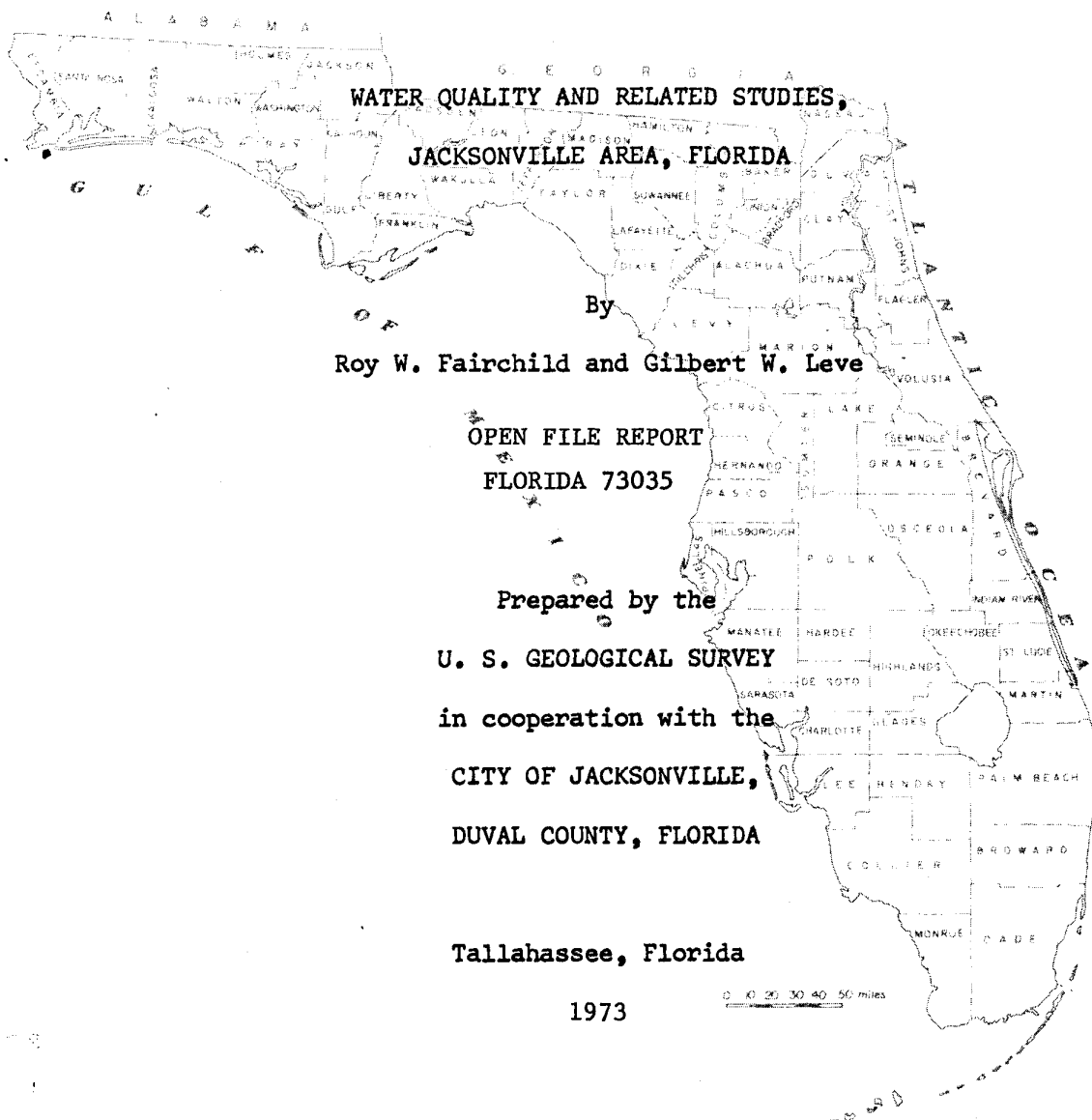
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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



Water quality and related studies, Jacksonville area, Florida" by Fairchild and Leve



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER QUALITY AND RELATED STUDIES,
JACKSONVILLE AREA, FLORIDA

By
Roy W. Fairchild and Gilbert W. Leve

OPEN FILE REPORT
FLORIDA 73035

Prepared by the
U. S. GEOLOGICAL SURVEY
in cooperation with the
CITY OF JACKSONVILLE,
DUVAL COUNTY, FLORIDA

Tallahassee, Florida

1973

75-0186

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WATER QUALITY AND RELATED STUDIES,
JACKSONVILLE AREA, FLORIDA

By

Roy W. Fairchild and Gilbert W. Leve

ABSTRACT

Since 1960 the U. S. Geological Survey, in cooperation with the city of Jacksonville, has made studies of the water resources in the Jacksonville area. Several studies made by the Geological Survey have dealt with the water quality of streams. The Survey operates 10 streamflow and sampling stations at various places on the St. Johns River. A water-quality monitor on the St. Johns River at the Main Street Bridge records hourly temperature, dissolved oxygen, pH and specific electrical conductance of the water in the river. The hourly and daily maximum, minimum and mean values of each parameter are tabulated on a computer printout.

Studies are being made that will be useful to the planner when selecting and monitoring sanitary landfill sites. Geohydrologic data are presented on maps that will be useful to the planner in determining the suitability of a site for sanitary landfills or septic tanks.

A comprehensive water-quality management plan is underway to identify the quality of existing receiving waters before pollution. The Geological Survey is sampling water from the headwaters of eight streams in Duval County to obtain water-quality information for the city of Jacksonville in its pollution abatement program.

INTRODUCTION

Jacksonville, like many other cities in Florida and in other parts of the Nation, has witnessed tremendous growth in population in the last few decades. The population of Jacksonville increased from about 40,000 in 1900 to more than 500,000 in 1970 (table 1). By the year 2000 its projected population is estimated to be more than 700,000 (fig. 1).

Table 1
near here

Fig. 1
near here

As the population has increased and industries have entered the area or have expanded, there has been a continual increase in the discharge of municipal, industrial and domestic waste into the surface streams and water-table aquifer.

The U. S. Geological Survey has the responsibility of appraising the quantity and quality of our water resources, of making interpretive studies of areas of existing or potential water problems, and of engaging in research in the field of hydrology and related sciences. Much of the work is a cooperative effort in which planning and financial support are shared by State and local governments and other Federal agencies. At present (1973) the U.S. Geological Survey is making studies in the Jacksonville area in cooperation with the city of Jacksonville Department of Public Works and the Jacksonville Area Planning Board.

This report presents a brief outline of the activities of the Geological Survey in the investigation of water quality in the Jacksonville area. It is aimed largely toward acquainting water planners and managers with the types of data that are available for their use in meeting demands for water supplies. Those studies dealing directly with water-quality problems, as well as those indirectly concerned, are discussed in the following pages.

Table 1. Population of Duval County, 1900-1970.

(U. S. Bureau of Census data)

<u>Year</u>	<u>Population Duval County</u>	<u>Period</u>	<u>Percent Increase</u>
1900	39,733		
1910	75,163	1900-1910	89.2
1920	113,540	1910-1920	51.1
1930	155,503	1920-1930	37.0
1940	210,143	1930-1940	35.1
1950	304,029	1940-1950	44.7
1960	455,411	1950-1960	49.8
1970	513,439	1960-1970	12.7

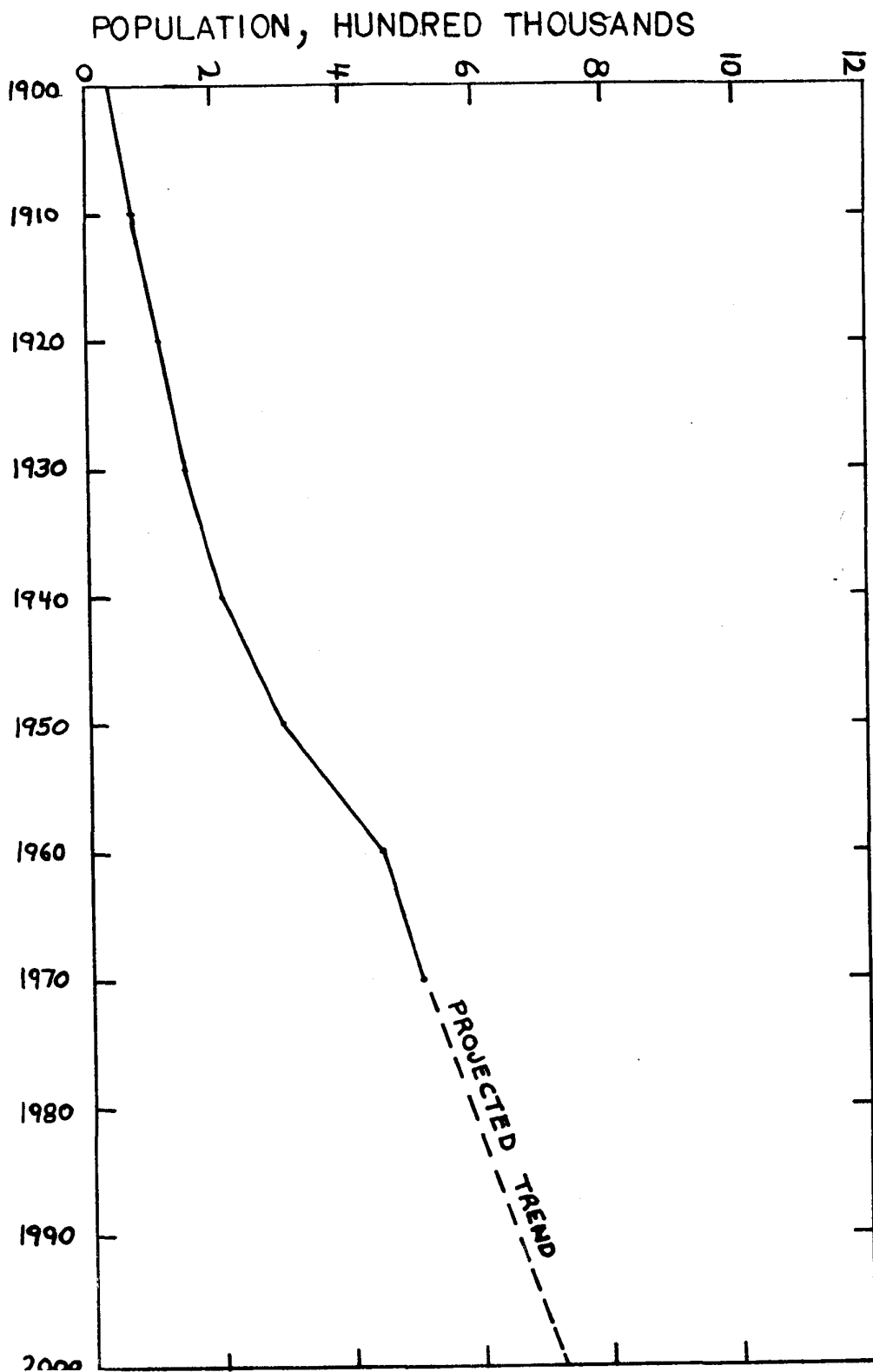


Figure 1. Population growth 1900-70 and projected trend to the year 2000 for Duval County.

Previous Investigations

Several studies made by the U. S. Geological Survey in the Jacksonville area have dealt with water quality of streams. Goolsby (1965) showed that acid industrial effluent was severely affecting the quality of water in Little Six Mile Creek and the upper Ribault River. Reports by Anderson (1972) and Anderson and Goolsby (1973) discuss the flow characteristics of surface streams and the effects of flow on the quality of water in the streams.

The geohydrologic characteristics of the aquifers in the area and the quality of the water in them are discussed by Leve (1966), and Fairchild (1972). The production and utilization of water from the aquifers and surface streams are described by Leve and Goolsby (1969).

STREAMFLOW

Streamflow Monitoring Stations

The Geological Survey operates and maintains six continuously recording streamflow stations and two crest and discharge stations on the St. Johns River and other streams in the Jacksonville area. The locations of surface-water monitoring stations in the Jacksonville area are shown on figure 2.

Fig. 2
near her

Flood Prone Maps

One use of streamflow data is to determine areas that are susceptible to flooding. The Geological Survey is presently (1973) mapping flood prone areas in many parts of Florida. A segment of a map of some of the flood prone areas around Jacksonville is shown on figure 3.

Fig. 3
near her

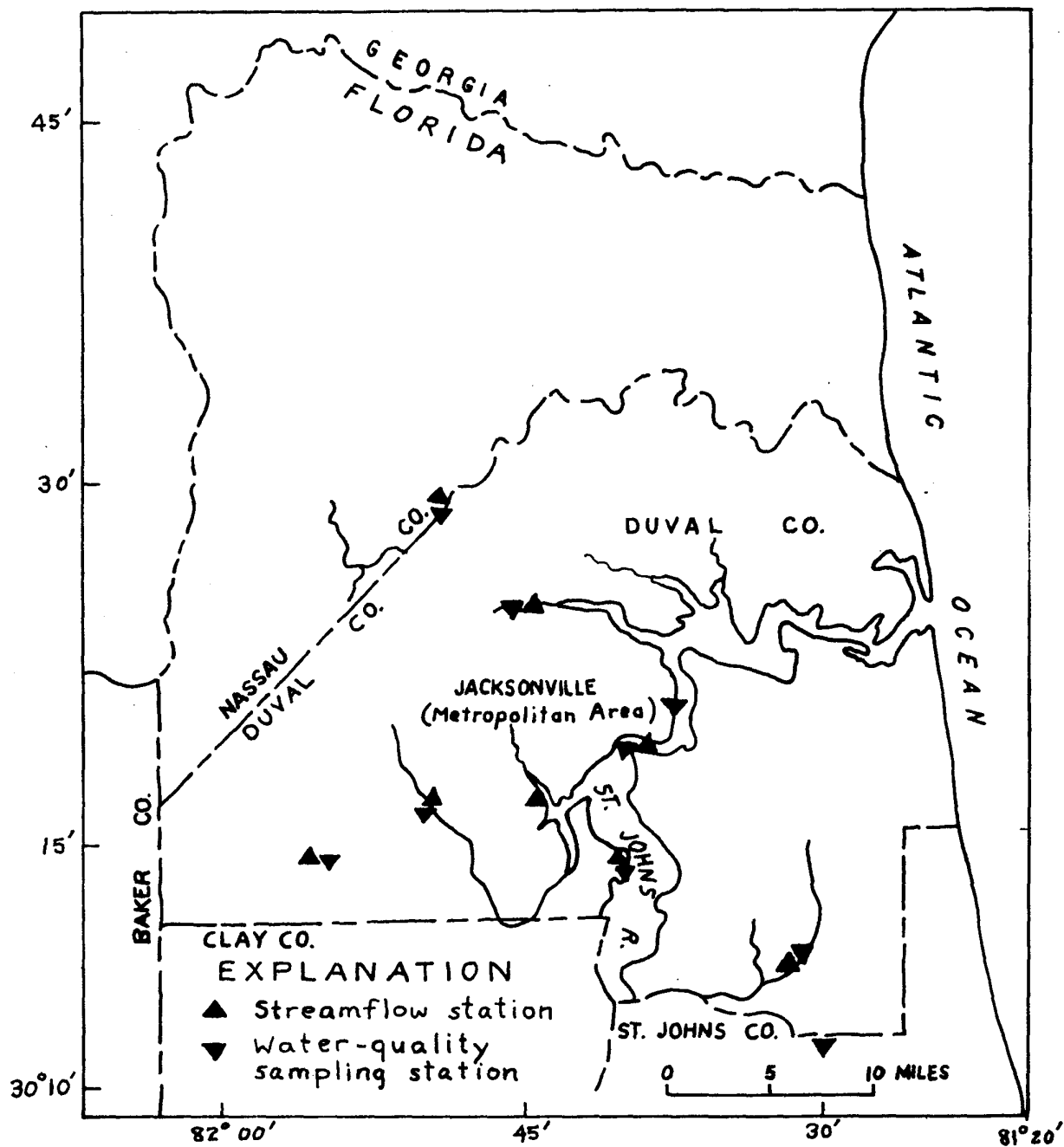


Figure 2. Map of Duval County showing location of streamflow and water-quality sampling stations.

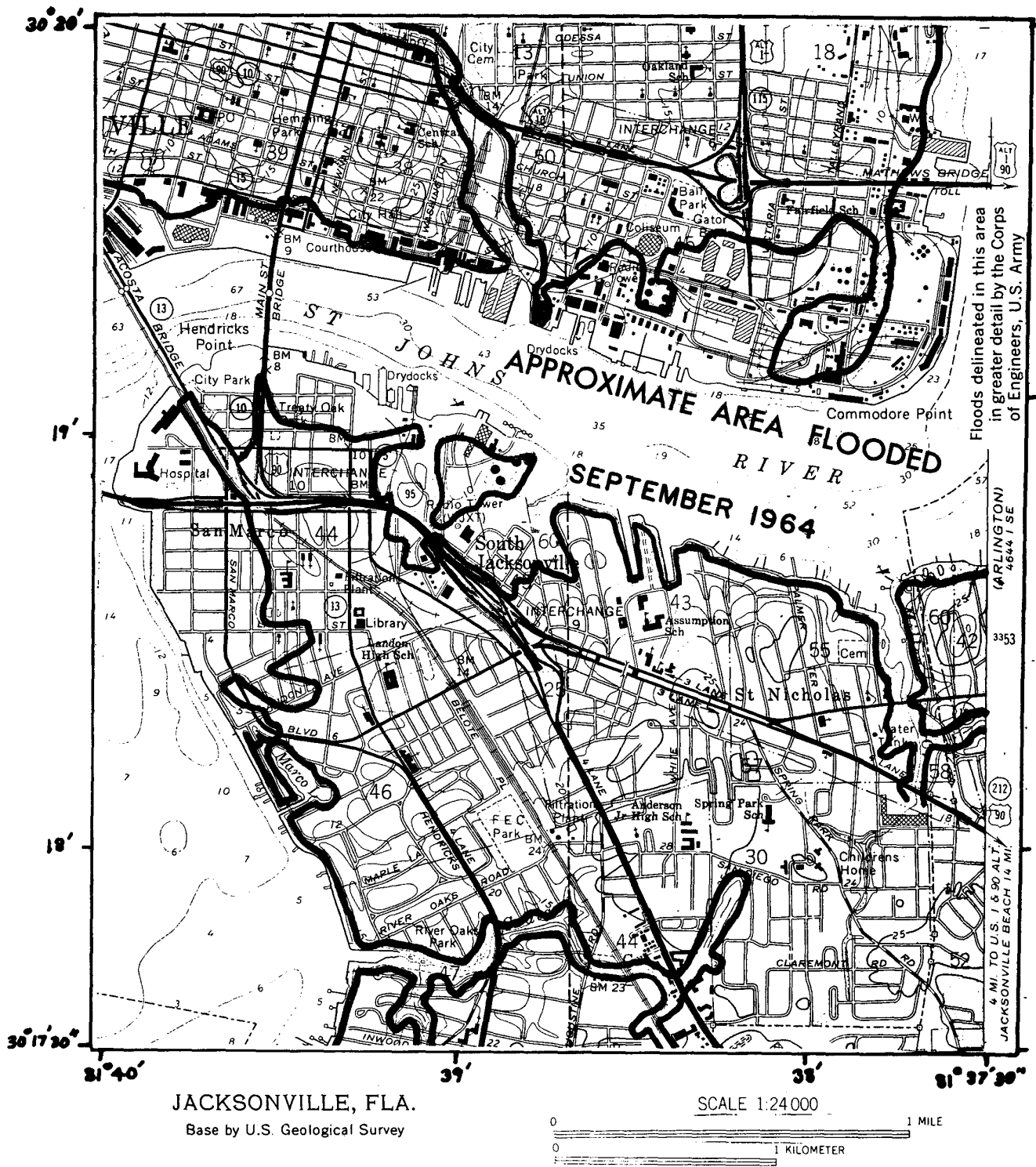


Figure 3. Segment of a map of flood prone areas in the Jacksonville area.

Flow Characteristics of Streams

The U. S. Geological Survey is studying the flow characteristics of the complex river system at Jacksonville. Factors such as velocity and direction of flow, daily discharge, effects of tide, wind, and rainfall on the river have been investigated. The results of these investigations are described by Anderson and Goolsby (1973). Time-of-travel studies have also been made in the St. Johns River from Jacksonville to the ocean.

The quality of water in the St. Johns River and tributary streams depends to a large extent on the flow characteristics of these streams. The ability of the river to flush out polluted water is hampered by daily tidal fluctuations. Waste material that enters the river may remain in the vicinity of the outfall for prolonged periods of time due to the effects of tidal fluctuation. At times, strong northeast winds, accompanied by abnormally high tides, may push the polluted water upstream a considerable distance from its point of outfall.

SURFACE-WATER QUALITY

Continuous Monitoring

The U. S. Geological Survey is operating a water-quality monitor on the St. Johns River at Jacksonville that measures temperature, dissolved oxygen, pH, and specific electrical conductance of the water in the river.

The temperature of the water varies daily or seasonally with changes in atmospheric conditions. It also may vary because of the influx of pollutants from waste outfalls. The dissolved oxygen content varies with changes in air temperature or barometric pressure or with changes in other factors but it may also vary because of the influx of oxygen-consuming organic and inorganic constituents from waste outfalls. The hydrogen ion concentration or pH indicates the alkalinity or acidity of the water. The pH may be related to several natural environmental factors including the types of soil or rock that the river flows through and the vegetation in and along the river. It can also indicate the influence from municipal, industrial and agricultural effluents. Specific conductance indicates the amount of minerals in the water. Pure water has a very low specific conductance, usually less than or equal to 1 micromho per centimeter. Sea water, on the other hand, has a very high specific conductance, about 50,000 micromhos per centimeter.

The water-quality monitor electronically analyzes the water from the river at 30-minute intervals and punches the results into a special tape which is then translated and stored in a computer to be tabulated later as needed. Figure 4 is a flow diagram showing this sequence of events.

Fig. 4
near here

Examples of the type of data obtained from the water-quality monitor are shown in table 2 and figure 5. Table 2 is a printout of hourly values of each parameter from January 4 through February 11, 1971. It also shows the daily maximum, minimum and mean values of each parameter. Figure 5 was constructed from the data in table 2 and graphically shows the daily maximum and minimum values of each parameter.

Table 2
near here

Fig. 5
near here

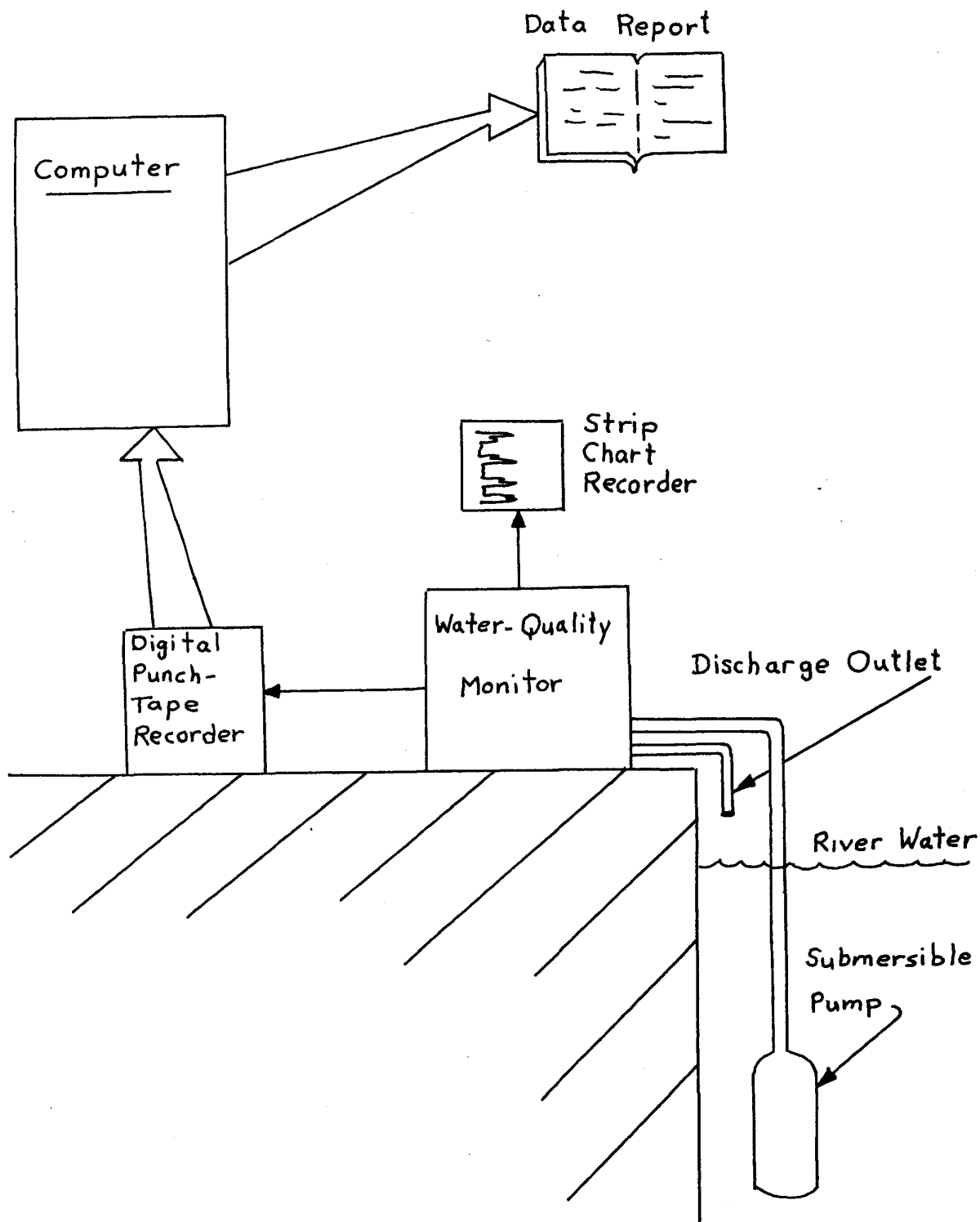


Figure 4. Flow diagram showing the operation of the water-quality data-collection system on the St. Johns River at Jacksonville.

Table 2. Printout of data from the water-quality monitor on the
St. Johns River from January 4, 1971 to February 11, 1971.

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION															
PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORD															
ST. JOHNS RIVER AT JACKSONVILLE, FLA.															
WATER YEAR ENDING SEPT. 30, 1971															
RT NO 01			WATER TEMPERATURE(°C)			PAPAM-CODE 00010			XSEC-LOC			SAMPLING DEPTH			
DATE	MAX	MIN	MEAN	1	2	3	4	5	6	7	8	9	10	11	12
1-04	15.3	15.0	15.1 * AM						15.1	15.3	15.2	15.0	15.1	15.2	15.2
			PM						15.3	15.4	15.5	15.4	15.3	15.4	15.4
1-05	15.8	15.0	15.4 AM	15.0	15.1	15.2	15.3	15.2	15.6	15.6	15.7	15.6	15.7	15.6	15.6
			PM	15.4	15.4	15.5	15.4	15.6							
1-06	15.7	15.5	15.6 AM	15.5	15.6	15.6	15.7	15.6	15.6	15.7	15.7	15.7	15.7	15.7	15.6
			PM	15.5	15.5	15.5	15.5	15.6	15.5	15.6	15.6	15.6	15.6	15.6	15.5
1-07	15.8	15.2	15.6 AM	15.4	15.3	15.2	15.4	15.4	15.4	15.4	15.5	15.5	15.6	15.7	15.6
			PM	15.7	15.8	15.7	15.7	15.6	15.8	15.7	15.7	15.7	15.7	15.7	15.6
1-08	15.9	15.2	15.6 AM	15.5	15.3	15.2	15.4	15.4	15.4	15.5	15.6	15.7	15.7	15.7	15.9
			PM	15.8	15.8	15.7	15.5	15.4	15.4	15.5	15.6	15.7	15.7	15.7	15.7
1-09	15.7	14.9	15.3 AM	15.5	15.3	15.2	15.1	14.9	15.2	15.4	15.3	15.6	15.6	15.6	15.6
			PM	15.6	15.6	15.3	15.3	15.2	14.9	15.0	15.3	15.3	15.4	15.4	15.3
1-10	15.4	14.6	15.0 AM	15.3	15.2	14.9	14.7	14.6	14.6	14.9	15.0	15.0	15.1	15.3	15.4
			PM	15.4	15.4	15.3	15.1	14.9	14.9	14.9	14.9	14.9	15.1	15.2	15.2
1-11	15.3	14.5	14.9 AM	15.2	15.0	14.9	14.7	14.5	14.5	14.5	14.5	14.7	14.7	15.0	15.1
			PM	15.2	15.2	15.1	15.2	15.2	15.0	15.0	14.8	14.9	15.0	15.0	15.2
1-12	17.1	14.8	15.3 AM	15.2	15.1	15.1	15.1	14.9	14.9	14.8	14.8	14.8	15.0	15.1	15.2
			PM	15.2	15.4	17.1	15.5	15.7	15.7	15.4	15.4	15.5	15.6	15.6	15.6
1-13	16.1	15.1	15.6 AM	15.5	15.6	15.6	15.6	15.5	15.1	15.2	15.1	15.2	15.2	15.4	15.6
			PM	15.7	15.6	16.1	15.9	16.0	16.0	16.0	15.8	15.7	15.8	15.9	15.8
1-14	16.6	15.5	16.0 AM	15.8	15.8	15.9	15.9	15.8	15.8	15.6	15.5	15.5	15.7	15.8	16.0
			PM	16.1	16.2	16.2	16.2	16.3	16.5	16.5	16.3	16.3	16.3	16.3	16.3
1-15	16.6	15.8	16.2 AM	16.3	16.3	16.4	16.3	16.4	16.3	16.0	16.0	15.9	15.8	15.9	16.1
			PM	16.3	16.4	16.4	16.6	16.5	16.3	16.3	16.3	16.1	16.0	16.1	16.2
1-16	16.2	15.3	15.8 AM	16.1	16.1	16.1	16.2	16.0	16.0	15.8	15.6	15.3	15.4	15.6	15.9
			PM	16.0	15.9	16.1	16.1	16.0	15.9	15.8	15.8	15.7	15.6	15.4	15.6
1-17	15.9	14.6	15.3 AM	15.7	15.6	15.6	15.6	15.6	15.7	15.5	15.3	15.1	14.7	14.7	14.9
			PM	15.5	15.6	15.7	15.9	15.7	15.8	15.6	15.2	14.9	14.7	14.7	14.6
1-18	15.8	14.4	15.1 AM	14.8	14.9	15.1	15.1	15.2	15.2	15.2	15.1	14.7	14.6	14.4	14.5
			PM	14.8	15.2	15.4	15.6	15.7	15.7	15.6	15.3	15.0	14.8	14.7	14.6
1-19	15.4	13.3	14.9 AM	14.9	15.1	15.2	15.2	15.2	15.4	15.3	15.2	15.0	14.9	14.7	14.6
			PM	14.6	15.1	15.2	15.1	15.2	15.2	15.0	14.9	14.8	14.3	13.5	13.3
1-20	14.3	11.8	13.5 AM	13.1	14.3	14.2	14.2	14.1	14.1	14.2	14.0	14.2	14.0	13.7	13.4
			PM	13.0	12.8	13.7	14.0	14.0	13.9	13.0	13.3	12.9	12.3	12.2	11.8
1-21	12.7	11.2	11.9 AM	11.5	11.3	11.9	12.3	12.3	12.3	12.7	12.5	12.4	12.1	11.6	11.4
			PM	11.5	11.7	11.7	11.7	11.8	12.1	12.0	12.0	11.7	11.6	11.7	11.5
1-22	12.0	11.3	11.7 AM	11.4	11.3	11.3	11.4	11.4	11.5	11.5	11.5	11.8	11.9	11.7	11.9
			PM	11.8	11.8	11.8	11.9	11.9	11.8	11.9	11.9	11.9	11.9	11.9	11.9
1-23	13.0	11.8	12.3 AM	11.8	11.8	11.9	11.8	11.9	11.9	11.8	12.0	12.0	12.1	12.2	12.1
			PM	12.2	12.4	12.7	12.6	12.7	12.7	13.0	12.6	12.6	12.7	12.6	12.7
1-24	13.8	12.7	13.2 AM	12.9	13.0	12.9	12.7	12.8	12.9	12.8	12.8	12.7	12.8	12.8	13.2
			PM	13.2	13.2	13.6	13.7	13.8	13.8	13.8	13.6	13.4	13.4	13.4	13.4
1-25	14.2	10.0	12.3 AM	13.5	13.8	13.9	13.9	13.9	14.0	13.8	13.7	13.5	13.5	13.5	13.7
			PM	13.9	14.2	10.1	10.3	10.5	10.5	10.5	10.5	10.4	10.0	10.0	10.1
1-26	11.1	10.1	10.6 AM	10.2	10.1	10.4	10.6	10.6	10.7	10.6	10.5	10.4	10.3	10.2	10.2

Table 2. (Continued)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION																
PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS																
ST. JOHNS RIVER AT JACKSONVILLE, FLA.																
022465C0		WATER YEAR ENDING SEPT. 30, 1971														
RT NO C1		WATER TEMPERATURE(DEG. C)				PARAM-CODE 00010				XSEC-LOC		SAMPLING DEPTH				
DATE		MAX	MIN	MEAN	VALUES AT INDICATED HOURS											
					1	2	3	4	5	6	7	8	9	10	11	12
1-27	10.7	10.1	10.5	PM	10.3	10.5	10.4	10.6	10.9	11.0	11.0	10.9	10.8	10.7	10.5	10.4
				AM	10.4	10.4	10.4	10.6	10.7	10.7	10.7	10.7	10.5	10.4	10.4	10.3
1-28	10.1	9.4	9.8	AM	10.3	10.4	10.4	10.4	10.5	10.5	10.5	10.4	10.5	9.7	9.7	9.8
				PM	10.0	10.1	10.0	9.9	9.8	9.7	9.5	9.6	9.7	9.7	9.8	9.9
1-29	10.0	8.8	9.5	AM	10.0	10.0	10.1	10.1	10.0	9.9	9.6	9.6	9.4	9.7	9.7	9.8
				PM	9.9	9.8	9.8	9.8	9.5	9.2	9.0	8.8	8.9	9.0	9.3	9.6
1-30	9.8	9.0	9.5	AM	9.9	9.9	10.0	10.0	10.0	9.8	9.6	9.4	9.4	9.5	9.6	9.6
				PM	9.8	9.8	9.8	9.7	9.5	9.1	9.1	9.0	9.0	9.0	9.0	9.3
1-31	10.8	9.5	10.0	AM	9.4	9.5	9.7	9.6	9.6	9.5	9.6	9.5	9.5	9.6	9.6	9.6
				PM	9.5	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.8	9.9	10.0	9.9
2-01	10.5	9.9	10.1	AM	10.0	9.9	10.0	10.1	10.0	9.9	10.1	10.3	10.6	10.8	10.7	10.6
2-02	10.1	9.3	9.7	AM	10.4	10.3	10.2	10.1	10.2	10.2	10.1	10.0	9.9	10.0	10.0	10.0
				PM	10.0	10.2	10.3	10.2	10.3	10.1	10.2	10.1	10.0	9.9	10.0	10.0
2-03	10.1	9.4	9.8	AM	9.5	9.6	9.7	9.9	10.0	10.0	9.8	9.8	9.6	9.5	9.4	9.3
				PM	9.5	9.5	9.7	9.9	10.0	10.1	10.0	9.9	9.7	9.5	9.4	9.3
2-04	10.8	9.4	10.1	AM	9.7	9.7	9.8	10.0	10.0	9.9	9.9	9.9	9.9	9.9	9.7	9.6
				PM	9.6	9.4	9.8	9.7	10.0	10.0	10.1	10.1	10.0	10.0	10.1	10.1
2-05	10.6	10.0	10.4	AM	10.2	10.3	10.6	9.9	10.2	10.2	10.2	10.2	10.3	10.3	10.3	10.2
				PM	10.1	10.0	10.0	10.1	10.1	10.1	10.2	10.2	10.3	10.3	10.5	10.6
2-06	11.2	10.3	10.7	AM	10.5	10.6	10.5	10.5	10.5	10.5	10.5	10.4	10.5	10.6	10.5	10.5
2-07	11.5	10.9	11.2	AM	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.5	10.6	10.6	10.8	10.8
				PM	10.9	11.1	11.0	11.0	11.2	10.9	10.9	10.9	10.9	10.9	11.0	10.9
2-08	11.9	11.2	11.5	AM	11.0	11.0	11.1	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.2	11.2
				PM	11.2	11.2	11.3	11.4	11.4	11.4	11.3	11.4	11.4	11.3	11.3	11.4
2-09	11.4	10.3	10.7	AM	11.3	11.3	11.3	11.2	11.3	11.3	11.2	11.3	11.3	11.4	11.4	11.4
				PM	11.5	11.7	11.8	11.8	11.9	11.8	11.8	11.6	11.7	11.8	11.7	11.5
2-10	10.6	9.3	9.9	AM	11.3	11.0	10.8	10.7	10.6	10.5	10.5	10.5	10.6	10.6	10.7	10.9
				PM	10.9	10.8	10.8	10.8	10.7	10.5	10.3	10.4	10.4	10.5	10.5	10.5
2-11	10.0	8.8	9.6	* AM	10.5	10.4	10.2	9.6	9.3	9.6	9.4	9.4	9.5	9.8	10.0	10.2
				PM	10.3	10.4	10.2	10.2	9.9	9.8	9.6	9.7	9.8	9.8	10.0	10.0
				PM	10.0	10.0	9.9	9.7	9.4	9.0						

NOTE: * DENOTES DAILY SUMMARY FOR AN INCOMPLETE DAY

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION
PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS

[illegible]

Table 2. (Continued)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS																
02246500			ST. JOHNS RIVER AT JACKSONVILLE, FLA.				WATER YEAR ENDING SEPT. 30, 1971									
RT	NO	Q1	DISSOLVED OXYGEN(MG/L)				PARAM-CODE 00300				XSEC-LOC		SAMPLING DEPTH			
DATE	MAX	MIN	MEAN	1	2	3	4	VALUES AT INDICATED HOURS				8	9	10	11	12
								5	6	7						
1-27	8.0	7.0	7.6	PM	7.3	7.4	7.5	7.6	7.7	7.7	7.6	7.5	7.4	7.4	7.3	7.1
1-28	8.0	6.9	7.4	AM	7.2	7.4	7.4	7.5	7.7	7.8	7.8	7.7	7.6	7.6	7.4	7.2
				PM	7.2	7.4	7.4	7.6	7.7	7.9	8.0	7.9	7.7	7.5	7.3	
1-29	8.1	7.0	7.6	AM	6.9	6.9	7.0	7.1	7.3	7.5	7.6	7.6	7.6	7.6	7.4	7.1
				PM	6.9	6.9	7.0	7.1	7.3	7.5	7.6	7.6	7.6	7.8	7.9	7.7
1-30	8.0	6.9	7.6	AM	7.4	7.4	7.4	7.5	7.8	8.0	8.1	8.0	7.9	7.8	7.6	7.4
				PM	7.3	7.0	7.0	7.2	7.5	7.6	7.8	7.9	7.6	7.6	7.6	7.4
1-31	7.8	7.3	7.6	AM	7.1	6.9	6.9	7.0	7.1	7.4	7.7	7.7	7.8	7.8	7.7	7.7
				PM	7.6	7.7	7.7	7.7	7.8	7.6	7.7	7.8	7.8	8.0	7.9	7.9
2-01	7.7	6.8	7.3	AM	7.7	7.6	7.3	7.2	7.1	7.1	7.3	7.5	7.5	7.5	7.6	7.6
				PM	7.4	7.3	7.2	6.9	6.8	7.2	7.0	7.2	7.3	7.4	7.5	7.5
2-02	7.5	6.7	7.0	AM	7.5	7.3	7.1	6.9	6.7	6.7	6.8	6.9	7.0	7.2	7.3	7.3
				PM	7.2	7.1	6.9	6.8	6.7	6.9	6.7	6.8	6.9	7.0	7.2	7.3
2-03	7.3	6.5	6.7	AM	7.0	7.0	6.8	6.7	6.6	6.6	6.6	6.6	6.7	6.8	6.8	7.1
				PM	6.9	6.9	6.8	6.7	6.6	6.6	6.6	6.6	6.7	6.7	6.8	7.0
2-04	7.5	6.4	6.9	AM	7.2	7.3	6.8	6.9	6.7	6.5	6.4	6.5	6.4	6.7	7.0	7.3
				PM	7.1	7.3	7.4	6.8	6.7	6.5	6.4	6.4	6.5	6.4	6.7	7.0
2-05	7.3	6.1	6.8	AM	7.3	7.3	7.1	6.8	6.9	6.8	6.7	6.9	7.1	7.4	7.3	7.3
				PM	6.9	6.7	6.8	6.9	6.9	6.8	6.8	6.8	6.5	6.4	6.7	6.8
2-06	7.1	6.0	6.7	AM	7.1	7.1	7.0	7.0	6.9	6.9	6.7	6.8	6.1	6.2	6.3	6.3
				PM	6.5	6.7	6.8	7.1	6.9	6.7	6.7	6.4	6.2	6.5	6.6	6.6
2-07	7.5	6.4	7.1	AM	6.7	7.0	7.0	7.3	7.2	7.2	7.1	7.3	6.9	6.8	6.7	6.7
				PM	6.8	6.9	7.1	7.5	7.2	7.3	7.5	7.2	7.3	7.4	7.4	7.4
2-08	9.9	4.9		AM	7.4	7.5	7.6	7.5	7.4	7.3	7.3	6.9	6.1	5.5	4.9	4.9
				PM	7.4	5.9	7.1	7.5	7.4	7.1	7.3	7.1	6.9	6.1	5.5	4.9
2-09	9.2	7.5		AM	8.5	8.5	8.5	8.8	8.9	8.4	8.0	9.1	9.1	8.9	8.6	8.6
				PM	7.6	7.5	7.4	7.4	7.3	7.2	7.2	7.7	7.5	7.6	7.6	
2-10	7.9	6.7	7.4	AM	7.5	7.5	7.4	7.6	7.8	7.9	7.5	7.4	7.7	7.7	7.9	7.9
				PM	7.5	7.5	7.4	7.6	7.8	7.9	7.5	7.0	6.8	6.7	6.7	6.7
2-11	7.2	6.7	7.0 * AM	AM	6.9	7.0	7.1	7.1	7.2	7.1	7.2	7.4	7.7	7.7	7.9	7.9
				PM												
PERIOD	9.9	2.2														

NOTE: * DENOTES DAILY SUMMARY FOR AN INCOMPLETE DAY

Table 2. (Continued)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION
PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS

C02246500 ST. JOHNS RIVER AT JACKSONVILLE, FLA.

WATER YEAR ENDING SEPT. 30, 1971

[illegible]

Table 2. (Continued)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION									
PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS									
ST. JOHNS RIVER AT JACKSONVILLE, FLA.									
WATER YEAR ENDING SEPT. 30, 1971									
RT NO 01	PH (STANDARD UNITS)	MAX	MIN	MEAN	1	2	3	4	5
DATE									
1-27	AM	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.8
1-28	PM	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.8
1-29	AM	7.9	7.7	7.7	7.7	7.7	7.7	7.7	7.8
1-30	PM	7.9	7.7	7.7	7.7	7.7	7.7	7.7	7.8
1-31	AM	7.9	7.8	7.9	7.9	7.8	7.8	7.8	7.9
2-01	PM	7.9	7.7	7.8	7.9	7.8	7.8	7.8	7.9
2-02	AM	7.8	7.7	7.8	7.8	7.8	7.7	7.7	7.8
2-03	PM	7.9	7.7	7.8	7.7	7.8	7.7	7.8	7.9
2-04	AM	8.0	7.8	7.9	7.8	7.8	7.8	7.8	7.9
2-05	PM	8.0	7.9	7.9	7.9	7.9	7.9	7.9	8.0
2-06	AM	8.0	7.8	7.9	7.9	7.9	7.9	7.9	7.9
2-07	PM	7.9	7.7	7.8	7.9	7.9	7.9	7.9	7.9
2-08	AM	7.9	7.6	7.8	7.8	7.8	7.8	7.8	7.8
2-09	PM	7.9	7.8	7.9	7.7	7.7	7.7	7.7	7.8
2-10	AM	7.9	7.8	7.9	7.8	7.8	7.9	7.9	7.9
2-11	PM	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8
PERIOD		8.0	7.5						

NOTE: * DENOTES DAILY SUMMARY FOR AN INCOMPLETE DAY

Table 2. (Continued)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION															
PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS															
ST. JOHNS RIVER AT JACKSONVILLE, FLA.															
WATER YEAR ENDING SEPT. 30, 1971															
C22465C0				PARAM-CODE 00095											
RT NO 01				XSEC-LOC											
CONDUCTANCE(MICROMHOS)				VALUES AT INDICATED HOURS											
				SAMPLING DEPTH											
DATE	MAX	MIN	MEAN	1	2	3	4	5	6	7	8	9	10	11	12
1-04	19960	10760	15300	* AM											
1-05	17840	8880	12090	PM	10640	10640	11280	12600	14280	18440	18000	16720	15520	13200	10760
1-06	13440	8200	10180	AM	8440	8240	8320	8640	9400	9960	11440	12920	13120	11960	10360
1-07	17560	8000	11850	AM	9640	8840	8680	8680	9040	9720	10720	11840	11880	10920	9960
1-08	21280	10280	15680	PM	12200	11000	9840	9800	10680	10920	13000	12560	13560	14120	13200
1-09	23000	10640	16330	AM	13320	11560	10800	10280	11260	12580	14000	16720	18560	16520	14560
1-10	21000	10360	14950	PM	19360	17560	14800	13640	12400	13400	15120	16880	18680	20440	17920
1-11	16000	9080	11410	AM	16160	14360	12000	11400	10640	13000	14520	15760	17960	17640	17660
1-12	12880		9414	PM	21040	19840	16880	14600	13080	12280	13320	15480	16840	21280	22560
1-13	11800	7160	8853	AM	17400	15880	13760	11880	11160	10920	12760	14440	15920	19400	16760
1-14	11600	6800	8593	PM	20120	18600	16240	14120	12720	11520	10360	12480	12800	14880	15640
1-15	9640	5200	6948	AM	14640	13360	12080	10640	9960	9360	9360	10000	10840	11600	15040
1-16	10040	5520	7016	PM	16000	13520	12320	11200	9560	9240	9280	9080	9680	10040	11680
1-17	11680	5320	7880	AM	12040	11200	10400	9680	8640	8280	7840	7920	8440	9120	11360
1-18	12280	5320	7812	PM	12640	12880	10680	10680	8680	8160	7680	7160	7960	8480	9680
1-19	17040	7080	12860	AM	10720	10160	9760	9160	8520	7680	7480	7400	7320	7800	9320
1-20	19680	9160	15180	PM	10760	11800	10720	10400	9480	8480	7760	7400	7240	7800	9000
1-21	14680	5560	9138	AM	9840	10360	9680	9160	8720	7800	7160	6960	6880	7240	8480
1-22	8320	4040	5502	PM	9840	11360	11600	10800	9720	8880	7720	7080	6800	6840	7720
1-23	5640	3280	4001	AM	8400	9640	9520	8680	7960	7400	6640	6360	6000	5840	6320
1-24	4520	2320	3371	PM	6880	7520	7720	7360	6960	6320	6320	5720	5320	5200	5640
1-25	6480	2440	3796	AM											
1-26	10160	2480	5326	PM											
				AM	6040	6400	6880	7280	6520	6400	6160	5720	5520	5520	6640
				PM	7200	8240	9160	10040	9240	8760	8000	7360	6640	6240	6560
				AM	7080	7800	8560	9120	9080	9240	8520	7680	6840	6120	6280
				PM	6960	8360	9760	9320	9600	9640	8800	7440	6360	5840	5400
				AM	5840	6560	7320	7680	8600	8080	7840	7360	6520	5720	5480
				PM	6240	8600	9800	10080	12280	10320	10400	9600	7960	6480	6080
				AM	7280	8840	10480	11280	13440	15200	14840	14520	12880	12000	10280
				PM	10120	13680	14640	14400	16680	16680	15640	15320	15080	14120	10800
				AM	9160	14360	14520	16000	16320	17800	19680	19400	18640	17960	14320
				PM	12680	11400	16520	16280	18040	17400	14520	15160	13880	12040	9320
				AM	7920	7000	9760	11520	12120	13880	13240	13960	13000	11760	8040
				PM	7760	6960	6680	8280	8640	9800	8680	7880	7360	6240	5560
				AM	5160	4760	4640	5040	5480	6360	6480	6920	8280	7320	5960
				PM	5400	4960	4680	4480	4360	4640	4880	5200	5080	4880	4040
				AM	3840	3640	3360	3360	3600	4000	4280	4720	5480	5640	4680
				PM	4440	3880	3600	3360	3280	3320	3520	3720	4040	3800	3480
				AM	3240	2920	2680	2320	2400	2720	3160	3520	3960	4280	3960
				PM	3880	3720	3240	2960	2800	2800	2920	3280	3680	4000	3840
				AM	3520	3160	2760	2520	2480	2720	3160	3280	3760	4680	5720
				PM	5080	4600	4160	3320	2880	2800	2840	3040	3920	4720	5560
				AM	5320	4520	3560	2880	2640	2480	2680	3000	3880	5480	9160

Table 2. (Continued)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS									
ST. JOHNS RIVER AT JACKSONVILLE, FLA.									
02246500	RT NO 01	CONDUCTANCE(MICROMHOS)	MAX	MIN	MEAN	1	2	3	4
DATE						PM	AM	PM	AM
1-27	10760	2640	6125			9160	7920	7240	6080
						8440	7800	6400	4840
1-28	11760	3080	6759			10760	9720	9320	7960
						10920	9680	8520	7280
1-29	11480	2560	6332			11680	11760	10840	9960
						10120	10280	8360	7440
1-30	11440	1840	5319			8800	11240	11480	10160
						9240	11440	11440	9880
1-31	5520	1320	2637			5160	5920	6880	6240
						3000	3600	4840	5000
						1920	2480	3120	3520
2-01	7040	1520	3496			1680	2320	3400	4200
						2480	3360	4240	6200
2-02	11360	2280	6711			2480	3360	4720	7120
						4200	4680	6600	8440
2-03	18480	4680	13420			6160	7160	9120	11640
						10160	9400	14280	14440
2-04	21560	6520	13520			7720	6920	13920	11640
						9000	8760	7640	15280
2-05	16560	6120	10320			7200	6560	6480	13000
						8680	8600	7720	7520
2-06	13320	5360	8833			6400	5680	5440	5440
						10120	7920	7360	6600
2-07	14280	6560	9740			9480	7800	6840	6560
						12400	11320	8800	8280
2-08	12760	5320	7927			9120	8480	6960	6280
						10960	10600	9240	7400
2-09	5520	3440	4433			5120	5160	4680	4440
						5320	5040	4800	4480
2-10	4440	2800	3541			4320	4160	3800	3280
						4280	4040	3840	3800
2-11	4080	2640	3495 *			4080	3920	3760	3560
PERIOD	23000								

NOTE: * DENOTES DAILY SUMMARY FOR AN INCOMPLETE DAY

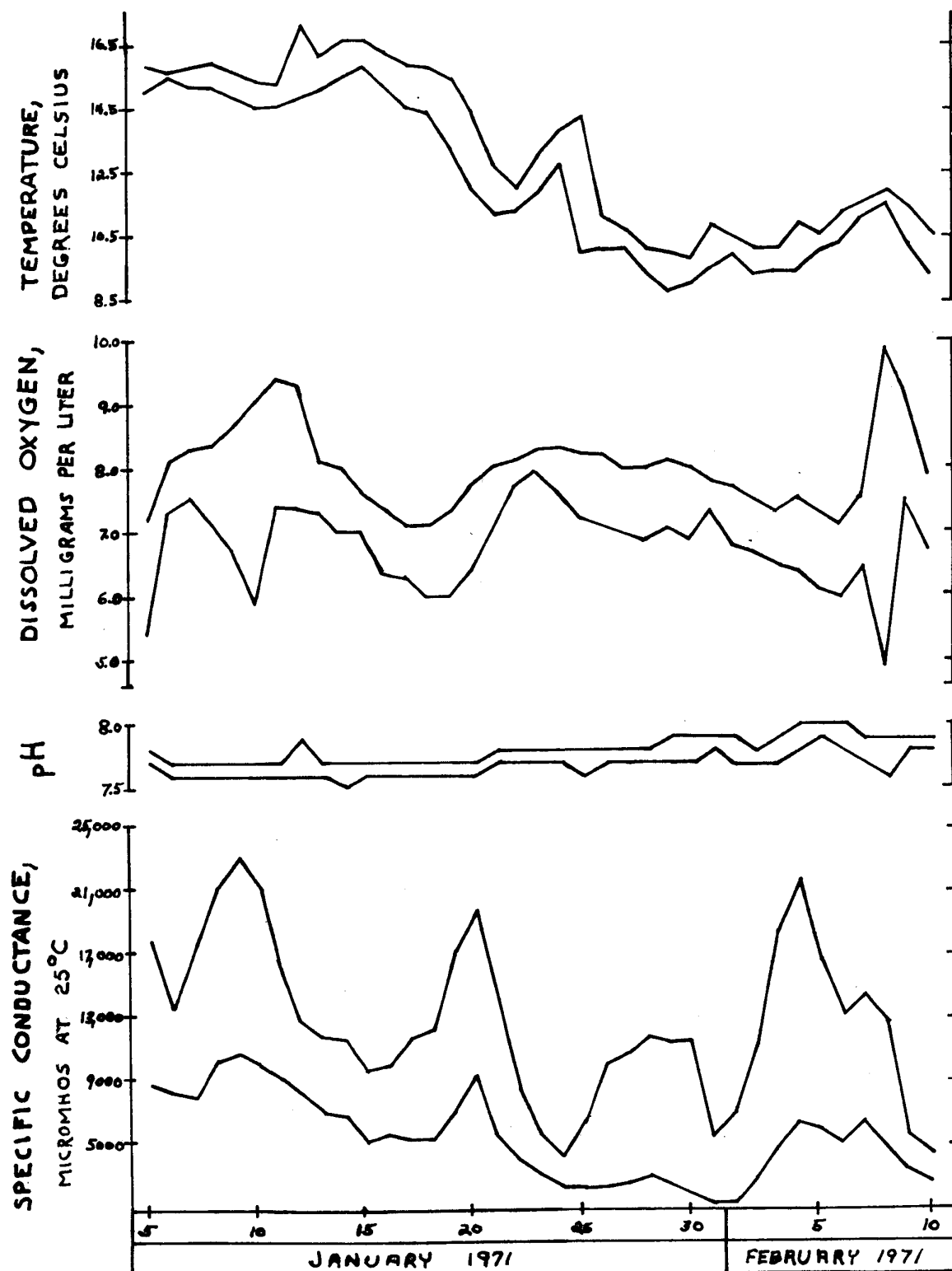


Figure 5. Graphs of daily maximum and minimum temperature, dissolved oxygen, pH and specific conductance of water in the St. Johns River at the Main Street Bridge in Jacksonville from January 4, 1971 to February 11, 1971.

Figure 6 is a graph showing the temperature, dissolved oxygen, pH, and specific conductance of the St. Johns River at the Main Street Bridge at Jacksonville for the period August 23, 1968 to September 5, 1968. The four parameters vary with changes in atmospheric conditions and tidal fluctuations.

As shown in figure 6, the first several days (August 23-28, 1968) of the specific conductance record illustrates the variation in water quality. This variation in quality is directly related to the tidal cycles. The maximum and minimum specific conductance is about the same for each tide cycle, indicating stable flow conditions. On August 28-30 brisk northeast winds caused unusually high tides which pushed salt water farther upstream. The maximum specific conductance of water in the river at the Main Street Bridge on August 29 was 27,000 micromhos per centimeter. On August 29, 30, 31, and September 1, about 17 inches of rain fell in the area and flushed the salt water out of the streams in the Jacksonville area. By September 5, fresh-water outflow reduced the conductivity to less than 500 micromhos and no tidal variation was apparent.

Fig. 6
near here

On August 23-28 the dissolved oxygen reached a daily minimum at high tide and a daily maximum at low tide. The magnitude of the change is more than would be expected due to the small change in salinity. This is explained as follows: on the ebb tide water is flushed downstream and the fresher water from upstream is present at the Main Street Bridge at low tide. The river also receives domestic and industrial wastes and a major part of this waste enters the river downstream from the Main Street Bridge, generally during ebb tide, lowering the oxygen content. During the next flood tide this "polluted" water is forced back upstream past the Main Street Bridge.

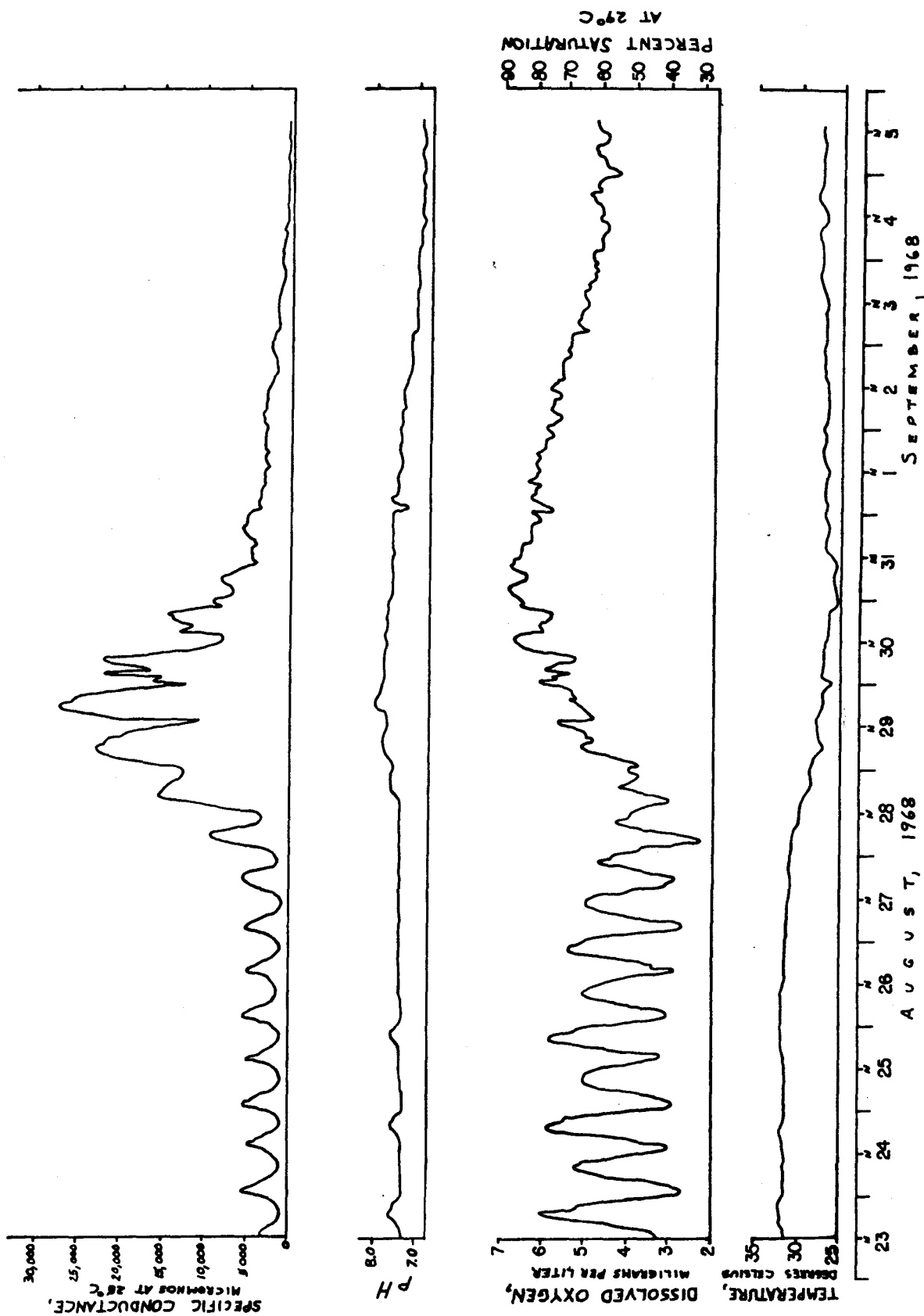


Figure 6. Graphs of the hourly values of temperature, dissolved oxygen, pH and specific conductance of water in the St. Johns River at the Main Street Bridge in Jacksonville from August 23, 1968 to September 5, 1968.

During August 23-26 the pH was highest at low tide, indicating that the pH of the fresh water from upstream is higher than the pH of tidal water. The pH increased to a maximum of 8.0 during the period when specific conductance was high, probably because of the influence of sea water (the pH of sea water is 8.1 to 8.4). The decrease in pH to about 6.8 on September 4 and 5 evidently reflects the fresh-water runoff from swamps and tributary streams.

The temperature record (fig. 6) illustrates the accompanying weather conditions during the time span August 23-September 5, 1968. The weather became cloudy and cooler about August 27 followed by heavy rains on August 29, 30, and 31. On these days the water temperature dropped about 6.5°C (12°F). After the rain stopped the temperature began to rise slowly.

Point Sampling

The Geological Survey samples and analyzes water from several locations in the St. Johns River and tributary streams at Jacksonville.

Analyses of water from streams in the Jacksonville area are listed in table 3. Also listed, among other constituents, are quantities of phosphorus and nitrogen, the most common nutrients used as pollution indicators. The nutrients are usually associated with organic solids which enter the river stream by both man-made and natural means. Phosphorus is a component of sewage and is always present in animal metabolic waste (Hem, 1970, p. 184). Nitrogen can occur in any of several oxidation states, many species of which may occur in water that contains organic or industrial waste.

Table 3
near here

Table 3. Chemical and nutrient analyses from surface water sampling stations in Duval County.

ANALYSES OF MISCELLANEOUS STATIONS

DATE	DIS- CHARGE (CFS)	TEMP- ERATURE (DEG C)	SILICA (SiO ₂) (MG/L)	DIS- SOLVED IRON (FE) (UG/L)	DIS- SOLVED CAL- CIUM (CA) (MG/L)	DIS- SOLVED MAG- NESIUM (MG)	SODIUM (NA) (MG/L)	PO- TAS- SIUM (K) (MG/L)	BICAR- BONATE (HCO ₃) (MG/L)	SULFATE (SO ₄) (MG/L)	CHLO- RIDE (CL) (MG/L)	DIS- SOLVED FLUO- RIDE (F) (MG/L)
02231280 - 09C THOMAS CREEK NR CRAWFORD FLA (LAT 30 27 39 LONG 081 49 57)												
NOV., 1967												
16...	2.4	13	7.8	.06	8.6	2.9	4.0	.2	38	.0	8.2	.2
JAN., 1968												
04...	--	15	--	--	--	--	--	--	--	--	--	--
FEB.												
15...	--	7	--	--	--	--	--	--	--	--	--	--
MAR.												
28...	--	12	--	--	--	--	--	--	--	--	--	--
MAY												
01...	6.2	17	8.1	.12	8.4	2.7	4.4	.4	36	.0	8.0	.1
JUNE												
11...	--	25	--	--	--	--	--	--	--	--	--	--
OCT., 1968												
02...	5.3	22	--	--	--	--	--	--	--	--	--	--
NOV.												
05...	7.5	17	--	--	--	--	--	--	--	--	--	--
DEC.												
19...	8.3	12	--	--	--	--	--	--	--	--	--	--
FEB., 1969												
04...	12	12	--	--	--	--	--	--	--	--	--	--
MAR.												
26...	68	15	--	--	--	--	--	--	--	--	--	--
APR.												
30...	2.7	17	6.9	50000	7.8	2.7	4.1	.3	38	.0	7.5	.1
JUNE												
19...	1.9	26	--	--	--	--	--	--	--	--	--	--
AUG.												
14...	6.3	24	--	--	--	--	--	--	--	--	--	--
OCT., 1969												
08...	177	23.0	--	--	--	--	--	--	--	--	--	--
NOV.												
26...	14	14.0	--	--	--	--	--	--	--	--	--	--
JAN., 1970												
14...	84	8.5	--	--	--	--	--	--	--	--	--	--
MAR.												
03...	20	16.5	--	--	--	--	--	--	--	--	--	--
MAY												
13...	--	21.0	.6	--	5.8	2.2	4.2	.4	28	.8	5.5	.1
JUNE												
26...	2.3	23.0	--	--	--	--	--	--	--	--	--	--
AUG.												
06...	14	26.0	--	--	--	--	--	--	--	--	--	--
SEP.												
23...	--	25.0	--	--	--	--	--	--	--	--	--	--

Table 3. (Continued)

ANALYSES OF MISCELLANEOUS STATIONS												
DATE	ORGANIC NITRO- GEN (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS- SOLVED ORTHO- PHOS- PHATE (PO4) (MG/L)	DIS- SOLVED SOLIDS (SUM OF CONSTI- TUENTS) (MG/L)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L)	HARD- NESS (CA+MG) (MG/L)	NON- CAR- BONATE HARD- NESS (MG/L)	SPECI- FIC COND- UCTANCE (MICRO- MHOS)	PH (UNITS)	COLOR (PLAT- INUM- COBALT UNITS)	DIS- SOLVED OXYGEN (MG/L)	PER- CENT SATUR- ATION
02231280 - 09C THOMAS CREEK NR CRAWFORD FLA (LAT 30 27 39 LONG 081 49 57)												
NOV., 1967	--	.7	.02	52	60	34	2	87	6.8	40	--	--
JAN., 1968	--	--	--	--	--	--	--	68	--	--	--	--
FEB.	--	--	--	--	--	--	--	85	--	--	--	--
MAR.	--	--	--	--	--	--	--	78	--	--	--	--
MAY	--	--	--	--	--	--	--	93	6.7	60	8.9	92
JUNE	--	.8	--	51	62	32	2	56	--	--	--	--
11....	--	--	--	--	--	--	--	510	--	--	--	--
OCT., 1968	--	--	--	--	--	--	--	62	--	--	--	--
NOV.	--	--	--	--	--	--	--	98	--	--	--	--
DEC.	--	--	--	--	--	--	--	81	--	--	--	--
19....	--	--	--	--	--	--	--	47	--	--	--	--
FEB., 1969	--	--	--	--	--	--	--	80	6.3	30	7.7	79
MAR.	--	.1	--	49	56	31	0	--	--	--	--	--
APR.	--	--	--	--	--	--	--	--	--	--	--	--
26....	--	--	--	--	--	--	--	65	--	--	--	--
JUNE	--	--	--	--	--	--	--	46	--	--	--	--
19....	--	--	--	--	--	--	--	52	--	--	--	--
AUG.	--	--	--	--	--	--	--	38	--	--	--	--
OCT., 1969	--	--	--	--	--	--	--	40	--	--	--	--
NOV.	--	--	--	--	--	--	--	70	6.4	60	7.1	79
26....	--	--	--	--	--	--	--	76	--	--	--	--
JAN., 1970	--	--	--	--	--	--	--	45	--	--	--	--
14....	--	--	--	--	--	--	--	42	--	--	--	--
MAR.	--	--	--	--	--	--	--	--	--	--	--	--
03....	--	--	--	--	--	--	--	--	--	--	--	--
MAY	--	--	--	--	--	--	--	--	--	--	--	--
13....	.20	.2	.05	34	52	24	1	70	6.4	60	7.1	79
JUNE	--	--	--	--	--	--	--	76	--	--	--	--
26....	--	--	--	--	--	--	--	45	--	--	--	--
AUG.	--	--	--	--	--	--	--	42	--	--	--	--
06....	--	--	--	--	--	--	--	--	--	--	--	--
SEP.	--	--	--	--	--	--	--	--	--	--	--	--
23....	--	--	--	--	--	--	--	--	--	--	--	--

20b

Table 3. (Continued)

ANALYSES OF MISCELLANEOUS STATIONS												
DATE	DIS- CHARGE (CFS)	TEMP- ERATURE (DEG C)	SILICA (SI02) (MG/L)	DIS- SOLVED IRON (FE) (UG/L)	DIS- SOLVED CAL- CIUM (CA) (MG/L)	DIS- SOLVED MAG- NE- SIUM (MG)	SODIUM (NA) (MG/L)	PO- TAS- SIUM (K) (MG/L)	BICAR- BONATE (HC03) (MG/L)	SULFATE (SO4) (MG/L)	CHLO- RIDE (CL) (MG/L)	DIS- SOLVED FLUO- RIDE (F) (MG/L)
02246150 - BIG DAVIS CREEK AT BAYARD, FLA. (LAT 30 09 05 LONG 081 31 34)												
NOV., 1967												
17...	1.4	14	8.5	.06	2.4	1.7	7.5	.4	74	1.6	12	.2
JAN., 1968												
04...	--	17	--	--	--	--	--	--	--	--	--	--
FEB.												
16...	--	12	--	--	--	--	--	--	--	--	--	--
MAR.												
28...	--	14	--	--	--	--	--	--	--	--	--	--
MAY												
02...	1.2	18	7.1	.08	24	1.7	7.0	.5	77	5.9	11	.2
JUNE												
12...	11	25	--	--	--	--	--	--	--	--	--	--
JULY												
23...	.93	25	--	--	--	--	--	--	--	--	--	--
OCT., 1968												
03...	2.0	23	--	--	--	--	--	--	--	--	--	--
NOV.												
06...	5.4	18	--	--	--	--	--	--	--	--	--	--
DEC.												
20...	3.9	14	--	--	--	--	--	--	--	--	--	--
FEB., 1969												
05...	2.6	10	--	--	--	--	--	--	--	--	--	--
MAR.												
27...	21	14	--	--	--	--	--	--	--	--	--	--
APR.												
30...	1.2	22	5.3	0	21	1.6	8.2	.5	70	.0	14	.1
JUNE												
20...	1.2	24	6.6	0	23	1.7	7.9	.6	70	.0	12	.1
AUG.												
15...	2.8	25	--	--	--	--	--	--	--	--	--	--
OCT., 1969												
09...	50	22.0	--	--	--	--	--	--	--	--	--	--
20...	9.0	14.0	--	--	--	--	--	--	--	--	--	--
JAN., 1970												
06...	--	12.0	--	--	--	--	--	--	--	--	--	--
MAY												
20...	1.1	18.5	5.9	--	17	1.3	6.6	.4	55	.8	9.5	.1
JULY												
15...	3.0	27.0	--	--	--	--	--	--	--	--	--	--

Table 3. (Continued)

ANALYSES OF MISCELLANEOUS STATIONS												
DATE	ORGANIC NITRO- GEN (N) (MG/L)	NITRATE (NO ₃) (MG/L)	DIS- SOLVED ORTHO- PHOS- PHATE (PO ₄) (MG/L)	DIS- SOLVED SOLIDS (SUM OF CONSTITU- ENTS) (MG/L)	CIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L)	HARD- NESS (CA.MG) (MG/L)	NON- CAR- BONATE HARD- NESS (MG/L)	SPECI- FIC COND- UCTANCE (MICRO- MHOS)	PH (UNITS)	COLOR (PLAT- INUM- COBALT UNITS)	DIS- SOLVED OXYGEN (MG/L)	PER- CENT SATUR- ATION
02246150 - BIG DAVIS CREEK AT BAYARD, FLA. (LAT 30 09 05 LONG 081 31 34)												
NOV., 1967	--	.2	.16	92	102	67	6	167	6.9	45	--	--
JAN., 1968	--	--	--	--	--	--	--	149	--	--	--	--
FEB.	--	--	--	--	--	--	--	180	--	--	--	--
MAR.	--	--	--	--	--	--	--	175	--	--	--	--
MAY	--	--	--	--	--	--	--	191	7.0	60	7.0	74
JUNE	--	--	--	--	--	--	--	120	--	--	--	--
JULY	--	--	--	--	--	--	--	153	--	--	--	--
23...	--	--	--	--	--	--	--	140	--	--	--	--
CCT., 1968	--	--	--	--	--	--	--	110	--	--	--	--
NOV.	--	--	--	--	--	--	--	148	--	--	--	--
DEC.	--	--	--	--	--	--	--	170	--	--	--	--
20...	--	--	--	--	--	--	--	87	--	--	--	--
FEB., 1969	--	--	--	--	--	--	--	155	6.6	100	6.9	78
05...	--	--	--	--	--	--	--	155	6.5	80	--	--
MAR.	--	--	--	--	--	--	--	155	--	--	--	--
27...	--	--	--	--	--	--	--	155	--	--	--	--
APR.	--	--	--	--	--	--	--	54	--	--	--	--
30...	--	.0	--	85	106	59	2	100	--	--	--	--
JUNE	--	.0	--	86	111	65	7	65	--	--	--	--
20...	--	--	--	--	--	--	--	65	--	--	--	--
AUG.	--	--	--	--	--	--	--	117	6.8	30	8.2	87
15...	--	--	--	--	--	--	--	140	--	--	--	--
CCT., 1969	--	--	--	--	--	--	--	140	--	--	--	--
09...	--	--	--	--	--	--	--	140	--	--	--	--
20...	--	--	--	--	--	--	--	140	--	--	--	--
JAN., 1970	--	--	--	--	--	--	--	140	--	--	--	--
06...	--	--	--	--	--	--	--	140	--	--	--	--
MAY	--	--	--	--	--	--	--	140	--	--	--	--
20...	.23	.1	.31	69	81	48	30	117	6.8	30	8.2	87
JULY	--	--	--	--	--	--	--	140	--	--	--	--
15...	--	--	--	--	--	--	--	140	--	--	--	--

Table 3. (Continued)

ANALYSES OF MISCELLANEOUS STATIONS												
DATE	DIS- CHARGE (CFS)	TEMP- ERATURE (DEG C)	SILICA (SI02) (MG/L)	DIS- SOLVED IRON (FE) (UG/L)	DIS- SOLVED CAL- CIUM (CA) (MG/L)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO- TAS- SIUM (K) (MG/L)	BICAR- BONATE (HCO3) (MG/L)	SULFATE (SO4) (MG/L)	CHLO- RIDE (CL) (MG/L)	DIS- SOLVED FLUO- RIDE (F) (MG/L)
02246300 - 09E ORTEGA RIVER NR JACKSONVILLE, FLA. (LAT 30 14 50 LONG 081 47 49)												
NOV., 1967												
16....	1.8	13	9.6	.04	12	3.0	6.0	1.4	47	5.6	10	.2
JAN., 1968												
04....	--	16	--	--	--	--	--	--	--	--	--	--
FEB.												
16....	--	10	--	--	--	--	--	--	--	--	--	--
MAR.												
27....	4.9	16	--	--	--	--	--	--	--	--	--	--
MAY												
01....	2.5	20	8.7	.14	13	3.0	6.7	1.7	44	10	11	.2
JUNE												
11....	130	26	--	--	--	--	--	--	--	--	--	--
JULY												
24....	47	26	--	--	--	--	--	--	--	--	--	--
NOV., 1968												
03....	4.6	21	--	--	--	--	--	--	--	--	--	--
NOV.												
05....	8.4	17	--	--	--	--	--	--	--	--	--	--
DEC.												
19....	5.8	10	--	--	--	--	--	--	--	--	--	--
FEB., 1969												
05....	5.5	9	--	--	--	--	--	--	--	--	--	--
MAR.												
26....	72	17	--	--	--	--	--	--	--	--	--	--
APR.												
29....	2.2	22	9.3	0	12	2.9	6.9	1.1	38	11	10	.1
JUNE												
19....	8.3	25	--	--	--	--	--	--	--	--	--	--
AUG.												
14....	7.8	25	--	--	--	--	--	--	--	--	--	--
OCT., 1969												
08....	197	22.0	--	--	--	--	--	--	--	--	--	--
NOV.												
26....	11	16.0	--	--	--	--	--	--	--	--	--	--
JAN., 1970												
19....	85	14.0	--	--	--	--	--	--	--	--	--	--
MAR.												
03....	17	15.0	--	--	--	--	--	--	--	--	--	--
MAY												
14....	1.4	21.0	8.4	--	11	2.8	6.6	1.2	40	4.8	9.5	.2
JUNE												
24....	2.6	26.0	--	--	--	--	--	--	--	--	--	--
AUG.												
04....	1.7	27.0	--	--	--	--	--	--	--	--	--	--
SEP.												
23....	--	25.0	--	--	--	--	--	--	--	--	--	--

Table 3. (Continued)

ANALYSES OF MISCELLANEOUS STATIONS												
DATE	ORGANIC NITRO- GEN (N)	NITRATE (NO3) (MG/L)	DIS- SOLVED ORTHOPHOS- PHATE (PO4) (MG/L)	DIS- SOLVED SOLIDS (SUM OF CONSTI- TUENTS) (MG/L)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L)	HARD- NESS (CA+MG) (MG/L)	NON- CAR- BONATE HARD- NESS (MG/L)	SPECI- FIC COND- UCTANCE (MICRO- HHOS)	PH (UNITS)	COLOR (PLAT- INUM- COBALT UNITS)	DIS- SOLVED OXYGEN (MG/L)	PER- CENT SATUR- ATION
02246300 - ORTEGA RIVER NR JACKSONVILLE FLA (LAT 30 14 50 LONG 081 47 49)												
NCV., 1967	--	.2	.02	71	80	42	3	122	6.7	30	--	--
JAN., 1968	--	--	--	--	--	--	--	94	--	--	--	--
FEB.	--	--	--	--	--	--	--	112	--	--	--	--
MAR.	--	--	--	--	--	--	--	107	--	--	--	--
APR.	--	--	--	--	--	--	--	--	--	--	--	--
MAY	--	--	--	--	--	--	--	--	--	--	--	--
JUNE	--	1.4	--	78	89	45	9	146	6.7	40	7.3	79
JULY	--	--	--	--	--	--	--	51	--	--	--	--
AUG.	--	--	--	--	--	--	--	68	--	--	--	--
SEP.	--	--	--	--	--	--	--	91	--	--	--	--
OCT., 1968	--	--	--	--	--	--	--	88	--	--	--	--
NOV.	--	--	--	--	--	--	--	114	--	--	--	--
DEC.	--	--	--	--	--	--	--	160	--	--	--	--
JAN., 1969	--	--	--	--	--	--	--	71	--	--	--	--
FEB.	--	--	--	--	--	--	--	122	6.2	30	7.1	81
MAR.	--	--	--	--	--	--	--	89	--	--	--	--
APR.	--	.5	--	73	88	42	11	92	--	--	--	--
MAY	--	--	--	--	--	--	--	63	--	--	--	--
JUNE	--	--	--	--	--	--	--	90	--	--	--	--
JULY	--	--	--	--	--	--	--	68	--	--	--	--
AUG.	--	--	--	--	--	--	--	73	--	--	--	--
SEP.	--	--	--	--	--	--	--	115	6.4	60	5.6	62
OCT., 1969	--	--	--	--	--	--	--	144	--	--	--	--
NOV.	--	--	--	--	--	--	--	160	--	--	--	--
DEC.	--	--	--	--	--	--	--	120	--	--	--	--
JAN., 1970	--	--	--	--	--	--	--	--	--	--	--	--
FEB.	--	--	--	--	--	--	--	--	--	--	--	--
MAR.	--	--	--	--	--	--	--	--	--	--	--	--
APR.	--	--	--	--	--	--	--	--	--	--	--	--
MAY	--	--	--	--	--	--	--	--	--	--	--	--
JUNE	.43	3.0	1.1	69	84	39	7	115	6.4	60	5.6	62
JULY	--	--	--	--	--	--	--	144	--	--	--	--
AUG.	--	--	--	--	--	--	--	160	--	--	--	--
SEP.	--	--	--	--	--	--	--	120	--	--	--	--
OCT.	--	--	--	--	--	--	--	--	--	--	--	--

Table 3. (Continued)

ANALYSES OF MISCELLANEOUS STATIONS													
DATE	DIS- CHARGE (CFS)	TEMP- ERATURE (DEG C)	SILICA (SiO2) (MG/L)	DIS- SOLVED IRON (FE) (UG/L)	DIS- SOLVED CAL- CIUM (CA) (MG/L)	DIS- SOLVED MAG- NE- SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO- TAS- SIUM (K) (MG/L)	BICAR- BONATE (HCO3) (MG/L)	SULFATE (SO4) (MG/L)	CHLO- RIDE (CL) (MG/L)	DIS- SOLVED FLUG- RIDE (F) (MG/L)	
02246500 - ST JOHNS RIVER AT JACKSONVILLE FLA (LAT 30 19 26 LONG 081 39 12)													
DEC., 1967	--	17	3.0	.08	161	409	3400	127	103	870	6000	.7	
06....	--	22	2.7	.03	240	555	4580	168	114	1160	8500	.9	
MAY, 1968	--	0	3.1	.14	19	9.1	58	2.8	40	30	103	.3	
02....	--	27	--	--	--	--	--	--	--	--	485	--	
SEP.	--	27	6.8	290	101	260	2080	79	78	502	3650	.4	
05....	--	27	--	--	--	--	--	--	86	690	5150	.6	
OCT., 1968	--	27	6.4	270	122	344	2820	106	--	--	--	--	
07....	--	--	--	--	--	--	--	--	--	--	--	--	
14....	--	--	--	--	--	--	--	--	--	--	--	--	
14....	--	--	--	--	--	--	--	--	--	--	--	--	
14....	--	--	--	--	--	--	--	--	--	--	--	--	
NOV.	--	--	--	--	--	--	--	--	--	--	--	--	
14....	--	12	--	--	--	--	--	--	--	--	--	--	
DEC.	--	15	--	--	--	--	--	--	--	--	--	--	
19....	--	17	2.5	--	--	--	--	--	--	--	156	--	
FEB., 1969	--	24	2.3	0	90	180	1440	12	82	388	2520	.5	
05....	--	31	2.7	0	75	136	1080	37	70	200	1950	.3	
MAR., 1969	--	30	2.2	40	68	128	996	35	68	220	1800	.3	
28....	--	30	1.4	30	92	186	1680	58	72	400	2950	.4	
APR.	--	26.0	--	--	--	--	--	--	--	--	--	--	
30....	--	27.0	4.6	--	25	9.2	53	3.0	49	37	98	.3	
JUNE	--	13.0	6.2	--	--	--	--	--	--	--	113	--	
19....	--	13.0	6.4	--	--	--	--	--	--	--	1700	--	
AUG.	--	12.0	5.0	--	23	8.6	51	2.5	46	30	92	.3	
08....	--	16.5	3.0	--	--	--	--	--	--	--	71	--	
OCT., 1969	--	20.5	1.3	--	18	6.1	38	2.1	36	25	69	.2	
08....	--	26.0	--	--	--	--	--	--	--	--	--	--	
22....	--	27.0	--	--	--	--	--	--	--	--	--	--	
DEC.	--	13.0	6.2	--	--	--	--	--	--	--	--	--	
29....	--	13.0	5.0	--	--	--	--	--	--	--	1700	--	
JAN., 1970	--	12.0	5.0	--	23	8.6	51	2.5	46	30	92	.3	
06....	--	16.5	3.0	--	--	--	--	--	--	--	71	--	
27....	--	20.5	1.3	--	18	6.1	38	2.1	36	25	69	.2	
MAR.	--	26.0	--	--	--	--	--	--	--	--	--	--	
03....	--	27.5	3.0	250	32	32	227	9.8	66	77	405	.6	
30....	--	30.5	2.3	--	--	--	--	--	--	--	3260	--	
MAY	--	--	2.0	--	34	23	150	5.9	64	66	272	.3	
11....	--	--	--	--	--	--	--	--	--	--	--	--	
MAY, 1970	--	--	--	--	--	--	--	--	--	--	--	--	
15....	--	--	--	--	--	--	--	--	--	--	--	--	
JUNE	--	--	--	--	--	--	--	--	--	--	--	--	
24....	--	--	--	--	--	--	--	--	--	--	--	--	
AUG.	--	--	--	--	--	--	--	--	--	--	--	--	
25....	--	--	--	--	--	--	--	--	--	--	--	--	
													20g

20g

FL Open-file # 73035 "Water quality and related studies, Jacksonville area, Florida" by Fairchild and Leve

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER QUALITY AND RELATED STUDIES,
JACKSONVILLE AREA, FLORIDA

By
Roy W. Fairchild and Gilbert W. Leve

OPEN FILE REPORT
FLORIDA 73035

Prepared by the
U. S. GEOLOGICAL SURVEY
in cooperation with the
CITY OF JACKSONVILLE,
DUVAL COUNTY, FLORIDA

Tallahassee, Florida

1973

Table 3. (Continued)

ANALYSES OF MISCELLANEOUS STATIONS													
DATE	DIS- CHARGE (CFS)	TEMP- ERATURE (DEG C)	SILICA (SiO2) (MG/L)	DIS- SOLVED IRON (FE) (UG/L)	DIS- SOLVED CAL- CIUM (CA) (MG/L)	DIS- SOLVED MAG- NE- SIUM (MG)	SODIUM (NA) (MG/L)	PO- TAS- SIUM (K) (MG/L)	BICAR- BONATE (HCO3) (MG/L)	SULFATE (SO4) (MG/L)	CHLO- RIDE (CL) (MG/L)	DIS- SOLVED FLUO- RIDE (F) (MG/L)	
02246200 - DURBIN CREEK NR DURBIN FLA (LAT 30 05 57 LONG 081 31 34)													
MAY, 1968													
02...	.00	20	7.2	.07	37	3.2	13	1.6	124	12	18	.2	
APR., 1969													
30...	4.0	24	8.8	0	26	2.9	14	.7	80	.8	24	.2	
MAY, 1970													
25...	.00	19.0	10	--	25	2.8	10	1.1	81	8.0	14	.2	
02246530 - 09EST JOHNS R AT DREDGE DEPOT NR JACKSONVILLE F O (LAT 30 21 25 LONG 081 37 18)													
MAY, 1968													
01...	--	25	2.3	.03	230	648	5310	200	124	1340	9500	.1	
DEC., 1968													
19...	--	12	--	--	--	--	--	--	--	--	--	--	--
FEB., 1969													
05...	--	16	--	--	--	--	--	--	--	--	--	--	--
APR.													
30...	--	24	1.7	70	114	280	2400	94	92	590	4050	.6	
JUNE													
14...	--	31	2.1	0	100	240	1960	78	79	500	3300	.5	
AUG.													
14...	--	29	2.2	--	--	--	--	--	--	--	5400	--	--
OCT., 1969													
08...	--	26.0	--	--	--	--	--	--	--	--	--	--	--
JAN., 1970													
06...	--	13.0	5.2	--	--	--	--	--	--	--	4100	--	--
MAR.													
03...	--	16.5	2.7	--	--	--	--	--	--	--	438	--	--
MAY													
14...	--	29.0	2.0	--	42	59	485	19	60	140	865	.4	
JUNE													
24...	--	31.0	2.3	--	--	--	--	--	--	--	3700	--	--
02246600 - 09ETRCUT RIVER AT DINSMORE FLA (LAT 30 25 51 LONG 081 46 07)													
MAY, 1968													
01...	.00	19	10	.08	122	154	455	24	104	164	1120	.4	
APR., 1969													
29...	.10	22	9.1	0	16	4.5	12	1.7	62	7.2	19	.2	
MAY, 1970													
13...	--	23.0	6.0	--	19	4.9	12	1.9	76	7.5	16	.3	

Table 3. (Continued)

ANALYSES OF MISCELLANEOUS STATIONS													
DATE	ORGANIC NITROGEN (MG/L)	NITRATE (NO3) (MG/L)	DIS- SOLVED ORTHO PHOS- PHATE (PO4) (MG/L)	DIS- SOLVED SOLIDS (SUM OF CONSTI- TUENTS) (MG/L)	DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L)	HARD- NESS (CA+MG) (MG/L)	NON- CAR- BONATE HARD- NESS (MG/L)	SPECI- FIC COND- UCTANCE (MICRO- MHOS)	PH (UNITS)	COLOR (PLAT- INUM- COBALT UNITS)	DIS- SOLVED OXYGEN (MG/L)	PER- CENT SATUR- ATION	
02246200 - 09E DURBIN CREEK NR DURBIN, FLA. (LAT 30 05 57 LONG 081 31 34)													
MAY, 1968	--	1.3	--	155	163	106	4	260	7.3	40	5.5	60	
APR., 1969	--	.2	--	117	162	77	12	210	6.6	100	5.2	61	
MAY, 1970	.78	.8	.27	112	134	74	8	200	7.0	60	5.2	55	
25...													
02246530 - 09EST JOHNS R AT DREDGE DEPOT NR JACKSONVILLE F O (LAT 30 21 25 LONG 081 37 18)													
MAY, 1968	--	.6	--	17300	--	3240	3140	27300	7.2	30	5.9	70	
CL...	--	--	--	--	--	--	--	19800	--	--	--	--	
DEC., 1968	--	--	--	--	--	--	--	7720	--	--	--	--	
19...	--	--	--	--	--	--	--	12600	6.9	70	5.0	59	
FEB., 1969	--	.4	--	7580	--	1440	1360	10800	6.9	60	--	--	
05...	--	1.3	.52	6220	--	1240	1170	15500	--	--	--	--	
APR.	--	1.1	.41	--	--	--	--	640	--	--	--	--	
30...	--	--	--	--	--	--	--	13200	--	--	--	--	
JUNE	--	.0	.10	--	--	--	--	1680	--	--	--	--	
14...	--	.5	.15	--	--	--	--	3100	6.6	100	6.7	86	
AUG.	--	.2	.46	1640	--	348	299	11800	--	--	--	--	
14...	--	.6	.34	--	--	--	--	--	--	--	--	--	
CCI., 1969	--	--	--	--	--	--	--	--	--	--	--	--	
08...	--	--	--	--	--	--	--	--	--	--	--	--	
JAN., 1970	--	.0	.10	--	--	--	--	--	--	--	--	--	
06...	--	.5	.15	--	--	--	--	--	--	--	--	--	
MAR.	--	.2	.46	1640	--	348	299	11800	--	--	--	--	
MAY	.60	.2	.46	1640	--	348	299	11800	--	--	--	--	
14...	--	.6	.34	--	--	--	--	--	--	--	--	--	
JUNE	--	.6	.34	--	--	--	--	--	--	--	--	--	
24...	--	.6	.34	--	--	--	--	--	--	--	--	--	
02246600 - 09ETRCUT RIVER AT DINSMORE FLA (LAT 30 25 51 LONG 081 46 07)													
MAY, 1968	--	.2	--	2100	--	940	855	3870	7.1	50	3.0	32	
01...	--	.0	--	101	129	59	8	170	6.5	100	3.5	40	
APR., 1969	--	.4	.41	105	149	68	6	195	5.7	160	7.2	83	
29...	--	.4	.41	105	149	68	6	195	5.7	160	7.2	83	
MAY, 1970	.60	.4	.41	105	149	68	6	195	5.7	160	7.2	83	
13...	--	.4	.41	105	149	68	6	195	5.7	160	7.2	83	

Dissolved Oxygen and Salinity Profiles

At various times the Geological Survey has made lateral and vertical profiles of one or more quality-of-water parameters in the St. Johns River and tributary streams under various conditions. The quality of water in the streams at Jacksonville varies both laterally and vertically because of tidal and climatic conditions, the physical characteristics of the channels, and man-made influences.

Points on streams where the water has been tested for dissolved oxygen content are shown on the maps on figures 7 and 8. The quantities of dissolved oxygen shown on the maps are from data collected in October, 1966 and in January, 1967. Under average stream conditions the stream must contain at least 5 mg/l of dissolved oxygen to support a varied fish fauna in good condition (Federal Water Pollution Control Administration, 1968). As shown in the figures, the dissolved oxygen value in some of the small tributary streams was below 5 mg/l.

Fig. 7
near here

Fig. 8
near here

Both lateral and vertical salinity profiles have been made in the river at different seasons of the year to determine the extent of salt water-fresh water stratification and also the extent of upstream movement of salt water during various segments of the tidal cycle and under different climatic conditions. Such profiles are useful in determining the length of time required for salt water to move in or out of the river and in determining the waste-assimilation capabilities of the river at various seasons of the year and at various locations on the river.

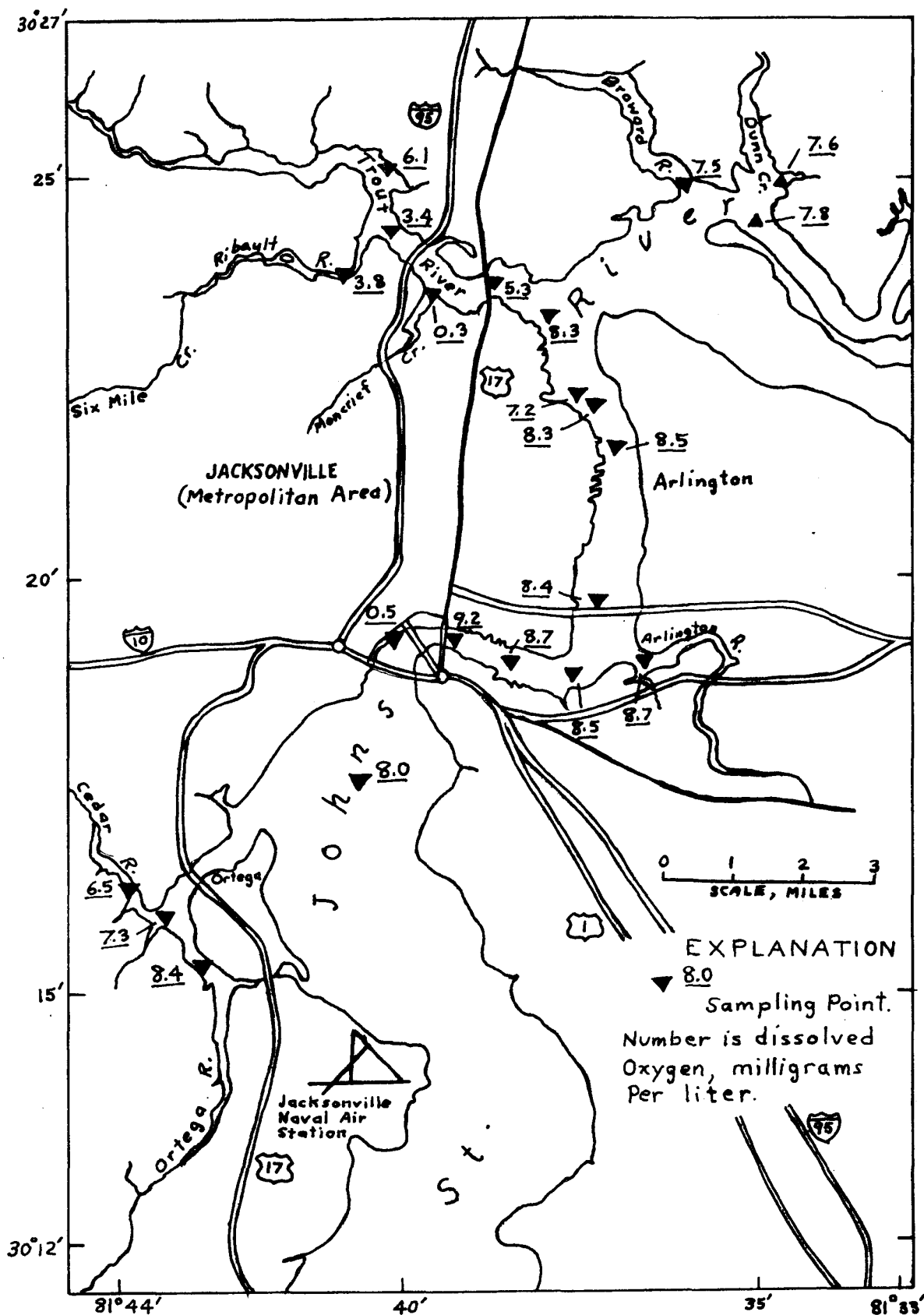


Figure 7. Map of Jacksonville area showing points on streams sampled for dissolved oxygen on October 19, 1966.

URBAN HYDROLOGY STUDIES

Sanitary Landfills

The effects of solid-waste disposal are being studied throughout the county. Landfills could have an adverse effect on ground and surface water in the vicinity of landfill sites by leachate from the landfills.

As shown diagrammatically in figure 9, if the landfill site is in permeable material or if the water is too close to the surface the leachate can move out of the landfill and into the surrounding ground and surface water. However, if the site is underlain by impermeable materials and the water table is below the base of the landfill the leachate is confined to the immediate vicinity of the landfill and the danger of pollution of the ground and surface water is minimized.

Fig. 9
near here

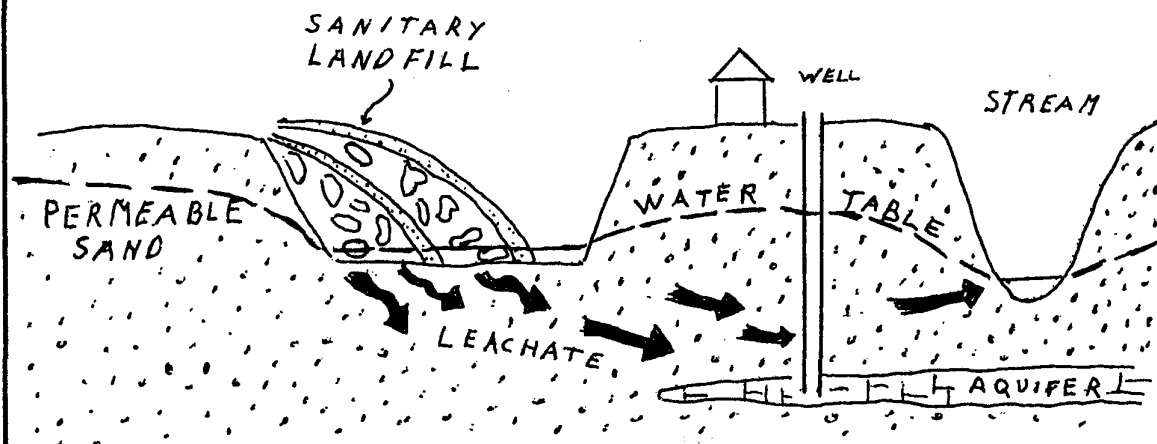
Some of the geologic and hydrologic factors to be considered in selecting a landfill site are:

- 1) The permeability of the subsurface material.
- 2) Depth to water table and water-bearing zones (the aquifers).
- 3) The type and thickness of underlying materials between the base of the landfill and any underlying aquifer.

The Geological Survey has investigated the geologic and hydrologic conditions at two proposed sanitary landfill sites at Jacksonville. One is the Crystal Springs site and the other is the Old Plank Road site, both shown in figure 10. A test boring was made at each site to determine the type of subsurface material, the depth to water table and depth to the underlying "rock" aquifer. The test boring at Crystal Springs Road site penetrated mostly silt and plastic clay from land surface to a depth of 165 ft. (fig. 10).

Fig. 10
near here

IMPROPER HYDROLOGIC CONDITIONS



PROPER HYDROLOGIC CONDITIONS

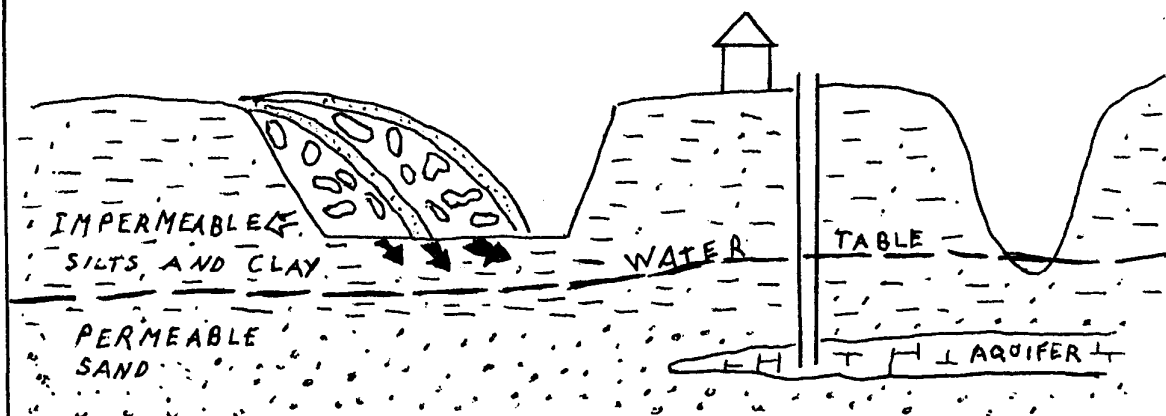


Figure 9. Diagrams showing different hydrologic conditions for sanitary landfill sites.

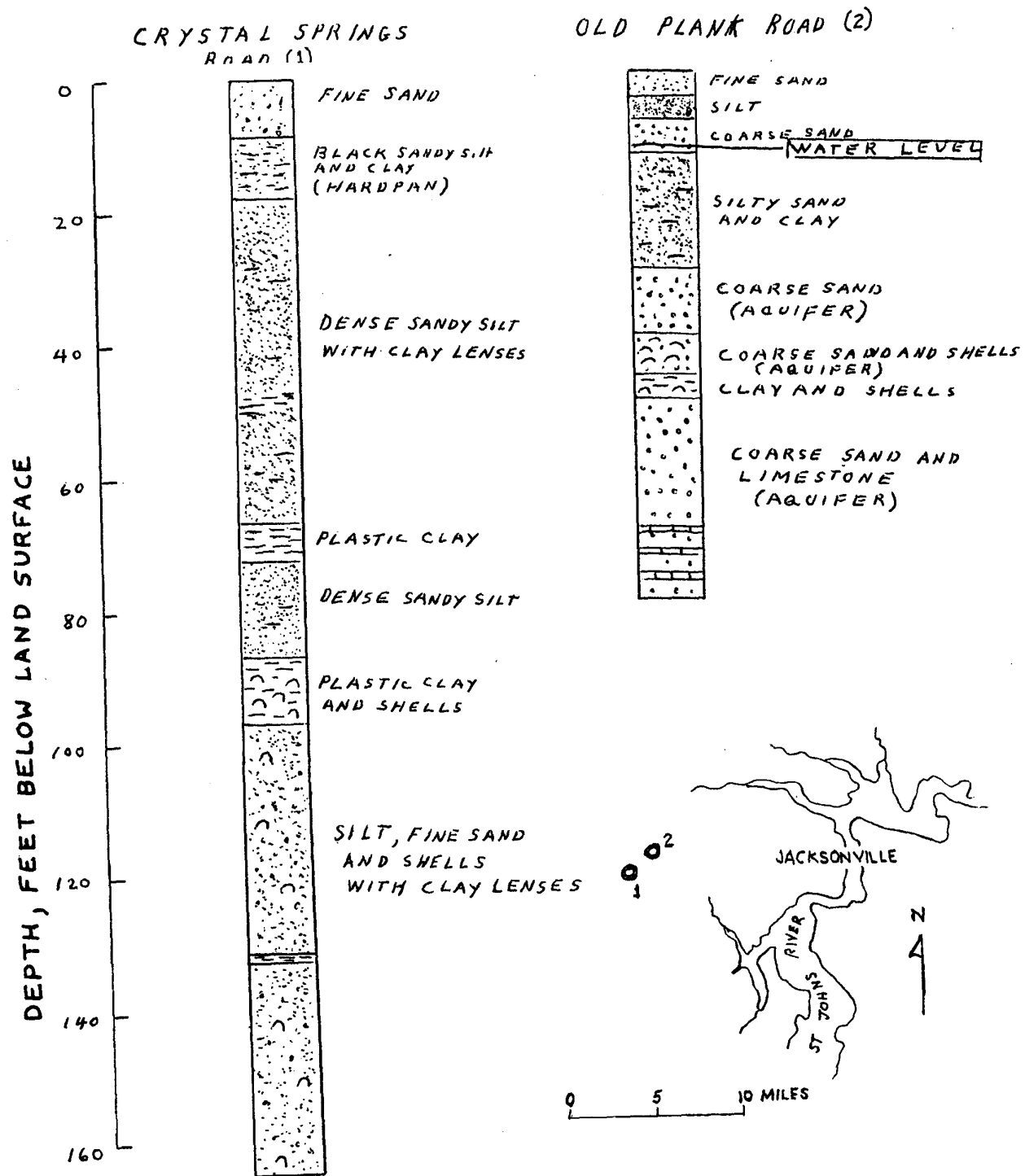
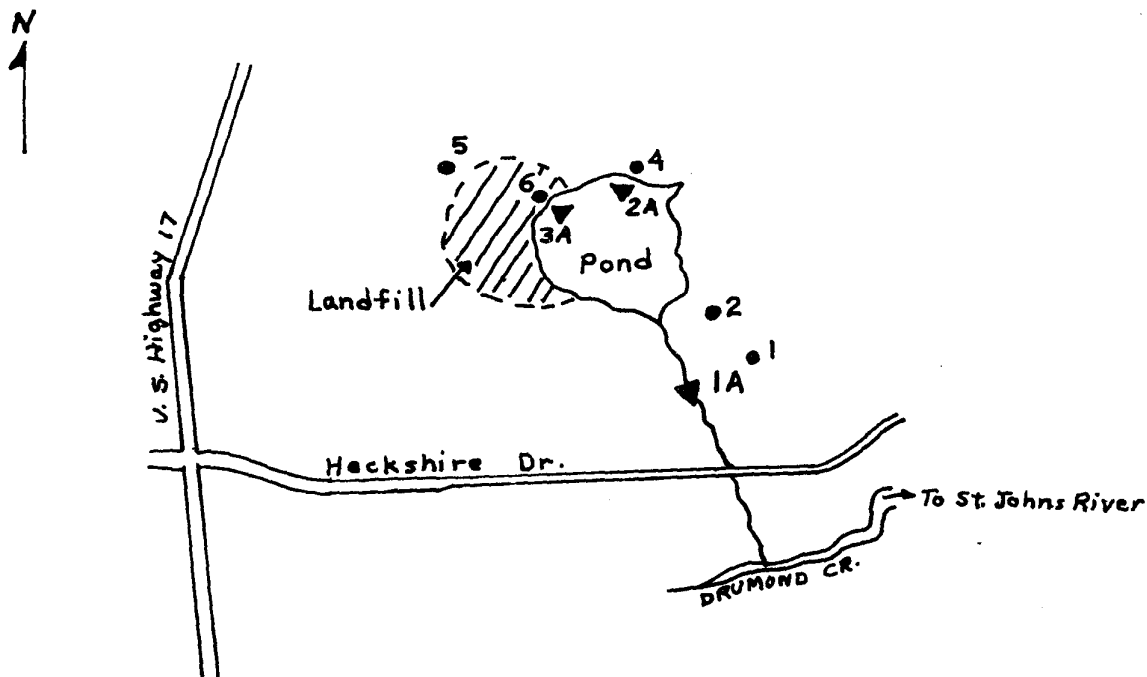


Figure 10. Lithologic logs of test borings at proposed sanitary landfill sites at Jacksonville.

At the completion, the boring hole did not yield water, indicating that the silt and clay are impermeable. The impermeable silts and clays would restrict the downward movement of leachate and there would be little danger of contaminating the water in the surficial aquifer. The test boring at the Old Plank Road site (fig. 10) penetrated fine sand and silt from land surface to about 6 feet and then coarse silty sand to 35 feet. Below 35 feet the boring penetrated mostly coarse sand, shell and limestone to a depth of 85 feet. At the completion of drilling the water level in the boring was 12 feet below land surface. The permeable coarse sand and shell below 35 feet are a part of the shallow-aquifer system and leachate from a landfill can move into the aquifer and contaminate the fresh water.

In addition to investigation of hydrologic and geologic conditions at landfill sites, the Geological Survey is monitoring the quality of water near the active municipal landfill at Imeson Airport (fig. 11). The municipal landfill is at the edge of a large pond which is hydraulically connected to the regional surficial aquifer. Some of the solid waste is deposited below the water table and leachate from the landfill directly enters the surficial aquifer, the pond, or through the pond into the surficial aquifer. Water samples were collected both from shallow wells that penetrate the surficial aquifer in the vicinity of the landfill and from the pond. The samples were analyzed for bacteriological content, common chemical constituents and various trace metals to determine the type of leachate from the landfill and the distribution of the leachate in the receiving waters.

Fig. 11
near her



0 1 MILE

EXPLANATION

- ² Ground-water sampling point and number.
- 2A ▼ Surface-water sampling point and number.

Figure 11. Map showing location of quality of water sampling points at the municipal sanitary landfill at Jacksonville.

Analyses of water from both the shallow aquifer and the pond collected on January 11, 1972 (table 4) showed a higher bacteriological and mineral content than normally would be found in these waters in this area. This indicates that both the ground water and surface water in the vicinity of the landfill are being affected by leachate. However, some of the analyses are anomalous. For example, the coliform count and mineral constituents were lower in water from some of the wells close to the landfills than in water from some wells farther away. In addition, most of the constituents whose presence commonly indicate the existence of leachate were low in all samples. The landfill has been in operation for only 3 years, not long enough for the leachate to completely saturate the subsurface material and it is possible that none of the constituents of diagnostic value will be detected for years.

Table 4
near her

Collecting additional samples of water from these wells, particularly the ones farthest away from the landfill, over a period of many years may help in determining the extent and nature of the leachate and also in determining the average long-term chemical composition of natural ground water.

Water Quality Management

The Geological Survey in cooperation with the Jacksonville Area Planning Board is investigating the hydrology of the area. The studies include the flow characteristics of surface streams, identification of the aquifers, movement of ground water, quality of water, and the relationships between surface and ground water. These data will be useful in the preparation of a comprehensive water quality management plan for Jacksonville. This plan can be utilized by planners to determine methods that will maintain and improve the quality of water in the area.

Maximum limits of concentration of various constituents in water have been established by both the Florida Department of Pollution Control and the City of Jacksonville Bio-Environmental Services (Table 5). When the concentration of the constituents shown on the table are exceeded the water is considered by these agencies to be polluted. As shown on the table, the acceptable concentration or level of numerous parameters, dissolved oxygen, temperature, specific conductance and pH depends on the natural background quality of the waters being mixed. The natural quality of water is the quality before it mixes with industrial or other man-made effluent. The natural quality of both surface and ground water can vary considerably in an area. For example, a deep aquifer may have a higher chloride content than a shallow aquifer. It is therefore important to know the areal and vertical variations in natural quality of the receiving waters (waters receiving effluent) to determine the extent and degree of pollution throughout the area.

Table 5
near here

The Geological Survey is investigating the chemical quality of surface and ground water throughout the Jacksonville area. Water samples are being collected from selected wells and stream sites and are being analyzed for chemical, physical, and bacteriological constituents. These analyses will help to determine areal and depth variations in chemical quality.

Table 5. Water Quality Standards for Class I - Class V Waters
Established by the Florida Air and Water Pollution Control
Commission and the city of Jacksonville Bio-Environmental
Services.

<u>Constituents</u>	<u>Limits</u>	
	Class I - IV	Class V
Fluoride	Shall not exceed 1.4-1.6 mg/l F	
Chloride	Fresh water shall not exceed 250 mg/l Brackish or saline shall not increase 10% above background	
D O	Shall not be depressed below 4.0 ppm (unless background indicates unpolluted background is less than 4.0)	Sufficient to be aerobic (not less than 1.0 ppm, average of not less than 2.0 ppm)
BOD	Not to be altered to depress DO below 4.0 ppm	
Temperature	Shall not be increased over background	
Dissolved Solids	Shall not exceed 500 mg/l as a monthly average or more than 1000 mg/l at any time	
Specific Conductance	Shall not be increased 100% above background or over 500 micromhos/cm in fresh water streams	
pH	Shall not vary more than 1.0 unit from normal background or less than 6.0 or more than 8.5 except when background varies above or below these levels	
Radioactive Substances (Gross Beta on known absence of Strontium-90 and Beta emitters)	Shall not exceed 100 micromicrocuries	
Cyanide or Cyanate	None detectable	

FUTURE STUDIES

The programs carried out by the Geological Survey in the Jacksonville area are problem-oriented. They supply planners with the technical information necessary to manage the area's water resources in such a way that conflicting interests can be satisfied. The existing monitoring networks have gone a long way toward assisting in accomplishing this goal. However, much work is yet to be done. Some additional studies that could be undertaken in an effort to more fully appraise the water resources in the Jacksonville area are:

- a) Expand the present water-quality network to define the quality characteristics of water resources in the area, particularly to obtain more complete data on the quality of surface water in tributary streams.
- b) Monitor ground and surface water conditions in the vicinity of additional sanitary landfill sites to determine the effects, if any, of sanitary landfills on the quality of water.
- c) Make short-term and detailed time-of-travel studies on the St. Johns River and its tributaries, particularly those where surface-water reservoirs might be constructed.
- d) Study the effects of urbanization on runoff; increase the number of stage and discharge stations in small drainage basins where urbanization is expected to occur.

Table 5. (Continued)

<u>Constituents</u>	<u>Limits</u>	
	Class I - IV	Class V
Copper	Shall not exceed 0.5 mg/l	
Zinc	Shall not exceed 1.0 mg/l	
Chromium	Shall not exceed 0.5 mg/l hexavalent Shall not exceed 1.0 mg/l total Cr in effluent discharge Shall not exceed 0.05 mg/l total Cr after mixing in stream	
Phenolic type compounds (as phenol)	Shall not exceed 0.001 mg/l	
Lead	Shall not exceed 0.05 mg/l	
Iron	Shall not exceed 0.30 mg/l	
Arsenic	Shall not exceed 0.05 mg/l	
Oils and Grease	Shall not exceed 15 mg/l or no visible oil be present to cause taste and odor	
Odor	Threshold odor number not to exceed 24 at 60°C as daily average	Shall not interfere with designated use
Bacteriological Quality		
Coliform group	Shall not exceed 1,000 ml as MPN or MF nor to exceed more than 20% of samples examined during any month Shall not exceed 2,400 per 100 ml on any day (Class II - Shall not exceed 70 per 100 ml nor more than 10% of samples exceed 230 per 100 ml)	

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