UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HYDROLOGIC MONITORING PROGRAM IN ELDRIDGE-WILDE AND EAST LAKE ROAD WELL-FIELD AREAS, PINELLAS AND HILLSBOROUGH COUNTIES, FLORIDA, 1978

OPEN-FILE REPORT 80-1195

Prepared in cooperation with

PINELLAS COUNTY, FLORIDA

80-1195 HYDROLOGIC MONITORING PROGRAM IN ELDRIDGE-WILDE AND EAST LAKE ROAD WELL-FIELD AREAS, PINELLAS AND HILLSBOROUGH COUNTIES, FLORIDA, 1978 80-1195

CONVERSION FACTORS

For readers who may prefer to use SI (metric) units rather than inch-pound units, conversion factors for terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain SI (metric) unit
inch (in)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
million gallons per day (Mgal/d)	0.0438	cubic meter per second (m^3/s)
* * * * * * * * * * * *		
mean sea level (msl)	---	National Geodetic Vertical Datum of 1929 (NGVD of 1929)

Abbreviations used

mg/L = milligrams per liter

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By Luther R. Mills

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UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, Secretary

GEOLOGICAL SURVEY

H. William Menard, Director

For additional information write to:

U.S. Geological Survey
Water Resources Division
325 John Knox Road, Suite F-240
Tallahassee, Florida 32303

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By Luther R. Mills

ABSTRACT

Data obtained from the observation-well network in and adjacent to the Eldridge-Wilde and East Lake Road well fields during 1978, as well as rainfall and pumpage records, are presented and discussed. During 1978, the water table of the surficial aquifer and the potentiometric surface of the Floridan aquifer in the Eldridge-Wilde well field were near that of 1977. Water levels fluctuate seasonally 4 to 6 feet in the Floridan aquifer, whereas those in the surficial aquifer fluctuate approximately 2 feet. In April 1978, water levels declined below regulatory limits set by the Southwest Florida Water Management District in regulatory wells 2S, 113A, and N-2, while those in well 139G remained above the limit.

Chloride limits have been established on five wells at depth of the wells and one well at three depths. Chloride exceeded regulatory limits in wells North Lake Tarpon and S.W. deep at the 730-foot depth; all other wells and depths showed little or no change in chloride trend.

INTRODUCTION

The Eldridge-Wilde and East Lake Road well fields are located, respectively, northeast and east of Lake Tarpon in northeast Pinellas County (fig. 1). Part of the Eldridge-Wilde well field extends into the northwest part of Hillsborough County. The well fields, operated by Pinellas County, supply water to several municipalities and unincorporated areas of Pinellas County. A previous study of the area was made by Joyner and Gerhart (1980).

Purpose and Scope

The Southwest Florida Water Management District has established restrictions on withdrawal of water from the Eldridge-Wilde and East Lake Road well fields to prevent excessive lowering of water levels and deterioration of water quality by lateral or upward movement of saltwater. The purpose of this report is to present data from the observation-well network in and adjacent to the Eldridge-Wilde and East Lake Road well fields. Water-level and water-quality data obtained during 1978 are presented. Selected data from previous years are included to provide an indication of trends.

Acknowledgments

Appreciation is extended to A. O. Finney, Pinellas County Water System, for his cooperation in providing data and to the land owners who permitted access to their land and allowed the sampling of water and measuring of water levels in their wells.

OBSERVATION-WELL NETWORK

The observation-well network in the Eldridge-Wilde and East Lake Road well-field areas consists of 15 surficial aquifer wells (6 to 31 feet deep) and 38 Floridan aquifer wells (29 production-zone wells, 90 to 608 feet deep, and 9 saltwater-monitoring wells, 310 to 1,200 feet deep). In addition, the production wells in both fields are sampled monthly for chemical-quality analysis. The observation-well network is monitored by the Pinellas County Water System and the U.S. Geological Survey.

The observation wells at the Eldridge-Wilde and East Lake Road well fields are finished in either the surficial aquifer or the Floridan aquifer. Some wells, mostly those of greater depth, penetrate the freshwater-saltwater interface. Figure 1 shows locations of the observation wells. Figure 2 shows the depths, casing depths, and open-hole intervals (where known) of the wells.

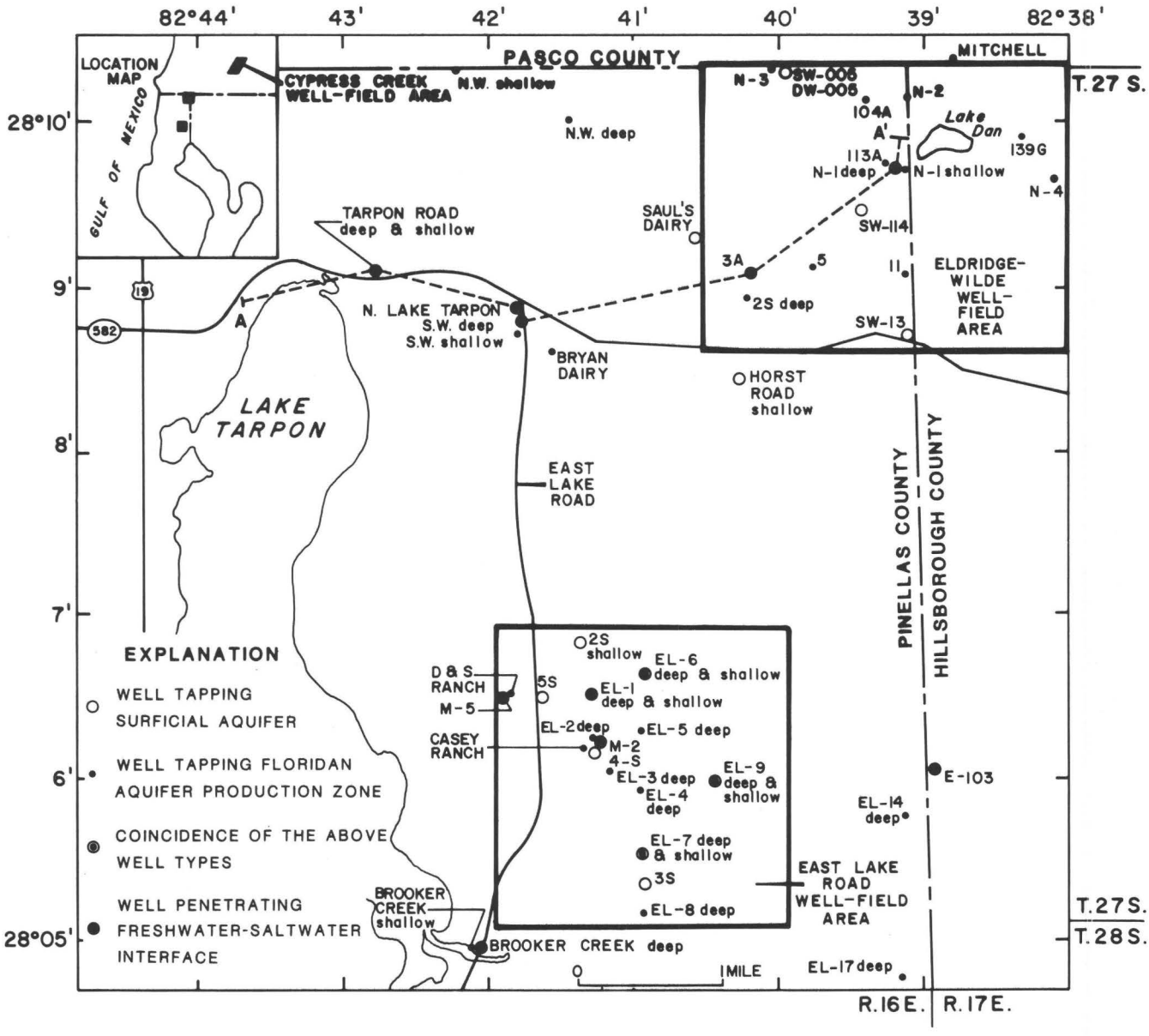

Figure 1.--Locations of observation wells in and near the Eldridge-Wilde and East Lake Road well fields.

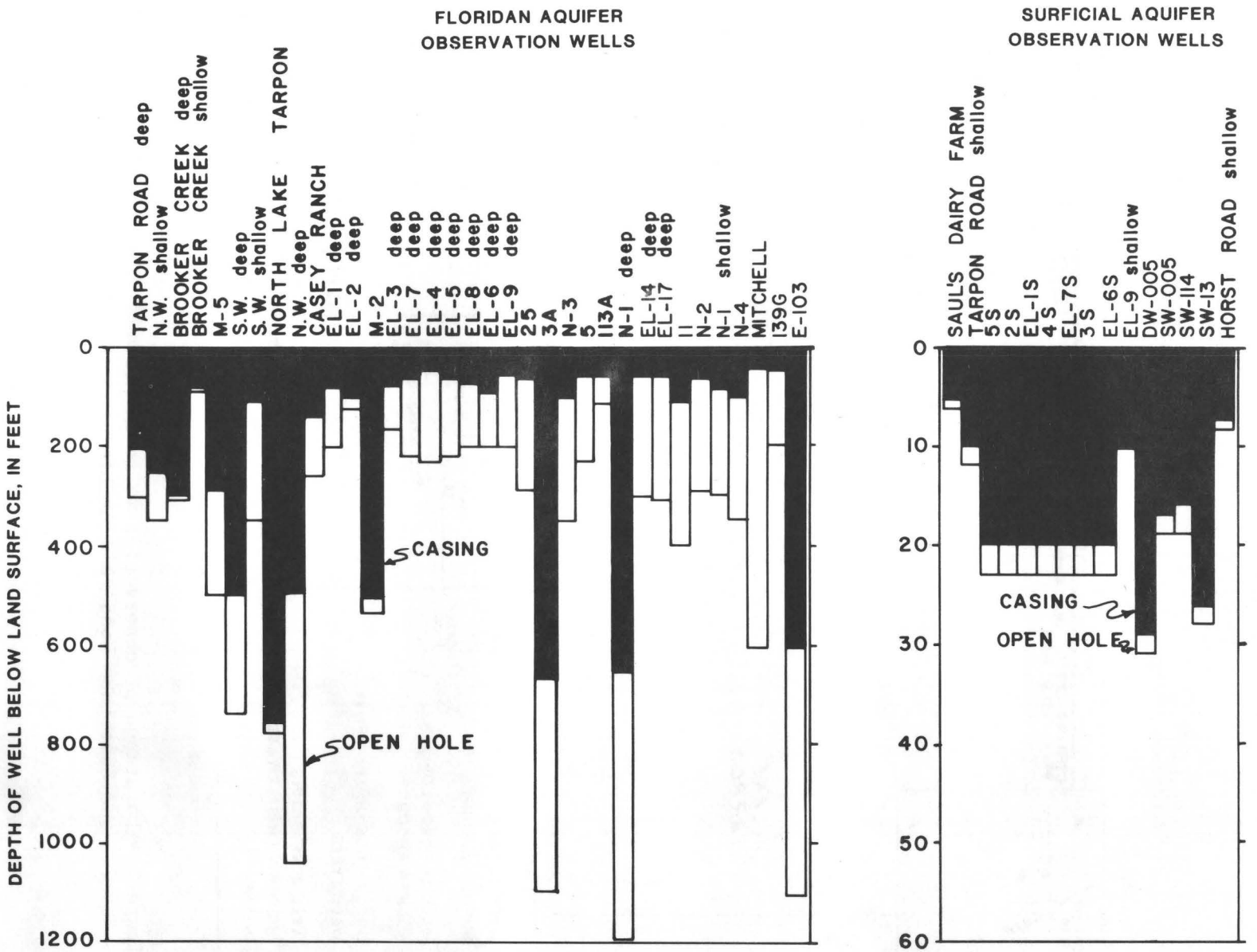

Figure 2.--Depths, casing depths, and open-hole intervals, where known, of observation wells in and near the Eldridge-Wilde and East Lake Road well fields.

Surficial Aquifer Monitor Wells

The observation-well network includes 15 wells that tap the surficial aquifer (table 1). Of these wells, seven have been designated by the Southwest Florida Water Management District as regulatory wells. Regulatory wells are those constructed and monitored to insure minimum water levels and water-quality standards. As of 1978, regulatory levels had not been established for these wells. Water levels are measured weekly in well 4S and monthly in the other six regulatory wells. Most of these regulatory wells are in the western and northwestern parts of East Lake Road well field (fig. 1) to monitor lateral movement of water between the well field and Lake Tarpon.

Floridan Aquifer Monitor Wells

Production Zone

Table 2 lists 29 observation wells that tap the production zones in the Eldridge-Wilde and East Lake Road well fields. Wells EL-1 deep through EL-8 deep are production as well as observation wells in East Lake Road well field. The others are used only for observation. The 58 production wells in the Eldridge-Wilde well field, not listed in the table, are sampled monthly for chemical analysis.

The wells listed in table 2 include 17 that have been designated regulatory wells by the Southwest Florida Water Management District. As of 1978, limits on water levels or water quality have been established on eight of these wells. Four wells have minimum water-level regulatory limits ranging from 4.0 to 16.0 feet above the National Geodetic Vertical Datum of 1929 (NGVD of 1929), and four have maximum chloride concentration limits ranging from 50 to 1,200 mg/L.

Freshwater-Saltwater Interface

Table 3 lists nine monitor wells, five of which have been designated as regulatory wells to monitor the freshwater-saltwater interface. As of 1978, maximum chloride concentration limits that range from 150 to 10,500 mg/L have been established on three of the wells. On one of these wells (S.W. deep) limits have been established at three different depths, 560, 620, and 730 feet.

HYDROLOGIC CONDITIONS

Rainfall

Several rain-gage stations are operated in the two well fields and adjacent areas. U.S. Weather Bureau records are available for Clearwater for 18 years; Tarpon Springs, 90 years; and Tampa, 88 years. The U.S. Geological

Table 1.--Data on observation wells that tap the surficial aquifer

Monitoring agency: USGS, U.S. Geological Survey; PCWS, Pinellas County Water System.
Frequency of data collection: b, bimonthly; m, monthly; w, weekly, Sr, stage-recorder.

Well	Depth (ft)	Casing depth (ft)	Diameter (in)	Monitoring agency	Frequency of water-level measurement	Regulatory limits		Monitoring purpose
						Water level (ft above NGVD of 1929)	Chloride (mg/L)	
Tarpon Road shallow	12	10	1-1/4	USGS	b	None	None	Data
2S	23	20	2	PCWS	m	None	None	Regulatory
EL-6S	23	20	2	PCWS	m	None	None	Regulatory
EL-1S	23	20	2	PCWS	m	None	None	Regulatory
5S	23	20	2	PCWS	m	None	None	Regulatory
4S	23	20	2	PCWS	w	None	None	Regulatory
EL-7S	23	20	2	PCWS	m	None	None	Regulatory
3S	23	20	2	PCWS	m	None	None	Regulatory
Sauls Dairy Farm	6	5	1-1/4	USGS	m	None	None	Data
Horst Road shallow	8	7	1-1/4	USGS	m	None	None	Data
SW 005	19	17	2	USGS	m	None	None	Data
DW 005	31	29	2	USGS	m	None	None	Data
SW 13	28	26	2	USGS	m	None	None	Data
SW 114	19	16	1-1/4	USGS	m	None	None	Data
EL-9 shallow	10	8	4	USGS	Sr	None	None	Data

Table 2.--Data on observation wells that tap the production zone (Floridan aquifer)

Monitoring agency: USGS, U.S. Geological Survey, PCWS, Pinellas County Water System.
Parameters monitored and frequency: Sm, stage-monthly; Cb, chloride-bimonthly; Sb, stage-bimonthly; C, chloride; K, specific conductance; DS, dissolved solids; SO_4, sulfate; m, monthly; Cm, chloride-monthly; Sr, stage-recorder; Sw, stage-weekly.

Well	Depth (ft)	Casing depth (ft)	Diameter (in)	Monitoring agency	Parameters monitored and frequency	Sampling method or depth sampled (ft)	Regulatory limits		Monitoring purpose
							Water level (ft above NGVD of 1929)	Chloride (mg/L)	
Brooker Creek shallow	90	82	6	USGS	Sb, Cb	Pumped	None	1,200	Regulatory
N.W. shallow	350	250	4	PCWS	Sm, (C, K, DS, SO_4), m	320	None	None	Data
D&S Ranch	110	---	4	PCWS	Cm	Pumped	None	100	Regulatory
S.W. shallow	350	103	6	PCWS	Cm	350	None	None	Data
Bryan Dairy	405	---	6	PCWS	Cm	Pumped	None	50	Regulatory
Casey Ranch	261	135	6	PCWS	Cm	Pumped	None	250	Regulatory
EL-1 deep	200	80	6	PCWS	Cm	Pumped	None	None	Regulatory
EL-2 deep	125	100	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-3 deep	169	76	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-4 deep	235	44	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-5 deep	220	62	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-6 deep	200	88	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-7 deep	220	65	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-8 deep	200	73	12	PCWS	Cm	Pumped	None	None	Regulatory
EL-9 deep	200	55	12	PCWS	Sr	None	None	None	Regulatory
2S deep	290	61	12	USGS	Sr	None	4.0	None	Regulatory
113A	114	58	12	USGS	Sr	None	5.0	None	Regulatory
11	400	110	12	USGS	Sr	None	None	None	Data
N-2	292	62	8	USGS	Sr	None	9.0	None	Regulatory
N-3	350	100	6	USGS	Sr	None	None	None	Data
N-4	350	100	6	USGS	Sr	None	None	None	Data
104A	---	---	12	USGS	Sm	None	None	None	Data
Tarpon Road deep	305	205	6	USGS	Sr, Cm	Pumped	None	None	Data
N-1 shallow	300	82	12	PCWS	Sw	None	None	None	Data
5	229	58	4	USGS	Sr	None	None	None	Data
EL-14 deep	300	57	12	USGS	Sm	None	None	None	Data
EL-17 deep	305	57	12	USGS	Sm	None	None	None	Data
139G	195	44	4	USGS	Sr	None	16.0	None	Regulatory
Mitchell	608	42	10	USGS	Sr	None	None	None	Data

Survey has collected daily rainfall data from a recording station in the Eldridge-Wilde well field since April 1973. The monthly rainfall at this station for 5 years, 1974 through 1978, is shown in figure 3. At the well-field station, rainfall was 51.78 inches in 1978, which is equal to the average annual rainfall (52 inches for the period of record), and was also near normal when compared with the long-term average annual rainfall for the U.S. Weather Bureau stations at Clearwater (53.0 inches), Tarpon Springs (53.7 inches), and Tampa (49.4 inches).

Ground-Water Levels

The observation-well network is jointly operated by the Pinellas County Water System and the U.S. Geological Survey. The Pinellas County agency maintains two recorders--one in well EL-9 deep and the other in well E-103--for continuous measurement of the potentiometric surface of the Floridan aquifer. The county also measures water levels weekly or monthly in many of the surficial aquifer observation wells and production-zone observation wells. The U.S. Geological Survey maintains recorders on 12 wells for continuous measurement of water levels and also measures water levels monthly or bimonthly in other surficial aquifer and Floridan aquifer observation wells. In addition, mass water-level measurements of the well fields are made in May (when water levels are expected to be lowest) and in September (when water levels are expected to be highest). The mass measurements are used for the preparation of water-level contour maps released twice annually (Wolansky and others, 1978a and 1978b).

Surficial Aquifer

The water table fluctuates seasonally approximately 2 feet throughout most of the Eldridge-Wilde well field. However, there is a small area in the south-central part of the well field, lying parallel and west of the Hillsborough-Pinellas County line, where water levels seasonally fluctuate approximately 4 feet. Figures 4 and 5 show water-table contours for the surficial aquifer in May and September 1978. Recovery of the water table from May to September ranged from 4 feet in the south-central part of the Eldridge-Wilde well field to 2 feet throughout the other parts. A water-level change of less than 1 foot occurred in the water table from May to September 1978 in the East Lake Road well-field area.

Floridan aquifer

The potentiometric surface of the Floridan aquifer in the Eldridge-Wilde and East Lake Road well fields in May and September 1978 is shown in figures 6 and 7. Pumpage from the Eldridge-Wilde well field caused a cone of depression exhibited in both the May and September maps. Water levels recovered 4 feet from the seasonal low in May to the seasonal high in September.

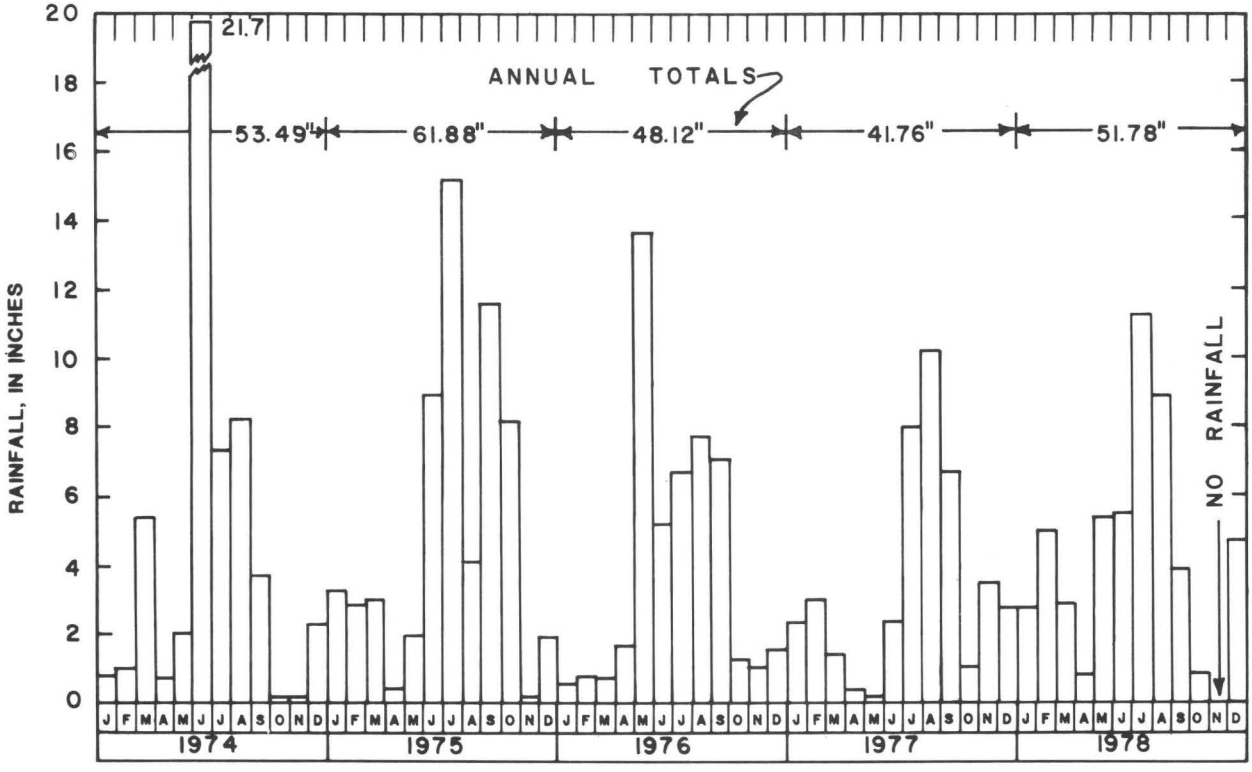

Figure 3.--Monthly rainfall at Eldridge-Wilde well field, 1974-78.

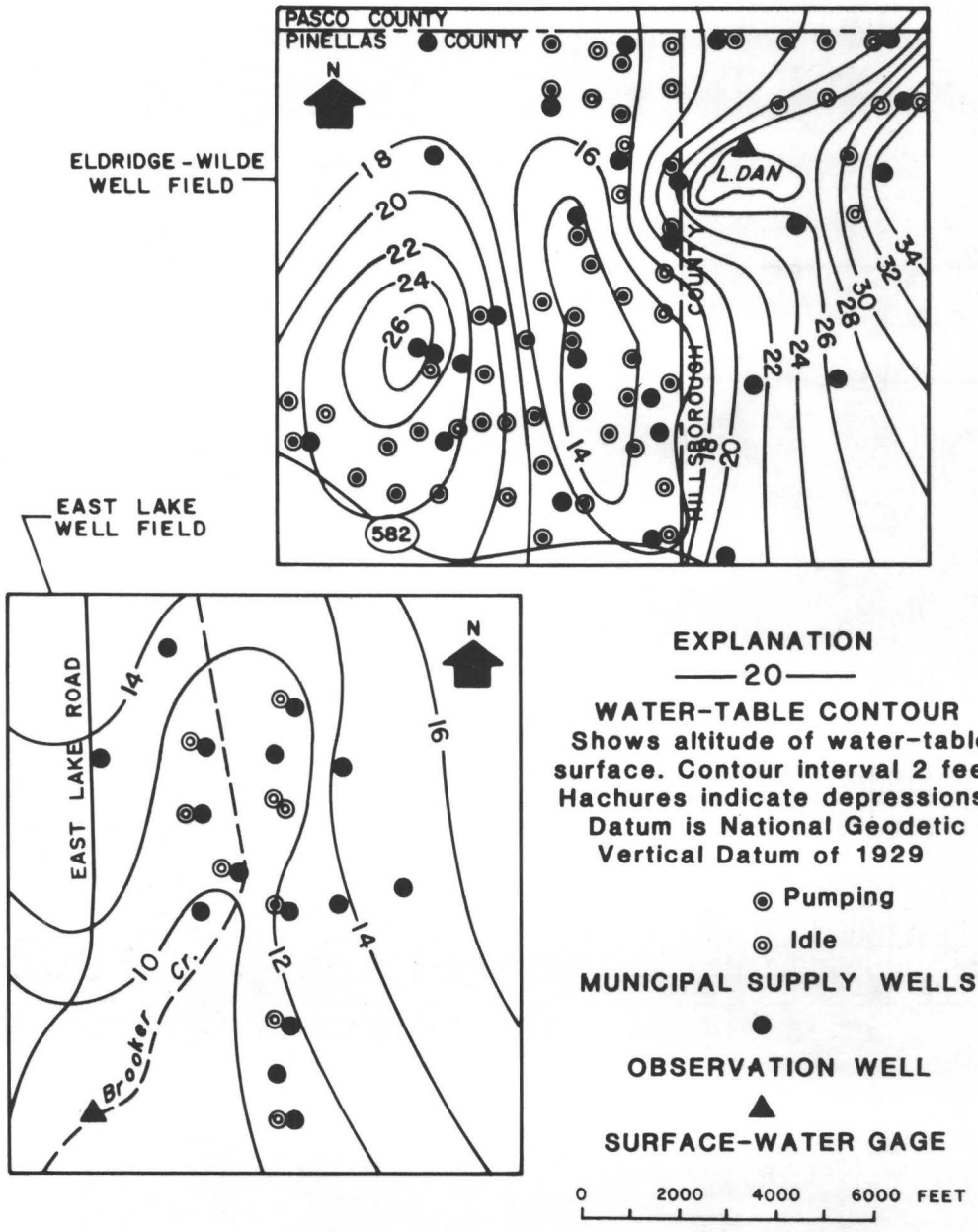

Figure 4.--Water-level contours in the surficial aquifer, May 1978 (from Wolansky, Mills, and Woodham, 1978a).

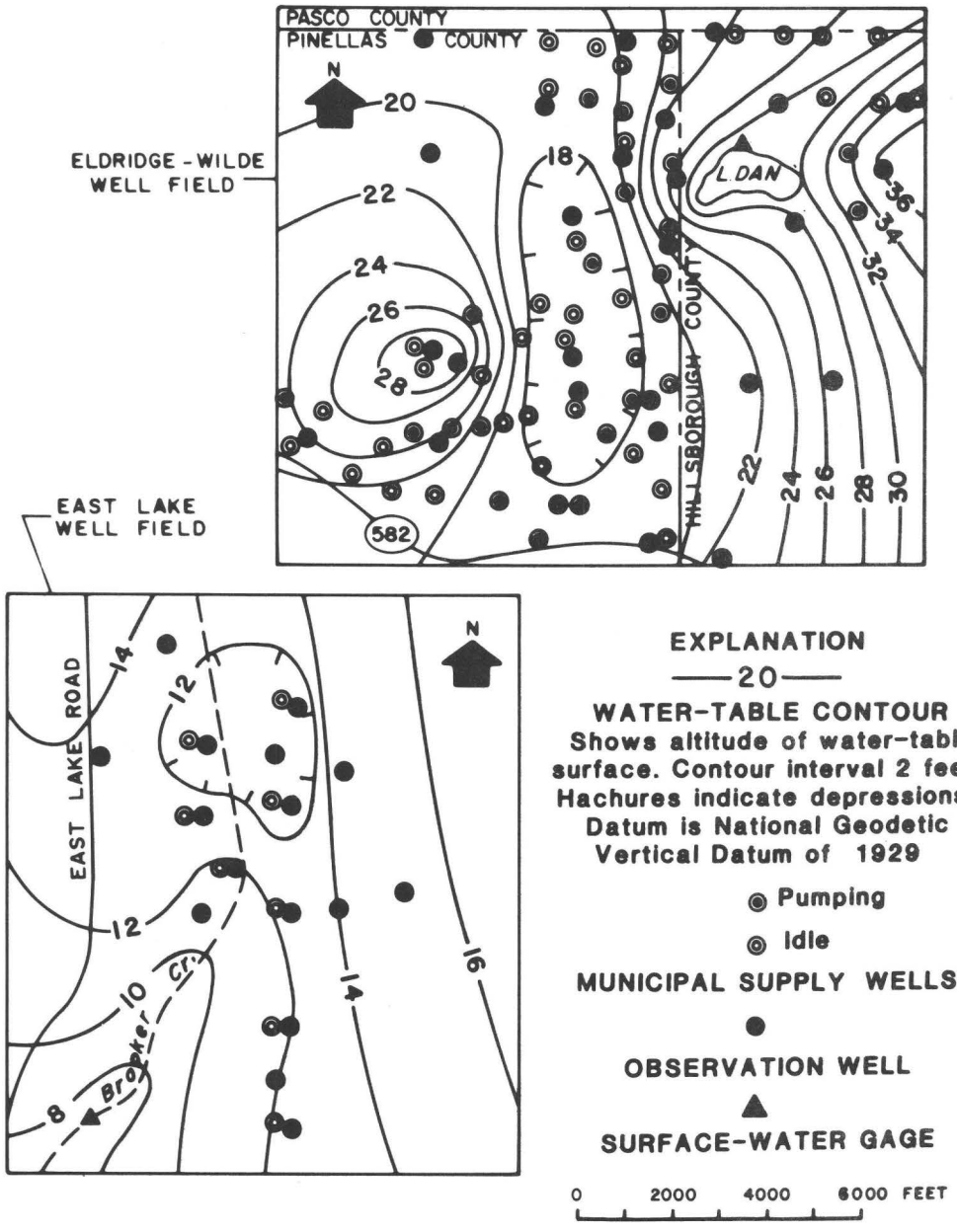

Figure 5.--Water-level contours in the surficial aquifer, September 1978 (from Wolansky, Mills, and Woodham, 1978b).

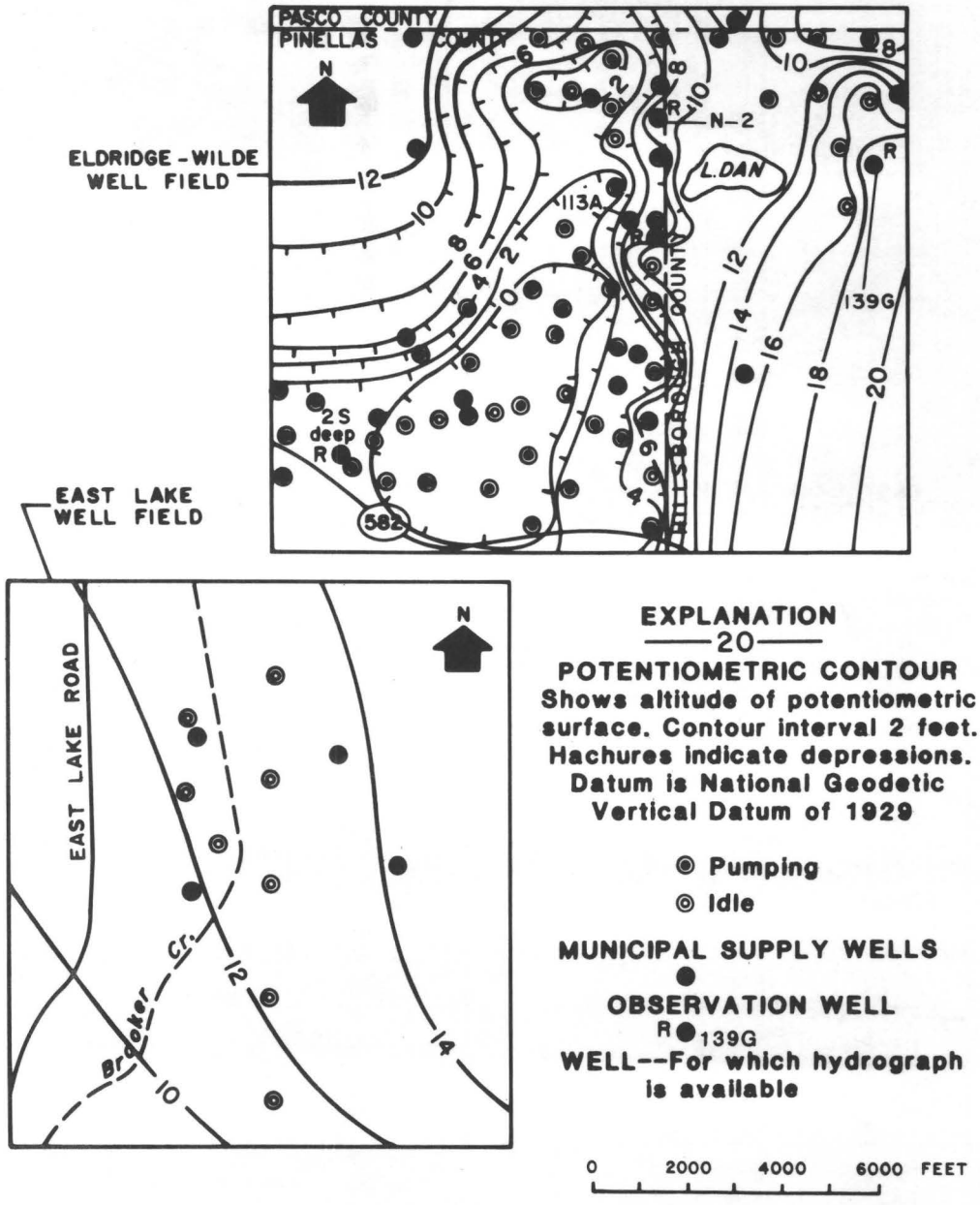

Figure 6.--Potentiometric-surface contours in the Floridan aquifer, May 1978 (from Wolansky, Mills, and Woodham, 1978a).

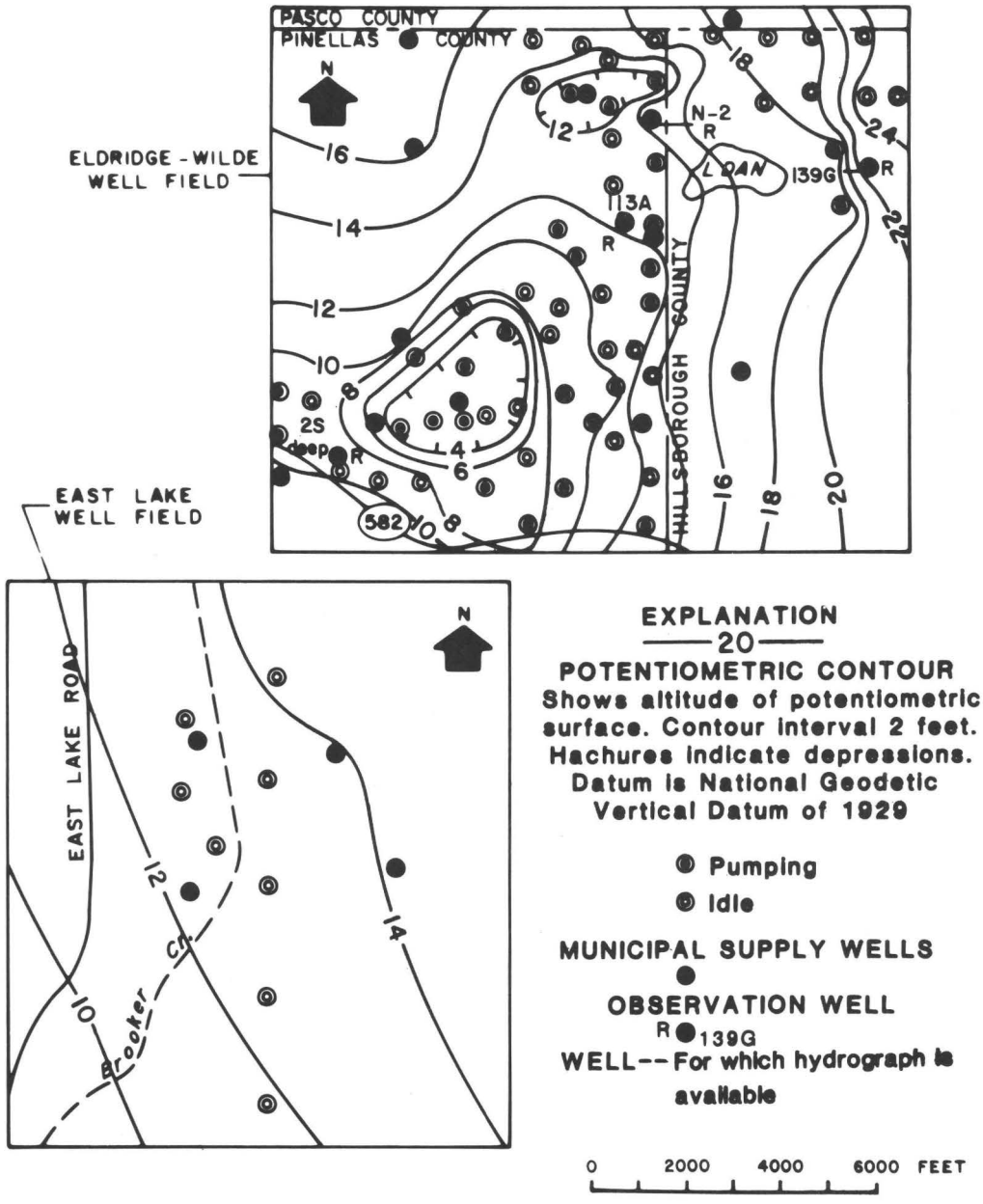

Figure 7.--Potentiometric-surface contours in the Floridan aquifer, September 1978 (from Wolansky, Mills, and Woodham, 1978b).

The East Lake Road well-field pumpage was reduced during January through July and was discontinued in August through December 1978. The seasonal water-level fluctuation in East Lake Road well field during 1978 was less than 1 foot.

REGULATORY WATER LEVELS

Figures 8-11 show the end-of-month maximum water-level elevations for 1974 through 1978 at the four regulatory wells in the Eldridge-Wilde well field. The regulatory limit established by the Southwest Florida Water Management District for each well is shown on the illustrations. All wells had water levels that declined below regulatory levels 4 years out of 5. These minimum levels occurred during the seasonal low water-level period in the spring.

WATER QUALITY

Chloride concentrations determined in 1977 and 1978 for 12 observation wells are listed in table 4. Seven wells have maximum regulatory limits established for chloride concentrations, either in samples pumped from the wells or in samples obtained at a given depth in the well bore. In four wells, chloride concentrations are determined at more than one depth (table 3).

Two wells, North Lake Tarpon at depth and S.W. deep at the 730-foot sampling point, have exceeded regulatory limits in their chloride concentrations. Chloride concentrations remained above regulatory limits in the North Lake Tarpon well throughout 1978, whereas S.W. deep, at the 730-foot sampling point, exceeded the limit during June but was below the limit by September. Chloride concentrations in the remainder of the wells were about the same in 1978 as in 1977.

North Lake Tarpon well samples reached a maximum chloride concentration of about 13,000 mg/L in April and June of 1978 and then decreased to 12,000 mg/L in July and remained at that level until the end of the year (fig. 12). The 13,000 mg/L maximum concentration is 2,500 mg/L higher than the regulatory limit.

Fluctuations in chloride concentration in the S.W. deep well at 730 feet are shown in figure 13. The regulatory limit for chloride concentration in water from this level is 6,000 mg/L. In June 1978, the concentration reached a maximum of 6,446 mg/L. The maximum since sampling began at this well is 8,250 mg/L that occurred in January 1977.

The chloride concentrations ranged from 12,000 to 13,000 mg/L from the sampled interval 758-780 feet in the North Lake Tarpon well and from 850 to 6,446 mg/L at the 730-foot depth of S.W. deep well during 1978. These two wells are about 600 feet apart. The wide range of the chloride concentrations in the S.W. deep well and the relatively narrow range in the North Lake Tarpon well have been explained by Joyner and Gerhart (1980) to be caused by the difference in the interval of the Floridan aquifer to which they are open. The North Lake Tarpon well is open to a zone that is about 30 feet deeper than the S.W. deep well. According to Joyner and Gerhart (1980), the higher concentrations and lower variability of chloride in the North Lake Tarpon deep well

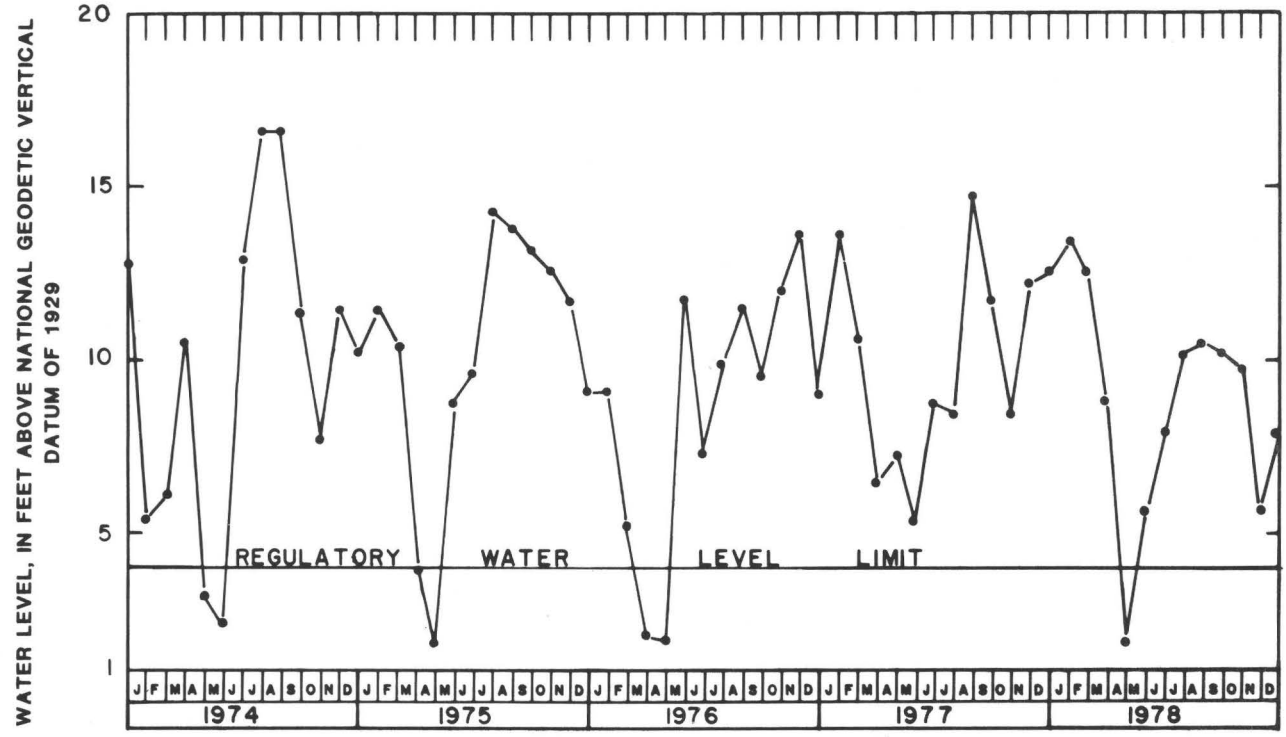

Figure 8.--End-of-month maximum water levels in observation well 2S deep, 1974-78.

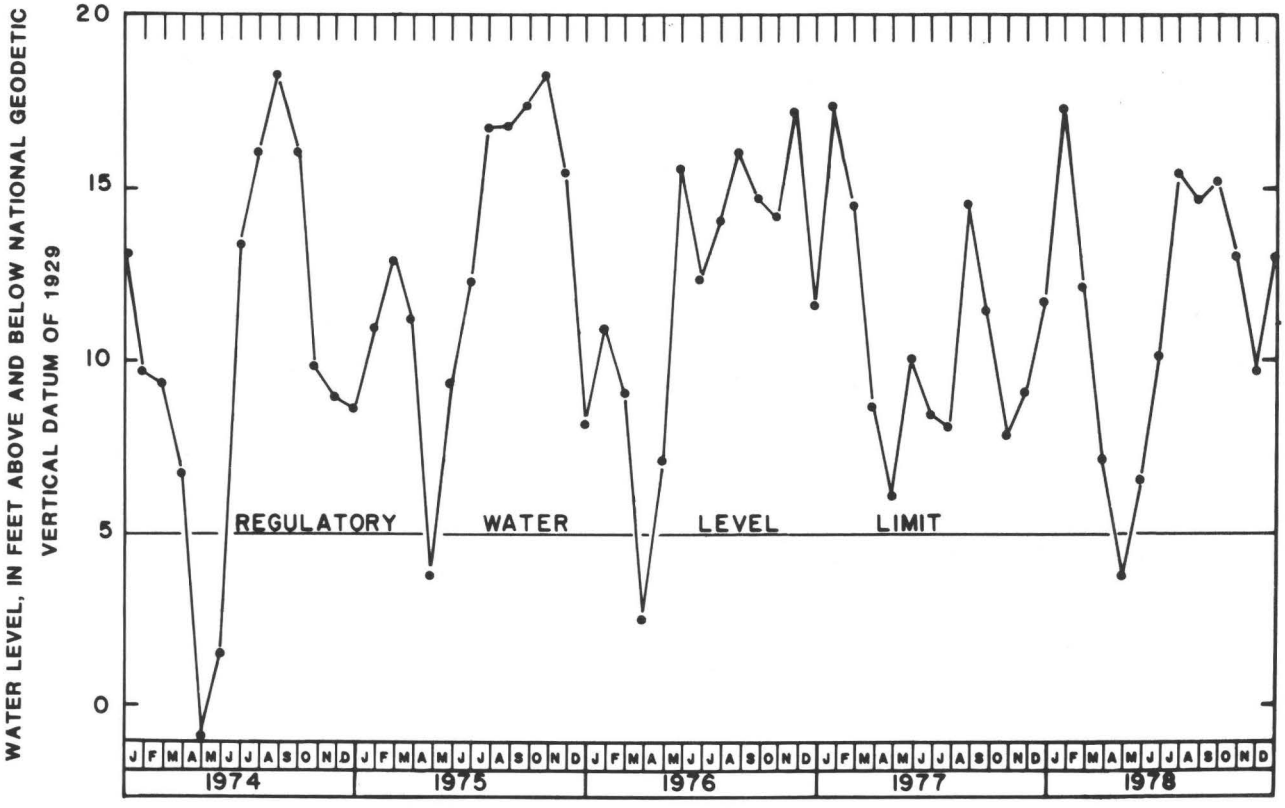

Figure 9.--End-of-month maximum water levels in observation well 113A, 1974-78.

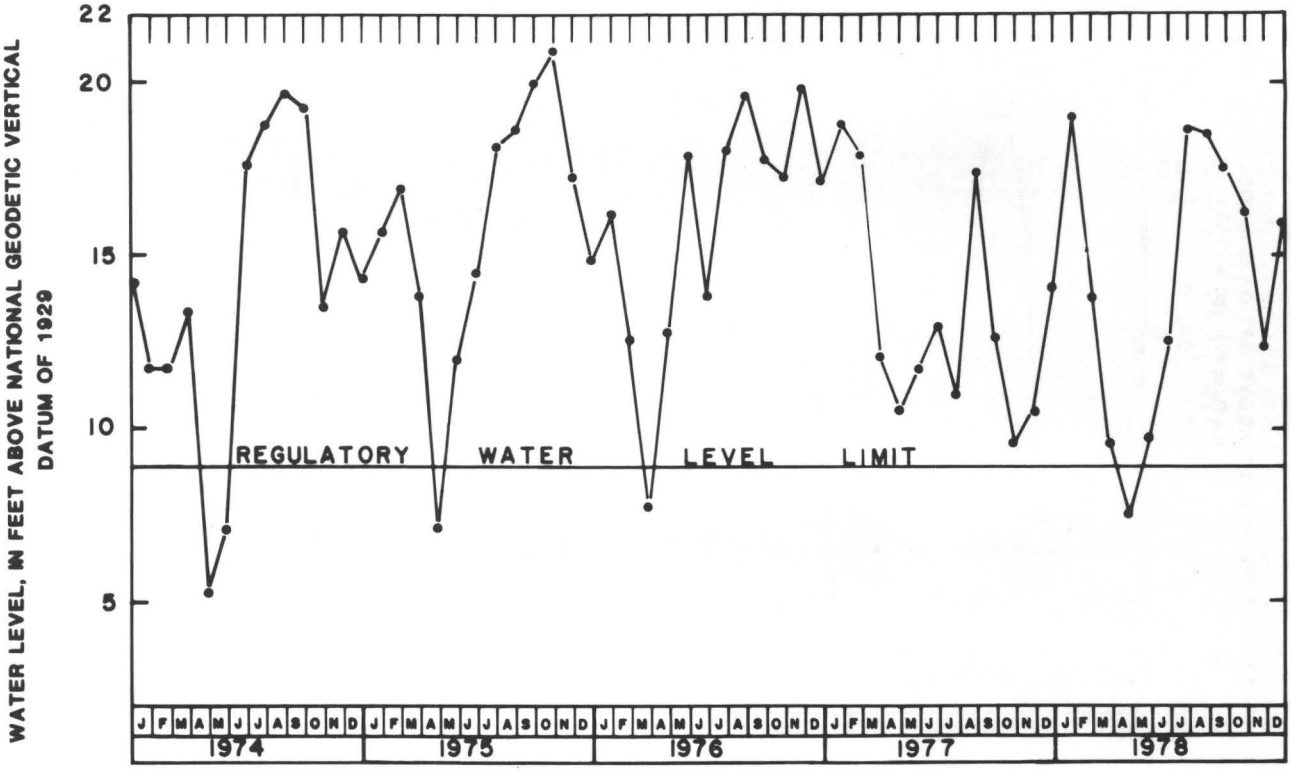

Figure 10.--End-of-month maximum water levels in observation well N-2, 1974-78.

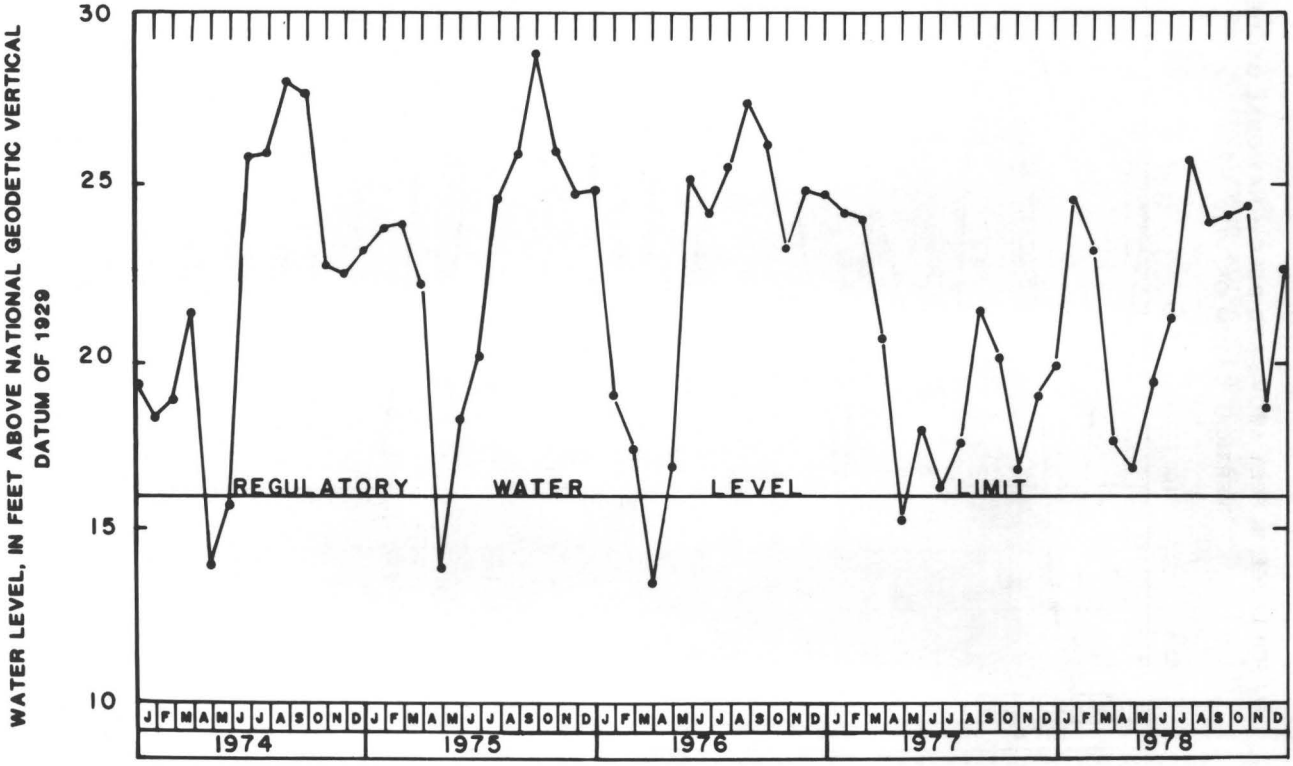

Figure 11.--End-of-month maximum water levels in observation well 139G, 1974-78.

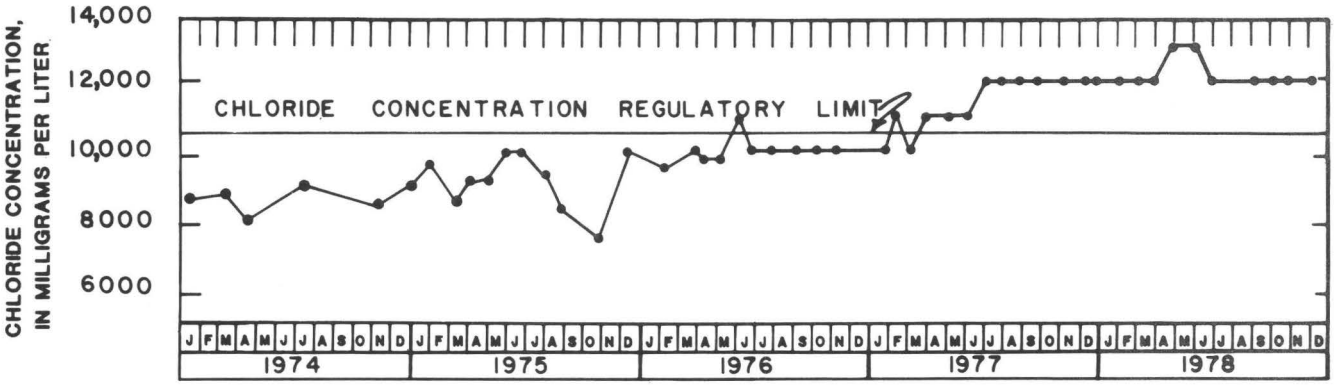

Figure 12.--Chloride concentrations in water from the North Lake Tarpon observation well, 1974-78.

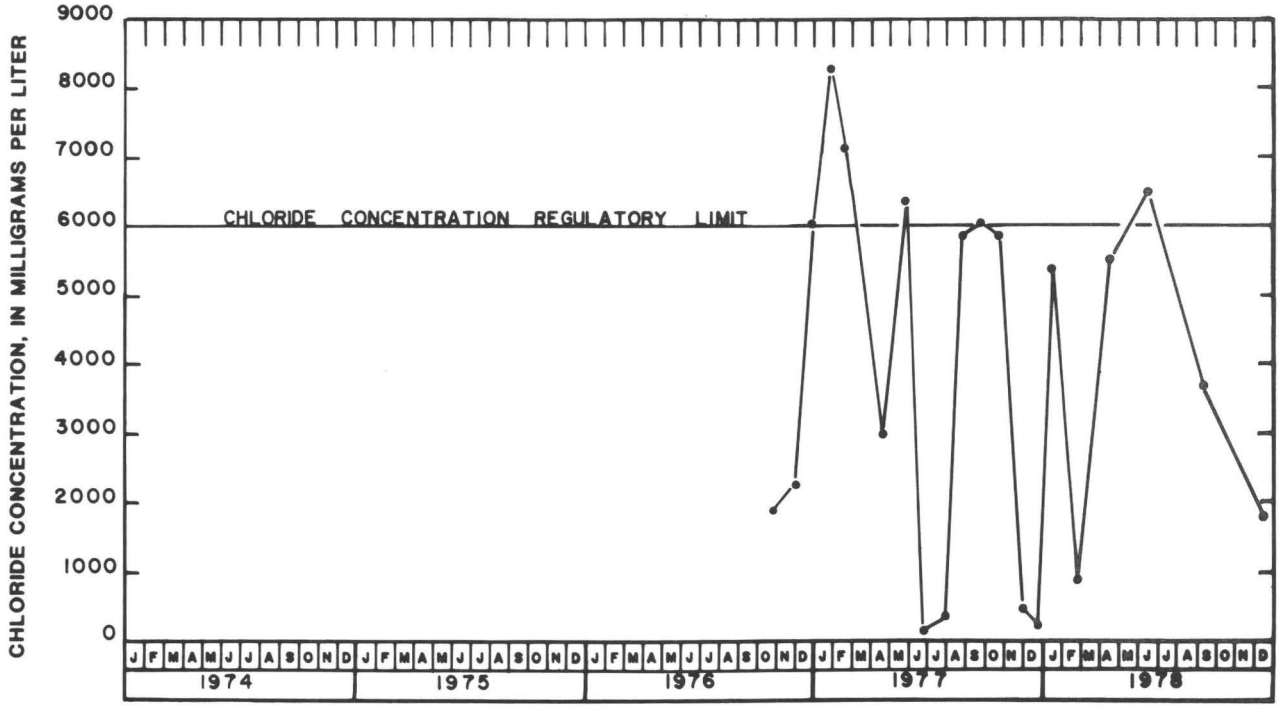

Figure 13.--Chloride concentrations in water from 730-foot depth in observation well S.W. deep, 1976-78.

Table 3.--Data on observation wells that penetrate the freshwater-saltwater interface (Floridan aquifer)

Monitoring agency: USGS, U.S. Geological Survey; PCWS, Pinellas County Water System.
Parameters monitored and frequency: Sr, stage-recorder; Cb, chloride-bimonthly; K, specific conductance; DS, dissolved solids; C, chloride; SO_4, sulfate; S, stage; a, annual; Sm, stage-monthly; Cm, chloride-monthly; sa, semiannual.

Well	Depth (ft)	Casing depth (ft)	Diameter (in)	Monitoring agency	Parameters monitored and frequency	Sampling method or depth sampled (ft)	Regulatory limits		Monitoring purpose
							Water level (ft above NGVD of 1929)	Chloride (mg/L)	
Brooker Creek deep	310	300	6	USGS	Sr, Cb	Pumped	None	1,500	Regulatory
M-5	500	288	6	USGS/ PCWS	(K, DS, C, SO_4, S), m	320 350 410 490	None None None None	None None None None	Regulatory
North Lake Tarpon	780	758	8	USGS	(S, K, C),m	Pumped	None	10,500	Regulatory
S.W. deep	741	500	6	USGS/ PCWS	(K, DS, C, SO_4, S), m	560 620 730	None None None	150 550 6,000	Regulatory
3A	1,100	670	8	USGS/ PCWS	(K, DS, C, SO_4, S), sa	700 1,000 1,100	None None None	None None None	Data
N-1 deep	1,200	653	8	USGS/ PCWS	(K, DS, C, SO_4, S), sa	700 1,100 1,180	None None None	None None None	Data
M-2	538	507	6	USGS/ PCWS	(K, DS, C, SO_4, S), sa	510 535	None None	None None	Regulatory
N.W. deep	1,040	488	4	USGS	Sm	760 850	None None	None None	Data
E-103	1,111	605	6	PCWS	Sr	None	None	None	Data

Table 4.--Chloride concentrations in water from selected observation wells

Well	Regulatory limits	Date sampling began	Maximums since sampling began		Chloride concentration (mg/L)	
	Chloride (mg/L)		Chloride (mg/L)	Date of maximum	9/77	9/78
Brooker Creek shallow	1,200	3/72	1,000	6/76	780	830
Brooker Creek deep	1,500	8/73	1,400	1/74	1,300	1,300
D&S Ranch	100	1/61	38	2/62	9	8
M-2, 510 ft	---	1/75	1,900	9/76	1,450	1,480
M-2, 535 ft	---	1/75	2,270	6/77	2,120	1,910
Bryan Dairy	50	1/61	11	4/77	9	8
Casey Ranch	250	1/61	185	11/77	154	115
North Lake Tarpon	10,500	9/71	13,000	3/76	12,000	12,000
S.W. deep, 560 ft	150	10/73	150	7/77	69	62
S.W. deep, 620 ft	550	10/73	550	1/77	215	157
S.W. deep, 730 ft	6,000	10/73	8,250	1/77	6,000	3,650
3A, 700 ft	---	9/73	215	12/76	188	172
3A, 1,000 ft	---	9/73	275	2/76	198	205
3A, 1,100 ft	---	9/73	800	4/77	200	259
N-1 deep, 700 ft	---	3/69	95	7/76	44	44
N-1 deep, 1,100 ft	---	3/69	12,000	12/76	51	59
N-1 deep, 1,800 ft	---	3/69	14,740	5/73	300	59
N.W. shallow, 320 ft	---	2/76	25	7/77	21	20
S.W. shallow, 350 ft	---	10/73	15	8/76	11	12

suggest that it is tapping a zone that is always below the freshwater-saltwater interface. Water from the lowest level of the S.W. deep well had a lower maximum chloride concentration and varied significantly in chloride concentration during 1977. Therefore, it appears that the lowest level in the S.W. deep well taps the zone through which the freshwater-saltwater interface fluctuates (Joyner and Gerhart, 1980).

Figure 14 shows variations of chloride concentrations at specific depths for September 1978 along a section from Tarpon Lake to N-1 deep well in the Eldridge-Wilde well field (fig. 1). Measurements show that chloride concentrations greater than 250 mg/L in the Eldridge-Wilde well field are about 700 feet deeper than the average 350-foot depth of the production wells in the field. The deepest production well in the Eldridge-Wilde well field is 805 feet, about 300 feet above the level where concentrations exceed 250 mg/L.

WATER USE

The Cypress Creek well field (located about 15 miles northeast of the Eldridge-Wilde well field) began pumping in April 1976 enabling the Pinellas County Water System to meet its growing water-supply needs without excessively pumping the Eldridge-Wilde and East Lake Road well fields. Figure 15 shows the monthly pumpage from Cypress Creek, East Lake Road, and Eldridge-Wilde well fields for 1974-78. The maximum monthly pumpage from the Eldridge-Wilde well field was 1,245 Mgal in March 1976. The maximum monthly pumpage from East Lake Road well field was 151 Mgal in April 1976. Cypress Creek well field produced a monthly maximum of 945 Mgal in May 1978, of which 573 Mgal went into the Pinellas County Water System. The maximum aggregate monthly pumpage--the total water pumped from the three well fields for the Pinellas County Water System--was 1,722 Mgal in May 1978. This was a 3.5 percent increase or 56 Mgal more than May 1977.

MODIFICATIONS IN OBSERVATION-WELL NETWORK, 1978

The following additions or modifications in the monitoring network were made in and adjacent to the Eldridge-Wilde and East Lake Road well fields in 1978.

1. Began monthly water-level measurements on well M-5 at the golf course.

2. Began monthly sampling of Tarpon Road deep well for specific conductance and chloride concentrations.

3. Discontinued E-103 water-level measurements and water-quality sampling due to well caving in.

4. Discontinued N.W. deep well water-quality sampling due to caving in and began monthly water-level measurements.

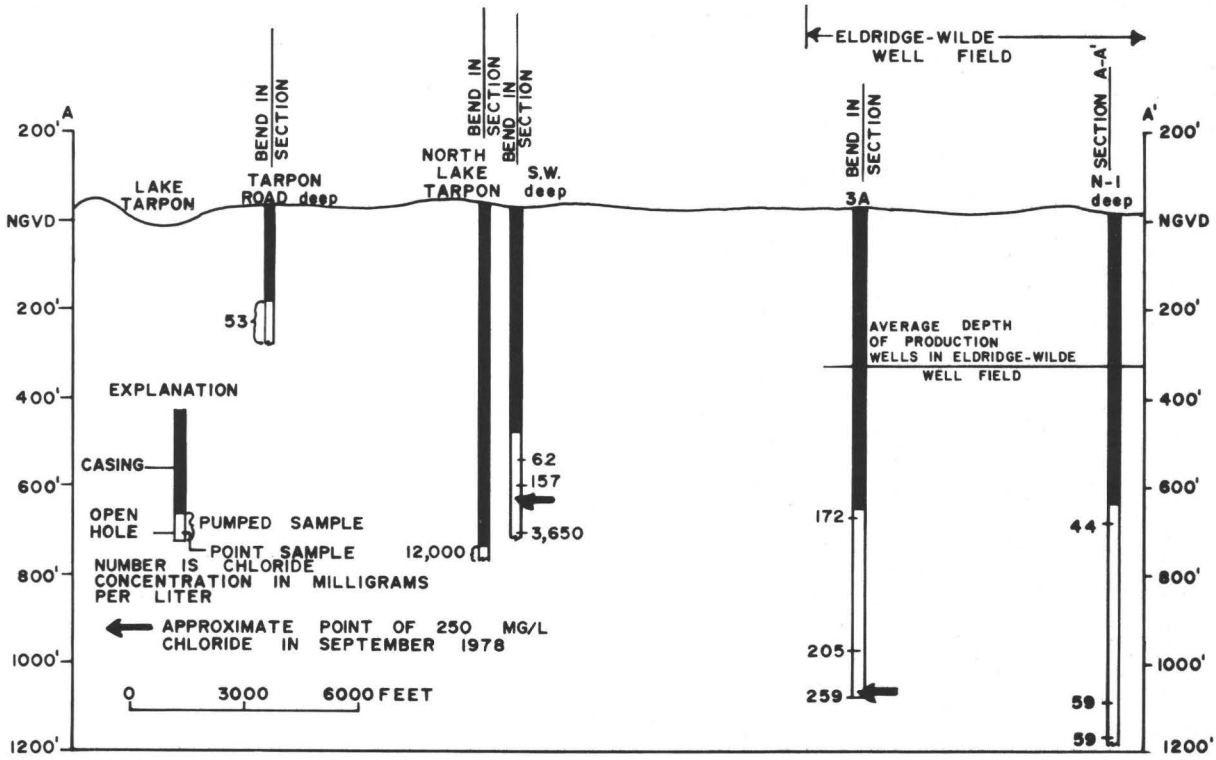

Figure 14.--Section showing chloride concentrations at specific depths, September 1978.

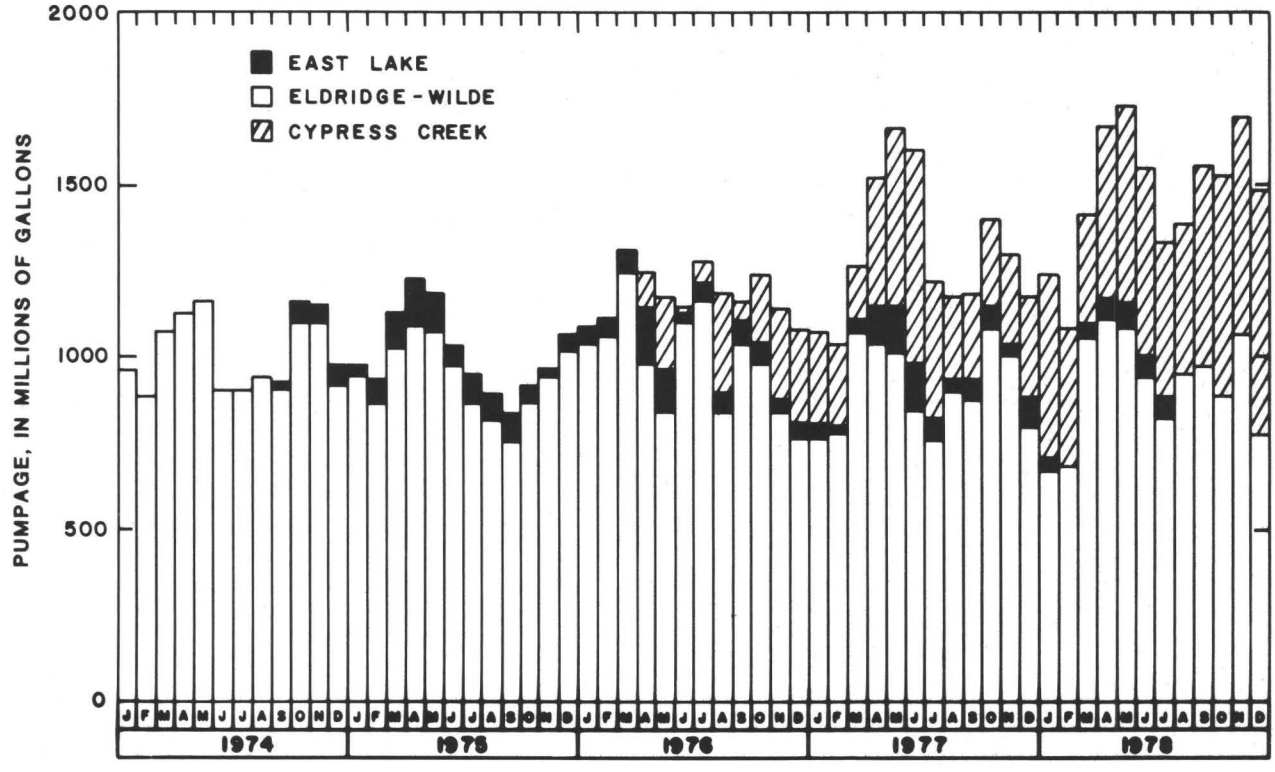

Figure 15.--Monthly supply to Pinellas County Water System from Eldridge-Wilde, East Lake Road, and Cypress Creek well fields, 1974-78.

CONCLUSIONS

The Eldridge-Wilde and East Lake Road well fields are being extensively monitored for water levels and water quality in both the surficial and the Floridan aquifers. The Floridan aquifer is monitored by means of observation wells open to the production zone and wells that penetrate the freshwater-saltwater interface.

A normal rainfall of 52 inches occurred in the Eldridge-Wilde well field in 1978 resulting in water table and potentiometric surface levels that were about average. The water table and potentiometric surface were 2 feet higher in May 1978 than in May 1977.

Chloride concentrations generally increase during the low precipitation months of April and May. This increase in chloride concentrations coincides with the period of sparse rainfall, increased pumpage, and lower levels of the water table and the potentiometric surface.

The hydrologic stress on the Eldridge-Wilde and East Lake Road well fields has received some relief since the Cypress Creek well field began operation in April 1976. The highest monthly pumpage from the Cypress Creek well field was about 945 Mgal in May 1978, of which 573 Mgal was distributed to the Pinellas County Water System, relieving some of the demand from the Eldridge-Wilde and East Lake Road well fields.

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