THE ANCLOTE AND PITHLACHASCOTEE RIVERS AS WATER-SUPPLY SOURCES

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Prepared by
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in cooperation with
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
and
BUREAU OF GEOLOGY
FLORIDA DEPARTMENT OF NATURAL RESOURCES

TALLAHASSEE, FLORIDA
1973

INTRODUCTION

PURPOSE AND SCOPE

Water for municipal, industrial, domestic, and agricultural use in the Anclote and Pithlachascotee River basins in west-central Florida (fig. 1) is withdrawn from the limestone Floridan aquifer, which underlies the entire region. Demands for water have increased in the last few years, and alternate sources must be considered to meet the demands of the future. One alternate source is surface water from the two rivers.

The purposes of this study are to define the quantity and quality of water flowing in the Anclote and Pithlachascotee Rivers and to determine whether the water is suitable and adequate for such uses as: (1) water supply by direct withdrawal; (2) water supply during dry periods by diversion into flood-detention areas; and (3) inducing recharge to the Floridan aquifer.

Both rivers are short and discharge into the Gulf of Mexico. Flow in their downstream reaches reverses during tidal cycles, and salt water is mixed with fresh water for several miles upstream from their mouths.

Data on mean discharge, flow duration, and magnitude and frequency of annual high and low flows are presented for three sites on each river. Water-quality data are presented also; these include the delineation of the upstream extent of salt water in each river, chemical analyses, results of sampling for pesticides, heavy metals, biochemical oxygen demand and bacteria. The relation between specific conductance and dissolved solids, hardness, and flow duration is presented graphically.

DESCRIPTION OF DRAINAGE BASINS

The drainage area of the Anclote River is about 100 square miles. The basin's easternmost boundary is near U.S. Highway 41 in Pasco County between Denham and Drexel, and the river's mouth is at Tarpon Springs in northwestern Pinellas County (fig. 2). The topographic basin of the Pithlachascotee River encompasses about 200 square miles and extends from Brooksville, in Hernando County, southwestward to include Crew's Lake, then westward through New Port Richey and to the Gulf at Port Richey.

Land-surface altitudes in the Anclote River basin range from sea level at the Gulf to near 80 feet at the basin's easternmost boundary. Highest altitudes in the Pithlachascotee Basin exceed 250 feet at the east edge of the basin southeast of Brooksville and east of Masaryktown. A series of sand hills as high as 60 feet above sea level parallels the Gulf coast about 2 miles east of the coast line. The topographic relief is 100 to 150 feet in a faulted and eroded ridge area southeast of Brooksville. The remaining part of the area (about 85 percent) is characterized by sand-covered flatlands dotted with depressions containing cypress swamps. Most of these depressions are sinks, which are the surface expression of solution collapse in the underlying limestone. Small sinks prevail over the entire surface of both river basins. The largest sinks and sink complexes are in the upper reaches of the Pithlachascotee Basin–generally north and northeast of Crew's Lake. Much of the rainfall here collects in the sink holes and drains into the underlying Floridan aquifer. Within the aquifer it moves west and northwest to the coastal areas of northern Pasco and southern Hernando Counties.

STREAMFLOW

Streamflow data presented in this report were collected at sites A-1, A-3 and A-4 on the Anclote and at sites P-1, P-2, and P-4 on the Pithlachascotee (fig. 3). As of 1972, records were being collected only at sites A-4, P-1 and P-4. Sites A-4 on the Anclote is the major (or reference) site used in this study. Its record was used in developing graphical streamflow regressions with the other five sites by means described by Searcy (1960). The degree of correlation between the reference site and the other five is good, ranging from 0.85 to 0.97.

Streamflow and rainfall generally follow the same pattern. Each year, on the average, nearly half the 52.55 inches of rain at Tarpon Springs falls in June, August, and September; 4.26 inches in March, 4.91 inches in June, and 2.88 inches or less in each of the other months. On the average, almost 45 percent of the annual discharge of the Anclote River at site A-4 occurs in August and September, and more than 34 percent in November through June. Discharge is lowest in May, June, November, and December. Runoff accounts for about 30 percent of the rainfall.

The average discharge of the Anclote River at site A-4 near Elfers from 1947 to 1969 was 83.2 cfs (cubic feet per second) or 1.15 cfsm (cubic feet per second per square mile). That of the Pithlachascotee River at site P-4 near New Port Richey was 36.7 cfs (0.202 cfsm) from 1963 to 1969; and is estimated to be 49 cfs (0.270 cfsm) for 1947-69. Therefore, the 182- square-mile drainage area above site P-4 on the Pithlachascotee River yields a little more than one-half the discharge and less than one-fourth as much runoff per square mile as the 72.5-square-mile area above site A-4 on the Anclote River.

The difference in runoff per square mile from the two basins is related to recharge and discharge of the Floridan aquifer and the direction of flow in the aquifer. The aquifer is recharged over most of this region through the permeable material overlying the aquifer and through sinkholes (Cherry and others, 1970, p. 56). Discharge is mainly through springs and seeps along the coast and in the lower reaches of the rivers.

Figure 2 shows the altitude of the potentiometric surface of the Floridan aquifer in May 1969, and the arrows indicate the direction of movement of ground water after it infiltrates into the aquifer through permeable material overlying the aquifer. Water in the aquifer moves parallel to the axis of the Anclote Basin, nearly parallel to the axis of the lower part of the Pithlachascotee Basin and discharges to the rivers in their lower reaches. The direction of ground-water movement is nearly perpendicular to the axis of the upper part of the Pithlachascotee Basin, and water moving from the east toward the upper Pithlachascotee Basin underflows this area and moves on toward the coast. The water that infiltrates to the Floridan aquifer in the upper Pithlachascotee Basin also moves westward and discharges near the coast several miles north of the Pithlachascotee River estuary. Closed depressions and sinkholes in the upper part of that basin capture a large part of the storm runoff. This water often evaporates or infiltrates to the Floridan aquifer and does not reach the lower part of the basin as streamflow. By this process streamflow in the Pithlachascotee River is less than what a basin of this size should yield. In mid 1972, wells in three major well fields–Eldridge-Wilde, Cosme, and Section 21 well fields–produced on the average 65 mgd (million gallons per day) from the Floridan aquifer. (See fig. 2 for locations of these well fields.) At that time, the Tampa, Pasco County, and Starkey well fields were in various stages of planning and construction and were not taking water from the aquifer.

As of 1972, some water that had been entering the Anclote River from the aquifer during low flow was being diverted to wells in the Eldridge-Wilde field, and the effect of the wells in this and other fields on the low-flow regimen of the Anclote River has been noted by Cherry and others (1970, p. 81-86). The base flow of the Anclote River will be reduced still more when wells in the Pasco County field begin production, and withdrawals from the Starkey well field will reduce flow in the lower reaches of both rivers. Production from the Tampa well field will not affect low flow in either the Anclote or Pithlachascotee Rivers.

FLOW DURATION

The Anclote at site A-4 and the Pithlachascotee at site P-4 have never gone dry during the period of record (table 1). The potentiometric surface of the Floridan aquifer during the dry season (low flow) intersects the rivers' channels a short distance above these sites, and the aquifer sustains the flow by outflow from ground-water storage. The aquifer does not sustain flow in the streams above any of the other sites, and the streams at all other sites have zero flow at 95 percent duration. The South Branch of the Anclote (site A-3) has more periods of zero flow than any other stream studied; it has no flow at 70 percent duration.

FLOW MAGNITUDE AND FREQUENCY

The streams at all sites except A-4 and P-4 (table 2) will have no flow for 30 days once every 2 years on the average and for 60 days once every 10 years on the average. Flow in the South Branch of the Anclote at Odessa site (A-3) will be zero for 60 consecutive days once every 2 years on the average.

The magnitude and frequency of the highest average flow for specific recurrence intervals are shown in table 3. In contrast to the long periods of zero flow, the South Branch of the Anclote at Odessa site (A-3) shows more discharge for all the high flow listed than the other three tributary streams (sites A-1, P-1, and P-2). Even though the drainage area of the South Branch at site A-3 is only 25 square miles and the drainage area above site P-1 is 150 square miles, high flow at A-3 is almost always twice that at P-1. This illustrates the effect of the many closed depressions in the upper Pithlachascotee River basin on discharge.

WATER QUALITY
EXTENT OF SALT WATER

The main water-quality problem in coastal streams is the presence of salt water in the stream channels because salt water restricts the use of these stream waters for most off-channel uses.

Chloride content is a useful criterion for distinguishing the salt water-fresh water interface, because chloride is the major ion in sea water. In coastal areas, a rise in the chloride content of fresh water nearly always indicates that it has become mixed with sea water. The contrast between the chloride concentrations in the upper and lower reaches of these coastal streams is great. Concentrations of chloride in the upper reaches of the Anclote and Pithlachascotee Rivers are typically less than 100 mg/l (milligrams per liter), and at the rivers' mouths, the chloride content ranges from 3,000 mg/l to 15,000 mg/l. A chloride content of 250 mg/l is used in this report to distinguish between fresh and salt water. This value is the upper limit recommended by the State of Florida for an acceptable public water-supply source.

The dense salt water forms a wedge that tapers upstream below the less dense fresh water. Water containing 250 mg/l of chloride may occur 200 to 10,000 feet farther upstream at the bottom of the stream channel than at the water surface. The salt-water interface moves upstream and downstream in response to changes in tides and the amount of fresh-water discharge. The interface moves upstream during a flood tide and downstream during ebb tide. High fresh-water discharge will push the salt water toward the Gulf and flush it from part of the stream channel. During low flow, flushing does not take place and the salt-water front moves upstream.

Figure 3 delineates three zones–salt-water zone, transition zone and fresh-water zone–in the Anclote and Pithlachascotee Rivers. The zones were defined by determining the position of water with a chloride content of 250 mg/l at the bottom of the stream channels during high tide.

Water with a chloride content less than 250 mg/l can be withdrawn from the fresh-water zone of each river at any time. Water withdrawn from the salt-water zone nearly always will have a chloride content greater than 250 mg/l. Water withdrawn from the transition zones, which extend as far as 11 miles upstream from the mouth of the Anclote River and 6 miles upstream from the mouth of the Pithlacascotee River, may be fresh or salt depending upon tidal conditions and the amount of fresh-water discharge. Upstream withdrawals of fresh water would diminish fresh-water discharge at the salt-water front; the front could move farther upstream and lengthen the transition zone. Reversal of flow during tidal cycles occurs as far upstream as half a mile upstream from A-5 and 1 mile upstream from P-5. These would be the maximum upstream distances salt water could occur if all fresh-water discharge were stopped.

If withdrawals of fresh water are desired from the salt-water or transition zones, a barrier would be required to hold the salt water downstream. Operation of a barrier would extend the fresh-water zone downstream to the location of the barrier. Among the barriers that might be used are a low dam with movable gates or a plastic or rubber inflatable dam.

FRESH-WATER ZONES

Direct relations between specific conductance and dissolved solids and hardness of water at sites A-4, P-4 and P-5 are well defined (fig. 4) as is the inverse relation between stream discharge and specific conductance at sites A-4 and P-4. The conductance is lower during storm runoff and higher during base flow when the more mineralized ground water is the major contributor to the streamflow. The relation between discharge and color of water is not well defined, but a direct relation between them is evident. Colored water is the rule for both rivers–the color being about that of tea. Color is highest during storm runoff when organic acids are flushed from swamps and other areas where decaying plant debris has accumulated. Maximum color encountered during this study for these sites is in the 200 to 300 range shown by Kaufman (1969).

On the Pithlachascotee River, the specific conductance of water flowing past downstream site P-5 is higher than at upstream site P-4 (fig. 5). At site P-4 the specific conductance is generally intermediate between those for P-4 and P-5. Because site P-5 is at the upstream end of the transition zone (fig. 3), the specific conductance of water there is high, more than 550 micromhos, at 98 percent duration.

The relation between specific conductance and dissolved solids and hardness (fig. 4) can be used in conjunction with the specific conductance duration curves (fig. 5) to estimate the percentage of time water of a certain quality can be expected. For example, to determine when water with a hardness of 100 mg/l or less is available from the Anclote River at site A-4, first consult figure 4 which shows that this hardness corresponds to a specific conductance of about 215 micromhos. Then consult figure 5 which shows the specific conductance of water at A-4 is equal to or less than 215 micromhos nearly 60 percent of the time.

Fresh water from both rivers is generally of the calcium bicarbonate type except during short periods of unusually high surface runoff when calcium is in combination with sulfate, sulfate chloride, or chloride (table 4).

Phosphorus and nitrogen are essential for plant growth; in fact, amounts, especially of phosphorus, in excess of certain limits encourages algal blooms. Blooms are undesirable in lakes and streams because the high oxygen-consumption rate from the respiration of billions of the microscopic plants often reduces the dissolved oxygen content of the water to cause asphyxiation of other aquatic biota. Blooms are also unsightly and not only cause undesirable odors but create problems for persons using or treating such waters. Guidelines for desirable limits for total phosphorus are 0.1 mg/l for rivers and 0.05 mg/l for streams entering lakes (U.S. Dept. Interior, p. 53). Table 4 shows that total phosphorus at all sites in the fresh-water zones in both rivers is below the 0.1 mg/l level; but only those on the Pithlachascotee River were consistently below 0.05 mg/l. Therefore, Anclote River water impounded for any length of time would have a slightly greater chance of experiencing algal blooms than water impounded from the Pithlachascotee River.

Phenolic compounds were not detected at either site A-5 or P-4 during high flow, but amounts in excess of the Florida Department of Pollution Control's criterion for public-water supplies of 0.001 mg/l were found at both sites during low flow (table 4).

Pesticides, including Aldrin, DDT, DDD, DDE, Dieldrin, Endrin, Heptachlor, Lindane, 2,4-D, 2,4,5-T, and Silvex were not detected in the water samples collected in 1971 at site A-5 on February 9 and April 1 or at site P-5 on February 10 and March 31.

Criteria for concentrations of arsenic and several heavy metals in water have been established by the State of Florida. All metals in water samples listed in table 5 meet those criteria. The upper limit for arsenic is 50 micrograms per liter, and this amount was reached or approached in water from both rivers during the high-discharge period of February 1971.

BOD (biochemical oxygen demand) in several water samples taken during ebb tide from the lower reaches of both rivers, was less than 3 mg/l (table 6). A BOD of this magnitude is expected to result from natural conditions in a biologically active area such as west-central Florida. That it is no greater indicates that no large quantity of decomposable oxygen-demanding material was in the rivers, at least when the BOD samples were collected.

Total coliform, fecal coliform, and fecal streptococcus bacteria determinations were made using membrane filter techniques. The total coliform group, long used as an indicator of pollution from warm-blooded animals, includes bacteria from non-fecal sources, mainly types that thrive in the soil. Fecal coliform and fecal streptococcus bacteria indicate recent pollution from warm-blooded animals. The ratio of fecal coliform to fecal streptococcus is used to identify the type of warm-blooded animal causing the pollution. Ratios of about 4 indicate a human waste source, and ratios of 1 or less suggest domestic animal-waste source.

Because standard tests for coliform and fecal coliform bacteria are based on several samples collected over a period of time, the few samples analyzed during this study are not conclusive for judging the suitability of these streams for water supply. Some single-sample criteria do exist, and the Florida Department of Pollution Control's total coliform limit of 2,400/100 ml (individuals per 100 milliliters of sample) for public-supply sources was approached one time in water from site A-4. The fecal coliform count of 360/100 ml is near that of the Federal Water Pollution Control Administration's limit of the 400/100 ml that should not be exceeded in 10 percent of the samples from a public-supply source (U.S. Dept. of Interior, 1968, p. 12).

Fecal coliform/fecal streptococcus ratios are generally less than 1 and well below 4. Some minor influence of fecal pollution from humans may be indicated by ratios of 1.40 and 1.10 at sites A-10 and P-7, respectively.

SUMMARY

The Anclote and Pithlachascotee Rivers are suitable sources for only supplemental water supplies, which could be used in conjunction with ground- water supplies, and as sources of recharge water to the Floridan aquifer. At times, zero flow is experienced at most places along these streams and their tributaries upstream from sites A-4 and P-4. The streams at sites A-4 and P-4 are sustained by outflow from ground-water storage and at no time during the period of record has the flow been zero. At 90 percent duration the combined discharge at sites A-4 and P-4 is only 5.7 cfs (3.7 million gallons per day). The lowest combined discharges at these two sites that can be expected for a 7-day period once every 20 years is only 1.5 cfs (1 million gallons per day). Major well fields in the southern part of the Anclote River basin are depleting that river during low flow. The Pasco County well field will deplete the Anclote, and the Starkey well field will deplete both the Anclote and the Pithlachascotee.

Overland runoff is sometimes considerable, even from some of the smaller tributary areas such as at sites A-1, A-3, and P-2. This runoff could be diverted to temporary detention sites such as swamps or sinkhole areas to induce more infiltration into the Floridan aquifer, or it could be diverted to some of the larger lakes for storage.

During low flow, salt water extends about 11 miles upstream from the coast in the Anclote River and 6 miles in the Pithlachascotee River. In order to withdraw fresh river water from points closer to the coast during low flow, salt-water barriers must be placed in the transition or salt- water zones. Upstream withdrawals of fresh water could result in the salt water moving farther upstream during low flow.

The river water in the fresh-water zones usually meets quality standards for public water-supply sources; only occasionally have phenolic compounds, arsenic, and bacteria in objectional concentrations been detected. Further studies would confirm or disprove their repeated occurrence. Proper water- and land-management practices would, of course, circumvent any problems such constituents might cause.

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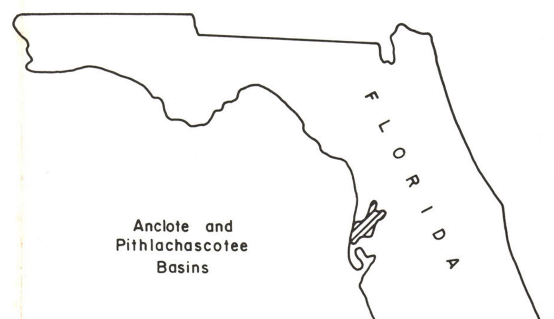


Figure 1. Location of the basins.

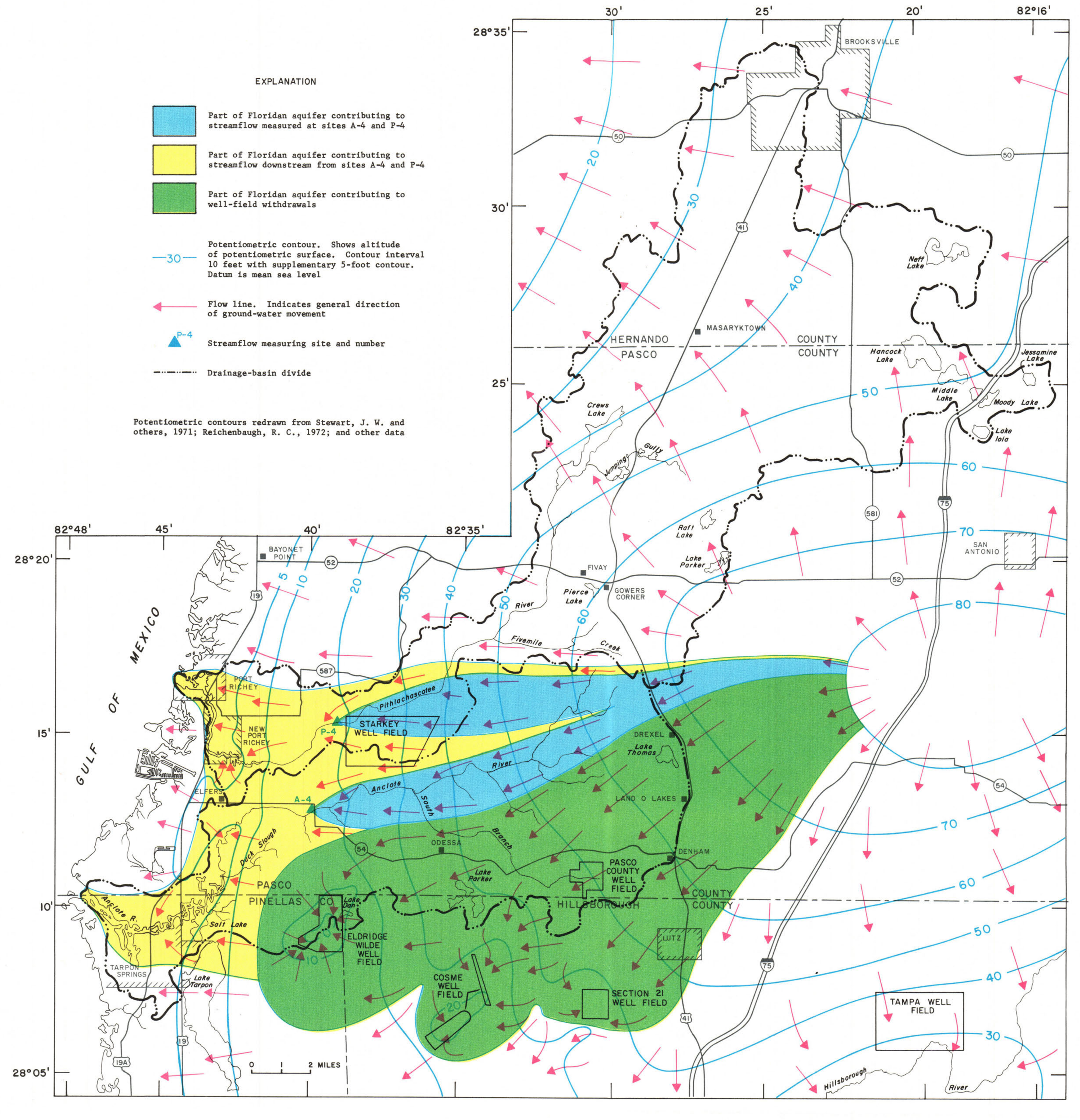


Figure 2. Potentiometric surface of the Floridan aquifer and areas of ground-water contributions to major well fields and streamflow during low-flow periods.

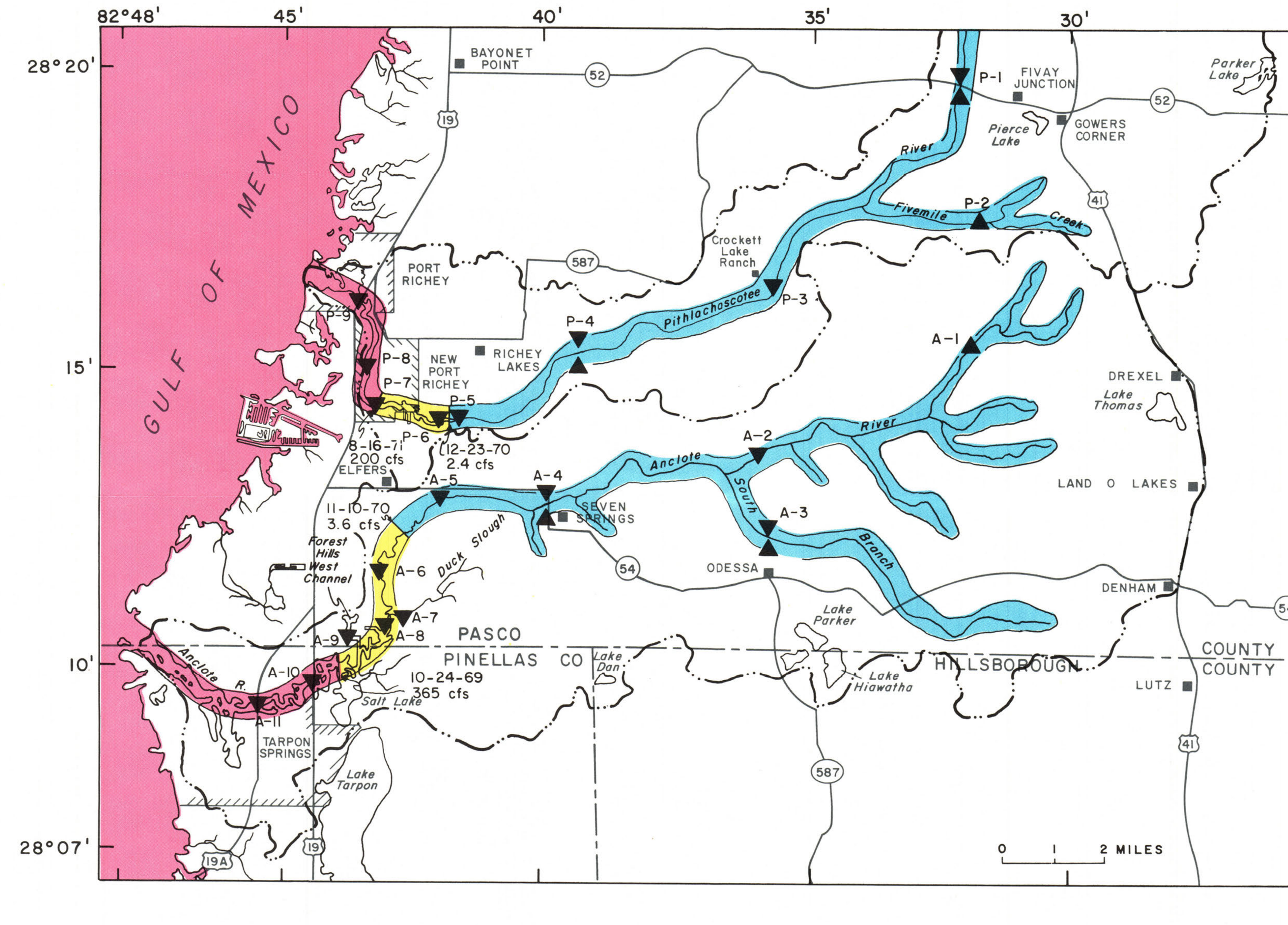
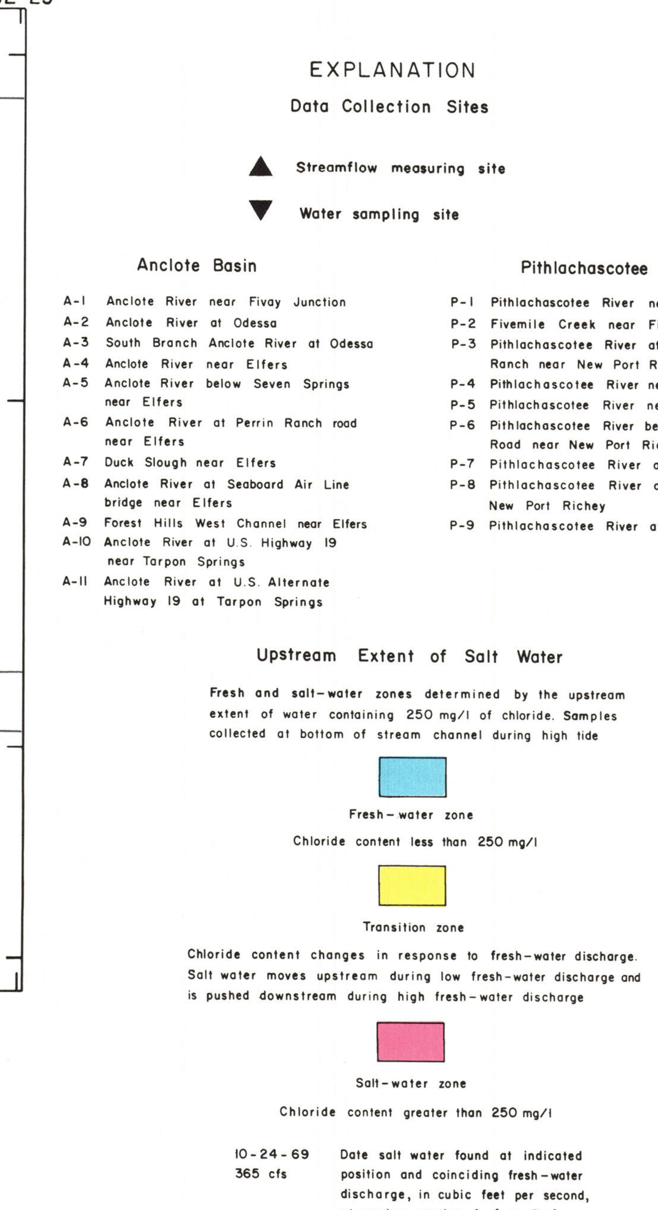


Figure 3. Data-collection sites and upstream extent of salt water.



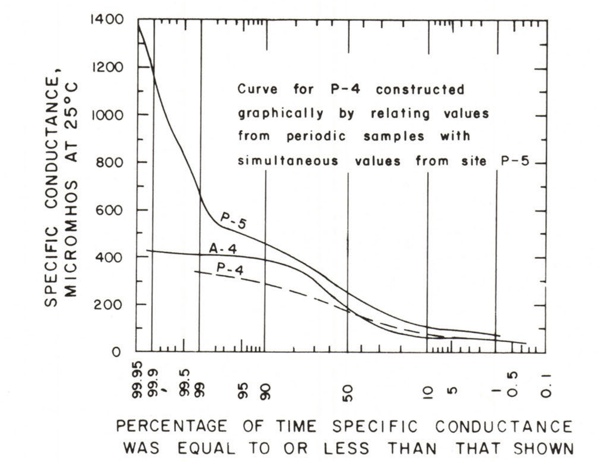


Figure 5. Specific conductance-duration curves for Anclote River near Elfers (A-4) and Pithlachascotee River near New Port Richey (P-4) and near Richey Lakes (P-5).

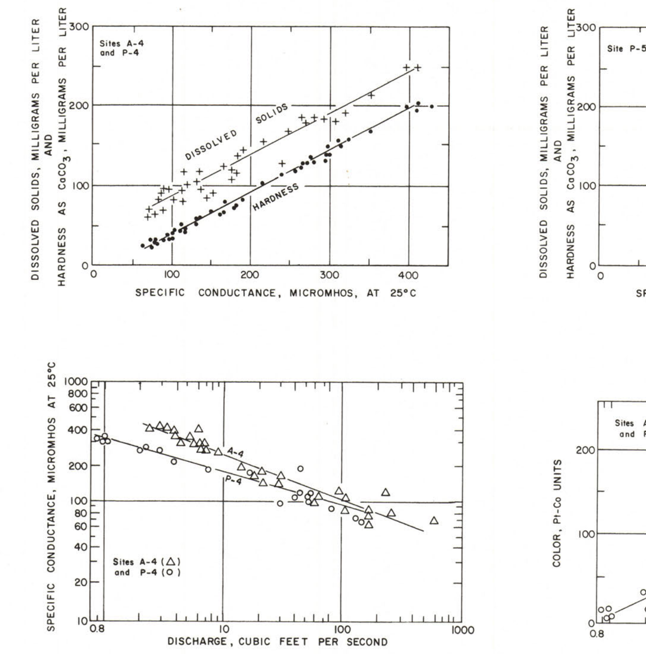


Figure 4. Water-quality relations for Anclote River near Elfers (A-4), Pithlachascotee River near New Port Richey (P-4), and Pithlachascotee River near Richey Lakes (P-5).

Table 1. — **Duration of daily flow**

Station number	Drainage area (sq. mi.)	Period of record used	Number of measurements	Average discharge (cfs)	Flow, in cubic feet per second, which was equaled or exceeded for indicated percent of time																
					99.5	99	98	95	90	80	70	60	50	40	30	20	10	5	2	1	0.50
A-1	9.0	1964-67, 1971	19	a16	0	0	0	0	0.03	0.43	1.2	2.4	4.4	7.5	12	19	34	49	70	87	104
A-3	25.3	1964-66, 1971	20	a16	0	0	0	0	0	0	0	.41	.86	3.6	9.9	23	53	91	145	203	285
A-4	72.5	1947-69, 1971	(b)	a83.2	1.6	2.0	2.5	3.1	3.7	4.8	6.5	10	19	32	56	104	230	370	600	800	1,140
P-1	150	1964-69, 1971	56	a17	0	0	0	0	.20	.62	1.4	2.6	5.1	8.4	13	21	38	54	77	95	118
P-2	7.0	1964-67, 1971	19	a2.9	0	0	0	0	0	.03	.10	.23	.50	1.0	1.9	3.7	8.7	15	26	36	49
P-4	182	1964-69,	(b)	a49	.23	.32	.56	1.1	2.0	4.2	6.5	9.8	16	25	40	65	120	185	270	360	460

[a]estimated for 1947 to 1969.
b continuous records
To convert cubic feet per second to million gallons per day, multiply the cfs value by 0.646.

Table 2. — **Magnitude and frequency of annual low flows**

Station number	Lowest average flow, in cfs, for indicated recurrence intervals														
	3-day			7-day			30-day			60-day			183-day		
	2 year	10 year	20 year	2 year	10 year	20 year	2 year	10 year	20 year	2 year	10 year	20 year	2 year	10 year	20 year
A-1	0	0	0	0	0	0	0	0	0	0.30	0	0	8.8	2.4	1.4
A-3	0	0	0	0	0	0	0	0	0	0	0	0	5.7	.40	.05
A-4	2.8	1.4	1.1	2.9	1.6	1.3	3.2	2.2	2.1	4.3	2.5	2.3	40	11	6.9
P-1	0	0	0	0	0	0	0	0	0	.50	0	0	10	2.8	1.5
P-2	0	0	0	0	0	0	0	0	0	.02	0	0	1.3	.24	.11
P-4	.83	.20	(a)	.90	.23	.18	1.2	.40	.33	3.3	.57	.44	30	10	7.2

a data not available for accurate estimate; value less than 0.2 cfs

Table 3. — **Magnitude and frequency of annual high flows**

Station number	Highest average flow, in cfs, for indicated recurrence intervals														
	3-day			7-day			30-day			60-day			383-day		
	2 year	10 year	20 year	2 year	10 year	20 year	2 year	10 year	20 year	2 year	10 year	20 year	2 year	10 year	20 year
A-1	87	(a)	(a)	74	(a)	(a)	44	71	80	35	58	65	19	34	40
A-3	208	515	(b)	165	385	495	79	157	187	55	116	138	22	53	65
A-4	841	2,080	2,700	663	1,360	2,000	329	639	755	233	475	565	105	225	270
P-1	96	183	218	82	148	178	49	78	89	36	62	70	21	37	43
P-2	37	(c)	(c)	28	(c)	(c)	13	2	32	9.1	20	24	3.9	9.0	11
P-4	355	740	920	295	580	720	165	280	325	125	225	255	66	120	140

a data not available for accurate estimate; all values greater than 100 cfs
b data not available for accurate estimate; value greater than 600 cfs
c data not available for accurate estimate; all values greater than 50 cfs

Table 4. — **Chemical analyses of river water for selected high and low discharges**

Sampling site	Date of collection	Discharge (cubic feet per second)	Silica (SiO_2)	Iron (Fe)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total Nitrogen (N)	Total Phosphorus (P)	Total Organic Carbon	Phenolic compounds	Hardness as $CaCO_3$: Calcium-magnesium	Hardness as $CaCO_3$: Non-carbonate	Dissolved solids	Specific conductance (micromhos at 25° C)	pH	Color (Pt-Co units)	Field temperature (°C)
			Milligrams per liter																	
A-2	2- 9-71	a120	2.9	0.07	16	20	9.5	0.3	0.6	0.71	0.06	15	—	24	11	87	107	6.7	50	15.0
	4- 1-71	1.0	2.4	.07	30	0.8	14	.2	0	.78	.03	15	—	—	—	68	110	7.4	80	17.0
A-3	2- 9-71	a50	4.0	.05	5	35	11	.3	5.0	1.6	.03	22	—	60	56	123	140	5.7	—	13.0
	4- 1-71	0	1.6	1.3	26	23	21	.2	0	2.3	.07	47	—	—	—	146	180	7.1	24	20.0
A-4	2- 9-71	a200	2.7	.08	13	21	11	.3	1.3	.86	.07	14	—	42	50	79	114	6.9	—	14.0
	4- 1-71	4.0	8.4	.04	176	16	11	.2	0	.22	.03	5	—	—	—	218	350	8.2	30	19.5
A-5	2- 9-71	ab250	2.9	.15	16	23	12	.3	1.9	.96	.06	16	0	42	29	98	123	6.9	60	13.0
	4- 1-71	b-4.16	6.8	.09	160	12	11	.1	0	.27	.03	5	0.005	140	10	185	313	8.1	30	17.0
A-7	2- 9-71	a50	3.5	.10	20	33	29	.3	2.0	.95	.02	29	—	68	52	162	210	7.1	100	15.0
	4- 1-71	0	4.0	.10	9	110	680	.2	0	.45	.04	11	—	—	—	1,500	2,600	8.2	20	17.5
A-11	2- 9-71	(b)	—	—	112	—	7,100	—	—	—	—	19	—	2,500	2,400	14,700	21,400	7.5	—	16.5
	4- 1-71	(b)	—	—	156	—	13,000	—	—	—	—	5	—	—	—	25,700	37,500	8.0	—	17.0
P-1	2-10-71	a37	2.6	.13	8	13	10	.3	0	.38	.01	36	—	30	24	77	81	6.6	40	10.0
	3-31-71	2.8	3.4	.05	22	.8	12	.2	0	.84	.04	15	—	—	—	70	85	7.0	100	15.0
P-3	2-10-71	a200	2.7	—	20	—	9.0	—	0	.40	.01	161	—	25	9	80	85	6.9	80	10.5
	3-31-71	4.18	4.4	.09	48	.8	13	.2	0	.81	.02	29	—	—	—	142	130	7.6	120	16.0
P-4	2-10-71	a275	2.2	.10	20	7.9	9.0	.2	0	.42	.01	95	—	30	35	79	81	6.9	80	12.0
	3-31-71	7.2	5.4	.11	82	2.4	12	.2	.3	.79	.02	13	—	—	—	136	185	8.0	70	16.0
P-5	2-10-71	ab290	2.6	.17	24	9.6	9.4	.4	0	.40	.01	20	0	33	14	81	93	7.2	80	12.0
	3-31-71	b7.71	6.6	.15	120	23	30	.1	.4	.62	.03	9	.017	120	24	210	329	7.6	60	17.0
P-9	2-10-71	(b)	—	—	42	—	370	—	—	—	—	17	—	200	170	1,250	1,400	7.2	—	11.5
	3-31-71	(b)	—	—	164	—	7,300	—	—	—	—	6	—	—	—	14,200	22,000	8.1	—	16.0

a = estimated
b = affected by tide

Table 5. — **Arsenic and heavy metals in water at sites A-5 and P-5**
(Results in micrograms per liter)

Sampling site	Date of collection	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Mercury (Hg)	Iron (Fe)	Manganese (Mn)	Lead (Pb)	Zinc (Zn)
A-5	2- 9-71	40	0	30	0	0.5	150	10	0	30
	4- 1-71	10	—	20	0	0	90	10	0	30
P-5	2-10-71	50	0	20	0	.5	170	0	0	50
	3-31-71	10	—	20	0	.5	150	10	0	40
Criteria[a]		50		50	500		300		50	1,000

[a]Rules of the Florida Air and Water Pollution Control Commission, State of Florida

Table 6. — **Biochemical oxygen demand and bacteria**

Sampling site	Date of Collection	Discharge, cfs	BOD, mg/1, 5-day at 20°C	Total coliform[a]	Fecal coliform[a]	Fecal streptococcus[a]	FC/FS ratio
A-4	12-18-70	2.6	0.4	b100	—	—	—
	8-11-71	53	2.2	66	30	—	—
	8-25-71	121	1.3	2200	46	190	0.24
A-5	12-18-70	—	.6	800	—	—	—
	8-11-71	—	1.2	79	59	—	—
	8-25-71	—	1.1	820	44	270	.16
A-6	12-18-70	—	1.3	b320			
	8-11-71	—	1.3	630	54	—	—
	8-25-71	—	.9	1200	41	220	.19
A-9	12-18-70	—	2.6	b60	—	—	—
	8-11-71	—	2.3	110	23	—	—
	8-25-71	—	2.0	210	0	b2	
A-10	8-11-71	—	1.8	66	—	—	—
	8-25-71	—	1.4	820	60	43	1.4
A-11	12-18-70	—	1.9	160	—	—	—
	8-11-71	—	2.1	160	51	—	—
	8-25-71	—	1.3	520	—	47	—
P-4	8-12-71	12	1.5	250	b60	—	—
	8-25-71	44	1.0	480	b30	120	0.25
P-5	8-12-71	—	.8	490	b60	—	—
	8-25-71	—	.8	550	60	200	.30
P-6	8-12-71	—	1.7	200	c120	—	—
	8-25-71	—	1.7	650	90	160	.56
P-7	8-12-71	—	1.7	1200	c120		
	8-25-71	—	1.2	1600	360	330	1.1
P-8	8-12-71	—	1.4	140	60		
	8-25-71	—	1.1	1200	c170	240	0.71
P-9	8-12-71	—	2.0	120	—	—	—
	8-25-71	—	1.2	800	56	55	1.0

[a]Individuals/100 ml of sample
[b]Low colony count
[c]Non-ideal count

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BUREAU OF GEOLOGY

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