



Figure 11.--Relation of chloride to dissolved solids concentration in water from the lower Hawthorn-upper Tampa aquifer, Sanibel and Captiva Islands.

If wells tapping water-bearing zones are being degraded by saline water entering the wells through the casing or by other means, more detailed field study will be required to determine the mechanism by which the degradation is occurring. Of 24 wells from which water samples were collected at least 1 year apart, the chloride concentration increased in 3, decreased in 10, and remained the same in 5. The pattern is random, and there is no relation between increase in chloride concentration and distance to the center of pumping.

A summary of selected chemical constituents in water from the deep aquifers is shown on table 3. When comparing the range in chemical constituents and their averages, it is evident that the water from the lower Hawthorn-upper Tampa aquifer is generally more saline. Chloride, magnesium, and calcium concentrations in water from this aquifer are at least twice as great as in water from the upper Hawthorn aquifer; sulfate is about the same, and bicarbonate is less. Water from the upper Hawthorn aquifer, however, has a greater range in concentrations of chemical constituents.

WATER USE

Two deep artesian aquifers are the principal sources of water supply on Sanibel and Captiva Islands. Most of the water used is obtained from deep wells that tap the lower aquifer in the lower part of the Hawthorn Formation and the upper part of the Tampa Limestone, chiefly those wells of the Island Water Association which treat and distribute water throughout the islands. The average pumpage from these wells in 1977 was 1.4 Mgal/d or 496 Mgal for the year (table 4). This water is processed through a desalination plant on Sanibel Island before distribution. Additional treated water is purchased from the Greater Pine Island Water Association, when needed, and is transmitted to the island through a pipeline underlying San Carlos Bay. About 22 Mgal were purchased in 1977. In addition, wells 408 and 587 on the northern part of Captiva Island are used as an emergency supply for the Island Water Association. In 1977, the two wells produced about 300,000 gallons.

Most of the remaining deep artesian wells on Sanibel and Captiva Islands are used for irrigation of lawns and golf courses. Private pumpage in 1977 from wells in both of the deep artesian aquifers for all purposes is estimated at about 135 Mgal (0.37 Mgal/d) on Sanibel and about 59 Mgal (0.16 Mgal/d) on Captiva. Most of this water was withdrawn during the dry season, November to June.

The total volume of water withdrawn in 1977 from the deep aquifers was estimated to be 690 Mgal, an average of about 1.9 Mgal/d. The total capacity of all existing wells tapping the deep artesian aquifers is estimated at about 6 Mgal/d, or about 3 times the 1977 daily average use.

Table 3.--Summary of selected constituents in water from the upper Hawthorn aquifer and from the lower Hawthorn-upper Tampa aquifer, Sanibel and Captiva Islands

[All values in milligrams per liter]

	Upper Hawthorn aquifer		Lower Hawthorn- upper Tampa aquifer	
	Average	Range	Average	Range
Calcium	43	18-75	94	48-160
Magnesium	35	13-60	92	40-180
Sodium	439	230-700	664	440-1,000
Potassium	29	18-40	39	14-60
Sulfate	379	100-890	381	270-700
Chloride	403	140-730	1,078	440-2,200
Fluoride	3.2	2.0-3.6	2.2	1.1-3.5
Bicarbonate	322	200-427	210	128-288
Carbonate hardness	254	99-440	610	290-1,200
Dissolved solids	1,540	721-2,390	2,571	1,700-4,130

Table 4.--Monthly water pumpage from Island Water Association wells on Sanibel Island

[Millions of gallons]

Month	1974	1975	1976	1977	1978	1979
January	-	<u>1</u> /35.2	43.5	39.2	37.1	34.4
February	-	24.1	43.8	41.0	29.0	35.7
March	-	<u>1</u> /33.7	52.4	58.4	39.1	41.4
April	36.2	40.0	51.6	48.7	33.4	41.0
May	<u>1</u> /34.2	41.9	42.7	43.3	29.5	34.8
June	<u>1</u> /30.7	43.5	36.5	40.5	28.6	33.3
July	<u>1</u> /33.0	38.8	44.8	40.1	30.7	33.9
August	<u>1</u> /28.1	39.3	38.5	40.9	31.1	38.8
September	25.4	29.6	32.1	28.9	21.9	27.9
October	21.2	33.2	35.7	33.7	27.4	31.5
November	31.3	38.0	39.9	41.6	27.9	44.7
December	29.3	42.1	43.2	40.0	31.0	42.6
Total	269.4	439.4	504.7	496.3	366.8	440.0
Daily Average	1.0	1.2	1.4	1.4	1.0	1.2

1/ Estimated

SUMMARY AND CONCLUSIONS

Sanibel and Captiva Islands are underlain by a series of freshwater and saline-water zones. The water-table zone, from land surface to a depth of about 15 to 30 feet, commonly contains freshwater in the upper part of the zone and saline water in the lower part. A shallow artesian zone underlies the water-table zone and extends from a depth of about 30 to as much as 120 feet. This aquifer contains saline water with chloride concentrations ranging from 2,250 to 30,900 mg/L. The Tamiami Formation, which underlies the shallow artesian zone, locally provides small amounts of potable water to wells, although at some localities this zone contains salty water.

The Hawthorn Formation and Tampa Limestone successively underlie the Tamiami Formation. These formations consist predominantly of gray-white phosphatic limestone with interbedded carbonate clay or marl. The Hawthorn Formation and Tampa Limestone contain two widely used artesian aquifers: (1) the upper Hawthorn aquifer in the upper part of the Hawthorn Formation, and (2) the lower Hawthorn-upper Tampa aquifer in the lower part of the Hawthorn Formation and upper part of the Tampa Limestone.

Water from the upper Hawthorn aquifer is used to supply water mostly to residents on North Captiva Island, Captiva Island, and northwestern Sanibel Island. Water from this aquifer is usually better quality than that from the lower Hawthorn-upper Tampa aquifer. North Captiva Island, Captiva Island, and northwestern Sanibel Island are areas where the water can be used without desalination. Water from the upper Hawthorn aquifer contains dissolved solids concentration which averages 1,540 mg/L. The water contains about 440 mg/L of sodium, 400 mg/L of chloride, and 380 mg/L of sulfate plus smaller concentrations of other chemical constituents. Water levels in wells that tap the upper Hawthorn aquifer range from 8 to 15 feet above sea level; most wells flow at land surface.

The lower Hawthorn-upper Tampa aquifer is the principal source of water supply for most uses on Sanibel and Captiva Islands. Desalinated water from this aquifer constitutes part of the public supply for these islands. Wells that tap this lower aquifer may flow at rates as much as 160 gal/min. The water ranges in calcium magnesium hardness from 330 to 1,200 mg/L. The dissolved solids concentration in water ranges from 1,700 to 4,130 mg/L and averages 2,570 mg/L. The water contains about 660 mg/L of sodium, 1,080 mg/L of chloride, and 380 mg/L of sulfate. Between July and November 1977, water levels in the aquifer ranged from about 7 to 32 feet above sea level throughout Sanibel and Captiva. Water levels were lowest in the central part of Sanibel Island where most of the production wells for the Island Water Association are located.

Pumpage from both deep artesian aquifers for all purposes during 1977 was about 690 Mgal, averaging 1.9 Mgal/d. During 1977, pumpage from wells of the Island Water Association open to the lower Hawthorn-upper Tampa aquifer averaged about 1.4 Mgal/d.

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