

RECONNAISSANCE WATER SAMPLING FOR  
RADIUM-226 IN CENTRAL AND NORTHERN  
FLORIDA, DECEMBER 1974-MARCH 1976

by

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For use of those readers who may prefer to use metric units rather than English units, the conversion factor for the term used in this report is listed below:

<u>English</u>	<u>Multiply by</u>	<u>Metric</u>
ft (foot)	0.3048	m (meter)

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ABSTRACT

Analyses of 115 water samples collected from December 1974 through March 1976 in eight Florida Counties indicated that 22 samples (19 percent) had radium-226 activities equal to or in excess of 3 picocuries per liter, the concentration limit recommended for drinking water by the U.S. Public Health Service. The maximum radium-226 activity was 90 picocuries per liter in water from a shallow well in Polk County.

The sampling reconnaissance was generally limited to areas of active phosphate mining and areas of undisturbed phosphate deposits. Because of this it is not known if high radium-226 activities are also present elsewhere in the State where there are no phosphate deposits.

INTRODUCTION

According to EPA (Environmental Protection Agency, 1974), radium-226 activities of some waters in Polk County exceed the drinking water limit of 3 pCi/l (picocuries per liter) recommended by the U.S. Public Health Service (U.S. Public Health Service, 1962). The report concluded that the high activities of radium-226 might be the result of phosphate mining operations and suggested that additional studies be made.

As a result of the EPA report (1974), Governor Reuben O'D. Askew requested that a Task Force of Federal, State, and local agencies be formed to conduct a second reconnaissance study. The Task Force was composed mainly of representatives from the Southwest Florida Water Management District, the Suwannee River Water Management District, the Florida State Department of Environmental Regulation and the U.S. Geological Survey. This cooperative reconnaissance water sampling was conducted by these agencies from December 1974 through March 1976.

Water samples were collected for radium-226 analysis at selected sites in Hamilton, Suwannee, Columbia, Hillsborough, Polk, Hardee, Manatee, and DeSoto Counties (fig. 1). Samples were collected mainly in areas of active and potential phosphate mining. The primary emphasis of the reconnaissance was to sample ground water from the shallow sand

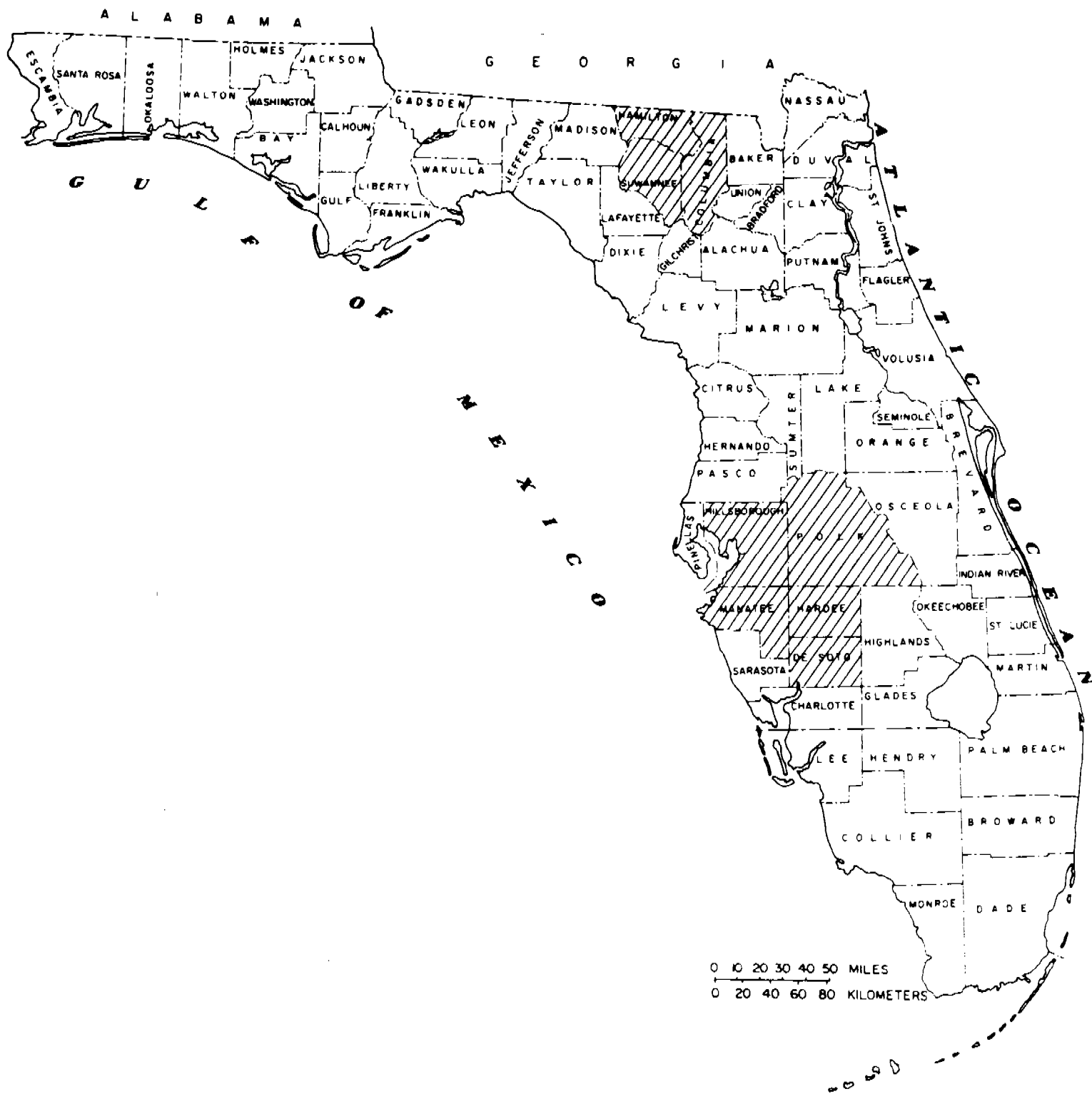


FIGURE 1.--Areas selected for analysis of radium-226 in water.

aquifer and from both the upper and lower parts of the artesian Floridan aquifer. Some surface-water samples were collected, mainly in the Peace River drainage basin in southwest Florida. In all, 115 water samples were analyzed for radium-226.

## METHODS

Water samples collected during this reconnaissance were analyzed by the U.S. Geological Survey in Denver, Colorado, using the Radon emanation analytical method (Thatcher and others, written commun., 1976). Although the same analytical method was used to analyze for the radium-226 in all samples, two different preanalysis sample treatments were used. Seventy-nine of the samples were filtered through a 0.45 micrometer membrane in the laboratory and analyzed with no additional treatment. Thirty-six of the samples were acidified prior to analysis with 10 milliliters of 6-normal nitric acid per gallon of sample. After acidification the samples were mixed, digested at room temperature for 24 hours, then filtered through a 0.45 micrometer membrane, for subsequent analysis. This preanalysis treatment (acidification and filtration), requested by the Department of Environmental Regulation, is not a technique endorsed by the U.S. Geological Survey.

## RESULTS

Radium-226 analyses of 79 untreated, filtered, unacidified ground- and surface-water samples collected in Polk, Hillsborough, DeSoto, Manatee, and Hardee Counties are listed in table 1. The minimum activity detected was 0.05 pCi/l in a U.S. Geological Survey monitor well in the shallow-sand aquifer in northern Hardee County. The maximum activity was 90 pCi/l, occurring in a water sample collected in March 1976 from a shallow well in Polk County. A sample collected in February 1976 from this same well had a radium-226 activity of 22 pCi/l.

Radium-226 activity exceeding 3 pCi/l was detected in water from all aquifers from wells ranging in depth from 17 to 2,788 ft (7 to 850 m). Radium-226 activity was less than 3 pCi/l in all surface-water samples, except a sample from a slime pit.

Of the 77 sites sampled for radium-226 in central Florida, water from 16 sites (21 percent) did not meet the drinking water standards of the U.S. Public Health Service. Water from the shallow-sand aquifer had both the highest and lowest radium-226 activities, and water from 6 of 44 sites (14 percent) exceeded 3 pCi/l. Water from 5 of the 18 wells (28 percent) tapping the upper part of the Floridan aquifer, and from 1 of 11 wells (9 percent) tapping the lower part of the Floridan aquifer

Table 1.--Summary of radium-226 data from selected sites in Polk, Hardee, DeSoto, Manatee, and Hillsborough Counties, December 1974-March 1976. (Filtered, unacidified water samples.)

Symbols have been omitted from the latitude and longitude coordinates. Latitude 274504 should read 27°45'04" and longitude 814656 should read 81°46'56".

Latitude	Longitude	County	Well Depth		Date of Collection	Radium 226 (PiC/1)	Aquifer <sup>2/</sup>	Remarks
			Total (feet)	Casing (feet)				
274504	814656	Polk	Peace River <sup>1/</sup> at Ft. Meade		12/06/74	0.12		
275219	821241	Hillsborough	Alafia River <sup>1/</sup> at Lithia		do.	.06		
275158	821357	do.	Lithia Springs <sup>1/</sup> at Lithia		do.	.68		
271303	815037	DeSoto	320	141	12/20/74	7.9	UF	Municipal supply for the city of Arcadia.
272954	814930	Hardee	220	84	12/03/74	1.5	UF	Near future phosphate mining area.
272954	814930	do.	35	21	do.	.20	SA	Do.
273001	820816	Manatee	1225	750	01/29/75	4.7	LF	Do.
273002	820817	do.	195	130	do.	.54	LF	Do.
273008	820816	do.	30	20	do.	.20	SA	Do.
273008	820817	do.	650	500	do.	1.4	LF	Do.
273516	814628	Hardee	17	12	03/12/75	.24	SA	USGS monitor well

<sup>1/</sup> Duplicate Samples (See Table 3).

<sup>2/</sup> See page 10 for explanation

Table 1.--Summary of radium-226 data from selected sites in Polk, Hardee, DeSoto, Manatee, and Hillsborough Counties, December 1974-March 1976. (Filtered, unacidified water samples.)--Continued

Latitude	Longitude	County	Well Depth		Date of Collection	Radium 226 (Pic/1)	Aquifer <sup>2/</sup>	Remarks
			Total (feet)	Casing (feet)				
273528	813448	Hardee	17	12	03/12/75	0.20	SA	USGS monitor well
273532	814024	do.	26	21	02/27/75	.05	SA	Do.
273540	815216	do.	17	12	02/25/75	.20	SA	Do.
273541	820203	do.	18	13	02/25/75	1.9	SA	Do.
273659	815639	do.	23	18	02/26/75	.20	SA	Do.
273846	820320	Manatee	18	8	02/25/75	.20	SA	Do.
273847	813946	Polk	51	46	03/12/75	.20	UF	Do.
274925	815913	do.	24	21	12/04/74	.26	SA	Sand mine tailings
274942	815315	do.	22	17	02/26/75	.64	SA	USGS monitor well
275006	821442	Hillsborough	31	26	03/17/75	.20	SA	Do.
275020	813830	Polk	21	16	03/19/75	.20	SA	Do.
275110	820255	Hillsborough	17	12	03/11/75	4.5	SA	Do.
275121	815034	Polk	Slime Pit (S-1)		01/08/75	25	-	Pit filled with water and clay by-products
275129	820104	do.	80	60	12/10/74	1.5	UF	Domestic well

<sup>2/</sup> See page 10 for explanation

Table 1.--Summary of radium-226 data from selected sites in Polk, Hardee, DeSoto, Manatee, and Hillsborough Counties, December 1974-March 1976. (Filtered, unacidified water samples.)--Continued

Latitude	Longitude	County	Well Depth		Date of Collection	Radium 226 (PiC/l)	Aquifer <sup>2/</sup>	Remarks
			Total (feet)	Casing (feet)				
275143	815044	Polk	700	272	12/04/74	1.6	LF	Water level observation well
275145	815044	do.	145	63	12/12/74	.37	UF	Do
275211	815101	do.	(a)	(a)	12/13/74	.58	UF	Near slime pit (S-1)
275216	815101	do.	(a)	(a)	do	1.5	UF	Do
275220	814830	do.	772	196	12/05/74	.79	LF	Agricultural - citrus processing near slime pit (S-1)
275221	814946	do.	(a)	(a)	01/08/75	14	UF	Near slime pit (S-1)
275308	815007	do.	(a)	(a)	12/12/74	.96	UF	Water well in Bartow area
275337	815233	do.	(a)	(a)	01/08/75	6.0	UF	Near slime pit (S-1)
275406	813745	do.	200	99	02/13/76	7.3	UF	Domestic well
275408	815957	do.	2,788	2,775	12/04/74	19	(a)	Monitor well at a chemical waste injection site

<sup>2/</sup> (a) See page 10 for explanation.

Table 1.--Summary of radium-226 data from selected sites in Polk, Hardee, DeSoto, Manatee, and Hillsborough Counties, December 1974-March 1976. (Filtered, unacidified water samples.)--Continued

Latitude	Longitude	County	Well Depth		Date of Collection	Radium 226 (Pic/l)	Aquifer <sup>2/</sup>	Remarks
			Total (feet)	Casing (feet)				
273937	815159	Polk	23	20	12/03/74	4.4	SA	Completed in phosphate sands.
273937	815159	do.	do.	do.	03/03/76	5.7	SA	Do.
273950	814922	do.	22	17	02/26/75	.20	SA	USGS monitor well
274004	815330	do.	23	18	do	.54	SA	Do.
274033	820536	Hillsborough	11	11	12/10/74	1.5	SA	Domestic well
274043	813733	Polk	32	27	03/12/75	1.4	SA	USGS monitor well
274132	814143	do.	27	22	02/27/75	22		Do.
274132	814143	do.	do.	do.	03/13/76	90	SA	Do.
274154	815729	do.	27	22	02/25/75	.20	SA	Do.
274155	815732	do.	302	280	12/13/74	.14	LF	Observation well
274159	815645	do.	60	(a)	12/05/74	3.4	SA	Adjacent property mined for phosphate
274216	820847	Hillsborough	22	17	02/26/75	.20	SA	USGS monitor well
274217	821442	do.	22	17	03/17/75	.29	SA	Do.
274336	820336	do.	17	12	03/11/75	.20	SA	Do.

<sup>2/</sup> (a) See page 10 for explanation

Table 1.--Summary of radium-226 data from selected sites in Polk, Hardee, DeSoto, Manatee, and Hillsborough Counties, December 1974-March 1976. (Filtered, unacidified water samples.)--Continued

Latitude	Longitude	County	Well Depth		Date of Collection	Radium 226 (PiC/l)	Aquifer <sup>2/</sup>	Remarks
			Total (feet)	Casing (feet)				
274400	820708	Hillsborough	826	246 <u>1/</u>	12/10/74	0.06	LF	Observation well in future phosphate mining area
274400	820708	do.	160	114 <u>1/</u>	do.	.24	UF	Do.
274400	813552	Polk	20	15	03/19/75	.20	SA	USGS monitor well
274438	814456	do.	122	84	12/10/75	.26	UF	Old irrigation well
274451	815316	do.	27	22	03/11/75	.20	SA	USGS monitor well
274505	814903	do.	23	18	02/25/75	.32	SA	Do.
274536	815938	do.	16	11	02/25/75	.28	SA	Do.
274544	821442	Hillsborough	22	17	02/25/75	.32	SA	Do.
274612	815035	Polk	(a)	(a)	12/05/74	5.3	SA	Domestic well indicating high Ra-226 in May 1974
274622	814141	do.	27	22	03/19/75	.20	SA	USGS monitor well
274712	815347	do.	803	284	12/02/74	1.5	LF	Industrial well
274729	814435	do.	39	34	03/19/75	7.7	SA	USGS monitor well
274731	820323	do.	15	10	03/11/75	2.0	SA	Do.
274748	815855	do	200	87	12/12/74	4.5	UF	Observation well in future mining area

1/ Duplicate sample (See Table 3)

2/ (a) See page 10 for explanation