

DISTRIBUTION AND OCCURRENCE OF TOTAL COLIFORM BACTERIA IN  
FLORIDAN AQUIFER WELLS, WESTERN LAKE COUNTY, FLORIDA

By George F. Taylor

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U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 84-4130

Prepared in cooperation with the  
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT and  
LAKE COUNTY, FLORIDA



Tallahassee, Florida

1984

UNITED STATES DEPARTMENT OF THE INTERIOR

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ABSTRACT

This report presents total coliform bacteria data for Floridan aquifer wells in western Lake County, central Florida. Included are data collected from 1966 to 1979 by the Florida Department of Environmental Regulation for 98 public supply wells, and data collected during 1982 by the U.S. Geological Survey for 29 wells.

The data for the 98 public supplies indicate that 85 percent have a record of total coliform occurrence in the raw water. Data from the 29 wells sampled by the Geological Survey indicate that 55 percent have a record of total coliform occurrence. Further comparison of the two data sets indicates that the Geological Survey data generally indicate a lower percentage of sites with coliform occurrence and, in some cases, a different pattern of occurrence than did the Department of Environmental Regulation data.

INTRODUCTION

Lake County comprises about 1,150 square miles in central-peninsular Florida. Western Lake County, as used herein, is an area of about 775 square miles and includes all of Lake County west of the Orange County - Lake County boundary and west of the northward extension of this boundary (fig. 1).

Agricultural and recreational land uses predominate in western Lake County. The population density is relatively low and distributed more or less evenly in the several municipalities and numerous smaller rural communities.

The Floridan aquifer is the source of water for all public supply systems in western Lake County, as well as for most of the central part of the State. One of the most persistent problems associated with public water-supply systems in western Lake County are reports of the presence of coliform bacteria in the raw water obtained from Floridan aquifer wells. Positive tests for total coliform bacteria appear to occur with a significantly greater frequency in western Lake County than in other areas of central peninsular Florida (K. R. Wicks, Lake County Department of Pollution Control, oral commun., 1980).

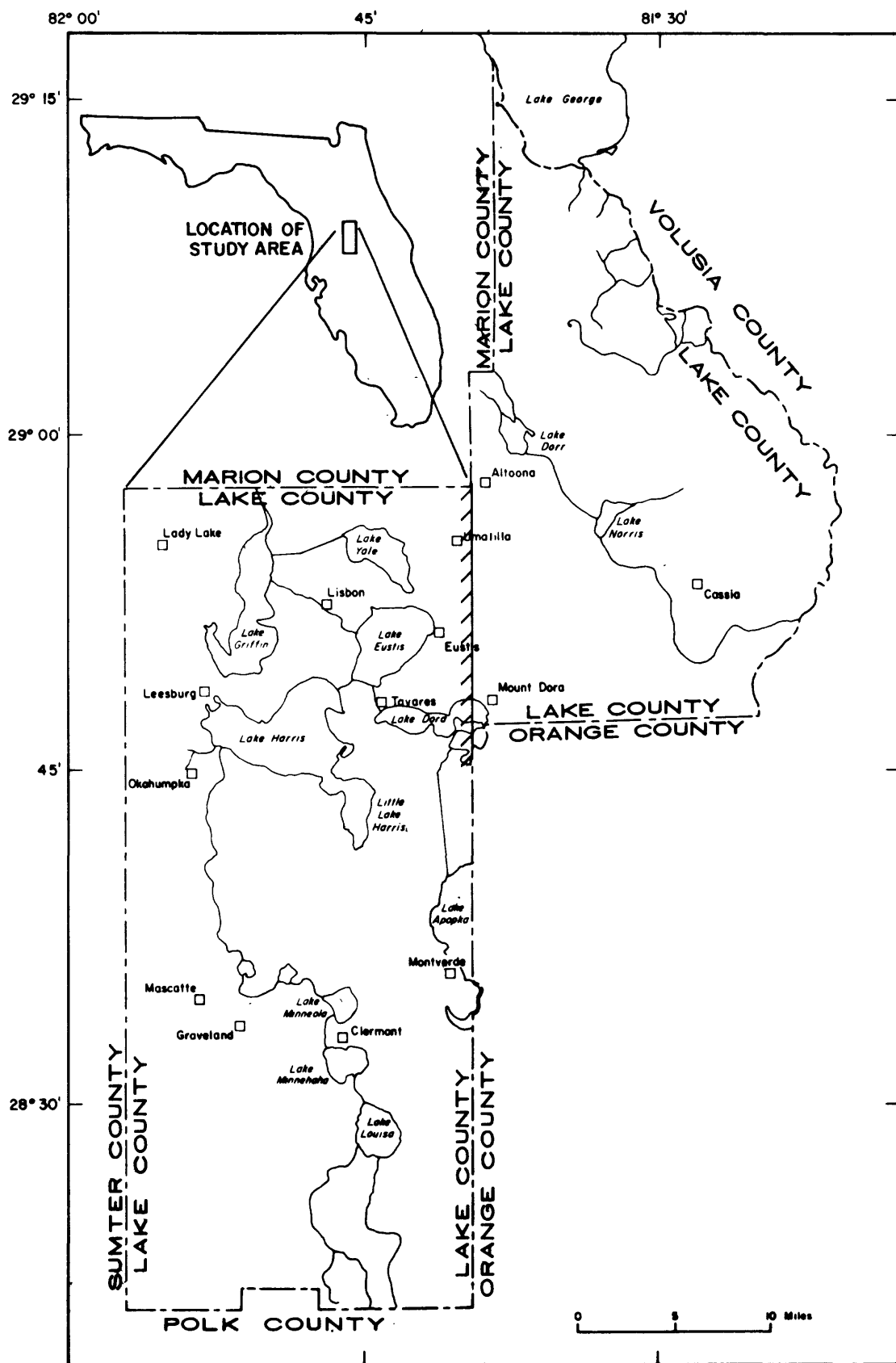


Figure 1.--Location of western Lake County.

The U.S. Geological Survey conducted a reconnaissance of western Lake County during 1982 in cooperation with Lake County and the St. Johns River Water Management District. Objectives were to (1) compile and evaluate the historical information on occurrence of total coliform bacteria in the Floridan aquifer, and (2) establish and resample a network of wells within the area for bacterial analyses. This report presents and summarizes the total coliform data from the reconnaissance investigation.

## WELL CONSTRUCTION

Although the precise mechanisms of contamination of Floridan aquifer wells are unknown, a likely possibility could be the result of improper well construction. A brief discussion of the methods used for construction of large-diameter wells in western Lake County is included below.

Prior to the 1970's, most public supply wells and almost all irrigation wells were drilled by cable tool method. In that method, steel well casing is driven to refusal, that is, driven downward until the bottom of the casing is seated in competent rock. The well is then completed as open hole into the limestone of the Floridan aquifer.

The first competent rock was not always at the top of the Floridan aquifer, but in some instances was actually a relatively thin limestone stringer underlain by a thickness of clayey sand and silt that, in turn, was underlain by the Floridan aquifer. In those instances, the open hole, or uncased, length of the well was subject to having sand, silt, or clay enter the well. In many cases, this posed no particular problem except for, perhaps, raised levels of turbidity. However, the potential exists for bacteria or other pollutants to enter the well from a horizon that is not part of the Floridan aquifer. Unfortunately, well records are not adequate to identify or locate the wells constructed with insufficient casing.

In more recent years, public supply wells were generally drilled by mud rotary method and were cement grouted back to land surface. The rotary method allows drilling to progress through limestone stringers and down and into the first few feet of the persistent limestone of the Floridan prior to emplacement of the permanent well casing. The casing is then lowered to the bottom of the hole and is cement grouted in place from bottom to land surface. The well is then completed as open hole by a variety of drilling methods including cable tool. Thus, the well is protected from caving of the overburden by the steel casing and is effectively sealed from direct surface contamination by the cement grout seal.

## ACQUISITION AND PRESENTATION OF COLIFORM BACTERIA DATA

### Data for 1966-79

All public water suppliers are required to periodically submit data on total coliform analyses and other parameters to the FDER (Florida Department of Environmental Regulation). Data for 98 public water supplies in western Lake County were obtained from the FDER; raw water samples from these supplies had been periodically sampled and analyzed for total coliform bacteria from 1966 to 1979.

The data for total coliform result from analyses by the membrane filter method. For purposes of this method, total coliform bacteria are defined as all organisms which produce colonies with a golden-green metallic sheen within 24 hours when incubated at 35°C on M-Endo medium (Greenson and others, 1977, p. 29). The sample to be incubated is collected on a special filter by filtration of 100 mL of the raw water. Care is taken not to contaminate the sample with coliform during the entire process of collection and analysis.

The total coliform data obtained from the FDER are summarized in table 1. Each of the 98 public water supplies is assigned a sequential, or site ID, number that is used to show its location in figures 2 through 6. Each site also is identified by coordinates of latitude-longitude. Where applicable, these coordinates indicate the location of the public supply well from which water samples were collected. Some public supplies, however, submit composite raw water samples from several wells; in these cases, the coordinates indicate location of the water-treatment plant.

The sampling frequency at the sites for which data are summarized in table 1 varied, depending on the size of the population served and results of bacteria analysis. In addition, the period of sampling and total number of samples varied between sites. So, to simplify the data analysis, the classification for sites used herein is:

Y = total coliform bacteria present in at least  
one sample during period of analyses

N = no total coliform bacteria present during  
period of analyses

In applying this simple classification it was arbitrarily assumed that no total coliform bacteria were present at a site during the period of analyses if: (1) the maximum number of colonies counted for any sample was 3 per 100 mL of sample, or less, and; (2) the number of positive samples was less than 20 percent of the total samples analyzed for the site. The results of this classification are shown, in the rightmost column of table 1, for each of the 98 sites.



Table 1.--Summary of total coliform data from  
Florida Department of Environmental Regulation

Site ID No.	Location LatLong		Sample period	Total coliform					Site classi- fication Y or N
				Number of samples			Counts MaxMin		
				Posi- Taken	Nega- tive	tive			
1	282204	814110	5/75-3/79	42	13	29	50	0	Y
2	282637	813922	11/72-9/79	47	5	42	50	0	Y
3	282732	815457	7/76-4/78	54	10	44	50	0	Y
4	282825	814545	5/78-1/79	7	5	2	14	0	Y
5	282922	814327	1/76-11/78	20	5	15	50	0	Y
6	283005	814629	2/76-8/79	11	5	6	50	0	Y
7	283104	814535	1/72-9/79	47	16	31	50	0	Y
8	283149	814702	10/72-8/79	77	8	69	50	0	Y
9	283220	813950	11/75-12/78	30	12	18	50	0	Y
10	283310	815040	4/75-8/79	43	5	38	18	0	Y
11	283320	814820	2/76-9/79	39	4	35	50	0	Y
12	283330	815120	7/72-8/79	25	5	20	50	0	Y
13	283333	814823	10/75-9/79	46	14	32	50	0	Y
14	283354	815115	1/76-8/79	68	11	57	33	0	Y
15	283354	815121	11/73-9/79	126	25	101	50	0	Y
16	283415	814100	8/72-8/79	57	6	51	21	0	Y
17	283430	814500	11/76-8/79	219	129	90	50	0	Y
18	283430	814900	2/75-9/79	60	4	56	23	0	Y
19	283432	815306	10/76-9/79	103	71	32	50	0	Y
20	283530	814535	8/72-9/79	61	5	56	50	0	Y
21	283530	814605	12/74-8/79	85	57	28	50	0	Y
22	283534	814012	4/76-9/79	44	6	38	50	0	Y
23	283723	814515	7/76-9/79	40	10	30	50	0	Y
24	283840	814800	10/77-9/79	162	1	161	50	0	Y
25	283952	815103	11/77-9/79	116	48	68	50	0	Y
26	284000	815200	6/76-9/79	37	5	32	50	0	Y
27	284230	814400	7/72-9/79	60	4	56	50	0	Y
28	284235	814615	11/75-8/79	96	1	95	9	0	Y
29	284300	814655	4/76-9/79	74	7	67	14	0	Y
30	284329	815249	10/75-3/78	538	372	166	50	0	Y
31	284331	814657	1/75-9/79	53	14	39	50	0	Y
32	284342	814402	3/76-11/78	24	2	22	50	0	Y
33	284408	814348	6/76-9/79	73	5	68	25	0	Y
34	284450	814805	8/76-8/79	33	3	30	6	0	Y
35	284450	814940	1/76-8/79	41	8	33	6	0	Y

Table 1.--Summary of total coliform data from  
Florida Department of Environmental Regulation--Continued

Site ID No.	Location LatLong		Sample period	Total coliform					Site classi- fication Y or N
				Number of samples			Counts		
				Posi- Taken	Nega- tive	Max	Min		
36	284513	815154	6/76-9/79	121	2	119	14	0	Y
37	284543	814110	9/74-9/79	108	8	100	33	0	Y
38	284552	814525	11/76-9/79	53	23	30	50	0	Y
39	284615	814520	7/76-4/78	15	5	10	50	0	Y
40	284638	815300	1/76-9/79	46	4	42	5	0	Y
41	284807	814330	1/76-8/79	163	10	153	50	0	Y
42	284810	814340	2/77-9/79	28	3	25	10	0	Y
43	284840	814518	7/72-8/79	83	10	73	12	0	Y
44	284840	815330	12/76-9/79	428	165	263	19	0	Y
45	284905	814540	3/76-3/78	20	1	19	7	0	Y
46	284910	814350	2/73-9/79	49	12	37	50	0	Y
47	284912	814616	2/73-4/77	36	6	30	50	0	Y
48	284921	815124	12/72-9/79	125	69	56	50	0	Y
49	284925	815020	7/76-8/79	52	8	44	40	0	Y
50	284930	814320	8/75-3/79	47	3	44	19	0	Y
51	284932	814755	6/73-9/79	60	15	45	50	0	Y
52	284942	814727	3/76-9/79	49	2	47	50	0	Y
53	284937	815011	7/76-9/79	42	1	41	37	0	Y
54	284947	814633	7/72-9/79	57	2	55	13	0	Y
55	285003	814950	8/73-9/79	43	5	38	10	0	Y
56	285016	815200	12/75-9/79	64	2	62	50	0	Y
57	285017	814722	1/76-9/79	55	2	53	18	0	Y
58	285058	815328	7/73-8/79	101	30	71	50	0	Y
59	285059	815316	3/74-8/79	74	4	70	16	0	Y
60	285109	815240	7/75-9/79	25	5	20	50	0	Y
61	285112	815315	6/76-7/79	78	20	58	27	0	Y
62	285128	815320	2/76-5/79	29	7	22	11	0	Y
63	285140	815028	6/78-9/79	36	1	35	19	0	Y
64	285142	815137	1/74-4/79	107	23	84	50	0	Y
65	285142	815145	12/73-8/79	112	1	111	9	0	Y
66	285145	815200	4/75-7/79	74	8	66	50	0	Y
67	285206	814070	1/76-9/79	45	1	44	50	0	Y
68	285209	814512	2/76-8/79	41	1	40	7	0	Y
69	285213	814652	2/74-2/79	37	6	31	50	0	Y
70	285215	814612	4/76-8/79	102	21	81	40	0	Y

Table 1.--Summary of total coliform data from  
Florida Department of Environmental Regulation--Continued

Site ID No.	Location LatLong		Sample period	Total coliform					Site classi- fication Y or N
				Number of samples			Counts		
				Posi- Taken	Nega- tive	Counts Max	Min		
71	285220	814700	7/72-6/79	30	7	23	50	0	Y
72	285230	814412	6/76-9/79	87	7	80	50	0	Y
73	285230	815512	12/74-9/79	51	2	49	4	0	Y
74	285230	815512	1/75-9/79	50	3	47	17	0	Y
75	285244	814334	3/74-9/79	21	11	10	50	0	Y
76	285250	815511	6/74-7/79	43	7	36	50	0	Y
77	285304	815413	8/76-9/79	115	38	77	20	0	Y
78	285422	815430	2/77-8/79	53	13	40	50	0	Y
79	285428	815430	9/73-9/79	92	26	66	50	0	Y
80	285441	815457	5/76-9/79	83	37	46	50	0	Y
81	285500	815307	11/74-9/79	53	4	49	50	0	Y
82	285700	815530	3/75-8/79	67	7	60	50	0	Y
83	285700	815655	7/74-8/79	79	14	65	50	0	Y
84	282207	814100	5/76-2/78	22	0	22	0	0	N
85	283506	813939	5/73-6/79	49	0	49	0	0	N
86	283716	814602	10/77-9/79	162	1	161	1	0	N
87	284210	814040	5/76-10/78	41	0	41	0	0	N
88	284558	815304	11/75-9/79	51	0	51	0	0	N
89	284606	815311	9/75-9/79	63	0	63	0	0	N
90	284850	815050	2/75-9/79	53	3	50	3	0	N
91	284910	814650	8/76-9/79	56	1	55	3	0	N
92	284912	813940	9/74-9/79	54	0	54	0	0	N
93	284943	814813	2/76-8/79	41	0	41	0	0	N
94	285028	814646	3/77-4/79	16	3	13	2	0	N
95	285030	814622	12/75-9/79	54	8	46	3	0	N
96	285030	814630	7/75-9/79	31	0	31	0	0	N
97	285228	814750	2/78-1/79	21	1	20	1	0	N
98	285440	815535	1/78-8/79	72	1	71	2	0	N



### Data for 1982

During this reconnaissance the Geological Survey sampled raw water from 29 Floridan aquifer supply wells for coliform bacteria analyses. The network sites were selected on the basis of obtaining representative coverage of the western Lake County study area. That is, some were selected to allow resampling of wells that the FDER data had indicated routinely to contain, or not to contain, coliform; others were selected on the basis of obtaining reasonable coverage of the different geohydrologic areas in western Lake County. The total of 29 public supply wells are from 22 different public supply systems.

This network of 29 wells was sampled by Geological Survey personnel during April through August 1982, to encompass part of both the dry and wet seasons of the year. Most network wells were sampled on a monthly basis. However, a few sites were sampled less frequently due to limited accessibility. The majority (18 of 29 sites) were sampled four times.

All samples were collected and analyzed in accord with methods from Greeson and others (1977, p. 29-33). The membrane filter method of analysis was used on 100 mL of sample and resulting colonies were counted and reported as colonies per 100 mL of sample, as were those in the FDER data base. All samples collected by the Geological Survey were analyzed for both fecal and total coliform bacteria, in order to detect the possibility of warmblooded animal waste as a source of any bacterial contamination.

A summary of the total coliform bacteria data from this network of 29 wells is shown in table 2. This summary is analogous to the summary of pre-existing data shown in table 1. The fecal coliform data also are shown in table 2.

### Comparison of Data

The summary of data for the 98 public supplies from FDER files (table 1) indicates that a majority have had some total coliform bacteria reported over the years. Eighty-five percent of these supplies had a record of recurring total coliform occurrence in the raw water; only 15 of 98 supplies recorded no coliform bacteria during the monitoring period.

The summary of data for the network sampled by the Geological Survey (table 2) also indicates that a majority had some total coliform bacteria reported. Fifty-five percent (16 of 29 wells) had a record of coliform occurrence during the monitoring period. Fecal coliform bacteria were present in samples from 3 of the 29 wells.

To further portray and compare data from tables 1 and 2, the classification (Y or N) results and site ID numbers are plotted on base maps that show various hydrologic and geohydrologic features for western Lake County (figs. 2 through 6). In each of these figures the classification results for the FDER data set and the Geological Survey data set are plotted separately on the base

Table 2.--Summary of total and fecal coliform data  
collected and analyzed by U.S. Geological Survey

[Sample period from April through August 1982]

Site ID No.	Location LatLong		Total coliform					Site classi- fication Y or N	Fecal coliform		
			Number of samples		Counts	Counts	Counts				
			Taken	Posi- tive					Nega- tive	Max	Date
1	282204	814110	4	2	2	9	0	Y	0	-	0
2	283430	814500	1	1	0	2	0	Y	0	-	0
3	283432	815306	4	2	2	4	0	Y	0	-	0
4	283600	814020	3	2	1	50	0	Y	0	-	0
5	284252	814412	4	1	3	4	0	Y	0	-	0
6	284840	815330	1	1	0	5	0	Y	0	-	0
7	284841	815330	4	2	2	11	0	Y	0	-	0
8	284921	815124	5	3	2	50	0	Y	1	4/82	1
9	284934	814748	4	1	3	7	0	Y	0	-	0
10	285047	814010	4	1	3	6	0	Y	0	-	0
11	285129	815410	4	1	3	3	0	Y	0	-	0
12	285140	815028	1	1	0	12	0	Y	0	-	0
13	285145	815200	4	3	1	32	0	Y	1	5/82	1
14	285206	814070	4	1	3	16	0	Y	0	-	0
15	285424	815416	4	1	3	15	0	Y	0	-	0
16	285700	815530	4	1	3	2	0	Y	1	5/82	1
17	282732	814456	4	0	4	0	0	N	0	-	0
18	283254	814632	3	0	3	0	0	N	0	-	0
19	283305	815140	4	0	4	0	0	N	0	-	0
20	283313	814500	1	0	1	0	0	N	0	-	0
21	283338	815123	1	0	1	0	0	N	0	-	0
22	283346	814447	3	0	3	0	0	N	0	-	0
23	283604	814030	1	0	1	0	0	N	0	-	0
24	283716	814602	4	0	4	0	0	N	0	-	0
25	284445	814621	3	0	3	0	0	N	0	-	0
26	284513	815154	4	0	4	0	0	N	0	-	0
27	284822	815207	4	0	4	0	0	N	0	-	0
28	285244	814334	4	0	4	0	0	N	0	-	0
29	285627	814000	4	0	4	0	0	N	0	-	0

map. Also, distribution of the Y classification sites by the various hydrologic and geohydrologic features is shown in tables 3 through 7. This type of presentation is used to allow more ready comparison between the two sets of data.

The distribution of total coliform data sites in relation to drainage basins is shown in figure 2. Topography in western Lake County consists of ridges, upland areas, and broad valleys which contain a number of lakes. Most of the area drains north by way of the Oklawaha River; however, the western part of the area is drained by the Withlacoochee River basin, and the southeastern corner is drained by the Kissimmee River basin. Several parts of the area are internally drained (fig. 2). Table 3 shows the distribution of the Y classification sites by drainage basins.

Table 3.--Distribution of Y classification sites  
by drainage basins

Drainage basin	FDER data, percent of sites with total coliform	Geological Survey data percent of sites with total coliform
Withlacoochee River basin	14/15 = 93 percent	3/5 = 60 percent
Oklawaha River basin	67/80 = 84 percent	11/23 = 48 percent
Kissimmee River basin	2/3 = 67 percent	1/1 = 100 percent
Internally drained karst areas	11/12 = 92 percent	3/5 = 60 percent

For the FDER data set the highest proportion (93 percent) of Y classification sites is in the Withlacoochee River basin; and 84 and 67 percent, respectively, of sites in the Oklawaha and Kissimmee River basins are classified as Y. Ninety-two percent of sites in the karst areas (in parts of all three river basins) are Y classification sites. For the Geological Survey data set, the proportion of Y classification data sites are lower but their distribution is generally similar to that of the FDER data set, with the exception of the Kissimmee River basin in which only one site was sampled.

The area is in the Central Highlands topographic division, which is further divided into five landforms (Sumter Upland, Central Valley, Mount Dora Ridge, Lake Wales Ridge, and Lake Upland) in western Lake County (fig. 3). Land-surface altitudes range from more than 300 feet above sea level on the Lake Wales Ridge to less than 60 feet in the Central Valley. Coliform bacteria have occurred in wells in all the five landform areas (table 4).

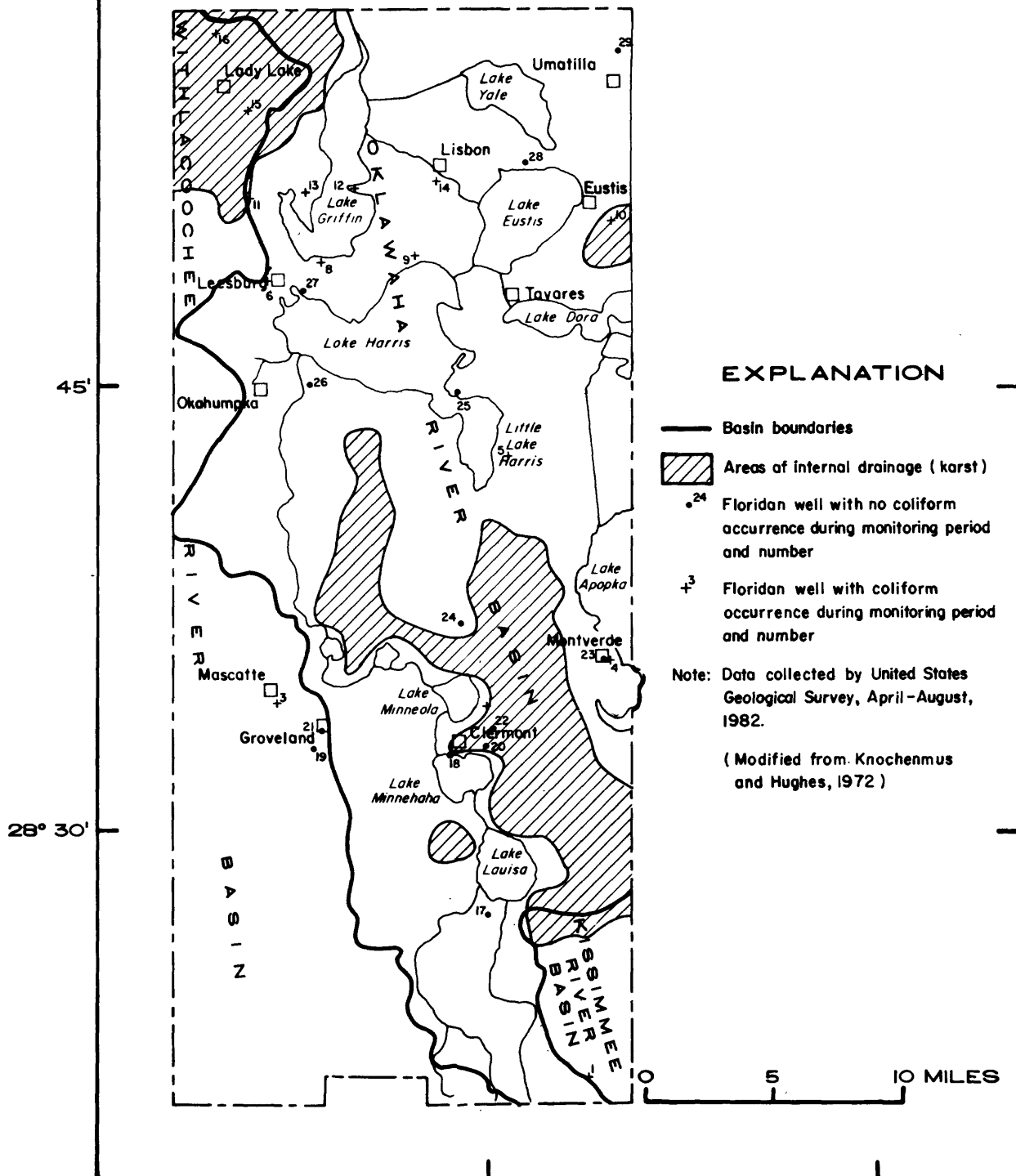




29° 00' 82° 00'

45'

81° 30'



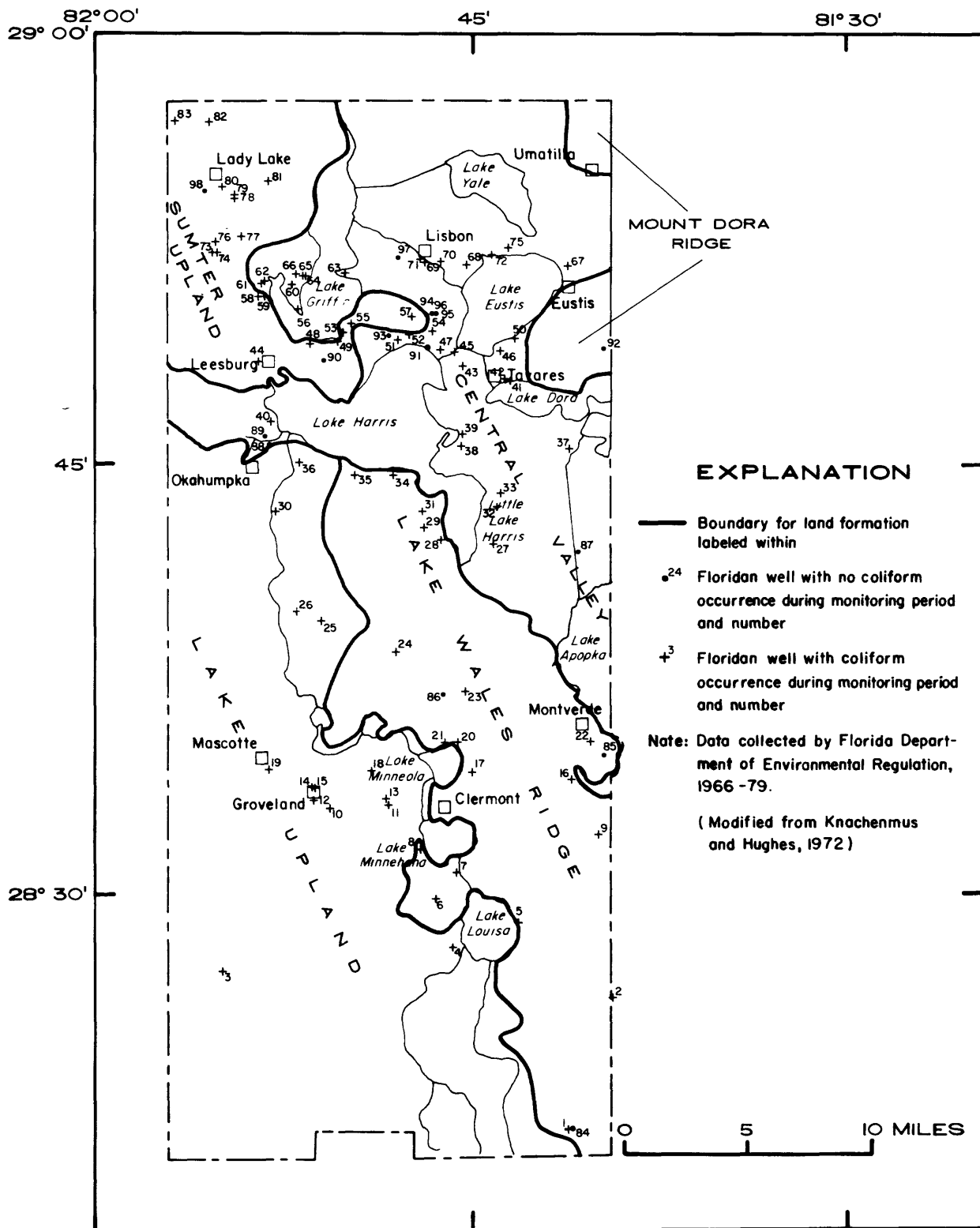


Figure 3.--Total coliform occurrence and landforms.

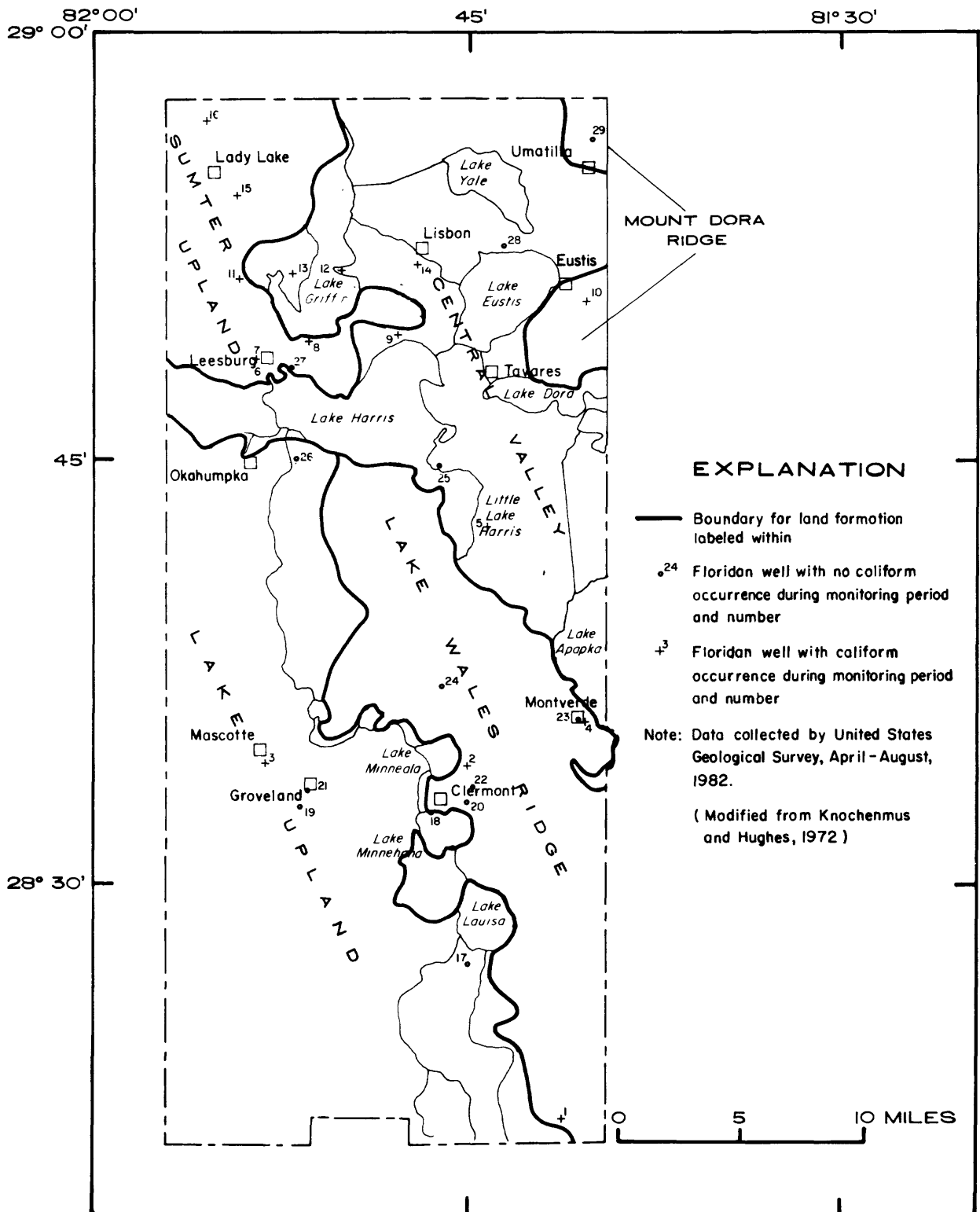




Table 4.--Distribution of Y classification sites  
by landforms

Landform	FDER data, percent of sites with total coliform	Geological Survey data percent of sites with total coliform
Lake Upland	14/14 = 100 percent	1/6 = 17 percent
Sumter Upland	18/20 = 90 percent	6/7 = 86 percent
Lake Wales Ridge	19/22 = 86 percent	3/7 = 43 percent
Central Valley	32/41 = 78 percent	5/7 = 71 percent
Mount Dora Ridge	0/1 = 0 percent	1/2 = 50 percent

For the FDER data set, all sites in the Lake Upland are Y classification; and the other landforms also have a high proportion of Y classification sites, with the exception of the Mount Dora Ridge where only one well had been sampled. The highest proportion of Y classification sites for the Geological Survey data set is 86 percent for wells in Sumter Upland.

The distribution of total coliform data in relation to thickness of overburden on the Floridan aquifer is shown in figure 4. The thickness of overburden on the Floridan aquifer ranges from less than 50 to about 200 feet. Sandy material in the upper part of these overburden deposits forms the surficial aquifer. The proportion of clayey material tends to increase with depth in the overburden and the lower part of it confines, or partially confines the underlying Floridan aquifer. The distribution of Y classification sets by thickness of overburden is shown in table 5.

Table 5.--Distribution of Y classification sites by  
thickness of overburden

Thickness of overburden	FDER data, percent of sites with total coliform	Geological Survey data percent of sites with total coliform
0-50 feet	4/4 = 100 percent	2/2 = 100 percent
50-100 feet	35/39 = 90 percent	4/10 = 40 percent
100-200 feet	44/59 = 80 percent	10/17 = 59 percent

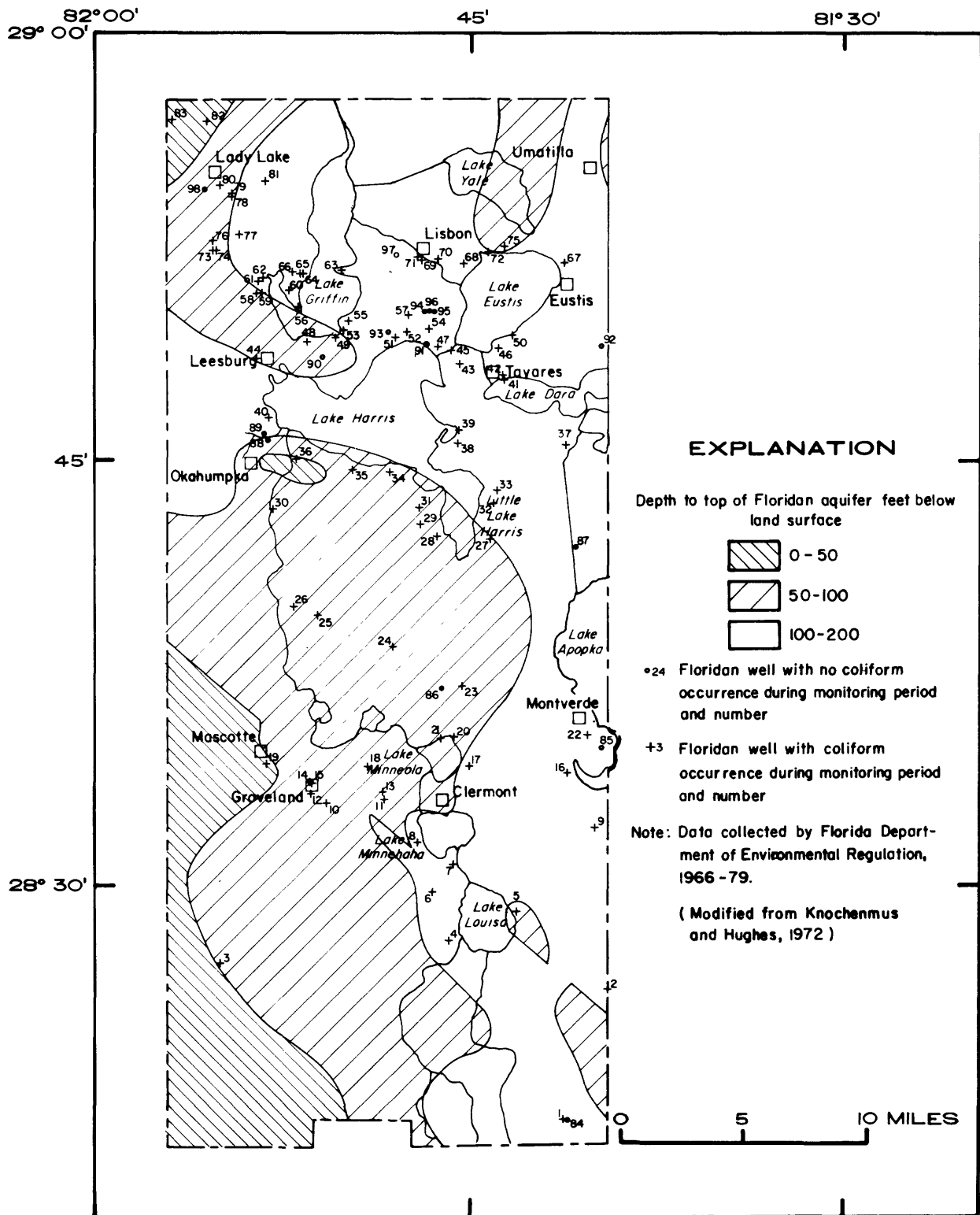


Figure 4. Total coliform occurrence and the thickness of overburden on Floridan aquifer.

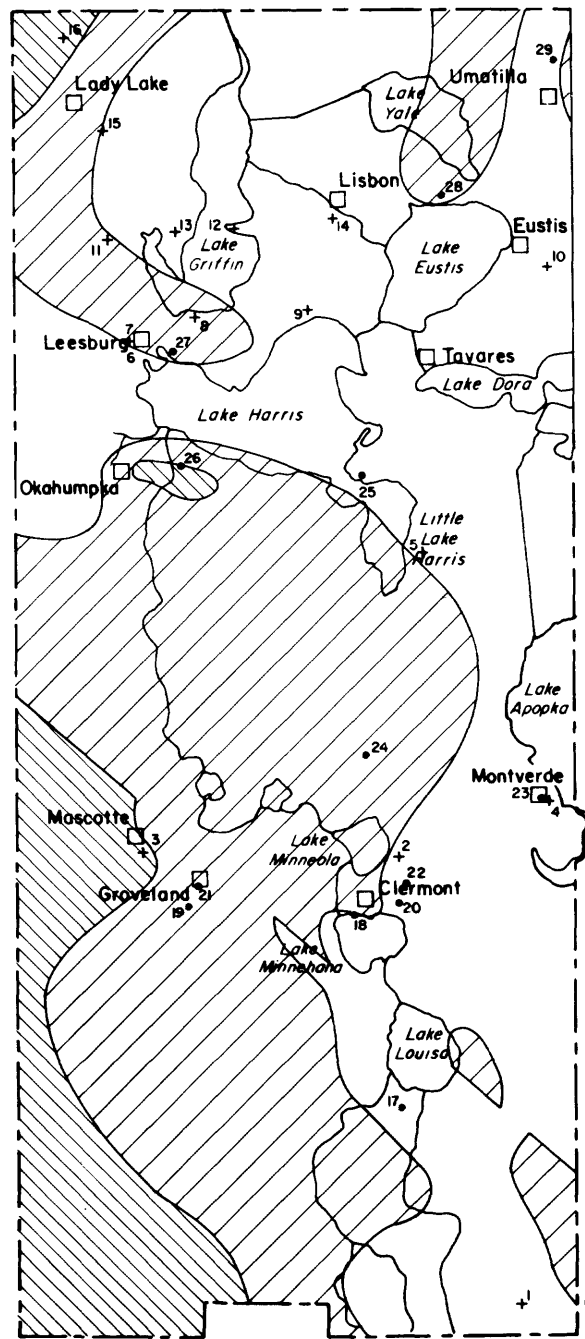
82° 00'  
29° 00'

45'

81° 30'




45'

28° 30'



### EXPLANATION

Depth to top of Floridan aquifer, feet below land surface

-  0 - 50
-  50 - 100
-  100 - 200

•<sup>24</sup> Floridan well with no coliform occurrence during monitoring period and number

+<sup>3</sup> Floridan well with coliform occurrence during monitoring period and number

Note: Data collected by United States Geological Survey, April-August, 1982.

( Modified from Knachenmus and Hughes, 1972 )

0 5 10 MILES





The FDER data indicate high proportions (80 percent, or greater) of Y classification sites in all three of the thickness of overburden categories. The Geological Survey data set show lower percentages of Y classification sites than the FDER data and, excluding the 0 to 50 feet thickness areas, a different pattern of occurrence. That is, the FDER data indicate the 50 to 100 feet thickness areas to have a higher proportion of Y classification sites than the 100 to 200 feet thickness areas, while the Geological Survey data indicate the opposite.

On the basis of interrelations between the two aquifers, ground and surface waters, and topographic and soil association characteristics, six geohydrologic areas were delineated by Knochenmus and Hughes, 1976. These are shown with the distribution of average recharge to the Floridan aquifer in figure 5. The Floridan receives recharge over all of western Lake County except in parts of the Oklawaha River Valley.

The FDER data indicate that all geohydrologic areas (fig. 5) have a high proportion of Y classification sites in relation to amount of annual recharge to the Floridan aquifer (table 6).

Table 6.--Distribution of Y classification sites  
by amounts of annual recharge

Average annual recharge, Floridan aquifer	FDER data, percent of sites with total coliform	Geological Survey data percent of sites with total coliform
2 inches	33/43 = 77 percent	5/7 = 71 percent
6 inches	1/1 = 100 percent	4/10 = 40 percent
10 inches	31/33 = 94 percent	10/17 = 59 percent
14 inches	18/21 = 86 percent	3/7 = 43 percent

However, the Y classification sites occur less frequently (77 percent) in the 2 in/yr recharge areas than in areas of higher recharge. The Geological Survey data set, in contrast, indicates a lower percentage of Y classification sites for all areas and a pattern of increasing percentage of Y classification sites with decreasing recharge.

Artesian flow from the Floridan aquifer occurs only in the Oklawaha River valley (fig. 6). Because of the upward flow from the aquifer the potential for coliform to be present in the water would be expected to be less. The general direction of water movement in the Floridan aquifer is to the north and northeast, as shown by the map of the potentiometric surface (Schiner and

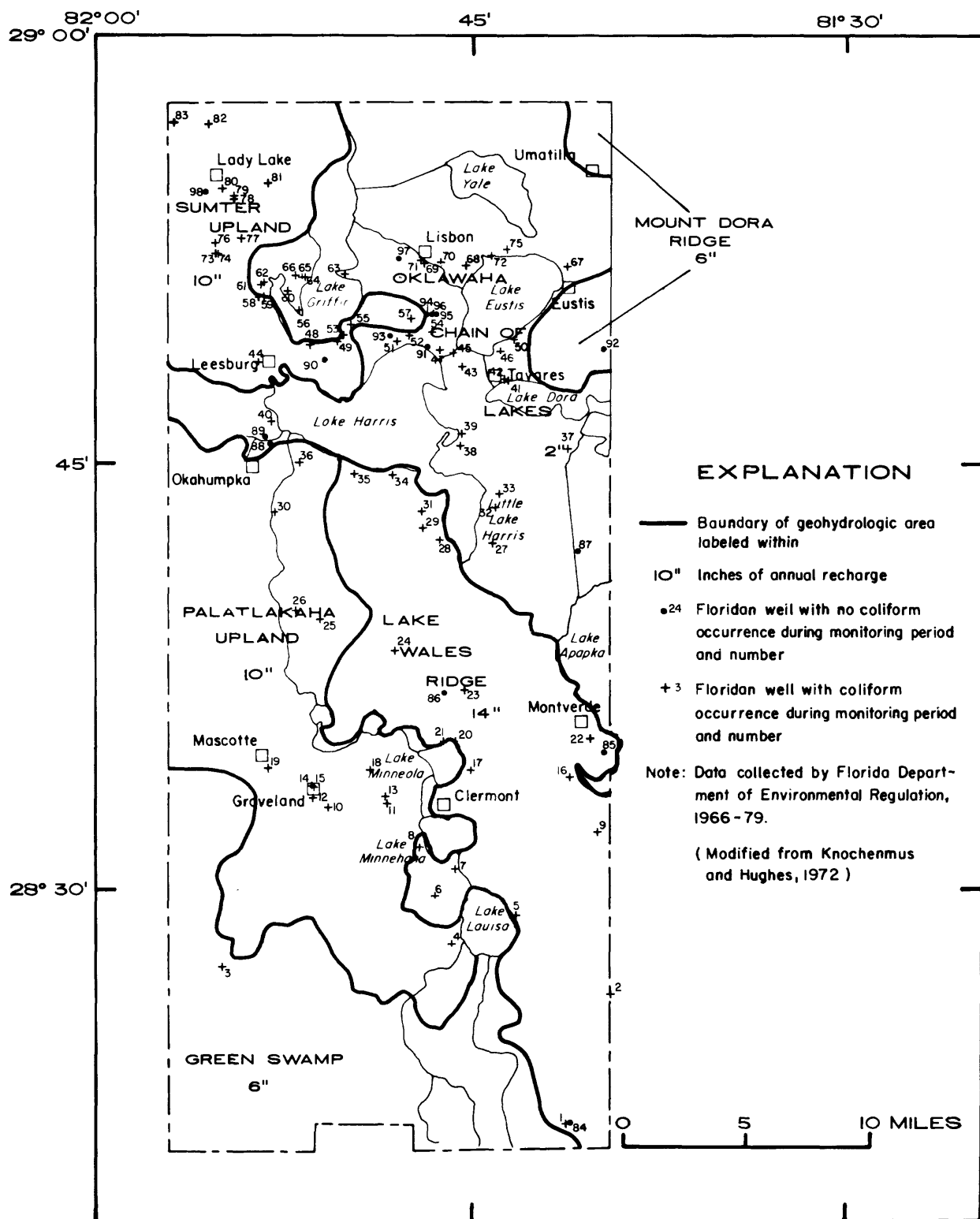
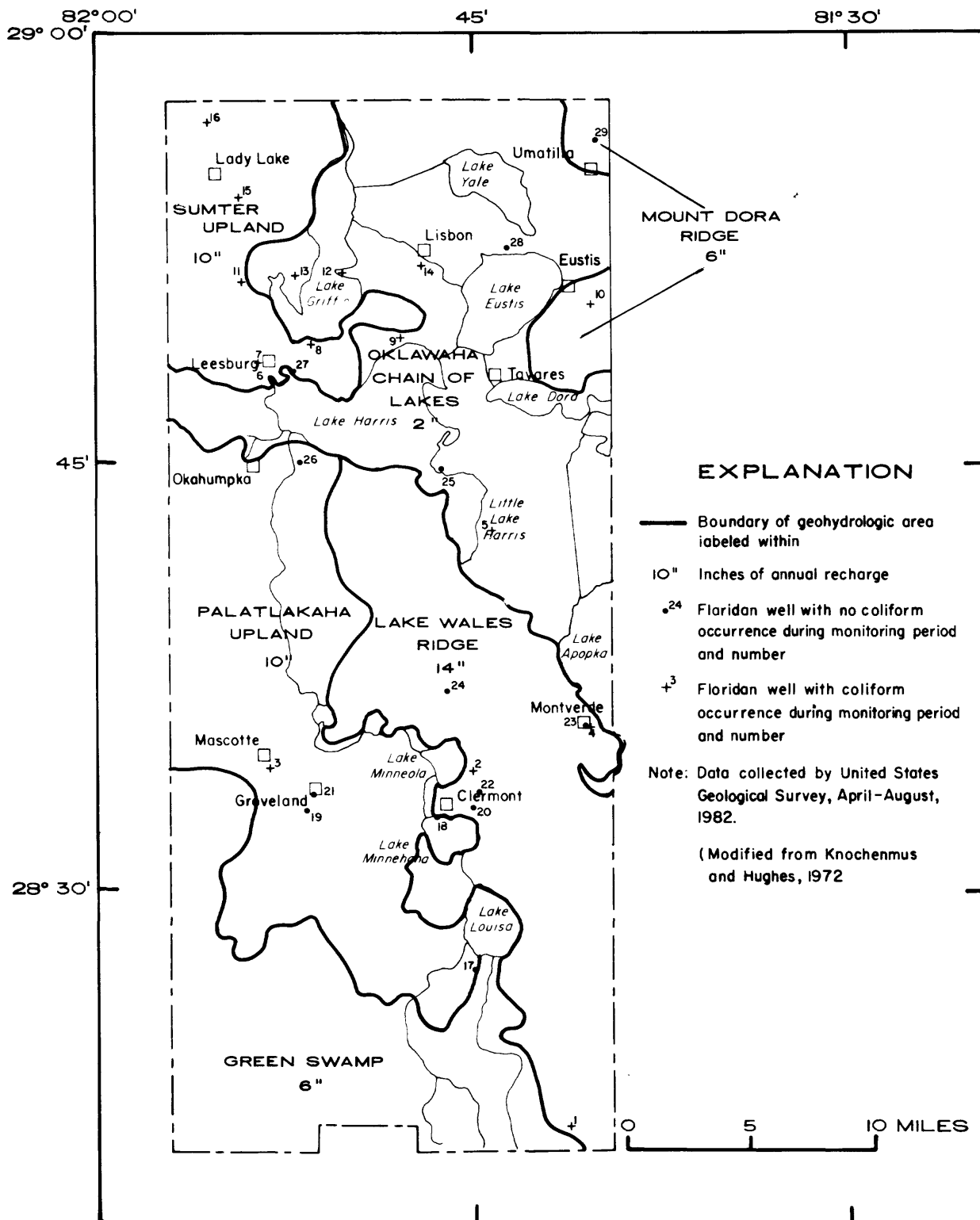


Figure 5.--Total coliform occurrence and the average annual recharge to the Floridan aquifer by geohydrologic areas.



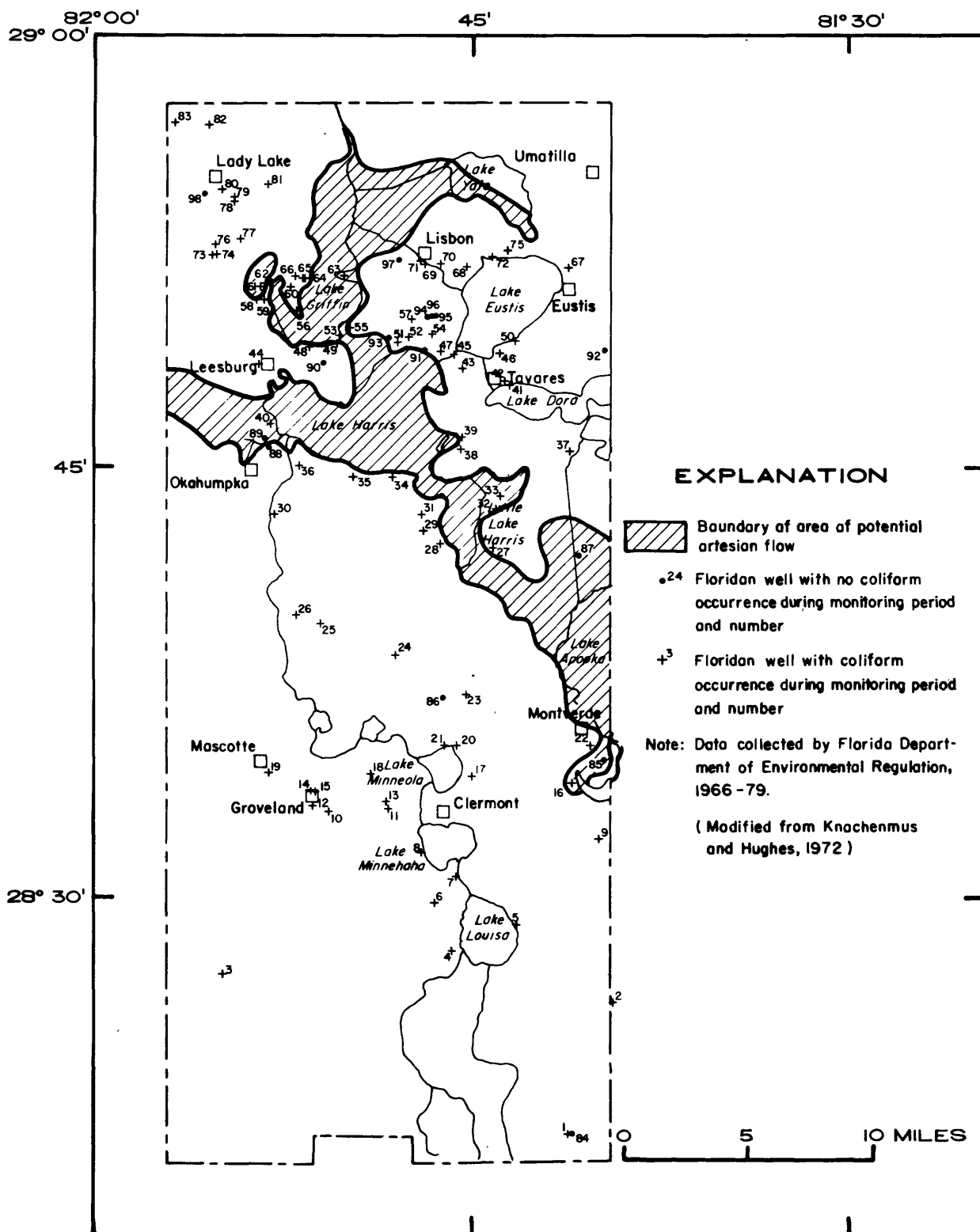
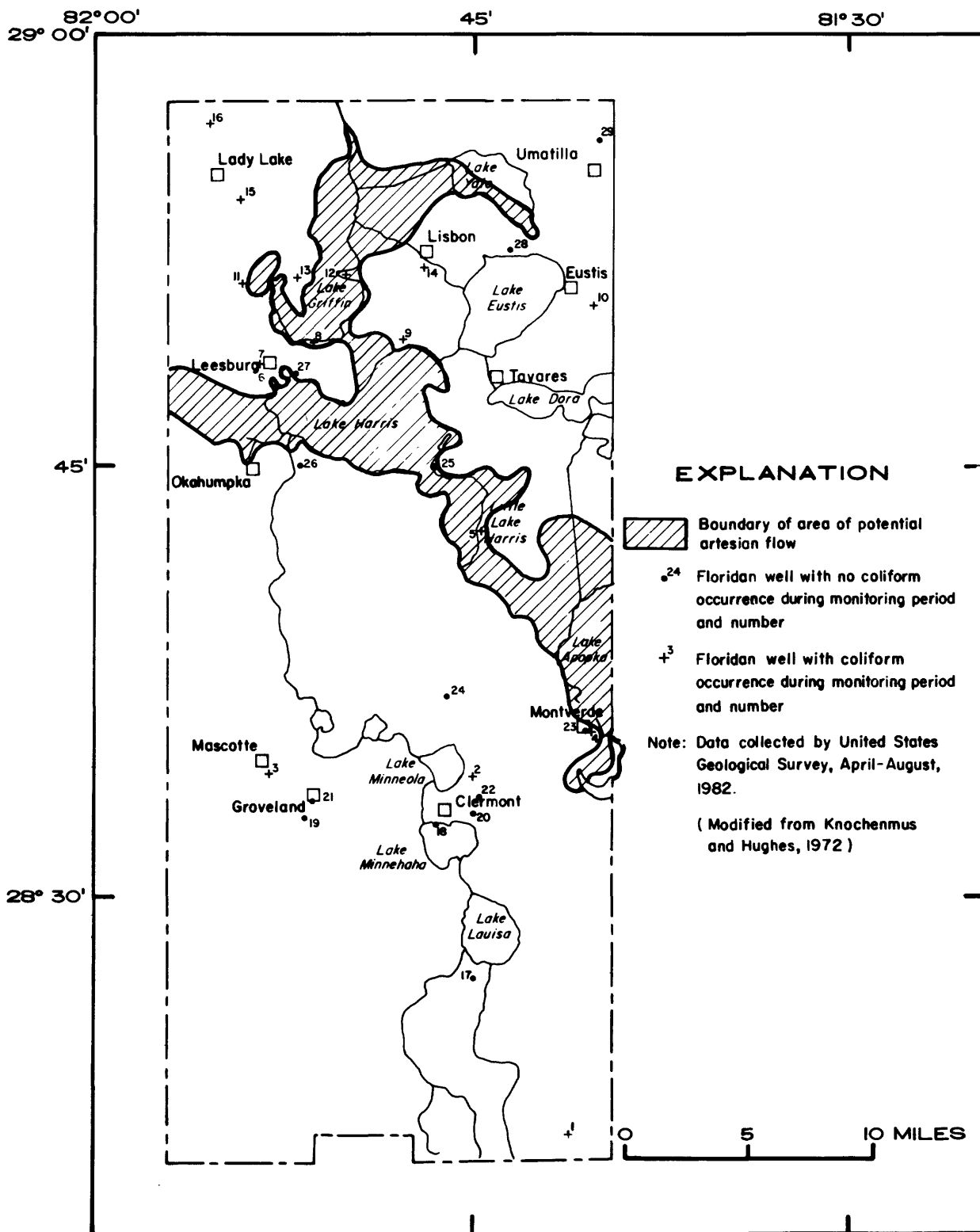


Figure 6.--Total coliform occurrence and areas of artesian flow.



Hayes, 1982) of the aquifer in figure 7. Water that enters the aquifer as recharge in the southern part of the area has the potential to move northward within the area and to discharge in the northern part of the area.

Figure 6 shows distribution of sites for both data sets in relation to areas of artesian flow: table 7 contains distribution of the Y classification sites for both data sets.

Table 7.--Percentage distribution of Y classification sites by areas of artesian flow

	FDER data, percent of sites with total coliform	Geological Survey data percent of sites with total coliform
Areas of artesian flow	10/13 = 77 percent	3/4 = 75 percent
Nonflowing areas	73/85 = 86 percent	13/25 = 52 percent

The FDER data indicate relatively high proportions (77 percent, or greater) of Y classification data sites in areas of artesian flow as well as in nonflowing areas. The Geological Survey data indicate a lower percentage of Y classification data sites in the nonflowing areas.

#### SUMMARY AND CONCLUSIONS

The U.S. Geological Survey conducted a reconnaissance study of western Lake County during 1982 in cooperation with the St. Johns River Water Management District and Lake County. The objectives of this reconnaissance were: (1) to compile and evaluate the historical information on the occurrence of total coliform bacteria in raw well water obtained from the Floridan aquifer, and (2) to establish and resample a network of wells within the area for bacterial analyses. The historical information was collected by the FDER during 1966-79 and included results of total coliform analysis of water from a network of 98 public supply wells. The reconnaissance data collection by the Geological Survey was from April to August 1982, and was comprised of a network of 29 wells.

#### General findings of the reconnaissance:

1. The data collected by the FDER from 1966 to 1979 on raw well water from 98 public supplies indicated that 85 percent of the samples contained total coliform bacteria. Data from the 29 wells sampled from April to August 1982 by the Geological Survey indicated that 55 percent of the samples had positive total coliform occurrence. The apparent variation in total coliform occurrence between the two sampling periods is likely due in part to the differences in areal coverage and sampling-period duration.

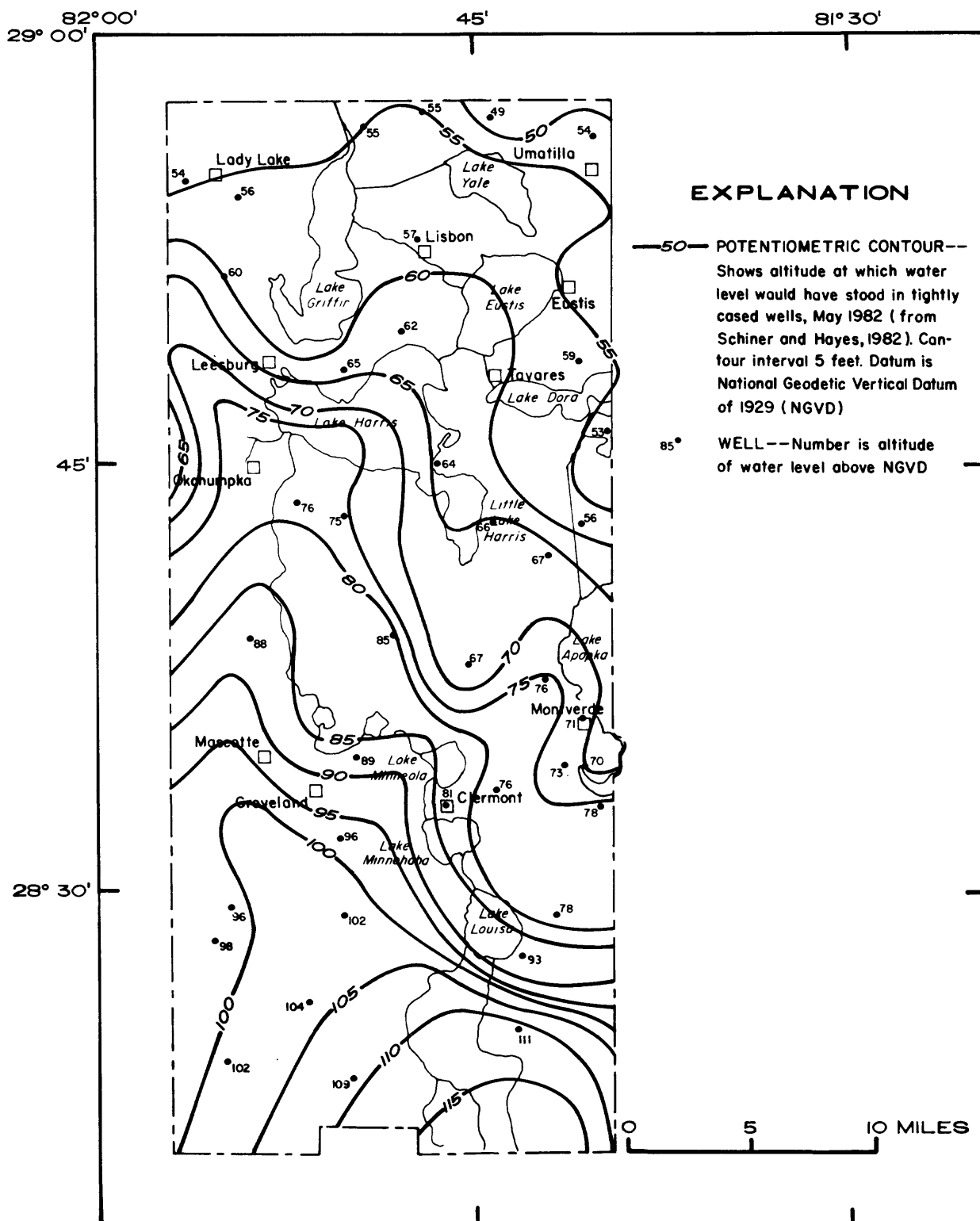


Figure 7.--Potentiometric surface, Floridan aquifer, May 1982.

2. In addition to a lower percentage of sites with coliform occurrence, the 1982 data in some cases indicated a different pattern of occurrence than did the 1966-79 data. For example, differences in the occurrence of total coliform among the three river basins for both sampling periods were indicated. However, the largest difference was noted for the 1982 reconnaissance, ranging from 100 percent occurrence (Kissimmee basin) to 48 percent occurrence (Oklawaha basin). This difference in frequency of occurrence among the river basins is probably not highly significant, however, because the number of samples were not equally distributed among the sites during the 1982 reconnaissance.

3. Relations between the occurrence of total coliform and such hydrologic features as thickness of overburden, recharge, and artesian flow were not indicated from the results of the 1982 reconnaissance.

4. A review of FDER records indicated that other areas of Lake County appear to have a similar history of occurrence of total coliform bacteria in samples from public supply wells.

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