

Figure 1.—Location of the Clear Lake Roadless Area, Leon County, Fla.

EXPLANATION

Jackson Bluff Formation — Pliocene
Hawthorn Formation — Tertiary
St. Marks Formation — Miocene

● Drill hole or well for which formations penetrated were identified by Hendry and Sproul (1966, table 2)
× Clayey sand or borrow pit

— Contact, inferred. Entire area is blanketed by Holocene and Pleistocene sand and clay, shown only in cross-section A-A'

307 Forest Service road

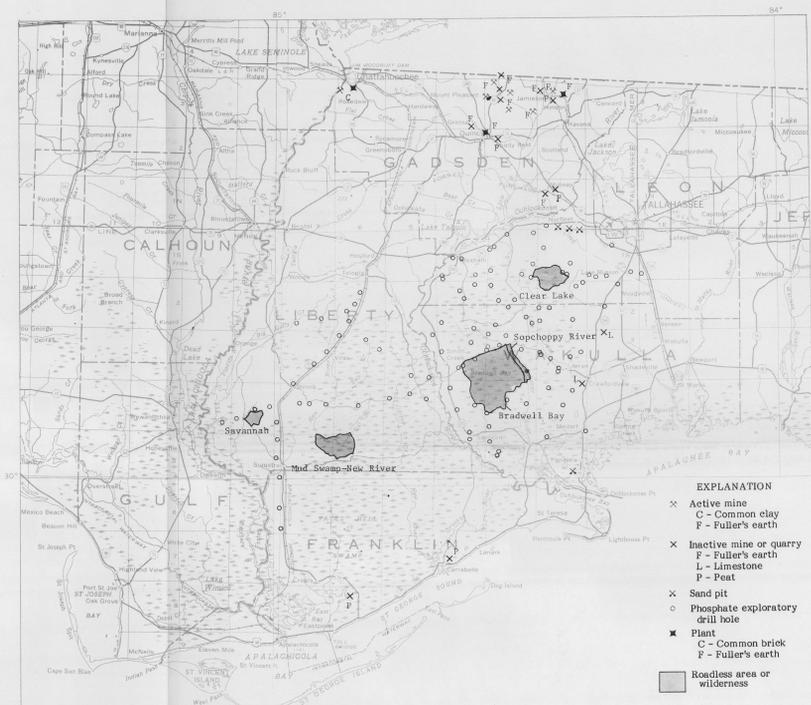


Figure 3.—Locations of industrial-mineral pits, mines, quarries, and plants, in the Big Bend region.

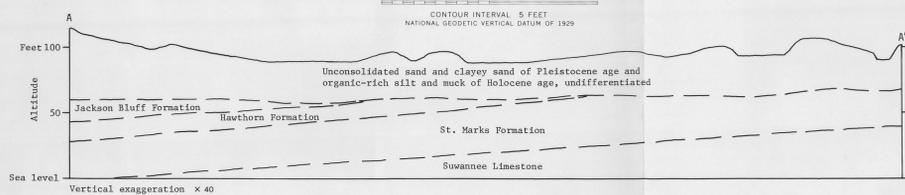


Figure 2.—Geologic map and cross section of the Clear Lake Roadless Area. Map does not show Pleistocene and Holocene sediments.

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral resource potential survey of the Clear Lake Roadless Area in the Apalachicola National Forest, Leon County, Florida. The Clear Lake Roadless Area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

The only mineral material that has been produced within the Clear Lake Roadless Area is clayey sand used as fill for highway construction and for stabilizing Forest Service roads. Fuller's earth, common clay, and sand and gravel presently are produced in Leon County and in nearby counties, and limestone and peat have been produced in the past. However, no commercial deposits of these commodities exist in the Clear Lake Roadless Area. The Apalachicola National Forest has been explored for phosphate and the region recommendered for heavy minerals, but no valuable deposits of either have been found.

The potential for finding valuable mineral deposits or oil and gas in the Clear Lake Roadless Area is low. However, the area and nearby lands have not been thoroughly tested for oil and gas, and the possibilities for discovery cannot be ruled out.

INTRODUCTION

The Clear Lake Roadless Area is in the Apalachicola National Forest, Leon County, which is in the Big Bend region of the Florida panhandle (fig. 1). The area is about 10 mi southwest of the Tallahassee business district. Clear Lake, for which the area is named, is the designation used on U.S. Forest Service maps of the small body of water otherwise called Dog Pond on the U.S. Geological Survey (USGS) topographic map (fig. 2). The roadless area contains 6,485 acres and is bounded by Florida Highway 287 on the southwest and by Forest Service unimproved roads 387, 385, and 383 on the west and north and 307 on the southeast. The topography is gently undulating, altitudes range from a maximum of 117 ft at a benchmark along the western boundary road to a low of 75 ft in the southwestern part of the area. The water level is at 48 ft in the collapsed sinkhole forming the Clear Lake basin. A few small swamps are scattered throughout the area, but permanently wet areas are not as extensive as indicated by the swamp symbols on the map. The drier areas are covered by pine-palmetto flatwoods, and the small swamps support stands of slough, small trees, and other plants of the littoral-vegetation type (Clewley, 1971).

Acknowledgments

The authors are grateful for the cooperation and assistance of several people. William B. Waite, soil scientist, U.S. Forest Service, Tallahassee, Fla., provided soil maps and other information of value during the fieldwork. Personnel of the U.S. Bureau of Land Management, Alexandria, Va., supplied records of leasing and prospecting activities. Staff members of the U.S. Forest Service, Atlanta, Ga., provided information on surface-mineral ownership. David Curry and Felipe A. Pontigo, Jr., of the Florida Bureau of Geology, Tallahassee, aided in gathering information on oil and gas exploration. Officials of the Roberts Sand Co. gave permission for collecting sand samples from the pit at Norfleet, Fla.

SURFACE-AND MINERAL-RIGHTS OWNERSHIP

The Federal Government owns all surface and mineral rights in the Clear Lake Roadless Area, which were acquired under the authority of the Weeks Act in the early 1930s by the U.S. Department of Agriculture, Forest Service.

In the 1950s a permit was issued to the State Highway Department to open a borrow pit and remove fill for construction of State Highway 287. The permit was terminated when highway construction was completed. In the 1960s phosphate-prospecting permits were issued for the entire Apalachicola National Forest; however, there were no subsequent applications for phosphate leases. Although the entire Clear Lake Roadless Area has been under simultaneous oil and gas leases in the past, there were no active oil and gas leases or applications for leases in the area as of October 1981.

GEOLOGY

The Clear Lake Roadless Area is entirely blanketed by unconsolidated sediments of Pleistocene and Holocene age that average about 35 ft in thickness (see section, fig. 2). The principal Pleistocene sand that was called the Wicomico Formation by Hendry and Sproul (1966, p. 83). Holocene sediments consist mainly of a veneer of organically silt, clay, and muck in the basin of Clear Lake and in some of the small swampy areas. Higher areas consist of slightly clayey sand containing minor organic material and peat remains.

Rocks beneath the unconsolidated sediments include the St. Marks and Hawthorn Formations of Miocene age and the Jackson Bluff Formation of Pliocene age (fig. 2). Formational contacts shown in figure 2 are inferred and trend approximately north-south. The St. Marks Formation underlies the eastern third of the Clear Lake Roadless Area, and is predominantly silty and sandy limestone that has undergone varying degrees of dolomitization. It is unconformably overlain by the Hawthorn Formation, which underlies the central portion of the roadless area. The Hawthorn is composed of fine- to medium-grained sand, sandy phosphatic limestone layers, silt, sand-size phosphatic pellets, and irregularly distributed ataxialite, kaolinite, and montmorillonite. Clayey sands and sandy clays of the Jackson Bluff Formation, which underlies the western third of the roadless area, rest conformably on the Hawthorn Formation. The rocks that underlie the St. Marks Formation include about 2,800 ft of Paleocene to Oligocene beds and nearly 4,000 ft of Cretaceous strata. Little is known about the older rocks below the roadless area, but sedimentary facies of Jurassic and Triassic and probably Early Paleozoic ages as well as crystalline rocks are present in the central part of the Apalachicola embayment and probably underlie the roadless area.

Structure

The sedimentary formations underlying the roadless area dip gently to the southwest toward the Apalachicola embayment (Fressler, 1947), which was formed by downwarping of crustal rocks. The central part of the

embayment is filled with sediments of Tertiary to Quaternary age having a thickness of more than 14,000 ft. No faults have been recognized in the roadless area. However, strata have been disturbed in many places by slumping into solution voids.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Fuller's earth, sand and gravel, clayey sand, and common clay are produced in the Big Bend region, and limestone was quarried and past dug in the past. The region also has been explored for phosphate and for oil and gas and recommendered for heavy minerals, but no commercial deposits have been found. The only mining activity within the boundaries of the Clear Lake Roadless Area was the removal of sand from a single borrow pit, which was used as fill in the construction of Florida Highway 287 and for stabilizing Forest Service roads.

Fuller's Earth and Other Clays

A large diatrem leading the world in the production of polygorskite (atapaugite-type fuller's earth) straddles the boundary of Florida and Georgia north of the Clear Lake Roadless Area (fig. 3). The closest active processing plants are at Quincy, Fla., 29 mi northwest of Clear Lake, and Hinson, Fla., 22 mi north of the roadless area. Fuller's earth mines closest to Clear Lake are in the vicinity of Midway, 11 mi north of the area, where the deposits are in the Hawthorn Formation. Mining near Midway ceased about five years ago, but production from pits located farther north has not increased.

Inasmuch as the Hawthorn Formation is present in the central part of the Clear Lake Roadless Area (fig. 2), some polygorskite may be present there. However, no deposits of sufficient size and purity to be mined at a profit are known to exist south of the vicinity of Midway (Patterson, 1974), and the potential for fuller's earth in the roadless area is low.

Clay

The only use of common clay in the Big Bend region is at the Apalachee Correctional Institution plant south of Chattahoochee, Fla., about 20 mi northwest of Clear Lake. This plant, which is operated by the State of Florida, uses clay and silt alluvium from the floodplain of the Apalachicola River to make common construction brick. The alluvial materials in the vicinity of Clear Lake are small and scattered accumulations, and are of no value in making brick.

Heavy Minerals

Several reconnaissance studies of heavy minerals in sands in the Big Bend region have been made, but no valuable concentrations have been found. The studies include 3.5 hours on heavy minerals in Leon and Wakulla Counties, cited by Schmidt and Clark (1968, p. 72). In the work leading to the present report, heavy-mineral determinations (table 1) were made of three samples from pits near the Clear Lake Roadless Area and two samples from the Roberts Sand Co. pit 7 mi north of Clear Lake, at Norfleet.

Heavy-mineral contents of samples from pits near Clear Lake range from 0.07 to 0.22 percent, which is far too low for profitable recovery. Heavy minerals identified include biotite, ilmenite, tourmaline, staurolite, rutile, zircon, kyanite, chlorite, garnet, and phosphate. The large variety of mineral species present, in addition to the insufficient concentrations of valuable minerals such as ilmenite, rutile, and zircon, further detracts from the heavy-mineral potential of the sand.

Limestone

Several inactive quarries, where limestone was obtained for stabilizing roadways, are scattered throughout the Big Bend region. The largest one is in sec. 4, T. 3 S., R. 1 W., east of Florida Highway 369 about 9 mi southeast of the Clear Lake Roadless Area. The workings of this quarry, which has not been operated for many years, extend over more than 40 acres. Another old quarry is located in sec. 12, T. 4 S., R. 2 W., 2.3 mi east of Crawfordville. The limestone at both quarries is in the St. Marks Formation. Marl, a soft impure calcareous rock, was also dug for road-surfacing material in the western part of Leon County about 9 mi west of the roadless area.

Large quantities of limestone are present below the surface in the roadless area, but they have no value. In the eastern part of the area, the St. Marks Formation, consisting mainly of limestone containing minor dolomite, underlies sand of the Pleistocene Wicomico Formation that is as much as 60 ft thick (fig. 2, cross section). In the western part of the area the St. Marks is even more deeply buried because both the Hawthorn and Jackson Bluff Formations as well as the Wicomico overlie it. Limestone also is present in the Suwannee Limestone and other formations below the St. Marks. Limestone in the Clear Lake Roadless Area has no value because of excessive overburden thickness and because the St. Marks Formation is under much thinner cover in extensive areas east and south of Clear Lake.

Peat

Peat has been produced on a minor scale in the Big Bend region, and small deposits occur in several swamps. The production closest to the roadless area in recent years has been near Carnobbio, about 35 mi to the southwest, where both bulk and packaged humus peat have been marketed (Cameron and Mory, 1977, p. 29). Minor use of local peat in Leon County and adjoining counties in the past was also reported by Davis (1949), but he noted no specific localities.

The swamps in the roadless area may contain few of the peat pockets of peaty materials, but deposits sufficiently large to be attractive for mining are not present. This conclusion is supported in that the swamps are small, and favorable environments for peat accumulation extend over areas of no more than 300 ft in the longest dimension. The most favorable environment for peat is the bog-swamp type, which supports vegetation characterized by sweetflag (*Magnolia virginiana*) and several low-growing species (Cameron and Mory, 1977, p. 29) adapted to living under waterlogged conditions.

Phosphate

Minor amounts of phosphate occur in the marine strata underlying the Apalachicola National Forest. The phosphate is generally most common in the Hawthorn Formation, but it is also found in older formations and in younger beds including sandstone, but sedimentary facies of marine beds in Pleistocene seas. Most of the identifiable phosphate occurs in very fine to medium-size pellets colored white, gray, blue, and black, but some is in the form of phosphatic fish and other fossil remains (Cathcart, 1968).

In the 1960s, phosphate-prospecting permits covering the entire Apalachicola National Forest were issued to two companies. A total of 124 holes were drilled, ranging from 40 to 150 ft in depth, and no minable deposits were found. One company did no analytical testing after examining core samples. The other company found that 37 of 52 holes

penetrated phosphatic material worth sampling. The sample richest in P_2O_5 (5.45 percent) was from a 3-ft-thick interval (81-84-ft depth) penetrated by a single hole. Two other samples from this, deep interval each contained 4.18 percent P_2O_5 . The remaining 49 samples contained less than 4 percent P_2O_5 and about half of them had less than 2 percent P_2O_5 .

The current grade requirement by the Florida phosphate industry is for phosphate containing more than 28 percent P_2O_5 (J. B. Cathcart, written commun., 1981). Company data support the conclusion that it is not economically feasible to mine phosphate deposits present in the Apalachicola National Forest. It is even more unlikely that valuable deposits underlie the Clear Lake Roadless Area because samples from all nearby drill holes contained very little phosphate; four drill holes on the boundary roads contained so little phosphate that they were not analyzed.

Sand and Fill

The only mineral material produced within the boundaries of the Clear Lake Roadless Area was clayey sand used as fill in constructing the grade for Highway 287. The sand was dug from a rectangular borrow pit, now filled with water, near the southern corner of the area. The sand in this pit is in the Pleistocene Wicomico Formation. Similar sand in this formation is dug occasionally from a borrow pit located 2 mi south of Clear Lake, from another 2 mi east of the lake and from a third pit one-half mile southwest of the western end of the roadless area (fig. 2). Grain-size distribution (table 1) was determined for samples from two of these pits and for samples from the Roberts Sand Co. pit at Norfleet. The Roberts Sand Co. is one of three firms producing sand from deposits in a marine terrace that has an east-west extent of more than 12 mi. These three companies produce sufficient sand to satisfy the requirements of the Tallahassee market area. A fourth company produces sand from three pits in the vicinity of Panama, Fla. (Scott and others, 1980) 22 mi south of Clear Lake. The markets along the Gulf coast are in the Wicomico Formation in the Clear Lake Roadless Area has very little value. This material is virtually unaltered sand of the same type of sand in surrounding areas, and much better quality sand is located considerably closer to the major markets. The grain-size distribution of samples from the two pits 2 mi east and south respectively of Clear Lake (table 1) show the sand to be much finer grained and to contain a great deal more silt and clay than the extensive marine deposits in the Roberts Sand Co. pit at Norfleet. These marine deposits are notably closer to the Tallahassee area than are the deposits near Clear Lake.

ASSESSMENT OF OIL AND GAS POTENTIAL

According to the reports and records of the Florida Bureau of Geology, many exploratory holes have been drilled in search of oil and gas in the Big Bend region (fig. 4 and table 2). To date, only a few shows of oil have been reported, and all of the holes have been dry. Of the selected holes shown in table 2, 30 were deeper than 5,000 ft and 15 were deeper than 10,000 ft. The deepest hole bottomed at 14,570 ft. Surprisingly, two of the shallow holes (table 2, holes 5 and 8) were reported to have good shows of oil (Hendry and Sproul, 1966, p. 103). These two holes are located less than 20 mi from the Clear Lake Roadless Area.

Although there are no reasons for optimism about the discovery of oil and gas in and near the roadless area, the possibilities cannot be completely ruled out. The principal reason for this unfavorable outlook is the large number of dry holes in the Big Bend region, and the probable absence of the Jurassic-Smectovian Formation which geologists think has the greatest potential for oil and gas in the region—under the Clear Lake Roadless Area. The Smectovian Formation is thought to be the most likely rock because it contains the oil and gas produced in the Jay field in the westernmost Florida panhandle and nearby fields in Alabama (Babcock, 1972). The Smectovian has been found to be present in several wells southwest of Clear Lake and is thought to underlie about 2,000 mi² in the Big Bend region. However, the upper limit of this formation is shown by Appligate, Fontigo, and Roake (1978, fig. 11) to be more than 15 mi west of the Clear Lake Roadless Area, in Liberty County. Reasons why some possibility remains for oil and gas discoveries near the roadless area include: 1) the shows of oil in the holes east of the area, noted in the foregoing paragraph and 2) uncertainty as to whether or not formations older than the Smectovian may contain oil and gas.

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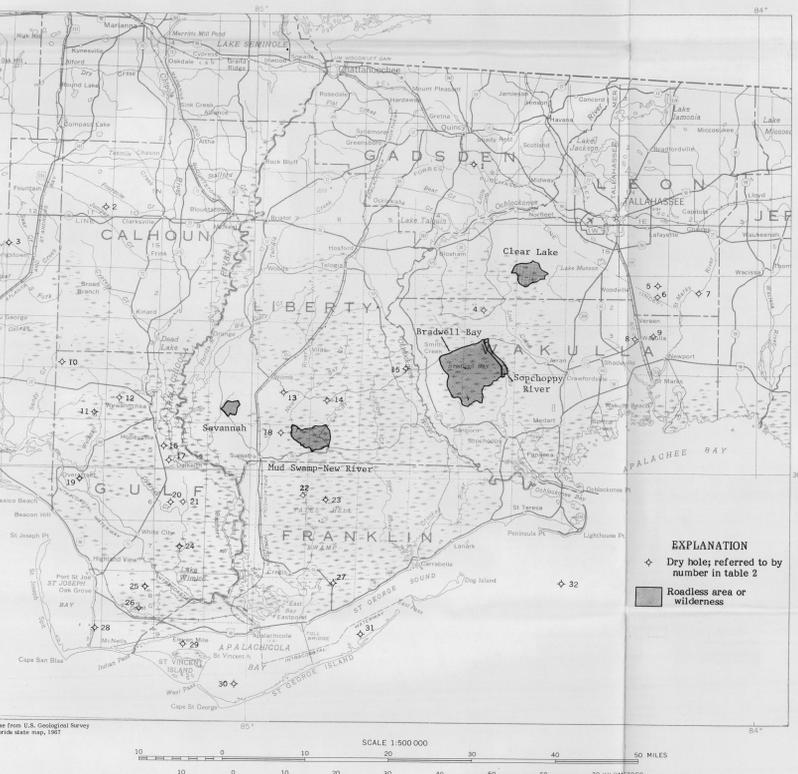


Figure 4.—Locations of dry holes in the Big Bend region.

Table 1.—Grain-size distribution and heavy-mineral content of sand in the vicinity of the Clear Lake Roadless Area, in weight percent

Sample	Grain-size distribution					Heavy minerals				
	>19 mesh	16-18 mesh	10-20 mesh	50-60 mesh	<50 mesh	Bi	Il	Tu	St	Zr
1.	.02	.08	2.2	22.4	44.8	25.4	0.97			
2.	.04	1.0	2.2	22.4	34.1	22.8	0.22			
3.	..	.13	4.9	24.0	29.9	40.0	0.21			
4.	3.1	8.2	29	29	29	29	0.22			
5.	10.2	18.2	14.8	29.8	14.1	4.6	0.29			

1. Coarsest sample of clayey sand from 15 ft thick, in wall of borrow pit 2 mi south of Clear Lake.
2. Coarsest sample of sandy clayey sand from 3 ft thick, in wall of borrow pit 2 mi east of Clear Lake.
3. Coarsest sample of clayey sand from 10 ft thick, underlying borrow pit.
4. Composite of grain samples of upper sand bed, approximately 12 ft thick, in wall of Roberts Sand Co. pit located 7 mi north of Clear Lake.
5. Composite of grain samples of lower sand bed, approximately 5 ft thick, underlying sample no. 4.

Table 2.—Selected exploratory oil and gas data for Apalachicola National Forest and surrounding region [Source: Florida Bureau of Geology, oil and gas reports and records]

Florida Bureau of Geology number	Dry hole number	Company or owner's name	Dry hole or firm name	County	Sec.	T.	R.	Year of completion	Altitude of depth floor sea level (ft.)	Depth of hole (ft.)
305	1	C. S. Faison	Edwin O'nealy	Calhoun	28	28	18	1963	197	7,021
149	2	Ben Oil Co.	F. L. Jordan, et al	Calhoun	36	18	11W	1953	100	5,002
246	3	Fleming Oil Co.	F. L. Jordan, et al	Way	18	15	12W	1956	134	5,000
696	4	Fland Oil Co.	Fland Oil Co. No. 1	Walton	27	25	19	1974	99	11,214
932	5	Central Florida Oil and Gas Co.	Shades No. 1	Leon	11	28	1E	1924	50	3,755
717	6	Phillips Petroleum Co.	St. Joe Paper Co. #1	Leon	14	28	1E	1974	33	10,446
9784	7	Standard Oil Co.	St. Joe Paper Co.	Leon	15	28	2E	1964	41	6,250
412	8	Industrial Employment Co.	Cates No. 1	Walton	16	35	1E	1919	19	2,169
844	9	Bedford Rivers	Y. C. Phillips No. 1	Walton	14	35	1E	1943	28	3,746
744	10	Bank Oil Co.	International Paper Co.	Gulf	31	35	11W	1974	81	13,284
48	11	Bank Oil Co.	F. L. E. McMillan	Gulf	35	45	11W	1947	44	5,069
844	12	Exxon Corp.	Neal Lecher and Hfg. Co.	Gulf	20	45	10W	1976	59	13,367
799	13	Fland Oil Co.	Fland Oil Co. No. 1, 18A, 19A, 20A	Liberty	10	45	7W	1975	75	12,654
753	14	Fland Oil Co.	Fland Oil Co. No. 1, 18A, 19A, 20A	Liberty	16	45	4W	1974	74	12,400
730	15	Fland Oil Co.	Fland Oil Co. No. 1, 21A, 22A	Liberty	26	35	5W	1975	62	12,131
11459	16	Pure Oil Co.	Kate Calkins No. 1	Gulf	19	55	9W	1945	43	4,468
957	17	Wesa Petroleum Corp.	St. Joe Paper Co. 20A-21	Gulf	29	55	9W	1973	47	10,607
277	18	Culpeper Drilling and Exploration Co.	Culpeper Drilling and Exploration Co. No. 1, 12A, 13A	Liberty	4	55	7W	1959	49	10,010
40	19	Pure Oil Co.	St. Joe Paper Co. #3	Gulf	3	65	11W	1946	11	5,025
14170	20	Pure Oil Co.	---	Gulf	---	65	9W	---	33	7,153
9314	21	Pure Oil Co.	---	Gulf	---	65	9W	---	32	6,268
940	22	Wesa Petroleum Corp.	Buckeye Callahan Corp.	Franklin	23	65	9W	1979	87	11,950
814	23	Exxon Corp.	Buckeye Callahan Corp. No. 2A	Franklin	16	65	9W	1976	50	11,590
134	24	Pure Oil Co.	---	Gulf	---	75	9W	---	21	5,796
762	25	Charter Exploration Co.	St. Joe Paper Co.	Gulf	12	85	10W	1973	22	14,370
670	26	Charter Exploration Co.	St. Joe Paper Co.	Franklin	26	85	10W	1975	24	14,290
32	27	Pure Oil Co.	Cates and Levin	Franklin	3	85	16	1946	13	5,060
37	28	Gulf Oil Co.	Yak Holdings et al #1	Gulf	13	95	11W	1946	14	4,484
43	29	Phillips Petroleum Co.	Florida State Block 5-8	offshore	---	---	---	1947	10	7,221
387	30	W&M Oil Corp.	#1 Florida State Lease 22A-A	offshore	---	---	---	1968	37	14,369
281	31	The Calhoun Co.-Central Petroleum Co.	Florida State Lease 22A-A	offshore	---	---	---	1961	28	7,031
293	32	The Calhoun Co.-Central Petroleum Co.	Florida State Lease 22A-A	offshore	---	---	---	1959	34	10,540

MINERAL RESOURCE POTENTIAL MAP OF THE CLEAR LAKE ROADLESS AREA, LEON COUNTY, FLORIDA

By
Charles W. Hendry, Jr., Sam H. Patterson,
Thomas M. Crandall, and John W. Sweeney¹
1982

¹Florida Bureau of Geology ²U.S. Geological Survey ³U.S. Bureau of Mines