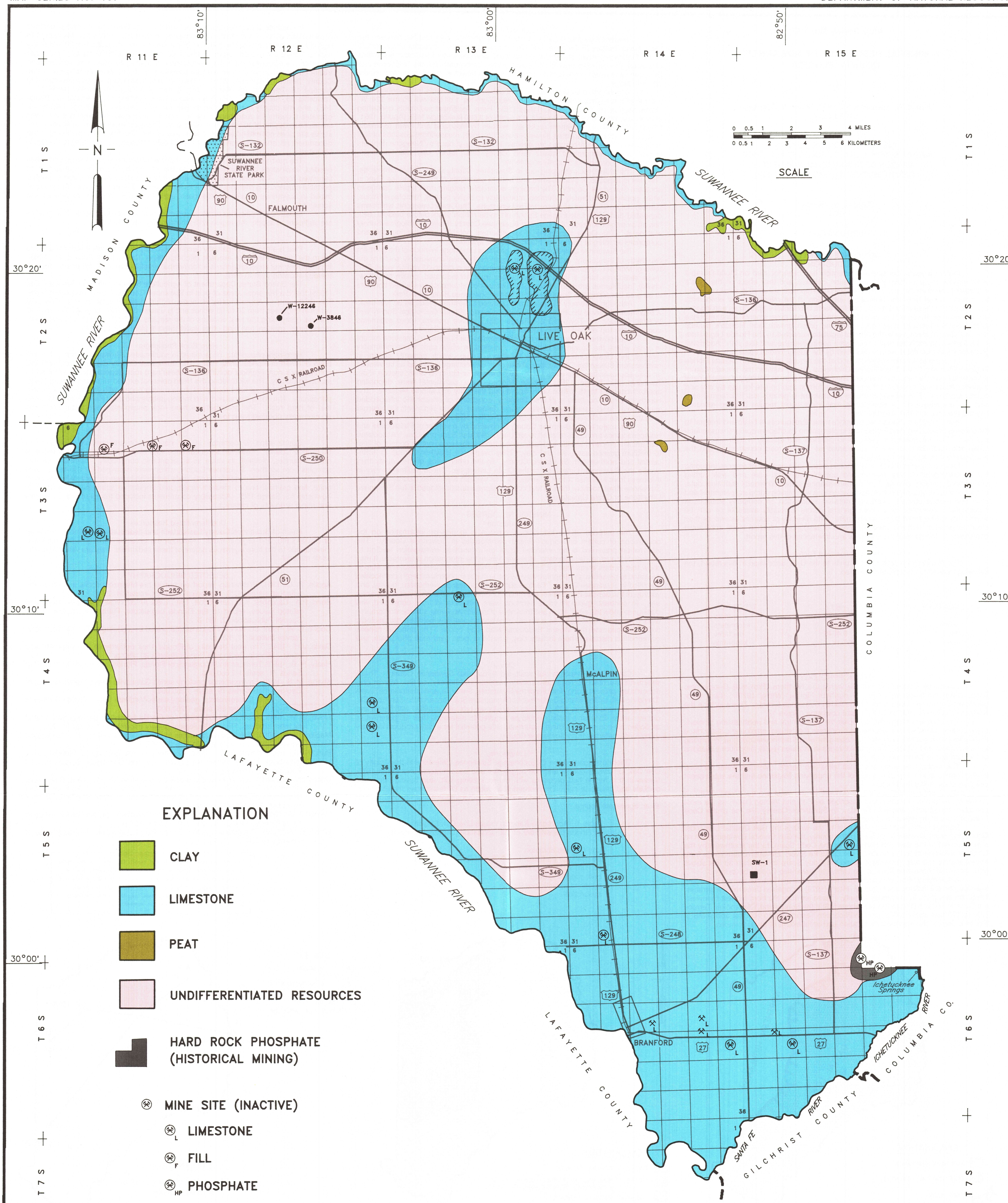
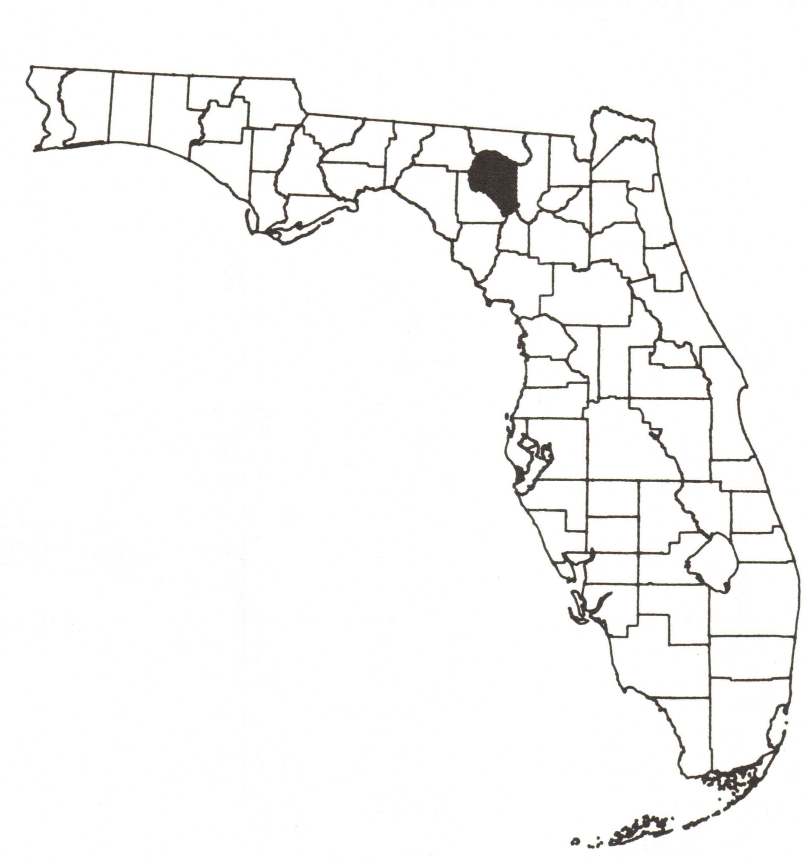


EXPLANATION

- CLAY
- LIMESTONE
- PEAT
- UNDIFFERENTIATED RESOURCES
- HARD ROCK PHOSPHATE (HISTORICAL MINING)
- MINE SITE (INACTIVE)
  - L LIMESTONE
  - F FILL
  - HP PHOSPHATE
- MINE SITE (ACTIVE)
  - L LIMESTONE
- MINING REGION
- SW-1 SAND SAMPLE LOCATION
- WELL CUTTINGS LOCATION
- STATE PARK



MINERAL RESOURCES OF SUWANNEE COUNTY

FLORIDA

BY

RONALD W. HOENSTINE, P.G.#57, STEVEN M. SPENCER, AND ED LANE

1993

FLORIDA GEOLOGICAL SURVEY EST. 1907

WALTER SCHMIDT
STATE GEOLOGIST AND CHIEF

CARTOGRAPHY BY JIM JONES & TED KIPER

Map Series No. 137

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WALTER SCHMIDT, STATE GEOLOGIST AND CHIEF
DIVISION OF RESOURCE MANAGEMENT
DEPARTMENT OF NATURAL RESOURCES

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SUWANNEE COUNTY

INTRODUCTION

In recent years, considerable attention has been focused on Florida's rapid development, the accompanying population increase, and their effect on the state's important mineral resources. Frequently, this development occurred in areas underlain by known mineral deposits, precluding extraction of the minerals. The economics associated with these mineral resources represent substantial employment and income to the private sector as well as taxes to county and state governments. One response to this conflict between rapid population and urban growth, and Florida's mineral resource development was in the form of legislation enacted by the Florida Legislature in 1985 requiring each county to establish a comprehensive land use plan. Additional guidelines and due dates were established by the 1986 Florida Legislature.

In response to this legislation, and at the request of the North Central Florida Regional Planning Council, the Florida Geological Survey initiated this investigation of Suwannee County's mineral resources. The objectives were to identify potential mineral resource areas and to present the results in a format appropriate for use by city and county planners. This mineral resource assessment is general and is intended as a land-use planning tool. A site-specific evaluation would require detailed research beyond the scope of this investigation.

A knowledge of Suwannee County's mineral resources is basic and integral to the process of initiating, developing, and implementing an effective comprehensive land use plan. This information is essential to planners and officials in their analyses of urban and rural development in such areas as zoning, road construction and the establishment of waste disposal sites.

Resource evaluation for this report is based on a number of sources including Florida Geological Survey reports and unpublished data, core and well cutting descriptions, geological logs, field reconnaissance, state and federal statistical data, company reports, questionnaires, and discussions with mining company personnel and state and federal officials. Although detailed information on company statistics is confidential, information of a more general nature is readily available or can be reasonably extrapolated from existing data. The diversity of sources as well as their close association with the various aspects of resource evaluation lends substantial confidence to the general assessments and inferences of this report.

Metric Conversion Factors

For readers who prefer metric units to the U. S. units used in this report, the following conversion factors are provided.

MULTIPLY	BY	TO OBTAIN
feet	0.3048	meters
miles	1.609	kilometers
acres	0.4046	hectares
tons	907.18	kilograms

GEOMORPHOLOGY

Suwannee County lies entirely within the Northern (Proximal) Geomorphic Zone, which encompasses much of northern Florida (White, 1970). Two major geomorphic divisions occur in this zone within Suwannee County. These include the Northern Highlands and the Gulf Coastal Lowlands (Figure 1).

The Northern Highlands occupies the east-central and northeastern portions of the county. Here, various weathering processes (i.e., stream erosion and subsurface dissolution) have played a key role in shaping the area's distinctive topography forming undulating hills and ridges. Topographic highs in this area reach maximum elevations of 185 feet above mean sea level (MSL).

This region has numerous small lakes and ponds. Most are karst features, having formed due to the dissolution of the underlying limestone and the subsequent collapse of overlying sediments.

The Northern Highlands is bounded to the west by the Cody Scarp, a prominent escarpment named and described by Puri and Vernon (1964) as the most persistent topographic break in Florida. In Suwannee County, the toe of the Cody Scarp occurs at an elevation of approximately 100 feet above MSL.

Bordering the Northern Highlands to the west is the Gulf Coastal Lowlands. Occupying approximately 60 percent of the county, the Gulf Coastal Lowlands lie in an area bounded to the east and northeast by the Cody Scarp, to the southwest by the Suwannee River and to the south by the Santa Fe River. Elevations here range from approximately 100 feet above MSL along the Cody Scarp to less than 30 feet above MSL along the Suwannee River at the Lafayette-Suwannee County boundary.

A number of terraces representing relict depositional features formed by ancient seas are present in Suwannee County. Healy (1975) recognized three marine terraces, based on elevation, in Suwannee County. These terraces are from highest to lowest: the Coharie Terrace (170 to 215 feet above MSL), the Sunderland/Okefenokee Terrace (100 to 170 feet above MSL) and the Wicomico Terrace (70 to 100 feet above MSL). Figure 2 depicts the approximate location and areal extent of these terraces.

GEOLOGY

Suwannee County is part of a transitional geologic area that lies between the thick, lower Tertiary (Paleogene) and Cretaceous carbonate sediments characteristic of the Florida peninsula and the age-equivalent, predominantly siliciclastic sediments of western Florida. The area is underlain by thick carbonate deposits of Eocene and Oligocene age which are in turn covered by younger limestones and dolomites, sands, silts and clays.

To date, the deepest penetration of subsurface sediments in the county is to a depth of 4,424 feet below MSL in Hunter Petroleum No. 1 oil test well (Permit 724, W-12246, section 16, Township 2S, Range 12E). Here, basement sediments consisting of Paleozoic black shales are present at a depth of 3,630 feet below MSL (Applin, 1951; Lloyd, 1985). These basement rocks are overlain by Mesozoic and lower to middle Cenozoic Erathem carbonates (limestone and dolomite) measuring thousands of feet in thickness. These carbonates are overlain in the near-surface by Neogene deposits of fine- to medium-grained quartz sand, clayey sand, sandy clay, silt, limestone, dolomite, and organic-rich (peat) sediments.

The oldest rock cropping out in Suwannee County is the Ocala Limestone. This unit is exposed in pits, quarries and bottom sediments of the Suwannee River in southern Suwannee County. The lithology is variable, ranging from a pale orange to white, poorly to moderately indurated, moderately to highly porous, microfossiliferous, partially dolomitized, partially recrystallized limestone. The Ocala Limestone, which was deposited during the Late Eocene Epoch (41 to 38 million years before present, BP), has an average thickness of 150 feet in Suwannee County (Florida Geological Survey well data). The Ocala Limestone is an important potable water-bearing unit and comprises an integral part of the Floridan aquifer system.

The Suwannee Limestone overlies the Ocala Limestone in much of the northern two-thirds of the county, extending as far south as the area immediately south of the town of McAlpin. Deposited during the Oligocene Epoch (38 to 33 million years BP), these sediments have a lithology that ranges from an indurated, cream to yellow, chalky, fossiliferous limestone over much of its area of occurrence to silicified boulders in an area bordering the Suwannee River at the Suwannee River State Park.

Although extremely variable, the Suwannee Limestone averages 90 feet thick. A maximum observed thickness of 115 feet occurred in Florida Geological Survey well W-8780 (section 14, Township 2S, Range 13E). Where present, these sediments comprise the top of the Floridan aquifer system in Suwannee County.

The Hawthorn Group unconformably overlies the Suwannee Limestone except in areas where the Suwannee Limestone is missing, in which case it unconformably overlies the Ocala Limestone. The Hawthorn Group, which primarily occurs in northeastern Suwannee County, was observed in well cuttings to extend as far west as an area approximately four miles south of the town of Falmouth (W-3846; section 15dc, Township 2S, Range 12E). These Miocene age sediments were deposited approximately 23 to 15 million years ago during the Early and Middle Miocene. The Hawthorn Group contains a diverse lithology, consisting of phosphatic interbedded sand, clayey sand, sandy clay, limestone and dolomite. These sediments are referred to in the cross sections as Hawthorn Group Undifferentiated.

The majority of Suwannee County is covered by a veneer of Pleistocene and Holocene sands and clays referred to as "Undifferentiated Sand and Clay." Associated with ancient sea level stands and lacustrine deposits, these sediments consist of fine- to medium-grained sand, silt and clay. They overlie the Hawthorn Group in north-central and northeastern Suwannee County. In the other areas of the county they overlie the Suwannee Limestone or the Ocala Limestone. These sediments vary in thickness from less than a foot in areas such as western Suwannee County along the Suwannee River, to more than 50 feet in karst depressions developed in the Suwannee Limestone or Ocala Limestone.

MINERAL RESOURCES

Introduction

The purpose of the following discussion is to provide information on the occurrence of certain economic mineral commodities in Suwannee County. The information presented is not intended to be an exhaustive investigation leading to immediate industrial development. However, where the information is favorable, it may show that certain areas warrant further investigation. The Mineral Resources Map is designed to present a geographic overview of the major economic mineral commodities identified in Suwannee County. Factors such as thickness of overburden, quality, and volume of the deposit could affect the mining of the mineral commodity at any specific site. In contrast, geologic cross sections were extrapolated from cores and well cuttings to show the distribution and thickness of surface and near-surface stratigraphic units (Figures 3b and 3c). As a result, occasional variations between the geologic cross sections and the Mineral Resources Map may occur. The principal mineral commodities discussed here include clay, limestone, peat, hard rock phosphate, and sand.

Clay

Clayey sand deposits are scattered throughout Suwannee County. These sediments are used as road construction material and, locally, as fill. Alluvial clay deposits are present along portions of the Suwannee, Santa Fe, and Ichetucknee Rivers (David Howell, United States Department of Agriculture Soil Conservation Service, SCS, personal communication, 1991). These deposits are typically stratified with sands and clayey sands. Extensive testing would be required to determine their full potential as an economic commodity. There is currently little potential for a clay products industry using local materials from Suwannee County.

Limestone

Operators quarried the Oligocene age Suwannee Limestone in the vicinity of Live Oak for use as coarse and fine aggregate, and base material until about 1975. Miners in this region had problems with the rock being soft, and having numerous pockets and seams of clay. Overburden of as much as 50 feet covers the limestone in the area. Table 1 lists ranges and values used to determine suitability of limestone as an aggregate source.

Table 1. Aggregate Ranges/Values-Live Oak Region
(Source: Florida Department of Transportation, unpublished data)

Los Angeles abrasion	31.4-41.7
percent soft particles	3.7-11.9
sodium sulfate soundness	28.60
bulk specific gravity	2.50
apparent specific gravity	2.65
absorption	2.70

In southern Suwannee County near Branford, the Eocene age Ocala Limestone is mined and used as base material when used in state road contracts. Mining in this region is to depths approaching 40 feet below water level. An additional 20 feet of dry rock is mined for a total depth of about 60 feet below land surface. The Ocala Limestone is not suitable for the manufacture of aggregate due to its softness and friable nature. Currently, there are four limestone quarrying operations in Suwannee County (Mineral Resources Map). They include Hatch Enterprises, Incorporated (section 16, Township 6S, Range 14E); Anderson Mining Corporation (section 19, Township 6S, Range 15E); Tim-Prep, Incorporated (section 14, Township 6S, Range 14E); and the county road department (section 14, Township 6S, Range 14E) which operates a quarry for road base material. Hatch Enterprises, Inc., mines a dolomitic limestone to depths of 30 feet below water level. The occurrence of dolomitic limestone at this site does not extend eastward to nearby mines. Tim-Prep, Inc., the county road department pit, and Anderson Mining Corp. all extract limestone belonging to the Ocala Limestone.

The quarrying of limestone is accomplished with the use of draglines and, when needed, explosives are used to facilitate the mining by fracturing and loosening indurated rock. The rock is stockpiled and allowed to dry before it is run through a portable crusher. It is then put into trucks for shipping. The primary uses for limestone mined in Suwannee County are roadbase, agricultural soil conditioners, and asphalt screenings.

Suwannee County has ample reserves of near-surface limestone. The reserves are sufficient to supply the region with limestone for years to come.

Peat

Peat is a product of partially decomposed organic materials which accumulate when the depositional rate exceeds decomposition (Davis, 1946; Bond et al., 1986). In perennially wet areas organisms which normally metabolize plant matter are inhibited, thereby allowing peat to form.

The United States Department of Agriculture Soil Conservation Service (SCS) (1965) found a few small areas of peat in Suwannee County (Mineral Resources Map). The SCS mapped approximately 90 acres of this material in the county. The peat varies in thickness from 30 to 60 inches and is usually underlain by sand. The organic material comprising the peat consists of the remains of sweetbay, ash, cypress, pine, moss, ferns, maidencane, and other water-tolerant plants (SCS, 1965).

Hard Rock Phosphate

Hard rock phosphate, once mined in southeastern Suwannee County, has not been quarried in Florida since 1966. The Suwannee County deposits represent this commodity's northernmost occurrence. These hard rock deposits occur as far south as Pasco County. The width along this trend does not exceed 16 miles (Vernon, 1943).

The demise of hard rock phosphate mining began with the mining of pebble phosphate. The costs associated with mining pebble phosphate are much lower than that of hard rock. The probability of hard rock phosphate once again becoming economically competitive is low.

Sand

Quartz sand is common in the near-surface and surface sediments of Suwannee County. However, its occurrence with clays, along with the presence of other impurities, diminish its value as an economic commodity. Surficial sediment samples from southern Suwannee County, which were examined for this study, were typically unconsolidated quartz sands, pale yellowish-brown to very pale-orange in color, fine grained, fine to medium range, and angular to subrounded (section 19, Township 5S, Range 15E). Accessory constituents included traces of heavy minerals and minor amounts of organics.

Undifferentiated Resources

Much of Suwannee County has surface and near-surface sediments made up of clayey sand, and organic muck. Although the potential for large scale mining is minimal due to the heterogeneous nature of these sediments, they are valuable locally as fill material.

SELECTED BIBLIOGRAPHY

Applin, P. L., 1951, Preliminary report on buried pre-Mesozoic rocks in Florida and adjacent states: U.S. Geological Survey Circular 91, 28 p.

Bond, P.A., Campbell, K.M., and Scott, T.M., 1986, An overview of peat in Florida and related issues, report to the Florida Legislature: Florida Geological Survey Special Publication 27, 151 p.

Cooke, C. W., 1939, Scenery in Florida as interpreted by a geologist: Florida Geological Survey Bulletin 17, 120 p.

Davis, J.H., 1946, The peat deposits of Florida, their occurrence, development and uses: Florida Geological Survey Bulletin 30, 250 p.

Healy, H. G., 1975, Terraces and shorelines of Florida: Florida Bureau of Geology Map Series 71, scale 1:2,000,000.

Knapp, M. S., 1978, Environmental geology series-Gainesville sheet: Florida Bureau of Geology Map Series 79, scale 1:250,000.

__________, 1978, Environmental geology series-Valdosta Sheet: Florida Bureau of Geology Map Series 88, scale 1:250,000.

Lloyd, J. M., 1985, Annotated bibliography of Florida basement geology and related tectonic studies: Florida Geological Survey Information Circular 98, 72 p.

MacNeil, F. S., 1950, Pleistocene shorelines in Florida and Georgia: U. S. Geological Survey Professional Paper 221-F, p. 95-107.

Puri, H. S., and Vernon, R. O., 1964, Summary of the geology of Florida and a guidebook to the classic exposures: Florida Geological Survey Special Publication 5 (revised), 312 p.

United States Department of Agriculture Soil Conservation Service, 1965, Soil survey report for Suwannee County, Florida: U.S.Department of Agriculture Soil Conservation Service in cooperation with the University of Florida, Institute of Food and Agricultural Services, 101 p.

Vernon R. O., 1943, Florida mineral industry, with summaries of production for 1940 and 1941: Florida Geological Survey Bulletin 24, 207 p.

White, W. A., 1970, The geomorphology of the Florida peninsula: Florida Bureau of Geology Bulletin 51, 164 p.

Two well systems are used in this report. One uses the rectangular system of section, township and range for identification. The well number consists of six parts: W for well, county abbreviations, the Township, Range, and Section, and the quarter/quarter location within the section. The other system uses the Florida Geological Survey sample repository accession number.

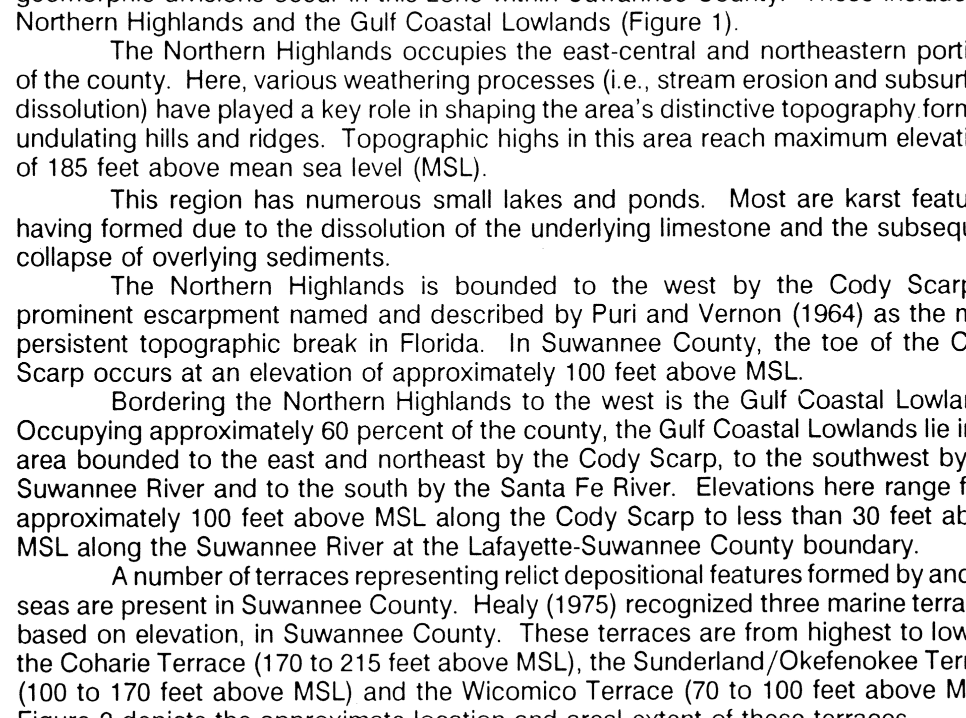

Figure 1. Geomorphology (modified from White, 1970)

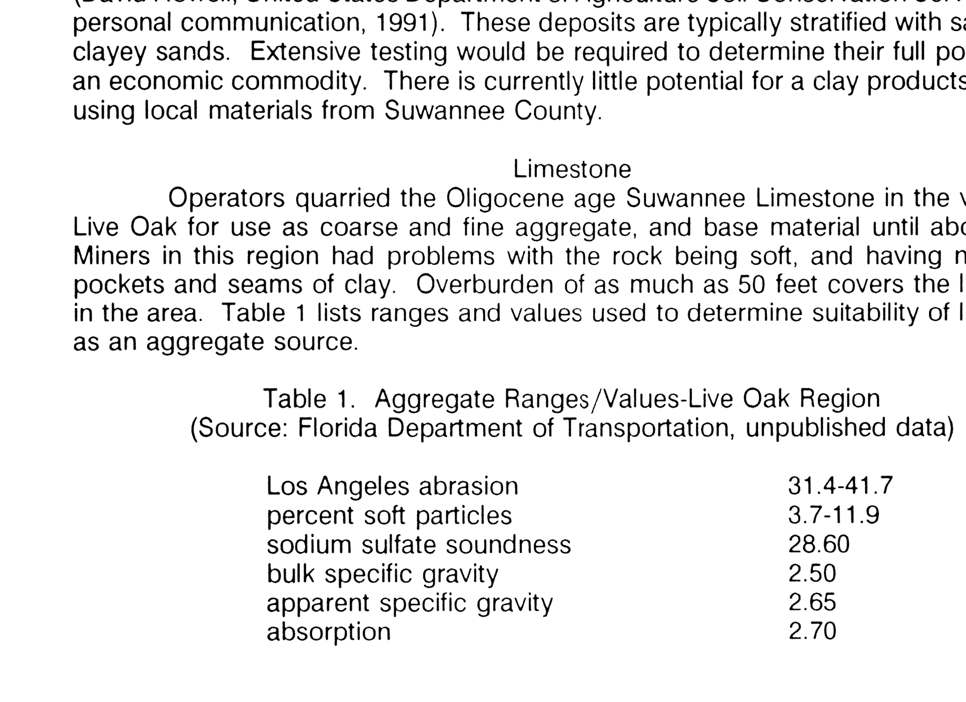

FIGURE 2. TERRACES AND SHORELINES (modified from Healy, 1975)

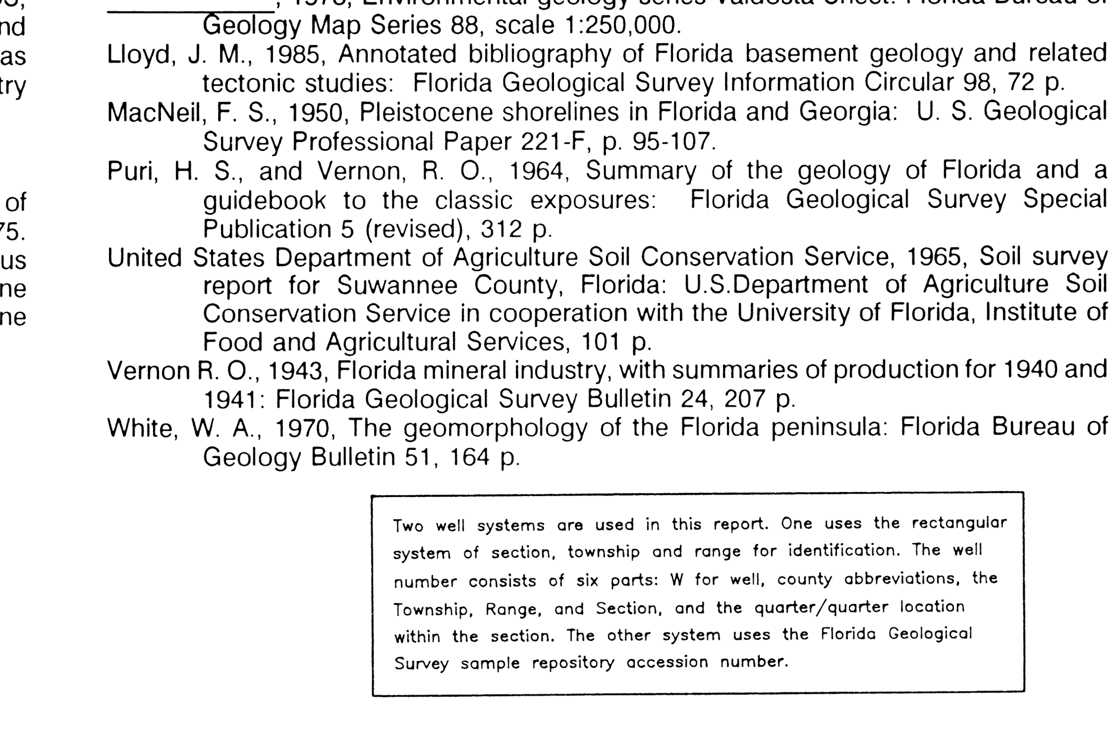

FIGURE 3a. GEOLOGIC CROSS SECTION LOCATIONS

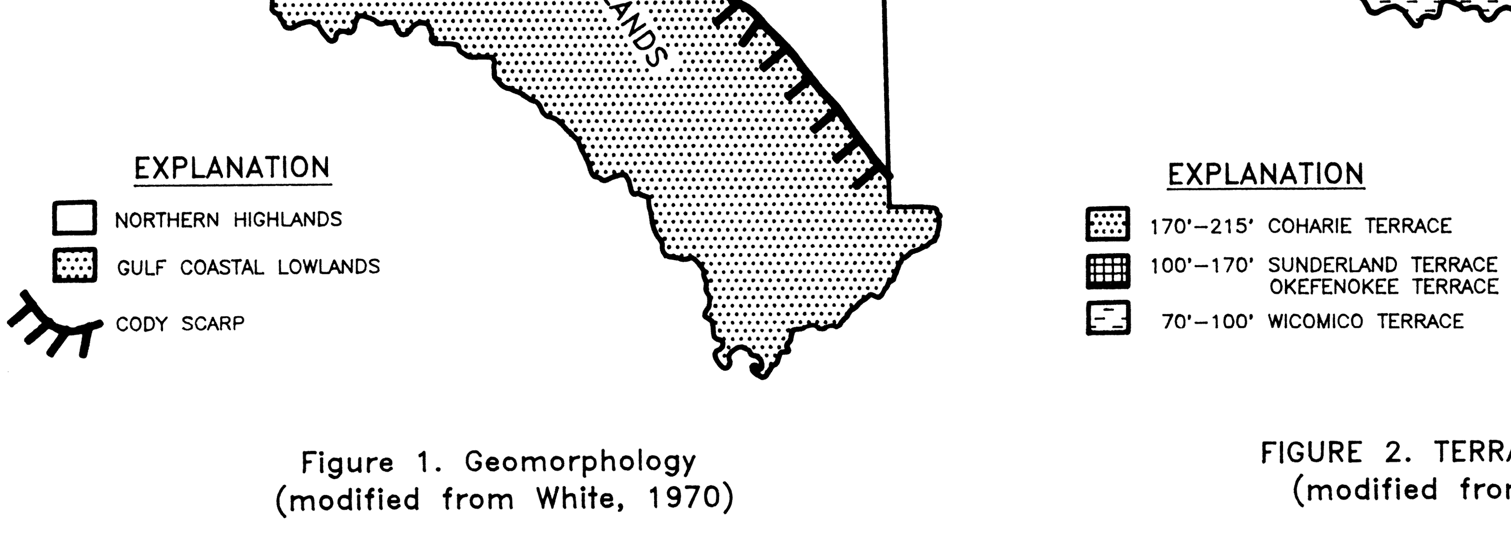

FIGURE 3b. GEOLOGIC CROSS SECTION A–A'

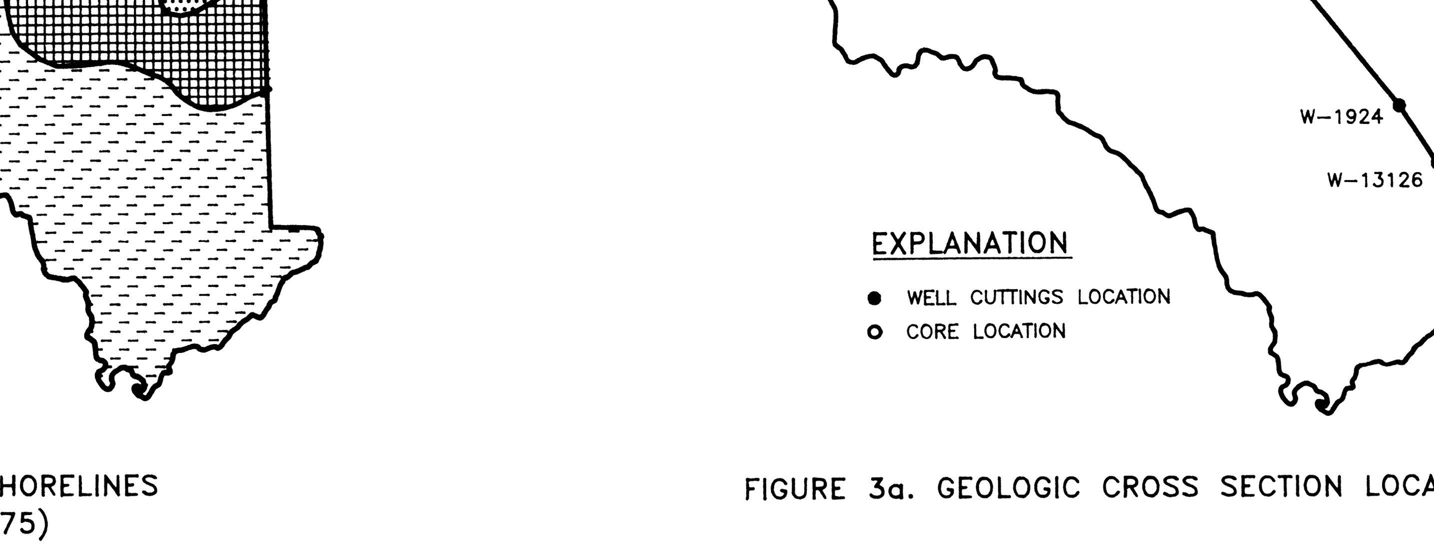

FIGURE 3c. GEOLOGIC CROSS SECTION B–B'

SCALE
0 2 4 MILES
0 3 6 KILOMETERS
SCALE FOR FIGURES 3b AND 3c

VERTICAL EXAGGERATION FOR FIGURES 3b AND 3c IS APPROXIMATELY 175 TIMES HORIZONTAL