

DEPOSITIONAL ENVIRONMENTS OF THE SUNNILAND FORMATION AND DIAGENETIC CHARACTERISTICS OF THE PRODUCTIVE FACIES, LEHIGH PARK FIELD, FLORIDA

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ABSTRACT

The Sunniland Formation in the subsurface of Lehigh Park field in South Florida consists of eleven carbonate facies deposited during a transgressive and regressive cycle in five major depositional systems: shallow water shelf, shoal-water carbonate complex, restricted and open lagoon, tidal flat, and sabkha.

The shallow water shelf facies consist of northwest-southeast trending caprinid-chondrodontid patch reefs which overlie chondrodontid mounds. Caprinid-chondrodontid rudstones/grainstones/packstones form a talus debris apron surrounding the patch reefs with abundant lime mud in more protected areas. Mollusc- and gastropod-bearing peloidal packstones/grainstones flank the shallow areas adjacent to the patch reefs. Sea grass probably grew in a mud-rich, protected, back-reef lagoon. In protected, shallow-water areas between and behind the patch reefs, chondrodontid and requieniid wackestones/mudstones were deposited. *Orbitolina*(?) sp. and *Coskinolina sunnilandensis* are found in the higher energy shallow-water shelf deposits, with miliolids prevalent in the more protected areas.

The productive shoal-water complex overlies the shallow water shelf facies and consists of porous mollusc-, echinoid-, and intraclast-bearing, orbitolinid packstones/grainstones.

Impermeable lagoonal deposits of low-energy, burrowed, miliolid mudstone/wackestone and nodular anhydrite in dolomitic mud provided the trap rock for the productive shoal-water sequence. Requieniid- and miliolid-bearing wackestones accumulated in the shallow water protected lagoon on the lee side of the shoals. Broad colonies of chondrodontids inhabited the transitional lagoon-tidal flat areas. Oolitic coated grainstones composed of miliolids, gastropods, and dasyclads occur in tidal channels, banks, and bar.

The lagoonal facies are overlain by tidal flat deposits composed of an algally-laminated miliolid-, pycnodont-, gastropod- and intraclast-bearing dolomitic mudstone/wackestone.

Sabkha deposits of nodular/nodular-mosaic anhydrite overlie and are interbedded with the tidal flat sediments.

Early Sunniland time was characterized by a gradual transgression over the underlying Punta Gorda anhydrite resulting in an open, shallow-water, shelf environment in which the patch reefs formed. Progradation of the restricted marine and landward facies during a rapid eustatic fall in sea level probably resulted in this evolution of facies and eventually led to the anhydrites of the overlying Lake Trafford Formation ("Upper Massive Anhydrite").

Subaerial exposure and freshwater phreatic diagenesis preserved high, primary interparticle porosity and resulted in good secondary moldic porosity in the grainstones/packstones of the shoal-water complex and shallow water shelf sediments. Diagenetic similarities exist with four other producing facies identified from Sunniland fields. Other high energy facies deposited and subaerially exposed during Sunniland time may also provide attractive exploration targets.

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