

**PS The Autogenic Origin and Sequence Stratigraphic Setting of the Eocene Cocoa Sand Member of the Yazoo Formation in the Mobil-Mississippi Cores, Wayne County, Mississippi\***

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Search and Discovery Article #50759 (2012)\*\*

Posted December 10, 2012

\*Adapted from poster presentation at AAPG Annual Convention and Exhibition, Long Beach, California, April 22-25, 2012

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**Abstract**

The Eocene Cocoa Sand Member of the Yazoo Formation of Mississippi is a subrounded to subangular, moderately to well sorted, poorly cemented quartz arenite with a composition of Q96 F0 L4. Embayed and subhedral quartz grains are common. Lithic fragments are largely found at the base of the Cocoa Sand Member at the contact with the underlying North Twistwood Creek Member of the Yazoo Formation. These lithic fragments consist of sedimentary rock fragments and are interpreted as rip-up clasts from the underlying quartz-rich mudstone.

Previous work has interpreted the Cocoa Sand Member as shelf margin sand deposited as part of a lowstand systems tract. The presence of rip-up clasts at the base of the Cocoa sand member supports the presence of a transgressive surface at the contact with the North Twistwood Creek. In addition, there is evidence that the upper contact of the Cocoa Sand with the Pachuta Marl is a sharp contact, representing an upper erosion surface.

We interpret the Cocoa Sand Member of the Yazoo Formation to be an autogenic sand sheet deposited as part of a transgressive systems tract. During transgression, the North Twistwood Creek Member was cannibalized, sediment reworked, and re-deposited with rising sea level.



# The Autogenic Origin and Sequence Stratigraphic Setting of the Eocene Cocoa Sand Member of the Yazoo Formation in the Mobil-Mississippi cores, Wayne County, Mississippi

By

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## ABSTRACT

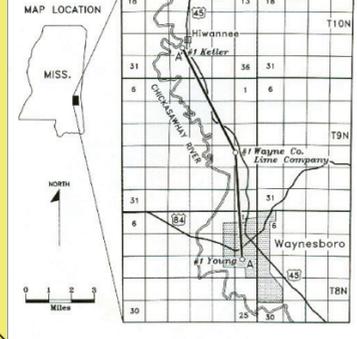
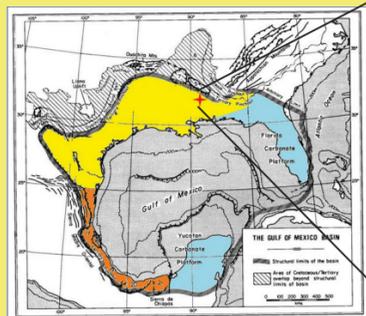
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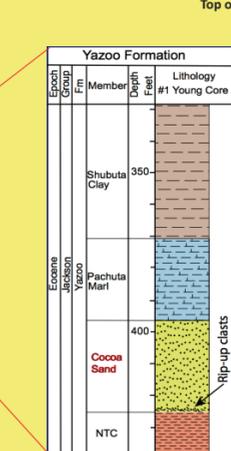
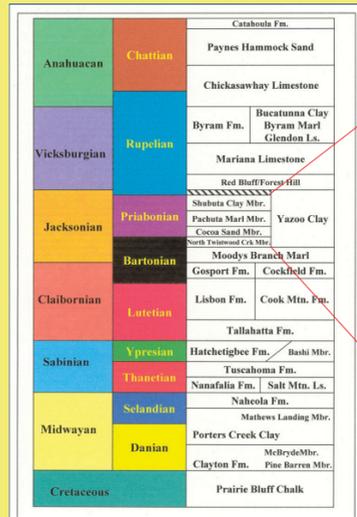
## LOCATION OF STUDY

### Location within Gulf Coastal Plain



The Yazoo Formation is part of the Jackson Group, which extends in outcrop from southwest Alabama, northwest to Yazoo County, Mississippi. The Mobil-Mississippi drilling project is located in Wayne County, Mississippi and resulted in core from the #1 Ketter, #1 Wayne Co. Lime Company, and the #1 Young wells (after Dockery et al, 1994). Only the #1 Ketter and #1 Young wells penetrated through the Cocoa Sand Member of the Yazoo Formation.

## STRATIGRAPHY



Stratigraphic column from the #1 Young core. Note rip-up clasts at the base of the Cocoa Sand Member. NTC = North Twistwood Creek Member.

## Mobil-Mississippi #1 Young Core

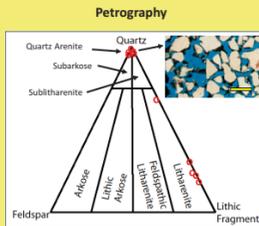


Top of the Cocoa Sand

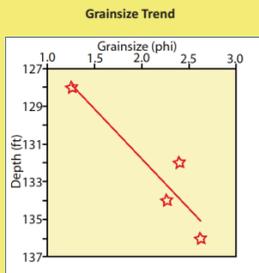
Pachuta Marl

Rip-up clasts

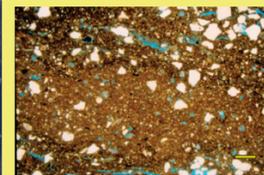
Base of the Cocoa Sand



The Cocoa Sand is a poorly to moderately sorted quartz arenite. Samples rich in lithic fragments are found at the base of the formation. Yellow bar scale is 250 µm.



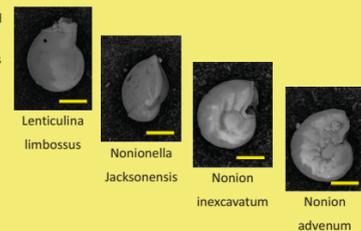
A coarsening upward trend defines the Cocoa Sand. Data from #1 Ketter core.



Thin-section of the North Twistwood Creek Member. This is a silty-sandy shale with quartz and foraminifera common. Yellow bar scale is 250 µm.

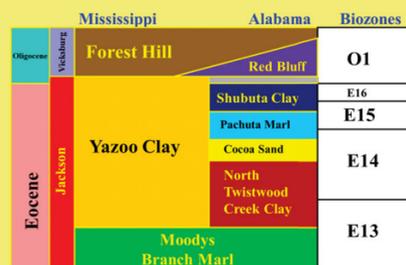


The Cocoa Sand Member is a subangular to subrounded, poor to moderately sorted quartz-rich sandstone with the cleanest sand and most coarse grainsize found at the top of the Member. Yellow bar scale is 250 µm.



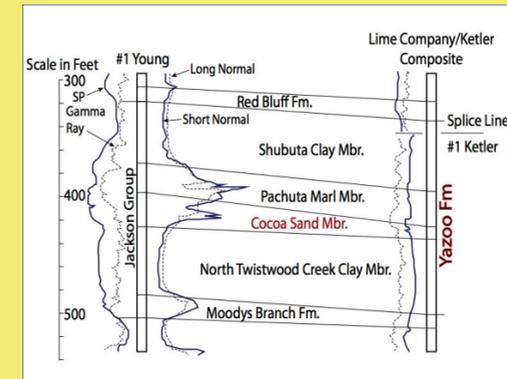
## Paleogene of the Eastern Gulf Coastal Plain

## BIOZONES

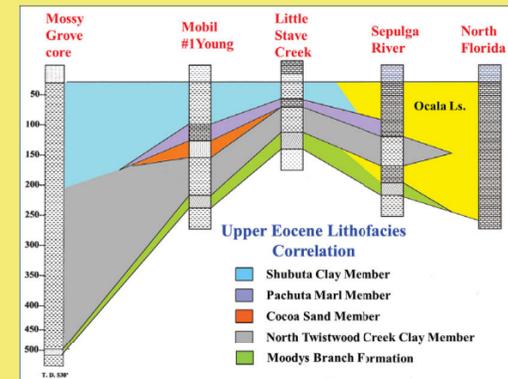


The Cocoa Sand Member of the Yazoo Clay correlates to Biozone E14 as defined by Berggren and Pearson (2005). The benthic foraminiferal assemblage in the Cocoa Sand member of the Yazoo Clay has a low diversity and is dominated by species of *Nonion*, *Nonionella*, and *Lenticulina*. This assemblage has been recognized within the Yazoo Clay at other sites (Mossy Grove core; St. Stephens core) and is considered to represent inner to middle neritic conditions (5 m – 30 m depth). Foraminifera are more abundant at the base of the Cocoa Sand. A higher diversity benthic foraminiferal assemblage at the base of the Cocoa Sand identified by Echols et al. (2003) is here considered to be associated with rip-up clasts of re-worked North Twistwood Creek Clay Member. Yellow bar scale is 100 µm in Foraminifera images to the right.

## UPPER EOCENE LITHOFACIES CORRELATION

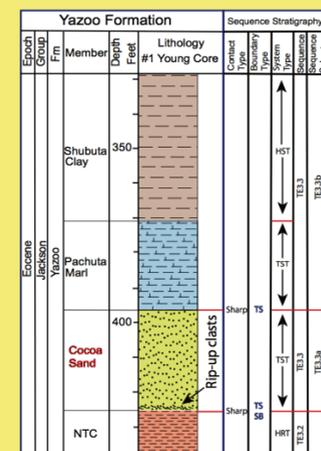


Lithofacies correlation between the #1 Young and the #1 Lime Company/#1 Ketter composite wells (after Dockery et al. 1994). The Cocoa Sand Member thickens from the north to the south in this small sampling. More mapping is necessary to fully understand its distribution. Note the coarsening upward expression of the SP and Gamma Ray logs.

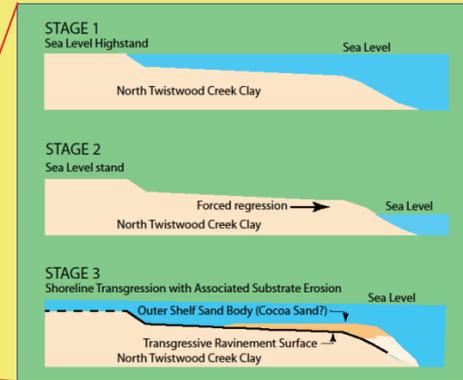


Upper Eocene lithofacies correlation across the Gulf Coastal Plain. The Cocoa Sand Member pinches out near Little Stave Creek, Alabama, thickens at the #1 Young location, Wayne County, Mississippi, and thins to the northwest, pinching out before reaching the Mossy Grove core location in Hinds County, Mississippi.

## SEQUENCE STRATIGRAPHY AND HYPOTHESIZED MODEL



The contact shown here between the Cocoa Sand and Pachuta Marl has been reported as both sharp and gradational. Therefore the relationship between these members is still being investigated.



Stage 1 represents a time of sea level highstand and deposition of the North Twistwood Creek Member. At stage 2 sea level fall has exposed the sea floor and the shore line moves seaward. At stage 3, transgressive forces erode the sea floor (North Twistwood Creek Member) winnowing away the clays and leaving behind a sand ridge (bar?) that thins toward the new shoreline (Cocoa Sand Member).

## DISCUSSION

There is no argument that a sequence boundary occurs at the North Twistwood-Cocoa Sand contact (Baum and Vail 1988; Miller et al. 2008). The question arises as to the source and deposition of the Cocoa Sand in the middle of a thick mud sequence. The sand has been interpreted as part of a shelf margin systems tract (Echols et al. 2003) and as part of a transgressive systems tract, with its source being the erosion and reworking of the North Twistwood Creek Member during transgression. Early evidence supports this hypothesis, but there is more work to do before a final conclusion can be made.

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