DEPOSITIONAL ENVIRONMENTS AND REGIONAL STRATIGRAPHY OF JURASSIC NORPHLET FORMATION IN SOUTH ALABAMA

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ABSTRACT

In the Western Gulf Coastal plain area the Norphlet Formation is typically characterized by non-marine and red bed lithofacies. In south Alabama, the Norphlet consists of an updip conglomerate, a basal shale, red beds overlying the shale, and an upper quartzose sandstone, the Denkman Member. The Norphlet Formation unconformably overlies either salt, anhydrite, red beds, or Paleozoic rocks. The Smackover Formation overlies the Norphlet Formation with a sharp contact over most of south Alabama, except in parts of Mobile County where the contact is gradational.

The conglomeratic lithofacies is discontinuous in areal extent, and is present in cores from Escambia, Monroe, and Wilcox Counties (Fig. 1). It consists of red and grey sandstone, conglomerate, and conglomeratic sandstone. The shale lithofacies also appears to be discontinuous in areal extent, and is present in cores from Escambia County (Fig. 2). It consists of mostly black shale, with some brown and red shale. The red-bed lithofacies was penetrated in wells in Escambia and Clarke Counties (Fig. 3). It consists of red, brown, and grey, very fine- to coarse-grained sublitharenite and subarkose, with an average composition of 64 percent quartz, 13 percent feldspar, 8 percent rock fragments, and 10 percent matrix. It is characterized by low-angle planar crossbeds and discontinuous laminae, along with interbedded silt and coarse sand. The quartzose lithofacies (or Denkman Member) is present in cores from Mobile, Baldwin, Escambia, Clarke, Choctaw and Washington Counties (Fig. 4). It attains a thickness of from 400 to over 700 feet in parts of Choctaw, Washington and Mobile Counties, and thins dramatically to the northeast and east (Clarke, Monroe, Conecuh, Escambia Counties) where Norphlet red beds and conglomerates predominate. The quartzose lithofacies consists of grey and brown, very fine- to medium-grained subarkose with an average composition of 76 percent quartz, 12 percent feldspar, 3 percent rock fragments, and 2 percent matrix. It is characterized mainly by low- to high-angle planar crossbeds, and also contains slump structures, wavy discontinuous laminae, and massive intervals.

Norphlet deposition in South Alabama took place in an arid climate. The lower shale probably was deposited in lagoons or mud flats left from a retreating hypersaline sea which had deposited the Louann salt. Accompanying the retreat of this sea were climatic and/or tectonic changes which resulted in clastics being shed from exposed paleo-highs. Initial clastic deposition took place in alluvial-braided stream environments which are represented by sediments of the conglomeratic and red-bed lithofacies. These sediments were reworked into downdip areas and deposited in desert dune and inter-dune environments. A transgression near the end of Norphlet time resulted in reworking of underlying sediments and deposition in intertidal environments. These deposits may be partial landward equivalents of seaward Smackover carbonates. Dune, interdune, and intertidal environments are represented by the quartzose lithofacies or Denkman Member. Basement paleo-highs not only were a source of sediments but also controlled Norphlet deposition in that the formation thins or is absent over them.

The Norphlet Formation is an important reservoir in south Alabama. Stratigraphic relationships indicate that lower Smackover Formation carbonate mudstones provide the petroleum-source rocks. Reservoirs are facies selective, occurring mainly in Norphlet intertidal, eolian, and braided-stream deposits. Traps are due to a combination of favorable stratigraphic and structural development.

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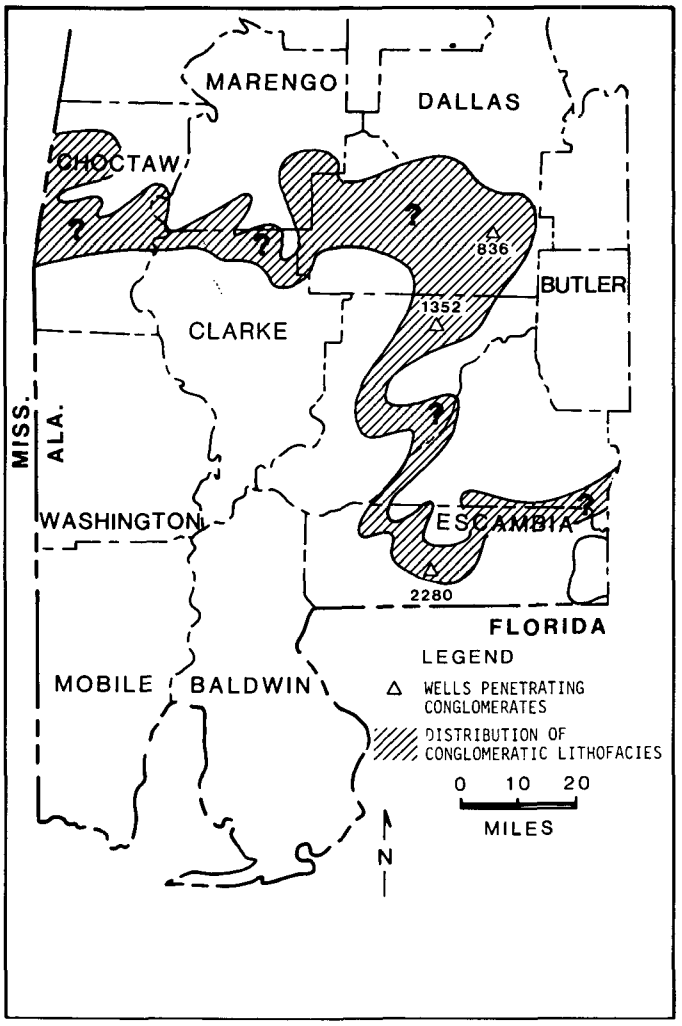

Figure 1. Distribution of conglomeratic lithofacies in south Alabama. Wells identified according to State Oil and Gas Board Permit Number.

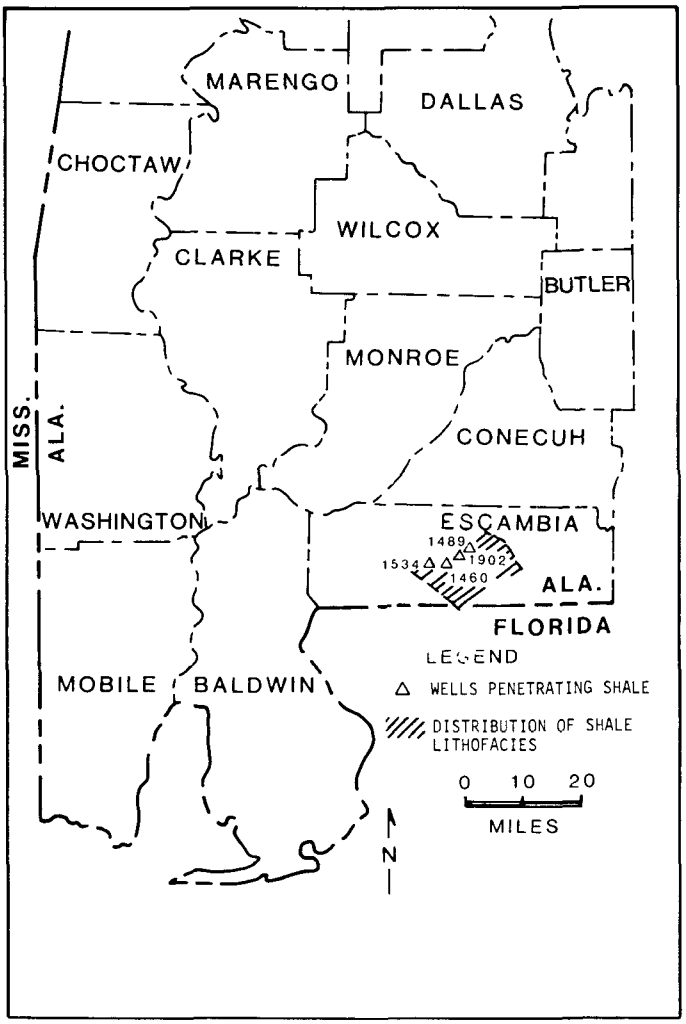

Figure 2. Distribution of shale lithofacies in south Alabama. Wells identified according to State Oil and Gas Board Permit Number.

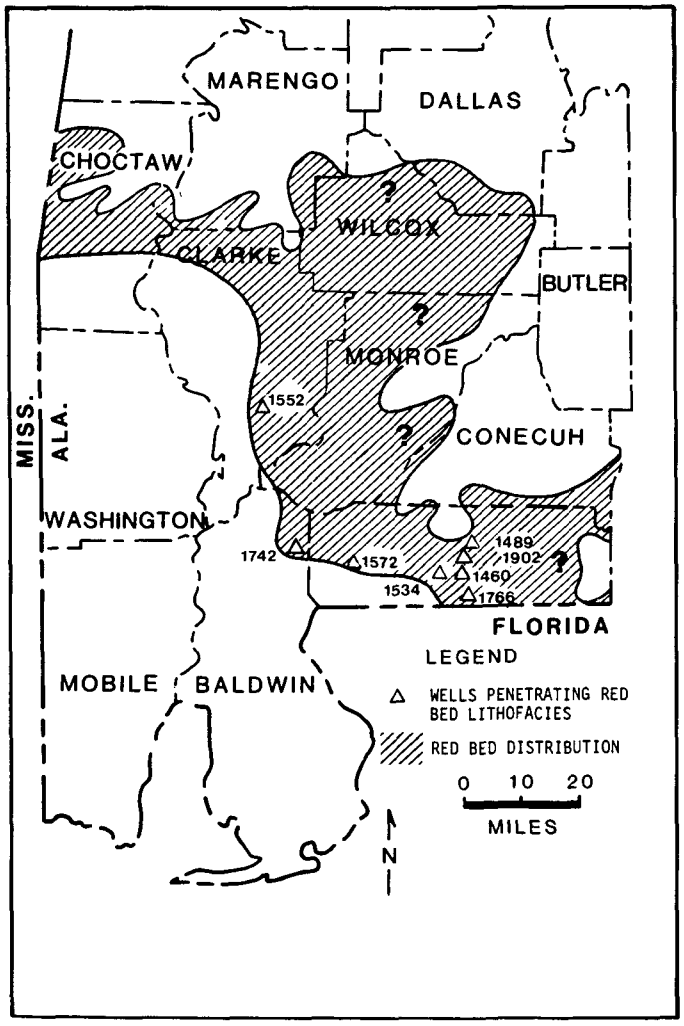

Figure 3. Distribution of red bed lithofacies in south Alabama. Wells identified according to State Oil and Gas Board Permit Number.

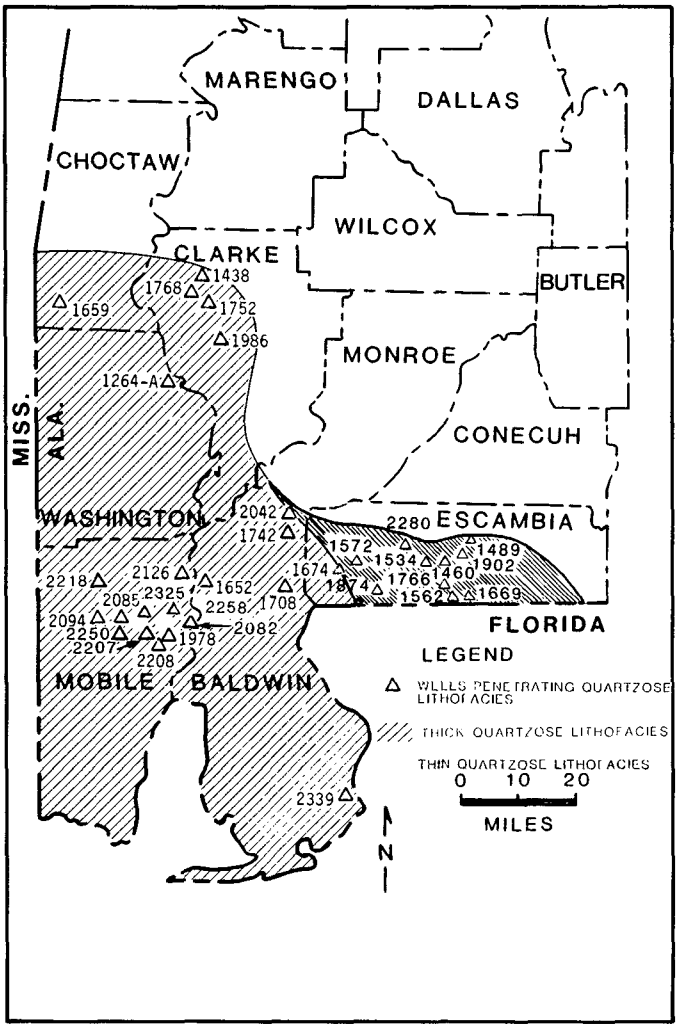

Figure 4. Distribution of quartzose lithofacies or Denkman Member in south Alabama. Wells identified according to State Oil and Gas Board Permit Number.