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Introduction

Previous work on the Edwards Formation (The Upper Comanche Series, South Central Texas) has clearly defined the boundaries of the Edwards and its members (Lozo and Smith, 1964; Rose, 1972; Miller, 1984; Humphreys, 1984; and Hovorka, 1996). Most studies have not accounted for the facies changes that occur as the Edwards Formation grades southward into the Devils River trend. The Devils River trend comprises a reefal shelf edge that cuts northwest-southeast through South Central Texas in an irregular line through Medina and Frio counties (Rose, 1972). Lozo and Smith (1964) defined the Devils River Formation based on the absence of the Regional Dense Member of the Edwards Formation. The focus of this study is to better delineate the facies changes that occur in the areas of transition on both sides of the Devils River trend.

Sequence stratigraphy, with special emphasis on accounting for fluctuating paleoenvironmental conditions, will form the basis for correlation through the Devils River trend. By using previous research and filling in data gaps, a contiguous time-stratigraphic framework over the South Central Texas Region can be constructed. Maximum flooding surfaces (**MFS**) will be emphasized by using eustatic sea level changes for regional correlation of the Edwards at the member level. The focus will initially be on the McKnight Formation and its genetic platform equivalent in order to trace its eustatic signature through the Devils River trend. Other formations and their boundaries will be used primarily for correlation purposes.

Thesis statement

The purpose of this thesis is (1) to trace the members of the McKnight Formation as they progress into and through the Devils River trend; (2) interpret the correlative strata in the Devils River Formation; and (3) tie these into the at least partly correlative Edwards Formation by means of the resolution of it's members as they progresses from the Devils River trend onto the San Marcos Platform.

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Approach/methodology

This research will be accomplished through surface and subsurface correlations of parasequence-level genetic stratigraphic units. The methods used to define and correlate members of the relevant formations will be based on sequence stratigraphy. As defined by Walker (1992), sequence stratigraphy is "the study of rock relationships within a chronostratigraphic framework wherein the succession of rocks is cyclic and is composed of genetically related stratal units" (from Posamentier *et al.*, 1988, p. 110). Detailed analysis of shelf edge facies as they relate to the depositional systems of the region will also be carried out.

Surface correlations will be mapped through field reconnaissance from the San Marcos Platform through the Maverick Basin. Measured section correlations will be made utilizing existing measured sections and newly drafted sections. Mapping will be based on outcrop locations and the mapping of key marker beds and horizons, such as the Georgetown – Edwards contact, the Regional Dense Member, and the Edwards – Glen Rose contact, all of which are characterized by a **MFS**. Lithology, fossil content, and genetic surfaces will be the basis for defining chronostratigraphic units. Hand samples will be taken at each outcrop and examined, and thin-sections prepared and analyzed.

The subsurface portion of this thesis will be built on previous work. Log cross-sections will be constructed. Where new logs are available, further correlations will added to existing cross-sections. Cores from previous work will be re-examined and any available new cores will be analyzed. The subsurface work will be mainly centered in the Maverick Basin, with logs from the Devils River trend and Edwards used for correlative purposes.

Preliminary results and discussion

Initial field reconnaissance has indicated that major transgressive surfaces are traceable from the San Marcos Platform, through the Devils River trend, and into the Maverick Basin. These markers are the contact between the Georgetown and Edwards formations, the boundary between the Regional Dense and Grainstone members of the Edwards Formation, and the contact between the Edwards and Glen Rose formations.

The boundary between the Georgetown and Edwards is well defined. Rose (1972) reported that in all areas examined, there is evidence that the boundary is unconformable. Observations cited include truncated shell fragments and spar-filled fractures, which indicate a transgression over the Edwards, before deposition of the Georgetown. The contact is clearly seen in outcrop on the San Marcos Platform (Loop 337, ~2 mi. north of I-35).

The Regional Dense Member has been described by Rose (1972) as 15-25 feet of dark grayish brown, compact, wispy, argillaceous micrite. It records a time of very rapid flooding and is recognizable in the subsurface by a decrease in the SP curve and a peak in resistivity. As the beds progress north and west, the Regional Dense Member pinches out along an irregular line through Medina and Frio counties. Lozo and Smith (1964) define the Devils River Formation here, where the Regional Dense Member is regarded as not present. Rose (1972) also notes that Winter (1962) "recognized that the black shaly limestone and anhydrite lithosome in the Maverick Basin...changes facies into the upper part of the Edwards...and the Regional Dense Member. The eastern boundary of the Maverick Basin is coincident with the zone of facies change." Winter also noted the subsurface expression of the Regional Dense Member, terming it a "SP indention". This regional marker will be the main correlative unit used throughout this thesis.

Another potential regional marker is the Dr. Burt zone (informal) (Young, 1966). The Dr. Burt zone is an ammonite zone used to mark the base of the Burt Ranch member of the Segovia Formation in the eastern Edwards Plateau. The deposition of the Dr. Burt Zone has occurred in a shallow tidal flat environment. The base of the zone is bored and contains encrusting oysters. Early interpretations of this surface have been that it is a disconformity (Smith and Lozo, 1964). This, coupled with previous interpretations of the McKnight–Salmon Peak contact as disconformable, has led to the correlation of the two disconformable surfaces. Miller, 1984, and Rose, 1972, concur that the McKnight – Salmon Peak contact is conformable and that the basal part of the Burt Ranch member is correlative with the middle McKnight. Although the Dr. Burt zone is not traceable through the Devils River Trend and equivalent deposition is characterized by shallow marine platform-type lithologies, the middle McKnight in the Maverick Basin is interpreted as being deposited in a restricted lagoonal environment (Miller, 1984).

Initial field work in Kinney County has shown a definable boundary between the Salmon Peak and McKnight Formations. Outcrops examined include contact between the McKnight and Salmon Peak (Tularosa Road [RR 3119]; Stop 6 of Smith, Miller, and Rose, 1984) and the Laguna Roadcut (Stop 5 of Smith, Miller, and Rose, 1984). Although the outcrop on RR 3119 is faulted, the contact between the McKnight and Salmon Peak is discernable as a layer of thinly bedded argillaceous material. In fact, the contact itself and the overlying Salmon

Peak beds appear to have not been disturbed by faulting. Further outcrops are to be studied in this area pending access to private property.

Correlative, time-equivalent layers are also seen in outcrops of middle McKnight and Kainer-equivalent rocks. The Laguna road cut contains thinly bedded argillaceous layers. Immediately below, a collapsed breccia layer occurs. This layer is possibly related to the Kirschburg Evaporite Member. Both have been interpreted by Rose (1972) to represent early dissolution of evaporite layers by meteoric water in a supratidal to intertidal depositional environment.

Implications of research

A better understanding of the Edwards Formation can be gained, and Lower Cretaceous eustatic sea level fluctuations can be interpreted, by correlating regionally definable **MFS**. Direct implications can be made to the Edwards Aquifer, which by definition includes the Salmon Peak Limestone, McKnight Formation, West Nueces Formation, Devils River Limestone, Person Formation, Kainer Formation, Edwards Group, and Georgetown Formation (Texas State House Bill 2901). The implications of better defining the Edwards Aquifer include identifying potentially viable sources of potable water, determining controls on flowpaths, and better defining the bad water line.

The subsurface portion of this thesis will contribute to improved correlations between the Maverick Basin and the San Marcos Platform. The Maverick Basin is a known producer in the Cretaceous of oil, gas, and coalbed methane. Current research includes a paper from the AAPG Annual Meeting 2002 titled “The Sacatosa Coalbed Methane Field: A First for Texas” that discusses the occurrence of coalbed methane in the Upper Cretaceous of the Maverick Basin. Due to fracturing, most of the smaller plays have been overlooked. The potential for future exploration exists to exploit economically viable quantities of hydrocarbons.

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