

A Plea for a Standardized Three Forks Stratigraphy

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Abstract

Commonly used stratigraphic nomenclatures of the Three Forks Formation are informal, ad hoc conventions that assign numerical or alphabetic labels to marker horizons and reservoirs keyed to the order in which they are drilled (descending). In some cases, the same label is applied to different markers. In other cases, units properly belonging to the Pronghorn member of the Bakken Formation are incorrectly assigned to the Three Forks. Inevitably confusion follows, highlighting the need for an accepted standard stratigraphic section. In 1961, Christopher subdivided the interval between the base of the lower Bakken and Nisku (Birdbear) Formation into the Big Valley and Torquay Formations. He traced these units with core, aided by logs, across Canada and into North Dakota. In North Dakota, Christopher's Big Valley Formation is equivalent to the Pronghorn member of the Bakken Formation; and his underlying Torquay Formation is equivalent to the Three Forks. Christopher split the Torquay Formation into 6 units (labeled in ascending order) in which two lithofacies dominate. The first consists of thinly bedded subtidal to supratidal dolarenites; the second contains massive, unsorted, conglomeritic paleosols that are easily recognized on gamma ray logs. Dumonceux (1984), noting the unconformity capped, upward shoaling nature of Christopher's lithofacies, recast his 6 units into three members (upper, middle and lower). The lower member is dominated by structureless, argillaceous and anhydritic lime mudstones and conglomerates that conformably overlie the Birdbear (Nisku) Formation. This member extends up to the unconformity that caps the well-defined paleosol at the top of unit 3. Both the upper and middle members are transgressive-regressive sequences bounded by unconformities. The middle member (units 4 and 5) is bounded by the top of the paleosols in units 5 and 3, and contains the intervening tidal laminates of unit 4. The upper member contains unit 6, and is bounded above by the Bakken / Three Forks unconformity, and below by the unit 5 paleosol. Most recently, Bottjer et al. (2011) combines LeFever et al.'s Pronghorn member of Bakken Formation with Dumonceux's Three Forks stratigraphy and in doing so provides the most detailed stratigraphy to date. We propose that this nomenclature be accepted and used as the template for any further refinements.

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