

Mannville Paleo-topography and Depositional Trends in the Glauconitic Formation, Southern and Central Alberta.

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The Glauconitic Formation of the Lower Cretaceous Mannville Group is a major producer of hydrocarbons in southern and central Alberta. Reserves are contained mainly in a series of channels or incised valley systems and related shoreface complexes. The relatively mature nature of these plays coupled with excellent well control in the basin has allowed detailed mapping over a relatively large area. Gross depositional trends within the Glauconitic were controlled by the interplay between relative sea-level fluctuation and paleo-topography on the pre-Cretaceous unconformity surface. Presented here are a series of regional maps illustrating the relationship of the major depositional trends to the positions of Glauconitic-aged highlands.

Topographic highlands were defined using a Mannville isopach map; isopach values of less than 100 metres were considered to be areas of subaerial exposure at the maximum flooding of the Ostracod to early Glauconitic-aged sea. A reconstruction of these highlands shows the controlling influence exerted on Glauconitic depositional trends. Moving from south to north, the main topographic features were: the Medicine Hat, Kinderslie and Hackett Highlands and the Wainwright Ridge (Figure 1). The Jenner-Cessford shoreline complex, which barred the depression between the Medicine Hat and Kinderslie Highlands, marks the highstand position of the Ostracod flooding event (after Karvonen and Pemberton, 1997). A correlative shoreline was also developed in the Coutts area at the U.S. border. Shoreface sands developed in the Claresholm and Alliance areas may also relate to this highstand.

As relative sea-level dropped following the initial flooding, the shoreline prograded northwest to a stillstand at the present position of the Hoadley Barrier Complex (Figure 2). Associated with this base-level drop was the incision of a series of Glauconitic channels or incised valleys. The Hoadley trend has been mapped from areas published by Chiang (1984) and Rosenthal (1988) to the northeast where it intersects the Wainwright Ridge, effectively barring the southern Alberta sub-basin. A correlative shoreface complex trends east from the Wainwright Ridge, across the Edmonton sub-basin forming a Wabasca shoreface complex (using heavy-oil terminology). Glauconitic and post-Glauconitic Lithic channels intersect the Hoadley-Wabasca shoreline at several locations.

In the southern portion of the map area, the gross southeast-northwest trend of the major Glauconitic and Lithic valley systems was controlled by the position of

the Medicine Hat, Kindersley and Hackett Highlands to the northeast (Figure 2). These valley systems flowed north from Montana, feeding the Hoadley and related shoreface complexes. Although masked by the thickening of the Mannville section on the southwest edge of the map area, it is inferred that the valleys were constrained to some extent by highlands to the southwest. The Lithic systems, which post-date the quartzose Glauconitic systems, fed the Torrens Member shoreface complex ('Glauconitic A1 using Rosenthal's terminology).

In the northeast portion of the map area, both the Bellshill Lake-Provost and Halkirk valley systems are constrained by the Hackett High and the Wainwright Ridge. The Bellshill Lake-Provost channel and the channel just east of Edmonton represent the earliest stage of Glauconitic channelling, pre-dating the Glauconitic coal marker. The Halkirk system and the northerly-trending system which cuts through the Wainwright Ridge to feed the Wabasca Complex can be shown to truncate and post-date the coal marker. One Lithic channel was mapped in this area, although it is unclear by its trend exactly how it relates to the other Lithic systems.

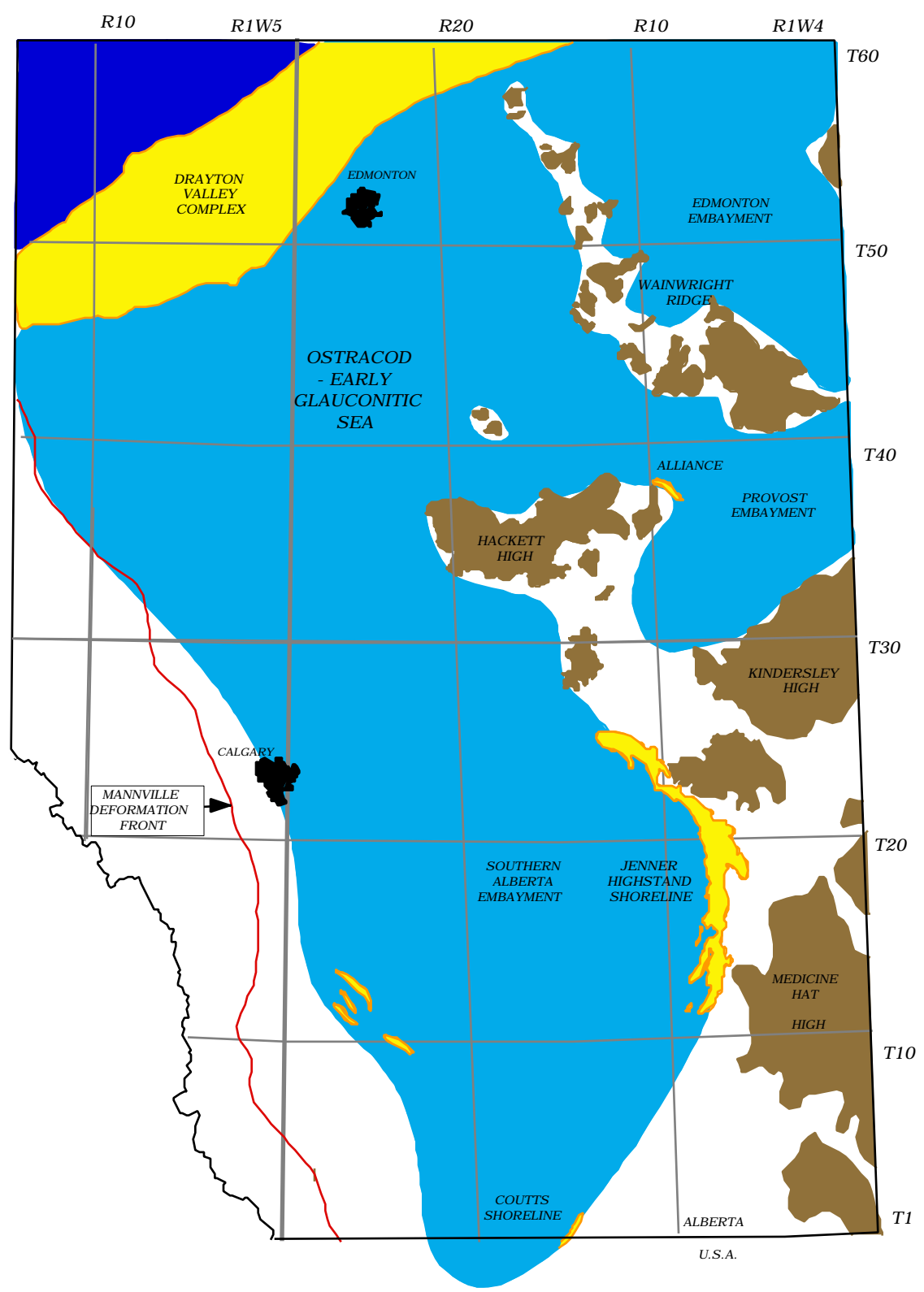


Figure 1: Southern Alberta paleogeography at maximum flooding of Ostracod-early Glauconitic Sea, illustrating major highlands and Jenner-Coutts shoreline trend.

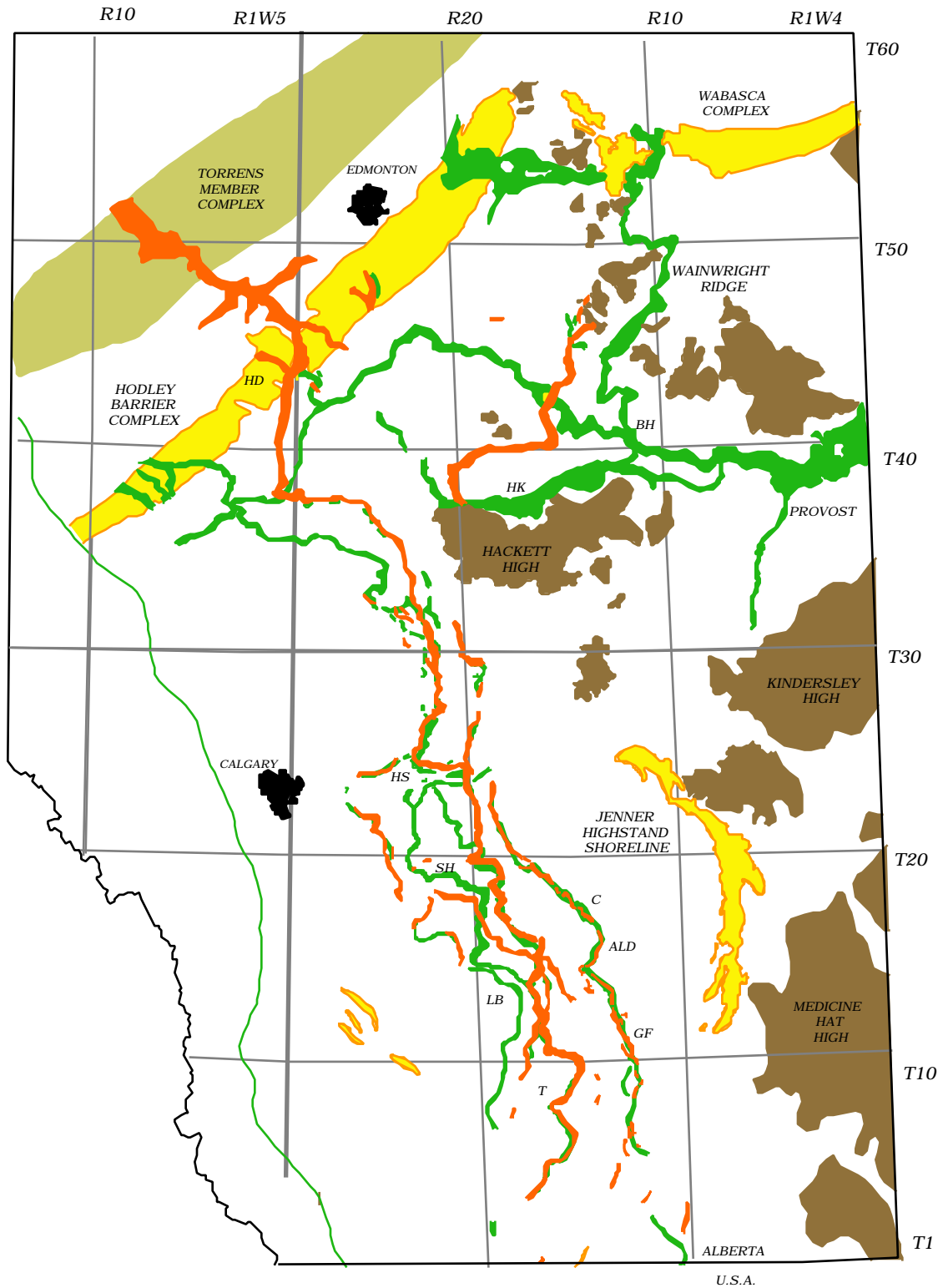


Figure 2: Paleogeography after regression of sea to the position of the Hoadley-Wabasca shoreline trend; Glauconitic channels in green, Lithic channels in orange; major fields: T-Taber, GF-Grand Forks, LB-Little Bow, ALD-Alderson, C-Countess, SH-Shouldice, HS-Hussar, HK-Halkirk, BH-Bellshill Lake, HD-Hoadley.