

Sedimentology and sequence stratigraphy of the Green River Formation, eastern Uinta Basin, Utah

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Lacustrine basin systems have always been valued for their abundant conventional oil and gas reserves, but also their potential for unconventional petroleum development. Some of the largest oil and gas fields in Utah produce from the sands within the Uinta Basin's lacustrine system, while the deeper lake sediments contain one of the largest oil shale resources in the world. In order to better understand the evolution of Utah's Eocene Lake Uinta and to help facilitate prudent and economic development of Utah's oil shale resource, a predictable sequence stratigraphic model of the basin's lacustrine sediments needs to be refined. Herein, we describe lacustrine sedimentary facies and stratigraphic stacking patterns present in the upper Douglas Creek Member and Parachute Creek Member of the Green River Formation along the NW – SE trending Evacuation Creek outcrop (about 2.7 miles long) on the eastern flank of the Uinta Basin, near the Douglas Creek Arch. In addition to this outcrop dataset, a core located about ten miles to the west was also described. We define nine different facies deposited as either siliciclastic inputs into the lake, classic shallow carbonate lacustrine deposits, or by volcanic activity. These datasets provide a unique opportunity to highlight significant lateral changes in facies architecture. These sections record meter-scale shallowing upward successions, with an overall shallow to deep transformation of the lake system. Also present are regionally significant variations in sediment supply that are likely climatically driven. Periods of high sediment supply are recorded by laterally extensive sandstone mouth bar deposits, whereas low sediment supply conditions are recorded by carbonate dominated rich zones. Broadly, data collected from the Evacuation Creek outcrop sections support the regional applicability of the preliminary sequence stratigraphic model developed by Birgenheier and Vanden Berg (2011), with similarities in lake phase evolution. These sections record meter-scale shallowing upward fluctuations, with an overall shallow to deep transformation of the lake system. This research provides a key dataset towards developing a regional sequence stratigraphic framework for lake evolution in the Uinta Basin.