The basin fill history of the Green River Formation in the Piceance Creek Basin, CO

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Abstract:

The Green River lakes occupied the Uinta, Piceance, and Greater Green River Basins during the Early to Middle Eocene time. These foreland basins were initiated during the late Cretaceous and early Cenozoic Laramide Orogeny. The Green River Formation in the Piceance Creek Basin contains over 2000 ft of lacustrine deposits composed of alternating, kerogen-rich mudstones, carbonates, and sandstones, and forms the world's largest oil shale reserve of about 1 trillion BOE.

In this study we used outcrops, cores, and over 200 well-logs to identify the major sequences across the Piceance Creek Basin. The sections that we analyzed are composed of numerous high-frequency sequences manifested by distinctive flooding surfaces. These prominent surfaces display relatively conformable, flat-lying stacking, thus indicating minor incision between sequence boundaries that are probably tied to high-frequency, low-amplitude, lake-level changes. The sections also indicate an important sedimentary source from the Douglas Creek Arch that divides the Piceance and Uinta basins, and a sedimentary fill that kept pace with the spatially variable basin subsidence.

The analysis of the sedimentary sections indicates six lacustrine stages for the Green River Formation in the Piceance Creek Basin: a) Filling – initial lacustrine environments with gradual deepening. b) Fluctuating – shorelines were fluctuating at the basin marines. c) Lowstand - lake levels were low and shoreline regressed far into the basin. d) Saline – the salinity of the lake was significantly high with evaporate deposition e) Deep Lake – lake levels increased and lowered the salinity. f) Very Deep Lake - with extensive oil shale deposits at the basin margins..