

**Lacustrine Lithofacies, Depositional Processes and Diagenesis of the Uteland Butte Member,
Uinta Basin**

Katie Logan¹, Rick Sarg¹

¹Colorado School of Mines, Golden, CO

The Uteland Butte Member of the Green River Formation represents the first widespread lacustrine deposit preserved in the Eocene Uinta Basin. The Uteland Butte is a highly cyclic, climatically driven, ostracod, molluscan and dolomite-rich 14-50 m (45-164 ft) thick unit. This research describes outcrops at the basin's edge, where marginal lake sediments were deposited, and whole-core at the basin's center, where sublittoral sediments were deposited. These two paleoenvironments were stratigraphically correlated from outcrop to core. Further analysis focused on the characterization of reservoir properties and their relation to facies, geochemistry, fractures, and diagenesis.

The littoral lake margin is overall thinner and composed of massive beds of silt, packstone and grainstone. The sublittoral central basin deposits are thicker and lack evidence of in situ vegetation, show strong lamination, are bioturbated, finer grained, and contain ostracods and bivalve shells. The Uteland Butte is divided into four depositional cycles, each bounded by sublittoral, lean oil shale. At the margin each cycle is approximately 4.2-7 m (13.8-23 ft) thick while in the sublittoral region each cycle is approximately 7-12.5 m (23-41 ft) thick. All cycles are correlative from the margin into the deeper basin.

These Uteland Butte cycles are interpreted to have resulted from a fresh-water lake which experienced four large pulses or wetter periods that slowly tapered into drier periods. Stable isotope results suggest fresh lake conditions with a relative low salinity, high inflow and high organic productivity. Mixing zones with brackish and fresh water may have influenced dolomite diagenesis. Additionally the Uteland Butte lacks stromatolites, evaporates, and analcime, and is rich with abundant bivalves, gastropods and ostracods across the lake that indicates a fresh water lake environment.

Recently, unconventional development (lateral drilling and multistage hydraulic fracturing) has targeted three oil-saturated, dolomitized, sections in the central Uinta Basin. Dolomite mud is abundant, making up 25-50% of carbonate material, in marginal and sublittoral deposits with an average of 35%. These dolomites are laterally variable, with porosity values between 7.2-17%, and low permeability due to a microcrystalline fabric in the dolomite. In the dolomite mud porosity is concentrated within intercrystalline porosity.