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Sequence Architecture in Distal Lake Bonneville (Late Quaternary), Northwestern Utah

The application of sequence stratigraphy to lacustrine sediments is an essential tool in exploration for and exploitation of hydrocarbon resources. However, water levels in lakes can vary at different rates than in sea level in ocean basins. Therefore, it is necessary to study well-exposed lake deposits to determine how best to interpret the sediments using sequence stratigraphy. Lake Bonneville, which was the largest of the late Quaternary paleolakes in the western United States (51,000 sq. km), existed from 28 ka to 12 ka. Previous studies describing the sequence architecture of Lake Bonneville deposits have all been conducted on the eastern margin of the lake along the Wasatch fault. The large accommodation space and high sedimentation rates in this area have influenced sequence stratigraphic interpretations but are not representative of the entire lake setting.

The Matlin 7.5-minute quadrangle, northwest Utah, contains remnants of all the major shorelines formed by Lake Bonneville leaving a complete record in a region of minimal sediment input and low tectonic influence. The Bonneville sequence in more distal portions of the quadrangle is composed of a transgressive marl capped by the white marl that represents the maximum flooding surface. The catastrophic drop in lake level associated with the Bonneville flood also produced a regressive, more clastic-rich regressive marl. Proximal areas contain a transgressive systems tract composed of a series of backstepping, isolated shorefaces, which could be misinterpreted as a series of forced regressive shorefaces. A single forced regression shoreface is present at the Provo level. The lake level then continued to fall after Provo time and the sequence boundary was formed by the transgression of Great Salt Lake.