

Stratigraphy of the Lower Mississippian Lodgepole Formation in the Central Williston Basin, North Dakota, U.S.A.

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Abstract

The Lower Mississippian Lodgepole Formation in the Williston Basin of North Dakota comprises a carbonate dominated formation that reaches a maximum thickness of ~900 ft (275 m) near the center of the basin. Twenty cores and >1,450 petrophysical well logs from the Williston Basin in North and South Dakota were used to evaluate the large-scale stratigraphic architecture of the Lodgepole Formation. At least six stratigraphic cycles are recognized within the Lodgepole Formation. These cycles comprise a gradual change in lithofacies from organic shale at the base to fossiliferous marls and wackestones in the middle to finally carbonate dominated, fossiliferous wackestones and packstones at the top. The cycles are recognized on petrophysical gamma ray logs by having a thin interval of high API values at the base where the shale facies dominate. The bounding surfaces that separate the cycles are placed at these gamma ray maxima and are interpreted to represent maximum flooding surfaces. Above these surfaces, the API trend decreases upwards into the more carbonate-dominated facies, achieves a minimum API value, and then increases upwards into the next gamma ray maxima. Correlation of these cycles across the study area reveal that they represent different parts of a prograding carbonate ramp system. Clinof orm sets in this system generally dip northwest, away from the paleo highs to the south and east. The abundant data provides a detailed view of how these depositional cycles successively filled in and around each other as well as revealing paleoerosional patterns at the top Lodgepole disconformity.