cycles are represented by vertical variations from oölitic-fragmental and normal marine limestone (or dolomitized equivalents) to evaporitic rocks including anhydrite, locally halite, and associated cryptocrystalline or dense carbonates. Within the Wyoming shelf, the cycles exhibit only partial development in which the evaporitic interval is thinly represented by primary cryptocrystalline or dense dolomite. Dolomitized limestones (fine to coarse crystalline dolomites) generally form the marine intervals in the shelf areas.

By recognition of these lithologic cycles, the Lodgepole, Mission Canyon, and Charles formations may be correlated to their respective eroded edges in Wyoming, South Dakota, and north-central Montana.

Mississippian sedimentation commenced earliest in the Williston basin and central Montana trough with the deposition of black shales (Bakken formation) followed by dense limestones and shales (lower Lodgepole). Preceding and accompanying the initial marine transgression on the Wyoming shelf, minor terrestrial to near-shore marine clastic deposition took place in the Black Hills area (Englewood formation). Widespread marine deposition formed normal marine and fragmental-oölitic limestones which were subject to dolomitization in the shelf areas (upper Lodgepole, lower Pahasapa, and Guernsey formations).

Marine limestone and dolomite sedimentation, interrupted by two episodes of evaporite precipitation, resulted in the development of the Mission Canyon formation and the superjacent evaporites of the basal Charles, and their equivalents in the Pahasapa formation of the Black Hills area.

Restoration of normal marine conditions and development of a complex evaporite cycle followed (Charles formation, excluding basal evaporites and uppermost few beds of the Pahasapa).

Big Snowy clastics were deposited in Chester time in the basinal areas of Montana. In areas to the south, pre-Amsden, pre-Minnelusa, or pre-Pennsylvanian weathering and erosion affected the Mississippian beds. In north-central Montana, pre-Middle Jurassic erosion strongly truncated the upper Madison strata.

Oil occurrence in the Madison group is related to the two main provinces of deposition. In general, the oil from the basinal or limestone province is of relatively high gravity, whereas that from the dolomite or shelf province is of much lower gravity.

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Mississippian Lithologic Sequence in Southern Saskatchewan

Mississippian rocks of southern Saskatchewan comprise in descending order, the Charles, Mission Canyon, Lodgepole, and Bakken formations. However, in the Wood Mountain area of southwestern Saskatchewan, the Charles is absent as a result of pre-Jurassic erosion and at Carievale, in south-eastern Saskatchewan, only the basal anhydrite bed of the Charles has been preserved. Cyclically deposited chalk, oölitic limestone, and bioclastic limestone comprise the Mission Canyon formation which may be subdivided into six members. The Lodgepole comprises argillaceous limestone, dense siliceous limestone, primary chert, and calcareous shale. The Bakken formation consists of two black bituminous shale members with intervening siltstone.

The origin of the various rock types is an outgrowth of this study, and criteria are presented for the recognition of evaporitic dolomite.

Differential weathering of the chalk members, as compared with the much harder limestone and evaporitic dolomite units, probably has a marked influence on the topography of the erosion surface of the Mississippian sub-crop.

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Stratigraphy of Lodgepole Formation, Virden Area, Manitoba

The increasing importance of Virden-Roselea and North Virden oil production has made it desirous that a workable subdivision of Lodgepole stratigraphy be undertaken for this area and for adjoining regions wherever correlation is satisfactory. The present paper proposes a member breakdown of the Lodgepole of the Virden area, and describes these units in some detail from type wells of the vicinity.

Due to lithologic variations resultant from changes in depositional environment within the preserved portion of the Lodgepole of the eastern Williston basin, the proposed stratigraphic units are applicable in general only to the eastern portion of the Manitoba and northern North Dakota sections. Recognizable correlation becomes increasingly difficult and unreliable rather abruptly westward of a northerly-trending narrow zone of demarcation. Correlation east of this zone, however, is generally good and can be referred readily to the Virden type section. Despite the limited areal extent of application, the economic importance of this region warrants systematic stratigraphic subdivision.