

Shaunavon, and Vanguard formations of Saskatchewan. However, they are not the exact equivalents of these formations since some overlapping occurs.

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Jurassic of Southwestern Saskatchewan

The Jurassic in this area consists of four formations, the Vanguard, Shaunavon, and Gravelbourg of essentially marine nature, and an underlying Watrous formation composed of redbeds and evaporites. These formations were originally described by Milner and Thomas in 1952, and the subdivisions of these formations used here are essentially the same except for some slight modifications in the subdivision of the Vanguard formation.

The Watrous formation is considered to be of Jurassic age but the formation is largely unfossiliferous and many workers believe that at least the basal part of the formation may be Triassic in age. The Gravelbourg, Shaunavon, and most of the Vanguard formation are unquestionably Jurassic and extend from the Bajocian into at least the Oxfordian. In much of the area the top of the Jurassic is placed at a marked unconformity between obvious Jurassic and an unfossiliferous sequence of shale and sandstone thought to be of Lower Cretaceous age. In many wells, however, part of this unfossiliferous section may also be Jurassic in age and the top of the Jurassic is difficult to locate.

Correlations with adjacent areas are possible and the Saskatchewan section is most easily correlated with the Ellis group of Montana. The Saskatchewan section is considerably thicker than that found in the outcrop areas along the southwestern edge of the Jurassic basin, and the formations present in Saskatchewan are only partially represented in typical outcrop sections of the Ellis group. Despite this, equivalents of the Swift, Rierdon, and Sawtooth formations of Montana can be recognized in Saskatchewan.

The Jurassic seas covered most of Southern Saskatchewan and the northern shoreline of this Jurassic basin extended in a general east-west arc across the Province approximately 150–200 miles north of the International Boundary. Sediments deposited in this basin thicken southward, the maximum thickness in Saskatchewan being about 1,400 feet. The western side of the basin is marked by an extensive shelf area extending eastward from the Sweetgrass arch across Saskatchewan as far as a line running approximately through the Dollard-Fosterton trend.

Minor fluctuations in the strand line during Bajocian or Kimmeridgian time are expressed by the deposition of both clastic and carbonate sediments in the basin. The deposition of suitable reservoir rocks, including both sands and fossil debris, is closely related to transgression and retreat of the Jurassic seas, while local relief on the ocean floor due to the irregular topography on the old Paleozoic surface was important in controlling the deposition of these reservoir rocks.

Oil occurrences in the area are mainly stratigraphic in nature although minor structural features related to compaction and regional downwarping of the area in Jurassic and Cretaceous time have played some part in localizing oil accumulation. Oil production has been established in the upper and lower members of the Shaunavon formation, in the middle Vanguard, and in the basal sands of questionable Cretaceous age.

The geologic reasons for the deposition of reservoir rocks in the Jurassic of southwestern Saskatchewan are illustrated by means of isopach maps of the various formations and members, and an attempt is made to relate the occurrences of oil in these reservoirs to the geologic history of the area.

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Jurassic Stratigraphy of Sweetgrass Arch—Manitoba Section

In southern Saskatchewan and Manitoba the interval between the late Paleozoic and late Jurassic epeirogenies is represented in stratigraphic order by continental redbeds, evaporites, carbonates, and clastics. The sequence is in excess of 1,400 feet thick in south-central Saskatchewan and thins north, west, and east. Depositional and erosional thinning are complementary and the northern limits are determined by late to post-Jurassic truncation.

The system was divided (Milner and Thomas, 1954) into the Watrous, Gravelbourg, Shaunavon, and Vanguard formations, each representing widely recognizable lithologic units.

Proof of Jurassic age is available for the Gravelbourg, the Shaunavon, and Vanguard formations. These formations together appear to represent the Bajocian to Kimmeridgian time interval. The evaporites of the Watrous formation possibly represent the lower Bajocian or earlier Jurassic stages. Recent findings, still unpublished (Peterson, 1955), indicate that rocks of Triassic age may be included in the lowermost continental sediments of the Watrous.

A minor unconformity of Middle Jurassic age is indicated by the occurrence of chert on top of marine carbonates of the Gravelbourg. The evidence for this unconformity is strongest in central and southeast Saskatchewan. There the anhydrite of the Watrous formation thickens markedly and the evaporite conditions appear to have lasted into a higher stratigraphic level than in western Saskatchewan. In the same area the marine sediments above the unconformity thin and gradually change facies. The carbonates to the west are substituted by clastics, and coarse clastics appear in increasing