

Bakken Formation Middle Member Lithofacies 2



Julie A. LeFever

LITHOFACIES 2

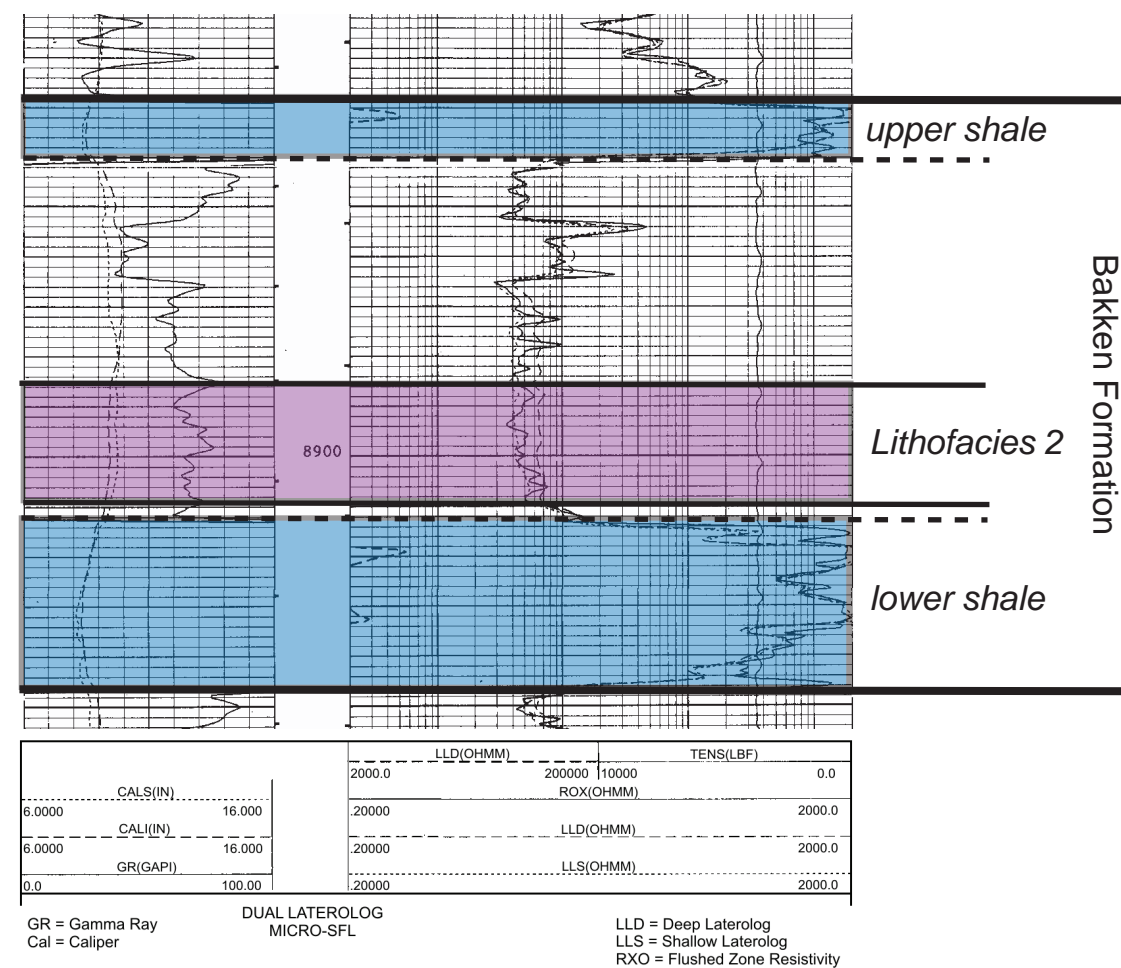
Lithofacies 2 varies from a greenish-grey argillaceous siltstone to brownish grey very fine-grained sandstone. Sandstone accumulations are areally restricted on localized highs. There is an abrupt change in lithologies that is represented by a narrow band from a more gradual portion of the shelf to the deeper sediment starved portion of the basin with an abrupt edge along the western Nesson anticline.

The sandstone portion of the facies is medium grey to dark grey and very fine-grained with brachiopods, burrows, and localized crinoid fragments. Rip-up clasts were observed along the southwestern limit of the sandstone. Calcite is the common cement and cementing is complete in areas of coarser grain size. Local dolomitization of the calcite cement enhances the porosity. The sandstone gradually changes in to a medium brown siltstone with brachiopods and burrows with localized dolomite cement. As the central portion of the basin is approached the siltstone becomes a medium-dark grey shaly siltstone. The facies is characterized by clay draping and or Helminthopsis burrows. These are concentrated in the lower portion of the section. Extensive burrowing has homogenized the upper section. Porosity is also enhanced by burrowing. Fossils are commonly replaced by pyrite. Pyrite nodules are occasionally present.

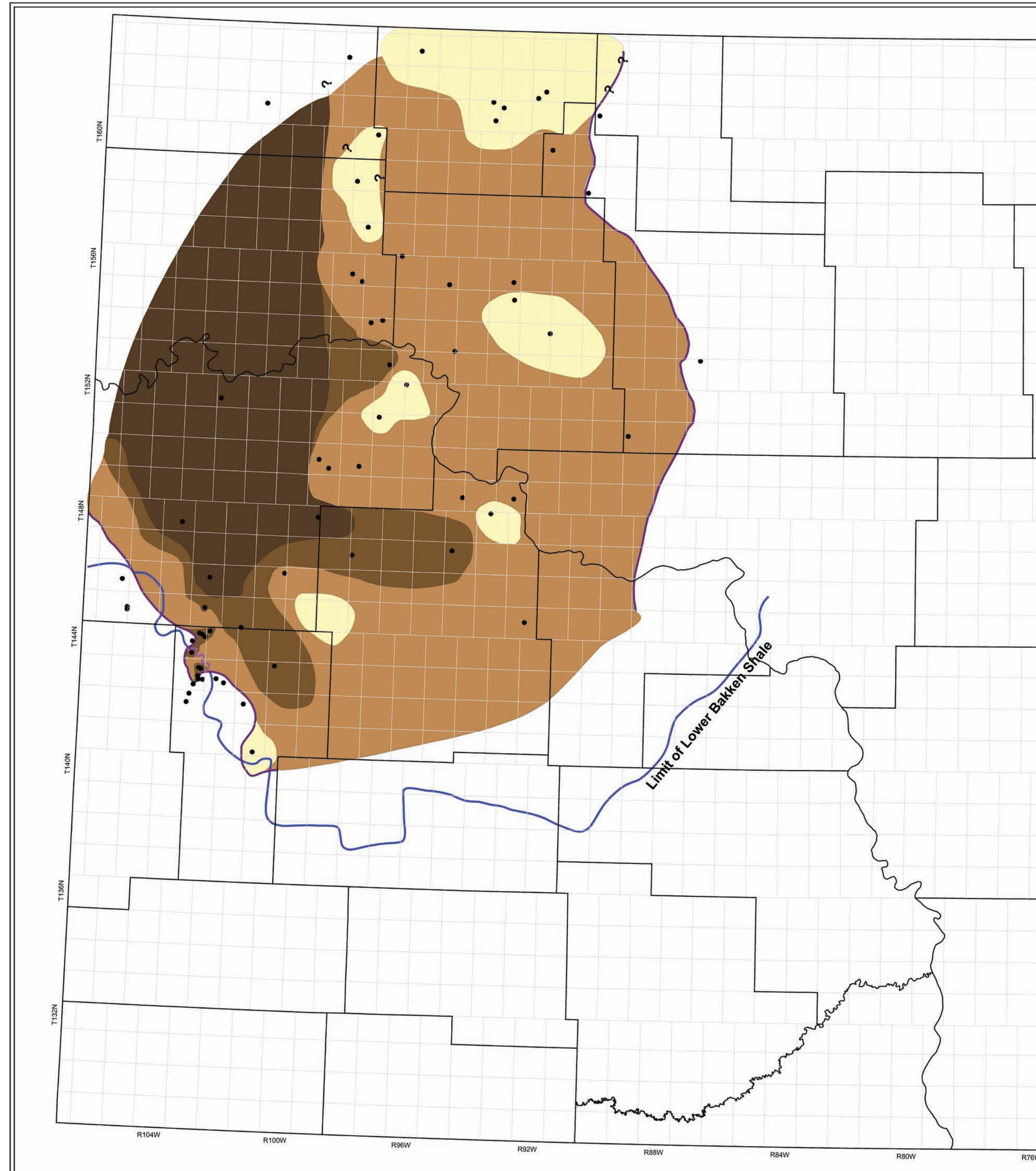
Lithofacies 2 reaches a maximum thickness of 40 ft, averaging 14 ft. The facies gradually thins towards the margin. Abrupt thickness variations occur in areas of uplift or salt collapse. The facies has the greatest areal extent and is easily recognized throughout the Williston basin by its distinctive burrows and clay drapes. The interval is mappable on wireline logs. The lower section deflects the gamma-ray curve to the right (increasingly shaly) with the upper section having a noticeably cleaner gamma-ray curve representing the highly burrowed portion of the facies (see wireline log). Log porosities for this interval commonly range from 6 to 12% and appear to indicate dolomitization. This section is the stratigraphic equivalent to the producing zone in the Elm Coulee Field, Montana. Mapping with wireline logs should reference the available core control whenever possible.

The sediments of Lithofacies 2 represent upper to lower shoreface. Although Helminthopsis is thought to represent deep water facies, in this case it is indicative of a facies not an environment. Sediment source is from the northeast with transport restricted to the eastern side of the Nesson anticline. It is readily apparent that the marine channel has become broader with the transgression of the Bakken seas. It is also apparent that uplift on the Nesson is confined to the northern and southern portion of the structure.

SENW Sec. 11, T.160N., R.95W
 Conoco, Inc.
 #17 Watterud "A"

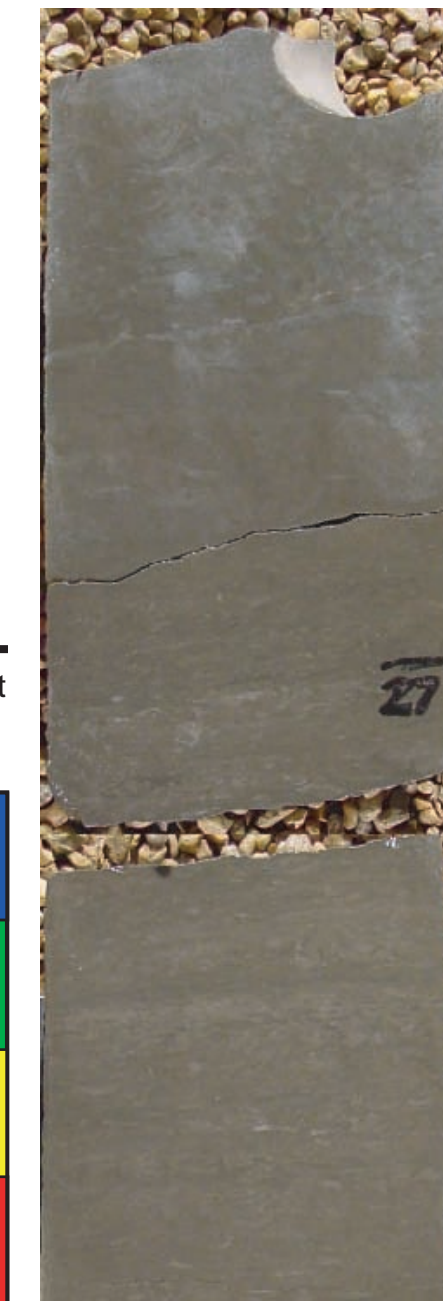


NDIC File No: 13318



Upper

NENW Sec. 19, T.147N., R.96W.
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 KB = 2547



Interparticle and microfracture porosity are prevalent in the very fine-grained sandstone to siltstone interbeds.

Pervasive interparticle porosity within thin dolomitic limestone beds.

Interbedded dolomitic limestone with a very fine-grained sandstone-siltstone. Heavily burrowed with interparticle porosity.

Lower

NENW Sec. 19, T.147N., R.96W.
 Maxus Exploration Co.
 #21-19 Carus Fee
 KB = 2547



Dolomitization has occurred along small lenses or thin laminae of calcite. Interparticle-intercrystalline and microfracture porosity are prevalent.

Open and pyrite cemented microfractures within clay draped sandstone-siltstone sequence. Some of the calcite cement exhibits dolomitization.

Very fine-grained sandstone-siltstone laminae overlain by clay drapes with pervasive interparticle and microfracture porosity.

Lithofacies 2

- Limit of L2 Lithofacies
- Unconformity - L2 - Underlying Unit
- Limit of Lower Bakken Shale
- Upper Shoreface
- Sandstone Siltstone - Middle Shoreface
- Siltstone - Lower Shoreface
- Siltstone - Mudstone - Distal
- Bakken Core Locations