

# Bakken Formation Middle Member Lithofacies 1



Julie A. LeFever

## LITHOFACIES 1

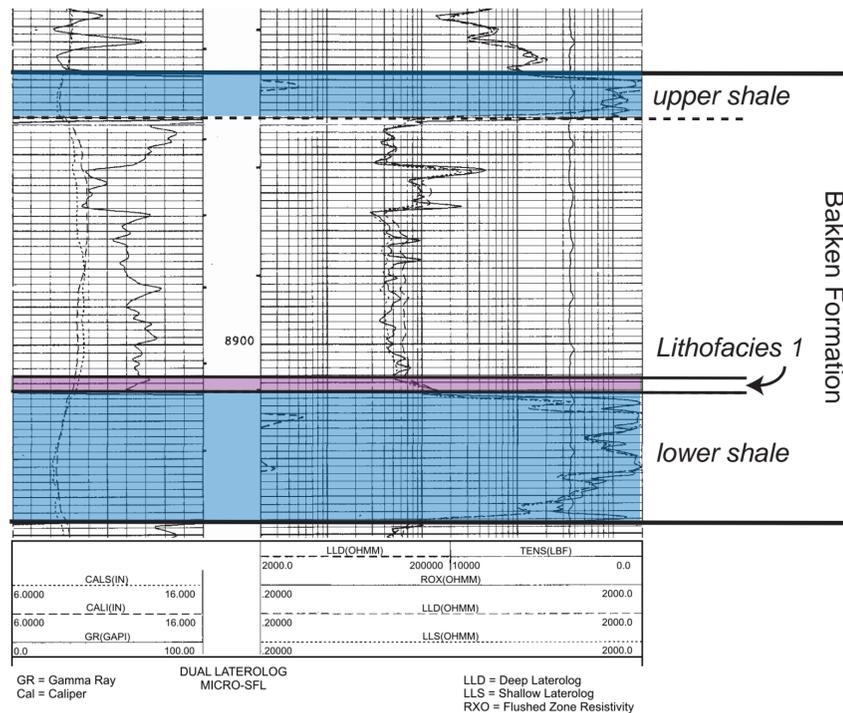
Lithofacies 1 is a transitional facies from the anoxic deposition of the lower Bakken black shale into the normal marine setting. Subtle variations of components and shale content determine the distribution of the various environments present. Core coverage for the facies is limited to the basin margin and southern portion of the Nesson anticline. Two cores along the margin consist of medium brown, shaly- to silty-limestone. The remaining cores consist of light-grey, greenish-grey, or brownish-grey argillaceous siltstone with the argillaceous content increasing basinward.

The shaly- to silty-limestone that is present within this facies contains a mixture of bioclastic material consisting of crinoid, brachiopod, and a few bryozoan fragments. One of the wells also contained glauconite grains. Where a contact was present in the core, it was erosional. The remaining portion of the sequence consists of a massive- to burrowed argillaceous siltstone and an interbedded argillaceous siltstone-claystone sequence. Crinoid fragments and burrowing with an occasional gastropod are present along the margins. The lithofacies becomes more massive with a few scattered brachiopods towards the basin center. Where present, the porosity is interparticle with calcite and pyrite acting as the predominant cement. As the contact with the underlying Bakken shale is approached, there is a noticeable increase in the amount of pyrite present in the rock. Bioclastic material is commonly coated or replaced with pyrite. Where the lower shale is absent a lag deposit has developed at the contact, consisting of bitumen-coated fossil fragments, brachiopods and brachiopod spines, sand and pyrite grains. Contacts between Lithofacies 1 and the lower Bakken shale vary from erosional and unconformable along the margin to a gradational contact in the central basin.

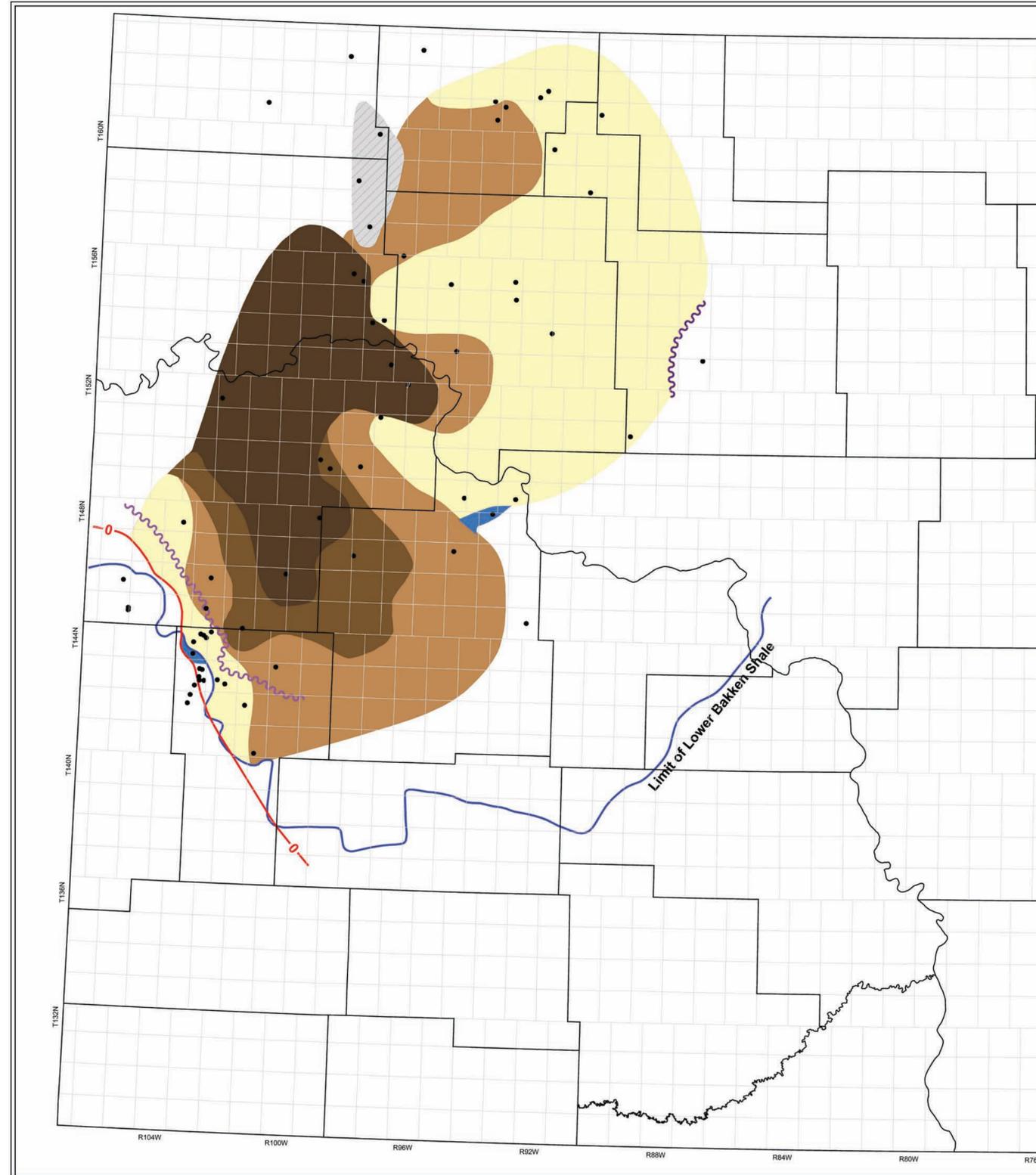
Lithofacies 1 ranges in thickness from 1.5 to 6 ft, averaging 3 ft. Maximum thickness for this lithofacies is in the area of the main depocenter for the middle member. Thickness remains constant over the rest of its extent with the exception of one locality in Billings County. At that location the abnormal thickness is probably related to the dissolution of the Prairie Salt. The recognition of the facies on wireline logs is dependent on the presence of the lower shale. The wireline log character for Lithofacies 1 is a small response in the gamma-ray signature (see wireline log) that is sometimes difficult on the older logs where the shale signature is less defined.

Lithofacies 1 represents upper to lower shoreface environments of deposition. Contacts are conformable in the central portion of the basin becoming sharp and unconformable to the southwest. Sediment source was from the northeast and restriction of transport by the Nesson anticline was not significant at this time. The marine connection was relatively narrow to the west of the Nesson, and in a predominantly north-south direction.

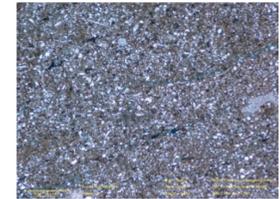
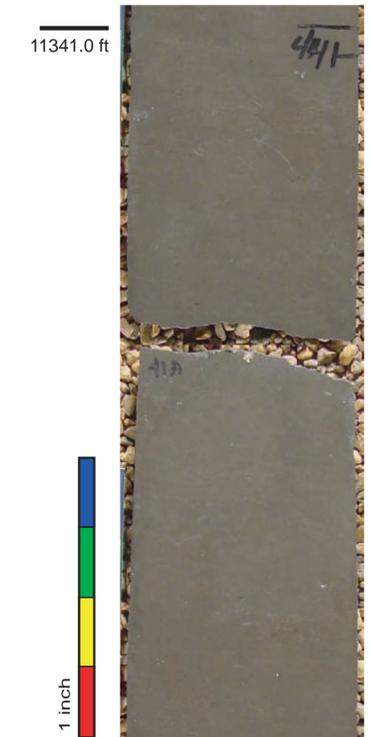
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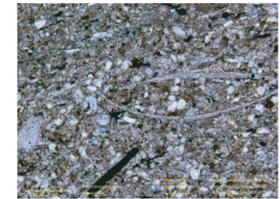
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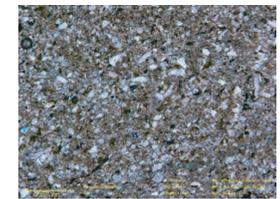
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 KB = 2547



Dolomitization has occurred along the micro-fractures present in the calcareous siltstone. Scattered fossil fragments are also present.



Brachiopod shells and spines within a calcareous siltstone. Locally calcite cement has been replaced with dolomite. Fossil fragments are commonly replaced with pyrite.



Microfractures and interparticle porosity within calcareous siltstone.

## Lithofacies 1

- 0- Limit L1 Facies
- Unconformity - L1 - Lower Unit
- Limit of Lower Bakken Shale
- Siltstone - Upper Shoreface
- Siltstone - Middle Shoreface
- Siltstone - Lower Shoreface
- Siltstone - Mudstone - Distal
- Limestone
- Not Cored
- Bakken Core Locations