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MIOCENE BATESLAND FORMATION NAMED
IN SOUTHWESTERN SOUTH DAKOTA

by
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ERRATA

Page 7 Lines 12, 25, 39. Mammalian should be mammalian.

10 Line 16. Vertebrate should be vertebrates.

10 Line 27. Mammal-bearing should be mammal-bearing.

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SOUTHWESTERN SOUTH DAKOTA²

by
J. C. Harksen³ and J. R. Macdonald⁴

INTRODUCTION

Since 1956 the South Dakota Geological Survey has been actively engaged in mapping the late Cenozoic geology of southwestern South Dakota at a scale of approximately one inch to the mile. As a result of this mapping project, several rock units have been accorded formational status and several more are being considered for formal naming.

As geologic work continues in this area and the sum total of our knowledge grows it becomes necessary to discontinue the use of many geologic names and at the same time propose names for rock units that have previously been overlooked. While the basic framework for the geologic nomenclature in the northern Great Plains was laid down by Meek and Hayden, Darton, Hatcher and others, their work must be viewed in the light of new geological discoveries and modified to accommodate this new knowledge. Wood and others (1941) and Simpson (1933) presented material on the history of the geological nomenclature which is pertinent to this area.

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BATESLAND FORMATION, New Name

A new middle Miocene formation is proposed in this paper. This unit was delineated by the senior author during the geologic mapping of Bennett County, South Dakota (see fig. 1A). The type section of the Batesland

¹Name approved by the Geologic Names Committee, United States Geological Survey.

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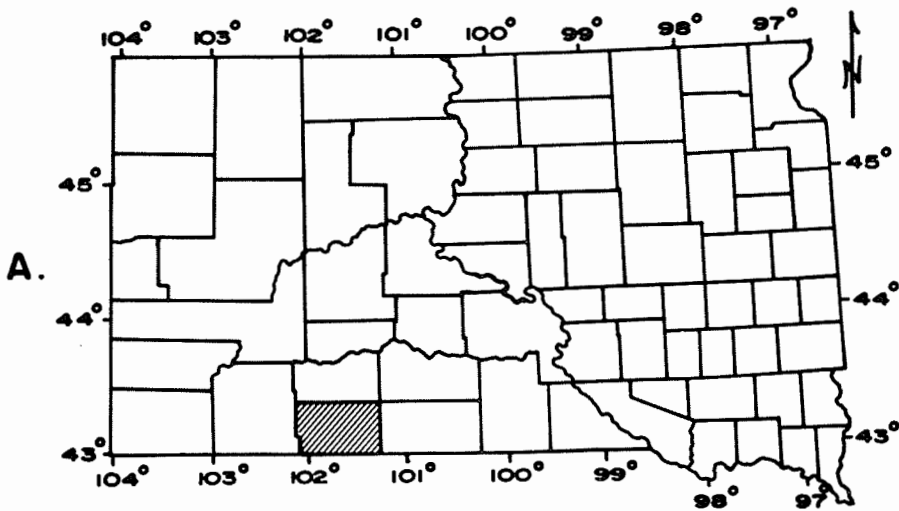


Figure 1A. Index map of South Dakota showing the location of Bennett County. (crosshatched area)

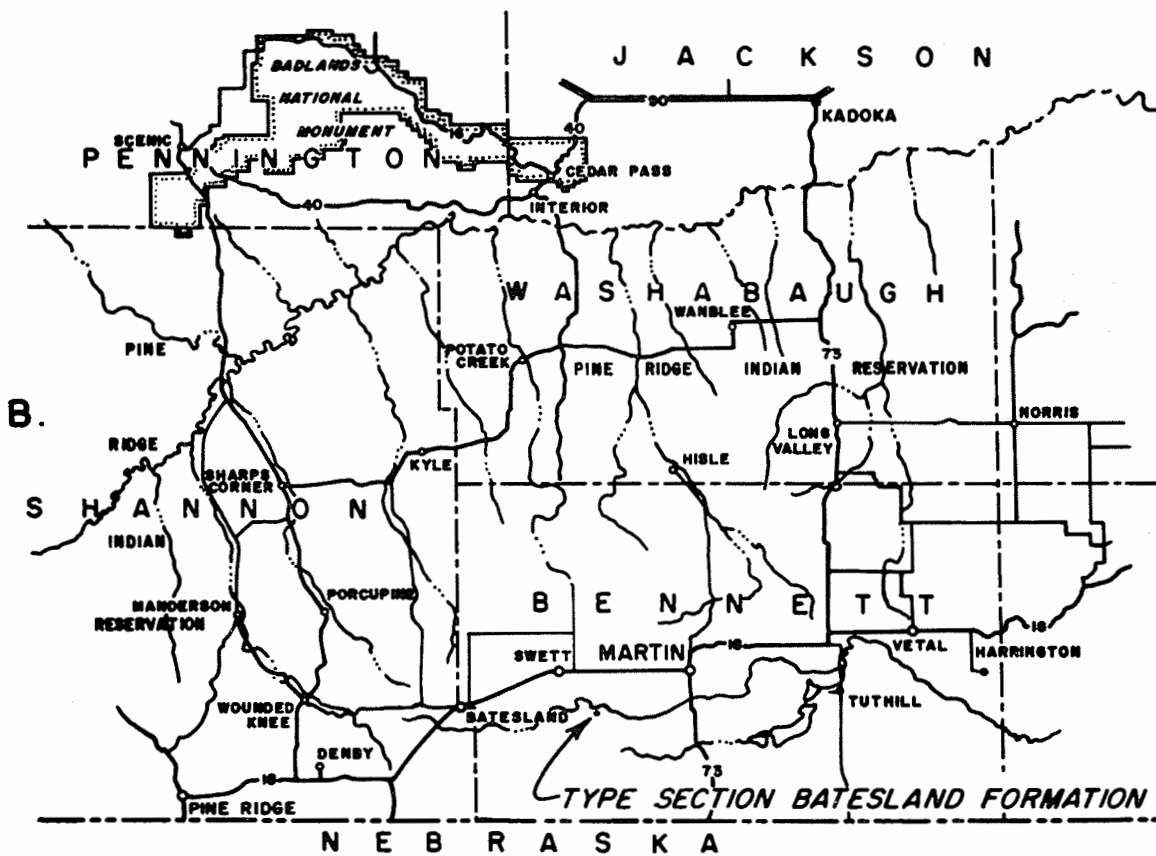


Figure 1B. A portion of a map of South Dakota showing the location of type section of the Batesland Formation.

Formation, table 1 and figure 3, is in the SE $\frac{1}{4}$, sec. 36, T. 37 N., R. 39 W., Bennett County, and about 10 miles east of the town of Batesland, Shannon County, South Dakota. The name, Batesland Formation, is herein proposed because the rocks to which this name is applied are not part of any presently accepted stratigraphic unit. The Batesland Formation is present as far west as Oglala in sec. 26, T. 36 N., R. 46 W., Shannon County (Harry C. Haywood, personal communication) and as far east as the type section, an east-west distribution of about 50 miles. The distribution of the Batesland Formation in the type area is presented in figure 2.

The Batesland Formation is hereby proposed as a formal stratigraphic unit in conformance with the Code of Stratigraphic Nomenclature (American Commission of Stratigraphic Nomenclature, 1961).

BATESLAND FORMATION AND RELATED STRATIGRAPHY

In the type section area the Batesland Formation is composed of about 50 feet of bedded and cross-bedded sands along with silts, clays, and marls that unconformably overlie the Middle Miocene Rosebud Formation and is overlain unconformably by the Ogallala Formation.

The Batesland Formation can be distinguished from the underlying Rosebud Formation by: (1) its light-greenish versus pink color, (2) its abundance of sand and marl versus silt and clay, (3) its lack of concretionary ledges, (4) its overall appearance in gross observation in the field, (5) its occurrence in the stratigraphic column as it is now known, and (6) its contained fossils.

The Batesland Formation at the type section and throughout the area of outcrop has no overlying rocks in natural exposures. In normal stratigraphic sequence, based on our present knowledge of the stratigraphic column, the Ogallala Formation would overlie the Batesland. The Batesland Formation differs from the Ogallala by: (1) its greenish versus grayish to brownish color, (2) its finer sand grains, (3) the color of the fossils; a diagnostic gray in the Batesland Formation and mostly white and blue in the Rosebud and Ogallala Formations, (4) its overall appearance in the field, and (5) its contained fossils.

SEDIMENTARY HISTORY OF THE BATESLAND FORMATION

The Batesland Formation is a paleo-valley fill. Soon after the close of Rosebud deposition, the area streams became rejuvenated and began to cut down through the rock that, geologically speaking, had just been deposited.

There is at this time no accurate information concerning the depth to which the "Batesland" streams cut down into the Rosebud Formation or the thickness to which the Batesland was deposited. However, at the type section area there is approximately 50 feet of Batesland present, meaning that at the very least this much Batesland was deposited. Inconclusive evidence indicates that several times the thickness measured was once present in this area. Virtually all of the Batesland but a few scattered remnants have been removed by subsequent erosion.

Table 1.--Type section for the Batesland Formation (see figs. 1 and 2)
 SE $\frac{1}{4}$ sec. 36, T. 37 N., R. 39 W., Bennett County, South
 Dakota. Terminology regarding particle size is that of
 Wentworth (1922).

| <u>Unit</u> | <u>Feet</u> |
|--|-------------|
| 10. Recent soil. | 1.0 |
| 9. Silt, ashy, highly calcareous, light-greenish tan weathering to white, vertical weathering. | 9.0 |
| 8. Marl, ashy, light-tan, some lichen on surface; grades into beds above and below and grades out laterally. | 0.7 |
| 7. Silt, calcareous to marly, ashy, light-greenish tan weathering to white, massive with some traces of bedding; some pisolites of pink montmorillonite? are present in this unit. | 2.0 |
| 6. Sand, fine to very coarse, bedded and cross bedded, light-gray to gray to light-green with some iron staining along bedding planes, the upper half is calcareous while the lower half is noncalcareous, mineralized rootlets are common along the upper contact; the coarser materials are of local derivation. This unit correlates lithically with the Flint Hill fossil quarry and contains many small bone fragments. | 2.0 |
| 5. Sand, very fine to fine, light-grayish green; interbedded with clay, fissile in places, light-green; clay beds to 63 mm in thickness, unit weathers to a light-greenish white. | 12.0 |
| BREAK IN SECTION | |
| 4. Same as unit 5. | 7.0 |
| 3. Sand, fine to very fine, greenish-gray, with several 2-inch zones of calcareously cemented siltstone. | 3.0 |
| 2. Sand, fine to very fine, massive, poorly consolidated light-grayish green, clay content becomes greater toward the base. This unit lies unconformably upon the Rosebud Formation. | 10.0 |
| TOTAL THICKNESS BATESLAND FORMATION | |
| | 45.7 |
| 1. Rosebud Formation. Silt, clayey, massive to bedded, compacted to consolidated, pinkish. The base of this unit is not exposed nor is the thickness known. | 10.0+ |

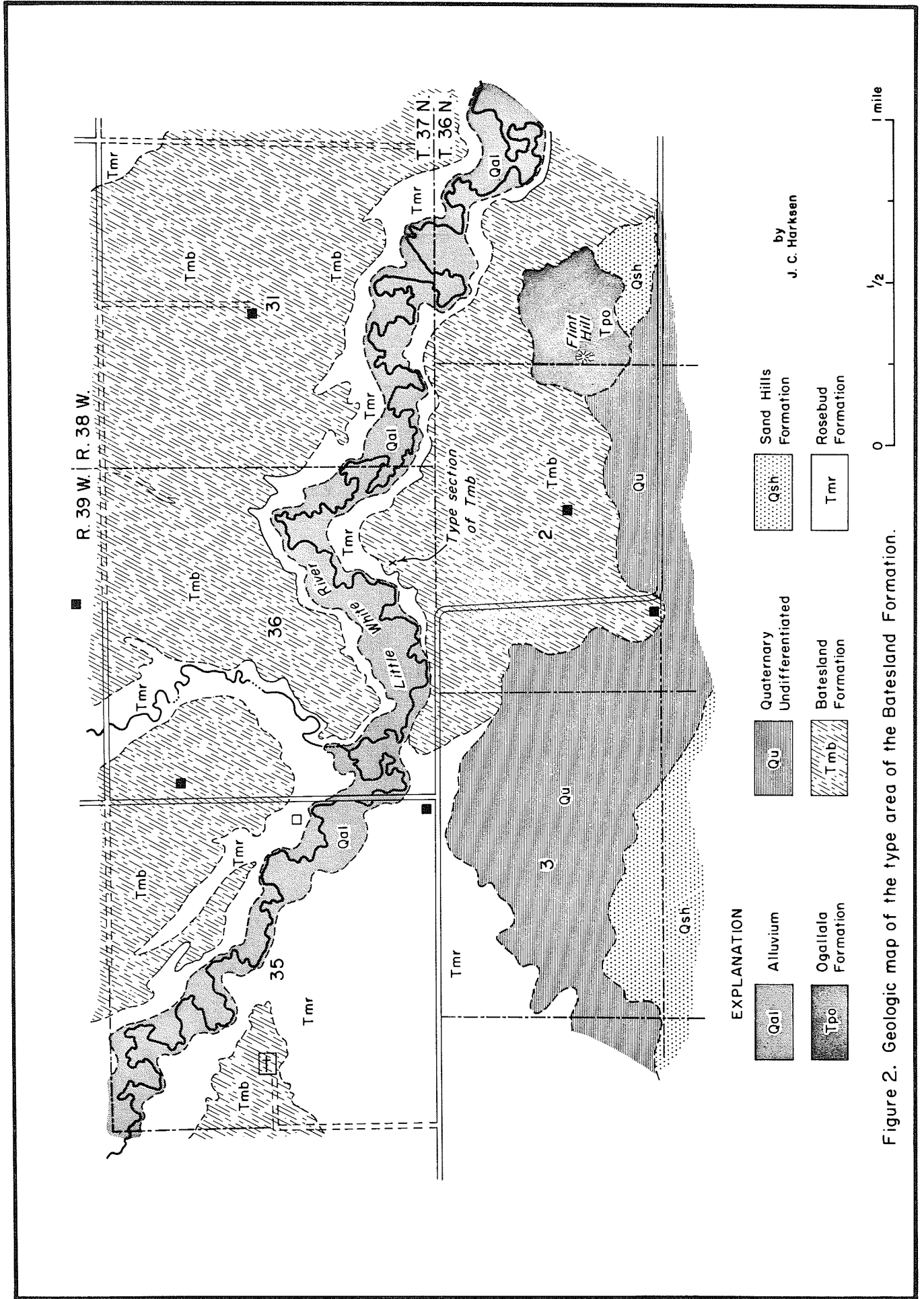


Figure 2. Geologic map of the type area of the Batesland Formation.

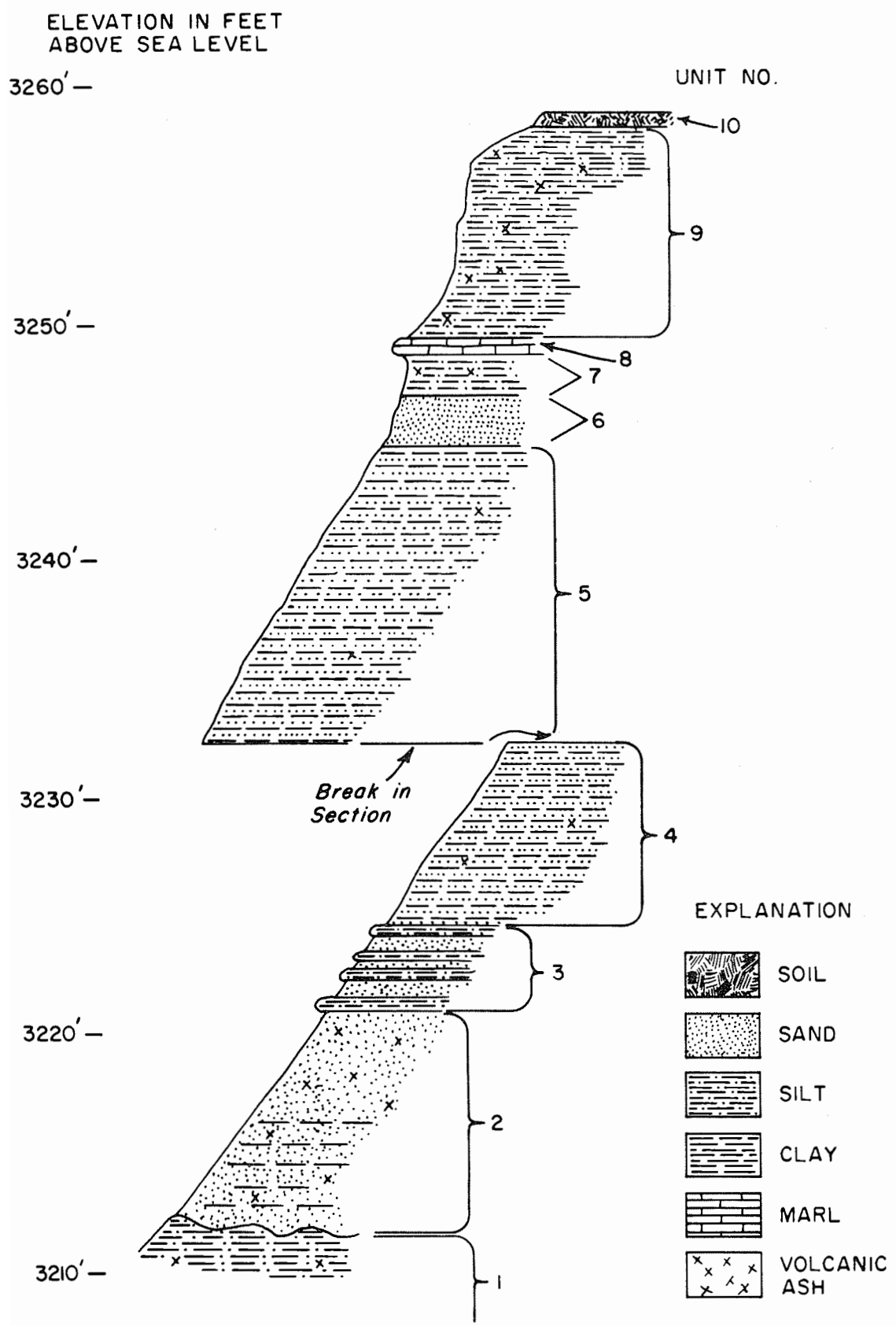


Figure 3. The type section of the Batesland Formation. The unit numbers are the same as those used in Table 1.

The post-Batesland pre-Ogallala history of this area is unknown as rocks representing this time interval are not known to be present in southwestern South Dakota.

VERTEBRATE FAUNA FROM THE BATESLAND FORMATION

The primary source of vertebrate fossils from the Batesland Formation has been the University of California's "Flint Hill" quarry (see table 2). Collecting began at this site in 1934 while field parties were working the nearby Big Spring Canyon site.

Miller and Compton (1939) described two species of birds from the quarry and later Miller (1944) completed a description of the known avifauna.

The late R. A. Stirton and J. T. Gregory have sporadically worked on the Mammalian fauna when they could find time amid their other commitments. They furnished the junior author with a faunal list which was published (Macdonald, 1951) in a guidebook article on the vertebrate faunas of South Dakota. Stirton (1967) published a paper describing the protoceratid from the quarry. Stirton (personal communication) also said that the Arretotherium was in fact A. fricki, Macdonald and Schultz (1956). M. O. Woodburne is now working on the peccaries from this area and plans to publish his work in the near future.

In comparing the faunal list from the Batesland with the faunal lists from the Rosebud and Ogallala, one finds significant differences. The fauna appears to be more advanced than the Rosebud fauna and not as advanced as the Ogallala fauna. J. T. Gregory (personal communication) believes the Flint Hill fauna to lie close to the Runningwater fauna in time.

Comparing the Mammalian faunas of the Ogallala Big Spring Canyon (Macdonald, 1951) against the Flint Hill locality (table 2) we find that no species or even genera are common to both the Flint Hill and Big Spring Canyon faunas.

In comparing the Wounded Knee-Rosebud fauna (Harksen, 1967) against the Flint Hill fauna (table 2) we find that two species, Promartes lepidus and Parahippus cognatus, are possibly common to both faunas; three genera, Proheteromys, Nothocyon, and Merychys are definitely present in both faunas; while one genus, Oxydactylus, possibly occurs in both faunas. It may also be noted that Desmathyus pinensis Matthew, which has been collected from both the Rosebud along Wounded Knee Creek and the Rosebud underlying the Flint Hill quarry, is not known from the Flint Hill fauna.

It is quite obvious that significant differences occur between the Mammalian faunas of the Batesland Formation as represented by the Flint Hill fauna (table 2) and that of the overlying Ogallala Formation (Macdonald, 1951) and the underlying Rosebud Formation (Harksen, 1967). The stratigraphic evidence that the Batesland Formation is a separate lithic unit occupying an interval of time somewhere between the time of deposition of the underlying Rosebud and the overlying Ogallala is amply supported by the faunal evidence.

Table 2.--The vertebrate fauna from the Batesland Formation
as known from the University of California's "Flint
Hill" locality.

OSTEICHTHYES

Ostariophysi

Ictiobini sp.

Ameiurus sp.

AMPHIBIA

Anura

Bufo sp.

REPTILIA

Chelonia

Emydidae indet.

Squamata

Boidae indet.

AVES

Ciconiiformes

Megapleolodus connectens Miller 1944

Anseriformes

Paranyroca magna Miller and Compton 1939

Dendrochen robusta Miller 1944

Querquedula integra Miller 1944

Falconiformes

Buteonine indet.

Palaeoborus rosatus Miller and Compton 1939

Galliformes

Ortalis pollicaris Miller 1944

Tympanuchus stirtoni Miller 1944

Miotryx teres Miller 1944

(continued)

Table 2. --continued

Strigiformes

Strix dakota Miller 1944

MAMMALIA

Insectivora

Heterosorex sp.
Talpidae gen. indet.

Rodentia

Castoridae gen. indet.
Proheteromys sp.

Carnivora

Nothocyon sp.
Cynodesmus n. sp.
Amphicyon sp.
Palaeogale aff. lagophaga (Cope)
Promartes cf. lepidus Matthew
Melinae n. gen. indet.

Perissodactyla

Parahippus cf. cognatus Leidy
Anchitherium cf. agatensis (Osborn)
Archaeohippus cf. blackbergi (Hay)
Moropus sp.
Diceratherium sp.

Artiodactyla

cf. Stibarus
Daeodon sp.
Tayassuidae - two genera
Arretotherium cf. fricki
Merychys cf. arenarum Cope
Merychys sp.
Lambdoceras hessei Stirton
?Oxydactylus
Parablastomeryx galushai Frick
Pseudoblastomeryx cf. advena (Matthew)
?Pseudoparablastomeryx sp.
?Barbouromeryx sp.

Considering the Flint Hill fauna (table 2), the genera Proheteromys, Cynodesmus, Moropus, Arretotherium, Merychys, and Oxydactylus are restricted to the Arikareean and Hemingfordian while the genera Promartes, Parahippus, and Archaeohippus are restricted to the Hemingfordian. The presence of these genera in the faunal list would serve to restrict the Batesland Formation to the Hemingfordian. By superposition we know the Batesland to be younger than the Hemingfordian Rosebud Formation--how much younger will only be known after additional stratigraphic and paleontologic work.

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