

REVISION AND INTERPRETATION OF THE BIJOU FORMATION

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ABSTRACT

The Bijou formation was formally named by Stevenson in 1953 for a series of Mio-Pliocene sands and clays characterized by beds of ledge-forming greenish siliceous sandstone. The formation has been revised in accord with the facies concept to allow a clearer understanding of the stratigraphy. The revised Bijou formation consists of lenses and thin beds of greenish siliceous sandstone which may be found interbedded with strata of Pliocene or Miocene age (un-named upper Miocene, Valentine, or Ash Hollow).

INTRODUCTION

The Bijou formation was formally named by Stevenson (10) in 1953 to include a series of Tertiary sediments characterized by the presence of lenses and beds of a greenish siliceous sandstone ("quartzite") and conglomerate in the Bonesteel-Lake Andes-Bijou Hills area. The strata contained a mixed fauna of Mio-Pliocene (Barstovian-Clarendonian) age. A paratype section was described near Bonesteel in the 1953 publication. At that time the writer expressed the hope that further field work would enlarge the known areal extent and delimit the Miocene and Pliocene portions of the Bijou formation.

During August, 1956, the writer while mapping the Gregory Quadrangle for the State Geological Survey visited outcrops of the siliceous sandstone ("quartzite") in the Bijou Hills, and also examined with Dr. A. F. Agnew, exposures in the Colome Hills, at Red Hill, and near Wood, South Dakota. Dr. Agnew has aided the writer immeasurably by many discussions. Thanks are also extended to Dr. J. R. Macdonald for information obtained as a result of a field conference and fossil identifications.

REVISION OF THE FORMATION

Recent work to the west of Bonesteel has shown the beds originally described as Bijou to be an extension of the lower Pliocene Valentine formation. Detailed mapping south of Gregory has shown the green siliceous sandstone ("quartzite") to be interbedded with the Pliocene Ash Hollow beds. West of Gregory the stratigraphic position of the beds with which it is interbedded is not known. In the type area of the Bijou formation, the lithology is similar to both the Valentine and Arickaree in the areas just mentioned, but fossils indicate a probable upper Miocene age.

From this additional evidence, it appears that the greenish siliceous sandstone ("quartzite") and conglomerate occupy several stratigraphic posi-

tions in the sandy Tertiary strata while always maintaining their diagnostic color and cement. It is therefore suggested that the Bijou formation be restricted to those siliceous strata irrespective of their stratigraphic position. That is, the Bijou represents a discontinuous facies of greenish silica-cemented sandstone in the Miocene and Pliocene rocks of south-central South Dakota.

THE BIJOU FORMATION AND THE FACIES CONCEPT

Moore's (9) definition of sedimentary facies "as any areally restricted part of a designated stratigraphic unit which exhibits characters significantly different from those of other parts of the unit," seems to express the general concept of facies. One of the basic ideas therefore, regarding facies is that they are strata characterized by definite and easily distinguished lithology. Formations are also characterized by diagnostic lithologies, therefore, the Bijou facies can also be considered as a formation.

Diagnostic lithologic properties which characterize the Bijou as a formation, a facies, and an easily mappable unit, is the nearly homogenous composition, siliceous cement, greenish color and resistance to erosion. These properties quickly distinguish the Bijou facies from the other strata of the Mio-Pliocene stratigraphic unit of which it is a part.

DESCRIPTION OF FORMATION

Bijou Formation (Stevenson 1953)

emended

Introduction: The formation was named for exposures in the Bijou Hills, first examined by Hayden in 1855.

Areal Extent: This formation is found in scattered areas in southern South Dakota and adjacent parts of Nebraska as ledges and butte caps. In another paper, Agnew (1) discusses the distribution in detail.

Lithology: The Bijou consists of very fine to coarse grained (average-medium), massive, cross-laminated, feldspathic to quartzose sandstone with lenses and interbeds of grit and pebble conglomerate. It is characterized by granules and pebbles of a partly silicified greenish clay. The entire sediment is well to poorly cemented with silica and generally has a greenish color. The sandy portions are slightly argillaceous.

Thickness and Contacts: The thickness of the silica cemented zones ranges from 6 inches to 35 feet (usually \pm 3 feet). There may be several zones in a single stratigraphic section (see Fig. 1) with sand and silty sand intervals of 2 to 35 feet.

The contact of the Bijou and the Tertiary strata with which it is interbedded is generally quite sharp, but may show a transitional character locally.

Paleontology: The faunal list given by the writer (10) for the Bijou

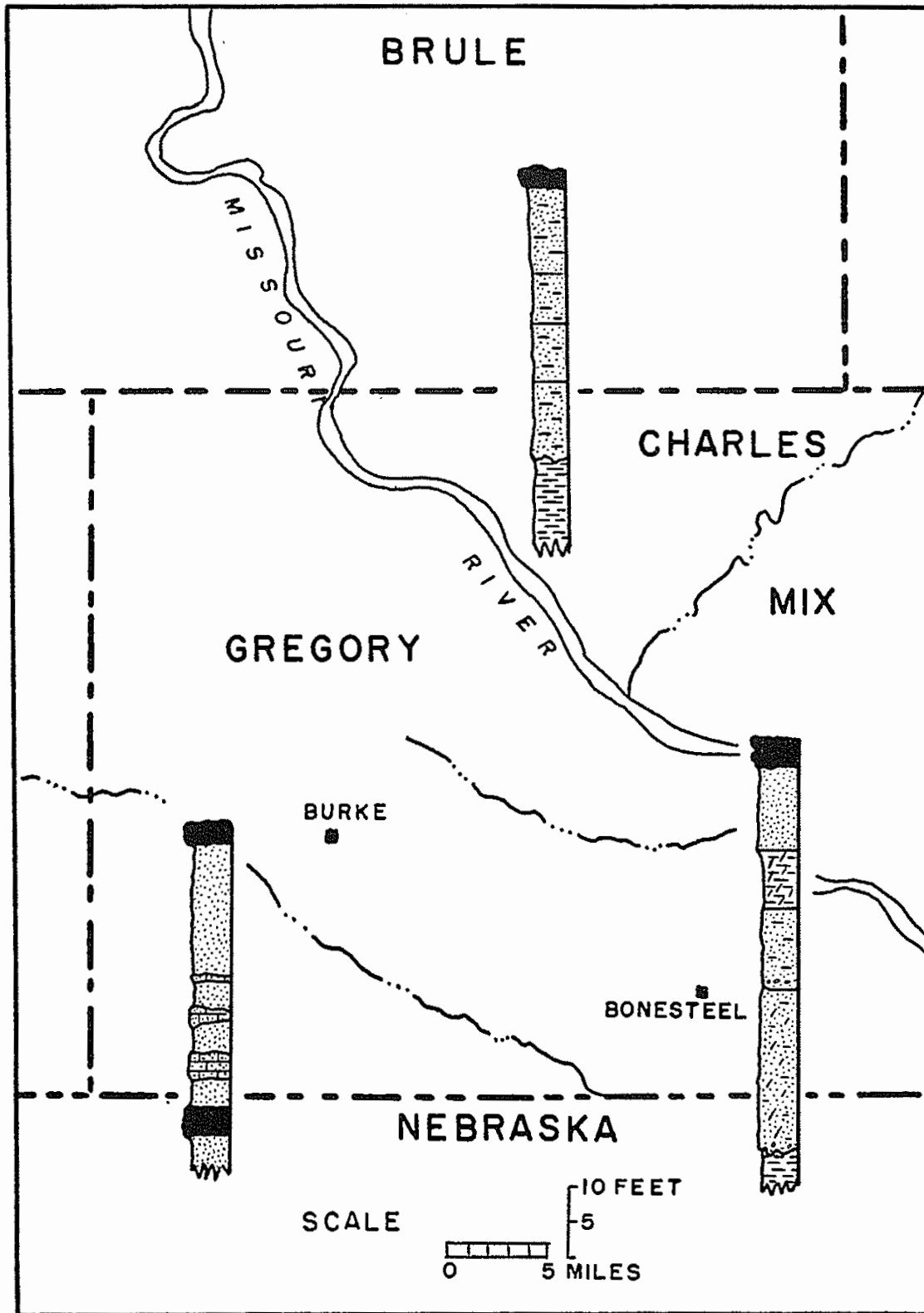


Figure 1. Stratigraphic Sections of the Bijou Formation
Which is Shown in Black

was of specimens from the interbedded, non-silica cemented facies of the Mio-Pliocene sediments. The writer has noted numerous **Testudo** carapaces and bone fragments of horses and camels in the siliceous sandstone. From the deposit near Wood, South Dakota, Agnew (Per. Comm.) collected bone fragments* of horses (including **Neohipparion**), camels, rhinoceroses, and gomphotherids. The School of Mines museum has a gomphotherid jaw fragment collected from the siliceous sandstone in the Bijou Hills (8).

Sections: The holotype section here described for the first time, is 5 miles north of Academy, South Dakota, in the Bijou Hills (SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. T. 101 N., R. 69 W.)

Bijou Formation		
Unit 1	2 feet	Greenish fine to medium grained siliceous sandstone.
Unnamed sediments (Upper Miocene? age)		
Unit 2	11 feet	Greenish-buff fine clayey silt and silty clay with small white limy concretions.
Unit 3	6 $\frac{1}{2}$ feet	Pinkish-buff fine clayey silt and silty clay with small white limy concretions.
Unit 4	8 feet	Same as unit 2.
Unit 5	10 feet	Same as unit 3.
— unconformity —		
Pierre Formation (Upper Cretaceous)		
Unit 6	35 + feet	Orange, brown to grey clay with limonitic concretions.

This holotype, a paratype (Stevenson, 1953, Fig. 1) and another typical section are shown in Figure 1.

Age: The age of the Bijou ranges from early Miocene to early Pliocene.

REVISION OF PREVIOUSLY MAPPED BIJOU FORMATION

In the north-central part of the state, west and northwest of Mobridge there are a number of buttes and small mesas capped with a light grey (locally slightly greenish) calcareous to siliceous subgreywacke sandstone. In the Mahto (5) and Wakapala (6) quadrangles, this sandstone was mapped as Bijou? formation. Recent work by the writer in this area (11) has shown

*Identifications by Dr. J. R. Macdonald, South Dakota School of Mines and Technology, Rapid City.

these sandstones to be the Colgate members of the Fox Hills formation. It differs from the Bijou by its greywacke composition, grey color, and an occasional marine fossil.

In the Missouri River quadrangles, the Bijou formation as mapped included the siliceous sandstone facies and the associated Mio-Pliocene strata. Actually the siliceous material forms a small part of the Tertiary strata, most of which is non-consolidated strata belonging to the Ogallala group. Quadrangles involved are: Iona (7); Dixon (2); Lucas (3); Herrick (4); Bonesteel (12); and Lake Andes (13).

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