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No. 99

**TYPE SECTIONS FOR THE CHADRON AND BRULE FORMATIONS
OF THE WHITE RIVER OLIGOCENE IN THE BIG BADLANDS,
SOUTH DAKOTA**

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INTRODUCTION

One of the obligations of each generation of scientists is to tidy up after its predecessors. In the past, and unfortunately sometimes today, a geologist will vaguely point or wave his actual or literary arm in the general direction of some distant outcrops and state, "That is the type section of the Wazealeah Formation." To later students, such a type section often presents difficulties when better sections are discovered or concepts change through more sophisticated approaches. These difficulties are far outweighed, however, by the confusion caused when there are no type sections designated and the interpretation of a geologic sequence and its nomenclature is later approached from different compass directions and philosophic bases.

The White River Group has had its share of names, most of them a natural consequence of nomenclatural evolution, but the current problems with the formational names within the group are the result of Darton's formal designations in 1899. The White River Group has been the source of perhaps the most complete middle Tertiary mammalian fauna in the world. Since the first fossil was reported by Hiram Prout in 1846, fossils have been searched out and described each year. From Evans (1852) through Schultz and Falkenbach (1968), lettered, numbered, and named faunal zones have been used for this sequence in various combinations. Table 1 is a nomenclature chart showing the main stream evolution of stratigraphic nomenclature in the White River Badlands of South Dakota.

CHADRON FORMATION

The nomenclatural story of the Chadron Formation is typical of not only this formation but of many others in the West. Evans (in Owen, 1852) first gave a name to this sequence when he referred to the "Palaeotherian bed" (p. 200) in his columnar section. On his map ("Map showing the positions of the Bad Lands or Mauvaises Terres of Nebraska from a draft by John Evans of the U. S. Geological Corps") he labeled the "Paleotherium Bed" and located it on the southwest side of Bear Creek in what is now Pennington County, South Dakota. Leidy (1853, p. 13) reproduced Evans's section but substituted "*Titanotherium* bed" for "Palaeotherian bed", as he erected the genus based on "*Titanotherium Proutii* Leidy" which he described on page 72. He reproduced Evans's map without change, however, still showing the "Paleotherium bed." Meek and Hayden (1858) also referred to these beds as the "*Titanotherium* bed." Hatcher (1893, p. 204) continued to use "*Titanotherium*," rejecting Marsh's (1877) use of "*Brontotherium* beds," but retaining Marsh's plural. He went on (p. 206) to suggest a "typical locality," "located in that portion of Washington County embraced between the White and Cheyenne rivers, at that point where they approach nearest to each other." Previously, there had been a simple substitution of biologic names for these beds, until Hatcher made this unwarranted shift in the location of the typical locality. Evans's map clearly indicates the beds to be on the southwest side of Bear Creek in what is now Pennington County; Bear Creek does not extend into Washington County which became part of Shannon County in the 1940's.

Darton (1899, p. 736 and 759) proposed the formational name "Chadron formation" without designating a type section or locality, but referred to the typical regions in South Dakota. This was a substitution of a geographical name for a well-established biologic name.

Osborn (1929, p. 7, fig. 8), in his monograph on the brontotheres, showed the "type geologic locality" for the "*Titanotherium* zone" on the southwest side of Bear Creek as originally indicated by Evans, and showed a panoramic view from the locality (ibid, fig. 72, p. 105).

Wilmarth (1938, p. 392) quoted a personal communication from Darton to the effect that the formation was named for exposures at Chadron, Nebraska. Schultz and Stout (1955, p. 26) concluded that Darton did not mean this, and decided that the type section should be his (Darton's) "Adelia" section northwest of Crawford, Sioux County, Nebraska. Kerohar (1966, p. 703) worsened the situation by stating that the "standard section" for the Chadron Formation was "in Big Badlands on south fork of Indian Creek, from Sec. 34, T. 3 S., R. 12 E., to Sec. 10, T. 4 S., R. 12 E., Pennington County, S. Dak. Named for exposures at Chadron, Dawes County, Nebr." While the Indian Creek basin is a traditional hunting ground for brontotheres and has good Chadron Formation exposures, it is ten miles from the Bear Creek typical locality. There is a great deal of lateral variation in this distance.

In short, the whole story is one of name substitution and roving type localities. Evans clearly showed where the "Paleotherium bed" was located. Darton related his Chadron Formation to the typical beds in the Badlands, and Osborn pinpointed the location of the type area on both map and photograph.

The vertical bounds of the Chadron Formation in southwestern South Dakota have not been subject to controversy. In the type section area the lower contact is very easy to spot as the Chadron Formation lies unconformably upon the marine shales of the Pierre Shale. The upper contact is marked by changes in weathering, color, lithology, and fauna. The Chadron weathers to a series of hummocky mounds often referred to as haystack topography which is in contrast to the tread and riser topography of the Brule Formation. The Chadron is generally green in contrast to the Brule which is generally brown. Typically there are several thin marl (limestone) beds at the top of the Chadron Formation. The top of the uppermost marl near the Chadron-Brule contact is sometimes used as the precise contact. Generally the Chadron is noncalcareous while the Brule is calcareous. The name *Titanotherium* beds was a good faunal name for the Chadron Formation as in southwestern South Dakota these big perissodactyls are **only** found in the Chadron Formation.

We do not believe that the section on Bear Creek is a good type section, but, as with children, just because you don't approve of one, you are not allowed to send it back. Osborn's selection does not show all the Chadron Formation, as the top is either eroded away or covered with Pleistocene gravels (see fig. 1 for the location of the section, fig. 2 for its lithologic description, and fig. 3 for a photograph of the section). We suggest a section three miles to the southeast as a **reference section** (figs. 1, 4, and 5). This section is the closest readily available section which includes the Chadron sequence from its contact with the underlying Pierre Formation-Interior Palaeosol to the contact with the overlying Brule Formation.

BRULE FORMATION

The nomenclatural history of the Brule Formation generally follows that of the Chadron Formation. Evans, in his 1852 report, did not name the rocks above his "Paleotherian bed," which he numbered as "bed 10," but only continued the numbering upwards from 9 through 1, except to say that bed 7 was the "turtle and bone bed." We may assume that beds 10 through 8 represent the Chadron Formation, and that the overlying remainder plus some higher rocks is the equivalent of the Brule Formation.

Hayden (1958, p. 153 and p. 49-50) lettered the Brule Formation sequence beginning with "Bed B," which he named the "Turtle and Oreodon Bed," and followed by an unnamed "Bed C." Wortman (1893, p. 98) named Hayden's Bed C the "*Protoceras* Bed" with a "*Leptauchenia* Layer," thus filling the void left by Hayden. It was not until Matthew (1901, p. 368) switched the order of things that the upper half of the Brule Formation became known as the *Leptauchenia* clays, containing the *Protoceras* sandstones.

When Darton (1899) proposed the name Brule Formation, he did not designate a type

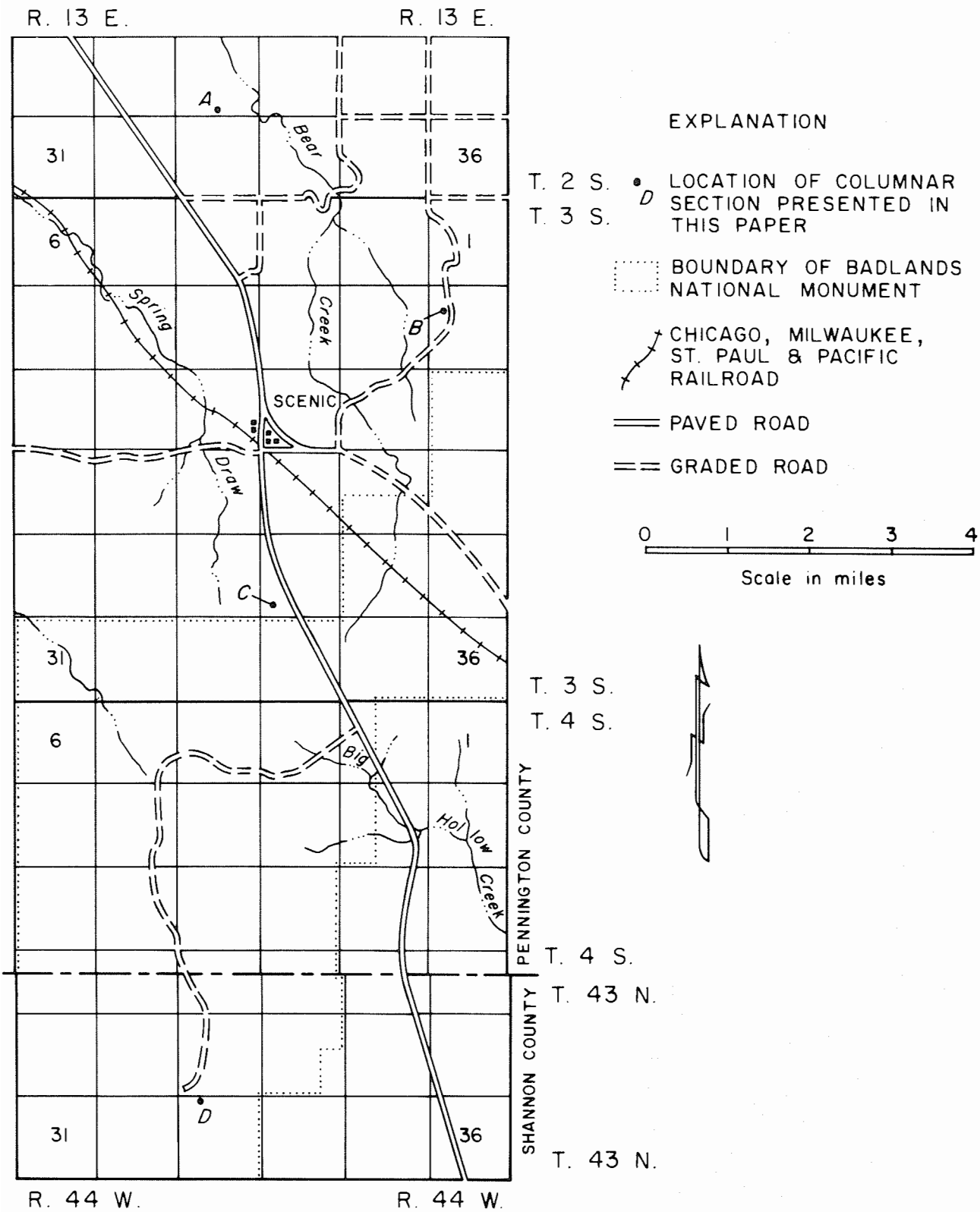


Figure 1. Index map showing the locations of the columnar sections in figures 2, 4, 6, and 8. Point A is where the columnar section presented as figure 2 was measured, B marks the site of figure 4, C marks the site of figure 6, and D marks the site of figure 8.

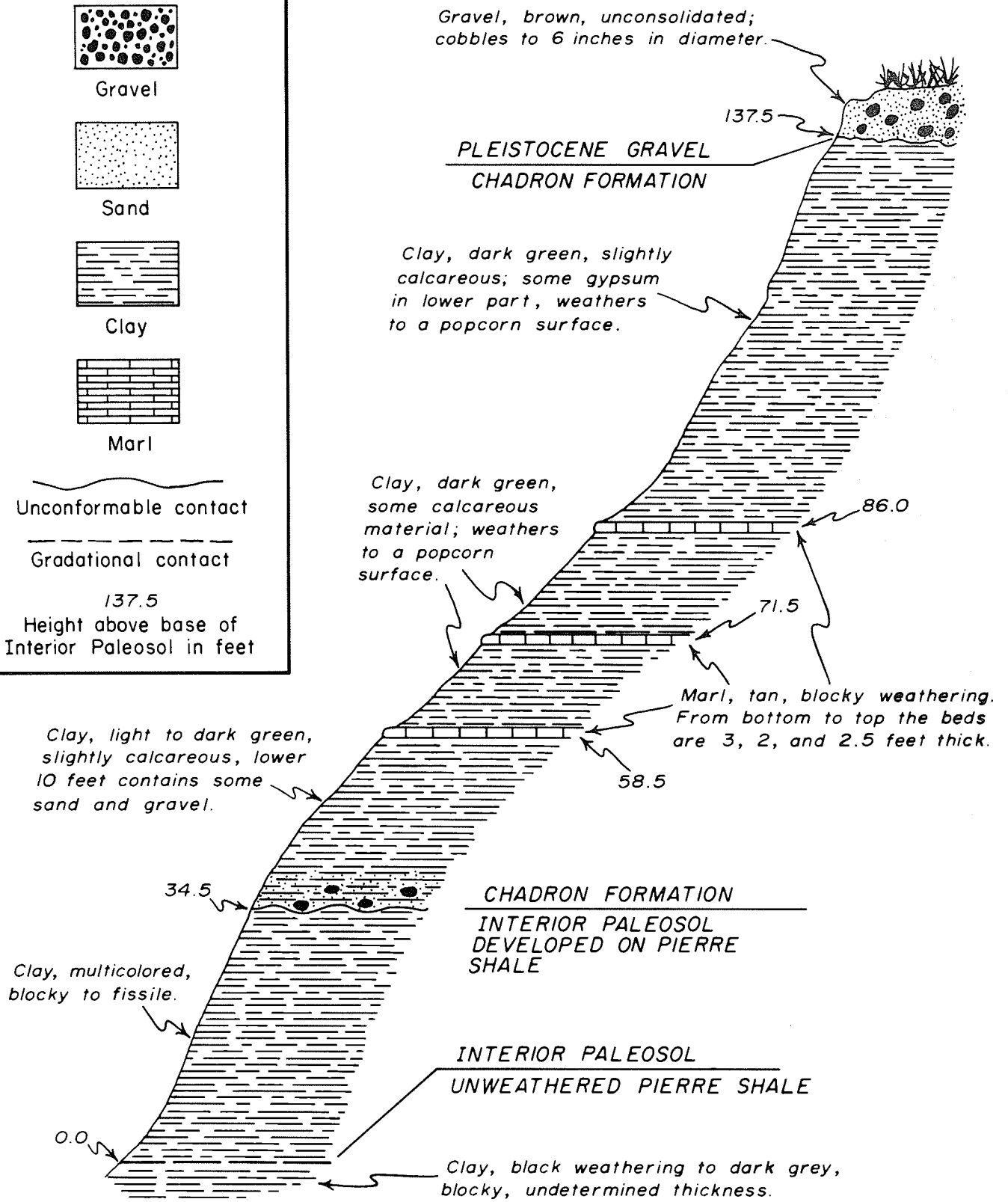
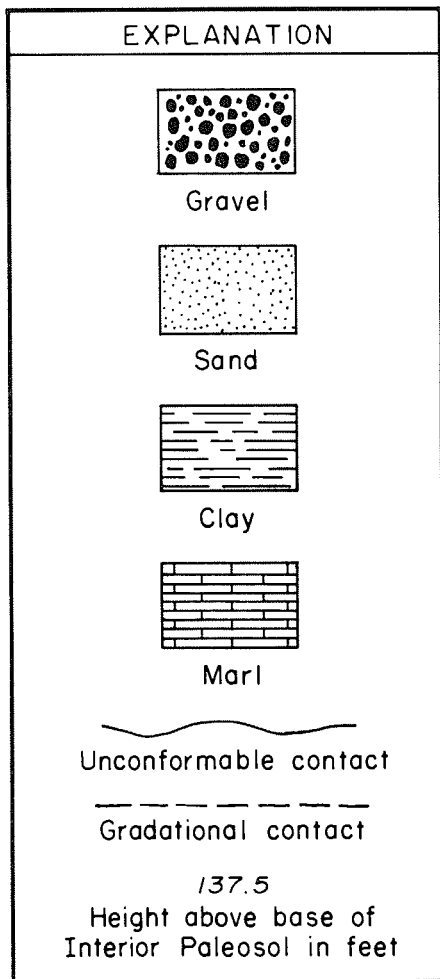


Figure 2. Columnar section of the type section of the Chadron Formation in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, T. 2 S., R. 13 E., Pennington County, South Dakota. This section is redrawn from Harksen and Macdonald (1969).



Figure 3. Type section for the Chadron Formation. The arrow marks the uppermost part of the columnar section in figure 2. Jeep for scale.

section. However, when describing the section near Adelia station, Nebraska, he stated (Darton, 1899, p. 758), "This section closely resembles the typical section in the Big Badlands in South Dakota, but appears to include some higher beds." These higher beds are probably the temporal equivalent of the lower part of the Sharps Formation of South Dakota.

With the defense that Darton's usage of "typical" did not mean "type" (Schultz, personal communication), Schultz and Stout (1955) selected Darton's "Round Top to Adelia" section in Nebraska as the type section for the Brule Formation. We believe this section is invalid, as it was not Darton's intent to have the type section in Nebraska. He had many sections he could have so designated if he wished western Nebraska to be the type area for the Brule Formation. The Nebraska area lacks a number of important features typical of this formation, such as the *Protoceras* Channels, which are well-developed in a number of areas in the Badlands of South Dakota.

To formalize and pinpoint Darton's concept of the Brule Formation we feel that the sections selected by Bump (1956) as representative of the Brule Formation in South Dakota should be considered the type sections for the formation. Bump, after a lifetime of work with the strata and fauna of the Badlands, expressed his belief in the importance of the Badlands section when he said (p. 429), "...classically these deposits (the Brule Formation) were studied and described from the Big Badlands of southwestern South Dakota, the type area of the White River Group."

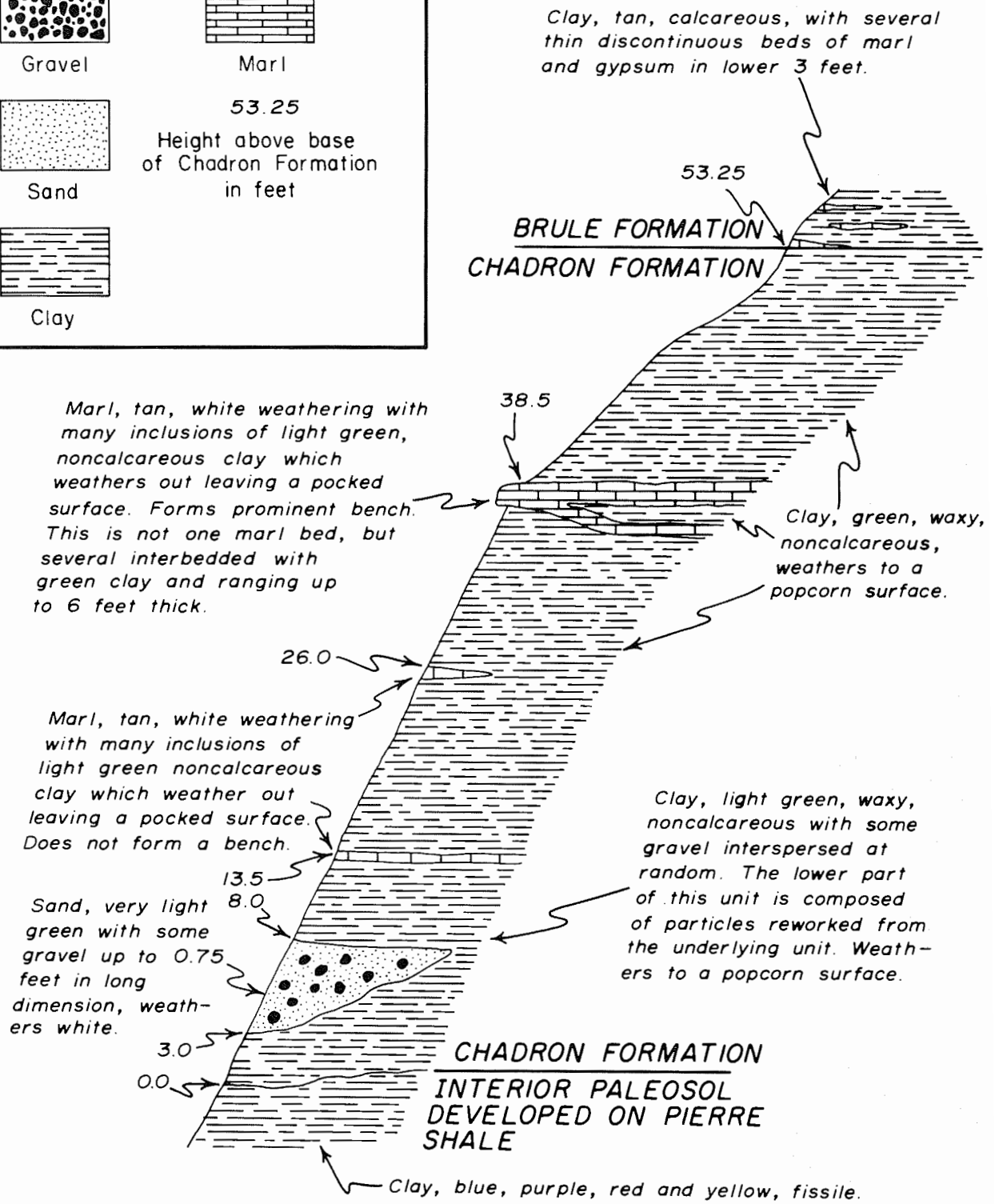
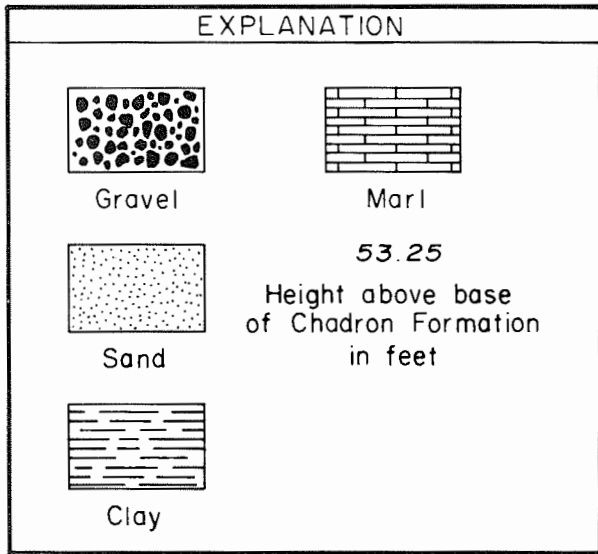


Figure 4. Columnar section of the Chadron Formation in the NW $\frac{1}{4}$ sec. 12, T. 3 S., R. 13 E., Pennington County, South Dakota.



Figure 5. The Chadron Formation where the columnar section presented as figure 4 was measured. A, arrow points to the Chadron–Brule contact. B, arrow points to the Pierre–Chadron contact.

Bump (1956) described a lower Scenic Member and an upper Poleslide Member of the Brule Formation in the Badlands of South Dakota. Although these sections are six miles apart, they are in an area of great lithologic continuity, and they overlap lithologically. The lower section (figs. 1, 6, and 7) conformably overlies the Chadron Formation, and the upper section is conformably overlain by the Rockyford Ash which here forms the base of the early Arikareean (early Miocene) Sharps Formation (figs. 1, 8, 9, and 10).

These two sections typify the classic concepts of the post Chadron White River deposits and are in the center of the historic collecting grounds. The lower section is on a main Badlands access road, and although the upper section is in a deep, steep canyon, it is near the end of a developed scenic road and is the best readily-accessible section which has such features as *Protoceras* Channels immediately at hand for examination.

There should be no confusion regarding the limits of the Brule Formation as defined in this paper. The Brule is that portion of the White River Group which overlies the Chadron Formation. The Chadron–Brule contact has been discussed above and is delineated graphically on figures 5 and 7. The upper contact of the Brule Formation is best described as being at the base of the Rockyford Ash Member of the Sharps Formation, the Rockyford is a white bed that can be seen for many miles. On the south side of Sheep Mountain Table the Brule–Sharps contact is where the bedded grey to brown Brule meets the massive white ash containing small (4 to 6 inch), brown, calcareous concretions. The contact is marked on the photograph presented as figure 10.

The legal descriptions for the type sections of the Scenic and Poleslide Members as used in this paper are not those presented by Bump (1956). Bump stated that the “standard section” for the Poleslide Member was “in the NW¼ sec. 23, T. 43 N., R. 44 W., eight and one-half miles south of Scenic, South Dakota and on the south rim of Sheep Mountain Table, Shannon County, South Dakota.” Anyone familiar with the geology and geography of the Big Badlands can soon ascertain that the above legal description is in error. For example, not only is the legal description of the “standard section” of the Poleslide Member not on the south rim of Sheep Mountain Table but Bump claimed to have measured a 299 foot section of Poleslide from an area (section 23) where the maximum relief is only 70 feet. The writers have gone on the assumption that a simple typographical error in legal descriptions is involved here. Consultation with the late Dr. Bump’s family and co-workers helped the writers in their attempt to relocate his areas which are pictured in figures 7 and 9 as the type sections for the Scenic and Poleslide Members of the Brule Formation and the Brule Formation itself. The corrected legal description for the Scenic Member is the SW¼ sec. 27, T. 3 S., R. 13 E., Pennington County, South Dakota, while the corrected legal description for the Poleslide Member is the NW¼ sec. 33 and the SW¼ sec. 28, T. 43 N., R. 44 W., Shannon County, South Dakota.

SUMMARY

The nomenclature of the Chadron and Brule Formations has slowly changed as the techniques of naming rock units have changed. Beginning with the biological names still in use by some writers, the formations were finally given geographical names by Darton in 1899. Unfortunately, Darton did not designate type sections for these formations, and although discussing rocks in Nebraska, he referred to the typical beds in the White River Badlands of South Dakota. During the 70 years since Darton’s publication of the names Chadron and Brule Formation, various authors have designated type areas for these formations. With the exception of Osborn (1929) the historic development of the names, concepts, and the obvious wishes of Darton were ignored. In an attempt to dispel the confusion and follow Darton’s published intent, we have formally reconfirmed the type area of the Chadron Formation and designated a logical type section of the Brule Formation in the White River Badlands of South Dakota.

FOSSIL VERTEBRATES FROM THE WHITE RIVER GROUP IN SOUTH DAKOTA

This list of taxa from the White River Group in South Dakota has been gleaned from the

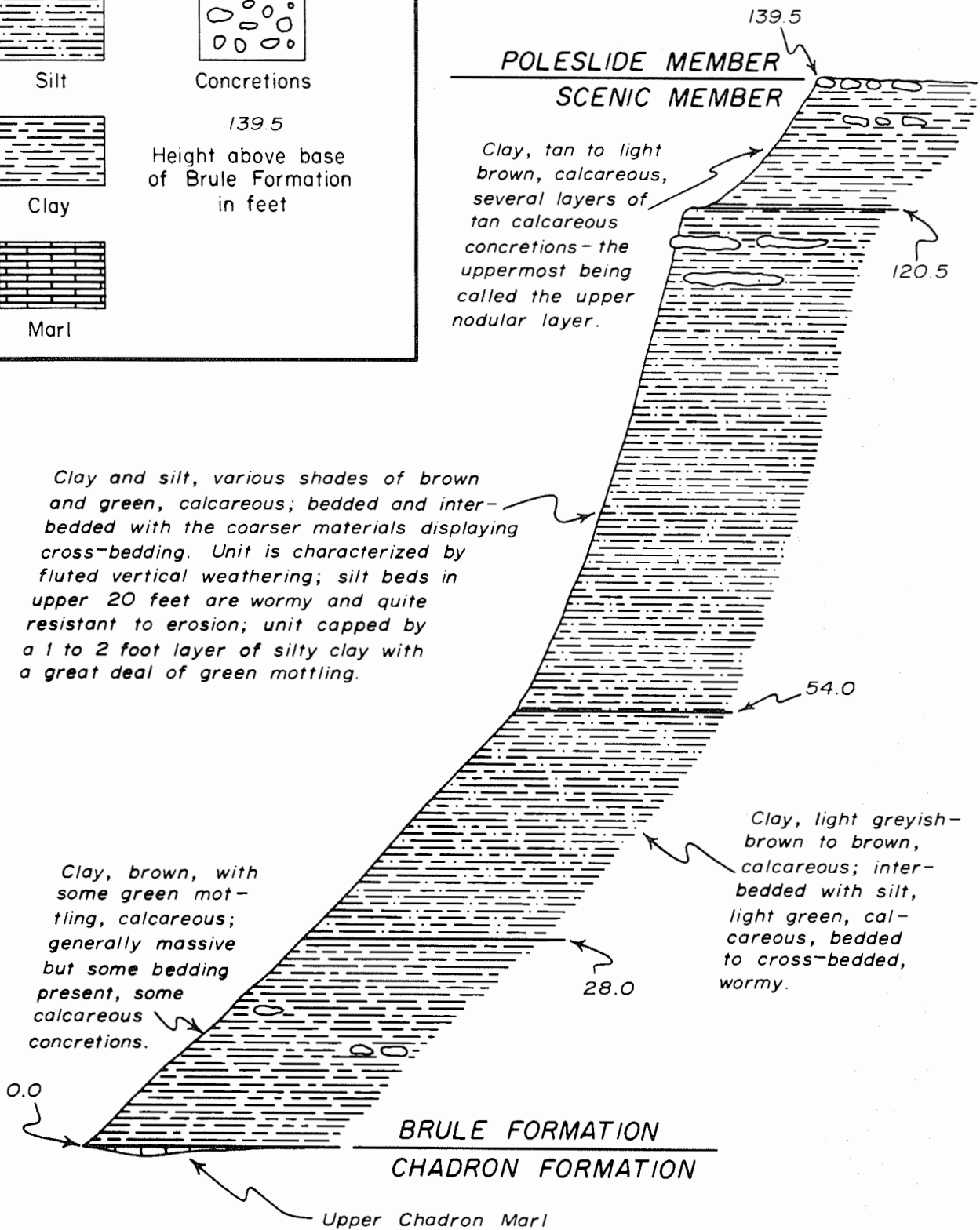
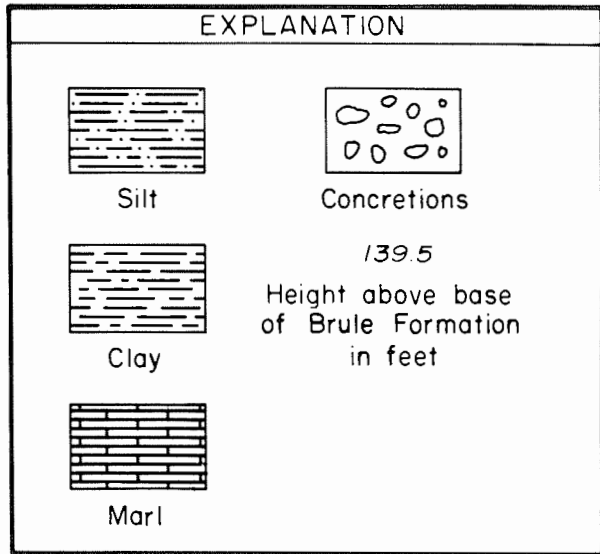


Figure 6. Columnar section of the type section for the lower part of the Brule Formation. This section is in the SW $\frac{1}{4}$ sec. 27, T. 3 S., R. 13 E., Pennington County, South Dakota.

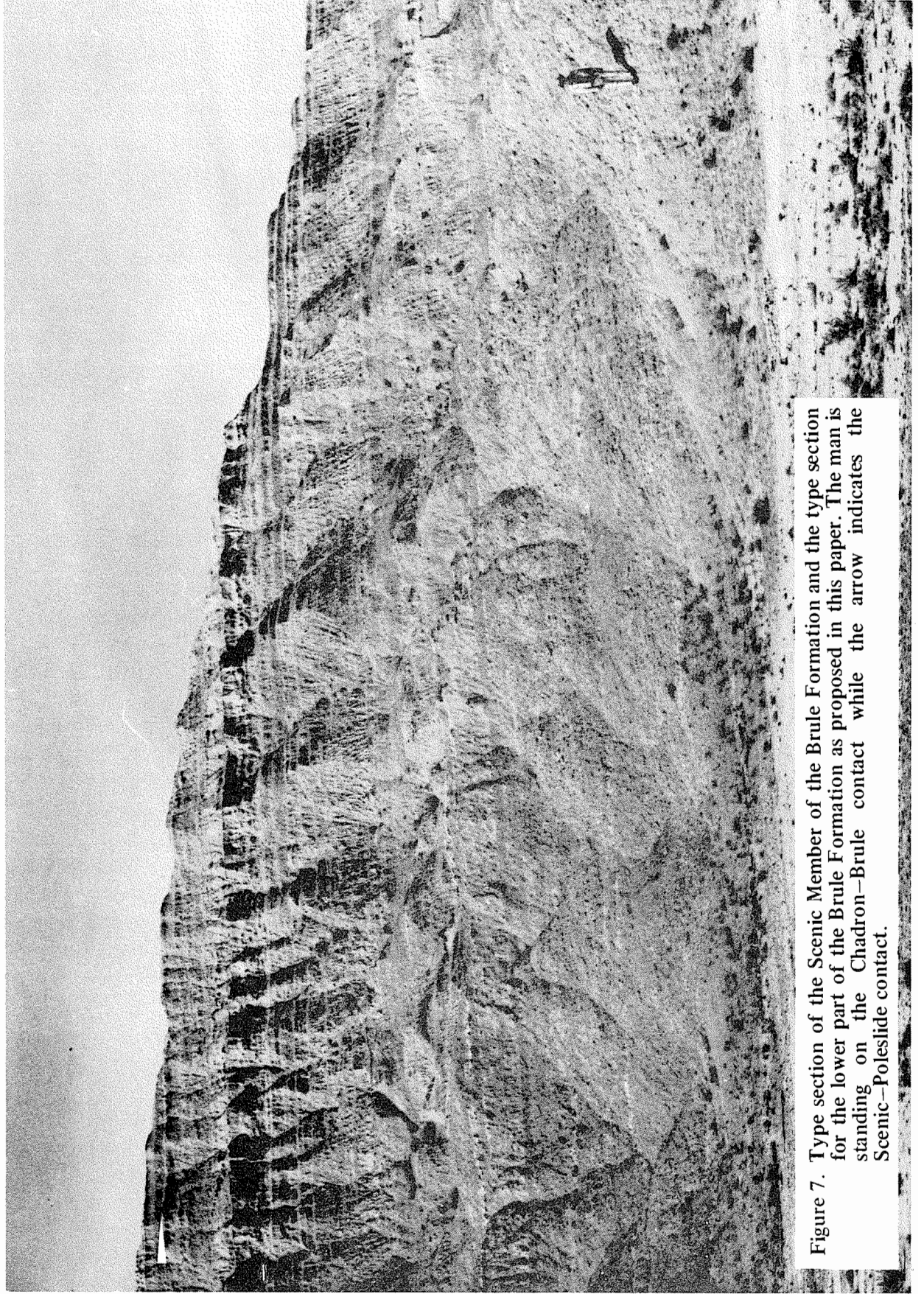


Figure 7. Type section of the Scenic Member of the Brule Formation and the type section for the lower part of the Brule Formation as proposed in this paper. The man is standing on the Chadron—Brule contact while the arrow indicates the Scenic—Poleslide contact.

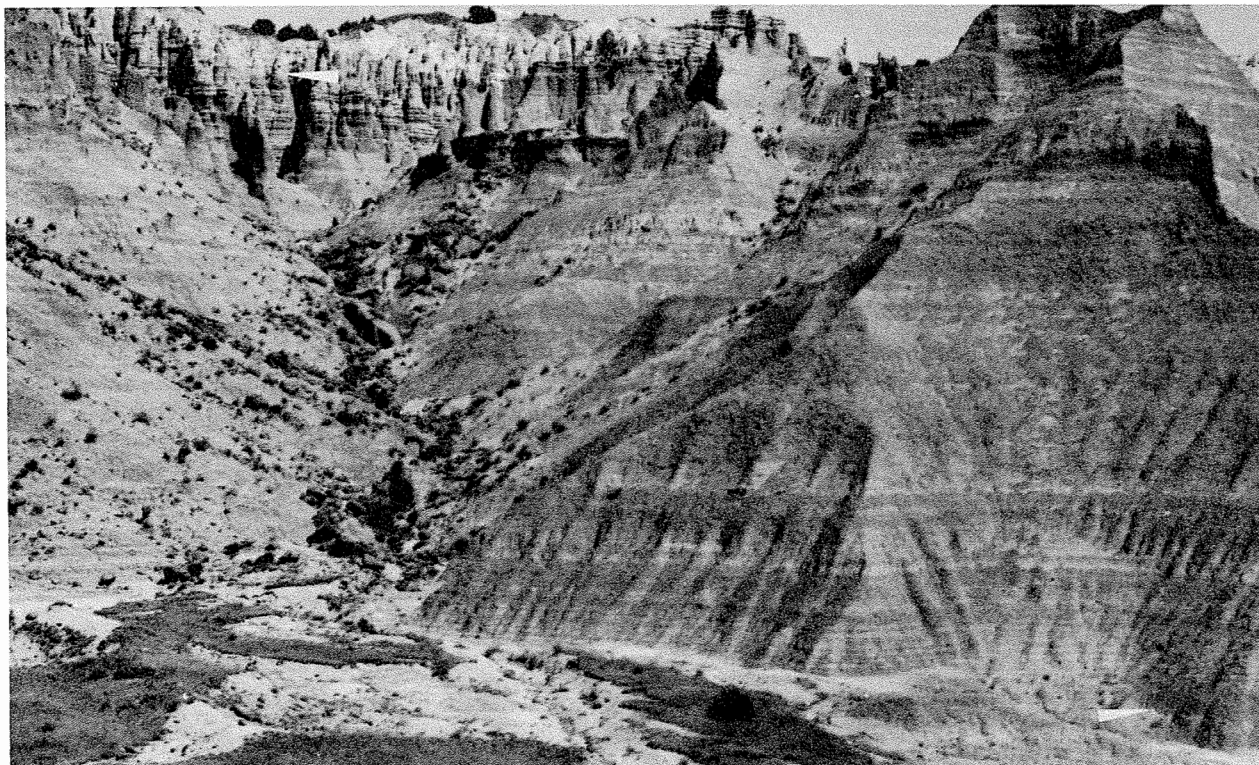


Figure 9. Type section for the Poleslide Member of the Brule Formation and the type section for the upper part of the Brule Formation as proposed in this paper. The arrows indicate the upper and lower contact.

literature and the compiler's personal knowledge. It is not complete as many collections probably have taxa which have not been reported or lie unidentified in storage. This list contains some taxa not considered valid. The horses and brontotheres are badly in need of revision and the recent oreodon population explosion has not yet stood the test of time. The changing tempo of scientific interest in the area is shown by the temporal distribution of descriptions of new species. This may be regarded as an index to general interest and research activity. There have been times when the study of the White River Oligocene has been considered *passé* but these periods are replaced by times of renewed interest. The following activity list, abstracted from the faunal list, indicates the number of proposed new species described during each decade beginning in the 1850's and the people generally responsible for these descriptions:

1840-1849	3	
1850-1859	26	Leidy
1860-1869	8	Leidy
1870-1879	0	
1880-1889	6	
1890-1899	39	Marsh, Osborn, and American Museum Associates
1900-1909	25	Osborn, and American Museum Associates
1910-1919	1	

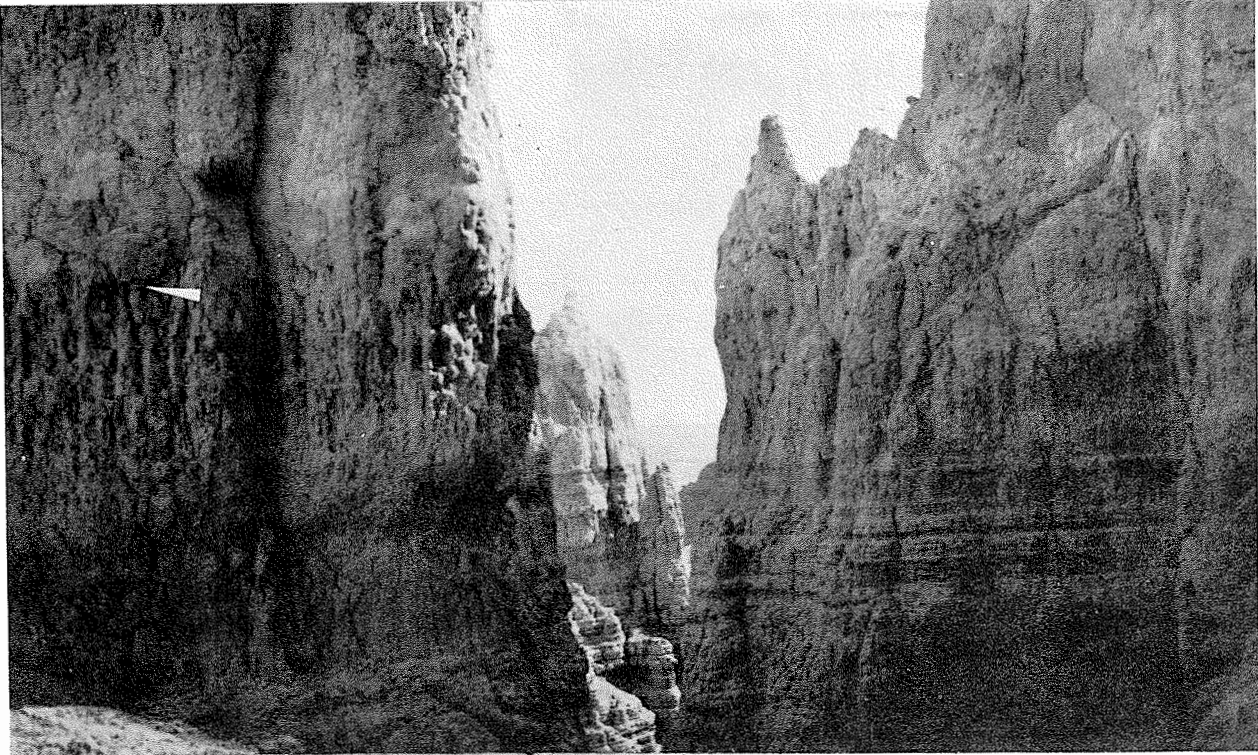


Figure 10. The arrow indicates the contact between the Poleslide Member of the Brule Formation and the Rockyford Ash Member of the Sharps Formation. It was in this canyon that the columnar section presented as figure 8 was measured.

1920-1929	17	Sinclair, Thorpe, and Troxell
1930-1939	19	Clark, Jepsen, Scott, and Wood
1940-1949	8	Scott
1950-1959	14	Macdonald, and Schultz and Falkenbach
1960-1969	17	Clark and Beerbower, Macdonald, and Schultz and Falkenbach

Species marked with an asterisk are based on types found in South Dakota. Wherever possible the location and number of the type is given. Citations to papers in this section are not listed in the literature cited section but are given in reference to the Hay and Camp bibliographies. The following abbreviations are used to designate the depositories of types:

AM	Amhurst College Museum
AMNH	American Museum of Natural History
ANSP	Academy of Natural Sciences of Philadelphia
CM	Carnegie Museum
CNHM	Chicago Natural History Museum
F:AM	Frick Laboratory
LACM	Los Angeles County Museum of Natural History
MCZ	Museum of Comparative Zoology
PU	Princeton University
SDSM	South Dakota School of Mines and Technology
UM	University of Michigan
USD	University of South Dakota
USNM	United States National Museum
YPM	Yale Peabody Museum

EARLY OLIGOCENE – CHADRONIAN – CHADRON FORMATION

AMPHIBIA

Anura

**Eopelobates grandis* Zweifel, 1956 (PU 16441)

REPTILIA

Chelonia

Aspiderietes sp.

**Xenochelys formosa* Hay, 1906

**Graptemys* (?) *cordifera* Clark, 1937 (PU 13838)

**Graptemys* (?) *inornata* (Loomis), 1904

**Trachemys antiqua* Clark, 1937 (PU 13839)

Stylomys sp.

**Testudo brontops* Marsh, 1890 (YPM "Box 27, 1885")

Testudo laticunae Cope

Crocodilia

**Alligator prenasalis* (Loomis), 1904 (SDSM 991)

**Alligator visheri* (Mehl), 1916 (USD 1044)

**Allagnathosuchus riggsi* Patterson, 1931 (CNHM P12141)

Squamata

?*Peltosaurus* sp.

AVES

Galliformes

**Procrax brevipes* Tordoff and Macdonald, 1957 (SDSM 511)

Ralliformes

Bathornis veredus Wetmore

MAMMALIA

Marsupialia

Peratherium sp.

Insectivora

**Apternodus altitalonidus* Clark, 1936 (PU 13,774)

Apternodus mediaevus Matthew

Arctoryctes galbreathi Reed

**Clinopternodus gracilis* (Clark), 1936 (PU 14,197)

Ictops dakotensis Leidy

**Geolabis magnus* (Clark), 1936 (PU 13835a)

Primates

**Sinclairiella dakotensis* Jepsen, 1934 (PU 13,585)

Lagomorpha

Megalagus turgidus (Cope)

Rodentia

Ischyromys sp.

Prosciurus vetustus Matthew

Adjidaumo minutus (Cope)

Paradjidaumo minor (Douglass)

Eutypomys nr. *thomsoni* Matthew

Carnivora

Hyaenodon crucians Leidy

Hyaenodon cruentus Leidy

Hyaenodon cf. *horridus*

Hyaenodon cf. *montanus*

Hesperocyon gregarius (Cope)

Daphoenocyon dodgei (Scott)

**Parictis dakotensis* Clark, 1936 (SDSM 2476)

**Parictis parvus* Clark and Beerbower, 1967 (PU 16265)

**Plesictis priscus* (Clark), 1936 (PU 13,775)

**Dinictis fortis* Adams, 1895

Eusmilus sp.

**Hoplophoneus mentalis* Sinclair, 1921 (PU 12,515)

Hoplophoneus robustus Adams

Perissodactyla

Mesohippus celer Marsh

**Mesohippus grandis* Clark and Beerbower, 1967 (CM 9157)

**Mesohippus hypostylus* Osborn, 1904 (AMNH 1180)

Mesohippus latidens Douglass

Mesohippus portentus Douglass

**Mesohippus proteulophus* Osborn, 1904 (AMNH 514a)

Mesohippus viejensis McGrew

**Telodus avus* Marsh, 1890 (YPM 10321)

**Brontops amplus* (Marsh), 1890 (YPM 12015A)

**Brontops bicornutus* (Osborn), 1902 (AMNH 1476)

**Brontops brachycephalus* (Osborn), 1902 (USNM 4261)

Brontops dispar Marsh

**Brontops robustus* Marsh, 1887 (YPM 12048)

**Brontops tyleri* (Lull), 1905 (AM 327)

?*Brontops* sp. (footprints)

**Menodus crassicornis* (Marsh), 1891 (USNM 4289)

**Menodus giganteus* Pomel, 1849 (Neotype AMNH 505)

**Menodus marshi* (Osborn), 1902 (AMNH 501)

**Menodus proutii* (Owen, Norwood, and Evans), 1850 (USNM 113)

**Menodus serotinus* (Marsh), 1887 (USNM 4260, Skull Q)

**Megacerops copei* (Osborn), 1908 (USNM 4711)

**Brontotherium dolichoceras* (Scott and Osborn), 1887

Brontotherium gigas Marsh

**Brontotherium hatcheri* Osborn, 1908 (USNM 1216)

**Brontotherium leidyi* Osborn, 1902 (USNM 4249, Skull R)

**Brontotherium medium* (Marsh), 1891 (USNM 4256)

**Brontotherium platyceras* (Scott and Osborn), 1887

**Brontotherium ramosum* (Osborn), 1896 (AMNH 1447)

**Brontotherium tichoceras* (Scott and Osborn), 1887 (MCZ)

**Colodon occidentalis* (Leidy), 1868

Colodon kayi (Hough)

Hyracodon nebraskensis (Leidy)

**Metamynodon chadronensis* Wood, 1937 (AMNH 11,866)

**Trigonias osborni* Lucas, 1900 (USNM 3924)

**Trigonias wellsi* Wood, 1927 (AMNH 13226)

Caenopus mite (Cope)

Amphicaenopus platycephalus (Osborn and Wortman)

Subhyracodon copei (Osborn)

**Subhyracodon trigonius* (Osborn and Wortman), 1894 (AMNH 528)

Artiodactyla

Archaeotherium cf. *crassum* Marsh

**Archaeotherium marshi* Troxell, 1920 (YPM 12025)

Archaeotherium mortoni Leidy

**Archaeotherium scotti* Sinclair, 1921 (PU 10885)

Perchoerus cf. *minor* Cook

Perchoerus cf. *nanus* (Marsh)

**Aepinacodon americanus* (Leidy), 1856 (ANSP 10583 and 10584)

**Aepinacodon deflectus* (Marsh), 1890 (YPM 11802)

Heptacodon sp.

Agriocheorus cf. *antiquus* Leidy

Merycoidodon culbertsonii (Leidy)

- **Merycoidodon lewisi* Clark and Beerbower, 1967 (CM 9105)
- Otionohyus bullatus* (Leidy)
- Otionohyus wardi* Schultz and Falkenbach
- Poebrotherium* cf. *andersoni* Troxell
- **Heteromeryx dispar* Matthew, 1905 (AMNH 12326)
- Leptomeryx esulcatus* Cope

MIDDLE OLIGOCENE – ORELLAN – LOWER BRULE FORMATION
REPTILIA

- Chelonia
 - Graptemys* sp.
 - **Styemys nebrascensis* Leidy, 1851
 - **Testudo thomsoni* Hay, 1908 (AMNH 3940)
- Squamata
 - Rhineura hatcherii* Baur
 - Peltosaurus granulosa* Cope
- Crocodylia
 - Alligator prenasalis* (Loomis)

AVES

- Anseriformes
 - Anatidae* indet. (Eggs)
- Falconiformes
 - **Buteo grangeri* Wetmore and Case, 1934 (UM 14405)
- Ralliformes
 - **Badistornis aramus* Wetmore, 1940 (SDSM 3631)
 - Bathornis* cf. *celeripes* Wetmore

MAMMALIA

- Marsupialia
 - Peratherium* sp.
- Insectivora
 - **Ictops bullatus* Matthew, 1899
 - **Ictops dakotensis* Leidy, 1868
 - **Leptictis haydeni* Leidy, 1868
 - Geolabis* sp.
 - Proterix loomisi* Matthew
 - **Proscalops tertius* Reed, 1961 (AMNH 19420)
 - **Domnina crassus* (Scott), 1894
 - Domnina* cf. *gradata* Cope
- Primates
 - Sinclairiella* sp.
- Lagomorpha
 - Palaeolagus burkei* Wood
 - **Palaeolagus haydeni* Leidy, 1856
 - Megalagus turgidus* (Cope)
- Rodentia
 - **Manitsha tanka* Simpson, 1941 (AMNH 39081)
 - Prosciurus relictus* (Cope)
 - Prosciurus* aff. ? *saskatchewaensis* Lambe
 - Ischyromys veterior* Matthew
 - **Ischyromys typus* Leidy, 1856
 - Pelycomys* sp.
 - Adjidaumo minutus* (Cope)
 - Paradjidaumo trilophus* (Cope)
 - **Diplolophus adspectans* (Wood), 1936 (USNM 13748)
 - Sciuridae*, two genera undescribed
 - Apletotomeus crassus* Reeder

Heliscomys hatcheri Wood
 **Heliscomys senex* Wood, 1935 (PU 13459)
Agnotocastor sp.
Castorid gen. *idet.*
Eumys brachyodus Wood
 **Eumys elegans* Leidy, 1856 (ANSP 11027)
 **Eumys exiguus* Wood, 1937 (AMNH 12261)
Eumys obliquidens Wood
Eumys parvidens Wood
Scottimus sp.
 **Eutypomys magnus* Wood, 1937 (PU 13779)
 **Eutypomys thompsoni* Matthew, 1905 (AMNH 12254)

Carnivora

**Hyaenodon crucians* Leidy, 1853
 **Hyaenodon cruentus* Leidy, 1853
 **Hyaenodon horridus* Leidy, 1853
 **Hyaenodon mustelinus* Scott, 1894
 **Hyaenodon paucidens* Osborn and Wortman, 1894
Daphoenus hartshornianus (Cope)
 **Daphoenus minimus* Hough, 1948 (AMNH 39099)
 **Daphoenus vetus* Leidy, 1853
 **Protemnocyon inflatus* Hatcher, 1920
Hesperocyon gregarius (Cope)
 **Brachyrhynchocyon intermedius* (Loomis), 1931 (AMNH 2752)
Palaeogale lagophaga Simpson, 1946
 **Dinictis bombifrons* Adams, 1895
 **Dinictis cismontanus* (Thorpe), 1920
 **Dinictis felina* Leidy, 1856
Dinictis squalidens (Cope)
 **Hoplophoneus occidentalis* (Leidy), 1866
 **Hoplophoneus primaevus* (Leidy), 1851
 **Hoplophoneus robustus* Adams, 1896 (AMNH 650)
 **Eusmilus sicarius* Sinclair and Jepsen, 1927 (PU 12,953)

Perissodactyla

Mesohippus antiquus Schlaikjer
 **Mesohippus bairdi* (Leidy), 1850
 **Mesohippus barbouri* Schlaikjer, 1931 (MCZ 17641)
 **Mesohippus obliquidens* Osborn, 1904 (AMNH 674)
 **Colodon dakotensis* Osborn and Wortman, 1895 (AMNH 1212)
 **Protapirus simplex* Wortman and Earle, 1893 (AMNH 660)
 **Hyracodon nebraskensis* Leidy, 1850
 **Metamynodon planifrons* Scott and Osborn, 1887
 **Caenopus dakotensis* Peterson, 1920 (AMNH 1110)
 **Subhyracodon copei* (Osborn), 1898 (AMNH 522)
Subhyracodon metalophus (Troxell)
 **Subhyracodon occidentalis* (Leidy), 1851 (Neotype USNM 114)
 **Subhyracodon trigonodus* (Osborn and Wortman), 1894 (AMNH 528)
Diceratherium tridactylus (Troxell)

Artiodactyla

?**Stibarus loomisi* Scott, 1940 (AM 1787)
Stibarus obtusilobus Cope
 **Leptochoerus gracilis* Marsh, 1894 (YPM 10322)
 **Leptochoerus spectabilis* Leidy, 1856 (ANSP 15593)
 **Nanochoerus elegans* Macdonald, 1955 (AMNH 12315)
Nanochoerus quadricuspis (Hatcher)
 **Nanochoerus scotti* Macdonald, 1955 (SDSM 3375)

- ?*Entelodon cf. magnus* Aymard
 **Archaeotherium mortoni* Leidy, 1850
 **Archaeotherium wanlessi* Sinclair, 1921 (PU 12522)
 *? *Megachoerus praecursor* Scott, 1940 (AMNH 572)
 **Perchoerus nanus* (Marsh), 1894
 **Perchoerus probus* Leidy, 1856
 **Aepinacodon rostratus* (Scott), 1895 (PU 11172)
 **Heptacodon occidentalis* Scott, 1940 (AMNH 1039)
 **Heptacodon quartus* Scott, 1940 (PU 10828)
 **Agriochoerus antiquus* Leidy, 1850
 **Agriochoerus latifrons* Leidy, 1869
 **Agriochoerus major* Leidy, 1856
 **Miniochoerus affinis* (Leidy), 1869 (ANSP 10679)
 **Miniochoerus battlecreekensis* Schultz and Falkenbach, 1956 (F:AM 45001)
 **Miniochoerus gracilis* (Leidy), 1851 (ANSP 10692)
 **Miniochoerus helprini* Schultz and Falkenbach, 1956 (F:AM 49501)
Platychoerus heartensis Schultz and Falkenbach
Platychoerus platycephalus (Thorpe)
Stenopsuchoerus joderensis Schultz and Falkenbach
Subdesmatochoerus socialis (Marsh)
Prodesmatochoerus meekae Schultz and Falkenbach
 **Merycoidodon culbertsoni* Leidy, 1848 (ANSP 10727 and 10728)
Merycoidodon dani Schultz and Falkenbach
Paramerycoidodon bacai Schultz and Falkenbach
 **Paramerycoidodon georgei* Schultz and Falkenbach, 1968 (F:AM 45143)
Otionohyus bullatus (Leidy), 1869 (ANSP 10681)
Otionohyus wardi Schultz and Falkenbach
 **Genetochoerus norbeckensis* Schultz and Falkenbach, 1968 (F:AM 49733)
Genetochoerus percolorum (Cope)
Leptauchenia harveyi Schultz and Falkenbach
 **Poebrotherium eximium* Hay, 1920
Poebrotherium labiatum Cope
 **Poebrotherium wilsoni* Leidy, 1847
 **Paratylopus primaevus* (Matthew), 1904 (AMNH 9806)
Hypertragulus calcaratus Cope
 **Leptomeryx evansi* Leidy, 1853
Hypisodus minimus Cope

LATE OLIGOCENE – WHITNEYAN – UPPER BRULE FORMATION
 REPTILIA

Chelonia

- Stylemys nebrascensis* Leidy
Testudo laticunae Cope
Testudo thompsoni Hay

Squamata

- **Hypsorhina antiqua* Baur, 1893 (PU 11,390)
 **Peltosaurus abbotti* Gilmore, 1927 (CNHM 12861)
Peltosaurus granulosa Cope
 **Rhineura hatcherii* Baur 1893 (PU 11389)

AVES

Galliformes

- Palaeonossax senectus* Wetmore, 1956
Cracoidid n. gen.

Ralliformes

- **Gnotornis aramielus* Wetmore, 1942 (SDSM 40158)
Bathornis cursor Wetmore

MAMMALIA

Insectivora

- **Proterix bicuspis* (Macdonald), 1951 (SDSM 4048)
- **Proterix loomisi* Matthew, 1903 (AMNH 9756)
- Proterix* sp.
- **Geolabis wolffi* Macdonald, 1964 (LACM 9582)

Lagomorpha

- Palaeolagus haydeni* Leidy
- ?*Megalagus turgidus* (Cope)

Rodentia

- Eumys* sp.
- Prosciurus* cf. *relictus* Cope
- Ischyromys typus* Leidy
- **Agnotocastor praetereadens* Stirton, 1935 (AMNH 1428)

Carnivora

- Hyaenodon* cf. *cruentus* Leidy
- Hesperocyon gregarius* (Cope)
- **Sunkahetanka sheffleri* Macdonald, 1967 (LACM 17476)
- Daphoenus* sp.
- **Brachyrhyncocyon sesnoni* Macdonald, 1967 (LACM 17039)
- **Cynarctoides cuspidatus* (Green), 1954 (SDSM 2980)
- Nimravus brachyops* (Cope)
- Dinictis bombifrons* Adams
- Dinictis felina* Leidy
- Hoplophoneus* sp.
- **Eusmilus dakotensis* Hatcher, 1895 (PU 11079)

Perissodactyla

- **Miohippus brachystylus* (Osborn), 1904 (AMNH 11860)
- **Miohippus crassicuspis* Osborn, 1904 (AMNH 683)
- **Miohippus gidleyi* Osborn, 1904 (AMNH 1192)
- **Miohippus intermedius* (Osborn and Wortman), 1895 (AMNH 1196)
- **Miohippus meteulophus* Osborn, 1904 (AMNH 1210)
- **Miohippus validus* (Osborn), 1904 (AMNH 1218)
- **Protapirus obliquidens* Wortman and Earle, 1893
- **Protapirus validus* Hatcher, 1896 (PU 10899)
- Hyracodon nebraskensis* (Leidy)
- Subhyracodon* sp.
- Metamynodon planifrons* Scott and Osborn
- **Caenopus dakotensis* Peterson, 1920 (AMNH 1110)
- **Amphicaenopus platycephalus* (Osborn and Wortman), 1894 (AMNH 540)
- **Diceratherium tridactylus* (Osborn), 1893 (AMNH 538)

Artiodactyla

- **Leptochoerus supremus* Macdonald, 1955 (SDSM 4090)
- Stibarus lemurinus* (Cope)
- **Archaeotherium altidens* Sinclair, 1921
- **Archaeotherium latidens* Troxell, 1920
- **Archaeotherium lemleyi* Macdonald, 1951 (SDSM 2423)
- **Archaeotherium zygomaticus* Troxell, 1920 (PU 11156)
- Perchoerus probus* Leidy
- **Elomeryx armatus* (Marsh), 1894 (YPM 10176)
- **Heptacodon gibbiceps* Marsh, 1894 (YPM 10194)
- **Agriochoerus gaudryi* (Osborn and Wortman), 1893
- **Promesoreodon scalonii* Schultz and Falkenbach, 1949 (F:AM 45329)
- **Miniochoerus cheyennensis* Schultz and Falkenbach, 1956 (F:AM 9797)
- **Miniochoerus nicholsae* Schultz and Falkenbach, 1956 (F:AM 49585)
- Platychoerus hatcreekensis* Schultz and Falkenbach

- Stenopsuchoerus berardae* Schultz and Falkenbach
 **Subdsmatochoerus shannonensis* Schultz and Falkenbach, 1954 (AM 1310)
 **Merycoidodon galushai* Schultz and Falkenbach, 1968 (F:AM 45279)
 **Merycoidodon lambi* Schultz and Falkenbach, 1968 (F:AM 72139)
 **Merycoidodon lynchi* Schultz and Falkenbach, 1968 (F:AM 45297)
 **Paramerycoidodon major* (Leidy), 1853 (USNM 19099)
 **Paramerycoidodon wanlessi* Schultz and Falkenbach, 1968 (F:AM 72104)
 **Otionohyus alexi* Schultz and Falkenbach, 1968 (F:AM 72060)
 **Otionohyus hybridus* (Leidy), 1869 (ANSP 10860)
Genetochoerus chamberlaini Schultz and Falkenbach
 **Genetochoerus geygani* Schultz and Falkenbach, 1968 (F:AM 49734)
 **Sespia nitida* (Leidy), 1896 (ANSP 10870)
Pithecistes tanneri Schultz and Falkenbach
 **Leptauchenia decora* Leidy, 1856 (ANSP 10875)
Leptauchenia harveyi Schultz and Falkenbach
 **Hadroleptauchenia primitiva* Schultz and Falkenbach, 1968 (F:AM 45577)
 **Pseudocyclopidius frankforteri* Schultz and Falkenbach, 1968 (F:AM 45500)
 **Pseudocyclopedius major* (Leidy), 1856 (ANSP 10941)
 **Pseudolabis dakotensis* Matthew, 1904 (AMNH 9807)
 **Pseudolabis matthewi* Lull, 1921
Poebrotherium (?) (footprints)
Leptomeryx evanisis, Leidy
 **Leptomeryx minimus* Frick, 1937 (AMNH 1347a)
 **Leptomeryx obliquidens* Lull, 1922 (YPM 10541)
Leptomeryx semicinctis Cope
 **Protoceras celer* Marsh, 1891
 **Protoceras comptus* Marsh, 1894
 **Protoceras cristatus* (Marsh), 1894
 **Protoceras nasutus* Marsh, 1897
 **Calops consors* (Marsh), 1897

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