

**Article XXI.—TERTIARY FAUNAL HORIZONS IN THE WIND
RIVER BASIN, WYOMING, WITH DESCRIPTIONS OF
NEW EOCENE MAMMALS.**

BY WALTER GRANGER.

PLATES XX-XXIII.

In the fall of 1908 this Museum received from Mr. N. H. Brown, a civil engineer of Lander, Wyoming, a finely preserved skull of the Upper Eocene rhinoceros *Amynodon*, which he had collected on the northern side of the Beaver Divide. This divide forms a part of the southern border of the Wind River Basin, about forty miles southeast of Lander. The specimen gave evidence of a horizon in the basin not previously known to exist there, so far as the writer is aware.

The American Museum expedition of last summer (1909) examined this horizon carefully, in company with Mr. Brown, and succeeded in obtaining additional specimens from it and in finding at that point a very interesting series of Tertiary beds. The larger part of the season, though, was spent by this expedition in collecting in the Wind River beds at the old and well known localities in the northern and northeastern parts of the basin, where the results obtained alter considerably some of the ideas previously held regarding the faunal levels of the Wind River group. The object of this article is to present briefly the results of the work in these two widely separated parts of the basin.

The Wind River Basin has an extent, roughly stated, of seventy-five miles east and west and fifty miles north and south. It is bounded on the north by the Owl Creek and Bridger ranges and by the southern end of the Big Horn Mountains, to the eastward by the low Powder River divide, on the south by the Sweetwater divide, and to the westward by the Wind River Mountains. The drainage is into the Big Horn Basin to the north through the deep, narrow Wind River cañon, cut through the Owl Creek Mountains. Except in the spring or after heavy rains nearly all of the water contained in the main drainage stream, Wind River, as it enters the cañon, is derived from the Wind River Mountains and the ranges lying to the northwest of the basin. All of the streams from the east and southwest, as well as Muddy Creek from the Owl Creek Mountains, run dry as the summer advances, except toward their sources. The central and eastern parts of the basin are very open, with low, grass-covered divides, very few buttes of any consid-

erable size, and with low escarpments along some of the main creeks. Along Wind River, above the mouth of Little Wind River, the stream has cut down through the soft Tertiary rocks so that in places steep bluffs several hundred feet in height occur. Along the foot of the mountains, especially of the Wind River range, the country is much rougher, owing chiefly to the upturning of the Mesozoic strata.

These older formations are seen only along the northern, western, and southern borders of the basin; the great central area is entirely Tertiary, the Wind River group of Hayden. Most of this exposed Tertiary is younger than the Wasatch and older than the Bridger.

Along the southern border of the basin, in the Sweetwater divide, there are over 1,000 feet of Tertiary deposits, reaching in time from the Wasatch to at least the top of the Lower Oligocene. At one time these beds undoubtedly extended out over the basin to the northward a considerable distance, possibly across to the Owl Creek and Bridger ranges. The erosion has removed all traces of them, down to the Lower Eocene, with the exception, perhaps, of the northwestern part, Crow Heart Butte in particular, where the upper levels may be of Middle Eocene age.

The earliest descriptions of the Tertiary of the basin are by Hayden, who explored it as early as 1859-60; but he did not secure vertebrate fossils of any importance. The first acquaintance with the mammalian fauna of the beds was made in 1880, when J. L. Wortman traversed the basin in a search for fossils for Professor Cope and discovered on Muddy Creek and on Alkali Creek, in the extreme northeastern part of the basin, exposures of red-banded shales and clays in which mammalian remains were fairly abundant. His collection made that year comprised about twenty-five new species, including the famous skeleton of the Eocene horse, *Eohippus venticolus*. Subsequent explorations for fossils were made by Dr. Wortman for this Museum in 1891 and 1896, by Dr. F. B. Loomis of Amherst College in 1904 for that institution, and by the writer in 1905 for the American Museum. The collections obtained by these various later expeditions were all from or near the exposures which yielded the first fossils. The formation has been examined in other parts of the basin by Dr. Wortman, the writer, and others, but it has proved to be nearly barren of vertebrate remains except in these two localities.

BEAVER DIVIDE¹ SECTION.

A few miles east of the stage road, where it crosses from Beaver Creek and Sweetwater River, the divide rises to a height above Beaver Creek of over 1,200 feet. From the crest of this divide to the southward the land slopes gently down to the Sweetwater; to the northward, facing the Wind River Basin, it breaks off very abruptly with a slope so precipitous in places as to be difficult of ascent. This abrupt face is maintained to the eastward along almost the whole southern border of the basin. It was examined as far east as Barrel Spring, beyond which the face of the bluff is so covered with vegetation as to largely obscure the beds. The beds of this bluff in the area examined, aggregating nearly 1,100 feet, are all Tertiary, lying nearly horizontal, and resting on the upturned edges of the Mesozoic strata. Endlich has described them,² calling the lower part Wasatch, the upper part the Sweetwater Group, and noting an unconformity of dip between the two amounting to 1° or less.

The section given below was taken, with hand-level measurements, near the western end of the bluff, at a place known as "Green Cove," about four miles east of Hailey, the old stage station on Beaver Creek, where the exposures were particularly good.

Section through the Tertiary deposits of the Beaver Divide, about four miles east of Hailey.

Top of Divide.

- | | |
|---|-----|
| 9. Buff and gray calcareous marls with some coarse sandstone and a little sandy shale. Marls more highly calcareous than No. 8, and toward the top weather out into hard ledges | ft. |
| 8. Buff-colored calcareous marls, very uniform in nature except the lower 50 feet where the marls are interbedded with coarse sandy layers from one inch to two feet in thickness | 210 |
| | 330 |

Erosion Unconformity.

- | | |
|---|-----|
| 7. Coarse greenish sandstone | 10 |
| 6. Yellowish green and olive coarse, loosely compacted sandy stones | 55 |
| 5. Gray and yellowish clay | 27 |
| 4. Blue-gray clay and sandstone, forming a prominent ledge along the face of the bluff; weathers nearly vertical | 20 |
| 3. Beginning at the base of the main bluff where there is a red stratum corresponding with the one at the top of the butte in No. 2, the rock is pale yellowish brown and alternates between sandy and clayey shales, with coarse sandy beds at intervals. Some layers weather out harder, forming rounded ledges | 165 |

¹ That part of the Sweetwater divide where the Lander-Rawlins stage trail passes over from Beaver Creek and Sweetwater River is known locally as Beaver Divide or Beaver Hill.

² Endlich, F. M. 11th Ann. Rept. U. S. G. Surv. Terrs., 1879, p. 110.

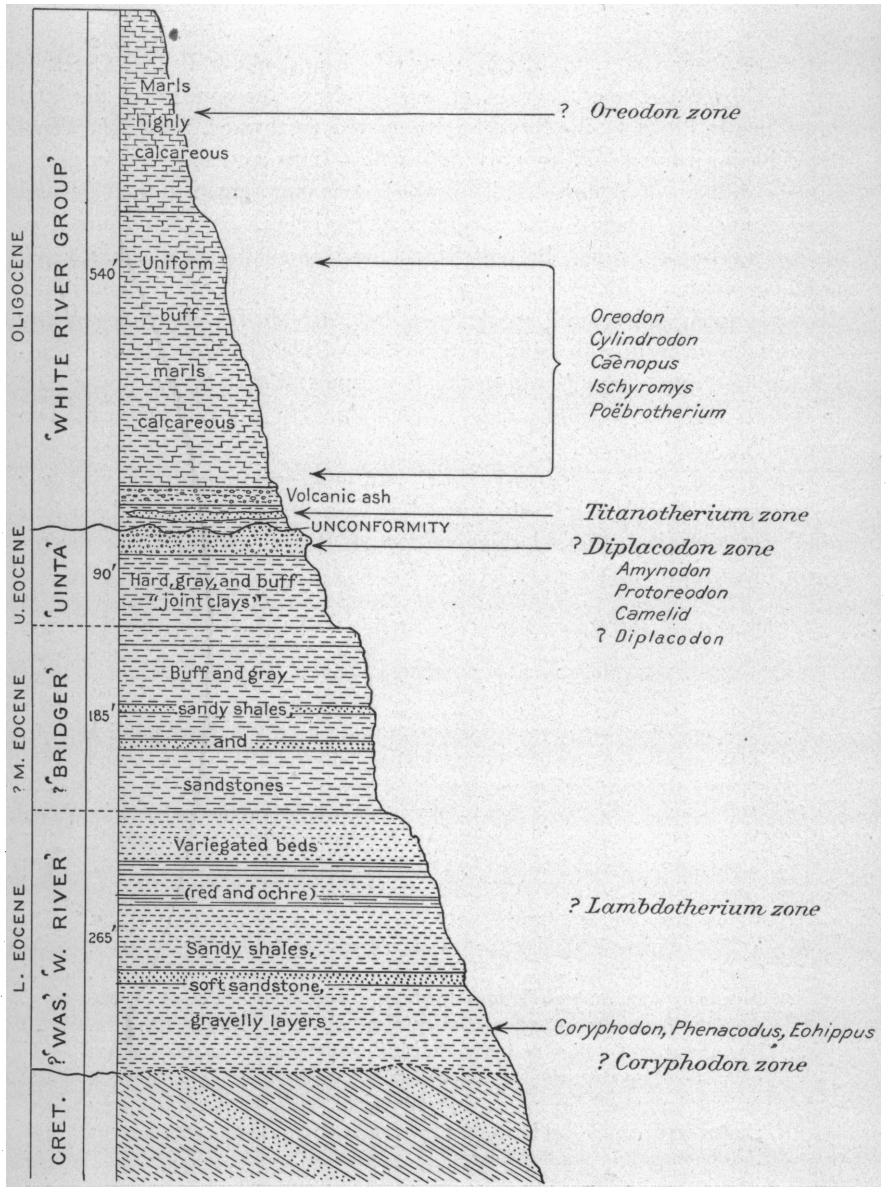
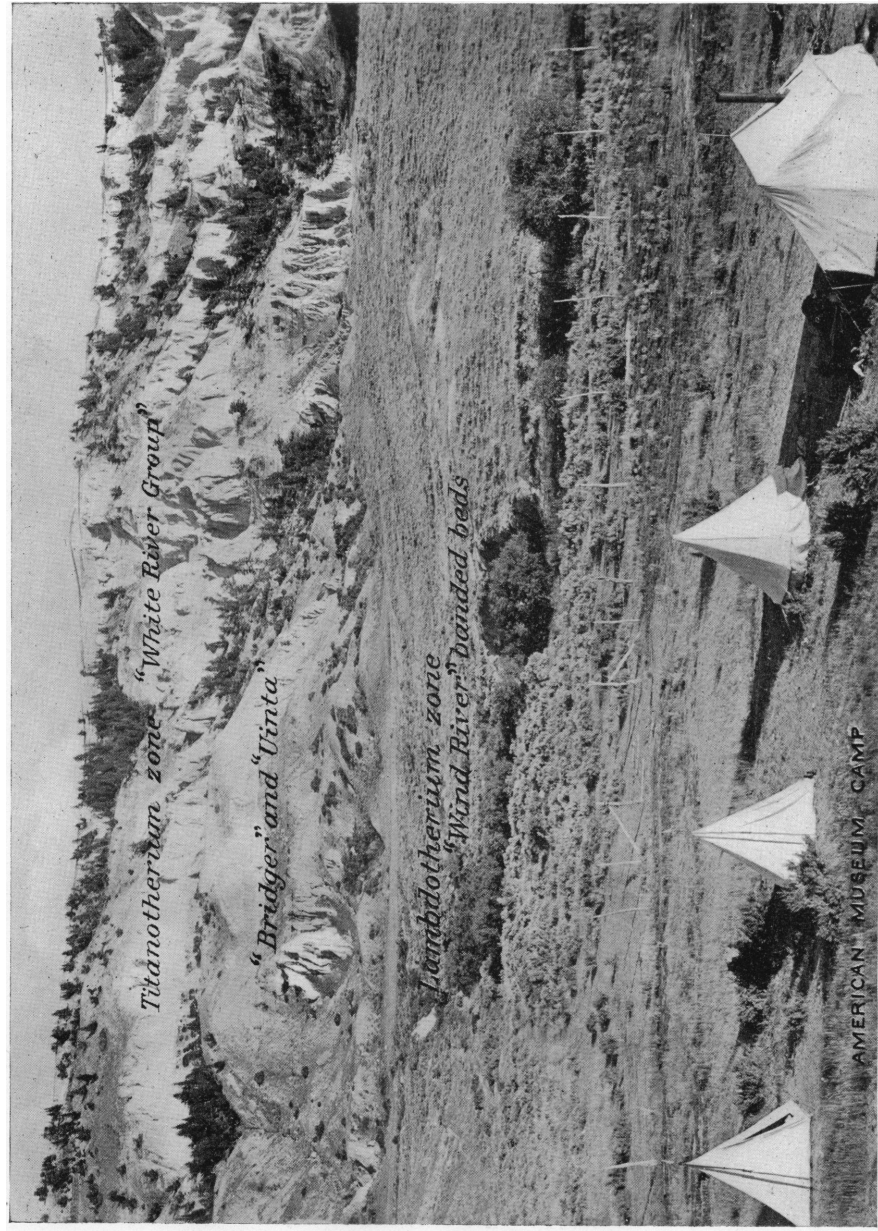


Fig. 1. Generalized section of the Tertiary of the Beaver Divide.



Escarpment of the Beaver Divide at Green Cove, near Hailey, looking south. The top of the bluff is about 900 feet above the camp.

- | | | |
|----|--|------------|
| 2. | A small outlying butte is composed of alternating layers of gray and purplish clays, gray-green sandy shales and strata of coarse sand. Some of the sandy layers weather out salmon-colored | ft.
125 |
| 1. | One mile out from the foot of the bluff, and resting nearly horizontally on upturned Cretaceous, are sandy clays, becoming more sandy toward the top, and with a two-foot stratum of calcareous sandstone midway. The clays are yellowish, greenish, and purplish (Corresponding level at Barrel Spring contains ? Wasatch fauna.) | 140 |
| | Total | 1,082 |
| 0. | Cretaceous. | |

Lithologically, as well as faunally, the beds fall into three groups: (1) the red banded clays and coarse sands of the Lower Eocene, (2) the greenish, blue-gray and olive-colored shales, clays, and sandstones of the (?) Middle and Upper Eocene, and (3) the buff and light gray calcareous marls of the Lower Oligocene. The upper and lower groups are fairly constant in character throughout the area examined, but the middle one is variable, the various strata maintaining their character over a very limited area only. An exception to the uniformity of the Lower Oligocene is the presence, near Wagon-bed Spring, of a five-foot bed of volcanic material not observed at Green Cove, where the above section was taken. The bed is from fifty to one hundred feet above the unconformity and consists of gray ash, in which is imbedded in places numerous smooth, rounded masses of pumice an inch or two in diameter. This bed is well shown near the top of the exposures in Plates XXI and XXII.

No break in sedimentation was detected in the Eocene series, yet a careful examination by a competent stratigrapher might bring it to light. The Bridger formation in the Bridger Basin has a maximum thickness of 1,800 feet, and the only beds in this section which might be assigned to that formation are the 200 or 250 feet of unfossiliferous strata between the Lower Eocene banded beds and the layers lying immediately below the unconformity, which are unquestionably Upper Eocene.

Mammalian fossils were found on three levels, as noted in the section above. They were not at all abundant on any level nor in any locality, and it was only by painstaking and prolonged search that the number of forms listed below was obtained. The genera and species, so far as determined, from the three horizons are as follows:

WASATCH (? *Coryphodon* Zone).

Eohippus sp.

Phenacodus sp.

Coryphodon ?*testis*.

UINTA (? *Diplacodon* Zone).? *Diplacodon*.*Amynodon* ?*antiquus*.*Protoreodon* ?*parvus*.

Camelid, gen. nov.

WHITE RIVER (*Titanotherium* Zone).*Titanotherium* ?*heloceras*.*Hyracodon* sp.*Cænopus* sp.*Oreodon* sp.*Leptomeryx* ?*esulcatus*.*Pcëbrotherium*.? *Mesodon*.*Palæolagus* ?*temnodon*.*Ischyromys* *veterior*.*Cylindrodon* *fontis*.

Of the Wasatch specimens, which were found low down in the variegated beds on Sand Draw, near Barrel Spring, the *Eohippus* and *Phenacodus* are merely isolated molar teeth and not specifically determinable; the *Coryphodon* is a front of a skull with full dentition, and a careful comparison shows it to be near to, if not identical with *C. testis* of the Big Horn Wasatch and unlike any species of this genus from the *Lambdotherium* zone of the Wind River. The determination of these beds then, as pertaining to the *Coryphodon* zone, rests upon the identification of this one specimen, all three genera being common to both zones.

On the Uinta level the fossils came, with one exception, from Wagon-bed Spring, and were found mostly in a pale yellowish, tough, sandy clay, although a few fragments were in the base of the hard, coarse, greenish sandstone immediately overlying and at the very top of the Eocene series. The exception was a single lower molar of *Amynodon* together with a few indeterminate fragments from Barrel Spring. The exact locality of the finds at Wagon-bed Spring is the northern half of Sec. 3, Tp. 31N., R. 95 W. The *Titanotheriidae* are represented by a jaw fragment with last lower molar. It was found by a ranchman several years ago and is still in his possession and not available for exact comparison. Judging from the measurements it might pertain to *Diplacodon* or *Protitanotherium* from Uinta C, or to *Telmatherium ultimum* from Uinta B. The *Amynodon* skull agrees with the description of the type, *A. antiquus*, from Washakie B, and cannot be separated specifically from a skull in the American Museum Collection from this locality. Two specimens of *Protoreodon* seem to be referable to *P. parvus*, a species recorded in the American Museum collection from the Uinta Basin as coming chiefly from the base of Horizon C, and in the Princeton collection, according to Professor Scott, from the top of Horizon B.

The Camelid is represented by a lower jaw. Its closest affinities are with *Protylopus* from Uinta C. It is doubtful, therefore, whether this horizon is to be correlated with the true Uinta (Horizon C) or with Uinta B and its equivalent (in part) in the Washakie Basin, Washakie B.

In the Oligocene beds well preserved fossils were found sparingly throughout the area examined, chiefly in the marls from fifty to two hundred feet above the base, although the skull of *Titanotherium heloceras* was in a coarse sandstone channel deposit near the base of the beds. The small fauna resembles very much that of the Titanotherium Zone of Pipestone Springs, Montana, especially in the Rodentia. The *Ischyromys*¹ is identical with the Montana species, which Dr. Matthew has recently separated subgenerically from the species of the Oreodon beds of South Dakota and Colorado. The genus *Cylindrodon* has only been recorded from Pipestone Springs, the type locality, and from near Bates's Hole, Wyoming, in a locality recently explored by Mr. W. H. Reed. The beds in the latter locality are further connected with those of the former by the presence of the Insectivore *Apternodus mediavus* Matthew.² The *Titanotherium* beds of the Beaver Divide may very probably be a westward extension of those of Bates's Hole.³ It would seem, at any rate, that the beds of the three localities were of contemporaneous deposition.

LOST CABIN SECTION.

Alkali Creek Exposures (Lambdotherium Zone).

The Wind River formation as treated by Osborn,⁴ chiefly upon the descriptions of Hayden and Wortman and information furnished by Dr. Loomis and the writer, comprises 1,200 to 1,400 feet of sediment, which he divides into two zones, the lower, or Lambdotherium zone (400–500 ft.), and the upper, or Bathypopsis zone (800–900 ft.). The collections and studies made last season make possible some corrections in this section, as

¹ A fairly good skull and jaws with a considerable part of the skeleton of this genus was found. The species differs materially from the typical *Ischyromys* of the Middle Oligocene and is regarded by Dr. Matthew as typical of a distinct subgenus (Matthew, W. D., 1910. Notes on the Osteology and Relationships of *Paramys*, and the Affinities of the Ischyromyidae. Bull. Amer. Mus. Nat. Hist., Vol. XXVIII, p. 63).

² Matthew, W. D., 1910, On the Skull of *Apternodus* and the Skeleton of a new Artiodactyl. Bull. Amer. Mus. Nat. Hist., Vol. XXVIII, p. 33.

³ Darton notes that this formation (Sweetwater of Hayden Survey) strongly resembles the White River, and that it appears to merge with the Chadron formation on the high plateau west of Alcova on the Platte River (Darton, N. H., 1908, Paleozoic and Mesozoic of Central Wyoming. Bull. Geol. Soc. Am., Vol. XIX, p. 463).

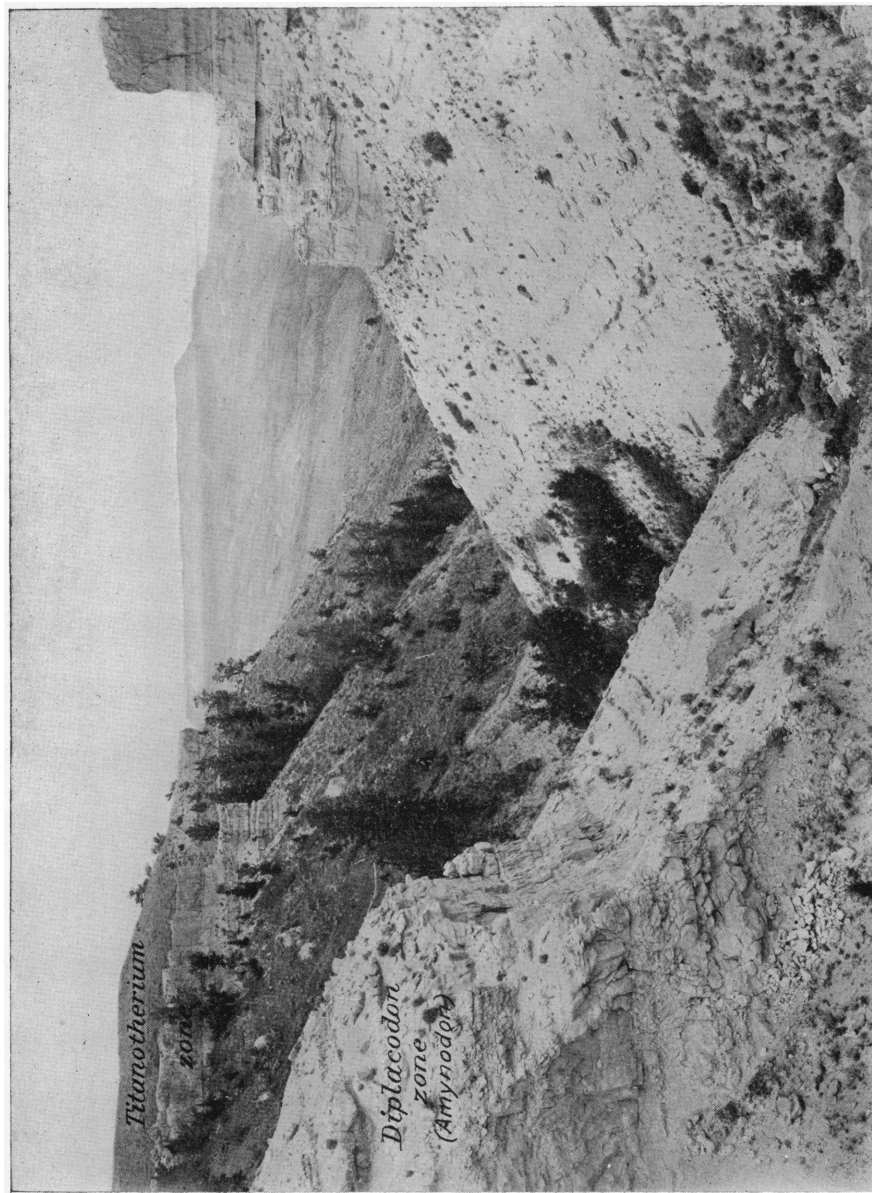
⁴ Osborn, H. F., 1909, Cenozoic Mammal Horizons of Western North America. Bull. U. S. G. S., No. 361.

will be seen by a comparison with a new generalized section, Fig. 2. As stated before, the Wind River deposits are unfossiliferous throughout the greater part of their area, the two localities where mammalian remains have been found being along Muddy Creek, on the west side of the Wind River, and in the vicinity of Lost Cabin, particularly along Cottonwood and Alkali Creeks, on the east side. The beds exposed along Cottonwood Creek, as is shown later, do not pertain to the *Lambdaotherium* zone. The Muddy Creek exposures are similar in appearance to those of Alkali Creek, contain the same fauna, and need not be mentioned separately.

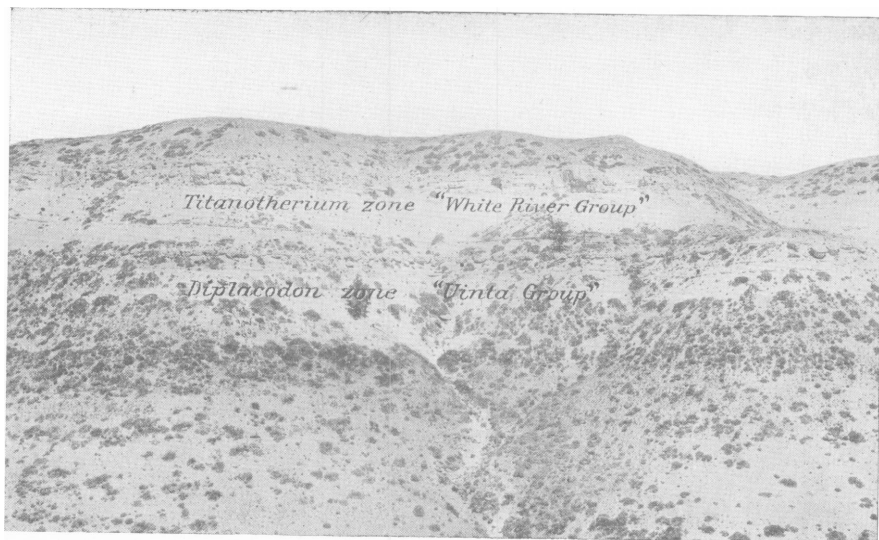
The exposures along Alkali Creek are all within the *Lambdaotherium* zone. It is difficult to measure the full thickness of the beds here, because they are not cut through to their base at any point; it is probably not over 500 feet, however. The exposures are chiefly in a series of isolated "pockets," extending along parallel with the creek, on both sides of it. These pockets are usually less than a mile in extent and rarely expose a thickness of more than 200 feet. The dip is slight and irregular in direction. The material of the beds is sandy shale predominating, with some sandstone and a few thin strata of clay. The clays and shales often present a banded appearance, the colors being gray, brick red, and purplish. In a typical exposure, about eight miles east of Lost Cabin, the strata were as follows:

	ft.
11. Chiefly gray (deep weathering) with five or six faint purplish bands and several thin layers of sandstone	50
10. Dull purplish	4
9. Gray	15
8. Brick red	4
7. Gray	5
6. Brick red	8
5. Gray	3
4. Brick red	3
3. Gray	5
2. Dark red, purplish at base and rusty brown at top	10
1. Gray	+ 15
Total,	122

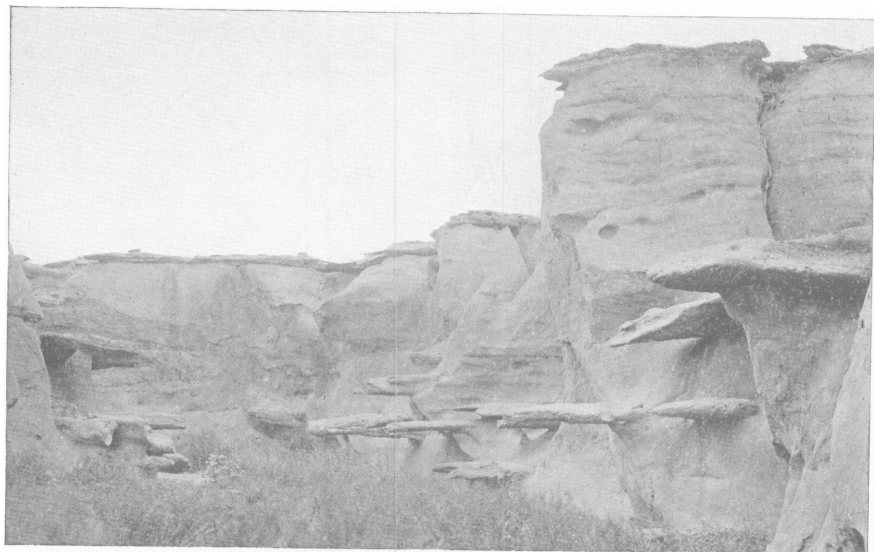
With the exception of Nos. 1 and 2 none of these strata could be traced over any considerable area. Many of them maintain their identity for but a few hundred yards along the face of the escarpment. The dark red stratum, No. 2, however, could be identified for twenty miles along Alkali Creek, partly by its peculiar coloring and partly by the presence, always, of numerous fragmentary fossils; wherever seen it was always resting on the thick gray stratum, No. 1.



View looking southwest along the northern face of the Beaver Divide from Wagon-bed Spring. The skull of *Amynodon* came from the prominence at the left in the foreground.



1. Exposure at Wagon-bed Spring, Beaver Divide, showing contact between Upper Eocene and Lower Oligocene. The skull of *Titanotherium* was from the draw in the distance.



2. Lamdotherium zone, Wind River beds. Soft yellow sandstones containing hard gray concretionary sandstones. North side of Alkali Creek, about eight miles east of Lost Cabin.

The sandstones occur either in thin strata covering only a small area, or in masses ten to twenty feet in thickness and having the appearance of channel deposits. These more massive sandstones are quite soft, pale yellow in color, and usually contain hard gray sandstone concretions, often in the form of flattened spheres or in long flat strips from one to three feet in width and a few inches in thickness. Occasionally the long concretions are subcylindrical, twenty feet or more in length, and with one end developed into a large bulb, like a thermometer tube. The long masses, wherever in place, point in an east and west direction. In Plate XXII, Fig. 2, a mass of this soft, yellow sandstone with the contained concretions is shown.

The fossils are found almost exclusively in the clays and shales, and are comparatively rare except on one or two levels; they are more abundant in areas where the red and gray banding is most pronounced. One particular stratum, the dark red one mentioned above, was fairly rich in fragmentary remains and could be depended upon to yield fossils wherever examined. Along Muddy Creek the banding is less conspicuous and fossils are more rare. In the central part of the basin the variegated beds are not observed, the shales being pretty uniformly gray or greenish, and mammalian fossils are practically absent.

Of considerable interest was the discovery in the *Lambdotherium* zone last season of specimens of the genera *Bathyopsis* and *Eotitanops*. In the absence of any definite records of levels or localities with the types or other specimens of these genera in the American Museum collection, Osborn was led to believe that they came from a higher level than the *Lambdotherium*, and which he termed the *Bathyopsis* zone, this being a part of the 1,200 feet or more of Wind River deposits which Hayden describes as occurring in the western part of the basin. Two specimens of *Bathyopsis*, one a good skull, were obtained from opposite sides of Alkali Creek, north of Wolton station. They were from the same level and were in association with *Lambdotherium*, *Heptodon*, *Eotitanops*, *Phenacodus*, etc. Of *Eotitanops* ten specimens of the two species *E. brownianus* and *E. borealis* were found on various levels along Alkali Creek, and two specimens of the latter species were obtained from Muddy Creek. It would seem that the *Bathyopsis* zone must be eliminated; it is improbable that there is any distinct faunal level of the Wind River formation above that in which *Lambdotherium* occurs. The upper part of the deposits to the west, especially near Crow Heart Butte, more probably belong to the Bridger than to the Wind River horizon, although in the absence of mammalian fossils it is impossible to say definitely.

Two other genera of interest were found in the *Lambdotherium* zone last year. They are *Meniscotherium*, previously recorded only from the Wasatch

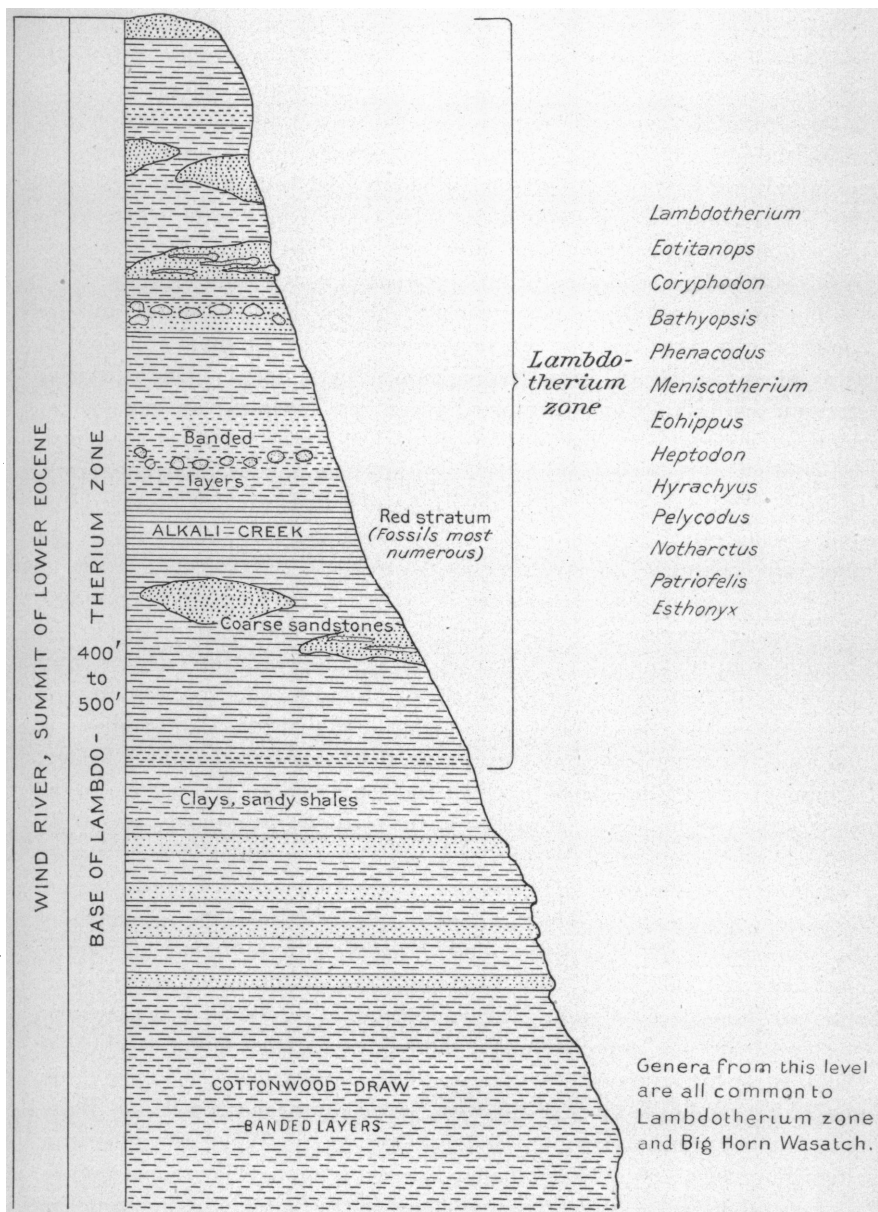
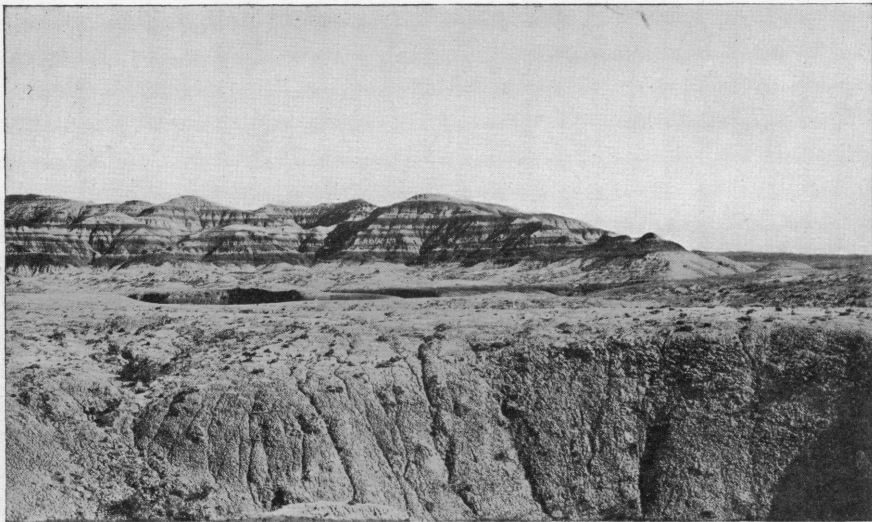
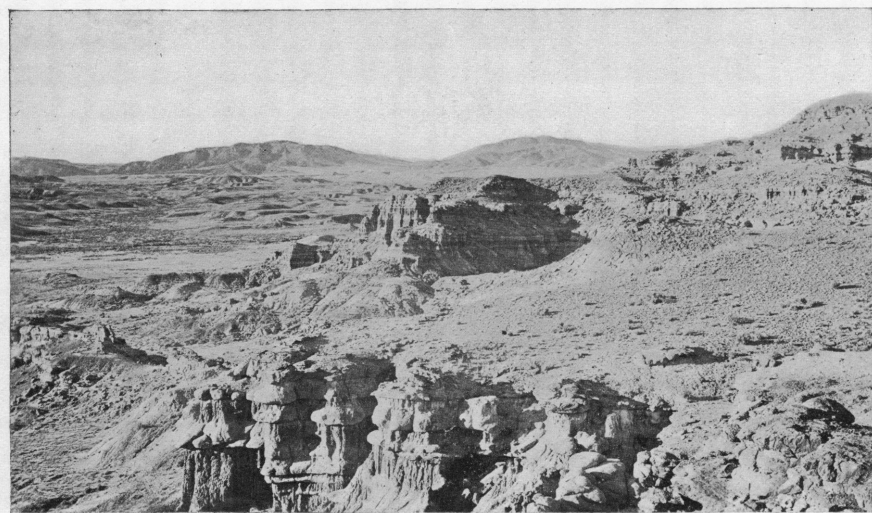


Fig. 2. Generalized section of the Lower Eocene in the vicinity of Lost Cabin.



1. Lamdotherium zone, Wind River beds. A typical exposure of red-banded layers, north side of Alkali Creek, about eight miles east of Lost Cabin.



2. Cottonwood Creek exposures, looking north, up the creek. Palaeozoic foothills of the Big Horn Range in the distance

of New Mexico, and *Hyrachyus*, not found before below the Bridger.¹ The addition of these two genera to the Wind River fauna serves to show more clearly the intermediate position which this formation occupies, with a decided faunal overlapping in both directions.

Cottonwood Creek² Exposures.

About five miles northwest of Lost Cabin, along the south side of Cottonwood Creek, is an exposure of over 350 feet of variegated beds. They dip slightly and apparently pass under the *Lambdotherium* beds on Alkali Creek to the south. They show in section:

	ft.
Yellowish and gray sandy shales covered with heavy mantle of pebbles from the older rocks of the mountains	50
Alternating buff sandstones (1 ft. to 5 ft. in thickness) and red and gray shales	200
Gray and dark brick red sandy shales (red predominating) and gray sandstones	100
Total,	350

These exposures have a somewhat different appearance from those of Alkali Creek, due principally to the yellowish shales and numerous layers of buff sandstone in the middle and upper portions, which give the beds a much more ochreous aspect than is seen elsewhere in the Tertiary of the basin. Following up Cottonwood Creek toward the foothills of the Big Horn Mountains the sandstones and red-banded shales gradually disappear, and near the contact with the Palæozoic rocks the beds are chiefly dull-colored clays, disintegrated to a depth of two or three feet, and containing a large amount of gypsum.

Toward the mouth of Cottonwood Creek, where the exposures present the greatest thickness, fossils are to be found on nearly all levels, and are particularly abundant near the base, especially in a dark red sandy shale stratum. The remains are more fragmentary than on Alkali Creek, but are more abundant than in any other part of the basin. Dr. Loomis discovered this locality in 1904 and obtained upwards of 500 specimens, and as many more have been obtained by the American Museum parties of 1905 and 1909. A preliminary study of this fauna³ shows two points of interest. *First.*

¹ Douglass has reported two species of *Hyrachyus*†, found associated with *Heptodon*† and *Metamynodon*†, from the Sage Creek beds of Montana. This is an extraordinary association of forms and leaves the age of these beds much in doubt (see Douglass, Earl, 1903. New Vertebrates from the Montana Tertiary. Ann. Carnegie Museum, VII, p. 145).

² This is the "Bridger Creek" locality of Dr. Loomis.

³ The writer is indebted to Dr. Loomis for information regarding the presence or absence of certain genera in the Amherst College collection.

All of the genera from these beds are common to the *Lambdotherium* zone and to the *Coryphodon* zone of the Big Horn Wasatch. *Second*. The affinities of the species are, in general, closer to those of the latter than of the former zone. The absence in these collections of *Lambdotherium*, one of the most common forms, and of *Eotitanops*, a not uncommon genus of the Alkali Creek beds but a few miles distant, clearly indicates that these Cottonwood Creek beds belong to a faunal horizon distinct from the *Lambdotherium* zone. On the other hand, the absence of the equally common *Systemodon* of the Big Horn Wasatch makes it difficult to correlate the beds with the *Coryphodon* zone. They appear to be intermediate between the two zones, with none of the characteristic faunal features of either. Dr. Loomis states¹ that his collection from the Big Horn Wasatch was made on two levels, which he terms the Upper and Lower Tatman Mountain horizons. A still higher level in Buffalo Basin, immediately to the south of Tatman Mountain, yielded a small collection, in which *Lambdotherium* was the most common form although entirely absent from the Tatman Mountain levels. *Systemodon* he found particularly abundant in the Upper Tatman Mountain level and absent from the Buffalo Basin level; and he concludes that this latter level overlaps, in time, the lower Wind River, referring presumably to the *Lambdotherium* zone. Between the fossiliferous layers of Upper Tatman Mountain and Buffalo Basin are some 200 feet or more of unfossiliferous beds. During the period when these beds were laid down *Systemodon* migrated or became extinct, and *Lambdotherium* arrived; and it would seem reasonable to consider the Cottonwood Creek beds as synchronous with this series in the Big Horn Basin. The absence of *Lambdotherium* or *Systemodon* from the Cottonwood Creek strata could hardly be accounted for on geographical grounds. As to whether the beds should be considered as pertaining to the Wasatch or Wind River formations, the writer does not feel competent to say.

The extent of these exposures is small. They may be traced along Bad Water Creek, above Lost Cabin, for some distance, and probably extend considerably to the westward of Bridger Creek, but always lie between the *Lambdotherium* beds and the older rocks of the foot hills to the north. It seems not unlikely that these beds may be of the same age as those at the base of the Beaver Divide section.

¹ Loomis, F. B., 1907, The Origin of the Wasatch Deposits, Amer. Jour. Sci., Vol. XXIII, p. 356.

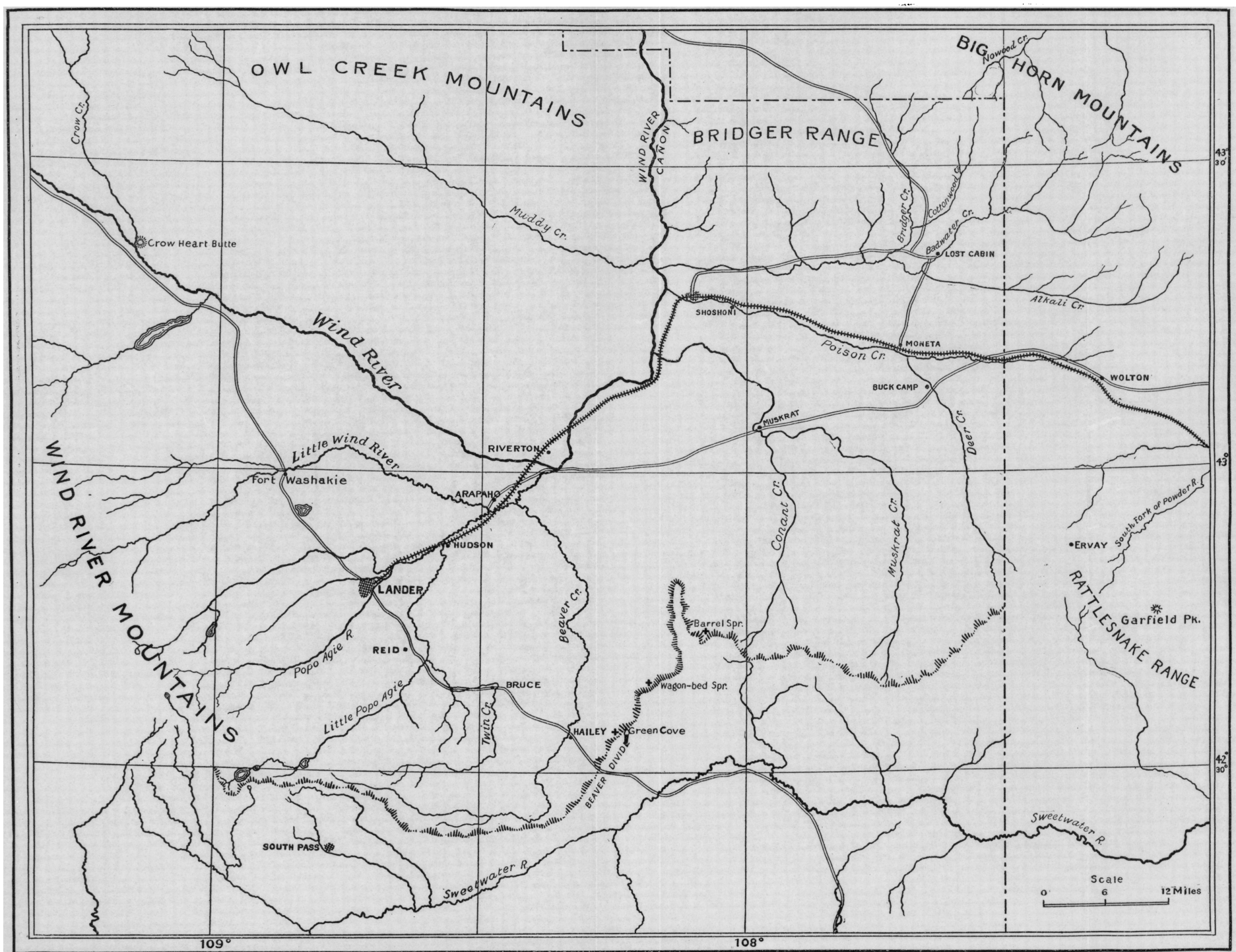


Fig. 3. Sketch map of the Wind River Basin. Based mainly on a map of Fremont County, by N. F. Brown.

SUMMARY.

1. The Wind River Basin is covered throughout the greater part of its area with beds of the Wind River group, pertaining to the *Lambdotherium* zone.

2. Mammalian remains are extremely rare or absent from these beds except in two localities in the northern and northeastern part of the basin, viz., along Alkali Creek and between Muddy Creek and the Owl Creek Mountains.

3. Lying along the northern border of the Tertiary deposits in the northeastern corner of the basin, between the foot hills and the *Lambdotherium* beds, apparently older than the latter and with the best exposures along Cottonwood Creek, is a series of strata of 350 feet or more, containing a fauna intermediate between the *Lambdotherium* zone and the *Coryphodon* zone of the Big Horn Wasatch, the genera being all common to both zones.

4. Along the southern border of the basin, on the divide between Sweetwater River and Beaver Creek, there is exposed a thickness of 1,100 feet of Tertiary, a remnant of deposits which undoubtedly extended over a large part of the basin at one time. Three distinct faunal levels, as indicated by mammalian fossils, are exhibited, Lower Eocene, Upper Eocene, and Lower Oligocene, the levels being correlated with (1) the ?*Coryphodon* Zone of the Wasatch, (2) the ?*Diplacodon* Zone of the Uinta, and (3) the *Titanotherium* Zone of the White River. An unconformity exists between the Eocene and Oligocene, but no break in sedimentation was detected in the Eocene series.

5. Between the *Coryphodon* and *Diplacodon* levels are several hundred feet of unfossiliferous beds, the lower part of which pertain probably to the *Lambdotherium* zone of the Wind River group, and the upper part possibly to the Middle Eocene faunal zones of the Bridger Basin.

NEW EOCENE MAMMALS FROM THE WIND RIVER BASIN.

In the collection made by the American Museum party in the Wind River Basin in 1909 are three new genera of mammals; one from the newly discovered Upper Eocene locality, and the other two from the *Lambdotherium* beds of Alkali Creek. The present opportunity is embraced to put these new forms on record.

Family CAMELIDÆ.

Camelodon arapahovius gen. et sp. nov.

Type. The left ramus of a jaw (Amer. Mus. Coll. No. 14604) with p_2 - m_3 in good preservation. From the Uinta beds (Diplacodon zone) of the Beaver Divide, near Hailey, Wyoming. Amer. Mus. Exped. 1909.

Measurements.

	mm.
P_2 - m	51.
M_1 - m_3	27.5
M_3 long. diam.	12.5
M_3 transv.	5.3
Diastema between p_2 and p_3	4.8
Depth of ramus at m_2	12.

An extremely slender-jawed type of selenodont artiodactyl with the teeth, especially the premolars and the third molar, much compressed, and *with a long diastema between the second and third premolars*, the latter character not being observed in other Uinta genera of this group. The second and third premolars are rather simple, compressed, and trenchant. Each has a long posterior crest and a shorter, more abrupt anterior one. On each tooth, but more marked on p_3 , there is also a rudimentary internal posterior crest running backward and somewhat inward

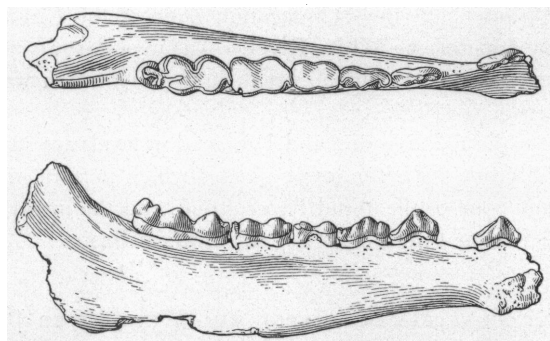


Fig. 4. *Camelodon arapahovius*, lower jaw, superior and internal views, nat. size. Type specimen, No. 14604, Uinta beds, Beaver Divide, Wyoming.

from the tip of the protocone, and enclosing a long, narrow valley between it and the external posterior crest, a character well shown in the type of *Leptotragulus profectus* Matthew from the Titanotherium beds of Pipestone Springs, Montana; on p_3 the posterior and anterior basal cusps are barely indicated. In addition to strong fore and hind basal cusps there is a large cusp on the posterior inner face of the main cusp or protocone and a very small one on the inner side of the posterior basal cusp. The first and second molars are too much worn to show important characters. The

last molar is very long and narrow, with well rounded outer crescents and a strong fifth lobe with a median ridge and a small cusp on its inner side, as in *Protylopus*. There is a mental foramen below the second premolar. The symphysis extends backward to the posterior edge of the second premolar.

This genus shows strong resemblances to both *Leptotragulus* and *Protylopus*, especially in the premolar construction, and for that reason is placed in the Camelidæ. It differs from *Leptotragulus* in the more simple p_2 and p_3 and the more complicated p_4 . From *Protylopus* it is distinguished by the more selenodont character of the molars and the greater complication of p_4 . *Leptomeryx* differs in having strong anterior and posterior basal cusps on p_2 and p_3 , a broader p_4 , and more highly specialized molars. *Hypertragulus* resembles the present genus in having a diastema back of p_2 , but the premolars are much narrower antero-posteriorly, with high, sharp, pointed cusps, while in *Camelodon* these teeth are broad, with low, blunt cusps.

Family ANAPTOMORPHIDÆ.

Shoshonius cooperi gen. et sp. nov.

Type. A right maxilla with p^3 - m^3 , unworn, and finely preserved (Amer. Mus. Coll. No. 14664). From the Wind River beds (Lambdotherium zone) of Alkali Creek, near Lost Cabin, Wyoming. Collected by Mr. C. Forster Cooper, Amer. Mus. Exped. 1909.

Measurements.

	mm.
P^3 - m^3	8.7
M^1 - m^3	5.7
P^4 tr. diam.	2.3
M^2	2.3
M^3	2.7

Distinguished at once from the other genera of this family, in which the upper dentition is known, by the presence on all three molars of a mesostyle. The third and fourth premolars are of equal size and smaller than the first molar; they have the usual Anaptomorphid construction of a large outer conical cusp and a smaller subconical inner cusp. A well defined ridge extends from the apex of the inner cusp to the external anterior angle of the tooth, which bears a diminutive parastyle. Of the molars the second is the largest, the first a trifle smaller, especially in transverse diameter, and the third somewhat smaller

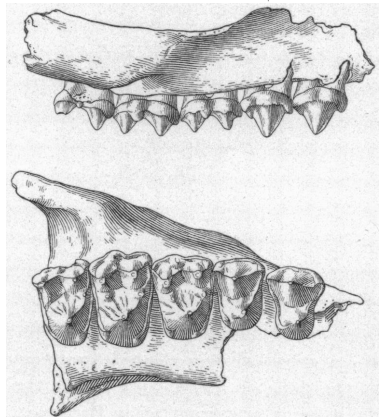


Fig. 5. *Shoshonius cooperi*, upper jaw, external and crown views, $\times \frac{1}{2}$. Type specimen, No. 14664, Wind River beds, Wyoming.

than the first but not showing the amount of reduction seen in *Anaptomorphus homunculus*. In each tooth the para- and metacones are small and of nearly equal size; and the single inner cusp, the protocone, is larger and conical. Protoconules and metaconules are clearly indicated on all three teeth. Parastyle very weak on m^1 , but increases in strength to m^3 . The mesostyle is small on m^1 , strong on m^2 , and on m^3 the other edge of the tooth is broken, but a portion of the mesostyle is left, indicating that it was at least as large as on m^1 . There are two small cusps also on the lingual side of each molar, at the postero-internal and antero-internal angles. The postero-internal cusp is practically absent on m^3 , largest on m^1 , and the antero-internal is largest on m^2 . These lingual cusps are much weaker than those seen in the first and second molars of the Bridger *Hemiacodon*. The lower rim and floor of the orbit are preserved, and are similar to the corresponding parts in *A. homunculus*.

There are no additional specimens in our collection which can be referred to this genus. The types of nearly all Anaptomorphids are lower jaws, and with some of the genera upper teeth have not been found in certain association with lower teeth. Such discoveries might unite the present genus with one already described.

Family LEPTICTIDÆ.

Parictops multicuspis gen. et. sp. nov.

Type. Lower jaws, with p_2 - m_3 preserved and roots of anterior teeth, and a few skeleton fragments (Amer. Mus. Coll. No. 14741. From the Wind River beds (Lambdotherium zone) on Alkali Creek, Wind River Basin, Wyoming. Amer. Mus. Exped. 1909.

Measurements.

	mm.
I_1 - m_3 (approx.)	31.
M_1 - m_3	9.5
P_2 long diam.	3.5
P_3 " "	4.5
P_4 " "	4.
P_2 tr. "	1.4
P_3 " "	1.8
P_4 " "	2.3
Depth of ramus at m_2	7.8

A genus closely related to *Palæictops* Cope. A comparison with the lower jaw of the type of *P. bicuspis* shows the molars and the fourth premolar to be almost identical in construction in the two specimens. In the second and third premolars, however, generic differences are shown. The characters of the present genus are: Incisors three, of about equal size; canines considerably larger than incisors and elliptical in cross section at the base of the enamel; p_1 single-rooted, and intermediate in size between the canines and incisors; p_2 - p_3 large, highly trenchant, blade-like teeth, with the cusps much compressed, and all set in the median line; in

Palæictops these teeth are simple, moderately compressed, pointed teeth, lacking the broad, flattened cutting blade of the crown in this genus; p_2 has four cusps, the protocones with two small cusps placed high up on its anterior and posterior edges, and a small posterior basal cusp; p_3 is a considerably larger tooth than p_2 , and differs in cusp arrangement in having the small anterior cusp placed about half way up on the anterior edge of the protocone instead of near the apex as in p_2 . The posterior basal cusp is proportionately larger than in p_2 and bears directly in front a tiny accessory cusp. The fourth premolar is molariform, but differs from the molars in having

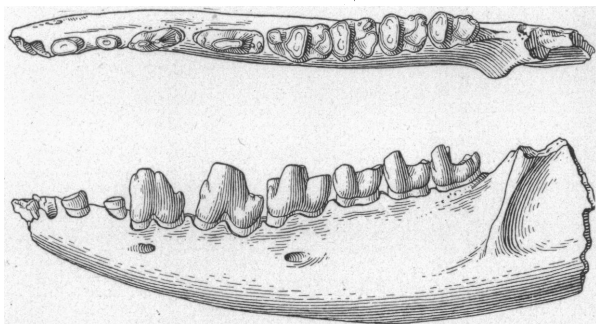


Fig. 6. *Parictops multicuspis*, lower jaw, superior and external views. $\times 1$. Type specimen, No. 14741, Wind River beds, Wyoming.

the anterior cusp of the trigonid lower and considerably isolated from the other two. In the molars the antero-posterior diameter increases slightly from m_1 to m_3 . The pattern is similar in all three teeth. There is a high trigonid and a broad talonid which bears three large cusps and a fourth very diminutive one on the inside. There are two mental foramina, one below p_2 , the other below p_4 . The ramus is of moderate depth and compressed. The symphysis is long, extending back to the third premolar. There is a very short diastema between the canines and p_1 .

The genus and species are represented in the collection by the type only.

