



Age of the Ringold Formation

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Introduction

THE SEDIMENTARY BEDS of the Ringold formation crop out in the White Bluffs of the Columbia River northwest of Pasco in the south central part of Washington. These deposits have received intermittent attention from geologists for nearly 70 years (Sternberg, 1881). Merriam and Buwalda (1917), who named the formation, published paleontological data that suggested a late Pliocene or Pleistocene age. In this paper is presented a condensed account of fossil collections and identifications that confirm a Pleistocene age for these deposits.

The age of the Ringold formation is important in helping to date the deformation of the underlying Columbia River basalt, as well as in solving other structural and stratigraphic problems of the region.

Stratigraphy

Approximately 490 feet of beds of the Ringold formation are exposed in the bluff 13 miles northwest of Pasco, Washington. The lower 90 feet are an iron-stained pebble and cobble conglomerate that contains a few sand lenses and is comparatively resistant to erosion. The beds above the conglomerate are clay, sand, clayey sandstone, laminated siltstone, and occasional thin beds of ash, diatomite, gravel, and well-cemented, flaggy sandstone. The uppermost part of the formation, where undissected, is composed of a thick caliche zone formed in a sandy siltstone. Glacial outwash materials of several phases and a wind-blown soil overlie the Ringold formation in places.

Of the fossils described below, the caribou remains where found at the top of the conglomerate, those of the camel in a thin gravel bed higher in the formation, and the other fossils were recovered from siltstone beds.

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Prior Age Determination

The place where Merriam and Buwalda found the *Equus* fossil which was used in their age determination of the Ringold formation was located from a photograph and descriptions in their paper (Merriam and Buwalda, 1917). The strata were examined and it was verified that they are part of the Ringold formation.

Collection of Fossils

The beds from which the fossils were recovered are also part of the Ringold formation. Care was taken to select locations of geologic sections so as to sample beds of good continuity and to avoid landslide areas and terrace deposits. The presence of fragile bones in the fossil assemblages established the contemporaneous deposition of bone material and the enclosing beds. Although many of the fossils found were fragmental and some were poorly preserved, bones of a caribou, camel, ground sloth, peccary, and mastodon were in good condition and identifiable.

Determinative Fossils

The fossil identifications and descriptions given below, with references to geologic range and significance, are by the junior author. Included are the locations of the collecting points.

1. *Rangifer* (caribou). Range, Pleistocene to Recent. Metapodial. Location: SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 1, T. 10 N., R. 28 E., WBM, at an altitude of about 440 feet.

2. *Camelops*. Range, Pleistocene. Proximal portion of metapodial of a large camel, not certainly identifiable generically, but probably *Camelops*. Location: SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, T. 12 N., R. 28 E., at an altitude of about 540 feet.

3. *Megalonyx*. Range, Pleistocene. A scapula and humerus of the ground sloth *Megalonyx*. Location: NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T. 13 N., R. 27 E., at an altitude of about 550 feet.

4. *Platygonus*. Range, Pleistocene. Two complete feet and other parts of limb bones of the peccary *Platygonus*. Both *Megalonyx* and *Platygonus* are such characteristic Pleistocene genera that their presence in the fauna of the Blanco formation is cited as evidence of the Pleistocene age of that fauna by Grayson Meade (1945). Location: NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T. 13 N., R. 28 E., at an altitude of about 525 feet.

5. *Mammot* (*Mastodon americanum* (Kerr)). Range, Pleistocene. Large part of lower jaws including jaw symphysis, left ramus with complete

dentition, 4th and 5th upper right molars, 5th upper left molar. The specimen, which is a fine one, is almost certainly *Mammuth americanum*, the common American mastodon. This identification, which was made after careful comparison with the types in the National Museum, is concurred in by C. L. Gazin, Curator of Vertebrate Paleontology in the Museum, whose opinion was asked because of the stratigraphic importance of the specimen. Most specimens of *M. americanum* come from late Pleistocene deposits. The type is from Big Bone Lick, Kentucky. The alluvial deposits there are usually considered to be of Wisconsin age, although Hay originally thought them to be of Sangamon age—in his chronology, the third interglacial stage. True mastodons are known from earlier (Aftonian) Pleistocene deposits, but like the Pliocene forms they have either tusks in the lower jaw, elongate symphyses, complicated ridge patterns on the teeth, or other characteristics quite unlike those of this specimen. Nevertheless, an early Pleistocene age is not precluded. The distribution of *Mammuth americanum* is known to be peculiar—that is, largely in the eastern and central states, which presumably were heavily forested during late Pleistocene and early Recent times. The species may well have existed earlier in other parts of North America. In the opinion of the junior author, the mastodon confirms the Pleistocene age found by Merriam and Buwalda and even suggests middle or rather late Pleistocene age. Location: NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, T. 12 N., R. 28 E., at an altitude of about 600 feet.

Conclusion

On the basis of the fossil collections and identifications given above, the age of the Ringold formation in the White Bluffs of the Columbia River is considered by the authors to be definitely Pleistocene, probably middle or late Pleistocene.

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TABLE OF CONTENTS

Volume XXVI, 1952

Number 1, February

Experimental thinnings in young Douglas-fir. Norman P. Worthington and Leo A. Isaac	1
Book review. E. L. Cheatum	9
Schistosome dermatitis in Montana. William L. Jellison, Ronald E. Losee, Edith Kuhns, and Royal B. Brunson	10
A dimensionless system for studying column behavior. Harold S. Davis	14
Additions to the downy mildews (Peronosporaceae) of the Pacific Northwest. Charles Gardner Shaw and William D. Yerkes, Jr.	19
News and notes	22
The Supreme Court: Interpreter of religious liberty. Clifford Dobler	23
Grazing management of bunchgrass type forage. E. William Anderson	32

ABSTRACTS

Bureaucracy and British socialism. Joel B. Montague, Jr.	37
Mineralogy and paragenesis of the ore deposits in the Elliston mining district, Montana. Forbes Robertson and Jerome Regnier	37
City managers and public housing officials: A case history in anomie. Charles Woodhouse	38
Collective bargaining between the Boeing airplane company and the aero mechanics union. Reed R. Hansen	38
Some notes on the stratigraphy of the phosphoria formation in Montana. William R. Paine	39
Spore formation in some aquatic hyphomycetes. Francis V. Ranzoni	39
Construction of an electrolytic cell for the oxidation of organic vapors. Robert F. Manoske and Harry Stern	40
Equipment for testing a heat transfer theory of fractional distillation. Stanley A. Murdock and Harry Stern	40

Number 2, June

The use of banding data in the study of certain aspects of the dynamics and structures of avian populations: part I. Donald S. Farner	41
A fossil bison skull from Prescott, Washington. Philip H. Pope	51
Magmatic source of Idaho ores. Alfred L. Anderson	55
Tick paralysis in the American buffalo, <i>Bison bison</i> (Linn.). Glen M. Kohls and N. J. Kramis	61
Precipitation measurement on wind-swept slopes. Austin E. Helmers	65
Historical geography of the Spokane valley. Willis B. Merriam	69
Book reviews. William H. Baker and James Hatter	76
News and notes	78

Number 3, August

The use of banding data in the study of certain aspects of the dynamics and structures of avian populations: part II. Donald S. Farner	79
Larch—Douglas fir regeneration studies in Montana. Arthur L. Roe	95