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A Paleontological Site Survey Conducted in the Horse Heaven Hills of South-Central Washington

The purpose of this paper is to report the results of a survey conducted to locate vertebrate paleontological sites in a region of the Horse Heaven Hills south of Kennewick, Benton County, Washington. Survey explorations were concentrated in a triangular region of about 25 square miles bounded roughly by Fourmile Canyon on the south, Beck Road on the north and, on the west, by a north-south line five miles west of State Highway 14. Some random explorations were also conducted in near-by localities.

Summary and Conclusions

The survey revealed 31 sites at which vertebrate fossil material was found. Mammoth was identified at 21 of the sites, bison at five, and horse at three. Deer was represented at some of the sites and some of the material collected remains to be identified. No attempt has been made to classify the animals as to species. The material appears to have an age representation extending to greater than 12,000 years old, with the majority of the fossils in the 7,000 to 12,000 year old range.

Incidental to the paleontological survey, a variety of archaeological specimens, principally projectile points, were found. The significance of these specimens is the subject of the previous paper in this issue by David G. Rice of Washington State University. The artifacts appear to represent a time span extending to possibly as old as 13,000 years. While the archaeological specimens were surface finds and cannot be directly related to the fossil remains of extinct fauna, the apparent overlapping of the age ranges of the paleontological and archaeological materials indicates that detailed excavation may reveal that some of the extinct animals represented were killed by man.

Sufficient paleontological and archaeological material was found during the course of this survey to indicate that the Horse Heaven Hills is an attractive locality for further study. A detailed study could yield important information in the areas of paleoecology, paleoclimatology, archaeology and late Pleistocene and Recent stratigraphy.

Previous Work

The immediate area of this survey has been studied very little. Although occasional discoveries of mammoth bones and tusks have been reported over the years, systematic vertebrate paleontological studies have been limited to the Ringold Formation to the north, in the Pasco Basin, and to the McKay Reservoir area south of Pendleton, Oregon. Both these sites are considerably older (Pliocene) than the late Pleistocene and Recent sites found during the survey. Systematic archaeological studies have been limited principally to those along the Columbia and Snake Rivers. The area has been studied geologically only in reconnaissance fashion, although it lies midway between the intensively studied Pasco and Umatilla Basins.

ogical Considerations

triangular region surveyed in some detail lies on the south slope of the Horse en Hills anticlinal ridge. This basalt ridge is locally cut deeply with drainage nels, and the surface, for the most part, is covered with fine silt and sand. The and sand appear to have been derived from sediments deposited by floods from acial Lake Missoula, related lakes and meltwaters as described most recently by Richmond, Fryxell, Neff and Weis. The sediments have subsequently been extensively reworked by wind and, locally, by water. Deposits outside the canyons appear to be almost entirely eolian. The canyons contain fine silt of apparent eolian origin, plus alluvial deposits of basalt gravel, sand and silt apparently laid down by a combination of spring run-off, flash floods, and spring-fed streams during times when climatic conditions were less arid than at present. Gastropod shells are found in deposits of fine silt in the canyons at the lower elevations; and small springs, damp areas and shallow wells in the canyons today add credibility to the postulated existence of flowing, spring-fed streams.

Most of the vertebrate fossil material was found in canyon exposures of well cemented fine silt, exposed as a result of recent erosion by run-off. A few fossils were found in basalt gravel, but these may have been redeposited by spring run-off and flash floods. There are but few exposures of the older deposits in locations outside the canyons and these are confined to wind eroded areas. These exposures suggest that the older deposits may blanket much of the Horse Heaven Hills. Fine silt beds in these deposits are less cemented than similar beds in the canyons, probably because they have been subjected to less mineral-laden water to cement them. One non-canyon exposure of older deposits covers several acres in Sec. 4, T.6N, R.29E and has been eroded in places to a depth of greater than five feet. In this area of deflation by wind action, mammoth and bison skeletal material was collected plus a projectile point having a probable age of 7,000 to 8,000 years.

Beds of volcanic ash are exposed in the older silt deposits. The beds evidently represent ash falls from the 6,700-6,900 year old Mt. Mazama event and the 12,000-13,000 year old Glacier Peak event as described by Fryxell. The Mt. Mazama ash beds are generally thicker and often diffuse compared to the thin, often bifurcated Glacier Peak beds. Fossil remains were found as deep as seven feet below the Glacier Peak ash. In those locations in which mammoth material was clearly relatable to ash beds, it was found below the Mt. Mazama ash consistent with the 10-11,000 BP extinction date postulated for this animal. Volcanic ash relationships are somewhat complicated in the canyons since there are instances in which the Glacier Peak ash bed is found at a higher elevation on the side of a canyon than the Mt. Mazama ash bed. This is due to the Glacier Peak ash bed having been veneered onto the sides of the pre-existing canyon. This veneer experienced varying degrees of erosion prior to the deposition of the Mt. Mazama ash bed. Further erosion has left locations at which the older Glacier Peak ash is exposed higher on a canyon wall than the more recent Mt. Mazama ash.

Prior to the start of the survey some mammalian fossil material had been found in the typical Touchet Beds. These beds, first described and named by Flint, contain clastic dikes, are well stratified, and display features characteristic of fluvial bedding. The Touchet Beds are believed to have been deposited directly by the glacial lake and meltwater floods. Early in the survey, the fossil bearing beds of fine silt were con-

sidered to be Touchet Beds. It was soon realized that this was not the case. Mammoth fossil material was found at 1,480 feet elevation in silt deposits typical of some of the fossil beds at lower elevations. This is well above the maximum elevation of the glacial lake and meltwater floods, thus excluding these floods as a direct source of the fossil-bearing sedimentary deposits. A maximum flood level of about 1,200 feet elevation has been estimated in the vicinity based on the distribution of ice-rafted erratics. While a few bones have been found articulated, complete articulated skeletons have not yet been found. Also there is evidence of skeletal material having been subjected to weathering before being covered by silt. This evidence is contrary to a hypothesis that the animals were drowned and buried by one of the catastrophic floods. These factors, plus a lack of the characteristic fluvial bedding, support the conclusion that the fossil beds, at least those above about 800 feet elevation, are not Touchet but are principally eolian with some alluvial desposits in the canyons. Below about 800 feet elevation, clastic dikes begin to appear and the beds become more Touchet like in appearance.

Paleontological and Archaeological Considerations

Skeletal material was collected when found exposed and easily recoverable and the site locations were recorded. Site data are presented in Table 1 and in Figure 1. Figure 2

TABLE 1. Paleontological sites.

Site No.	Location	Elevation In Feet Above Sea Level	*Faunal Distribution* Mammoth	Horse	Bison	Other or Unidentified
1	SW ¼ Sec. 29, T.7N, R.29E	1,390	X		X	
2	SE ¼ Sec. 31, T.7N, R.29E	1,100	X	X	X	
3	NE ¼ Sec. 7, T.6N, R.29E	950			X	
4	NE ¼ Sec. 18, T.6N, R.29E	900				X
5	SW ¼ Sec. 21, T.6N, R.28E	580	X			
6	NW ¼ Sec. 32, T.8N, R.28E	1,480	X			
7	NW ¼ Sec. 29, T.8N, R.28E	1,180	X			
8	NE ¼ Sec. 35, T.8N, R.28E	1,280				X
9	NW ¼ Sec. 4, T.8N, R.27E	1,070	X	X		
10	SE ¼ Sec. 33, T.9N, R.27E	800				X
11	NE ¼ Sec. 13, T.6N, R.28E	850	X			
12	SE ¼ Sec. 12, T.6N, R.28E	910		X		
13	SW ¼ Sec. 1, T.6N, R.28E	1,040	X			
14	NE ¼ Sec. 36, T.7N, R.28E	1,200	X			
15	SW ¼ Sec. 4, T.6N, R.29E	1,000	X			
16	SW ¼ Sec. 9, T.6N, R.29E	930	X			
17	NE ¼ Sec. 2, T.6N, R.29E	1,140	X			X
18	NW ¼ Sec. 2, T.6N, R.29E	1,100	X			X
19	SW ¼ Sec. 3, T.6N, R.29E	1,000	X			
20	NW ¼ Sec. 10, T.6N, R.29E	1,070				X
21	SE ¼ Sec. 34, T.7N, R.29E	1,200	X			
22	NE ¼ Sec. 34, T.7N, R.29E	1,240				X
23	SE ¼ Sec. 27, T.7N, R.29E	1,300				X
24	SE ¼ Sec. 3, T.6N, R.29E	1,050	X			
25	NE ¼ Sec. 4, T.6N, R.29E	1,150	X		X	
26	SW ¼ Sec. 2, T.6N, R.28E	1,050	X			
27	SW ¼ Sec. 26, T.7N, R.28E	1,355	X			
28	NE ¼ Sec. 10, T.7N, R.29E	1,350			X	
29	NE ¼ Sec. 30, T.9N, R.27E	600				X
30	SW ¼ Sec. 17, T.6N, R.28E	770	X			
31	NW ¼ Sec. 6, T.6N, R.29E	1,140	X			X
			21	3	5	10

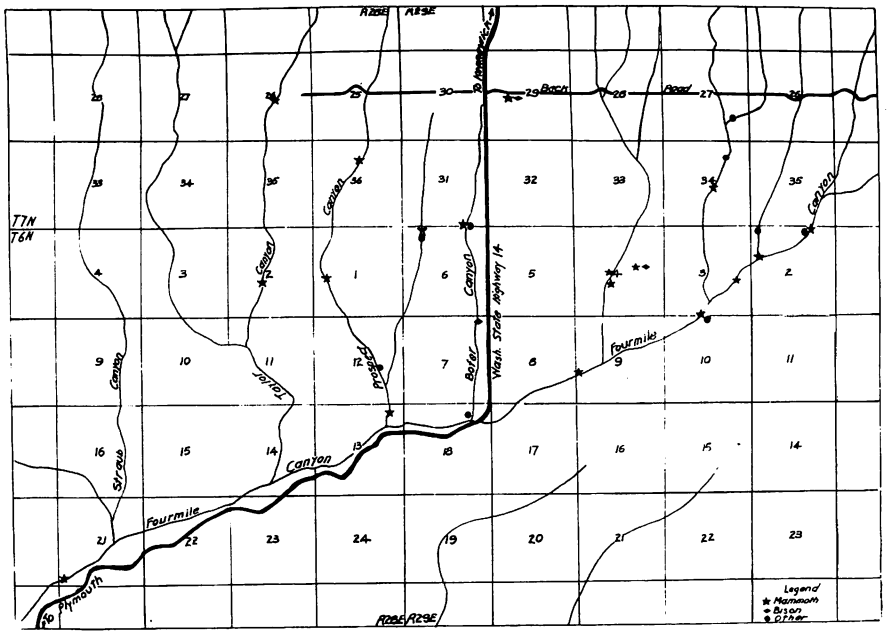

Figure 1. The survey was concentrated in a triangular region of about 25 square miles bounded roughly by Fourmile Canyon on the south, Beck Road on the north and on the west by a north-south line five miles west of State Highway 14. The map shows the distribution of sites at which vertebrate fossil material was found.

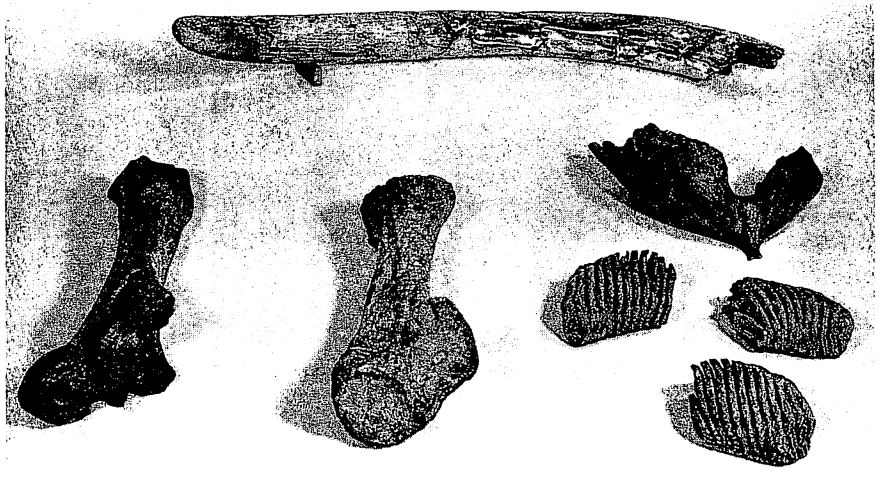

Figure 2. Some of the better mammoth material found during the survey. The section of tusk is 4½ feet long.

is a photograph of some of the better mammoth material recovered during the survey. Mammoth, bison and horse are suggestive of climatic conditions providing lush grazing. This contrasts with the Blancan fauna (G. Jakway, Los Angeles County Museum, personal communication), found in the Ringold Formation some 30 miles to the north, which shows an abundance of such browsing animals as mastodon, camel, deer and sloth.

The cultural material collected was, from surface finds, entirely unrelatable to skeletal material of extinct fauna. The size, form, material, and workmanship of one projectile point is nearly identical to specimens described at Lind Coulee, Washington by Dougherty, which are thought to date between 11,000 and 13,000 years BP. Table 2 gives the location and elevation of the artifacts found during the survey.

TABLE 2. List of archaeological specimens.

Specimen Number	Specimen	Location	Elevation In Feet Above Sea Level
T-17	Knife fragment	SE ¼ Sec. 31, T.7N, R.29E	1,100
T-23	Projectile point	SE ¼ Sec. 31, T.7N, R.29E	1,100
T-39	Projectile point	SW ¼ Sec. 21, T.6N, R.28E	650
T-64	Projectile point with fragmented base	SE ¼ Sec. 33, T.7N, R.29E	1,150
T-82	Projectile point	NE ¼ Sec. 4, T.6N, R.29E	1,140
T-86	Projectile point with fragmented base and tip	NE ¼ Sec. 26, T.7N, R.29E	1,400
T-91	Projectile point	NW ¼ Sec. 19, T.6N, R.30E	930
T-97	Projectile point *		
T-98	Projectile point *		
T-99	Projectile point *		
T-103	Projectile point	SW ¼ Sec. 4, T.6N, R.29E	1,040
T-106	Knife midsection	SE ¼ Sec. 31, T.7N, R.29E	1,150
T-107	Knife tip?	SE ¼ Sec. 31, T.7N, R.29E	1,150
T-109	Point or knife midsection	NE ¼ Sec. 6, T.6N, R.29E	1,100
T-110	Projectile point	NE ¼ Sec. 4, T.6N, R.29E	1,150
T-111	Projectile point tip	NE ¼ Sec. 4, T.6N, R.29E	1,150
T-119	Projectile point midsection	SE ¼ Sec. 31, T.7N, R.29E	1,100
T-124	Projectile point	NE ¼ Sec. 4, T.6N, R.28E	1,200
T-127	Projectile point	SW ¼ Sec. 31, T.7N, R.29E	1,160
T-128	Projectile point	NW ¼ Sec. 6, T.6N, R.29E	1,140

* These projectile points were associated with a single camp site, the location of which is not reported in order to preserve the site for scientific study.

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