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HOLOCENE BISON REMAINS, (*Bison bison*), FROM GREENE COUNTY, INDIANA

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ABSTRACT: The remains of two adult bison, *Bison bison*, were recovered from a Holocene slackwater deposit in the White River floodplain of Greene County, Indiana. The surficial geology of the immediate vicinity suggests that the findspot was an oxbow lake located between Wisconsinan terrace outliers and sand dunes.

While large bison herds were observed in 29 Indiana counties prior to 1808, the Greene County specimens represent the first documented case of bison bones from primary contexts.

INTRODUCTION

The Greene County bison site is located approximately 4 km northwest of Bloomfield, in northcentral Greene County, Indiana (SW 1/4, Sec 9, T7N, R5W). In the autumn of 1988, Phill Crulo from the Bloomfield area discovered portions of at least two bison skeletons in the tailings of a recent sand and gravel mine. Cranial fragments were removed from the site at this time and brought to the attention of the authors, who identified them as the remains of Holocene bison, *Bison bison*. During a subsequent visit to the site, pertinent geological and paleoecological data were collected. These data include the observation of deer bones, mussels, aquatic snails, and abundant hardwood roots in the bison-bearing deposit.

GEOLOGIC AND PHYSIOGRAPHIC SETTING

The bison site is located at the eastern margin of the Wabash Lowland, an area with rolling upland plains, broad terraced valleys, and flat bottomlands (Schneider 1966:49). Surficial sediments in the immediate vicinity include thick and widespread Late Wisconsinan and Early Holocene lacustrine, outwash, and alluvial deposits. These sediments are underlain by Pennsylvanian (Raccoon Creek Group) shales, siltstones, limestone, and coal. Pennsylvanian bedrock is exposed in the walls of the White River valley, north and east of the site. The Wabash Lowland, and a portion of the Crawford Upland abutting to the east, were covered by one or more lobes of pre-Wisconsinan glaciation. This event is marked by a sandy loam till (Jessup Formation) overlying the Pennsylvanian bedrock.

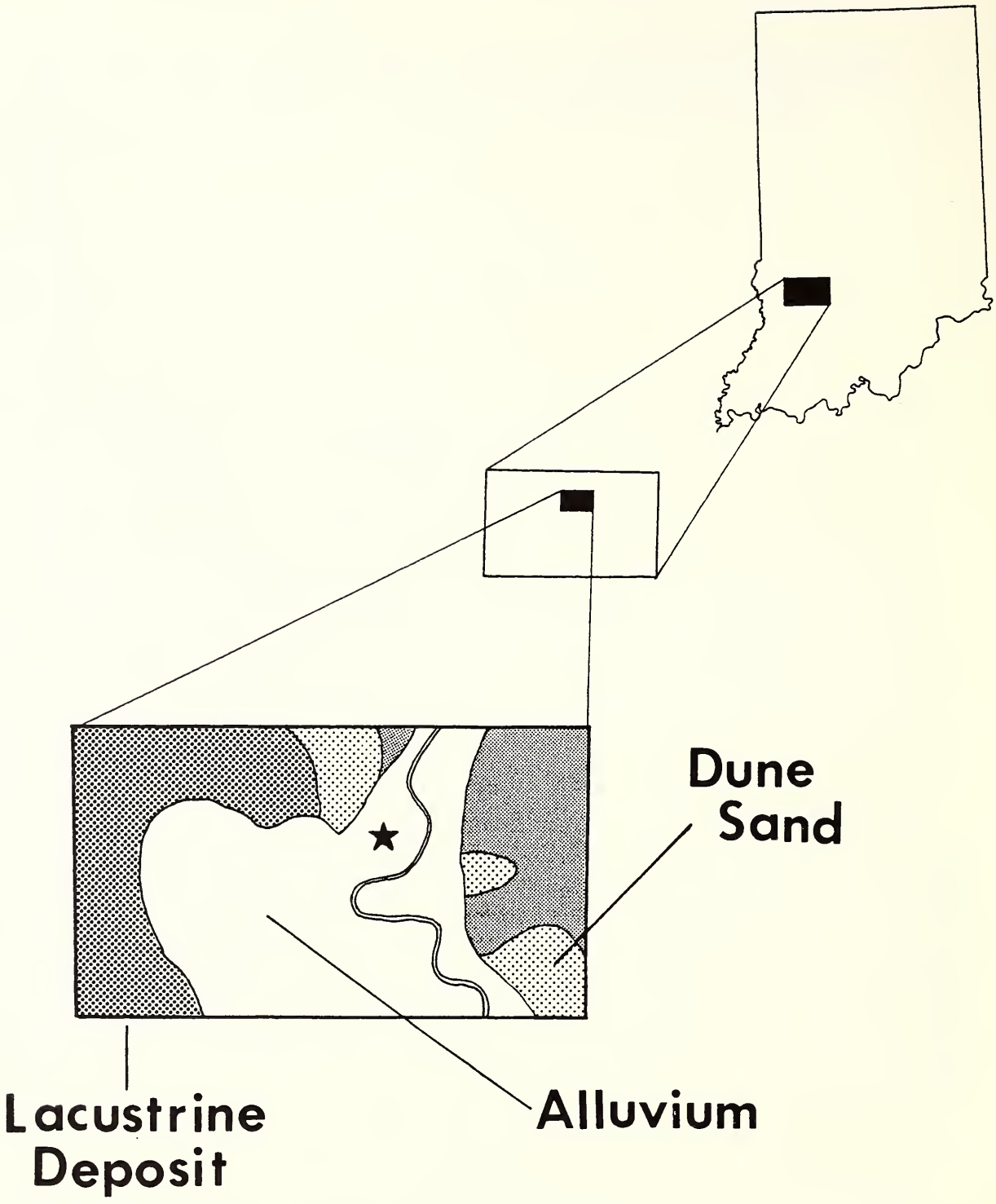

Figure 1. The geographic and geologic setting of the Greene County Bison Site.

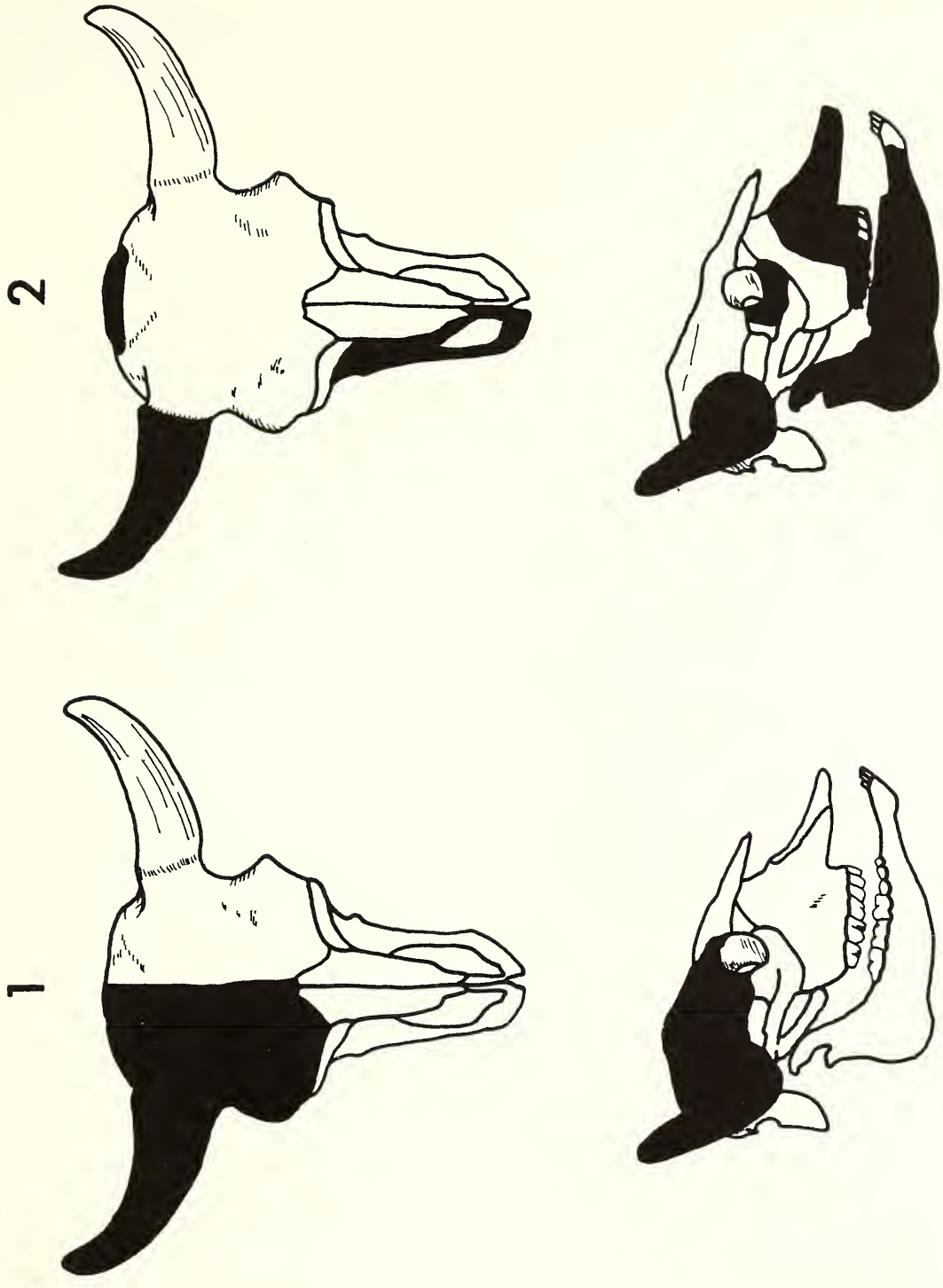

Figure 2. The placement of cranial fragments for specimens 1 and 2. Blackened areas represent the bones that were examined.

The findspot lies on the western floodplain of the White River approximately 153m above mean sea level (Figure 1). The topography of the area consists of a relatively flat, wide lacustrine plain to the west, and rounded hills with gentle bedrock slopes to the east. Stabilized sand dunes rise above the valley walls (maximum elevation ca. 15m), north and south of the site. While silver maple and sycamore are the most common trees at the site today, beech and sugar maple were likely the dominant canopy trees at the time the floodplain deposits were formed (Petty and Jackson 1966:276-281).

SITE DEPOSITS AND DEPOSITIONAL HISTORY

The bison remains were recovered from a complex lowland of eroded Late Wisconsinan terrace outliers, Holocene alluvium, and Holocene slackwater deposits. When viewed from the surface, these features are virtually indistinguishable. Their textural compositions, however, are quite different. For example, the Wisconsinan terrace outliers are composed of a buff-gray sand and gravel. Most of these sediments are well-rounded carbonates with little or no organic material. In other words, the strata contained in the terrace outliers resulted from a high-energy depositional environment.

The Holocene alluvium is composed of a tan silt and sand. While fragments of bone, shell, and wood occur in these deposits, they are generally water-worn. This alluvium also formed in a high-energy depositional environment, but one that is lower than that represented by the terrace deposits. In juxtaposition, the Holocene slackwater deposits consist of a dark, organically stained clay, silt, and sand. Bones of large and small animals, shells of mussels and aquatic snails, and roots of hardwoods are common.

The bison bones were apparently buried in the slackwater deposits. This inference is based on the fact that the bones show no evidence of stream wear, such as rounded edges, smoothed fractures, striations, or polish on curved surfaces. While most of the thin, delicate bones of the eye orbit, palate, and nasal area were broken during mining operations, they were present, an additional indication that the burial process was one of relatively low energy. Organic clay, silt, and sand contained within the cancellous portions of the bone suggests that the bison were part of the White River's slackwater deposits.

At some time in the past, a slackwater lake, or oxbow, was present at the site. We speculate that the bison entered the water at this time, either walking into the ponded water and dying there, or they died near the waters edge and were quickly covered by rising water. It is unlikely that the skeletons were exposed to the surface for any length of time prior to deposition because the bones lack bleached areas and cracks from drying. Also, the fact that the bones were recovered more or less in their correct anatomical position would argue that they were buried at or shortly after the time of their death.

The only possible suggestion that people were responsible for the demise of the bison is a single piece of wood charcoal recovered from the interior of one of the horn cores. We feel, however, that it is unlikely that the bison were dispatched given the facts that there were no cut marks on the bones and associated cultural materials were absent. It is more likely that the bison died of natural causes. The charcoal is probably not anthropogenic.

Subsequent to the death of the bison, the ponded area was filled. This burial process is not unusual given the geology of the area. Just north of the site, the White River is channeled through a short but narrow bedrock valley. The bison site is situated below the downstream opening of this valley and at its intersection with a broad lacustrine

plain (Gray 1989). As a result of these features, the White River meanders widely and creates seasonal chute cutoffs. This active landscape is not only responsible for the rapid burial of the bison, but it also created the complex setting of oxbow lakes, terrace outliers, and floodplain.

The absence of historic cultural material suggests that the bison were buried sometime before Euroamerican settlement of the area. The absence of extinct Pleistocene fauna (vertebrate and invertebrate), and the presence of hardwood roots demonstrate that the deposits are post-Pleistocene in age. The oldest acceptable radiocarbon dates for Holocene bison in eastern North America fall between the late fifteenth and early sixteenth centuries (McDonald 1981:274-284; Tankersley 1986:299). Therefore, it is likely that the bison remains from Greene County are probably no older than 500 years and no more recent than 250 years.

RECOVERY AND LABORATORY PROCEDURES

All of the bison bones were recovered from dredging operations. The bones were dredged to the surface from a depth estimated at 12m, well below the current water table. Unfortunately, this mining technique broke all bones that were greater than 30 cm in length or width—essentially craniums and long bones. A conveyor transported the bones from the dredge to a "prewash" stockpile. Mr. Crulo spotted the bones as they fell from the conveyor. The bones were recognized as something unusual and removed from the tailings.

Selected cranial fragments were sent to Indiana University's Zooarchaeology Laboratory for identification. All of the bones were subsequently air dried, then brushed clean and preserved with a dilute solution of acryloid B-72 in acetone. Broken pieces were mended with Duco cement. These specimens are presently curated at the Zooarchaeology Laboratory under catalogue number 891410.

DESCRIPTION OF THE BISON

The bones examined are from two adult male bison. Recovered elements include: a right horn core, an occipital bone displaying the condyles and foramen magnum, a section of the lower right eye orbit, part of the right maxilla with partial dentition, a right nasal bone, a right mandible with partial dentition, and a right cranial fragment displaying major portions of the frontal, parietal, and occipital bones and an attached horn core (Figure 2). The presence of two right horn cores and two occipital bones in this assemblage demonstrate that at least two individuals are represented.

Unfortunately, the fragmentary condition of the craniums limited the amount of useful biometric data that could be obtained (Table 1). Direct measurements were made of the horn core bases and dentition. Mirror imaging was necessary to take measurements of the occipital condyles and frontal bones. The resulting biometrics compare well with those described for adult males of the taxon *Bison bison* (McDonald 1981:96).

The adult stage of growth is also evident in the occlusal surface of the dentition. The superior molar wear suggests that at least one of the bison was a fully mature adult—M3 is in full wear, M2 is nearly worn, and the M1 style is fully worn (McDonald 1981:43; after Skinner and Kaisen 1947). Frison (1982:247) suggests that this pattern of dental wear is indicative of a bison with a skeletal age between 6.6 and 6.9 years.

The enamel of M1 is above the alveolus but that of M2 is at the alveolus or just below. The prefossette on M1 is reduced in size, allowing a considerable cupping of the dentine between it

Table 1. Biometric Data in Millimeters.

Standard Measurement	Specimen 1	Specimen 2 Male	Female	Mean*
HORN CORE BASE (Right)				
Dorso-ventral diameter	73	80	82	51
Minimum circumference	254	267	255	162
Antero-posterior diameter	71	81	83	52
Angle of divergence	70	—	68	66
OCCIPITAL CONDYLES				
Width	—	112	127	116
FRONTALS				
Least width	270	—	271	216
Greatest width	328	—	325	268
UPPER DENTITION				
M1-M3 alveolar length	—	82	91	82
M3 anterior cusp width	—	27	28	26

* After McDonald 1981:96.

> and the outside enamel....The exostylid on M3 is coming into wear....the...occlusal surfaces are beginning to flatten over the entire tooth row (Frison 1982:247).

DISCUSSION

Sometime between A.D. 1450 and 1500, bison herds entered Indiana in great numbers (McDonald 1981; Tankersley 1986). Climatically, this time period marks the beginning of what is commonly referred to as the "Little Ice Age" (Webb 1988:408). This species continued to graze and migrate through the state until their extirpation ca. A.D. 1800 (Allen 1876; Mumford 1969:106).

Amazingly, the Holocene bison remains from Greene County represent the first published case of skeletal remains of this species in the state. While a handful of bison bones have been recovered from burial or other ceremonial contexts on late prehistoric archaeological sites in southern Indiana, they occur as tools and are viewed as trade items (Adams 1949; Green and Munson 1978). The relative absence of documented cases of bison remains from Indiana is rather surprising when one considers the fact that literally thousands of bison were observed in 29 Indiana counties prior to A.D. 1800 (Lyon 1936:320). Lyon (1936:319) stated that

> I know of no specimens of the Bison from Indiana in any public collection, or owned by any person, not even a fragment of a skull. The largest recent mammal of the state has been completely wiped from the map.

Aside from the published historic sightings of bison herds, there are references to the presence of bison bones. For example, in 1679 LaSalle found "a number of buffalo horns and carcasses of those animals" in the marsh at the St. Joseph-Kankakee River portage, in what is known today as St. Joseph County, Indiana (Mumford 1969:107; Howard 1907:27). John Heckewelder in 1792 described French Lick in Orange County, Indiana as a place where "many heads and skeletons of these animals [bison] are to be

found which were either shot from time to time, or had died there'' (Mumford 1969:107; after Wilson and Thornbrough 1946:186).

Additionally, Holocene bison altered portions of the landscape. After grazing in one area, bison herds moved through deciduous forests toward patches of open vegetation or salt licks. These movements were often part of the bison's seasonal round or migration pattern (Jilson 1936:30). As herds moved from one area to the next, they left behind ''wallows,'' heavily trodden ground, and a series of deep, wide trails, or ''roads'' and ''traces'' as they were known historically (Wilson 1919; Jilson 1936:15; Lyon 1936:317). After a period of only 300 years, bison had created or expanded patches of open vegetation (Apsley et al. 1985:223) and deeply entrenched trails into the Indiana countryside. In fact, many of these features survive to this day in southcentral Indiana (Mumford 1969:106).

Both historical records and the physical features remaining on the landscape attest to the fact that bison were quite numerous prior to A.D. 1800. The dilemma that persists, however, is the relative absence of their physical remains.

Perhaps a clue to understanding this perplexing situation lies in the early historic biogeography of this species. Bison do not appear to have occupied the densely wooded portions of central Indiana. They were, however, abundant on the prairies and oak savannas of northwestern Indiana, in the ''barrens'' of southcentral Indiana, and in parklands along major river valleys, especially in the southwestern portion of the state (Lyon 1936:319). In other words, bison were not homogeneous across the landscape; rather, they were concentrated in areas displaying patches of open vegetation or mineral springs. Consequently, we should not expect bison remains to occur everywhere.

While bison bones are likely present in peat bogs in the north and in sinkholes in the south, we argue that the greatest concentrations of their remains occur in the floodplain deposits of major streams and their tributaries. This pattern, however, is not unique to Indiana. Indeed, the floodplain deposits surrounding Big Bone Lick, Kentucky contain an extensive bison bone-bed just below the current water table (Tankersley 1986). By comparison, the Greene County site may represent a ''typical'' Holocene bison findspot.

The fact that the bones were recovered from a depth of 12m, i.e., many meters below the present water table also provides a clue to the apparent absence of Holocene bison remains in the state. After the introduction of the ''sod buster'' farmers were able to break into the soils of the prairie. This new technology in combination with floodplain agriculture led to a relatively rapid aggradation of the major streams and their tributaries. Many meters of overbank alluvium were formed at this time. This situation was compounded by the fact that the flow patterns of most major streams were subsequently altered. Consequently, the water table in many areas of Indiana is higher today than it was at the time bison roamed across the state (Gray 1984). If a bison died in or near a major stream in Early Historic times, then its remains are likely buried in floodplain alluvium at a depth below the current water table—a setting comparable to that illustrated by the Greene County bison site.

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