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An Analysis of the Faunal Assemblage from the Elam Site: An Upper Mississippian Seasonal Encampment on the Kalamazoo River in Allegan County, Michigan

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AN ANALYSIS OF THE FAUNAL ASSEMBLAGE FROM THE ELAM SITE: AN UPPER MISSISSIPPIAN SEASONAL ENCAMPMENT ON THE KALAMAZOO RIVER IN ALLEGAN COUNTY, MICHIGAN

by

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INTRODUCTION

During the 1977 archeological field season, a survey crew from Western Michigan University gained access to the property of Mr. and Mrs. Harry Elam in Section 9 of Valley Township in Allegan County, Michigan. This parcel of land overlooks the present channel of the Kalamazoo River and stands approximately 2 m above water level. Due to the abundance of materials collected, both by the survey team and local collectors, as well as the site's continuity with materials from previously excavated sites in the drainage, Dr. Elizabeth Garland, Project Director, sought and acquired permission from the Elams to test the site.

In the spring of 1978, Western Michigan University's Field School conducted seven and one-half weeks of excavations at the Elam Site. A total area of $130.6 m^2$ was excavated with an estimated 68.5 m^3 of dirt being processed. Feature fill accounted for 16 m^3 of this volume. The numerous lithic and ceramic artifacts recovered from these excavations indicate an Upper Mississippian, Early Woodland and possibly an Archaic component are present at the site. However there are virtually no faunal remains in association with either the Early Woodland or possible Archaic components. At this point the ceramics have been only briefly examined, however, sherds from the Late Woodland period features represent an estimated 21 vessels, including both shell and grit tempered plain wares of Upper Mississippian affiliation, (personal comm., Elizabeth Garland). A total of 10,729 bone fragments, weighing 2,888.21 g, were recovered from the Upper Mississippian Component at Elam, and are the topic of this thesis.

Chapter II

THE PROBLEM

This study was undertaken in order to add to our knowledge of the subsistence systems of Upper Mississippian cultures utilizing the Kalamazoo River basin. Using the faunal remains recovered from excavations at the Elam site (20 AE 195) hypotheses will be developed relevant to the position of this site in the subsistence settlement system of peoples utilizing this area circa 1250 A.D.. Animal procurement strategies will be discussed in relationship to the scheduling of animal exploitation and site seasonality. Using volumetric procedures, the data will be presented in such a manner that inter- and intra-site comparisons can be readily made, thus enhancing the testability of the hypotheses presented.

Fitting and Cleland (1969) have suggested that a Miami (or Potawatomi) settlement pattern characterized the occupation of the southern portion of the Upper Great Lakes Region during late prehistoric times. This was a semisedentary pattern consisting of large villages occupied in the summer from which men hunted and women grew crops. In the winter both men and women dispersed into temporary hunting camps (Kinietz 1940:171,313).

Fitting and Cleland (op. cit.) recognized an apparent lack of archeological sites fitting this settlement pattern model. However, they did offer the Moccasin Bluff site in Berrien County, Michigan as a possible example of a permanent summer agricultural village.

Archeological research in the Kalamazoo River basin by Western

Michigan University led to excavations at the Schwerdt Site in 1977 under the direction of Dr. William Cremin. After a cursory examination of the materials from this Upper Mississippian site, as well as relevant site survey data and historical documents, Cremin (1977) suggested that such warm season sites in this drainage are not the large permanent agricultural villages suggested by Fitting and Cleland but, rather, that they are special purpose sites reflecting short term occupation by a small group of villagers whose permanent agricultural communities lay outside of the Kalamazoo drainage.

It was in this light that the analysis of the faunal assemblage from the Elam site was initiated. The usefulness, indeed the necessity, of analyzing the animal remains from archeological sites no longer needs to be argued at length. To consider bones as nonartifactual, and save only the whole bones for shipment to a zoologist for identification and appending to the site report, is no longer acceptable. As has been noted by Daly, Reeds' classic phrase, "The remains of the food animals have passed 'through the cultural filter.' (Reed and Braidwood 1960:165)," is all too appropriate. Daly (1969:146-149) would argue:

> "They do not constitute a chance assemblage, nor is their presence in the site due to anything but human behavior. In an archeological site bones from food animals are the direct result of human activity... To slight such material, or to study it with less care than is accorded potsherds, is to ignore or to misinterpret the evidence for an important segment of culture."

In a recent discussion of Middle Mississippian exploitation of animal populations, Smith (1975:4) addresses several basic questions which should be asked of faunal assemblages:

1. What was the relative importance of various species of animals in the diet of the aboriginal population?

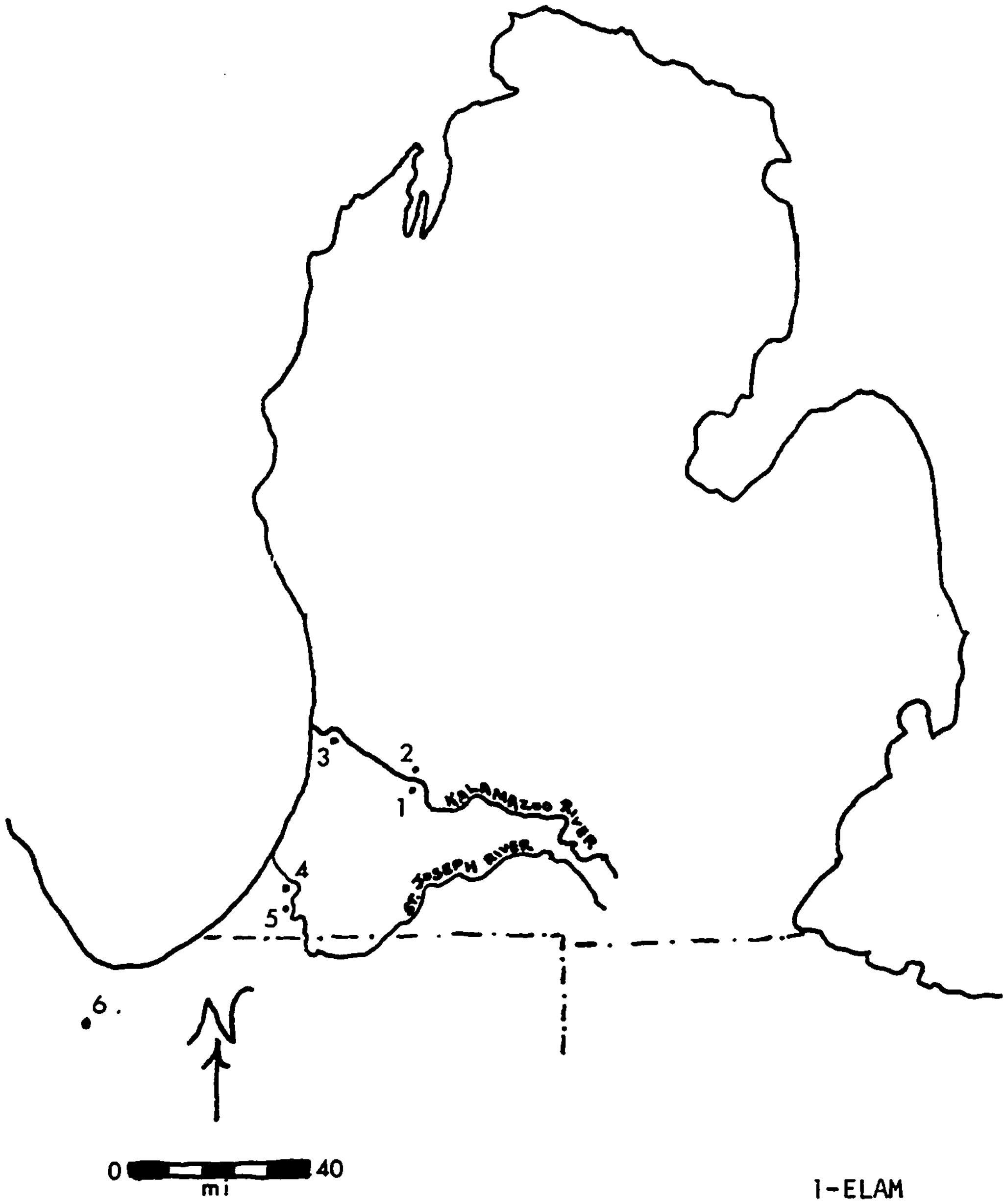
2. Was exploitation of animal populations primarily a seasonal activity and if so, during what season of the year was each species hunted?

3. To what degree was human predation of animal populations selective?

The analysis presented in this thesis was undertaken with these questions in mind. And in this context, the hypothesis that late prehistoric sites in the Kalamazoo River Basin served as short term limited activity sites in a subsistence settlement system encompassing an area transcending the Kalamazoo River drainage, as put forth by Cremin (1977), will be tested. Ethnohistoric and archeological accounts relevant to the problems at hand will be evaluated as a further means of examining the hypothesis.

This study utilizes only a small portion of the data which have been and are being accumulated for the Kalamazoo River Basin. When information from this study is combined with the information from the many analyses now underway at Western Michigan University, an understanding of both the culture history and subsistence settlement systems of the aboriginal populations which resided in this area of Michigan should be realized.

FIGURE 1: Site Locations



1-ELAM
2-ALLEGAN DAM
3-SCHWERDT
4-WYMER
5-MOCCASIN BLUFF
6-GRIESMER

Chapter III

SITE SETTING

The Elam site is located on the property of Mr. and Mrs. Harry Elam in the SE$\frac{1}{4}$, SE$\frac{1}{4}$, Section 9, Valley Township, Allegan County, Michigan. This parcel of land overlooks the present channel of the Kalamazoo River and stands approximately 2 m above the water. The site is located 39 km upstream from the mouth of the Kalamazoo River and 27.5 km above the Schwerdt site, a recently excavated Upper Mississippian component reported by Cremin (1977, 1979) and Higgins (1979). The Allegan Dam site, a third site having Upper Mississippian affiliations, and which is in the final stages of analysis by Mr. George Spero, lies .7 km due north, and on the opposite side of the river from Elam. Garland (1979) has noted that Mississippian sites in the Lower Kalamazoo Valley are found only along the main river channel, and that this contrasts markedly with the distribution of preceding Late Woodland sites which also occur on tributaries and in areas from the main river channel. This riverine orientation will be discussed in more detail below.

Elam lies in a small field near a bend on the south side of the Kalamazoo River. The field measures approximately 100 m east-west and 60 m north-south. Although most of the parcel was at one time plowed, it now lies fallow. The site is bounded on the east by a low area which remains wet most of the year. To the west there is a 4 m high knoll which projects to the river's edge. This hill is occupied by the Elam family's house, garage, and various outbuildings. Our

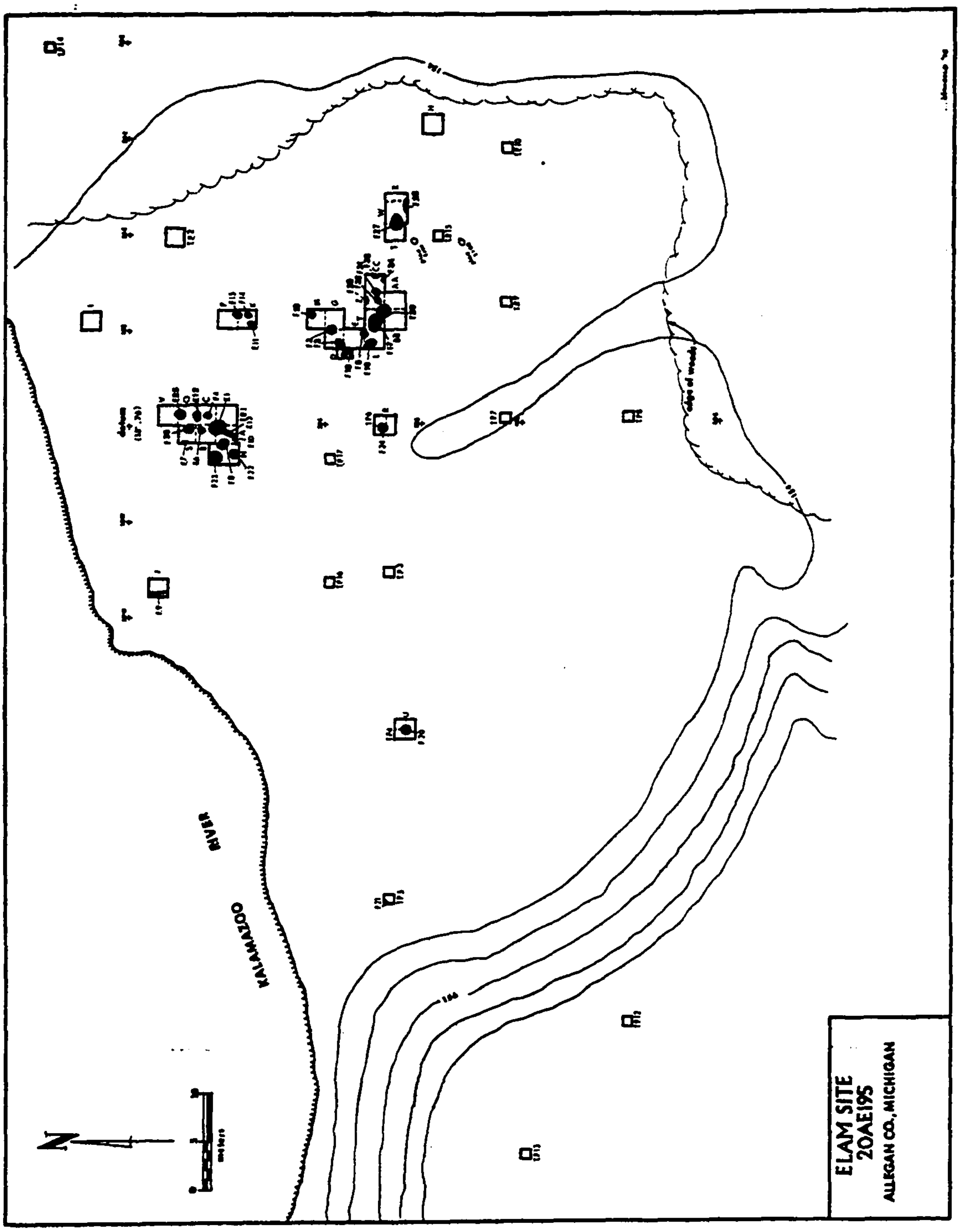


FIGURE 2

excavations in this area were therefore very limited. Test pits and surface collections show the southern limits of the site to be within 50 m of the river's edge.

Micro-environment

The micro-environments in the immediate area of the site include swampland paralleling the river to the north and west, and an upland forest zone to the south. Cremin's (1979) catchment analysis very nicely illustrates the mosaic nature of the environment in the immediate area of the Schwerdt site. Although no attempt will be made in this study to reconstruct the aboriginal environs in the immediate area of the Elam site, I feel that such a study would result in the reconstruction of micro-environments virtually identical to those which were accessable to the inhabitants at Schwerdt. These include beech-maple forest, oak-pine forest and wetland vegetation in the form of marsh and swamp associations.

Macro-environment

The Kalamazoo River drainage is located in what Fitting (1970) refers to as the southwestern natural and cultural area of Michigan. The Kalamazoo is the sixth largest river in the state, with a tributary watershed of 3302 km^2, a length of 200 km, and a basin 160 km long varying in width from 16 to 48 km. Situated between the much larger Grand River to the north and the St. Joseph River to the south, early historic accounts refer to this area as a "no man's land" which was shared by the Ottawa and Potawatomi for winter hunting and spring fishing and maple sap collection (Johnson 1880).

The forests of Allegan County are classified by Fitting (1970:28) as being on the border of the southern oak-hickory and northern maple-basswood-beech climax forest. Based on the very diverse plant communities present in this portion of southwest Michigan, Garland (1979) suggests the area be considered as transitional between the Carolinian and Canadian biotic province as presented by Cleland (1966). Cremin (1979), however, considers this area to be the northern periphery of the Carolinian biotic province. For a more thorough discussion of the biotic province concept as it relates to this portion of Michigan see Martin (1976).

Due to the diversity of vegetation zones it is not surprising that an equally diverse faunal inventory would have been available for exploitation by the aboriginal inhabitants. Some of the more economically important mammal species include elk, white-tailed deer, black bear, both red and gray fox, coyote, gray wolf, bobcat, beaver, raccoon, woodchuck, squirrel, rabbit, and muskrat (Burt 1957). Birds common to this portion of Michigan include the wild turkey, passenger pigeon, woodthrush, red-shouldered hawk, barred owl, turkey vulture, bobwhite quail, red-headed woodpecker (Cleland 1966:8), plus numerous species of migratory waterfowl, ruffed grouse, and many more. Over 230 species of fish representing 29 families live in the Great Lakes (Hubbs and Lagler 1958).

Although there exists no information on the fishery of the Kalamazoo prior to it being considered an industrial river, warm water streams of this type usually contain largemouth and smallmouth bass, yellow walleye, crappie, chub, rock bass, and various darters, sunfishes, suckers, catfishes and others (Hubbs and Lagler 1958:4). The lake sturgeons is another species of fish that is of major importance to this study. The lake sturgeon is an anadromous fish which leaves the Great Lakes in late spring to spawn in the larger rivers. It would, therefore, have been seasonally available to the aboriginal populations which utilized the Kalamazoo River.

Reptiles common to this portion of the state include the snapping, spotted, stinkpot, map, eastern box and eastern spiny softshell turtles, and the Kirtland's, queen, blue racer and black rat snakes. Amphibians of the area include the eastern tiger salamander, Fowler's toad, and the western chorous, pickerel, geeen, leopard, and wood frogs (Conant 1958). Although numerous species of freshwater mussels undoubtedly inhabited the Kalamazoo River, no studies indicating species present or their relative abundance were available for consultation.

Chapter IV

EXCAVATION METHODOLOGY

Due to poor surface visibility the limits of the Elam site could not be determined prior to testing. Therefore, to optimize data recovery, a judgement sampling strategy was employed. An arbitrary datum point was established by which the site was gridded and a series of 2x2 m excavation units with letter designations was generated[1]. A number of sequentially numbered 1x1 m test pits were also excavated both to extend our coverage of the probable site area and to ascertain its limits. Twenty eight 2x2 m excavation units and twelve 1x1 m test pits, together with a number of expansion units, comprise the total 130.6 m^2 area excavated. Given an estimated site size of 4200 m^2, our 1978 excavations comprised a 3% sample of the Elam site.

The units were excavated by removing the sod with a flat shovel, and proceeding downwards in 10 cm arbitrary levels. The soil from these levels was passed through a $\frac{1}{4}$" mesh screen and all cultural materials were saved. Although the Elam property now lies fallow, the vast majority of the site area was at one time under cultivation. Thus, the first 35-40 cm of each excavation unit represents the disturbed plow zone and will be treated as a single analytical unit in this study. Given an average depth of 40 cm for this zone, an estimated 52.04 m^3 of level fill was processed through the $\frac{1}{4}$" screen.

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[1]Test pits one and two are also 2x2 m units.

Only 493 g, or approximately 17% of the faunal remains recovered, came from the distrubed zone. Bone concentrations in this zone ranged from 0.0 g/m^3 to 82.0 g/m^3, with an average concentration of 9.5 g/m^3 (See Appendix C).

Below the plow zone, and unless subsurface features were present, culturally sterile yellow sands were encountered and excavations were terminated. Where soil staining possibly related to human activity was apparent at the base of the plow zone, the stain was given a feature number and a plan view drawing, indicating size, shape, location, color, and surface content was prepared.

All features were excavated in the following manner. First, a cross-section was made through the center of the stain. Half of the feature was excavated in 10 cm levels and passed through an 1/8" mesh screen. A profile of the feature became apparent when the first half was completely excavated. In most cases there were soil color and texture differences within the feature, itself. These were given lettered soil unit designations and a profile drawing of the feature was made.

Soil samples were extracted from each designated soil unit to be processed by the flotation procedure pioneered by Struever (1968). These samples ranged in size depending on the size and nature of the feature itself. At least 4 l, and usually 8-12 l. of soil from each unit was floated (See Appendix D for flotation sample sizes). The necessity of using techinques such as flotation for the recovery of small scale archeological remains has been amply demonstrated (Ford 1972; Watson 1976) over the past decade and needs no justification in this study. All soil from the features not processed by flotation was hand troweled and sifted through 1/8" mesh screen by soil unit and all cultural materials saved for analysis. In addition, small volume, one or two liter, samples of soil were also taken from each feature as laboratory control samples which could be used to check the efficiency of the field flotation techniques. However, based on comparisons made on sites excavated by Western Michigan University during the previous two field seasons, it did not seem necessary to include materials from these samples in this analysis. If as yet unforseen questions regarding the data presented herein do arise, these samples are available for study.

Chapter V

THE FEATURES

Excavations at Elam revealed a total of 30 cultural features (Table I) and 4 possible postmolds. No structures were encountered, either as a result of sampling bias, or alternatively as a reflection of site function or seasonality which may have made construction of substantial dwellings unnecessary.

The 24 features for which complete data was obtained can be divided into five categories on the basis of feature morphology and the preliminary analysis of feature contents (See Appendices D and F).

Feature 27, the furthest feature to the east on the site map, was the only rock hearth encountered in our seven and one-half weeks of excavation. It contained very thick, coarse grit tempered, red colored ceramics, cord marked on the interior and exterior. One more feature, Feature 29, contained five very thick sherds of similar type. This feature was unlike any other on the site, being approximately 2.5 m in diameter and 70 cm deep. It was the largest feature we encountered. No cultural materials other than the sherds previously mentioned and 5 small fragments of unidentified turtle in Feature 27 were recovered from these features. Carbon-14 analysis of a charcoal sample from Feature 29 produced a date of 2540 ± 65 years: 590 B.C. (UGa-2630). It appears that these two features represent an Early Woodland component. Due to the virtual absense of faunal remains from this occupation, which is much earlier than the rest of the site, with the possible exception of Feature 3, no subsistence or seasonal interpretation will be attempted at this time.

TABLE 1

FEATURE TYPES

Feature	Type	Cultural Affiliation
1	A	Upper Mississippian
2	B	Upper Mississippian ?
3	irregular	possible Archaic
4	A	Upper Mississippian
5	B	Upper Mississippian ?
6	B	Upper Mississippian ?
7	not dug	
8	D	Upper Mississippian
9	non-feature	
10	not dug	
11	B	Upper Mississippian ?
12	A	Upper Mississippian
13	irregular	Upper Mississippian ?
14	C	Upper Mississippian
15	C	Upper Mississippian
16	C	Upper Mississippian
17	A	Upper Mississippian
18	not dug	
19	B	Upper Mississippian ?
20	C	Upper Mississippian
21	non-feature	
22	A	Upper Mississippian
23	A	Upper Mississippian
24	A	Upper Mississippian
25	A	Upper Mississippian
26	A	Upper Mississippian
27	Hearth	Early Woodland
28	not dug	
29	deep pit	Early Woodland
30	not dug	
31	C	Upper Mississippian
32	not dug	

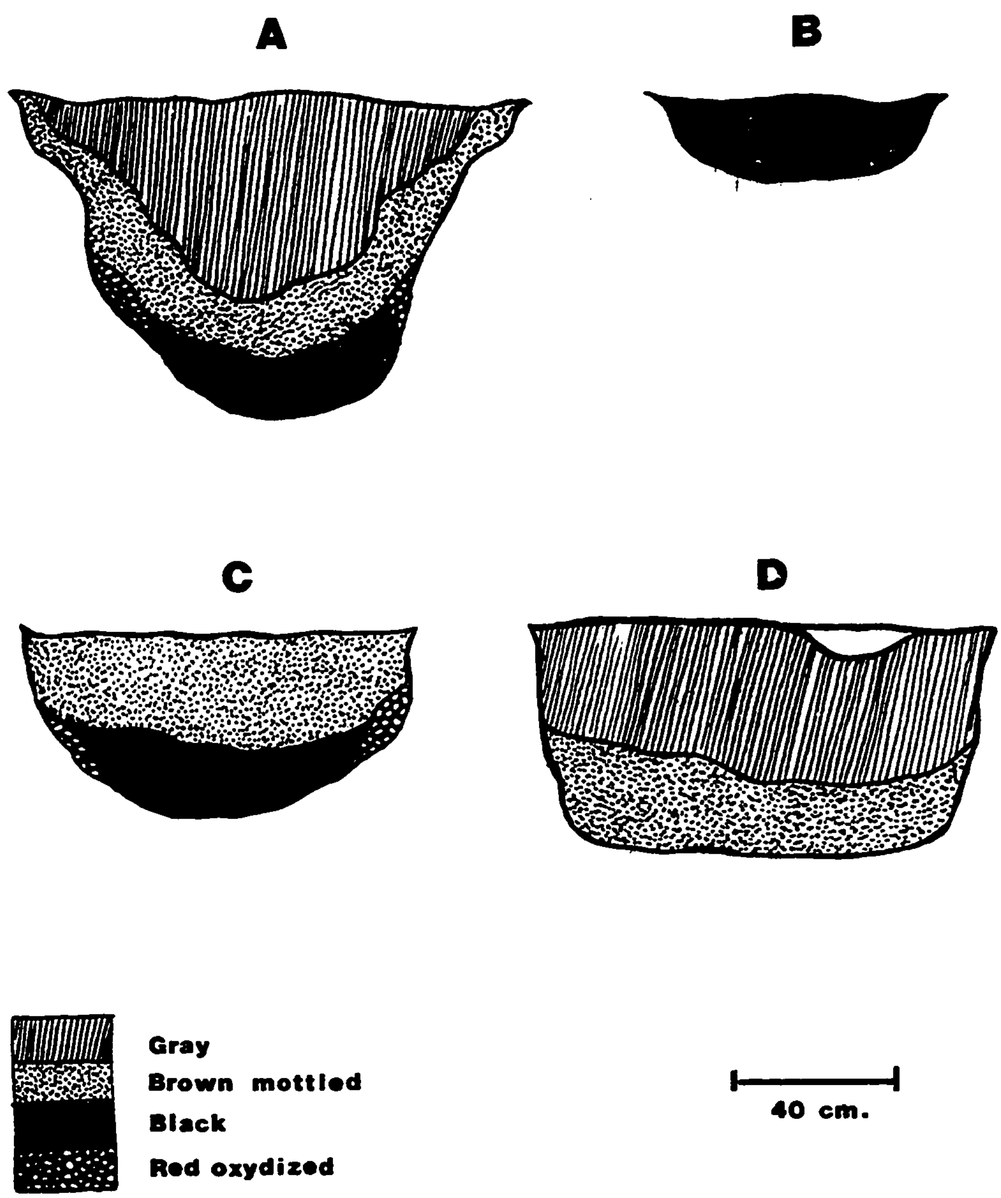
Feature 3 appears to be the only feature on the site that did not originate in the plow zone. Approximately 3 cm of tan soil overlay this small irregular feature. This, coupled with feature contents consisting only of a little chippage and one side notched point, suggests a possible archaic occupation of the site. Faunal remains from this feature consist of two fragments of unidentified mammal bone. Until more information is available for this possible component, no meaningful interpretation can be offered.

The remaining 21 features are pits which can be assigned with near certainty to the Upper Mississippian occupation of the site. Using a charcoal sample from Feature 23, this component has been radiocarbon dated 685 $\pm$ 85 years: A.D. 1265 (UGa-2631). These late prehistoric features are divided into four types based on their morphology (Figure 3).

Nine features are of the type designated "A" in Figure 3. These pits are circular or oval in plan view and all appear to be basin-shaped in cross-section. The pit diameters range from 190-110 cm ($\bar{x}$=138$\pm$29). Depth ranges from 65-95 cm ($\bar{x}$ =77$\pm$11). Using formula provided by Cremin, pit volume estimates range from .552 to 2.080m^3 ($\bar{x}$=1.110$\pm$.510).

These features compare favorably with the deep roasting pits discussed by Faulkner (1972:48) for the Griesmer site in northwestern Indiana and by Cremin (1977) for the Schwerdt site. Some of the "fire pits" discussed by Bettarel and Smith (1973:27) for the Moccasin Bluff site in Berrien County, Michigan may also be of this type. The bottom soil unit of these features is a black primary fuel zone

FIGURE 3: ELAM SITE PIT TYPES



consisting of charcoal and burnt log fragments with little or no cultural materials present. Current analysis of the botanical remains from these pits by Kathryn Parachini (personal comm.) has revealed carbonized plant tubers in this soil unit and may indicate a tuber roasting function for these pits.

Red oxidized sand generally follows the pit contours near the fuel zone. The entire bottom soil unit is capped by a layer of brown mottled sand which Faulkner (1972:48) suggests served to keep materials being roasted from scorching in the coals. Cultural remains in this zone are also very sparse.

The upper-most soil unit consists of a grayish-colored redeposited fill. It is in this zone that the heaviest concentration of cultural debris occurs. Sixty-Four percent of all bone by weight, as well as large quantities of ceramics and lithics, came from these features. Similar to Schwerdt and Griesmer, the roasting pits at Elam were ultimately used as a recepticle for camp garbage.

There are two apparent anomalies in the type "A" features. One, Feature 17, is the only type "A" feature in the southernmost excavation block. It also has by far the lowest bone concentration recorded for all features of this type. Seven of the remaining eight type "A" features are located in the northern block excavation. When bone concentrations from the plow zones of the northern and southern blocks are compared, a much higher concentration of bone is also apparent in the northern block. When the distribution of faunal remains is compared with the distribution of the lithic, ceramic and botanical assemblages, differing cultural activity areas may be discernable.

Feature 1 is unique in that it has a trench, designated F-13, originating in its bottom fuel zone and running in a straight line to the southwest. Although this trench is virtually free of cultural materials, the similarity of the soils throughout, suggests it is a functional part of Feature 1. It is possible that hot coals were removed from the pit and placed in the trench for some purpose. The analysis of the charred botanical remains from features 1 and 13 may help clarify the issue and indicate the manner in which this trench was used.

Five features at Elam are homogenous, shallow basin-shaped pits, and have been designated type "B" in Figure 3. These features are circular in plan view, range from 50-104 cm ($\bar{x}=81\pm20$) in diameter and in depth vary from 18-25 cm ($\bar{x}=22\pm3$). Volumes range from .040-.164 m^3 ($\bar{x}=.105\pm.037$). Ceramic and lithic debris are meager to absent in these pits and only 5% of the faunal assemblage was recovered from them. They consist of a single black soil unit composed of carbonized fuel residues. These features are possibly similar to the type designated as "Hearths" by Bettarel and Smith (1973:29) for the Moccasin Bluff site. No features of this type were encountered at the Schwerdt site and only one of the 77 features discussed by Faulkner (1972:44) for Griesmer fits this description. The function of these five features is questionable.

The faunal contents of Feature 5 deviates from the rest of the features of this type in that this pit produced 137 g of bone while the next highest faunal concentration for features of this type is only 4 g. However, 98 g of this quantity is deer antler which, for reasons to be discussed in a later chapter, should be considered as constituting the raw material for tools and not as food refuse.

Type "C" features at Elam are five in number. Pits of this type are basin-shaped in cross-section and have a depth less than half their orifice diameter. Diameters range from 80-170 cm ($\bar{x}$=118±33), depths vary from 35-60 cm ($\bar{x}$=49±11), and volume estimates range from .190-1.256 m^3 ($\bar{x}$=.618±.427).

The bottom soil unit for type "C" features is identical to the primary fuel zone described for type "A" features. Carbonized plant tubers have been identified from this soil unit as well. Red Oxidized sand is found along the pit walls and occasionally forms a narrow lens overlying the entire fuel zone. Above the fuel zone and layer of oxidized sand, there occurs a deposit of brown mottled sand similar to the middle soil unit in the type "A" features. However, there is no evidence of a redeposited fill zone at the top of the type "C" features and, thus, a very low concentration of cultural materials. Less than 6% of the faunal assemblage came from features of this type. Differences in the primary function of types "A" and "C" features are unclear at this time. Excavation data indicate that these two feature types are located in different areas of the site. No type "C" pits occur in the northern block excavation area where the vast majority of type "A" pits have been observed. Ongoing analysis of the botanical and cultural remains from the site may reveal differences in the activities associated with these two feature types.

One type "C" pit, Feature 20, deserves special attention since it is the only Upper Mississippian feature at the site which did not yield sturgeon or turtle remains. It is also the only pit feature encountered on the western half of the site. Although it cannot be demonstrated conclusively at this time, it is possible that this portion of the site was used at a different time of the year or, alternatively, it was characterized by different cultural activities on the part of the site's inhabitants. It will be interesting to see if the lithic, ceramic, or botanical remains from this unit show any discontinuity with the remainder of the site. Suggestions for further testing to clarify this matter will be made in the final chapter.

Feature 8, represented as type "D" in Figure 3, is unique with respect to all other features. It is circular in plan view, with a diameter of 120 cm, a depth of 65 cm, and an estimated volume of .735 m^3. Unlike other features on the site, it is virtually straight sided and flat bottomed. Also unique is the absence of a fuel zone. Pit contents include ceramics and lithics, however faunal remains are most abundant. This single feature accounts for over 7% of the entire faunal assemblage by weight. The majority of this material represents the remains of sturgeon. Due to the symmetry of the pit, reflecting considerable care in construction, and the lack of a fuel zone, it may be suggested that this feature served an initial storage function. Pits of this type have been noted for both Griesmer (Faulkner 1972:50) and Moccasin Bluff (Betteral and Smith 1973:20), but they are far more prevalent at the latter site.

Statements made in this chapter are not intended to be taken as the final word on the function of these features, or the apparent presence of different activity areas within the site. Rather, these are observations based on feature morphology and variations in faunal content, and as such, should be further tested using data from other analyses being undertaken by others studying the site.

Chapter VI

ANALYTICAL METHODOLOGY

All bone recovered from the excavations and flotation are analyzed in this study. Using osteological keys in conjunction with synoptic collections at Western Michigan University and Michigan State University, all of the bone from each provenience unit was identified and sorted as to animal type. Each bone fragment was identified when possible to the level of species. If it was not possible to be certain which species a given bone represented, it was identified to the nearest category (genera, class) or regarded as unidentifiable. For each faunal specimen the element, portion of element (i.e. distal or proximal) side represented (when pertinent), unusual wear which might indicate utilization as a tool, and specimen weight were recorded. These procedures provided the raw data base from which a meaningful analysis could be undertaken.

Ziegler (1973) discusses numerous methods of anlysis by which faunal remains from archeological sites may be studied. All of the methodologies are intended to take the raw data beyond the level of a mere statement of presence or absence of a species and make them useful in determining the relative economic importance of each of the various species represented in the surviving residues. Because the faunal remains from the Elam site were relatively well preserved, 86% of the bone by weight couid be identified to the level of class, an approach first suggested by White (1953), and since advocated by many others including Cleland (1966) and Daly (1969), was used. This method is to simply determine the minimum number of individuals (MNI) of each species present in the faunal sample and to multiply that number by the appropriate amount of usable meat obtainable from each individual. The MNI for each species was determined by counting the largest number of any one diagnostic bone (i.e. if two left distal humeri of white-tailed deer are present in the sample then the minimum number of white-tailed deer represented is two). This can further be refined by noting the age or size of the animal represented by the faunal element. For instance, if it were determined that the two left distal humeri represented adult deer and a right humerus from an immature deer was also present, then the minimum number of deer represented would be three. By multiplying the MNI per species by the usable meat available from an average individual of that species, a figure which represents the usable meat per species is derived. White (1953) suggests that 50% of the live weight of long legged animals, such as deer and elk, and 70% of the live weight of short legged animals, like beaver or bear, represents the usable meat from these species. Cleland (1966) accepts White's percentages for mammals and further recommends that 80% of the live weight of fish, 20% of the live weight of turtles, and 70% of the live weight of certain birds be used as conversion factors for calculating usable meat. These percentages will be utilized in this study. The relative importance of mussels in the aboriginal diet is a question of some significance. For a discussion of this issue the reader is referred to Faulkner (1972:111). For the purposes of this study, I have assumed a generous live weight of .5 lbs. and a usable meat conversion factor of 25% for the mussel species represented.

The live weights used for this analysis are the most part those used by Cleland (1969). Live weights for species which were not considered by Cleland are derived from Parmalee, et. al. (1972).

Numerous articles concerned with the exact percentage of the live weight of animals which could have, or would have, been consumed by prehistoric populations have been published (Daly 1969; Parmalee et. al. 1972; Ziegler 1973; Smith 1975; Lyman 1979). These same authors have also addressed the problem of determining average live weights for animals which lived during prehistoric times in environments quite different from those inhabited by members of the same species today. Although these arguments are indeed justified, what must be emphasized is that the MNI analysis is principally concerned with determining the relative economic importance of various food animals. The figures are not intended to represent actual amounts of meat in the diet, but rather, they are used to arrive at ratios which reflect the animals' economic importance. In short, the MNI analysis being used in this study is not particularly suited for nutritional studies, but from it may be derived an estimate of the relative economic importance of the various species represented.

Once the usable meat available for each species had been calculated, the figures were summed to arrive at the total meat available. Calculations were than used to determine what percentage each species contributed to this total. The total weight of bone from each species, as well as the percentage each species contributed to the total weight of identfiable bone, were calculated to permit comparisons with other site faunal assemblages and also as a means of indicating the relative abundance of bone from the various species represented at the Elam site.

Table 3 compares the recovery rates of bone from screens and from flotation samples. The implications of this chart, as they relate to the efficiency of recovering bones from the smaller members of the animal kingdom, will be discussed at length for each species in the Chapter 7 "Fauna".

For the purposes of both inter- and intra-site comparisons, estimated volumes for the features and excavation levels were calculated using formulae provided by Dr. William Cremin (personal communication). Using these volumes, a concentration index (CI) of total bone present in each provenience unit was calculated and expressed in grams per cubic meter (Appendices C and D). This procedure allows for discussion of bone concentrations as they relate to the various feature types and for a general discussion of areas of differing faunal concentrations within the site. Through the use of volumetric analysis, excavation units of different sizes can be conveniently compared.

Chapter VII

FAUNA

A total of 10,729 bone fragments, weighing 2888.21 g, were recovered from the 1978 excavations at Elam. Eighty three percent of these came from the features. The remainder were recovered from the plow zone above the features. Because the identified Archaic and Early Woodland features on the site appear to be virtually faunistically sterile, all faunal material recovered has been treated as belonging to the 13th. century component at the site.

Using various illustrated osteologies in conjunction with synoptic collections at Western Michigan University and Michigan State Univeristy, 86% of the faunal remains were identified to the class level.

Mammals

From Table 2 it is clear that mammals comprised the most important class of fauna to Elam's inhabitants, at least in terms of usable meat. The larger game species, deer, elk, and bear, represent over 71% of the total usable meat. Another 9% comes from the smaller mammals, with beaver being most numerous in terms of counts, MNI, and weight. All of the mammals present would have been readily available in the immediate environs of the site. In fact, the diversity of habitats in such a small geographic area would have been very conducive to occupation by the major food

TABLE 2

PERCENTAGES OF MEAT REPRESENTED BY ANIMAL BONES FROM THE ELAM SITE

SPECIES	Bones #	Wt. (g)	% by wt.	MNI	Live wt. ind. (lbs)	Usable meat/ ind.	Usable meat/ sp.	%
FISH	2306	509.84	20.55	9				16.29
Lake Sturgeon	2245	498.39	20.09	7	30	24	168	15.84
Channel Catfish	5	2.78	.11	1	4	3.2	3.2	.30
Freshwater Drum	1	.08	...	1	2	1.6	1.6	.15
Unident. fish	55	8.59	.35					
MAMMAL	343	1422.53	57.32	11				80.36
Elk	3	70.03	2.82	1	700	350	350	32.99
Black Bear	3	14.85	.60	1	300	210	210	19.80
White-tailed Deer	47	251.81	10.15	2	200	100	200	18.85
Beaver	71	122.69	4.94	2	45	31.5	63	5.94
Canis sp.	1	14.89	.60	1	40	20	20	1.88
Woodchuck	4	.62	.02	1	8	5.6	5.6	.53
Muskrat	8	2.14	.09	1	3	2.1	2.1	.20
Sciurus sp.	7	.54	.02	1	2	1.4	1.4	.13
Small rodent	1	.08	...	1	.5	.4	.4	.04
Deer Antler	65	777.29	31.33					
Unident. mammal	133	167.53	6.75					
TURTLES	1446	484.65	19.53	12				2.39
Snapping turtle	17	15.89	.64	2	30	6	12	1.13
Softshell turtle	4	.62	.02	1	30	6	6	.57
Box turtle	217	217.56	8.77	6	4	.8	4.8	.45
Blanding's turtle	8	22.33	.90	1	4	.8	.8	.07
Map turtle	2	6.66	.27	1	7	1.4	1.4	.13
Painted turtle	5	1.02	.04	1	2	.4	.4	.04
Unident. turtle	1191	220.48	8.89					
BIRD	3	2.21	.08	2				.93
Wild Turkey	1	.80	.03	1	12	8.5	8.5	.80
c.f. Ruffed Grouse	1	.31	.01	1	2	1.4	1.4	.13
Unident. bird	1	1.10	.04					
MUSSELS	3	60.23	2.42	2				.02
Truncilla truncatta	1	17.67	.71	1	.5	.1	.1	.01
Unident. mussel	2	42.56	1.71	1	.5	.1	.1	.01
GASTROPODS	6	1.52	.06	6	--	--	--	--
TOTAL IDENT. BONE	4105	2480.98	99.93	42			1060.8	99.99
UNIDENT. BONE	6624	407.23	14.10					
TOTALS	10,729	2888.21		42			1060.8	99.99

species. The only dog element found during excavations, the distal portion of a left humerus, compares favorably in size to a wolf humerus in the synoptic collections at Michigan State University. However, there is insufficient data to assign this element to the species Canis lupes. Be that as it may, the size of the element and the documented abundance of wolves in this area at the time of European contact (Johnson 1880:15) strongly suggest that this tentative identification is appropriate. Furthermore, the wolf can be anticipated to have frequented this area, since it is one where its prey species thrived.

The relative infrequency of white-tailed deer, only 2 out of a total 42 individuals represented at the Elam site, indicates a seasonal occuption of the site which does not include the optimal late fall and winter hunting season for deer. This same phenomenon has been observed at the Schwerdt site (Higgins:1979), on the Kalamazoo River, and the Griesmer site (Faulkner 1972:108) on the Kankakee River. At all of these sites other species are more abundant than the white-tailed deer. Contrary to this, at the Moccasin Bluff site, white-tailed deer far outnumber all other animal species (Bettarel and Smith 1973:133). This suggests that Upper Mississippian cultures were utilizing the Moccasin Bluff site at different times of the year than the other three sites.

Looking at the relative abundance of mammal remains, with regard to their percentage of the total bone weight, can be misleading. Deer antler alone accounts for over 56% of the total weight of mammal elements. Furthermore, all the antler beam portions have the burr, or coronet, still intact. This indicates that they were either very loose and ready to fall off the deer at the time of death, or, alternatively, that they had already been shed by the deer and were later collected by the Indians to be used as tools. A number of observations support the latter proposition. The number of antlers present, at least 8, is much greater than would have been supplied by the number of deer present on the site (as inferred from other deer elements). Other seasonal indicators for the site do not support the late December to early January occupations which would be necessary to procure deer in this stage of antler development. Finally, some of the antler shows signs of being worked. These will be discussed in more detail in the section on worked bone. With the antler weight subtracted, mammal remains would account for only 26% of the identified bone.

A further indication of the relative abundance of mammals can be gleaned from the actual number of bones on the site. Only 343 out of a total of 4105 identified bones are mammal. Granted, this lack of abundance does not in any way diminish the importance of mammals as a meat source; however, this observation may reflect differences in the intensity of exploitation as it relates to other classes of fauna.

Fish

The most abundant class of fauna, by count, are the fish. Sturgeon is the most abundant single species represented at Elam in terms of count, weight, and minimum number. Remains of sturgeon were found in virtually every provenience unit which contained bone.

The sturgeon is the best faunal indicator for seasonality from this site. This fish ascends rivers to spawn in late spring. From mid May to early June, they would have been available for exploitation by the Elam inhabitants (Harkness and Dymond 1961). Historical accounts indicate that the Indians used wooden spears to take sturgeon from the rivers (Turner 1911:571). Faulkner (1972:101) suggests that antler and bone projectile points recovered from the Griesmer site may have functioned as fishing implements. The apparent absence of these implements at Elam may relate to the documented use of wooden spears for this purpose. The other two identified fish, a large catfish and a freshwater drum, could have been procured in these same waters in a like manner. That other fish were utilized by the Elam inhabitants is indicated by the presence of 12 unidentfiable fish vertebrae which range in diameter from 10 mm to 3 mm. Comparing the number of fish elements recovered from screening with the number recovered from flotation (See Table 3) suggests that smaller fish species may be under represented. However, the procurement of these smaller fish was not as important to the Elam inhabitants as it was to the inhabitants of the Schwerdt site. An abundance of fish vertebrae in the 3 mm range at Schwerdt suggests a procurement strategy specifically directed at this resource (Higgins 1979). At Elam this strategy was much reduced if practiced at all. This relative scarcity of small fish remains at Elam may, alternatively, reflect the much larger volume of soil processed by flotation at Schwerdt (over 1300 l of soil were processed by

TABLE 3

COMPARISON OF SCREEN AND FLOTATION RECOVERY TECHNIQUES

SPECIES	SCREEN ct.	SCREEN wt. g	SCREEN %	FLOTATION ct.	FLOTATION wt. g	FLOTATION %	TOTAL ct.	TOTAL wt. g
FISH	1558	477.23	93.6	748	32.61	6.4	2306	509.84
Lake Sturgeon	1539	466.28	93.5	706	32.11	6.5	2245	498.39
Channel Catfish	5	2.78	100.0				5	2.78
Freshwater Drum				1	.08	100.0	1	.08
Unident. fish	14	8.17	95.1	41	.42	4.9	55	8.59
MAMMAL	319	1419.98	99.8	24	2.55	.2	343	1422.53
Elk	3	70.03	100.0				3	70.03
Black Bear	3	14.85	100.0				3	14.85
White-tailed deer	47	251.87	100.0				47	251.87
Beaver	71	122.69	100.0				71	122.69
Canis sp.	1	14.89	100.0				1	14.89
Woodchuck	3	.57	91.9	1	.05	8.1	4	.62
Muskrat	8	2.14	100.0				8	2.14
Sciurus sp.	1	.19	35.2	6	.35	64.8	7	.54
Small rodent	1	.08	100.0				1	.08
Deer Antler	65	777.29	100.0				65	777.29
Unident. mammal	116	165.38	98.7	17	2.15	1.3	133	167.53
TURTLES	1248	476.71	98.4	194	7.94	1.6	1446	484.65
Snapping turtle	17	15.98	100.0				17	15.98
Softshell turtle	3	.57	91.9	1	.05	8.1	4	.62
Box turtle	217	217.56	100.0				217	217.56
Blanding's turtle	8	22.33	100.0				8	22.33
Map turtle	2	6.66	100.0				2	6.66
Painted turtle	5	1.02	100.0				5	1.02
Unident. turtle	996	212.59	96.4	193	7.89	3.6	1191	220.40
BIRD	3	2.21	100.0				3	2.21
Wild Turkey	1	.80	100.0				1	1.80
c.f. Ruffed Grouse	1	.31	100.0				1	.31
Unident. bird	1	1.10	100.0				1	1.10
Mussels	3	60.19	99.9	--	.04	.1	3	60.23
Truncilla truncatta	1	17.67	100.0				1	17.67
Unident. mussel	2	42.52	99.9	--	.04	.1	2	42.56
GASTROPODS	6	1.52	100.0				6	1.52
TOTAL IDENT. BONE	3137	2437.84	98.9	968	43.14	1.8	4105	2480.98
UNIDENT. BONE	2000	362.62	89.0	4624	44.61	11.0	6624	407.23
TOTALS	5137	2800.46	97.0	5592	87.75	3.0	10729	2888.21

flotation at Schwerdt compared to 470 l at Elam) or some other sampling bias. Even though the fish, more specifically the sturgeon, supplied only 16% of the usable meat, their ubiquity and abundance, (over 2200 of the 4105 identified bones from Elam were sturgeon), as well as the presence of many other riparian species, indicate the procurement of this resource was a most important factor in regard to site location and season of occupation.

Turtles

The abundance of turtles at the site, 1446 of the 4105 identifiable bone and nearly 20% by weight of all bone recovered, also indicates a warm weather occupation. Turtle species found at Elam emerge from hibernation any time between March and May (Cahn 1937). The map turtles are the earliest to emerge, coming out of hibernation shortly after the ice is out. The two major food species, snapping and softshell turtles, are the last to emerge (Cahn 1937:41,191). Six of the twelve turtles represented were box turtles. The box turtle is essentially a terrestrial woodland species however, during the hot, dry spells of midsummer they would have congregated near any available water (Pope 1939:120,124). Box turtles at Elam were consistently found with their carapaces intact, while those of all other species were fragmented. This observation, coupled with their small size, may indicate that box turtles were being procured for use as vessels rather than as a food resource. Parmalee, et.al. (1972:26) lends support to this interpretation by noting that over 1/3 of the box turtle from the Apple Creek site were used as vessels.

All turtles combined account for only 2.4% of the total usable meat. They are, however, nearly as ubiquitous as the sturgeon. This ubiquity reflects both the availability of this resource in the site environment and the intensity of exploitation. The abundance of turtle remains is a strong indicator for a warm weather occupation of the site.

Birds

Only two birds are represented in the Elam fauna, a wild turkey and a ruffed grouse. Both are year round inhabitants and could have been taken in the immediate area of the site any time of the year. In total, birds supplied less than 1% of the usable meat represented, accounted for only 3 of the 4105 identifiable elements recovered and .08% of the bone by weight.

Mussels

The paucity of mussels at Elam, (only 3 valves, representing 2 individuals, 2.4% of the total identifiable bone weight, and negligible amount of usable meat, were recovered), is unusual for riverine oriented sites of this time period. They were heavily utilized by the inhabitants of the Griesmer site and also prevalent at the Moccasin Bluff site. Because there is no study available on the mussel populations of the Kalamazoo River it is not possible to determine if this scarcity at the Elam site reflects limited availability, poor preservation, or an avoidance of this resource by the Indians. At Schwerdt mussels represent a larger percentage of the fauna recovered (Higgins 1979). This may suggest either poorer preservation or a mussel avoidance at Elam.

Gastropods

All six gastropods encountered during excavations were from the plow zone and were considered more recent than the prehistoric occupation of the site. No attempt was made to identify them as to species, and they were not considered in the calculations of usable meat from the site.

Summary

That procurement strategies at the Elam and Schwerdt sites and at the Griesmer site in the Kankakee Valley were focused on aquatic and riparian resources is certainly apparent based upon the data presented above. Fish, turtles, mussels, beaver, and muskrat constitute 80% of the individuals represented at Elam, 82% at Schwerdt, and 88% at Griesmer. With respect to usable meat, these resources supplied 25%, 37%, and 25% at the three sites, respectively. This observation contrasts sharply with faunal materials from the Moccasin Bluff site on the St. Joseph River in Berrien County. These materials were analyzed and reported by Cleland (1966), who noted that only 30% of the individuals considered important food species at this site are aquatic or semi-aquatic and that, in aggregate, they supplied only 16% of the usuable meat calculated for this assemblage. There are far more white-tailed deer represented than any other species at this site (Cleland 1966:216). This observation, in conjunction with the presence of sturgeon, turtle, and corn has led Cleland to propose that Moccasin Bluff was probably occupied on a "year round" basis. By comparison, these data for Elam, Schwerdt, and Griesmer argue for short-term, seasonal occupation by groups intent upon exploiting specific warm weather flora and fauna concentrated in the aquatic and riparian habitats located adjacent to these sites.

Chapter VIII

ROLE OF THE ELAM SITE IN THE UPPER MISSISSIPPIAN SUBSISTENCE SETTLEMENT SYSTEM

Faunal materials from the Upper Mississippian component of the Elam site indicate a warm weather occupation. The ubiquity and abundance of sturgeon and turtle remains, as well as the co-occurrence of sturgeon and plant tubers in the features, support a late spring to early summer occupancy. Even though some of the turtle species would have been available in the early spring, the apparent absence of evidence for cultigens both here and at Schwerdt (Cremin 1979) suggests that the population was elsewhere during the planting and harvesting seasons. The absence of a fall occupation is supported by the presence of only shed deer antler, the relatively low number of white-tailed deer, and the sparse amount of carbonized nut shell observed in flotation samples.[1]

The number and diversity of mammal species exploited, and the presence of four different types of features, may indicate a longer and more diverse occupation than would be necessary to fully exploit the anadromous sturgeon. That Elam functioned simultaneously as both a hunting and fishing station is supported by the uniface to biface ratio of 1:1 derived by Meszaros (personal communication) for stone tools from the site. This correlates well with ratios derived by Weston (1975:174) for other mixed hunting and fishing stations in

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1 Analysis of the plant remains is currently underway and positive support on points made here must wait completion of the analysis by K. Parachini.

Michigan. Even though Schwerdt hay have functioned in a manner similar to Elam in the settlement system of the Upper Mississippian culture (Cremin 1979) the uniface to biface ratio of 3:1 for Schwerdt lithics, along with the higher percentage of fish in all catagories (Higgins 1979), and fewer feature types than Elam suggests some differences in resource procurement scheduling between the two sites.

Realizing that much of the materials from Elam are not as yet fully analyzed, it would still seem feasible to propose the following hypothesis:

> This site was occupied sometime in late May or early June for the procurement of spawning sturgeon and other riparian resources which were available in the immediate site area. It served as both a fishing and hunting station until its abandonment in late summer or early fall when the inhabitants would return to their agricultural villages.

Historical accounts of the Indians who utilized Allegan County in the early 1800's indicate that this area was a "no man's land" occupied by both the Potawatomi from the south and Ottawa from the north as a winter hunting grounds and spring maple sap collecting and fishing area. During the summer the Potawatomi returned to their agricultural villages on the St. Joseph River and Ottawa returned to the Straits of Mackinac (Johnson 1880:18, 39-40). Evidence from Upper Mississippian sites in this area attest to similar use of the Kalamazoo drainage for spring fishing. However, three years of intensive, systematic survey in the Lower Kalamazoo Valley has yet to locate a single upland hunting station which can be definitely assigned to this culture.(Garland 1979; Cremin personal comm.). This may, however, reflect and inability to recognize a site as Upper Mississippian, based only on scant surface finds usually devoid of ceramics, rather than a real absence of such sites. The recognition of a maple syrup procurement strategy from archeological data is also a problem. If evidence for this strategy were obtained from Upper Mississippian sites in the Kalamazoo drainage, and Parachini (personal communication) has now identified carbonized sap from features at Elam, it would extend the time of occupation of the site from an arrival in mid May to perhaps as early as March. Zawacki and Hausfater (1969:61) note that sap could only be efficiently taken during March and April. Yarnell (1964:49) cites historical data which confirm Zawacki and Hausfater's observations.

Settlement data collected from the Kalamazoo River Basin and analyzed to date do not conform neatly to the Miami and Potawatomi settlement pattern presented by Fitting and Cleland (1969) for southwestern Michigan during the late prehistoric period. The warm weather occupations in this drainage are not the large permanent agricultural villages hypothesized by Fitting and Cleland (ibid), nor is there yet positive evidence to support the utilization of this area for early spring syruping or winter hunting as recorded for the historic period by Johnson (1880). Rather, the warm weather occupation in the Kalamazoo drainage appears to represent short term camps which were utilized by a small group of people possibly abandoning their permanent agricultural village between the planting and harvesting seasons to undertake the exploitation of specific natural food resources abundantly available in the valley.

Chapter IX

COMPARISONS WITH OTHER UPPER MISSISSIPPIAN SITES IN THE KALAMAZOO DRAINAGE

Excavations carried out by Western Michigan University on the Schwerdt and Allegan Dam sites indicate that they are from the same Upper Mississippian cultural horizon as the Elam site. Radiocarbon dates of 505 ± 70 years: A.D. 1445 (UGa-1725) and 500 ± 120 years: A.D. 1450 (UGa-1726) for Schwerdt, 740 ± 100 years: A.D. 1210, 640 ± 100 years: A.D. 1310 (Crane and Griffin 1972) and 735 ± 60 years: A.D. 1215 (UGa-2629) for Allegan Dam, and 685 ± 85 years: A.D. 1265 (UGa-2631 for the Elam site, have been obtained.

Both Allegan Dam and Schwerdt have easy access to the same resource zones available to the Elam inhabitants, and the fauna from both (Martin 1978 and Higgins 1979) are virtually identical to those species comprising the Elam assemblage. Sturgeon outnumbers every other species, both in terms of count and weight, and a number of lines of additional evidence strongly suggest that all 3 sites served principally the same function in the subsistence settlement systems of the peoples utilizing them. The co-occurrence of plant tubers and sturgeon in the features at Schwerdt, as well as the abundance and ubiquity of sturgeon at the site, first led Cremin (1977) to suggest a short term warm weather occupation of this site for the procurement of aquatic and riparian resources. A more thorough analysis of the Schwerdt materials by Cremin (1979) and Higgins (1979) supported these initial impressions. At Allegan Dam the preservation of faunal remains was poor, however, Martin (1978) did suggest a warm weather occupation for this site. George Spero's analysis (personal communication) lends further support to this interpretation.

The materials from all three of these Upper Mississippian sites are, at this time, in various stages of analysis. Spero will be submitting an analysis of the material from Allegan Dam as a Masters Thesis to Western Michigan University in the very near future. Likewise, the assemblages from Elam and Schwerdt are being readied for thesis presentation and or publication by various students and faculty members at Western Michigan University. Given the incomplete nature of these analyses, no further comparisons are warranted at this time.

Chapter X

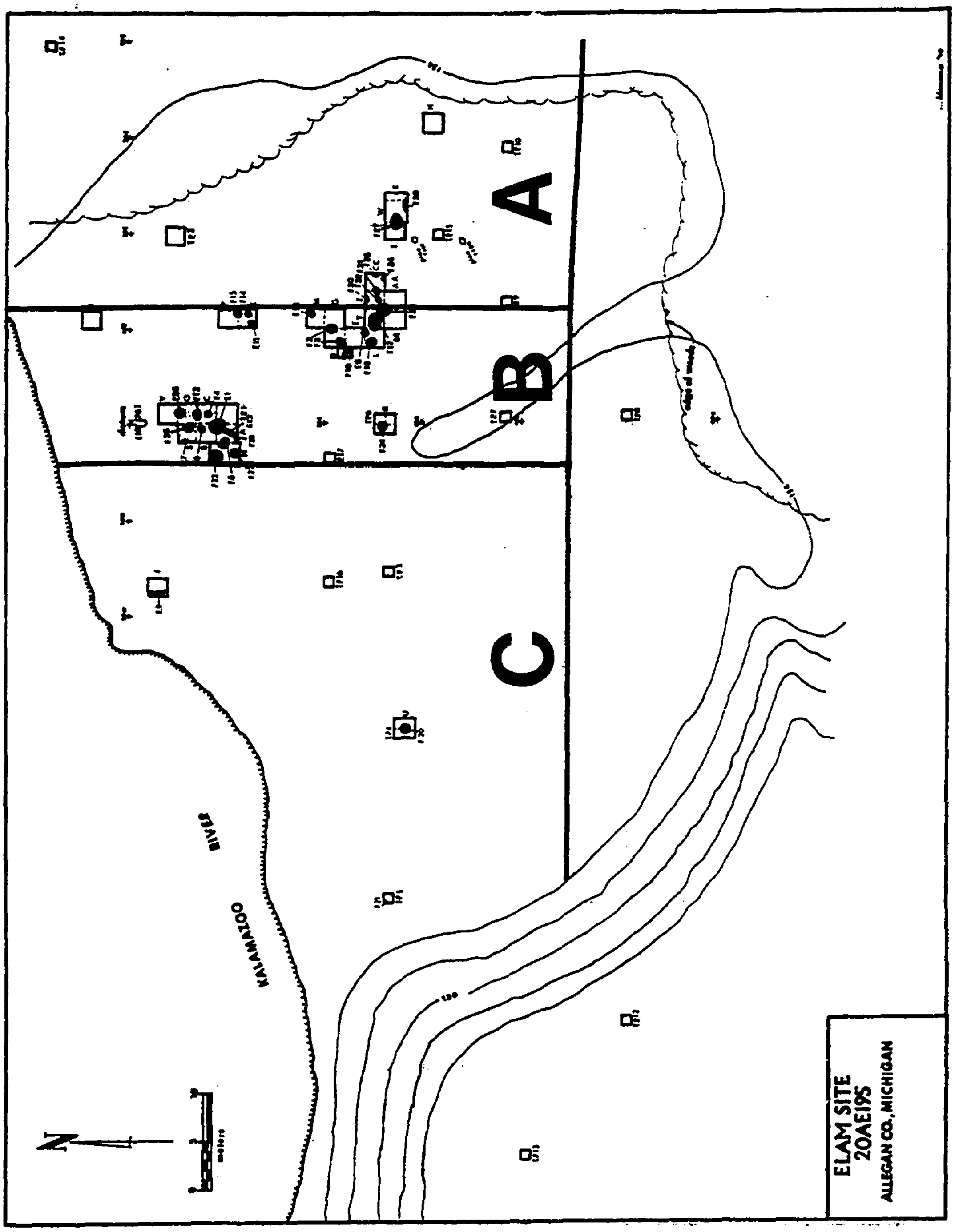
RECOMMENDATIONS FOR FUTURE RESEARCH

At The Elam Site

Due to the use of judgement sampling for the maximization of data recovery during the initial year of excavations at Elam, certain areas of the site received more intensive treatment than others. Data on feature morphology and faunal content suggest that different areas of the site may have been used differently. These observations include:

1. The area designated A in Figure 4 contains an Early Woodland component. The remainder of the excavated portion of the site does not.
2. Area B was apparently much more intensively utilized than other areas of the site. The northern portion of this area has a higher concentration of faunal materials and contains many type "A" features, while the southern portion has a much lower faunal concentration and the deep pits in this area are of the type designated "C".
3. Area C appears to have been utilized to a lesser extent than the remainder of the site. The only feature encountered in this area contained no sturgeon or turtle either in the pit proper or in the associated plow zone, possibly indicating a different season of use.

FIGURE 4: Recommended Strata for Future Research



In order to discern if these observations are a reflection of the manner in which space was utilized or a product of sampling bias, a sampling strategy designed to alleviate the differential coverage of the various areas will be needed. There follows a sampling design which might be used to compensate for the differential coverage obtained during our initial season of investigation.

The site may be divided into three distinct strata based on the location of last years excavations and observed disimilarities in cultural data recovered. These areas are marked A, B, and C in Figure 4. There is no one sample size which is adequate for every situation. The size of the sample used on any given site is dependant on the nature of the site itself and the manpower and time available for excavations (Rootenberg 1964:184). In 1978, 130.6 m^2 (about 3%) of the site was excavated. Based on this figure a sample of at least 5% should be easily obtainable for each of the strata in one more season's work.

1978 excavations carried out in the area designated stratum A comprise an estimated 2.5% sample. If 5 2x2 m test squares and 13 1x1 m test pits were randomly chosen and alternatives were used for any unit which overlapped with previous excavations, the desired 5% sample for this stratum would be achieved.

1978 excavations in the area designated stratum B comprised a 10% sample of this area. I, therefore, recommend the use of judgement samples as time permits in the area between the two major block excavations.

1978 excavations carried out in the area designated stratum C comprise a 0.6% sample. To obtain the desired 5% sample of this area, 74 m^2 of excavation units will have to be opened. I recommend that these units be chosen randomly and that alternatives be used for units that overlap with previous excavations. This sample could be obtained utilizing 10 2x2 m test squares and 34 1x1 m test pits.

In total, the recommended sample for stratum A and stratum C would comprise 107 m^2 of excavations. Based on the area excavated in 1978, ample time would be available to further test portions of stratum B as well as any other problem areas.

The recommendations presented here are by no means the only, or necessarily the best, strategy for further testing. Further testing aimed at a more representative sample, however, is recommended.

In The Region

At the present time there exist excellent data sets for three Upper Mississippian warm weather encampments on the Kalamazoo River. What is now needed is information on the remainder of the subsistence settlement system. As stated previously, after three years of intensive survey in the Kalamazoo drainage, survey teams have yet to locate any village or hunting stations which can definitely be assigned to the Upper Mississippian culture.

Excavations on some of the small upland hunting stations which appear to be late Woodland, may prove helpful. Seldom is pottery recovered from the surface survey of these small upland sites.

This may reflect a real absence of ceramics at these sites or, alternatively, the difficulty of recognizing ceramics during surface survey due to less than optimal surface visibility. Without the aid of ceramics it is virtually impossible to distinguish Upper Mississippian sites from the preceding Late Woodland cultures. However, it is possible that excavations may reveal ceramics which could help alleviate this problem.

Another direction suggested by Cremin (1979) which has much promise, is to expand the research universe to include neighboring river drainages. Initial work in this direction began last season with Dr. Cremin's preliminary survey of the Thornapple River drainage in Barry County and Dr. Garland's 22 mi. contract transect in Berrien County. Although I recall no shell tempered pottery in any of the Barry County collections we observed, there were some chipped stone hoes which might indicate possible agriculture. Historically, Barry County housed the "middle village", a large historic Indian settlement, on its prairie remnants. Further research in this area may locate similar large sites on these prairie remnants. Survey carried out thus far on the former prairie remnants of Kalamazoo County however, have failed to locate any sites of this type. Work done last summer by Western Michigan University under the direction of E. Garland in the St. Joseph drainage suggests that this area may be vital to our understanding of regional Upper Mississippian cultural systems. Andrews University has located and directed excavations on a fairly large Upper Mississippian site, the Wymer site, located 10 km downstream from the Moccasin Bluff site on the second terrace above the St. Joseph River. My initial impression of Wymer, with its numerous postmolds and abundance of deer bone, notably one deer skull with attached antler, is that it may have served a function in the subsistence-settlement system similar to that hypothesized for Moccasin Bluff. At this point these are only general impressions. However, the potential for research in this area is great. Numerous historic references (Johnson 1880; Kinietz 1940) also point to the St. Joseph River as the location of the Potawatomi agricultural base camps.

As the research program at Western Michigan University finishes the Kalamazoo drainage surveys and further expands its research universe to neighboring areas, the possibility for greater understanding of the late period cultural systems utilizing the Kalamazoo drainage is at hand. Recent problem oriented research in this drainage has developed questions and hypotheses which can only be addressed using a pan-regional approach to the problems of Upper Mississippian subsistence settlement behavior in southwestern Michigan.

Chapter XI

CONCLUSIONS

Faunal materials from the Upper Mississippian component of the Elam site indicate a warm weather occupation of the site by a small group of people who focused their economic activities on the aquatic and riparian resources available to them in the Kalamazoo River and its adjacent swamp associations. The ubiquity of sturgeon and turtle remains, as well as the co-occurrence of sturgeon and plant tubers in the features, support a late spring to early summer occupation. Even though some of the turtle species would have been readily available in the early spring, the lack of evidence for cultigens suggests that the populations were elsewhere during the planting season.

In light of recent data from southwestern Michigan and the Kankakee marsh of northwest Indiana some modifications of the Miami and Potawatomi settlement system, as described by Fitting and Cleland (1969), are in order. Sites such as Moccasin Bluff on the St. Joseph River are probably representative of Fitting and Cleland's permanent agricultural village. However, evidence from the Griesmer site in Indiana and the Elam and Schwerdt sites on the Kalamazoo River suggests that portions of the population moved away from the main villages in late spring in pursuit of the abundant aquatic resources available at that time of the year.

This dispersal during the months between planting and harvest, when agricultural goods from the previous year have been depleted and the exploitation of deer is least desirable, offers security to an agricultural based system which is being pushed to its northernmost limits. The adaptive behavior of these Upper Mississippian cultures operating on the northern margins of effective corn agriculture fits the Late Focal Pattern suggested by Cleland (1976). In the area where the growing season was long enough to insure only a single crop production, the procurement of secondary resources became increasingly important. Resources were selected whose procurement could be scheduled around the agricultural activities.

When the data from this and similar studies are combined with the data from the other studies now underway for sites in the Kalamazoo River drainage, our understanding of both the cultural history and subsistence settlement systems operating in this drainage will be greatly enhanced.

APPENDIX A

Worked and Utilized Bone and Antler

Prov.	Species	Element	Comment
Unit S	Unidentified	Unidentified	4 small bone fragments with high shine
T.P. 13	Unidentified	Unidentified	High shine, numerous striations and notched on one edge
T.P. 13	Unidentified	Unidentified	3 small bone fragments with high shine
F. 4	Unidentified	Unidentified	Burnt bone object
F. 8	Unidentified	Unidentified	Small bone fragment with high shine
F. 23	White-tailed deer	Antler	Possible flaker
F. 23	White-tailed deer	Antler	Worked for removal of distal portion
F. 24	White-tailed deer	Antler	Possible scraper
F. 26	Unidentified	Unidentified	Possible awl
F. 26	Unidentified	Unidentified	2 bone fragments with high shine
F, 26	White-tailed deer	Antler	Worked for removal of most proximal tine

BONE

The majority of the bone fragments being considered in this section are small unidentified fragments which have a shiny finish (Figure 5, letter A). This shine indicates either intensive handling or utilization of the bone for some purpose. Due to the small size of all these fragments,,I will suggest no function for them.

One bone fragment was spilt in such a manner as to produce a sharp point.(Figure 5, letter B). This object also had a slight shine indicating it was utilized. It may have functioned as an awl.

Feature 4 produced a small burnt bone object,(Figure 5, letter C), for which I can suggest no function. It is presented here because it is unusal and may be recognized by someone reading this report.

FIG: 5 WORKED AND UTILIZED BONE FROM ELAM

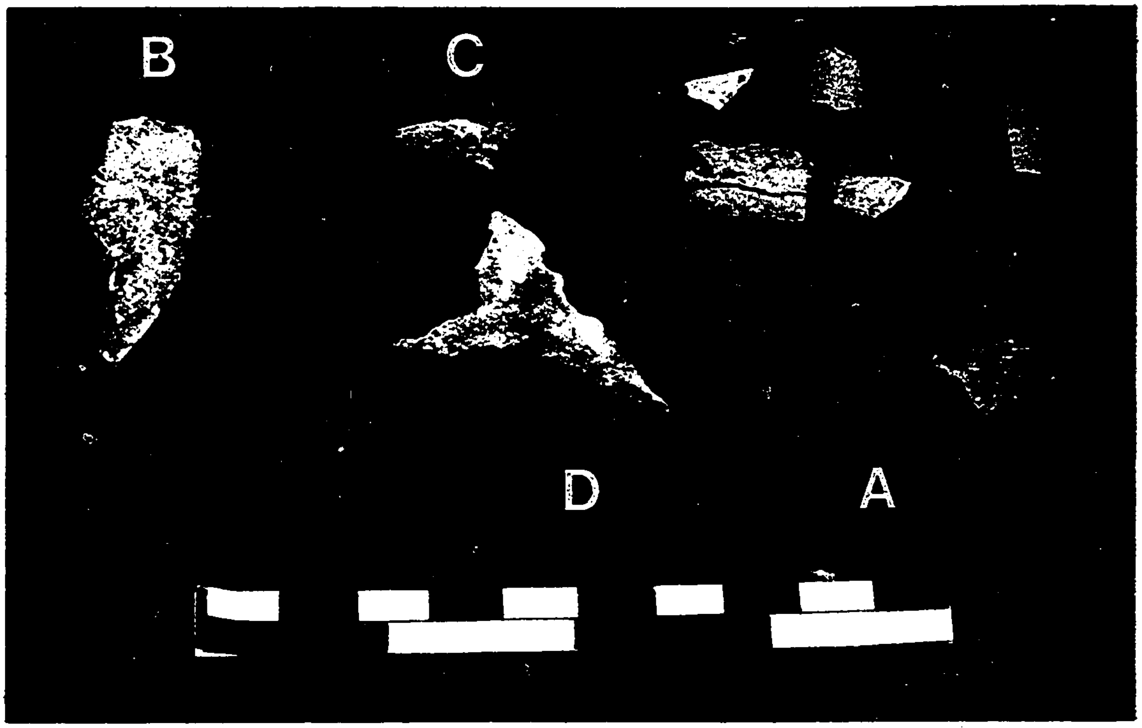
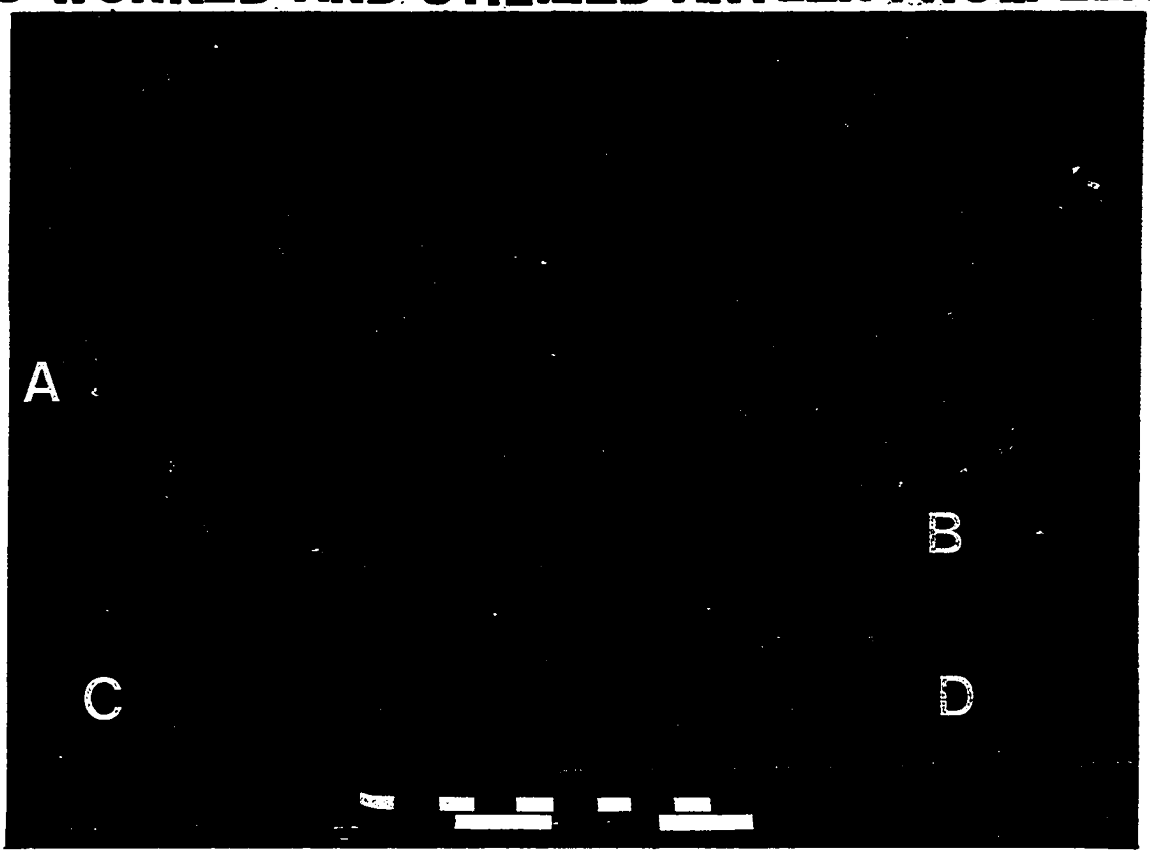


FIG: 6 WORKED AND UTILIZED ANTLER FROM ELAM



APPENDIX A continued

One other bone object was found. This also had a shine, as well as numerous striations across its surface. The characteristic of most interest is two small notches on one edge which show signs of wear. Once again I offer no functional interpretation for this apparent tool (Figure 5, letter D).

ANTLER

Numerous relatively complete deer antlers were retrieved from excavations at Elam. Although these show no wear which can be definitely linked to a function, they may have been used as digging implements. Faulkner (1972) suggests that antler were bought onto the Griesmer site and used as both digging implements and raw material for tools. The abundance of antler from Elam suggests that they may have served a similar function at this site. (Note the antler illustrated in Figure 6, letter A. This specimen could have served as an adequate digging implement).

Some of the antler at the site exhibit definite signs of being worked. Notice the cuts for the removal of the most proximal tine on antler letter B, Figure 6. The antler labeled C has been to badly eroded to observe definite wear; however, it resembles a flaker in gross morphology. Specimen letter D has one edge beveled and looks like a scraper in appearance.

In total, artifacts of bone are relatively sparse. On the other hand, evidence suggests that antler were bought onto the site specifically as a source of raw material for tools.

APPENDIX B

Detailed Recovery Notes of Faunal Remains

Lake Sturgeon (*Acipenser fluvescens*):

Pectoral spine	7 right, 7 left, 18 fragments
Main head plates	3, 2 right fragments
Clitherium	3 left
Unidentified fragments	2205

Freshwater Drum (*Aplodinotus grunniens*):

Otolith	1 fragment

Channel Catfish (*Ictaluris punctatus*):

Vertebra	5

Unidentified fish

Vertebra	13
Spines	24
Unidentified fragments	18

White-tailed deer (*Odocoileus virginianus*):

Femur fragments	1 left distal
Metatarsal fragments	2 right proximal, 2 left proximal
Metapodial fragments	2 distal
Radius fragments	1 right proximal, 1 left proximal
Astragali	2 right, 2 left
Navico-cuboid	2 left
Calcaneous fragments	1 left, 1 right
Humerus fragments	2 left distal
Tibia fragment	1 left distal
Scapula fragments	2 left
Phalanges	4
Vertebra fragments	2
Tarsal	1 left
Pelvis fragment	1 left acetabulum
Molars	8, 8 fragments

Elk (*Cervus canadensis*):

Calcaneus	1 right
Pelvis fragment	1 left ischium fragment
Metatarsal	1 right distal

Black bear (*Ursus americanus*):

Atlas vertebra	1

APPENDIX B continued

Beaver (*Castor canadensis*):

Zygoma fragment	1 right anterior
Mandible fragments	2 right, 2 left, 2 fragments
Pelvis fragments	2 left acetabulum
Femur fragments	2 left proximal, 1 right proximal, 1 right trochanter
Tibia fragments	2 left shaft, 2 right shaft, 1 right distal
Maxilla	3 fragments
Scapula fragments	1 right proximal
Phalanges	3
Incisors	4, 6 fragments
Molars	13, 11 fragments

Muskrat (*Ondatra zibethicus*):

Tibia fragments	1 left, 1 right shaft
Femur fragment	1 right proximal
Humerus fragment	1 left shaft
Molars	2
Incisors	2

Woodchuck (*Marmota monax*):

Radius fragment	1 left proximal
Molars	3

Squirrel (*Sciurus* sp.):

Tibia fragment	1 left proximal
Scapula fragments	2 right, 1 left
Ilna fragment	1 right proximal
Humerus fragment	1 left distal
Radius fragment	1 left proximal

Dog (*Canis* sp.):

Humerus fragment	1 left distal

Small rodent (*Cricetidae*):

Mandible	1

Spiny Softshell turtle (*Trionyx spinifer*):

Carapace fragments	4

APPENDIX B Continued

Snapping turtle (*Chelydra serpentina*):

Femur	1 right
Ulna	1 right, 1 right proximal, 1 left
Humerus	1 right
Tibia fragment	1 left proximal
Vertebra	1
Carapace fragments	9
Plastron fragments	1

Box turtle (*Terrapene carolina*):

Scapula and Coracoid	1 right
Carapace	6 virtually complete, 80 fragments
Plastron	2 complete posterior to hinge, 1 fragment

Blanding's turtle (*Enydoidea blandingi*):

Carapace fragments	4
Plastron	1 quarter, 3 fragments

Painted turtle (*Chrysemys picta*):

Ulna	1 left, 1 right proximal
Scapula and Coracoid	1 left
Carapace fragment	1

Map turtle (*Graptemys* sp.):

Nuchal	1
Carapace fragment	1

Wild Turkey (*Meleagris gallopava*):

Carpal metacarpal	1 right distal

Ruffed Grouse (*Bonasa umbellus*):

Sternum fragment	1

Unidentified bird

Femur fragment	1 proximal

Deer Toe mussel (*Truncilla truncatta*):

Valve	1 right

APPENDIX C

Volumetric Data on Levels

Excavation unit	Unit size m	Vol.* m^3	Bone wt. g	g/m 3
A	2x2	1.6	20.97	13.11
B	2x2	1.6	26.80	16.75
C	2x2	1.6	24.67	15.42
D	2x2	1.6	2.39	1.49
E	2x2	1.6	5.20	3.25
G	2x2	1.6	1.73	1.08
H	2x2	1.6	2.05	1.28
I	2x2	1.6	.50	.31
J	2x2	1.6	22.74	14.21
K	2x2	1.6	46.07	28.79
L	2x2	1.6	.88	.55
M	2x2	1.6	11.30	7.06
N	2x2	1.6	131.72	82.32
N(ext. W)	2x .5	.4	4.24	10.60
N(ext. S)	2x .7	.56	38.19	68.20
O	2x2	1.6	8.20	5.12
P	2x2	1.6	10.11	6.32
R	2x2	1.6	.32	.20
S	2x2	1.6	9.07	5.67
T	2x2	1.6	1.60	1.00
U	2x2	1.6	3.18	1.99
V	2x2	1.6	16.81	10.51
W	2x2.3	1.84	--	--

APPENDIX C continued

Volumetric Data on Levels

Excavation unit	Unit size m	Vol* m^3	Bone wt. g	g/m 3
X	1x2	.8	1.15	1.44
X(ext.E)	1x .3	.12	.93	7.75
Y	2x2	1.6	1.70	1.06
Z	2x2	1.6	56.42	35.26
AA	2x2	1.6	--	--
BB	2x2	1.6	.10	.06
CC	2x2	1.6	15.89	9.93
T.P.1	2x2	1.6	10.14	6.32
T.P.2	2x2	1.6	6.69	4.18
T.P.3	1x1	.4	--	--
T.P.4	1x1	Part of unit U		
T.P.5	1x1	.4	--	--
T.P.6	1x1	Part of Unit R		
T.P.7	1x1	.4	--	--
T.P.8	1x1	.4	--	--
T.P.9	1x1	.4	--	--
T.P.10	1x1	.4	--	--
T.P.12	1x1	.4	1.82	4.55
T.P.13	1x1	.4	3.39	8.47
T.P.14	1x1	.4	5.54	13.85
T.P.15	1x1	.4	.74	1.85
T.P.16	1x1	.4	--	--

APPENDIX C continued

Volumetric Data on Levels

Excavation unit	Unit size m	Vol m^3*	Bone wt. g	g/m 3
T.P.17	1x1	.4	--	--
ext. of unit D & E	1x1.3 x.25	.325	--	--
Total		52.045	493.25	

*Volume assumes an excavation depth of 40 cm.

APPENDIX D

Volumetric Data on Features[1]

Feature	Type	Dia. cm	Depth cm	Vol. m^3	Bone wt. g	g/m^3	Flot. l	
1	A	130	82	1.001	455.49	455.03	105.5	
2	B	104	18	.112	.87	7.77	16	
3	irregular	70	20	.068	1.07	15.73	12	possible Archaic
4	A	128	72	.809	102.81	127.08	32	
5	B	82	24	.113	137.31	1215.31	8	
6	B	100	25	.164	4.24	25.85	12	
7	not dug				1.72			
8	D	120	65	.735	208.45	283.60	30	
9	non-feature							
10	not dug	connected to F13 nature questionable						
11	B	50	20	.040	3.34	83.50	8	
12	A	110	74	.667	36.70	55.02	22	
13	irregular	90	20	.122	.81	6.64	12	
14	C	80	35	.190	.32	1.68	8	ambiguous
15	C	92	35	.235	.03	.13	12	
16	C	108	55	.423	115.72	273.57	18	
17	A	140	86	1.203	15.81	13.14	14	
18	not dug							

[1] The volumes used here are an approximation of the amount of dirt fill from which archaeological materials have been isolated. It is used to calculate the densities of a particular class of data in order to allow for direct comparisons between features irregardless of different sizes (volumes). The volumes have been estimated by use of formulae developed by William Cremin (personal communication) and are not meant to measure the absolute or real volume, but only to furnish an estimate for the purpose of calculating densities.

APPENDIX D Continued

Feature	Type	Dia. cm	Depth cm	Vol. m^3	Bone wt. g	g/m^3	Flot.[1]	
19	B	70	25	.094	---	---	6	
20	C	170	58	1.256	3.41	2.71	20	
21	non-feature							
22	A	110	65	.552	91.21	165.23	22	
23	A	190	90	2.080	672.96	323.54	26	
24	A	110	65	.552	44.03	79.76	24	
25	A	140	95	1.391	61.91	44.51	24	
26	A	188	65	1.732	378.79	218.70	20	
27	Hearth	138	20	.207	.58	2.80	18	Early Woodland
28	not dug							
29	deep pit	160	70	1.523[2]	---	---	--	Early Woodland
30	not dug				3.85			
31	C	140	60	.988	51.07	51.69	--	
32	not dug							
TOTALS				16.257	2394.91		469.5	

[2] Does not include part of feature in squares Z, AA, BB

APPENDIX E Faunal Level Associations

Unit designator	A	B	C	D	E	G	H	I
Lake Sturgeon	4 2.88	15 3.51	4 .49					
Channel Catfish								
Unident. fish								
Elk								
White-tailed deer								
Beaver	5 7.09	1 8.80			1 1.07			
Canis sp.								
Woodchuck								
Muskrat								
Sciurus sp.								
Small rodent								
Deer Antler								
Unident. mammal	1 .21	1 1.13	2 9.09		1 .07			
Snapping turtle								
Softshell turtle								
Box turtle								
Blanding's turtle								
Map turtle								
Painted turtle								
Unident. turtle	2 .25	9 3.66	3 1.28	2 .72	5 .82	2 .40	4 .64	
Wild Turkey								
c.f. Ruffed Grouse								
Unident. bird								
Truncilla truncatta								
Unident. mussel						3 .12		
Gastropods							11 1.04	3 .24
Unident. Bone	18 10.54	47 9.70	36 13.81	5 1.67	20 3.24	3 1.21	1 .37	2 .26
TOTAL	30 20.97	73 26.80	44 24.67	7 2.39	27 5.20	8 1.73	16 2.05	5 .50

APPENDIX E Faunal Level Associations

Unit designator	J	K	L	M	N	N EXT.W	N EXT.S	O
Lake Sturgeon	6 1.02	6 .72	1 .08	4 1.71	10 1.57	1 .19	2 1.46	23 2.57
Channel Catfish								
Unident. fish								
Elk		1 37.33						
White-tailed deer		1 .29		2 2.00	11 34.74			
Beaver	2 1.47				4 14.28			
Canis sp.								
Woodchuck	1 .31							
Muskrat								
Sciurus sp.								
Small rodent								
Deer Antler							4 28.01	
Unident. mammal		1 1.02			4 7.21			
Snapping turtle					7 8.65			
Softshell turtle					1 .20		1 .10	
Box turtle								
Blanding's turtle	1 2.09				1 3.05			
Map turtle								
Painted turtle		1 .10						
Unident. turtle	6 1.36	6 1.15	1 .31	9 2.42	39 10.48	10 2.84	5 .92	11 .94
Wild turkey								
c.f. Ruffed Grouse					1 .31			
Unident. bird								
Truncilla truncatta								
Unident.mussel					9 14.85			
Gastropods							1 .15	2 .09
Unident. Bone	74 16.49	17 5.46	4 .49	19 5.17	113 36.39	6 1.21	16 7.55	45 4.60
TOTAL	90 22.74	33 46.07	6 .88	34 11.30	200 131.72	17 4.24	29 38.19	81 8.20

APPENDIX E Faunal Level Associations

Unit designator	P	S	T	U	V	X	X EXT.E	Y
Lake Sturgeon	2 .26	3 .36			6 .88			1 .34
Channel Catfish								
Unident. fish					1 .51			
Elk								
White-tailed deer								
Beaver	1 .73	1 .36					9 .86	
Canis sp.								
Woodchuck								
Muskrat								
Sciurus sp.								
Small rodent								
Deer Antler								
Unident. mammal					1 1.81			
Snapping turtle								
Softshell turtle								
Box turtle								
Blanding's turtle								
Map turtle								
Painted turtle								
Unident. turtle	2 .23	18 .99	1 .12		4 .55	2 .39		1 .13
Wild Turkey								
c.f. Ruffed Grouse								
Unident. bird								
Truncilla truncatta								
Unident. mussel								
Gastropods								
Unident. Bone	21 8.89	33 5.28	5 1.48	6 2.94	30 13.06	6 .76	1 .07	5 1.23
TOTAL	26 10.11	59 9.07	6 1.06	6 2.94	42 16.81	8 1.15	10 .93	7 1.70

APPENDIX E Faunal Level Associations

Unit designator	Z	BB	CC	T.P. 1	T.P. 2	T.P. 4	T.P. 6	T.P. 12
Lake Sturgeon	4 .80			2 .39	2 .16			1 .40
Channel Catfish								
Unident. fish				1 .15				
Elk								
White-tailed deer				1 1.09				
Beaver								
<u>Canis</u> sp.								
Woodchuck								
Muskrat								
<u>Sciurus</u> sp.								
Small rodent								
Deer Antler	1 19.26							
Unident. mammal			1 1.51	1 4.81				
Snapping turtle								
Softshell turtle								
Box turtle	11 11.53		29 14.38					
Blanding's turtle								
Map turtle								
Painted turtle								
Unident. turtle				3 .71	6 .80			
Wild Turkey								
c.f. Ruffed Grouse								
Unident. bird								
<u>Truncilla truncatta</u>								
Unident. mussel	7 20.24							
Gastropods								
Unident. Bone	13 4.59	1 .10		15 2.99	20 5.73	1 .24	2 .32	5 1.42
TOTAL	36 56.42	1 .10	30 15.89	23 10.14	28 6.69	1 .24	2 .32	6 1.82

APPENDIX E Faunal Level Associations

Unit designator	T.P. 13	T.P. 14	T.P. 15
Lake Sturgeon		1 .18	
Channel Catfish			
Unident. fish			
Elk			
White-tailed deer			
Beaver			
Canis sp.			
Woodchuck			
Muskrat			
Sciurus sp.			
Small rodent			
Deer Antler			
Unident. mammal		1 2.60	
Snapping turtle			
Softshell turtle			
Box turtle			
Blanding's turtle			
Map turtle			
Painted turtle			
Unident. turtle		3 1.55	
Wild Turkey			
c.f. Ruffed Grouse			
Unident. bird			
Truncilla truncatta			
Unident. mussel			
Gastropods			
Unident. Bone	4 3.39	13 1.21	2 .74
TOTAL	4 3.39	18 5.54	2 .74

APPENDIX F Faunal Feature Associations

Feature	F1	F1 (flot)	F2	F3	F4	F4 (flot)	F5	F6
Lake Sturgeon	180 50.29	197 18.36	1 .51		22 5.65		58 19.24	7 1.35
Channel Catfish								
Freshwater Drum		1 .08						
Unident. fish	3 .32	15 .24						
Elk					1 2.95			
Black Bear								
White-tailed deer	10 106.72				1 10.28			
Beaver	4 2.53							
Canis sp.					1 14.89			
Woodchuck								
Muskrat	2 .55							
Sciurus sp.		1 .05						
Small rodent								
Deer Antler	30 38.66						9 98.70	
Unident. mammal	17 24.73	11 2.05		2 1.02	9 10.88		3 3.86	
Snapping turtle	4 3.90							
Softshell turtle		1 .05						
Box turtle	111 68.80							
Blanding's turtle	1 2.09						1 8.70	
Map turtle								
Painted turtle					1 .15			
Unident. turtle	176 49.00	121 4.47			7 2.43	2 .08	11 2.38	
Wild Turkey								
Unident. bird							1 1.10	
Truncilla truncatta	1 17.67							
Unident. mussel								
Unident. Bone	380 37.78	3141 27.15	3 .36	3 .05	88 19.96	355 1.53	22 3.33	14 1.70
TOTAL	919 403.04	3488 52.45	4 .87	5 1.07	145 101.20	357 1.61	82 137.31	21 3.05

APPENDIX F Faunal Feature Associations

Feature	F6 (flot)	F7	F8	F8 (flot)	F11	F12	F12 (flot)	F13
Lake Sturgeon	2 .26	2 .81	461 149.58	452 10.19	9 .72	37 7.20		
Channel Catfish			5 2.78					
Freshwater Drum								
Unident. fish	12 .09			1 .01				
Elk								
Black Bear						3 14.85		
White-tailed deer			2 4.27			1 5.56		
Beaver						1 .04		
<u>Canis</u> sp.								
Woodchuck								
Muskrat								
<u>Sciurus</u> sp.			1 .19	5 .35				
Small rodent								
Deer Antler								
Unident. mammal			3 10.63	6 .10		1 .87		
Snapping turtle								
Softshell turtle								
Box turtle			18 14.30					
Blanding's turtle								
Map turtle								
Painted turtle								
Unident. turtle		1 .65	39 3.56	5 .21	10 1.86	14 1.89	4 .14	1 .81
Wild Turkey								
Unident. bird								
<u>Truncilla</u> <u>truncatta</u>								
Unident. mussel								
Unident. Bone	74 .84	5 .26	67 4.45	353 7.91	7 .76	40 5.38	50 .77	
TOTAL	88 1.19	8 1.72	596 189.68	822 18.77	26 3.34	106 35.79	54 .91	1 .81

APPENDIX F Faunal Feature Associations

Feature	F14	F14 (flot)	F15 (flot)	F16	F16 (flot)	F17	F17 (flot)	F20
Lake Sturgeon				5 1.05	7 .14	6 .89		
Channel Catfish								
Freshwater Drum								
Unident. fish				1 .01				
Elk								
Black Bear								
White-tailed deer								
Beaver						4 3.19		
Canis sp.								
Woodchuck								
Muskrat								
Sciurus sp.								
Small rodent								
Deer Antler				13 108.63				
Unident. mammal						3 .83		1 2.37
Snapping turtle								
Softsheil turtle								
Box turtle								
Blanding's turtle								
Map turtle								
Painted turtle								
Unident. turtle						27 5.77		
Wild Turkey								
Unident. bird								
Truncilla truncatta								
Unident. mussel				8 5.04				
Unident. Bone	1 .27	11 .05	5 .03	2 .21	42 .64	54 5.39	3 .04	3 .86
TOTAL	1 .27	11 .05	5 .03	28 114.93	50 .79	94 15.77	3 .04	4 3.23

APPENDIX F Faunal Feature Associations

Feature	F20 (flot)	F22	F22 (flot)	F23	F23 (flot)	F24	F24 (flot)	F25
Lake Sturgeon		18 7.21	6 .26	310 114.95	23 1.90	72 12.27		30 5.36
Channel Catfish								
Unident. fish			1 .06	8 6.98		1 .22		
Elk								
Black Bear								
White-tailed deer		1 20.75		7 43.26				
Beaver		14 40.38		10 7.23		1 2.16		
Canis sp.								
Woodchuck								
Muskrat						2 .31		1 .25
Sciurus sp.								
Small rodent				1 .08				
Deer Antler				4 226.73		1 5.70		
Unident. mammal		12 11.87		22 21.53		2 5.44		7 5.25
Snapping turtle				4 2.66		1 .43		
Softshell turtle				1 .27				
Box turtle				28 68.48				9 34.01
Blanding's turtle				2 1.18				1 1.29
Map turtle				2 6.66				
Painted turtle				3 .77				
Unident. turtle		9 1.53		421 85.45	43 1.98	24 3.04	4 .22	26 2.84
Wild Turkey		1 .80						
Unident. bird								
Truncilla truncatta								
Unident. mussel			1 .03	2 .39		1 .14	1 .01	19 .70
Unident. Bone	1 .18	40 7.61	17 .71	276 50.49	365 2.22	83 13.76	21 .33	64 10.90
TOTAL	1 .18	95 90.15	25 1.06	1100 666.86	431 6.10	188 43.47	26 .56	157 60.60

APPENDIX F Faunal Feature Associations

Feature	F25 (flot)	F26	F26 (flot)	F27	F28	F30	F31
Lake Sturgeon	5 .56	147 25.44	14 .48		2 .26	5 1.07	62 42.54
Channel Catfish							
Unident. fish			1 .01				
Elk							
Black Bear							
White-tailed deer		3 14.52					
Beaver		1 3.29			1 .34	1 2.67	
Canis sp.							
Woodchuck		2 .26	1 .05				
Muskrat		3 1.03					
Sciurus sp.							
Small rodent							
Deer Antler		3 251.61					
Unident. mammal		21 37.77					
Snapping turtle		1 .34					
Softshell turtle							
Box turtle		2 .13					5 3.85
Blanding's turtle		1 3.93					
Map turtle							
Painted turtle							
Unident. turtle	6 .49	56 15.58	8 .30	5 .50	2 .18		14 1.45
Wild Turkey							
Unident. bird							
Truncilla truncatta							
Unident. mussel		3 1.06					
Unident. Bone	86 .68	180 21.46	101 1.53	1 .08	5 1.63	1 .11	55 3.23
TOTAL	97 1.73	423 376.42	125 2.37	6 .58	10 2.41	7 3.85	136 51.07

APPENDIX G

Radiocarbon Ages for Sites Discussed

Allegan Dam	
740 ± 100 years: A.D. 1210	(Crane and Griffin 1972)
640 ± 100 years: A.D. 1310	(Crane and Griffin 1972)
735 ± 60 years: A.D. 1215	(UGa-2629)
Elam	
2540 ± 65 years: 590 B.C.	(UGa-2630)
685 ± 85 years: A.D. 1265	(UGa-2631)
Schwerdt	
550 ± 70 years: A.D. 1445	(UGa-1725)
500 ± 120 years: A.D. 1450	(UGa-1726)
Moccasin Bluff	
890± 110 years: A.D. 1060	(Crane and Griffin 1970)
860 ± 110 years: A.D. 1090	(Crane and Griffin 1970)
800 ± 110 years: A.D. 1150	(Crane and Griffin 1970)
360 ± 100 years: A.D. 1590	(Crane and Griffin 1970)
310 ± 100 years: A.D. 1640	(Crane and Griffin 1970)
Griesmer	
430 ± 130 years: A.D. 1520	(Faulkner 1972)
420 ± 130 years: A.D. 1530	(Faulkner 1972)

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