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LATE PALEO-INDIAN ACTIVITY AT THE LUBBOCK LAKE SITE

by

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ABSTRACT

Excavations at Lubbock Lake (41LU1), Southern High Plains of Texas, revealed the presence of a complex, late Paleo-Indian feature containing a camping area and bison (*Bison antiquus*) kill/butchering locale. The feature is found within a cienega or marsh deposit and dates from 8300 to 8600 years. At least two camping episodes are indicated, separated by the kill/butchering event. Camp debris consists of a projectile point midsection, unifacial and bifacial tools, and flakes. Faunal debris includes remains of butchered pronghorn antelope, rabbits, ducks, grouse, and turtles. The kill/butchering locale contains remains of four bison and three fetuses, a bone expediency tool, a reworked projectile point base, unifacial butchering tools, and flakes. Projectile points, other lithic tools, and age of the feature indicate a Firstview occupation. From faunal and geologic data, site environs are reconstructed as a marshlands rimmed by a narrow border of wet meadows grading into a mixed grass prairie. Although several late Paleo-Indian kill/butchering locales are known on the Southern High Plains, this feature is the first late Paleo-Indian camp.

INTRODUCTION

Numerous Paleo-Indian localities are reported on or near the Southern High Plains (Llano Estacado) in eastern New Mexico — western Texas (Fig. 1). The majority of these sites occur in the various draws that traverse and form the drainage system for the Llano Estacado. Perhaps the most famous Paleo-Indian locality for this geographic region is the Clovis site, Blackwater Draw Locality No. 1 (Hester 1972). A "sister site" to this locality in

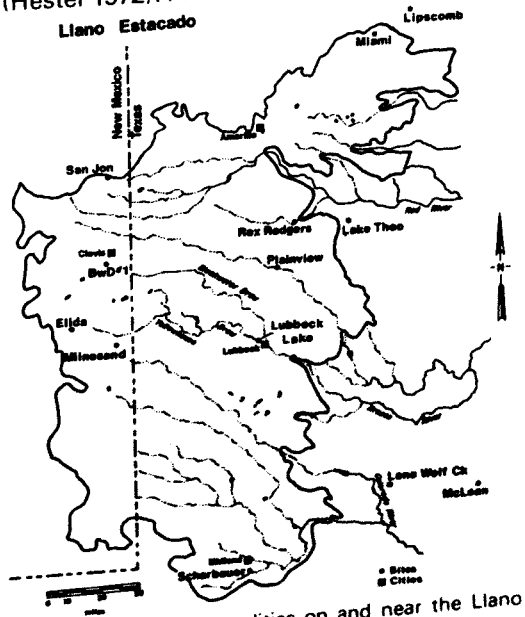

Fig. 1. Paleo-Indian localities on and near the Llano Estacado.

Lubbock Lake, situated in an old meander bend of Yellowhouse Draw on the northern outskirts of the City of Lubbock, Texas (Fig. 1). Blackwater and Yellowhouse draws join in the City of Lubbock, forming Yellowhouse Canyon which is a tributary of the Brazos River.

Lubbock Lake, long known as a Paleo-Indian locality (Sellards 1952; Black 1974), records in its stratified deposits a complex cultural, faunal, and geological history covering the past 12,000 years. This complex sequence, at least for the Paleo-Indian period, is similar to that known for Blackwater Draw Locality No. 1 (Johnson 1976; Hester 1972).

During the past eight years, The Museum of Texas Tech University has been conducting intensive excavations at the site. Primary excavation emphasis of the Lubbock Lake Project has been within Paleo-Indian deposits, although testing efforts also are conducted within more recent time periods. Numerous activity areas dating from 8,000 to 12,000 years have been located, most representing either kill/butchering locales or processing stations.

A stratified geocultural sequence of activity areas is being uncovered in one particular part of the site (Area 6) that represents Clovis to late Paleo-Indian occupations (Fig. 2). The activity area at the top of the sequence is designated feature FA6-3 (Fig. 3). Approximately 100 square meters have been opened into the activity area. The known western boundary is an arbitrary one, created by 1930s dredging operations that revealed the buried site (Holden 1974).

PHYSICAL SETTING

Five general geologic units are identified and described at the site (Stafford 1977, 1978). The Paleo-Indian sequence is contained in strata 1 (12,000 to 11,000 years) and 2 (11,000 to 8,000 years). Late Paleo-Indian material is found in upper stratum 2 (substratum 2C).

Stratum 2 contains exclusively lacustrine and marsh sediments, reflecting downstream damming of the drainage and a reduction in available moisture through time. The basal member (substratum 2A) consists of laminated diatomite and clays and diatomaceous earth.

A massive unlaminated diatomaceous earth unit (substratum 2B) conformably overlies 2A. This unit represents a change in sedimentation within the lake basin whereby higher amounts of silt and clay were deposited relative to diatomite. The homogeneity of the unit also indicates water turbulence which prevented development of or destroyed bedding.

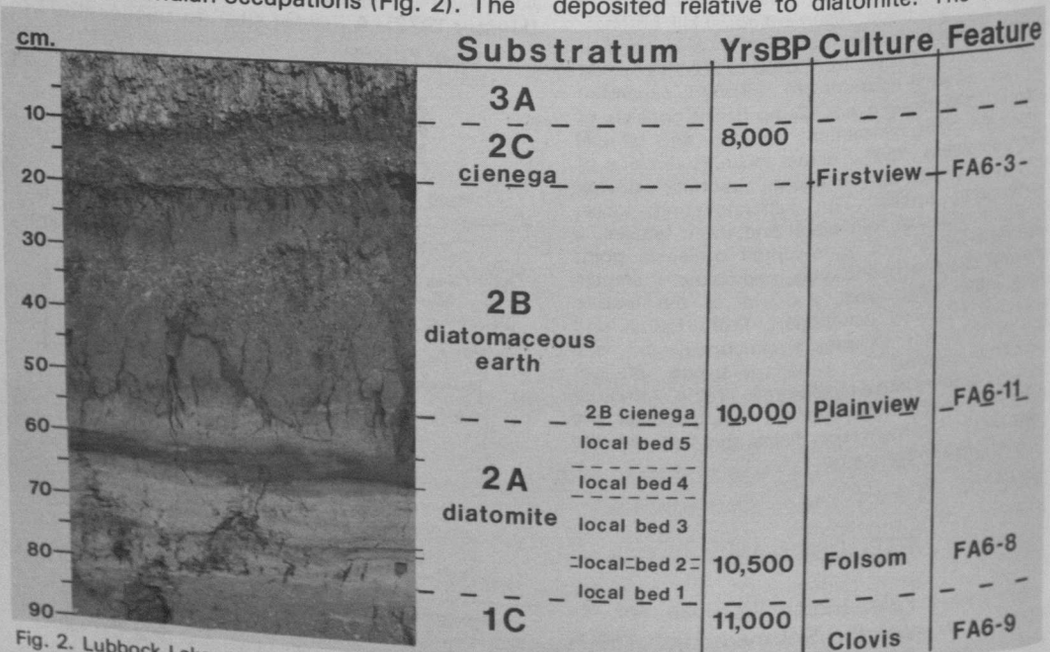

Fig. 2. Lubbock Lake stratum 2 microstratigraphy and cultural sequence.

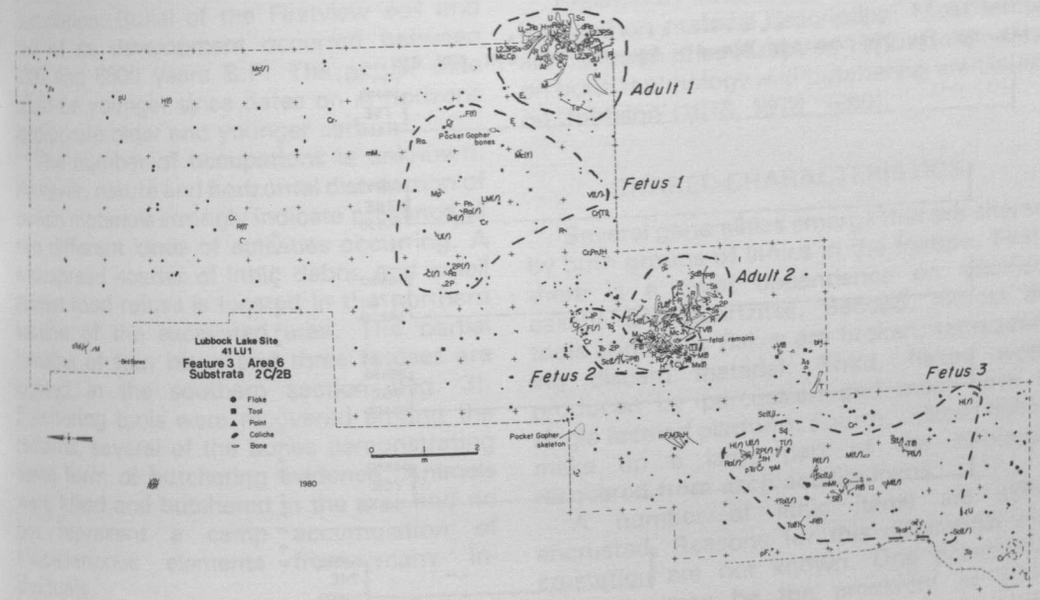

Fig. 3. Feature map of FA6-3, a Firstview camp and bison kill/butchering locale complex, Lubbock Lake.

Continuing silt and clay deposition decreased the pond's relief until water was shallow enough to permit widespread growth of aquatic and semiaquatic plants, forming a cienega or springfed marsh (substratum 2C). This cienega generally represents the termination of stratum 2.

Substratum 2C also is identified as the Firstview soil, the oldest in a sequence of buried soils identified at the site (Holliday and Allen, in press). The soil is characterized by a highly organic A horizon. The zone is dark grayish brown (10YR3/2, moist) and ranges from a silty clay to clay loam. It overlies a C horizon of diatomaceous earth (substratum 2B).

Cultural material is located near the base of substratum 2C and at the 2C/2B contact. Discovery of the feature in this position indicates that, at times, ground surface was stable and dry enough to support occupation. Presence of the material also indicates that this period (or periods) of surface stability occurred at the termination of 2B deposition or early in cienega development. An obvious surface at the 2B/2C contact is lacking. Cienega development probably destroyed the evidence.

A vertical distribution plot of lithic material (Fig. 4) demonstrates occasional placement differences within a unit or adjacent units, however, there is a single clustering of material along the contact. The plot clearly shows the north-south incline of the paleosurface and southerly increasing concentration of materials. This situation indicates that the main activity area was on more southerly, higher ground.

CHRONOLOGY

Eight radiocarbon dates (humate fractions) are available from upper substratum 2B and substratum 2C (Table 1). The feature pro-

Table 1. Lubbock Lake Radiocarbon Dates from Contact 2B/2C and Substratum 2C

Stratigraphic Location	Radiocarbon Dates
FA6-3	8655 ± 90 years B.P. (SI-4177) 8095 ± 230 years B.P. (SMU-827)
2B/2C contact	8300 ± 300 years B.P. (SMU-830) 7890 ± 100 years B.P. (SMU-302)
lower 2C	7970 ± 70 years B.P. (SMU-262)
middle 2C	7255 ± 75 years B.P. (SI-3204)
upper 2C	6705 ± 95 years B.P. (SI-4178) 6400 ± 80 years B.P. (SMU-544)

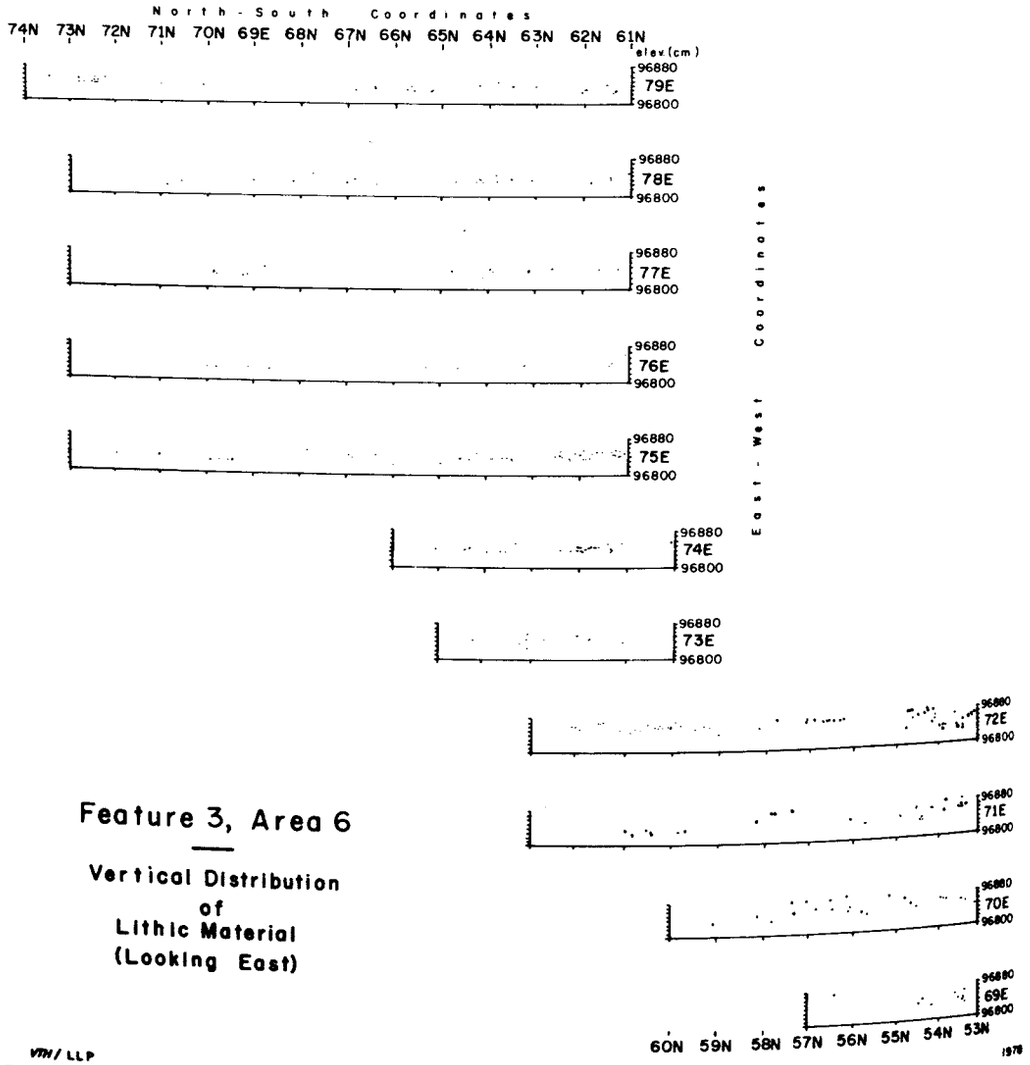

Fig. 4. Vertical distribution plot of lithic material from feature FA6-3, showing north-south incline of paleosurface.

duced dates of 8655 ± 90 years B.P. (SI-4177) and 8095 ± 230 years B.P. (SMU-827). The 2B/2C contact at the top of feature FA6-3 dated at 8300 ± 300 years B.P. (SMU-830); on the eastern side of the site, the contact yielded a date of 7890 ± 100 years B.P. (SMU-302). A date from lower 2C on the eastern side assayed at 7970 ± 70 years B.P. (SMU-262); middle 2C, from a trench 120 meters west of Area 6, dated at 7255 ± 75 years B.P. (SI-3204). Uppermost 2C provided dates of 6705 ± 95 years B.P. (SI-4178) in Area 6 and 6400 ± 80 years B.P. (SMU-544) from a trench 170 meters northwest.

There is some variation and apparent reversals in the dates. Considering the time transgressive nature of 2C and distribution of the samples within the site, the sequence of dates is acceptable. Termination of 2B deposition ranges from about 8000 to 8600 years B.P. while dates on initiation of 2C development (Firstview soil) range from about 8000 to 8300 years B.P.

Since cienega formation postdates the cultural activity, feature FA6-3 dates from the period 8300 to 8600 years B.P. The dates coincide with the archaeological evidence for the feature representing a late Paleo-Indian occupation. Burial of the Firstview soil and end of its development occurred between 6300 and 6800 years B.P. The actual date could be younger since dates on A horizons incorporate older and younger carbon.

The number of occupations is unknown. However, nature and horizontal distribution of certain materials strongly indicate presence of two different kinds of activities occurring. A widespread scatter of lithic debris and small animal food refuse is located in the northern section of the excavated area. The partial remains of four bison and three fetuses are located in the southern section (Fig. 3). Butchering tools were recovered among the remains, several of the bones demonstrating some form of butchering evidence. Animals were killed and butchered in the area and do not represent a camp accumulation of miscellaneous elements from many individuals.

While these two activities may represent adjacent, contemporaneous loci of the main camp, they also could represent seasonal use of the area or different use of the area over a long period of time. From the attempt to separate the butchering locale, it appears that possibly three occupations had taken place (two camping events and the kill).

METHODOLOGY

Materials recovered from feature FA6-3 are discussed as coming from either camping debris or the butchering locale. Separation of the two was not always clear as neither horizontal nor vertical lines could be drawn to delineate sharply the butchering locale. Lithic material occurs both above and below what was considered the butchering level. Changing ground surface had to be considered.

Clustering of bone from various individual bison were considered separately and material in and around them initially placed in the butchering locale. Elevation ranges were established for each bone cluster. Material occurring outside a cluster range was considered camp debris. Undoubtedly, there is some error in this somewhat arbitrary separation. However, most butchering tools come from within bone clusters. Furthermore, this separation allows an analysis of the feature in terms of possible behavioral patterns represented.

Preliminary lithic analysis of feature FA6-3 is based on material description. Most terms are common ones (Crabtree 1972). Comments on bone technology and butchering are based on Johnson (1976, 1978, 1980).

SHARED CHARACTERISTICS

Several generalities emerge that are shared by both groups of lithics in the feature. First, there is a great dependence on silicified caliche and quartzites. Second, almost all tools and many flakes are broken, representing discard material. Third, flakes were produced by percussion and most have a single faceted platform. Fourth, utilized flakes make up a large part of the debitage recovered from each activity locus.

A number of lithic items are silica encrusted. Reasons for this differential encrustation are not known. One possibility, however, may be the proximity of lithic materials to marsh plants whose roots were silicified. Substratum 2C is rich in silica.

Another unusual situation is the use of caliche for tools. Caliche, at best, is a poor resource and difficult if not impossible to flake. However, flake scars and shaping are evident on several items. This material now is so soft that washing can obliterate flake scarring. A tenable hypothesis is that indurated caliche, exposed in local outcrops, was used as a resource material. The wet, acidic environment of the cienega could have softened the calcium carbonate of the stone (C.C. Reeves Jr., personal communication).

ACTIVITY AREA

Excluding numerous, unmodified chunks/blocks of silicified caliche (burned and unburned), total lithic collection consists of 168 items. The majority of tools and debitage were placed in the camping debris, accounting for 83%, of recovered lithic material. Flakes and utilized flakes were the most numerous items, followed by cores and scrapers (unifacial tools). Some tools, such as the backed blade, appear to be for delicate, finishing work; others, such as the core-choppers, probably were for heavy duty tasks.

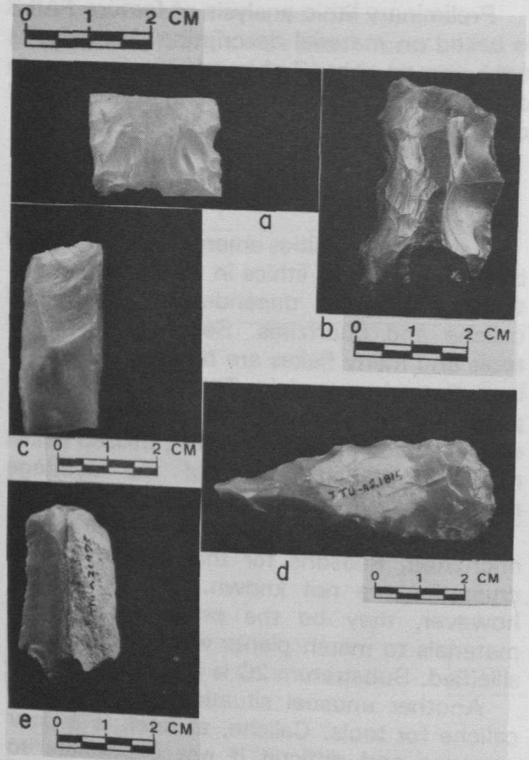

Fig. 5. Lithic tools from camping debris of feature FA6-3 complex. 5(a) projectile point midsection; 5(b) denticulate; 5(c) blade; 5(d,e) unifacial tools.

Camping Debris

A projectile point midsection (TTU-A7563) was recovered in the camping debris. Made from a chert of unknown source, the point is lenticular in cross section and approaches a median ridge. Flaking is irregular collateral (Fig. 5a). A broken, bifacially flaked, denticulate (TTU-A2980), Edwards Formation chert, is lenticular in cross section. It was reworked by removal of large flakes from the dorsal side, particularly along the left edge. This reworking produced a scalloped edge (Fig. 5b). Use damage flake scarring is apparent along both sides, with heaviest use on the right edge.

A broken backed blade (TTU-A15901), made from chalcedony, has steep angle retouch along both sides, with use damage flake scarring along the right edge (Fig. 5c). Lateral grinding produced the backing. A burin facet on the left edge may have occurred when the blade snapped. The blade continued to be used after the facet was removed since a few use damage flake scars crosscut it.

Scrapers (unifacial tools) are the most numerous tool type recovered. Most are broken and appear to be made on flakes. Ten flake scrapers for which shape can be determined are of different forms. Eight of these have their working edge along a side; one has a lateral and distal edge, and the last has a distal working edge. Of the total 17 scrapers recovered, 11 were made from chert, 3 from silicified caliche, 2 from quartzite, and 1 from caliche. A variety of cherts were used, Edwards Formation being the most common.

Scraper TTU-A7541 (Edwards Formation) has steep retouch along the sides, with heavy use wear along the left distal edge. Three scrapers (TTU-A13359, Potter chert; TTU-A19293, Tecovas chert; TTU-A19823, quartzite) have steep retouch along the left edge, with use damage flake scarring evident. Two others have steep retouch along the right edge; one (TTU-A13313, petrified wood) with heavy use flake scarring, the other (TTU-A21667, silicified caliche) having a minimal amount.

Scraper TTU-A22743 (silicified caliche) exhibits steep retouch along the left anterior border, with some use damage flake scarring. Another (TTU-A21976, Alibates chert) has a distal working end, with steep retouch and use damage flake scarring evident. Flake scraper TTU-A29553 (silicified caliche) exhibits steep retouch on the left lateral and distal ends, with use damage flaking along the distal end and left laterodistal corner.

Scraper TTU-A21815 (Edwards Formation) is triangularly shaped with retouch along the three edges (Fig. 5d). Neither bulb nor platform are present, evidently removed in retouch. The tool is steeply retouched along the posterior two-thirds of the left and right sides to the apex. These edges appear to have been dulled (crushed and rounded, particularly along the left edge), perhaps for hafting purposes.

The distal end and anterior one-third of the sides exhibit low angle retouch, along with heavy use damage flake scarring and edge crushing. Several large flakes were removed parallel to the working edge along the anterior half of the tool on the ventral border. A few smaller ones are perpendicular to this edge. This action apparently was taken in order to flatten the ventral side.

The one scraper (TTU-A7529) of caliche has several large flakes removed along the left edge. However, wear pattern is impossible to determine because of the nature of this material.

Six remaining scrapers are broken, distal ends. The Alibates specimen (TTU-A7623) has steep angle retouch along one edge, with heavy use damage flake scarring. Intense utilization also occurred along the opposite edge. Scraper TTU-A21975 (chalcedony) shows steep retouch along the distal end, with heavy use damage flake scarring, edge crushing, and rounding. It also exhibits intense utilization damage along the left side. Scraper TTU-A21814 (quartzite) has steep retouch along three adjacent edges on the ventral side. There is some edge crushing and use damage flake scarring.

Of the three scrapers made from Edwards Formation material, one (TTU-A7618) is a broken hinge flake that has retouch flakes removed along the center of the hinge, with use damage flake scarring. Another (TTU-A15935) demonstrates steep retouch along unbroken sides, with heavy use damage flake scarring along left and distal edges. The entire edge is scalloped, with worn and heavily used points. Scraper TTU-A15936 has steep retouch along right and distal edges and left distal corner; heavy wear is restricted to the distal end.

Sections of three bifaces and two unifaces were recovered. One of the bifaces (TTU-A15582) and a uniface (TTU-A13321), Edwards Formation chert, are small sections showing a few flakes removed. Biface TTU-A13306 (Alibates chert) is flaked along one edge, the opposite edge being cortex. More flakes were removed dorsally. Wear along the edge is lacking. Biface TTU-A7622 (silicified caliche) demonstrates several large flakes removed from both sides, creating a sinuous edge, but wear damage is lacking. Uniface TTU-A22771 is a chunk of silicified caliche that has a flat ventral surface. Several large flakes are removed along the lateral edges; wear damage is minimal.

Three core choppers were recovered, exhibiting minimal wear. Two cores are biconical (TTU-A7535, Potter chert; TTU-A13352, quartzite) and the third (TTU-A7625, quartzite) conical. The latter is a unidirectional core along one face. Two core choppers were made from cobbles which still retain cortex. A multidirectional core (TTU-A13070, Tecovas chert) exhibits utilization damage along an edge.

Six unmodified cores and a core segment also were located in the camping debris. Several are broken; core segment TTU-A13364 (Potter chert) is a section removed either to prepare or rejuvenate a core. Three cores (TTU-A7555, silicified siltstone; TTU-A7616, TTU-A29695, silicified caliche) are multidirectional ones; cores TTU-A13400 (quartzite) and TTU-A15998 (silicified caliche) are bidirectional. Core TTU-A7561 (chalcedony) is biconical in shape.

Eighty-five flakes were recovered, 26 of which were utilized. Additionally, 19 broken, distal ends of flakes were recovered, 7 of which were utilized. A variety of combinations of edges and sides were utilized, demonstrating use damage flake scarring. One combination did not appear preferential. Eight flakes were utilized along the right edge, four of which had scarring on the ventral side; five were utilized along the distal end; four on the left distal corner; and two on the left proximal corner.

Other combinations, represented by one specimen each, include utilization along the: left edge on ventral side; left edge and left distal hinge; left distal corner and right distal end of ventral side; left and right edges; and left and distal edges with reuse of broken (proximal) edges on ventral side. Shallow indentations were used as notches in two utilized flakes. Notches occurred along the left edge of one flake and along the ventral right proximal edge of a second.

Figure 6 summarizes various tabulations for both utilized flakes and utilized/unmodified flakes. In general for utilized flakes, tertiary flakes of silicified caliche were favored. Even when quartzites and cherts are grouped together, preference still is pronounced. Morphology appears to have played some part in flake selection for utilization, with rectangular and contracting ones selected more often. There is a pronounced preference for use of tertiary flakes over the other two categories, both with whole flakes (54%) and when data from broken pieces are included (55%). On the other hand, tertiary

flakes were more abundant (63%) so that opportunity for utilization was greater.

Within flakes as a whole, in addition to the high yield of tertiary flakes, preferred material is silicified caliche (45%). Although a variety of cherts are represented, emphasis is overwhelmingly (80%) nonchert resources. Morphological distribution shows a selection for rectangular and contracting flakes. Discoid flakes are least numerous. Although apparently not a desired flake shape, nevertheless, two of the three discoid flakes were utilized.

Percentage of utilization within shape varies. Discoid flakes have the highest percentage of use (66.6%). Other use percentages are: 38% for contracting flakes; 31% for ovoid and expanding forms; 27% for trapezoid; and 25% for rectangular ones.

Data can be manipulated in a variety of ways. The important aspect is that the material represents waste products, discards from the camp. Three preferences stand out: use of percussion techniques; selection of silicified caliche; and production of tertiary flakes.

Several features were noted on some flakes during initial sorting, the most common being hinge fracturing. Eleven flakes showed this feature, four of which are of silicified caliche. Five flakes (quartzite) are split flakes, broken perpendicularly through the bulb. One split flake also has a hinge fracture. One large core rejuvenation flake (quartzite) was found in two pieces (split flake), but treated as one in all tabulations except total number in collection. Lastly, two flakes, (quartzite and Edwards Formation chert) have adjacent, double bulbs of percussion.

These features were noted on flaking debris created during knapping experiments by Shafer (1973). His (1973:91-94) explanation

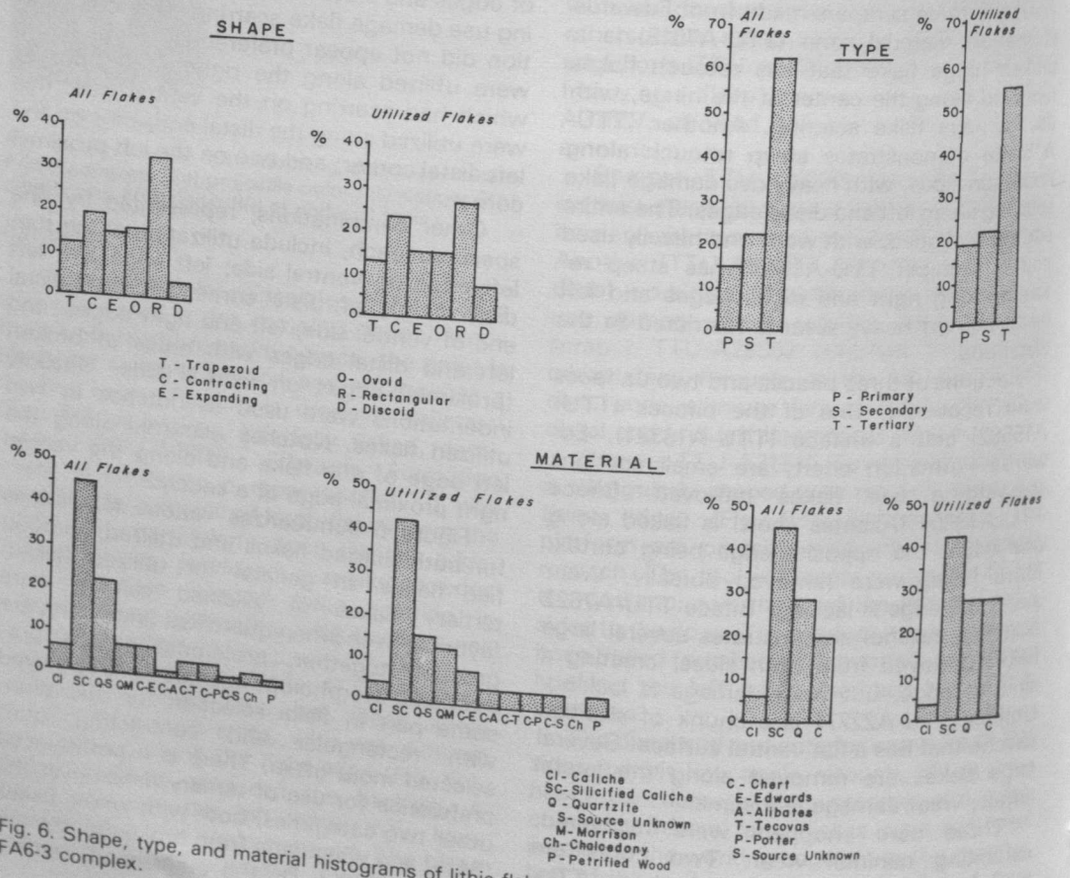

Fig. 6. Shape, type, and material histograms of lithic flakes and utlized flakes from camping debris of feature FA6-3 complex.

points out several items. One, features are characteristic of hard hammer percussion technique. Second, flakes of this nature were produced from large pebbles to small cobble sized cores. Third, the smaller the core, the greater effect cushioning (from the hand) has on the fracture pattern. This altered fracturing pattern results in hinged flakes.

The significance of these remarks points to the limited availability of lithic resources in large form and great use of small nodules of local caliche and Plio-Pleistocene river gravels as sources. On the other hand, they also suggest a conservation of lithic material since even chert cores are reduced to a very small size.

Remains from various game animals that were hunted and processed for food were recovered from the area of camping debris. These animals include: pronghorn antelope (*Antilocapra americana*), cottontail (*Sylvilagus* sp.), blacktail jackrabbit (*Lepus californicus*), mallard (*Anas platyrhynchos*), gadwall/pintail (*A. strepera* or *A. acuta*), teal (*A. discors* or *A. cyanoptera*), and prairie chicken/grouse (*Tympanuchus/Pedioecetes* or *Centrocercus*).

Only a few elements from each animal were recovered, as would be expected from a trash midden. Antelope remains bear cut lines and blow marks (Fig. 7); bones of other animals are broken in a standard pattern or burned. Turtles, particularly ornate box (*Terrapene ornata*), may have been a food source. Most shell material recovered is broken across suture lines.

Ducks and turtles provide some information on possible season of accumulation of camping debris. Mallards, gadwalls, pintails, and teals winter over in the Lubbock region today, available from August to May (Peterson 1963). Summers are the most active time for turtles, but at least box turtles can be found from March to November (Stebbins 1966).

Overlapping of available time periods suggests an early spring or late fall occupation, yet a summer activity cannot be ruled out. Ducks occasionally occur in the area during summer. Not enough data are available yet to determine this part of the occupational pattern and relationship between the activity loci.

Butchering Locale

Lithic material from the butchering locale (Fig. 3) is much less numerous than from the camp, accounting for 17% of the collection. This limited amount may be due in part to restrictions placed on determining which lithics belong to which locus. However, in comparing total number (29) of items to those recovered from other Paleo-Indian kill/butchering locales at the site, the amount is concordant, if not higher, with them. The majority of the tool assemblage consists of percussion flake scrapers (unifacial cutting tools) and utilized flakes.

Flake tools and unmodified flakes have single faceted platforms and were produced by hard hammer percussion. There is a variety of morphological shapes and wear patterns. These unstylized flake tools were utilitarian in nature, with function and ease of production the more important criteria.

Frison (1974:34) points out ". . . the choice of a cutting tool in communal bison butchering sites was mainly a large percussion flake tool that could be held securely in the hand, sharpened easily with a soft hammer, and discarded when no longer functional. There was a minimum of effort in manufacture and preparation. . ." Furthermore, "It was preferable to utilize tools that were nearly equally functional, less esthetic and upon which there was little investment in time and effort." Although speaking of Northern Plains mass kills, the concept is applicable as well to Southern Plains small kills.

Of the five scrapers recovered, one is a core scraper (TTU-A15939). It is a unidirect-

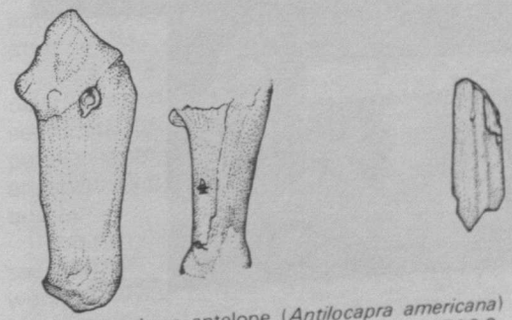

Fig. 7. Pronghorn antelope (*Antilocapra americana*) remains from camping debris of feature FA6-3: butchering blow mark and cut lines on calcaneum; metatarsal shaft exhibiting spiral fracture surfaces through controlled breakage from marrow processing.

tional core made from silicified caliche. Numerous hinge fractures along the left dorsal surface attest to flake removal attempts. Retouch appears along the left side with damage flake scarring, particularly along the left distal edge (Fig. 8a).

The rest are unifacial flake tools which show a variety of materials and wear patterns. One scraper (TTU-A15645, quartzite) has retouch and use damage flake scarring along three sides. Another (TTU-A19119, silicified caliche) has retouch and some use damage flake scarring along the left edge and a worn and rounded, scalloped right edge. Scraper TTU-A7542 (Alibates chert) was made on a hinge flake. It has steep retouch along the ventral right edge and use damage flake scarring (Fig. 8b). Use damage flake scars also are evident along the ventral distal end.

Scraper TTU-A2999 (chert of unknown source) is a contracting flake. It shows steep retouch along the right edge, with use damage flake scarring along the right side and left apex edge.

Two stylized lithic tools (Tecovas quartzite) were recovered in the butchering locale, a projectile point (TTU-A19285) and a knife (TTU-A13401). The projectile point is the basal section (Fig. 8c). It appears to have broken during manufacturing (H.M. Wormington, personal communication) and then reworked into a butchering tool. It has a slightly concave base with basal and lateral grinding and probably parallel sides.

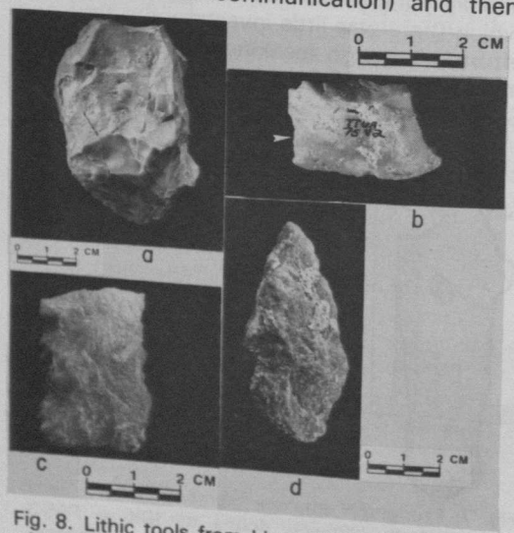

Fig. 8. Lithic tools from bison kill/butchering locale within feature FA6-3 complex. 8(a) unifacial cutting tool (core scraper); 8(b) unifacial cutting tool; 8(c) projectile point; 8(d) knife.

Both sides were resharpened into a scalloped edge. Scallop points are worn and some use damage flake scarring is evident, particularly along the right edge. Condition of this point is reminiscent of the treatment given Kersey points at the Jurgens site (Wheat 1976, 1979; Greiser 1977) when reused as butchering tools.

The knife, alternately beveled, with damage flake scarring along both edges, is subtriangular in shape, with a blunted proximal end (Fig. 8d). From its form, size, thickness, and shape, it was probably hafted.

Cultural affiliations are obscured by reworking of the point and possibly nature of material. However, use of Tecovas quartzite in manufacturing these stylized tools points out both the skill and craftsmanship of the group and their great dependence on locally available materials. The knife was recovered from adult bison #1 bone pile; the reworked point was located between fetal individuals #2 and #3 (Fig. 3).

Of the debitage recovered from the butchering locale (21), 16 are whole flakes, 5 of which are utilized. Generalizations are difficult with such a small sample size. A clear preference pattern was not noted other than use of tertiary flakes. The majority of flakes are either contracting or rectangular, but other common shapes also are represented. Silicified caliche, quartzites, and cherts are equally common. If broken pieces are considered (5), then cherts are more abundant (38%), Alibates in particular. However, three Alibates items are tiny resharpening debitage that may have come from the same tool.

Utilized flakes consist of two trapezoid and one each of contracting, ovoid, and rectangular forms. Most are from a different lithic source: silicified caliche, quartzite, and Alibates (2) and Potter cherts. Two flakes are utilized along the distal end. A third has use damage flakes removed along the distal end in alternate sections where shallow indentations were used as notches. Another flake exhibits use damage flake scarring along the ventral anterior left edge where an indentation was used. The contracting flake has an area of use damage flake removal along the left edge near the apex. Lastly, a broken section from a utilized flake has damage flake scarring along the working edge.

One bone expediency tool (TTU-A21523) was recovered (Johnson 1976, 1980). Made from an anterior border section of a left scapula (bison), several retouch flakes were removed from the anterolateral edge. Use damage flake scarring and some wear polish is evident (Fig. 9). This tool was located within piled elements of fetus #2 (Fig. 3).

Partial remains of four bison (*Bison antiquus*) and three fetuses were recovered from the exposed section of the butchering locale (Table 2). The semiarticulated forequarters of an adult, disarticulated elements of a second adult, and partial carcass of a fetus were placed in discrete piles. Other fetuses were disarticulated and spread across the surface (Fig. 3). None of the fetal material showed butchering damage in terms of cut lines or blow marks. However, carcasses probably were processed given context of recovery, associated butchering tools, and skeletal disarticulation.

Two juvenile bison are represented by two partial right scapulae within fetal grouping #3 and a few scattered elements (Table 2). One scapula has a blow mark at the base of the acromion along the neck region and both have the acromion and spine removed. This damage is the result of loosening attachments in removal of scapular muscles.

Bones from the adult carcasses show some butchering damage. In adult #1, the left ulna has a blow to the olecranon, an action which would have resulted in severing several shoulder and arm muscles. The left humeral shaft has a series of shallow, defleshing cut lines, resulting from muscle stripping. Blow marks appear at the base of vertebral spines, and spinal tips are broken. This type of damage is a result of loosening muscle attachments along transverse processes and removing the ligamentum nuchae. Mandibles were broken at the symphyseal surface; the left coronoid process was damaged. Damage of this type is a result of loosening facial muscle attachments and tongue removal (Johnson 1976, 1980).

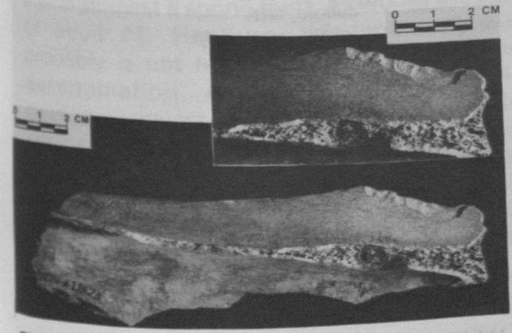

Fig. 9. Bone expediency tool from bison kill/butchering locale within feature FA6-3 complex. Closeup inset of retouch flaking.

The semiarticulated nature of the remains and minimal bone damage indicate an incomplete butchering process. Complete carcass resources (meat and byproducts) were not utilized, suggesting selectivity of meat cuts.

With adult #2, damage also is minimal but butchering of the major units (Johnson 1980) is indicated. The forequarter unit received the most attention (damage), with severing of shoulder and arm muscles. The major trochanter of the humerus was partially removed and sections along the head edge chunked out (blows to the area). Cut lines appear on the shaft below the head (meat stripping). The humerus was spirally fractured through controlled breakage, with part of the cancellous bone removed in marrow retrieval. The right scapula had the blade and spine removed through pounding. Blade and spine segments were found scattered through the concentration. The spine had been broken in four places during removal attempts.

Transverse processes of a cervical and caudal vertebra were damaged or removed; vertebral spine segments were located throughout the concentration. Pounding action along the spinal column loosened attachments for several neck and back muscles. Rib heads were damaged from disarticulation, shafts segmented, and some segments further split. Apex and borders of patellae were damaged in attempts to loosen encapsulating .hock joint ligaments (hindquarters).

The mandible was broken at the symphyseal surface. The ascending ramus and angle were removed through a series of vertical blows along the ramus below the M_3. Facial and neck muscles attach at the angle; removal also facilitates tongue extraction and exposes the marrow cavity below the tooth row.

Elements are disarticulated and at least one

Table 2. Inventory of Bone Concentrations in Firstview Bison (*Bison antiquus*) Kill/Butchering Locale (FA6-3), Lubbock Lake

Adult #1
mandibles, right and left
hyoid section

atlas
axis
cervical vertebrae (4)
lumbar vertebrae (2)

rib sections

scapula, left
humerus, left
radius, left
ulna, left
metacarpal, left
captitate-trapezium, left
unciform, left
scaphoid, left
carpal cuneiform, left
accessory carpal, left
articulated forefoot, phalanges and sesamoids, left

articulated foreleg, humerus to third phalanges, right

Adult #2
mandible, right
skull parts
hyoid section

cervical vertebrae (2)
thoracic vertebrae (4)
lumbar vertebra
caudal vertebra

rib and rib sections

scapulae, right and left
humerus, right
radius, right
ulna, right

acetabulum
tibiae, right and left
patellae, right and left
calcaneum, right
first tarsal, right and left
cubonavicular, left
femur, right

second phalanges, right and left
third phalanges, left (2)
metapodial section
sesamoids (8)

Calves
skull parts

scapulae, right (2)
metacarpal shaft

astragali, right and left

first phalange, left

Fetus #1
vertebra

humerus, right
radius, left
ulna, right
metacarpal, left

lateral malleolus, right

metapodial
second phalanges, right and left

Fetus #2
maxillae, right and left
mandibles, right (2) and left (2)
hyoid, left

cervical vertebrae (2)
thoracic vertebrae (8)
caudal vertebra

ribs

scapula, left
humeri, right and left

humeri, distal epiphyses, right and left
radii, right and left (2)
radii, distal epiphyses, right and left
ulnae, right and left
metacarpals, right and left
metacarpal, distal epiphysis, right
lunars, right and left
scaphoids, right and left
unciforms, right and left
carpal cuneiforms, right and left

pelves, right and left
femora, right and left
tibiae, right and left
tibiae, proximal epiphyses, right and left
tibiae, distal epiphysis, left
calcaneum, right
navicular, right
cuboid, left
fourth tarsal, right
metatarsal

sesamoids (4)
first phalange, left
second phalange, right

Fetus #3
skull parts

scapula, right
humeri, right and left
radius, right
ulna, right
scaphoid, right

pelvis, left
tibia, right

marrow processed. Rib segmentation suggests bone grease production (Bonnichsen 1973:11). However, this practice seems incongruous with leaving most marrow rich long bones intact. Processing selectivity is indicated.

Adult bison #1 was a female approximately 6 years old based on comparison with the Casper population (Reher 1974) and other independent studies (Koch 1934; Bedford 1974). Wear pattern on mandibular teeth fall within Reher's (1974:116) Group 6 (5.6 to 11.6 years). Aging schedule based on epiphyseal union (Koch 1934) indicates a closer approximate age of 6 years. Adult bison #2 also was a female within the Group 6 age range. Epiphyses are fused on recovered elements (Table 2) indicating an age of greater than 8 years (Koch 1934).

Adult bison #1 mandibles (TTU-A13048, TTU-A13449) measure 81 mm for mandibular width below the M_3, a measurement that falls within the female group of the Casper population (Reher 1974:117). Small metacarpal size agrees with a female determination. Adult bison #2 mandible (TTU-A37116) measures 72 mm, an estimate due to butchering damage.

The juvenile bison are calves, based on small size (postnatal) and comparison with known specimens. Fetuses were approximately the same age of 3/4 to near term (7 to 9 months). Presence of at least one more female bison within the locale is suggested by this recovered group of two females, two calves, and three fetuses.

Season of kill becomes a question when considering all bison slaughtered. Fetal remains suggest a spring hunt, as would the age of adult #1. However, this age estimate probably is not reliable to base a seasonal determination. Although Wilson (1974) cautions against using fetal remains in determining season of kill, it seems unlikely that of a few bison killed, three would be near delivery with out-of-season births. Sample size is too small and additional recovery of measurable and aged specimens are needed for further interpretation.

ENVIRONMENTAL RECONSTRUCTION

Faunal material is not restricted to game animals. All excavated sediment is water processed through a series of fine mesh screens in a modified operation developed by Guilday and McCrady (Guilday et al. 1964). All vertebrate classes have been recovered from feature concentrates. Analysis is preliminary since concentrate materials have not been separated into the two loci. Nevertheless, several statements can be made concerning faunal assemblage and environmental considerations.

Table 3 is a species list of vertebrates identified from feature FA6-3. Avifauna was identified by Amadeo Rea (in press), snake and lizard by Thomas Van Devender (University of Arizona). The rest of the fauna was identified by the senior author.

The fauna is almost a modern one. All but one of the animals either range in the Lubbock area today or did historically before intensive Anglo settlement. Bison chronospecies occupied the same niche and relationship in the assemblage as modern bison. Interpretation of presence and subsequent absence of the crake is difficult since so little is known about fossil distribution (Olsen 1974) and habitat parameters (other than a marshlands form). Preceding faunal assemblages at the site are composed of numerous extinct forms or animals which no longer range into the Lubbock area. This late Paleo-Indian fauna probably reflects the onset of modern climatic conditions (Johnson 1976, in press a).

Another situation reflected in the assemblage is the changing environs of the valley floor. Animals within the assemblage represent various habitats prevalent in the draw and point to an expanded mixed grasslands. Catfish inhabited shallow waters, while frogs, turtles, garter snakes, rails, and surface feeding ducks shared marsh and riparian wet meadows. Brushy areas in the grasslands are indicated by presence of mexican ground squirrels, woodrats, and cottontails. Grassland forms dominate the assemblage and denote, from cotton rats to bison, a mixed grass prairie. Along the waterway, the interconnected ponds of the immediately preceding period (Johnson 1976, in press a; Johnson and Holliday 1980) had given way to a widespread, shallow marsh.

From habitat and geological data, the environs and very general vegetational pattern can be reconstructed as a marshlands rimmed

Table 3. Species List, Feature FA6-3, Firstview Period, Lubbock Lake.

Mammalia	
Sylvilagus sp.	cottontail
Lepus californicus (Gray)	black-tailed jackrabbit
Spermophilus tridecemlineatus (Mitchell)	13-lined ground squirrel
Spermophilus mexicanus (Erxeleben)	mexican ground squirrel
Cynomys ludovicanus (Ord)	black-tailed prairie dog
Geomys bursarius (Shaw)	plains pocket gopher
Dipodomys ordi (Woodhouse)	Ord's kangaroo rat
Onychomys leucogaster (Weid)	northern grasshopper mouse
Sigmodon hispidus (Say and Ord)	hispid cotton rat
Neotoma cf. *micropus* (Baird)	southern plains wood rat
Neotoma cf. *albigula* (Hartley)	white-throated wood rat
Antilocapra americana (Ord)	pronghorn antelope
≠*Bison antiquus* (Leidy)	extinct bison
Aves	
Anas platyrhynchos (Linnaeus)	mallard
Anas strepera (Linnaeus) OR *A. acuta* (Linnaeus)	gadwall or pintail
Aves	
Anas cyanoptera (Vieilott) OR *A. discors* (Linnaeus)	cinnamon or blue-winged teal
**Tympanuchus cupido* (Linnaeus) OR *Centrocercus urophasianus* (Bonaparte)	prairie chicken or sage grouse
**Tympanuchus* OR *Pediocetes phasianellus* (Linnaeus)	prairie chicken or sharp-tailed grouse
Porzana carolina (Linnaeus)	sora
**cf. Laterallus exilis* (Temminick)	grey-brested crake
Agelaius phoeniceus (Linnaeus)	red-winged blackbird
Reptilia	
Kinosternon flavescens (Agassiz)	yellow mud turtle
Chrysemys scripta (Schoepff)	pond slider
Terrapene ornata (Agassiz)	ornate box turtle
Eumeces obsoletus (Baird and Girard)	great plains skink
Lampropeltis getulus (Linnaeus)	milk snake
Thamnophis cf. *sirtalis* (Linnaeus)	common garter snake
Amphibia	
Rana catesbeiana (Shaw)	bull frog
Rana pipiens (Schreber)	leopard frog
Pisces	
cf. *Ictalurus* spp.	catfish

*No longer occurs in the area
≠Extinct

by a narrow border of wet meadow grading into a mixed grass prairie (Fig. 10). Lastly, the assemblage reflects a changeover from the earlier Rolling Plains biotic encroachment to the modern biota of the eastern draws of the Llano Estacado (Johnson 1976, in press a; Johnson and Holliday 1980).

The fauna does not indicate the situation on the flat uplands. Uplands at this time were probably also a grasslands, but its distributional pattern and community associations would be different than those of the draw, if for no other reasons than topography and available water.

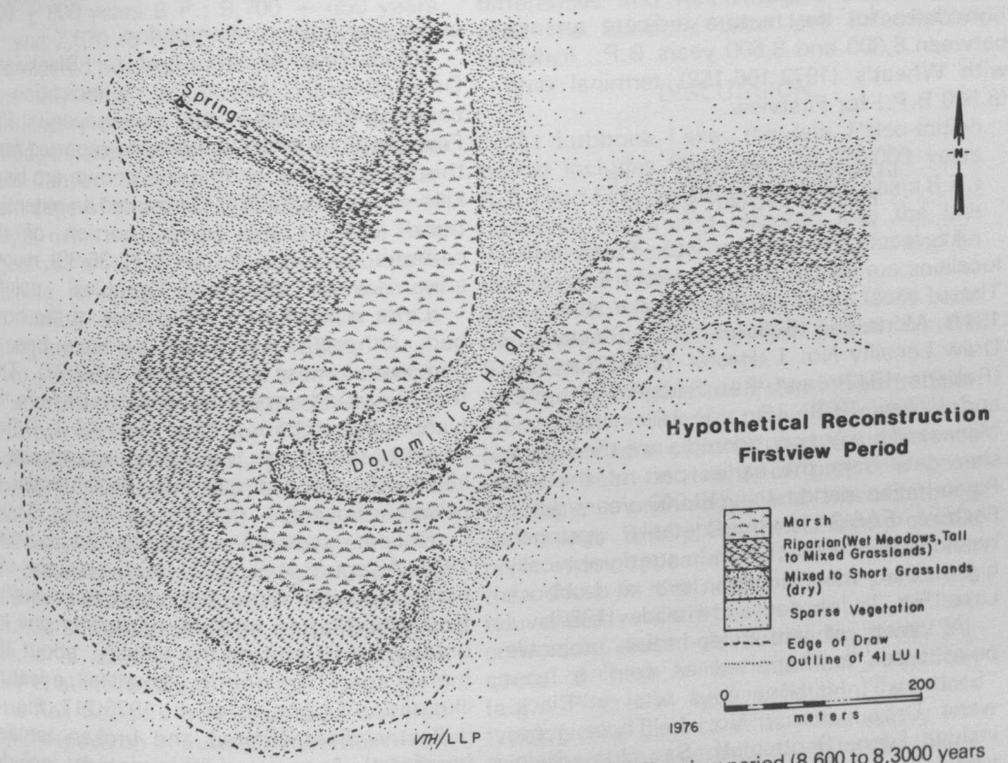

Fig. 10. Hypothetical reconstruction of Lubbock Lake environs during the Firstview period (8,600 to 8,3000 years B.P.).

Within the site area, different grassland habitats and their spatial relationship to the activity area are suggested by relative abundance of certain rodents. Further analysis of all substratum 2C concentrates may permit a more detailed reconstruction of the site area than the sweeping generalization of mixed grasslands in the valley floor.

CULTURAL AFFILIATIONS

The late Paleo-Indian (post-Folsom) period at Lubbock Lake dates from about 8,000 to 10,000 years ago. Specifically, feature FA6-3 is a manifestation of the Firstview culture (Wheat 1972). Assignment of this feature to the late Paleo-Indian period/Firstview culture is based on presence of certain diagnostic artifacts and geochronological and stratigraphic information.

Firstview culture, found on the Southern and Central Plains, is typified by Firstview points. Other material that define the culture include large hammerstones, large flake knives, snubnosed end scrapers, bone needles, denticulate edges, and stone and bone anvils (Wheat 1972:154).

Definite typological determination is not possible on recovered projectile points since one is a midsection and the other a reworked base. However, Wheat (1972:147-152) utilized a variety of indices based on certain dimensions of late Paleo-Indian projectile points to aid typological classification. These indices combined with other characters are useful in typing Lubbock Lake specimens. The midsection has parallel sides, a width/thickness index of 33, and irregular collateral flaking (Fig. 5a). The base section has parallel sides, slightly concave base, basal and lateral grinding, and a width/thickness index of 29 (Fig. 8c). These characters generally conform to the Firstview type.

Two snubnosed end scrapers (Fig. 5d, e) and a denticulate tool (Fig. 5b) add additional credence to Firstview affiliation. Furthermore, a Firstview point was recovered from Lubbock Lake in 1949 (Holliday 1977). In addition, Lubbock Lake is only 100 miles across the Llano Estacado from the Clovis — Portales (New Mexico) area, believed to be the central distribution area (Wheat 1972:152). Radiocar-

bon dates for the feature indicate an age between 8,300 and 8,600 years B.P., in line with Wheat's (1972:156-158) terminal date (8,500 B.P.) for Firstview.

LLANO ESTACADO LATE PALEO-INDIAN SITES

At least five other late Paleo-Indian localities are known on the Llano Estacado. These sites are Plainview (Sellards et al. 1947), Milnesand (Sellards 1955), Blackwater Draw Locality No. 1 (Hester 1972), San Jon (Roberts 1942), and Rex Rodgers (Hughes and Willey 1978) (Fig. 1). Plainview and Milnesand are not considered since these type sites date from the earlier part of the late Paleo-Indian period (ca. 10,000 years ago). Feature FA6-3 is considerably younger, typologically distinct, and stratigraphically higher than the Plainview level at Lubbock Lake (Fig. 2; Johnson and Holliday 1980).

A variety of late Paleo-Indian projectile point types are reported as coming from "Stratum 5" (carbonaceous silts) at Blackwater Draw Locality No. 1. These types include Eden, Scottsbluff, San Jon, Plainview, Milnesand, and Firstview (Agogino and Rovner 1969; Agogino et al. 1976; Haynes and Agogino 1966; Sellards 1952; Stevens 1973). Several problems are encountered in dealing with this material.

Wheat (1972) points out classification problems and difficulties in determining exact stratigraphic relationships. Virtually nothing is known of the cultural context of points recovered prior to the 1970s, e.g., type of activity area with which they were associated. In trying to assign artifacts to particular groups, Sellards' (1952) "Portales Complex" is of little use as it is anomalous, containing a variety of distinctly different projectile point types.

Geological situation of artifacts similarly is nebulous. Unit E has four associated radiocarbon dates: 9,890 ± 290 years B.P.; 8,740 ± 350 years B.P.; 6,300 ± 150 years B.P.; and 6,230 ± 150 years B.P. (Hester 1972:174). The first two dates are from the top of the unit. The last two are from an upper and apparently separate facies of Unit E. Hester (1972) points out that the two latter dates may be too young. Nevertheless, dates and point typologies suggest that Unit E spans the entire late Paleo-Indian period.

Work thus far reported for Blackwater Draw Locality No. 1 lacks indication of camping features in the carbonaceous silts. Few features of any kind were reported from this level, but those that are known are bison kills. Sellards (1952) encountered an extensive bone bed in the upper portion of the carbonaceous silts (Hester 1972:36-39), recovering several "Portales Complex" points.

Little is known of the nature of the bone bed, although it appears to have been a communal mass kill (Hester 1972:37). This feature would appear to be different from the bison kill/butchering locale in FA6-3. Differences between the two would include size of kill, bone disposal pattern, and number of people involved.

Recent excavations at the locality (Stevens 1973; Agogino et al. 1976) uncovered part of a bone deposit in the upper carbonaceous silts. Both this feature and the preceding one are on the south end of the locality, about 100 meters apart. Apparently a small kill, a feature illustration (Agogino et al. 1976:217, Fig. 4) indicates disarticulated and broken remains (nonfetal). Associated lithic material includes a Firstview point. Bone appears to have been extensively marrow processed.

This situation varies from that seen in the bison kill/butchering locale in feature FA6-3. Remains were semiarticulated to disarticulated and most not marrow processed. Furthermore, while there seems to be some clustering of bone in the Blackwater Draw Locality No. 1 feature, there is not the discrete stacking present in the FA6-3 locale.

The San Jon site (Roberts 1942), north of Blackwater Draw Locality No. 1, is on the northwestern edge of the Llano Estacado (Fig. 1). Taxonomy of projectile points recovered at this site presents some problems. The type San Jon point apparently was found within the same stratum as a Folsom point. A reputed Scottsbluff point was recovered stratigraphically above this level. Wheat (1976) demonstrated that San Jon are reworked Firstview points.

Little else is known of occupational features associated with either Scottsbluff or San Jon points. Both are associated with bison kills, but kill size, patterns, and other pertinent data were not determined. Three radiocarbon dates available from the site

(7,300 ± 800 years B.P.; 9,700 ± 650 years B.P.; and 2,670 to 2,580 ± 380 years B.P.) are considered unreliable (Hester 1972:19-20).

The only other documented late Paleo-Indian locality on the Llano Estacado is the Rex Rodgers site (Willey et al. 1978), located in Tule Canyon (Texas). The site is on the eastern edge of the Llano Estacado, approximately 80 miles north of Lubbock (Fig. 1). Rex Rodgers is a bison kill/butchering locale containing remains of at least six animals killed during the winter. Evidence of a camping area is lacking (Speer 1978).

Two varieties of projectile points (lanceolate and side hollowed) were recovered. A radiocarbon date of 9,831 ± 83 years B.P. was determined on bone apatite (Speer 1978). However, Willey et al. (1978) consider the site to date closer to 10,000 years. Cultural affiliations are not clear. The Rodgers point (side hollowed) may have typological affinities with Brazos Fishtail of Central Texas (Watt 1978), San Patrice of East and Southeast Texas, or a variety of eastern U.S. types (Willey et al. 1978:66).

The Rex Rodgers bone bed was covered by rapid deposition of outwash material which may have displaced some remains (Speer 1978:70). The locale also was disturbed by erosion and only parts of animals recovered. Nevertheless, several similarities exist between this locale and the one in feature FA6-3. Similarities include apparent small kill size, butchering techniques (Johnson 1978), articulated units, and slight to nonexistent marrow processing damage. One difference is the lack of distinct bone piles at Rex Rodgers. This absence may be due to feature location in an arroyo which might restrict the area in which stacking could occur.

The camping area in feature FA6-3, then, is the only well documented late Paleo-Indian camping locality on the Llano Estacado. Others are certain to exist. Bison kills are the principal late Paleo-Indian feature known for the area. The two at Blackwater Draw Locality No. 1 are distinctly different both from each other and the FA6-3 locale. However, these three may be roughly contemporaneous and perhaps have typologically similar lithic artifact inventories. At Rex Rodgers, the bone deposit shares a number of similarities with the FA6-3 kill/butchering locale. There are typological differences and Rex Rodgers dates earlier than the Lubbock Lake late Paleo-Indian feature.

DISCUSSION

At Lubbock Lake, the late Paleo-Indian period includes Plainview (ca. 10,000 years B.P.) and Firstview (8,600 to 8,300 years B.P.) cultures. Continuing research into the late Paleo-Indian period at Lubbock Lake and on the Southern High Plains leads the authors to agree with Wheat's (1972, 1976, 1977) basic hypothesis concerning this period on the Southern Plains.

Southern Plains late Paleo-Indian tradition is distinctly different from contemporary Northern Plains cultures. A major difference can be seen in terms of projectile point typology, morphology, and manufacturing technology. Briefly, Southern Plains projectile point styles appear to be wider and thinner than those in the north. Broken points are rejuvenated with a new base or tip and commonly reused as butchering tools. Because of these traits, individual collections (e.g., Plainview type collection) are less typologically distinct within themselves but the general style persists much longer than a given Northern Plains complex (e.g., Cody).

Validity of Wheat's (1972) hypothesis (specifically the Firstview complex) was challenged by Stevens (1973) and Agogino et al. (1976) but arguments are unconvincing. A significant revision of Firstview might be in its dating, at least on the Southern High Plains. Dates for this period (from Lubbock Lake and Blackwater Draw Locality No. 1) indicate a range of perhaps 10,000 to 8,500 years B.P. The date of 10,150 ± 500 years B.P. from the Firstview type locality (Olsen-Chubbuck; Wheat 1972) is in general agreement with this range. However, the date is difficult to interpret since it is a single determination on bone with a 1,000 year standard deviation.

In addition to the broader cultural affiliations, an initial integration of Lubbock Lake data provides a glimpse of the lifeway patterns of a late Paleo-Indian cultural group. The two loci were probably used by the same people, perhaps reflecting different seasonal or yearly activities. Time between activities is minimal and camping debris was located above and below the butchering level. Furthermore, although not conclusive, projec-

tile points do not indicate different cultural groups and debitage recovered from each locus follow the same pattern.

The butchering locale is small, with a minimum four bison (and fetuses) being slaughtered (small cow-calf group). The trash accumulation area is not as constricted as the butchering locale, yet is not extensive. These activities probably represent those of a residential unit (perhaps an extended family) with only a few people involved. Residential unit size is speculative and quantification attempts based on lithic or faunal debris. Wilmsen (1974:117-118) estimates 10 people (composed of two or three families). Wheat's (1972:123) various ratios of people involved in the communal kill at Olsen-Chubbuck indicate that the Lubbock Lake butchering locale may have been handled by one to three adults (active males of a residential unit?).

Only a few animals were killed at any one locale at Lubbock Lake (synchronically and diachronically); indications of massive slaughters are lacking. Furthermore, these few individuals were killed near a watering area, along pond and marsh margins. This water association is a pattern seen by Wheat (1971:25) for most Paleo-Indian kill/butchering localities throughout the Plains and Southwest. Evidence of traps at Lubbock Lake is lacking; bison killed at the FA6-3 locale (as well as at others in the site) probably were stalked. Pattern of occupation by a probable residential unit and small kill/butchering locales was established early at the site and continued throughout Paleo-Indian occupation (Johnson 1976, in press b).

Territorial extent of a residential unit is unknown (closest recorded site with Paleo-Indian age deposits is less than 2 miles downstream from Lubbock Lake). However, Hester and Grady (1977:92) estimate a Paleo-Indian band territorial radius of 90 to 120 miles on the Llano Estacado. With Lubbock Lake as a center, a radius of 120 miles would place the closest known outcrops of Alibates, Tecovas, and Edwards Formation cherts and Tecovas quartzite within band reach. However, the majority of recorded Paleo-Indian sites are within the draws (Hester and Grady 1977) and band territoriality may extend along the drainageways. Lithic resources would be limited to Plio-Pleistocene gravel beds and caprock caliche sources. Trade (or travel) with bands to the north and south could procure cherts and high quality quartzites.

Limited availability and conservation of cherts and dependence on quartzites and silicified caliche may be more a product of band territoriality than preference. However, at Blackwater Draw Locality No. 1 (Hester 1972:142) during this time period, Edwards Formation, Alibates, and Tecovas cherts are favored materials. Quartzites are at a minimum without reported use of silicified caliche. Under these circumstances, band territory and preference both may be factors in the use of particular lithic resources, albeit not the only ones involved.

The Paleo-Indian occupational pattern is one of intense use of the draws. Only a few known sites, such as Miami (Sellards 1938) and Elida (Warnica 1961), are reported from around upland playas. Draws offered a concentration of resources: fresh water, variety of game, some lithic material, harvestable plants, fuel supply, and shelter. They also offered typographic opportunities for band level communal mass kills, such as at Plainview (Sellards et al. 1947). A few sites were occupied repeatedly for various purposes.

SUMMARY

At Lubbock Lake, feature FA6-3 represents a multiple use of an area perhaps at different seasons of the year. Seasonality of occupation is not clear because of inconclusive evidence. Based on overlapping availability of ducks and turtles in the region today, camping activities could have occurred during early spring or late fall (although summer cannot be ruled out). Fetal material indicates a probable spring use of the butchering locale.

The Lubbock Lake late Paleo-Indian occupation is one of only a few known for the Southern High Plains. Activities at the site give an incomplete and partial view of the lifestyle of the particular group involved. Material occurs along a southerly incline around a marsh edge. Excavated portion of the feature consists of two loci: a camp and a bison kill/butchering locale. Each may have been occupied at different times of the year and the camp probably reused several times.

Butchering evidence indicates selectivity of meat cuts and limited use of available resources of a bison carcass. Dependence on locally available silicified caliche and quartzites is noticeable. Orientation of a part of the lithic technology to the use of small nodules (pebbles and cobbles) influenced debitage being created.

The area was occupied by a small group of people who focused their activities on the ecotonal interface of marsh — wet meadowlands. Climatic conditions began to moderize; and these people interacted with a nearly modern fauna in an area dominated by grasslands. This initial analysis provides a glimpse of the Llano Estacado late Paleo-Indian lifeway pattern and forms the basis for future, more detailed investigation.

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