ARCHAEOLOGICAL RECONNAISSANCE

OF PORTION OF THE SOUTH PLAINS REGION

REPORT NO. 4
Analysis of Archaeological Materials

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ANALYSIS OF ARCHAEOLOGICAL MATERIALS

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FOREWORD

From early 1975 to present the South Plains Association of Governments has contracted for archaeological research within its area. The research is considered necessary to provide an understanding of the cultural resources within the fifteen county S.P.A.G. area of West Texas. S.P.A.G., which is charged with regional planning and the review of applications for developments supported by federal and state funds, is in need of an evaluation that will enable them to determine the environmental impact upon and disturbance of the prehistoric cultural resources. The evaluation will also aid in determining the time, personnel and funds necessary to fulfill government requirements concerned with the impact on these resources.

Scientists have recognized the need to protect, preserve or salvage prehistoric cultural resources for most a century since it is these concentrations of archaeological materials, or archaeological sites, that provide the sole source of information for most of man's past and his cultural developments. It has been only in the past 150 to 400 years that any documentation for man's activities in the S.P.A.G. area has existed. Yet, archaeological investigations have already shown that man has been in the area for nearly 12,000 years. Cognizant of this the federal and state government has sought to support scientific interest and aid in researching the entire range of man's occupation and activities in the past.

Government support began in 1906 with the passage of the Antiquities Act which prohibited non-scientific activities to disturb archaeological sites on federal lands. Additional state and federal legislation has been enacted since then to enhance the proper treatment of such resources. Wi the passage of the National Environmental Policy Act of 1969 the requirement for an assessment of all cultural resources within areas to be developed with federal funding was initiated. Unfortunately for developers, the extent of these unknown resources posed a problem in that preliminary planning and estimates of cost could not account for the expenditures that would be needed in dealing with problems of unknown extent. To enable developers and planners to project these costs, S.P.A.G. sponsored research designed to obtain a sample of the archaeological resources and the probabilities of their extent. This will enable one to estimate the expenditure in dealing with them. These probabilities of the archaeological potential in the S.P.A.G. area are described in the last part of this report. The effort to provide a practical preliminary investigation to ward off future problems is the first of its kind to be conducted by any organization with responsibilities similar to these of S.P.A.G.

Staff members of S.P.A.G. proposed the project to staff archaeologists of the Department of Anthropology, Texas Tech University in the fall of 1973 (Mayer-Oakes and Campbell 1974:5), preliminary archaeological surveys as a part of course work offered by Dr. Robert Campbell were conducted in the spring and fall of 1974 (Campbell 1975a:49-51; 1975b:20-21). Assistance was obtained from the South Plains Archaeological Society who provided bibliographical resources, the department who furnished

equipment and the University who made laboratory space available.

Preparations for contracted research were complete when S.P.A.G. provided their first contract in March, 1975. The contract required survey of areas proposed for water impoundment in the S.P.A.G. area and a final report of these investigations. Dr. William Mayer-Oakes served as principle investigator and Dr. Robert Campbell as Field Director. The survey was conducted in the spring of 1975 with field crews that numbered from three to eleven members. Five large areas near lakes and canyons and another five smaller localities in communities were surveyed by the end of June. The final report was submitted in late July (Campbell 1975c).

A second contract was let to the Department in May, 1976 to acquire and record all known archaeological sites within the S.P.A.G. area. Mr. Jerry Bowermon and later Ms. Sharon Judd served as directors and Dr. Robert Campbell as Principle Investigator. Report No. 2 which included corrections and additions to the first report and report No. 3 with a tabulation of sites and materials acquired during the course of the second contract, were completed and maps and site records submitted to S.P.A.G. in the fall of 1976 (Campbell 1976; Judd 1976a; 1976b; Mayer-Oakes 1976). A third contract with the department required survey in the sand hills and a report of the analysis of all archaeological data of the S.P.A.G. area. Dr. Campbell again served as Principle Investigator and Ms. Judd who analyzed the sites and materials as a subject for her master's thesis, served again as director. The survey was completed by January 1, 1977 (Judd 1977) and report Nos. 2 and 3 were submitted by May, 1977 to S.P.A.G. (Campbell 1977; Campbell and Judd 1977). Ms. Judd completed her thesis in May and Dr. Campbell

revised it to complete the present report. The studies revealed a need for excavation of some sites located or reported during the course of investigations and the projections of possible resources in areas of future development yet to be investigated will require survey, any possible excavation; however, at this moment immediate future work will only be necessitated by proposals for definite development.

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INTRODUCTION

Statement of Purpose

The purpose of this study is to provide a general framework for a greatly needed areal prehistory of the South Plains Association of Governments region, known herein as S.P.A.G., or the central Llano Estacado and adjacent western Rolling Plains of Texas. This study should provide a stepping stone for future studies and more analytical research concerned with archeological problems and the understanding of man's early activities within the area.

Through the analysis of archeological data acquired during S.P.A.G. research projects, the areal distribution and serial order of culturally and chronologically distinct prehistoric diagnostics, and other artifacts, and associated material has been preliminarily determined. Relationships have been established from time period to time period between chronologically successive prehistoric cultures with their particular environmental settings in order to describe their technology, subsistence, seasonal round, settlement pattern, and environmental utilization of these consecutive groups or complexes.

Method of Research

The writers' involvement with S.P.A.G. projects from the spring of 1974 to the present provided the basis for the conception of the study. The method, purpose and intended conclusions were outlined. Shortly thereafter, research was initiated. Six steps were necessary to complete

the study. They are as follows:

Step I: Completion of the field work

Step II: Acquisition of bibliographical resources

Step III: Attainment of new data and records from institutional and private sources

Step IV: Mapping, recording and site record preparation of published and unpublished data of all reported sites in the S.P.A.G. area

Step V: Analysis of site distribution and density, and environmental and microenvironmental data

Step VI: Preparation of manuscript

The first step involved the selection of locations within the S.P.A.G. region needed to provide a complete sample of the various topographic areas, or those with different land forms (to be explained in the Environmental Situation section). Landowners were contacted and permission gained to conduct a survey or a careful investigation of the entire surface area to be examined for the purpose of determining the number of concentrations of archaeological materials obvious to the investigator. Field work was conducted under the direction of Dr. Robert Campbell or Ms. Sharon Judd with crews varying in size from three to eight. A systematic pattern of search for archaeological evidence was employed. Crew members formed a parallel line working abreast of one another with each member moving back and forth through an assigned area. The completion of this survey provided a sample of the major variations of the topography within the S.P.A.G. region (map 1-3). Although the variations of topographic areas at the completion of the survey were not of equal

size, they were sufficiently large enough to provide an adequate sample.

With the completion of step II all known published and unpublished manuscripts concerning the archaeology of the area were examined. The following were utilized as resource data: University, departmental and personal library material, as well as S.P.A.G. area site records, maps and materials. Archaeological materials of the Department of Anthropology, Texas Tech University Museum, and certain private collections were also checked.

During step III some new records were obtained. It is assumed that a number of known sites have not been reported to the S.P.A.G. project at this date, but that these comprise no sizeable number and that their use would not statistically alter the results significantly.

In step IV site records of sites were prepared for all locations known to have concentrations of archaeological materials noted in publications, manuscripts and collections. These locations of archaeological sites, or concentrations, were recorded on U.S.G.S. Quandrangle maps. During this step of activity a tabulation of sites and their features and materials were made.

In step V locations of previous archaeological surveys, both extensive, that is those that inventory archaeological sites, and intensive surveys, those that examine the type of archaeological evidence, were plotted to determine in which topographic areas they were located. The topographic areas were studied to determine the nature of their environment, that is, their land forms, soils, vegetation or flora and animal life or fauna. All prehistoric archaeological sites, those locations with evidence

of occupation before historical documentation of the area occurred, were examined and their environmental situation compared with their material content. Specific periods of time that the site was occupied were then determined if it contained chronological diagnostics, that is materials such as projectile points or pottery for which ages, or dates, have been determined (Suhm, Kreiger and Jelks 1954). An examination of the areal and environmental location, or situation, of those sites with chronological diagnostics aided in determining the distribution of sites from time to time, and the differences in location of sites during one period as against another period. The distribution and frequency of sites of each period were noted to determine with which environmental variants they were most frequently associated. Within each time period, the unique types of materials were related to specific environmental features to determine the prehistoric activity there; and conclusions were drawn as to the possible utilization of each environmental variant by each chronologically successive cultural stage, or distinct combinations of archaeological traits that characterize a defined period of time. Wherever possible those areas most likely suitable for residence, foraging or other activities were noted.

In the final phase the maps, tables (Campbell and Judd 1977) and illustrations were prepared and the final writing of the manuscript was undertaken.

Situations encountered, but resolved, in the study resulted from the use of site records provided by persons other than the writer; consequently most sites and materials were not examined first hand, and thus it was difficult for the writer to be certain that site

records were sufficiently accurate to be used for this study.

Only the style of bifacial triangulates (projectile points) and ceramics have been studied and consequently only these serve as the sole cultural and chronological diagnostics for sites. Site age could not be determined in this study unless the occurrence of diagnostics was reported. In fact, of 990 sites only 130 had chronologically diagnostic materials. This number is adequate to provide a suggestion of the number of sites from period to period and their preference in environmental situations and their activity there.

Many sites reported materials other than diagnostics but the collecting of such materials no doubt occurred in a random manner. Such grab samples are now noted to be misleading and reveal less information of the entire material culture than a controlled surface collection (Mayer-Oakes 1977:2). Thus the technology and activity of the occupants of the site may be difficult to determine due to the distorted representative sample of tool types.

Frequently, recovered material was not fully described as to industry, type, style or quantity of each. As has been noted by Jane Holden Kelley (1964:1)

> It is difficult to work with someone else's field data. The original investigator was not concerned with the problems one is investigating. The insights tucked away in the back of one's mind are not available to the person years later, or to one reading a site card.

The majority of site reports came from non-professionals and there is no way to evaluate their strategy of collecting from sites or in reporting them. Nevertheless, the data that did appear was frequently suggestive if not explicit and was used wherever possible.

Frequently, reported materials displayed a collecting bias. As has been noted by Shafer (in press) there is a heavy bias in favor of collecting projectile points due to shape, beauty, and indications of antiquity and of hunting.

Some inaccurate site locations presented difficulty in pinpointing the exact environmental situation of the site. For example, many locations of sites were originally plotted by recording the mileage and direction from a certain point. Later studies by the writer sometimes found that the site was not in the county originally designated by the reporter. However, it is assumed that the majority were properly located and therefore a preferred environmental situation for each successive cultural complex can be determined.

Many of these surface collections showed a mixture of chronologically diagnostic materials, and this made it uncertain as to which of the materials were associated with which of the cultural complexes. If a high frequency of associated materials was found with relative consistency with one diagnostic, it was determined that these materials tend to indicate affiliation with this diagnostic rather than others that were present.

As an example sites with chronological diagnostics, denoting a time range and occupation between 500 B.C. and A.D. 500 had a higher frequency of side-end scrapers than any other time period. Consequently it is the writers' judgment that this tool was used more in this period of time even though it may have been used before or after. In other words, this study is not concerned with whether or not an artifact or a combination of them were absolutely present or absent from one period

but more with the popularity from period to period.

An inequitable representation from each environmental zone resulted from the random nature of previous field work. Most materials were recovered from those areas wherein most professional and amateur archeologists are located--thus Lubbock County is better known and reported than Yoakum County which lies in the far west of the S.P.A.G. region. Reports have been obtained from each environmental variant within the region, providing a relatively accurate picture of its usage from period to period.

Previous Work in the Area

The earliest systematic archaeological investigation in the S.P.A.G. area was at the well-known Lubbock Lake Site under the direction of Joe Ben Wheat who conducted excavations here in 1939 and 1941; the first report by Wheat was published in 1940 (Kelley 1974:44; Wheat 1940:4-6, 1974:16). In the 1940's and 50's the Texas Memorial Museum renewed excavations at Lubbock Lake; the project was conducted by E. H. Sellards. Glen Evans, and Grayson Meade (Kelley 1974:46). In 1959-1960 projects were again undertaken here; this time by Texas Tech University, under the direction of Earl Green and Jane Holden Kelley. Texas Tech Museum Director Craig Black took direction of excavations at Lubbock Lake in 1973; this project continues to the present (Holden 1974:14). A symposium held in 1974 discussed discoveries made at the Lubbock Lake Site in the broader context of early man in North America (Black 1974:8), Since then, zooarchaeological studies at this site have been summarized (Johnson 1976a, 1976b). The Lubbock Lake Site constitutes the earliest and most intensely investigated site in the S.P.A.G. area. More

information on this site will soon be forthcoming. Publications will include two Master's theses—"Investigations into Modern and Late Pleistocene Flora at Lubbock Lake" by Jerome Thompson (1977 personal communication) and "Cultural Chronology at the Lubbock Lake Site" by Vance Holliday (1977 personal communication). A major volume on the Lake Site project is expected to be published by 1978 (Thompson 1977 personal communication).

Another important site in the S.P.A.G. area to be reported in the 1940's was the Plainview Site (Sellards, Evans and Mead 1947). Field research outside the S.P.A.G.area at Blue Mountain Rock Shelter, Winkler County, provided data applicable to understanding the prehistory of the Rolling Plains area (Holden 1938:10). The diagnostic material from this site has been found distributed in the Rolling Plains which indicates a similar cultural complex existed in both areas.

Studies of sites and materials during the 30's and 40's provided information concerned with corner-tanged artifacts, ceramics, shaft tools, flint sources and other artifacts and sites characteristic of the S.P.A.G. area (Kelley 1948; Patterson 1936; Pearce 1936; Watts 1939; Witte 1947). In these early decades of research interest was most concerned with Paleoindian period materials, or the earliest time in which man was known to occupy the area (Fritz and Fritz 1940; Roberts 1936; Sayles 1935).

Following World War II interest in a broader view of the S.P.A.G. area prehistory began to unfold. During the 1950's field research was undertaken near Mound Lake, Coyote Lake, Yellowhouse Canyon and Lubbock Lake (Bryan 1953; Jennings 1953; Newcomb 1955; Wheat 1955).

Field investigations increased during the 60's. Important excavations at the Andrews Lake Site, located south of the S.P.A.G. area, and its report supplied significant data for Llano Estacado area prehistory (Collins 1966, 1968). Excavations and surface surveys and collections within the area provided additional important data (Brown 1968; Green 1961; Harper and Shedd 1969; Riggs 1966a. 1965b, 1966. 1968; Runkles 1964; Word 1963). In addition to the report of a burial from Yellowhouse Canyon In 1955 (Newcomb 1955) other burials were reported (Cockrum 1963; Shedd 1968; Suhm 1961), providing added details of prehistoric mortuary practices. Studies of rock art and unusual incised artifacts (Riggs 1965b, 1968; Watts 1965) as well as ceramics were not reported (Collins 1969; Watts 1963) for the area. However, the interests of professional archaeologists continued to be largely concerned with the Paleoindian period (Green 1962; Trout 1963). Only Kelley (1964) made an attempt to define later periods of occupation.

In recent years, an additional burial has come to light (Word 1975) and studies of bedrock mortars have been initiated (Kirkpatrick 1977). Intensive surveys have Increased (Guffee 1976; Guffoe and Hughes 1974; Skinner 1973; Thorns and Proctor 1<'76) and random survey and collecting continued (Hart 1975; Parsons 1967; Randall 1970; Riggs 1975). Reports of progress at the renewed excavations at Lubbock Lake have now become available (Black 1974; Johnson, C. 1974; Johnson, E. 1974, 1976a; Johnson and Johnson 1975). A report of an early excavation by the South Plains Archaeological Society (S.P.A.S.) at the Slaton Dump site is being prepared (Booker and Campbell 1977) and a report of intensive

excavations at the Canyon Lakes site is anticipated (Keslin and Mayer-Oakes 1976). Review of areal prehistory indicates an improved status in our knowledge of the past (Collins 1971; Holden 1974; Kelley 1974; Hester 1975; Wheat 1974; Word 1965). A bibliography of the area's prehisotry has become available (Thorns and Montgomery 1976). Additional studies concerning the prehistory, particularly with prehistoric human ecology or man's adaptation to the S.P.A.G. environment, have been produced (Holt 1976; Weedman 1976).

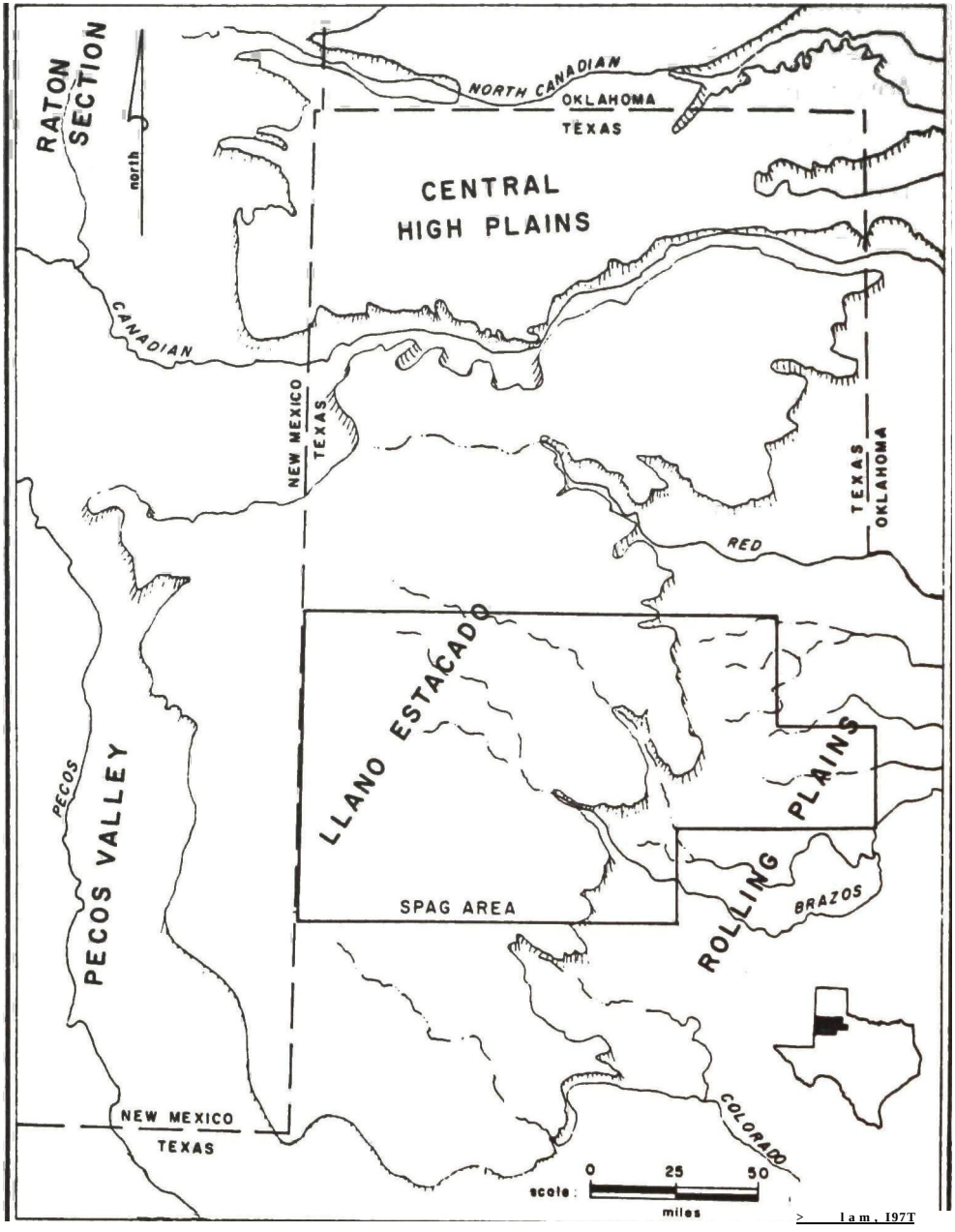
ENVIRONMENTAL SITUATION

Area of Investigation

The South Plains Association of Governments area (**map** 1), generally referred to as S.P.A.G. has been defined as consisting of fifteen West Texas counties, covering nearly 14,000 square miles and as of 1970 having a population of approximately 320,000. The counties include Bailey, Cochran, Yoakum, Lamb, Hockley, Terry, Hale, Lynn, Lubbock, Crosby, Dickens, Floyd, Garza, Motley, and King. The eastern counties fall within the central lowland Province referred to as the Texas, or southwestern,Osage Plains, and herein referred to as the Rolling Plains. Two-thirds of more of the west end of the S.P.A.G. area falls onto the Llano Estacado region of the Southern High Plains section of the Great Plains Province (Campbell 1975:4-10).

The Llano Estacado (map 1) has the distinction of being one of the flattest, most riverless, most windswept, treeless, and featureless areas in North America (Holden 1962; Rathjen 1973; Wendrof and Hester 1975:1). It is a semi-arid region with limited and erratic rainfall, poorly established drainage systems and very few lakes or reservoirs (Dvoracek and Wheaton 1968). In the 1850's the Llano was labeled on maps of the United States as part of "The Great American Desert." W. B. Parker, a member of the U.S. Army expedition of Captain Randolph B. March, in 1854, was clearly unimpressed with the Texas High Plains as he wrote:

Map 1. The S.P.A.G. Area



> Iam, 197T

> For all purposes of human habitation--except it might be for a penal colony--those wilds are totally unfit. Destitute of soil, timber, water, game, and everything else that can sustain or make life tolerable, they must remain as they are, uninhabited and uninhabitable (Carlson 1975:19-21).

However, there is sufficient evidence to show that the area has not been totally unfit for human occupation and exploitation through much of the time that mankind has occupied the North American continent.

Topography

The Llano Estacado blends into the Central High Plains (Texas and Oklahoma Panhandles), on its northern edge and is separated from the Las Vegas Plateau of the Raton Section to the northwest and the Pecos Valley to the west by an escarpment in New Mexico. The area grades gently into the Edwards Plateau of Texas to the south and southeast, but drops sharply to the east where it is divided from the Rolling Plains by the caprock (Fenneman 1931:45).

The Rollins Plains (map 1), on the other hand, is comparatively better endowed. Water, plant and animal resources are generally somewhat more abundant than in the Llano.

This area is bordered by the Osage Plains of Oklahoma, the Southern High Plains or Llano Estacado on the west, the Colorado River to the south, and the Cross Timber to the east (Hunt 1967:255).

Relief in the Llano Estacado is slight and consists only of such features as sand dunes; a few shallow valleys or draws; numerous shallow depressions, the well known playa lakes, and a few saline marsh lakes (Bell and Sechrist 1965:35; Reeves 1965:505). The average elevation of the Llano Estacado is over 3,000 feet (Bell and

Sechrist 1967:32; Grubb and Parks 1968:12; Reeves 1970:59). Campbell (1975c:8-9) describes these features in more detail (map 2). Plains and their playas are divided into level vegas and duned vegas, with occasional low knolls with gentle relief.

The playas have gradually descending slopes with more or less level basins. The saline marsh-lake regions are often surrounded by low ridges; these slope downward from their crests to the adjacent plain on the far side of the lakes and downward to terraces above the lake shore. The terraces drop sharply forming embankments above the lake beach and its basin. Often small sloping vales interject between the low ridges and the vales frequently contain arroyos thatempty into the lakes. Along the shallow draws the rims fall off in gentle slopes to broad level flood plains (Campbell 1975c:8-9).

The Rolling Plains has been referred to as the "Lowland along the Colorado" (Fenneman 1931:58) or the "Break of the Plains" (Baker 1915:45). The elevation in this region rises from 800 feet above sea level in the northeast to 2800 feet above sea level at the base of the Llano Estacado along its western Border (Blair 1950; Chamber 1946:4; Fenneman 1931:10). Within the S.P.A.G. area the plains range from 1800 to 2500 feet (Fenneman 1931:10). This region is better drained than the Llano, and is a region of transition from eastern to western faunas (Blair 1950:110; Harris in press).

The Rolling Plains (map 3) can be divided into sloping upper prairies, or mesas, that are cut by canyons of moderate relief, which in turn widen into broad, level lower prairies where occasional isolated mesas or buttes appear. The upper prairies consist of

Map 2. Topographic Variants in the S.P.A.G. Area

LLANO ESTACADO

•DRAW SLOPE

r-DRAW BASIN

INNER SLOPE-

-LAKE EMBANKMENT

OUTER SLOPE-

-LAKE BEACH

r-DRAW RIM

l-LAKE BASIN

DUNED VEGA

LEVEL VEGA

rCREST

. ^

-VALE

PLAYA SLOPE

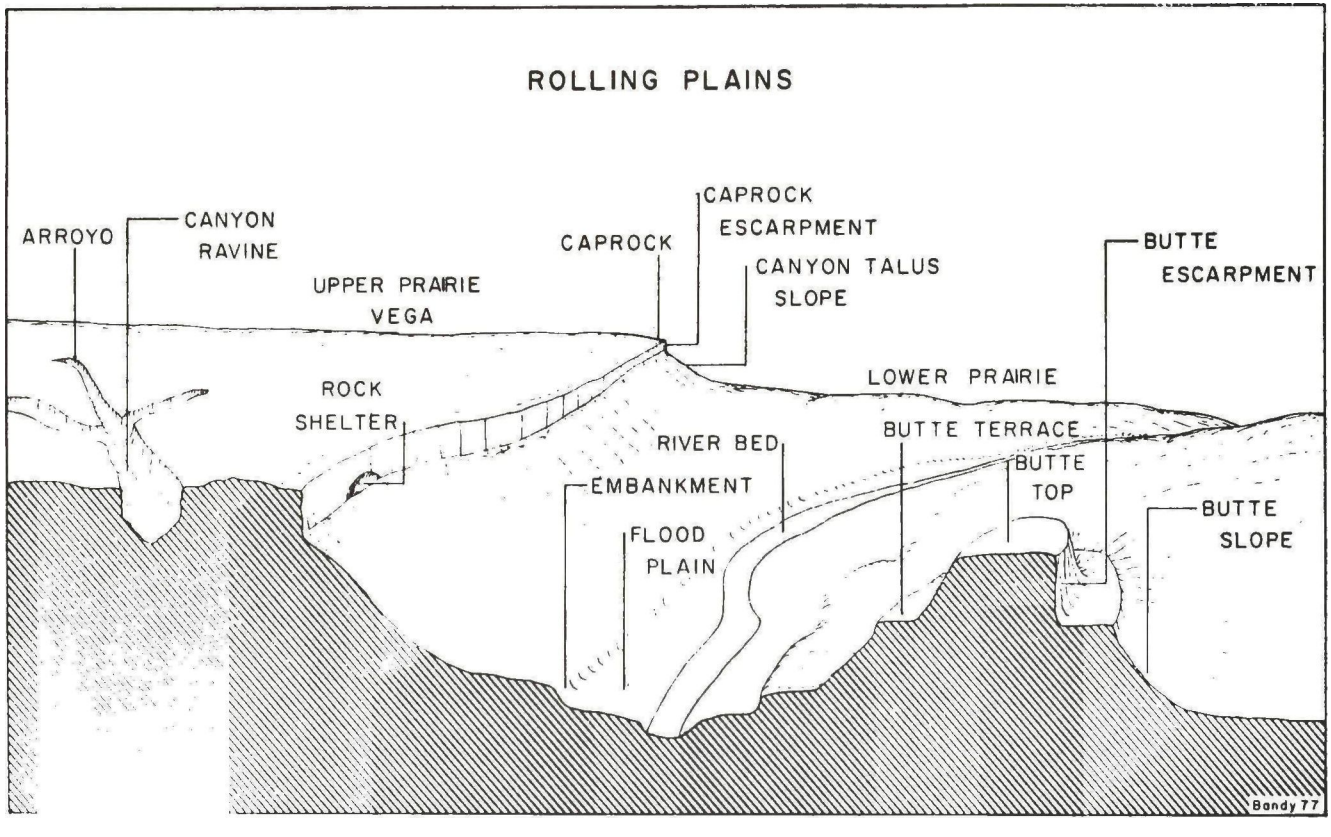
PL/

either level stretches, vegas or grassland, or arroyo that dissect these grasslands. The canyons are upper tributaries of rivers and are fed by the upper prairie arroyos. A Caprock forms the rim above the canyon and an escarpment occurs beneath the caprock that in some places is weathered forming rock shelters; talus slopes are usually found below the escarpments, and rugged ravines are located at the base of narrow side canyons. Broad, level flood plains are found along the wider canyons. The buttes are remnants of upper plains that have been isolated by extension arroyo and canyon development. They often have level tops below which are escarpments or slopes that descend to terraces which in turn descend in lower slopes to the broad, level lower prairies. The latter consist of level meadows (Campbell 1975c:4-10) and/or groves of mesquite savannahs (Dice 1953:43) broken by river cuts with slopes, or embankments, that descend to the flood plains and river beds (Campbell 1975:5-6).

Geology, Hydrology and Soils

The Llano Estacado is underlain by the Ogallala Formation of Pliocene Age (11 million years ago) (Baker 1915:86; Frye and Leonard 1959:39). Its capping caliche and freshwater limestone are primarily responsible for the Llano Estacado boundary known as the caprock (Conselman 1970:2-3; Evans and Brand 1956). Major erosion of the Ogallala Formation (map 4) and deposition of undifferentiated Pleistocene deposits have created a ground-water reservoir in the Llano and surround regions (Finch and Wright 1970:54-55; Swain 1977 personal communication). In fact, this formation creates the

Map 3. Topographic Variants in the S.P.A.G. Area

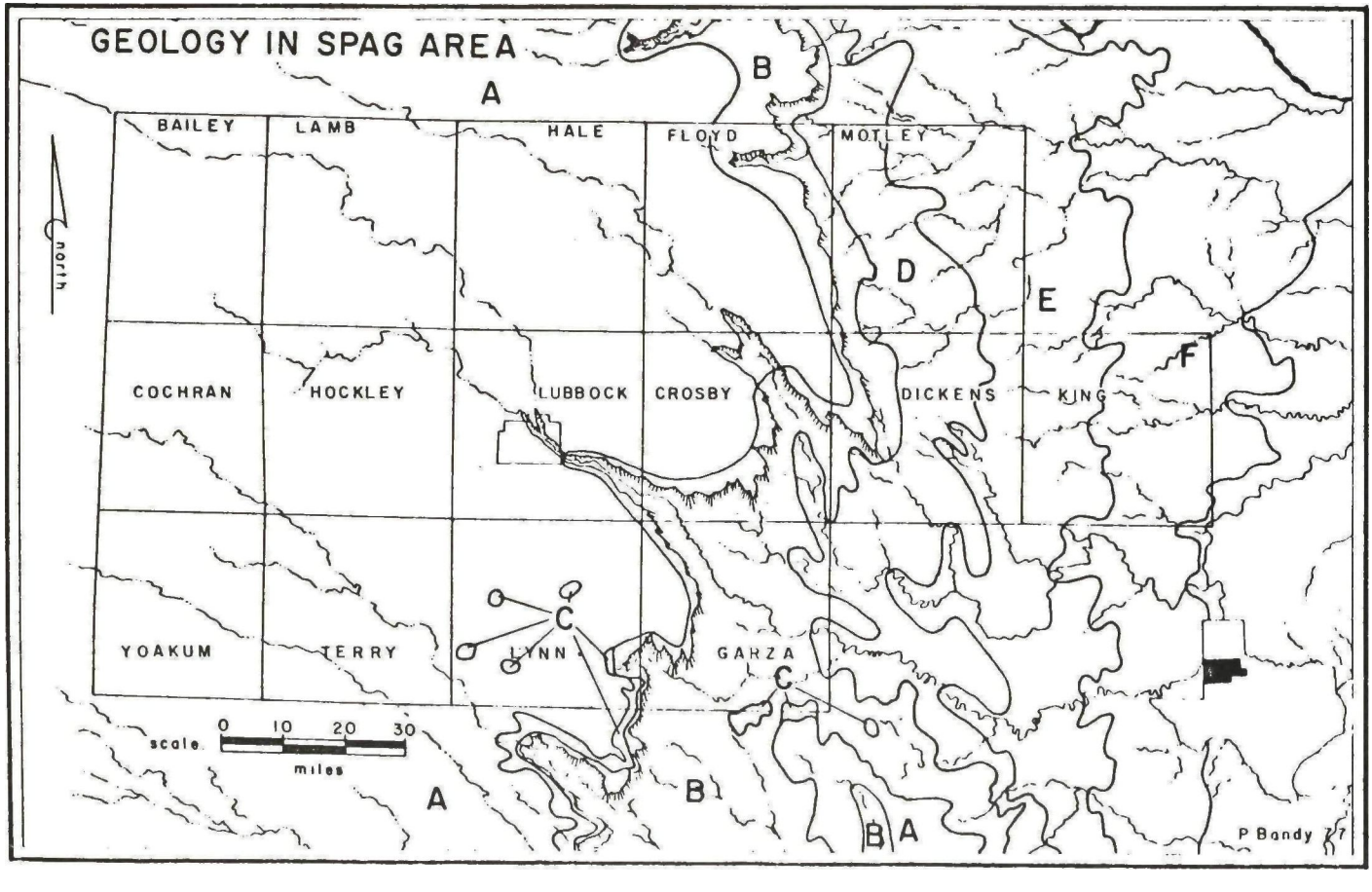


largest ground-water reservoir in the entire Great Plains region (Frye 1970:13; Smith 1977 personal communication). This aquifer system is the major factor in conditioning available water resources which consequently determine settlement and exploitation by prehistoric, historic and modern societies.

Early Pleistocene streams carved into the Ogallala and other formations forming deep southeast-trending valley or draw systems. The direction of the systems resulted from tilting of the Llano Estacado toward the southeast at a descending rate of eight to ten feet per mile (Chamber 1946:181; Reeves 1970:59-68). For example, Melrose, New Mexico, near the extreme western edge of the Llano is approximately 4600 feet above sea level while Lubbock, 125 miles closer to the eastern border is 3300 feet (Bell and Sechrist 1970: 32; Grubb and Parks 1968:2).

Parallel west-east flowing streams or draws in the S.P.A.G. area are the Running Water Draw-White River system and the Double Mountain Fork-Yellowhouse Canyon system, both tributaries are a part of the headwaters of the Brazos River (U.S. Army Corps Engineers 1968). The period of Ogallala deposition closed with stream rejuvenation and renewed warping which caused stream courses to take their semi-radial present drainage pattern (Cozeau and Siemankowski 1974:98; Frye 1970:7, 10). The southeast trending valleys, or draws, which were established before the known presence of man probably provided oasis channels for movement across the Llano Estacado in more well-watered times. The heads of the Running Water

A. Ogallala Formation, Pliocene Age
B. Dockum, Formation, Triassic Age
C. Comanchean Series, Cretaceous Age
D. Double Mountain Group, Permain Age
E. Marlow Formation, Permain Age
Fs El Reno Group, Permian Age



Draw and the Double Mountain Fork systems seem to converge northwestward in the vicinity of a bend of Alamosa Creek, New Mexico. The bend is an extension of a fault which caused Alamosa Creek to be deiverted from its former southeast course into the Brazos River drainage to its present-day southwest course into the Pecos (Finch and Wright 1970:55-66). This diversion left the Llano with no external supply of water. Precipitation alone provides the total water supply for the Llano Estacado, and the sole external water supply for the Rolling Plains comes from the Llano. Consequently, variations in precipitation drastically effect the water supply and environmental balance as well as man's use of the area.

At present the Llano playas are among the most dynamic of land forms and surface water sources (Vandertulip 1961). Their geomorphic features reflect daily, seasonal and annual changes in the environment (Motts 1972:20; Neal 1972:107; Price 1972:305; Schreiber et al. 1972). Therefore, a knowledge of them is important in an analysis of man and his relationship to the environment. Playas occur singly and in groups or clusters of "playa complexes," and they occupy the lowest parts of enclosed valleys (Motts 1972:90-91). These small undrained depressions are dry most of the time; in fact, the term playa lake means a source of water that only temporarily covers the surface (Green 1972:7-14; Price 1972:306-307). Carlson (1975:19-21) points out that playas are the so-called "buffalo wallows" of pioneer times. The depressions may range in size from less than one acre to more than fifty acres and may be from only a few inches to several feet deep.

It

Nine hundred to one thousand depressions per normal county area, or about every A99 square miles, have been counted in some areal studies (Reeves and Parry 1969:348-354). Other estimates of playa lakes in the central High Plains and Llano Estacado range from 16,000 (Grubb and Parks 1968) to 19,000 (Dvoracke and Wheaton 1969) to 36,000 (Connally 1967:36). Compromising these statistics, there are an estimated 9,000 playas of varying size and shape in the S.P.A.G. area which in season might provide water for human populations. Various sources estimate that runoff collected in these playa depressions averaged between 2.5 and 3 million acre feet annually. There is 2.7 million acre-feet or 90 percent lost to evaporation (Bell and Sechrist 1972:33). The depressions are usually filled in May and June and remain partially filled until October or November and then are dry the rest of the year (Ward and Huddleston 1972:205). Rainfall data for the area indicates that May and September would be the months during which lakes catch one full volume. Full lake catchment would occur twice as frequently in May as during September due to more high-intensity rains in the spring and damper soils that prevent water absorption and aid run-off (Carr 1967; Rickers, Huddleston and Wells 1970). Grubb and Parks (1968) using historical rainfall data and recent data of the Department of Agricultural Engineering, Texas Tech University, estimated that filling frequencies during a three year period would result in a catch of a one-fourth volume twice and three-fourths volume, once; and in a six year period, one overflow volume one year. Playas are seen then as of seasonal use, but are not a completely dependable source In any season due to year

to year variations in rainfall. Water samples from five playas were analyzed at intervals for twenty-four days following runoff from a single storm and it proved to be of better quality than Ogallala water because it had less total dissolved solids, and less nitrate (Lehman 1972:25; Rekers 1970:1). Nevertheless, this study shows that aboriginal populations did not come to depend on playas as often as the streams, or draws, and marsh lakes in the earlier prehistoric stages even though playa water was better at some seasons.

Deeper depressions support lakes during a series of wet years but dry up during a series of dry years. These larger bodies of water are often called "alkali," or "saline lakes," because the water usually has a high mineral content as a result of the concentration of salt (Baker 1915:77; McCarraher 1972:15-24). Salinity results from the underlying Ogallala soil, evaporation mechanisms, and stream deposition (Smith 1977 personal communication). The study area is bordered and dotted by saline areas (Dregne 1963:222). These include about twelve salt lakes and approximately seventeen more with freshwater (Wendorf and Hester 1975:13-32; Witt 1947:76).

Soils in the study area condition to some extent variations in the production of grasses, forbs, woody and herbaceous plants (Brown 1977 personal communication; Blackston 1977 personal communication). This has resulted in variations in amount and seasonal availability of forage for the animal population and hence differences in the number of game animals from season to season, and place to place. The United States Soil Conservation Department noted a grazing perf«Fence by animals for certain areas in the Llano Estacado and Rolling Plains. Such knowledge of game preferences would be an aid to any hunter and would condition his selection of hunting areas.

If

Grazing preference may change from season to season depending upon the animal, plant palatability, nutritive stage, stage of growth, season of use, relative abundance, availability, and associated plants. V/ith more precise data than is presently available, a student might suggest a prehistoric hunter's preferences and movements on the basis of soil distribution in areas that presently have been denuded of their original vegetation. A variety of soils are known in the Llano Estacado; some forty-five types have been defined (Allen 1977 personal communication; Dregne 1963).

Playa lake-beds are characterized by a unique soiT--the Randall Series. Randall soil is a dark gray clayey, soil with a high percentage of montmorillonite clay, which has a high shrink-swell capacity. This soil is found at a depth of six to twenty feet below the high-water mark. It becomes sticky and plastic when wet and the permeability is very low (Dvoracek and Wheaton 1969:3; Grubb and Parks 1968:9). It may have served as a source of clay used by aboriginal peoples in the making of pottery.

At the western extent of the Rolling Plains, just east of and below the caprock escarpment, sedimentary rocks of Triassic age (225 to 180 million years ago) ourcrop (map 4). These rocks consist of shales, sandstones, limestones and beds of salt and gypsum (Lonsdale 1943:17-18). In some sections of the Rolling Plains streams have cut channels through these rock formations that are as much as 400 feet deep. Gypsum ledges are found in these areas (Snider 1917). East of these are various Permian Redbeds (map 4) which consist of soft

shales and red sandstones (Simpson 1958; Snider 1917). In a few locations these are overlain by rocks of the Comanchean series of Cretaceous age (120 to 60 million years in age) (Shafer 1969:2) or late Tertiary (11 to 1 million years in age) and sandy to clayey sediments which result from outwash of the Rocky Mountains and Llano Estacado (map 4) (Fenneman 1931:10).

In the Rolling Plains where the Ogallala Formation has eroded on its eastward and southern escarpment down to the Triassic red beds, the calcium carbonate from underground water has created water pools (Smith 1977 personal communication). Surface water on the upper prairies of the Rolling Plains is confined to these intermittent ponds in the vegas or pools in the arroyos. No playas appear on the Rolling Plains. Permanent springs in the canyons are found in tributaries and permanent pools in the main canyon channels. Water sources are intermittent ponds or seasonal channels created by running water courses (Campbell 1975c:6). Primary water sources are the Red, Wichita, Colorado, Brazos and Pease, but only the last two named are in the S.P.A.G. area (map 1) (Vandertulip 1961). Streams and rivers on the Rolling Plains drain from the northwest to the southeast. They have cut deep valleys in which narrow river beds exist. The small tributaries provide rapid drainage in the region. The water is potable even though it contains gypsum and salt (Blair 1950:109).

Characteristic soils in the Rolling Plains are red to brown soils formed in outwashes of clayey to silty redbeds, or over limestone formations (Pool 1975). The decomposition of Permian redbeds has

produced these from oxide soils (Chambers 19^6:177). The sixty-three known soil varieties of the area are distinguished by differences of .he land features on which they are located.

Climatology

The western two thirds of Texas including the S.P.A.G. area are arid and semi-arid on a long term basis (Connally 1967:35). An average evaporation rate of 80 inches per year and an average wind velocity of about 12 mph are typical (Bell and Sechrist 1972:35; Carr 1967: Norris and Scott 1972).

The average annual precipitation of the Llano Estacado ranges from 17 to 21 inches, but has had extreme variations of 7 to 44 inches. These variations bring an expectation of one year below 11 Inches and one year above 25 Inches during a ten year period. Precipitation occurs most frequently as thunderstorms rather than as general rains. The maximum rainfall occurs during the months of May and June when thunderstorms are most frequent. Precipitation during winter months is slight and occurs mostly as light snows. The rainfall pattern for the area Is such that thereis a gradual decrease in rainfall from east to west.

Excessive wind velocities in the spring (March and April) contribute to high soil and plant moisture depletion through evaporation (Carr 1967; Norris and Scott 1972; Pool 1975). This season is the most unfavorable for human occupation.

Temperature, like rainfall, varies greatly, especially during the colder six months of the year. Frequent surges of cold air from the north cause losses in the plant community. Summer days are hot,

but the low humidity and good wind circulation lessen the intensity of the heat. The optimum growing season of native plants begins about '; r1l 15 and terminates around October 30. The frost free period ranges from 181 to 206 days and normally falls between April 10 and November 1 (Dice 1962:302). Frost free days correlate with the time of greatest precipitation and lowest wind velocity and make this the optimum period from human occupation.

Annual precipitation on the Rolling Plains averages the same as for the Llano Estacado. Approximately 75% of the rainfall occurs as widely scattered thunderstorms of high intensity and short duration during the months of April through October; the period of May through September receives the most. The moisture received during the winter months is usually characterized by rains of low intensity that cover a large area. Light snows are received occasionally during winter. The rainfall distribution shows a gradual decrease from north to south. The mean minimum temperature for January ranges from 26 degrees to 32 degrees and maximum temperature in July and August from 96 to 101 degrees. The optinmum growing season of native plants and frost free period is the same for both study areas (Pool 1975). Slightly less severe climatic conditions occur in the Rolling Plains during winter months than in the Llano, and coupled with more natural shelter, is more conducive to human occupation during this season,

Flora and Fauna

The Llano Estacado region is at the southern boundary of the Short Grass Plains district of the Kansan Biotic Province (Tharp 1939).

It is virtually treeless and supports a distinct drought resistant flora, or vegetation, consisting primarily of buffalo, gramma and beard grasses (Blair 1950:110-112; Correll and Johnson 1970). Bison, deer and antelope were once plentiful. The present fauna includes kit fox, coyote, prairie dog, jack rabbit, cottontail rabbit, skunk, badger, numerous rodents, box turtle and 14 species each of lizards and amphibians and 31 species of snakes; none are restricted to the area (Costello 1975; Jones et al. 1975:1-14; Wendorf 1961:17).

In the Llano the playa lakes are characterized by a change in the nature and types of vegetation that correspond to soil change. Depending upon the intensity and amount of early se^on rainfall, the playa will have either a dense vegetative cover of annual and perennial, terrestrial, or semi-aquatic weeds (smartweed, ragweed, pigweed, knotweed, blueweed, arrowhead, barnyard grass and spike rush) or may be nearly barren (Ward and Huddleston 1972:205). Short grasses are usually in vegas or sand dunes on the northeastern sides of playas (Atwood 1940:265).

The playa lake, during periods of above normal rainfall, is an attractive habitat for many species of wildlife. Birds include blue-winged teal, mourning doves, sparrows, pintails, shovellers, Wilson's Phalarope, sandpipers, snipes and yellow legs (Oberholser and Kincaid 1974: Peterson 1963; Robbins 1966: Ward and Huddleston 1972:245). Here, amphibians and reptiles reproduce with the spring rains. Spade-foot toads, tadpoles, leopard frog and the spotted frog are noted visitors during heavy rains along with turtles, salamanders and a few snakes (Raun and Gehlbach 1972; Ward and Huddleston 1972:247). There are

four distinct playa ecozones each with a distinct vegetation related to differences in the water level. Some vegetation is available whether the playa is full or nearly extinction (Ward and Huddleston 1972:247).

Amaranthus, Chenopodium, Helianthus, Polygonum, Scirpus and Typha are also found commonly in the playa areas (Correll and Johnson 1970; Gregory 1973; Harrington 1972; Knutsen 1975). These have been noted as constituting a part of the native American Indian diet. Yucca and hackberry from surrounding areas were also Important (Bryant 1974a, 1974b; Bryant and Dean 1975; Clements 1937; Pecora 1967:50; Pettit 1977 personal communication; Potter et al. 1975; Shafer 1976a, 1976b).

In saline-alkaline playa-type waters of Texas and New Mexico there are shrimp of the genera Penaceus, Macrobrachlum, and Crythiops; the soft shell clam, Myaarenaria; and oyster, Crassostrea virginica. It has not been demonstrated that these marine crustaceans were included in the American Indian cuisine, but they could have been one reason for the aboriginal settlement on saline lakes of the Llano Estacado. It has been noted that the Dawada tribe of the Central Northern Sahara have been utilizing Artemia salina (shrimp-like animals) as a food item for hundreds of years (McCarraher 1972:22).

The Rolling Plains are within the Mesquite Plains and Mixed-grass districts of the Kansan Biotic Province (Dice 1953:27). It is a region of transition from eastern to western faunas (Blair 1950:110- Harris n.d.). While 59 species of mammals are known from the Kansan province, only five are restricted to it (Blair 1950:111; Smith 1965). Fourteen species of lizards and amphibians and 31 species of snakes are listed

for the area but none are restricted to It (Blair 1950:112).

Within the Rolling Plains are mesquite, shrubs and low trees. Grasses include various species of grama, three awn, beardgrasses, broomweed, and gaillardia (Blair 1950:111; Coulter 1891; Gould 1969). Turableweed is also frequent; juniper are numerous on the steep canyon slopes and occur with the common thorny brush on the rocky upper prairie or mesa-tops (Shafer 1969:3).

Paleoenvironment: Climatic, **Flora** and Fauna Change

Marked environmental changes have occurred on the Llano Estacado during its long period of human occupation (Wendorf 1961; Wendorf and Hester 1962, 1975). These changes have no doubt necessitated readjustment to the environment by man and consequently resulted in cultural changes (Hester 1976a; Sellards 1940; Schultz 1943; Roberts 1953). Occupation in or near the S.P.A.G. area is known to have occurred as early as 12,000 years before present (B.P.) during the latter part of the last major glacial advance, the Wisconsin, of the Ice Age (the past 1,000,000 years) and into post-Wisconsin (Wormington 1957), or Neothermal (Antevs 1955) times. The climatic events of the late Wisconsin consisted of alternating time periods, or stages of pluvial, moist and cool times, and sub-pluvial, less moist times, with Intervals, dry stages. Neothermal (Post-Wisconsin) times are initiated by the final glacial fluctuations, or oscillations, known as the Cochrane (Willey 1966). This stage is often referred to as the Anathermal stage; it is succeeded by the dry Althhermal and it in turn by the milder Medithermal (Antevs 1955).

The stage or climatic events of the late Wisconsin (Harris n.d.) and post-Wisconsin (Antevs 1955) are listed in table 1 with their dates and the corresponding prehistoric cultural time periods and their subdivisions, or stages.

TABLE 1

THE STAGE OR CLIMATIC EVENTS OF THE LATE WISCONSIN AND POST-WISCONSIN

Years Before Present	Climatic Event	Cultural Period	Cultural Stage
10,000 B.C.	Lake Tahoka Pluvial	Paleoindian	
9,000 B.C.	Scharbauer		Clovis
8,000 B.C.	Lubbock Subpluvial		Folsom
7,000 B.C.	Anathermal		
6,000 B.C.			Piano
5,000 B.C.			
4,000 B.C.			
3,000 B.C.		Archaic '	Early
2,000 B.C.	Medithermal		
1,000 B.C.			Middle Late
1 B.C.			
A.D. 1000		Late Prehistoric	
A.D. 1700		Historic "	

The earliest of the time periods, the Paleoindian, is charactterized by lithic industries and associated faunal remains that suggest a subsistence means that relied heavily on hunting a number of now-extinct, very large land mammals, or megafauna. Changes in time with the tool complexes note successive Paleoindian complexes, or stages (Corbin 1976; Enlow and Campbell 1955; Green 1963; Hester 1962; Hester, Gilbow and Albee 1973; Hester and Hill 1975; Hester 1976b, 1976c; McCormick 1976; Moore 1976; Poteet 1938; Sellards 1938, 1945, 1952a, 1952b, 1960; Shafer 1966c; Shiner 1976; Story 1976; Studer 1955; Weir 1976; Witthoff 1954; Wright 1940). The earliest known stage, the Clovis or Llano, and the following stage, the Folsom or Lindenmeier, occur in Late Wisconsin times while the final stage of the Paleoindian period, the Piano, extends into the Anathermal (Willey 1966:29-51). The next period, the Archaic, is subdivided into early, middle and late stages. The first two stages occur in the Altithermal and the late Archaic, into the early part of the Medithermal. The Late prehistoric period spans the latter part of the Medithermal (Suhm, Kreiger and Jelks 1954).

Many feel that the earliest stage of man's occupation of the Llano Estacado, the Clovis stage, occurred after increasing arid conditions of the Scharbauer interval had begun (Wendorf and Hester 1975). Some believe that this stage, although brief in duration, which lasted from about 11,500 to 11,000 B.P. (Haynes 1970), overlapped with a pluvial stage (Late Tahoka) when conditions were more moist. Some studies indicate inyon-juniper woodland with oak and mountain mahogany was covering west Texas from more than 40,000 to as late as 11,000 years

ago (Wells 1966:970-975). The first well documented Paleoindian sites occurred as early as 11,500 B.P. (Van Devender 1976). This early occupation would be found with the pinyon-juniper woodland of cooler Late Tahoka Times. After 11,000 B.P. a good juniper-oak woodland persisted without pinyons until about 8,000 years ago and the start of the Anathermal. After 8,000 years ago a xeric woodland and/or grassland came into place (Antevs 1955; Van Devender 1976; Wells 1966:970-975).

The type of vegetation provides evidence of temperature ranges and amounts or precipitation. Pine is restricted by the minimum summer isotherm of 47 - 51 F. Spruce is restricted by the maximum summer isotherm of 66 - 70F.(Reeves 1965:187). Their presence indicates that the July mean monthly temperature must have been less than 66 - 70 F. and not lower than 47 - 51 during Late Tahoka. At present, the average July temperature is about 79.3 F. and the annual mean about 59.6 F. (Reeves (1965). It has been calculated that a maximum annual precipitation of 33 - 34 inches existed then compared with the present-day approximate 18 inches. Less evaporation, 44 inches, compared to the present rate of 60 inches and increase in runoff to at least 8.5 inches as against a modern rate of 9.25 inches resulted in a period of maximum filling for the Llano Estacado lakes and draws. After the Scharbauer Interval* "lake-fill" conditions apparently never agin reached such an extreme (Harris n.d.). Such heavy runn off no doubt created streams and pools in the draws which made them acceptable watering holes for man and game.

In sum, the climate of early Paleoindian times in west Texas is seen as an equitable one with mild winters and cool summers and with

summer rainfall persistant and winter rainfall increased (Van Devender 1976). The climate lacked the extremes of heat and cold found in the region today, but which averaged cooler and more effective moisture. This would allow more mixed biotic communities with greater species diversity (Hibbard 1960; Van Devender 1976). There seems to be no evidence of any drought period during the Clovis and Folsom stages (Harris n.d.).

The evidence at Blackwater draw, an important Clovis site on the Llano Estacado, indicates that the vegetation changed little from Clovis stage Into the following Folsom stage of the Paleoindian period (Slaughter 1975). Evidence indicates that the Folsom complex was associated with the most heavily wooded period ever known to man on the Llano Estacado: the Lubbock subpluvial (Oldfield and Schoenwetter 1975). It has been suggested that this stage is bracketed between the dates of 10,450 to 10,250 B.P. (Harris n.d.). During this time, groves of Ponderosa pine, with some admixture of spruce existed in the highest parts of the Llano (Oldfield and Schoenwetter 1975). In lower altitudes, mixed pine woodland probably covered smaller areas. Few if any spruce would be found here. Below the 2,500 foot elevation the predominantly herbaceous communities eatablished at the end of the Tahoka Pluvial seem hardly to be affected through the Lubbock subpluvial (Harris n.d.).

In sum, vegetational conditions in the Llano Estacado range from open grasslands (probably somewhat more lush than today) with riparian gallery forest on one extreme to patchy spruce-pine or ponderosa forests at the other extreme. Elsewhere in the southwest including the Rolling Plains, plains grassland, semi-arid grasslands and woodlands, all probably

more efficient moisture than occurs today, were established. The close of the Folsom stage and end of the Lubbock subpluvial is marked by the withdrawal of woodlands (Harris n.d.).

Although it is accepted that Clovis Man relied primarily on mammoth, and Folsom man on bison as the main protein source, summaries of animal food resources demonstrate that several other animals were part of a hunting "back-up" system (Gorman 1972; Haynes 1966, 1970; Johnson n.d.; Wheat 1971). A wider selection of now extinct megafauna appeared in the Clovis stage than in later Paleoindian stages (Hughes 1957; Saunders n.d.; Shotwell 1955). Remains of horse, camel, bison, sloth and tapir have been found in draws associated with mammoth remains (Dibble 1970; Dibble and Lorrain 1968; Irwin-Williams 1967; Lundelius 1970, 1974; Olson 1971; Warnica 1961; Warnica and Williamson 1968; Wilmsen 1974). Modern types of game such as black bear, deer, elk, pronghorn antelope, bird, rabbit, cottontail, jackrabbit, muskrats and turtles were also present and were hunted and used (Johnson 1976a, n.d.). With the close of the Paleoindian period and the termination of woodlands, the megafauna became extinct, but modern types persisted.

By 8000 B.C. the final oscillations of the last glacial advance, the Cochrane, were ending and a warming trend followed. Over the next 2000 to 3000 years, or within a climatic period known as the Anathermal, precipitation would decline; temperatures, rise; woodlands, retreat, and the last of the megafauna would become extinct (Antevs 1955). Semiarid conditions probably prevailed throughout the S.P.A.G. area during most of this time.

The Altithermal period, or "Long Drought," commenced around 5000 B.C. The area converted from semi-arid to arid lands and with this change the final stages of the Paleoindian period terminated.

Inth«next 2500 years average annual temperatures would be their highest and precipitation the lowest than at any time during the period of occupation by man on the Llano Estacado and western Rolling Plains. The low annual precipitation, decreased run-off, increased deposition in stream^ channels, and increased evaporation resulted in the elimination of running streams and permanent water pools in the draws. Similar circumstances affected the playas, and only the saline lakes probably maintained enough water to make them more than of seasonal use to man or animal.

Short grasses or drought resistant brush would dominate, but be scanty thus limiting the forage for game animals. At this time modern fauna would exist and continue into present times. Species such as bison, antelope, coyote, prairie dog, ground squirrels and kangaroo rats would be on hand, but generally, ifewer in number (Johnson 1976a). Hunting and gathering activites were possible, but more curtailed than before or after this "long drought."

The initiation of the Medithermal period about 2000 B.C. was marked by the development of climatic and biotic conditions that generally exist to this day. However, the area was probably marked by occasional, but prolonged droughts. It has been noted that droughts in the southwest occurred around 1000 B.C. (the "Cochise III Drought"), 500 B.C. (the "Fairbanks Drought"), A.D. 330 (the "Whitewater Drought"), A.D. 1276-1299 (the "Great Drought"), and A.D. 1573-1593 (Antevs 1955). Although such dry spells may not have been equally effective in the S.P.A.G. area, some are certain to have caused the maintenance of flora and fauna similar to that fnunfl in the area during the Altithermal. Such fickle climatic

conditions favor the drought resistant short grasses which vary In amount and quality and cause sharp rises and falls in numbers of native animals. Ground water supply would be unreliable over long periods. Such conditions did not favor rapid population growth or productivity among a stone age population, and left no surplus or leisure time to provide for a great number of Innovations. Cultural stability was largely maintained until an external society with a more advanced technology arrived in the past century and began exploitation in an entirely different manner than was previously possible.

Environmental Potential for Prehistoric Human Exploitation

During the earliest period of man's utilization of the S.P.A.G. area, potable water was available in draws with streams and pools, playas with a seasonal fill and in relatively stable bodies of water in the lakes. This resulted from higher precipitation and lower evaporation. These moist conditions provided for a greater variety and quantity of vegetation which in turn could provide greater food resources, more fuel and in the case of woody plants, more building materials. Animal life, directly and indirectly, dependent on the vegetation, was more abundant and varied providing a greater hunting potential especially on the Llano. This would provide food, hides for shelter, and bone for tools. Salt would be available from playas and lakes in drier seasons, or adequately provided from the large meat supply from the hunt. In the Rolling Plains, natural shelters such as rock shelters, could supplement construction of available wood and rock for housing. Sheltered areas for open encampment would

be found on the slopes of playas and woodland draws in the Llano; in rineons at heads of canyons, canyon bottoms, or timbered areas in the Rolling Plains. Mineral materials were very limited on the Llano, but some solidified caliche found near saline lakes could be used for more crudely made cutting tools. The Rolling Plains offered more minerals. Nearby sources of Edwards Plateau quartz and local South Fork quartzite provided the material for most cutting tools.

In Archaic times, a decrease in the water supply and consequent decrease in vegetation and game restricted man's movements in and exploitation of the S.P.A.G. area. Still some game and plant material as well as construction materials, minerals and fuels were available.

Late prehistoric societies saw an increase in these resources* but at no time did the water supply appear reliable enough to encourage the adoption of farming. The intermittent periods of aridity of unpredictable lengths would discourage farmers who could not be sure of spring rains for dry fanning, or subsequent run-offs and predictable water levels needed for irrigation farming. Foraging possibilities improved but would still require seasonal movement with variable use from year to year, thus eliminating an intensive sedentary way of life.

REGIONAL ARCHAEOLOGY

Archaeological Materials Diagnostic of Cultural-Chronological Periods

The first step in analyzing sites and materials of the area is to determine their age of occupation and with which cultural pattern they are most closely allied. Since no attempts had been made to date the occupation of these sites at or about the time they were discovered or reported, it was necessary to rely on the reports of certain materials, or their type or style, that had been assigned time ranges for their occurrence in previous studies.

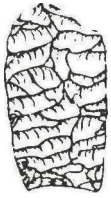
It is understood that a site containing a type with a long time range would not necessarily indicate that the site was occupied, or even repeatedly reoccupied, during this entire time range. For that matter, the lack of any type with a known time range, did not necessarily mean that the site was not occupied at that time; but in the absence of any positive data it was assumed not to have been so. With no positive knowledge of exactly when during a time range a site was occupied, it was assumed that the type represented possible occupation throughout the entire range. As an example, assume three sites had types dating between 7000 B.C. and 5000 B.C., three others with types ranging between 6000 B.C. and 2000 B.C., and three had types dating between 4000 B.C., and 1000 B.C.; this would indicate that three sites were probably occupied sometime between 7000 B.C. and 5000 B.C.; six, possibly between 6000 B.C. and 5000 B.C.

three between 5000 B.C. and 4000 B.C.; six between 4000 B.C. and 2000 B.C., and three between 2000 B.C. and 1000 B.C. Although the exact date of occupation for any site remains unknown, the probabilities of occupation for each millenium can be shown and this in turn suggests the fluctuations of intensity of occupation and utilization of the S.P.A.G. area from time to time.

These types of materials with known time ranges then serve to diagnose the probable time of occupation of each site, and consequently, such types are referred to as diagnostics. None of ther material showed sufficient distinctions in its areal distribution as to suggest that there were any great cultural differences at any one time within the S.P.A.G. area with the exception of some minor distinctions between the Rolling Plains and Llano Estacado. These latter distinctions may have resulted from different activities in the respective areas by the same ethnic group rather than activities by different ethnic groups.

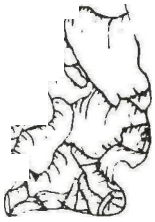
Of all archaeological materials reported for the S.P.A.G. area only projectile points (figures 1 and 2) and pottery could be used as diagnostic material, since they are the two types of materials adequately studies regarding time range and possible cultural affiliation and/or geographical range. The diagnostics reported on site records could not be examined first hand and consequently the reporters definition of types was accepted without reservation. Time ranges (figure 3) and affiliations were determined from literature and charts (Bell 1958, 1960; Breternitz 1966; Hughes and Thompson 1972; Perino 1968, 1971; Suhm and Jelks 1962; Suhm, Kreiger and Jelks 1954). Only projectile point types reflect times of site occupation throughout the entire time that man is

Figure 1. Artifacts from the S.P.A.G. area:
Projectile points

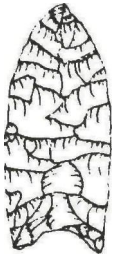


A. Plainview

B. Fresno



C, Edgewood



D. Kinney

E. Palmillas

F. Garza

G. Scallorn

H. Washita

I. Washita

J. Young

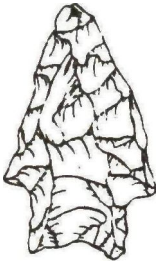
m

Figure 2. Artifacts from the S.P.A.G. area-
Projectile points

A. Harrell

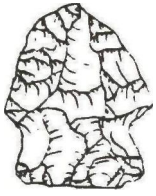
B. Fresno

C. Godley

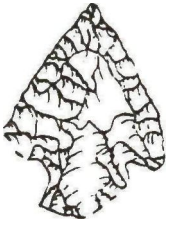


D. Bulverde

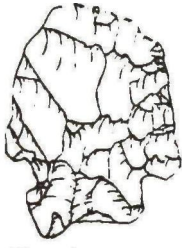
E. Kent



F. Ellis



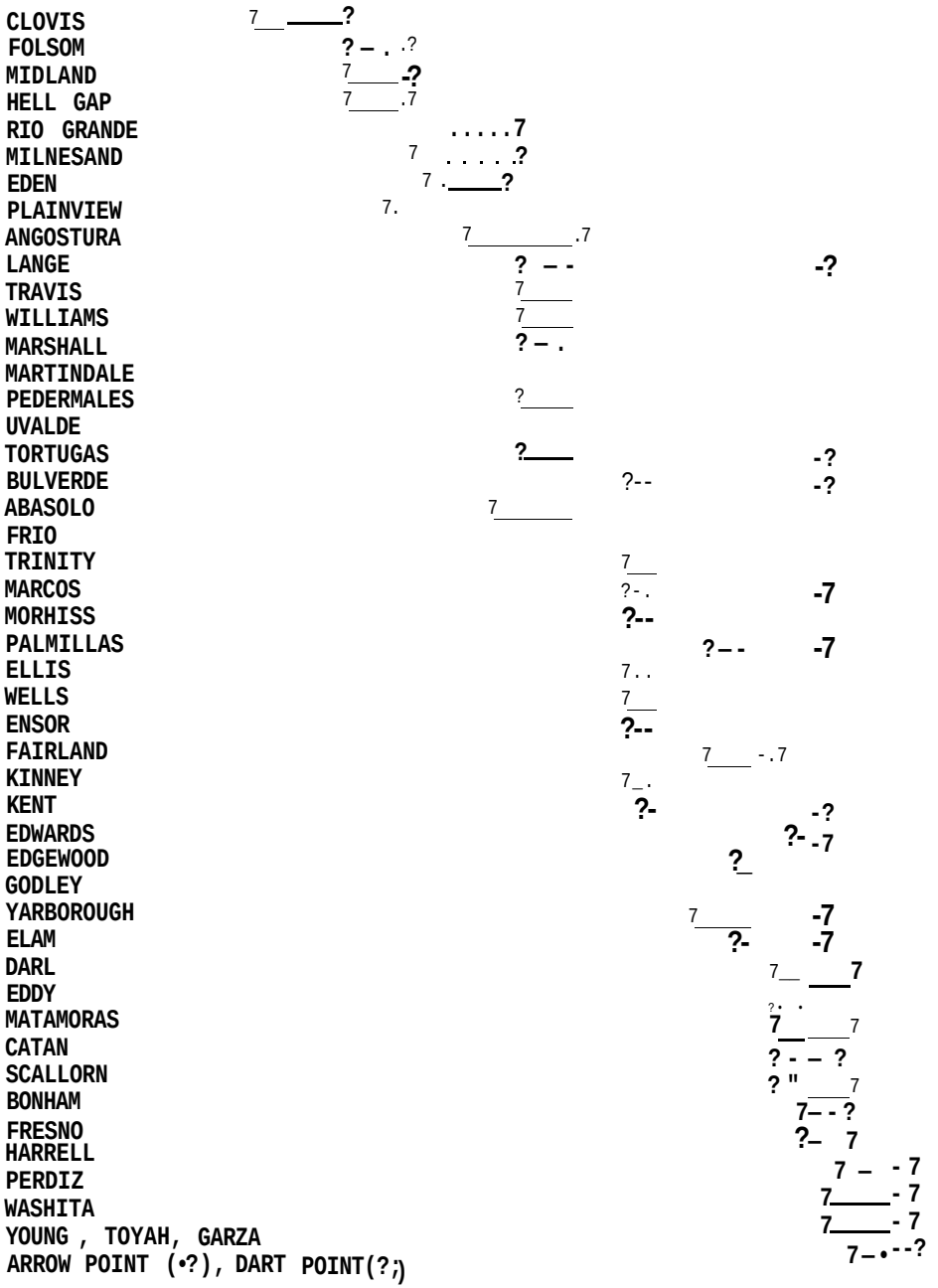
G. Ensor



H. Martindale

I. Trinity

Figure 3. Projectile Point Chronology in the S.P.A.G. Area



known to inhabit the area. Ceramics were found in a number of sites, but they indicate only late prehistoric Indian occupation (Breternitz 1966; Collins 1969; Hughes 1961; Hurt 1953; Kunz 1969). There has been no petrographic analysis of pottery, therefore there is no way to be certain if ceramics constitute trade ware or were made locally. In a number of cases the type of reported pottery was not identified and in other instances the types cited were unknown to the writer and of no use as diagnostics. Many unknown types that were described are grouped with known types of a similar nature since it was presumed that different reporters were referring to like types but using different terms. Thus any unknown Black-on-White type was assigned to the general category of Pueblo III or IV. A list of those categories of wares and suggested times for such follows in table 2. Types of unknown names are listed in parentheses by a type of known age.

The different successive prehistoric cultural periods and stages employed in the study were accepted from other studies (Willey 1966) since the date reported was not definitive enough to offer another chronology. It is uncertain if specific projectile point data is applicable to this area since time ranges for types are defined for their occurrence in other areas (Bell 1958, 1960; Hughes and Thompson 1972; Perino 1968, 1971; Suhm and Jelks 1962; Suhm, Kreiger and Jelks 1954); but due to the absence of data from the S.P.A.G. area it is assumed that their occurrence here was approximately the same as in the area for which they were defined. The most reliable projectile points were those of the Paleoindian period. These were lanceolate forms that persisted for a long time span. The Archaic period is marke<l by point

types with a less definite time range. The most questionable diagnostics were those Archaic types that were referred to as c'art ooints. The confusion results from use of the term "Archaic" and whether or not it designates a cultural affiliation or a chronological period; the two do not always correlate. Kreiger (1946) has noted that darts, usually associated with the Archaic period were found in nearly all of the sites of the Panhandle aspect which has an accepted time range of A.D. 1325-1450. However, in this study the designation of dart points was accepted as diagnosing occupation of the Archaic period when there were no Late Prehistoric types associated with it. The presence of ceramics and so-called "arrow points" placed sites in Late Prehistoric to Historic times. The appearance of metal at a site indicated that it was occupied in historic times (Holden 1962; Wallace 1952). Few of the latter were reported but one site on a talus slope of a canyon in Garza County, yielded chipped ground lithic tools and 44-90 sharps cartridges which were discontinued in use by 1878; they were found in association with bison bone (Campbell and Judd 1977).

TABLE 2

CERAMIC DISTRIBUTION IN THE S.P.A.G. AREA

Date	Ceramic Type
(Jornada)	
950-?	El Paso Brown
1300-1400	Lincoln B/R (Agua Fria B/R)
1310-1375	El Paso Polychrome (Red on Brown Indented)
950-1350	Jornada Brown (Brownware, Mogollon, Caliche Ware, Roswell Brown)
1150-1300	Three Rivers Terracotta (Wide Band/terracotta, 3 Rivers Narrow Lined R/terracotta, 3 Rivers Broadline, 3 Rivers R/terracotta)
1300-1450	Chihuahua Corrugated
1000-1200	Micaceous Tempered (Middle Pecos Micaceous)
1265-1385	Gila Polychrome
(Anasazi)	
1050-1300	Pueblo III Plina Gray (Plain Gray Ware. Gray)
1270-1370	Los Lunas Smudged
1150-1500	Chupadero B/W (Crosby B/W)
1050-1300	Pueblo III Painted (Socorro B/W , Mesa Verde B/W Puebloan Wares)
1300-1800	Pecos Glaze Polychrome
1300-1375	Heshotauthia Glaze
1300-1700	Puaray Glaze Polychrome
1050-1300	Pueblo III Corrugated (Corrugated Ware, Pueblo 3 Indented, Incised, Pueblo, Smooth Plainware, Water Storage Containers)
1400-1550	Bandelier B/G
1300-1700	Pueblo IV Corrugated (Pueblo IV, Pueblo IV Utility Ware, Ind. R. G. Utility, R. G. Utility Punched)
	Taos Micaceous (UNK, Late R. G. Micaceous)
1300-1450	Rio Grande Glaze I
1425-1475	Rio Grande Glaze II
1426-1550	Rio Grande Glaze III
1550-1600	Rio Grande Glaze IV
1600-1700	Rio Grande Glaze V
1700-1838	Rio Grande Glaze VI
1500-7	Tewa Polychrome
	Pueblo IV B/W (B/W Polychrome, SW G/W)
	Sapawe Corrugated

TABLE 2--Continued

Date	
(Central Plains)	
1300-1450	Cordmarked (Panhandle, Cord Red Slipped Indented, Borger Cordmarked, Upper Republican)
(Euro-American Ware)	
1700-	Historic Ware (Spanish)
(Caddoan Ware)	
1200-1700	(Shell-tempered Wares, Bullard Brushed, Other Texas Texas types)

Description of Archaeological Sites and Materials

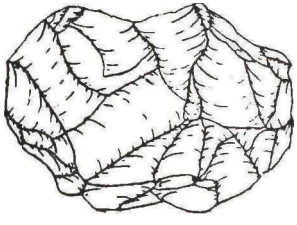
The vast majority of archaeological sites in the S.P.A.G. area were detectable on the surface by the presence of varying amounts of artifacts and rejectage, or discarded waste material (Campbell 1977). Only a few features such as burned rocks or hearths were noted at some sites and no structures or other constructions were reported. Thus, most sites appear to be temporary encampments occupied, and perhaps reoccupied, by foraging peoples for a single season of a year. Occasionally rock art or mortuary sites were reported, but not thoroughly described. In one case a cache of flint material was mentioned (Campbell and Judd 1977), but these provide little that can be used in interpreting the prehistoric culture of the S.P.A.G. area.

The vast majority of reported material consisted of chipped stone artifacts or rejectage which was most frequently of smooth textured crypto-crystalline quartz (so-called "flint" or "chert"). The rejectage was separated into two categories--cores and flakes.

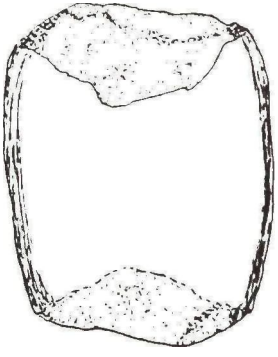
A core (figure 4B) is a nodule from which flakes have been removed. Approximately 760 cores were found in the S.P.A.G. area--706 in the Rolling Plains, fifty-four on the Llano. Of these, 395 were of Edwards Plateau quartz on the Rolling Plains; but there were only four on the Llano. Around 130 South Fork quantzite cores were noted in the Rolling Plains while only ten were reported from the Llano. Some eighty-eight of Ogallala chert were reported from the Rolling Plains, twenty-four on the Llano. Fewer cores, thirty-six of Alibates flint, were found in the Rolling Plains; peculiary, none were mentioned from the Llano.

Figure 4. Artifacts from the S.P.A.G. Area

A. Beveled Knife



B. Core

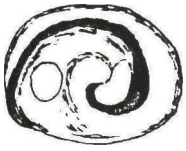


C. Rubbing Stone

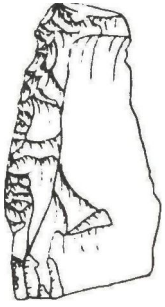
Flalfts are chips or spalls removed from a nodule by force. About 5,125 unmodified flakes were found in the area. Some 2,637 in the Rolling Plains, 2,488 in the Llano. On the Rolling Plains 7,595 were marip of Edwards Plateau quartz, 920 on the Llano. There were 438 of Ogallala chert from the Rolling Plains compared to 310 on the Llano. Around 391 South Fork flakes were reported from the Rolling Plains compared to 202 on the Llano, and sixty-six Alibates were reported on the Llano as against sixty-eight in the Rolling Plains. Only three basalt flakes were noted in the Rolling Plains, seven on the Llano. Around fifty obsidian flakes were found on the Llano, but none were reported for the Rolling Plains. Approximately 655 were made of unknown material on the Llano but only twenty were unknown for the Rolling Plains.

Among the chipped stone artifacts noted were 233 artifacts referred to as blades (figures 5B and 5C). A blade is an elongated flake (usually twice as long as it is wide), with parallel sides, and one or more ridges running nearly the length of the dorsal surface. Some thirty-eight were reported from the Llano, 185 in the Rolling Plains. Most were made of Edwards Plateau in both areas--fifty-four in the Rolling Plains, twenty-four in the Llano. Surprisingly, six Ogallala blades were found in each area. There were thirteen of South Fork quartzite in the Rolling Plains and three in the Llano; thirteen of Quitaque flint in the Rolling Plains and two in the Llano and two of Alibates for the Rolling Plains. There were ninety-six of an unknown material in the Rolling Plains and two in the Llano. More blades were found in the Rolling Plains than on the Llano.

Figure 5. Artifacts from the S.P.A.G. Area

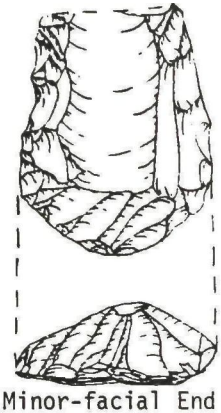


A. Shell Bead

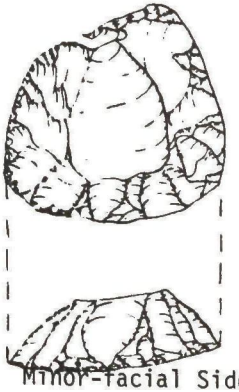


B. Flake Blades

C. Flake Blades



D. Minor-facial End Scraper



E. Minor-facial Side and End

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Reported in the S.P.A.G. area were 130 bifacial blades, or artifacts that have both major faces with edges secondarily flaked. There were 101 in the Llano made of the following material; thirty-four unidentified, thirty Quitaque, eighteen Edwards Plateau, fourteen Obsidian, and five Ogallala. In the Rolling Plains twenty of unidentified material, five of Edwards Plateau, and four of Ogallala were reported.

The beveled knife (figure 4A) is a four-sided tool with alternate major and minor faces that result in a trapezoidal form in cross-section. There were twenty-eight of these knives reported in the Rolling Plains--eighteen of Edwards Plateau, two of South Fork,one of Quitaque, and seven of unknown material. Only seven made of an unknown material were reported on the Llano.

Scrapers, artifacts with secondary chipping on the minor or narrow faces and made from large percussion flakes, were noted In the records—sixty-five of unidentified material in the Rolling Plains, 228 of unidentified material in the Llano. Others include one of Alibates, one of Ogallala, and nineteen of Quitaque In the Rolling Plains; and one of Quitaque on the Llano.

Approximately 351 side-end scrapers (figure 5E). large flakes with flakes removed from all narrow or minor faces were reported on the Llano and ninety-four in the Rolling Plains. More were made of Edwards Plateau in both areas. Some thirty-five were of Ogallala in the Rolling Plains compared to seven in the Llano. There were fourteen of Quitaque in the Llano, one in the Rolling Plains; fifteen of South Fork in the Rolling Plains, two in the Llano; and one of Alibates from each area. Only three basalt scrapers were reported from the Llano

and 285 of unknown material; five of unknown material were found in the Rolling Plains.

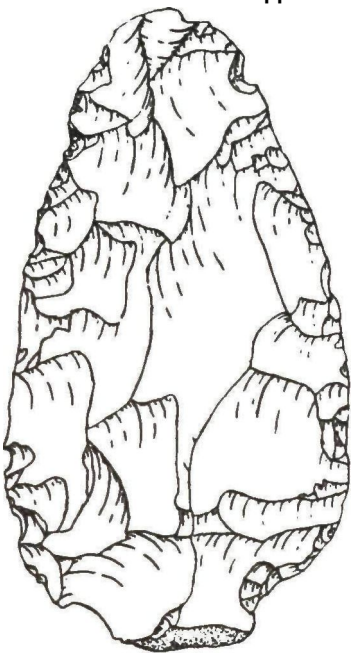
Side scrapers (figure 6D) which are artifacts that have flakes removed from one or both long and narrow sides were common. There were 143 reported in the Llano--ninety-six of unidentified material, thirty-six Edwards Plateau, six Ogallala, three Quitaque, one Basalt, and one Obsidian. Reports from the Rolling Plains cite sixty-five made of Edwards Plateau, thirty-four of South Fork, twenty-seven of Ogallala, thirteen of unknown material, six of Alibates, and two of Quitaque.

End Scrapers (figures 5D and 6C) which are elongated flakes with secondary flakes removed from both ends were not reported in the Rolling Plains. References reported eighty in the Llano. The largest number reported was of unidentified material--thirty-nine; then eighteen of Alibates, thriteen of Quitaque, four of Edwards Plateau, two of Ogallala, and two of South Fork.

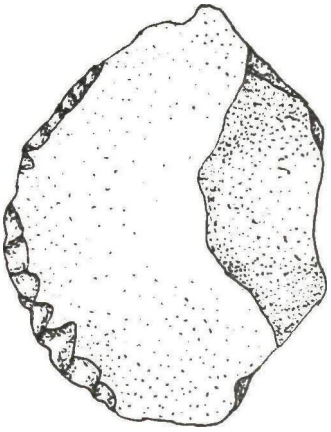
Punches and gravers are small tapered points unaltered except for trimming necessary to fashion the point. Around thirty-four punches were located--twenty-three on the Llano, eleven on the Rolling Plains. Only three on the Llano were made of Alibates. All others were made of unidentified material. About twenty-two gravers were recorded. Around ten were made of Edwards Plateau on the Rolling Plains and six others in each area were of unknown material. Some five spokeshaves, or shaft scrapers, were found on the Llano, six in the Rolling Plains.

Some bifacially and unifacially chipped stone fragments were

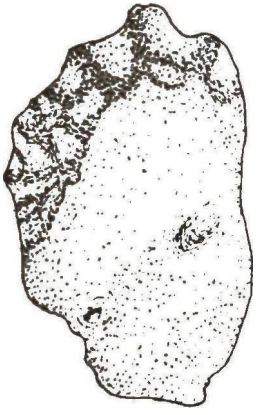
Figure 6. Artifacts from the S.P.A.G. Area: Chipped Stone



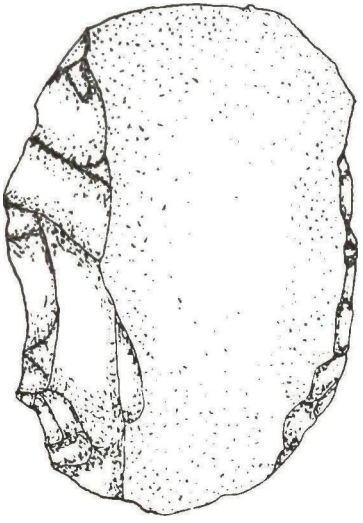
A. Bifacial Flake Fragment



B. Assymetrical



C. Basalt End Scraper



D. Side Scraper

reported. A number of kinds of these flake fragments, which have had their striking platform or bulb of percussion removed, are noted. Assymetricals (figure 6B), flake fragments of unproportioned forms were mentioned--fourty-slx in the Llano, fifteen in the Rolling Plains. The majority were made from Edwards Plateau in both regions. A few rectangulates, flakes with right angles, were also reported in the S.P.A.G. area. Of the bifacial ovates, a circular to oblong flake with secondary flaking on both major faces, eighty-two were reported in the Rolling Plains--thirty-eight of unidentified material, twenty-eight of Edwards Plateau, nine of Ogallala, eight of South Fork and one of Quitaque. In the Llano, twenty were of unidentified material and one each of Obsidian and Quitaque. Of the unidentified bifacially flaked fragments, there were thirty-one on the Llano and ninety-six in the Rolling Plains, most were made of Edwards Plateau. Only eight choppers, nodules of stone with one or more bifacially chipped edges, were found in the Llano and five in the Rolling Plains.

Also included in the chipped stone industry are bifacial triangulates most of which were projectile points (figures 1, 2 and 6). These are three-sided flakes with chipping on each major surface. Items of this nature are usually referred to as projectile points whether they are or not. Some 700 were reported. They have been discussed previously in the first part of this section.

The next most common industry reported was ground stone, those artifacts made of a more granular material. Hammerstones, nodules formed by battering or grinding, consisted of thirty-four specimens from the Llano, and fifty-two from the Rolling Plains, all made of

South Fork or some unknown material.

The manos (figure 7) reported consisted of large oval stones shaped by pecking or abrading. Generally the size ranged from six inches long, three to six inches wide, and two inches thick. There were eight manos and seventy-one fragments of such located on the Llano, forty-eight complete ones and seventeen fragments on the Rolling Plains; most were made of quartzite and sandstone.

Metates (figure 8), broad, flat stones with pecked and ground areas on their broad surfaces, were reported--forty-two complete specimens and four fragments in the Llano and fifteen complete specimens and thirty-five fragments from the Rolling Plains. The majority were made of sandstone or an unknown material. Size varied from six to twelve inches long, six to eight inches wide, and three to six Tlnches in thickness.

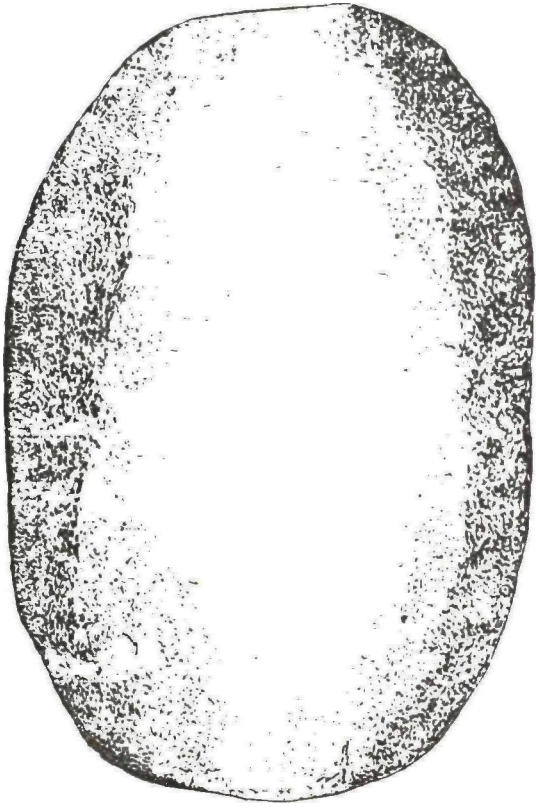
Milling stones, which were used in seed and plant preparation, consisted of sixteen specimens of unknown material; all were from the Rolling Plains.

Abraders, or rubbing stones (figure 4C), are small stones produced by abrading and used for such purposes. More of these were found in the Llano, twenty-one, than in the Rolling Plains where there were thirteen; all were made of quartzite or sandstone.

In the Rolling Plains, ten sites with bedrock mortars were reported in sandstone formations. These are small depressions in rocks caused by abrasion which resulted from heavy grinding activity on the rock face.

A few other materials were reported from the S.P.A.G. area; most

Figure 7. Artifacts from the S.P.A.G. Area
Ground Stone



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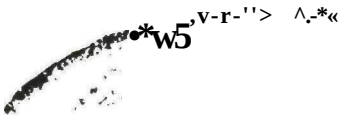

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are perishable materials which do not preserve well in the many open sites, or at least on their surface. Most of these objects **are** presumed to have been left in late prehistoric times. Beads of bone, shell (figure 5A), turquoise, stone and glass were recovered in the S.P.A.G. area. A small amount of plant material was noted: mesquite beans, charcoal and wood. The quantities are unfortunantely of little aid in establishing dietary habits or other actlviites. Mussel shells and a small amount of other unidentified shell fragments were also recorded. Numerous mention is made of the presence of bone in archaeological sites in the S.P.A.G. area. Many unidentified fragments were mentioned. One large concentration of bison bone was mentioned in the Rolling Plains (Campbell and Judd 1977). the presence of other bone types includes: horse, wolf, coyote, turtle, mammoth, bison taylori, reptiles, rodents and birds.

Cultural Stages and Their Characteristic Materials

Most sites contained diagnostics of more than one period or stage thus making it difficult to assign associated artifacts, rejectage or features to any one time period. But, not all sites had all periods or stages represented and thus it is believed that where a certain type of material has a high frequency at sites with a diagnostic of a certain period or stage and a low frequency or absence when the diagnostic is absent, that it suggests that the material was common to that period. Sites with diagnostics of the same time range are treated collectively to determine whether or not certain materials had a high or low frequency

and whether or not they were common in this or that time range. The percentage of the total material of a certain artifact or kind of rejectage for each period or stage determines if this material was common or uncommon in the cultural complex.

is difficult to separate the stages of the Paleoindian Period since most sites with Paleoindian diagnostics contained some diagnostics from all stages of this period. Thus the common artifacts or "tool kit" of this period will be considered the same for all its stages. Some materials such as ceramics that are reported from sites with both Paleoindian and Late Prehistoric diagnostics are automatically considered not to be associated with the Paleoindian diagnostics, and are not mentioned in the "tool kit" of this period.

Most materials associated with Paleoindian diagnostics are mainly of chipped stone. Little rejectage was described as to the size, amount or materials. Undifferentiated scrapers comprised 30 percent of the chipped stone material; however, of the typed scrapers, 8 percent of the chipped stone industry were end scrapers, 11 percent were side scrapers and only 1.3 percent were side-end scrapers. It may be assumed that most undifferentiated types reported were probably either side or end scrapers, and only a few were side-end scrapers. By employing the percentage of the known types of scrapers in estimating what percentage of the undifferentiated types would fall into each type one can calculate that 27.5 percent of all chipped stone artifacts were side scrapers, 20 percent were end scrapers and only about 2 percent were side-end scrapers. So few of the latter are noted that there is some question as to whether

or not they should be truly associated with the Paleoindian Period tool kit in the S.P.A.G. area.

Well-made lanceolate projectile points constitute 49 percent of *AV* ' -^œd stone material. The high percentage probably results from *unm*, ••" *Ac* collecting of these sites which no doubt favored the recovery of these artistic objects. Blades constitute only 1 percent of the mentioned material, but in truth, they were probably more common. Their lack of aesthetic appeal would make them frequently overlooked.

A few other chipped stone artifacts were reported--nine flake fragments, one chopper, five gravers, and two punches ("Clear Fork Gouges"). They *are* too few in number to be certain that they constituted a part of the Paleoindian chipped stone tool kit. A few ground stone tools or fragments of such—manos, metates, hammerstones, and rubbing stones, were mentioned; but again, their association is questionable. Bone fragments, tools and wastage were reported. No other materials were recorded with Paleoindian diagnostics except for some possible hearths.

The chipped stone industry associated with diagnostics of the e^rly Archaic also shows a preponderance of points and scrapers. Undifferentiated scrapers constitute 46 percent of the total chipped stone artifacts, but nearly all defined types of scrapers are side-end scrapers implying that the more specialized scrapers had fallen into disuse. Broad, stemmed projectile points comprise 40 percent of the reported chipped stone and bifacial flake fragments, about 1 percent. A few punches, gravers and choppers are reported as well

as a few ground stone items. There was some mention of hearths and burned rock, and reference was made to one turquoise bead and one bone awl. However, only broad, stemmed points; large side-end scrapers and a few blades seem to be clearly associated with this stage. Only one core was mentioned, but a number of flakes were reported; most (71 percent), were of Edwards Plateau quartz, but a few were of Alibates (20 percent) and Ogallala (9 percent).

In the middle Archaic sites, the reported material is largely chipped stone. A few more cores are mentioned, mostly of Edwards Plateau (68 percent). Broad stemmed or unstemmed points constitute 41 percent of the chipped stone tools and scrapers, 42 percent; however, of the identified scrapers 75 percent are side-end types and 25 percent are side types. No end scrapers are mentioned. About 10 percent of the chipped stone are now flake fragments; of those identified as to type, unifaclal and bifacial ovates, and bifacial assymetricals are reported. Blades constitute 6 percent of the industry. Other chipped stone items mentioned are gravers, punches, choppers and beveled knives; there are too few of these to be certain of their association and, in particular, the beveled knives are assumed to be associated with later diagnostics at this site. Ground stone tools now constitute 5 percent of the total artifacts. These are mainly manos and metates, but a few hammerstones and rubbing stones are mentioned. A few hearths and some scattered burned rock as well as charcoal are also reported. Mesquite beans appeared at three sites and bison bone at four sites. In general the tool kit was dominated by broad, stemmed points; side and side-end scrapers;

flake fragments; a few blades; and manos and metates.

The chipped stone in late Archaic times is primarily of Edwards Plateau (61 percent). South Fork (20 percent), Ogallala (10 percent) fl'-'d Alibates (9 percent). One basalt and one obsidian flake were reported, but their association Is dubious. In contrast, the cores consisted of Ogallala (48 percent). South Fork (24 percent), Edwards Plateau (20 percent), and Alibates (8 percent). It would appear that most cores (72 percent) were of local material, but more flakes (70 percent) were of imported varieties. This may Indicate that many quarry blanks were imported, but not many cores. Again the chipped stone industry was dominated by stemmed points (32 percent), and side-end scrapers (39 percent) and side scrapers (12 percent). However, at this time, the side scrapers appear to be less popular. Some end scrapers (3 percent) have appeared. About 10 percent of the chipped stone consists of flake fragments--primarily ovates and assymetricals. A few blades, punches, gravers, choppers, spokeshaves and beveled knives are mentioned but their association is uncertain. The ground stone tools now constitute 8 percent of the total tool kit with manos, metates and rubbing stones being most common. A few beads of stone, bone, shell and turquoise are reported, but their association Is questionable. Some bone and plant material occurs and there is more frequent mention of hearths.

About half of all reported sites with diagnostics contained identified pottery. This indicates a preponderance of Late Prehistoric or post-A.D. 500 occupation in the S.P.A.G. area and would also suggest that

most materials with diagnostics of more than one stage that include Late Prehistoric diagnostics were probably deposited in Late Prehistoric times. Artifacts from this period probably constitute at least a third of all reported for the area.

The chipped stone industry is still the most commonly represented material. Again most flakes are of Edwards Plateau (65 percent) and so are most cores (54 percent). Flakes of Alibates or Quitaque (18 percent). Ogallala (12 percent) and South Fork (4 percent) are reported. There are also a few of basalt and obsidian.. Cores are of Ogallala (28 percent). South Fork (11 percent) and Alibates (5 percent). Projectile points comprise 34 percent of all chipped stone artifacts. About one-fourth of all are still broad, stemmed or unstemmed types; but the majority are short and slender, and frequently notched. Nearly 50 percent of all chipped stone artifacts are scrapers, but in this period end scrapers (19 percent) and side-end scrapers (21 percent) dominate; the side scraper declined proportionately (10 percent). Flake fragments constitute 12 percent of the industry and blades about 3 percent of it. A few more beveled knives are reported, and it is probably at this time that they are introduced. Only a few punches, gravers and choppers are noted. Ground stone tools now constitute 11 percent of the total artifacts. Manos, metates and hammerstones provide for the bulk of them, but some mortars and rubbing stones are noted. Turquoise, shell, bone and stone beads were reported and six bone awls were also mentioned. Bison, horse, coyote, wolf, badger, turtle and raccoon bone material was identified. Some red ocher that probably served as a pigment was recovered. Much

burned rock and many hearths were associated with this material, and of the thirteen burials reported it is likely that most date to this time period.

As in previous periods, the Late Prehistoric took kit consisted mostly of chipped stone. Now both dart and arrow points were in use, and most scrapers were the small end-scrapers or all-purpose side-end types. Beveled knives and ceramics now appear. Other items are minor in amount and their association is questionable.

There were twenty sites reported with some pre-twentleth century historic materials, e.g., as metal tools, glass, etc. About fifteen also had some aboriginal materials intermixed with them, but the association is not clear (Texas Tech Archaeological Laboratory n.d.: site records). In one case, a burial (Texas Archaeological Laboratory n.d.:Site Record 41CR11) of a horse-nomad (e.g., Comanche Indian) of the nineteenth century was recovered.

S.P.A.G. AREA PREHISTORY

Paleoindian Period

The earliest substantial evidence of man's occupation in or near the S.P.A.G. area dates back to approximately 10,000 B.C. This early evidence falls into the first recognized stage, the Clovis stage, of the Paleoindian Period. A major type site for this stage, Blackwater Draw, New Mexico, lies a few miles west of the S.P.A.G. area (Agogino 1968:121; Anderson and Haynes in press; Hester 1975:14; Stark 1975:14). From it were recovered lanceolate, fluted points (the Clovis point) smaller unfluted types, flake fragments, end scrapers ("snub nosed" scraper), a hammerstone and bone tools. This stage was overlain and succeeded by the Folsom stage at Blackwater Draw (Wormington 1957:47-51). This period is represented at the Lubbock Lake site in the S.P.A.G. area. Extensive excavations here have produced fluted, dart points (Folsom points) and other generalized artifacts similar to those in the Clovis stage (Kelley 1974:51; Wheat 1974:29). This stage has been dated from about 7000 B.C. to 8000 B.C. (Wormington 1957:40). A later stage of the Paleoindian Period was recognized at the Plainview site in the S.P.A.G. area (Sellards, Evans and Meade 1947). Here unfluted lanceolate points (Plainview points) were recovered with some other chipped stone artifacts and much bison bone; these have been dated between 5000 and 7000 B.C. (Wormington 1957:107-108). Material overlying the Folsom stage at

Blackwater Draw also contained unfluted lanceolate points (Milnesand points) which were dated about 4000 to 5000 B.C. (Sellards 1955:344). The Plainview, Milnesand and similar unfluted points serve as diagnostics for the third and last stage of the Paleoindian Period, the Piano stage (Sellards and Evans 1960:639).

There have been twenty-six sites containing Paleoindian diagnostic points reported in the S.P.A.G. area, but with the exception of the two excavated sites, Lubbock Lake and Plainview, nearly all have yielded point styles of all stages. Since the two excavated sites were similar, both bison kill sites with generalized chipped stone artifacts, and differed only in age and diagnostics, it is impossible to differentiate one stage from another at the other S.P.A.G. sites on the basis of percentage differences of materials with reported Paleoindian diagnostics. Consequently, no attempt will be made to differentiate the cultural development through these stages in the S.P.A.G. area.

It appears that between 10,000 and 4000 B.C. occupants of the area maintained a relatively simple technology which consisted largely of chipped stone artifacts—projectile points, side scrapers, end scrapers and blades, that were useful in hunting and processing game. The basic subsistence means of hunting was more practical at this time because of a greater amount and variety of fauna that existed. The cooler, wetter, more moderate climate resulted in more vegetation for graze and browse thus Increasing the hunting potential. The finely made points and more specialized scrapers emphasize the concern for exacting hunting practices.

Few tools appear that would be useful in gathering and processing plant material, but with more plants available less effort may have been needed to acquire and use them. For example, existing stands of pine would have provided nuts which could be collected, dried and preserved, and eventually eaten without the use of any specialized tools.

Nearly all sites are located on the Llano Estacado, and the two sites in the Rolling Plains are found near the edge of the Llano. Most of these residences and/or foraging stations are found near lakes or draws; only two sites are near playas. Nearly all sites are located on elevations such as rims of draws, butte tops, crests of ridges or knolls within a quarter of a mile of permanent bodies of water. Only six sites were found below rises--three on lake benches, two in draws, and one In an arroyo. The latter appear to be kill sites and include the Lubbock Lake and Plainview sites. Those sites on elevations probably served as residence or lookouts. From here they had easy access to water and game in the draws, lakes, playas and canyons below. The pine and other trees located along the rises would provide shelter, plant food and wood for tools and residences. With less concern for plant material seasonal movement would be hardly required; but migrations of game animals would necessitate some movement.

It is not known what type of dwelling was in use, but since houses have not been reported and Paleoindian people were somewhat nomadic, it can be assumed that houses were of perishable material--perhaps consisting of hides over a slight frame. Nothing is known of clothing; however, it may have consisted of hides or leather too.

The lack of any tool kit for leather-work makes this questionable. No ornaments or artistry other than carefully chipped stone work, ceremonial items or mortuary practices can be assigned to this period.

Exchange in Paleoindian times with other areas is hard to detect. There appears to be little contact or interaction with the Rolling Plains during the Clovis stage, but the Blackwater Draw site in the western Llano, the Miami site in the Texas Panhandle and McLean site on the Edwards Plateau indicate that this cultural pattern was widespread In the High Plains (Wormington 1957:47-56). The Folsom stage is better represented, but still not common in the Rolling Plains of the S.P.A.G. area. Well-known sites of Folsom age are found in all directions from the area--the Lipscomb site in the Texas Panhandle (Johnson 1976a:471), the Steadman site (Tunnel 1 1975) to the south on the Edwards Plateau, the Scharbauer site in the southern Llano (Wormington 1957:41), Blackwater Draw on the western Llano (47-51), and northwest in the Raton Section at the type site, Folsom (23-29). Piano stage sites also appear in many directions from the S.P.A.G. area—the Milnesand (Warnica and Williamson 1968), Blackwater Draw (Wormington 1957:112-113), Elida (Hester 1962; Warnica 1961), and San Jon sites to the west (Wormington 1957:112-113), the Wolf Creek site to the south (Hester 1976a:l), the Nail site to the north (Baker, Campbell and Evans 1958), the Pigeon Cliffs site (Steen 1955) to the northwest, and the Beidelman site to the east in the Rolling Plains (Suhm 1960). It is apparent that the Paleoindian cultural pattern of the S.P.A.G. area forms just a part of a much more widespread pattern throughout the Southern Plains. It appears to be better developed in the Llano than in the Rolling Plains.

Archaic Period

With the coming of the "Long Drought" in Altithermal times there is a decrease in varieties and amounts of vegetation and game, and a probable decrease in population In the S.P.A.G. area. Only seven sites with diagnostics of the early Archaic period occur. They are associated with a comparatively crude chipped stone tool kit--broad points, large side-end scrapers and blades. The tool kit suggests a continuing emphasis on hunting, but with less concern for an exacting technology. The extinction of the megafauna and decrease of other types of game may have turned interest toward plant gathering, but ground stone tools and other artifacts used for gathering and processing vegetation are not numerous. The readjustment to this harsh environmental change may not have been completed in this period from 4000 B.C. to 3000 B.C.

All but one of the reported sites are located in the Llano, and this one is located in the Rolling Plains near the caprock. However, two others are near the edge of the caprock on the Llano. Two are near the draws, by springs, and the others by the lakes. Again all those in the Llano are located atop elevations and only the site in the Rolling Plains is located on a plain, this one in a canyon. More migration can be expected at this time since water supply and game have diminished. The playas and draws, except at springs, would be totally undependable; consequently occupation is largely confined to areas in or near the large lakes or canyons. Three sites with no diagnostics, but with a preponderance of side-end scrapers that may indicate early Archaic age, were located in or near timbered areas by the canyons of the Rolling Plains. This suggests that they were used as gathering stations, but those on the

Llano with projectile points were used seasonally for hunting.

During middle Archaic times (3000 to 1000 B.C.) the number of occupied sites increased to twnety-five. As the "Long Drought" terminated and the water supply increased, it appears to have caused an increase in the population and exploitation of the area. The tool kit consisted largely of chipped stone tools--broad points, side and side-end scrapers and more bifacially worked blades; slightly more sophisticated hunting and processing artifacts for hunting and processing game now appear. Ground stone tools become more common indicating more plant gathering and processing.

Of the eighteen sites in the Llano, seven are located in the vegas and two on knolls with their nearest source of water in nearby playas which are being replenished by greater rainfall and run-off. Of the seven sites along draws, four are located below the rim. Only near the lakes, where two sites are known, are the sites located solely on higher elevations. The residents of the area appear to be moving toward better sources of vegetation, and are probably less concerned about competing with and driving off game. Most sites in the Rolling Plains are found in or near the canyons. In addition to seven sites with middle Archaic diagnostics another eighteen have a large number of side and side-end scrapers which dominate at this time and suggest middle Archaic occupation of all of these. Eighteen are placed in the heavily timbered upper tributaries or caprock areas of canyons. This suggests again that plant resources such as pine in the timbered areas were of major importance.

Between 1000 B.C. and A.D. 500 climatic conditions remained much the same as in middle Archaic as well as at present. During this late Archaic stage, occupation increased to twenty-five sites in the Llano Estacado and thirteen in the Rolling Plains. The chipped stone tool kit remains basically the same as earlier, but ground stone tools increase suggesting that exploitation of native plants is still increasing. In the Llano, ten sites are found on the vegas or knolls, less than half of the seven sites around draws are below rims, and four of the eight sites near lakes are situated on benches. The sites progressively move downhill throughout the Archaic getting closer to water, useable native vegetation and into the few sheltered areas of the open plains. In the Rolling Plains, the sites are closer to the canyons throughout the Archaic; only a few are reported from the upper prairies or lower prairies.

All sites in the Archaic are open campsites. No structures or residences are reported but an increasing number of hearths and burned rocks appear through time. Sites get larger and contain more cultural debris. This suggests that the campsites are occupied by larger groups, and for longer seasons in later times. The greater use of plant material which is reflected by the increase in ground stone tools and some plant material reported at a few sites, might indicate not only dietary changes but also changes in production of residences and clothing; but no direct evidence of this appears in the records. Nor is there any definite evidence of ornaments, art, ceremonialism or mortuary practices. It could be that some reported rock art and burials fall into the Archaic, but no attempts have been made to demonstrate this.

There are no noticeable differences in artifact types between the Llano Estacado and Rolling Plains which implies that both areas were ethnically the same. Groups may have shifted from one region to the other, from season to season. Presumably, they would use the Llano principally in the summer and fall and the Rolling Plains in the winter and spring. The cold, dry winter and windy spring are less unpleasant in the Rolling Plains. Inadequate data on the Archaic from areas adjacent to the S.P.A.G. area in both the Rolling Plains and the Llano Estacado makes it impossible at present to determine relationships with other areas beyond the S.P.A.G. area. The presence of Alibates and/or Quitaque flint from north of the area in the Panhandle, points to connections with that region (Bryan 1950; Green 1955; Kendrick 1966; McWhinney 1965; Shaeffer 1968). Edwards Plateau quartz which dominates the type of chipped stone used throughout the Archaic was probably partly from areas to the south and east. However, it is quite possible that the same ethnic group occupied the Panhandle, Rolling Plains and Llano Estacado during the Archaic. Thus, no interareal exchange can be established.

Late Prehistoric Period

Between A.D. 500 and historic times there is a marked increase in the number of sites with diagnostics of this period. There are eighty-one sites with late prehistoric identified types of diagnostics. All but fifteen of these sites had ceramics. The earliest pottery dates from about A.D. 950 to A.D. 1000. In these fifteen all but three had point types that dated after A.D. 1000. This leaves only three late prehistoric sites with occupation dates of A.D. 500 to A.D. 1000.

However many of the sites with later diagnostics were probably occupied in pre-A.D. 1000 times too. In addition to the seventy-eight sites with occupation in post-A.D. 1000 times, another 107 reported sites without diagnostics have unidentified ceramics and "arrowheads" which imply Late Prehistoric occupation.

The large amount of chipped stone tools--dart and arrow points, side and end scrapers, bifacial and unifaclal flakes (flake fragments) Indicate the continued importance of hunting and processing of game. The arrow points most likely mean that the bow and arrow was now in use. The greater proportion and total amount of ground stone tools imply a significant Increase in plant gathering. Larger sites, more material, greater variety of artifacts and the presence of fragile items such as ceramics all attest to a more balanced and successful foraging pattern that permitted longer seasonal use and more frequent usage of the area.

It Is still beleived that some degree of nomadism was necessary since game such as bison migrate often and seasonal changes affect the vegetation bringing some into fruition in some places before others bear in other locales. In addition, horticulture apparently was never practiced in the S.P.A.G. area. The year to year variation In precipitation and run-off would make the volume of water in any water source too unpredictable to permit irrigation farming, and the fickleness of the rainfall inhibited dry farming. Furthermore, no horticultural tools such as those known in the Panhandle (Kreiger 1946; Reed 1947) are reported for the area..

There are fifty-five Late Prehistoric sites in the Llano Estacado

with identified diagnostics and forty-eight more with unidentified ceramics and arrowpolnts. Most sites, fifty-six in all, are now located on level areas such as the sand dunes, open vegas or bottom plains of the draws. Only twenty sites are located on slopes--mostly near lakes (fourteen), and only twenty-seven are on elevations--mostly on knolls (seventeen). About 70 percent of all sites are nearer to playas than other water sources. This means more dependable precipitation now than in Archaic times, but also less winter use. Of the eighty-five sites in the Rolling Plains, 73 percent are situated in timbered, sheltered areas such as arroyos of the upper prairies, the canyons or the buttes. This implies greater usage in winter times.

No structures or residences are reported from this period, but there is an increase in the number of hearths and concentrations of burned rock which again reflects a longer occupation of a campsite and/or more frequent seasonal reoccupation. The lack of any great amount of ornamentation or artistic items suggests that there was little leisure time and consequently limited seasonal use of a site. This is supported by the lack of cemetaries, or a concentration of burials. Though most reported burials probably date from this period no more than one has been reported at a site. There is also a lack of ceremonial objects at sites indicating that there was no permanent focal point in the area. Only rock art can be considered ritualistic and it frequently depicts game animals which again emphasize hunting activities and a nomadic way of life.

Most chipped stone material is still of Edwards Plateau quartz, but local types--Ogallala and South Fork, are more common than before.

There is slightly more Alibates and Quitaque from the Panhandle and the presence of a little basalt and obsidian point to connections with areas west of the Llano Estacado. The predominant projectile point styles--Washita, Harrell, Fresno, and Scallorn relate more toward areas to the east, north and west in the Middle Pecos; only the Garza appears to be native to the area. The most commonly mentioned utility ware (pottery or ceramic) in both the Llano Estacado and Rolling Plains is Jornada brown and the next most common is El Paso Brown. This shows that a close trade contact existed with various branches of the Jornada, if indeed some group of Jornada were not the basic element in the area. However, some typical Trans-Pecos Jornada points--Toyah or Livermore, are absent or at best, infrequently reported. A few other types of utility ware appear--cord-marded ware from the Panhandle and some east Texas wares. The former types may be trade ware, but it has been suggested that some of the latter ware was made locally. Perhaps, much of the unidentified pottery of the Rolling Plains are of this type. The most common decorated ware is Chupadero Black-on-White, a trade ware from the southeastern Anasazi frontier in Central New Mexico, very little utility ware comes from this area but some other black-on-whites and glaze wares are from other parts of the Upper Rio Grande Anasazi realm.

The predominance of Jornada brown, point types similar to those of the Middle Pecos, and the nearness of this area to the Llano Estacado leaves the impression that the Llano falls within the pale of the Middle Pecos Jornada Branch of the Mogollon, a widespread cultural pattern of the southern part of the southwest, for much of the late Prehistoric period. The presence of pottery such as Chupadero Black-on-White and a

minority of other Upper Rio Grande wares as well as a few other items such as basalt, obsidian and turquoise can be explained as trade to or, at least, through the Middle Pecos Jornada. The similarity in points and a minor amount of Alibates and Quitaque flint from the Panhandle indicates influence from thi"^ area, but the lack of any sizeable amount of cord-marked ware suggests no occupation of the Llano occurred by groups from here. Trade ware such as El Paso Brown and a little El Paso Polychrome are present, but the lack of characteristic points of the southern Jornada, indicate trade connections, but no utilization by groups from this area. The absence of horticultural practices as are known for the Late Prehistoric in the Middle Pecos would suggest that the Llano served as a foraging area for these people. With the decline of horticulture after A.D. 1300 and the increase of bison hunting (Jellnek 1967:164) it may have become the primary area of occupation for the Middle Pecos Jornada.

The large amount of Edwards Plateau quartz on the Llano clearly shows its connections with the Rolling Plains. Jornada brown, the most frequently identified ware is the pottery most often reported for the latter area, too. However, the presence of East Texas pottery, or imitations of such, and the very high percentage of unidentified ware, which may also be from East Texas, suggests that the Rolling Plains may have been occupied by a different ethnic group than that which utilized the Llano. The greater use of Edwards Plateau quartz, near confinement of all artifacts of South Fork quartzite, and use of large flake and blade tools in the Rolling Plains support this argument. Nevertheless, the eastern edge of the Llano Estacado and western edge of the Rolling Plains in the S.P.A.G. area appear to be a zone of intermixture

or interchange between the two groups. The gradual decline in use of Edwards Plateau quartz from early Archaic (71 percent of flakes) to late prehistoric times (54 percent of flakes) might reflect a gradual retreat by groups based in the Rolling Plains in face of the advance by groups based in the Middle Pecos. This retreat may have been intensified in Late Prehistoric times with the development of horticulture in the Middle Pecos and the consequent rise in population here. Population pressure may have caused the Jornada to expand into the Llano.

Although this study is not concerned with historic materials of the S.P.A.G. area, it will do to note some aspects of such here since some aboriginal materials are certainly of these late times. Shortly before the close of Late Prehistoric times the Jornada and Rolling Plains groups may have been displaced by new arrivals from the north. Late prehistoric-early historic Apaches and/or Wichitas (the Henrietta Focus) may have shifted south. Records of the Coronado expedition of 1541-1542 would indicate that one or another, if not both, of these two groups were in the S.P.A.G. area (Schroeder 1962:2-23; Wedel 1970:161-168). The late Garza points, small amounts of some micaceous ware and late glaze trade ware from the Pueblos may have been left primarily by the Apache, while some of the many Harrell points may have been left by people of the Henrietta Focus (A.D. 1300-1600) or their later relatives, the early historic Quivirans, or their later historic descendants, the Wichita. The latter group were known to have occupied the Red River area by A.D. 1700 (Wedel 1964:147). By 1717 the Comanche moved south to the Red River and began to displace the Apache (Shroeder 1960:22). These horse nomads along with the Kiowa (perhaps the last surviving Middle Pecos Jornada), the Kiowa-Apache and Lipan Apache, the only two groups

of Apache to survive the Comanche conquest, remained in the area until the start of the fourth quarter of the nineteenth century (Wellman 1947: 69-96).

Summary of S.P.A.G. Area Prehistory

There is no substantial evidence of occupation in the S.P.A.G. area before the start of the Paleoindian period. Settlement and exploitation begins about 10,000 B.C. by small bands of hunters with a refined chipped stone industry who relied on the hunting and processing of now extinct megafauna and to a lesser degree on smaller types of game. They apparently preferred to occupy higher elevations overlooking draws and lakes in which they frequently hunted. No doubt they were somewhat nomadic since they would be required to follow the migrations of the megafauna, at least, through the lakes and draws.

With the termination of the last glacial advances, the increase of warmer and more arid climes, the decrease in vegetation and game, and the extinction of the megafauna, the big game hunters of the Paleoindian period dwindle in number. After the onset of the Archaic period and "long Drought" of the Altithermal, the Paleoindians evolved into or are replaced by a few groups of hunters, perhaps from the Rolling Plains, with a less sophisticated chipped stone tool kit. Throughout the Archaic and into the Late Prehistoric period it appears that the population, and the occupation and exploitation of the Llano Estacado and Rolling Plains increases. It is at its lowest point in the early Archaic and rises to its highest point about A.D. 1300 to 1500. This rise in population is accompanied by continuing improvement and elaboration of the tool kit and an increase on the reliance of native vegetation which results in producing a more balanced foraging subsistence

ARCHAEOLOGICAL POTENTIAL FOR THE S.P.A.G. AREA

The S.P.A.G. archaeological surveys served a number of purposes. They were intended to provide a better understanding of prehistoric mans's past, and add to the general knowledge of group human behavior, or the varieties of culture. The surveys also provided a training ground for students who have chosen a career in archaeology. Equally, important is the data acquired by the surveys and its value to planners and developers In proposing practical environmental impact statements needed for obtaining federal and state assistance in pursuing projects, (figure 5)

Though the surveys and reports can provide developers a means of anticipating problems to be encountered with the cultural resources of the area, the research itself should not be seen as a final tool. Too many questions regarding the prehistoric cultural resources and the area's prehistory remain unanswered. It must be recognized that only a limited area has been surveyed systematically, 1.3% of the S.P.A.G. area. In fact, less than half of the 990 sites reported were located during systematic surveys. It is always possible that certain unreported areas may be more significant than those presently investigated. Howevfir the surveys provided some survey in each recognizably distinct topographic zone. Some imbalance occurs here since 14.5% of the marsh/lakes zone have been surveyed while only 0.2% of the open vegas have been checked. In the case of the vegas and sandhills of the Llano Estacado and the

pattern.

With the appearance of ceramics and arrow points, the area may experience its greatest degree of settlement and exploitation, but foraging, seasonal use and continuing nomadism still characterize the subsistence and settlement pattern of these larger groups who occupy the more expansive campsites. During much of this late prehistoric period, the Llano was a marginal foraging area for Jornada Mogollon groups from the Middle Pecos Valley, and the Rolling Plains was occupied by another group from central Texas. About A.D. 1500 to 1600 other groups from the north--Apaches from the northwest (Raton Section and/or Panhandle area) and Wichitas from the northwest (Great Bend in Kansas and/or Red River of Texas and Okalahoma) may have displaced the Jornada and central Texas groups. During the eighteenth century, the horse-nomads--Comanche, Kiowa, Kiowa-Apache and Lipan Apache, controlled the area until removed to reservations in the 1870's by encroaching Anglo-Americans from the east and Hispanos from the west.

Figure 5

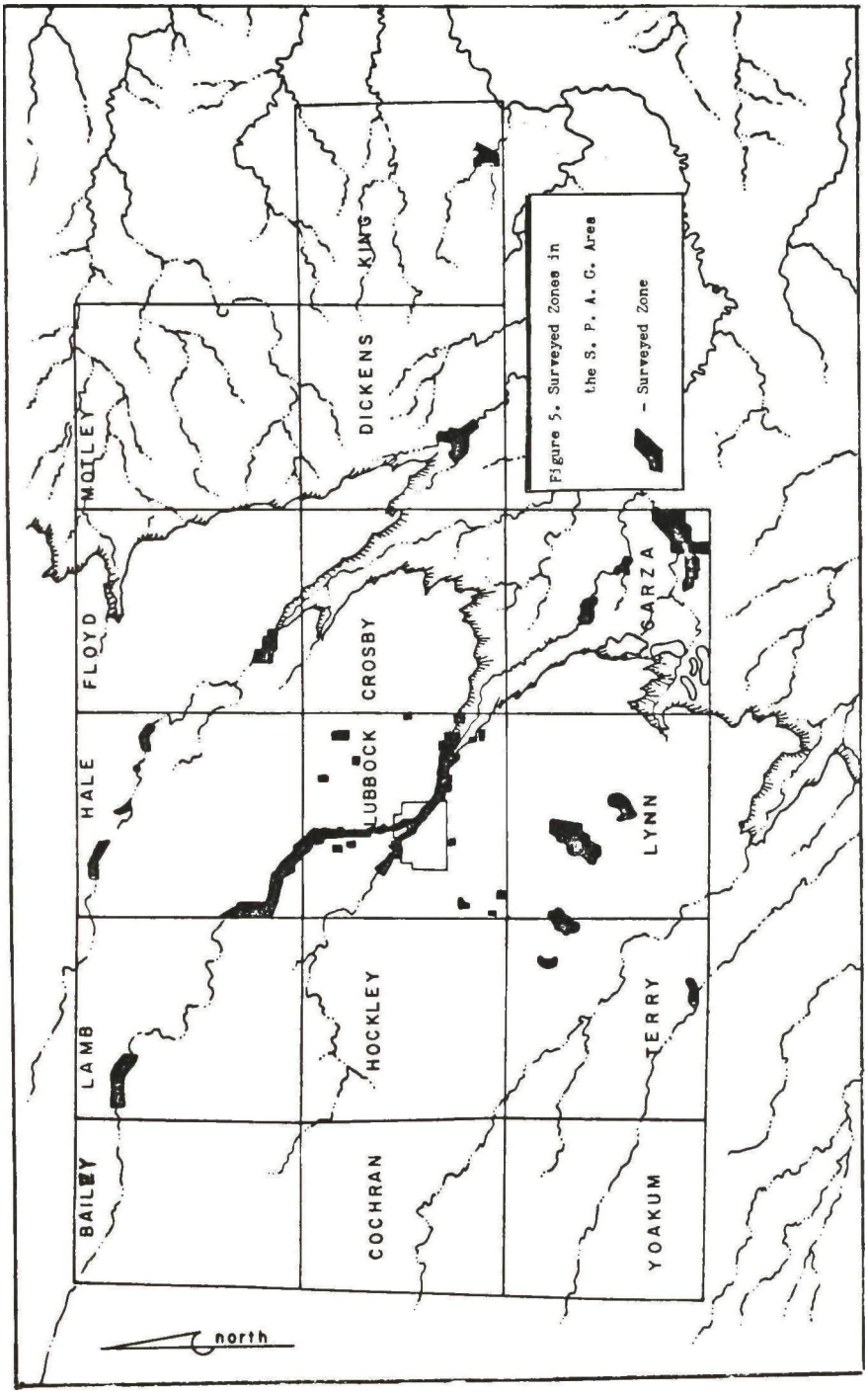
Figure 5. Surveyed Zones in
the S. P. A. G. Area
- Surveyed Zone
MOTLEY
KING
DICKENS
FLOYD
CROSBY
GARZA
HALE
LUBBOCK
LYNN
LAMB
HOCKLEY
TERRY
BAILEY
COCHRAN
YOAKUM
north

Buttes and Upper Prairies of the Rolling Plains the sample may be too low to be dependable for projecting the potential of the zones, but it is at least suggestive. Future surveys may provide a better balanced picture of prehistoric man's occupation and use of the S.P.A.G. area.

There are problems in analyzing archaeological data from sites located and collected in surveys. The investigator sees only one phase of the materials--that on the surface which usually represents only the latest occupation. Plowed or disturbed sites may have materials from earlier periods intermixed with those of later stages making it impossible for the investigator to distinguish the different tool kits that characterize each successive occupation. It is obvious that excavation of undisturbed sites Is needed to establish the characteristics of each occupational level. At present only seven sites in the S.P.A.G. area have been excavated and have, or are expected to be reported; all but one consisted of a single occupational level. This stratified site was not highly productive of characteristic materials of the many successive levels or cultural horizons.

Although much is to be learned of the archaeology of the area, the survey does provide suggestions of the potential of sites, materials and other data and the degree of care needed when planning to alter the environmental situation. The following chart lists, from right to left, the square miles in each zone in the S.P.A.G. area and the number of square miles of each that has been systematically surveyed. Then follows the number of sites reported during the surveys; about 75% of the reported sites were located in S.P.A.G. funded survey. There follows the average number of reported sites per square mile in each and the approximate expected number that may exist.

Figure 5

Archaeological Potential in the S.P.A.G. Area

	Approximate Square Miles in Zone	Approximate Square Miles Surveyed	Number of Sites Recorded	Average Number of Sites Per Square Mile	Approximate Potential Sites in Zone
Llano Lake	«	•	^	2.8%	560
Llano Draw	M	m	^3'	1.4%	1160
Sandhill	ffQ	t	%	0.7%	190
Llano Vega	8460	15	M	1.1%	9310
Lower Prairie	1500	®	W-	1.1%	1650
Upper Prairie	970	i	#	1.3%	1260
Canyon	1100	.»	178	4.6%	5060
Butte	420	3	3	1.0%	420
Total	13,750	Til	401	2.2%	19,610

As can be seen there is a higher percentage of sites in the lake and canyons area, yet no excavation has occurred in here; it would be useful to do so. Most of the other areas, except the draws should be surveyed more extensively.

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