La Tierra

A Study of Prehistoric Biface Caches from Texas

Kevin A. Miller

Volume 34
No. 1 & 2
2007

Journal of the Southern Texas Archaeological Association

LA TIERRA

A Study of Prehistoric Biface Caches from Texas

KEVIN A. MILLER

Volume 34
No. 1 & 2
2007

Journal of the
Southern Texas
Archaeological
Association

The Southern Texas Archaeological Association

The Southern Texas Archaeological Association brings together persons interested in the prehistory of south-central and southern Texas. The organization has several major objectives: To further communication among avocational and professional archaeologists working in the region; To develop a coordinated program of site survey and site documentation; To preserve the archaeological record of the region through a concerted effort to reach all persons interested in the prehistory of the region; To initiate problem-oriented research activities which will help us to better understand the prehistoric inhabitants of this area; To conduct emergency surveys or salvage archaeology where it is necessary because of imminent site destruction; To publish a journal (*La Tierra*), newsletters, and special publications to meet the needs of the membership; and to assist those desiring to learn proper archaeological field and laboratory techniques for southern Texas.

STAA Officers and Staff 2007

Information for Contributors

The editor of La Tierra 34 is Thomas R. Hester. Original manuscripts should be sent to Hester either by mail (P.O. Box 625, Utopia, TX 78884) or if possible, by email to *secocreek@swtexas.net*. Authors with questions about their manuscripts or illustrations should contact the editor. New authors are particularly urged to seek assistance in developing and submitting their papers. La Tierra welcomes papers on the archaeology of South Texas and surrounding areas, but we will also consider relevant manuscripts dealing with the archaeology of other parts of Texas.

Membership Information

Request information on joining the STAA and send membership applications to Lynn Yakubik, Membership Chair, 9607 Fonthill Dr, San Antonio, TX 78254, (210) 521-0091. Email: *lsyakubik@satx.rr.com*. Also see STAA internet address below. Back issues of *La Tierra* and *Special Publications* should also be ordered online or through Ms. Yakubik.

STAA Mailing Address
P.O. Box No. 791032, San Antonio, Texas 78279.
Internet address: *http://www.staa.org.*

About the cover: Specimens from the Fairview Park biface cache, Travis County, Texas

ISSN No. 0163-0695

Printed in 2008 in the United States of America by Morgan Printing in Austin, Texas

Contents

A Study of Prehistoric Biface Caches from Texas

By
Kevin A. Miller

Chapter 1

Introduction

Caches are accumulations of materials placed in storage or hiding for future recovery and utilization (Tunnell 1978). Caching of materials, such as lithics, tools, or perishable foodstuffs, appears to have been practiced by many prehistoric groups throughout the United States and may be related to numerous cultural and environmental variables, including resource scarcity, settlement strategies, raw material preferences, trade or exchange systems, and technological organization. The study of caches can therefore provide unique data on prehistoric cultural processes, technology, and behaviors. The goal of this study is to examine a particular cache type from Texas, biface caches, by providing a detailed analysis of four caches of bifaces. The four caches of bifaces analyzed are: the Fairview Park Cache (41TV9) of 17 bifaces, the Baird Cache of 6 bifaces, the Goldapp Cache (41FY521) of 35 bifaces, and the Riley Cache of 29 bifaces. The study focuses on contents and contexts, distributions, possible behavioral implications, and possible functions of biface caches in prehistoric cultures from Texas.

Caches of bifaces have been reported in the archaeological literature from Texas for the past 50 years (Bryan 1950; Green 1955; Hart 1983; Jackson and Woolsey n.d.; Lorrain 1963; Tunnel 1978; Witte 1942). With the exception of those produced by Tunnell (1978), Bement (1991), and Taylor and Highley (1993), studies of these caches have generally been limited to describing their locations and contents. This may be due to several factors. First, most caches have been recovered by non-archaeologists, e.g. farmers who plow up caches in their fields. Since these caches were not excavated archaeologically, many data on context has been lost and descriptive studies of their contents are used as the main means of analyzing the cache. Second, biface caches are rare discoveries and their function in Texas prehistoric cultures is little understood. They therefore are usually treated as exotic, isolated finds with little concern for related cultural processes or systems. Third, most reported biface caches lack definite temporal contexts or associated diagnostic artifacts, therefore limiting interpretations on cache functions, comparisons between caches, and associated cultural groups. These limitations have hindered biface cache studies to such a degree that little progress has been made in understanding their functions, chronology, and relationships to cultural mechanisms, such as trade or exchange. It is the premise of this study that these limitations are due in part to the restricted use of the concept of context and can be partially overcome by examining the contexts of biface caches at several scales of analysis as well as performing more systematic, detailed analyses of individual caches.

The concept of context employed in the study of most caches of bifaces has generally been small scale, usually restricted to cache structure and content. However, the context of a cache can also include elements of a larger scale, such as geographic location, distance from the source of raw materials, related archaeological sites, and spatial, structural, technological, and temporal affinities with similar caches. Both the small and large scale elements of context can yield important information on biface cache functions and behavioral implications. Small scale contextual analysis relates to biface characteristics and technology while larger scale analysis seeks information on biface cache origins, chronology, and related cultural variables such as transport or mobility. Cache context must therefore be addressed from a multi-scale perspective. In this study of four biface caches, three progressively larger scales of analysis are applied: the microscale, mesoscale, and macroscale (Butzer 1982). Microscale analysis involves examining the smallest analytical units of a cache, its structure and contents. It is at this scale which most biface cache studies have been performed. At the microscale, analysis in this study included: (1) performing a detailed analysis of the cache bifaces by recording a wide range of metrical, morphological, and technological variables, (2) statistically manipulating the metrical data, (3) investigating cache structure, and (4) examining general biface technology in prehistory.

Mesoscale analysis, an intermediary scale between small and large, involved examining cache setting in relation to raw material sources, archaeological sites, and structural or chronological affinities with caches located within the same general area. Macroscale analysis involves examining caching behavior and cache functions on a very broad scale. In this study, the macroscale is Texas and analysis included investigating prehistoric caching behavior and proposed functions of biface caches in prehistory, researching possible biface cache chronologies and temporal affiliations, and examining biface cache distributions. It is believed that by examining biface caches in this manner, a better understanding of their functions and relationships with cultural groups and processes can possibly be gained. The analysis of the four biface caches was performed in order to investigate the utility and productivity of such a study.

The multi-scale cache study yielded interesting results. At the macroscale, comparative study of over 40 biface caches and their contexts revealed that, in general, most biface caches from Texas date to the Middle to Late Archaic and possibly the Late Prehistoric. The lack of temporal data on the majority of these biface caches made chronological assessments difficult and speculative. The distributional and comparative studies revealed that biface caches in Texas may have functioned in several different ways. First, many caches of bifaces may be related to technological organization or settlement strategies, where raw materials are cached to provide resources for future needs. The bifaces would have therefore served as blanks to be used as cores or to be reduced into tools. Biface caches also may have been created due to transport-cost decisions. Large amounts of raw material are procured and shaped into bifaces at a quarry, transported a relatively short distance, and cached.

Second, biface caches may be related to the trade and exchange of raw materials between prehistoric groups. Quantities of high-quality, exotic central Texas Edwards chert bifaces appear to have been widely traded as commodities throughout Texas. The caching of such bifaces may be related to security considerations, where the bifaces were cached in order to protect them from thievery. The distributional study possibly supported this hypothesis by revealing that many biface caches have been found near possible trade routes. It is hypothesized that the bifaces being traded were left at an early stage of reduction in order to insure their durability during transport as well as maintain their versatility as blanks which could be reduced into a number of tool types by consumer groups. Trade of bifacial blanks appears to have been particularly active during the Late Archaic and Late Prehistoric, where consumer demand for large bifacial tools and uneven distributions of lithic resources may have influenced the production and trade of these commodities. The distributional study revealed strong evidence that bifacial blanks were being traded into the Caddo area of east Texas.

Third, large bifaces, and biface caches, appear to have functioned as status items during the Middle and Late Archaic as well as the Late Prehistoric. The inclusion of large bifaces and biface caches in mortuary contexts suggests their value as status items or commodities. The fact that many of these artifacts are made from exotic cherts non-local to their final resting place may be a further indication of the trade of bifaces in prehistory.

The microscale and mesoscale analysis of the four biface caches was inconclusive in establishing individual biface cache functions. I believe this was mainly due to the lack of temporal and associational data for the caches as well as the fact that the macroscale study revealed multiple possible functions for biface caches in Texas. Furthermore, the raw materials from only two of the caches, the Goldapp and Baird Caches, could be sourced with a fair amount of confidence. All of the bifaces from the caches are well-made early to middle stage biface blanks made from high-quality Edwards cherts. Many, including those from the Fairview Park, Baird, and Goldapp Caches, are very large and thin in comparison to other bifaces found in caches. Metrical and statistical analyses revealed that, in general, the bifaces from all four caches represent sets of artifacts at common stages of reduction.

Though the exact functions of the caches could not be determined, inferences were made. The Goldapp Cache most likely represents raw material blanks traded or transported over 100 km into an area poor in lithic resources. The Baird Cache, which contained a utilized biface, may be related to raw material and tool curation, since it was located in a habitation site. The Riley Cache was found in a possible heat-treating pit and may relate to technological organization. Conclusions on the possible function of the Fairview Park Cache were hindered due to many missing bifaces and a lack of associational and temporal data but comparisons with other caches suggest it may represent a stockpile of raw materials or a possible offertory cache.

Chapter 2

Definition of a Cache

Many definitions of caches have been proposed. Webster's Ninth New Collegiate dictionary defines a cache as "a hiding place for concealing or preserving provisions or implements" or "a secure place for storage." According to Curtis Tunnell's definition, "a cache is an accumulation of useful material that is hidden away for future recovery and utilization. Such things as food, clothing, tools, and raw materials may be placed in a cache (Tunnell 1978:1)." In her paper on tool caching behavior, Schlanger (1981:4) defines a cache or the act of caching as "placing tools, equipment, and other materials in hiding or storage" representing a "concrete expression of the anticipation of future needs." Common to these definitions is the implication that the hidden or stored items will be recovered for later use. Therefore, these definitions exclude associated items found in burial or ritual contexts as caches because future recovery was not expected. Instead, these items are treated as grave goods or offerings (Kornfeld et al. 1990:301; Tunnell 1978:1).

However, for the purposes of this paper, accumulations of artifacts found in ritual or burial contexts will be termed caches. This will be done in order to present a common terminology throughout the paper. In the literature on reported burial grave goods or ritual offerings, terminology is inconsistent and does not follow the above mentioned definitions of a cache (Bement 1991; Frison and Van Norman 1985; Lippincott 1985b). Burial "caches" have been compared to and discussed with implement caches due to the similarity of their contents (Bement 1991; Kornfeld et al.1990:301). The terms "cache," "grave goods," and "offerings" are often used interchangeably, implying a common definition. This has resulted in confusion and inconsistency.

Therefore, for the sake of consistency and simplicity in terminology within this paper, the term "cache" will be used to describe all accumulations of burial or ritual items. However, use of this term will not imply that these types of caches are considered to conform to the definitions given above, that is, that the materials were intended to be recovered at a later date.

Chapter 3

Caching Behavior

Caching behavior can be viewed as a response to a variety of environmental and cultural variables in which the storage or hiding of materials meets present or future anticipated needs. Cultural variables which are interrelated with caching behavior include subsistence economy, settlement structure and mobility, technology, exchange or trade patterns, resource control, belief systems, and cultural preferences. Environmental variables effecting caching behavior can include resource shortages, resource distributions, and seasonality. Furthermore, caching behavior may result from ad hoc situations, where factors such as warfare or blizzards may precipitate the storage or hiding of materials. These variables are often reflected in the cache's context, composition, and associations. Therefore, caches can have direct implications for studying and understanding various prehistoric cultural and behavioral processes. The following is a discussion of the processes which can effect and result in specific caching behaviors and cache types.

According to Lewis Binford (1980), caches are the result of logistically organized behavior within a hunter-gatherer collector economy. Binford makes the distinction between two types of hunter-gather groups, foragers and collectors. Foragers generally have high residential mobility and gather food on a daily basis. A distinctive characteristic of this strategy is that food is rarely stored or cached (Binford 1980:5). In contrast, collectors have a logistically organized strategy, utilizing specially organized, small task groups to procure specific resources for consumption or use by the larger group (Binford 1980:10). Instead of moving the consumers to resources, collectors solve the problem of unequal distributions, or spatial incongruity, of resources through the use of task groups who procure and bring resources to the consumer. Integral to this strategy is the storage or caching of food and raw materials. "Caches are a common component of a logistical strategy in that successful procurement of resources by relatively small groups for relatively large groups generally means large bulk "(Binford 1980:12). Quantities of resources too large to transport are temporarily stored in isolated caches away from the residential base until they can be retrieved at a later date. Caches of this type serve as temporary holding areas, to store resources for future transport to the residential base (Thomas 1983:81).

The occurrence of many lithic caches near their source may be related to this type of behavior. For example, the Highland Uni and Dani peoples of Irian Jaya, Indonesia often quarried, manufactured, and stockpiled large amounts of blade blanks in caches near their raw material source (Hampton 1992). The blades were retrieved when a large enough group could be assembled to recover the stockpile. In North America, caches of blanks or flakes are often recovered within or near lithic quarry areas (Bryan 1950; Shafer 1992). The creation of caches or stockpiles of materials at or near a quarry may reflect transport cost decisions.

This type of strategy can also result in what has been termed "load-exchange caches" (Schlanger 1981:5). In this type of caching behavior, tools or equipment used for the procurement of the resources are carried into the activity area, used, and cached. They are replaced on the return journey by the resources procured. An example is the carrying in of hammerstones into a lithic procurement area, using the stones, caching them, and then carrying out the preferred lithic raw materials. This caching behavior results in caches at nonresidential locations, especially procurement sites and short-term camp sites (Schlanger 1981:7). Over time, caches would build up at regularly visited procurement sites, making the caching or transporting of further tools into the area unnecessary. However, this type of behavior is not limited to collector strategies. For example, the foraging !Kung San, through this load-exchange process, have distributed nut cracking stones throughout the nut forest areas which they exploit (Lee 1979:152-154). As a result, enough stones have accumulated to where the !Kung women rarely need to carry in their own stones for processing.

Caching behavior is also closely linked to other interrelated features of prehistoric economic systems. These include trade, exchange and storage of resources or commodities and resource access and control. In a prehistoric exchange system, caching may have functioned as a means of storage of valuable commodities or resources. If valuable commodities were being traded over long distances, caching would provide a means of secure storage between times of transport. This would safeguard the commodities from being stolen.

Commodities or valuables are also cached for security purposes independent of trade or exchange. Valuables are hidden or buried for safekeeping until they are needed. Examples of these types of caches have been found in most human cultures. Termed "banking caches", these caches are usually found in isolated contexts or near distinct landmarks (Rathje and Schiffer 1982). One example of "banking caches" are the Viking Age (800-1066 AD.) hoards commonly found in England (Richards 1991:16). These hoards generally consist of coins, hack silver, and jewelry and are found buried at various places throughout the country. It is believed that the caching of these valuable materials is related to the economic instability and personal insecurity of the time period (Richards 1991).

Limited distributions of resources can result in several types of caching behavior. Temporally limited resources, such as seasonal foodstuffs, are often cached or stored in order to provide resources for future needs. "Since some resources are available for only a limited period of time, their practical availability can artificially be extended by protecting them (by caching) from deterioration or consumption by other organisms" (Thomas 1983:81). For example, the Southern Paiute of the Great Basin made extensive use of caches of limited foodstuffs, including seeds, lizards, and certain berries (Thomas 1983). Other examples of these caches include storage pits, granaries, and storehouse facilities (Kornfeld et al. 1990:301-302; Schlanger 1981:9-12). Caching may also occur in situations where one group controls a resource, limiting access by other groups. Caching of resources may have been done by the controlling group in order to limit their distribution and therefore increase their value (Kornfeld et al. 1990:302). Conversely, a group with limited access to a resource due to control by another group may cache or stockpile the resource in order to limit its needs and therefore ensure its independence from the controlling group (Kornfeld et al. 1990:302).

Technological organization and settlement strategies can also be related to caching behavior. In a study examining the technological organization of one collector group, the Nunamiut Eskimo, Binford (1979) discusses the relationship between the organization of gear or tools and caching behavior. Two types of gear organizations, "insurance gear" and "passive gear," in the overall Nunamiut technology are closely linked with caching behavior. Insurance gear can consist of a variety of tools, raw materials, and food. "Insurance gear is cached throughout the region, not in terms of specifically anticipated seasonal needs, but in terms of what might be generally be needed at the location at some time in the future"(Binford 1979:257). These caches can be found in site locations not in use, at distinct markers in the landscape, or in deliberately constructed facilities. Some of the Nunamiut caches of this type include fire making implements, hammerstones, and food.

The use of multiple insurance caches can also be an energetically efficient way of utilizing tools and resources by groups practicing foraging strategies (Potts 1989:345) In this scenario, caches of tools or stone raw materials are created at various places within a foraging area. When need arises for tools or materials, such as when meat is procured and requires processing, the nearest cache or caches are utilized. In this manner, return trips to base camp with bulky, unprocessed resources are eliminated (Potts 1989:345-346). This both increases group mobility, since large tool kits need not be transported from site to site, and minimizes time and energy spent in transporting resources.

Passive gear differs from insurance gear in that it is often seasonal in nature. Passive gear is technology in storage, generally consisting of season specific gear curated in caches in the off-season. For example, when summer arrives, the Nunamiut cache their winter gear, sleds, harnesses, ice-fishing gear, snowshoes, etc., until they will be needed in the following winter (Binford 1979:257-258). Caches of passive seasonal gear found in residential sites can be good indicators of what season a site was in use (Schlanger 1981:14). Passive gear is also cached within sites as "site furniture"(Binford 1979:263-264). Site furniture consists of items considered site specific and can be both seasonal or non-seasonal in nature. Common items of site furniture are hearth stones, anvils, grinding stones (Binford 1979:264). Site furniture is utilized during the occupation of the site and recached when the site is abandoned.

A similar type of caching behavior results in what Schiffer calls "abandonment caches"(Schiffer 1987:89-95). According to Schiffer, abandonment caches are a type of de facto refuse. De facto refuse consists of still usable tools, facilities, structures, and other cultural materials which are left behind when an activity area is abandoned (Schiffer 1987:89). De facto refuse deposition is dependent on a number of variables, including rate of abandonment, anticipated return, distance to the next settlement, principal activities in the next settlement, artifact size and weight, replacement costs, and remnant use-life (Schiffer 1987:91). Abandonment caches differ from general de facto refuse in that they are deposited at sites where return is expected or likely.

Abandonment caches are common in societies following mobile subsistence strategies, where specific locations are often returned to and reoccupied on a seasonal or sporadic basis (Schlanger 1981:6). In this context, abandonment caches are related to settlement system and technological organization and can serve three different functions. First, caches can function as a means for the curation of tools. Second, group mobility can be maximized by the caching of seasonal tool kits or raw materials whose bulk could increase transportation costs and hinder mobility (Schiffer 1987:93; Thomas 1983). Third, abandonment caches can minimize time and energy spent in procuring raw materials or manufacturing tools when a site is reoccupied each season. It has been hypothesized that many lithic tool caches found in the Northwest Plains of North America are abandonment caches of this type (Clark and Fraley 1985; Beckes 1985; Kornfeld et al. 1990:306-307).

Caching behavior can also be associated with ritual or ceremonial activities. Ritual caches include burial, dedicatory, and offertory caches (Schiffer 1987). Ritual caches differ as a whole from the above discussed caches in that they were not intended for future recovery (Tunnell 1978:1). However, their similarity in contents and form to other cache types has resulted in their discussion in the archaeological literature as "caches." This similarity may be a "function of sociocultural integration, resulting in both burial goods and stored implements consisting of items of personal gear" (Kornfeld et al. 1990:301). The veracity of this observation is not being doubted but, as discussed in Chapter 2, they will be termed caches when being considered in this paper.

Burial caches are deposits of goods placed with a buried individual or individuals. Burial caches can contain a wide variety of items, such as clothing, commodities, ceramics, and tools. Items placed in burial caches generally have economic or symbolic value and often reflect the occupation or status of the buried individual (Bement 1991; Schiffer 1987; Tainter 1978; Taylor and Highley 1993). Furthermore, the contents of burial caches can reflect distinct levels of group energy expenditure or investment which in turn may be related to the status of the buried individual (Bement 1991; Tainter 1978; Taylor and Highley 1993).

Dedicatory caches consist of objects ceremonially deposited at the dedication of a newly constructed building or site (Rathje and Schiffer 1982:114). As with burial caches, dedicatory caches can include a wide variety of items, such as weapons, commodities or valuables, foodstuffs, and tools. Offertory caches consist of items ritually deposited as offerings (Schiffer 1987:80). These caches are placed in a variety of locations, many often isolated, and can represent a wide range of ritual or ceremonial activities, such as making offerings to deities. Types of offertory caches vary from culture to culture and consist of a variety of items, such as commodities, raw materials, tools, and ritual items (Brown 1985:77; Schiffer 1987:80). Items found in burial, dedicatory, and offertory caches can yield unique and important information on the possible belief systems of a culture.

In conclusion, the above discussion illustrates how caching behavior can be interrelated with a diverse set of cultural and environmental variables. These variables can include settlement strategies, resource distributions, economics, technology, and ritual practices. Caching of materials or implements represents one way of coping with many logistical problems presented by elements of these variables, such as resource access or group mobility. Responses to different cultural and environmental problems or variables result in different cache types. The following chapter presents an examination of different caches which have been found in Texas with discussions of their possible cultural implications.

CHAPTER 4

Cache Types from Texas

In Texas, many types of caches have been recovered. These include burial or ritual caches, raw material caches, and implement caches. Burial and ritual caches have been reported from several regions in Texas (Bement 1991; Hall 1981; Janes 1930; Labadie 1988; Lukowski 1988; Taylor and Highley 1993). Burial or ritual caches commonly contain implements, such as lithic tools, bone or antler tools, and bifaces, worked groundstone, shell or bone ornaments, and other exotic artifacts. Examples include a ritual cache of over a thousand arrowpoints found on the top of Mount Livermore (Janes 1930), offertory and burial caches of bifaces and other implements from the Loma Sandia Site (41LK28), a late Middle Archaic cemetery (Taylor and Highley, 1993), and a burial cache of implements, chert cobbles, decorated shell and bone from burial #2 at 41BX1 (Lukowski 1988). However, the majority of caches which have been recovered in Texas consist of lithic raw materials and implements.

Lithic caches have been found in a variety of contexts , isolated, near landmarks, or within archaeological sites, and range temporally from Paleoindian to Historic Indian times (Tunnell 1978; Wyckoff 1984). Based on their contents, lithic caches from Texas fall into four general categories, unmodified raw material caches, flake or blade caches, formal tool caches, and biface caches. These categories are not exclusive, however, since many caches contain more than one of these four types of lithic artifacts (Hart 1983; Slesick 1978; Tunnell 1978; Witte 1942; Wyckoff 1984). Therefore, placement of certain caches into the categories used in this paper is based upon the most numerous lithic artifact type found in the cache. Differences in cache contents may be related to numerous variables, such as specific lithic technological organizations, trade or exchange of lithic materials, mobility, or subsistence strategies.

RAW MATERIAL CACHES

Several caches of lithic raw materials have been reported from Texas. The Carl Mehrkam Cache (41HR365) consists of 50 tested chert cobbles cached in a slight depression in a field approximately 1.86 miles northeast of Hockley, located in Harris County, Texas (Hale and Freeman 1978:90-98). The cobbles are of river rolled Cretaceous Edwards chert and weigh a total of approximately 100 pounds. The cache was an isolated find, with no associated sites or diagnostic artifacts. The location of the cache relevant to the possible source of the cobbles suggests that they were possibly transported over 46 miles from the west (Tunnell 1978:45). This cache represents a stockpiling of raw materials which may be related to several of the caching behaviors discussed in the previous chapter. A similar cache of 8 tested cobbles was recovered near the mouth of the Guadalupe River in Calhoun County (Calhoun 1965). Also, Hart's (1983:95) Cache No. 7 contained 13 slightly modified Edwards chert cobbles from Mitchell Lake in Martin County, Texas. None of these reported caches have temporal contexts.

FLAKE OR BLADE CACHES

A more common type of lithic cache found in Texas consists of large quantities of chert flakes or blades. The flakes or blades in these caches functioned as expedient flake tools or as flake blanks for later reduction into tools. Over 20 caches of this type have been reported from central and west Texas, the Texas

Panhandle, and Oklahoma (Tunnell 1978; Lintz 1978; Wyckoff 1984). Many lithic flake caches which have been recovered have isolated contexts. For example, the Palo Duro Cache consists of 608 unmodified chert flakes found in an arroyo which drains into the Palo Duro River near Canyon, Texas (Witte 1942:75). There are no habitation sites found near the cache locality.

Other examples include the Mackenzie Cache, found at the Mackenzie Reservoir in Briscoe County, Texas, consisting of 666 flakes of Tecovas Jasper found in a possible heat treating pit (Hughes and Willey 1978) and the Brookeen Cache of 250 blades made from Edwards chert recovered from Hill County, Texas (Mallouf 1981). Many flake caches also contain lesser amounts of bifaces or finished lithic tools. For example, the Weaver-Ramage Cache, found on a terrace of the Salt Fork of the Brazos River in Kent County, contained a Late Prehistoric Perdiz arrowpoint, two broken bifacial knives, 8 tested chert cobbles, a core, a large biface, 24 unifacial scraping tools, 21 bifacial thinning flakes, 102 flakes and chips, and 652 blades, many which could be refitted to one another (Tunnell 1989:370). The Ryan Site Cache, from near Shallowater, Texas, contained 9 Plainview projectile points, 37 bifaces, and 54 modified and unmodified flakes (Hartwell et al. 1989).

A great number of flake caches consist of high-quality or exotic lithic materials which were transported or traded over large distances. Caches of flakes made from Alibates Dolomite from the Canadian River in the Texas Panhandle have been recovered in Texas, northwestern Oklahoma, New Mexico, and Kansas (Lintz 1978, 1981; Tunnell 1978). In a discussion of flake caches from northwestern Oklahoma, Lintz describes a total of 7 caches consisting of Alibates flakes transported or traded from Texas (Lintz 1981). For example, the Heerwald Site Cache, consisting of 62 flakes and 3 implements made from Alibates material, was recovered from a Late Prehistoric village site in far western Oklahoma located approximately 170 miles from the Alibates quarry (Lintz 1978). A probable Antelope Creek Phase cache composed of 51 flakes, unifaces, and 1 biface made from Alibates lithics was recovered approximately 40 miles from the raw material source at a site on Pedrosa Creek in Potter County, Texas (Slesick 1978).

Many caches of flakes made from Cretaceous Edwards cherts from central Texas have also been recovered far from their source areas. For example, the Brookeen Cache discussed above was recovered approximately 37 miles from the flake material's probable source (Mallouf 1981). Also, the Weaver-Ramage Cache materials, made from high quality Edward's Plateau chert, were recovered approximately 62 miles from their probable source (Tunnell 1989). The recovery of caches of flakes of quality lithic materials far from their source areas has several possible implications for prehistoric trade and exchange of raw materials as well as prehistoric group mobility and technology.

Though most recovered flake caches have isolated contexts and cannot be dated, it has been suggested that caches of this type are generally Late Prehistoric in age, due to their similarities to Late Prehistoric lithic technological organization (Lintz 1978; Tunnell 1989; Wyckoff 1984). The few flake caches which have been dated or contain diagnostic tools support this hypothesis. However, caches of distinct, Clovis technology blades have also been reported from Texas and Oklahoma (Green 1963; Hammatt 1970) For example, a cache (41NV659) of 13 blades of probable Clovis affiliation were recovered from an isolated context along a small tributary of the Trinity River in Navarro County, Texas (Young and Collins 1989).

TOOL CACHES

A less numerous type of lithic cache reported from Texas are caches of tools. Caches of tools have been recovered in isolated contexts, in habitation sites, and, as noted earlier, in ritualistic or mortuary contexts. Caches of used or unused lithic tools may be related to hunter-gatherer technological organization, tool curation for example, or hunter-gatherer settlement strategies, such as the seasonal caching of tools discussed in Chapter 3. Tool caches found in isolated contexts are variable. Brown (1985) reports two caches of Guadalupe tools from isolated contexts, the Lindner cache of 9 unused Guadalupe tools from Medina County, and the Peterson cache of 6 used Guadalupe tools from Atascosa County, Texas. Brown suggests that the caching of these artifacts is closely related to tool curation. Brown (1989) also reports a cache of 23 Guadalupe tools and picklike bifacial implements from an isolated context in northwestern Webb County. Many of the tools had been used and Brown suggests that the cache represents what Schlanger (1981) calls a "load-exchange cache" (see Chapter 3). An isolated cache of 9 projectile points was recovered during construction at Kelly Field in San Antonio, Texas (Hester 1972). The projectile points were tentatively classified as Yarbrough or Palmillas type points.

Caches of lithic tools found in habitation sites are also variable. A cache of 3 Castroville projectile points, 1 unused and 2 broken, and 1 preform, was found at the Blue Hole Site (41UV159) in Uvalde County, Texas (Mueggenborg 1991). The points were found neatly stacked on top of one another. A cache of 22 used endscrapers was recovered from 41RN169, a Late Prehistoric bison processing site located in Runnels County (Treece 1993) It is hypothesized that the endscrapers were used during the processing of the bison and then cached once the task was completed (Christopher Lintz, personal communication). The Granberg Cache from Bexar County was found buried within an occupation site, 41BX271 (Brown 1985:95). The cache consisted of 4 Guadalupe tools, 3 of which exhibit use wear. Jackson and Woolsey (n.d.:18-19) report a cache of 44 lithic artifacts found at the center of a prehistoric habitation mound at the A.J. Trammel Farm in Travis County, Texas. The cache contained 3 scrapers, 3 arrowpoints, 31 bifaces, and 7 chert flakes. Finally, several caches of individual and multiple manos were recovered from within the Sleeper Site (41BC65), an Early Archaic occupation site (Johnson 1991). These mano caches may represent site furniture (see Chapter 3; Binford 1979).

BIFACE CACHES

Caches consisting of bifaces are the most numerous type of lithic cache found in Texas. Over 40 caches of bifaces have been reported from areas of Texas, including central Texas, north Texas, west Texas and the Panhandle, and southwest Texas (Hart 1983; Hester and Brown 1988; Jackson and Woolsey n.d.; Tunnell 1978; Witte 1942; see Appendix I for listing of biface caches). Biface caches have rarely been reported from the Texas Coastal Plain and northeast Texas. Whether this is due to the absence of this cache type in these areas or due to the fact that biface caches have been found and gone unreported is not known. The relative absence of biface caches from northeast Texas may have implications for biface trade or exchange and will be discussed in Chapter 6.

Reported biface caches often differ from one another in context and content, suggesting several different types of biface caches. As discussed in Chapter 3, differing cache contexts may be related to specific functional and behavioral determinants in a cache's creation. Contextually, many reported biface caches have been found in isolated settings and, as a result, cannot be dated due to the lack of associated diagnostics or dated sites. Caches with isolated contexts are often found at prominent positions in the landscape, such as at the tops of hills, high ridges, or alluvial terraces. Caches may have been placed at these spots in order to facilitate future relocation and recovery of the cache. Many biface caches have also been found within prehistoric habitation sites and a few have been recovered from mortuary or ritual contexts.

The few biface caches which have been recovered from datable contexts are mainly Middle to Late Archaic in age (Dockall n.d.; Hart 1983; Hasskarl 1961; Jackson and Woolsey n.d.; Lorrain 1963; Wiseman et al n.d.; Wyckoff 1984).The contents of reported biface caches differ in several ways. First, different caches often contain bifaces at different stages of manufacture. In other words, one cache may contain nicely thinned bifaces which are preforms at later stages of reduction while another cache may contain large bifaces which are blanks at early stages of reduction. This may be related to different temporal or functional aspects of each cache. For example, the caching of numerous large, early stage bifaces near a quarry may be related to transport cost decisions as discussed by Binford (1980 see chapter 3). Second, the number of bifaces found within these caches varies greatly, from caches consisting of only a few bifaces to caches consisting of over 100 bifaces. Also, reported biface caches often contain lesser amounts of other lithics, including flakes, tools, and unmodified lithic raw material (Bryan 1950; Jackson and Woolsey, n.d.; Tunnell 1978; Witte 1942). These differences may also be related to differing temporal and functional determinants for each cache. For example, caches of large numbers of bifaces may be related to the stockpiling of raw materials while a cache of a few bifaces and other lithic tools may be related to insurance caching, where tools and raw materials are placed throughout the landscape in anticipation of future needs.

As with many of the flake caches mentioned above, the bifaces which constitute many reported caches are also often made from cherts which are non-local to the cache's location, implying prehistoric trade or transport. Bifaces found in caches are commonly made from cherts from well-known lithic sources, such as the Edwards Plateau and the Alibates Quarry. Caches of bifaces made from Edwards cherts have been found in New Mexico, Oklahoma, and Kansas (Bryan 1950; Wiseman et al. n.d.; Wyckoff 1984) Utilization of these sources of high-quality or exotic cherts in the production of bifaces and the caching of them far from their source may be related to several cultural factors, prehistoric trade and exchange, mobility, and raw material preferences for instance, which are discussed in Chapter 6.

Various biface caches have been recovered from habitation sites. A cache of four, possibly heat-treated bifaces were found in a tight cluster in a site in southwestern Dimmit County (Hester and Brown 1988). No diagnostics were recovered from the site which would date the cache. A cache of 10 medium size bifaces with associated Pedernales points was recovered from the Wiley Williams site, 41TV29 (Jackson and Woolsey n.d.). The bifaces are very thin and well-shaped and are made from tan and blue/black Edwards cherts. A cache of 19 bifaces made from Edwards cherts were recovered from an Archaic age, Carrollton Focus site located on the Elm Fork of the Trinity River near the Dallas-Denton county line (Lorrain 1963). Eleven of the bifaces were at later stages of thinning while 8 were at rough, early thinning stages. Lorrain(1963:4) further describes an unpublished cache of Edwards chert bifaces and one Edgewood point recovered from the Wood Pit Site at the Carrollton Focus stratigraphic level. Hasskarl (1961) reports a cache of four large, lanceolate bifaces found buried within the Central Midden site, one of the Boggy Creek sites located in Washington county. Other caches of bifaces found in sites include the Goldapp Cache (41FY521) of 35 bifaces, the Baird Cache of 12 very large bifaces, the Feature 2 cache of 12 bifaces at 41LN253 (Prewitt and Associates 1990), the Hill Cache of 93 large, early stage bifaces (Horne 1936), and the Gus B. Mauermann Cache (41TV30) of 7 bifaces found within a Middle Archaic site (Jackson and Woolsey n.d.). See Chapter 7 and Appendix I for further descriptions of these caches.

Biface caches recovered from habitation sites also commonly contain lesser amounts of other lithic tools. Hart (1983) reports 4 different lithic caches from west Texas found within habitation sites, none of which are dated. They are Cache No. 2, 3, 8, and 10 recovered from Dawson, Martin, Howard and Gaines counties. All 4 caches primarily contained bifaces along with lesser amounts of other lithic artifacts, including Corner-tang knives, modified flakes, cores, and unifaces. The number of bifaces found within each cache ranges from 9 to 24 and the bifaces range from crude, early stages to later, preform stages of manufacture. The bifaces from the four caches were made from Edwards cherts, suggesting they were transported over considerable distances. The inclusion of three corner tang knives in Cache No. 8 suggests that it is Late Archaic in age (Turner and Hester 1985:210).

Four of the seven Bissell Collection caches recorded by Dockall (n.d.), Cache #1, #2, #3, and #5, were found in habitation sites and three contain other lithic tools. Bissell Caches #1 and #3 were found in the same Archaic site in Pecos county. Cache #1 contained 12 large, middle to late stage bifaces and 2 flakes while Cache #3 contained 10 small, flake bifaces, 9 unifaces, and 2 flakes. Several of the unifaces and flakes in Cache #3 appear to have been utilized. Bissell Cache #5, also from Pecos county, was found in a multicomponent site and contained 6 early stage bifaces, 4 modified chert nodules, and 2 unifaces. The presence of other lithic tool types, such as uniface scrapers, cores, or utilized flakes, in these caches, as well as the fact that they were recovered from habitation sites, suggests these caches may be abandonment or insurance caches related to settlement system and technological organization, where tools and raw materials are cached and curated in locations which are returned to on a seasonal or intermittent basis (see Chapter 3 for a description of abandonment and insurance caches).

Caches of bifaces have also been recovered from mortuary contexts. Bement (1991) describes a Middle

Archaic mortuary cache of 14 well-made, lanceolate shaped bifaces and one drill found in the Bering Sinkhole (41KR241), a vertical shaft cemetery. Bement relates the caching of these bifaces to group investment of time and valuables, in the form of bifaces, in the burial of the dead. Taylor and Highley (1993) describe three caches of large bifaces from the Loma Sandia Site (41LK28), a late Middle Archaic cemetery. The caches, Features 195, 225, and 291, were found within the cemetery but unassociated with any burials, suggesting they represent offertory caches. Feature 195 contained 5 bifaces while Features 225 and 291 both contained 4 bifaces. The bifaces are all large, thin and triangular in shape. Jackson and Woolsey (n.d.) describe a cache of 26 narrow, long, lanceolate bifaces from a Historic Indian grave from near Kickapoo Springs in Anderson County. Based on their shapes, the bifaces were most likely used as knives.

As mentioned above, a large number of biface caches have been recovered from isolated contexts. The Running Water Draw Cache, containing over 120 large bifaces, several flakes, and 2 chert nodules, all made from Edwards cherts, was recovered from an isolated context in Castro County (Green 1955; Tunnell 1978). A similar size cache, the Texas Ranger Museum Cache, was recovered from an ash-filled pit near the town of Stanton in Martin County. The cache contained 120 bifaces and one large chert nodule. Fifteen of the bifaces are very large and thick, several exceeding 25 mm in length, while 105 of the bifaces have long, thin lanceolate shapes. Most of the bifaces appear to be heat-treated, suggesting that the pit in which they were found was a heat-treating facility. Witte (1942) reports two biface caches from isolated contexts, the Johnson Cache and the Whitzitt Cache. The Johnson Cache was found in a field in Clay County and contained 30 small to large sized bifaces (Witte 1942:75). The Whitzitt Cache, found beneath a flat stone on the Whitzitt farm in Jack County, contained 28 very large, ovate-shaped bifaces. The bifaces from both caches were made from non-local Edwards cherts, suggesting that they were transported over considerable distances. Jackson and Woolsey (n.d.) report a biface cache, the Mrs. Brice Reid Cache (41HO23), which was found in an unusual isolated context. The cache, containing 13 middle stage, lanceolate shaped bifaces, was recovered near the town of Grapeland during construction of a road. A huge clay ball was unearthed and broken open. The bifaces were found stacked on top of one another inside the clay ball.

Caches of bifaces with isolated contexts are often found at conspicuous places in the landscape, such as on hill tops or other high places. For example, the Jewett Mine Biface Cache (41LN44), was recovered from the top of a hill in Leon County (Espy, Huston, & Associates, Inc. 1980). The cache contained 11 large, subtriangular shaped bifaces made from a translucent chert. Hart (1983) reports two biface caches found at prominent places in the landscape. Cache No. 5 was found in the middle of a playa lake located 23 miles northwest of Lamesa, Texas in Gaines County. The cache contained 43 early to middle stage bifaces made from Edwards cherts, suggesting a considerable transport distance for the bifaces (Hart 1983:66-88). Cache No. 9 was found on a high point of land overlooking a playa lake bed located five and one half miles south of Lamesa. The cache contained 17 middle to late stage, ovate bifaces (Hart 1983:108-121).

Finally, many of the reported biface caches found in isolated contexts contain unusually large bifaces. Two of these caches, the Running Water Draw Cache and the Texas Ranger Museum Cache, have already been mentioned. Jackson and Woolsey (n.d.) report three caches which contain bifaces of unusual size. The M.M. Reynolds Cache was plowed up in a field near Midway, Texas in Madison County (Jackson and Woolsey n.d.:8). The cache contained many bifaces, six of which can best be described as huge, all exceeding 18 cm in length with one biface over 27 cm long. The L.K. Stam Cache, found in an isolated setting 10 miles north of the town of Mason in Mason County, contained 26 bifaces, many of which are very large in size (Jackson and Woolsey n.d.:2). The Fairview Park Cache from Austin, Texas, described in detail in Chapter 7, contained 26 bifaces which average 16.4 cm in length (Jackson and Woolsey n.d.:8). Five of the bifaces exceed 18 cm in length, one of which is fully 28.3 cm in length. Several of the biface caches found in habitation sites, the Baird Cache, Goldapp Cache, and the Mayfield Kothman Cache, for example, also contain bifaces of unusually large size. The caching of such large bifaces may be related to their value as raw materials, trade commodities, or status items and is further discussed in Chapter 6.

Descriptions of many other biface caches found in isolated contexts which have not been mentioned in the above discussion can be found in Appendix I.

CONCLUSIONS

In conclusion, a variety of caches, from Paleoindian to Historic Indian in age, have been found in Texas. These include mortuary or ritual caches, lithic raw material caches, flake or blade caches, tool caches, and biface caches. Of these, flake and biface caches are the most numerous. Dated caches seem to indicate that flake caches are generally Late Prehistoric in age while biface caches are generally Archaic in age. The limited numbers of other reported cache types, such as formal tools, do not appear to be limited to any one time period. This possible age difference between flake and biface caches is likely related to differing technological organizations (i.e. tool kits) of cultural groups from both time periods. For instance, in general, the tool kits employed in the Late Prehistoric mainly consisted of arrow points and tools made from flakes, though the large beveled knives from this time period are an exception. The greater incidence of flake caches with Late Prehistoric affiliations may reflect the shift to this flake-tool oriented lithic technology. Though this topic merits a paper of its own and cannot be fully addressed in this thesis, the relationship of biface caches to specific lithic technologies from the Archaic will be discussed in Chapter 6.

Chapter 5

Biface Technology

As many authors have pointed out (Callahan 1979; Collins 1975; Patterson 1977), lithic technology is a subtractive process, where the reduction of mass results in an artifact. Prehistorically, this subtractive process was accomplished through a number of different reduction strategies. Bifacial reduction is one strategy employed in the production of lithic tools. According to Kelly (1988:718), "a biface is a flake or core blank that has been reduced on both faces from two parallel but opposing axes." In other words, flakes are driven off both faces of the core material until a desired shape and size are achieved.

Bifacial reduction of lithics has consistently been viewed as a stage or step-like production process (Patterson 1977:60). This means that as a biface is reduced, it goes through several sequential stages or steps differentiated from one another by the manufacturing implement employed, the size and thickness of the biface, and its form. The sequence and nature of these stages or steps differ depending upon numerous variables, including the desired end product of the reduction process, the form and quality of the parent raw material, and the style or technique in which flintknapping is performed in individual cultures. However, the process of bifacial reduction should be viewed as a continuum (Callahan 1979; Collins 1975; Muto 1971; Patterson 1977). According to Collins (1975:16), the reductive process is linear in nature, with no sharp divisions between steps or stages. "Though each stage is generally the precuser to the next stage in the reduction sequence" (Patterson 1977:61), their are several optional steps, such as utilization, heat-treating, or storage which can be performed along any point in the continuum (Collins 1975:17). Yet, the basic steps of the reduction sequence "are sufficiently distinct in terms of their procedures and output to merit separation" (Collins 1975:16). "There are definite stages that a bifacial core tool must go through during the reduction continuum, and each stage is slightly different in kind as well as in degree from the next" (Callahan 1979:33). Stage models of biface reduction can therefore serve as valid analytical tools in understanding biface manufacturing processes and techniques.

Numerous stage models of biface reduction have been proposed (Callahan 1979; Collins 1975; Muto 1971; Newcomer 1971; Patterson 1977; Sharrock 1966). These models have been based on both archaeological biface assemblages, such as Patterson (1977) and Sharrock (1966),and biface replication experiments, such as Callahan (1979), Muto (1971), and Newcomer (1971). The models vary in the number and nature of reduction stages as well as the attributes used to define each stage. For instance, Newcomer (1971) defines three stages of bifacial reduction, differentiated from one another by biface size and flake scars, based on his experimental replication of Paleolithic handaxes while Patterson (1977) defines five stages of biface production, differentiated from one another by biface shape and metrical attributes, based on an assemblage of artifacts recovered during the excavation of a central Texas site. The most common attributes used in defining stages are length, width, thickness, and weight measurements or ratios of these (Bement 1991:102).

All of the models have three common stages: core/blank, preform or secondary thinning, and final shaping. Most of the models, excluding Muto (1971) and Newcommer (1971), have four main stages: core/blank, primary thinning, secondary thinning, and final shaping. Of the biface stage models cited above, the most widely used is Callahan's model (Callahan

1979). This is due in part to its thoroughness, his extensive replication studies, and its detailed presentation of metrical and technological attributes which define each stage. Callahan's model is used in the analysis of the bifaces from the four caches described in this paper.

Callahan's (1979) model of bifacial reduction stages is based on his replication of Clovis-like fluted projectile points from Virginia. Callahan defines 9 stages involved in the production of these fluted points, the last four of which, stages 6 through 9, are specific to the fluting of the projectile point. Callahan's stages 1 through 5 are relevant to the study of biface production. Callahan uses two variables, width to thickness ratios and edge angle measurements, as his main attributes in defining the stages of the reduction sequence. In Callahan's model, width/thickness ratios increase as the biface is thinned in each successive stage until they then begin to decrease with final shaping and rejuvenation. "A corollary of width to thickness ratio is the edge angle which decreases with progression through the reduction sequence" (Bement 1991:102). Morphological attributes, including edge sinuosity, biface cross-section, and flaking patterns are also used to characterize each reduction stage.

Callahan's Stage 1 involves the initial procurement of a piece of lithic raw material suitable for reduction. This may involve the production of large flakes or the selection of a cobble or nodule to be reduced into a biface itself (Callahan 1979:36). Stage 2 involves the initial edging of the piece, where a bifacial edge is produced in order that subsequent thinning may be facilitated. Width to thickness ratios for this stage roughly fall between 2.00 and 3.00, but may exceed 6.00 in flake reduction, while edge angles generally range between 55° to 75° (Callahan 1979:67). Work at Stage 2 is usually done using a hard hammerstone with the resulting biface being irregular in shape, with a sinuous edge and thick cross-section. Stage 3, primary thinning, is the stage in which extensive thinning is performed using hard or soft hammerstones and width to thickness ratios are stabilized (Callahan 1979:90). In this stage, flakes are struck to or beyond the midline of the biface and width to thickness ratios fall between roughly 3.00 and 4.00. Edge angles range between 40° and 60° and a biconvex cross-section is obtained. It is in this stage that the biface is the most break resistant, making it easily transportable, and often may have been the form in which raw materials were exported from quarry areas. According to Callahan (1979:91), "numerous cache or trade "blanks" show unmistakable Stage 3 characteristics and width/thickness ratios."

Stage 4, secondary trimming, involves initial shaping of the biface and further thinning using soft hammers and/or antler billet percussors. In this stage, cross-sections are flattened, flake scars travel to or beyond the midline of the biface, and width/thickness ratios fall between roughly 4.00 and 5.00 or more. Edge sinuosity is greatly reduced or eliminated with edge angles ranging between 25° and 45°. Stage 4 bifaces usually can be considered the rough preform, depending upon the desired end-product of the reduction sequence.. According to Callahan (1979:116), "whereas Stages 1-3 may well have been executed at the quarry, Stage 4 may have been dressed out later for trade in thinned, flawless preforms "cache blanks" or "trade blanks" to be worked down by the consumer into specific products". Stage 5 involves the final shaping of the biface, commonly into its finished form. This can include notching, edge and base shaping, serration, or, as in Callahan's study, preparation for subsequent fluting, and is usually accomplished through pressure flaking techniques.

As discussed above, the biface reduction sequence is a continuum, a fact which Callahan acknowledges (Callahan 1979:33). Consequently, his model should be applied in a generalized manner, since biface reduction techniques and sequences differ according to the numerous factors, such as the raw materials used and the desired end-product of the maker. Furthermore, the metrical attributes used to characterize each stage of reduction are based on the replication of Clovis-like fluted points and therefore may not be wholly applicable to other biface reduction strategies. As Callahan himself points out, "the definition of a given reduction stage is not dependent upon any one variable but rather upon interacting combinations of variables" (Callahan 1979:172).

Chapter 6

Biface/Biface Cache Functions

Bifaces and biface caches functioned in several different roles in the organization of prehistoric lithic technology and settlement strategies. Furthermore, bifaces appear to have functioned as commodities or status items in many prehistoric economies. According to Kelly (1988:718-719), bifaces served two main roles in lithic technological organization: as core/variable use tools and as long use-life tools First, large bifaces may have served as flake cores as well as tools. In this scenario, biface function is related to hunter-gatherer mobility and raw material distributions. Mobile groups occupying areas of low lithic raw material density may have maximized transportable raw material while minimizing transport weight through the use of bifacial cores. "Using large bifaces as cores maximizes the amount of tool edge carried while minimizing the amount of stone, and, by carrying all tools as one solid biface, one can assure that flakes struck from it will have sharp, undamaged edges" (Kelly 1988:718).

Flakes driven off the core can be used as is or modified into specific shapes. Also, the bifacial core itself can be used as an implement when necessary. "The use of bifaces as cores indicates that hunter-gatherers need to prepare for a variety of tasks requiring stone tools, but can anticipate not knowing exactly how many such tasks will be conducted in the future and that raw material may not be available where the group or individual intends to go" (Kelly 1988:718). The use of bifacial cores has been associated with the organization of lithic technology in the Folsom Paleoindian complex and several bifacial cores were recovered from the Blackwater Draw locality (Boldurian 1991). Bifaces may have also been utilized as specialized cores for the production of large, thin flakes in certain Late Prehistoric Southern Plains cultures (Lintz 1978). Use of bifaces as cores would therefore be more related to specific reduction strategies than raw material scarcity.

Bifaces functioned as long use-life tools in many hunter-gatherer cultures (Kelly 1988:720). In situations of raw material scarcity and low residential mobility, the use of bifaces would have conserved materials while providing a multipurpose tool which could perform a variety of tasks, such as cutting or scraping. Bifaces could be easily shaped or rejuvenated as required. The use of bifaces in this manner is not solely related to situations where residential mobility is low and raw materials scarce. In fact, bifacial tools, excluding projectile points and some drills, appear to have been a major component of the lithic technology of many hunter-gatherer groups. Bifaces were often utilized as large knives or scrapers and were used in a variety of circumstances. For example, hunter-gatherer groups on long search and encounter (as opposed to target specific) logistical forays, where a variety of tool needs or tasks may be encountered, may have used bifaces as multipurpose tools (Kelly 1988:721). Use of bifaces in this manner would therefore be more related to logistical considerations than raw material scarcity.

As noted in the discussions of caching behavior and Texas caches in the previous chapters, biface caches may be related to technological organization or settlement strategies. Bifaces may have been cached in order to provide raw materials for future tool needs. The caching of bifaces, as opposed to flakes or nodules, as a raw material may be related to their versatility as blanks which could be used as is or reduced into a variety of tools. Miller et al. (1991) describe a cache of 18 early stage chert bifaces from a site in Wyoming found in a heat-treating pit 124 miles from their raw material source. They attribute the caching of the bifaces to the anticipation of future raw material needs and lithic technological organization. They believe that the bifaces were stored at the site for later completion into tools (Miller et al. 1991:55). A similar strategy of biface storage for future tool needs has been hypothesized for lanceolate biface caches in Oregon (Minor and Toepal 1989), though others argue against this hypothesis (see below). In discussing a cache of lanceolate bifaces found at Lava Island Rockshelter, Minor and Toepal (1989:104-106) argue that the biface caches from Oregon relate to hunting technology and that the bifaces are projectile point preforms placed at various spots throughout the landscape as an anticipation of future needs.

Smith (1894) describes nine biface and tool caches from the Saginaw Valley in Michigan, many of which contained over 100 artifacts. Smith (1894) relates the caching of these bifaces and tools to raw material concerns. Apparently, raw materials were procured from quarries and reduced into bifaces, which were then transported to and cached in villages. The bifaces then would serve as a stockpile of raw material, "where they could be easily obtained and worked up into the various specialized forms as such implements were required for use, or they may have been used as they were without specialization" (Smith 1894:1). Clark and Fraley (1985:37) suggest that the creation of many biface caches on the Northern Plains during the Late Prehistoric Period may be related to logistical procurement strategies, such as those suggested by Binford (1980). They argue that caching of bifaces may be a partial solution to the unequal distribution of resources and/or seasonal restriction of resource availability. For example, bifaces may have been cached at sites expected to have been occupied during a period when procurement was hindered by snow cover or inaccessibility to source areas (Clark and Fraley 1985:37).

Bifaces also appear to have functioned as trade commodities or status items in many prehistoric cultures (Callahan 1979; Hester and Barber 1990; Miller et al. 1991; Turner and Hester 1985:30; Rick and Jackson 1992; Scott et al. 1989; Wyckoff 1984). Ethnographic and archaeological data indicate that bifaces made from high-quality lithic materials were often exchanged or traded in many prehistoric economic systems. The bifaces usually were traded in the form of large blanks, early to middle stage bifaces with generalized shapes.. Bifacial blanks would have been an economical means of transporting and trading high-quality lithic materials in that they would minimize transport weight and could be reduced into a variety of tools as well as serve as cores for flake production. Bifaces found in many caches are often described as "trade blanks" and are believed to be related to the exchange of lithic raw materials in prehistoric economies. Caches of this type are often recovered at considerable distances from their raw material source, suggesting trade or other cultural mechanisms of long-distance transport.

Biface caches have been linked to prehistoric trade systems in many areas of the United States (Beckes 1985; Clark and Fraley 1989; Minor and Toepal 1989; Rick and Jackson 1992; Scott et al. 1986, 1989) In Oregon, Scott et al. (1989) suggest that the lanceolate biface caches recovered from throughout the state, including the one from Lava Island Rockshelter discussed above, represent stores of surplus artifacts intended for trade and/or distribution to lithic resource poor areas. They go on to further state that the study of these caches and their raw material sources may identify trade networks (Scott et al. 1989:111). In an analysis of a cache of 69 obsidian bifaces from northern California, Rick and Jackson (1992:58) hypothesize that some forms of lithics, namely bifaces of high-quality obsidian, were closely linked to exchange systems in northern California. Based on study of the cache bifaces and those from related archaeological sites, they suggest that large numbers of standardized preforms were being produced and traded throughout the area (Rick and Jackson 1992).

On the Northwest Plains, trade of raw materials in the form of bifaces appears to have occurred in areas where raw materials were unevenly distributed or where access to these raw materials was limited due to cultural mechanisms (Clark and Fraley 1985). Biface caches of exotic cherts are often recovered at considerable distances from their source areas and may be linked to raw material preferences and trade. Beckes (1985), in his analysis of a cache of 36 large bifaces made from Knife River Flint, suggests that Late Plains Archaic groups purposefully exploited exotic cherts, such as the Knife River Flints, for their superior flaking qualities and trade value. He believes that groups procured exotic cherts, reduced them into durable, early stage bifaces, and carried them with them on their seasonal rounds. They then traded the bifaces to other groups encountered on their wanderings or utilized them when needed (Beckes 1985:71). This hypothesis may be supported by the presence of caches of exotic chert bifaces in areas with available local chert materials suitable for lithic reduction. For example, Clark and Fraley (1985) describe three caches of exotic Spanish Diggings and Hartsville Uplift chert bifaces and flakes recovered 248 miles from their source. The caches were recovered in areas with available local cherts which had been utilized by prehistoric groups over thousands of years. The presence of these caches in this area suggests preferences for specific, exotic lithic materials, which had to be transported or traded into the area.

The value of bifaces in prehistoric cultures is further indicated by their inclusion in many reported burials (Bement 1991; Frison and Van Norman 1985; Jackson and Woolsey n.d.; Lippincott 1985a, 1985b; Taylor and Highley 1993) The bifaces recovered from these burials range technologically from early to later stages of manufacture and are often similar to reported "trade blanks." Bifaces recovered from burials range from one to over 100 in number. The inclusion of bifaces in burials or mortuary contexts suggests they had more than purely economic value in certain cultures and may have been status items. For example, in discussing a cache of 14 early stage bifaces recovered from a burial context in central Texas, Bement (1991:107) suggests that the bifaces had both symbolic and economic value. According to Bement (1991), the placement of the bifaces in the burial is an indication of the individual's status and reflects group investment in providing the furniture of the dead. The biface cache possibly "was a capital investment in the affirmation of territory," since cemeteries in hunter-gatherer societies are often associated with the identification of territory (Bement 1991:107). Frison and Van Norman (1985:52) suggests that the placement of bifaces in a burial may be an indication that the individual was a flintknapper, and that his goods were being interred with him.

BIFACE/ BIFACE CACHE FUNCTIONS IN TEXAS

In Texas, bifaces and biface caches appear to have played important roles in prehistoric technological organization, exchange systems, and mortuary behaviors. Bifacial lithic reduction was employed in the production of many lithic tool forms throughout prehistory, as evidenced by the vast quantities of manufacturing debris in the form of broken bifaces recovered from archaeological sites in Texas. Bifaces also were employed as long use-life tools and large, biface knives were an integral part of Middle to Late Archaic as well as Late Prehistoric tool kits (Prewitt 1981; Shafer 1992:8; Turner and Hester 1985). Lithic debris from archaeological sites in Texas indicate that biface cores were used in the production of flakes. Whether the use of biface cores is related to scarce raw materials or mobility is unknown. It seems unlikely, considering the large quantities of available lithic raw materials in many parts of Texas. Further research on this aspect of biface functions in Texas is necessary.

The presence of many biface caches in habitation sites in Texas suggests that they may be related to technological organization and settlement strategies. Many of the caches from the southern Panhandle reported by Hart (1983, see Chapter 4 and Appendix I) contained mixed amounts of bifaces, flakes, and lithic tools made from Edwards cherts. Furthermore, most were found within habitation sites. These caches may have functioned as stockpiles of quality raw materials and tools which were curated in locations which would be returned to at a later date. Other biface caches may be related to logistical procurement groups, where large amounts of bifaces are produced at a quarry and cached due to transport-cost decisions. The Hill Cache of 93 large, early stage bifaces reported by Horne (1936) may be such a cache. The cache was recovered approximately 15 miles from the quarry from which the bifaces were manufactured. The large quantity of bifaces would have been a substantial load to transport and may have been cached for future retrieval.

Large bifacial blanks appear to have been traded throughout most of Texas (Bement 1991; Hall 1981; Hester and Brown 1988; Hester and Barber 1990;

Shafer 1992; Turner and Hester 1985:23; Tunnell 1978). Evidence for the trade of large bifaces may include: caches of bifacial blanks found near possible trade routes or in locations far from their raw material source, large biface knives made from central Texas cherts recovered far from their sources, and ethnographic evidence of the trade of chert bifaces in south Texas (Shafer 1992; Davenport and Wells 1918). The trade of bifaces of central Texas cherts may be related to raw material preferences, unequal distributions of lithic resources, or specialized consumer needs. Shafer (1992:7-8) believes the trade of bifaces in Texas was most prevalent in the Archaic, when territorialism between hunter-gatherer groups was pronounced, leading to less mobility and the development of social mechanisms to exploit resources in other territories. According to Shafer (1992:8), large bifaces made from high-quality central Texas cherts were traded eastward and southward into regions which had poor lithic resources.

Based on the study of grave goods from three mortuary sites located in the northern coastal plain of Texas, Hall (1981) hypothesized that in the Late Archaic, populations increased and central Texas groups participated in a complex import-export system with Woodland groups of the southeastern United States. Hall (1981:291-300) suggests that high-quality central Texas cherts were being traded, possibly in the form of bifaces or large knives such as the corner tang variety, eastward in exchange for other commodities, including boatstones and marine shell. Evidence also suggests that bifaces made from central Texas cherts were traded into the Plains areas of west Texas and Oklahoma as well as into New Mexico (Tunnell 1978; Wisemann et al. n.d.; Wyckoff 1984). Wyckoff (1984) describes three probable Middle Archaic caches from Oklahoma which contained bifaces of Edwards chert. The bifaces are similar in flaking attributes and size, and their presence in Oklahoma sites suggests some sort of long-distance transport or trade mechanism.

The use of large biface tools, such as Friday bifaces or projectile point types like the Castrovilles (Turner and Hester 1985), in the Middle and Late Archaic and the Late Prehistoric may have also been a factor in the trade of large bifacial blanks. Groups occupying areas where lithic resources were lacking or unsuitable for biface reduction due to size or quality may have sought lithics with which large biface tools could be manufactured. This consumer demand may have led to the production of large bifaces by groups occupying areas rich in lithic resources, such as central Texas, which could be traded or exchanged to groups with specialized needs. Evidence of this type of trade relationship may be found in the Caddo area of east Texas. The Late Prehistoric Caddo groups used large Gahagan bifaces for utilitarian and ritual purposes, but lithic materials suitable for the production of such bifaces were not readily available in their region. Lithics from which Gahagan bifaces could be manufactured would therefore have to be acquired from other areas. Consequently, raw materials in the form of large bifaces were obtained from central Texas, as evidenced by the numerous Gahagan bifaces made from central Texas Edwards cherts recovered from the George C. Davis Caddo Site in Cherokee County, Texas (Shafer 1973). The recovery of a cache of 64 biface preforms made from high-quality Edwards cherts from the site is further evidence of the importation of non-local cherts to the area (Shafer 1973:235).

The possible relationship of biface caches to trade systems in Texas is difficult to assess due to the lack of temporal contexts for most biface caches. However, caches of bifaces made from exotic cherts which are found in isolated context at considerable distances from their sources are often referred to as "trader caches" or "trader stocks" (Bryan 1950). It is believed that these caches represent the goods of a trader, and were cached for security or protection along trade routes. There are numerous caches which have been attributed to this type of behavior, most of which share several similarities. The bifaces in these caches are usually large, early stage blanks, show no use wear, and, as mentioned above, are made from exotic cherts. Examples of these are numerous and cannot be listed here (see Appendix I for cache listing). Alternative explanations for the functions of these caches are possible. Caches of large bifaces found in isolated contexts may be related to some of the factors outlined above, such as the stockpiling of raw materials for future use. Instead of acquiring lithics through trade, prehistoric groups may have procured lithic materials directly from their source, reduced them into bifaces, and transported them into other areas to be cached for future utilization.

Large bifaces have also been found with burials or in mortuary contexts in Texas (Bement 1991, Hall 1981; Labadie 1988; Taylor and Highley 1993), and, as noted in the above discussion, are believed to represent valuable commodities which were interred with the individual as an indication of status or occupation. The inclusion of large bifaces in burials is further evidence of the exchange of large bifaces in Texas, since many are made from cherts from distant sources. For example, several reported burials from the Texas coastal plain have contained large bifaces made from central Texas cherts, suggesting they were transported or traded into the area. This may be "an indication that the large thin bifaces, often made of Edwards Plateau chert, were being traded onto the coastal plain as objects of some considerable value, important enough to be buried with certain individuals" (Hester and Barber 1990:4). Evidence also suggests that these bifaces were often utilized as tools (Labadie 1988; Taylor and Highley 1993). The ceremonial value and utilization of large, bifacial knives is indicated in accounts of Cabeza de Vaca's dealings with the Cutalchuches Indians from south Texas (Campbell and Campbell 1981).

The three caches of large, utilized triangular bifaces recovered from the Loma Sandia Site may represent dedicatory of votive caches (Taylor and Highley 1993) The three caches were found in the cemetery but unassociated with any burials. The biface may have been cached in order to honor the cemetery as a sacred site or may represent post-internment offerings left for an individual (Taylor and Highley 1993). The interpretations of these three caches has bearing on the study of other biface caches. If the above hypothesis is correct, biface caches may have been created for ritual or ceremonial purposes. Many recovered biface caches may therefore have functioned as ritual deposits or markers. The wide distribution of biface caches in Texas may therefore indicate a broad religious or ideological system in which caching of large bifaces held a ritual significance. Further work is needed to fully investigate this hypothesis.

Finally, an interesting hypothesis on the function of biface and other lithic caches in Texas and Oklahoma has been put forth by Button (1989) and L. Bement at the University of Oklahoma (personal communication). Button (1989:216) believes that caches of exotic lithics may have been purposefully left in place. The caches themselves functioned like money and, though ownership may be exchanged, the caches were never unearthed. Button (1989:216) states, "Like kula objects, Yap money, or gold in Fort Knox, the intrinsic value of the objects (i.e., the worth of what it can do or make) is replaced by the greater value of what it has in the past been traded for." He goes on to state that once a cache has achieved greater value than its intrinsic worth, there would be strong reasons for not recovering it (Button 1989:216). If caches functioned in this manner, they may indicate prehistoric cultural boundaries.

DISTRIBUTION OF TEXAS BIFACE CACHES

In order to investigate the spatial patterning and possible functions of Texas biface caches at the macroscale, a distribution map of 42 reported biface caches was produced (Figure 1). However, this map cannot be considered complete due to the exclusion of perhaps two dozen biface caches across the state. Some of these are unreported, and others have been published since this research was done in 1992-1993. It is hope that in the future additional data can be added to the present study to further explore patterns and fill in gaps in our knowledge.

Several distributional patterns are evident in Figure 1. First, biface caches are noticeably absent from several regions, including south and far west Texas, areas of the coastal plain, and northeast Texas. The absence of caches from these areas may be due to a lack of reporting of recovered biface caches. However, the absence of biface caches from the Caddo area of northeast Texas may be related to cultural factors, i.e. the importation of cherts for reduction into biface tools, which are discussed below.

Second, a noticeable cluster of reported biface caches can be seen in west Texas near the edge of the Caprock Escarpment. These caches, mainly reported by Hart (1983), Dockall (n.d.), and Pope (1993) consist of bifaces and other lithics made from Edwards cherts and appear to be primarily Archaic in age. Presently, the significance of this cluster cannot be determined. However, many were found adjacent to

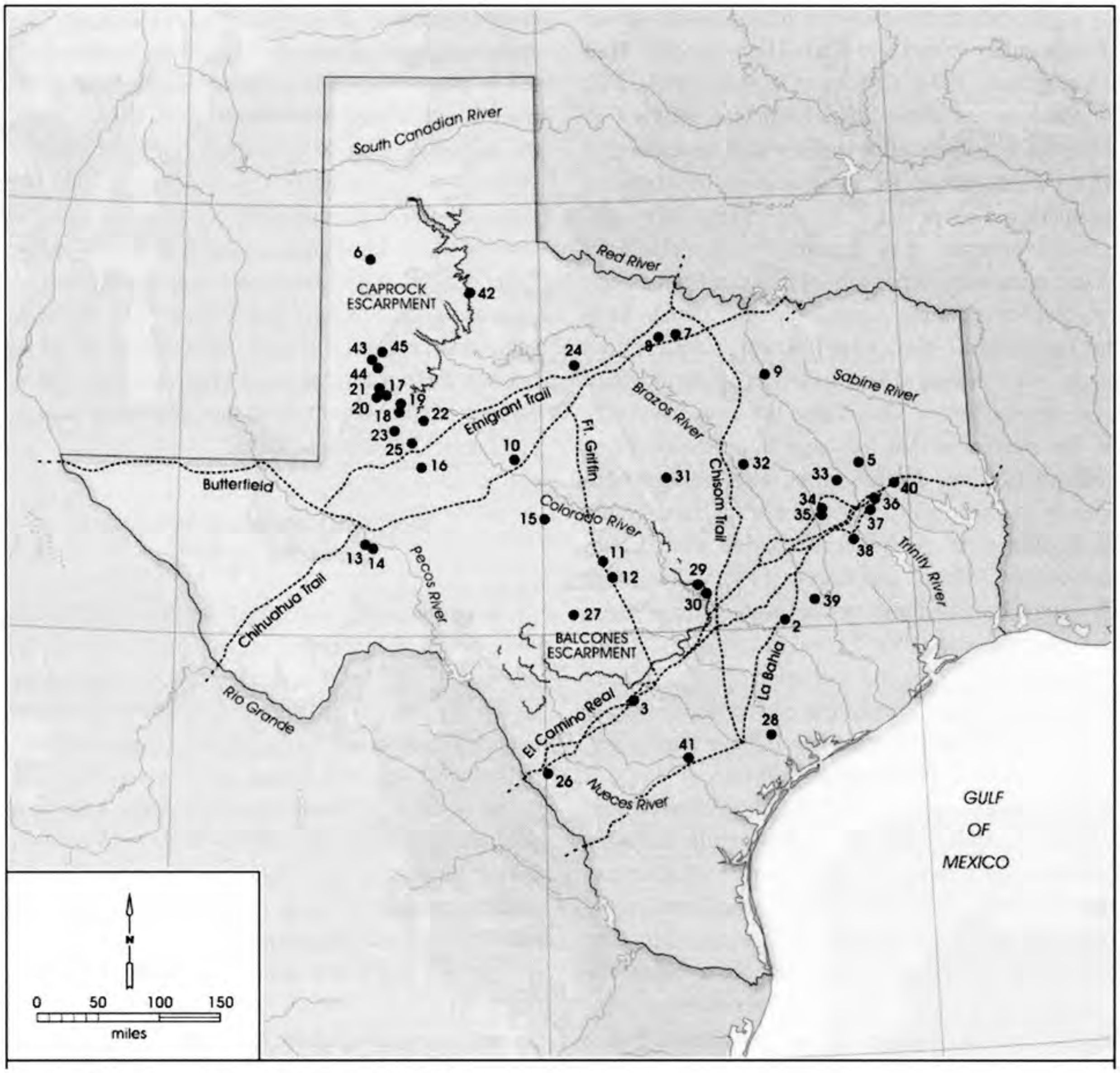

Figure 1. Distribution Map of Texas Biface Caches.

1. Fairview Park Cache
2. Goldapp Cache
3. Riley Cache
4. Baird Cache
5. R.L. Jowell Form Cache
6. Running Water Draw Cache
7. Johnson Cache
8. Whitsit Cache
9. Carrollton Cache
10. Fort Chadbourne Cache
11. L.K. Stam Cache
12. Mayfield Kothman Cache
13. Bissell Cache #1
14. Bissell Cache #3
15 Bissell Cache # 2
16. Bissell Cache #6
17. Hart Cache #2
18. Hart Cache #3
19. Hart Cache 49
20. Hart Cache #5
21. Hart Cache #8
22. Hart Cache #6
23 . Hart Cache # 10
24. Lake Stcmford Cache
28. Texas Ranger Museum Cache
26. Briscoe Cache
27, Thunder Valley Burial Cache
28. F. N. Fosatti Cache
29. Gus B. Mauermann Cache
30. Willey Williams Site Cache
31. Hill Cache
32. Chapline Cache
33. Reagan Cache
34. Feature 2 Cache
35. Jewett Mine Cache
36. Mrs. Brice Reid Cache
37. Dan Beaw Site Cache
38. M. M. Reynold's Cache
39. Boggy Creek Site Cache
40. George C. Davis Cache
41. Loma Sandia Cache
42. Roaring Springs Cache
43. Brownfleld Cache
44, Tolliver Cache
45. Caswell Cache

playa lakes and may reflect embedded technological organization strategies related to seasonal events. Also they may reflect a boundary between the cultural regions of west Texas and the Panhandle (M.B. Collins, personal communication)or they may indicate a trade route which extended from central Texas into the Plains. Third, most biface caches are located near major waterways or tributaries. This patterning may be due to the prehistoric use of waterways as natural routes of travel or may be related to the prehistoric settlement patterns, where habitation sites were commonly located near water for subsistence purposes.

A fourth pattern evident in Figure 1 is the location of multiple biface caches along early historic roads or trails. The significance of this is unknown but several possible implications can be made. It has been suggested by McGraw et al. (1991) that early Spanish and pioneer roads, such as the Old San Antonio Road and the Camino Reales, were often established on prehistoric Indian trade routes or roads. The location of biface caches near these historic roads may support this hypothesis. This patterning may support the hypothesis discussed above that bifaces were traded between prehistoric Texas groups and often cached near or along trade routes. It is interesting to note that many of these caches share the same attributes usually attributed to "trader's caches" discussed above, that is they contain unused, early stage bifaces of exotic cherts. Further, detailed study is needed to properly assess this patterning.

Finally, the characteristics and spatial patterning of biface caches in east/east central Texas suggest that bifaces of a standardized form were being traded or transported from central Texas into the east Texas region. The caches, #s 33,34, 35, 36, 37, 38, and 40 on the map, which cluster in Leon, Houston, Freestone, Madison, and Cherokee counties are similar in several ways. First, the bifaces from the caches are made from exotic cherts, mainly honey colored "beeswax" cherts, which are non-local to the county areas. Second, the bifaces from the caches are similar in morphology and technology. All seven caches contain medium to large size, early to middle stage bifaces with lanceolate shapes. Third, none of the bifaces from these caches appear to have been utilized. Of particular interest is the morphological and technological similarities of these cache bifaces to those from the George C. Davis Site Cache, which contained 64 lanceolate bifaces. These inferences may indicate that a standardized form of biface, at early to middle stages of reduction with a lanceolate shape, was being imported into the Caddo area during the Late Prehistoric Period to fulfill a demand for large biface tools, particularly the Gahagan bifaces. Unfortunately, none of the seven caches have temporal contexts which might refute or support this hypothesis.

A related issue is the absence of biface caches from far east Texas. If bifaces were being traded into the Caddo area from central Texas as hypothesized above, the absence of biface caches from the area may be indicate that the bifaces were reaching their destination and being reduced into tools. The biface caches from surrounding areas may therefore indicate trade or transport routes into the Caddo area. Further investigation of this possibility is needed, and could be accomplished through examining frequencies of exotic lithic debitage from Caddo habitation sites as well as frequencies of bifacial tools made from exotic, imported lithics.

CHAPTER 7

Analysis of the Four Caches

ANALYTICAL TECHNIQUES

A wide range of metrical and morphological variables were recorded for each cache biface in order to maximize data on technology, shape, and production trajectories. Visual observation was employed to examine chert raw materials and possible use wear. These data were then statistically manipulated in order to elucidate any technological patterns in biface variability within each cache as well as between the four caches. Analytical procedures employed were patterned after previous biface cache studies (Bement 1991; Clark and Fraley 1985; Eberhard 1985; Miller et al. 1991). Analysis consisted of two stages, a thorough metrical analysis followed by visual observations. Metrical analysis included the following procedures. Specimens were weighed using an Ohaus triple beam scale. Length, width, and thickness measurements were then taken using standard dial calipers. Three measurements of biface width and thickness were taken in order to maximize data on overall biface shape (Figure 2). These three measurements were taken at the proximal and distal ends and at the medial portion of the biface. Proximal and distal measurements were taken at approximately 25 mm in from the biface end being measured. Medial measurements were taken at the midpoint of the biface. Maximum widths and thicknesses were recorded when they did not fall within these three measurements. Using the maximum width and thickness measurements, a width to thickness ratio was then obtained for each biface. Biface edge angle measurements were then taken using a standard goniometer. Edge angles were recorded at the proximal and distal ends and on the left and right lateral edges of the bifaces. Edge angle measurements were generally taken at the most representative area of the biface edge. However, due to the length of many of the bifaces, a range of edge angles was recorded. For statistical purposes, ranges of edge angles were converted to averages.

After taking these measurements, a number of visual observations were recorded. First, biface morphology was described in detail using Crabtree's terminology (Crabtree 1982). Attributes described include overall shape, base shape, lateral edge shape, cross-section shape, and symmetry. Each biface was then examined for the presence or absence of cortex, raw material characteristics, degrees of patination, and flaking patterns. Flaking patterns were recorded as general descriptions of flake scar attributes, such as size and regularity. Also, manufacturing techniques, whether hard or soft hammer percussion, billet percussion, or pressure flaking, were inferred. Each biface was then examined for wear patterns, particularly use wear and "bag" or "transport" wear, using a Bausch and Lomb binocular microscope, powers 1.0x to 7.0x. In general, low level microscopic examination, powers 1.0x to 2.0x, was used. In cases of questionable areas of possible wear which could not be fully inspected at low power levels, higher microscopic levels, powers 3.0x to 7.0x, were used.

Following edge wear examination, each biface was inspected under ultraviolet "black" light as an aid in determining raw material source. Dr. Michael B. Collins of the Texas Archeological Research Laboratory has been conducting a study on Edwards chert based on the color it fluoresces under ultraviolet "black" light (Collins, personal communication). Edwards chert fluoresces a characteristic orange-yellow to olive green. However, Edwards cherts are distributed in a very broad region, with a multitude of primary and secondary sources. No comprehensive studies have been performed on the number and

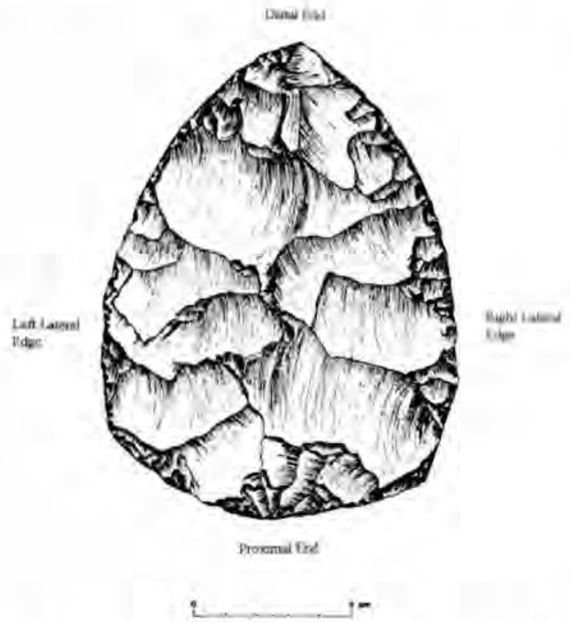

Figure 2. Description of Terminology Used in Analysis.

nature of chert sources in this region. Cherts from well-known sources, such as the Georgetown chert quarries, can be generally identified but the majority of cherts cannot. Exact sourcing of Edwards Plateau or Edwards cherts is therefore difficult if not impossible. However, a more exact sourcing of the Edwards cherts was desirable. Inferences about group territory or mobility, possible exchange systems, and other aspects of lithic procurement cannot be made without fairly exact source data (Clark and Fraley 1985:5).

Therefore, in order to get more exact data on the bifaces' raw materials, all bifaces which fluoresced as Edwards chert were examined by Glenn T. Goode of the Texas Department of Transportation. Goode has acquired extensive personal knowledge of many of the chert sources found in the Edwards Plateau and central Texas hill country and can often recognize the materials from these sources. It was felt that by examining the bifaces, Goode could possibly give a more exact sourcing for the cherts used in their manufacture. After inspection of the biface caches, Goode was able to provide valuable data on the possible sources of most of the caches' bifaces. His suggestions are included in the discussions of raw materials for each cache.

Statistical analysis of biface attributes was performed for two purposes. First, statistical analysis using the biface's metrical attributes serves as a further means of characterizing the four caches individually and as a whole. This adds robustness to the overall biface cache database and allows for a further level of comparison between the four caches. Second, it was felt that statistical analysis could possibly distinguish technological or functional relationships and patterns between biface attributes, bifaces, and the four caches which are not evident through normal, descriptive studies. The strengths of any relationships made evident by statistical analysis could then be tested through comparisons with metrical data from bifaces or biface caches not included in this study.

Statistical analysis consisted of simple, descriptive statistics and graphics using biface metrical data. Graphical analysis consisted of plotting w/t ratio values for each cache. This was done in order to elucidate any patterning or grouping within the caches and provide a means of displaying similarities in biface reduction stages. As discussed in Chapter 5, w/t ratios become greater with each successive stage of bifacial reduction. If a group of bifaces have similar w/t ratio values and cluster on the graph, it usually indicates that they are at a common stage of reduction. Means, standard deviations, and coefficient of variation values were calculated for all biface attributes. Means were calculated in order to examine the overall characteristics of a biface cache group and to facilitate comparisons with other biface cache groups. Standard deviations, defined as the square root of the arithmetic mean of the squared deviations from the mean, give a measure of dispersion of a set of values from their mean. Coefficient of variance values, defined as the standard deviation divided by the mean, give a measure of the size of the standard deviation relative to the mean and therefore are a better indicator of population variability than simple standard deviations.

Coefficient of variance values, herein termed *CV*, are used to measure the variability among each set of biface attributes which aids in examining and characterizing the bifaces from each cache as a group. Low *CV* values indicate a low degree of variability in a population while high *CV* values indicate a high degree of variability. For example, *CV* values for biface widths can give an estimate of the relative variability in biface sizes. If a group of bifaces differ in size width values will also differ. This size differential would be reflected in a high *CV* value, usually of .20

or more. If a group of bifaces is similar in size, width *CV* values should be low, below .20, and reflect the uniformity in the bifaces. Comparisons of the means and *CV* values of the four caches measure the relative similarity between the groups of bifaces.

THE FAIRVIEW PARK CACHE (41TV9)

Background

The Fairview Park Cache (41TV9) was found in 1919 by a workman digging a sewer line ditch during construction of the Fairview Park suburb, located in the Travis Heights area of South Austin, south of the Colorado River (Figure 3). According to records on file at TARL, after discovery, the cache was acquired by Professor J.E. Pearce of the Anthropology Department Museum of the University of Texas, Austin. It is not known if Pearce bought or otherwise acquired the cache from the workman after its discovery or actually excavated the cache after being informed of its discovery.

Data on the context of the cache is somewhat limited. The cache was found in an isolated setting approximately 18 inches below ground surface and

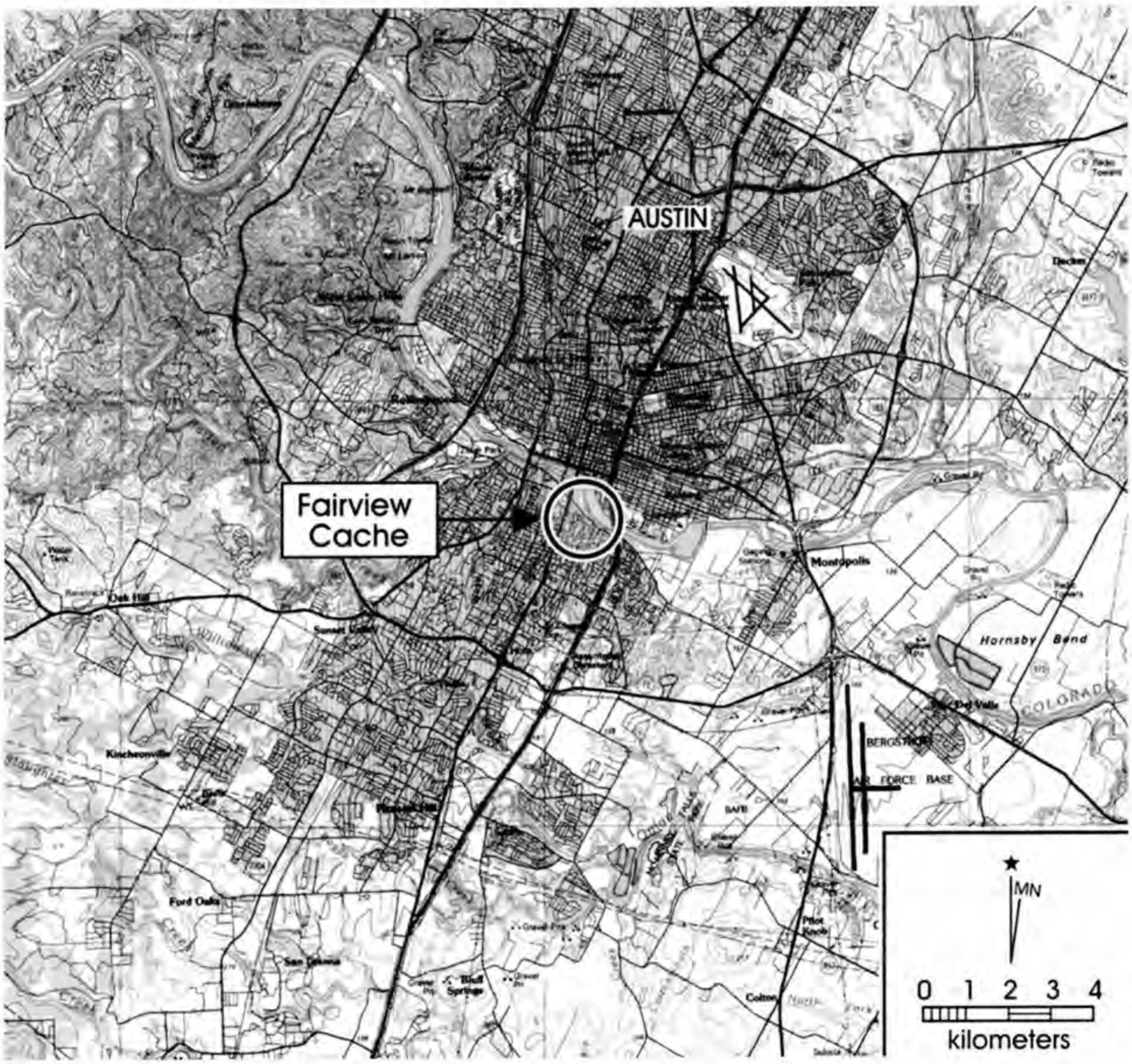

Figure 3. Approximate Location of the Fairview Park Cache.

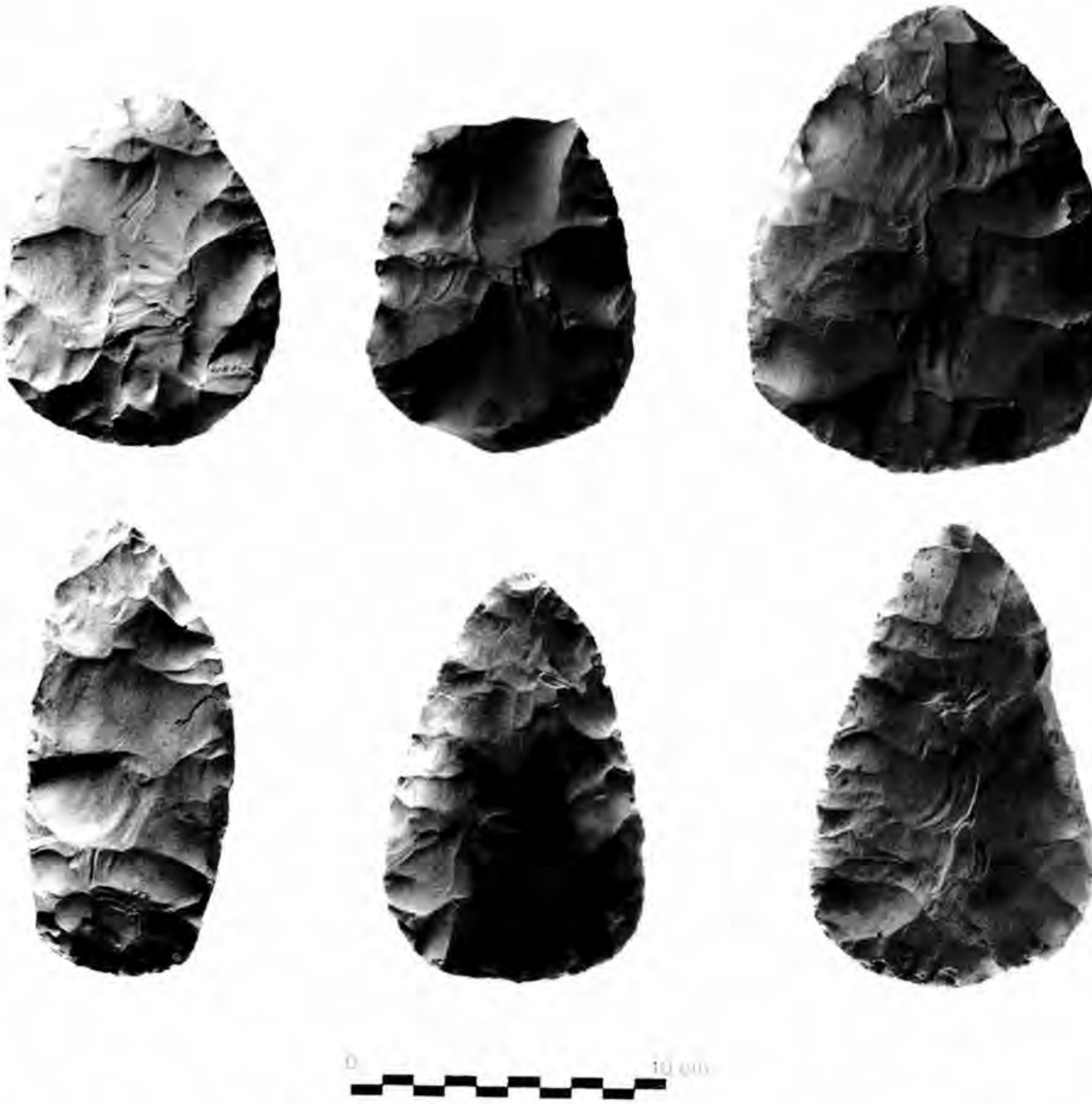

Figure 4. Photograph of Fairview Park Cache Bifaces, Specimens IC-5-318, 319, 320, 321, 323, and 324.

approximately 50 feet above the level of the Colorado River (Houston Post, Feb. 16,1919). A total of 26 bifaces and a possible mano were found in the cache (Jackson and Woolsey n.d.; Pearce n.d.). The bifaces were arranged in a pyramidal pile with their pointed ends turned outward. The possible mano was found lying on top of the bifaces. Current research performed by the author has yielded no further data on the cache's context. 41TV546, an Archaic site with burned rocks and lithic debitage, is located near the cache site. In later years after the cache's discovery, Pearce gave many of the bifaces to museums around the country, most notably the Smithsonian Institution in Washington and the Lowie Museum of Anthropology, recently renamed the P.D. Hearst Museum, at the University of California at Berkeley. The exact number of bifaces distributed was 14. The Smithsonian and P.D. Hearst museums have loaned 5 of these specimens to TARL, but 9 are still missing. At the present time, TARL is in possession of 17 of the original 26 bifaces (Figures 4, 5, 6). Therefore, analysis of the cache was limited to these 17 bifaces. However, several black and white negatives of many of the cache bifaces were taken after their discovery.

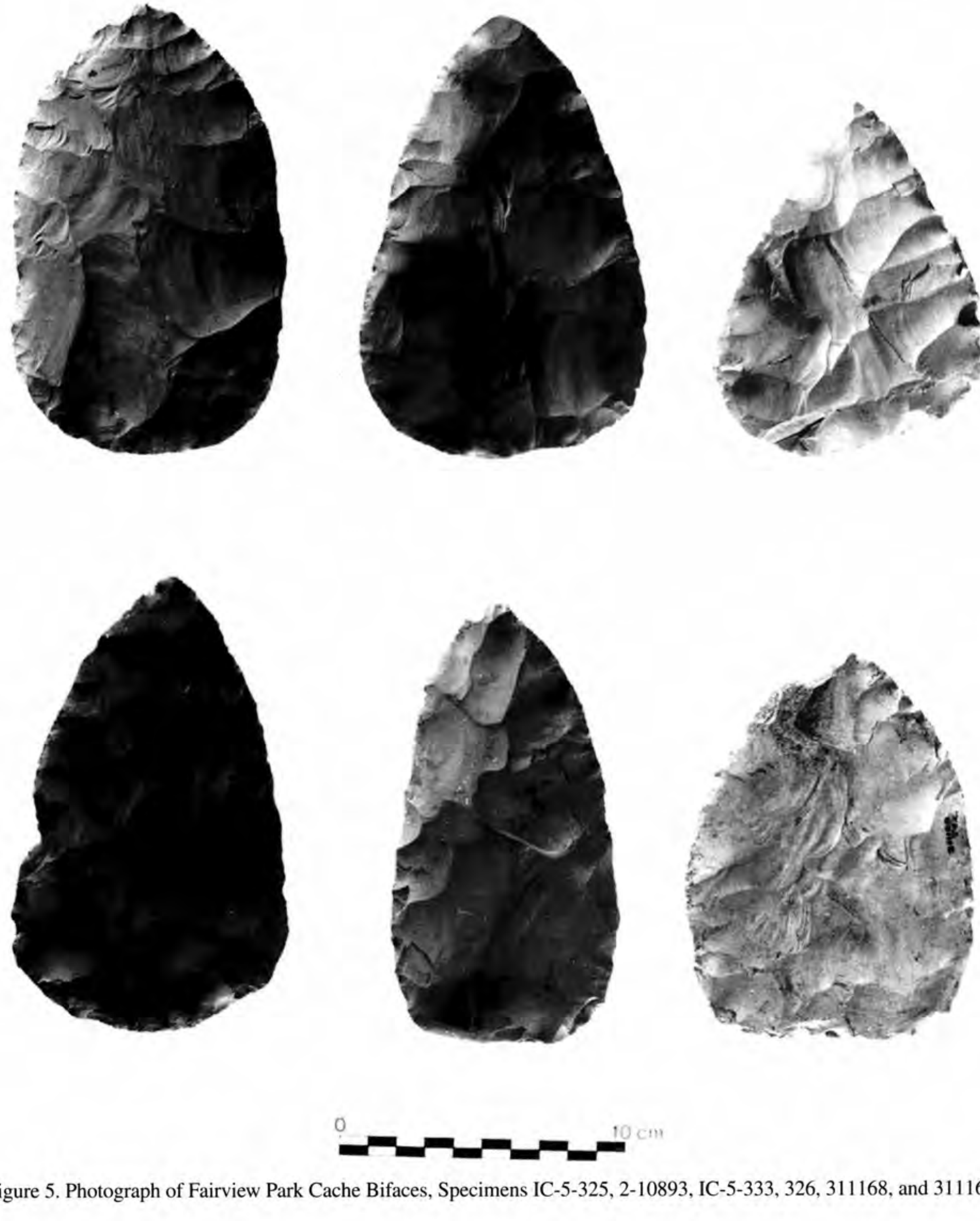

Figure 5. Photograph of Fairview Park Cache Bifaces, Specimens IC-5-325, 2-10893, IC-5-333, 326, 311168, and 311169.

In these photographs, 3 of the 9 missing bifaces are shown. Therefore, visual observations of the morphology and flake patterns of the cache bifaces include these three missing specimens. The possible mano found with the cache could not be located.

Results of Analysis

Results of the analysis of the Fairview Park Cache show the 17 bifaces to be similar in technology and raw materials but dissimilar in morphology and size.

Figure 6. Photograph of Fairview Park Cache Bifaces, Specimens IC-5-332, 311167, IC-5-327, 322, and 31116.

Metrical and statistical data on the cache bifaces are presented in Tables 1 and 2. Length measurements are large and variable, ranging from 105 mm to 283 mm with an average of 164 mm and a *CV* value of .30. Weight values, a good indicator of biface size, are highly variable, *CV*= .69, ranging from 144.3g to 801.3g, totaling 4.86 kg or 10.7 lbs. This would not have been a very heavy weight to transport. Biface widths are also variable as evidenced by their relatively high *CV* values. This reflects the differing morphologies and sizes of the bifaces. Maximum biface widths average 92 mm with a *CV* value of .21.

Table 1. Fairview Park Cache Material Data.

Specimen #	Length (mm)	Weight (g)	Width				Thickness				W/T Ratio
			Prox.	Med.	Distal	Max.	Prox	Med.	Distal	Max	
IC-5-318	110	144.3	81	86	46	86	12	12	11	12	7.18
IC-5-319	105	147.1	78	80	NA	84	12	13.9	NA	13.9	6.04
IC-5-320	149	297.3	111	111	63.5	111	11	14	12	14	7.93
IC-5-321	144.2	147.5	54	64	87	64	10.5	10.5	8.5	10.5	6.09
IC-5-322	243	467.9	59.5	82.8	45	82.8	11	17	11	17	4.87
IC-5-323	128	167.8	79	80	41	80	9	12.5	9.5	12.5	6.4
IC-5-324	146	203.4	90	81	38	90	11.5	12	9.5	12	7.5
IC-5-325	155	250.1	83	92.5	57	92.5	9.5	14.8	9.5	14.8	6.25
IC-5-326	150	255.6	93	91	48.5	99	11	12.5	9.3	12.5	7.92
IC-5-327	283	720.7	101	78.5	59.5	101	14	20	9.5	20	5.05
IC-5-332	181	205.1	35	77	39	77	8	12	9	12	6.42
IC-5-333	123	164.2	93	83	33	93	11.5	12	9	12	7.75
2-10893*	158	229.4	95	85	43	95	11.5	13	9.5	13	7.31
2-311167**	196.8	225	83	60.5	30	83	11	12	7	12	6.92
5-311169	133.8	226	93.2	98	53.5	98	11.2	10.2	9	11.2	8.75
14-311168	151.9	208.6	75.3	79.5	39.3	79.5	10	13.7	9.4	13.7	5.8
15-311166	230	801.3	153	135	53.1	153	16	13.5	11.7	15.5	9.92
Mean	163.9	285.9	85.7	86.2	42.7	92.3	11.2	13.2	9.1	13.4	6.94
Stand Dev.	48.6	194.8	25.3	17.1	14.4	19.2	1.9	2.4	2.6	2.4	1.3
C.V.	0.3	0.69	0.3	0.2	0.34	0.21	0.17	0.18	0.29	0.17	0.19

* unwashed specimen. Texas Memorial Museum artifact #
** Smithsonian Institution artifact numbers
NA = measurements not available due to broken distal tip

Table 2. Fairview Park Cache Edge Angle Measurements (in degrees).

Specimen #	Proximal Edge	Left Lateral Edge	Right Lateral Edge	Distal Edge
IC-5-318	35	32	38	43
IC-5-319	45	50	35	NA
IC-5-320	45	45	55	45
IC-5-321	45	55	47	45
IC-5-322	60	50	47.5	55
IC-5-323	35	47.5	58	55
IC-5-324	45	50	47.5	43
IC-5-325	44	42	50	40
IC-5-326	45	46	47	40
IC-5-327	68	55	55	55
IC-5-332	35	35	42.5	30
IC-5-333	60	38	35	31
2-10983	47	48	32	29
2-311167	50	45	50	35
5-311169	53	47.5	47.5	40
14-311168	45	52.5	40	45
15-311166	55	62.5	55	58
Mean	47.6	47	45.9	43
Stand. Dev.	9.2	7.5	7.8	13.7
C.V.	0.2	0.16	0.17	0.34

NA = measurement not available due to broken distal tip

Biface thicknesses are more uniform, with all *CV* values except distal thickness below .20. Maximum thicknesses average 13 mm with a *CV* value of .17. Width to thickness ratios for the cache bifaces are fairly high , averaging 6.94, and are fairly uniform, *CV*= .19. As can be seen in Figure 7, 13 of the 17 bifaces group between ratios of 5.8 to 9.00, with most falling between the 6.00 to 8.00 ratio boundaries. Four bifaces fall outside this grouping with one biface, specimen 15-311156, having the highest ratio of 9.92. The fairly tight grouping of biface w/t ratios indicates that the Fairview Park Cache bifaces are a

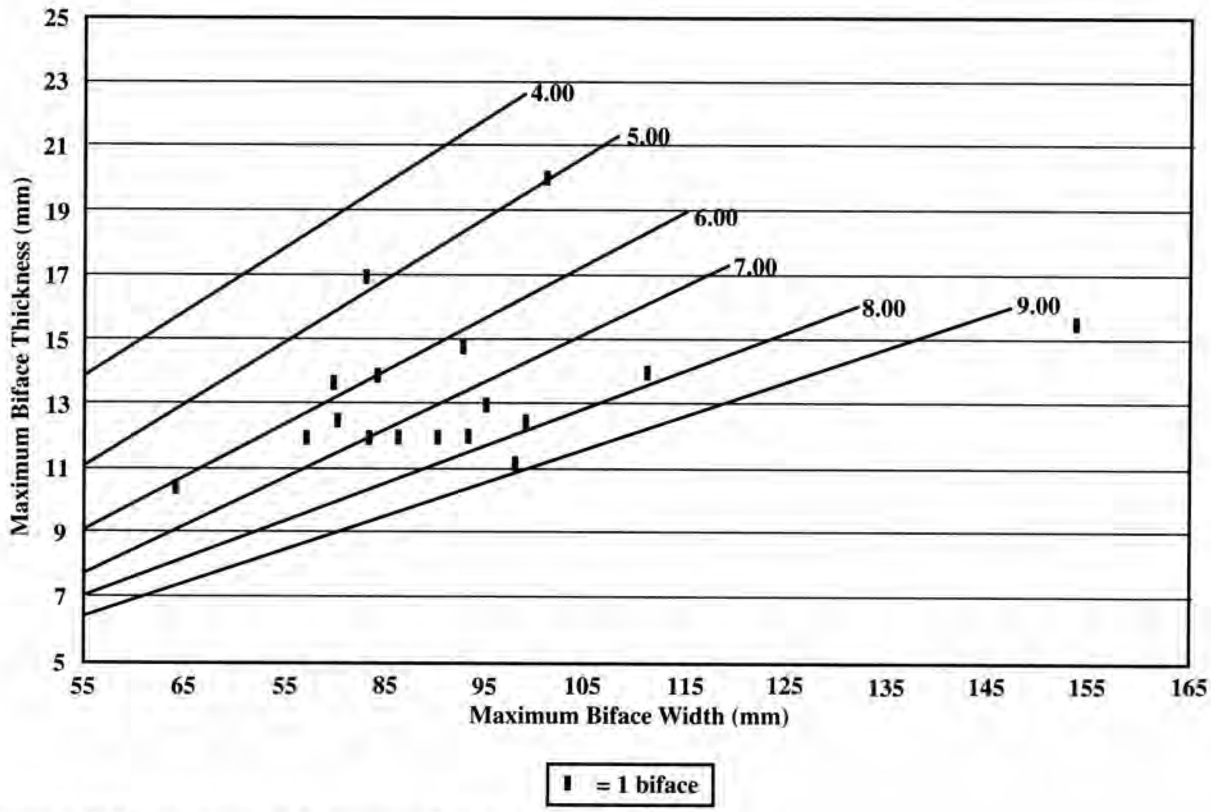

Figure 7. W/T Ratio Graph of the Fairview Park Cache Bifaces.

set of artifacts at a common stage of reduction. With the exception of the distal edge angles, the edge angles of the 17 bifaces are uniform. Edge angles generally range between 40° and 50° for most specimens. *CV* values for the proximal and lateral edge angles fall below or at .20. Distal edge angles are highly variable, *CV*= .34. Breakdown of individual biface edge angles and their means can be found in Table 2.

Morphology

The morphologies of the bifaces are highly variable (Table 3, Figures 4, 5, 6). Twelve bifaces have subtriangular to ovate shapes, 1 is triangular, 2 are lancelote, and 2 are irregular. All have biconvex cross-sections and 13 are symmetrical. The two irregular bifaces are IC-5-325, a biface with one straight and one convex lateral edge, and IC-5-332, a lenticular bipoint. The two lanceolate bifaces, IC-5-322 and IC-5-327, are very large and elongated. Based on photographs taken of several of the bifaces after their discovery, the morphologies of 3 of the 9 missing bifaces can be determined. Two of the three are similar to IC-5-325, having one straight and one convex lateral edge forming a crescent-like shape. The third biface is ovate. Different biface morphologies may indicate the prehistoric knappers desire for different tool preforms or may be a reflection of the shape of the original raw materials. The three irregular bifaces with crescent-like forms are reminiscent of corner tang knife morphologies. However, none of the bifaces' forms are clearly indicative of a specific lithic tool preform.

Technology

Visual observation of the biface flake patterns revealed that all 20 specimens, the three missing bifaces included, were probably produced by hard and soft hammer percussion. The bifaces exhibit broad, overlapping flake scars which meet at the midline of the biface, often terminating in slight hinges or feathering out (Figure 8). Flake patterns on all 17 bifaces are fairly regular with flake scars usually originating from the lateral edges of the bifaces. Most bifaces also

Table 3. Fairview Park Cache Biface Morphological Data.

Specimen #	Cortex*	Overall Shape**	Base	Lateral Edges***	Cross-section	Symmetrical
IC-5-318	A	ovate	convex	subconvex	biconvex	Y
IC-5-319	A	sub T	convex	subconvex	biconvex	Y
IC-5-320	P	sub T	subconvex	subconvex	biconvex	Y
IC-5-321	P	sub T	subconvex	sc st	biconvex	N
IC-5-322	P	lanceolate	subconvex	straight	biconvex	Y
IC-5-323	P	sub T	subconvex	subconvex	biconvex	Y
IC-5-324	P	sub T	convex	subconvex	biconvex	Y
IC-5-325	A	parallel-ovate	convex	straight	biconvex	Y
IC-5-326	P	sub T	convex	subconvex	biconvex	Y
IC-5-327	P	lanceolate	subconvex	straight	biconvex	Y
IC-5-332	P	bi-point	none	subconvex	biconvex	Y
IC-5-333	P	sub T	convex	con sc	biconvex	N
2-10893	A	sub T	convex	subconvex	biconvex	Y
2-311167	A	triangular	straight	straight	biconvex	N
5-311169	P	sub T	straight	convex	biconvex	Y
14-311168	A	sub T	subconvex	sc st	biconvex	Y
15-311166	P	sub T	subconvex	sc st	biconvex	N

* A = absent P = present

** T = triangular

*** In cases where a specimens's lateral edges differ in shape, two designations are given. Designation on right = shape of right lateral edge, designation on left = left lateral edge shape. st = straight sc = subconvex con = convex

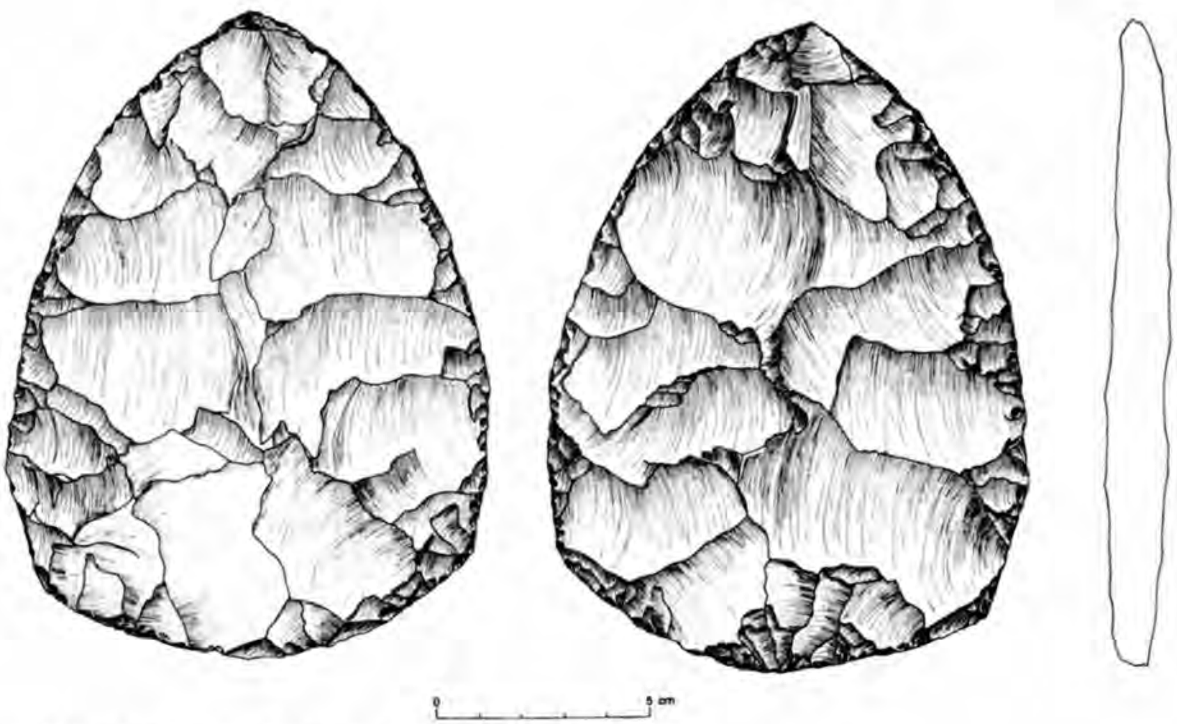

Figure 8. Sketch of Fairview Park biface IC-5-320.

exhibit some areas of marginal retouch which shaped the bifaces' lateral edges and completed their overall form. No bifaces show any indications of being pressure flaked. One biface, IC-5-319, is missing its distal end. The break appears to be fairly recent, occurring in the past 75 years, and its cause is unknown. The broken distal end is presently missing from the collection.

Raw Material

Visual observations revealed that 11 bifaces retain remnants of cortex (Table 3). Seven bifaces have small cortex remnants on one face while 4 bifaces have cortex on both dorsal and ventral faces. The locations of the cortex remnants on the bifaces suggests that the raw material used in their manufacture was tabular or relatively thin nodular chert. The nature of the cortex remnants, combined with the fact that none of the bifaces exhibit any attributes characteristic of large hard hammer flakes, indicate the bifaces were manufactured from cores and not large flakes. Examination of the bifaces under ultraviolet light revealed that all bifaces fluoresced a yellow-orange color, indicating that they are made of Edwards chert. Examination revealed the chert's original color to be medium brown with small red stains or blotches. After close inspection, Goode suggested that the raw material is similar to cherts found in Gillespie County (Glenn Goode personal communication). If this is true, the cache bifaces may have been transported over approximately 77 miles from their raw material source.

Visual observation also showed that the bifaces are heavily patinated. The patination on most specimens is unusually thick, almost obliterating the original color of the chert. The patination turned the bifaces a white to orange-white color. Differential patination, areas on the biface which exhibit heavy white patination along with areas of lesser degrees of patination in which the original color of the chert can be seen, occurs on one face of 12 of the bifaces. Two of these bifaces exhibit differential patination on both faces. The remaining 5 bifaces are heavily patinated on both faces. It is hypothesized that this differential patination was due to the locations of the bifaces in the cache pile. Depending on their position in the pile, some biface sides were more exposed to the elements and therefore heavy patination occurred while other sides were less exposed due to their location in the interior of the cache. This produced areas of differential patination. Whether the heavy patination on the bifaces indicates a considerable age for the cache is unknown. Studies on chert patination rates have been inconclusive and the exact causes of patination have not been determined. The patination of the Fairview Cache bifaces may be due to unique conditions in the depositional environment of the cache, such as high ground water levels, producing rapid patination rates. Conclusions on the bifaces' patinas must therefore be left for future studies.

Manufacturing Stage

Width/thickness ratios and edge angle measurements place the Fairview Park Cache bifaces in Callahan's biface reduction Stage 4 or Stage 5, where w/t ratios reach 5.00 or greater and edge angle measurements average 45° (Callahan 1979:36-37). Classification of the bifaces into these stages would indicate a stage of secondary thinning, cross-section flattening, or final shaping. However, the morphological attributes and sizes of the bifaces indicate otherwise. Their uneven biconvex cross-sections, large sizes, several exceeding 180 mm in length, and their indeterminate morphologies indicate an earlier thinning stage of biface manufacture. Yet, their flake patterns, broad, overlapping flake scars which penetrate well into the midline region of the biface, high w/t ratios, and edge angle measurements are indicative of Callahan's later stages of biface manufacture.

The most likely explanation for this discrepancy is the idiosyncratic nature of Callahan's data base. As discussed in Chapter 5, Callahan's stage model of biface manufacture is based on his replication of Clovis-like fluted points. The metrical attributes he defines for each stage are related to his specific, idiosyncratic biface reduction strategy and therefore may not be wholly applicable to other biface reduction strategies. The high w/t ratios and low edge angle measurements of the Fairview Park Cache bifaces, as well as their flake patterns, may be characteristic of the specific reduction strategy employed in their manufacture. That is, the goal of the reduction strategy may have been to produce large, thin tools, therefore necessitating significant thinning at the early reduction stages. As discussed in Chapter 5, biface stages must be defined based on numerous, interacting variables. Therefore, taking into consideration their sizes, indeterminate morphologies, and sinuous lateral edges, the Fairview Park Cache bifaces would be more appropriately classified as Stage 3 or early Stage 4 bifaces, indicating an early, primary thinning stage. As indicated above, biface shapes vary, and possible tool forms are not clearly discernible. This would preclude their classification as preforms (Bement 1991:105; Crabtree 1982). Consequently, the bifaces should be considered blanks of indeterminable function.

The w/t ratios and edge angles of the cache bifaces are uncommon in comparison to those defined for most primary thinning stages and merit further consideration. There are two possible explanations as to how such thin, large bifaces were produced. One explanation is that large, thin flakes or tabular raw materials were used in the manufacturing of these bifaces. The other explanation is that the biface thicknesses were quickly and skillfully achieved by extremely well executed hard or soft hammer percussion techniques (Clark and Fraley 1985; Eberhard 1985:79). I believe that both explanations are applicable to the Fairview Park Cache bifaces. Cortex remnants on the bifaces indicate the original raw materials were in tabular or nodular form. The use of thin tabular or nodular cherts may have facilitated biface thinning. Thickness values for the biface may therefore have been relatively low to begin with. Low *CV* values for the bifaces thicknesses may support this fact. Also, the flake patterning on all the bifaces indicates a high degree of flint-knapping skill. Early stage percussion techniques, Stages 2 and 3, possibly achieved a biface thickness usually associated with and accomplished by later stage thinning techniques. The use of thin tabular cherts or nodules by skilled flintknappers may therefore account for the high w/t ratios for the large, early stage bifaces.

Microscopic Edge Examination

Examination of the bifaces under a binocular microscope revealed spotty areas of marginal rounding on all bifaces. The rounding does not extend onto the flake scars of the bifaces and was identified as being related to the intentional grinding of the biface edge for platform preparation. According to Sheets (1973:218), "A clean, crisp junction between an abraded area and a flake scar indicates an edge that was strengthened and then flaked, but not used." Other than the evidence for platform preparation edge abrasion, no polish, striations, or step fracturing indicative of use wear was evident on any of the bifaces. None of the bifaces exhibits transport or bag wear.

Conclusions

In conclusion, the Fairview Park Cache consists of large bifaces at early stages of biface reduction. Biface technology is constant, with all 17 bifaces being produced from tabular or nodular cherts by soft hammer percussion techniques. Use of tabular cherts appears to have facilitated the production of the large, thin bifaces but would have required a high degree of flintknapping skill. The chert used in the in the bifaces' manufacture may have originated in Gillespie County, a source area more than 70 miles distant. Biface morphologies are variable and are not clearly indicative of specific tool preforms. None of the 17 bifaces exhibits use or transport wear. Lack of transport wear on the bifaces may indicate that they were cached fairly close to their raw material source or that the bifaces were knapped into their present forms near the cache site.

Lack of temporal or associational data for the Fairview Park Cache, as well as the exclusion of 9 of the original bifaces from the study, make functional interpretations difficult and speculative. The distance between the cache and the bifaces' presumed chert source may indicate that they were being traded or transported from one area to another and were cached for security measures. The large bifaces would have served as excellent blanks for reduction into a variety of lithic tools. Some of the largest of the bifaces may have been intended for reduction into corner tang knives, suggesting a Late Archaic age for the cache. The obvious value of this quantity of high-quality raw material in the form of bifacial blanks may be linked to the creation of the cache. The orderly arrangement of the bifaces within the cache and the placement of a possible mano atop the bifaces may indicate a possible offertory caching of valuable goods. However, an infinite number of explanations as to why the bifaces were cached is possible and cannot be addressed without further data.

THE BAIRD CACHE

Background

The Baird Cache was found in 1928 by E.B. Sayles near the town of Admiral, in southeastern Callahan County, Texas (Figure 9). The cache was in a prehistoric habitation site lying 2 miles southeast of Admiral near the head of Deep Creek. The site extends over a broad area and contains scattered burned rocks, shell, bone, and large amounts of lithic debris. A possible midden is also located on the site. The site lies within what Sayles describes as a "sand dune area" (Sayles, n.d.), in a wide valley at the foot of several gravel hills which form the easternmost extension of the Callahan Divide in Callahan County. The site is located approximately 2 miles north from a prehistoric lithic quarry site, 41CA6, on the Callahan Divide. According to Sayles, the cache contained 12 large bifaces. Sayles apparently acquired 6 of the bifaces and the whereabouts of the other 6 are unknown. Additional information on the structure, context, and associations of the cache, as well as information on the characteristics of the 6 missing bifaces is lacking. The cache's name, Baird Cache, originated from Sayles' original designation of the site, Baird 1:3, named for the largest town in Callahan County, Baird. The six bifaces recovered by Sayles are presently housed at the Texas Archeological Research Laboratory in Austin and are included this study (Figure 10 and 11).

Results of Analysis

Results of the analysis show the Baird Cache bifaces to be similar in technology and morphology. Metrical and statistical data on the bifaces are presented in Tables 4 and 5. Two of the cache bifaces, GP 35599 and GP 35600, are missing their distal ends and are not included in some of the statistical calculations. The whereabouts of the two distal ends from the broken bifaces are unknown. As indicated by a *CV* value of .19, length measurements of the 4 unbroken bifaces are fairly uniform, ranging from 148.5 mm to 255.0 mm with a mean of 211.4 mm. It is believed that if the two broken specimens were whole, their lengths would fall into the upper range of measurements. Biface weights, *CV*= .31, also appear to indicate size variability. Weights average 426.8 g and range from 264.4 g to 616.7 g, broken specimens included. This weight variability may due to the inclusion of the broken specimens. However, if these two bifaces are excluded, a *CV* value of .33 is obtained for weight.

The widths of the 6 bifaces are fairly constant as evidenced by their low *CV* values, all falling below .20. This indicates a general uniformity in biface shapes. Maximum biface widths average 115 mm, *CV* = .09. The thicknesses of the bifaces are less uniform, with most *CV* values above .20. Maximum biface thicknesses average 13.5 mm, *CV* = .21. The broken bifaces are included in all width and thickness calculations except those concerning distal measurements. It is believed that if whole, the two broken bifaces' maximum width and thickness values would not exceed those of their proximal and medial sections. Width to thickness ratios for the bifaces are very high and variable, ranging from 6.25 to 13.2 with a mean of 8.95. A high *CV* value of .29 reflects this w/t ratio variability. As can be seen in Figure 12, there is no groupingof the bifaces based on w/t ratios. The lack of clustering in the graph is a further indication of the variability in the bifaces' sizes and shapes. Edge angles of the bifaces are uniform, with *CV* values of .15 and lower (Table 5). Edge angles range between 35° and 52°, averaging between 41° and 45°.

Morphology

The morphologies of the 6 bifaces are fairly uniform, all being triangular or subtriangular (Table 6, Figures 10 and 11). The morphologies of the two broken bifaces were inferred based on examination of the existing biface sections. Biface base shapes are generally straight and all but specimen GP 35571 have biconvex cross-sections. GP 35571 has been thinned significantly and has a biplano cross-section. The morphologies of the bifaces do not indicate a specific tool preform and they therefore would be classified as blanks.

Technology

The flake patterns of the bifaces indicate that all 6 bifaces were produced by well executed soft hammer percussion techniques. Flake scars are broad, deep, and overlapping, usually feathering out at the midline of the biface. Flake patterns are fairly regular, with

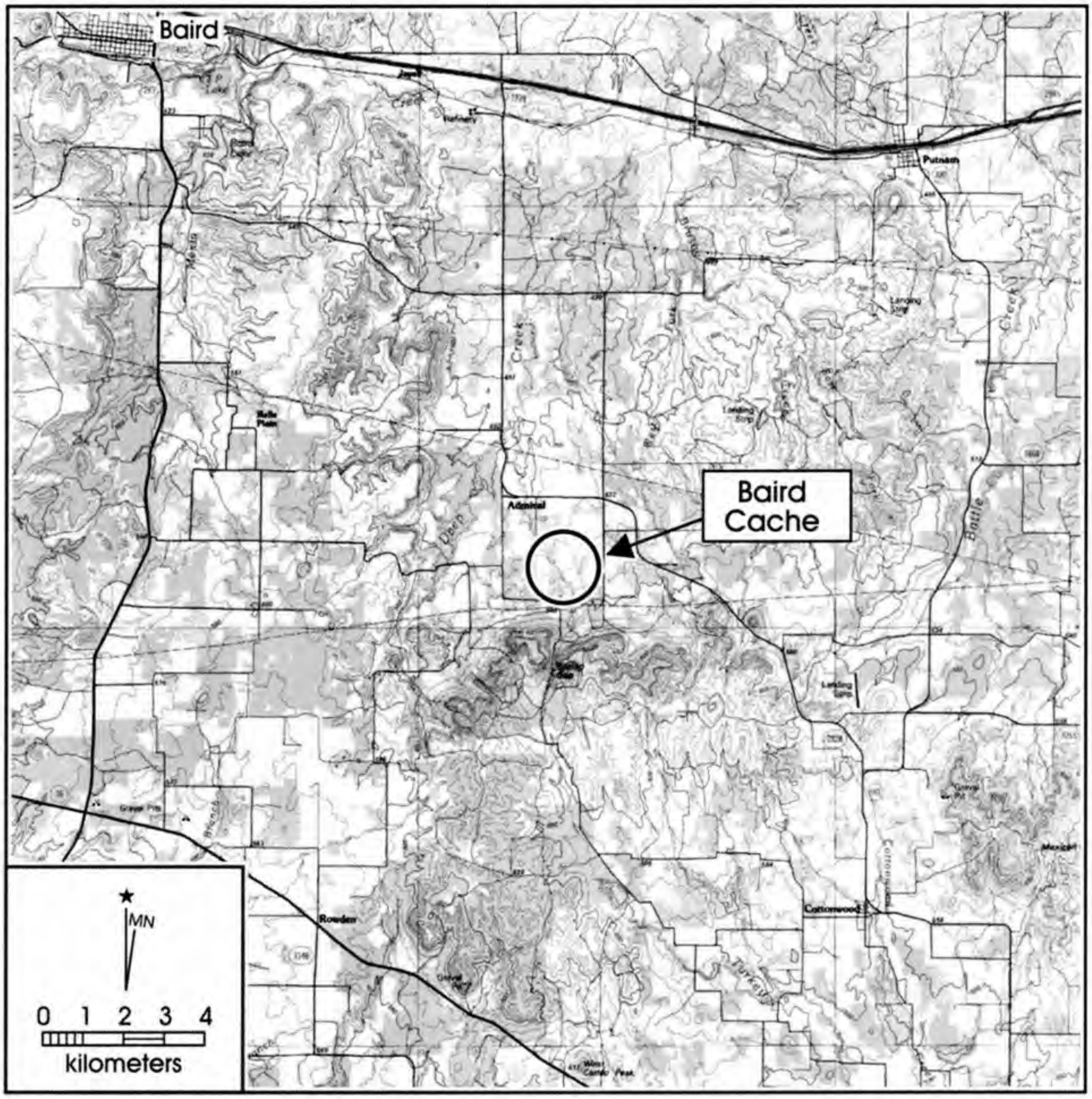

Figure 9. Map showing the approximate location of the Baird Cache

flake scars usually originating at the lateral edges of the bifaces. The flaking on GP 35571 is especially well-executed and regular, with several flake scars which plunge at the midline of the biface (Figures 13 and 14). Consequently, the biface is very thin and has an almost flat cross-section. The flaking on this biface was most likely produced by billet percussion techniques. Areas of marginal retouch are present on all 6 bifaces, probably performed to set up platforms, straighten the lateral edges, and shape the bifaces. The breaks on the two bifaces, GP 35599 and GP 35600, are apparently end shock breaks which occurred during biface manufacture (see Crabtree 1982:33 for description of break).

Raw Materials

Five of the 6 bifaces are made of a high-quality, light brown to tan colored chert. GP 35571 is made of a fine-grained, dark brown or chocolate colored

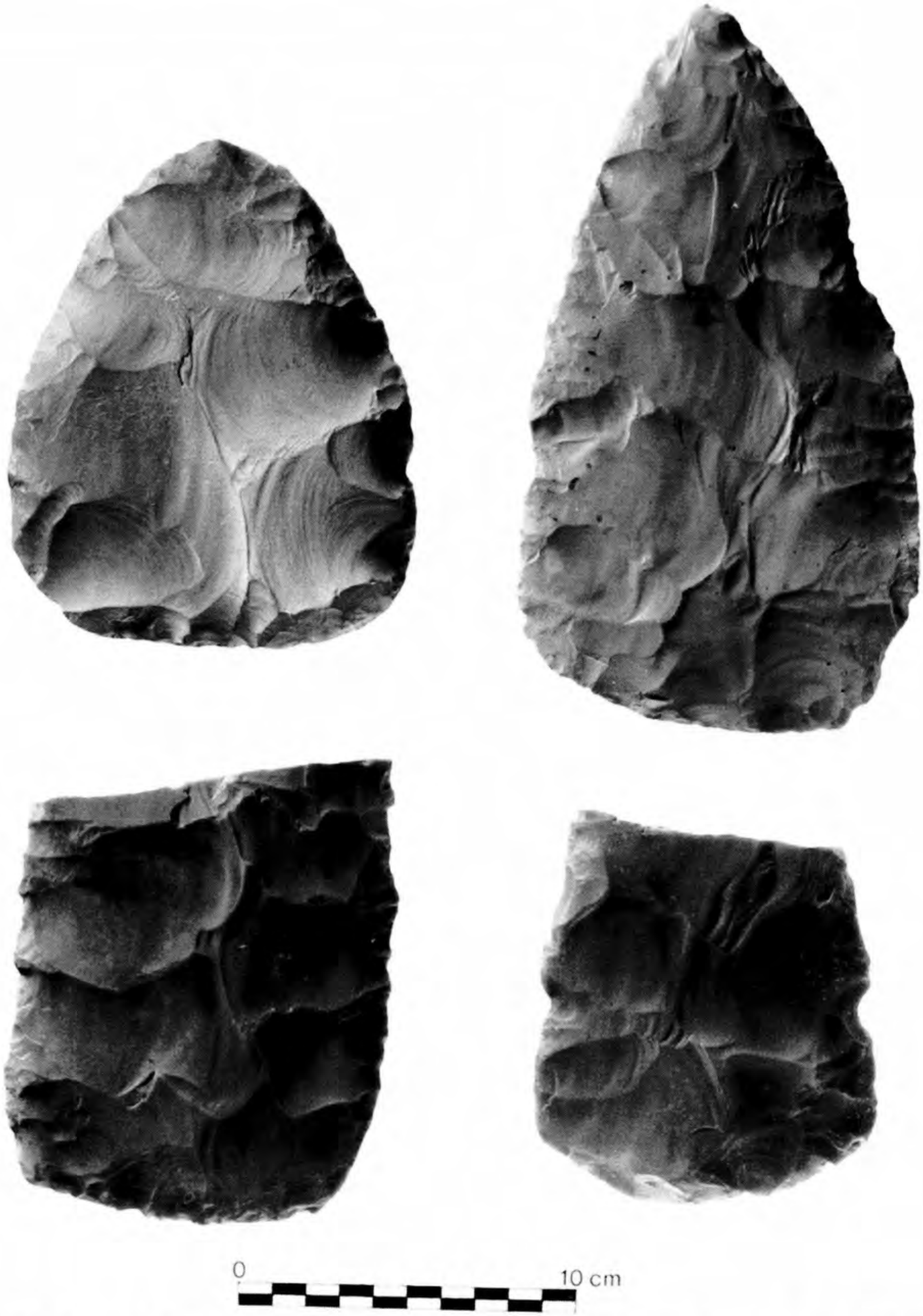

Figure 10. Baird Cache Bifaces, from left to right. Top row: Specimens GP 35568, 35569; bottom row: 35600, 35599

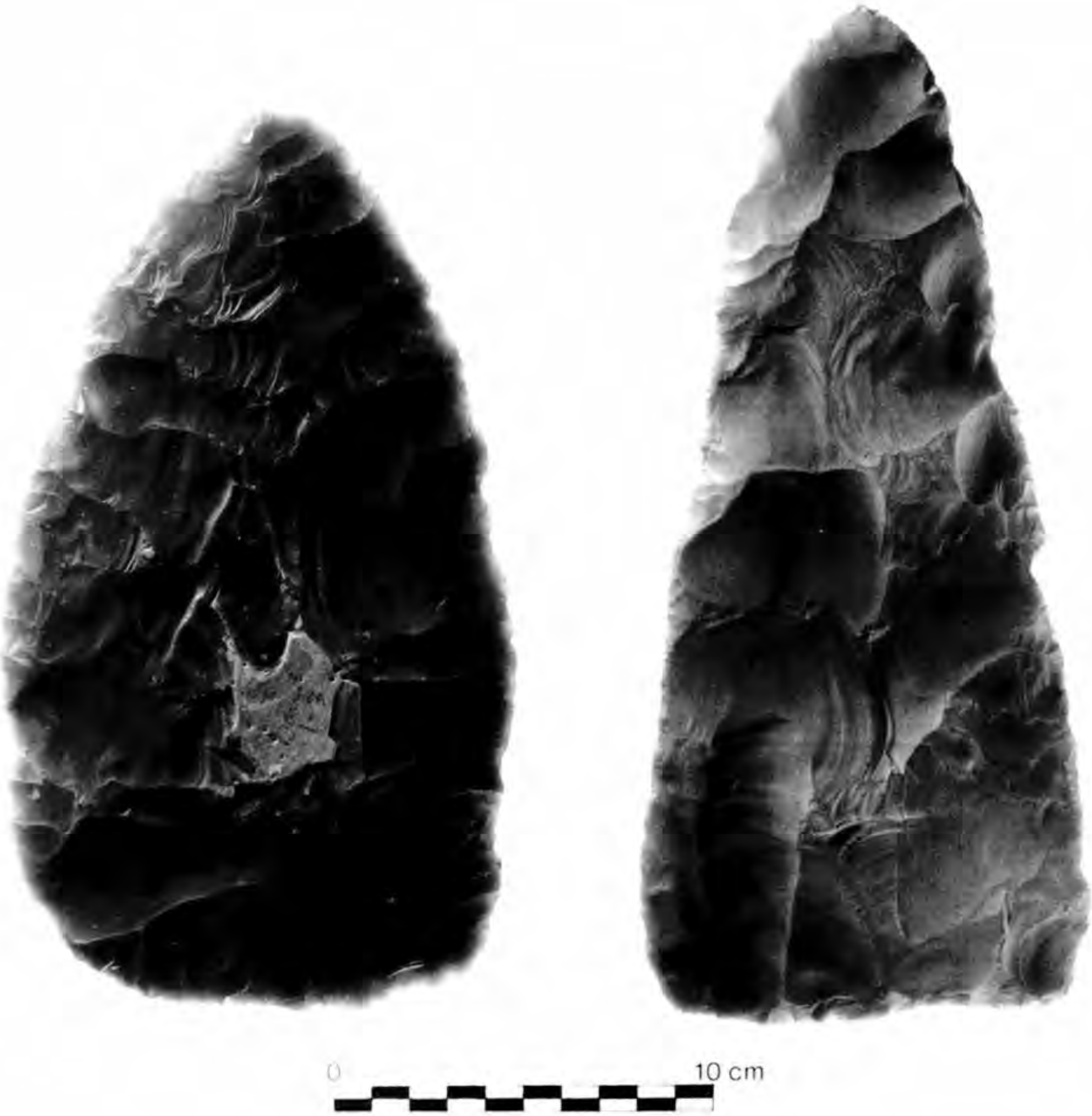

Figure 11. Baird Cache bifaces, from left to right. Specimens GP 35571, 35570.

chert. Four of the 5 bifaces made from the tan colored chert, GP35599, GP35600, GP35569, and GP3570, have a pinkish hue to them to which at first appeared to be due to heat-treatment of the chert. However, after close examination, it appears that this pinkish hue is a natural characteristic of the chert. Five of the six bifaces, excluding GP35568, are fairly lustrous or shiny on both faces and initially this was also believed to be due to the heat-treating of the chert. But, further examination of the bifaces showed this luster to be different from that usually seen on heat-treated cherts. Instead, the luster on the bifaces is more characteristic of sand polish (T.R. Hester, personal communication). Since the bifaces were cached in a sand dune environment, sand polishing would have been possible. However, the bifaces would have had to have been exposed to the surface environment, where wind blown sands could abrade the bifaces and cause the polish.

Microscopic examination of the bifaces revealed that the bifaces appear to have been impacted by

Table 4. Baird Cache Material Data.

Specimen #	Length (mm)	Weight (g)	Width				Thickness				W/T Ratio
			Prox.	Med.	Distal	Max.	Prox	Med.	Distal	Max	
GP 35568	148.5	317.6	118	116	59	118	12	11	8.5	11	10.727
GP 35569	210	472.8	105	112	44	116	13	15	8	15	7.733
GP 35570	255	616.7	116	95	45	116	9.5	17	13.5	17	6.823
GP 35571	232	524.5	124	132	54	132	8	10	9	10	13.2
GP 35599	111	264.4	100	84	NA	100	11	16	NA	16	6.25
GP 35600	133	365.1	103	103	NA	108	11	12	NA	12	9
Mean	181.5	426.8	111	107	50.5	115	10	13.5	9.7	13.5	8.95
Stan. Dev	58.6	134	9.6	16.7	7.2	10.7	1.7	2.8	2.5	2.9	2.6
C.V.	0.32	0.31	0.09	0.16	0.14	0.09	0.17	0.21	0.26	0.21	0.29

NA = measurements not available due to broken distal tip
The lengths of broken bifaces GP 35599 and GP35600 are not included in the statistical analysis.

Table 5. Baird Cache Edge Angle Measurements (in degrees).

Specimen #	Proximal Edge	Left Lateral Edge	Right Lateral Edge	Distal Edge
GP 35568	47.5	45	45	47
GP 35569	47.5	42.5	42.5	45
GP 35570	42.5	40	50	40
GP 35571	37.5	37	35	35
GP 35599	42.5	47.5	52	NA
GP 35600	40	40	42.5	NA
Mean	43.2	41.7	44.5	41.5
Stan Dev	3.9	3.9	6.1	5.1
C.V.	0.09	0.09	0.14	0.12

NA = measurement not available due to broken distal tip

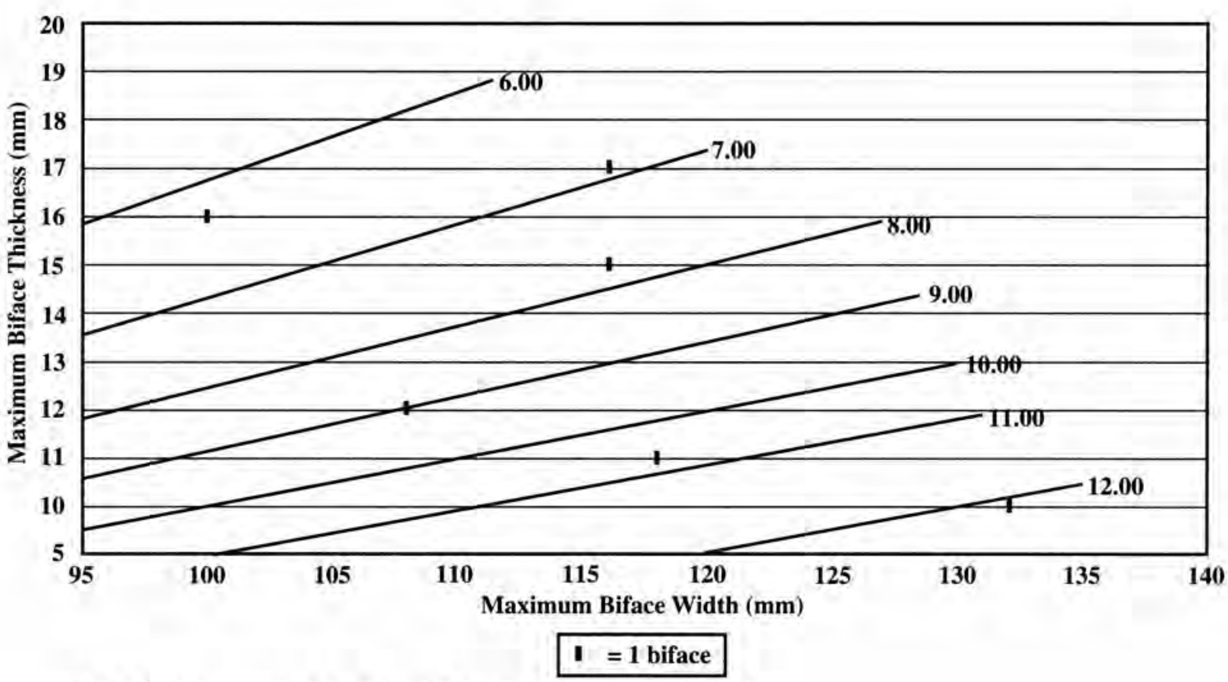

Figure 12. W/T Ratio graph of the Baird Cache showing ratio regression lines.

Table 6. Baird Cache Biface Morphological Data.

Specimen #	Cortex*	Overall Shape**	Base	Lateral Edges***	Cross-section	Symmetrical
GP 35568	A	sub T	straight	convex	biconvex	Y
GP 35569	A	sub T	subconvex	con sc	biconvex	N
GP 35570	P	triangular	straight	straight	biconvex	Y
GP 35571	P	sub T	straight	subconvex	biplano	Y
GP 35599	A	triangular	subconvex	straight	biconvex	U
GP 35600	A	triangular	straight	straight	biconvex	U

* A = absent P = present

** T = triangular

*** In cases where a specimens's lateral edges differ in shape, two designations are given. Designation on right = shape of right lateral edge, designation on left = left lateral edge shape. st = straight sc = subconvex con = convex

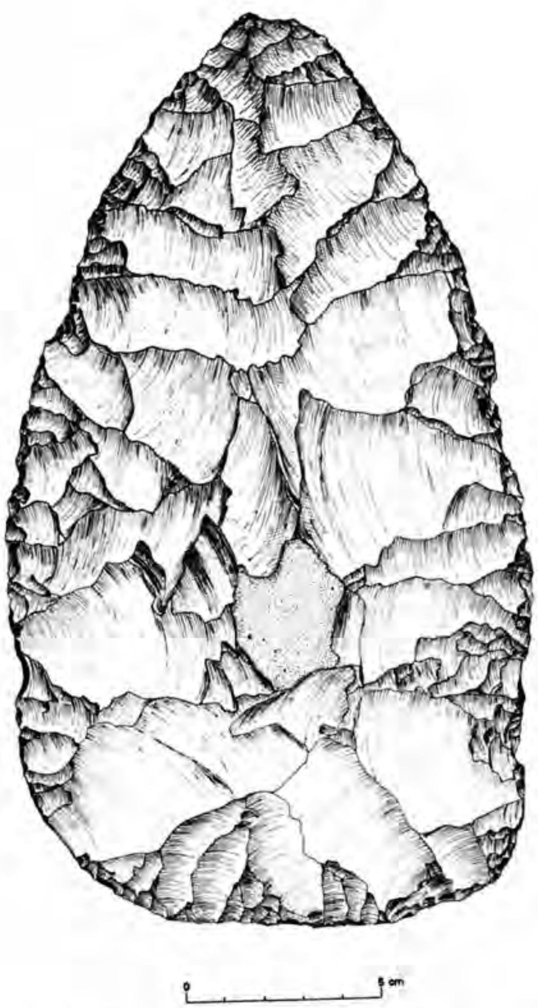

Figure 13. Sketch of Baird Cache biface, GP35571, front view.

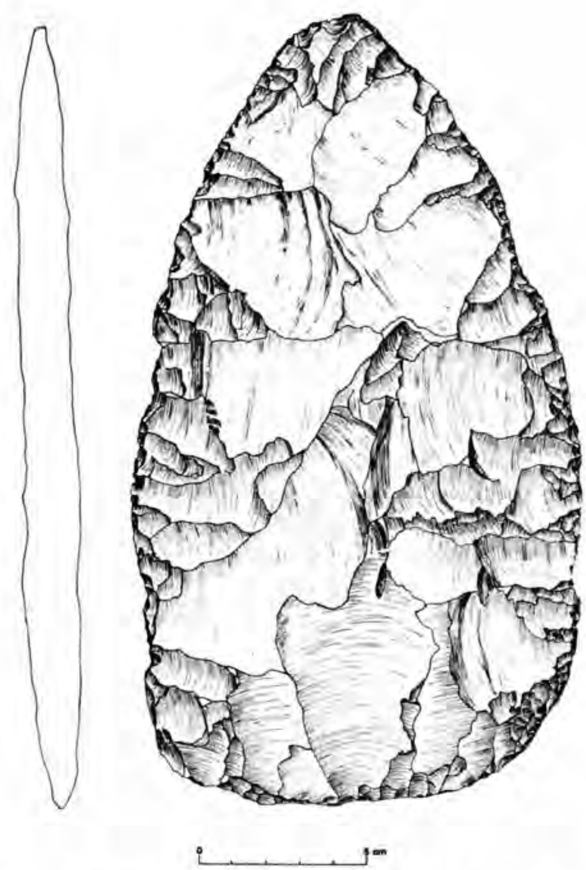

Figure 14. Sketch of Baird Cache biface GP35571, back view and cross-section.

plowing (see description below). If so, then they possibly were brought to the surface and exposed to surface processes, such as abrasion by wind blown sands. It is possible that the cache was disturbed by a plow, causing several of the bifaces to be strewn across the ground surface, therefore exposing them to the environment. Several bifaces may have remained buried in the cache and did not acquire sand polish, such as GP35568. An alternate explanation for the presence of sand polish on the bifaces is that the cache may have been periodically exposed on the surface by the movement of sand. If the bifaces were cached in a sand dune, sand movement over time could have exposed all or several of the bifaces to surfaces processes, thereby creating the conditions necessary for the development of sand polish. Without examining the missing 6 bifaces, it is difficult to be certain as to which of these interpretations is most likely.

All six bifaces fluoresced olive green to orange during examination under ultraviolet light, indicating that the bifaces were manufactured from Edwards chert. It is believed that these cherts were procured from the Callahan Divide. The Callahan Divide is a large, plateau landform located at the southern periphery of the Great Plains in Texas. The cache's location in Callahan County is near the eastern extension of the Divide. The Callahan Divide contains in situ and redeposited Edward's derived large cobble or boulder-size cherts that were deposited by erosion processes at the headwaters of the Brazos and Colorado Rivers (Banks 1990:109) Cherts found in the Callahan Divide vary in hue, from greys to browns, and are some of the highest quality cherts found in the Southern Plains (Mallouf 1989). These cherts have been significantly utilized by prehistoric peoples for the past 10,000 years.

Comparisons between cherts from the lithic quarry located near the cache and those of the bifaces strongly suggest that the 5 tan chert bifaces were produced using material from this area. Material from the quarry also has a pinkish hue. The exact source of the dark, chocolate brown chert used in the manufacture of GP35571 is unknown but may also be in the Callahan Divide. After inspection of this biface, Goode suggested that the chert used in its manufacture may have come from Gillespie County, Texas. Cherts with similar qualities and of sufficient size to manufacture this biface are found within this county. If the biface's chert is from Gillespie County, it suggests that the raw material was procured and transported or traded over a distance of over 140 miles. Further research is needed to confirm this hypothesis.

Two of the cache bifaces, GP 35570 and GP 35571, retain small remnants of cortex. The cortex remnant on GP 35571, located in the middle of its dorsal face, indicates that the original chert raw material was tabular in form. Cortex on GP 35570, located on its right lateral edge, suggests that the original chert raw material form was tabular or nodular.

Manufacturing Stage

Classification of the Baird Cache bifaces into a specific stage of bifacial reduction is difficult. Based on w/t ratios and edge angle measurements, the Baird Cache bifaces would fall into Callahan's later stages of biface manufacture, indicating secondary thinning, cross-section flattening, and final shaping. However, on only one biface, GP35571, does substantial secondary trimming and cross-section flattening occur. The other 5 bifaces' flake patterns, large sizes, and morphologies indicate an earlier stage of bifacial reduction. The discrepancies in the w/t ratios and edge angle measurements in comparison to Callahan's model are most likely due to the factors outlined in the Fairview Park Cache section. The 5 tan chert bifaces are therefore large, unusually thin bifaces at an early stage of reduction, probably Stage 3, which exhibit certain characteristics of later stage bifacial reduction, high w/t ratios and low edge angles. Biface GP35571 appears to be further along in the reduction process and therefore would best be classified as a Stage 4 biface.

Microscopic Edge Examination

Microscopic examination for use wear on the 6 bifaces' edges showed areas of abrasion and rounding. As with the Fairview Park Cache bifaces, this rounding and abrasion does not extend onto the flake scars of the biface and is characteristic of intentional edge grinding for platform preparation. Numerous, small fresh breaks were also noticed on the bifaces' edges. These breaks appear to be fairly recent and were most likely caused by mishandling and improper curation of the bifaces over the past 65 years. Two bifaces, GP35570 and GP35568, have striations and areas of crushing on their flake scar ridges located on their medial surfaces. These two bifaces, as well as GP35569, also have a reddish-black staining on small areas along their flake scar ridges. The damage and staining on these bifaces is most likely due to plow damage (T.R. Hester, personal communication). However, the striations and crushed flake scar ridges may also have been caused by transportation of the bifaces in a bag or , as with the fresh breaks on the lateral edges, by mishandling of the bifaces over time.

Microscopic examination of GP35571, the large chocolate brown biface, revealed use wear along its basal edge. The use wear consists of a slight rounding of the edge and a light polish is present extending approximately 3 mm up from both sides of the basal edge. Furthermore, many striations can be seen on the edge under lower powers of magnification. These striations run perpendicular to the basal edge, extending from one side of the edge to the other. Comparisons of this use wear with other known wear patterns indicate that it may have been produced by hide scraping or digging in soft soils (LeRoy Johnson, personal communication).

Conclusions

In conclusion, the Baird Cache bifaces studied are unusually large, early stage bifaces similar in technology and morphology. GP35571 exhibits secondary thinning and use wear and is one step further along in the reduction process then the other 5 bifaces. The absence of the other 6 cache bifaces from the study, combined with the paucity of contextual data, makes functional or behavioral interpretations for the cache difficult if not impossible. However, the analysis of the 6 bifaces has revealed a number of possible clues which may indicate certain behavioral or functional determinants in the cache's creation. First, one biface, GP35571, may have been made from chert from a source over 140 miles away. The other 5 bifaces appear to be made of chert from the nearby lithic quarry. Second, GP35571 appears to have been used as a scraping implement while the other 5 bifaces exhibit no use wear.

These two inferences indicate several possible scenarios for the caching of the bifaces, only one of which will be discussed in detail. First, a person or persons may have produced a number of large bifacial blanks at the lithic quarry and, in order to lighten the transport load, cached the bifaces at the nearby habitation site. GP35571 may have been produced at another locality and carried into the area. On its journey, the biface was utilized. The biface was placed in the cache to further lighten the load or to curate it for future use. If the majority of the bifaces were produced as a group and then cached, this would indicate a possible stockpiling of raw materials near their source for later retrieval, i.e. Binford's collector economy caching (see Chapter 3). A second scenario which may be hypothesized based on the two inferences outlined above is that the cache is an abandonment cache (Schiffer 1987). If so, the bifaces may have been related to prehistoric technological organization and settlement strategy, where raw materials and implements are cached in sites which will be returned to at a later date. Study of the 6 missing bifaces is necessary in order to better understand the Baird Cache's function.

THE GOLDAPP CACHE (41FY521)

Background

The Goldapp Cache (41FY521) was found in the spring of 1991 on a ranch owned by Mr. and Mrs. William Goldapp, approximately 10.4 miles north of the town of La Grange, in Fayette County, Texas (Figure 15). The cache site is located on USGS Nechanitz Quad, N3325700/E708500, 3/4 of a mile south of Jones Creek and 1/2 mile northwest of the juncture of FM2145 and county road 3011. The cache was discovered by Mrs. Goldapp in the roots of an overturned cedar tree. A violent spring storm had passed through the area and uprooted many trees on the ranch. While investigating the trees after the storm, Mrs. Goldapp discovered several bifaces secured in one of the tree's roots. Further investigation revealed a total of 35 medium to large-sized bifaces both in the tree roots and in a bedrock depression underneath the tree (Figure 16). Apparently, over time, the tree had grown over the cache and many of the bifaces had become entwined in its roots.

Subsequent to finding the cache, Mrs. Goldapp contacted TARL to report the find and, as a result, the author had the opportunity to visit the cache locality

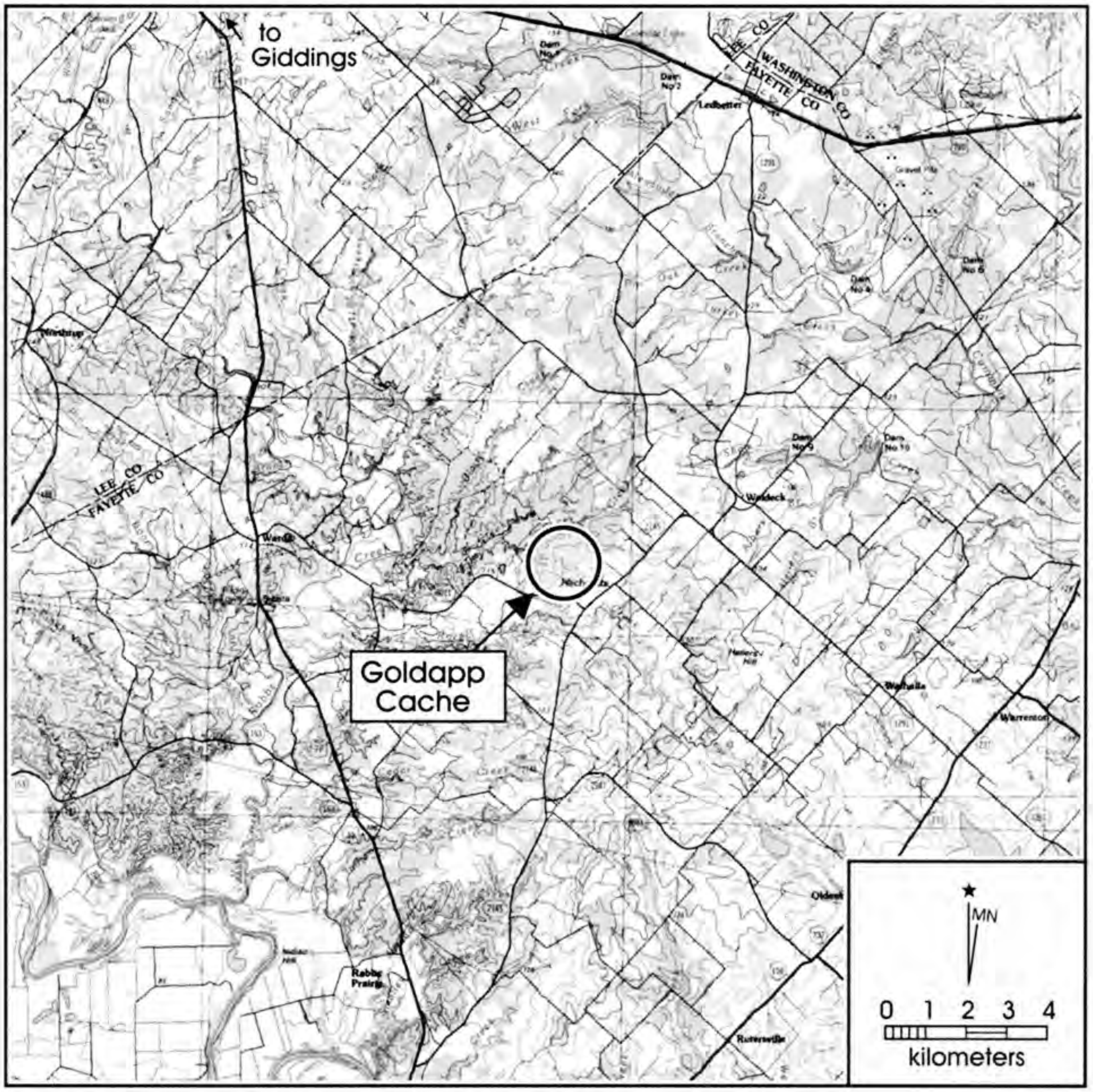

Figure 15. Map showing the location of the Goldapp Cache.

shortly after its discovery. Examination of the site revealed that the bifaces had originally been placed in a natural depression in sandstone bedrock approximately 50 cm below present ground surface (Figure 17). The bifaces had been stacked in this depression as well as placed vertically in pairs in a connecting bedrock seam (Figure 18). The cache appeared to have been capped with three or more large slabs of sandstone, two of which can be seen in the tree roots in Figure 10. Furthermore, many fist-sized pieces of palm wood appeared to be associated with the cache. However, it was impossible to clearly determine if these pieces were associated with the cache due to the large amount of disturbance caused by the uprooting of the tree and the fact that palm wood occurs in large quantities throughout the ranch.

Examination of the immediate surroundings of the cache revealed moderate amounts of lithic debris scattered on the ground. A collection of lithic artifacts gathered from this and nearby areas by Mr. and Mrs.

Figure 16. Goldapp Cache bifaces, left to right. Top row: 21, 33, 20, 31, 17, 32, 25, 26, 18, 29, 27, 28, 24; middle row: 30, 23, 19, 22, 8, 16, 7, 14, 1, 13, 6, 15; bottom row: 35, 11, 2, 3, 4, 10, 5, 9, 34. Biface #12 is missing from photograph, black and white marks on scale arrow equal 10 cm.

Figure 17. Photograph showing Goldapp Cache location and upturned tree.

Goldapp contained projectile points of the Bulverde, Bell, Early Triangular, Langtry, Fairland, Pedernales, Scallorn, and Ensor types as well as several untyped rectangular, contracting stemmed points. These types range temporally from the Early Archaic to the Late Prehistoric. Therefore, the cache's temporal context cannot be determined.

Results of Analysis

Results of the analysis of the Goldapp Cache bifaces show a general uniformity in biface technology, morphology, and raw materials. Metrical and statistical data on the cache bifaces can be found in Tables 7 and 8. Two of the bifaces, specimens #34 and #35, were not included in the statistical calculations due to their obvious dissimilarities with the other 33 bifaces. The large differences in their metrical and technological attributes from the other bifaces produce a skewing effect in the statistical calculations. Therefore, the two bifaces will be addressed separately in the discussions. As indicated by a low *CV* value of .14, length measurements of the 33 bifaces are uniform, ranging from 105 mm to 180 mm, with an average of 132.9 mm. Bifaces #34 and #35 are 235 mm and 262 mm in length respectively. The sizes of the 33 bifaces are variable as indicated by a weight *CV* value of .39. Weights range from 107 g. to 399.8 g. with an average of 215.0 g. The large sizes of bifaces #34 and #35 are reflected by their weights of 1500 g. each. The total weight of the cache, bifaces #34 and #35 included, is 10.1 kg. or 22.2 lbs.

The 33 bifaces' widths and thicknesses are fairly uniform, with *CV* values falling below .20. Low width *CV* values reflect the low degree of variability in biface shapes. Maximum

Figure 18. Photograph of bedrock seam in which the Goldapp Cache was found.

Table 7. Goldapp Cache Material Data.

Specimen #	Length (mm)	Weight (g)	Width				Thickness				W/T Ratio
			Prox.	Med.	Distal	Max.	Prox	Med.	Distal	Max	
1	127	282	90.5	100	50	100	12	18	13	18	5.55
2	154	304.5	88	95	50	95	11	16	10	16	5.93
3	157	309	92	86.5	59	92	16	18	11	18	5.11
4	180	399.8	95	99	56.5	99	12	17	10	17	5.82
5	140	363.5	109	114	73	114	18	16	15	18	6.33
6	143	366	95	98	58	98	15	21	14	21	4.66
7	134	224	89.5	88	56	89.5	13	15	9	15	5.91
8	150	190	63.5	66	43	66	10	16	8	16	4.12
9	157	357	83	95	46.5	101	15	18	13	18	5.61
10	150	261	81.5	82	53	82	15	17	11	17	4.82
11	154	295	92	80	49	92	12	19	13	19	4.84
12	134	183	75.5	71	48	75.5	15	16	9	16	4.71
13	133	272	86.5	91	50	91	16	20	12	20	4.55
14	146	327	85	91	60	91	18	21	11	21	4.33
15	142	223	83	84	52	86.5	13	17	11	17	5.08
16	134	194	77.5	88	58	88	11	14	11	15	5.86
17	113	176.5	80	88	58	90	13	15	11	15	6
18	131	146	67	69	46	69	11	13	10	13	5.3
19	134	142	68	61	36	68	13	15	9	15	4.53
20	121	146	69	70	40	73	11	16	12	16	4.56
21	105	107	58.5	57.5	35	58.5	12	16	10	16	3.65
22	116	182	74	76	49	76	13	18	12	18	4.22
23	142	169	73	64	38	73	13	17	10	17	4.29
24	153	160	69	64	45	69	13	16	8	16	4.31
25	114	150	67	70	47	70	11	16	11	16	4.37
26	119	138	70	68	43	70	12	15	9	15	4.66
27	127	169	61	64	41	66	13	21	11	21	3.14
28	118	141	60.5	66	43	66	13	15	10	15	4.4
29	122	143.5	66.5	60	50	66.5	11	17	12	17	3.91
30	106	153	77	71	50	78	14	16	12	16	4.87
31	102	141	80	80.5	56	81	14	14	11	14	5.78
32	121	148	62	66	49	66	14	17	10	17	3.88
33	105	135	79	71	51	80	13	15	12	15	5.51
34*	235	1500	142	140	100	142	29	35	22	35	4.05
35*	262	1500	135	149	82	151	31	34	23	34	4.44
Mean	132.9	215	77.8	78.6	49.6	81.2	13	17	11	17	4.87
Stan Dev	18.5	83.7	12.1	14.2	7.9	13.5	1.9	2	1.6	1.9	0.79
C.V.	0.14	0.39	0.16	0.18	0.16	0.17	0.15	0.12	0.15	0.12	0.16

* not included in the statistical calculations

biface widths are high, averaging 81.2 mm, with a *CV* value of .17. Biface thicknesses are also fairly high, with maximum biface thicknesses averaging 17 mm for a *CV* value of .12. Width and thickness measurements for bifaces #34 and #35 are very high, mirroring their large sizes. Maximum widths for bifaces #34 and #35 are 142 mm and 151 mm respectively while maximum thicknesses are 35 mm and 34 mm respectively. Width to thickness ratios of the 33 bifaces range between 3.14 and 5.93, averaging 4.87, with a *CV* value of .16. W/T ratios for bifaces #34 and #35 are 4.05 and 4.44, respectively. As can be seen in Figure 19, w/t ratios cluster across the y-axis of the graph, indicating the low variability in thicknesses. This suggests that biface thickness may have been a more important aspect than overall width during this stage of the manufacturing process. The clustering of the w/t ratios strongly suggests that the 33 bifaces are at a common stage of reduction. Bifaces #34 and #35 can be seen as outliers to the cluster in the upper right hand corner of the graph.

Edge angle measurements of the 33 bifaces average 42° to 45° (Table 8). *CV* values of .14 and lower indicate a low degree of edge angle variance among the bifaces, further suggesting that the 33 bifaces are at a common stage of reduction. The edge angles of bifaces #34 and #35 are high, averaging around 65°. Edge angle measurements could not be taken on the left lateral and distal edges of biface #35 due to irregularities.

Morphology

Biface morphologies vary somewhat (Table 9, Figure 15). Twenty-one of the bifaces are subtriangular, 9 are triangular, 4 are ovate and 1 is irregular. Basal and lateral edge shapes vary according to each individual biface. Twenty six of the 33 bifaces have biconvex cross-sections, 6 have biplano cross-sections, and 1, #30, has a plano-convex cross-section possibly indicative of a large flake. The two large bifaces, #34 and #35, have very thick cross-sections which can best

Table 8. Goldapp Cache Edge Angle Measurements (in degrees).

Specimen #	Proximal Edge	Left Lateral Edge	Right Lateral Edge	Distal Edge
1	50	50	40	50
2	55	45	45	40
3	45	40	35	40
4	40	45	45	45
5	55	45	42.5	55
6	50	50	45	50
7	45	35	40	40
8	40	40	42.5	40
9	55	55	55	40
10	45	40	40	40
11	40	45	42.5	45
12	42.5	37.5	35	38
13	45	45	42.5	43
14	58	47.5	45	50
15	42	37	35	40
16	30	32.5	32.5	30
17	37.5	35	35	33
18	45	35	37.5	40
19	40	37.5	37.5	36
20	40	40	37.5	40
21	40	50	42.5	40
22	40	40	37.5	38
23	40	40	40	36
24	40	40	40	40
25	40	42.5	40	40
26	37.5	40	45	45
27	40	50	51	40
28	55	40	58	45
29	45	47	42.5	45
30	45	45	55	45
31	40	45	45	46
32	40	42	50	45
33	40	40	42.5	40
34*	75	60	65	55
35*	65	NA	67.5	NA
Mean	43.7	42.3	42.4	41.8
Stan Dev	6.3	5.2	6.1	5.1
C.V.	0.14	0.12	0.14	0.12

NA = not available due to irregular shape of edge
* not included in statistical calculations

be described as irregular. Twenty-five of the 35 bifaces are symmetrical. Overall, it appears that a subtriangular, biconvex to biplano shape was the desired biface form, with variations within this generalized trajectory. None of the bifaces exhibits morphologies which would be indicative of a specific lithic tool preform. Therefore, the bifaces would be considered blanks (Crabtree 1982). The lateral edges of the bifaces are moderately sinuous and heavily ground, percussion platforms are present on most of the bifaces.

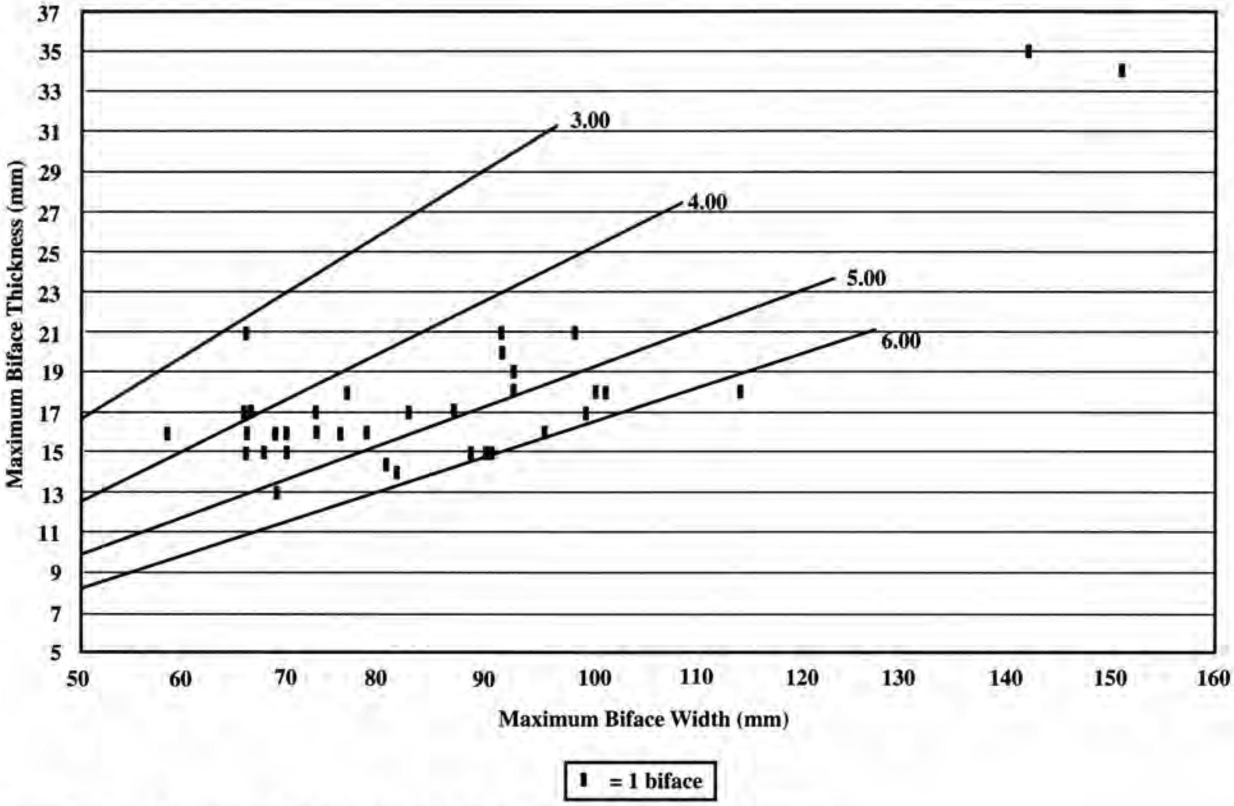

Figure 19. W/T Ratio graph of the Goldapp Cache showing ratio regression lines.

Technology

Flake patterns indicate that the 33 bifaces were produced by soft hammer percussion techniques (a drawing of only one of the cache bifaces is available due to limited access to the cache). Flake scars on most of the bifaces are broad and deep, meeting at or crossing over the midlines of the bifaces. Flake scars generally have a length to width ratio of 2 to 1 on most bifaces. Flake patterns are fairly regular, with flake scars originating from the lateral margins of the bifaces. Plunging and overshot flake scars are evident on many of the bifaces. As evidenced by the flake patterns and cross-sections, the flintknapper or flintknappers performed well executed, early stage percussion techniques to thin the cache bifaces considerably without losing much in biface width. All of the bifaces were subjected to moderate marginal trimming, which served to regularize the biface shapes. On bifaces #9 and #33, remnants of hard hammer flake scars are evident, suggesting an earlier, primary edging or thinning stage. A remnant flake scar on biface #30 indicates it was produced from a large, hard hammer flake. The bulb of percussion has been removed with several thinning flakes. Flake patterns on bifaces #34 and #35 indicate that they were produced through hard hammer percussion techniques. Flake scars on these two bifaces are very large and appear to have efficiently removed most of the cortex from the bifaces.

Raw Materials

All 35 bifaces were made from the same chert, a high-quality brown to dark brown material, often containing large gray inclusions of coarse grained material and crystals, with a tannish orange to gray-white cortex. Three of the bifaces, #16, #17, and #19, are gray in color due to cortex remnants on their faces. Fourteen of the 35 bifaces have some degree of cortex remaining on them. The cortex on 5 of these 14 bifaces indicates that their original raw materials were thin nodules or tabular cherts. Bifaces #34 and #35 seem to have been made from very large chert nodules. It therefore appears

Table 9. Goldapp Cache Morphological Data.

Specimen #	Cortex*	Overall Shape**	Base	Lateral Edges***	Cross-section	Symmetrical
1	A	sub T	convex	subconvex	biconvex	Y
2	A	sub T	subconvex	subconvex	biplano	Y
3	A	sub T	subconvex	subconvex	biconvex	Y
4	A	sub T	subconvex	sc st	biconvex	N
5	P	ovate	convex	convex	biconvex	N
6	A	sub T	subconvex	subconvex	biconvex	Y
7	A	sub T	subconvex	subconvex	biconvex	Y
8	A	sub T	subconvex	st sc	biconvex	Y
9	A	sub T	convex	subconvex	biconvex	N
10	A	sub T	subconvex	straight	biconvex	Y
11	A	T	straight	straight	biconvex	Y
12	A	T	straight	straight	biplano	Y
13	P	ovate	convex	convex	biconvex	Y
14	A	sub T	subconvex	subconvex	biconvex	Y
15	P	sub T	subconvex	subconvex	biconvex	Y
16	P	sub T	convex	subconvex	biplano	Y
17	P	ovate	convex	con sc	biplano	Y
18	A	sub T	subconvex	subconvex	biplano	Y
19	P	T	subconvex	st sc	biconvex	Y
20	P	sub T	subconvex	subconvex	biplano	N
21	P	sub T	subconvex	subconvex	biconvex	Y
22	P	sub T	subconvex	subconvex	biconvex	Y
23	A	T	subconvex	straight	biconvex	Y
24	A	T	subconvex	straight	biconvex	Y
25	P	sub T	straight	sc st	biconvex	N
26	A	T	subconvex	st sc	biconvex	Y
27	P	T	straight	st sc	biconvex	N
28	A	sub T	subconvex	st sc	biconvex	Y
29	P	T	straight	subconvex	biconvex	Y
30	P	sub T	subconvex	subconvex	plano-con	Y
31	A	ovate	subconvex	con sc	biconvex	N
32	A	sub T	straight	st sc	biconvex	N
33	A	T	straight	subconvex	biconvex	Y
34	P	sub T	subconvex	subconvex	biplano	N
35	P	irregular	convex	irregular	biplano	N

* A = absent P = present

** T = triangular

*** In cases where a specimens's lateral edges differ in shape, two designations are given. Designation on right = shape of right lateral edge, designation on left = left lateral edge shape. st = straight sc = subconvex con = convex

that the original raw material form of the chert from which the bifaces were produced occurs in nodules of various small to large sizes. Examination of the bifaces under ultraviolet light showed they fluoresce green to yellow, indicating Edwards chert. After examination of pictures of the Goldapp Cache bifaces, Goode strongly suggested that the chert from which they were made came from northern Williamson and southern Bell counties. Work with cherts from this area by the author supports this hypothesis. If the bifaces were made from cherts in these counties, their final resting place near La Grange suggests they were transported or traded over a distance of approximately 70 miles.

Manufacturing Stage

Based on the metrical and technological data, the bifaces fit Callahan's Stage 4 of biface manufacture, where secondary thinning occurs and cross-sections approach biplano or flat At this stage, biface w/t ratios generally fall between 4.00 and 5.00 with edge angles of 25° to 45°. With the exception of #34 and #35, the Goldapp Cache bifaces are excellent examples of this stage of Callahan's model. However, most of the bifaces are still relatively thick, have moderately sinuous lateral edges, and require significant amounts of further thinning if they were to be manufactured into projectile points or bifacial knives. Therefore, it appears that the 33 bifaces are at a transitional step between Stages 3 and 4. The thinning of the bifaces may have purposefully been halted at this point in the reduction continuum so that the bifaces would be relatively thick and durable during transport. The two large bifaces are at a very early stage of manufacture, Callahan's Stages 2 or early Stage 3, where edge trimming and primary, hard hammer percussion occurs.

Based on flake scars and cortex remnants, it appears that two bifacial production trajectories were employed in the manufacture of the Goldapp Cache bifaces, the reduction of nodules and of large, hard hammer flakes. Most of the larger bifaces were produced through the bifacial reduction of chert nodules. Evidence of Stage 3 work, primary thinning, is evident on several bifaces, indicating a sequence of reduction. Comparisons between the two early stage bifaces, #34 and #35, and several of the larger, well-shaped bifaces illustrates the possible sequence of reduction, from hard hammer primary thinning of a large nodule to soft hammer percussion secondary thinning and shaping. Variations of this process, where primary hard hammer thinning was marginal, occurred according to the original size of the parent nodules, as evidenced by the bifaces which were obviously produced from smaller nodules.

A second biface production trajectory was employed in the manufacture of several of the smaller bifaces. As evidenced by biface #30, large hard-hammer flakes were being reduced into bifaces. In this production trajectory, hard hammer flakes were struck from large cores or nodules and then shaped with soft hammer percussion techniques. Since the flakes are already thin, early, primary thinning is not needed and secondary, soft hammer thinning can be employed. Though only one of the bifaces exhibits evidence of being produced in this manner, I believe that several of the smaller bifaces may have also been made from large flakes. Remnants of ventral flake scars and bulbs of percussion may have been erased by subsequent thinning, therefore making the identification of these flakes impossible. The very large flake scars on bifaces #34 and #35 are evidence that sizable, hard-hammer flakes were being produced from the chert nodules. Use of the largest of these flakes for bifacial reduction would have been an efficient use of materials and time.

Microscopic Edge Examination

Microscopic examination of the bifaces' edges revealed no wear on any of the 35 bifaces. Areas of rounding and abrasion are evident on the bifaces' edges but appear to be due to intentional edge grinding for platform preparation. All 35 bifaces have well-ground platforms set up on their lateral edges which would have facilitated later reduction of the bifaces. No transport wear is evident on the 35 bifaces, suggesting careful transport of the materials from their raw material source area or thinning of the bifaces into their present forms near the cache locality.

Conclusions

In conclusion, the Goldapp Cache bifaces are a fairly uniform set of artifacts at a common stage of reduction. Except for the two large, early stage bifaces, the cache bifaces are at an early, secondary stage of thinning, a stage at which, according to Callahan (1979:116), bifaces are commonly traded to consumers as blanks to be worked down into specific products. Two production trajectories appear to have been employed in the bifaces' manufacture, bifacial reduction of nodules and bifacial reduction of large, hard-hammer flakes. The bifaces were most likely made from high-quality Edwards cherts from

Williamson or Bell counties, possibly indicating they were transported over 70 miles. None of the bifaces exhibits use wear.

Based on these inferences, I believe the Goldapp Cache represents an accumulation of raw material blanks transported or traded into the Fayette County area. The two large bifaces are obviously large raw material blanks and/or cores which would have provided a substantial amount of lithic materials to be utilized. The 33 well-made bifaces would have served as exceptional blanks for reduction into a variety of lithic tools, including knives, dart points, or other implements. The transport mechanism of the cache bifaces is unknown. The bifaces may have been produced near their raw material source by one prehistoric group and traded to another group in the Fayette County area. Or, the bifaces may have been procured directly from their source by a fairly mobile group who subsequently transported the materials over a fairly large distance. Variations on these two themes are also possible, such as the production of the bifaces by one or more enterprising individuals who then transported these valuable materials to other groups for personal profit.

The purpose behind the caching of the bifaces is unknown. The bifaces may have been cached as a security measure as they were most likely valuable items. An individual trader or a group which has acquired the bifaces may have cached them for this purpose. The cache may also represent a stockpile of raw materials created in order to insure available raw materials, constructed by a hunter-gatherer group which anticipated return to the site area in the future. The stockpile may also have been created by a group in order to insure their independence from other groups who controlled lithic resource areas. Finally, the possibility that the bifaces were cached for ritual purposes exists. However, no other artifacts which might be indicative of ritual activities, such as red ochre or human skeletal remains, were found in the cache.

THE RILEY CACHE

Background

The Riley Cache was discovered in 1929 along a tributary to Atascosa Creek southwest of the town of Lytle in Medina County, Texas (Figure 20). A young boy was hunting a rabbit with his dog. The rabbit ran into a burrow in the ground and the boy and dog proceeded to dig into the hole. While digging, the boy discovered the cache of 29 medium-sized bifaces (Figures 21, 22, 23). The boy took the bifaces to a grocery store in Lytle to trade them for groceries. The bifaces were then bought from the store owner by Garness R. Mac Almon. Over time, the collection, including the cache, came into the possession of Mrs. Mac Almon's nephew, the late Pat Riley, M.D. In 1992, the Riley artifact collection was donated to the University of Texas at Austin and study of the cache was made possible. The collection is presently housed at the Texas Archeological Research Laboratory.

The cache was apparently found in an isolated setting, with no associated sites or diagnostic artifacts. The temporal context of the cache is therefore unknown. The structure of the cache reportedly consisted of a circular pit dug into the ground. The pit was partially filled with white sand from the nearby creek bed. The 29 bifaces were found stuck point down into the sand within the pit. No other contextual data on the cache is available.

Results of Analysis

Results of the analysis of the Riley Cache show the bifaces to be fairly uniform in technology and morphology but variable in raw materials. Metrical and statistical data on the 29 bifaces can be found in Tables 10 and 11. Due to their inclusion in an inventory of the Riley Collection performed by the former owner, the bifaces were numbered 4 through 32. For consistency sake, these specimen numbers were used in the analysis. Overall, the Riley Cache bifaces are smaller than the bifaces from the three previously discussed caches. As indicated by a low *CV* value of .12, the lengths of the bifaces are fairly uniform. Lengths range between 62 mm and 121 mm with a mean of 100.8 mm. Biface weights range between 29.7 g and 122.8 g for an average of 89.4 g. A weight *CV* value of .24 indicates some variability in biface weights and sizes. The total weight of the cache bifaces is 2.59 kg or 5.7 lbs, which would have been a relatively light load to transport.

Biface widths and thicknesses are very uniform, with *CV* values of .14 and lower. Low width *CV* values reflect the relatively low degree of variability

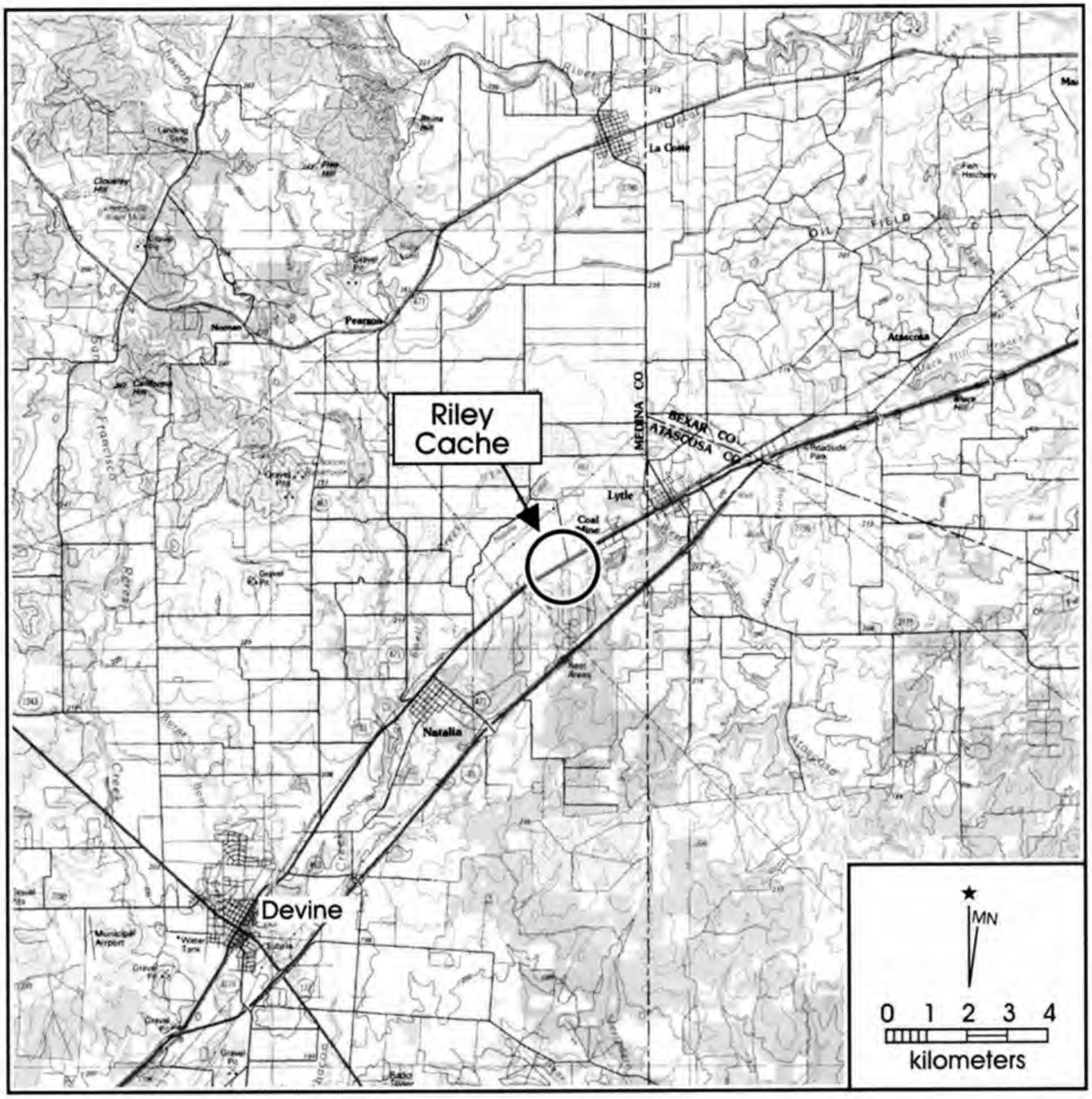

Figure 20. Map showing the approximate location of the Riley Cache.

in biface shapes. Maximum biface widths average 69.1 mm for a *CV* value of .11. Maximum biface thicknesses average 10.3 mm with a *CV* value of .13. Width to thickness ratios of the 29 bifaces are low in variability, *CV*= .12, ranging between 4.36 and 7.88 with a mean of 6.73. As can be seen in Figure 24, 21 of the 29 bifaces cluster between the 6.00 and 8.00 w/t ratio boundaries. Two bifaces, #16 and #18, have identical w/t ratios and therefore are seen as one dot on the graph. The loose clustering of the w/t ratios indicates the slight variability in biface sizes and also suggests the bifaces are at similar stages of reduction. Two bifaces, #28 and #32, can be seen as a distant outliers on the left-hand side of the graph. Biface #28 has differences in technology and size from the other 28 bifaces which may be related to its function. Biface #32 is a very small biface in comparison to the other 28 (Figure 24), resulting in its distance on the graph from the general cluster. This will be discussed below. Edge angles for the 29 bifaces are fairly low,

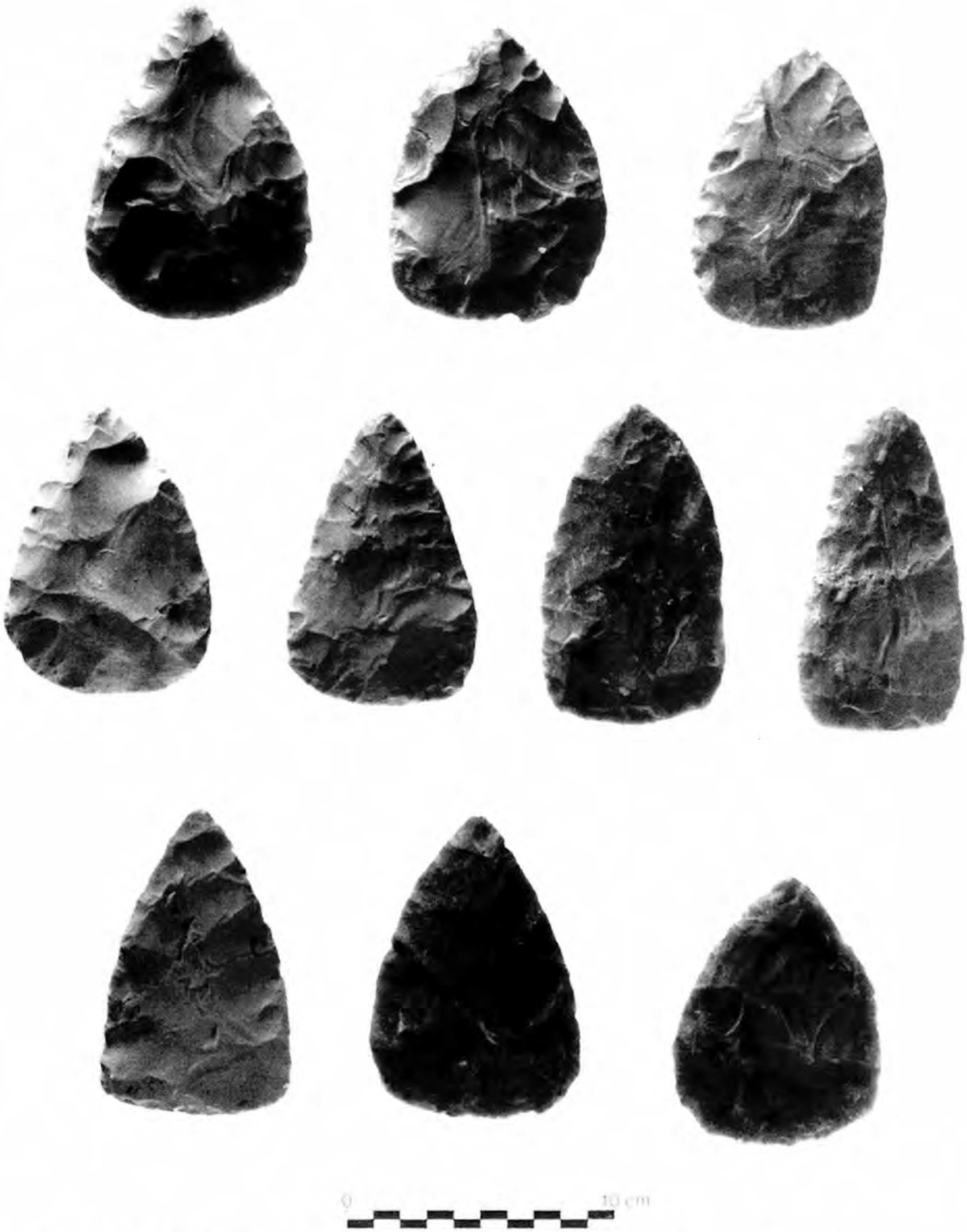

Figure 21. Riley Cache bifaces, from left to right. Top row: Specimens 4, 5, 6; middle row: 7, 8, 9, 10; bottom row: 13, 11, 12.

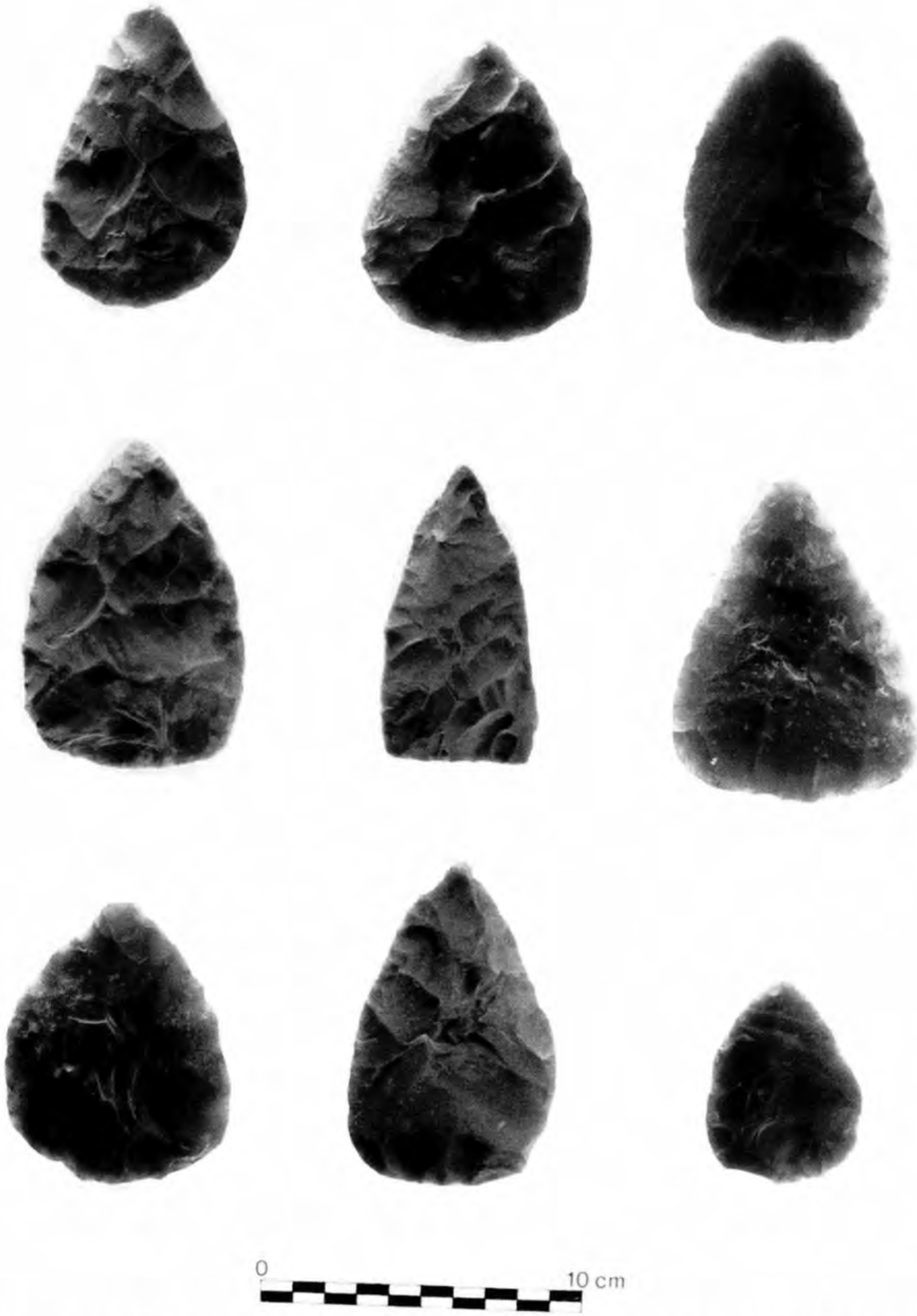

Figure 22. Riley Cache bifaces, from left to right. Top row: Specimens 14, 15, 16; middle row: 17, 18, 19, 20; bottom row: 21, 22, 23.

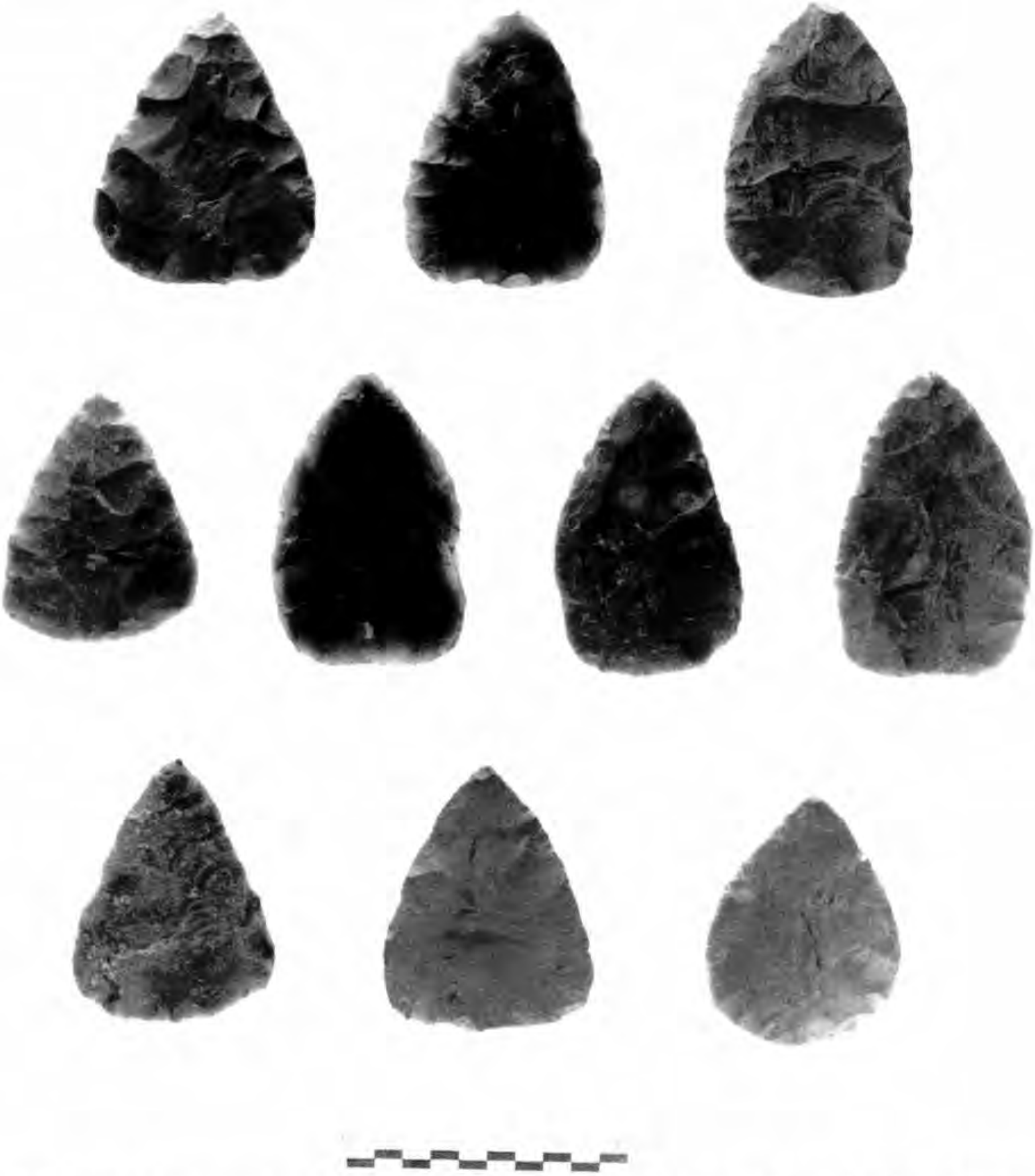

Figure 23. Riley Cache bifaces, from left to right. Top row: Specimens 24, 25, 26; middle row: 27, 28, 29; bottom row: 30, 31, 32.

averaging around 37.5°, and very uniform, with *CV* values falling below .10 (Table 11).

Morphology

Individual biface morphologies vary somewhat but an overall trend is evident (Table 12, Figures 21, 22, 23). Seventeen bifaces are subtriangular, 6 are ovate, 4 are triangular, 2 are irregular in overall shape. Basal and lateral edge shapes vary according to the individual biface. Twenty-six of the bifaces have biconvex cross-sections, with several approaching a biplano cross-section. Two bifaces, #8 and #25, have plano-convex cross-sections which indicate they were

Table 10. Riley Cache Material Data.

Specimen #	Length (mm)	Weight (g)	Width				Thickness				W/T Ratio
			Prox.	Med.	Distal	Max.	Prox	Med.	Distal	Max	
4	116	135	83	78	40	83	10	13	8	13	6.38
5	110	122.8	77	80	45	80	11	11	7	11	7.27
6	109	111	70	70	41	71	9.5	11	9	12	5.91
7	107	113.7	74	68	42	74	11	13	9	13	5.69
8	109	79.4	70	64	35	70	7	9	7	9	7.77
9	118	99.5	67	67	40	67	9	8	8	9	7.44
10	121	89.8	61.5	55	38	61.5	9	9	7.5	9	6.83
11	112	113.6	78	73.5	46	78	9	10	9	11	7.09
12	109	106.5	76	74	46	77	9	11	9	11	7
13	113	97.4	71	65	38	71	9	10	8	10	7.1
14	97	99.9	78.5	69	37	78.5	9.5	11	11	11	7.13
15	100	92.9	70	69	45	72	9	10	8.5	10	7.2
16	105	97.8	66	67	45	67	10	10	8	10	6.7
17	88	72.1	68	62	38	68	10	9	8	10	6.8
18	98.5	96.3	67	65	46	67	9.5	10	9	10	6.7
19	104	90.3	63	62.5	38	64	11	11	7	11.5	5.81
20	108	103.4	65	68	42	68	9	9	9	9	7.55
21	93	66.9	71	62	35	71	8	9	7	9	7.88
22	93.5	76.4	74	63	37	74	8	10	9	10	7.4
23	90	69.7	67	69	39	69	8	9.5	7	9.5	7.26
24	95	68.7	61	59	31	64	8	10	9	10	6.4
25	93.5	87.2	61.5	64	37	65	10	13	8.5	13	5
26	94.5	83.8	71	69	39	72	10	10.5	8	10.5	6.85
27	101.5	86.3	67	68	38	69	9	9	8	9	7.66
28	92	46.7	48	45	24	48	9	11	6	11	4.36
29	100	92.6	77	66	36	77	9	10	8	10	7.7
30	99.5	82.7	60	63	37	63	10	11	8	11	5.72
31	86	80.9	68	67	43	69.5	10	12	9	12	5.79
32	62	29.7	46	48	29	48	6	7	6	7	6.85
Mean	100.8	89.4	68.1	65.5	38.8	69.1	9.1	10.2	8.1	10.3	6.73
Stan Dev	11.6	21.3	8.1	7.3	5.1	7.8	1.1	1.4	1	1.4	0.84
C.V.	0.12	0.24	0.12	0.11	0.13	0.11	0.12	0.14	0.13	0.13	0.12

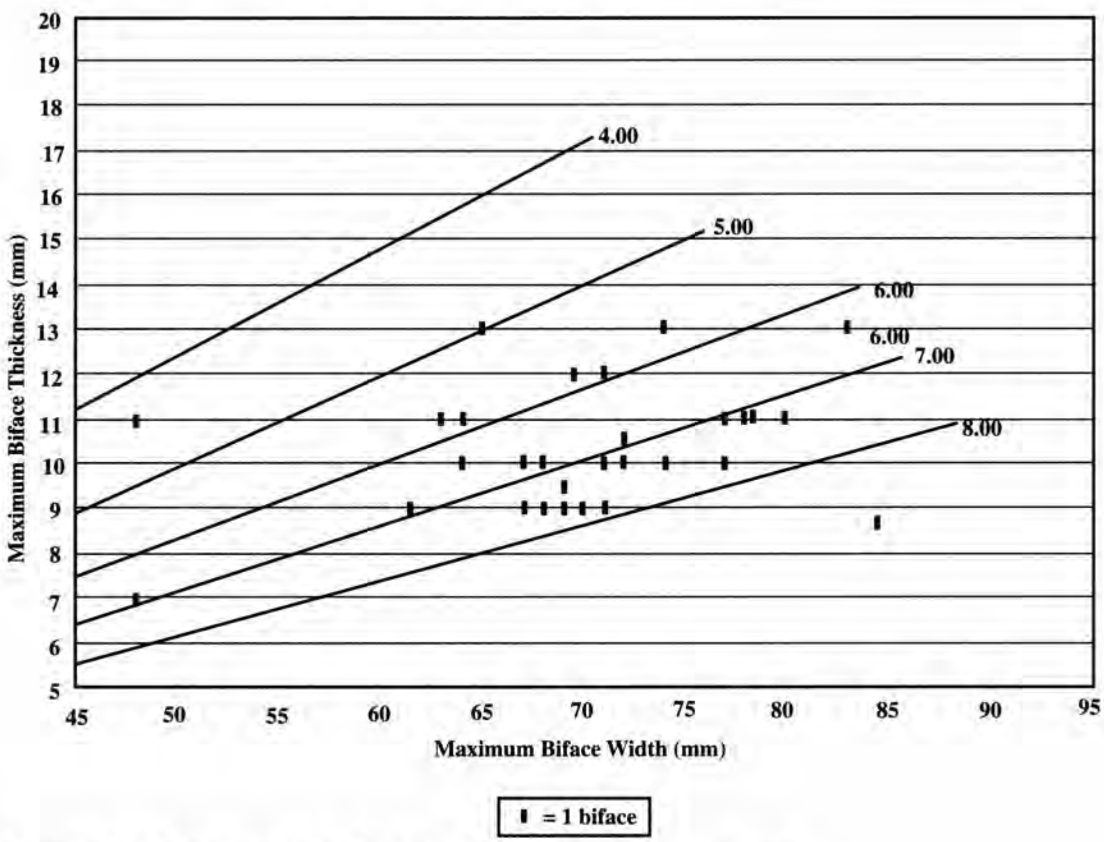

Figure 24. W/T Ratio graph of the Riley Cache showing ratio regression lines.

Table 11. Riley Cashe Edge Angle Measurements (in degrees).

Specimen #	Proximal Edge	Left Lateral Edge	Right Lateral Edge	Distal Edge
4	35	40	35	40
5	40	37.5	37.5	35
6	40	37.5	37.5	37.5
7	40	35	42.5	40
8	35	32.5	35	35
9	40	35	32.5	35
10	32.5	37	37	35
11	40	40	37.5	40
12	37.5	35	42.5	40
13	37.5	35	35	40
14	35	35	45	45
15	35	35	37.5	35
16	40	40	40	37.5
17	42	40	40	37.5
18	37.5	38.5	35	37
19	38.5	40	38.5	35
20	38.5	37.5	37.5	45
21	37.5	35	37.5	40
22	35	35	37.5	35
23	37.5	37.5	37.5	35
24	36	37.5	37.5	35
25	40	37.5	37.5	40
26	41.5	36	37.5	35
27	37.5	36	35	40
28	32.5	32.5	32.5	30
29	37.5	36	35	35
30	35	40	35	42
31	37.5	37.5	37.5	34
32	35	35	35	35
Mean	37.4	36.7	37.2	37.4
Stan Dev	2.5	2.2	2.7	3.4
C.V.	0.07	0.06	0.07	0.09

made from large flakes. Several of the other bifaces with biconvex cross-sections are slightly twisted or corkscrewed which may indicate that they were also made from large flakes. The smallest of the 29 bifaces, #32, has a biplano cross-section. Twenty-three of the 29 bifaces are symmetrical. Overall, it appears that a symmetrical, subtriangular, biconvex biface was the desired biface form with slight variations within this generalized trajectory.

Technology

Flake patterns on the 29 bifaces indicate they were produced by soft hammer percussion techniques. Flake patterns are fairly regular on most of the bifaces (Figure 24). Flake scars are generally broad and overlapping but originate from variable directions. Flake scars on many of the bifaces extend to or cross over the midline of the biface. Many flake scars terminate in slight hinges or plunge at the midline of the biface. There is a considerable amount of marginal retouch on most of the bifaces, apparently performed to shape the bifaces and set up percussion platforms. The variable directionality of the flake patterns on several bifaces suggests that the original raw materials were irregular in shape, making regular, percussion platform setups difficult. Two bifaces, #8 and #25, exhibit remnant flake scars

Table 12. Riley Cache Biface Morphological Data

Specimen #	Cortex*	Overall Shape**	Base	Lateral Edges***	Cross-section	Symmetrical
4	A	sub T	subconvex	subconvex	biconvex	Y
5	A	ovate	subconvex	con sc	biconvex	N
6	A	sub T	subconvex	subconvex	biconvex	Y
7	A	sub T	subconvex	subconvex	biconvex	Y
8	A	sub T	subconvex	subconvex	plano-con	Y
9	A	sub T	subconvex	sc str	biconvex	Y
10	A	triangular	straight	straight	biconvex	Y
11	A	sub T	subconvex	subconvex	biconvex	Y
12	A	ovate	convex	convex	biconvex	N
13	A	triangular	straight	subconvex	biconvex	Y
14	A	sub T	subconvex	subconvex	biconvex	Y
15	A	sub T	straight	subconvex	biconvex	Y
16	A	sub T	subconvex	subconvex	biconvex	Y
17	A	triangular	subconvex	subconvex	biconvex	Y
18	A	sub T	straight	subconvex	biconvex	Y
19	A	irregular	subconvex	str con	biconvex	N
20	A	sub T	straight	con sc	biconvex	N
21	A	sub T	subconvex	subconvex	biconvex	Y
22	A	sub T	subconvex	subconvex	biconvex	Y
23	A	ovate	convex	convex	biconvex	Y
24	A	irregular	convex	con str	biconvex	N
25	A	sub T	straight	con sc	plano-con	Y
26	A	ovate	convex	convex	biconvex	Y
27	A	sub T	subconvex	subconvex	biconvex	Y
28	A	triangular	straight	straight	biconvex	Y
29	A	sub T	subconvex	sc str	biconvex	Y
30	A	sub T	subconvex	sc con	biconvex	N
31	A	ovate	convex	convex	biconvex	Y
32	A	ovate	convex	convex	biplano	Y

* A = absent P = present

** T = triangular

*** In cases where a specimens's lateral edges differ in shape, two designations are given. Designation on right = shape of right lateral edge, designation on left = left lateral edge shape. st = straight sc = subconvex con = convex

on their ventral faces which indicate they were produced from large flakes. The bulbs of percussion on each of these bifaces have been removed with several thinning flakes. One biface, #28, exhibits multiple pressure flake scars originating from its lateral edges. The pressure flaking has thinned the biface's lateral edges considerably.

As with the Goldapp Cache bifaces, it appears that two biface production trajectories were employed in the production of the Riley Cache bifaces. The two trajectories consist of the bifacial reduction of chert nodules and the bifacial reduction of large, hard-hammer flakes. The number of bifaces produced through each trajectory is unknown, since evidence of the use of a large flakes in the production of many of the bifaces, such as bulbs of percussion or ventral flake scar remnants, may have been erased by subsequent bifacial thinning.

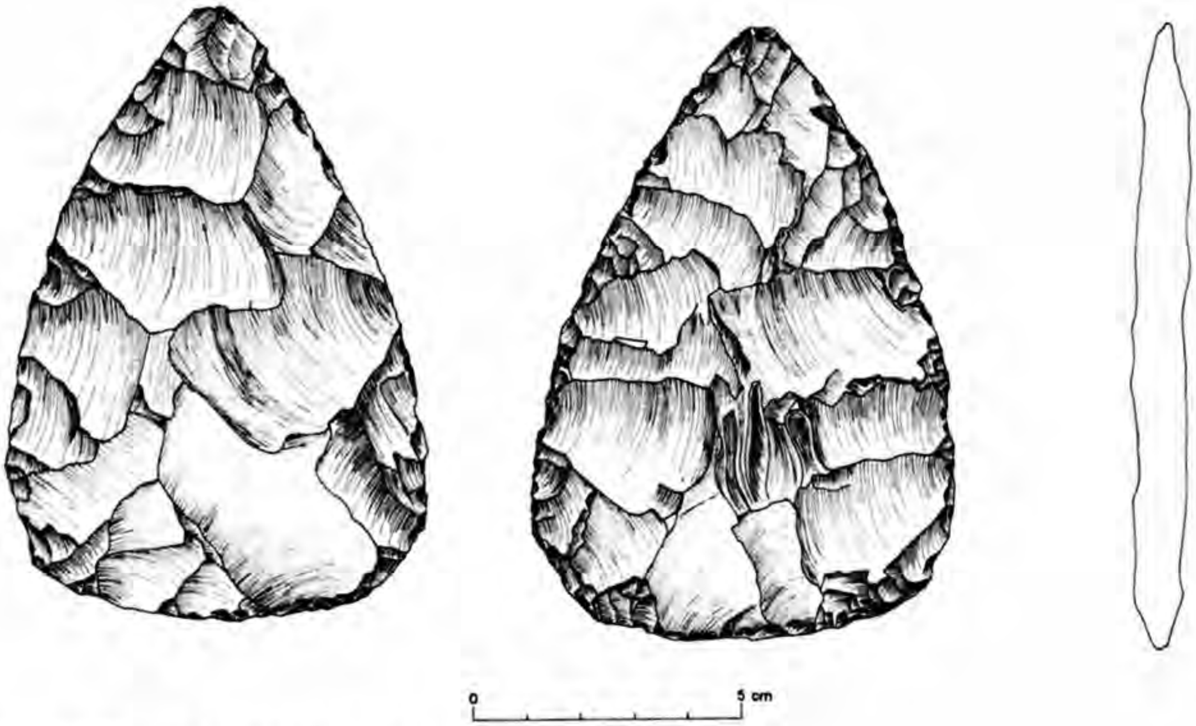

Figure 25. Sketch of Riley Cache biface #11.

Raw Materials

There is considerable variation in the cherts from which the 29 bifaces were manufactured. Chert colors range from light brown or tan to dark, chocolate brown and from light to dark gray. The quality of the cherts is fairly high, ranging between fine-grained and very fine-grained. Inclusions within the cherts vary but generally consist of small, irregularly shaped gray or tan inclusions of harder material. One biface, #19, is full of small fossil shell inclusions which give it a speckled appearance. None of the 29 bifaces has remnants of cortex which would indicate the original form of the raw materials. Based on the variation in the cherts characteristics, it appears the bifaces were made from raw materials from several sources. However, the possibility does exist that the bifaces were produced with raw materials from a single heterogeneous source, such as stream gravels. Twelve of the bifaces appear to be made from a similar gray-colored chert. Four bifaces, #1, #24, #25 and #32, appear to be made from the same dark brown, banded chert.

All 29 bifaces fluoresced a yellowish orange color under ultraviolet light, indicating Edwards cherts. The different colored cherts did not fluoresce in any recognizable patterns which would distinguish them from one another. Goode's examination of the bifaces was inconclusive as to their raw materials source. Goode suggested that the cherts came from the west and southwest hill country, namely, Real, Kerr, Bexar, Medina, and western Bandera counties. He also suggested that the cherts used in the manufacture of many of the bifaces were most likely stream-rolled gravels in their original form. Exact sourcing of the cherts therefore seems impossible. They could have come from a number of primary and secondary deposits found throughout a 5 county wide area or beyond. The possible use of several chert sources in the production of the bifaces has several behavioral implications for the cache which will be discussed below.

Manufacturing Stages

Based on w/t ratios, edge angle measurements, and flake patterns, the Riley Cache bifaces range between Callahan's Stage 3 and Stage 4 of biface manufacture, where primary and secondary thinning occurs and a biconvex to flat cross-section is obtained. Assignment to these stages of biface manufacture would indicate w/t ratios between 3.00 and 5.00, but, as with the other caches, the Riley Cache bifaces have high w/t ratios, averaging 6.73. I believe this discrepancy is due to the factors outlined for the Fairview Park Cache bifaces. These include: the probability that Callahan's model may not be wholly applicable to the reduction strategy employed in the manufacture of the Riley Cache bifaces, the use of cherts or flakes which may have already been thin in form, and the skillful execution of hard and soft hammer percussion techniques by the prehistoric flintknappers.

Placement of the bifaces into either Stage 3 or Stage 4 is difficult and somewhat arbitrary, and is based on numerous biface attributes. Many bifaces, such as #4, #7 and #12, would be classified as Stage 3 bifaces. They have fairly sinuous edges, significant humps and hinges, and need a decent amount of secondary thinning to reach a preform stage. On the other hand, several bifaces, such as #8, #10, and #24, would be classified as Stage 4 bifaces. They have been thinned considerably, have little edge sinuosity, and have cross-sections approaching plano-plano. These biface are close to being at a later, preform stage, where subsequent thinning could be accomplished through pressure flaking. In fact, biface #28 has been pressure flaked and is an obvious preform for a dart point or other lithic tool.

Microscopic Edge Examination

Examination of the bifaces' edges under binocular microscope showed areas of heavy abrasion, rounding, and hinging of all of the 29 bifaces. In many cases, as with biface #10, the lateral edges of the bifaces are significantly dulled from edge abrasion. Examination of these wear patterns on the bifaces show them to be indicative of intentional edge grinding for platform preparation. On none of the bifaces does the edge rounding or abrasion extend onto the flake scar ridges and, in most cases, there is a juncture between the ground edges and the flake scars which is characteristic of platform preparation (Sheets 1973). On only one biface, #28, is there evidence of possible use wear. The small biface exhibits areas of hinging and microflake removal along its straight lateral edge. This wear pattern may be indicative of the biface's use as a cutting tool, where a sawing motion along the edge has caused the removal of small flakes (LeRoy Johnson, personal communication).

Conclusions

In conclusion, the Riley Cache bifaces are similar in technology and general morphology, suggesting that they were manufactured by a single individual or by a small group with a common mental template of a biface. The bifaces are generally subtriangular in shape with biconvex cross-sections. Soft hammer percussion flaking patterns are fairly regular but some difficulties were apparently encountered in flaking several of the bifaces. Two production trajectories seem to account for the bifaces, the bifacial reduction of nodules and of large, hard hammer flakes. The bifaces are at or between two stages of bifacial reduction, primary thinning and secondary thinning. Of the 4 caches presented in this study, the Riley Cache bifaces appear to be the closest to being preforms due to their sizes. The bifaces would seem to be large, Archaic dart point preforms. However, ignoring the sizes of the bifaces, I believe classification of them into preforms is premature. Most of the bifaces still require moderate amounts of additional thinning to reduce them into a recognizable preforms. In addition, the bifaces which are close to being preforms cannot be classified with any certainty, for they may have been intended for reduction into other lithic tools instead of dart points, such as knives. Based on this, the Riley Cache bifaces, with the possible exception of #28, would best be described as blanks.

There are two characteristics of the Riley Cache which have possible behavioral implications, the inclusion of a used lithic tool and the possible use of chert from several different sources in the manufacture of the bifaces. The presence of the utilized bifacial preform, #28, within the cache suggests that it was being curated. Upon examination of this specimen, Goode suggested that it represented a type of knife which he has commonly found in Archaic age habitation sites from the western Hill Country (Glenn

T. Goode, personal communication). The pressure flaking and the use wear evident on this biface, unlike any of the other 28 bifaces, may support this claim.

The possible use of several different chert sources in the production of the bifaces has several behavioral implications. The bifaces may not have been produced during one, flintknapping episode. Cherts may have been procured by a group incidental to other subsistence tasks. When sizable, good quality cherts were encountered, bifaces were produced which would be suitable for later reduction into specific tools. Reduction of the cherts into bifaces of this shape and size would minimize the amount of lithics which would have to be transported. The differences in thinning of several of the bifaces would be related to the time spent at each locality. The similarity in the bifaces technology and morphology may indicate that one or several individuals in the group performed the flintknapping duties. In this scenario, the bifaces were accumulated over time and the cache is the end result of several chert procurement and reduction episodes. The cache would therefore represent a stockpile of curated raw materials accumulated over time by a mobile hunter-gatherer group. The inclusion of a utilized bifacial tool with the bifaces may support this hypothesis.

Of course, other plausible explanations can be put forth which might account for the variety of chert found within the cache. First, the cherts may have been found in a fairly close proximity to one another, therefore the bifaces could have been produced during one procurement episode. They would have then been transported to the cache locality for safekeeping. The lack of extensive transport wear on the bifaces may support this explanation. Second, suitable, high-quality cherts could have been purposefully collected and reduced into bifaces by an individual or group whom subsequently traded them into the Medina County area. Verification of these explanations is impossible due to the lack of exact sourcing and temporal data on the cache. The prehistoric individual's or group's reasons for caching the bifaces is also impossible to determine and explanations for its creation are speculative. Careful placement of the bifaces in a sand-filled pit suggests their importance or value. The sand-filled pit structure of the cache may indicate that the bifaces were being prepared for heat-treating but were abandoned for unknown reasons.

As suggested above, the cache may represent a hunter-gatherer group's stockpile of accumulated lithic raw materials, curated in the cache as insurance against anticipated shortage or need. The cache may have been created by a trader to safeguard the bifaces from thievery until return to the area was possible or until negotiations with a prospective buyer were concluded. Finally, as with the other 3 caches previously discussed, the cache may have been created for some ritual or ceremonial purposes.

CHAPTER 8

Summary and Conclusions

SUMMARY

Caches have been defined as accumulations of materials hidden or stored for future recovery or use (Schlanger 1981; Tunnell 1978). The act of caching usually represents an expression of the anticipation of future needs (Schlanger 1981). Caching behavior can be viewed as a response to a number of cultural and environmental variables in which the storage or hiding of materials, tools, equipment, food, etc., meets present or future, anticipated needs. The variables which are interrelated with caching behavior can include: settlement strategies and mobility, technology, exchange or trade, raw material preferences, belief systems, seasonality, or unequal resource distributions. These variables are often reflected in a cache's content and context. Caches therefore have direct implications for understanding a variety of cultural and behavioral processes. For example, the caching of season specific gear may be related to technological organization of a hunter-gatherer group (Binford 1979). The study of such caches can therefore yield data on specific behavioral processes, seasonality, and technology.

In Texas, a wide variety of caches have been reported. These include ritual or mortuary caches and caches of lithic tools or raw materials. Lithic caches reported from Texas include: caches of unmodified raw materials, caches of flakes or blades, caches tools, caches of bifaces, and mixed caches containing multiple lithic artifact types. Of these cache types, flake and biface caches are the most widely reported. Flake cache appear to be mainly Late Prehistoric in age while biface caches seem to range in age from the Middle Archaic to the Late Prehistoric. Biface caches, the focus of this thesis, are variable as to content and context. Reported biface caches from Texas have been found in isolated contexts and within habitation sites. The contents of these caches vary in the number of bifaces in the cache, the technology and stage of manufacture of the bifaces, the raw materials from which the bifaces were made, and the inclusion of other lithic tool forms. In general, most reported biface caches contain unfinished bifaces at the early to middle stages of reduction made from high-quality cherts. The differences or similarities in the contents and contexts of these caches may be related to various functional or temporal variables.

These variables were explored by examining biface technology and functions in prehistory as well as biface cache studies from Texas and other regions of the United States. The examination of biface technology illustrated a possible relationship between biface manufacturing stages and biface caches. As noted above, many caches contain bifaces at early stages of manufacture, a fact which may be related to the characteristics of early stage bifaces, that is, they are durable during transport and versatile in that they can be used as is or reduced into a variety of lithic tools. The caching of these bifaces may have implications for prehistoric transport mechanisms as well as technological organization. The technology of the bifaces recovered from caches may also be linked to specific reduction strategies, such as the production of large, bifacial knives.

The examination of biface cache studies and related literature from the United States and Texas revealed that biface caches have multiple functions. First, biface caches appear to be linked with prehistoric trade and exchange. Bifacial blanks of high-quality, exotic lithics were valuable trade commodities in many prehistoric economies (Clark and Fraley 1985; Rick and Jackson 1992; Shafer 1992; Turner and Hester 1985).

The trade of bifaces is most likely related to raw material preferences and uneven resource distributions, where prehistoric groups sought exotic materials for lithic reduction. In this scenario, biface caches may have served as hiding places to guard against theft. The value of such bifaces may also be related to their caching as "monetary items." In this scenario, the caches would function as money. Ownership may be exchanged but the caches were never unearthed due to their value (Button 1989).

Biface caches may have also functioned as stockpiles of raw materials or insurance caches created to fulfill present or future needs (Clark and Fraley 1985; Miller et al. 1991; Schlanger 1981). Bifaces may have been manufactured at a quarry or acquired through trade and subsequently cached in areas in which future needs were anticipated. The use of bifaces as a raw material would be an energetically efficient use of lithics in that they would minimize transport weight and could be reduced into a number of tools, used as is, or used as cores. Bifaces may have also been stockpiled as raw materials in order to limit a group's dependence on other groups controlling lithic resources (Kornfeld et al. 1990:302). Finally, bifaces appear to have been status items in many prehistoric societies and the caching of them, whether in mortuary or other contexts, may be related to an individual's status, group investment providing the furniture of the dead, or other ritual concerns (Bement 1991; Hester and Barber 1991; Taylor and Highley 1993). Biface caches may have been placed in sacred sites or isolated settings as an affirmation of group belief systems or territory.

CONCLUSIONS

Biface caches are a little understood archaeological phenomenon in Texas. Previous studies have focused on describing cache contexts and contents in a limited fashion. In order to attempt to gain a better understanding of biface cache functions and their cultural relationships, this study applied three scales of analysis, the microscale, mesoscale, and macroscale. At the micro and mesoscales, four biface caches from Texas were analyzed in order to investigate their characteristics, functions, and behavioral implications. This was also done to possibly elucidate any previously unrecognized patterns in cache biface attributes or biface cache functions. At the macroscale, biface cache studies and caching behaviors were examined as well as the distributions and possible chronologies of biface caches from Texas. The results of this study are numerous and variable.

The macroscale analysis revealed that, in Texas, biface caches appear to be mainly Middle to Late Archaic and Late Prehistoric in age. The lack of temporal data for most caches hindered the establishment of a definite chronology of biface caches. The proliferation of biface caches in these time periods may be closely linked with the use of large, bifacial tools by prehistoric groups, population increases and territorialism, and the increase in trade between groups occupying Texas and other areas of the United States (Hall 1981; Shafer 1992). Furthermore, the bifaces which constitute the majority of Texas biface caches are usually at early stages of manufacture and are made from high-quality chert, mainly central Texas Edwards cherts. This may be related to raw material preferences, unequal distribution of quality lithics in Texas, and specialized tool needs, and has direct implications for trade and transport mechanisms.

As noted in the summary discussion, biface caching may be related to numerous cultural and environmental variables and biface caches may have functioned in many ways. The lack of temporal and other contextual data for most biface caches makes investigating these variables difficult and speculative. There appear to be numerous possibilities from which one can choose to explain the function of a particular cache. However, attempts must be made to narrow the possibilities and make informed statements on possible cache functions. Inferences as to how caches functioned in Texas were made based on the review of biface cache literature and comparative and distributional studies attempted in Chapters 4 and 6.

The caching of bifaces in Texas appears to be related to four main factors, technological organization, settlement strategy, trade and exchange, and ritual behaviors. The variability in biface cache contents and contexts is related to these different factors. Many biface caches appear to be related to technological organization or settlement strategies, where materials are stockpiled or cached in places where future needs are anticipated. Based on comparisons of over 40 biface caches from Texas, it is hypothesized that biface caches of this nature would usually be found in or near habitation sites and contain lesser amounts of other, curated tools.

Many biface caches also appear to be related to trade or exchange of lithic materials between prehistoric groups in Texas. Evidence for this is includes: caches of bifaces made from exotic cherts, large biface knives made from exotic cherts, and ethnographic evidence of the trade of lithics between prehistoric Texas groups (Shafer 1992; Davenport and Wells 1918). Many authors, (Hall 1981; Hester and Barber 1991; Shafer 1992 to name a few), have hypothesized that large bifaces were being traded from central Texas groups to groups occupying south, east, and west Texas. The distributional study involving over 40 biface caches appears to support these hypotheses.

First, many biface caches are located on or near historic pioneer trails. The significance of this cannot be determined, due to the fact that the correspondence of historic trails or roads to prehistoric routes is unknown. However, this patterning does not appear fortuitous and may therefore have meaning. It is believed that further work on this subject could yield some very informative data on prehistoric trade and exchange. Second, the distribution of biface caches in east/east central Texas strongly suggests that bifaces of exotic central Texas cherts, possibly of a standardized form, were being traded or transported into the Caddo area of east Texas to be used in the manufacture of large knives. The absence of biface caches from northeast Texas may indicate that the bifaces were reaching their final destination and were being reduced into tools. This may support Hall's (1981) hypothesis of the presence of an import-export sphere operating between central and east Texas groups and those from the southeastern United States. It is hypothesized that biface caches related to trade would usually have the following characteristics: they are found in isolated settings, they contain large quantities of early to middle stage bifaces, the bifaces are made from exotic cherts, and the bifaces are unused.

Biface caches may also be related to mortuary or ritual behaviors. The inclusion of large bifaces in several reported burials and cemeteries indicates that the bifaces may have had significance as status items (Bement 1991; Taylor and Highley 1993). The inclusion of bifaces made from exotic cherts in burials in south Texas may be further evidence of the trade of bifaces in prehistory. The caches from the Loma Sandia Site suggest that bifaces may have been cached regardless of individual status and would therefore be offertory caches (Taylor and Highley 1993). If so, then other biface caches recovered from non-mortuary contexts may be offertory caches. Presently, more data is needed to assess this hypothesis. Finally, bifaces from Texas may have served as "monetary items" or territorial markers and may therefore have implications for the study of cultural boundaries (Bement 1991; Button 1989).

The results of the meso and microscale analyses of the four biface caches, the Fairview Park, Baird, Goldapp, and Riley caches, yielded interesting but inconclusive results. The significance of the similarities and differences between the four caches cannot be determined due to lack of contextual and associational data as well as the absence of many of the cache bifaces from the study. Technologically, the bifaces from the four caches are similar in that they are all Stage 3 or early Stage 4 bifaces, produced through well-executed soft hammer percussion techniques using high-quality Edwards cherts. Exact sourcing of the raw materials used in the manufacture of the cache bifaces proved difficult if not impossible. However, the Goldapp and Baird Cache bifaces were sourced with a fair degree of confidence. Flake scars on almost all of the bifaces are broad and deep, meeting at or crossing over the midline of the biface. With the exception of several of the bifaces from the Riley Cache, flake patterning on the bifaces is regular, with overlapping flake scars originating from the lateral edges of the bifaces. The flake patterns illustrate well how substantial, early stage thinning of the bifaces was accomplished through the removal of large flakes by well-executed soft hammer percussion techniques.

Bifaces from the four caches are generally subtriangular to ovate in morphology, with biconvex cross-sections and moderately sinuous lateral edges. The Fairview Park Cache bifaces have the most morphological variability, ranging from lanceolate to subtriangular to crescent in form. All of the bifaces from the caches are considered blanks, in that none exhibit morphologies indicative of a specific tool preform.

For the most part, the bifaces are large and relatively thin for early stages of biface reduction, possibly indicating that the main goal of the reduction strategy employed in their manufacture was to significantly reduce thickness while maintaining biface size . The resulting w/t ratios for the bifaces are therefore be fairly high, a fact which was extensively discussed in the analyses of the four caches. This hypothesis may be supported by the w/t ratio graphs of the Fairview Park, Goldapp, and Riley caches, Figures 7, 19, and 24, which show the bifaces clustering along the y-axes of the graphs, suggesting that biface thickness was a more important variable at the early stages of reduction than width. The Baird Cache w/t ratio graph, Figure 12, does not show this relationship very well but this may be due to the exclusion of six of the cache bifaces from the analysis. The production of such thin, early to middle stage bifaces may be related to transport cost decisions, where weight is minimized, or to specific temporally restricted reduction strategies. If the bifaces were intended for reduction into large, bifacial tools, such as those used in the Late Archaic, substantial thinning of the bifaces at early reduction stages may have been purposefully performed.

The w/t ratio graphs, with the exception of the Baird Cache graph (Figure 12), also show that the bifaces from each cache constitute sets of artifacts at or near the same stage of reduction. This may indicate that the bifaces from each of the three caches were produced as a group or by the same individuals. In an early study of the Fairview Park and Baird Caches performed by the author (Miller n.d.), it was hypothesized that the metrical attributes of the large bifaces from the caches may distinguish them as a separate biface cache type. However, the analysis of the four caches and the review of other biface caches from Texas has proved this hypothesis to probably be incorrect. Though the Fairview Park, Goldapp, and Baird Caches, as well as other caches noted in chapter 4, contained exceedingly large bifaces, metrical and comparative analysis could not find an distinct patterns in their bifaces' attributes or contexts which would indicate that they are a distinct, biface cache type.

Definite conclusions on the four caches' functions could not be reached but several inferences were made based on the nature of the contents and context of each cache. The Fairview Park Cache proved the most difficult to assess, due to an incomplete sample of the cache bifaces, the inability to exactly source the biface raw materials, and the lack of temporal and contextual data. It is hypothesized that the cache represents a stockpile of raw materials or an offertory cache. The Baird Cache appears to possibly be related to settlement strategy or technological considerations, and may represent an insurance cache of curated raw materials and tools. The bifaces, except for the one utilized biface, appear to have been produced with cherts local to the cache's location. As with the Fairview Park Cache, interpretations were hindered by the exclusion of half of the cache bifaces from the analysis.

The Goldapp Cache appears to be a stockpile of high-quality, central Texas cherts traded or transported over 40 miles into the Fayette County area. The bifaces from the cache, with the exception of the two large, crude bifaces, are a uniform set of artifacts at a common stage of reduction with common morphological and technological attributes, suggesting they were manufactured by only a few individuals. The presence of the large, crude bifaces, which are believed to be excellent raw material blanks or cores, further suggests that the Goldapp Cache is related to the trade or transport of quality lithic materials and raw material preferences. Definite conclusions as to the function of the Riley Cache could not be reached due to inexact sourcing of the bifaces' raw materials and lack of contextual data. However, the cache may be related to technological considerations, since it was found in a possible heat-treating pit and contained a utilized tool, or it may represent a stockpile of quality raw materials, traded or transported into the Medina County area.

In conclusion, this multiscale study of biface caches has illustrated how large amounts of information on cultural processes and systems can be gained through the study of caches. Though caches can present many interpretive problems, they can also yield unique data which are not commonly found in archaeological sites and assemblages. It is hoped that this study can contribute much to the existing database of biface caches in Texas and will be used and expanded on in the future.

References Cited

Bamforth, Douglas

1986 Technological Efficiency and Tool Curation. *American Antiquity* 51(1):38-50.

Banks, Larry D.

1990 From Mountain Peaks to Alligator Stomachs: A Review of Lithic Sources in the Trans-Mississippi South, the Southern Plains, and Adjacent Southwest. *Oklahoma Anthropological Society, Memoir 4.*

Beckes, Michael R.

1985 The Lower 30 Cache: A Preliminary Description and Lithic Analysis. *Archaeology in Montana* 26(2):62-72.

Bement, Lee

1991 The Thunder Valley Burial Cache: Group Investment in a Central Texas Sinkhole Cemetery. *Plains Anthropologist* 36(135):97-109.

Binford, Lewis R.

1979 Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research* 35(3):

1980 Willow Smoke and Dog' Tails: Hunter Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45(1):4-20.

Boldurian, Anthony T.

1991 Folsom Mobility and Organization of Lithic Technology: A View from Blackwater Draw, New Mexico. *Plains Anthropologist* 36(137):281-295.

Brown, Kenneth M.

1985 Three Caches of Guadalupe Tools from South Texas. *Bulletin of the Texas Archeological Society* 56:75-125.

1989 The Bingaman Cache of Stone Tools from Webb County. *La Tierra* 16(3):8-28.

Bryan, Kirk

1950 *Flint Quarries: the sources of tools and, at the same time, the factories of the American Indian.* Papers of the Peabody Museum of American Archaeology and Ethnology 17(3). Harvard University, Cambridge, Mass.

Butzer, K. W.

1982 *Archaeology as Human Ecology.* Cambridge University Press, Cambridge.

Button, Van T.

1989 The Byrd Mountain Lithic Cache (34GR149), A Find of Edward's Chert from Greer County, Southwestern Oklahoma. *Bulletin of the Texas Archeological Society* 60:209-216.

Calhoun, Cecil A.

1965 A Possible Cache of Flint from the Mouth of the Guadalupe River. *Newsletter of the Houston Archeological Society* 14:2-4.

Callahan, Errett

1979 The Basics of Biface Knapping in the Eastern Fluted Point Tradition: A Manual for Flintknappers and Lithic Analysts. *Archaeology of Eastern North America* 7(1):1-80.

Campbell, T. N. and T. J. Campbell

1981 *Historic Indian Groups f the Choke Canyon Reservoir and Surrounding Areas.* Center for Archeological Research, The University of Texas at San Antonio, Choke Canyon Series, vol. 1.

Clark, Gerald R. and David Fraley

1985 Three Lithic Material Caches from Southeastern Montana: Their Implications for Cultural Adaptation and Interaction of the Northwestern Plains. *Archaeology in Montana* 26(2):5-42.

Collins, Michael B.

1975 Lithic Technology as a Means of Processual Inference. In *Lithic Technology, Making and Using Stone Tools,* edited by Earl Swanson, 15-34. Mouton Publishers, The Hague.

Crabtree, D.E.

1982 *An Introduction to Flintworking.* Idaho State University Museum Occasional Papers 8. Idaho State University, Pocatello.

Davenport Harbert and Joseph K. Wells
1918 The First Europeans in Texas, 1528-1536. *The Southwestern Historical Quarterly* 22(2):111-142.

Dockall, John
n.d. Unpublished notes on the Bissell Collection Caches from the Museum of the Southwest. Notes in possession of the author.

Eberhard, Brent A.
1985 Analysis of the Elk Creek Cache. *Archaeology in Montana* 26(2):73-82.

Espy, Huston, and Associates, Inc.
1980 *An Assessment of the Cultural Resources of the Jewett Mine Project Area.* Document 8011, pp. 83-89. Espy, Huston, and Associates, Inc., Austin, Texas.

Fields, Ross C., L.W. Klement, Britt Bousman, David H. Journey, and M.M. Green
1990 *National Register Assessments of Eight Prehistoric and Four Historic Sites at the Jewett Mine, Freestone and Leon Counties, Texas.* Reports of Investigations 13. Prewitt and Associates, Inc., Austin, Texas.

Frison, George C. and Zola Van Norman
1985 The Wind River Burial and Cache: 48HO10. *Archaeology in Montana* 26(2):43-52.

Green, F. Earl
1963 The Clovis Blades: an Important Addition to the Llano complex. *American Antiquity* 29(1):145-165.

Green, Joe H.
1955 Stone Flint Caches in the Alibates Quarry, and a Stone Pestle. *Panhandle-Plains Historical Review* 28:78-81.

Hale, Thomas H., Jr., and Martha Doty Freeman
1978 *Cypress Creek: Reconnaissance Survey and Assessment of Archaeological and Historical Resources, Harris and Waller Counties, Texas.* Texas Archeological Survey Research Report 68. University of Texas at Austin.

Hall, Grant D.
1981 *Allens Creek: A Study in the Cultural Prehistory of the Lower Brazos River Valley, Texas.* Research Report 67, Texas Archeological Survey, The University of Texas at Austin.

Hammatt, Hallett H.
1970 A Paleo-Indian Butchering Kit. *American Antiquity* 35(2):141-152.

Hampton O.W.
1992 A Field Season with the Highland Una And Dani People and the Lowland Lake Sentani People. *Anthropological Explorations in Irian Jaya, Indonesia* Vol. 5. On file with the Explorer's Club, NY.

Hart, Alyce
1983 Eleven Caches from near Lamesa, Texas. *Transactions of the 18th Regional Archaeological Symposium for Southeastern New Mexico and Western Texas*, pp. 1-150.

Hartwell, W.T., Eileen Johnson, Vance T. Holliday, Ronald W. Ralph, and Sunny Lupton
1989 A Re-evaluation of Ryan's Site: A Disturbed Plainview Cache on the Southern High Plains of Texas. *Current Research in the Pleistocene* 6:14-15.

Hasskarl, Robert A., Jr.
1961 The Boggy Creek Sites of Washington County, Texas. *Bulletin of the Texas Archeological Society* 30:287-300.

Hester Thomas R.
1972 A Projectile Point Cache from Bexar County , Texas. *Texas Archeology* 16(4):6-7.

Hester, Thomas R. and Byron D. Barber
1990 A Large Biface from Atascosa County, With Comments on the Function of Such Artifacts in Prehistoric South Texas. *La Tierra* 17(2):2-4.

Hester, Thomas R. and Dorothy M. Brown
1988 A Cache of Bifaces from Southern Texas. *La Tierra* 12(4):3-5.

Horne, Sam
1936 A Hamilton County Cache. *Bulletin of the Central Texas Archaeological Society* 2:43.

Hughes, Jack T. and Patrick S. Willey
1978 *Archaeology at Mackenzie Reservoir.* Office of the State Archaeologist Survey Report 24, Texas Historical Commission, Austin.

Jackson, A.T. and A.M. Woolsey
n.d. Data on Caches of Flint Blades with Sketches by W.J. Warren. Unpublished Manuscript on file at the Texas Archeological Research Laboratory, the University of Texas at Austin.

Janes, Susan M.
1930 Seven Trips to Mount Livermore. *West Texas Historical and Scientific Society Publications* 3:8-9. Sul Ross State Teachers College, Alpine.

Johnson, LeRoy Jr.
1991 *Early Archaic Life at the Sleeper Archaeological Site, 41BC65 of the Texas Hill Country, Blanco County, Texas.* Texas State Department of Highways and Transportation, Highway Design Division. Publications in Archaeology, Report 39.

Kelly, R.L.
1988 The Three Sides of a Biface. *American Antiquity* 53:717-734.

Kelly, Thomas C.
1977 The High Lonesome Bead Cache. Appendix II in *An Archaeological Survey of the Radium Springs Area, Southern New Mexico,* edited by T.R. Hester. Center for Archaeological Research, University of Texas at San Antonio, Archaeological Survey Report 26. Center for Archeological Research, The University of Texas San Antonio.

Kornfeld, Marcel, Kaoru Akoshima, and George C. Frison
1990 Stone Tool Caching on the North American Plains: Implications of the McKean Site Tool Kit. *Journal of Field Archaeology* 17:301-309.

Labadie, Joseph H.
1988 Archaeological Investigations at the Shrew Site, 41WN73, Wilson County, Southern Texas. *Contract Reports in Archaeology* 2. Texas State Department of Highways and Public Transportation. Highway Design Division, Austin, Texas.

Lee, Richard B.
1979 *The !Kung San: Men, Women, and Work in a Foraging Society*. Cambridge, Cambridge University Press.

Lintz, Christopher
1978 Flake Blank Production Strategy of the Herrwald Site Cache. *Bulletin of the Oklahoma Anthropological Society* 27:179-206.
1981 Some Information on Lithic Caches from Western Oklahoma. Paper Presented at the Lithic Cache Workshop, Norman, Oklahoma.

Lippincott, Kerry
1985a Introduction. *Archaeology in Montana* 26(2):1-3.
1985b The Rattlesnake Ridge Burial/Biface Cache Site, 48WE487, In East Central Wyoming. *Archaeology in Montana* 26(2):53-61.

Lorrain, Dessamae
1963 A Cache of Blades from Carollton, Texas. *The Record* 18(1):2-7.

Lukowski, Paul D.
1988 *Archaeological Investigations at 41BX1, Bexar County*. Archaeological Survey Report 135. Center for Archaeological Research, The University of Texas at San Antonio.

Mallouf, Bob
1981 *A Case Study of Plow Damage to Chert Artifacts. The Brokeen Creek Cache, Hill County, Texas.* Texas Historical Commission, Office of the State Archeologist Report 33.
1989 A Clovis Quarry Workshop in the Callahan Divide: The Yellow Hawk Site, Taylor County, Texas. *Plains Anthropologist* 34(124):81-103.

McGraw, A. Joachim, John W. Clark, Jr., and Elizabeth A. Robbins
1991 *A Texas Legacy The Old San Antonio Road and the Camino Reales A Tricentennial History, 1691-1991*. Texas Department of Highways and Public Transportation, Highway Design Division, Austin.

Miller, Kevin A.
n.d. Two Large Biface Caches: The Fairview Park Cache (41TV9) and the Baird Cache. Unpublished report on file at the Texas Archeological Research Laboratory, the University of Texas at Austin.

Miller, Mark E., Michael D. Stafford, and George W. Brox
1991 The John Gale Site Biface Cache. *Plains Anthropologist* 36(133):43-56.

Minor, Rick and Kathryn Anne Toepal
1989 Exchange Items or Hunter's Tools? Another Look at Lanceolate Biface Caches in Central Oregon. *Journal of California and Great Basin Anthropology* 11(1):99-107.

Moore, Mrs. Glen E. and Mrs. Joe Ben Wheat
1951 An Archaeological Cache from the Hueco Basin. *Bulletin of the Texas Archeological Society* 22:144-163.

Mueggenborg, Henry
1991 Excavations at the Blue Hole Site, Uvalde County, Texas 1990. Master's thesis. The University of Texas at Austin.

Muto, Guy R.
1971 A Technological Analysis of the Early Stages in the Manufacture of Lithic Artifacts. Master's Thesis, Washington State University.

Newcomer, Mark H.
1971 Some Quantitative Experiments on Handaxe Manufacture. *World Archaeology* 3(2):85-94.

Patterson, Patience E.
A Lithic Reduction Sequence: A Test Case in the North Fork Reservoir Area, Williamson County, Texas. *Bulletin of the Texas Archeological Society* 48:53-82

Pearce, J.E.
n.d. Unpublished Manuscript on file at the Texas Archeological Research Laboratory, the University of Texas at Austin.

Pope, Leon
1993 Four Lithic Caches from Terry County, Texas. *The Cache*, Office of the State Archeologist 1:57-64.

Potts, Richard
1989 Home Bases and Early Hominids. *American Scientist* 72:338-397.

Prewitt, Elton R.
1981 Cultural Chronology in Central Texas. *Bulletin of the Texas Archeological Society* 52:65-89.

Rathje, William L. and Michael B. Schiffer
1982 *Archaeology.* Harcourt Brace Jovanovich, New York.

Richards, Julian D.
1991 *Viking Age England.* English Heritage, London.

Rick, John W. and Thomas L. Jackson
1992 A funny thing happened on the way from the quarry... Analysis of the Great Blades Cache from California. In *Stone Tool Procurement, Production, and Distribution in California Prehistory*, edited by Jeanne E. Arnold, 5-66. Perspectives in California Archaeology, Vol. 2, Institute of Archaeology, University of California, Los Angeles.

Sayles, E.B.
n.d. Unpublished notes on file at the Texas Archeological Research Laboratory, The University of Texas at Austin.

Schiffer, Michael B.
1987 *Formation Processes of the Archaeological Record.* University of New Mexico Press, Albuquerque.

Schlanger, Sarah H.
1981 Tool Caching Behavior and the Archaeological Record. Paper presented to the 46th Annual Meeting of the Society for American Archaeology, San Diego.

Scott, Sarah A., Carl M. Davis, and J. Jeffrey Flenniken
1986 The Pahoehoe Site: A Lanceolate Biface Cache in Central Oregon. *The Journal of California and Great Basin Anthropology* 8:7-23.
1989 Reply to Minor and Toepal: A View From Outside Lava Island Rockshelter. *The Journal of California and Great Basin Anthropology*11(1):107-113.

Shafer, Harry J.
1973 Lithic Technology at the George C. Davis Site, Cherokee County, Texas. Ph.D. dissertation. The University of Texas at Austin.
1992 Prehistoric Lithic Quarry as an Archaeological Resource: Bell and Coryell Counties, Texas. Unpublished manuscript on file at the Texas Archeological Research Laboratory, Austin.

Sharrock, F.W.
1966 *Prehistoric Occupation Patterns in SW Wyoming and Cultural Relationships with the Great Basin and Plains Culture Areas.* University of Utah, Department of Anthropology, Anthropological Papers, No. 77.

Sheets, Payson D.
1973 Edge Abrasion During Biface Manufacture. *American Antiquity* 38(2):215-218.

Slesick, Leonard M.
1978 A Lithic Tool Cache in the Texas Panhandle. *Bulletin of the Texas Archeological Society* 49:419-530.

Smith, Harlan I.
1984 Caches of the Saginaw Valley, Michigan. *Proceedings of the American Association for the Advancement of Science*, Vol. 17.

Tainter, Joseph A.
1978 Mortuary Practices and the Study of Prehistoric Social Systems. *In Advances in Archaeological Methods and Theory,* Vol. 1, edited by M.B. Schiffer, pp. 105-141. Academic Press, New York.

Taylor, A. J. and C. L. Highley
1995 Archeological Investigations at the Loma Sandia Site (41LK28), A Prehistoric Cemetery and Campsite in Live Oak County, Texas. 2 vols. Studies in Archeology 20. Texas Archeological Research Laboratory, The University of Texas at Austin. [Note: cited as 1993 in text, as volume had not yet been published]

Thomas, David H.
1983 The Archaeology of Monitor Valley, 1. Epistemology. *AnthropologicalPapers of the American Museum of Natural History* 58(1): 81-81.

Treece, Abbey
1993 *Cultural Resource Investigations in the O.H. Ivie Reservoir, Concho, Coleman, and Runnels Counties, Texas. Data Recovery from Non-ceramic Sites, vol. 3.* Research Report 346-III. Mariah Associates, Inc., Austin, Texas.

Tunnell, Curtis
1978 *The Gibson Lithic Cache from West Texas.* Texas Historical Commission, Office of the State Archaeologist Report 30.
1989 Versatility of a Late Prehistoric Flint Knapper: The Weaver-Ramage
Chert Cache of the Rolling Plains, in *Light of Past Experience: Papers in Honor of Jack T. Hughes.* Panhandle Archeological Society, Publication No. 5, Clarendon, Texas.

Turner, Ellen S. and Thomas R. Hester
1985 *A Field Guide to Stone Artifacts of the Texas Indians.* Texas Monthly Press, Austin.

Williams, Walter J.
1935 Archaeological Finds from near Waco. *Bulletin of the Central Texas Archaeological Society* 1:27-36.

Wisemann, Regge N., Dorothy Griffiths, and James V. Sciscenti
n.d. The Loco Hills Bifacial Core Cache from Southeastern New Mexico. Unpublished report in possession of the author.

Witte, Adolph H.
1942 Certain Caches of Flints from the North Texas Area. *Bulletin of the Texas Archeological and Paleontological Society* 14:72-76.

Wyckoff, Don G.
1984 *Oklahoma Biface Caches and Southern Plains Adaptations.* Paper given at the 1984 Plains Conference, Biface Cache Symposium. Lincoln, Nebraska.

Young, Bill and Michael B. Collins
1989 A Cache of Blades with Clovis Affinities from Northeastern Texas. *Current Research in the Pleistocene* 6:14-15.

Acknowledgments

The completion of this thesis would not have been possible without the help of numerous people. First, I would like to thank my thesis advisors, Dr. Thomas R. Hester and Dr. Michael B. Collins. Throughout my undergraduate and graduate school career at the University of Texas at Austin, Dr. Hester has freely given me both his time and advice on matters ranging from work to school. Dr. Hester suggested I write this thesis and, without his personal interest, research, comments, and encouragement, it would never have been completed. Dr. Hester has also been the driving force behind the publication of this thesis and I am very thankful for his efforts. Dr. Collins has also advised and assisted me in both my work and academic endeavors. Dr. Collins' personal interest, knowledge, and critical comments were invaluable to the completion of this thesis. Both Dr. Hester and Dr. Collins took time out from very busy schedules to assist me in my work and offer guidance when needed, and I am very appreciative.

I would also like to thank Mr. and Mrs. William Goldapp of La Grange, Texas for permitting me to examine and analyze the Goldapp Cache. The Goldapps were very helpful and kind in allowing me access to the cache and without their interest in archaeology, the cache may have never been reported. I am also very thankful to John Dockall at Texas A&M University for freely providing me with the data he collected on the caches from the Museum of the Southwest.

There are many people at the Texas Archeological Research Laboratory to whom I extend the deepest gratitude for their assistance and advice on my thesis research. First, I would like to thank A.J. Taylor, who provided invaluable data on biface caches from Texas and the Loma Sandia site. Without asking, A.J. personally took time from her work to provide information and offer advice. I would also like to extend my deepest thanks to Rosario Casarez and Carolyn Spock, who patiently assisted me with the library research for this thesis. I would also like to thank Elizabeth Andrews who performed all the photographic work, Dr. Darrell Creel for his advice on Texas prehistory and his assistance in my work with the TARL collections, Dr. Daniel Julien for his help with computers, Kelly Scott for her assistance with the formatting and printing of this thesis, and all other TARL employees who contributed to the effort.

A special thanks goes out to my fellow employees on the TARL-Burned Rock Midden Project, who, in the early 1990s offered advice and encouragement in my thesis work. In particular, I would like to thank Dr. Steve Black, who freely offered his knowledge and critical advice, allowing me to pursue my research while working at the laboratory. I am also grateful to Lori Douglass, whose constant encouragement and friendship helped me preserve my sanity while working on the document. Lori and her husband Sean also did an excellent job of drawing my maps.

My thesis would not have been possible without the assistance of several people with or formerly with Mariah Associates, Inc. in Austin. Mike Quigg provided helpful reference materials from the Northern Plains as well as offered valuable advice on biface caches. Dr. Christopher Lintz provided helpful reference materials on caches from Oklahoma as well as advice on caching behaviors. Carol Mills did a superb job on my artifact illustrations and her "student discount" will not be forgotten.

This thesis has been enriched by suggestions and comments from many of my fellow students at the University of Texas at Austin. They each deserve thanks: Steve Carpenter, Susan Dial, Brett Houk, John Lohse, Paul Maslyk, Matthew Tomaso, Lauren Sulliven, and Diane Wilson. I would like to extend a special thanks to Glenn T. Goode for his invaluable advice on raw material sources in Texas and lithic technologies. When asked for, Glenn always freely provided me with his time and assistance. I would also like to thank LeRoy Johnson for providing me with advice on statistics and examining many of the cache bifaces for use wear patterns.

For the publication of this thesis, a huge thanks to Bruce Moses for his work on the text, formatting, and graphics. Finally, I would like to extend my biggest thanks to my family, my wife Gina, sons Jake and Brady, daughter Ruby, my parents John and Grace, my brothers Jack, Tom, and Chris, and my sister Kathleen. My family have always supported my dreams and aspirations, whatever they may be, and provided the means of achieving them. Without my family's love and emotional support, this thesis would never have been completed.

July 23, 2008

Appendix I

A Review of Biface Caches from Texas

This appendix presents locational and descriptive data on 46 biface caches from Texas. The caches are listed in alphabetical order by county and the amount of available information on each cache varies. Biface size determinations, whether small, medium, or large, are arbitrary and are based on the lengths of the bifaces as well as their relative widths and thicknesses. In general, small is = <90 mm, medium is 90 to 150 mm, and large is = >150 mm. This Appendix is by no means a comprehensive listing of biface caches from Texas, considering the caches in possession of the State Archeologist, caches described in numerous published and unpublished site reports and monographs, and caches which have been discovered across Texas and gone unreported. The caches reported in this Appendix were compiled using previous cache studies (see references), the records and collections housed at TARL, and the authors personal research and communications. All biface caches listed here, with the exception of Bissell Cache #5, can be found in the distributional map of Texas (Figure 1).

Appendix I

Reported Biface Caches From Texas

Cache	Contents	Description	References
R.L. Jowell Farm Cache Anderson County	26 bifaces	Recovered in Historic Indian grave with metal gouge and knife from near Kickapoo Springs. Bifaces are long, narrow, and thin and were most likely used as knives.	Jackson and Woolsey n.d.
Baird Cache Callahan County	12 large bifaces	Found in prehistoric site with undetermined temporal context. Six bifaces missing, remaining six are large, thin, early stage bifaces. (see Chapter 7 for detailed description of cache bifaces)	Sayles n.d.
Running Water Draw Cache Castro County	120+ large bifaces	Found on the north side of Running Water Draw, the cache contained the bifaces, several "hide scrapers," a small quantity of flakes, and two large nodules. The tools are made from Edwards cherts, transported or traded into the area.	Green 1955:78-81; Tunnell 1978:43
George C. Davis Site Cherokee County	64 medium bifaces	Found near Mound A in the Late Prehistoric Caddo site, the bifaces are lanceolate in shape and are made from central Texas Edwards cherts. The bifaces are at the middle stages of reduction and may be preforms for Gahagan bifaces.	Shafer 1973:235-237
Johnson Cache Clay County	30 small to large bifaces	Found within the Trinity River drainage in Clay county, 20 miles east of Whitzitt Cache (see below). Bifaces are made from light blue Cretaceous flint. Bifaces appear to be at varying stages of reduction.	Witte 1942; Bryan 1950; Tunnell 1978

Cache	Contents	Description	References
Ft. Chadbourne Cache Coke County	47 medium to large bifaces 1 core 1 uniface	Found in a field approximately 150 to 250 m from Ft. Chadbourne in far northeast Coke county. The artifacts were found stacked point down "like dominos" in a small depression. The bifaces vary in shape, including subtriangular, ovate, and lanceolate, and vary in stage of reduction, from early stage to later, finished stages. In fact, one of the lanceolate, finished bifaces appears to be a possible Late Prehistoric knife. The artifacts are made from a variety of chert materials Many of the bifaces exhibit differing degrees of patination on one or more faces while others exhibit no patination. This may suggest that many of the bifaces were collected from other prehistoric sites by the person or persons who created the cache.	Dr. Darrell Creel, personal observation
Bissell Collection Cache #2 Concho County	23 large bifaces	Found in 1955 on a bank of Kickapoo Creek on the Doc Wimberley Ranch between the towns of Vancourt and Eden, Texas. The cache was located in the Kick site, a probable Middle Archaic site where Travis points have been recovered. The bifaces are made from tan, gray, and black Edwards cherts. The bifaces are lanceolate in shape, very large, one is over 25 cm in length, and appear to be at early and middle stages of bifacial reduction. The cache is presently housed at the Museum of the Southwest	Dockall n.d.
Cache No. 2 Dawson County	10 medium bifaces 1 uniface	Found in a multicomponent site located 12 miles west-northwest of Lamesa, Texas. The bifaces and uniface are made from gray and tan Edwards cherts. The bifaces are ovate in shape, well-made, and are at the middle to later stages of biface reduction.	Hart 1983
Cache No. 3 Dawson County	10 crude bifaces 3 modified flakes	Found in site on a plowed field ridge between 3 playa lakes 12 miles south of Lamesa. Bifaces are at very early stages of reduction, ranging in size from small to large.	Hart 1983

Cache	Contents	Description	References
Cache No. 9 Dawson County	17 medium to large bifaces	Found five and one half miles south of Lamesa on high point of land near playa lake. Bifaces are fairly thin at middle stages of reduction. Several bifaces appear to be made from large hard hammer flakes.	Hart 1983
Briscoe Cache, Dimmit County	4 medium bifaces	Found in site, no temporal context, bifaces found in tight cluster, the bifaces appear to have been heat-treated. They are ovate in shape and are at advanced early stages of bifacial reduction.	Hester and Brown 1988
Carrollton Cache Dallas County	19 medium bifaces	Found in Archaic age Carrollton Focus site on east side of the Elm Fork of the Trinity near Dallas-Denton county line. Bifaces are made of central Texas cherts.	Lorrain 1963
Goldapp Cache 41FY521 Fayette County	32 medium to large bifaces	Found in prehistoric site with multiple temporal contexts. Bifaces were found stacked in bedrock depression. Bifaces are made from chert from north Williamson, southern Bell counties. (see Chapter 7 for detailed description of cache bifaces)	K. Miller, personal observation
Reagan Cache 41FT1 Freestone County	15 medium bifaces	Cache was plowed up from the edge of an eroded hillside near a sulfur spring in Freestone county. The bifaces are lanceolate to subtriangular in shape, similar to the Mrs. Brice Reid Cache bifaces, and are at the middle stages of bifacial reduction.	Jackson and Woolsey n.d.
Cache No. 5 Gaines County	43 small to large bifaces	Found in the bottom of a playa lake 23 miles northwest of Lamesa, Texas and 1.5 miles southeast of Cedar Lake. Made of light to dark gray colored Edwards cherts, the bifaces vary in shape from sub-triangular to ovate and are at an early stage of biface reduction.	Hart 1983
Cache No. 8 Gaines County	9 large bifaces 3 Corner tang knives	Found in site located on high ridge overlooking a large playa lake 15 miles northwest of Lamesa, Texas. Bifaces are later stage, thin bifaces, many with pressure flaking. One biface is made from jasper while the remaining 11 are made from probable central Texas chert.	Hart 1983

Cache	Contents	Description	References
Bissell Collection Cache #6 Glasscock County	5 large bifaces 2 unifaces 3 hand axes	Found on the Hillger Ranch in Glasscock county, contextual data on the cache is lacking. The artifacts are made from tan and gray cherts of probable Edwards origins. The bifaces are at early to middle stages of bifacial reduction and are lanceolate and ovate in shape. The 3 handaxes are made from chert nodules, are roughly shaped, and exhibit heavy wear on their bit ends.	Dockall, n.d.
Hill Cache Hamilton County	93 large bifaces	Found in a site of unknown temporal context on Pecan Creek, 15 miles northwest of chert quarries in Coryell and Hamilton Counties. The bifaces are at rough, early stages of reduction and are made from black, gray, and translucent cherts.	Horne 1936
Lake Stamford Cache Haskell County	? bifaces	Bifaces of Cretaceous Edwards chert.	Tunnell 1978:45
Mrs. Brice Reid Cache 41HO23 Houston County	13 medium to large bifaces	Found in isolated context near Grapeland, bifaces were found within a huge clay ball. Made from yellow "beeswax" chert, the bifaces are fairly thin, lanceolate in shape, and are at a middle to later stage of biface reduction.	Jackson and Woolsey n.d.
Dan Bear Site Cache 41HO62 Houston County	16 medium to large bifaces 1 core	Found in a probable Archaic age site located on the property of Dan Bear 7 miles west/northwest of Crockett, Texas. The bifaces are made of white and gray chert and quartzite, are lanceolate in shape, and are at the early stages of biface reduction. The bifaces from this cache are very similar in morphology and technology to the Mrs. Brice Reid Cache bifaces.	TARL Site Records
Cache No. 6 Howard County	4 medium bifaces 5 unifaces	Found in isolated context on bank of Sulphur Draw, one and one half miles southwest of Vealmore, Texas. The artifacts are made from a gray flint and the bifaces are at the middle stages of biface reduction.	Hart 1983

Cache	Contents	Description	References
Whitzitt Cache Jack County	26 small to medium bifaces, 1 uniface,	Found in isolated context on Whitzitt farm in Jack county, cache was located underneath flat stone. Bifaces appear to have been made through percussion techniques, probably later stage billet percussion, and exhibit possible use wear. Twenty four specimens are made from blue Cretaceous cherts, while 4 are made from a brown chert	Witte 1942; Bryan 1950; Tunnell 1978
Thunder Valley Burial Cache (41KR241) Kerr County	14 large bifaces	Found in Middle Archaic fill with burial in Bering Sinkhole (41KR241). Bifaces are at early stages of reduction but are very thin. The bifaces are made from chert from the Segovia formation of the Edwards Limestones.	Bement 1991
Feature 2 Cache 41LN253 Leon County	13 small to medium bifaces	Found within site 41LN253, the bifaces are made from central Texas cherts and had probably been buried in a pouch or wrappings.	Fields et al. 1990
Jewett Mine Biface Cache (41LN44) Leon County	11 large bifaces	Found in an isolated context on a small hill, the 11 bifaces are made from a translucent chert, are subtriangular in shape, and are at an early stage of bifacial reduction. The bifaces average 13.4 cm in length, 5.9 cm in width, and 1.4 cm in thickness.	Espy, Huston & Assoc. 1980
Loma Sandia Site Caches 41LK28 Live Oak County	13 large bifaces	Three caches of large, thin, triangular bifaces were found within a middle Late Archaic cemetery site. The caches, features 195, 225, and 291, were not associated with any individual graves, and contained five, four, and four bifaces respectively. The bifaces are finely thinned and are made from Edwards cherts.	Taylor and Highley 1993
M.M. Reynold's Cache Madison County	6 large bifaces	The cache was plowed up in a field 5 miles northwest of Midway, Texas. The original number of bifaces in the cache is unknown, Six were loaned to the University of Texas in 1938 for study. The bifaces are very large, all over 18 cm in length, are at an early stage of biface reduction, and are made from "amber" chert.	Jackson and Woolsey n.d.

Cache	Contents	Description	References
Tx. Ranger Museum Cache Martin County	120 large bifaces 1 chert nodule	Found in an ash-filled pit in southern Martin county just north of the town of Stanton. The cache contained 15 very large, early stage bifaces, several over 25 cm in length, and 105 large, middle stage bifaces of lanceolate shape. The bifaces appear to be heat-treated, suggesting that the pit in which they were found was a heat-treating pit. The bifaces are made from brown, gray, and black Edwards cherts with orange cortex. The large bifaces were made from the same chert as the large nodule included in the cache.	K. Miller, personal observation
Cache No. 10 Martin County	24 large bifaces 1 chert nodule	Found in multicomponent open campsite approximately 27 miles southwest of Lamesa, Texas. The bifaces are made from a gray chert with a white cortex (probably Edwards chert) and are at early stages of biface reduction, many with cortex remnants.	Hart 1983
L.K. Stam Cache Mason County	26 large bifaces	Found by a WPA crew while working on the Fredonia Road 10 miles north of the town of Mason. The bifaces are very large, similar to the M.M. Reynold's and Baird Cache bifaces, and are at an early stage of biface reduction.	Jackson and Woolsey n.d.
Mayfield Kothman Cache Mason County	38 large bifaces	Found in a multicomponent campsite with artifacts ranging in age from the Early Archaic to Historic periods located near the Llano River, approximately 10 miles southeast of the town of Mason The cache was disturbed by plowing and recovered by the property owner, Mayfield. The bifaces are made from a dark brown to blue colored chert which may be local to the area. The bifaces are well-made, sub-triangular to ovate in shape, and are at the early to middle stages of biface reduction. One biface is very large and thin, exceeding 25 cm in length. The bifaces are very similar to the Fairview Park Cache and L.K. Stam Cache bifaces in shape, size, and flaking patterns.	Miller, personal observation
Chapline (?) Cache McLennan County	22 bifaces and scrapers	Found on the old Cadanhead farm 18 miles north of Waco, Texas on the Fort Graham road. Made of "beeswax" chert which is non-local to the area.	Williams 1935

Cache	Contents	Description	References
Riley Cache Medina County	29 medium to large bifaces	Found in isolated context in a sand-filled pit on a tributary to Atascosa Creek southwest of the town of Lytle, Texas. The bifaces are made from a variety of Edwards cherts and are at early to middle stages of biface reduction (see Chapter 7 for a detailed description of the cache bifaces).	TARL Collections
Roaring Springs Cache Motley County	? bifaces	Several Cretaceous Edwards chert bifaces, some stemmed.	Tunnell 1978:45
Bissell Collection Cache #1 Pecos County	12 large bifaces 2 flakes	Found by William M. Bissell in an open campsite with Early to Middle Archaic cultural debris located near the Pecos River. The bifaces are made from brown, tan, and gray Edwards cherts, average 12.5 cm in length, and are lanceolate in shape. The bifaces are at middle to late stages of biface reduction, several exhibiting fine pressure-flaking work. The flakes included in the cache are large primary flakes which retain cortex on their dorsal faces. The cache is presently housed at the Museum of the Southwest.	Dockall n.d.
Bissell Collection Cache #3 Pecos County	10 small bifaces 9 unifaces 2 utilized flakes	Found in the same site as Bissell Collection Cache #1, the artifacts from the cache are made from a variety of black and tan cherts of probable Edwards origin. Most of the bifaces were made from large flakes which have been shaped into lanceolate forms through percussion and pressure flaking. Several of the unifaces and flakes appear to have been utilized and 2 of the artifacts have been heat-treated. The cache is presently housed at the Museum of the Southwest.	Dockall n.d.
Bissell Collection Cache #5 Pecos County (?)	6 medium bifaces 4 modified chert nodules 2 unifaces	Found in a multicomponent site with projectile points ranging in age from Paleoindian to Late Prehistoric, the exact location of the site is presently unknown. The bifaces are made of light to dark brown Edwards cherts, are ovate in shape, and are at an early stage of biface reduction. The 4 chert nodules have a grainy, reddish orange cortex and have many of their margins removed by trimming. The unifaces and 2 of the bifaces appear to have been made from the same chert as the modified nodules. The cache is presently housed at the Museum of the Southwest.	Dockall n.d.

Cache	Contents	Description	References
Brownfield Cache Terry County	25 small to medium bifaces	Found in plowed field in site 41TY110, an Indian campsite. The bifaces are ovate to triangular in shape and are made from Edwards cherts.	Pope 1993
Caswell Cache Terry County	18 small to medium bifaces	Found approximately 19.2 km northeast of Brownfield, Texas, located 3m from the edge of a spring. The bifaces are ovate to triangular in shape and are at the early to middle stages of reduction. Most of the bifaces appear to be made from Edwards cherts but several may be made from cherts from New Mexico. One Chupadero pottery sherd may be associated with the cache.	Pope 1993
Tolliver Cache Terry County	16 small to medium bifaces 2 cores 2 scrapers 1 chopper (?)	Plowed up in a field somewhere in Terry County. All tools are made from Edwards cherts and the bifaces are at the middle stages of reduction.	Pope 1993
Willey Williams Site Cache, 41TV29 Travis County	12 medium to large bifaces	Found in a multicomponent habitation site, the cache is Middle Archaic in age based on two associated Pedernales points. The bifaces are made from two cherts, gray-blue and a tan in color. The bifaces are lanceolate in shape and are at the early to middle stages of biface reduction.	TARL Site Records
Fairview Park Cache 41TV9 Travis County	17 medium to large bifaces	Found in an isolated context on a terrace of the Colorado River in south Austin, Texas. The bifaces were arraigned in a pyramidal pile with a possible mano. The bifaces vary in shape and size, some of the larger bifaces exceed 20 cm in length, are made from Edwards cherts, possibly from a source as far away as 48 miles, and are at the early to middle stages of biface reduction. (see Chapter 7 for further details on the cache bifaces)	Jackson and Woolsey n.d.

Cache	Contents	Description	References
The Gus B. Mauermann Site Cache, 41TV30 Travis County	7 medium bifaces	Found within Mound 1 of Site 47, located 22 miles northwest of Austin, Texas. The bifaces are made of black Edwards chert, and are ovate in shape. Five of the bifaces are at early stages of bifacial reduction while two are the at middle to later stages of reduction. The bifaces had been carefully arraigned in a pit dug into the mound.	Jackson and Woolsey n.d.
F.N. Fosatti Cache Victoria County	10 bifaces	Found in an apparent isolated context in a gravel pit two miles southwest of Victoria in Victoria County. The artifacts are described as "thin, symmetrical and finely chipped knives."	Jackson and Woolsey n.d.
Boggy Creek Cache Washington County	4 large bifaces	Found in a road cut in the Central Midden site, a Middle Archaic to Late Prehistoric midden site with mussel shell, lithic tools and debitage, small amounts of fire-cracked rock, and pottery. The bifaces are lanceolate in shape and appear to be at the middle stage of biface reduction.	Hasskarl 1961