PALEO-ARCHAIC BROAD SPECTRUM ADAPTATIONS AT THE PLEISTOCENE-HOLOCENE BOUNDARY IN FAR WESTERN NORTH AMERICA

by

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A DISSERTATION

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Western Clovis and Western Stemmed cultural traditions, archaeologically indexed by fluted (Clovis) and stemmed projectile point complexes, represent the earliest human occupation documented in Far Western North America. The temporal closeness of Western Clovis, dated roughly from 11,500 to 11,000 B.P., to Western Stemmed complexes known as early as 11,140 to 10,800 B.P., has generated debate over the age and historical relationship of these cultures. The frequent co-occurrence of fluted and stemmed points along the lowest strandlines in pluvial lake basins has also led scholars to hypothesize an early development of the characteristically "Archaic" lake-marsh adaptations known from later periods.

Geoarchaeological research in the northern Alkali Lake Basin of south-central Oregon has addressed these issues of cultural chronology and economy by seeking data to test a paleoecological model of human land use in the basin from 11,500 to 7,000 B.P. The model posits a late Pleistocene Western Clovis settlement oriented to a small, shallow lake

or pond, followed by an early Holocene Western Stemmed occupation around a much larger lake and marsh fringe.

Data gathered through basin-wide site survey, stratigraphic studies, and high-resolution mapping of lake features and artifacts, support the model as proposed, and reveal a settlement pattern indicative of a "tethered" focus on local lake-marsh habitats. Research also verifies the horizontal separation of fluted and stemmed artifacts on different, sequent shorelines, indicating that Western Clovis occupation precedes Western Stemmed, although the two are close in time.

Data from Alkali Basin, and elsewhere, support the notion that Far Western cultures developed broad-spectrum adaptations much earlier than was once thought. This implies that the foundations of the Western Archaic were already in place by 11,000 B.P. In keeping with the adaptive flexibility embodied within the Desert Culture concept, environmental data further suggest that this "paleo-Archaic" lifeway developed quickly, not gradually, in response to punctuated climatic change and the emerging mosaic of regional habitats which characterized the Pleistocene-Holocene boundary, at a time when the desert as we know it was just coming into being.

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Research conducted since 1983 in the northern Alkali Lake Basin, and at the Dietz site, has involved the support and contributions of a multitude of students, faculty and friends, both amateur and professional, who donated many hours of time in the field and lab. Initial fieldwork at the Dietz site in May of 1983 was conducted as a volunteer effort in response to the urgings of Dr. John L. Fagan, to whom the site had been earlier reported by its discoverer, Dewey Dietz. Volunteers came from the University of Oregon and Washington State University, as well as various government agencies. The results of initial testing at the site by this large and enthusiastic crowd produced the data necessary to develop subsequent research proposals.

Much of the research was conducted under a cooperative agreement between the University of Oregon Anthropology Department and the Bureau of Land Management (BLM). William J. Cannon (Lakeview District BLM Archaeologist) and Dr. Richard C. Hanes (BLM State Office in Portland) were particularly instrumental in coordinating joint efforts and support. Throughout the project, the BLM has provided much in the way of logistical support: the Poor Jug trailer facility, vehicles, radios, mapping instruments, and the equipment and personnel needed in excavating all of the shoreline backhoe trenches. I am especially grateful to Bill Cannon for the countless hours of his time, for his endless enthusiasm and for his continuing support in the project.

I would like to extend special thanks to the crew members of the 1984, 1985 and 1986 field seasons, and to the many friends and volunteers who gave so much support and encouragement. In 1984, the research benefited from the cheery, indefatigable field assistance of Jane Benjamin, the mapping and survey expertise of Wayne R. Tucker, and the clarity and knowledge of visiting scholar Dr. Jonathan O. Davis. In 1985, University of Oregon Field School students and volunteers bore the brunt of the final surface collections and shore surveys in the basin. This motley crew of 10 was small but powerful and included Ron L. Barrows, Richard L. Bland, Deborah Day, Dan Flemmer, Lindley Keeney, William I. Morganti, Elaine Musselman, Amy Townsend, Wayne R. Tucker and John Witherspoon, assisted by Robert R. Musil. In fall of 1986, another small but powerful crew of three assisted in the final mapping and survey efforts: Monique Cushing, Kevin Donald and Wayne Tucker. Many other volunteers assisted on long weekends throughout the project. Those who were virtually omnipresent in the field include William Johnson and Carol J. Winkler. All of these people displayed a remarkably high level of energy, enthusiasm and good humor, despite the most rigorous and trying of conditions. This was their gift to me, and I owe them very much.

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CHAPTER I

CHRONOLOGY AND ADAPTATIONS OF WESTERN CLOVIS AND WESTERN STEMMED CULTURES IN THE FAR WEST

Introduction

Western Clovis and Western Stemmed cultural traditions, archaeologically indexed by fluted (Clovis) and stemmed projectile point complexes, represent the earliest human occupation accepted without controversy in Far Western North America. Fluted and stemmed point assemblages have been reported from a multitude of archaeological sites throughout the Far West, where their first appearance dates roughly from 11,500 and 10,800 B.P. The current distribution of reported sites includes western Washington and the Puget lowlands, southern British Columbia and the Columbia-Snake River systems in the north, as well as California and the entire Basin and Range province in the south (Figure 1).

Despite this abundance of sites, the temporal and cultural relationships of Western Clovis and Western Stemmed cultures have been unclear. In addition, there remain unanswered questions about the adaptive strategies and economic orientations of these early people at the Pleistocene-Holocene boundary in Far Western North America. Investigation of the age, historical relationship, economy and adaptations of Western Clovis and Western Stemmed cultures has been the major focus of the research presented here.

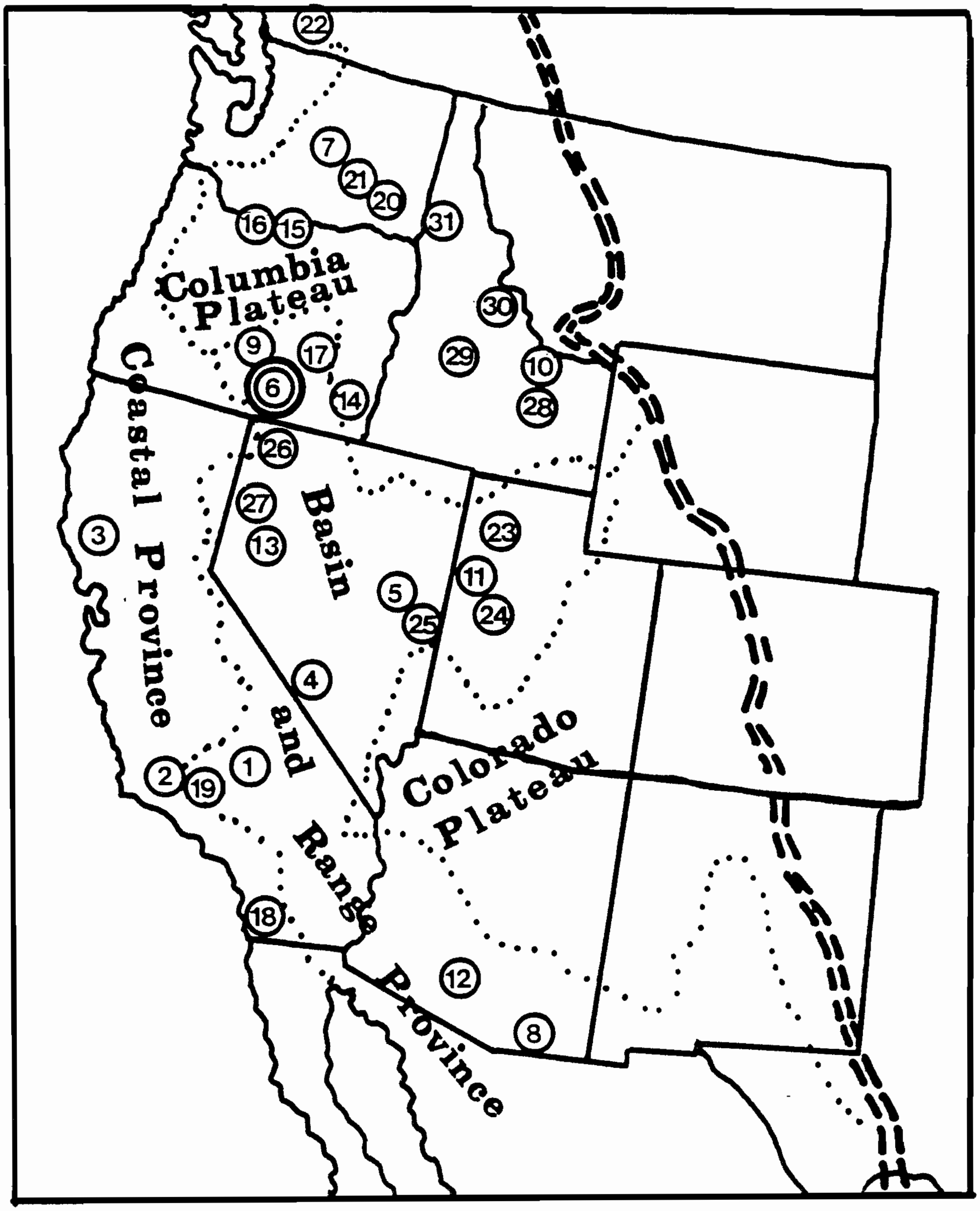


FIGURE 1. Map of Far Western North America Showing Locations of Major Western Clovis and Western Stemmed Archaeological Sites Discussed in Text (Adapted from Aikens 1983b and Jennings 1964). Numbers correspond to Site Locations Listed in Tables 1, 4 and 5.

Geoarchaeological research in the northern Alkali Lake Basin of south-central Oregon, and at the Dietz site (35 LK 1529), has addressed these issues of cultural chronology and economy by seeking data to test a paleoecological model of human land use in the basin from 11,500 to 7,000 B.P. (Figures 1 and 2). The northern Alkali Lake Basin offered an excellent opportunity to test such a model because it contained an unusually high abundance of Western Clovis and Western Stemmed artifacts and sites, in close association with well-preserved early postglacial landforms and lake stratigraphy. The Dietz site, in particular, has produced one of the largest and most diversified assemblages of fluted and stemmed points reported in the Far West.

The Dietz site is located 27 kilometers (km) southeast of the town of Wagontire in Lake County, Oregon, in the northernmost sector of a structural basin once occupied by Pluvial Lake Alkali (Figure 2). The site is an extremely large lithic scatter which dominates a small sub-basin of greater Alkali Lake Basin, and consists primarily of two series of artifacts assignable to the Western Clovis and Western Stemmed cultural traditions, respectively.

Since 1983, a continuing program of archaeological testing and controlled surface collection at the Dietz site has yielded a large diversified assemblage of early tools (Figures 3 and 4), including 60 fluted point fragments and 32 fragments of stemmed and shouldered points (Fagan 1984a, 1984b, 1986, 1988; Willig 1984, 1985, 1986, 1988). In addition, five crescent tools and 14 ground stone artifacts have been recovered in direct association with the Western Stemmed tool clusters (see discussion below under Western Clovis and Western

TOPOGRAPHIC SETTING OF DIETZ SITE
(35 LK 1529)

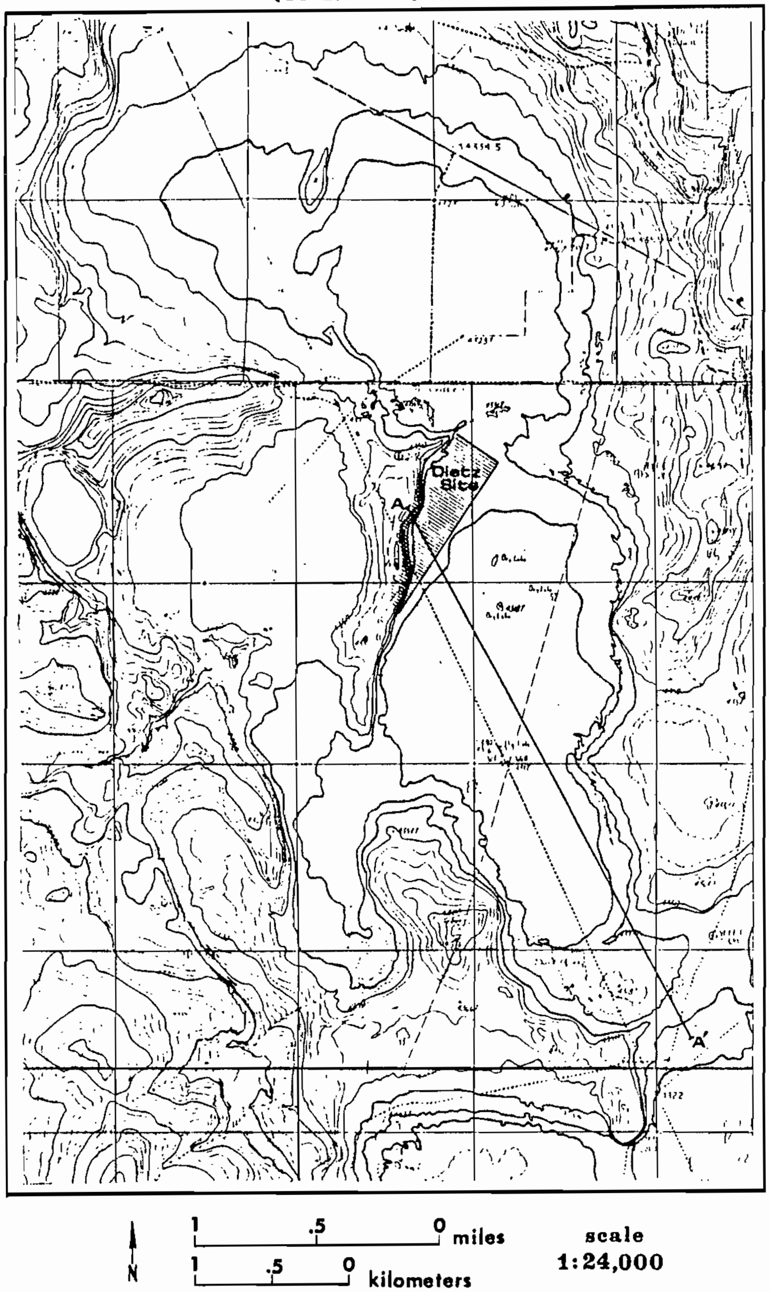


FIGURE 2. Location and Topographic Setting of the Dietz Site (35 LK 1529) in the Northern Sub-basin of Greater Alkali Lake Basin, Oregon

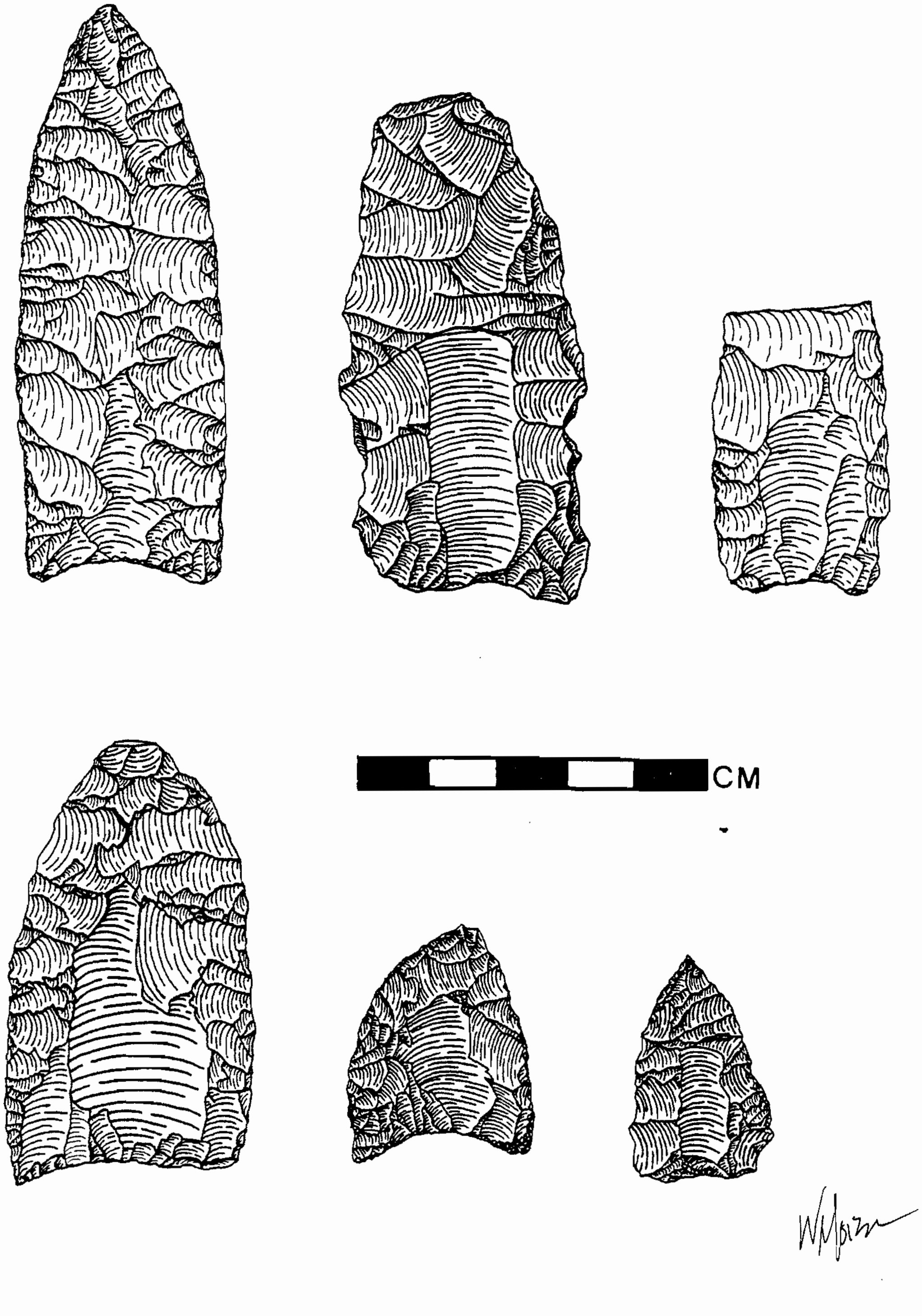


FIGURE 3. Sample of Western Clovis (Fluted) Points from the Dietz Site (35 LK 1529): a. #553-319; b. #553-258; c. #553-435; d. #553-262; e. #553-260; f. #553-241

FIGURE 4. Sample of Western Stemmed Artifacts from the Dietz Site (35 LK 1529): a. #553-425; b. #553-286; c. #553-45; d. #553-423; e. #553-418; f. #553-415; and g. #553-29

Stemmed Occupation at the Dietz Site). Appendices A through C contain site descriptions, mapping data, illustrations and proveniences for all time-diagnostic artifacts documented in the research.

The major focus of geoarchaeological research in the northern Alkali Lake Basin has been to reconstruct the Clovis and Stemmed-era landscape and lake history, and to determine the precise distribution and stratigraphic context of artifacts and sites upon that landscape. Detailed reconstruction of settlement pattern, paleoenvironment and artifact distributions has provided valuable inferences about chronology and paleoeconomy, thereby increasing our knowledge and understanding of these early cultures. The two major issues of concern have been the age and historical relationship of Western Clovis and Western Stemmed cultures, and the economic orientations which have been hypothesized for these people. These interrelated issues and questions are summarized below, in the context of the current data base, after a brief definition of terms. This is followed by a discussion of the significance of the Alkali Lake Basin research, as it bears upon these major questions and hypotheses.

Definition of Terms

Discussions of Far Western prehistory between 11,500 and 7,000 B.P. are handicapped by a plethora of overlapping terms and labels for regional phases, complexes, traditions, economies and time diagnostic point styles (Willig and Aikens 1988). To simplify matters, the following standardized terms and definitions for Far West, Western Clovis, Western Stemmed, Paleoindian, and Archaic are presented.

Far West

In this discussion, the Far West includes that region of North America extending west of the Rocky Mountains to the Pacific Coast, and from southern British Columbia to portions of northern Mexico (sensu Carlson 1983). It includes the Great Basin and Plateau of the Intermontane West, Desert West and Far West described by Daugherty (1962), Jennings (1964) and Aikens (1983b), with the addition of coastal areas in California, Oregon and Washington (Figure 1). Geographically, it also includes those portions of southern Arizona and New Mexico which fall within the Basin and Range province. However, the southwestern data are well known as part of the "core area" which fostered our original conception of Clovis-Llano culture (Sellards 1952). Therefore, for purposes of regional cross-comparison, the Southwest is set apart here.

Western Clovis

Fluted points similar to Clovis-Llano types defined in the Plains and Southwest were once considered rare in the Far West, but by 1960 the number of reported finds had greatly increased, indicating that Clovis culture was well established here, as elsewhere on the continent (Aikens 1978; Butler 1965; Clewlow 1968; Davis and Shutler 1969; Osborne 1956; Riddell and Olsen 1969; Shutler and Shutler 1959; Strong 1959; Tuohy 1968, 1969).

Fluted points are now known from many sites throughout California, Oregon, Washington, Idaho, Nevada and Utah. Some regional summaries are available (Aikens 1983b; Butler 1978; Carlson 1983; Jennings 1986; Madsen et al. 1976; Moratto 1984; Tuohy 1974, 1985, 1986; Wallace 1978; Willig et al. 1988). Most fluted point sites in the Far West consist of single isolated points. Only seven localities have produced major concentrations of undeniably Clovis artifacts (see locations and references for major sites on Figure 1 and Table 1.

In tool kits, typology, and intra-site variation, Far Western and Clovis-Llano fluted point assemblages compare closely. But the paleoenvironmental context and settlement pattern of major sites in pluvial lake basins suggests that Far Western complexes may represent a regional, adaptational variant of the specialized big-game hunting tradition implied by the term "Llano" (Willig 1989). Therefore, to designate a Clovis-age cultural tradition uniquely adapted to Far Western environments, the term "Western Clovis" is adopted here (sensu Tuohy 1974:98).

Western Stemmed

Complexes characterized by large stemmed, shouldered and lanceolate points, often associated with crescents and heavy core tools, have been reported from many sites throughout the Far West (Aikens 1978, 1982, 1983a, 1983b; Bryan 1965, 1979, 1980, 1988; Carlson 1983; 1988). These archaeological complexes have been variously defined as phases, horizons, complexes, traditions, or distinct regional styles. Figure 1 shows locations of major sites and the various terminological designations are listed below in Table 2.

TABLE 1. Major Western Clovis Sites in the Far West

Site/Location+		No. of points	References
	California		
1.	China Lake	49	Davis 1967, 1975, 1978a, 1978b
2.	Tulare Lake	49	Riddell and Olsen 1969 Wallace and Riddell 1988
3.	Borax Lake and Clear Lake	20	Fredrickson 1973, 1974 Fredrickson and White 1988 Harrington 1948 Meighan and Haynes 1968, 1970
	Nevada		
4.	Mud Lake and Tonopah Lake	58	Campbell and Campbell 1940 Kelly 1978; Pendleton 1979 Tuohy 1968, 1969, 1988b
5.	Lake Hubbs Sunshine Locality	21	Hutchinson 1988; Tuohy 1988b York 1975, 1976
	Oregon		
6.	Alkali Lake	60	Fagan 1984a, 1984b, 1986, 1988 Willig 1984, 1985, 1986, 1988
	Washington		
7.	Richey-Roberts Clovis Cache	14	Mehringer 1988a, 1988b, 1989
	Total no. points:	271	

+ Site locations plotted by number on Figure 1

TABLE 2. Various Terms and Designations for Western Stemmed Complexes in the Far West

Terms and Designations	References
<u>Phases or Horizons</u>	
Windust	Leonhardy and Rice 1970; Rice 1972
Cascade	Leonhardy and Rice 1970; Rice 1972
Milliken	Borden 1960, 1975
Fallon	Grosscup 1956
Birch Creek	Swanson 1972
Mt. Moriah	Bryan 1979, 1980, 1988
<u>Patterns</u>	
Borax Lake Pattern	Fredrickson 1973, 1974
<u>Complexes</u>	
San Dieguito	Rogers 1939; Warren 1967, 1968
Lake Mohave	Wallace 1962
Hascomat	Warren and Ranere 1968
<u>Traditions (T.)</u>	
Western Lithic Co-Tradition	Davis 1967; Davis et al. 1969
Western Pluvial Lakes T.	Bedwell 1970, 1973
Stemmed Point T.	Bryan 1980; Layton 1970
Great Basin Stemmed T.	Layton 1979; Tuohy and Layton 1977
Intermontane Western T.	Daugherty 1962
<u>Distinct Regional Styles</u>	
Lake Mohave	Amsden 1937
Silver Lake	Amsden 1937
Parman	Layton 1970, 1972, 1979
Cougar Mountain	Cowles 1959; Layton 1970,1972, 1979
Lind Coulee	Daugherty 1956
Haskett	Butler 1963, 1965, 1967
Windust	Rice 1972
Cascade	Butler 1961, 1962
Black Rock Concave Base	Clewlow 1968
Great Basin Concave Base	Pendleton 1979
Borax Lake Wide Stem	Fredrickson 1973, 1974
Birch Creek	Swanson 1972

Similar stemmed and shouldered forms are reported from the eastern U.S. (Kraft 1973; Mason 1962), especially the Great Lakes region (Fitting et al. 1966; Mason 1981), and from Great Plains Plano assemblages (Frison 1978; Frison and Stanford 1982). West of the Rockies, however, are a distinctive range of styles indigenous to the Far West. Within this broad pan-western distribution of stemmed and shouldered points -- from southern British Columbia to northern Mexico and from the Rockies to the Pacific Coast -- there is a certain diversity of regional styles, but all complexes share similarities in technology, typology, and implied settlement-subsistence patterns.

All of these stemmed point complexes can be seen as representing a single cultural tradition, referred to here as "Western Stemmed". The term is adapted from the technologically based concept of a Stemmed Point Tradition (Bryan 1980; Layton 1970) but with added implications for cultural-adaptational relationships as well. The word "western" is added to distinguish Far Western complexes from those in the Plains and Great Lakes regions, as well as from the Paijan, El Inga and Fell's Cave Fishtail point complexes of Central and South America (Lynch 1983; Mayer-Oakes 1966, 1984, 1986). Overviews of previously reported Western Stemmed sites have been published (Bryan 1965, 1980; Carlson 1983; Pendleton 1979; Willig et al. 1988), and additional new data are summarized in this paper.

Paleoindian

There are varied definitions of the term "Paleoindian". Some consider both fluted and stemmed complexes to be Paleoindian (Aikens 1983b; Price and Johnston 1988). Others reserve the term for complexes containing fluted points and extinct megafauna (Butler 1978, 1986; Carlson 1988; Krieger 1964; Tuohy 1968, 1974; Wormington 1957:3), implying the presence of a "Llano" big-game hunting lifeway (*sensu* Sellards 1952). As Simms points out (1988), usage of the term "Paleoindian" in conjunction with "Archaic" assumes an economic contrast between the two, and a cavalcade of recent studies suggests that this may not be the case (see discussion below under *The Problem of Reconstructing Adaptive Strategies*).

Scholars wishing to avoid the attribution of undemonstrated economic differences between Western "Paleoindian" and "Archaic" have used terms like "proto-Archaic" (Krieger 1964) or "pre-Archaic" (Elston 1982; Jennings 1986), but a significant contrast is still implicit. There is some sentiment (Simms 1988) that both "Paleoindian" and "Archaic" be dropped altogether in favor of regional time-environmental definitions.

To avoid further complications and confusion, the term "Paleoindian" is avoided in the following discussion in favor of more regional cultural definitions -- an approach first used by Sellards (1952) for the Plains Clovis-Llano cultures. Hopefully, older, more general terms like "Paleoindian" will eventually be supplanted in appropriate contexts by more specific regional definitions such as

Clovis-Llano, Folsom, Plano, Western Clovis and Western Stemmed. Additionally, the term "paleo-Archaic" is proposed here, to advocate the presence of broad spectrum (Archaic) adaptations among the earliest (paleo) occupants of the Far West.

Archaic

The term "Archaic" has also suffered from multiple definitions and applications, having been defined variably on the basis of: (1) a cultural level or "stage" first attributed to pre-ceramic, non-horticultural shell midden complexes (Ritchie 1932, 1944) and implying semi-sedentary foraging with diversified technology (Moratto 1984:277; Willey and Phillips 1958); (2) broad spectrum subsistence based on hunting-gathering-fishing (Aikens 1983b:193; Caldwell 1958; Harp 1983:121; Jennings and Norbeck 1955; Jennings 1964, 1974); (3) food collecting over hunting (Culbert 1983:499); (4) everything that follows specialized Paleoindian "big-game" hunting and precedes sedentary life with pottery and agriculture (Carlson 1988; Funk 1983:316; Lipe 1983:433; Muller 1983:379); and (5) intensive wild plant or seed processing (Aikens 1983b:165; Cordell 1984:123; Elston 1982), as marked by the appearance of milling stones which suggest a broadening of the diet to include more plant foods.

The term "Archaic" in this discussion is equated (<u>sensu</u> Jennings and Norbeck 1955 and Jennings 1964) with a broad-spectrum adaptive strategy -- an economic pattern in which a wide range of locally available plants and animals are exploited across regional microenvironments by populations familiar with their distribution and seasonality. The concept of "Archaic" as an adaptive strategy (rather than a "stage" or "period") does not bespeak any one particular tool kit, technology, ecosystem, settlement pattern or time period, and should not be equated with these except in the context of well known and well dated local sequences. Simms (1988) suggests that the term be abandoned altogether, but if specified as an economically-based adaptive strategy unconstrained by specific time periods or environmental conditions (Willig 1988), the term "Archaic" retains its original value and explanatory power.

Current Status of Western Clovis and Western Stemmed Chronology

Pre-Clovis Occupation in the Far West

Claims have been numerous for human occupation of the Far West much earlier than the time range of 11,500 to 11,000 B.P. assigned to Clovis assemblages in the Southwest and Great Plains (Haynes 1964, 1971; Haynes et al. 1984). But the evidence offered has always been questioned as to age or context of association, or the human workmanship of the specimens said to be artifacts (Aikens 1978, 1983b; Dincauze 1984; Jennings 1986). A recent summary of the history of this debate is provided by Willig and Aikens (1988).

One group of claims is comprised of "artifacts" or "features" found in clearly ancient settings, but human agency or workmanship is strongly questioned (Haynes 1973; Johnson and Miller 1958). Sites in California like Manly Terrace (Clements and Clements 1953), Texas Street (Carter 1957, 1980) and Calico Hills (Leakey et al. 1972) typify a larger number of "geofact" sites reported throughout the west, where a "few specimens that could be tenuously construed as artifacts of human workmanship have been selected from among thousands upon thousands of stones broken and flaked by natural processes" (Willig and Aikens 1988). Radiocarbon dates of 12,000 to 37,000 B.P. have been reported from "hearths" on Santa Rosa Island and other southern California sites (Carter 1957; Orr 1960, 1968), but natural burning in these wildfire-prone areas offers a more likely explanation for the observed "features" than does human agency (Cruxent 1962).

A second group of claims consists of artifacts of clearly human workmanship, but whose ages are questioned on the basis of poor context and on typological grounds. At the Scripps campus site (Carter 1957), the supposedly Pleistocene-age assemblage clearly resembled the La Jolla complex of the early Holocene (Wallace 1955). It was once thought that the Tule Springs site in Nevada had produced evidence of human occupation prior to 28,000 B.P. (Harrington and Simpson 1961), but subsequent research failed to produce artifacts demonstrably older than 11,000 B.P. (Shutler 1967).

The "Acheulian-like" bifaces reported from sites in southwestern Wyoming (Renaud 1940), Manix Lake, California (Simpson 1958, 1960) and the Chapala Basin of Baja California (Arnold 1957) have been offered as evidence for an ancient Old World Lower Paleolithic connection. But the enormous gap in time and space between these specimens and the youngest Acheulian assemblages in Asia makes the possibility of such an ancient connection highly implausible (Willig and Aikens 1988). Moreover, studies by Glennan (1976) and Sharrock (1966) have shown that these tools are quite clearly the remnants of primary lithic reduction activities.

The third group of pre-Clovis claims are comprised of undeniably cultural artifacts from numerous dry cave sites, in apparent association with extinct Pleistocene fauna and early radiocarbon dates. But materials incorporated within cave deposits are plagued by problems of stratigraphic disturbance, by both human and animal occupants, and by the collection, modification and use of older raw materials in the caves (bone, wood and tools) by later occupants at these sites (Rozaire 1969; Thompson et al. 1987).

The lowest occupation levels in Gypsum Cave, Nevada (Harrington 1933) were once thought to be of Pleistocene age, having produced atlatl darts and other tools in apparent association with the dung of now-extinct giant ground sloth. But this early age was later dispelled by a radiocarbon date of less than 3,000 B.P. on one of the atlatl darts (Berger and Libby 1967). At the Falcon Hill site in Nevada, the mandibles of Pleistocene-age shrub ox, incorporated within cultural deposits containing textiles, produced dates between 1,900 and 4,000 B.P. (Hattori 1982).

At Fishbone Cave in Nevada, the lowest occupation level (Level 4) produced an awl made from the splint bone of a now-extinct horse, as well as a horse mandible, in apparent association with two large chert knives, basketry fragments, and a human burial wrapped in juniper bark matting (Adovasio 1986; Orr 1952, 1956, 1974). The bark burial wrapping (L-245) produced two radiocarbon dates 10,900±300 B.P. and 11,250±250 B.P. and, for a long time, it was assumed that the burial and horse remains were contemporaneous. But a recent accelerator date of 12,280±520 B.P. on the horse mandible (Thompson et al. 1987) indicates that the burial probably took place well over 1,000 years after the horse's death. The evidence suggests that the bone tool was most likely manufactured by later occupants of the cave from fossil materials already present in the deposits.

Unquestionable artifacts in buried sites yielding radiocarbon dates earlier than the Clovis-Llano time horizon of 11,500 to 11,000 B.P. (Haynes 1964, 1969a, 1971; Haynes et al. 1984) are known in the Far West from only three places. These include Wilson Butte Cave in Idaho (Gruhn 1961, 1965), Fort Rock Cave in Oregon (Bedwell 1970, 1973; Bedwell and Cressman 1971), and Smith Creek Cave in Nevada (Bryan 1979, 1980, 1988). In all three cases, doubt has been cast on the association between artifacts and these earliest dates (Haynes 1969b, 1971; Irwin 1971). The dates from Fort Rock and Smith Creek Caves are discussed in the following section, because the associated tools closely resemble Western Stemmed point forms.

Wilson Butte Cave in Idaho produced two early dates on bone from cultural deposits of flakes, bifaces and/or modified bone said to be associated with the remains of Pleistocene horse and camel: (1) a date of 14,500±500 B.P. (M-1409) from Stratum C; and (2) a date of 15,000±800 B.P. (M-1410) from Stratum E (Gruhn 1965). But the cave deposits were described as being heavily disturbed by rodent activities, rendering the association of the dated bone and artifacts questionable (Gruhn 1961, 1965).

As demonstrated at sites like Gypsum Cave, Falcon Hill and Fishbone Cave, and by Dansie's (1988) work at Pyramid Lake, the co-occurrence of Pleistocene faunal remains with artifacts in the often-disturbed or deflated deposits of western sites does not necessarily mean they are of the same age. Therefore, only dates from culturally associated charcoal or artifacts themselves should be trusted (Dansie et al. 1988; Haynes 1988; Thompson et al. 1987).

Stratigraphic Context of Western Clovis Sites

Most fluted point sites in the Far West occur as surface finds which lack _in situ_ buried context. Exceptions to this include: (1) the newly discovered Richey-Roberts Clovis Cache in central Washington where fluted points have been recovered _in situ_ 70 cm below the surface, along with scrapers, bifaces and beveled bone shafts (Mehringer 1988a, 1988b, 1989); and (2) the recent re-discovery of a fluted point excavated from the "lowest levels" of Danger Cave by Elmer Smith in 1941 (Holmer 1986:94-95; Jennings 1957:47) (see discussion below).

Fluted points have been recovered from undated shallow depths (30 to 40 cm) in disturbed or deflated alluvial fan, stream or beach terrace deposits at four other sites in the Far West: Borax Lake (Fredrickson and White 1988; Harrington 1948; Meighan and Haynes 1968, 1970) and the Henwood site in California (Douglas et al. 1988); the Simon site cache in Idaho (Butler 1963; Butler and Fitzwater 1965; Woods and Titmus 1985); and the Old Humboldt site (26 Pe 670) at Rye Patch Reservoir in Nevada (Davis 1984; Rusco and Davis 1987).

At the Old Humboldt site in Nevada, both fluted and stemmed points were recovered in situ in shallow, buried overbank alluvium deposited on the highest terrace of the Humboldt River. However, Davis notes that the tools were not found on a single contact surface or bedding plane, but were spread throughout the 30 cm of alluvium which had also been subjected to aeolian processes and animal burrowing (Davis 1984; Davis and Rusco 1987:41). Therefore, the exact surface of origin for the fluted and stemmed points is not clear.

Component 1 at the Henwood site (4-SBr-4966) in California's Mohave Desert yielded one fluted point, two Lake Mohave points and a hearth which produced two dates of 8,470±370 B.P. (AA-648) and 4,360±280 B.P. (AA-798) (Warren et al. 1989). The younger date has been rejected as being contaminated (Douglas et al. 1988) while the older date is accepted as being in accord with the time range known for Lake Mohave complexes. But the association of the fluted point with this Lake Mohave component has been questioned because non-projectile tools characteristic of Lake Mohave and Pinto assemblages were also recovered, and a second fluted point was collected on the surface of the site (Douglas et al. 1988; Warren and Phagan 1988).

Absolute Dating of Western Clovis Sites

The vast majority of Western Clovis sites consist of isolated surface finds of single specimens which lack datable, buried context. The time range of 11,500 to 11,000 B.P. for Clovis occupation in the Southwest is well-dated from sites like Lehner and Murray Springs in from 11,840 to 10,640 B.P. (Haynes et al. 1984:188). Elsewhere, in the Far West, there are a few radiocarbon dates indirectly associated with fluted points, but still no dates that have been well documented as coming from reliable stratigraphic contexts and clear associations with fluted points. Available radiocarbon dates for the southwestern Clovis sites are listed in Table 3, followed by a list of radiocarbon dates of Clovis age from sites throughout the Far West (Table 4).

TABLE 3. Radiocarbon Dates Associated with Southwestern Clovis Sites

Site/Location+	Date (B.P.)	Lab No.	**	References
8. Lehner Site*	11,470±110	SMU-308	CH	Haynes et al. 1984
Arizona	11,170±200	SMU-264	CH	"
	10,710± 90	SMU-340	CH	"
	10,700±150	SMU-297	CH	"
	10,620±300	SMU-347	CH	"
	11,080±230	SMU-196	CH	"
	10,950±110	SMU-194	CH	"
	10,950± 90	SMU-290	CH	"
	10,860±280	SMU-164	CH	"
	11,080±200	SMU-181	CH	"
	10,940±100	A-378	CH	"
	10,770±140	SMU-168	CH	"
8. Murray Springs	11,190±180	SMU-18	CH	Haynes et al. 1984
Arizona	11,150±450	A-805	CH	"
	11,080±180	Tx-1413	CH	"
	10,930±170	Tx-1462	CH	"
	10,890±180	SMU-27	CH	"
	10,840±140	SMU-42	CH	"
	10,840± 70	SMU-41	CH	"
	10,710±160	Tx-1459	CH	"

+ Site locations plotted by number on Figure 1

* Three groups represent three separate features sampled

** Type of material dated (CH = charcoal)

TABLE 4. Radiocarbon Dates of Clovis Age in the Far West*

Site/Location+	Date (B.P.)	Lab No.	**	References
9. Cougar Mt. Cave No.2 35LK55/A Oregon	11,950±350	Gak-1751	CH	Bedwell 1970, 1973 Bedwell and Cressman 1971
10. Jaguar Cave Idaho	11,580±250	n.d.	CH	Butler 1978; Dort 1975 Sadek-Kooros 1966 Wright and Miller 1976
11. Danger Cave 42TO13 Utah	11,453±600 10,270±650	C-609++ M-202++	US CH	Jennings 1957 "
2. Witt Site CAKin32 California	11,380± 70	n.d.	BN	Wallace and Riddell 1988
12. Ventana Cave Arizona	11,300±1200	A-203	CH	Haury 1950 Haury and Hayden 1975
13. Fishbone Cave, NV 26Pe3e	11,200±250	L-245	SS	Orr 1956, 1974 Thompson et al. 1987
9. Connley Cave #4B 35LK50/4B Oregon	11,200±200	Gak-2141	CH	Bedwell 1970, 1973 Bedwell and Cressman 1971

+ Site locations plotted by number on Figure 1

* Dates are listed in general order from oldest to youngest. Note that only in the case of Danger Cave and the Witt Site are Clovis points present at the site

** Type of material dated (CH = charcoal; SS = shell; BN = bone; US = uncharred sheep dung)

++ Fluted points would be bracketed between these two dates

Two fluted points were excavated from the "lowest levels" of Danger Cave, Utah by Elmer Smith in 1941, but the points disappeared before they could be examined (Jennings 1957:47). Recently, one of the fluted points was rediscovered by Utah Museum of Natural History staff, having been misplaced in an unrelated collection (Figure 4b in Holmer 1986:95). Jennings (1957:47) cautions that precise one-to-one correlation of Smith's excavation levels with those of later excavations cannot be guaranteed; but six radiocarbon dates from the lowest levels of Danger Cave (Level I: Sands 1 and 2) would bracket a fluted point from these levels between 11,453±600 B.P. (C-609) and 10,270±650 B.P. (M-202).

One possibility of an early radiometric date for a Clovis campsite in the Far West is a uranium series date (230Th) of 11,380±70 B.P. on human skeletal remains from the Witt site at Tulare Lake, California (Wallace and Riddell 1988). The authors are cautious, however, about the dating results and the association of the human bones with Clovis points known from the site.

Other sites in the Far West have produced cultural deposits dating within the Clovis time range documented at Southwestern sites, but all of these lack the necessary association with Clovis type fluted points (Table 4). At Ventana Cave in Arizona, the Ventana complex from the lowest occupation levels in the volcanic debris layer dates to 11,300±1200 B.P. (A-203) (Haury and Hayden 1975). No fluted points were recovered, but the deposit produced remains of bison, sloth, horse and tapir in association with a leaf-shaped point and an unfluted concave based point (Haury 1950).

A hearth from Cougar Mountain Cave No. 2 in Oregon was dated 11,950±350 B.P. (Gak-1751) (Bedwell and Cressman 1971:18) and cultural charcoal from Connley Cave 4B dated 11,200±200 B.P. (Gak-2141) (Bedwell 1970, 1973). At Jaguar Cave, Idaho, remains of extinct camel, marten and arctic lemming were recovered from a deposit which also produced a hearth date of 11,580±250 B.P. and a "flaked antler tine with cut marks" (Butler 1978:61-62; 1986:128). As mentioned above, Fishbone Cave, Nevada produced a date of 11,200±250 B.P. (L-245) on twined juniper bark wrapped around a human burial in association with basketry fragments and two large knives made of crypto-crystalline silicate (CCS) material (Orr 1956, 1974).

Farther afield, four Folsom type fluted points were recovered at Owl Cave (Wasden site) in eastern Idaho. Bone collagen from the associated elephant bones produced two dates of 12,850±150 (WSU-1281) and 12,250±200 (WSU-1259), and a later date of 10,920±B.P. (WSU-1786) (Butler 1978, 1986; Miller and Dort 1978). The older dates are questioned because of differences in NaOH pretreatment, and because the bones on which they were obtained occurred stratigraphically above the bone which produced the younger date of 10,920 B.P. Also, the younger date is in accord with the known time range for Folsom on the Plains (Butler 1978:59-61). The find is unique because, with the exception of Idaho and the eastern Great Basin, Folsom fluted points are curiously rare in the Far West and are generally associated with bison, not elephant (Butler 1986; Hutchinson 1988; Titmus and Woods 1988; Tuohy 1985, 1986, 1988b; Willig 1989).

Stratigraphic Context and Absolute Dating of Western Stemmed Sites

Unlike fluted point sites, Western Stemmed assemblages have been recovered in buried context from a number of sites throughout the Far West. Most of the sites which have produced radiocarbon dates for Western Stemmed occupation in the Far West have been cave sites (Table 5). This tabulation of radiocarbon dates, the most comprehensive reported so far, shows that the dates for Western Stemmed complexes are spread across a broad time range from 11,000 to 7,000 B.P. Because of the potential problems of stratigraphic disturbance in western cave deposits, only dates from buried components directly associated with well defined stemmed and shouldered forms have been included in Table 5. The more generalized leaf-shaped points were not included, because their temporal range is broader and much less secure.

There are numerous other sites in the Far West which have produced radiocarbon determinations indirectly associated with Western Stemmed points, or with the more nondescript lanceolate forms. Recent work at Handprint Cave (26 HU 1836), Nevada has revealed a Western Stemmed occupation in the shallow silt deposits of a hidden, interior chamber whose walls are decorated with ochred pictographs (Gruhn and Bryan 1988). Test excavations in the upper 30 cm of deposits in this chamber yielded much charred wood, bovid and human hair and a large stemmed projectile point made of white CCS. The find is an intriguing one but the charcoal date of 10,740±70 B.P. (Beta-21885) from 10 to 20 cm depth can only provide a lower limit for the stemmed point since the point was recovered from the level above (0 to 10 cm).

TABLE 5. Radiocarbon Dates Associated with Western Stemmed Complexes in the Far West

Site/Location+	Date (B.P.)	Lab No.	**	References
<u>Oregon</u>				
9. Ft. Rock Cave 35LK1	10,200±230	Gak-2147	CH	Bedwell 1970, 1973 Bedwell and Cressman 1971
	9,053±350	C-428	SH	" " "
	8,550+150	Gak-2146	CH	" " "
9. Connley Cave #5B 35LK50/5B	9,540±260	Gak-1744	CH	Bedwell 1970, 1973
	7,430±140	Gak-2135	CH	" "
9. Cougar Mt. Cave No.1	8,510±250	UCLA-112	OG	<u>Radiocarbon</u> 1962:111
14. Dirty Shame R.S. 35ML65	9,500± 95	SI-1774	CH	Aikens et al. 1977
	8,905± 75	SI-1775	CH	Hanes 1988a, 1988b
	8,865± 95	SI-2265	CH	" " "
	8,850± 75	SI-2268	OG	" " "
	7,925± 80	SI-1768	OG	" " "
	7,880±100	SI-1773	CH	" " "
	7,850±120	SI-1771	CH	" " "
15. Wildcat Canyon 35GM9	10,600±200	Gak-1322	OG	Cole 1965,1967,1968
	9,860±510	Gak-1325	OG	Dumond & Minor 1983
	8,100±130	Gak-1324	OG	" " "
	7,370±190	Gak-1326	OG	" " "
	7,890±300	Gak-2240-43	CH	" " "
16. Fivemile Rapids 35WS8	9,785±220	Y-340	CH	Cressman et al. 1960
	7,675±100	Y-341	CH	"
17. Harney Lake	8,680± 55	USGS-461B	OG	Gehr 1980 Greenspan 1985

\+ Site locations plotted by number on Figure 1

** Type of material dated (CH = charcoal; SH = shell; OG = uncharred organic materials; BN = bone; CD = charred dung; BA = basketry)

TABLE 5. Western Stemmed Radiocarbon Dates (continued)

Site/Location+	Date (B.P.)	Lab No.	**	References
California				
18. C.W.Harris	9,030±350	A-722A	CH/OG	Warren 1967
Site	8,490±400	A-725	CH/OG	"
SDi-149	8,490±400	A-724	CH/OG	"
19. Buena	8,200±400	LJ-1357	SH	Fredrickson and
Vista Lk.	8,200±400	LJ-1356	SH	Grossman 1977
Ker-116	7,600±200	I-1928	SH	"
Washington				
20. Marmes	10,640±300*			Rice 1972
R.S.	a.10,810±300	WSU-363	SH	Sheppard et al. 1984
45FR50	b.10,475±300	WSU-366	SH	" " "
	9,370±200*			" " "
	a. 9,540±300	Y-2210	SH	" " "
	b. 9,200±110	Y-2482	SH	" " "
	8,850±300*			" " "
	a. 9,010±300	W-2207	SH	" " "
	b. 8,700±300	W-2208	CH	" " "
	7,850±300	WSU-211	SH	" " "
	7,550+300	WSU-120	SH	" " "
21. Lind	8,700±400+	C-827	BN	Daugherty 1956
Coulee	8,720±200	WSU-1709	BN	Irwin & Moody 1978
45GR97	8,600± 65	WSU-1422	BN	" "
(+ = average of two readings: 9,400±940 and 8,518±460)				
British Columbia				
22. Milliken	9,000±150	S-113	CH	Borden 1960, 1975
Site	8,150±310	S- 47	CH	" "
DjRi-3				
Utah				
11. Danger Cave	9,789±630	C-611	CH	Jennings 1957
42TO13	8,960±340	C-640	CD	"
23. Hogup Cave	7,815±350	GX-1287	OG	Aikens 1970
42BO36				
24. Sevier	9,570±430	Beta-12987	SH	Simms 1986
Desert	7,930±110	Beta-12988	SH	Simms and Isgreen
42MD300				1984

TABLE 5. Western Stemmed Radiocarbon Dates (continued)

Site/Location+	Date (B.P.)	Lab No.	**	References
<u>Nevada</u>				
25. Smith	11,140±200	Tx-1637	CH	Bryan 1979,1980,1988
Crk Cave	10,600±195*			" " "
26WP46	a.10,740±130	Birm-702	CH	" " "
	b.10,460±260	Gak-5444b	CH	" " "
	10,330±190	Tx-1638	CH	" " "
	9,940±160	Tx-1420	CH	" " "
26. Last	8,610±140*			Layton & Davis 1978
Supper	a.8,960±190	Tx-2541	CH	Layton 1970, 1979
Cave	b.8,260± 90	WSU-1706	CH	" " "
26HU102	8,790±350	LSU 73-120	SH	" " "
	8,630±195	WSU-1431	SH	" " "
27. Falcon Hill	9,540±120	UCLA-675	BA	Hattori 1982
Shinners	8,380±120	UCLA-672	BA	"
Site A				
26WA198				
<u>Idaho</u>				
28. Wasden	8,160±260	WSU-560	CH	Butler 1968, 1978
Site, or	7,750±210	WSU-641	CH	Miller and Dort 1978
Owl Cave	7,100±350	M-1853	BN	" " "
10BV30				
28. Bison R.S.	10,340±830	WSU-760	BN	Swanson 1972
Veratic	7,222±229	WSU-n.d	OG	"
R.S.(Birch Creek Sites)				
29. Redfish	10,100±300	WSU-1396	CH	Sargeant 1973
Lake	9,860±300	WSU-1395	CH	"
Overhang	8,060±285	WSU-1397	CH	"
10CS201				
30. Beta R.S.	8,175±230	WSU-402	CH	Swanson & Sneed 1966
Shoup Site				
31. Hatwai I	10,820±140	Tx-3159	CH	Ames et al. 1981
10NP143	10,110±720	Tx-3160	CH	"
	9,880±110	WSU-2440	CH	"
	9,850±870	Tx-3158	CH	"
	9,320±1830	Tx-3081	CH	"

At Fort Rock Cave in Oregon (Bedwell 1970, 1973; Bedwell and Cressman 1971) the controversial date of 13,200±720 B.P. (Gak-1738) was obtained from charcoal embedded in basal Pleistocene gravels in the lowest level (Level 10) of the cave. It appears to date a small assemblage of flakes and flake tools, a mano fragment and two fragmentary projectile points, one of which clearly resembles a re-sharpened Western Stemmed form (Figure 5b). Bedwell had classified second point as fluted and Folsom-like (Figure 5a), but this identification was later demonstrated by Fagan (1975) to be a mistaken one.

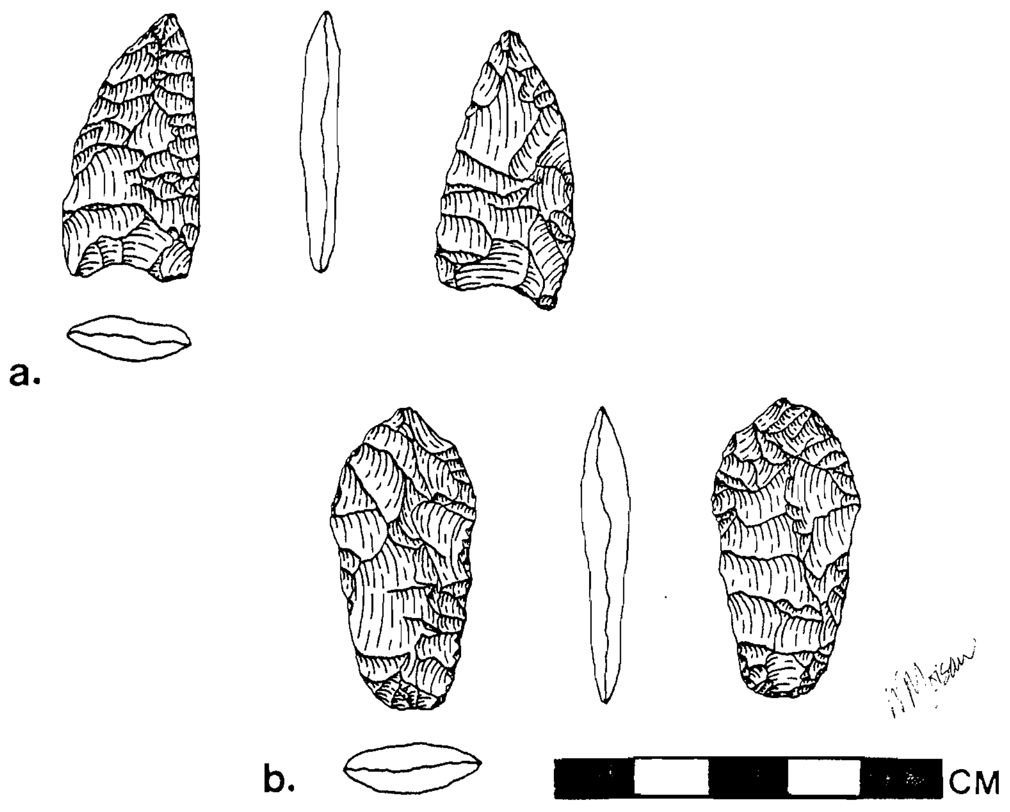


FIGURE 5. Western Stemmed Point Fragments from the Earliest Level (Level 10) on Top of Basal Gravels at Fort Rock Cave (35 LK 1): a. Small, unfluted concave based point with some basal thinning (#11-10/3-1); b. Re-sharpened Lake Mohave or Cougar Mountain point (#11-10/3-2)

For this earliest assemblage from Level 10 at Fort Rock Cave, there is no specific documentation to either prove or disprove the possibility of intrusive mixing of the artifacts and charcoal with earlier or later levels in the cave's deposits. Thus, the validity of the association of the Level 10 tools with the 13,000 B.P. date remains open to question (Aikens 1982:143; Haynes 1971). Furthermore, cultural charcoal from the overlying Level 8 produced a date of 10,200±230 B.P. (Gak-2147) in undoubted association with Western Stemmed artifacts (Table 5).

Five dates on culturally deposited hearth charcoal from Smith Creek Cave, Nevada bracket the Mt. Moriah occupation zone between 9,940±160 B.P. (Tx-1420) and 11,140±200 B.P. (Tx-1637). This latter date is the oldest one reported in the Far West in direct association with Western Stemmed materials (Bryan 1979, 1980). Recently, Bryan (1988) reports three dates of 10,840±250 B.P. (Riddl-795), 12,060±450 B.P. (Riddl-797) and 14,220±650 B.P. (Riddl-796) on bovid, camelid and artiodactyl hair samples from the same occupation level. Previously reported dates from the same zone, on non-hearth organics, range from 11,680 B.P. to 12,600 B.P.

Bryan (1979, 1980) contends that this set of pre-Clovis dates demonstrates that stemmed points have an antiquity greater than fluted points. But the cultural association of the hair samples cannot be guaranteed, and pine needles from the sterile layer beneath the Mt. Moriah zone are dated 12,600±170 B.P. (A-1565) (Bryan 1979, 1980:83). As demonstrated by the sites discussed above, the cave deposits in the Far West are plagued by problems of stratigraphic mixing of materials of different ages, and only materials directly associated with cultural remains should be trusted (Dansie et al. 1988; Thompson et al. 1987).

The Problem of the Age and Historical Relationship of Western Clovis and Western Stemmed Cultures

The data discussed above indicate that the convincing occurrence of clearly human traces in dated, buried deposits which are demonstrably pre-Clovis in age is yet to be documented in the Far West. The vast majority of fluted point sites in the Far West consist of isolated surface finds lacking datable, buried stratigraphic context. As a result, Western Clovis occupation is only roughly dated from 11,500 to 11,000 B.P. based on typological comparisons to well-dated Clovis-Llano complexes in the Southwest and Great Plains (Aikens 1983b; Haynes 1964, 1969a, 1980; Willig 1989; Wormington 1957). The few radiocarbon dates indirectly associated with fluted points in the Far West, limited as they are, do fall within the range documented for the Clovis-Llano horizon (Table 4).

The time range generally assigned to the Clovis-Llano tradition is 11,500 to 11,000 B.P., but the actual range of reported dates is from 11,840 to 10,640 B.P. (Haynes et al. 1984) (Table 3). Dates on Western Stemmed complexes from a number of western sites demonstrates a time span extending as late as 7,000 B.P. -- a time long after the Clovis-Llano horizon (Table 5). But the earliest stemmed points in the Far West date from 11,140 to 10,600 B.P., indicating an overlap at the early end of their floruit with Western Clovis occupation.

The geographic overlap and temporal closeness of Western Clovis and Western Stemmed traditions in the Far West have led to conflicting notions about the age and historical relationship of these early cultures living at the Pleistocene-Holocene boundary. Scholars like Aikens (1978, 1983a, 1983b) contend that the Western Stemmed tradition postdates Western Clovis, but developed from a Clovis base. Others believe that the two complexes represent quite distinct, contemporary traditions (Bedwell 1970; Bryan 1979; Davis et al. 1969), and that Western Stemmed is probably the more ancient of the two traditions (Bryan 1979, 1980, 1988).

How much of a temporal overlap actually exists for Western Clovis and Western Stemmed occupations in the Far West? Can it be demonstrated, through stratigraphic superposition or other means of relative dating, that the two are separated in time? Is there sufficient evidence to demonstrate that Western Stemmed is the more ancient of the two? Can it be conclusively demonstrated, through technological and typological studies, that the two are developmentally related? The available data suggest that, for the most part, Western Stemmed occupation in the Far West postdates Western Clovis, but that the two are close in time. This temporal precedence remains to be demonstrated by securely dated materials in reliable, buried stratigraphic context. In the absence of such direct dating, the answers to these questions must be sought through relative dating methods utilizing indirect data.

Current Data on Western Clovis and Western Stemmed Economy

Buried sites producing datable subsistence remains (seeds, bones and shell) and perishable artifacts directly related to specific economic pursuits (fishing hooks, nets, spears and traps) are extremely rare in the Far Western archaeological record from 11,500 to 9,000 B.P. (Aikens 1983a). At present, there are no dated subsistence remains from Western Clovis sites, although the faunal remains recovered from the Old Humboldt Site in Nevada (discussed below) offer intriguing possibilities (Rusco and Davis 1987).

Associations Claimed with Extinct Megafauna

The presence of kill sites and clear association of artifacts with hunted Pleistocene megafauna, one of the major indices of the Clovis-Llano horizon (Haynes 1964, 1969a, 1980; Sellards 1952), is yet to be documented outside the Plains and Southwest. Many claims have been made in the Far West for associations of early human artifacts with extinct Rancholabrean fauna, such as mammoth, horse, camel, sloth and bison. Reported sites include China Lake, California (Davis 1978a; 1978b), Wilson Butte Cave, Idaho (Gruhn 1961, 1965), and in Oregon, the Willamette Valley (Cressman and Laughlin 1941) and Paisley Five Mile Point Cave No. 3 (Cressman 1966).

But in most cases, the associations have been questioned as being too surficial or indirect to be confirmed (Heizer and Baumhoff 1970; Jennings and Norbeck 1955; Jennings 1986). Only at Owl Cave (Wasden site) in eastern Idaho are fluted points found in association with elephant remains (Butler 1978, 1986; Miller and Dort 1978). But the points are Folsom tools, not Clovis, and the dates obtained from elephant bone have been seriously questioned (Butler 1978:59-61).

Haynes (1988) critically evaluates the types of evidence advanced to support human use of terminal Pleistocene mammalian taxa like Mammuthus and Camelops. Based on taphonomic studies of natural bone accumulations at African watering holes, he summarizes a list of features which can "mimic" culturally induced cut marks and spiral fracturing of bone. These features are the result of natural deaths and/or post-mortem scavenging or trampling of bones, but are often mistaken for evidence of cultural butchering and processing. This is a sobering thought considering that the major Western Clovis and Stemmed sites are located in lake basins which would have served as attractive watering holes in periods of drought and lake recession at the Pleistocene-Holocene boundary (Haynes 1988; Willig 1984, 1988, 1989).

Dansie stresses the need for careful microstratigraphic and taphonomic studies in conjunction with dated lake histories in each basin (Dansie et al. 1988). Co-occurrence and geographic overlap of extinct faunal remains with early tools may indicate contemporaneity, but it does not necessarily demonstrate behavioral relationships (see also Meltzer 1988). Even contemporaneity cannot be assumed, as shown by Dansie's careful study of articulated Pyramid Lake camel skeletons.

Dansie's analysis of the taphonomy, stratigraphy and body position (upright "sudden death" posture) indicated that the Pyramid Lake camel bones were the result of natural lake edge deaths and quick post-mortem burial of drought-stressed animals drawn to the muddy death traps for drinking water during periods of lake recession. The presence of a Northern Side-notched point and other tools nearby might have suggested an association with the camel, but Stafford's six accelerator radiocarbon determinations on amino acids from the camel bone produced an average date of 25,800 B.P. (Dansie et al. 1988).

Subsistence Data from Western Stemmed Sites

Like the Far Western Clovis record, direct subsistence data from buried archaeological deposits prior to 9,000 B.P. continue to be rare. Subsistence remains for the period from 8,500 to 7,000 B.P. have been reported from numerous California, Great Basin and Plateau sites (Aikens 1978, 1983b), and include a wide range of plant and animal foods. Pioneering research at The Dalles, Oregon (Cressman et al. 1960), Danger Cave, Utah (Jennings 1957) and Frightful Cave, Mexico (Taylor 1966) produced some of the first evidence for early broad spectrum adaptations in the Far West prior to 9,000 B.P. Investigations in recent years have also contributed towards a rapidly growing data base of early subsistence remains, from which some dietary inferences may now be made (Willig and Aikens 1988).

At the Old Humboldt Site (26 Pe 670) along Rye Patch Reservoir in Nevada, a small, highly diversified assemblage of mammals, birds, fish and molluscs were recovered in association with one fluted point and two stemmed points (Dansie 1984, 1987; Rusco and Davis 1987). The fauna represented included bison, waterfowl eggshell, three species of rabbits, 76 clams and one large Lahonton trout. As mentioned above, the exact surface of origin for the fluted and stemmed points within the shallow alluvial deposits is not clear, and their direct association with one another cannot be guaranteed (Davis and Rusco 1987:41). Nonetheless, the assemblage is one of the earliest and most diversified of its kind and the tools are clearly documented in situ within the buried deposit.

Dansie has identified shellfish remains from numerous other early Holocene sites excavated in the vicinity of Rye Patch Reservoir (Dansie 1987). Freshwater clams were utilized by the earliest Western Stemmed occupants at Last Supper Cave in Nevada, dated between 9,000 and 8,000 B.P. (Layton and Davis 1978; Layton 1970, 1979). On the southern shore of Buena Vista Lake in the San Joaquin Valley of California, excavations of a deeply buried midden site yielded the remains of shellfish, birds, turtles, deer and a variety of fish (Fredrickson and Grossman 1977:179). The associated Western Stemmed points resemble Lake Mohave forms and radiocarbon dates have placed the occupation between 8,200 and 7,600 B.P. (Table 5).

The earliest levels of Danger Cave, Utah, dating from 11,000 to 10,000 B.P., contained quids of bulrush (Scirpus americanus) and bones of antelope, mountain sheep, and bison (Jennings 1957:224). The antelope remains were by far the most abundant of the three taxa. Evidence for the hunting of mountain sheep by other early Holocene groups in the Far West has been reported from Smith Creek Cave (Bryan 1979, 1980) and Hanging Rock Shelter (Thomas 1970) in Nevada.

In California, faunal assemblages from four Lake Mohave-Pinto sites on Fort Irwin indicate a predominance of hunting, and represent the first significant sample from sites of this antiquity in the Mohave Desert (Douglas et al. 1988). Rabbit bones were dominant elements in all of the sites studied, but artiodactyls were most prevalent in the earliest components (early Lake Mohave). Lizards and tortoise dominate more recent sites (late Pinto). Consistent preference for rabbits suggests cultural continuity through time, but the change from an early focus on large mammals to a later emphasis on tortoise can be explained by increasing aridity and differences in the availability of various taxa at each site's location on the paleolandscape (Douglas et al. 1988).

The earliest deposits at Hogup Cave, Utah (Aikens 1970), dating as early as 8,400 B.P., have produced an abundance of wild plant foods, especially pickleweed, and a diverse array of faunal remains, including waterfowl, bison, pronghorn antelope, mule deer, mountain sheep, hares, rabbits and small rodents. The abundance of milling stones, plant macrofossils, and vegetal-rich coprolites clearly reflects a diversity of plant and animal foods procured from the lake-marsh habitat outside the cave (Aikens 1978).

At The Dalles Roadcut site on the southern bank of the Columbia River in Oregon, the earliest occupation (Initial Early) level, dated between 9,780 and 7,680 B.P., produced a limited assemblage of blades, scrapers and bone tools (Aikens 1983b; Cressman et al. 1960). However, the overlying cultural deposits (Full Early) produced an abundance of faunal remains in direct association with Western Stemmed points, edge-ground cobbles, grooved sinker stones and a variety of bone and antler tools. The faunal assemblage was remarkably diversified, and included bones of elk, fish, birds, badger, marmot, fox, rabbit, beaver, otter, muskrat, small rodents and literally thousands of salmon vertebrae (Aikens 1983b:188).

Located on the interface of the Great Basin, Plains and Plateau, excavations at Dirty Shame Rockshelter in Oregon also indicate an early presence of broad spectrum subsistence (Aikens et al. 1977; Grayson 1977; Hall 1977; Hanes 1988a). Food remains identified from human feces and bone debris indicate a focus on the local, mesic canyon habitat (Aikens et al. 1977). The earliest cultural deposits in lower Zone VI, dated between 9,500 and 8,860 B.P., yielded crayfish, mussel shell fragments and a variety of small, burned mammal bones. These were recovered in association with Western Stemmed point styles, including one Windust, one Cougar Mountain and eight leaf-shaped lanceolates (Hanes 1988a, 1988b).

At the Lind Coulee site in south-central Washington (Daugherty 1956), the remains of bison, waterfowl and other small mammals were recovered in association with Windust and other Western Stemmed points, dating from 9,000 to 8,500 B.P. (Table 5). Results indicated sequent seasonal occupation adjacent to a series of shallow lakes and ponds, as evidence by the now-dry "coulee" (Ames 1988).

Excavations at numerous cave sites around the perimeter of Winnemucca Lake Basin in Nevada have produced fishing gear and remains of mammals, reptiles and fish that no longer inhabit the area (Hattori 1982; Orr 1952, 1974; Thompson et al. 1987; Tuohy 1974). At Fishbone Cave, remains of fish, marmot, bird bones were recovered from Level 4, including numerous mummified fish wrapped in grass and laid in cache pits (Orr 1956; 1974). These remains were found directly associated with two chert knives, some basketry fragments and a human burial wrapped in cedar bark which produced two radiocarbon determinations (L-245) of 10,900±300 B.P. and 11,250±250 B.P. (Orr 1956).

Other cave sites around the perimeter of Winnemucca Lake have yielded some of the earliest known basketry fragments in the Far West, both open and closed twine, dating between 11,250 and 7,830 B.P. (Adovasio 1986; Hattori 1982; Rozaire 1969, 1974; Thompson et al. 1987). In addition to those reported from Fishbone Cave, twined baskets dating 7,940±610 B.P. (I-6874) have been reported from the Nicolarsen site (26WA197) near Reno (Hester 1974; Roust 1958). Along with the baskets were found numerous caches, burials and one complete atlatl shaft. One of the Falcon Hill caves, Shinners Site A (26WA198), produced two dates on basketry and matting in association with a large, stemmed point: a date of 9,540±120 B.P. (UCLA-675) and a date of 8,380±120 B.P. (UCLA-672) (Hattori 1982:17).

From the northwestern shore of Pyramid Lake, Nevada, Tuohy (1988a) reports a date of 9,660±170 B.P. (Gx-13744) on what he considers to be sagebrush bark fishing line, from a site situated on one of the lowest lake levels recorded for the lake. In addition, Orr (1974) has reported a date of 7,830±350 B.P. (L-289KK) on what he describes as fish netting from the same level in Fishbone Cave that contained the early burial mentioned above.

Abundant remains of similar perishables, like basketry and fishing nets, are characteristic of the lakeside fishing-gathering industries of the Lovelock Culture so well documented in this area as early as 4,500 B.P. (Heizer and Krieger 1956; Heizer and Napton 1970; Loud and Harrington 1929). Although not necessarily indicative of a similar economic orientation, such items as ground stone and basketry have long been considered the "hallmarks" of the Western Archaic (Jennings and Norbeck 1955). Additionally, the proximity of these sites to fossil shorelines of shallow lakes and marshes, at such an early time, lends much support to the hypothesis of early lake-marsh adaptations (Aikens 1978, 1983a; Tuohy 1988a).

In the Fort Rock Basin, less than 10 km northwest of Alkali Lake Basin, faunal remains from excavated cultural deposits at a number of early cave sites have been interpreted as evidence of specialized lake-marsh oriented subsistence as early as 10,200 B.P. (Bedwell 1970, 1973). Even more importantly, these fauna suggest the presence, from 11,000 to 7,000 B.P., of habitats which were considerably more mesic than present (Grayson 1977, 1979; also, see discussion in Chapter IV under Implications of Alkali Basin Research). Sites producing food remains and Western Stemmed assemblages dating between 10,600 and 7,240 B.P. included Fort Rock Cave, Cougar Mountain Cave No. 2, and the Connley Caves. Identified mammal bones from the pre-Mazama deposits were by far the most numerous, and included rabbits, gophers, pikas, ground squirrels, porcupines, skunks, deer. The presence of other large, unspecified mammals were also indicated, possibly representing elk and bison (Bedwell 1970:84-88).

The oldest fish remains reported in the Great Basin were those of tui chub (Gila bicolor) recovered from Level 26 at Connley Cave 5A, above a level dating 9,800±250 B.P. (Gak-1743) (Greenspan 1985), also in association with Western Stemmed artifacts (Bedwell 1970). The remains of tui chub have been identified from Western Stemmed occupation levels at Connley Cave 4B (Greenspan 1985). These levels include: (1) Level 24, dating 9,670±180 B.P. (Gak-2142); (2) the lowest portion of Level 26, dated at 7,240±150 B.P. (Gak-2140); and (3) Level 31, dating between 6,800 and 7,240 B.P. by virtue of its stratigraphic position above Level 26 and below the Mazama ash layer. Numerous bones of waterfowl were also found, including those of ducks and grebes (Bedwell 1970).

These data suggest that as early as 10,000 B.P., and perhaps even earlier, people in the Far West were practicing a generalized economy which encompassed a broad range of plant and animal foods across a diversity of ecological zones and habitats, with a variable mix of both hunting, fishing and plant gathering. This is contrary to the majority of economic inferences which have been made for cultures at the Pleistocene-Holocene boundary in the Southwest, Plains and elsewhere in North America. The early Clovis-Llano kill sites fostered a belief in the dominance of big-game hunting for all cultural groups prior to the onset of the "Archaic" period as we know it. But, as indicated by the research presented here, studies of site distributions and paleoenvironmental settings associated with these early occupations in the Far West further support the strong likelihood that Archaic-like broad spectrum adaptations were in place by 11,000 B.P. (see concluding discussions in Chapter IV).

The Problem of Reconstructing the Adaptive Strategies of Western Clovis and Western Stemmed Cultures

There are three nested sets of questions to consider in postulating adaptive strategies for cultures of the Pleistocene-Holocene boundary in the Far West. The first question involves the role, if any, of specialized big-game hunting in determining the settlement-subsistence strategies of these early occupants, especially Western Clovis groups. The second issue is the hypothesis of early lake-marsh adaptations during the time of Western Stemmed, and possibly Western Clovis as well. The third is the question of the Clovis-Archaic Interface (sensu Willig et al. 1988), which addresses the broader issue of the time depth and inception of broad spectrum (Archaic) adaptations in the Far West.

Role of Early Big-game Hunting

The first major question relating to adaptive strategies is the role of "big-game" hunting, particularly in relation to Western Clovis economy. As discussed above, with the exception of Southwestern sites, there are no sites in the Far West which have produced artifacts and extinct fauna in direct, unambiguous association that clearly indicate a cultural relationship. As reviewed above, several studies have demonstrated the dangers of making hasty assumptions about apparent association and contemporaneity of early artifacts with fossil megafaunal remains (Dansie et al. 1988; Haynes 1988). This situation has led a number of scholars to seriously question the existence of a specialized "big-game hunting" strategy in the Far West (Aikens 1978, 1983a; Clewlow 1968; Heizer and Baumhoff 1970; Jennings 1964; Jennings and Norbeck 1955; Madsen 1982; Rozaire 1963; Simms 1988; Wilke et al. 1974; Willig 1989).

How significant was the hunting of large terrestrial game in determining the settlement and subsistence strategies of Western Clovis and Western Stemmed people? How focused does an economic system have to be to warrant the label of "specialized big-game hunters" (Meltzer and Smith 1986; Meltzer 1988; Simms 1988)? One possibility is that Western Clovis represents a regional adaptational variant of the specialized big-game hunting tradition implied by "Llano" (Willig 1988, 1989).

But the presence of specialized "big-game" hunting strategies in the Far West, and probably elsewhere as well, may be more a myth than a reality (Meltzer and Smith 1986; Meltzer 1988; Willig and Aikens 1988; Willig 1988, 1989). Human reliance on the hunting of large game may have been no more significant in the earliest period than it was during later "Archaic" times. Is our data base for the early periods refined enough to demonstrate such a distinction from later cultures which have been labeled as "Archaic"? What kinds of indirect data, from environmental studies, can be brought to bear upon this problem?

Role of Early Lake-marsh Adaptations

The second issue relating to paleoeconomy is the hypothesis of early lake-marsh adaptations for the earliest occupants of pluvial lake basins in the Far West. Sites producing Western Clovis and Western Stemmed artifacts are widely distributed across a variety of environments throughout the Far West, including coastal, montane and lowland valley settings. Nevertheless, most reported sites containing significant concentrations of fluted and stemmed points are located along the lowest strandlines in western pluvial lake basins.

This frequent co-occurrence and unique distribution in relation to fossil streamside, swamp edge and lake margin habitats has led a number of scholars to postulate a "pre-Archaic" lake-marsh adaptation in the Far West (Aikens 1978, 1983a; Bedwell 1970; Clewlow 1968; Davis 1967, 1978a, 1978b; Fredrickson 1973, 1974; Heizer and Baumhoff 1970; Madsen 1982; Rozaire 1963; Wilke et al. 1974). This unique site distribution was the basis for Bedwell's concept of the Western Pluvial Lakes Tradition, often referred to as WPL or WPLT (Bedwell 1970, 1973). The WPL concept postulates the widespread, early presence of a specialized economic adaptation geared to lake, marsh and grassland resources which would have been abundant in these western lake-marsh ecosystems.

There are several major problems embedded within the WPL concept, which are discussed below (see discussion in Chapter IV under Role of Early Lake-marsh Adaptations). One major question is just how plausible are these early lake-marsh adaptations hypothesized for the earliest occupants of pluvial lake basins in the Far West? How significant was the role of lake-marsh resources in determining settlement and subsistence strategies? Was the degree of human reliance on these resources significant enough to warrant recognition of such a specialized lake-marsh adaptation as implied by the concept of a Western Pluvial Lakes Tradition (Bedwell 1970, 1973)?

More specifically, does the documentation of a lake-marsh settlement focus confirm the presence of so specialized an adaptation? One possibility is that the lakeshore settings represent the pivot points of flexible, wide-ranging, broad-spectrum strategies "tethered" (sensu Taylor 1964) to mesic habitats which contained reliable sources of food and water (see concluding discussions in Chapter IV).

The Clovis-Archaic Interface: Myth or Reality?

The third and most important question to address about early occupations is the issue of the Clovis-Archaic Interface and the time depth of broad spectrum Archaic adaptations in the Far West. If Western Clovis and Western Stemmed groups were not specialized free-wandering big-game hunters (sensu Beardsley et al. 1956), and practiced economies which were more diversified than was once thought, then just how different were these cultures from the lifeways described in later periods as Archaic? Warren and Phagan make the excellent point that "before we can evaluate the Clovis-Archaic interface, we must first locate that interface" (Warren and Phagan 1988). Is there really a Clovis-Archaic Interface? Or is the economic contrast between the two an artificial one (Simms 1988; Willig 1989; Willig and Aikens 1988)? It may be that "Clovis" and Archaic" are far more alike than previously supposed.

Research Needs

The kinds of archaeological data which bear upon the age, historical relationship and economies of Western Clovis and Western Stemmed cultures include four major categories: (1) methods of absolute and relative dating (radiocarbon, stratigraphy, typology, obsidian hydration); (2) technological studies (lithic reduction sequences, assemblage structure and diversity, hafting traditions); (3) paleoenvironmental studies (reconstructions of paleolandscape, resource constraints/potentials and environmental context); and (4) studies of land-use patterns (based on lithic sourcing, subsistence remains, site distribution, settlement patterns).

There are distinct limitations in the current Far Western data base for answering the questions discussed above. This is especially true in the lack of radiocarbon dates and direct subsistence-related remains and artifacts which could demonstrate age or verify specific economic pursuits. Nevertheless, there is evidence available to establish a relative chronology of Western Clovis and Western Stemmed occupations. There is also much that can be induced about these early lifeways from a variety of indirect data provided by studies of technology, typology, paleoenvironmental context, and settlement and land use patterns.

Establishing Relative Chronology

The available radiocarbon dates suggest that, for the most part, Western Stemmed occupation in the Far West postdates Western Clovis, but that the two are close in time. This temporal precedence must ultimately be demonstrated by securely dated materials from reliable, buried stratigraphic context; but in the absence of buried, datable deposits and stratigraphic superposition, there are a number of indirect avenues which can provide a strong relative chronology.

In particular, studies of artifact typology, site distributions, stratigraphic cross-correlations and source-specific obsidian hydration have been quite successful in this regard. If the elevation and stratigraphic context of single-component occupation surfaces can be matched with specific lake levels and paleo-land surfaces, then radiocarbon dating of non-cultural materials from these deposits would indirectly date the occupation. Any research which could more closely circumscribe Clovis and Stemmed traditions in time, by means of relative dating methods such as these, would be a useful contribution.

Reconstructing Adaptive Strategies

Current archaeological research displays a renewed focus upon the concept of "adaptation" -- the human response to environmental change (Aikens 1982, 1983a; Jennings 1986; Kirch 1980). Kirch (1980:102) has called this a "robust concept" capable of integrating the eclectic and disparate data so peculiar to the field of archaeology. In the absence of direct economic data such as subsistence-related artifacts and food remains, the most reliable data for reconstructing prehistoric adaptive strategies are those generated from studies of technology, trade and exchange, settlement pattern and land use. Especially useful are studies of lithic sourcing and artifact context with respect to the paleolandscape, and its resource potentials and constraints.

When supplemented by a knowledge of ecology and hunter gatherer theory (Binford 1980; Kelly 1983), these data can provide the basis for inferences about prehistoric economy and adaptation (Meltzer 1988). Any research which could incorporate a detailed study of human land use and settlement pattern in relation to early postglacial landforms and habitats would be a valuable contribution towards building a fuller characterization of Western Clovis and Western Stemmed lifeways.

Alkali Lake Basin Research Design

Introduction

The northern Alkali Lake Basin of south-central Oregon, and the Dietz site (35 LK 1529) in particular, offered an excellent testing ground for hypotheses about the age and economic orientations of early cultures at the Pleistocene-Holocene boundary in the Far West, for several reasons. The now-dry basin, once occupied by Pluvial Lake Alkali, has produced unusually abundant and "pure" assemblages of Western Clovis and Western Stemmed artifacts and sites. Most of the fluted and stemmed points at the Dietz site and elsewhere in the basin occurred in spatially discrete, single component clusters or sites, and there is a virtual absence of sites dating later than 7,000 B.P.

Secondly, unlike many other geographic settings, closed lake basins such as Alkali Lake are excellent settings for reconstructing paleoenvironment because their lake histories are so dependent on and responsive to changing climatic conditions, and leave such visible sedimentological records of those changes (Davis 1982a; Smith and Street-Perrott 1983). Furthermore, unlike the case in many other western lake basins, the record of late Pleistocene and early Holocene landscape and lake levels in the northern Alkali Basin is remarkably well preserved.

In most western lake basins, the record of late Pleistocene and early Holocene sedimentation has been destroyed, by water levels associated with late Holocene lakes or by major erosional processes resulting from their desiccation. In the northern Alkali Lake Basin of Oregon, this record has survived relatively intact, with only minimal erosional gaps, primarily because the basin has remained essentially dry since 7,000 B.P. (see concluding discussions in Chapter III).

Thus, the northern Alkali Lake Basin has produced an abundance of early cultural remains in close association with well-preserved early postglacial landforms and lake stratigraphy. This situation provided an opportunity to record, in detail, the distribution and context of early sites, offering a clear perspective on human land use in relation to lake conditions and environmental change at the Pleistocene-Holocene boundary in the Far West. Reconstruction of lake levels and settlement patterns in the northern Alkali Lake Basin has provided valuable insight on the effects of early postglacial climatic change on early human occupations in the region.

Western Clovis and Western Stemmed Occupation at the Dietz Site

The Dietz site (35 LK 1529) is located in south-central Oregon, in the northernmost portion of Alkali Lake Basin, 27 km southeast of the town of Wagontire in Lake County (Figure 1). The site consists of an extremely large lithic scatter which is distributed along low-relief fossil shorelines in a structural basin once occupied by Pluvial Lake Alkali (Figure 2). There are primarily two series of artifacts represented which are assignable, respectively, to the Western Clovis and Western Stemmed cultural traditions.

The site was discovered in 1982 by Mr. Dewey Dietz of Redmond, Oregon. Recognizing the importance of the Clovis artifacts, Dietz reported the site to Dr. John L. Fagan, archaeologist for the Portland District Office of the U.S. Army Corps of Engineers. Initial site visits in 1983 by Dietz, Fagan and William J. Cannon (Lakeview District BLM archaeologist) revealed a rich abundance of early tools exposed on the surface, especially Clovis type fluted points (Fagan 1984a). The site was subsequently named in honor of Dietz, and has been the focus of extensive research ever since (Fagan 1984a, 1984b, 1986, 1988; Willig 1984, 1985, 1986, 1988, 1989).

A continuing program of archaeological testing and controlled surface collections at the Dietz site since 1983 has yielded 61 fluted point fragments (Figures 6 through 14). These include 12 complete or nearly complete points, four tip fragments, eight midsections, eight base and midsection fragments and 28 base fragments (Fagan 1988; Willig 1988). Two fluted base and midsection fragments, found 100 m apart from each other but at the same elevation, were fitted together (Fagan 1988), so the actual count of fluted points totals 60, not 61 (see #553-195 and #553-267 on Figure 11). Seven of these 60 fluted points (#553-1 through #553-7 and #553-319) were collected by Dietz prior to 1983 and have no recorded provenience.

Of the 47 fluted point fragments collected and identified by Fagan (1988), I have been able to examine and illustrate all but five. The five fluted point fragments not examined or illustrated here include: #553-32, #553-96, #553-138, #553-142, #553-238. Appendix C includes a complete set of full size illustrations (reverse sides and cross-sections) of all time-diagnostic artifacts collected from basin-wide sites, including the Dietz site.

Fagan (1984b, 1988) considers an additional 52 items from the Dietz site to be diagnostic Clovis artifacts. These include 25 blanks and 27 flute flakes. A sample of these are illustrated in Figure 15. A diversified assemblage of other tools has also been recovered in association with the fluted and stemmed point clusters (Fagan 1984a, 1984b, 1988). These include scrapers, gravers, bifacial blanks, preforms, knives, wedges, abrading stones, hammerstones, and a variety of flake tools (see Appendix C for more details).

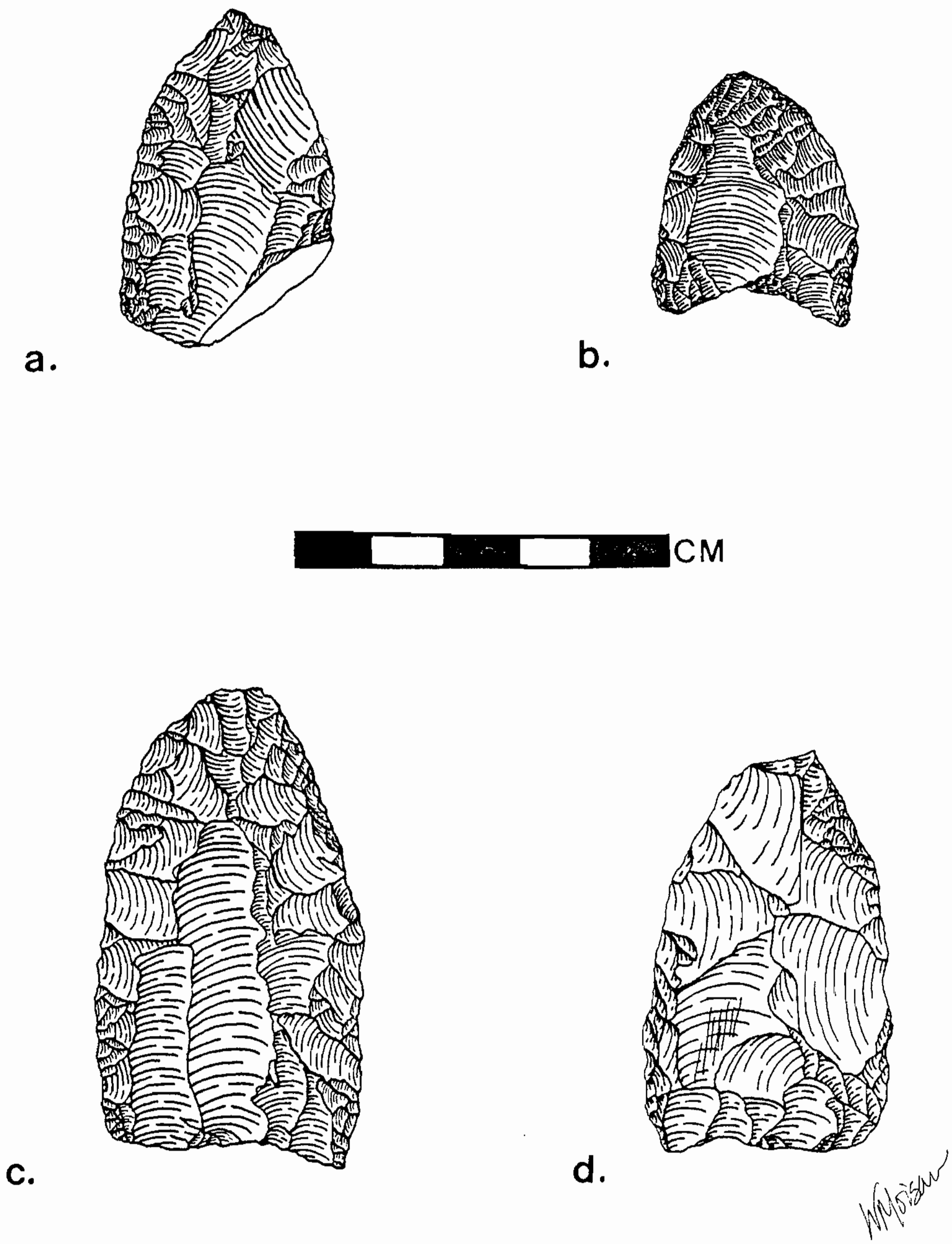


FIGURE 6. Complete and Near-complete Fluted Points from the Dietz Site: a. #553-14; b. #553-260; c. #553-262 and d. #553-421

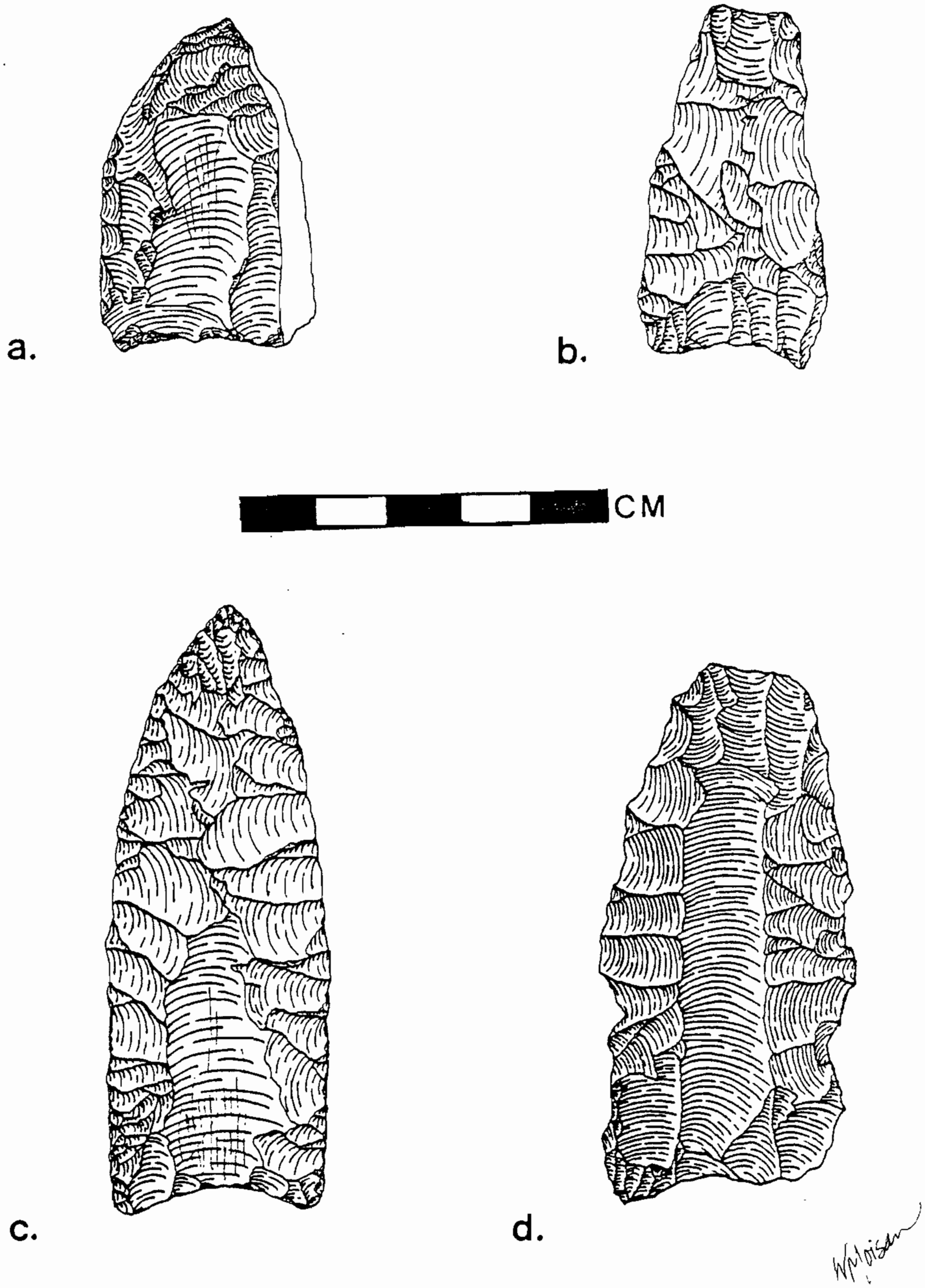


FIGURE 7. Complete and Near-complete Fluted Points from the Dietz Site: a. #553-17; b. #553-411; c. #553-319 and d. #553-258

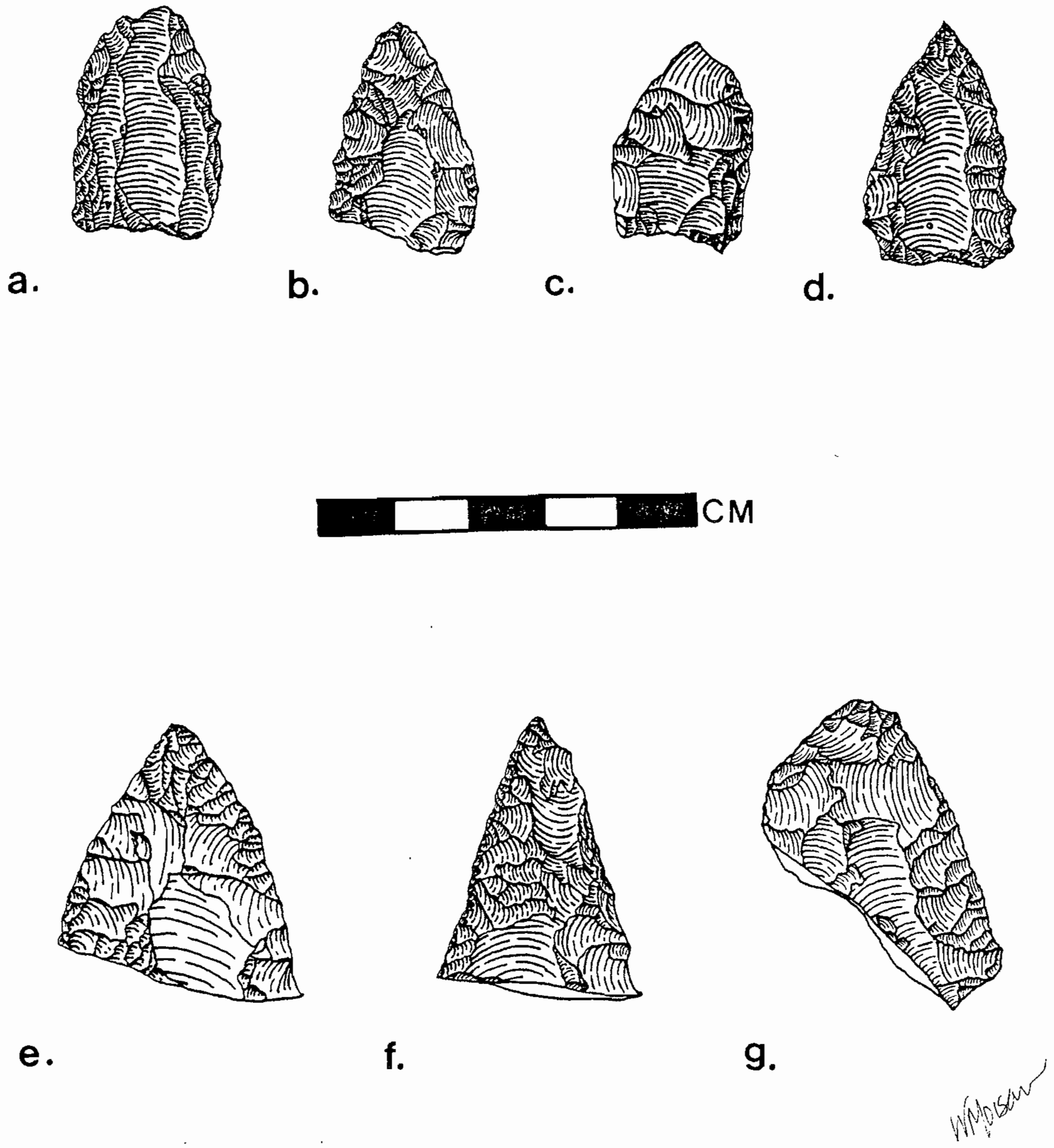


FIGURE 8. Complete (Miniature) Fluted Points and Fluted Point Tip Fragments from the Dietz Site. Points include: a. #553-271; b. #553-232; c. #553-33 and d. #553-241 Tips include: e. #553-433; f. #553-113; and g. #553-133

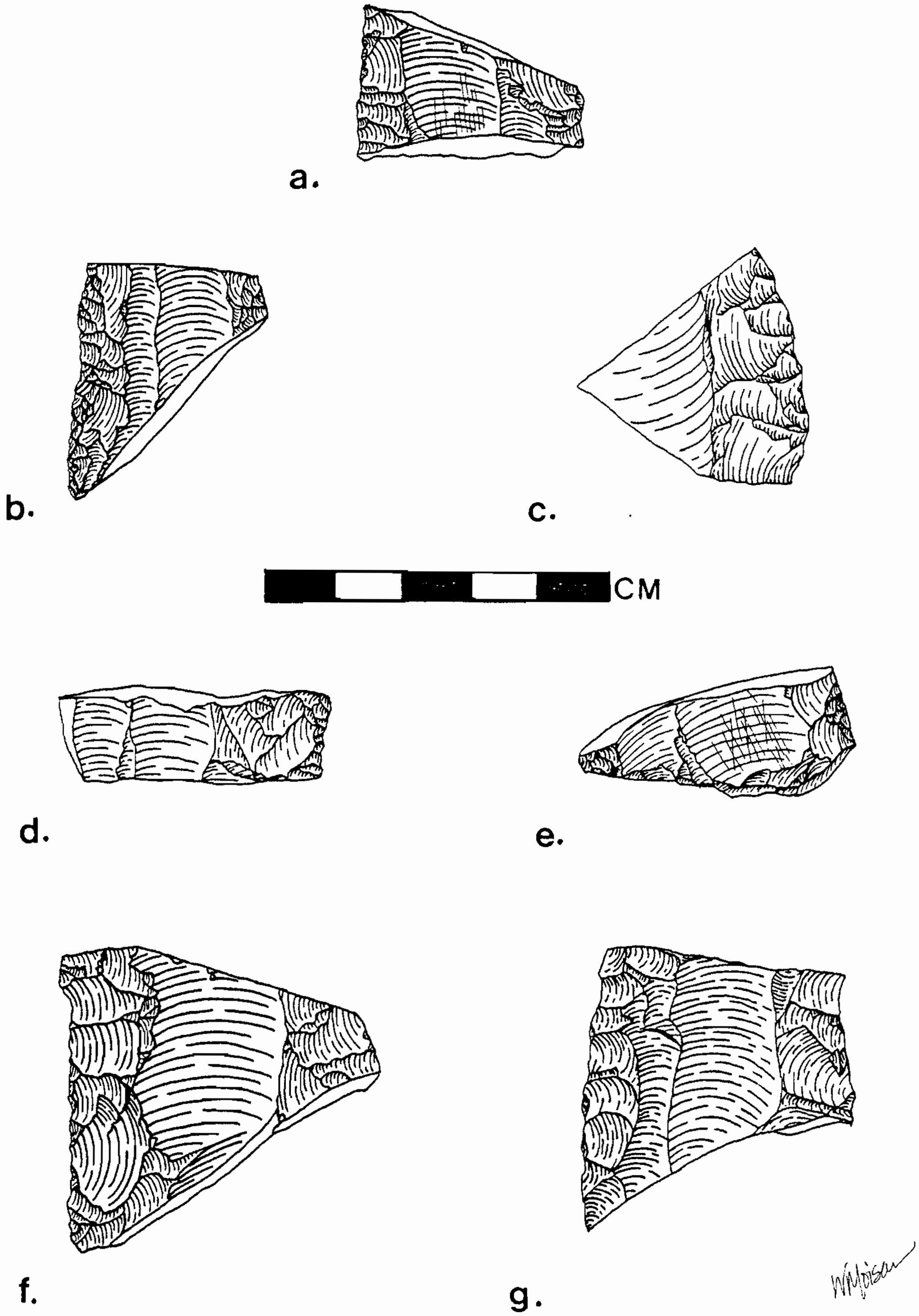


FIGURE 9. Fluted Point Midsection Fragments from the Dietz Site:
a. #553-16; b. #553-115; c. #553-432; d. #553-416;
e. #553-245; f. #553-140 and g. #553-422

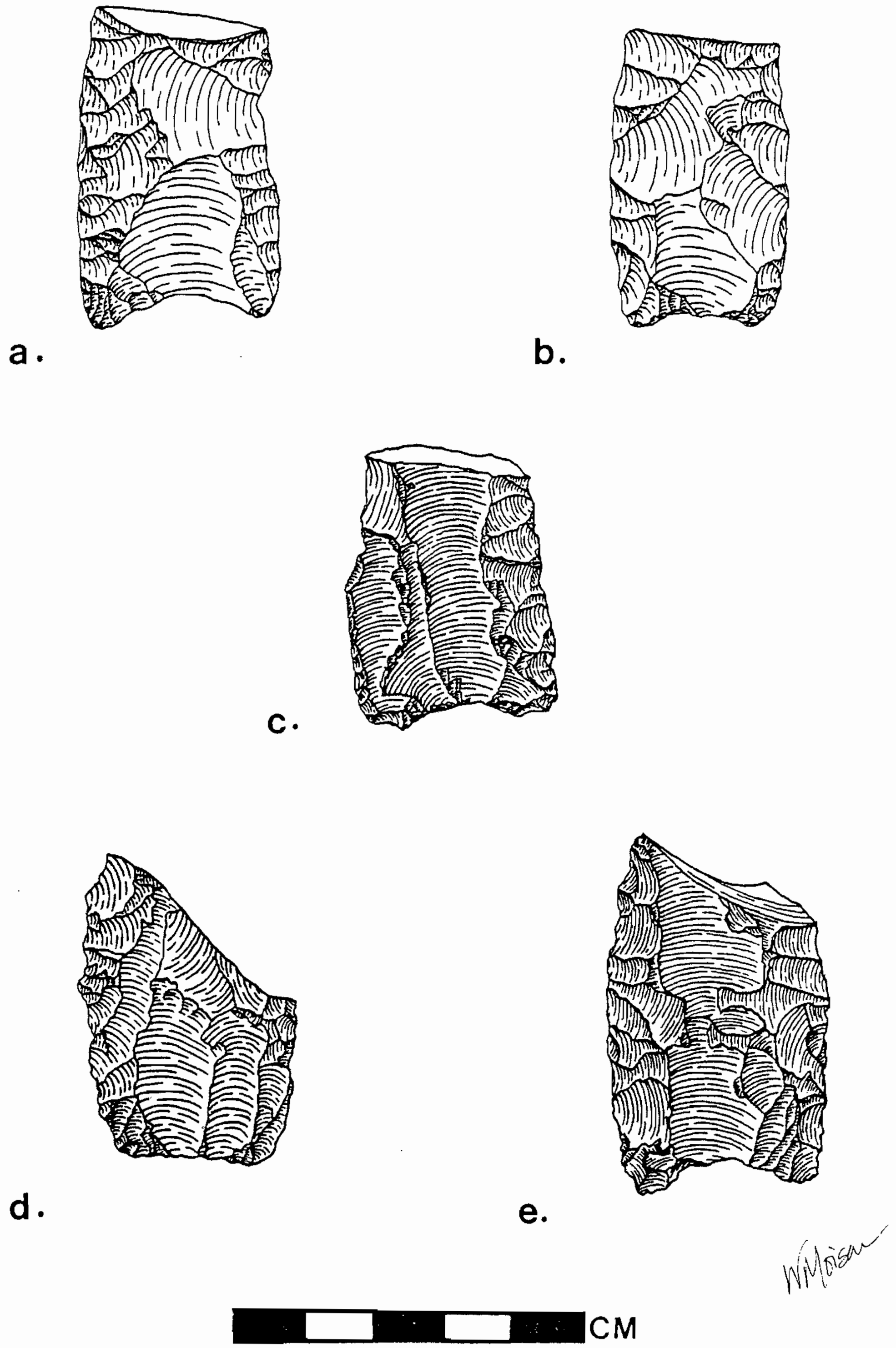


FIGURE 10. Fluted Point Base-Midsection Fragments from the Dietz Site: a. #553-417; b. #553-435; c. #553-47; d. #553-199; and e. #553-19

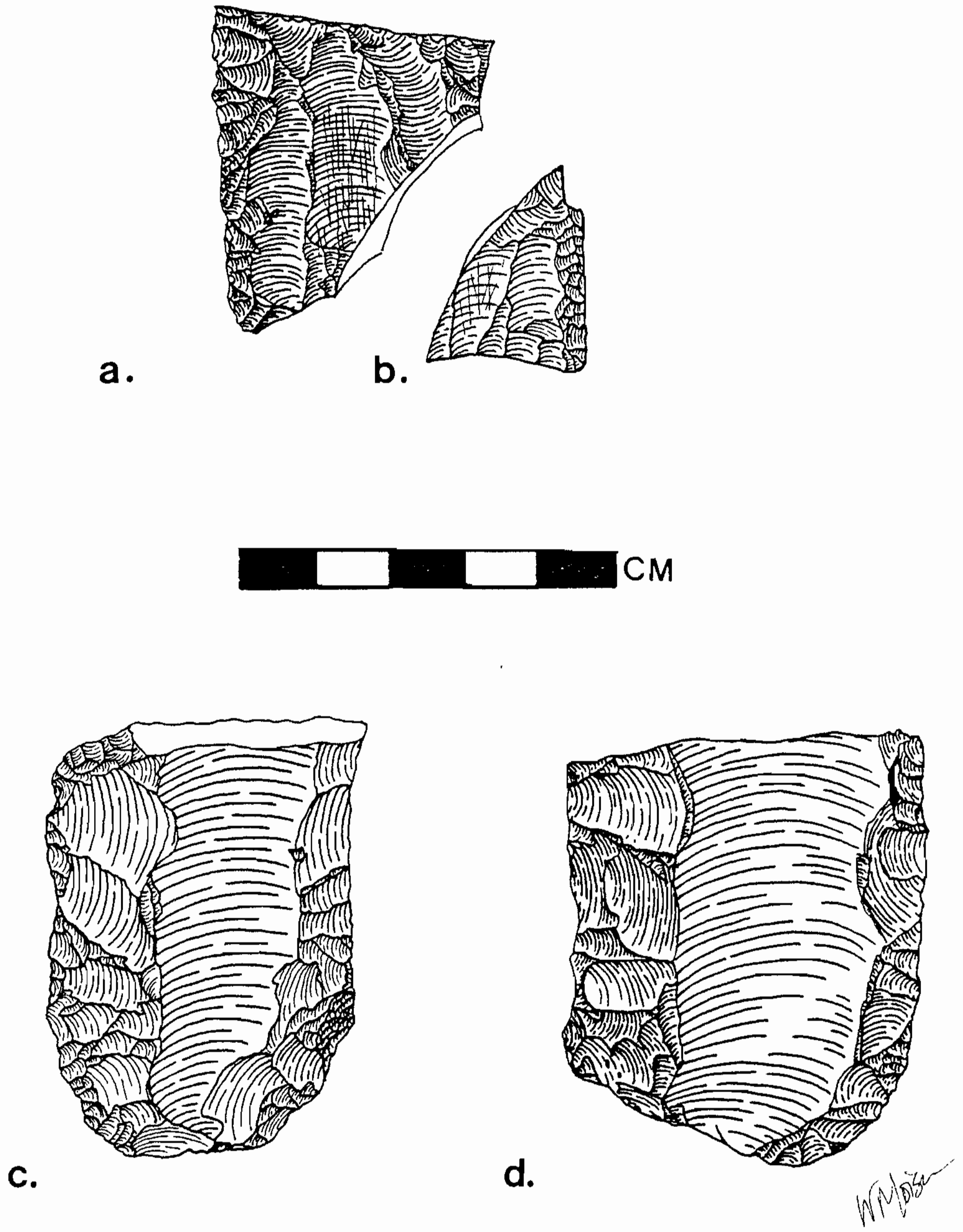


FIGURE 11. Fluted Point Base-Midsection Fragments from the Dietz Site: a. #553-195; b. #553-267; c. #553-295; and d. #553-1. <u>Note:</u> Re-fitted base fragments (a. and b.) were found 100 meters apart.

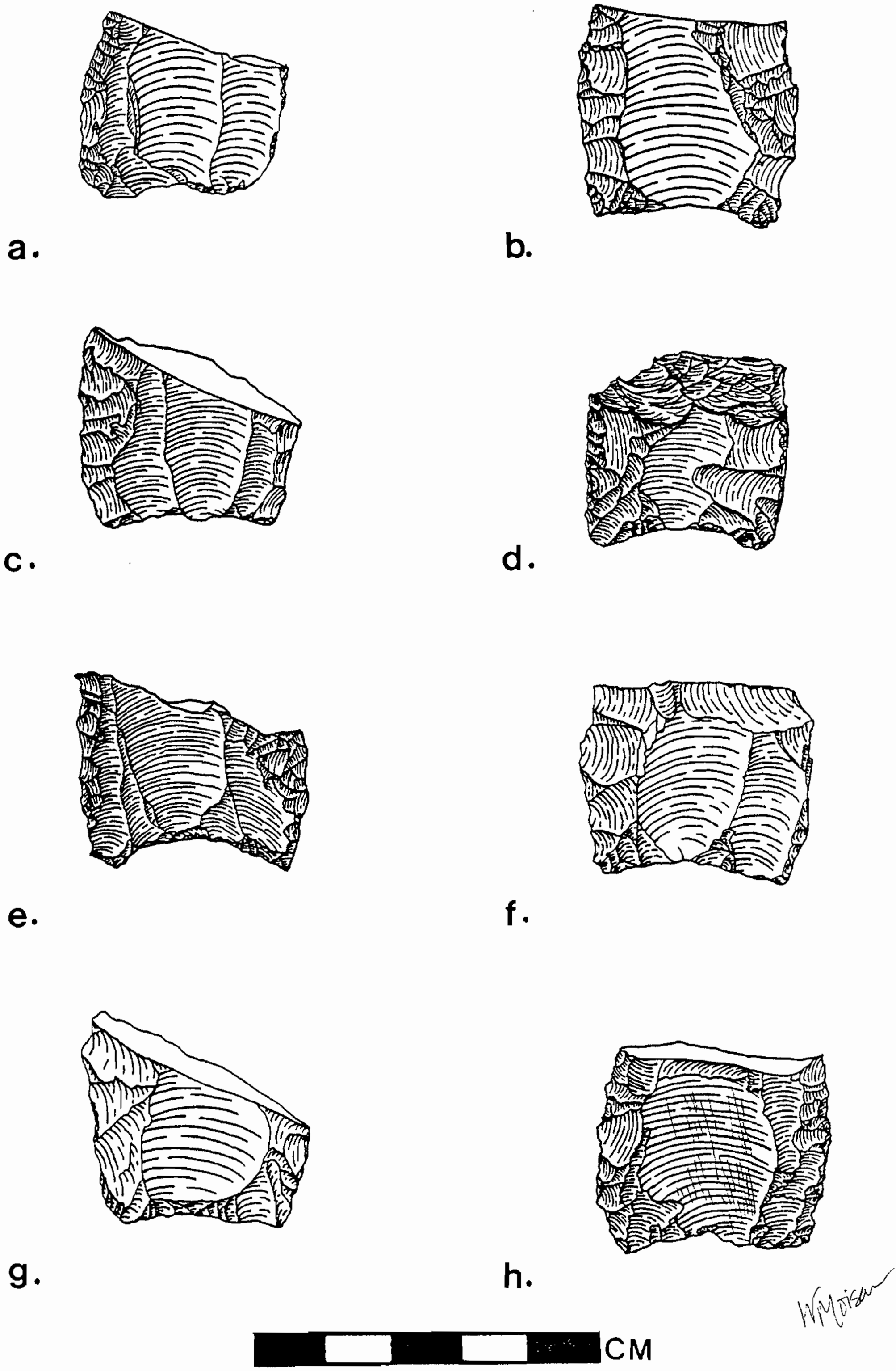


FIGURE 12. Fluted Point Base Fragments from the Dietz Site:
a. #553-234; b. #553-268; c. #553-3; d. #553-6;
e. #553-188; f. #553-5; g. #553-412 and h. #553-7

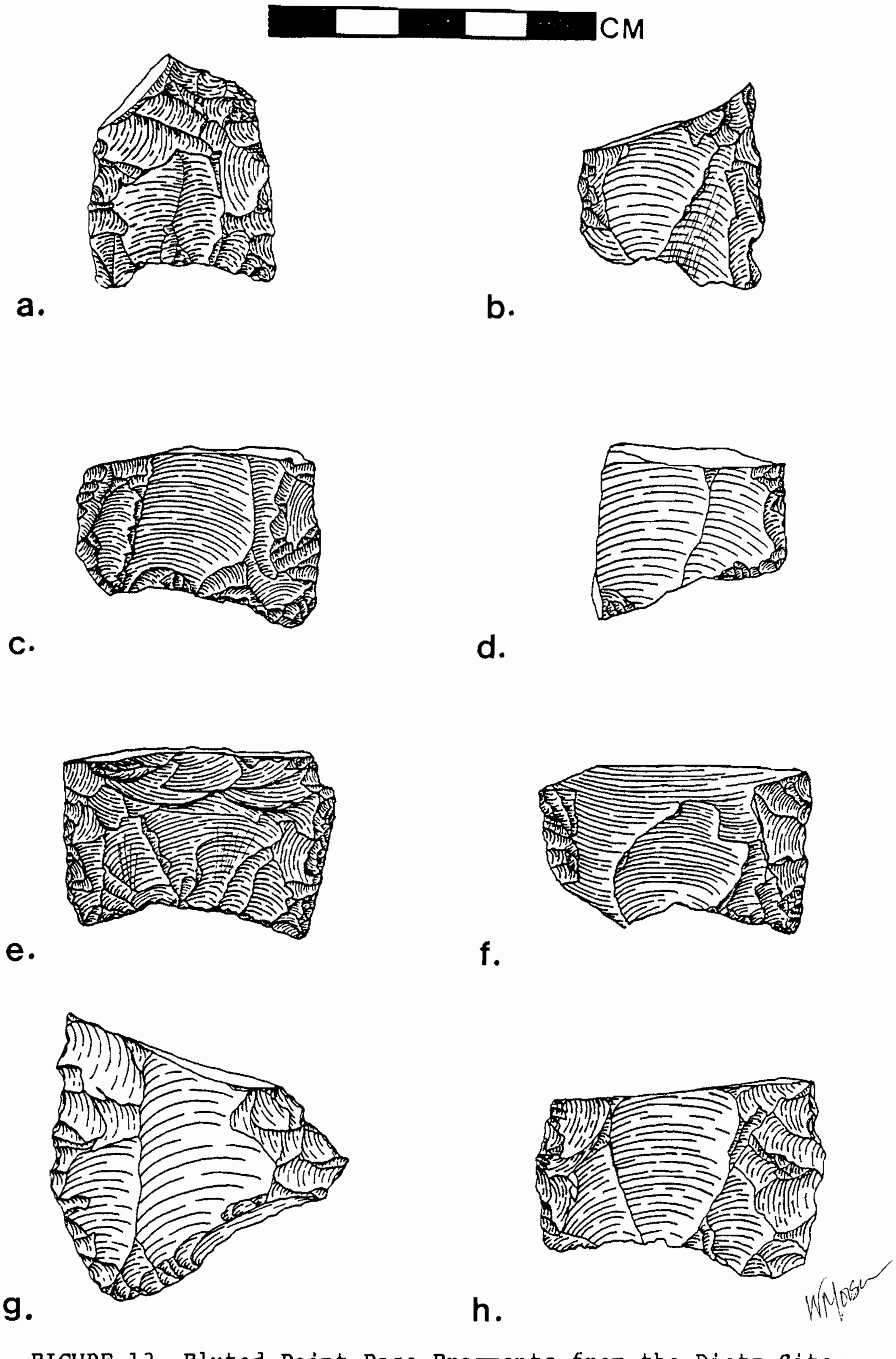


FIGURE 13. Fluted Point Base Fragments from the Dietz Site: a. #553-443; b. #553-100; c. #553-169; d. #553-39; e. #553-99; f. #553-201; g. #553-404 and h. #553-4

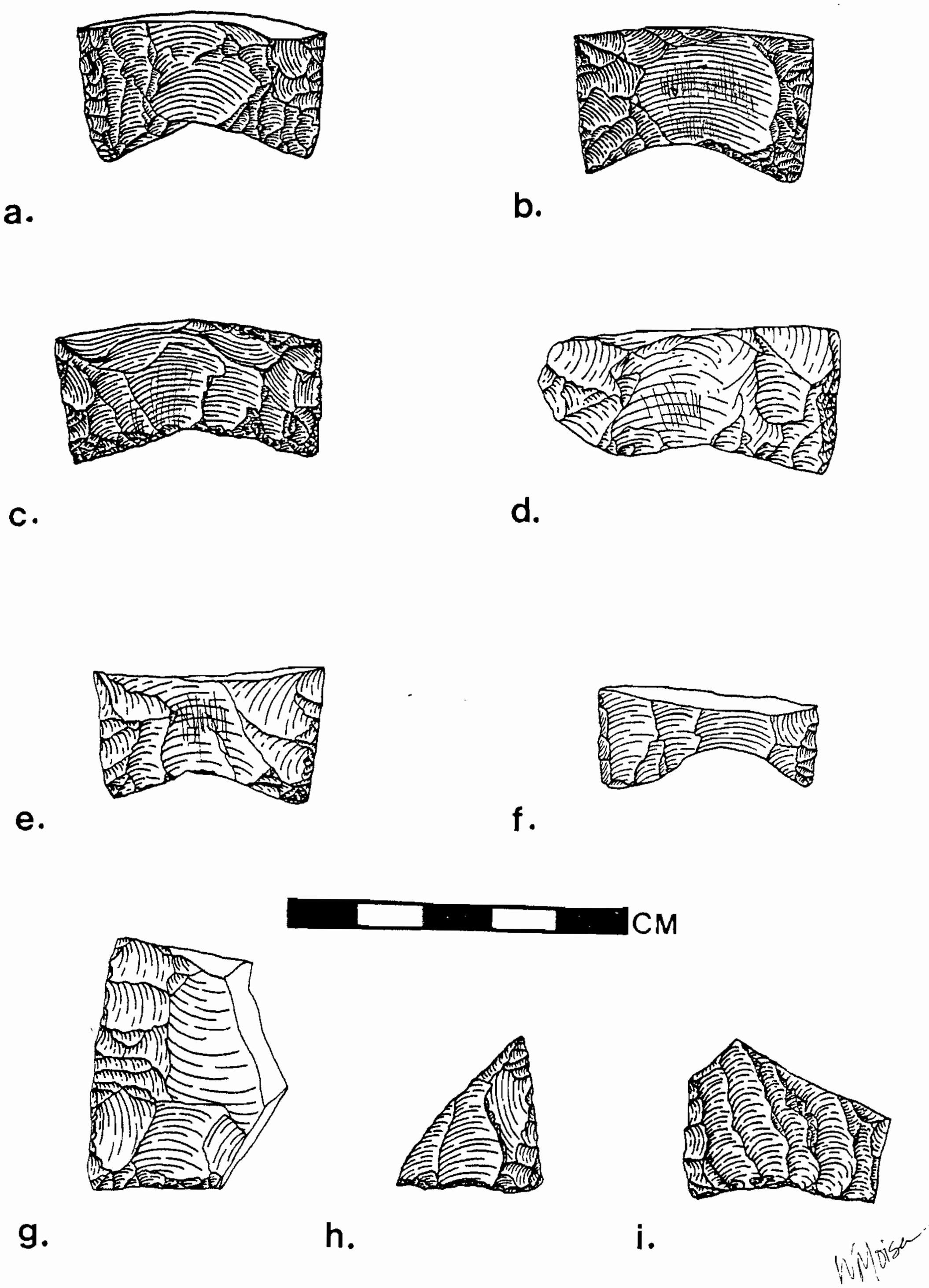


FIGURE 14. Fluted Point Base Fragments from the Dietz Site: a. #553-2; b. #553-196; c. #553-18; d. #553-431; e. #553-430; f. #553-239; g. #553-444; h. #553-144; and i. #553-410

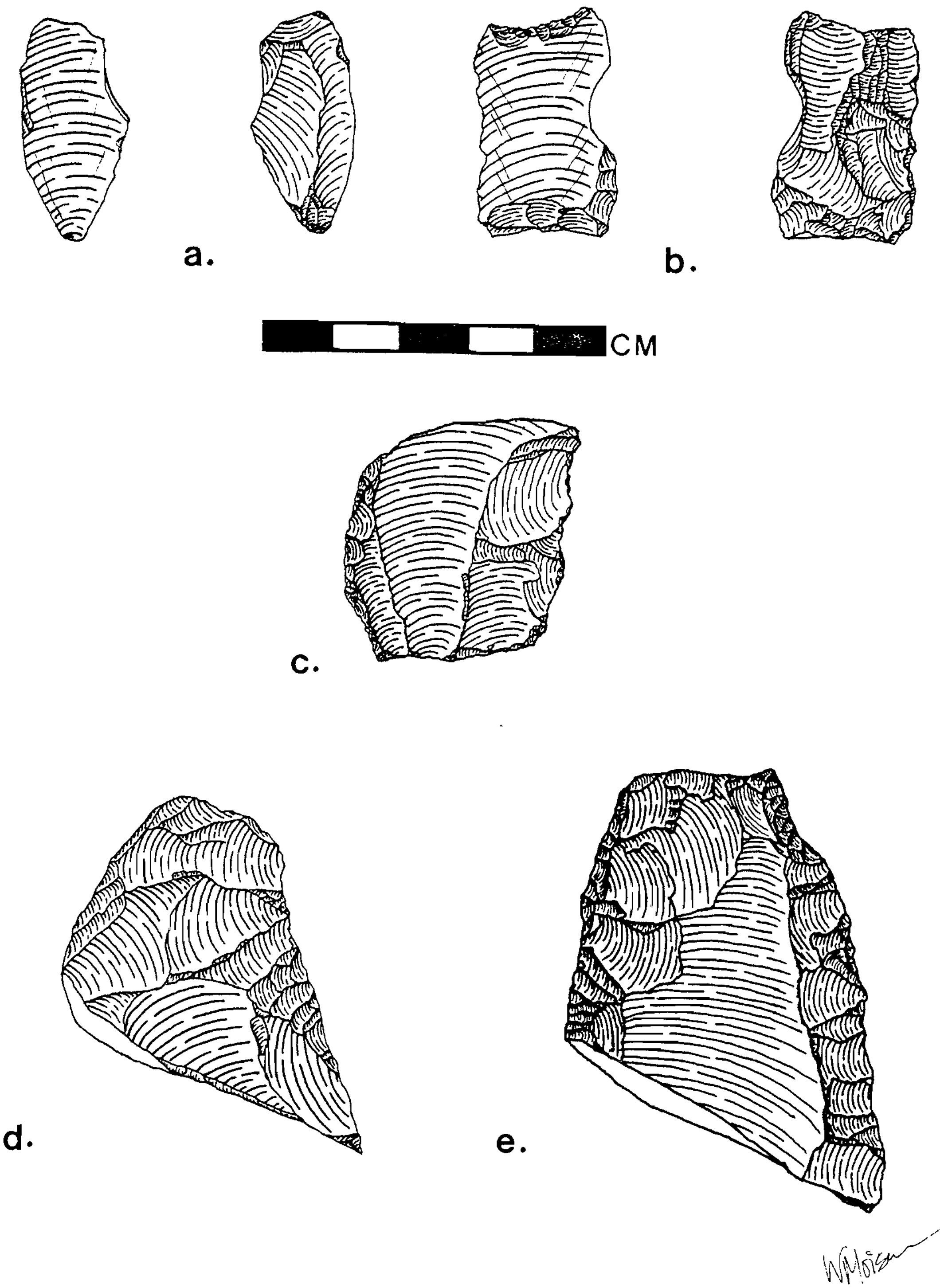


FIGURE 15. Clovis Artifacts Identified by Fagan (1988) from the Dietz Site. Flute Flakes: a. #553-143 and b. #553-243 Blanks or Preforms: c. #553-164; d. #553-244; and e. #553-204

The Dietz site has also produced a total of 32 stemmed and shouldered points assignable to the Western Stemmed Tradition, of which 18 were clearly identifiable as previously described types (Figures 16 through 18). These types include: seven Cougar Mountain, one Lake Parman, one Lake Mohave, one Haskett, three Windust, one Cascade, and three Plano-like square-based stemmed points.

The remaining 14 Western Stemmed tradition artifacts recovered include 11 miscellaneous stemmed point bases which most likely represent the Cougar Mountain type, but are too fragmentary to be certainly identified (Figure 16). Three other stemmed points were categorized as small (N = 2) and large (N = 1) transitional forms (Figure 18). In addition to the 32 stemmed point types described above, five crescents, 12 ground stone slabs of local volcanic tuff and two mano fragments have been recovered in direct association with the Western Stemmed tool clusters (Figures 19 and 20). The economic significance of the crescents and ground stone tools and the chronological relevance of the so-called transitional forms are further discussed in Chapter III under Sub-basin Correlations and in Chapter IV under Relative Dating of Clovis and Stemmed Cultures.

Of the 39 stemmed, shouldered and lanceolate points collected and identified by Fagan (1984b, 1988) at the Dietz site and at Site No. 45, I have examined and illustrated all but fourteen. The fourteen Western Stemmed artifacts not examined and illustrated here include: (1) #553-27, #553-41, #553-76, #553-79, #553-90, #553-106, #553-119 and #553-120 from the Dietz site; and (2) #490-45-131 through #490-45-137, and #490-45-139 from Site No. 45.

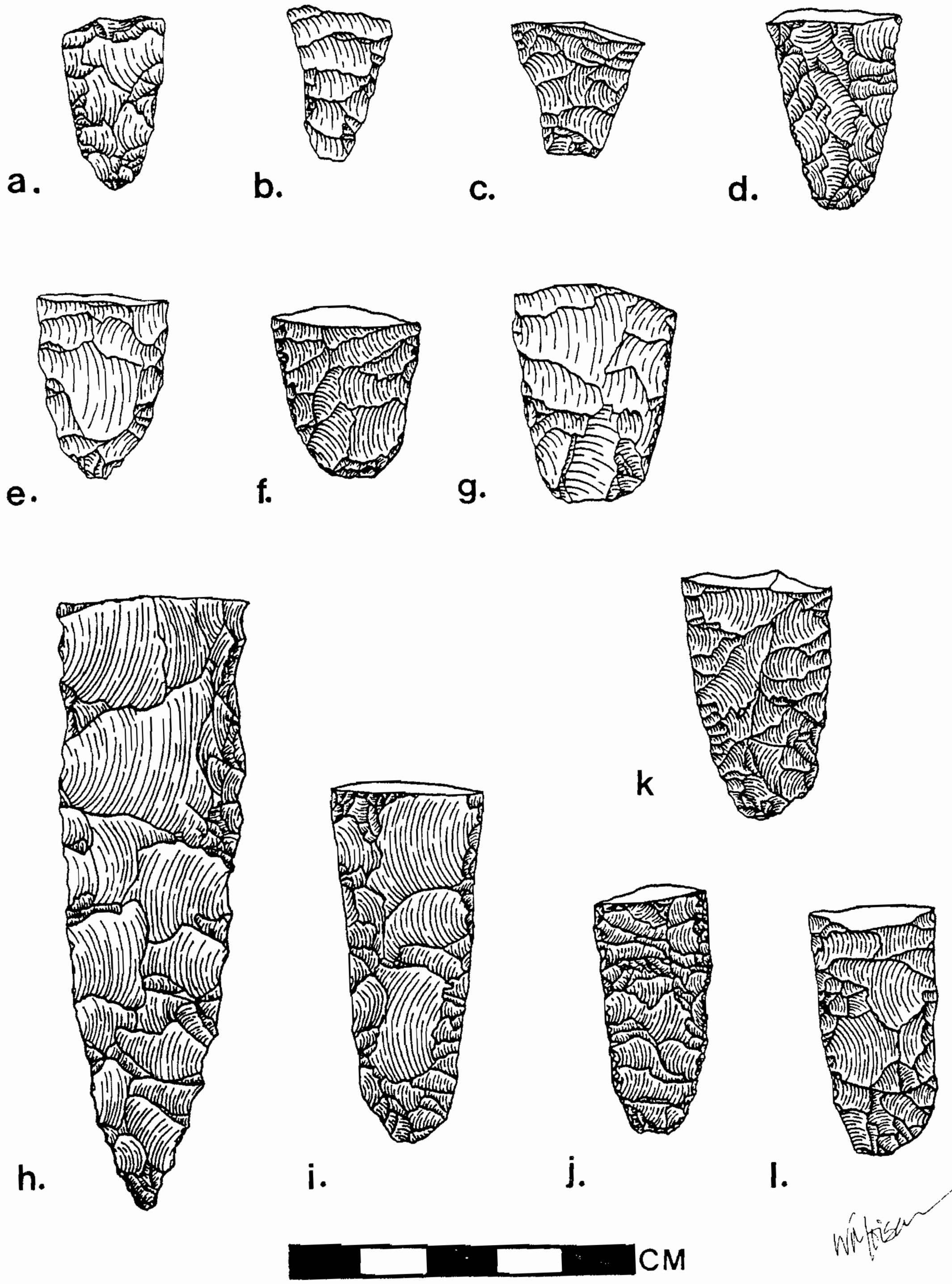


FIGURE 16. Miscellaneous Stemmed Point Base Fragments (WS-1) and Cougar Mountain Points (WS-2) from the Dietz Site. WS-1 include: a. #553-406; b. #553-408; c. #553-259; d. #553-50; e. #553-426; f. #553-77; and g. #553-405. WS-2 include: h. #553-51; i. #553-45; j. #553-168; k. #553-68 and l. #553-176

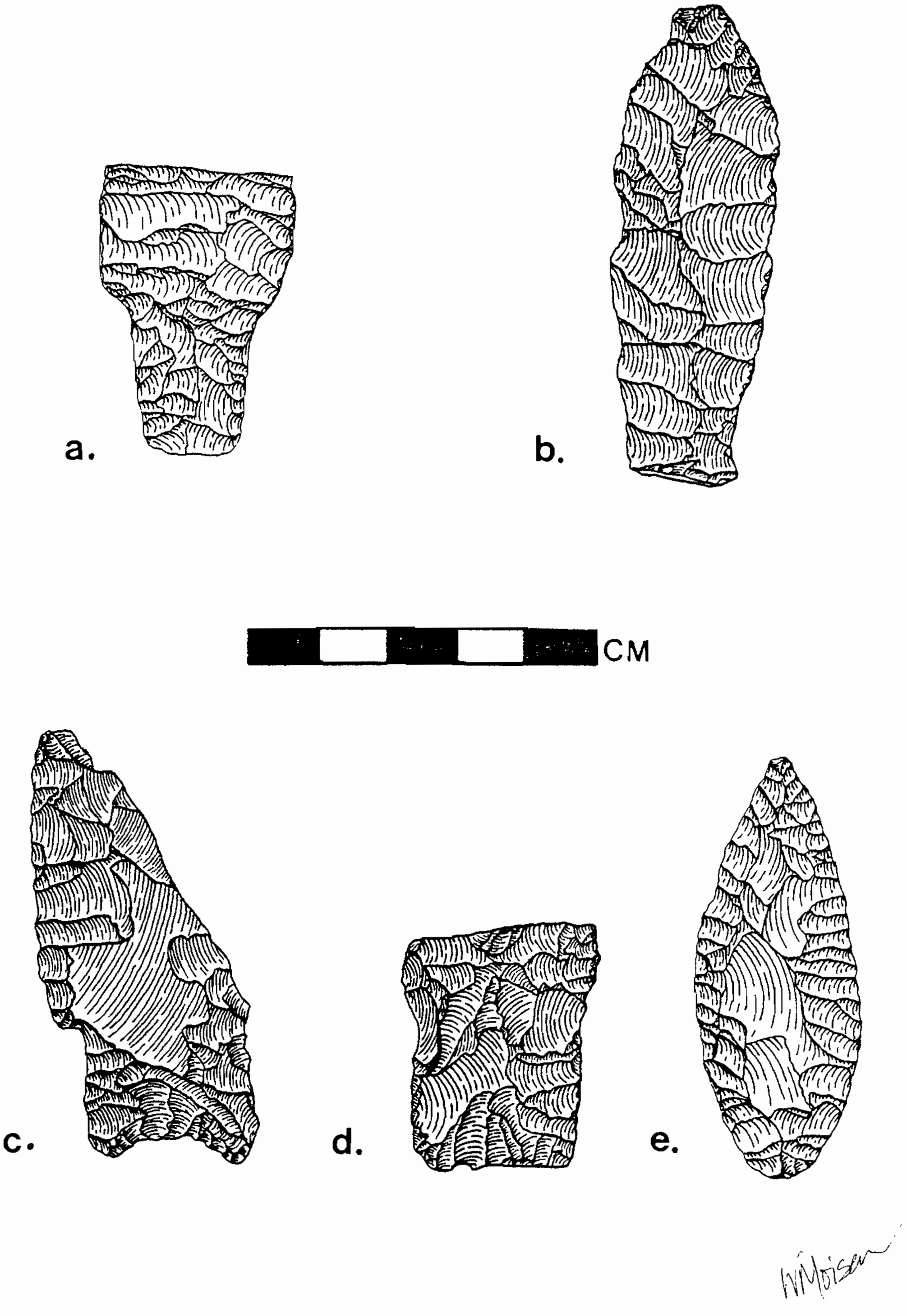


FIGURE 17. Parman (WS-3), Haskett (WS-5), Windust(WS-9) and Cascade Points (CA) from the Dietz Site. WS-3 includes: a. #553-418. WS-5 includes: b. #553-60. WS-9 include: c. #553-29 and d. #553-72. CA includes: e. #553-423

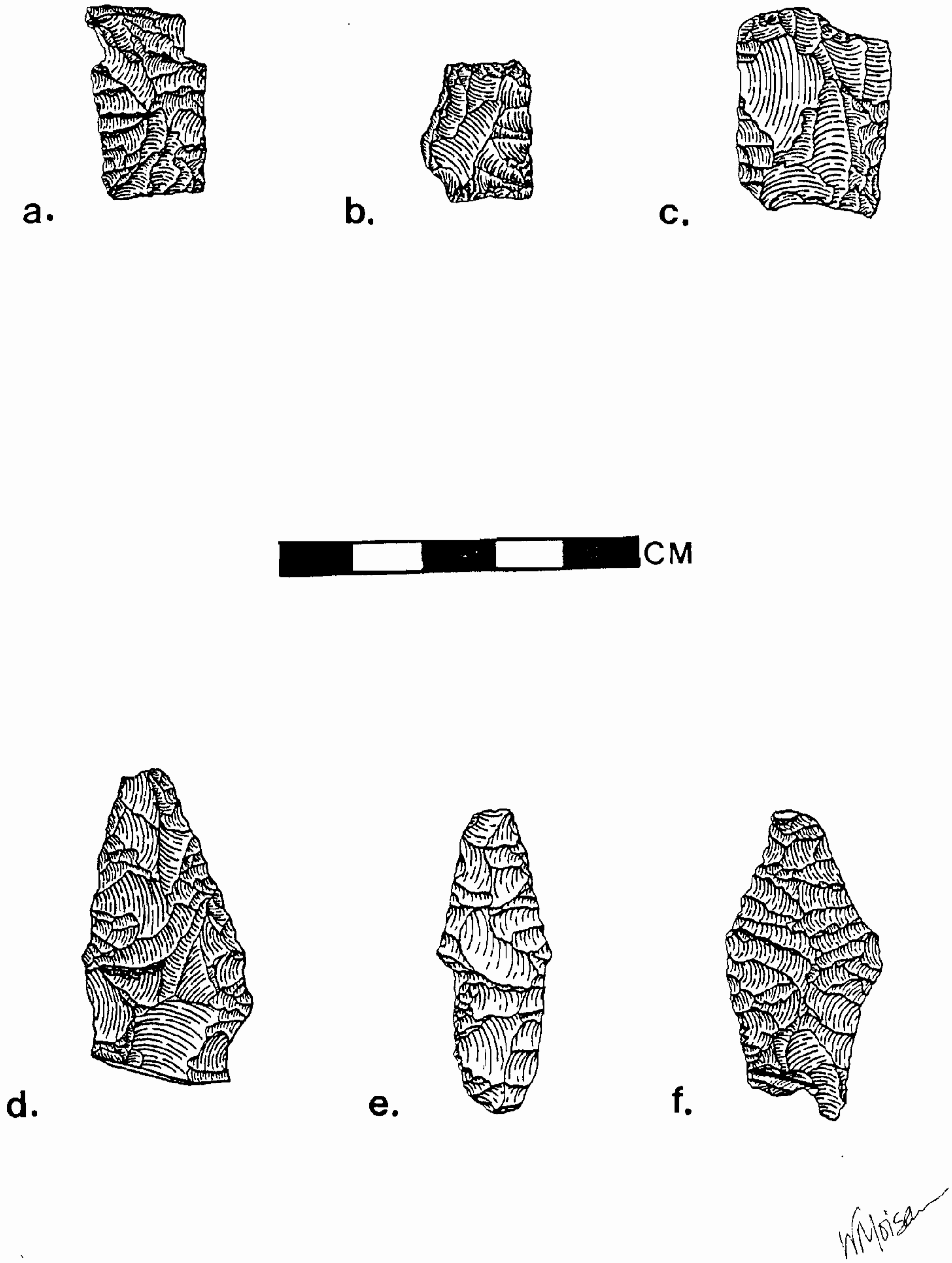


FIGURE 18. Large (WS-6) and Small (WS-8) Transitional Stemmed Points and Plano-like Square-based Forms (PS) from the Dietz Site. <u>PS include:</u> a. #553-109; b. #553-211; and c. #553-300. <u>WS-6 includes:</u> d. #553-61. <u>WS-8 include:</u> e. #553-415 and f. #553-289

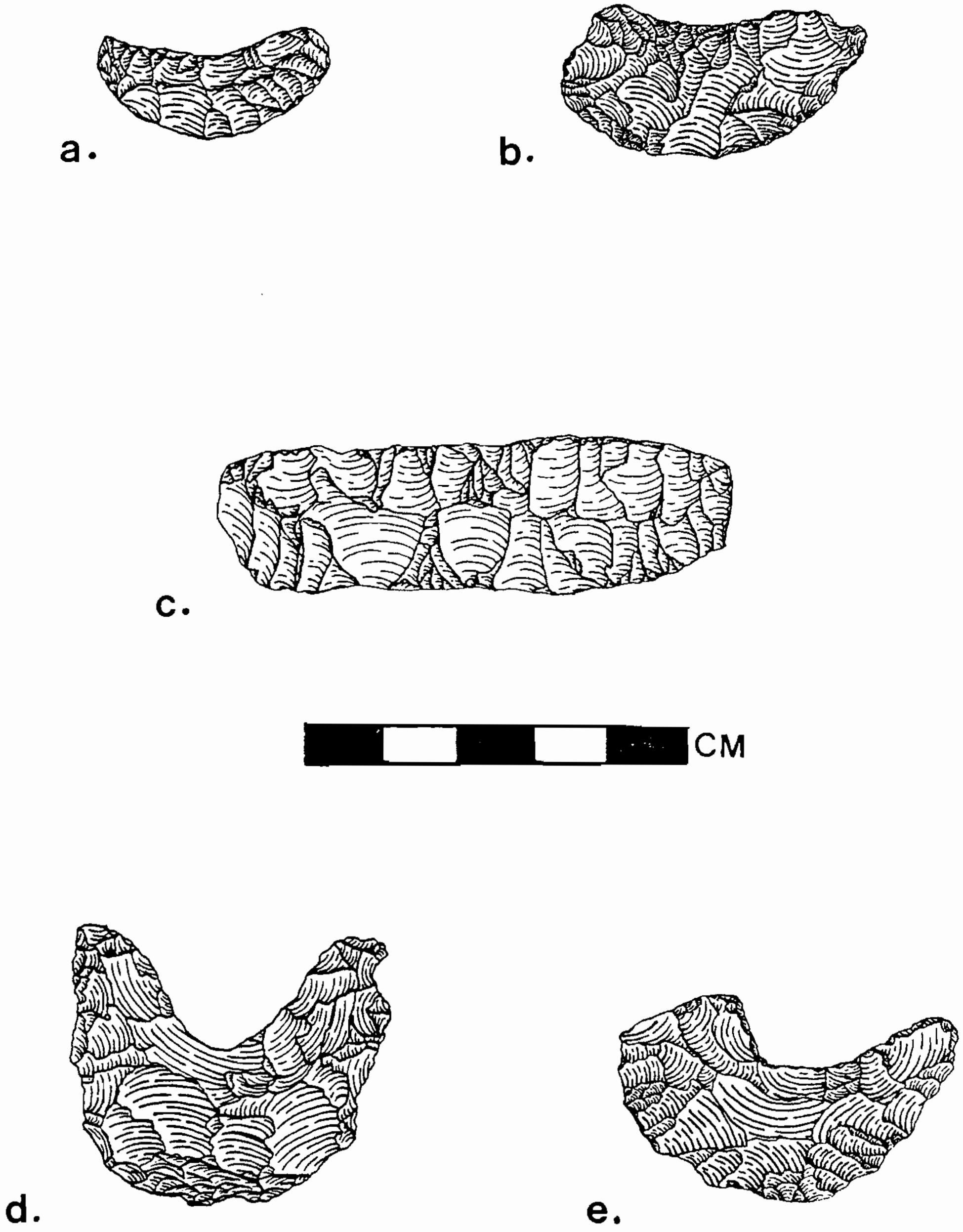
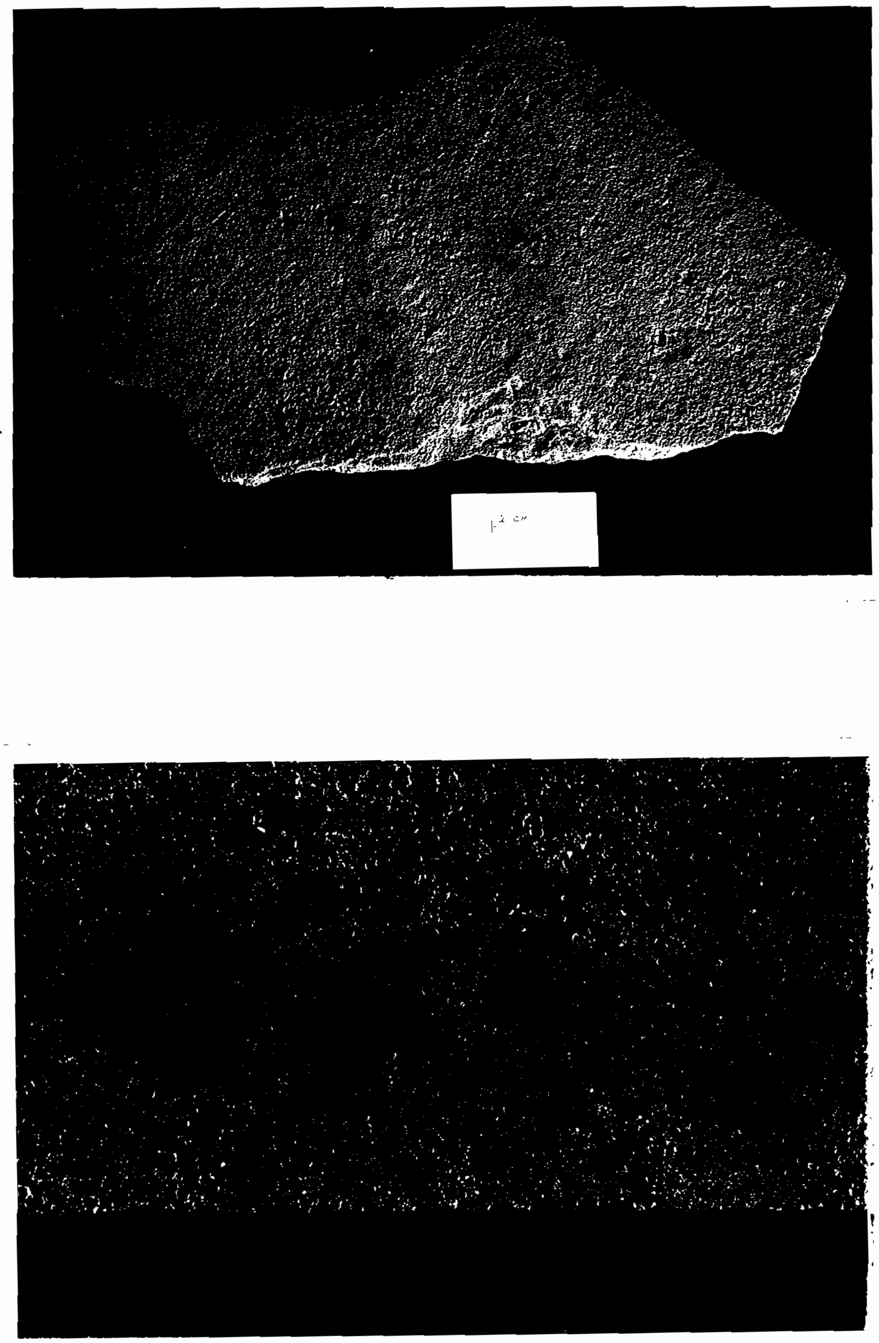


FIGURE 19. Crescent Tools from the Dietz Site: a. #553-425; b. #553-112; c. #553-434; d. #553-286 and e. #553-212



a.

b.

FIGURE 20. Large Ground Stone Slab (metate) of Local Tuffaceous Rock (#553-86) from the Dietz Site, Found in Association with Western Stemmed Point Clusters: a. Full View; b. Close-up of worn surfaces. Specimen measures 30 cm by 17 cm.

In addition to the transitional Western Stemmed forms mentioned above, the Dietz site has also yielded two unfluted concave based points (#553-187 and #553-400) and 14 "odd" point types that defy categorization and seem to be neither fluted, nor stemmed, or perhaps a little of both (Figures 21 through 23). It can be hypothesized that some of these so-called transitional point types represent temporally and culturally intermediate forms between Western Clovis and Western Stemmed, or between Western Stemmed and Humboldt/Pinto groups in the basin.

Other time-diagnostic artifacts (N = 18) recovered at the Dietz site include one small and three large corner-notched points, four side-notched points, two Pinto stemmed and shouldered forms, seven Humboldt series types (Figures 24 through 26). Most of these non-fluted and non-stemmed artifacts occurred as scattered, isolated finds not associated with the large, dense clusters of debitage producing fluted and stemmed points. In particular, two corner-notched points (#553-401 and #553-402) and one side-notched point (#553-403) which clearly date to later time periods were found conspicuously piled into a small cluster at a recently abandoned hunting camp near the base of the Dietz Hill, probably discarded as rejects by local artifact collectors. This modern camp, referred to as "Juniper Pole Camp", is the only physical evidence of potential human disturbance of cultural remains in the northern Alkali Lake Basin -- a factor of significance in reconstructing site formation processes (see discussion in Chapter III under Integrity of Deposits and Post-occupation Processes).

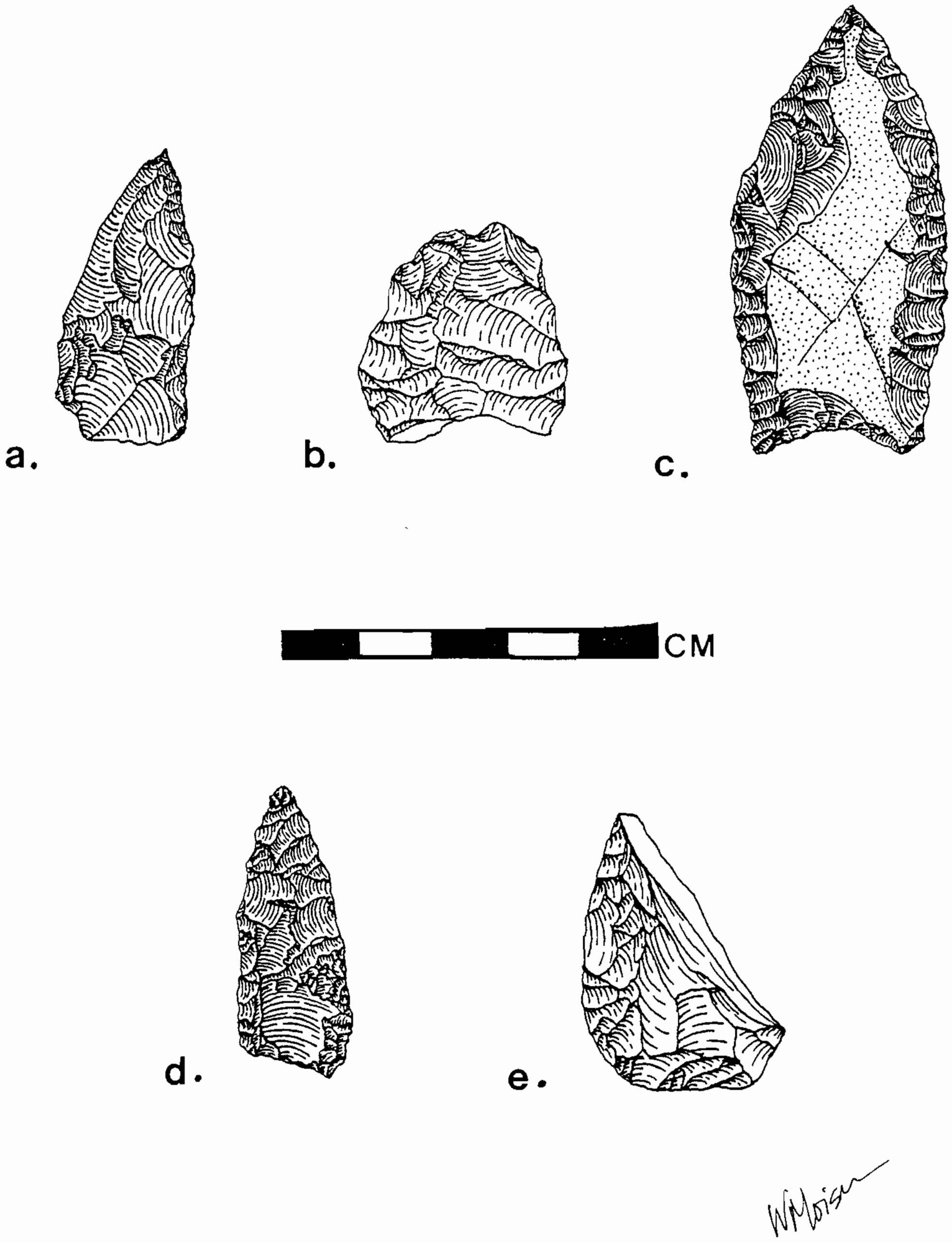


FIGURE 21. Unfluted Concave-based (CB) Points and Unique (Untyped) Fluted or Basally-thinned Points from the Dietz Site. CB include: a. #553-198; b. #553-407; and c. #553-187 Untyped include: d. #553-116 and e. #553-442

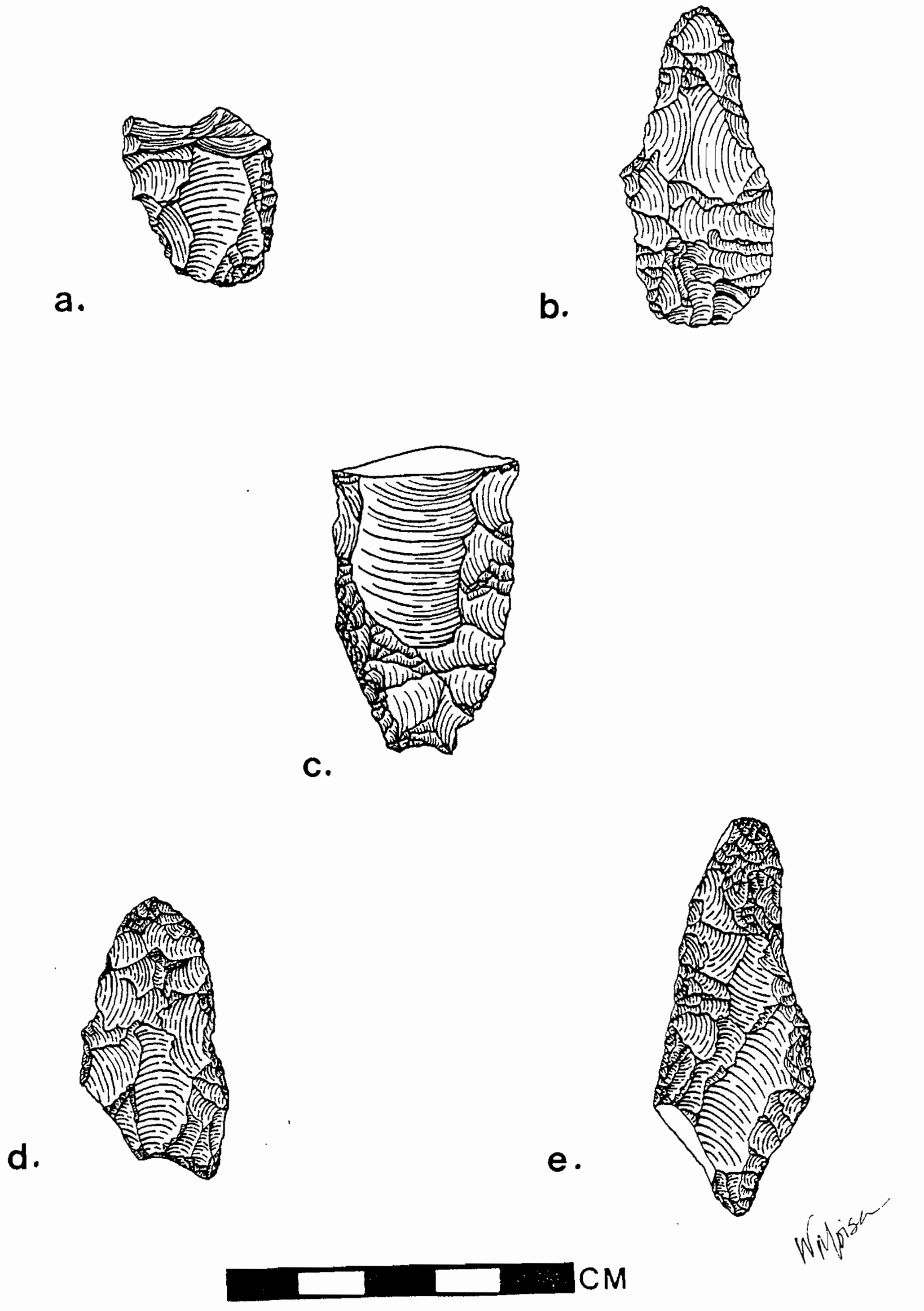


FIGURE 22. Unique (Untyped) Concave Based, Shouldered, Fluted or Basally-thinned Points from the Dietz Site: a. #553-145; b. #553-153; c. #553-159; d. #553-193; and e. #553-174

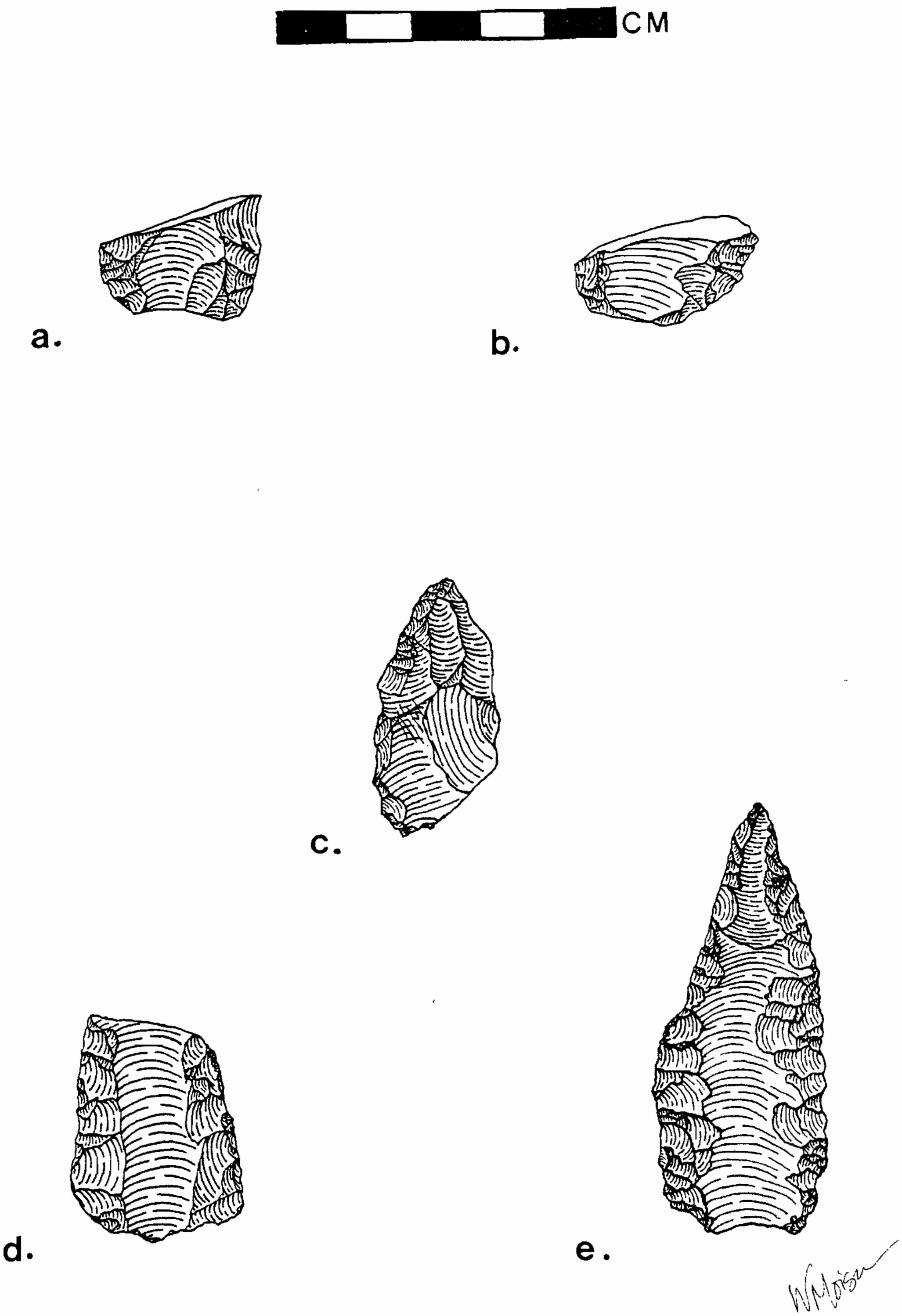


FIGURE 23. Unique (Untyped) Concave-based, Shouldered, Fluted or Basally-thinned Points from the Dietz Site: a. #553-420; b. #553-108; c. #553-118; d. #553-166 and e. #553-104

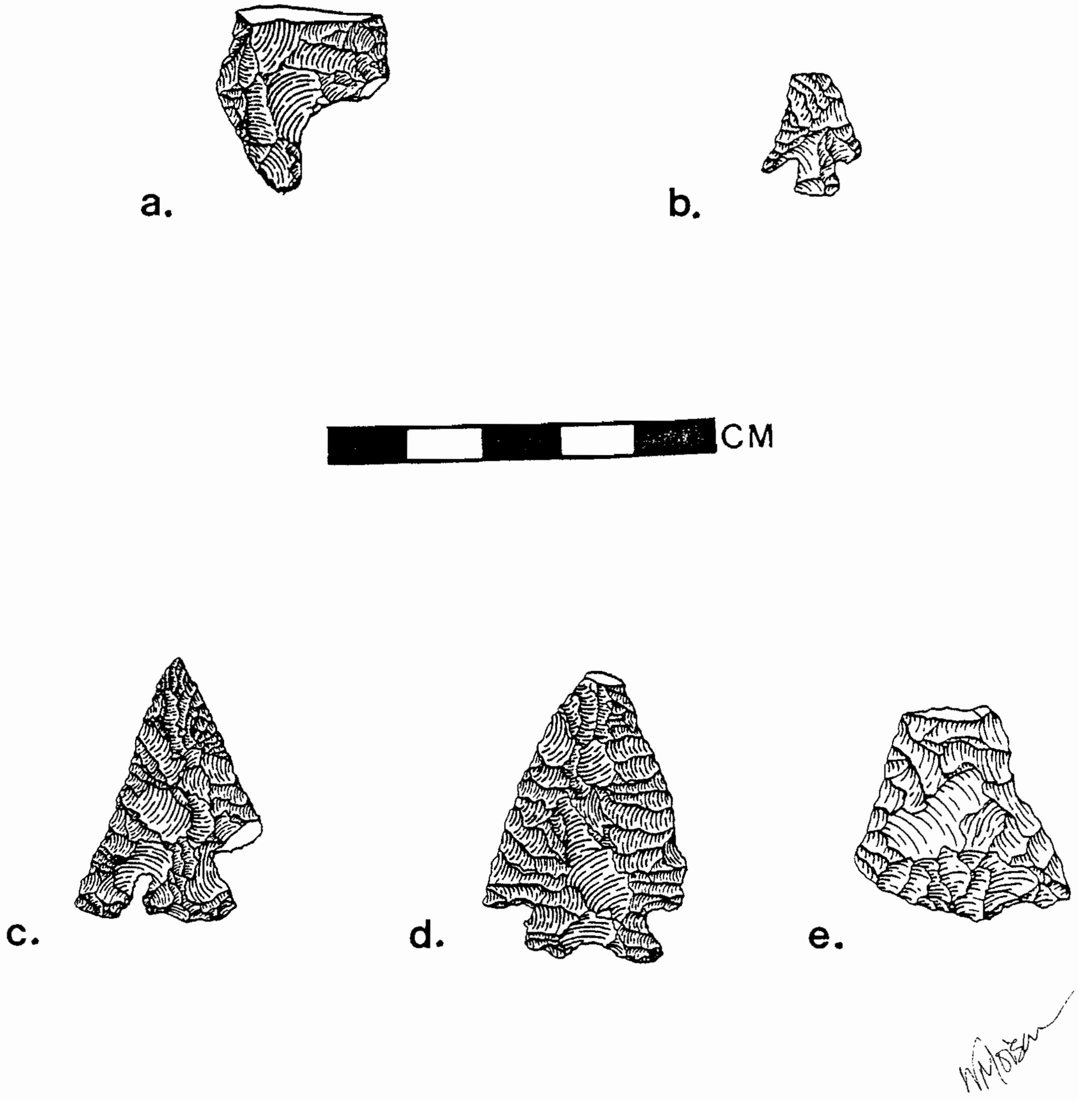


FIGURE 24. Miscellaneous Corner-notched (CN) and Untyped Eared Points from the Dietz Site. Untyped Eared: a. #553-67. Small CN: b. #553-402. Large CN: c. #553-69; d. #553-71; and e. #553-401

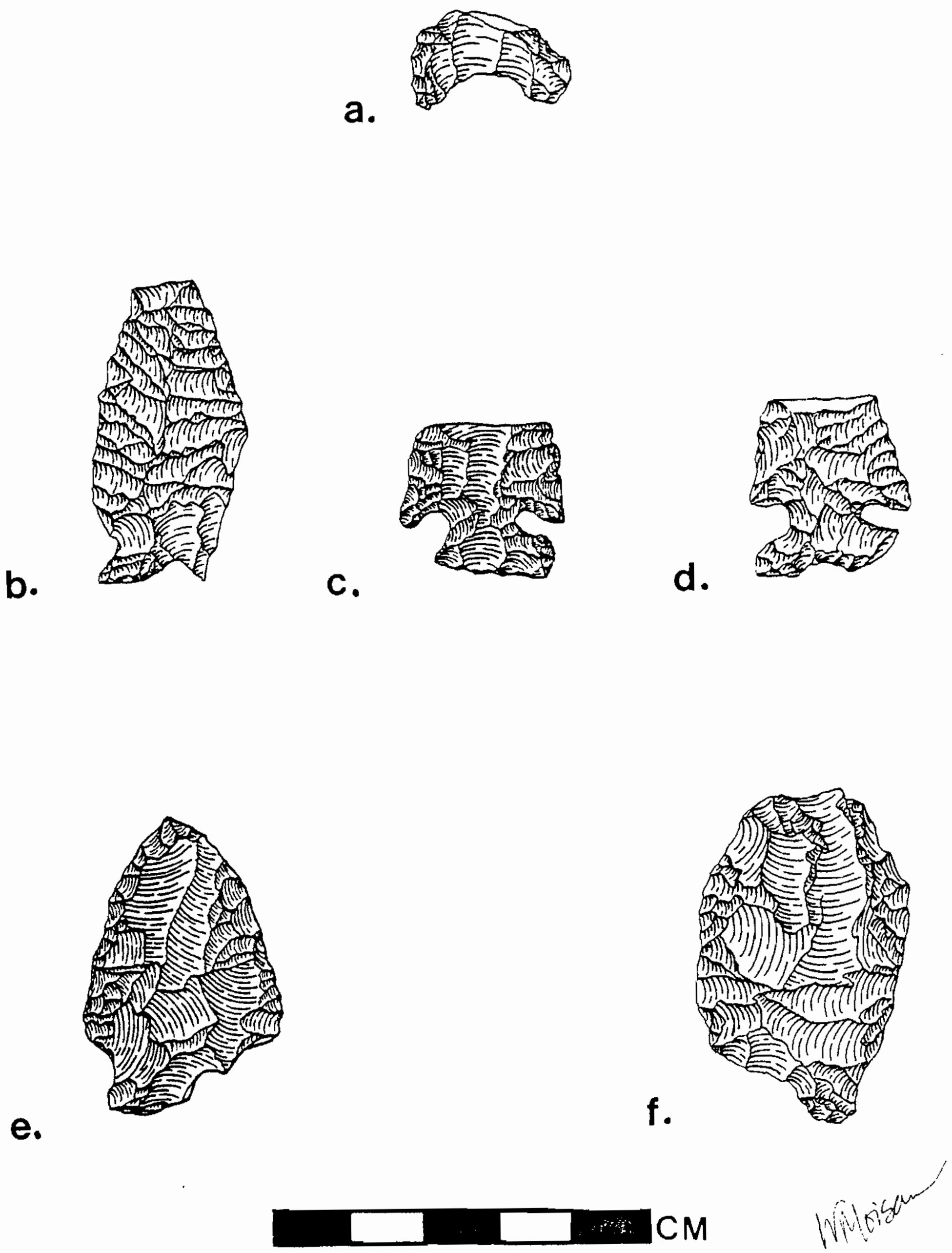


FIGURE 25. Side-notched (SN) and Pinto Shouldered or Notched (PI) Points from the Dietz Site. SN include: a. #553-403; b. #553-409; c. #553-296; and d. #553-424. PI include: e. #553-66 and f. #553-219

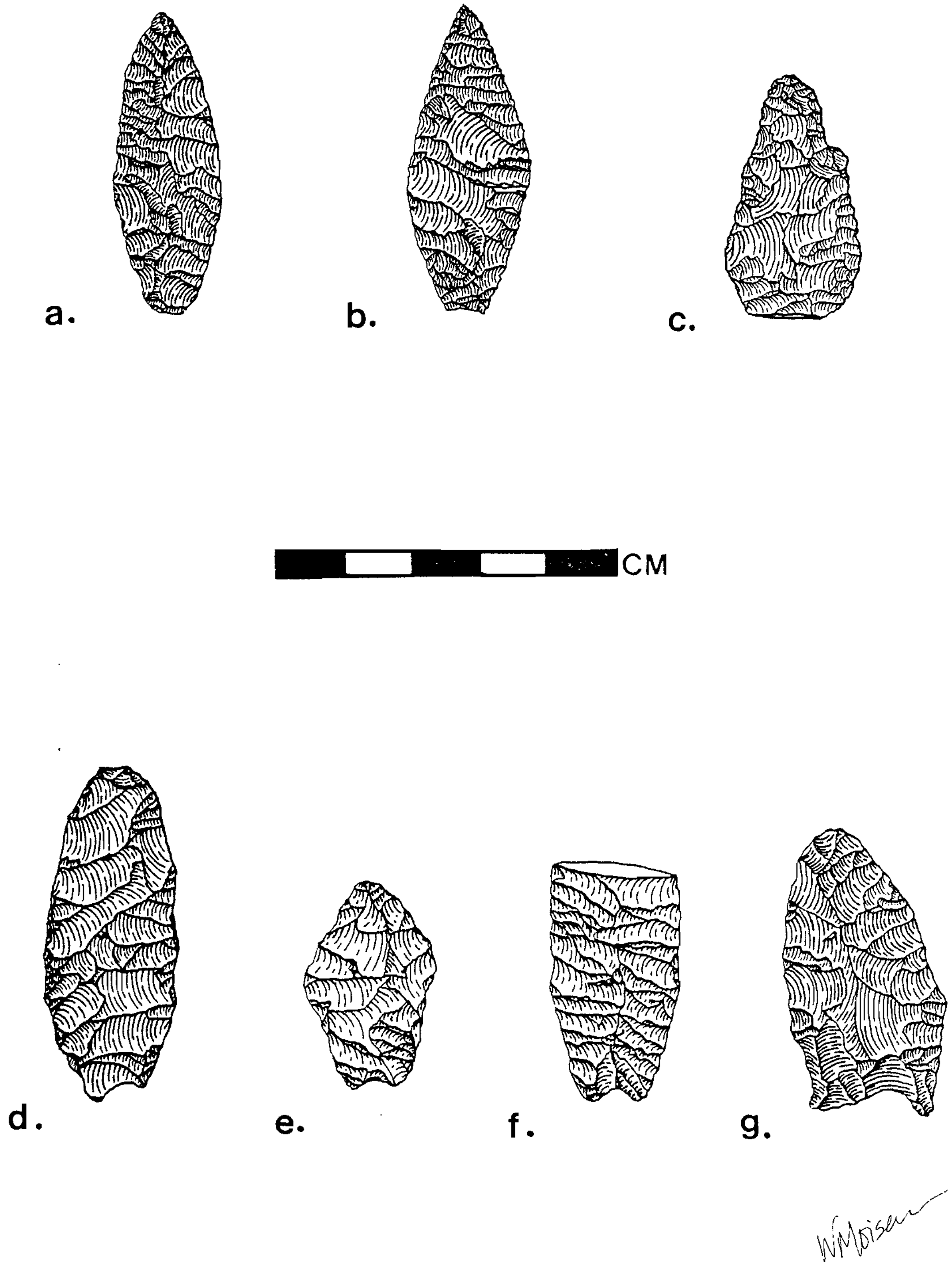


FIGURE 26. Humboldt Series Points (HU) from the Dietz Site: a. #553-288; b. #553-43; c. #553-40; d. #553-58; e. #553-413; f. #553-414 and g. #553-173

The other large corner-notched and side-notched points at the site, along with the Humboldt and Pinto types (N = 15), strongly suggest that the northern Alkali Lake Basin may not have been a place of choice after about 7,000 or 6,500 B.P. (see concluding discussions in Chapter III). These kinds of point types have generally been assigned to the early-to-mid Holocene range (7,000 to 5,000 B.P.). However, there is a growing consensus, based on a number of recent studies, that Pinto, Humboldt and large notched forms actually occur in two stages or periods of fluorescence in the Far West. The early floruit ranges from 8,000 to 7,000 B.P., and even as early as 9,000 B.P.; and the later period occurs between 6,500 and 5,000 B.P. (Ames et al. 1981; Hanes 1988a, 1988b; Holmer 1978, 1986; Layton 1970, 1972; Wilde 1985).

This two-stage temporal division of early and late Humboldt, Pinto, and large notched forms has important bearing upon the results of Alkali Lake Basin research. Although it was not discovered until the very late stages of research, there is compelling evidence, both cultural and environmental, for a two-stage Western Stemmed occupation in the northern Alkali Lake Basin. The first period probably began about 10,000 B.P. and continued to 8,600 B.P., while the later period probably ranges from 8,000 to 7,000 or 6,500 B.P. (see concluding discussions in Chapters III and IV). The data suggest that these early Humboldt, Pinto and large-notched forms in the basin are much closer in age and historical relationship to Western Stemmed people than was previously thought. Such a close temporal and cultural overlap would explain the high percentage of odd, transitional forms so common here.

Modeling Paleolandscape, Lake History and Early Human Land Use in the Northern Alkali Lake Basin

The major focus of geoarchaeological research in the northern Alkali Lake Basin, and at the Dietz site, has been to gather archaeological and paleoenvironmental data to answer questions about the age, historical relationship and economic adaptations of the Western Clovis and Western Stemmed cultures represented there. In particular, the research sought to reconstruct Clovis and Stemmed-era landscape and lake history in the basin, and to determine the precise distribution and stratigraphic context of artifacts and sites upon that landscape. Detailed reconstructions of settlement pattern, occupation surfaces and paleoenvironment have provided valuable inferences about chronology and paleoeconomy, thereby increasing our knowledge and understanding of these earliest inhabitants of the Far West.

The primary research strategies were threefold: (1) to reconstruct the Clovis-Stemmed era landscape, lake history and human settlement pattern in the basin from about 11,500 to 7,000 B.P.; (2) to determine the precise distribution and stratigraphic context of Western Clovis and Western Stemmed artifacts and sites upon that landscape -- in relation to each other and to sequent, datable fossil water bodies; and thereby, (3) to establish a relative or indirect dating of the Western Clovis and Western Stemmed occupations.

In 1983 and 1984, study of artifact distributions and fossil lake features in the vicinity of the Dietz site led to the development of a testable model of lake history and human land use in the basin from

11,500 to 7,000 B.P. The model posited a terminal Pleistocene Western Clovis occupation oriented to a small, shallow lake or pond, followed by an early Holocene Western Stemmed settlement around a larger lake and marsh fringe.

The main objectives of field research in 1985 and 1986 were: (1) to gather archaeological and environmental data from elsewhere in the northern sub-basin to test this model of lake history and human occupation pattern as proposed; and (2) to further explore the implications of this model for dating the Western Clovis and Western Stemmed occupations. Data to test the model were gathered through basin-wide site survey, stratigraphic studies, and high-resolution mapping of lake features and artifacts.

Field methods used in gathering the research data included: (1) large-scale piece-plotting of surface collected artifacts; (2) a continuing program of map and air-photo research, followed by geomorphic field survey of fossil lakeshore features at or below the elevation of the Dietz site; (3) basin-wide archaeological site survey; (4) extensive sub-surface testing and stratigraphic study of cultural deposits and fossil lake features; and (5) high resolution topographic mapping of low-relief lake features and time-diagnostic artifacts in the basin. These field methods are further discussed below in Chapter II under Model Testing and Research Methods, in the context of the environmental setting of the Dietz site.

CHAPTER II

GEOARCHAEOLOGICAL RESEARCH IN THE ALKALI LAKE BASIN

Regional Environmental Setting

Greater Alkali Lake Basin

The Dietz site (35 LK 1529) is located in south-central Oregon in the northernmost portion of a structural basin once occupied by Pluvial Lake Alkali. Alkali Lake Basin is one of several major structural basins of interior drainage in south-central Oregon (Figures 1, 2, 27 and 28) which contained a long succession of pluvial lakes during the late Pleistocene, as well as numerous smaller Holocene lakes (Allison 1940, 1979; Baldwin 1981; Forbes 1973; Mehringer 1977, 1986; Russell 1884, 1905). Geographically, this portion of Oregon falls within the Basin and Range geographic province of western North America (Baldwin 1981; Franklin and Dyrness 1973). Regional topography is dominated by multiple fault-block mountains and ridges which trend north-northeasterly and north-northwesterly, forming the margins of these closed lake basins.

As of 1983, when the Dietz site research was initiated, the record of late Quaternary stratigraphy and lake history for greater Alkali Lake Basin had not been studied in detail. The paleoenvironment and geology of the surrounding region has been studied by numerous geologists and Quaternary scientists (Allison 1940; Baldwin 1981;

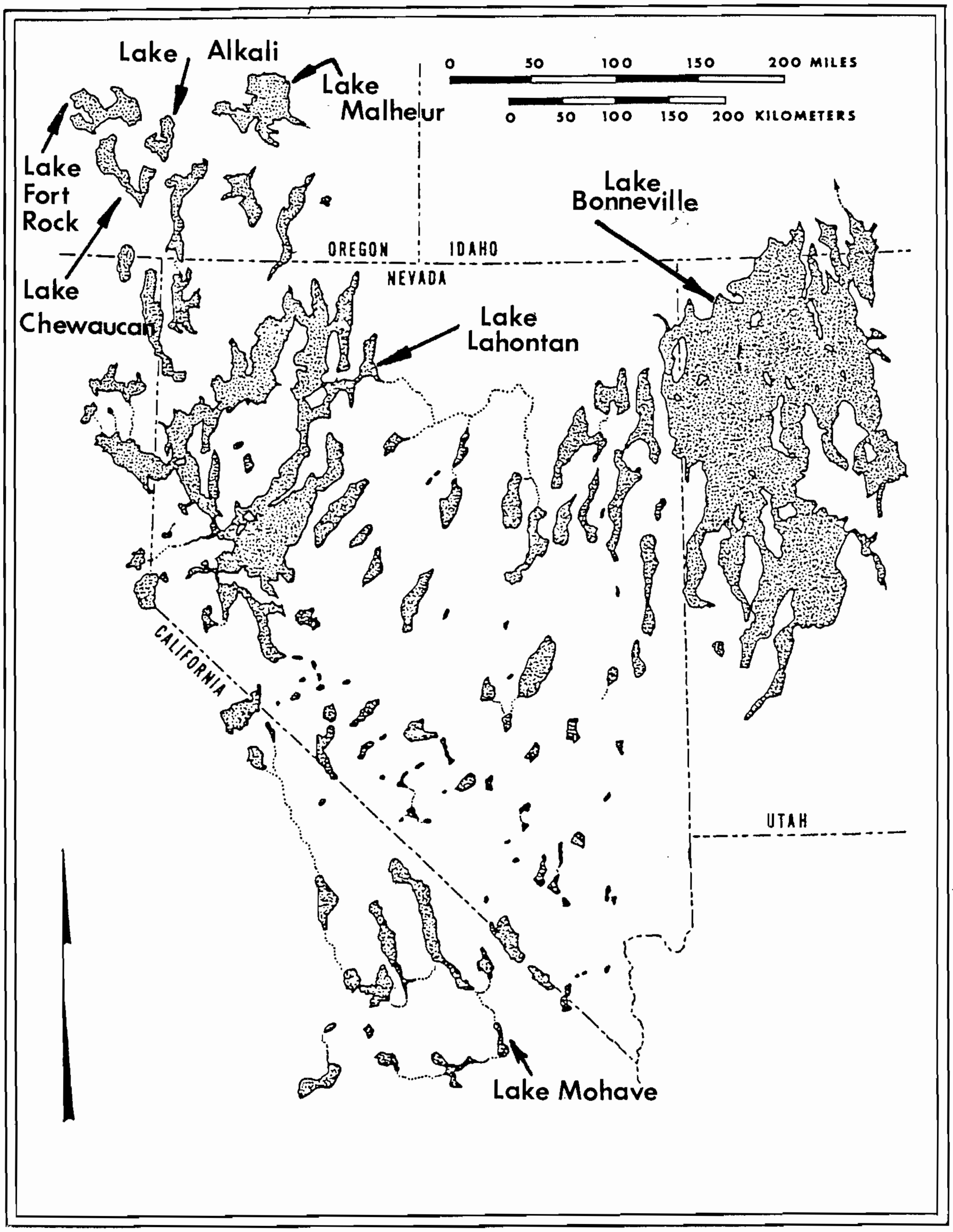
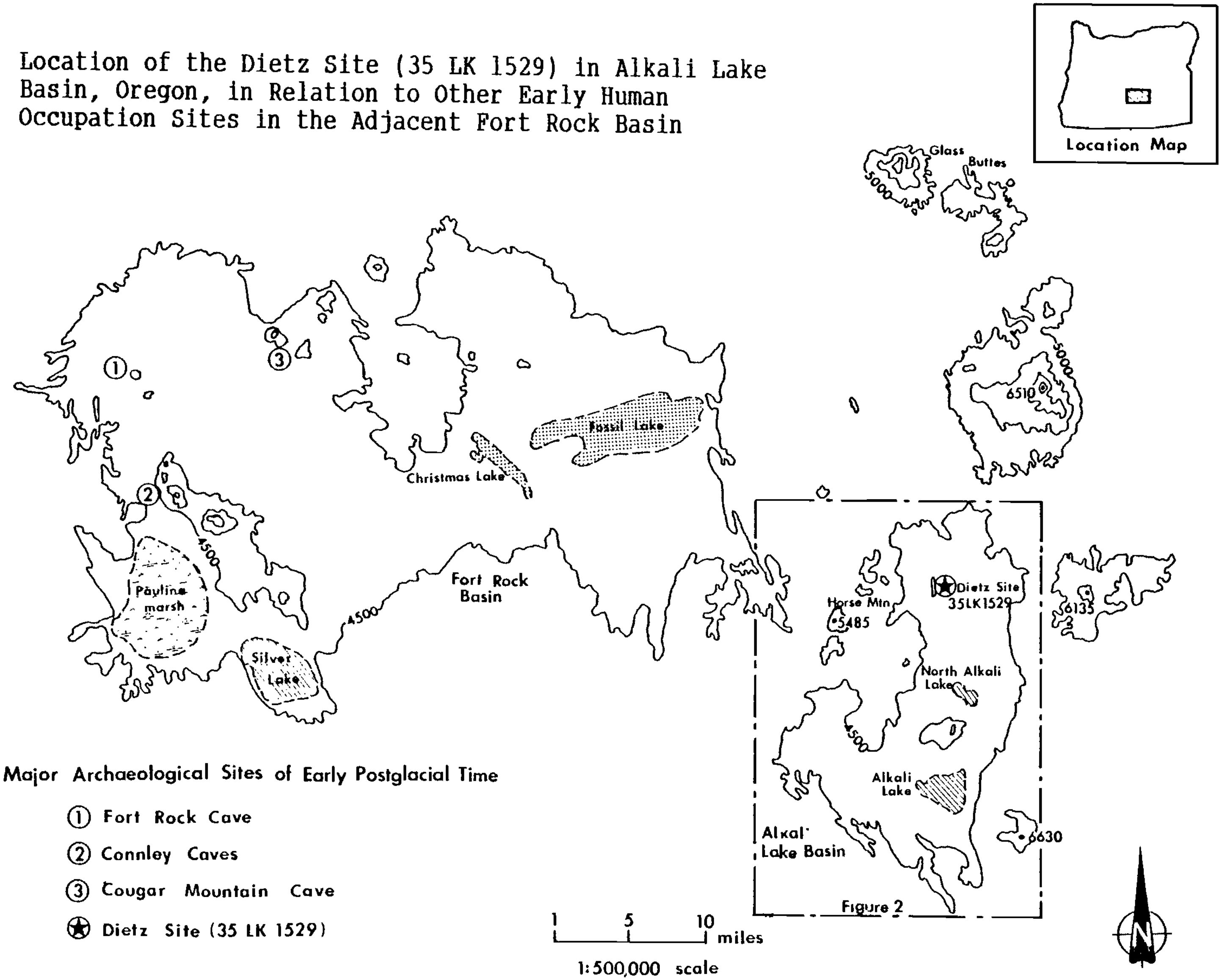


FIGURE 27. Map of Late Pleistocene Pluvial Lakes in the Great Basin Showing Location of Alkali Lake Basin and Other Major Lake Basins Discussed in Text (Adapted from Wilde 1985:48)

FIGURE 28. Location of the Dietz Site (35 LK 1529) in Alkali Lake Basin, Oregon, in Relation to Other Early Human Occupation Sites in the Adjacent Fort Rock Basin



Hansen 1942, 1947; Meinzer 1922; Mifflin and Wheat 1979; Peck 1961; Peterson and McIntyre 1970; Phillips and Van Denburgh 1971; Russell 1884, 1905; Snyder et al. 1964; Walker and Repenning 1965; Walker et al. 1967; Waring 1908).

The geology is characterized by tuffs, volcanic breccias, basaltic lava flows and eroded remnants of volcanic plugs and shields. Their formation and subsequent deformation are the result of volcanic and tectonic activity throughout the Pliocene and early Pleistocene (Allison 1979; Baldwin 1981). The late Pleistocene history of the region is dominated by the sedimentation and erosional processes associated with fluctuating pluvial lake levels, with some recent basalt flows as well. The dominant local bedrock which would have contributed parent material for prehistoric sediments and soils includes Miocene basalts and rhyolitic flows, Pliocene flows, tuffs and tuffaceous sedimentary rocks (Baldwin 1981). Reddish brown tuffaceous bedrock is common in Alkali Lake Basin, and was used as a source of camprock and ground stone tools by Western Stemmed groups in the northern Alkali Basin.

Alkali Lake Basin is surrounded by four other pluvial lake basins whose landforms and lake history have been the focus of numerous geological and paleoenvironmental studies (Figure 27). Fort Rock basin, located to the northwest, contained Pluvial Fort Rock Lake, of which Silver Lake and Paulina Marsh are modern remnants (Allison 1966a, 1979; Davis 1982b, 1985; Forbes 1973; Greenspan 1985; Hampton 1964). Chewaucan Basin, located to the southwest, contained Pluvial Lake Chewaucan, of which Summer Lake, Abert Lake and Chewaucan marsh are modern remnants (Allison 1945, 1966b, 1982; Davis 1982b, 1985; Greenspan 1985). Warner Basin, located to the southeast of Alkali Lake Basin, was the home of Pluvial Lake Warner, of which numerous small lakes remain today (D. Weide 1975; M. Weide 1968). The Harney-Malheur Basin, located to the northeast, contained Pluvial Lake Malheur, of which Malheur, Harney and Silver Lakes are modern remnants (Gehr 1980; Greenspan 1985).

These regional investigations in adjacent lake basins provided a basis for comparison of the lake history as reconstructed in the northern Alkali Lake Basin. Broader, long-distance comparisons can also be made to environmental studies in the Lahontan Lake Basin of Nevada (Benson 1978, 1981; Benson and Thompson 1987b; Dansie et al. 1988; Davis 1978, 1982a, 1983; Morrison 1964; Raven and Elston 1988; Russell 1883, 1885; Thompson et al. 1986) and the Bonneville Lake Basin of Utah (Currey and Oviatt 1985; Gilbert 1890). More general summaries of these basins are provided by Benson and Thompson (1987a), Broecker and Orr (1958) and Morrison (1965a). In particular, when Alkali Basin data were compared to those of its nearest neighboring basin (Fort Rock), the level of correspondence in lake level sequences and elevations was too striking to be explained by mere coincidence (Figure 28). The research strongly suggests that there is a long history of groundwater connections between the Fort Rock and Alkali Lake Basins. The implications of this are discussed further in Chapter IV under Implications of Alkali Basin Research).

Alkali Basin is essentially dry today, with the exception of the frequent, seasonal filling of highly chemical Alkali Lake in the southernmost portion of the basin. Other small lakes known to fill briefly with water on a seasonal basis include Buckaroo Lake in the northeast, and to some extent, North Alkali Lake in the center of the basin. Local inhabitants speak of brief water stands in the northern sub-basin, where the Dietz site is located, but these are always characterized as shallow and short-lived (Figure 29).

The elevation of the Alkali Basin floor ranges from 1300 meters (m) in the south to 1314 m in the north (Figure 29). There are at least five prominent topographic features in the vicinity of Alkali Lake Basin which rise from 400 to 700 m above the basin floor. In the northwest, Horse Mountain peaks at 1672 m elevation. To the north and northeast are Wagontire Mountain and Glass Buttes, at 1984 m and 1948 m elevation, respectively. Little Juniper Mountain rises to 1870 m in the east, and Juniper Mountain dominates the southeast at 2020 m elevation. Two of these prominences, Glass Buttes and Horse Mountain, are known as sources of abundant obsidian, which have been utilized heavily throughout the prehistoric period as quarries of raw material for the production of lithic tools.

Within Alkali Basin itself, Pliocene and Pleistocene volcanic and tectonic processes have formed numerous fault-block scarps, eroded volcanic cones and basalt-capped ridges of moderate relief which rise as much as 100 m above the basin floor in some places (Baldwin 1981). The more prominent of these include Alkali Buttes and Grays Butte, located in the southern portion of the basin. The Dietz site, located in the northern sub-basin of greater Alkali Lake Basin, is situated along the eastern flank of a basalt-capped ridge formed by uplift.

The Dietz Site within the Context of Greater Alkali Lake Basin: The Northern Sub-basin

The Dietz site is located in the northern sub-basin of greater Alkali Lake Basin (Figures 2, 28, 29, 30 and 31). The northern sub-basin is one of three major sub-basins of greater Alkali Lake Basin which contained terminal Pleistocene and early Holocene lake levels at elevations below 1323 meters (Figure 32). The northern, central and southern sub-basins form the basic units of comparison and reference for late Quaternary lake levels existing before the Dietz site was occupied (see discussion in Chapter III under Alkali Basin Lake History Reconstruction).

At 1323 m elevation and below, greater Alkali Lake Basin is divided into three distinct sub-basins, separated from one another by drainage divides of low-relief (7 m high) bars, terraces and spits formed by previous lake stands (Figure 32). Once water levels fell below 1323 m elevation, the northern, central and southern sub-basins would have been hydrologically independent of each other, unless connected by groundwater or near surface filtering.

The majority of the fluted and stemmed artifacts at the Dietz site, dating roughly from 11,500 to 7,000 B.P., range from 1315 m to 1321 m elevation. This meant that the highest possible lake level which could have existed at the time of the earliest occupation at the site would have been at or below 1315 m elevation. Therefore, the lake levels of relevance to early human occupation at the Dietz site would have been contained within the confines of the northern sub-basin.

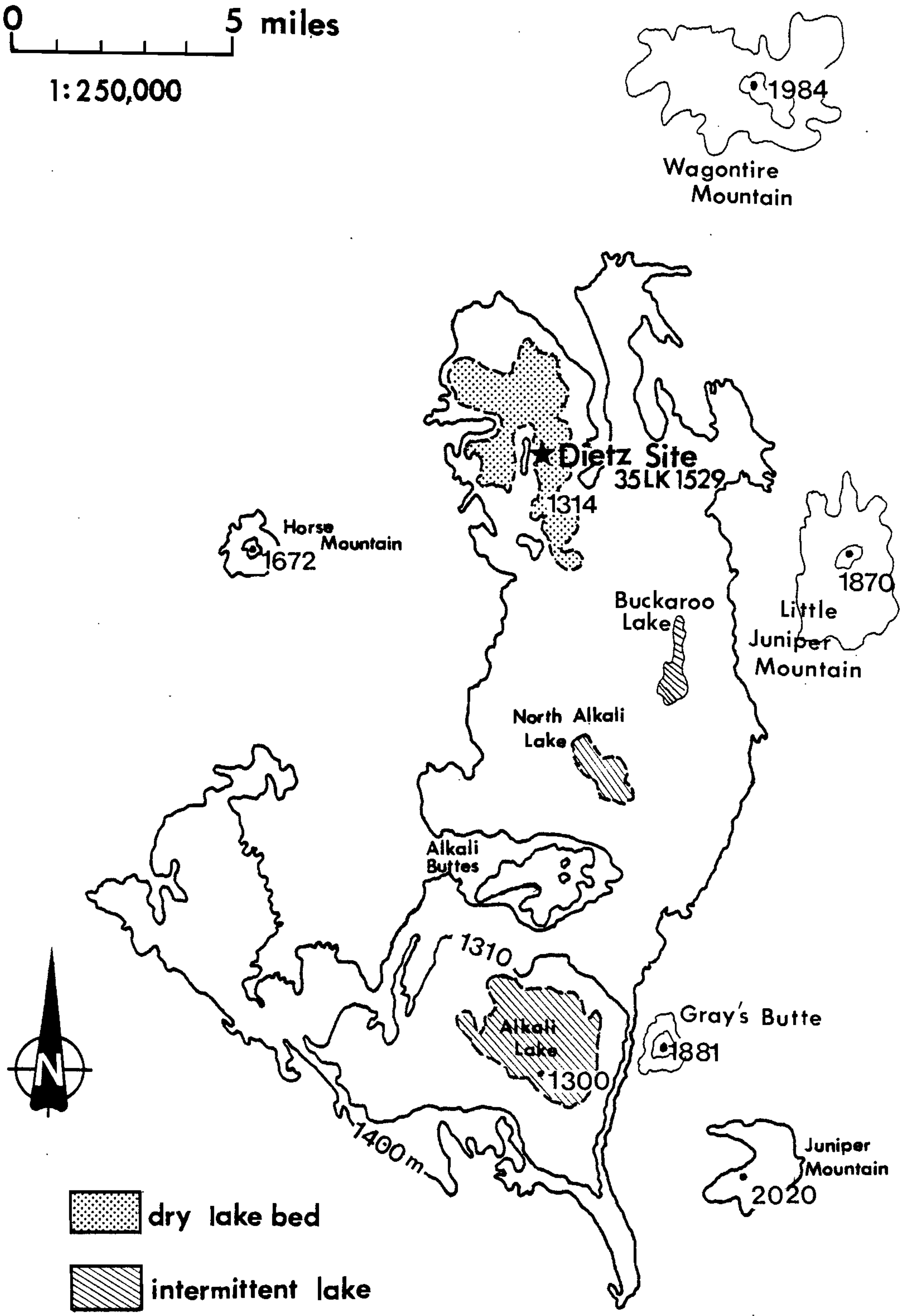


FIGURE 29. Location of the Dietz Site (35 LK 1529) in the Northern Sub-basin of Greater Alkali Lake Basin, and Locations of Major Geographic Features Discussed in Text

KEY

De = Point Debbie

Di = Point Dick

A = Point Amy

M = Point Monique

W = Point Wayne

K = Point Kevin

E = Point Elaine

R = Point Ron

B = Point Bob

J = Point John

C = Point Carol

H = Hilltop Site

F = Flemmer's Spit

U = Big Cut "Umbrella" Deposit

D = Dietz Site

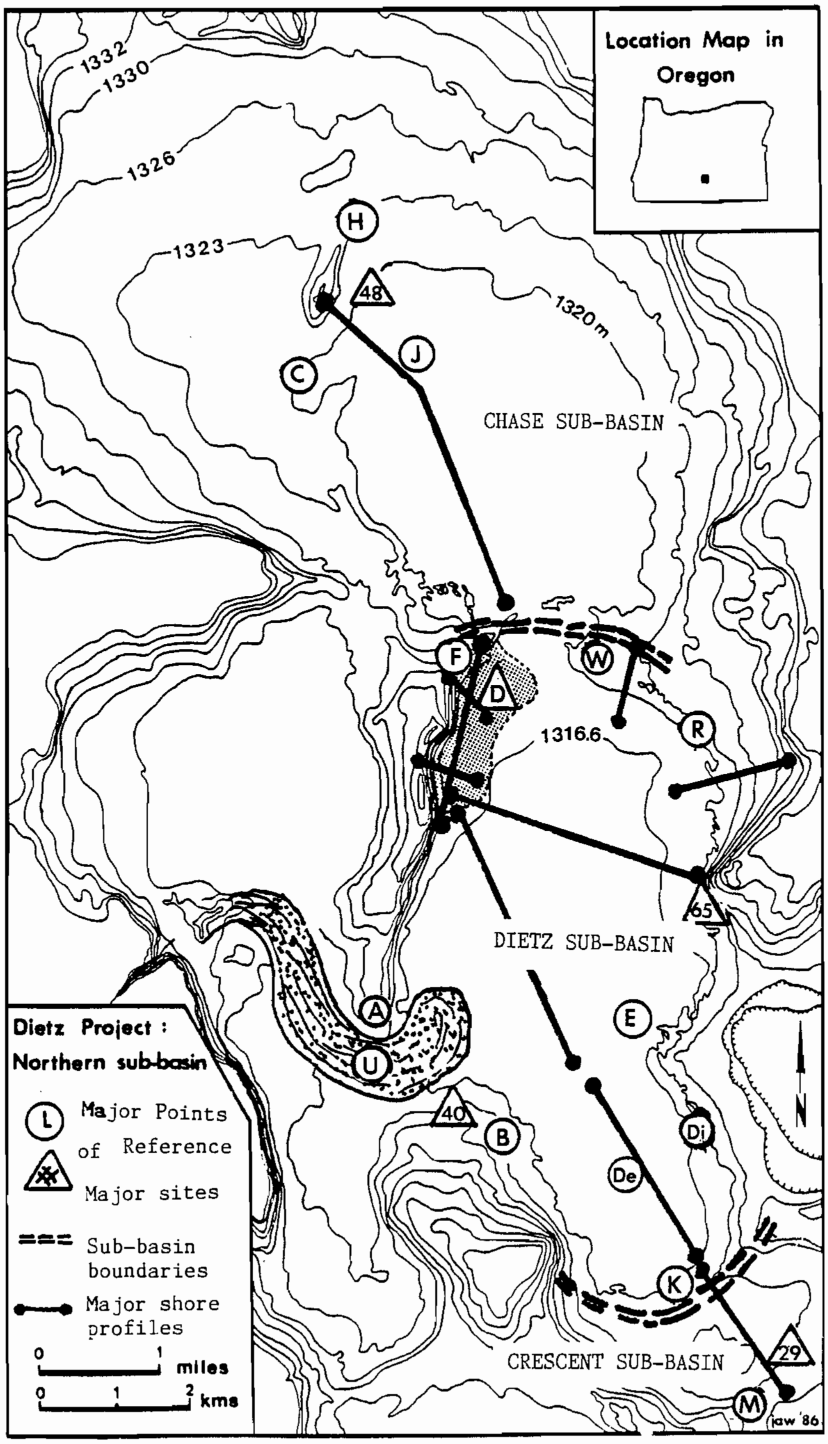


FIGURE 30. Project Map for Northern Alkali Basin and Dietz Site Research Showing Major Points of Reference Discussed in Text: Major Sites, Collection Units, Grid Systems, Datum Points, Trenches, Profiles, Lake Features and Sub-basins

FIGURE 31. Aerial Photo of Northern Alkali Lake Basin and the Dietz Site, Showing General Topography and Lake Features: a. Place where Post-occupation (Big Cut) Lake Deposits overlie Stemmed-era (Sand Ridge) Lake Terrace; and b. Place where Sand Ridge Terrace overlie Clovis-era Shoreline (Lake Koko)

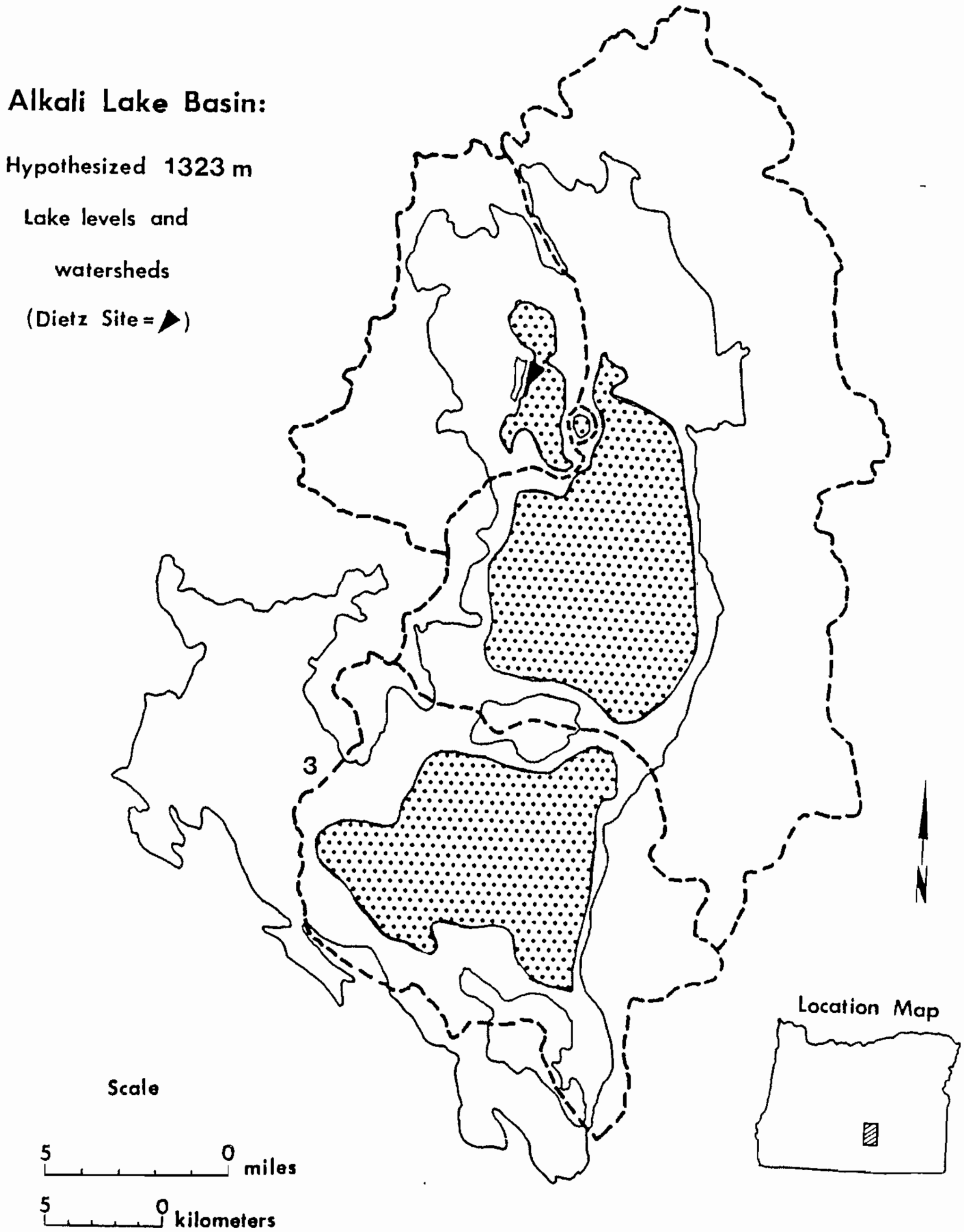


FIGURE 32. Areal Extent of Pluvial Lake Levels at 1323 m Elevation in Greater Alkali Lake Basin (dotted areas) and the Three Major Sub-basin Divisions (dashed areas): Northern, Central, Southern

The relevance of these three sub-basin divisions to Dietz site research is best illustrated by a northwest-to-southeast cross-section from the top of the hill above the Dietz site at 1341 m elevation (Point A on Figures 30 and 33) to the drainage divide near datum point "Monique". The beach ridge at "Monique" serves as the drainage divide which would have separated the northern and central sub-basins for all lake levels below 1323 m elevation (Point A' on Figures 30 and 33). Surface overflow needed to connect the two sub-basins would require a lake level in excess of 1323 m elevation which, as can be seen on Figure 32, would inundate the Dietz site by 8 to 9 m of water.

The Dietz Site within the Context of the Northern Sub-basin: The "Dietz" Sub-basin

The Dietz site has been described as being situated within the northern sub-basin of greater Alkali Basin (Willig 1984, 1985, 1986). Final results of map research further indicated that three smaller basins actually existed within the northern sub-basin during lake stands lower than 1320.8 m elevation. These subdivisions of the northern sub-basin are referred to, in order from north to south, as the "Chase", "Dietz" and "Crescent" sub-basins (Figure 30). At lake levels of 1320.8 m elevation and below, the Chase, Dietz and Crescent sub-basins would have been hydrologically independent of each other, unless otherwise connected by groundwater or near surface filtering.

Lake levels of relevance to the occupational history of the Dietz site are contained within the Dietz sub-basin. But archaeological site survey revealed the presence of 68 other sites located throughout the northern sub-basin at or below 1320.8 m elevation. These included

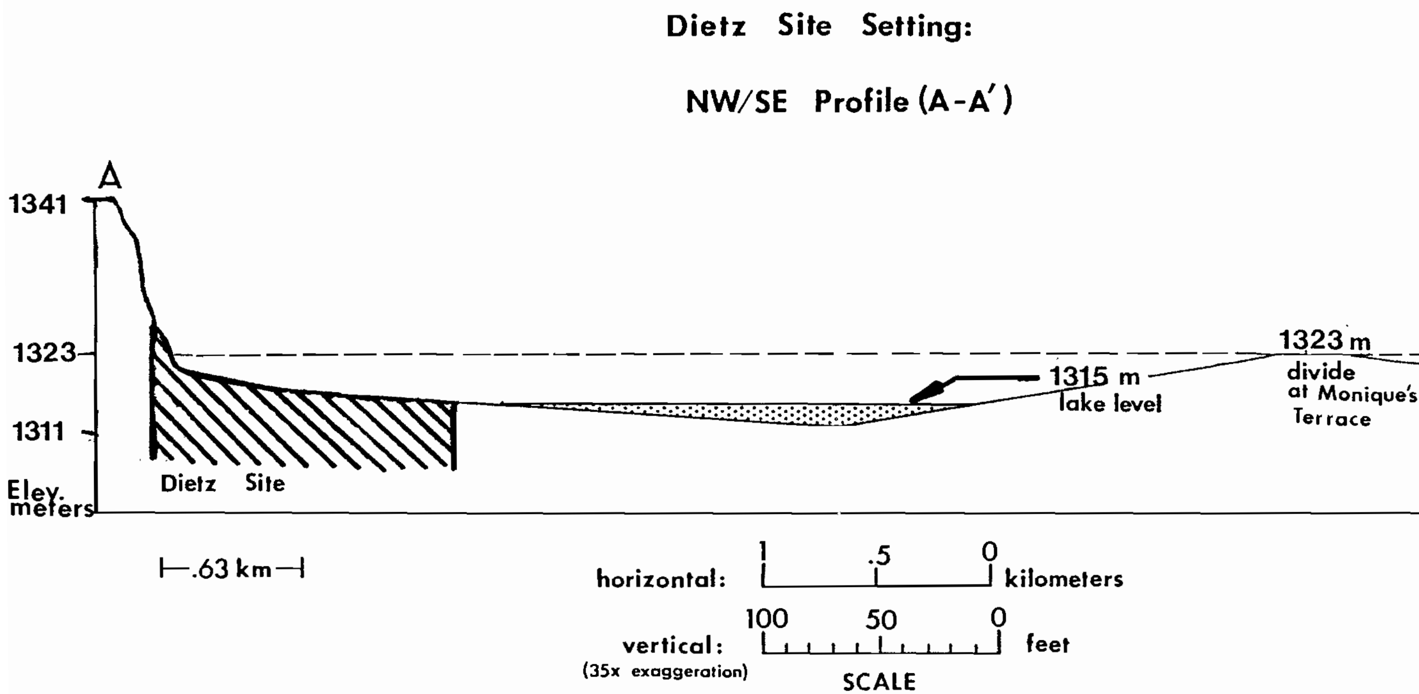


FIGURE 33. Northwest-to-southeast Profile Across the Northern Sub-basin, from the 1341 m Crest of the Dietz Hill (A) to the Drainage Divide (A') at Point "Monique", which Separates the Northern and Central Sub-basins Below 1323 m Elevation (See Figure 2 for Location of A-A' Profile)

14 sites in the Chase sub-basin, four sites in the Crescent sub-basin and 68 additional sites within the confines of the Dietz sub-basin.

Since the Chase, Dietz and Crescent sub-basins were effectively separated at water levels below 1320.8 m elevation, the elevations of time-equivalent lake levels and human occupation surfaces in each sub-basin would not necessarily correspond. Therefore, the lake levels and site distributions within each of these three smaller sub-basins are referred to separately throughout the following discussion, but within the context of the larger northern sub-basin.

Environmental Setting of the Dietz Site in the Dietz Sub-basin

The Dietz site is an extremely large lithic scatter which dominates a smaller portion of the northern sub-basin, referred to here as the "Dietz" sub-basin (Figures 2, 30 and 32). The artifact-productive area of the site extends for 1250 m north-south on low-relief remnant shorelines of now-dry Pluvial Lake Alkali, along the eastern base of a steep, basalt-capped ridge referred to here as the "Dietz hill" (Figure 2). The Dietz hill is a 3 km-long uplifted ridge, or horst, which rises abruptly 27 m above the basin floor on its eastern side and slopes gently towards the playa floor on its western side. The east-west distribution of artifacts at the Dietz site extends for 550 m from an elevation of 1314.5 m on the playa floor east of the hill, to an elevation of 1341 m along the crest of the Dietz hill to the west.

The southern portion of the site is nestled within a small embayment in the Dietz hill, referred to here as the "southern cove", which was most likely formed by the wave-action processes of much earlier and deeper lake levels in the basin. Two major beach terraces are visible in this portion of the site. Terrace #1 is a well-defined upper terrace visible as a distinct bench between 1330 m and 1332 m elevation, just below the basalt caprock of the Dietz hill. The lower terrace (Terrace #2), located between 1321.5 m and 1316.2 m elevation, is not as steep and well defined as Terrace #1, but is readily recognizable. It slopes gently to the east and gradually diffuses out onto as a thin mantle of sand onto the exposed lakebed silts of the playa floor. The lower sands of Terrace #2 are no longer visible at 1316.4 m elevation.

The northern portion of the Dietz site is situated within a second embayment in the Dietz hill referred to here as the "northern cove". The shoreline of the northern cove curves to the north-northeast, where it splits, and subsequently blends into two prominent lake-modified landforms. The first landform is a massive wave-built hook bar or spit, referred to here as "Flemmer's Spit", after the crew member who so diligently traversed its slopes in stadia mapping.

Flemmer's Spit marks the northern boundary of the Dietz site just north of its juncture with a second prominent lake form, an east-west trending beach ridge referred to here as "Wayne's Terrace", after the so-named survey datum established on its crest. Wayne's Terrace forms the northern drainage divide of the Dietz sub-basin at 1321 m elevation (see discussion in Chapter III under <u>Alkali Basin Lake History Reconstruction</u>).

The central portion of the Dietz site is disrupted by the projection of a steep, rocky point in the Dietz hill, referred to here as the "nose", which marks the place where the northern and southern coves meet. In 1983, a permanent site datum was established near the base of the Dietz hill at the southernmost extent of the lithic scatter south of the southern cove. This site datum was designated as 0 North/0 East (0N/0E). From this point, a 1250-meter long baseline was extended to the northernmost limit of the site at the base of Flemmer's Spit (Figure 30). This baseline, and the key geomorphic features just described, are the major points of reference in following discussions of the context and distribution of artifacts at the Dietz site.

Modeling Paleolandscape, Lake History and Human Occupation Patterns in the Northern Alkali Lake Basin

The major focus of geoarchaeological research in the northern Alkali Lake Basin, and at the Dietz site, has been to gather archaeological and paleoenvironmental data to answer questions about the age, historical relationship and economic adaptations of the Western Clovis and Western Stemmed cultures represented there. The primary research strategies were threefold: (1) to reconstruct the Clovis-Stemmed era landscape, lake history and human settlement pattern in the basin from about 11,500 to 7,000 B.P.; (2) to determine the precise distribution and stratigraphic context of Western Clovis and Western Stemmed artifacts and sites upon that landscape -- in relation to each other and to sequent, datable fossil water bodies;

and thereby, (3) to establish a relative or indirect dating of the Western Clovis and Western Stemmed occupations.

Model Formulation

In 1983 and 1984, initial study of artifact distributions and fossil lake features in the vicinity of the Dietz site led to the development of a testable model of lake history and human land use in the northern sub-basin from about 11,500 to 7,000 B.P. The model posited a Western Clovis occupation oriented to a small, shallow lake or pond with a wide marsh fringe in the center of the Dietz sub-basin (Figure 34), followed by a Western Stemmed settlement throughout much of the northern sub-basin, oriented around a much larger, slightly deeper lake and marsh fringe (Figure 35). Two major lines of evidence, both archaeologic and geomorphic, led to the development of this model. These factors were the differential distribution and elevational position of fluted and stemmed artifacts at the site with respect to two separate, sequent fossil shorelines observed.

Artifact Distributions

Although the stemmed and fluted point clusters at the Dietz site were primarily surficial, results of 1983 and 1984 surface collections and stadia mapping indicated that they occurred in spatially discrete clusters in two distinct "zones" of concentration. Stemmed points seemed to be confined to a zone above 1316 m elevation, from the base of the lower terrace (Terrace #2), extending west up the slope of the Dietz hill to about 1321 m elevation (Figures 36 and 37).

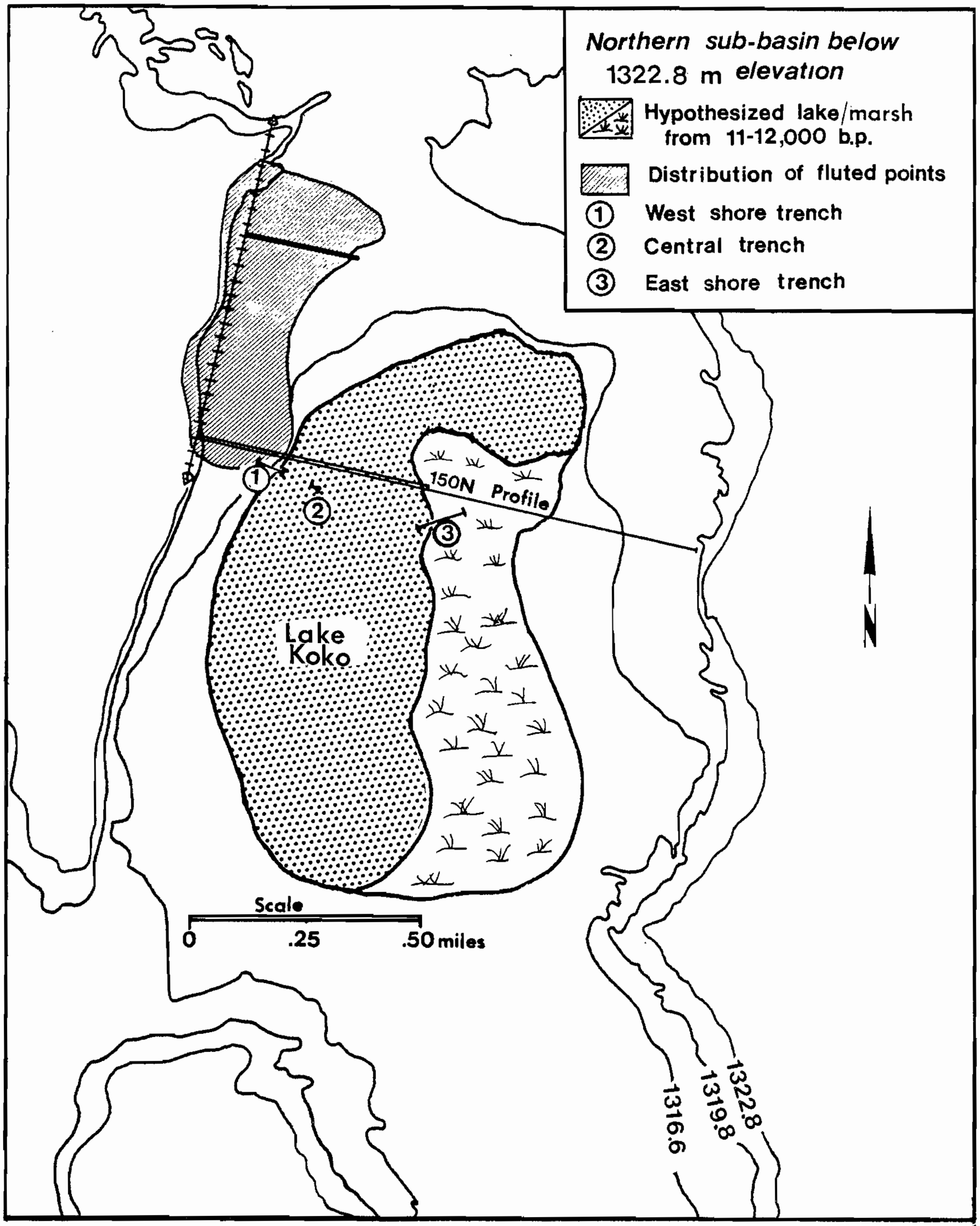


FIGURE 34. Hypothesized 1314.8 m Clovis-era Lake (Lake Koko) and Marsh in the Dietz Sub-basin, in Relation to the Distribution of Western Clovis (Fluted) at the Dietz Site

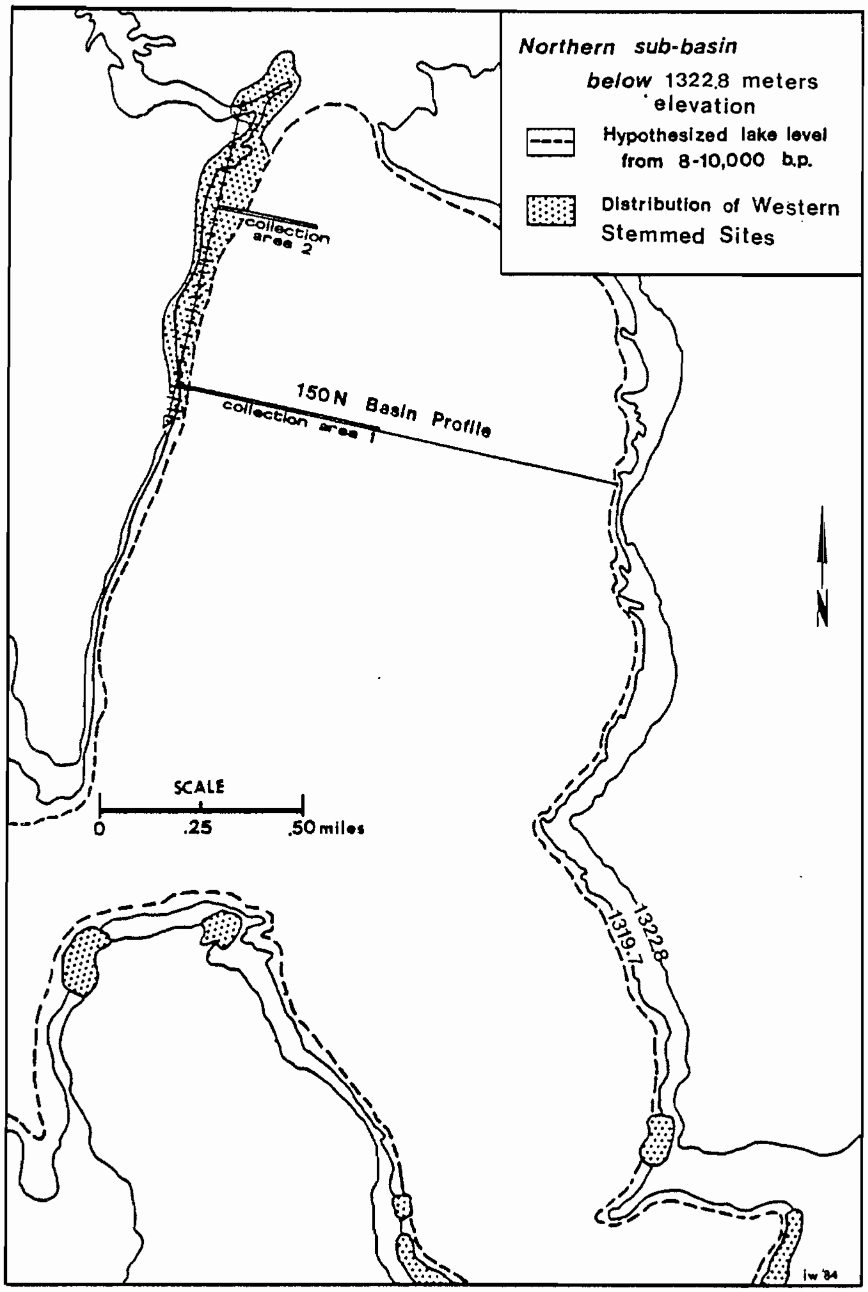


FIGURE 35. Hypothesized 1316 m Stemmed-era Lake (Sand Ridge Lake) in the Northern Sub-basin, in Relation to Some of the First Western Stemmed Shoreline Sites Discovered in 1984

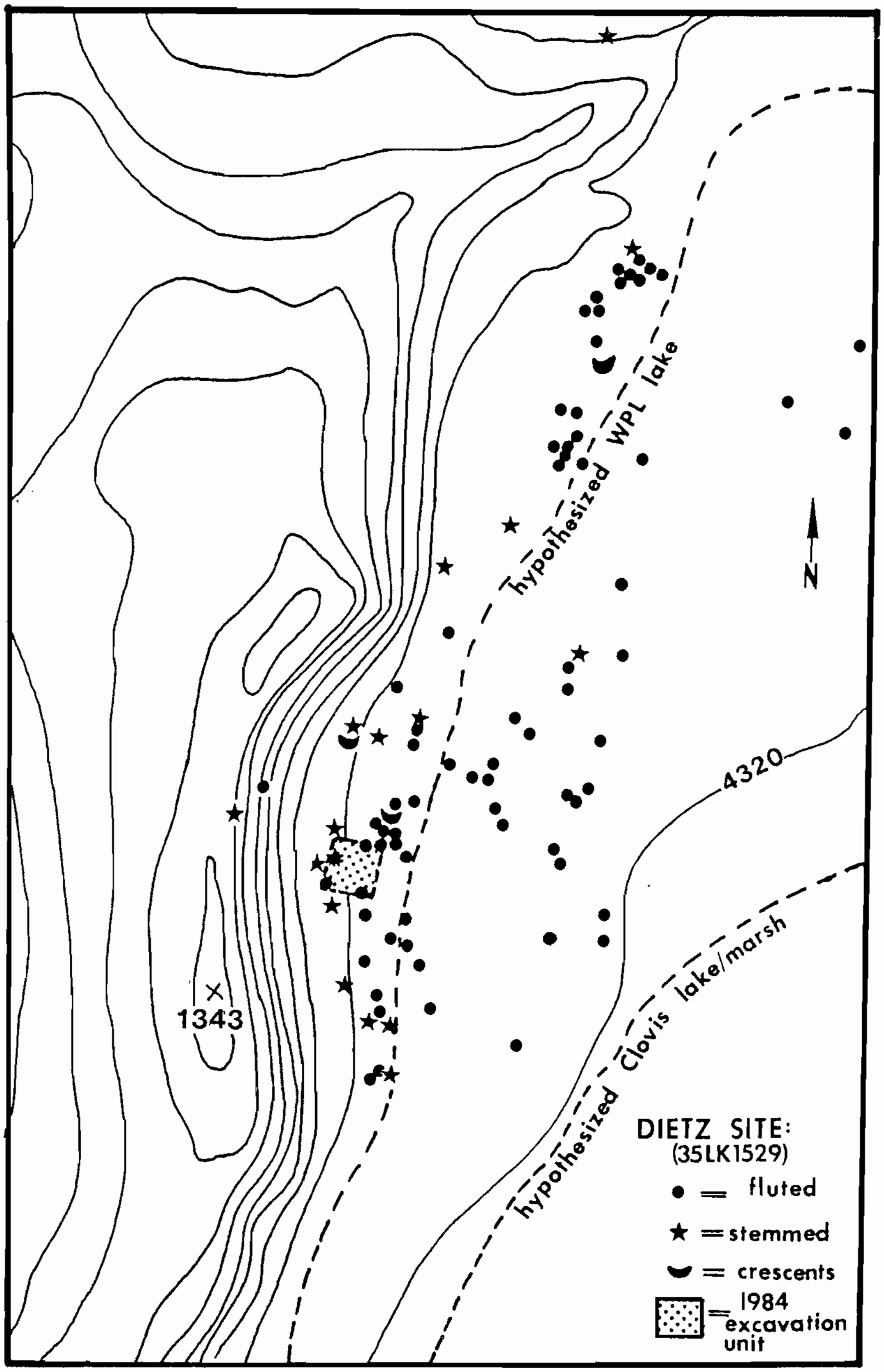


FIGURE 36. Horizontal Distribution of Stemmed (stars) and Fluted Points at the Dietz Site, in Relation to the Lake Levels Hypothesized During Western Clovis (1314.8 m) and Western Stemmed (1316 m) Period Occupations

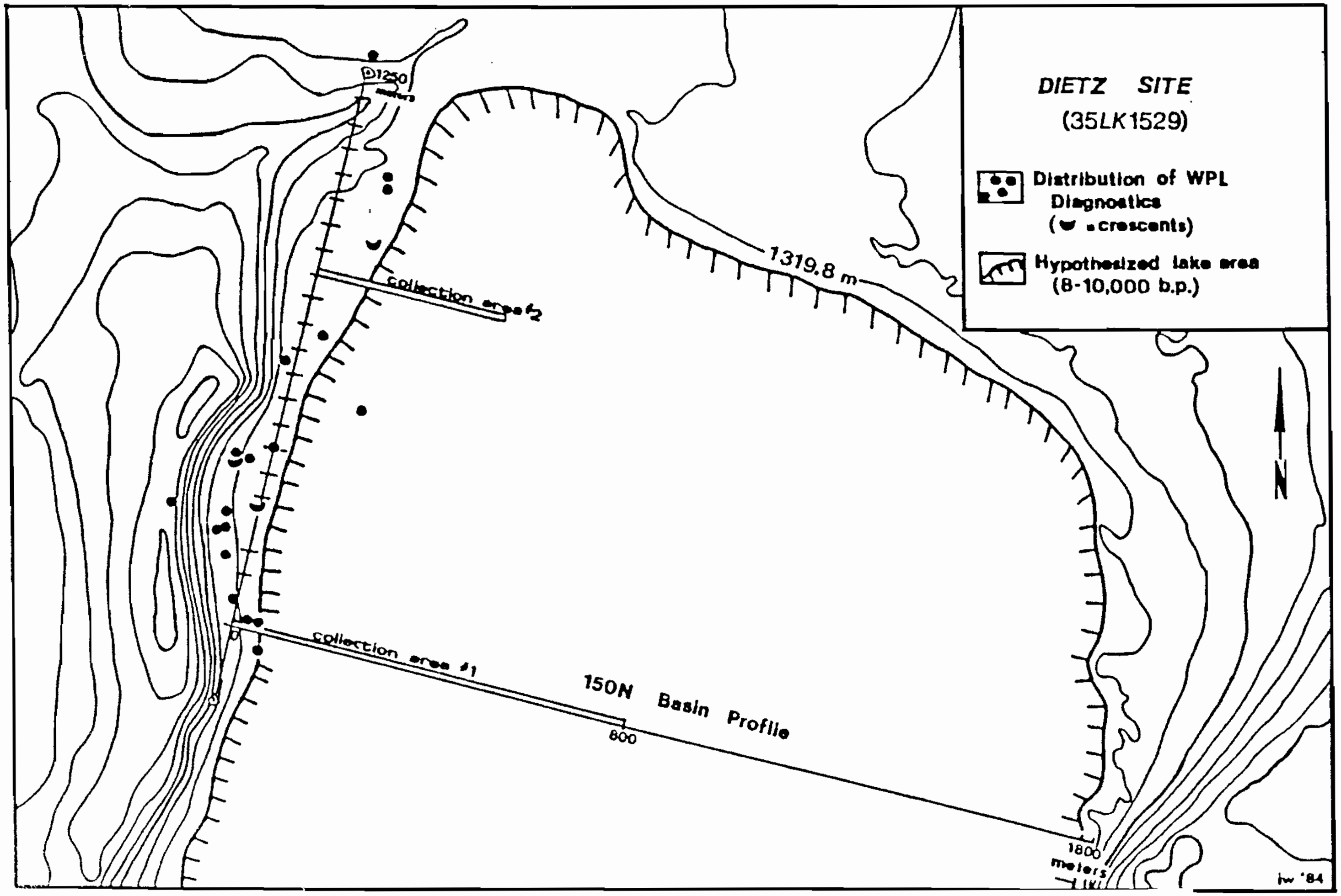


FIGURE 37. Closer View of Western Stemmed Artifact Distributions at the Dietz Site, in Relation to the Hypothesized (1316 m) Lake Level (Sand Ridge Lake)

In contrast, fluted points were restricted to a zone below 1318 m elevation, well beyond the base of Terrace #2, extending as far as 400 to 800 m eastward onto the playa floor, and as low as 1315 m elevation (Figures 34 and 38). In addition, the surface distribution of the two assemblages seemed to overlap slightly, within a zone about 80 m wide, beginning just below the base of Terrace #2, between grid points 0E and 80E (Figure 30). This overlap offered some potential for discovering buried deposits which might demonstrate a stratigraphic separation of the two assemblages (see discussion in Chapter III under Potential for Buried Deposits).

Fossil Shoreline Features

Results of initial air photo research, geomorphic field survey and artifact mapping in 1983 and 1984 further indicated that the two discrete distributions of fluted and stemmed artifacts at the Dietz site had separate orientations along two apparently distinct low-relief shoreline features in the Dietz sub-basin. The topography and geometry of these two sets of lake features, and preliminary stratigraphic studies, provided compelling evidence for the former existence of at least two shallow water bodies in the basin which probably related directly to two different early human occupations.

The majority of fluted points were concentrated below 1316 m elevation, along the northwestern margin of a low-relief shoreline (1 to 2 m high), in the west-central portion of the Dietz sub-basin. The distribution of Western Clovis artifacts extended onto the playa floor as far as 400 m to 800 m east and as low as 1315 m elevation,

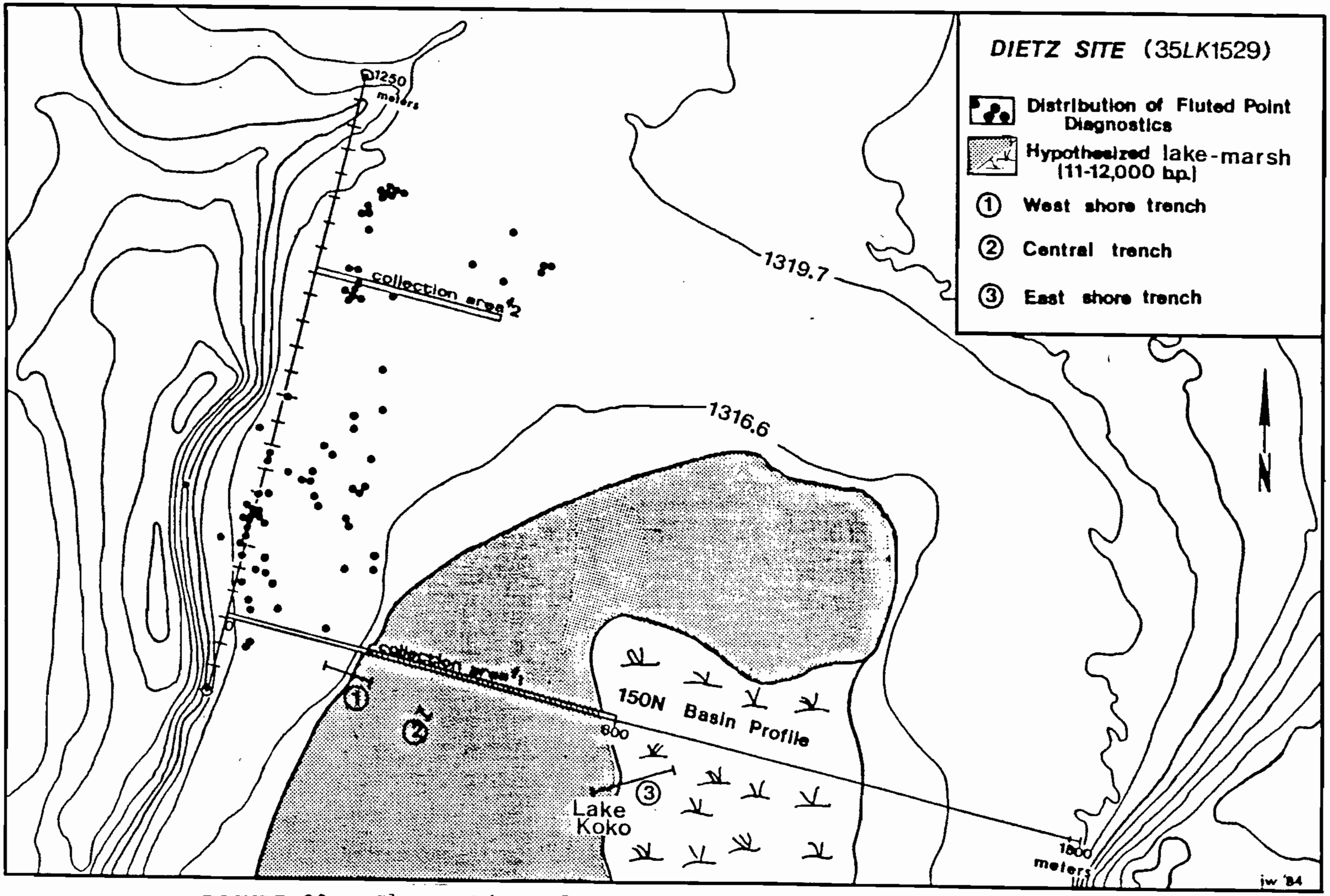


FIGURE 38. Closer View of Western Clovis (Fluted) Point Distributions at the Dietz Site, in Relation to the Hypothesized 1314.8 m Lake Level (Lake Koko)

well past and below the elevation of stemmed artifacts at the Dietz site (Figures 34, 36 and 38). The highest density of fluted points were found on the surface west of this shoreline feature, but not occurring beyond it.

When traced around the center of the Dietz sub-basin, this low-relief shoreline measured about 6 km in circumference and 2 to 4 square km in area, suggesting the former presence of a shallow lake or pond (40 cm to 60 cm deep). The shore profile and depth of this small but well-excavated feature on the basin floor indicated a lake of substantial duration and stability, not just an ephemeral pond or deflation basin. Furthermore, the slightly more elevated topography of the Dietz sub-basin's eastern sector also suggested that this shallow lake or pond may have been flanked in the east by a marsh fringe about 500 m wide.

In contrast to the distribution pattern of the Clovis artifacts around a low-elevation shoreline, the Western Stemmed artifacts were concentrated around a slightly higher beach terrace just below 1316 m elevation (Figures 35, 36 and 37). When this beach deposit was traced laterally around the perimeter of the northern sub-basin, it was clear that a lake at this elevation would occupy a much larger area than the Clovis-era lake, occupying portions of the Chase, Dietz and Crescent sub-basins as well.

The lake represented by this higher shoreline would have measured about 30 km in circumference, 14 square km in area, and would have held about 2 m of water. In addition, the topography of the three sub-basin floors were relatively flat and smooth, especially those of the Chase and Dietz sub-basins. This suggested that most of the periphery of this hypothesized Stemmed-era lake would have included a marsh fringe about 80 m wide.

Furthermore, air photo inspection suggested that the higher lake proposed for the period of Western Stemmed occupation might be transgressive, and therefore postdate the hypothesized Clovis-era water body. This was confirmed in 1985 and 1986 by field inspection and stadia survey of several places in the northern Alkali Lake sub-basin where the two shorelines intersect one another. In particular, about 150 m southeast of the OE/ON site datum in the Dietz sub-basin, the loose sandy beach deposits of the higher lakeshore partially bury and truncate the upper deposits of the hypothesized Clovis-era shoreline at an elevation of 1315.5 m (see Figure 30 and spot marked on Figure 31).

In general, the profile and morphology of the northern sub-basin is well-suited for the development of marsh habitats. Relatively small rises in water (50 cm or less) would cause large areas to be filled at shallow levels. Considering the paucity of late-period artifacts represented at the Dietz site, and elsewhere in the northern sub-basin, it was considered very doubtful that either of these lower shoreline features were "neo-pluvial" in age (see discussion in Chapter III under <u>Alkali Basin Lake History Reconstruction</u>).

Ten years ago, the notion of an early Holocene, post-pluvial lake transgression of this magnitude would have run contrary to the generally accepted notion that pluvial lakes had continued to gradually decrease in size after the last pluvial high stand in each basin (see discussion in Chapter IV under Implications of Alkali Basin Research: Regional Lake History). The possibility of an early Holocene transgressive lake level at the Dietz site, which post-dated terminal Pleistocene desiccation in the basin, made the research all the more intriguing (or dangerous as some might say). The confirmation of such a late, transgressive lake level held much significance in its potential to inform about cultural and environmental change at the Pleistocene-Holocene boundary in the Far West.

The possibility of a basin-wide settlement by people of the Western Stemmed culture, oriented to this higher lake level, seemed even greater after the first full season of exploratory field work in 1984. This involved a geomorphic survey of the higher shoreline in several places, in search of any natural profiles and exposures which might inform about basin-wide stratigraphic correlations. During this field survey, several other single-component Western Stemmed sites were discovered, which appeared to be located at the same elevation as the stemmed point clusters at the Dietz site.

Proposed Model of Lake History and Human Occupation

Based on these data, a testable model was proposed for two sequent lakeside or marsh-fringe settlement patterns in the northern Alkali Lake sub-basin, oriented to littoral habitats associated with two sequent and quite distinct fossil shoreline features. The model proposed, first, a terminal Pleistocene (Western Clovis) occupation at the Dietz site concentrated on the northwestern shore of a small, shallow lake or pond in the approximate center of the Dietz sub-basin.

This shallow lake would have held about 40 to 60 cm of water, flanked in the east by a 500 m-wide marsh fringe (Figures 34, 36 and 38).

According to the model, the Clovis-era occupation was followed by a dense basin-wide settlement by Western Stemmed groups during the early Holocene. These people were oriented to a much larger, slightly deeper lake (2 m deep) standing just below 1316 m elevation. This larger lake would have filled a substantial portion of the northern sub-basin, surrounded by a marsh fringe about 80 m wide (Figures 35, 36 and 37).

This model limited the possibilities for Clovis and Stemmed-era habitats to four, which served as working hypotheses to guide the remainder of the research. It was hypothesized that from 11,500 to 7,000 B.P., the habitats in the vicinity of the Dietz site would be characterized by: (1) a small lake or pond with a wide marsh fringe; or (2) a large lake with a narrow marsh fringe; or (3) a large marsh with no true lake at all; or (4) no water body of any kind.

The main objective of 1985 and 1986 field work was to gather archaeologic and stratigraphic data to test this model of lake history and human occupation pattern in the northern sub-basin of the greater Alkali Lake basin. Primary data to test the model were gathered through basin-wide site survey, more intensive surface collections of artifacts, stratigraphic studies, and high-resolution mapping of lake features and artifacts. If the model was correct, these data would verify the discrete distributions and stratigraphic contexts of the fluted and stemmed artifacts, both horizontally and vertically, with respect to the two hypothesized shorelines.

Model Testing and Research Methods

Geoarchaeological field research in the northern Alkali Lake Basin, and at the Dietz site, was completed in multiple phases from 1983 to 1986. Field methods used in gathering the research data included: (1) large-scale point-plotting of surface collections of artifacts in selected areas; (2) a continuing program of map and air-photo research, followed by exhaustive geomorphic field survey of fossil lakeshore features at or below the elevation of the Dietz site; (3) large-scale problem-oriented archaeological site survey; (4) extensive sub-surface testing and stratigraphic study of cultural deposits and fossil lake features; and (5) high resolution topographic mapping of low-relief lake features and time-diagnostic artifacts in the basin. These research efforts are outlined below.

Initial Mapping and Surface Collections

Many of the diagnostic fluted and stemmed points and other artifacts known from the Dietz site were collected prior to May of 1983 during initial visits by Dewey Dietz, John L. Fagan (1984a) and William J. Cannon. The locations of artifacts collected were staked and later recorded by transit. In May of 1983, a permanent site datum was established near the base of the Dietz hill at the southernmost extent of the lithic scatter. This site datum was designated as 0N/0E (Figures 30 and 39). From this point, a 1250 m long baseline was extended northward, along a line oriented 13.5 degrees east of true north, to the northernmost limit of the site. All subsequent artifact

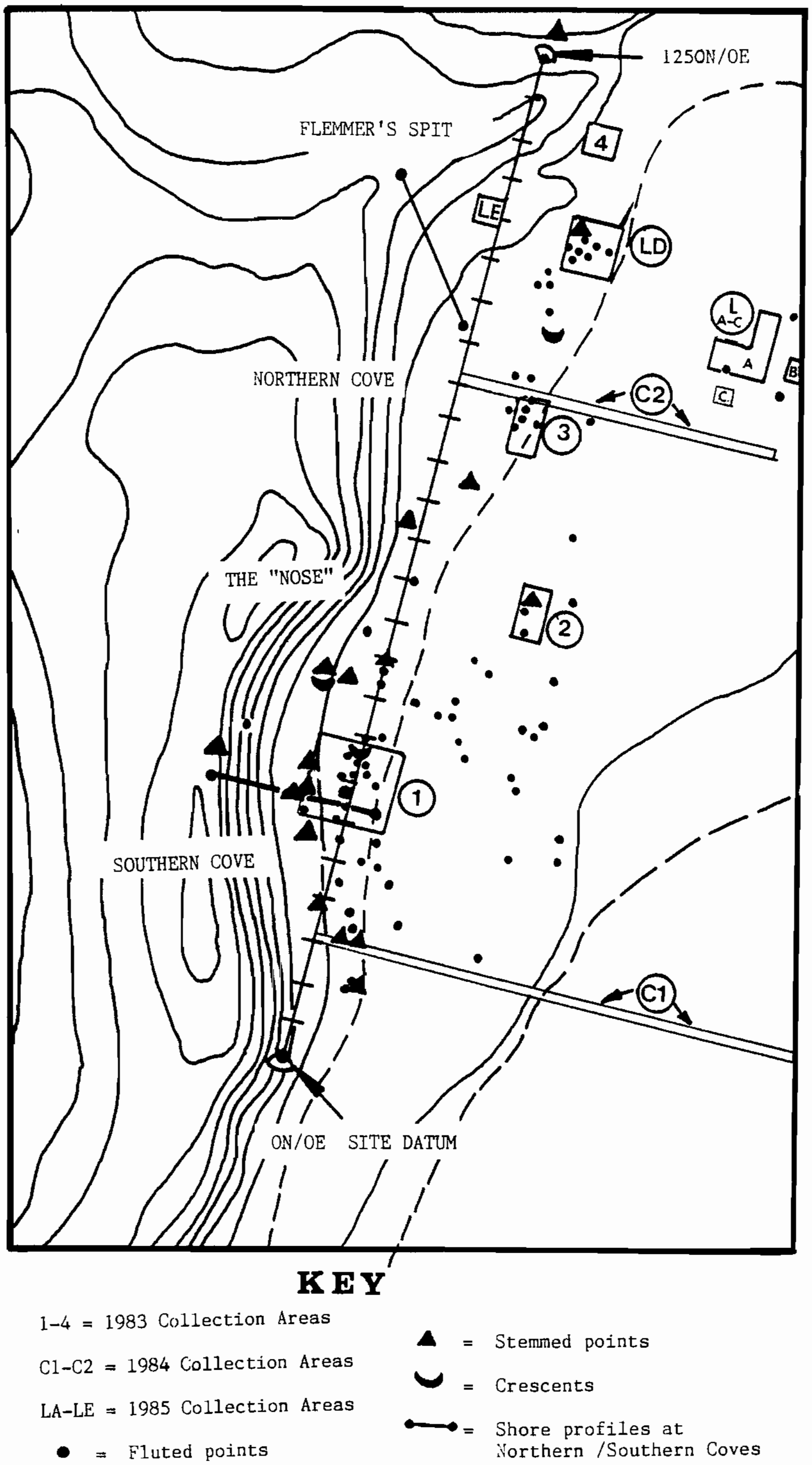


FIGURE 39. Closer View of the Dietz Site and Northern Alkali Basin Project Map (Figure 30), Showing Locations of Major Points of Reference Discussed in Text: Collection Units, Grid Systems, Artifact Distributions and Trench Profiles

collection units at the site were measured relative to this north-south baseline.

In May of 1983, four large collection grids were placed relative to the baseline in areas which had produced the majority of tools previously collected during initial visits to the site. The four units were mapped by transit relative to the site's baseline (Figures 30 and 39). Their locations and co-ordinates can be found in Appendix A.

Collection was controlled in quadrats of 10-meter squares (Areas 1-3) or 4-meter squares (Area 4). The locations of significant specimens discovered, or previously collected, were plotted and the boundaries of major concentrations of lithic debris were noted. Work was supervised by John L. Fagan, C. Melvin Aikens, Don E. Dumond and William S. Ayres; and the results have been reported elsewhere (Fagan 1984a; 1984b). These collections were not conducted as part of the geoarchaeological research design discussed here, but they are mentioned because they have relevance to the context and distribution of artifacts at the site.

<u>Point-plotted Surface Collections</u>

A two-stage program of 100% point-plotted surface collection was conducted in 1984 and 1985 in large blocks and linear transects across the Dietz site, gridded in 5-meter quadrats. All artifacts and flaking debris within each 5 x 5 meter quadrant were piece-plotted and collected relative to the site baseline (Figures 30 and 39). The main objectives were twofold: (1) to determine the distribution and precise context of fluted and stemmed artifacts across the site -- with respect to each other, and to observed near-surface sedimentary facies; and (2) to ascertain whether the lithic clusters were primary (exposed in situ) or secondary (re-deposited).

In 1984, these collections included two 10-meter wide linear transects which ran across the site, beginning at the site datum of 0E/0W and extending east beyond the site and out onto the playa floor. Collection Area #1 was placed in the southern portion of the site between grid points 130N and 140N, and extended 800 m eastward onto the playa floor. In 1985, this transect was extended even further across the entire sub-basin to the established 1800 E datum on the far eastern perimeter of the sub-basin. Collection Area #2 was placed at the northern end of the site between grid points 850N and 860N, and extended eastward for 400 m onto the playa floor (Figures 30 and 39).

In 1985, three large block collections were made at the northern end of the site, between grid points 900N and 1100N. Localities A through C were placed in areas which were thought to be primary Clovis clusters on the playa floor beyond grid point 285 E. Locality D was placed in a transitional zone between the two shorelines hypothesized for Clovis and Stemmed periods, in a zone where both stemmed and fluted artifacts had already been recovered. Locality E was placed above 1316 m elevation on the loose sandy surface of the higher shoreline hypothesized for the Western Stemmed occupation. Exact co-ordinates and locations for these collection units can be found on Figures 30 and 39.

Map and Air Photo Research

A continuing program of map and air photo research was essential to all stages of investigation. The first step essential to reconstructing lake history is the continuous lateral tracing of shoreline features around the perimeter of a lake basin. This allows the identification of a preliminary chronology and distribution of lacustrine features at different elevations. This approach was most heavily utilized in the initial stages of the lake history research -- to identify the broad parameters of the full pluvial lacustrine record and to segregate major drainage divides and sub-basins critical to pluvial lake levels near the elevation of the Dietz site.

It must be cautioned, however, that air photo inspection should be considered preliminary until verified through field reconnaissance and stratigraphic studies. This is mainly because air photos rarely provide sufficient resolution to identify the more subtle, low relief lake features such as those associated with the Dietz site below 1317 m elevation in the northern sub-basin (see Stadia Survey and Mapping below). The earliest full pluvial lakes in the Far West were large and powerful enough to carve prominent features in bedrock, form conspicuous wave terraces, and deposit large-scale, high relief gravel bars and spits measuring up to three km long and 30 m high. Such features are readily visible on maps and air photos.

In contrast, terminal Pleistocene and early Holocene lakes were smaller, shallower, and lower in elevation with respect to their basin floors. These later lakes re-worked existing sedimentary forms into more subtle features of lesser relief and smaller scale. For example, the mid-Holocene "neo-pluvial" beach ridges described by Allison (1979) and Forbes (1973) for the Fort Rock Basin are visible only as subtle rises near the center of the basin floor. Because the degree of resolution on aerial photos and topographic maps may not be sufficient to identify some of these later lake features, this stage of research must be augmented by field reconnaissance and stratigraphic studies.

Nonetheless, detailed air photo and map research was quite useful in guiding the general direction of research for earlier lake levels, in segregating the various drainage divides critical to lake history reconstruction, and in providing an overall "big picture" of the late Pleistocene and early Holocene paleolandscape.

Relying on comparisons in scale and form to pluvial lake features identified and mapped in adjacent Fort Rock Basin (Allison 1979; Forbes 1973), a careful air photo inspection of the entire perimeter of greater Alkali Lake Basin was made for lakeshore features similar in form and size. The location and elevation of all visible lacustrine features were recorded and plotted, using topographic maps as a cross-reference. The known range of elevation for the majority of fluted and stemmed artifacts at the Dietz site was 1315 m to 1321 m, therefore, particular attention was given to any visible features at or below the elevation of the site.

Geomorphic Field Survey

Geomorphic field survey in the vicinity of the Dietz site began in 1983 with careful pedestrian survey of site boundaries in relation to visible lake terrace features and near-surface sedimentary facies yielding artifacts. In 1984, more extensive field reconnaissance was made within the Dietz sub-basin, and around the entire perimeter of the northern sub-basin. This portion of the Alkali Basin fieldwork was conducted in conjunction with map and air photo research, sub-surface testing and stratigraphic studies.

Multiple pedestrian transects across the Dietz sub-basin did reveal the presence of small rises of ground in various places. But vegetation was so dense, the area so large, and the relief so subtle that coherent patterns were difficult to perceive on foot. In an effort to increase survey height and field of vision, horses were rented locally. Horseback survey allowed for more transects and greater areal coverage in a much shorter time and led to the successful identification of critical lake features below the elevation of the Dietz site. Constant cross-reference was made from observed features on the ground to air photos, and all subtle changes in topography were flagged for later inspection and stadia survey.

Stratigraphic Studies at the Dietz Site

Stratigraphic studies at the Dietz site were focused on determining the stratigraphic context of fluted and stemmed artifacts in relation to each other, and to the observed fossil lake features. The major tasks were threefold: (1) locating the surfaces of origin and sedimentary units upon or within which the artifacts were deposited; (2) investigating the processes which may have buried or altered those surfaces since occupation; and (3) determining if a buried context and stratigraphic separation of the two assemblages could, in fact, be demonstrated.

Initial sub-surface tests at the Dietz site in May of 1983 involved a series of 12 shallow excavations, placed at 50 meter intervals in two east-west transects across the site, perpendicular to the baseline and lake terraces along the east flank of the Dietz hill. The objective was to gain a preliminary assessment of the stratigraphic context of fluted and stemmed artifacts in relation to lake terrace deposits. Six shovel tests were dug between grid points 50W and 200E, along the 600N line perpendicular to the central portion of the Dietz hill. An additional six shovel tests were placed between grid points 50W and 150E, along the 1150N line perpendicular to observed lake terraces in the northernmost portions of the site.

More detailed examination of sub-surface stratigraphy at the site was undertaken in September of 1983. With help from the Lakeview District BLM, a total of 15 exploratory backhoe trenches, referred to as numbered "Segments", were excavated in a series along two east-west profiles across the Dietz site, also perpendicular to the baseline and lake terraces observed. The Trench A profile consisted of 11 trenches (Segments #1 through #11), averaging 5 m long, 1.5 m wide and spaced 5.5 m apart (Figures 30 and 39). This provided a 210 m long cross-section of the lake terraces observed in the southernmost portion of the site, beginning just below the basalt rimrock capping the Dietz hill and extending out onto the playa floor for 200 m.

The Trench B transect consisted of four separate trenches (Segments #1 through #4) spaced 10 to 20 m apart, which provided a 110 m long cross-section of lake terraces in the northern portion of the site (Figures 30 and 39). Two additional trenches were later excavated in 1985: one located along the Trench A profile between Segments #10 and #11 (Segment #10A), and another positioned along the uppermost beach terrace at the northern end of the site.

Basin-wide Stratigraphic Studies

In order to further examine the record of late Pleistocene and early Holocene lake history in the Dietz sub-basin, five exploratory backhoe trenches were excavated in 1984. Averaging 3 m wide and 35 m long, three of these trenches were placed perpendicular to the hypothesized Clovis-era shoreline and a fourth along the proposed Stemmed-era shoreline (Figures 30 and 39). The fifth trench was placed near the lowest spot in the center of the Dietz sub-basin, where the most complete record of lake sedimentation was expected.

The stratigraphic profiles exposed in these trenches were examined intensively. All sub-surface features, soils and sediments were described in detail, and samples taken for laboratory analysis. Samples were also taken of any materials which might be useful in dating or in paleoenvironmental reconstruction, such as lake microfossils, volcanic ash, charcoal flecks, bone or shell fragments.

Basin-wide Archaeological Site Survey

In 1985, a four-phase program of problem-oriented archaeological site survey was conducted throughout the northern sub-basin, to test the model of lake history and human occupation that had been developed. The first two phases included survey of two shorelines hypothesized as being correlative with Western Clovis and Western Stemmed occupations, respectively. The last two phases followed two linear transects across the entire northern sub-basin up to 1326 m elevation. These north-south and east-west transects cross-cut the full range of elevations and lakeshore features in the basin. Survey methods and rationale are further discussed below in Chapter III under Problem-oriented Basin-wide Archaeological Site Survey).

Stadia Survey and Mapping

The majority of lake and topographic features critical to the interpretation of artifact context at the Dietz site were too subtle to be identified on aerial photos and too low in elevation to be recorded on topographic maps. The lowest contour line available on the USGS topographic map of the Dietz sub-basin was 4320 feet, or 1316.67 meters (Figures 2 and 30). But most of the surface artifacts and low relief shore features of interest were at least two meters below this elevation. This necessitated the launching of an exhaustive program of field survey in the sub-basin, which consumed major portions of the field effort in 1985 and 1986. However, the rewards were great as this portion of the research came to be a key element in the interpretation of lake history, paleoecology and human occupation in the basin.

The survey program utilized two different systems, namely, a series of closed transit level loops, and multiple stadia shots with an Electronic Laser Distance Meter (EDM). The two primary objectives were: (1) to produce a high-resolution map of topography and lake features in the northern sub-basin, at and below the elevation of the Dietz site; and (2) to document the precise elevation and location of all time-diagnostic artifacts recovered at the Dietz site, and other sites discovered around the perimeter of the northern sub-basin, in the Chase, Dietz and Crescent sub-basins.

Survey was accomplished in three phases. The first phase involved tying in the Dietz site datum (0N/0E) to the "real world" through cadastral survey and transit level loops to the two closest USGS benchmarks. The first benchmark was located at 1324 m elevation in the center of Section 9 (T28S/R23E), approximately 1.5 km southeast of the Dietz site. The second was located at 1321 m elevation in the SW 1/4 of Section 25 (T27S/R22E) along the Christmas Valley road, approximately 1.5 km north of the Dietz site. This latter benchmark, near the Roger Chase residence, was designated as the elevational datum for the project (Figure 30).

The second phase of mapping established an extensive network of auxiliary datum points throughout the entire northern sub-basin. These datum points were tied in elevation to the Dietz site datum and to each other through multiple transit level loops and cross-checks. Named after crew members, these served as primary stations from which a series of localized stadia shots could be made of sites and lake features too distant to be within the range of direct shots made from the Dietz datum. The location and position of all major datum stations can be found in Figure 30.

The bulk of the mapping survey work was accomplished in the third phase. A total of 1,810 EDM stadia shots were made of key lake features, artifacts and sites throughout the northern sub-basin. Shots were taken of the location and elevation of each site discovered through archaeological survey, and of each time-diagnostic artifact collected from these sites. At the Dietz site, stadia shots were also made of all collection units, excavation pits, backhoe trenches and any stakes marking previously collected artifacts. In addition, a series of 24 topographic profiles were recorded perpendicular to critical lakeshore features, both at the Dietz site and around the entire perimeter of the northern sub-basin (Figure 30).

Subsequent to fieldwork, a grid system of north and east co-ordinates, measurable in meters (m), was established for the entire northern sub-basin oriented to true north and calibrated to historic cadastral surveys in the area. This co-ordinate system allowed for much simplified reduction and recording of the hundreds of stadia values, and could be easily replicable in future research. It was <u>not</u> oriented 13.5 degrees east of true north as was the site datum, but was tied to the site datum with the same point of origin (0N/0E). All stadia shots were reduced and assigned north (Y) and east (X) co-ordinates within the established grid system, as well as elevational (Z) values. Further details on the survey and mapping techniques, including standards of error and rotational adjustments made, are discussed in Appendix A.

Summary

Initial study of artifact distributions and fossil lake features in the vicinity of the Dietz site led to the development of a testable model of lake history and early human occupation patterns in the northern Alkali Lake Basin from 11,500 to 7,000 B.P. The model proposed two sequent lakeside or marsh fringe settlement patterns oriented to the littoral habitats represented by two sequent, and quite distinct sets of fossil shoreline features.

The model proposed, first, a terminal Pleistocene (Western Clovis) occupation at the Dietz site concentrated along the northwestern shore of a small, shallow lake or pond (40 to 60 cm deep) in the approximate center of the Dietz sub-basin, flanked in the east by a 500 m-wide marsh fringe (Figures 34 and 38). According to the model, the Clovis-era occupation was followed by a dense, basin-wide settlement by Western Stemmed groups during the early Holocene. These people were oriented to a much larger, slightly deeper lake (2 m deep) at or near 1316 m elevation, which would have filled a substantial portion of the northern sub-basin, surrounded by a marsh fringe about 80 m wide (Figures 35 and 37).

The main objective of 1985 and 1986 fieldwork was to gather archaeological and stratigraphic data on lake features, artifact distributions and paleosurfaces elsewhere in the northern sub-basin to test this model of lake history and human occupation pattern formulated on the basis of Dietz site data. If the model was correct, data from elsewhere in the northern sub-basin would verify the discrete distributions and stratigraphic contexts observed for fluted and stemmed artifacts at the Dietz site -- both horizontally and vertically -- with respect to the two hypothesized Clovis-age and Stemmed-era shorelines. Results of model testing and data gathered in the northern Alkali Lake Basin are presented below in Chapter III.

CHAPTER III

LAKE HISTORY, PALEOLANDSCAPE AND EARLY HUMAN OCCUPATION IN THE NORTHERN ALKALI LAKE BASIN : RESULTS OF INVESTIGATIONS

Results of Model Testing

Results of high-resolution stadia mapping of lake facies and artifact distributions, geomorphic and stratigraphic studies, and basin-wide site survey and surface collections conducted in the northern Alkali Lake Basin are presented below. Results of geoarchaeological investigations verified the discrete, two-level distribution and context of fluted and stemmed points at the Dietz site, both vertically and horizontally -- with respect to each other and to two separate, sequent shorelines in the basin, at 1314.8 m and 1316 m elevation respectively. The data produced in every sector of the field work supported the model of lake history and human occupation as proposed, with the following three modifications.

Modification #1: A Two-stage Western Stemmed Lakeside Settlement

Results supported the close association of fluted artifacts with the western shore of a shallow lake and marsh in the center of the Dietz sub-basin, represented by the low-relief shoreline at 1314.8 m elevation in the center of the Dietz sub-basin. Research also confirmed the close association of stemmed artifacts with the higher shoreline at or near 1316 m elevation, as first proposed in the model. Additionally, there is compelling stratigraphic and archaeological evidence in the Dietz sub-basin for a third lake level (1315.4 m) -- intermediate in elevation between the hypothesized Clovis and Stemmed-era lake levels (see Lake History below).

Apparently, the actual distribution of stemmed artifacts at the Dietz site was split into two distinct levels, or groups. The majority of stemmed artifacts were associated with a higher shoreline at 1316 m elevation, but a smaller subset of stemmed artifacts was distributed in close association with a slightly lower shoreline at 1315.4 m elevation. Data produced by basin-wide stratigraphic studies and stadia mapping of lake deposits and artifacts, suggested that Western Stemmed occupation in the northern sub-basin actually consisted of a two-stage settlement corresponding to a two-stage sequence of a prograding (or possibly retrograding) lake.

If the two-stage lake sequence was a prograding one, it could be hypothesized that initial Western Stemmed occupation at the Dietz site (about 10,000 to 9,500 B.P.) was oriented to a lake level at 1316 m elevation, followed by a recessional lake level during the later phase of the Western Stemmed period (sometime after 8,500 and 8,000 B.P.). It could further be stated that the cultural response to this environmental change would have been to shift the settlement pattern downslope and closer to the water's edge. If the two-stage lake sequence was retrograding, or transgressional, the same events are hypothesized, only in reverse chronological order (see Chronology of Western Clovis and Western Stemmed Occupation below).

Modification #2: A Post-occupation Transgressive Lake Level

Research revealed the presence of a post-occupation, transgressive lake event, referred to as the Big Cut Lake, which appears to have been of brief duration but massive proportions. This later, transgressive lake level averaged 4 m in depth and clearly truncated the deposits of the hypothesized Stemmed era lake level at 1316 m elevation (see discussion of Lake History below). The presence of such a post-occupation lake did not directly affect the lake history and human occupation model as proposed. But the post-depositional effects of this later, higher lake level played a critical role in the successful cross-correlation of lake levels and occupation surfaces between the Chase, Dietz and Crescent sub-basins (see Basin-wide Distribution of Artifacts and Sites below).

To refer to the above two lake levels as "modifications" to the model is somewhat of a misnomer, actually. Neither of these lake levels contradicts or nullifies the model of lake history and human occupation pattern proposed for the northern Alkali Lake Basin. To the contrary, they actually came to serve as useful sub-divisional stratigraphic markers which were easily recognizable in the field. Their presence added finer resolution to the relative sequence of events, both cultural and environmental, in much the same way as an increase in lines of measure on a ruler.

Modification #3: Hydrologic Independence of the Chase, Dietz and Crescent Sub-basins

The basin-wide stadia mapping of the vertical (Z = elevation) and horizontal (Y = north; X = east) positions of artifacts and lake levels in the northern sub-basin produced an extremely fine-grained data base, within which numerous internal cross-checks could be made for accuracy and basin-wide congruency (see discussion of Standards of Error in Appendix A). Basin-wide correlations of time-equivalent lake levels and occupation surfaces throughout the northern sub-basin could not be made until the very late stages of research, for several reasons.

First of all, the majority of lake and topographic features critical to the interpretation of artifact context at the Dietz site were too subtle to be identified on aerial photos and too low in elevation to be recorded on topographic maps (Figure 2). The lowest contour line available on the USGS topographic map of the Dietz sub-basin was 4320 feet (1316.67 m). But most of the surface artifacts and low relief shore features of interest in the northern Alkali Basin were at least two meters below this elevation. This fact became all too clear during my first few hours of fieldwork in the basin in 1984, filling me with great fear and dread during my first few weeks in the field.

This lack of elevational data below 1316 m necessitated the launching of an exhaustive program of field survey in the sub-basin, which consumed major portions of the field effort in 1985 and 1986. The rewards of the efforts were great, as this portion of the research came to be a key element in the interpretation of lake history, paleoecology and human occupation in the basin, but the results were slow and the process very frustrating.

Secondly, all 1800 stadia values recorded in the field had to be reduced, plotted, cross-checked and rotated, or calibrated, to correct for any errors discovered. As discussed in Appendix A, this was no small task. It involved multiple internal cross-checks to discover any errors (and their source), followed by numerous rotational adjustments to subsequently correct, if possible, any errors made in the field or lab, by human or mechanical means. This required many long hours of tedious, labor-intensive work, long after the fieldwork had been completed.

Finally, due to the above factors, it was not until the final stages of research that it became known to me that the Chase, Dietz and Crescent sub-basins were hydrologically independent units, effectively separated from one another at all water levels below 1320.8 m elevation (Figures 30 and 39). Moreover, their basin floors were also quite different in elevation, the lowest points being 1314 m in the Dietz sub-basin, 1316.8 m in the Chase sub-basin and 1316 m in the Crescent sub-basin. These factors greatly complicated the process of inter-basin correlations. It meant that the absolute elevation values for prehistoric water levels and occupation surfaces in each sub-basin would probably not correspond, and could not be used in correlating time-equivalent occupation surfaces and lake levels between sub-basins. The needed inter-basin cross-correlations were achieved through other means (see <u>Sub-basin Correlations</u> below).

Alkali Basin Lake History Reconstruction

Introduction

The following reconstruction of terminal Pleistocene and early Holocene lake history in the Alkali Lake Basin is based on the results of air photo research, geomorphic field reconnaissance, stratigraphic studies, distributions of time-diagnostic artifacts, and detailed stadia mapping of lake features in the northern sub-basin of greater Alkali Lake Basin. Hypothesized lake levels above 1341 m elevation should be considered more tentative than those below 1341 m, since this portion of the reconstruction was based only on air photo and map research.

From the map and air photo research, it was possible to identify a total of 71 lacustrine features distributed throughout greater Alkali Lake Basin between 1320 m and 1384 m elevation, which consisted primarily of lacustrine bars, spits and wave terraces (Table 6). As mentioned in the above discussion of research methods in Chapter II, air photo research is helpful in establishing the broad parameters of lake chronology and in providing an overall direction for field research. But results are tentative until verified through field mapping, stratigraphic studies and, ultimately, radiocarbon dating of lake deposits at each elevation.

The presence of actual lake stands associated with these initially recognized features were subsequently confirmed, for all elevations at or below 1341 m, by detailed mapping and geomorphic studies conducted in the northern sub-basin. Furthermore, nearly all

TABLE 6. Comparison of Pluvial Lake Levels Recorded in the Alkali Lake and Fort Rock Basins of Oregon

Alkali Basin Lake Levels			Fort Rock Basin Lake Levels	
Elevation (meters)	No. of Features	Reference Names	Allison (1979)	Forbes (1973)
1384*	8	Lake Alkali	1384*	
			1378-1379	
1365*	9+		1366-1367*	1367*
1359	4+		1359-1361	1362
			1356*	1356
1353*	6+		1353*	1353*
1350	1+		1350-1351	1352
			1346-1347	1346
1341*	8	Lake Buffalo	1341*	1341-1343*
1335-1338*	12	Lake Spoon	1336-1338*	1337*
1330-1332*	5	Lake Bland	1329-1332*	1332
1326-1328*	6	Lake Cannon	1326-1327*	
1323	6	Lake Monique	1323-1324	
1320-1322*	6	Lakes Wayne/Kevin	1320-1322	

* Recorded as a major (lengthy) highstand

\+ Features <u>not</u> cross-checked by mapping or field reconnaissance

1337 m = Lake level just below the early Fort Rock Basin cave site occupations (4440 feet) reported by Bedwell (1970, 1973)

1353 m = Tufa radiocarbon dated at 12,980 B.P., stratigraphically below a date of 9,780 B.P. (Allison 1979).

of the lake levels recorded in the basin, by air photo and in field studies, were near identical matches to those recorded in the Fort Rock Basin by Allison (1979) and Forbes (1973) (see Table 6 and discussion in Chapter IV under Implications of Alkali Basin Research: Regional Lake History).

The reconstruction of pre-occupation (pluvial) lake levels was not the focus of the Alkali Basin research presented here. But many of these levels were recorded in the northern sub-basin in the process of gathering data for identifying the lake levels which were critical to the prehistoric record of occupation in the northern sub-basin.

The lake levels reconstructed for elevations above 1321 m have no direct relevance to the history of human occupation at the Dietz site, except perhaps in demonstrating a close correspondence between Alkali Lake Basin and Fort Rock Basin, in lake sequences and elevational values. The data strongly suggest that a groundwater connection may have existed for some time between the two basins (see Allison 1979 and concluding discussions in Chapter IV).

Nonetheless, these pre-occupation (pluvial) lake levels are presented here, for the interest of Quaternary scholars of the "full-pluvial" persuasion (Willig 1984). For ease of reference in distinguishing the many lake features and sites identified through stadia survey in the northern sub-basin, the lake levels recorded in the vicinity of the Dietz site have been given names. These names refer to crew members who were present, or to primary datum points, similarly named, which were located throughout the northern sub-basin (Figure 30).

Pluvial (Pre-occupation) Lake Levels

The 71 lake features recorded in map and air photo research included the following elevations: six features between 1321 and 1322 m; six features at 1323 m; six features between 1326 m and 1328 m; five features between 1330 m and 1332 m; 12 features between 1335 m and 1338 m; eight features at 1341 m; one feature at 1350 m; six features at 1353 m; four features at 1359 m; nine features at 1365 m; and eight features just below 1384 m elevation. These lake levels are considered to represent major high stands of Lake Alkali prior to 11,500 B.P., before the Dietz site was occupied (Table 6).

Full Pluvial Lake Alkali (1384 m)

The highest lake terraces in the Alkali Lake Basin were identified through air photo research and later verified through field reconnaissance. They are located at or near 1384 m elevation, just below the 1387 m contour which divides Alkali Basin from the Fort Rock and Chewaucan Basins. These basins are located within 10 km to the northwest and southwest, respectively. The elevation of these uppermost lake terraces (1384 m) is identical to that of the highest pluvial lake level recorded in the Fort Rock Basin (Allison 1979; Forbes 1973). This 1384 m lake level probably represents the maximum high stand for Pluvial Lake Alkali as well.

Intermediate Pluvial Lakes (1365 m to 1350 m)

The lake features observed on air photos at elevations of 1365 m, 1359 m, 1353 m, and 1350 m elevation are not well known since they were not field checked, nor were they mapped as part of the Dietz site research. But three of them (1384, 1365 and 1353) correspond to major still stands reported for Pluvial Lake Fort Rock (Table 6).

Lake Buffalo (1341 m)

A total of eight lake features were observed at 1341 m elevation in the air photo and map research, suggesting that this elevation represents a lengthy lake stand, referred to here as Lake Buffalo. In addition, stadia mapping in the Dietz sub-basin also documented a major lake stand at this elevation. Lake Buffalo is represented by Facies Set #1 at the Dietz site's southern cove profile (Figure 40), in particular, the wave-planed top of the Dietz hill at 1341 m elevation. Both Allison (1979) and Forbes (1973) reported major stillstands between 1341 and 1343 m elevation in the Fort Rock Basin (Table 6).

Lake Spoon (1338 m)

Twelve lake features at a level at or near 1338 m elevation were observed in air photo and map research, and confirmed by stadia mapping in the northern sub-basin. This 1338 m lake level, referred to here as Lake Spoon, is represented by the 1338 m wave-cut at the base of the basalt caprock of the Dietz hill at the southern cove

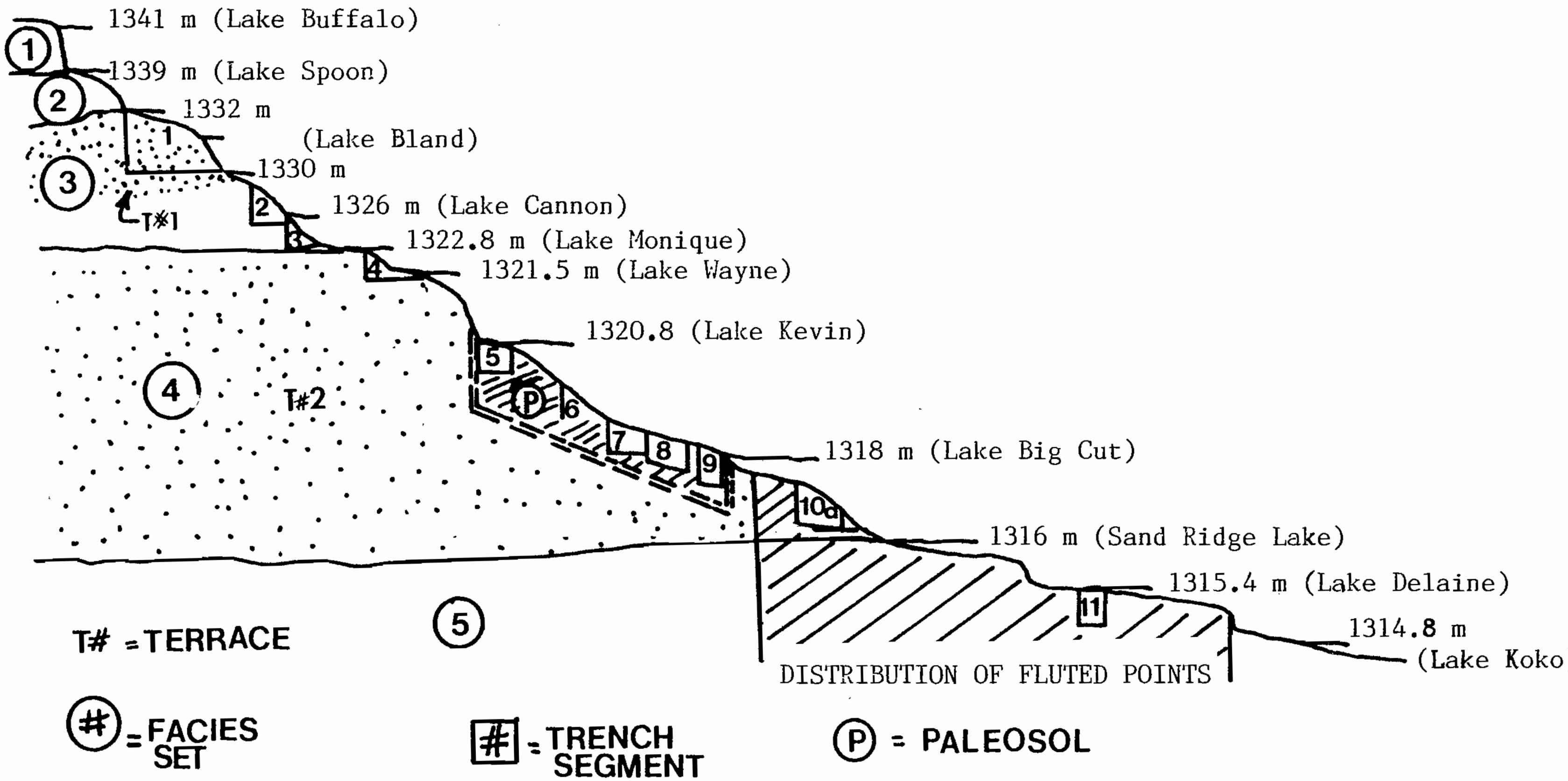


FIGURE 40. West-east Shore Profile Across the Southern Cove of the Dietz Site from the Dietz Hill Crest to the Base of Terrace #2

profile (Figure 40), and corresponds to the top of Facies Set #2 at the Dietz site (see Lateral Facies Descriptions below). Lake Spoon is also represented by the wave-cut base of the hill on the east shore of the Dietz sub-basin (Figure 41). A major lake level was reported from 1336 m to 1338 m elevation in the Fort Rock Basin by both Allison (1979) and Forbes (1973) (Table 6).

Lake Bland (1332 m to 1330 m)

Air photo research and stadia mapping confirmed the presence of a major lake level between 1332 m and 1330 m elevation, referred to here as Lake Bland. The paired set of readings at these two elevations correspond to what would have been the upper (erosional) wave-cut line and the lower (constructional) wave-deposits. These paired readings are associated with the top and bottom of distinct benches recorded by stadia mapping in the northern sub-basin. The highest level of Lake Bland (1332 m) is represented by the top of the uppermost bench (Terrace #1) at the Dietz site's southern cove at 1331.9 m (Figure 40), which corresponds to the top of Facies Set #3 here. Lake Bland is also recorded by the top of a similar bench on the northeast shore of the Dietz sub-basin at 1332.8 m (Figure 41). This lake is also represented at 1331 m elevation by the wave-planed crest of the hill at the Hilltop Site (Site No. 48 on Figure 30) in the Chase sub-basin (see Figure 42 and discussion below under Results of Basin-wide Archaeological Site Survey).

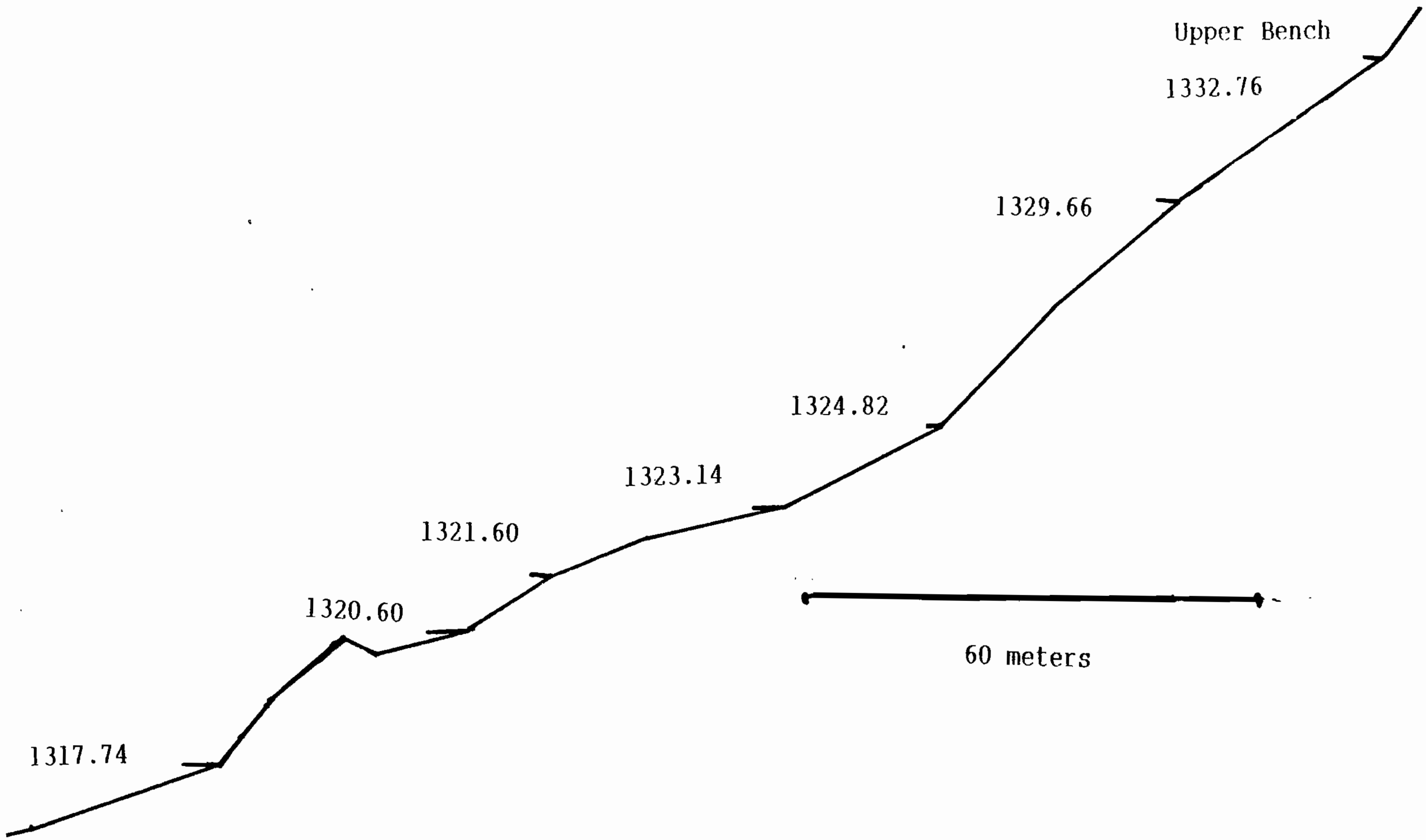


FIGURE 41. East-west Shore Profile Across the Upper Bench Area in the Northeastern Sector of the Dietz Sub-basin

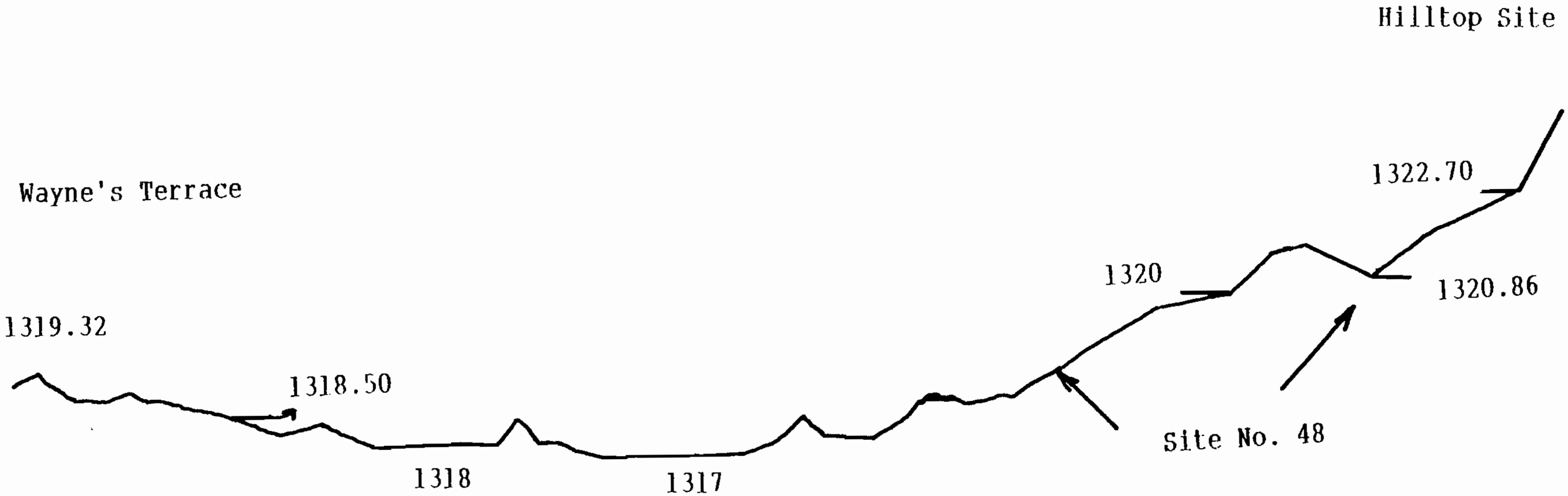


FIGURE 42. North-south Profile Across the Chase Sub-basin from the Crest of the Hilltop Site (Site No. 48) to the Crest of Wayne's Terrace

The lowest level of Lake Bland is represented by the bottom of Terrace #1 (upper portion of Facies Set #3) at 1329.7 m elevation at the Dietz site's southern cove profile (Figure 40). Likewise, the bottom of the highest bench on the northeast shore of the Dietz sub-basin (1329.5 m elevation on Figure 42) also corresponds to the lower level for Lake Bland. Both Allison (1979) and Forbes (1973) have reported a major lake stand between 1329 m and 1332 m elevation in the Fort Rock Basin (Table 6).

Lake Cannon (1328 m to 1326 m)

There were six lake features identified in map and air photo research between the elevations of 1328 m and 1326 m, and stadia mapping in the northern sub-basin confirmed the presence of lake features at these elevations. This 1328 to 1326 m lake level, referred to here as Lake Cannon, is represented at numerous places throughout the northern sub-basin. There is a distinct wave-cut feature at 1325.97 m in the mid portion of Facies Set #3 at the Dietz site's southern cove (Figure 40). Most of the wave-planed top of Flemmer's Spit measures from 1325 m to 1326 m elevation (Figure 43). This 1326 m elevation is considered to be the lower level of a lake stand at 1328 m elevation.

The 1328 m water level of Lake Cannon would have been responsible for depositing a portion of the basal sands on the prominent beach ridge at the southern end of the northern sub-basin. This southernmost beach terrace is referred to as "Monique's Terrace" after the so-named datum established on its crest (Figures 30 and 44). The elevation at

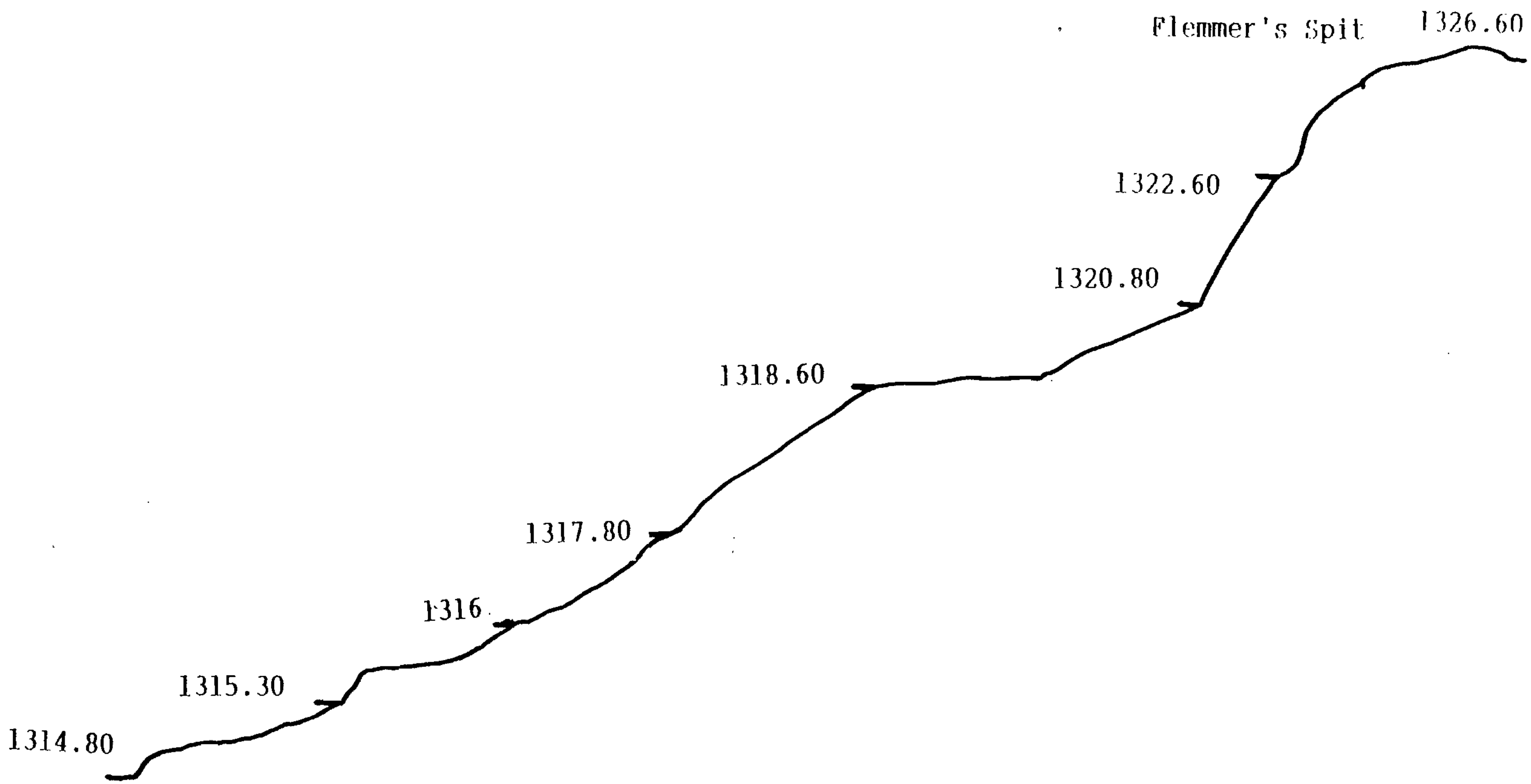


FIGURE 43. West-east Shore Profile Across the Northern Cove of the Dietz Site from the Crest of Flemmer's Spit to the Playa Floor

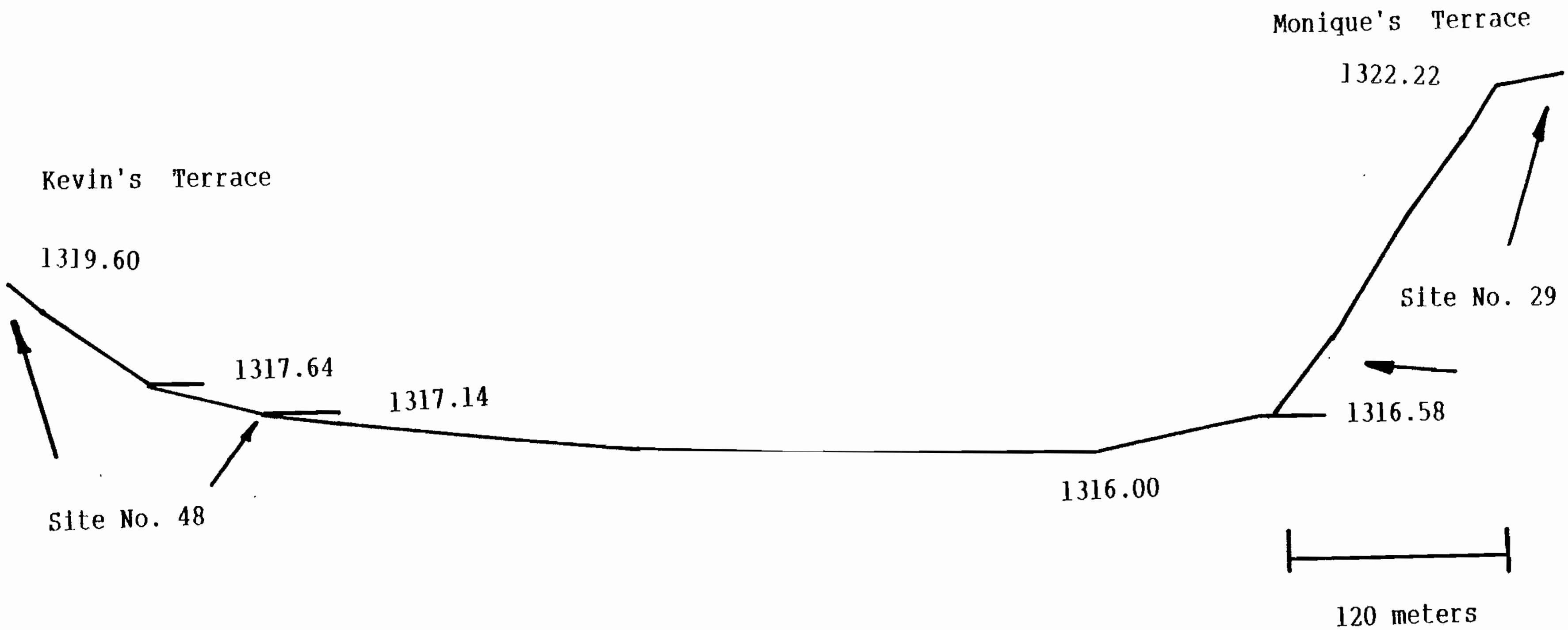


FIGURE 44. South-north Shore Profile Across the Crescent Sub-basin from the Crest of Monique's Terrace to the Crest of Kevin's Terrace

point "Monique" is 1325.98 m, but most of the surface of Monique's Terrace is wave-planed at 1323 m elevation by the Lake Monique (discussed below). The 1328 m lake level is represented at two places in the northern sub-basin. There is a subtle bench between 1328.1 m and 1326.3 m elevation at the Hilltop Site (Figure 42), and a break in slope at 1327.3 m elevation on the east shore profile (Figure 41) in the Dietz sub-basin.

Lake Monique (1322.8 m)

The postulated lake level at 1322.8 m elevation, referred to here as Lake Monique, was observed at six locations in greater Alkali Lake Basin during the air photo and map research. It is a major facies marker in the northern sub-basin, and has been recorded at the following locations: (1) a major cut at 1322.8 m in the lower portion of Facies Set #3 at the Dietz site's southern cove (Figure 40); (2) a major wave-cut at 1322.7 m at the base of the hill at the Hilltop site (Figure 42); (3) a major wave-cut at 1322.6 m at the Dietz site's northern cove (Figure 43); (4) a break in slope at 1322.6 m on the northeast shore profile in the Dietz sub-basin (Figure 41); and (5) most of the wave-planed top of Monique's Terrace measures 1322.75 m (Figure 44).

The 1322.8 m lake level is considered to be responsible for the deposition of the majority of the sand deposit comprising Monique's Terrace. Once formed, this southern terrace served as the drainage divide separating the northern and central sub-basins for all lake levels below 1323 m elevation. This 1323 m lake level would also have deposit the basal sands of Wayne's Terrace, Kevin's Terrace, and Terrace #2 at the Dietz Site. Allison (1979) reports a lake stand between 1323 m and 1324 m elevation in the Fort Rock Basin (Table 6).

Lake Wayne (1321.5 m)

There were six lake features observed between the elevations of 1320 m and 1322 m during air photo and map research, and Allison (1979) reports a lake stand between these same elevations in Fort Rock Basin (Table 6). But on-ground stadia mapping in the northern sub-basin recorded two distinct sets of features within this range: one at 1321.5 m, referred to here as Lake Wayne, and another at 1320.8 m, referred to as Lake Kevin (see discussion below).

The lake level elevation of 1321.5 m for Lake Wayne has been recorded at numerous places in the northern sub-basin: (1) the top of Terrace #2 and Facies Set #4 (1321.5 m) at the Dietz site's southern cove (Figure 40); (2) the 1323.3 m crest on Wayne's Terrace at point Wayne (Figure 45); (3) the 1321.6 m break in slope on the northeast shore profile in the Dietz sub-basin (Figure 41); and (4) a prominent 1321.5 m wave-cut scarp just below the older dune sands at the Hilltop site (Figure 42).

Lake Kevin (1320.8 m to 1319.1 m)

The 1320.8 m lake level, referred to as Lake Kevin, is also a prominent marker in the northern sub-basin, represented at the following locations: (1) a break in slope at 1320.8 m on Terrace #2 at the Dietz site's southern cove (Figure 40); (2) a break in slope at

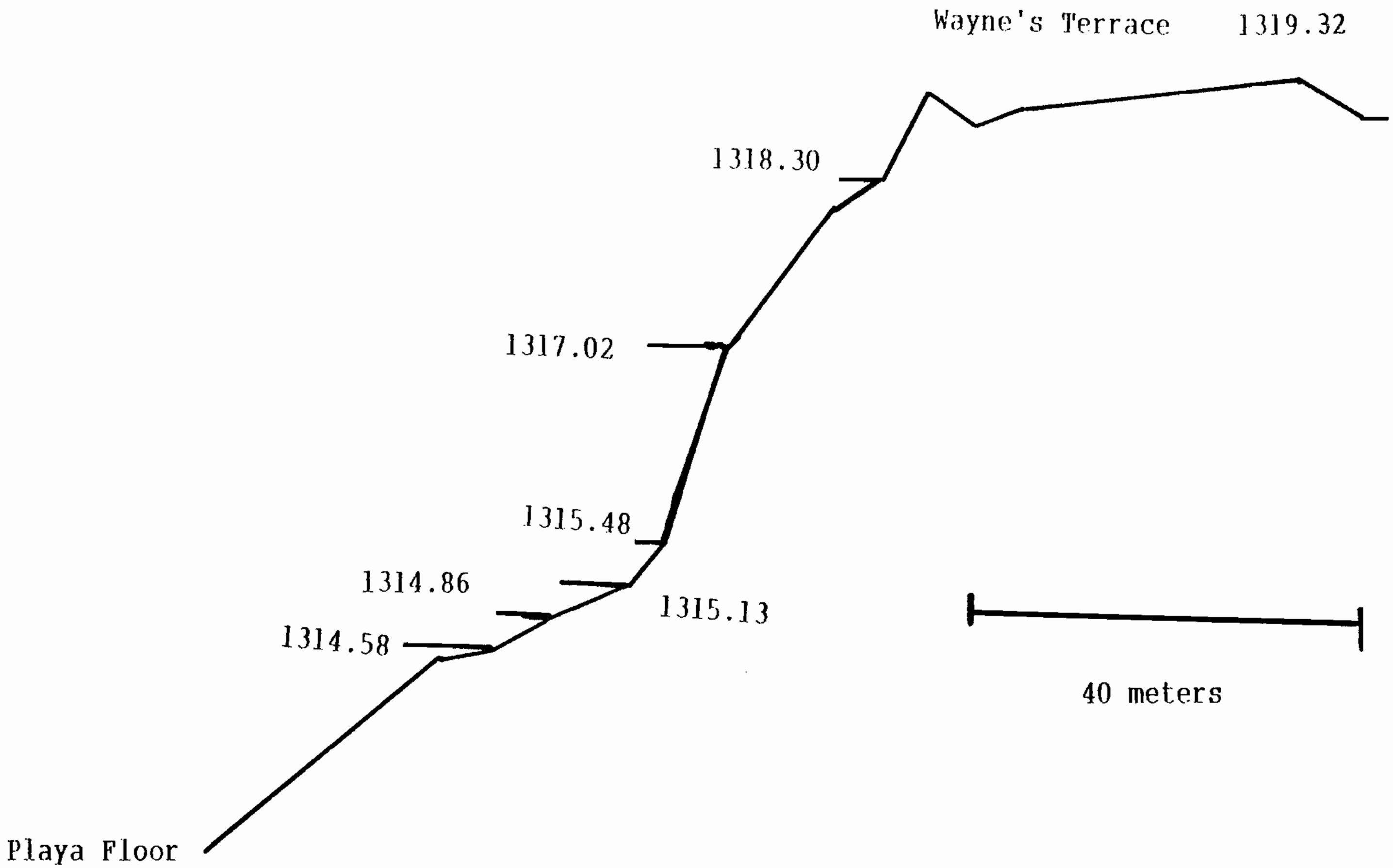


FIGURE 45. North-south Shore Profile Across the Northern Sector of the Dietz Sub-basin from the Crest of Wayne's Terrace to the Playa Floor

1320.6 m above the uppermost dune sands at the Dietz site's northern cove (Figure 43) and the northeast shore profile (Figure 41); and (3) the lower bench at 1320.8 m at the Hilltop site (Figure 42). The 1319.1 m contour is considered to be the lower level of the 1320.8 m lake stand of Lake Kevin. This lower level is represented by the majority of the wave-planed surfaces of Wayne's Terrace (Figure 45) and Kevin's Terrace (Figure 46).

Lake Kevin is the lowest in elevation of all the pre-occupation (pluvial) lake features recorded in Alkali Basin. The stratigraphy and lithology associated with Lake Kevin also suggest that it was the last major pluvial highstand in the basin. Lake Kevin would have deposited the coarse grey sands which form the basal portion of Terrace #2 at the Dietz site. These coarse sands comprise what would have been the dry, hillslope surface during Clovis occupation. The data suggest that, after Clovis occupation of this paleosurface, these sands were partially buried by aeolian processes prior to Stemmed-era occupation, and further modified and cemented by soil formation processes after Stemmed-era occupation (see discussion below under Paleolandscape and Occupation Surfaces).

Greater Alkali Basin : Lake Levels and Drainage Divides

Pluvial lakes pre-dating Dietz site occupation were much larger and deeper than those present between 11,500 and 7,000 B.P. This is best illustrated on Figure 47, which depicts what would have been the areal extent (dotted area) of a pluvial lake at 1338 m elevation in greater Alkali Lake Basin and the drainage area, or watershed, which

FIGURE 46. South-north Shore Profile Across the Southern Sector of the Dietz Sub-basin from the Crest of Kevin's Terrace to the Crest of Lake Koko's Shore Ridge

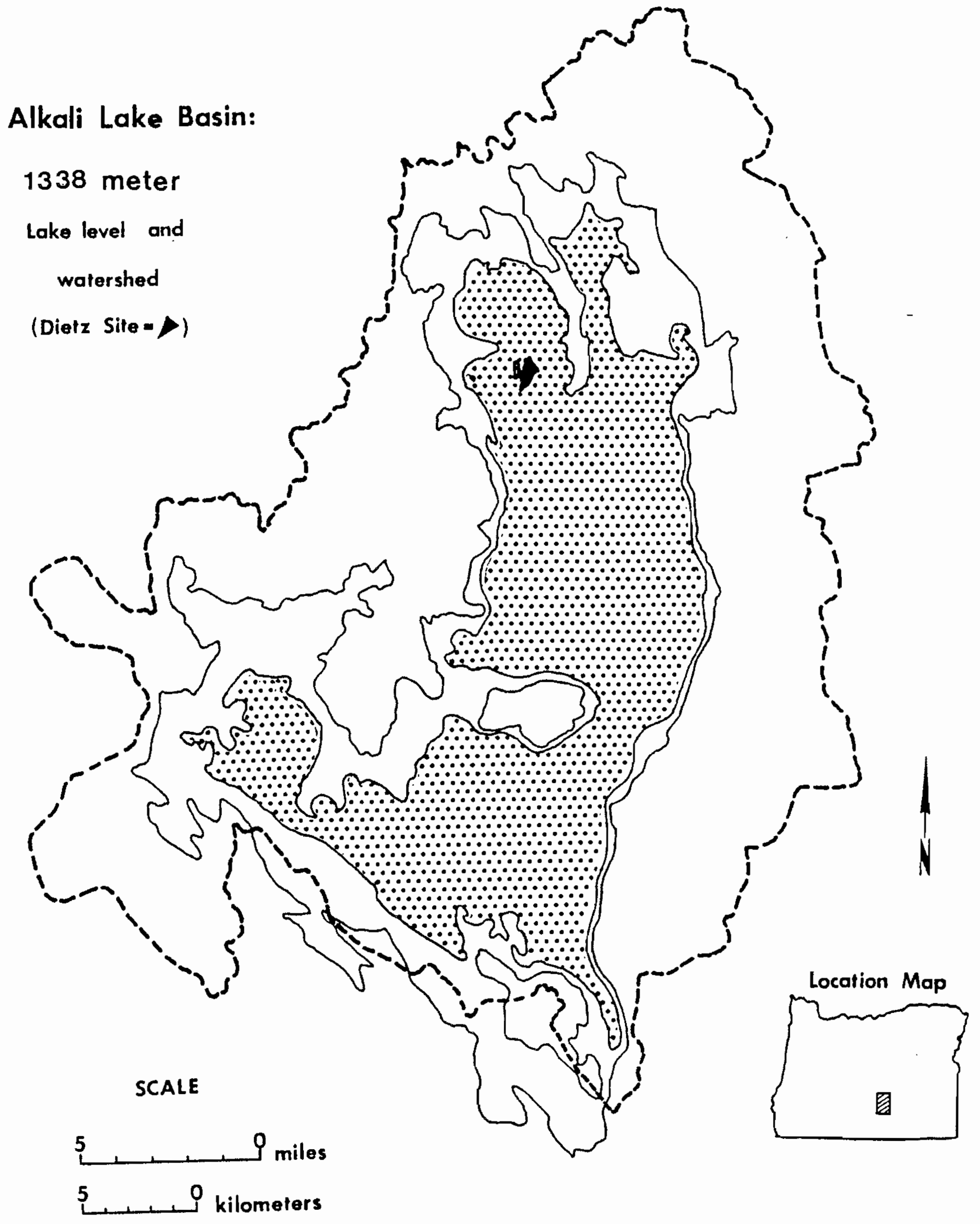


FIGURE 47. Areal Extent of a Pluvial Lake Level at 1338 m Elevation in Greater Alkali Lake Basin (Lake Spoon). The Dietz Locality is Represented by a Triangle.

would have contributed to its water supply (dashed lines). This 1338 m lake would have filled the greater part of Alkali Lake Basin, whose boundaries are broadly outlined in Figure 47 by the 1372 m contour.

Although the pluvial lake level at 1338 m elevation would have pre-dated any cultural presence in the Alkali Lake Basin, the location of the Dietz site in the northern sub-basin is also included in Figure 47 for the purpose of reference. The site is shown as a triangle -- a shape which closely approximates its actual configuration on the landscape. This 1338 m lake corresponds to a series of lake features identified with Lake Spoon (discussed below), which would have inundated the Dietz locality by 21 m of water, lapping up against the Dietz hill just below the base of the basalt flow which caps the hill.

At 1323 m elevation, three distinct sub-basin lakes are formed within greater Alkali Lake Basin. These can be described as follows: (1) a broad lake about 23 m deep in the southern sub-basin; (2) a broad lake about 16 m deep in the central sub-basin; and (3) a tri-lobed water body in the northern sub-basin, which would have covered the Dietz site locality by 8 to 9 m of water (Figure 32).

At 1323 m elevation and below, greater Alkali Lake Basin is divided into these distinct sub-basins, referred to as the northern, central and southern sub-basins. These sub-basins were separated from one another by low-relief bars and terraces formed by previous lake levels. As discussed in Chapter II under Regional Environmental Setting, the lake levels of relevance to early human occupation at the Dietz site would have been contained within the northern sub-basin.

Post Pluvial (Clovis and Stemmed Era) Lake Levels

Results of air photo research, geomorphic and stratigraphic studies, basin-wide site survey and detailed mapping of artifacts and lake features in the northern Alkali Lake Basin strongly support the model of lake history and human occupation patterns as proposed. In addition, data indicate the presence of two additional post-pluvial lake levels of relevance to the occupation history at the Dietz site.

Primarily, these include: (1) the recognition of a two-phase prograding (or retrograding) lake sequence associated with Western Stemmed occupation in the northern sub-basin, one at 1316 m elevation and a second lake stand at 1315.4 m elevation; and (2) the recognition of a very large but short-lived transgressive lake level in the northern sub-basin whose deposits truncate and partially bury the terrace sands of the 1316 m lake hypothesized for Stemmed period occupation. These lake levels are further described below, followed by a detailed discussion of the stratigraphic context of fluted and stemmed artifacts in relation to the land surfaces and lake levels which are hypothesized as being co-eval with human occupation.

Western Clovis Lake and Marsh: Lake Koko (1314.8 m to 1314.6 m)

The lake level between at 1314.8 and 1314.6 m elevation (Lake Koko) hypothesized for the period of Western Clovis occupation is strongly supported by the bulk of data gathered. The stratigraphic and geomorphic evidence for this shallow lake in the center of the Dietz sub-basin, referred to here as Lake Koko, has been recorded and cross-checked through mapping and trenching of shoreline profiles, four of which are illustrated in Figures 30, 39, 43, 45, 46, and 48.

The crest of Lake Koko's shore ridge ranges from 1314.8 m to 1315 m elevation, with a sharp lakeward break in slope at 1314.6 m, continuing down to 1414.4 m elevation. The water level during Clovis occupation is estimated between 1314.6 m and 1314.8 m elevation, indicating a depth of 30 to 50 cm above the 1314.3 m sub-basin floor. These elevational values are topographically represented at the following locations: (1) a break in slope between 1314.4 and 1314.8 m on the profile north of Kevin's Terrace (Figure 46); (2) a tripartite break in slope between 1314.86, 1314.58 and 1314.5 m on the profile south of Wayne's Terrace (Figure 45); (3) a break in slope at 1314.85 m at the eastern base of the Dietz site's northern cove profile (Figure 43); and (4) paired wave-cut scarps between 1314.85 and 1314.6 m elevation on profiles of the west and east shore ridges in the center of the Dietz sub-basin (Figure 48).

The subsurface deposits associated with Lake Koko have been studied in detail in the stratigraphic profile of the East Shore Trench (see discussion below under <u>Potential for Buried Occupation Surfaces</u>). The Clovis-period occupation surface could have included the entire terraced slope along the base of the Dietz hill (Facies Sets #1 through #4), since this surface would have been above water and available for occupation. However, the major focus of occupation seems to have been between 1314.8 m and 1315.4 m, as indicated by the major peak in fluted point distribution (see discussion below under <u>Basin-wide Distribution of Artifacts and Sites</u>).

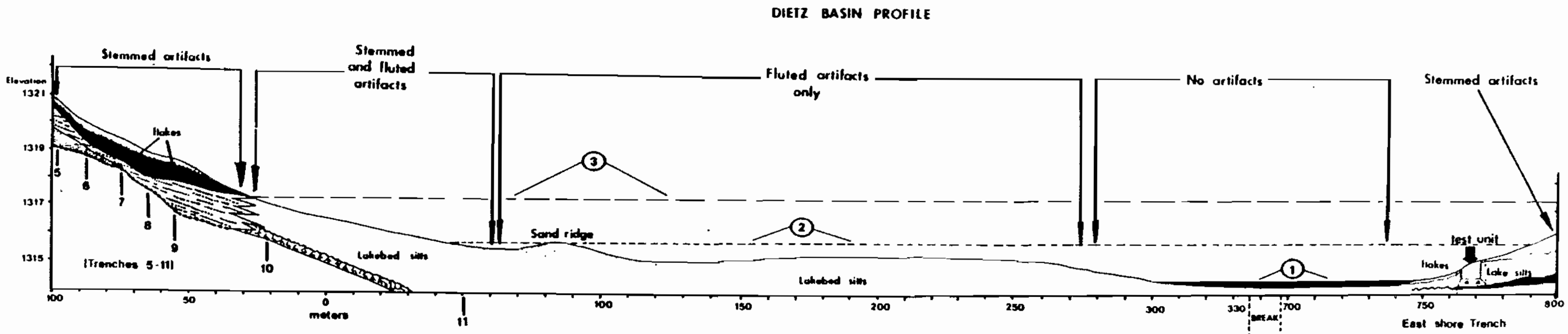


FIGURE 48. West-east Shore Profile Along the 150N Transect Across the Center of the Dietz Sub-basin from the Sand Ridge Terrace to the Eastern Crest of the 1314.8 m Shore Ridge (Lake Koko) Associated with Clovis Occupation

Western Stemmed Lake Stage I: Sand Ridge Lake (1316 m)

The first stage of the hypothesized Stemmed-era lake sequence, referred to here as the Sand Ridge Lake, stratigraphically corresponds to Subset #1 of Facies Set #5 (see Lateral Facies Descriptions below). The Sand Ridge Lake, excavated a distinct wave-scarp into existing shore terraces in the Dietz sub-basin at 1316.2 m and deposited 50 to 70 cm of coarse sands which typify the "Sand Ridge" terrace recorded at 1316 m around the perimeter of the Dietz sub-basin.

This paired set of wave-cut (1316.2 m) and wave-built (1316 m) features are represented at, but not limited to, the following profile locations in the Dietz sub-basin: (1) a cut scarp at 1316.2 m just below the base of Terrace #2 at the Dietz site's southern cove profile, and the Sand Ridge Terrace at 1316 m (Figure 40); (2) a cut scarp on the northern cove profile below Flemmer's Spit (Figure 43); (3) a 1316 m break in slope on the northern flank of Kevin's Terrace (Figure 46); and (4) the uppermost 50 to 70 cm of silt deposits on the surface of the Clovis-era east shore ridge may have been deposited by the Sand Ridge Lake (Figure 48).

The majority of stemmed artifacts in the Dietz sub-basin were recovered at or just above 1316 m elevation, suggesting that the human occupation surface ranged from 1317.3 to 1321 meters. Correlative occupation surfaces and lake levels are present in the Chase and Crescent sub-basins, although at different absolute elevations (see discussion below under Sub-basin Correlations).

The sandy beach deposit of the Sand Ridge Lake was traced laterally around the perimeter of the northern sub-basin. At one point in particular, at 1315.5 m elevation, about 150 m SE of the ON/OE site datum, these sand deposits of the Sand Ridge Lake partially bury the upper surface of the Clovis-era beach ridge (Figure 30). This superposition is clearly visible in stereo viewing of air photos for the Dietz site (Figure 31), and seems to be confirmed by the stadia profiles placed across this area in several places. The strata exposed in the Sand Ridge Trench suggests a similar superposition, but the trench is positioned too far north of the point of overlap to contain the necessary strata which would verify this. The available data suggest that this higher elevation Stage I Stemmed-era lake at 1316 m postdates the Clovis occupation at the Dietz site (see concluding discussion in Chapter IV).

Western Stemmed Lake Stage II: Lake Delaine (1315.4 m)

The second stage in the hypothesized Stemmed-era prograding lake sequence is postulated as a brief, recessional stage at 1315.4 m elevation. It is referred to here as Lake Delaine, so-named for the two datum points ("Debbie" and "Elaine") which record its elevation (Figure 30). The sub-surface (stratigraphic) deposits of Lake Delaine are represented in several of the shoreline trenches examined, and it corresponds to Subset #2 of Facies Set #5 (discussed below under Lateral Facies Descriptions).

In contrast, the topographic (surface) expression of Lake Delaine is extremely subtle and not readily apparent during fieldwork. In fact, the presence of Lake Delaine was discovered only after all of the detailed stadia shots were analyzed and profiled in the Dietz sub-basin. However, once recognized, it was possible to identify this subtle break in slope at 1315.4 m elevation on every shore profile that in the Dietz sub-basin that included this elevation.

Major locations include: (1) a subtle break in slope between 1315.4 m and 1315.3 m elevation just below the Sand Ridge on the Dietz site's southern cove profile (Figure 40); (2) a similar set of slope breaks at 1315.3 m and 1315.45 m on the Dietz site's northern cove profile (Figure 43); (3) two breaks in slope at 1315.48 m and 1315.13 m on the profile of the southern flank of Wayne's Terrace (Figure 45); and (4) a similar two-break sequence on the profile of the northern flank of Kevin's Terrace (Figure 46). Lake Delaine also cut a fresh scarp into the east shore profile of the Clovis-age Lake Koko, as can be seen along the central sub-basin profile (Figure 48).

The second distribution group of stemmed artifacts, although small in number, is closely associated with the Lake Delaine shoreline -- at the Dietz site and at five other sites in the northern sub-basin. The paleosurface associated with this occupation is considered to range between 1315.5 m and 1318 m elevation, with a definite peak at 1316 m elevation (see discussion below under <u>Basin-wide Distribution of Artifacts and Sites</u>).

<u>Post-occupation Lake: Big Cut Lake (1318 m to 1316.6 m)</u>

This lake level, referred to as the Big Cut Lake, is represented by a prominent wave-scarp between 1318.3 m and 1316.6 m elevation which was traced around the entire perimeter of the northern sub-basin. This major scarp is best visible at, but not limited to, the following profile locations: (1) between 1318.3 m and 1316.6 m elevation at the base of Terrace #2 at the Dietz site's southern cove (Figure 40); (2) a distinct strandline cut at 1317.9 m and a near-surface stratigraphic break at 1316.5 m elevation at the Dietz site's northern cove profile (Figure 43); and (3) two slope breaks at 1318 m and 1317.7 m on the northern flank of Kevin's Terrace (Figure 46).

There is evidence to suggest that the higher elevation Big Cut Lake at 1318 to 1316.6 m elevation is a transgressive one which postdates Western Stemmed and Western Clovis occupations in the northern sub-basin. In the southwestern sector of the Dietz sub-basin, about 350 m due southwest of the southern tip of the Dietz hill (see spots marked on Figures 30 and 31), the coarse sand-gravel deposits of the Big Cut Lake conspicuously bury and partially truncate the beach terrace deposited by the Sand Ridge Lake. This massive, sandy-gravel deposit left by the Big Cut Lake is referred to as the "Umbrella Handle", so-named for its characteristic shape.

This superposition of the Big Cut Lake's "Umbrella" deposits over those of the Stemmed-era Sand Ridge Lake is clearly visible in stereo viewing of the air photos for the sub-basin (Figure 31). The data indicate that this higher Big Cut Lake postdates both Clovis and Stemmed-era occupations in the northern sub-basin, and their associated lake levels (see concluding discussions in Chapter IV under <u>Implications of Alkali Basin Research: Regional Lake History</u>).

Stratigraphic and Geomorphic Contexts of Fluted and Stemmed Artifacts in the Dietz Sub-basin

Cross-correlation of Lateral Sedimentary Facies: Methodology

The stratigraphic contexts of fluted and stemmed points at the Dietz site, and elsewhere in the Dietz sub-basin, are described below -- in relation to each other and to the reconstructed paleolandscape and lake history sequence hypothesized for the Dietz sub-basin. The paleo-occupation surfaces reconstructed for the Western Clovis and Western Stemmed occupation periods were traced laterally across the Dietz sub-basin, in relation to several sets of time-equivalent sedimentary units, or lateral facies sets, which form the near-surface deposits in the basin.

In particular, the unique two-level distribution of fluted and stemmed points in the basin (horizontally and vertically), are described in relation to the hypothesized lake levels which correspond to each time-equivalent set of lateral facies. This discussion is followed by the results of basin-wide archaeological site survey, stadia mapping and stratigraphic studies conducted in the northern Alkali Lake Basin.

In the absence of buried context or materials suitable for radiocarbon dating, it is possible to establish a relative chronology for surface artifacts and sites. This can be accomplished through landscape reconstruction and stratigraphic cross-correlations of prehistoric occupation surfaces to temporally distinct sets of lateral facies in the near-surface deposits. A most useful method for relative sequencing of surface artifacts and sites, is the method of cross-correlating lateral sedimentary units, and subsequent mapping of the vertical and horizontal positions of all time-diagnostic artifacts onto that landscape.

Conditions for successfully achieving this kind of relative sequencing are most favorable when there is an abundance of typologically "pure" single component clusters of dated point types, and a well-preserved stratigraphic record of the paleolandscape, both during and after human occupation. These conditions were fully met at the Dietz site, and elsewhere in the Dietz sub-basin, which had produced a unique abundance of single component clusters of Western Clovis and Western Stemmed artifacts, in direct association with remarkably well-preserved paleolandforms and lake stratigraphy.

The precise horizontal locations (X = east; Y = north) and vertical positions (Z = elevation) of each time diagnostic artifact were carefully plotted in relation to the near-surface sedimentary units, or facies, deposited laterally across the site by sequent fossil lake levels at the site and the fossil lake levels they represented. This method is known as stratigraphic cross-correlation of lateral sedimentary facies.

In lake basin environments, the lithology and character of sedimentary units, or facies, deposited by a single lake level will vary laterally across the original surface of deposition (Friedman and Sanders 1978; Mintz 1977; Morrison 1965b). The variations are a result of different depositional environments which existed laterally across the lake environment from shoreline margins to central lake bottom. The sediments along this continuum generally range from coarse gravelly-sands deposited in high energy beach zones, to intermediate silt-sand deposits in near-shore breaker bars and slopes, to fine-grained silts and clays deposited on the central lake bottom. Figure 49 illustrates a typical lateral facies sequence in a closed lake such as Alkali Basin, with terrestrial hillslope facies gradually interfingering lakeward with beach facies, which in turn interfinger lakeward with central lake bottom facies.

Cross-correlation of paleosurfaces and lateral facies is based on the assumption that each suite of lacustrine facies is (more or less) synchronously deposited by the same lake level. Thus, careful lateral tracing of key marker beds across the original surface of deposition can establish time equivalence for that set of facies. It must be cautioned that all lateral facies in a given depositional environment are not automatically contemporaneous. The sedimentary record of basin lakes can be complicated by multiple transgressions and regressions of lake levels. Thus, establishing time-equivalence of key strata across the facies profile should be carefully cross-checked with elevational data, stratigraphic studies and, ultimately, verified by radiocarbon dating.

Cross-correlation of Artifacts and Occupation Surfaces with Facies and Lake Levels in the Dietz Sub-basin

The cross-correlation of certain time-equivalent lateral facies sets and their associated lake levels, with artifacts and their original occupation surfaces in the Dietz sub-basin, was based on

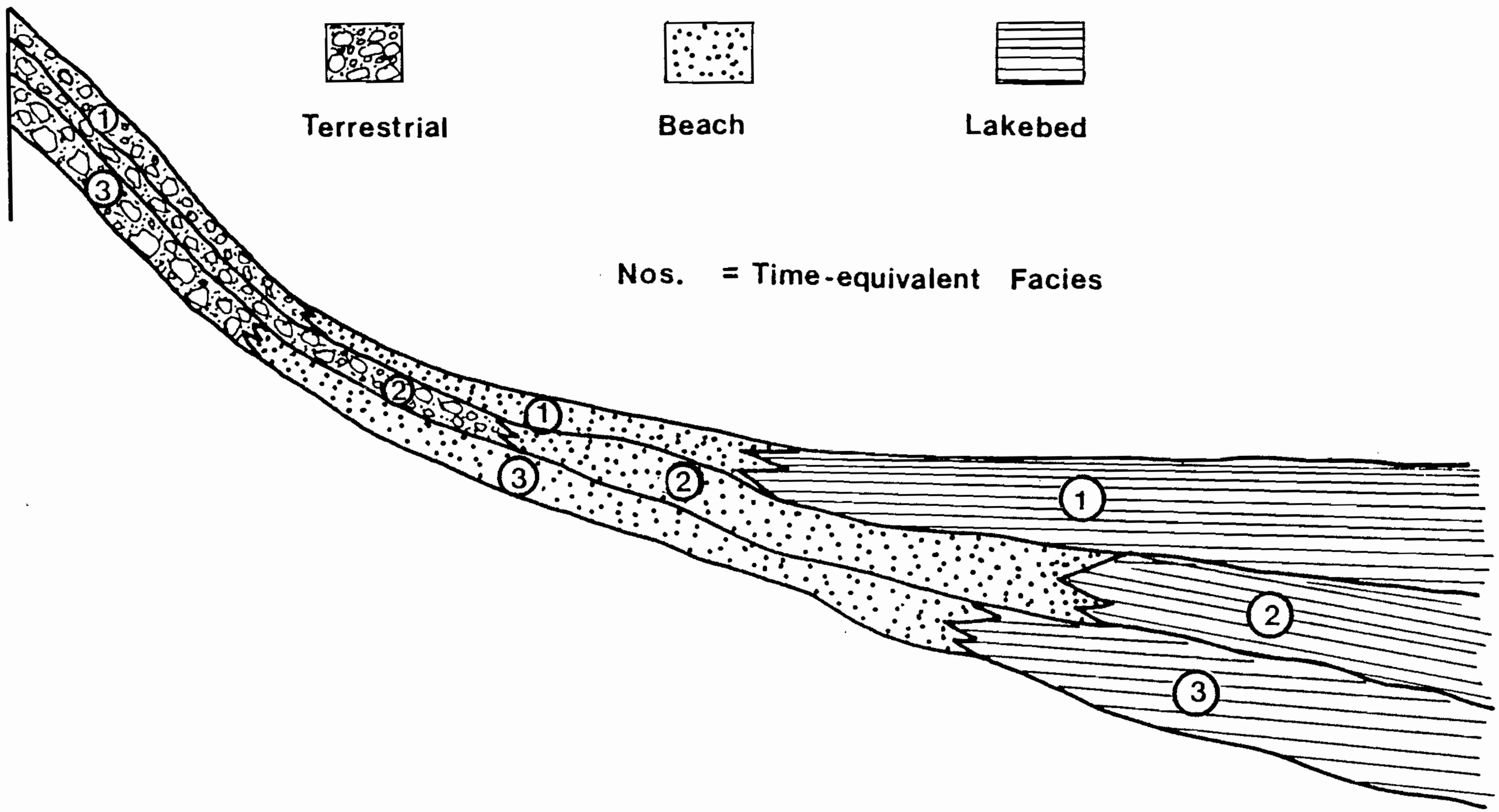


FIGURE 49. Generalized Shore Profile Illustrating a Typical Lateral Facies Sequence in a Closed Lake Basin

results of intensive basin-wide stadia mapping of artifacts and their original occupation surfaces. Additional fine-grained temporal resolution was provided by the abundance of single-component clusters of time-diagnostic artifacts, at the Dietz site and at 47 other sites discovered throughout the northern sub-basin through problem-oriented site survey (see discussion below under Problem-oriented Basin-wide Archaeological Site Survey).

From the research, it was possible to reconstruct the vertical position of fluted and stemmed artifacts in relation to the lateral sedimentary facies which form the near-surface deposits in the basin. The distributions of fluted and stemmed artifacts with respect to fossil lake features and near-surface sedimentary facies in the Dietz sub-basin are illustrated in the west-east profiles of Figures 48 and 50. The elevational data for these profiles were compiled from three major stadia transects across the Dietz site. These ranged from grid points 160W to 1800E along the 150N line, from grid points 180W to 0E along the 350N line, and from grid points 0E to 100E along the 0N line (Figures 30 and 39).

The discrete, though slightly overlapping, surface distributions of fluted and stemmed points across the Dietz site were first revealed through the artifact mapping and collections across the east-west basin profile at 150N (Collection Area #1). These distributions were the basis for developing the model of lake history and human occupation pattern proposed for the basin from 11,500 to 7,000 B.P. Briefly, the model proposed a terminal Pleistocene (Western Clovis) occupation oriented to a small, shallow lake or pond in the center of

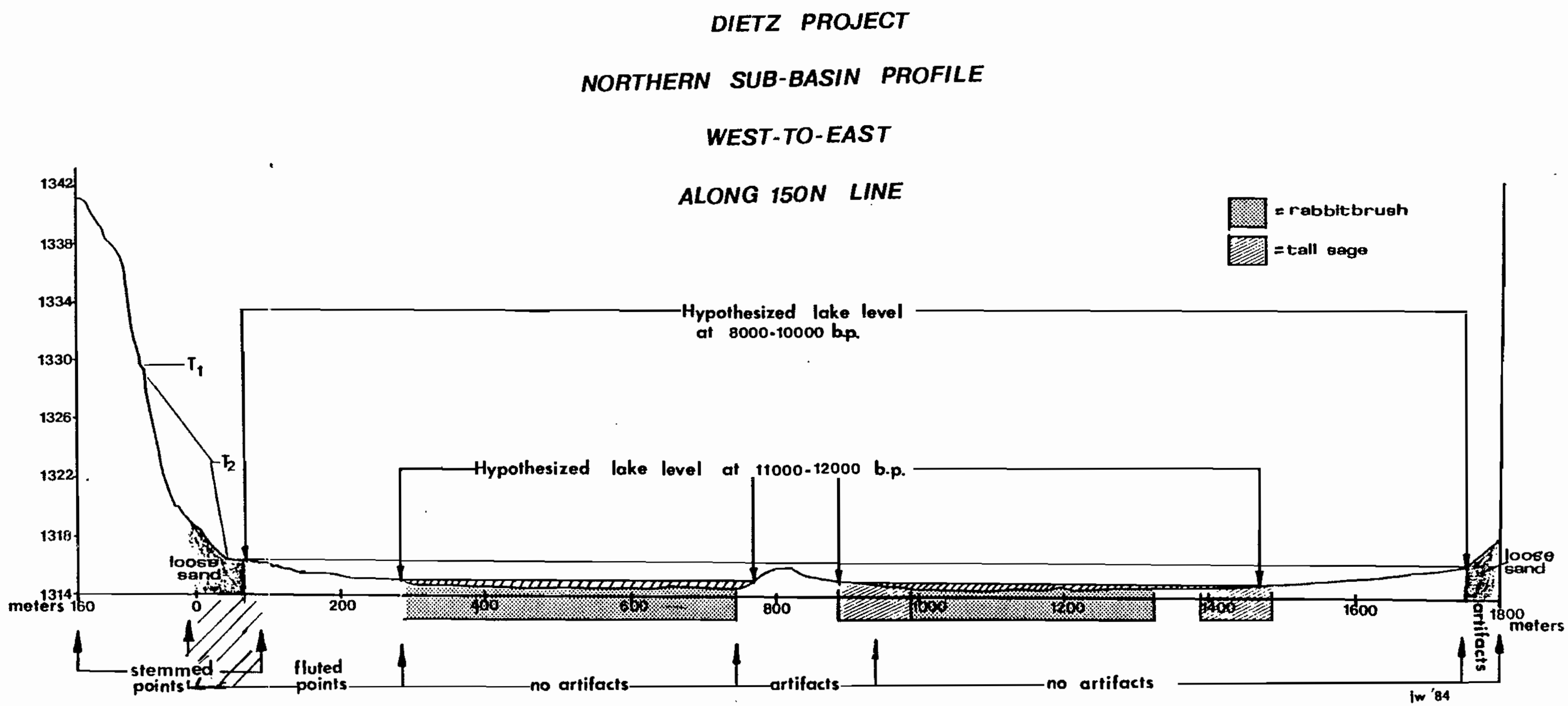


FIGURE 50. Comprehensive West-east Profile Across the Dietz Sub-basin Along 150N from the Dietz Hill Crest to the Tucker Site (Site No. 65), Showing the Horizontal and Vertical Distributions of Stemmed and Fluted Points in Relation to Major Lake Levels, Facies and Occupation Surfaces (For more details, refer to profiles in Figures 40-46 and 48)

the Dietz sub-basin at or below 1315 m elevation, followed by an early Holocene (Western Stemmed) settlement around a much larger lake and marsh fringe at or above 1316 m elevation.

Basin-wide Surface Distributions of Fluted and Stemmed Artifacts in the Dietz Sub-basin

The significance of the two-level fluted and stemmed artifact distributions in relation to the model proposed is best illustrated by the east-west profile which was staked and stadia mapped across the entire Dietz sub-basin along 150N line, illustrated in Figures 48 and 50. This east-west profile is referred to as the 150N Profile, but it also corresponds to Collection Area #1 which was surface collected in 1984. Artifacts and flaking debris of Western Stemmed clusters seemed to be confined above 1316 m elevation (80E) and extended west up the terraced slope of the Dietz hill to 1322 m elevation (35W).

In contrast, the distribution of fluted points was limited to a zone below 1318 m elevation (10W) and extended out onto the playa floor as far as 280E, at or below 1315.5 m elevation. In a zone about 90 meters wide, at the base of the lower terrace (Terrace #2) at the Dietz hill, the surface distributions of fluted and stemmed artifacts overlap, between 10W and 80E, and between 1318 m and 1316 m elevation. Below 1316 m elevation, fluted points clearly dominate surface distributions; and for a distance of 160 meters, beginning at 120E (1315.4 m) and continuing up to 280E (1314.8 m) to the crest of the hypothesized Clovis shore ridge, only fluted points are recovered.

The basin floor within the confines of the postulated Clovis-era water body, between 300E and 800E, is completely devoid of any artifacts. As one nears the eastern shore scarp of the Clovis-era lake at 800E, positive evidence of artifacts in the form of blanks, biface fragments and flaking debris begins to appear on the surface (see Site Nos. 64 and 91 on Figure 30). East and downslope of the Clovis shore scarp, from about 900E to 1800E, the slightly more elevated eastern basin floor is also devoid of artifacts of any kind. Again, positive evidence of flaking debris, large bifacial blanks and ground stone tools begins to be appear by about 1680E, at or near 1315.4 m elevation (Figure 50).

Geomorphic Survey of the 150N Profile Across the Dietz Sub-basin

The entire length of the 150N Profile was traversed carefully on foot, and detailed notes were made on subtle changes in slope, vegetation or surface sediments. These changes were then plotted along the profile relative to the established grid. It is interesting to note that changes in vegetation, surface deposits, slope and elevation correspond very well with the hypothesized lake levels and artifact distributions (Figures 48 and 50), lending further support to the lake history and human occupation model as proposed.

For instance, the near surface deposits at the western and eastern margins of the hypothesized 1316 m Stemmed-era lake (Stage I) were characterized by loose, well-drained sandy substrates dominated by tall sage and a high degree of plant diversity: from 35E to 85E (1322 m to 1316.2 m) in the west; and from 1760E to 1800E (1316.3 m to

1317.8 m) in the east (Figure 50). These sandy deposits in this general zone, between 1322 m and 1316 m elevation, actually correspond to the base of a series of prominent beach terraces (like Terrace #2 at the Dietz site) which form the boundaries of the Chase, Dietz and Crescent sub-basins.

These major beach terraces have been mapped in profile at points Monique, Kevin and Wayne, for whom the terraces are named. They have also been mapped in detail at the northern and southern coves of the Dietz site. The slope, lithology and profiles of these terraces are remarkably similar, and from 1323 m elevation and above, their sequences of lake level features are nearly identical (see discussion below under Cross-correlation of Facies and Sub-basins).

Changes in vegetation and surface sediments along the margins of the hypothesized Clovis-era lake level also correspond in similar ways. For instance, the surfaces of the basin floor near the hypothesized centers of the Clovis lake (in the west) or marsh (in the east) are characterized by hard-packed, poorly drained, silty playa sediments dominated solely by a dense stand of rabbitbrush (Figure 50).

This change in vegetation, from a greasewood/sage mix along the northwestern shoreline of the Clovis lake, to an extremely dense stand of rabbitbrush on the hard playa floor, is very abrupt and distinct. In fact, so distinct that in spring, the entire area once covered by the now-dry Clovis lake can be clearly seen from as far away as 2 km, conveniently outlined by the bright yellow blossoms on the tops of the rabbitbrush.

Other intra-lake features are less distinct and more difficult to identify. There is a recurring value of 1314.6 m elevation associated with the Clovis-era water level. This is based on many stadia shots in the Dietz sub-basin which mark a break in slope or an actual wave-cut at or near this elevation. Along the 150N profile in the more elevated eastern sector of the Dietz sub-basin, the Clovis era water level of 1314.6 m elevation falls within a zone between the grid points of 880E-1000E and 1400E-1480E (Figure 50).

According to the model proposed, these 1314.6 m elevation zones would have formed the margins of the Clovis-era pond or marsh fringe which would have filled the 500-m wide zone east of the actual lakeshore scarp with 40 cm of water. Field inspection of these margins along the 150N profile revealed the presence of discrete zones of loose, sandy substrate outlined by narrow dense bands of tall sage, which stand out conspicuously above the nearly barren playa floor. In fact, the presence of a mid-marsh ridge, or island of sorts, is indicated by a third zone of sand and tall sage at 1314.5 m elevation, between 1180E and 1220E (Figure 50). This subtle, narrow feature may represent a remnant of an earlier low stand previous to the Clovis lake-marsh, or may represent a single, short-lived lake recession during Clovis time.

The major point of this discussion is that there is a broad range of small, but useful data sets which can be brought to bear on reconstructing time-equivalant paleosurfaces in closed lake basins. The sediments and paleosurfaces of even the most subtle and indistinct of low-relief lakeshore features, if they still exist, can be identified and cross-correlated through careful mapping, field reconnaissance and stratigraphic studies.

Cross-correlation of Artifacts and Occupation Surfaces with Facies and Lake Levels at the Dietz Site

As elsewhere in the northern sub-basin, the cross-correlation of lateral facies with artifacts at the Dietz site was based on intensive stadia mapping and detailed stratigraphic studies. From the research, it was possible to reconstruct the vertical position of fluted and stemmed artifacts in relation to the lateral sedimentary facies which comprised the near-surface deposits in the basin. By cross-correlating the elevation (vertical position) and spatial distributions (horizontal position) of artifacts with respect to time-equivalent facies on the paleolandscape, it was possible to reconstruct the original surfaces of deposition for fluted and stemmed points across the Dietz site.

Descriptions of Lateral Sedimentary Facies at the Dietz Site

The near-surface sedimentary facies of relevance to the context of Clovis and Stemmed period occupation surfaces at the Dietz site are described below, beginning at the uppermost lake terrace below the crest of the Dietz hill (Figures 40 and 50). The associated lake levels mentioned by name correspond to the postulated sequence of Alkali Basin lake history discussed above.

It should be noted that these "Facies Sets" described below actually represent a series of time-equivalent lake deposits, each with its own depositional origin and age. The specific time-equivalent lake levels and occupation surfaces relevant to the periods of Stemmed and Clovis occupations in the basin include different subsets of these lateral facies. For example, the beach sands deposited by pluvial Lake Kevin (1320.8 m) served as the dry, hillslope occupation surface for Western Clovis occupation. Likewise, the coarse beach sands deposited by the Sand Ridge Lake during the first phase of Western Stemmed occupation later came to be the dry land surface occupied by the second phase of Stemmed-era occupation. These paleolandscape occupation surfaces are further discussed below under Paleolandscape and Occupation Surfaces.

Facies Set #1: Non-lacustrine Hilltop

The top of the Dietz hill is a wave-planed, boulder-studded surface which averages 1341 m elevation. The steep eastern edge of this uplifted hill, or horst feature, drops off sharply at 1339 m elevation, near the edge of the basalt flow which caps the ridgetop. The lateral, horizontal range of Facies Set #1, relative to the site's north-south running baseline, is from grid points 160W to 120W.

Associated Lake Levels

The wave-planed top of the Dietz hill at 1341 m elevation corresponds to the prominent pluvial lake level referred to above as Lake Buffalo.

Artifacts

The top of the Dietz hill is generally devoid of artifacts, but would have been above water and available for occupation throughout the late Pleistocene and into the Holocene. One base and midsection of a fluted point (#553-47) was found at 1329.33 m elevation, and one stemmed point base (#553-50) was found at 1329.96 m elevation.

Facies Set #2: Wave-modified Hillslope Colluvium

This uppermost hillslope deposit consists primarily of angular basalt boulders and cobbles, infilled by a gravel-sand matrix. The unit begins at the base of the basalt caprock near the top of the Dietz hill at 1337.5 m to 1338 m elevation, and continues downward to the beginning of Terrace #1 at 1331.5 m elevation. In relation to the site baseline, the horizontal range of Facies #1 is from grid points 120W to 84W.

Associated Lake Levels

There is one lake level associated with Facies Set #2. The wave-cut base of the basalt caprock at 1337.5 m to 1338 m elevation corresponds to the hypothesized Lake Spoon.

Artifacts

No fluted or stemmed artifacts have been recovered along the surface of Facies Set #2. Like Facies Set #1, this facies would have been dry and available for use anytime after about 12,000 B.P., but it is very steep and rocky and would most likely be considered unsuitable as an occupation surface.

Facies Set #3: Wave-modified Hillslope Colluvium

This lower hillslope deposit consists of materials similar to Facies Set #2, but it is less steep and rocky, with more sandy matrix and fewer boulders. It extends from the top of Terrace #1 at 1331.5 m elevation, to the top of Terrace #2 at 1321.5 m elevation. The horizontal range is from grid points 84W to 32W, between backhoe trench Segments #1 through #4.

Associated Lake Levels

There are three lake levels associated with Facies Set #3, all of which pre-date the earliest occupation at the Dietz site. The prominent lake level from 1331.5 m to 1329.5 m elevation, represented by the top and base of Terrace #1, corresponds to the above mentioned Lake Bland. The distinct, intermediate break in slope at 1325.9 m elevation corresponds to Lake Cannon. The lower break in slope at 1322.8 m elevation, just above Terrace #1, corresponds to the hypothesized Lake Monique.

Artifacts

No fluted or stemmed artifacts have been recovered on the surface of Facies Set #3. Like Facies Sets #1 and #2, Facies Set #3 would have been a dry (terrestrial) surface available for occupation well before and after the earliest occupation at the Dietz site. The unit is not as steep and rocky as Facies Set #2, but is still quite rough and seems highly unsuitable as an occupation surface.

Facies Set #4: Wave-modified Lacustrine Beach Terrace

This facies comprises the majority of Terrace #2 at the site, ranging in elevation from 1321.5 m at the top of the terrace, to 1316.2 m at its base. The lateral extent of Facies Set #4 can be traced lakeward from the top of Terrace #2 at 40W, to 40E -- an area covered by backhoe trench Segments #4 through #10A. This constructional lake terrace consists of loose, fine-to-coarse, well-sorted, well-rounded beach sands of varying lithologies. Initially deposited by Lake Monique, a lake level represented at the top of Terrace #2, these beach sands show evidence of having been moderately re-worked by wind. Terrace #2 is the lateral equivalent of the sandy terraces which comprise Wayne's Terrace, Kevin's Terrace, and Monique's Terrace (Figure 30).

Below 1317.5 m elevation, the loose surface sands which comprise Terrace #2 begin to thin considerably, and by 1316.4 m elevation, these sands are no longer visible. The eroded, lower portion of Terrace #2 gently slopes lakeward below the 1316.6 m cut scarp at 35E to the terrace base at 45E. Its surface is characterized by alternating patches of shallow, loose sandy deposits and exposed lakebed sediments.

Associated Lake Levels

There are three lake levels associated with Facies Set #4. The first is a major stillstand at 1321.5 m elevation, represented by Terrace #2, which corresponds to the above mentioned Lake Wayne. The second lake level is another prominent lake stand from 1320.8 m to 1319.1 m elevation, which corresponds to the above mentioned Lake Kevin. The third lake level is the transgressive water body hypothesized for the period after Western Stemmed occupation at the Dietz site, referred to above as the Big Cut Lake. This lake level is represented by a prominent wave-scarp between 1318.3 m and 1316.6 m elevation, which has been traced around the entire perimeter of the northern sub-basin.

Artifacts

The westernmost surface distribution of Western Stemmed artifacts coincides with the beginning of this facies at grid point 32W. Stemmed points are first visible on the surface at 1322 m elevation (top of Facies Set #4 and Terrace #2). These upper sands of Terrace #2, from 1317 m to 1320 m elevation correspond to the peak in distribution of the largest Western Stemmed occupation, associated with the 1316 m lake level.

In contrast, the first surface finds of fluted points occur 20 m east and downslope of the first surficial stemmed points, at 10W to 12W. This westernmost distribution of fluted points coincides precisely with the upper wave-cut scarp near 1318 m elevation, four meters below the first visible stemmed points upslope. With the exception of a single fluted point outlier found at 1318.67 m elevation in the far southern corner of the site, no fluted points occur above 1318 m elevation on the terraced slope of the Dietz hill.

Overlap Zone for Fluted and Stemmed Artifacts

In the lower portions of Facies Set #4, from 10W to 45E, and from 1317.5 m to 1316.2 m elevation, the surface distributions of fluted and stemmed points begin to overlap, with 13 stemmed artifacts co-occurring with seven fluted point fragments in this zone. This vertical and horizontal overlap hold exciting implications for future discovery of a buried, Clovis-era occupation surface at the site which might demonstrate a vertical superposition of stemmed and fluted assemblages (see discussion of Locality 3 below).

Facies Set #5: Two-stage Beach-Lakebed Sequence

Facies Set #5 consists of two intergrading sub-sets of beach and lakebed deposits which are directly associated with the majority of Western Stemmed artifacts at the Dietz site and at 27 other stemmed point sites around the perimeter of the northern sub-basin. The evidence suggests that the lake deposits of Facies Set #5 represent a two-phase sequence of prograding lake levels at 1316 m (Sand Ridge Lake) and 1315.4 m elevation (Lake Delaine), which directly relate to Stemmed-era occupation in the basin (see discussion above).

Subset #1: The Sand Ridge Lake

The lateral extent of the upper sub-set of Facies Set #5 can be traced from grid point 45E, near the Segment #11 backhoe trench, downslope to grid point 120E. Its surface slopes gently lakeward from a gradual break in slope between 1316.2 m and 1316 m elevation (below the base of Terrace #2), to a second, lower break in slope at 1315.4 m elevation. The lower break in slope at 1315.5 m elevation marks the upper boundary of the second sub-set. Scattered patches of deflated lakebed sediments are common throughout this zone. This is the hypothesized first stage of the two-stage Stemmed era lake, referred to above as the Sand Ridge Lake.

The Sand Ridge

The 1316 m elevation marks the western edge of a sandy, low-relief beach facies referred to as the "Sand Ridge". The Sand Ridge is a prominent 35-meter wide zone of unconsolidated, coarse-to-medium sands which have been heavily modified since deposition, by both lacustrine and aeolian processes. It can be traced lakeward from grid point 85E to 120E, where it ends abruptly at the 1315.5 m wave-cut scarp.

It is possible that portions of the Sand Ridge were initially deposited as an offshore bar, by higher elevation lake levels at 1321.5 m or 1316.6 m. This breaker bar feature would have been further modified by the active wave zone wave of the 1316 m lake, and subjected to aeolian processes in the interim. The position of the

Sand Ridge at the juncture of several overlapping lake levels renders its history more complex than other features in the basin.

Subset #2: Lake Delaine

The lower sub-set of Facies Set #5 begins at grid point 120E, at the 1315.5 m break in slope below the Sand Ridge. From here it slopes gently lakeward to the crest of a prominent 1314.8 m shoreline at grid point 285E. This is the hypothesized second stage of the two-stage Stemmed era lake, referred to above as Lake Delaine. The sediments along this surface consist largely of friable silts and fine sands which have been modified post-depositionally by a variety of lacustrine and wind processes. This has produced an irregular substrate of near continuous silt mounds or hummocks, referred to in the field as the zone of "puffy" silt.

Artifacts

Below 1316 m elevation, surface distributions are dominated by fluted points. The few stemmed points found below 1316 m elevation were in close association with the lower 1315.5 m lake level hypothesized for the two-phase Stemmed-era lake. Effectively, no stemmed points have been recovered at elevations below the lower lake level at 1315.5 m elevation. The only anomalies included six stemmed artifacts recovered below 1314.8 m elevation at the north end of the Dietz site. But closer inspection revealed that these six artifacts are restricted to a zone between grid points 600N-900N and 20E-150E.

This zone consists of a small, but well-defined deflation area south of the dunes in the northern portion of the Dietz site.

Facies Set #6: Lacustrine Shoreline

The lowest lakeshore terrace in the Dietz sub-basin, from 1314.8 m to 1314.6 m elevation, represents the lake level hypothesized for the Clovis period, referred to here as Lake Koko. Its lateral extent is limited between 285E and 800E, within the confines of the shoreline crest at 1314.8 m elevation. The crest and lakeward slope of this terrace consist of soft, friable silts and some fine sands. Below the scarp, at 1314.3 m elevation, the now-dry basin floor is dominated by playa lakebed sediments, consisting of highly compact, calcareous fine-grained silts and clays, with some fine sands.

Horizontal and Vertical Separation of Fluted and Stemmed Artifacts in the Dietz Sub-basin

Based on a program of detailed stadia mapping of artifacts and near-surface sedimentary facies at the Dietz site, it has been possible to identify a relative sequence of four distinct (sequent) lake levels at the Dietz site. The near-surface sediments of each sequent lake level were traced laterally across the site, in relation to surface (horizontal) distributions and elevational (vertical) positions of fluted and stemmed points. The original surfaces of deposition (occupation surfaces) for fluted and stemmed artifacts were then cross-correlated to separate lake levels, thereby separating the assemblages in relative time (discussed below).

The investigations verified that fluted points had a separate context and distribution relative to the first (1314.8 m) lake level in the sequence. Stemmed points at the Dietz site were found to have two discrete distributions and stratigraphic contexts, both vertically and horizontally, with respect to two separate but closely sequent shorelines in the basin at 1314.5 m and 1316.2 m elevation respectively.

Problem-oriented Basin-wide Archaeological Site Survey

Survey Methodology and Rationale

The initial archaeological data used to test the model were derived from basin-wide systematic survey for sites and diagnostic artifacts within zones which the model predicted as having high or low potential for sites yielding fluted or stemmed points. The high potential zone for Western Clovis would be areas adjacent to the lower 1314.8 m shoreline, whereas the high potential zone for Western Stemmed occupation would be the higher 1316 m shoreline.

If lakeside or marsh-fringe orientations existed during either occupation, then areas which were well above and away from the hypothesized shorelines, or below the elevation of the lake levels proposed, would not contain sites. These areas were considered low potential zones, and were surveyed in order to account for the null hypothesis, i.e. that lakeside or marsh-fringe habitats were _not_ the focus of settlement.

The first phase of testing involved archaeological survey of the two hypothesized shorelines (Figures 51 and 52). To avoid biased testing, the survey path followed was 400 m wide, covered in transects spaced 20 to 30 m apart. It was felt that this path was wide enough to span across two adjacent non-lacustrine zones, from the rocky slopes along the flank of the rimrock above the highest shoreline at 1326 m elevation, down to the flat playa floor at 1314 m elevation. In this way, if any sites existed in low potential zones along the hilltops or on the playa floor below the proposed lake levels, they would also be discovered.

To further test the null hypothesis, the second phase of testing involved archaeological survey along a 12 km-long north-south transect across the lowest, central portion of the northern sub-basin. This transect began at the southernmost drainage divide on Monique's Terrace at 1323 m elevation, and extended north to 1372 m elevation, just below the northernmost drainage divide of the northern sub-basin (Figure 53).

In addition, a two km-long east-west transect across the Dietz sub-basin had been surveyed in great detail in 1984, as part of basin-wide point-plotted surface collections of artifacts. This east-west line, from grid points 1800E to 180W along the 150N line, spanned the sub-basin from the east shore divide at 1323 m elevation, to the crest of the Dietz hill in the west. This east-west transect was later extended 2.5 km to the west, from the crest of the Dietz hill to western divide of the northern sub-basin up to 1371 m elevation (Figures 50 and 53).

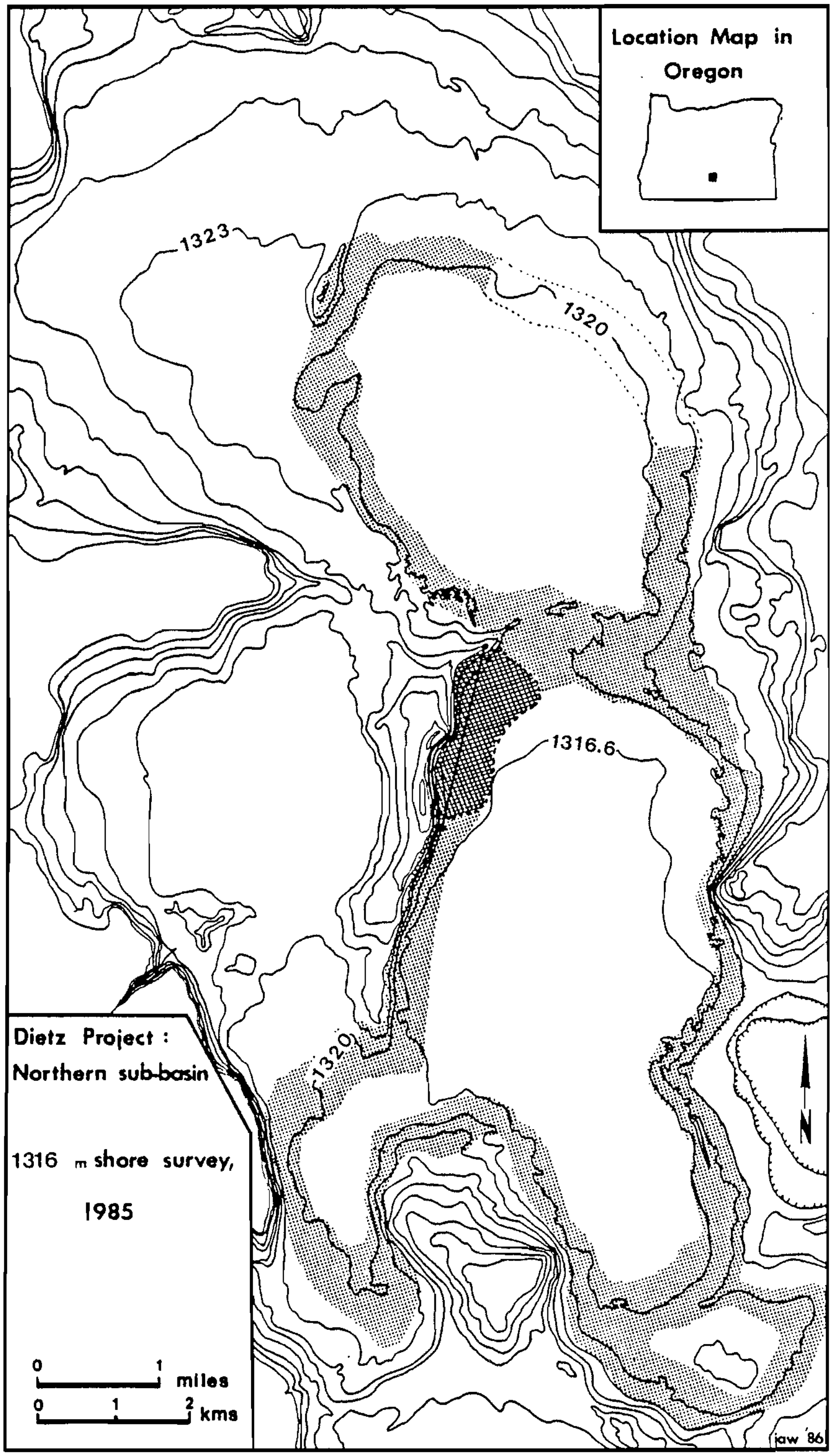


FIGURE 51. Area Surveyed Archaeologically Along the Hypothesized Stemmed-era (1316 m) Shoreline (Sand Ridge Lake) in the Chase, Dietz and Crescent Sub-basins

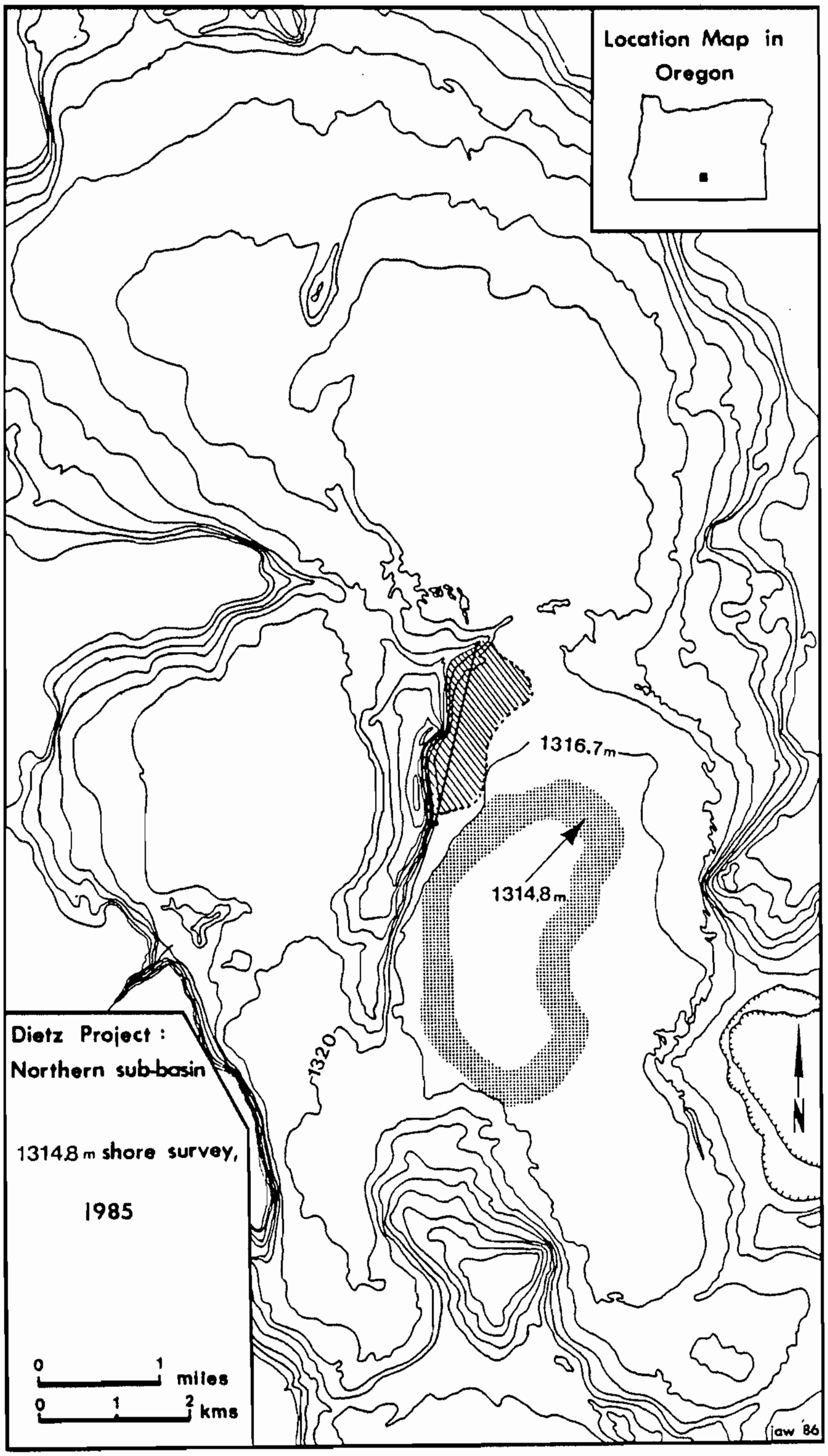


FIGURE 52. Area Surveyed Archaeologically Along the Hypothesized Clovis-era (1314.8 m) Shoreline (Lake Koko) in the Dietz Sub-basin

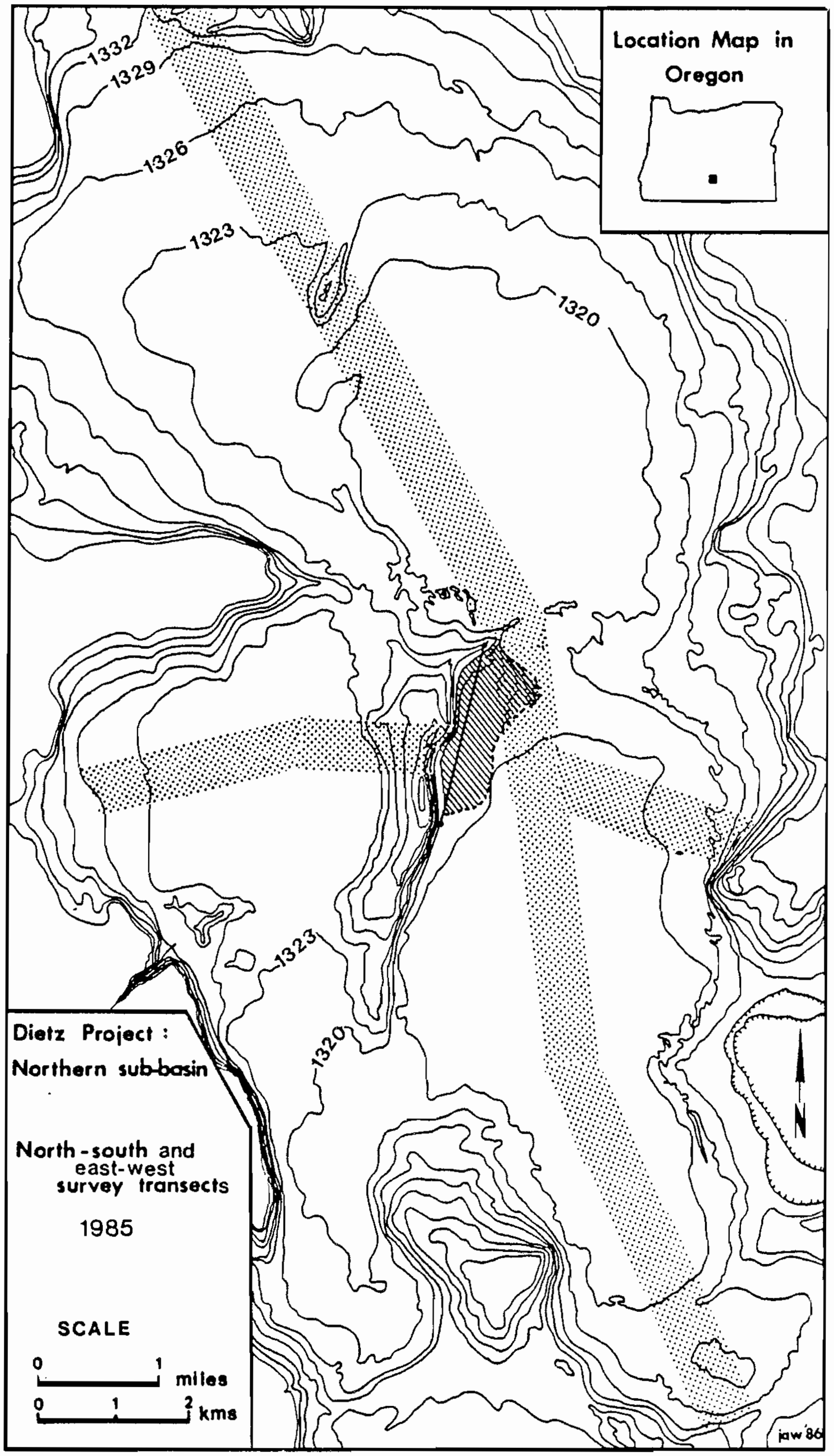


FIGURE 53. Area Surveyed Archaeologically Along the North-south and East-west Transects in the Crescent, Dietz and Chase Sub-basins, to Test for Non-lakeside Sites

Artifact collections at each site were aimed at obtaining a sample of time-diagnostic tools present. They do not represent the complete tool inventory at each site, although an effort was made to collect small numbers of non-diagnostic tools such as scrapers, blanks, preforms and ground stone. All lithic scatters encountered were recorded and searched for time diagnostic artifacts. Samples of each kind of point style or tool type were collected and staked so that they could be shot in later by transit to record their precise location and elevational position.

Except at the Dietz site (35 LK 1529) and the Tucker Site (Site No. 65), no subsurface testing was undertaken. The boundaries of each site were determined by direct observation of surface artifacts, and by the extent of the surface scatters. With few exceptions, the lithic scatters encountered displayed discrete boundaries and were easy to define. Specific data on the location, artifact density, vegetation, geomorphic setting, surface deposits, and cultural affinity of each site are included in Appendix B, and a complete set of artifact illustrations are included in Appendix C.

Results of Basin-wide Archaeological Site Survey

Survey of the Hypothesized Stemmed-era Shore: Sand Ridge Lake (1316 m)

Survey along 18 km of the 1316 m shoreline (Sand Ridge Lake) hypothesized for Stemmed-era occupation (Figure 51) revealed the presence of 68 sites, which included 53 lithic scatters and 15 isolated finds (Figure 54). The 15 isolated finds included two

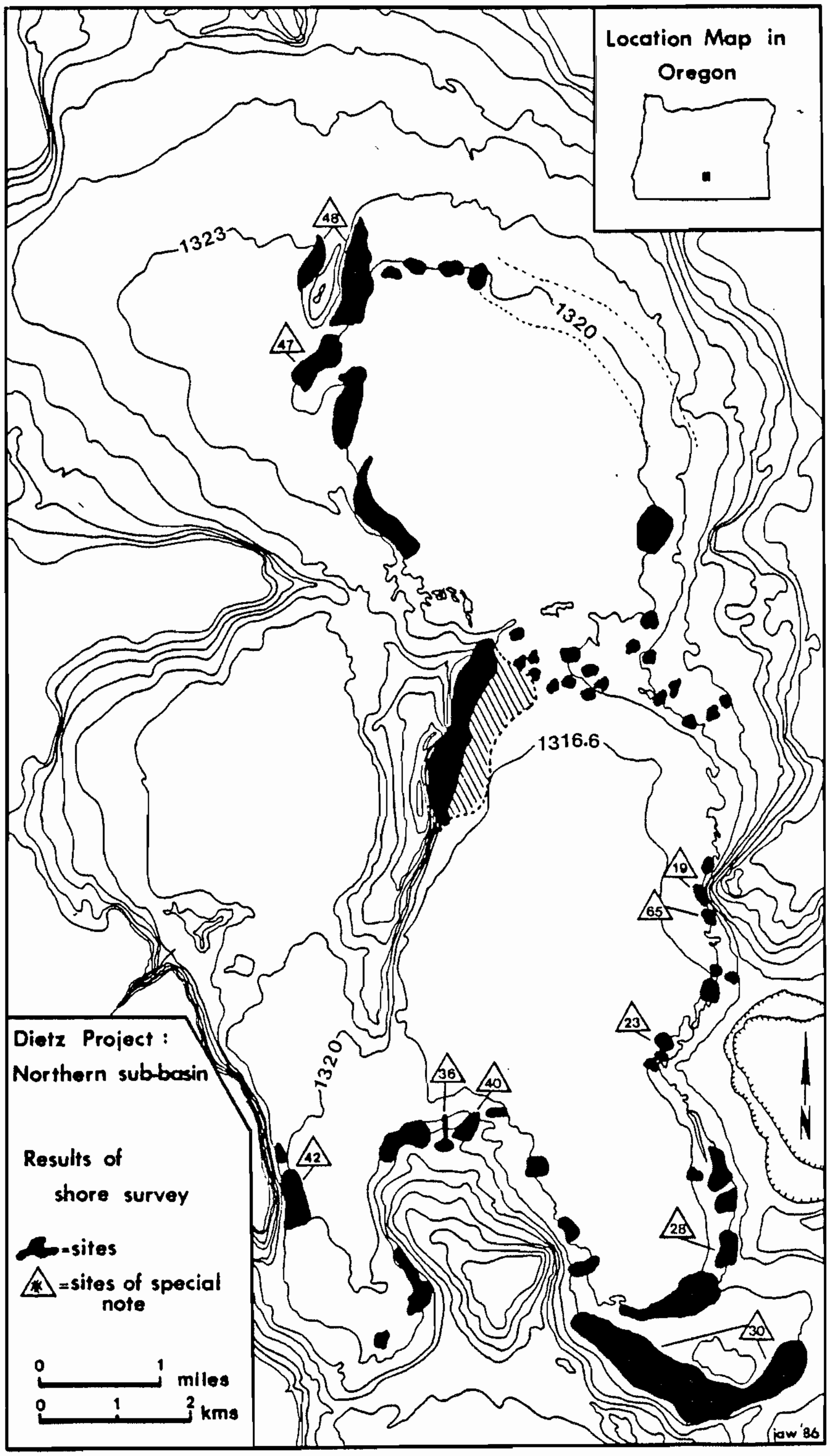


FIGURE 54. Results of Archaeological Site Survey Along the Hypothesized Stemmed-era (1316 m) Shoreline. Sites of Special Note are Shown by Number

crescents, and the following 12 point types: six large corner-notched, one large side-notched, one Pinto, one Cougar Mountain, one Cascade, one large "transitional" stemmed point form (WS6), and two concave based points, one of which may represent a fluted point preform.

Of the 53 lithic scatters, 30 sites (57%) did not contain time diagnostic point types which might assign them to a cultural period. Of the 23 sites which did contain diagnostic types, only four sites consisted of mixed components. Site No. 19, directly across the sub-basin from the Dietz site, produced a small contracting stem point and what appears to be a heavily re-worked and re-used fluted point fragment (#490-19-12). Site No. 23 produced a large corner-notched point (#490-23-26) along with two stemmed point types which are referred to here as large transitional (WS6) stemmed points (see discussion in Chapter IV under Typology of Western Stemmed Points).

Another mixed component site is Site No. 1, just north of the Dietz site scatter, which yielded a small stemmed point base and a fluted point base. In addition, Site No. 13 produced an early style Humboldt concave base point in association with a Cascade point. Both of these latter types could readily be assigned a time range of 8,000 to 7,000 B.P., which actually overlaps with the final period of Western Stemmed occupation in the Far West (Hanes 1988a; Holmer 1986).

Of the 19 lithic scatters producing single components, 16 sites (84%) contained Western Stemmed point styles. Of the remaining three sites, one site (5%) produced a large corner-notched point, and two sites (10%) contained early types of Humboldt concave base points and large side-notched forms, which could also date as early as 8,000 to 7,000 B.P. (Hanes 1988a; Holmer 1986).

Thus, results of survey along the higher shoreline hypothesized as having existed during Western Stemmed time produced a total of 68 sites, of which 34 contained single-component assemblages with time-diagnostic artifacts. Western Stemmed sites constituted 68% of these sites (N = 23). Although collection procedures aimed at representative, rather than complete, sampling, the general pattern is clear: 68% of the sites containing diagnostic tools along the higher 1316 m shoreline throughout the basin produced Western Stemmed point styles in recurring associations with crescents, large blanks and preforms, scrapers and, less frequently, minimally used ground stone slabs and manos made from local volcanic tuff. Of the 122 time diagnostic tools recovered, a total of 106 point types (87%) were assignable to the Western Stemmed cultural period.

In the course of the survey, two fluted points (2%), referable to the Western Clovis period were discovered, as were two large concave based points (2%). These latter points could be assigned a time range between Western Clovis and Western Stemmed. Another group of points (N = 5) included Pinto, Humboldt concave base and large, early forms of side and corner-notched points (4%). These types probably date from 8,000 to 7,000 B.P., a period which overlaps with Western Stemmed (Hanes 1988a; Holmer 1986). Thus, 95% of the 122 point types recovered (N = 116) represent the period from 11,500 to 7,000 B.P. Six corner-notched points (5%) represent the only types discovered which might be referable to periods later than 7,000 B.P.

In addition, with the exception of two points found on mixed component sites, all of the non-fluted and non-stemmed artifacts occurred as isolated finds, and did not follow any particular shoreline or pattern. Most of the late period isolates were directly associated with small blowouts in front of dunes, suggesting brief, sporadic occupation in areas which probably contained ephemeral ponds during the mid-to-late Holocene. Other late style points were found in the bare center of the playa floor, as if dropped by passers-by through the basin in later prehistoric times.

This dense lakeside distribution of predominantly Western Stemmed sites and artifacts in the northern Alkali Lake Basin represents a significant human presence there during the early Holocene. It strongly suggests that there must have been a fairly stable, or at least seasonally productive, ecological situation in the basin during this time that made it attractive to these people. These data, along with the conspicuous lack of evidence for later periods of occupation in the basin, lend much support to the cultural-environmental model proposed, and reaffirm the fact that the Alkali Lake Basin was not a place of choice after about 7,000 B.P. It is also very unlikely that the basin experienced lake rises during the so-called "Neo-pluvial" period (<u>sensu</u> Allison 1979, 1982) from 3,500 to 2,000 B.P. (see discussion in Chapter IV under <u>Implications of Alkali Basin Research: Regional Lake History</u>).

North-south Transect Survey

Survey along the north-to-south transect across the sub-basin (Figure 53) revealed the presence of nine lithic scatters lacking time-diagnostic points, and eight isolated point finds, four of which were not associated with either of the two shorelines (Figure 55). The isolated points included two corner-notched, one miscellaneous stemmed base, one large transitional stemmed, one Plano-like concave base, one fluted point (just north of the Dietz site), one Humboldt concave base and a large keeled crescent exquisitely made of white CCS. Western Stemmed points occurred at 50% of the sites producing time diagnostic tools.

Six of the lithic scatters consisted of small clusters of primary workshop debris of unknown age, situated in concentric patterns following higher elevation, older Pleistocene beach ridges well north of the Chase Sub-basin at 1327 m to 1341 m elevation. These sites were characterized by a high percentage of core flakes and core fragments, in association with obsidian nodules weathering out of these older beach ridges. This indicated that the sites represent opportunistic miniature quarry reduction stations, where obsidian nodules were occasionally reduced into blanks and carried away.

East-West Transect Survey

Point-plotted artifact collections made in 1984 within Collection Area #1 included a two km-long 10 meter wide east-west transect across the Dietz sub-basin, from grid points 1800E to 180W along the 150N

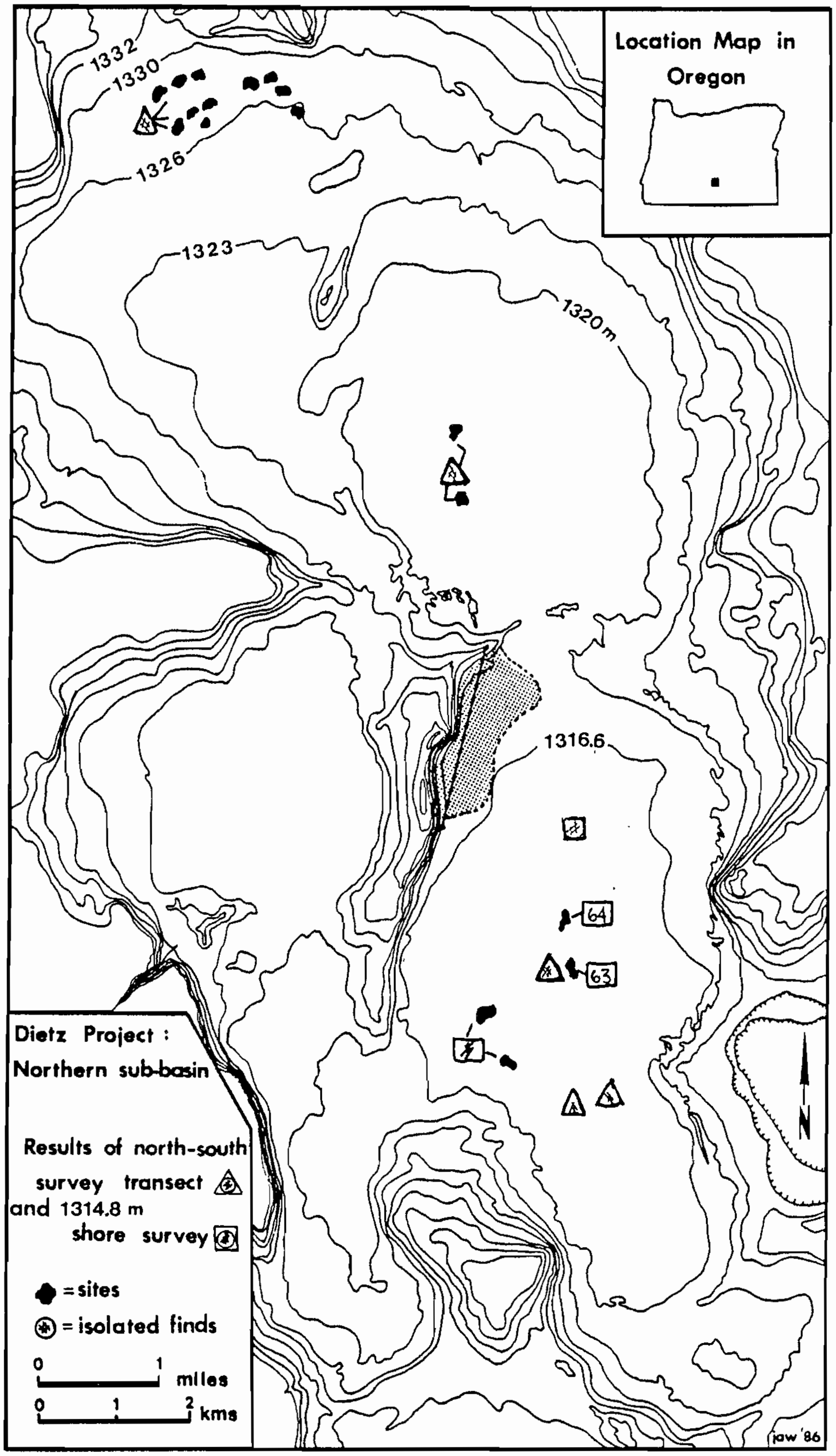


FIGURE 55. Results of Archaeological Site Survey Along the North-south and East-west Transect Surveys in the Northern Sub-basin, and Along the Hypothesized Clovis-era (1314.8 m) Shoreline (Lake Koko)

line. The differential distributions of fluted and stemmed artifacts along this 150N transect across the Dietz sub-basin proved to be key elements in the lateral cross-correlation of artifacts and near-surface facies at the Dietz site (see discussion above under Basin-wide Surface Distribution of Stemmed and Fluted Artifacts).

In 1986, this east-west transect was extended 2.5 km to the west, from the crest of the Dietz hill to western divide of the northern sub-basin up to 1371 m elevation (Figure 53). The survey failed to reveal the presence of any sites at these higher elevations or along the more elevated basin floor west of the Dietz hill.

Survey of the Hypothesized Clovis-era Shore at 1314.8 m: Lake Koko

Survey conducted along the 7 km of hypothesized Clovis period shoreline at 1314.9 m elevation in the center of the Dietz sub-basin (Figure 52) did not reveal the presence of fluted point concentrations other than the Dietz site. However, the survey did reveal the presence of two Western Stemmed period sites along the Clovis shore ridge (Site Nos. 64 and 66; Figure 55) at elevations of 1315.4 to 1315.8 m. Site No. 64 produced surface finds of a Cougar Mountain and Haskett point in association with ground stone slabs and a large keeled crescent. Site No. 66 yielded a Plano-like square-based point fragment.

The discovery of two sites yielding surface finds of Western Stemmed period tools as low as 1315.5 m elevation on the east shore of the hypothesized Clovis-age lake seemed troublesome at first. The Stemmed-era lake level was hypothesized at or above 1316 m elevation, which was 1.5 m higher in elevation (Figure 55). But continued stadia mapping in the Dietz sub-basin confirmed the presence of a second-stage distribution of Western Stemmed sites associated with a lower shoreline at 1315.4 m elevation, which was spatially and vertically distinct from the Clovis distributions (see discussion above under Results of Model Testing). The evidence from mapping and stratigraphic studies suggests that these Western Stemmed period sites, like Site Nos. 64 and 66, represent a brief, second-stage of Stemmed period occupation associated with this lower lake level of 1315.4 m elevation in the northern sub-basin.

A second sparse scatter was found in the vicinity of the East Shore Trench (see discussion below under Locality 1). This site (Site No. 91) produced large blanks and preforms, a scraper and a large biface fragment but no time diagnostic tools. But, like Site No. 64, its elevational position and stratigraphic context strongly suggests that it represents the same brief period of Western Stemmed occupation associated with the second stage lake level at 1315.4 m elevation.

Survey along the hypothesized Clovis-era shoreline (and the newly discovered second stage Stemmed-era shore) produced only two sites (Nos. 67 and 34) were discovered which did not relate to either Western Clovis or Western Stemmed occupation in the basin. Site No. 67 is located immediately to the east of Site No. 66, along the northwestern portion of the hypothesized Clovis-era shoreline, situated along the edge of a small shallow deflation basin. This site produced two large, probably early forms of Northern Side-notched points, and one small contracting stem point identical to the one associated with the fluted preform at Site No. 19 on the east shore. It seems to represent a brief, early-to-mid Holocene campsite associated with what would have been a shallow, pond within this small deflation zone.

In a similar vein, Site No. 34 consists of a sparse, discrete lithic scatter situated in the center of a deflated portion of the playa floor in the southwestern sector of the Clovis-shoreline. This site produced a small Desert Side-notched point and represents the youngest artifact type recovered in the field research. No other sites or artifacts were found along the hypothesized Clovis-era shoreline. However, it is interesting to note that, as in the north-south transect survey, 50% of the time-diagnostic tools recovered in association with the second-stage (1315.4 m) Stemmed-era lake level were Western Stemmed artifacts.

Summary of Basin-wide Archaeological Site Survey

The results of the 1985-1986 basin and shore survey revealed the following:

(1) The only Western Clovis site in the northern sub-basin is the Dietz site, suggesting that only the western portion of the 1314.8 m shoreline was favored, for whatever reasons.

(2) Except for a few small, nondescript quarry-related lithic scatters at higher elevations, no sites with diagnostic tools or substantial lithic scatters were found below or beyond the two hypothesized shorelines for the Western Clovis and Western Stemmed occupation periods. The only exceptions were the three lithic scatters recovered in association with the newly

discovered second-stage Stemmed-era lake level at 1315.4 m elevation -- a shoreline which coincided with the 1314.8 m Clovis-era shoreline in the center of the Dietz sub-basin (Figures 30, 39 and 48).

(3) Late-style points occur in small numbers, mostly as isolates or on the fringe of stemmed sites and do not follow any particular shoreline. They are most often associated with small, deflation zones which probably contained shallow ponds on a seasonal basis during the mid-to-late Holocene, and possibly slightly earlier.

(4) A total of 23 sites (68%) containing diagnostic materials were assignable to the Western Stemmed period. These sites represent a sizeable cultural presence in the northern sub-basin concentrated around the two-stage lake levels hypothesized at 1316 m and 1315.4 m elevation. Together, they strongly suggest the presence, from about 10,000 to 8,000 B.P., of an attractive, stable ecological situation in the northern sub-basin during the early Holocene.

Potential for Buried Occupation Surfaces in the Dietz Sub-basin

Although the bulk of fluted and stemmed artifacts has been recovered from shallow depths (30 to 40 cm) or surface contexts in the Dietz sub-basin, results of basin-wide site survey and mapping of artifacts in relation to near-surface sediments suggested that buried deposits might potentially exist at several localities in the Dietz sub-basin. The stratigraphy and contexts of artifacts at three of these localities are described below.

Locality 1: East Shore Trench

At Locality 1, along the east shore of the Clovis-era lake, stemmed artifacts, crescents and ground stone were recovered from the surface at 1315.5 m elevation, associated with the lower, second-stage Stemmed-era shore scarp (see Figures 30, 48, and 50, as well as above discussion of Site Nos. 64, 66 and 91). The discovery of a lower, second-stage Stemmed-era shoreline, which partially coincided with the previously occupied Clovis-age shore scarp, held much potential for identifying places where a stratigraphic separation of fluted and stemmed assemblages and a possible buried Clovis-period occupation surface might be demonstrated.

In 1985, an exploratory backhoe trench of 53 m length was placed perpendicular to the east shore in 1984, ranging from the eastern head of the trench at its highest point, extending to the west (lakeward) onto the flat playa floor at 1314.3 m elevation. The stratigraphic sequence represented here is illustrated in Figure 56, and consists of a basal sterile unit (Unit 1) of massive, blocky, diatom-rich silts and clays representing relatively deep-water pluvial lake bottom deposits.

Unit 1 is overlain by a fossiliferous, grey ashy loam (Unit 2) of variable thickness which represents a period of lake regression shortly after the last pluvial high stand in the basin, probably related to the volcanic event which deposited the ash particles. The layer is very ash-rich and was examined in the field for potential tephrochronological dating by Dr. Jonathan O. Davis (Desert Research

Dietz Project

East Shore Trench : West Portion

West - to - East Profile

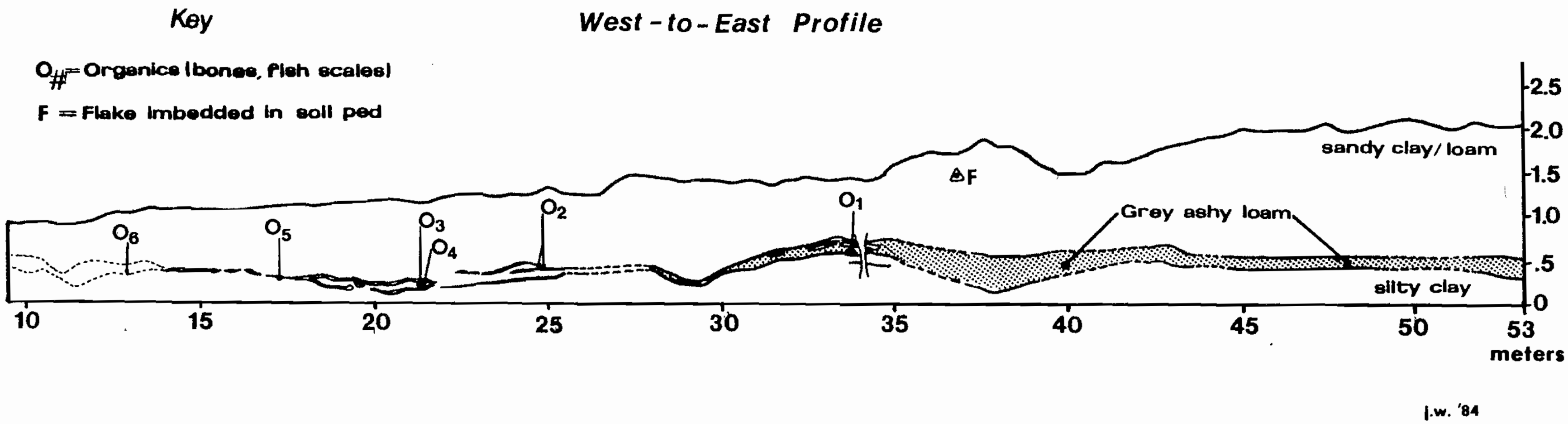


FIGURE 56. Stratigraphic Profile at Locality 1: East Shore Trench

Institute, Reno). The field assessment by Davis indicates that the ash is not a primary deposit and is heavily mixed with other sedimentary detritus. The stratigraphic data suggest that this grey ashy deposit (Unit 2) probably dates to a period just before Clovis occupation, and after the last pluvial lake levels documented in other basins by 13,000 and 11,000 B.P.

Unit 2 is overlain by 70 to 120 cm of coarse silts, interrupted by brief dry periods evidenced by thin loess-like lenses and conformities Unit 3), which probably represents the shallow lake bottom silts deposited by the 1314.8 m Clovis-era lake, and similar lake deposits associated with the two subsequent Stemmed-era lakes at 1316 m and 1315.4 m, respectively. Unit 3 is capped by Unit 3, which represents the modern soil sequence of the upper 30 cm of deposits, including a 10-20 cm thick vesicular A horizon and 5-10 cm of loose windblown silts and sands.

The lithology and geometry of the grey ashy loam layer (Unit 2) was carefully plotted laterally across the entire length of the 53-m long east shore profile. It is fairly thick (25-30 cm) at the head or eastern end of the trench, and gradually pinches out shoreward. At the westernmost terminus of the profile, the grey ashy loam interfingers and merges with the more exposed, deflated lakebed deposits of Unit 1, where it mixes with playa deposits in small lenses and swirls.

In 1985, a one x one meter test unit placed along the east shore trench revealed a buried, flake-bearing deposit, separated from the surficial Western Stemmed artifacts by 60 to 75 cm of sterile materials. The stratum just below this buried flake-bearing unit

(Unit 3) was found to contain numerous ostracode shells, fish scales, and bones of fish, small and large mammals and amphibians. Some of these faunal remains have been identified as representing frog, two species of fish (*Gila bicolor* and *Chasmistes breviroseris* and generalized grazing ungulates (see discussion and references in Chapter IV under *Paleoenvironmental Context*).

The stratigraphic, artifactual and mapping data suggest the following sequence of events. The first stage Stemmed-era lake level at 1316 m elevation would have inundated most, if not all, of the 1314.8 m shoreline ridge occupied during Clovis times. But the second, (regressional) stage of the Stemmed-era lake at 1315.4 m elevation would have exposed portions of the previously occupied Clovis shoreline, making this land surface available once again for occupation, if only seasonally, during the later phases of Stemmed-era occupation in the basin.

No fluted points have yet been recovered from the buried occupation zone at Locality 1. Trace charcoal flecks submitted for radiocarbon accelerator dating were too small to be registered, but in-process accelerator dates recently submitted bone and shell samples may prove these deposits to be Clovis in age. While it is true that a few buried flakes do not a Clovis site make, it is clear that an archaeological model sensitive to lake history has significantly narrowed down the basin-wide possibilities for finding buried materials.

More intensive excavations in localities such as this one could be very productive. In fact, during the 1985 field season, re-examination of artifact distributions, aerial photos and the elevational position and stratigraphy of critical shore trenches suggested the presence of two other localities which might demonstrate such a stratigraphic separation. These two additional localities are described below.

Locality 2: The Tucker Site

The second locality considered to have potential for producing buried deposits was the Tucker site,located on the far eastern margin of the Dietz sub-basin. In 1984, large bifaces, blanks, core flakes and flaking debris were found actively eroding out of buried deposits here, beneath the Big Cut Lake wave-cut scarp at 1318 m elevation. A one x one meter test unit at the Tucker site in 1984 produced flaking debris, burned bone and charcoal flecks in buried context from 90 to 150 cm below the surface (Figures 57 and 58).

This cultural debris was incorporated within a bioturbated soil-altered zone of mottled sandy loam suggestive of a buried A2 horizon (paleosol). Archaeological excavations are needed to recover time-diagnostic tools in situ, but the stratigraphic context suggests that the site represents a Western Stemmed campsite whose occupation surface was subsequently buried by loess or dune deposits, and later exposed by the transgressive rise in lake level (Big Cut Lake) which cut the 1318 m scarp.

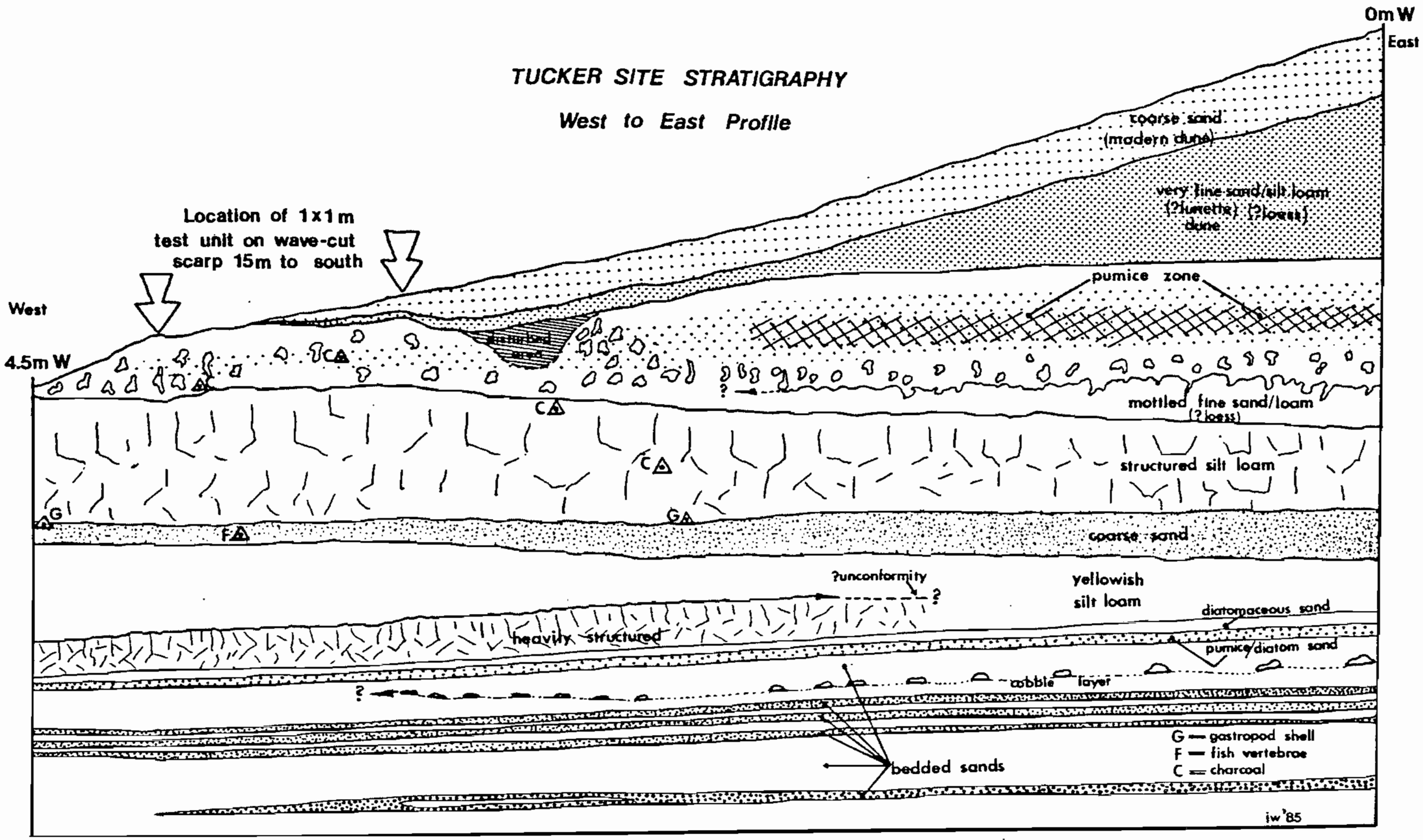


FIGURE 57. Stratigraphic Profile at Locality 2: The Tucker Site

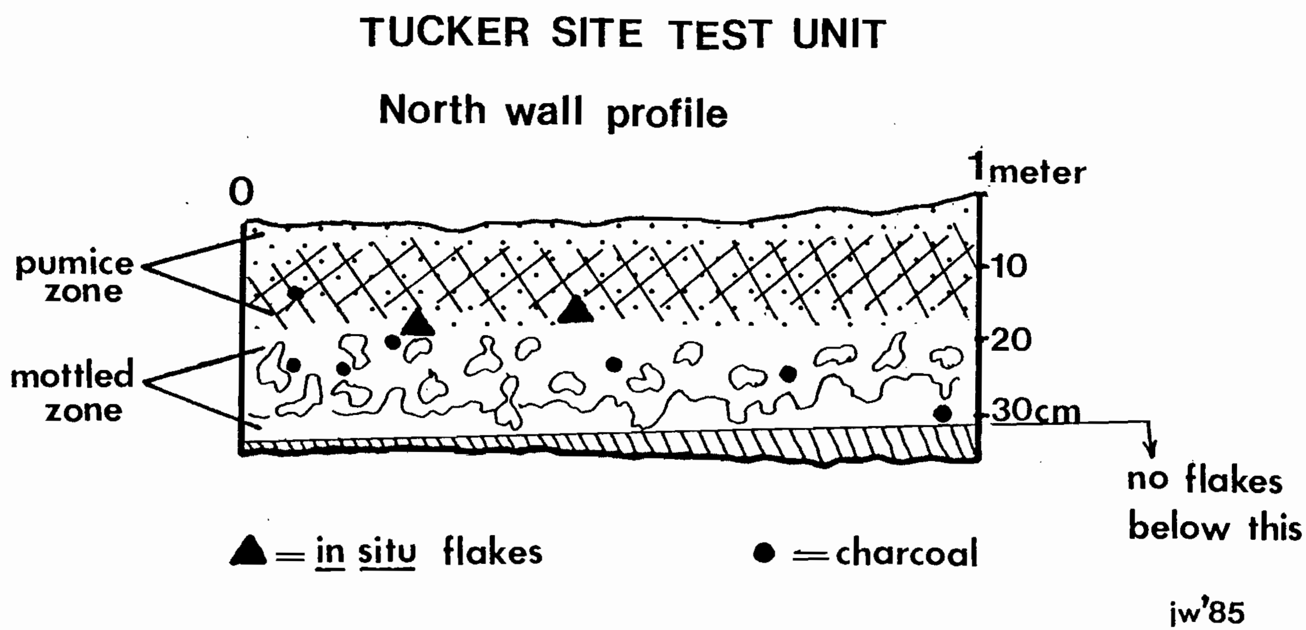


FIGURE 58. Stratigraphic Profile of Excavated Test Unit at Locality 2 (Tucker Site), Showing Location of Buried Paleosol and Occupation Surface

Locality 3: Buried Paleosurface at the Dietz Site

The third locality is the Dietz site itself, where data recovered thus far suggest that fluted artifacts may be eroding out of a buried hillslope surface or paleosol observed 50 to 75 cm below the modern surface in 5 of the 11 backhoe trenches placed along Terrace #2 (Segments #5 through #9). It is hypothesized that the heavy zone of overlap in fluted and stemmed points at the Dietz site, between 1318 m and 1316 m elevation, was most likely created by the erosional wave zone of the transgressive Big Cut Lake, which cut into an older (Clovis age), hillslope deposit buried beneath the surface sands of Terrace #2 (see profile of southern cove area in Figure 40).

This erosive action would have exposed the fluted artifacts and caused them to mix with stemmed artifacts, whose origin is probably in the overlying sands of Terrace #2. In 1984, a large bifacial thinning flake was found embedded within a heavily cemented, buried colluvial (hillslope) deposit at 40 to 70 cm depth in backhoe Segment #7. In this portion of the Dietz site, Western Stemmed points have been recovered within the loose sandy surface deposits of Terrace #2.

This buried colluvial surface, or paleosol is heavily cemented, probably by silica, and was traced beneath the surface from Segment #5 downslope for over 70 m to Segment #9 where it begins to pinch out at 1318 m elevation, the same elevation as the wave-cut scarp of the Big Cut Lake. Closer inspection of the top 80 cm in each of these backhoe trenches revealed the presence of a dozen or more small obsidian flakes weathering out of the unit along its entire length (Figure 59).

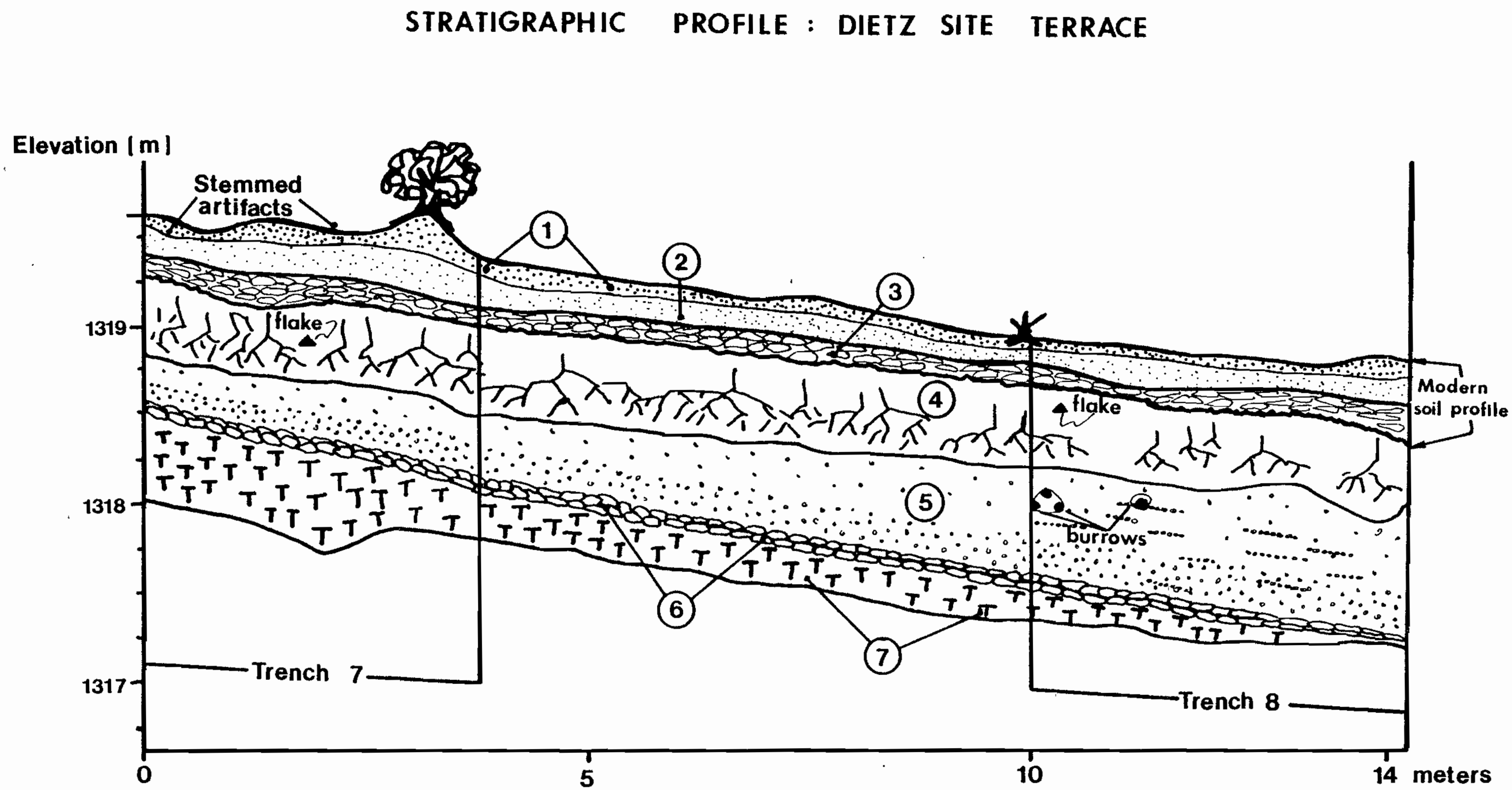


FIGURE 59. Stratigraphic Profile Between Trench Segments #7 and #9 at the Dietz Site's Southern Cove (Locality 3), Showing Location of Buried Paleosol Hypothesized as a Clovis-age Occupation Surface

The basic stratigraphic sequence at Locality 3 can be described as follows:

Unit 1

Unit 1 consists of loose wind-worked cover sands originating as beach sands deposited with Terrace #2. These sands contain heavy concentrations of stemmed artifacts, crescents and ground stone.

Unit 2

Unit 2 is represented by the vesicular (Av) horizon of the upper soil profile, which is capped by Unit 1.

Unit 3

Unit 3 consists of the platy (B) horizon of the upper soil profile, which includes Unit 2.

Unit 4

The buried surface in question is that represented by Unit 4. It consists of a 50 cm thick grey sandy loam deposit which is massive, very cemented (probably by secondary silica). It was observed to contain small obsidian flakes and possible charcoal flecks. This unit has a wavy, weathered unconformable upper boundary, is riddled with cicada burrows and other paleosol features. It seems to represent a truncated B horizon of a paleosol formed on buried hillslope deposits. Unit 4 is overlain by Units 1 through 3 which represent the upper soil profile.

Units 5 through 7

Unit 5 is a massive, friable (C) horizon of beach sands 30 cm thick. It overlies the basal (C Horizon) deposits below it -- an imbricated layer (4 cm thick) well-rounded, discoidal beach cobbles of basalt, representative of an earlier lake level. Unit 7 represents the basement bedrock of salmon-colored welded tuff.

Although diagnostic fluted artifacts have not been recovered from this depth, they do not occur above the level of Unit 4 (above). However, fluted points do occur at the surface 30 m downslope from Segment #9, where they seem to be eroding out of this same buried, colluvial unit (Unit 4), probably dissolved by the transgressive lake level rise documented by the 1318 m wave-cut scarp of the Big Cut Lake.

Clovis and Stemmed-era Paleolandscape and Occupation Surfaces in the Northern Alkali Lake Basin

Clovis-era Paleolandscape

The Clovis-era land surface included all surfaces above 1314.8 m elevation along the west shore of Lake Koko, extending to the west (landward) up the terraced slope of the Dietz Hill to its crest at 1341 m elevation. It is now evident that one section of that paleosurface occurs in buried context, and that a second portion is now missing as a result of three transgressive, post-occupational lakes (Sand Ridge Lake, Lake Delaine and Big Cut Lake)(Figures 30 and 50). The Clovis-age land surface now visible includes all the ground surface from the top of the Dietz hill to the top of Facies Set #4 (top of Terrace #2) at 1321.5 m elevation.

The pattern displayed when fluted artifacts are plotted by elevation (Figure 60) suggests a former distribution which was evenly spread across the ground surface up the terraced slope of the Dietz hill from 1315 m to 1318 m elevation, but which has been subsequently "sliced" into by the wave processes of the three lake levels which followed in time, at 1316 m, 1315.4 m and 1318.3 m, respectively. At this point, until more charcoal flecks can be retrieved from the buried colluvium which is hypothesized as a now-buried paleosurface for Clovis folk, the above suggestions remain just that, but the patterns are intriguing all the same. This is an area which should be further explored in future research at the site.

Below 1320.8 m elevation, beginning at a point midway between Segments #4 and #5, the Clovis paleosurface is buried 40 cm to 70 cm below the modern surface, as discussed above under Locality 3. This now buried surface represents the beach sands laid down by the last pluvial lake in the basin, i.e. Lake Kevin.

Research indicates that Clovis folk were living on the coarse, grey beach sands deposited by Lake Kevin, which can be traced from a point midway between Segments #5 and #6, downslope to a point midway between Segments #9 and #10, i.e. across most of Facies Set #4. Throughout Facies #4, the buried Clovis-age unit is represented by the silica-cemented, flake-bearing paleosol discussed above, which averages 40 cm in thickness (Figure 59). The upper surface of this paleosol consistently occurs 40 cm below the present surface, overlain

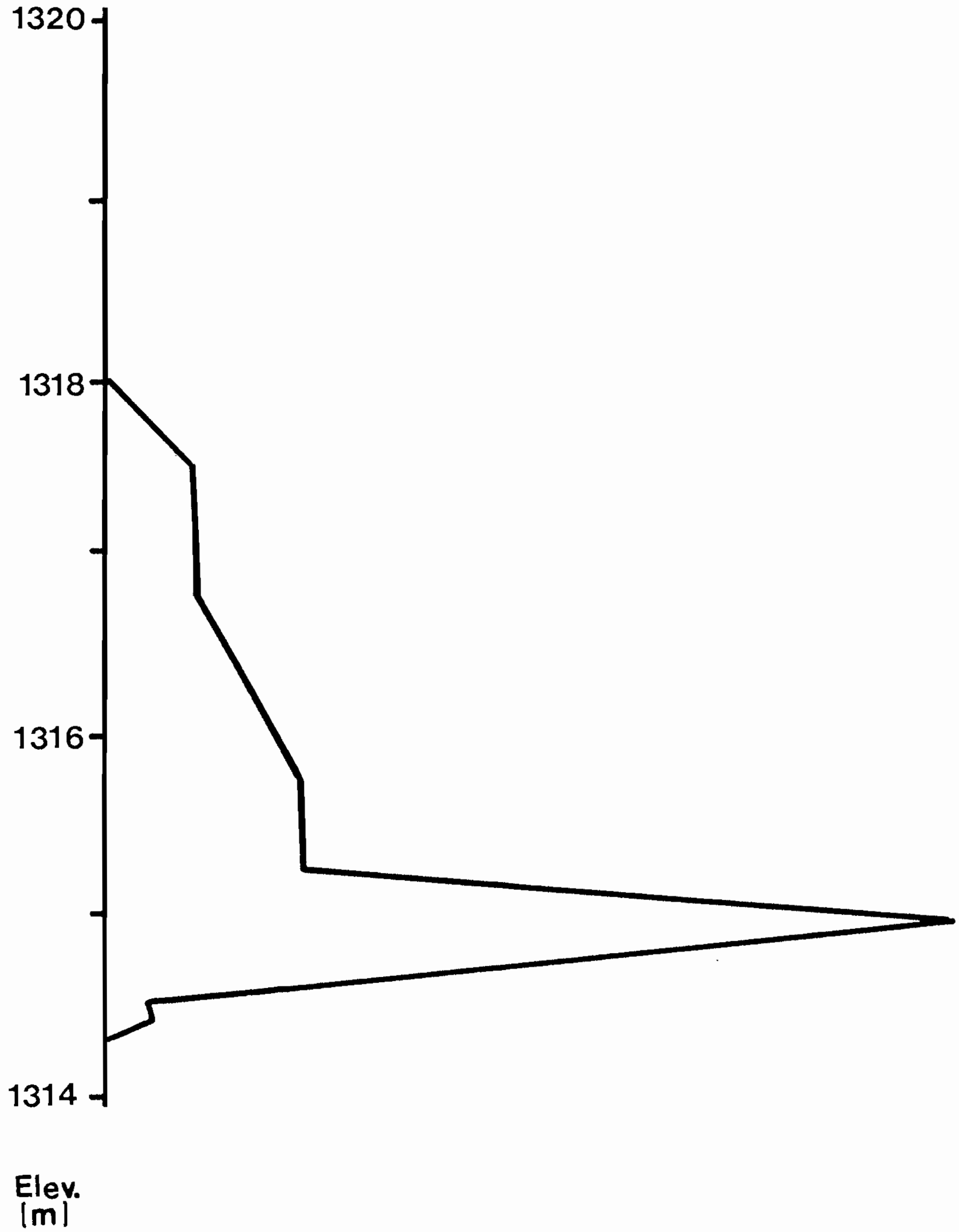


FIGURE 60. Distribution of Dietz Site Fluted Points by Elevation

unconformably by the Stemmed-era paleosol (platy B-horizon and buried Av) which is described below. The upper Clovis surface can be traced from Segment #6 at 1319.6 m elevation, downslope to Segment #9 at 1318.1 m elevation. Its upper surface is wavy, unconformable, and heavily eroded, indicating that a substantial period of time passed before the first Western Stemmed folk arrived. Because there is no evidence for a later lake in the basin after Big Cut Lake (1318 m), it is most likely that the paleosurface erosion was caused by wind processes during a very dry period sometime between 11,000 and 10,000 B.P.

This same eroded surface, between 1319.6 m and 1318.1 m elevation, marks the lower base of all of the large dunes throughout the basin (see discussion below under Summary of Lake History, Paleolandscape and Human Occupation Patterns). It can therefore be postulated that a long period of aridity and active dune-building followed the end of Clovis occupation. The Clovis paleosurface can no longer be traced below the level of the Big Cut Lake at 1318 m, or across most of Facies Set #5, which comprises the deposits of the two-stage Stemmed-era lakes. This would be expected since the active beach margins of all three of these lakes, presumably post-dating Clovis time, would have contributed to the erosion of the Clovis surfaces.

The only other possible place where the Clovis surface may have survived, other than Locality 1 discussed above, would be the interface of Facies Sets #5 and #6, somewhere between 200E and 280E (Figures 48 and 50). In this area, there may be a Clovis surface buried by the shallow silts of the two Stemmed era lakes in quiet water zones located at a safe distance from their beaches.

Stemmed-era Paleolandscape

The Stemmed-era paleolandscape consists of two closely sequent terrestrial-beach facies sets relating to the two-stage lake sequence discussed above, which occurs across most of Facies Set #5. If the two-phase lake sequence was a prograding one, the oldest occupation surface would have been all land surfaces uplsope from the beach deposits of its first shoreline at 1316 m elevation. This is the entire surface of Facies Set #4 (Figures 40 and 48). Like the Clovis paleosurface, the Stemmed-era surface is also buried for a short distance between Segments #6 and #9, where it overlies the eroded surface of the Clovis paleosol.

Throughout this zone between Segments #6 and #9, the wavy, eroded upper surface of the buried Clovis-age paleosol is overlain by the Stemmed-era paleosol -- a platy B-horizon formed in wind-deposited pebbly, brown sandy loam occurring between 30-40 cm below the surface. It is overlain by a heavily compressed, buried Av horizon occurring 20-30 cm below the surface, which may represent the upper surface of the Stemmed-era paleosol. The Stemmed-era paleosol is then overlain by the modern soil horizon, consisting of a recent Av horizon and 20 cm of loose, windblown surface sands.

The Stemmed-era paleosurface relating to the second, regressional lake level at 1315.4 m elevation (Lake Delaine) included the additional land surface above 1315.4 m and upslope to the old 1316 m beachline and beyond. Additionally, Western Stemmed folk during this second phase also camped on the surface of the now-exposed eastern shoreline of the Clovis lake (Lake Koko). As discussed above under Locality 1, the east shore ridge contains surface assemblages of Western Stemmed artifacts at or near 1315.5 m elevation, which overlie 60-75 cm of sterile lake silts. Beneath these sterile lake silts, is a flake-bearing surface between 1315.1 m and 1314.8 m elevation, which probably represents a Clovis-age land surface.

Overall Integrity of Deposits: Post-occupation Processes Affecting Artifact Density, Distribution and Transport

Human Disturbance

Alkali Lake Basin is currently managed by the Lakeview District of the USDI Bureau of Land Management (BLM) as seasonal rangeland, and was also the focus of some sheep-herding in historic time (W. J. Cannon, personal communication 1986). Besides recent cattle grazing, the major form of human disturbance in the basin since prehistoric time involves amateur collecting of surface artifacts. It is difficult to say just how much damage to archaeological sites has occurred as a result of amateur collecting. It is a well-known fact that, despite federal and state laws protecting cultural resources, artifact collecting is considered a way of life in Lake County by many local people. But it is also a local amateur (Dewey Dietz) who first took professional archaeologists to the Dietz site.

Some of the archaeological sites present in the northern Alkali Lake Basin have probably been surface collected to some degree by amateurs over the years. But the presence of large quantities of points which could be considered highly "collectable" by amateurs, from sites like Site Nos. 40 and 48, suggests that certain sites may have been overlooked by local collectors. Furthermore, most of these surface sites have produced a sizeable inventory of time-diagnostic tools, and none of them show physical signs of subsurface disturbance.

Natural Disturbance

Erosion by wind and water have no doubt affected all of the sites in the northern sub-basin to some degree. In fact, many of the east shore sites would not have been discovered if they were not in the process of eroding out of the base of dune deposits, as a result of the post-occupational, transgressive lake level rise associated with the Big Cut Lake. The 1318 m wave-cut scarp formed by the roughly 7,000 year-old Big Cut Lake truncated and exposed the occupation surfaces of many of these Stemmed-era sites.

The evidence suggests that this transgressive lake level was the only major disturbance affecting sites in the basin since the time of occupation. The reconstructed environmental history of the basin presented below suggests that there has not been enough water to cause much erosion of sites since 7,000 B.P. (see discussion below under Summary of Lake History, Paleolandscape and Human Occupation Patterns). Surface sites as old as 9,000 B.P. (dated on typological grounds) have remained discrete, well contained lithic scatters showing little signs of serious movement or disruption. Taking these human and natural disturbances into account, therefore, it seems reasonable to conclude that these late Pleistocene and early Holocene archaeological sites in the northern Alkali Lake Basin have maintained their integrity throughout the last 7,000 to 11,500 years, and show little signs of disturbance of any kind.

Summary of Stratigraphic Studies

To summarize, there are now several excellent possibilities for demonstrating the presence of diagnostic stemmed artifacts in sediments overlying a weathered Clovis-period surface. Verification of this apparent vertical superposition will require radiocarbon dating of materials recovered from the lower flake-bearing paleosurfaces, or finding a place where the artifact density of these buried surfaces is sufficient to allow recovery of buried diagnostic fluted points in situ. Only further excavation in these localities in the Dietz sub-basin will provide the answers.

Most importantly, the program of mapping and stratigraphic cross-correlation has documented a clear vertical and horizontal separation of Western Clovis occupation surfaces from Stemmed-era sites. The data provide the strongest case yet reported for separating the two assemblages in relative time.

Chronology of Western Clovis and Western Stemmed Occupations in the Northern Alkali Lake Basin

Basin-wide Distributions of Artifacts and Sites

The data gathered from basin-wide site survey and mapping, in conjunction with stratigraphic studies, provide strong support for the model of lake history and human occupation as proposed. Survey along the two shorelines hypothesized for Stemmed and Clovis time periods, and along the north-south transect within the archaeological district, revealed the presence of 93 sites, of which 83 sites (89%) are directly associated with the fossil shorelines.

There is a rich abundance of Western Stemmed sites along higher shorelines in all three northern sub-basins (Chase, Dietz and Crescent) (Figure 54). Clovis artifacts have a unique distribution distinctly associated with the 1314.85 m shoreline of Lake Koko. Artifacts dating to time periods later than 7,000 B.P. were rare, and most often occurred as isolates, not associated with any particular shoreline. They were most often associated with small deflation blowouts in front of dunes which would have held ponded water, suggesting only brief, sporadic occupation during the mid-to-late Holocene.

Only ten sites (11%) were not associated with the two hypothesized fossil shorelines. These included: (1) seven nondescript quarry-related sites (#57 through #63) in the far northern sector of the basin; and (2) three late-period isolates (#78 through #80). In addition, two lithic scatters (#55 and #56) and an isolated crescent (#88) found in the south-central portion of the Chase basin were first thought to be unrelated to the hypothesized Stemmed era shoreline. But results of sub-basin cross-correlations and mapping now indicate that these three spots are adjacent to the second stage lake level in the Chase Basin at 1317.8 m elevation (discussed below under Sub-basin Correlations).

Of the 93 sites discovered, 48 sites (52%) produced time-diagnostic artifacts which could typologically date them. Of the total number of sites recorded, only nine sites (10%) dated to periods later than 7,000 B.P. These included eight isolated finds of corner-notched points, and one Desert Side-notched lithic scatter located on the deflated southwestern corner of the Clovis shoreline. A total of 45 sites (48%) could not be assigned to a cultural period due to a lack of surface diagnostic tools.

Of the 48 sites producing time-diagnostic tools, 30 sites (63%) represent the Western Stemmed cultural period, containing diverse assemblages suggestive of a wide variety of campsite activities and functions. Together, they represent a sizeable, cohesive cultural presence in the northern sub-basin, oriented to the shores of two shallow (probably prograding) lakes and marshes -- Sand Ridge Lake and Lake Delaine -- and tied to what must have been an attractive, stable ecological situation during the early Holocene.

Further support for the model was provided by the elevational positions and distributions of all time-diagnostic points recovered through basin-wide site survey. The distribution of Humboldt, Side-notched and Pinto points, although a very small sample, ranges from 1315 m to 1316 m elevation. Corner-notched points have a wide distribution from range from 1315 m to 1323 m elevation follow no particular shoreline or pattern.

The stemmed artifacts were definitely concentrated around the higher two shorelines (1316 m and 1315.4 m) postdating Clovis, and ranged from 1315.4 m to 1326 m elevation, with a distinct peak at 1318 m, which would be about two meters above the elevation of the hypothesized water level during the first stage of Stemmed-era occupation. This 1318 m elevation coincides with a series of broad sandy platforms which fringe the fossil shorelines of the northern sub-basin, such as those represented by the top of Terrace #2, Wayne's Terrace, Kevin's Terrace and Monique's Terrace (Figure 30).

Sub-basin Correlations of Lake Levels and Occupation Surfaces

Results of the stadia mapping revealed that the prehistoric water bodies in the Chase, Dietz and Crescent sub-basins had different basin floor elevations and were effectively separated below 1320.8 m elevation. This meant that the absolute elevational values for lake levels and human occupation surfaces in each sub-basin would probably not correspond and could not be used in correlating time-equivalent occupation surfaces and lake levels between sub-basins. The needed inter-basin cross-correlations were achieved through other means.

This independence of sub-basins below 1320 m played a critical, and dangerously tardy, role in the final interpretation and testing of the model of lake history and human occupation as proposed. In order to avoid false interpretations based on inaccurate cross-correlations, a series of tedious, multiple cross-checks were made on the elevations of key lake strata and occupation surfaces. Also useful were the distributions of time-diagnostic artifacts by elevation. Another factor considered was the effect of post-occupational lake levels on the movement of surface artifacts down the slopes of steeper terraces. In the end, the position and elevation of ground stone artifacts at the Dietz site, and certain single-component Western Stemmed sites, turned out to be the most valuable aid in making successful correlations of time-equivalent surfaces across the northern sub-basin.

When the initial distributions, by elevation, of time diagnostic artifacts were plotted for Western Stemmed sites discovered in the Chase, Dietz, and Crescent sub-basins, the match was very poor between the sub-basins (Figure 61). Even within each sub-basin, there were problems. At the Dietz site, the fluted artifacts clearly "peaked" in association with the hypothesized 1314.8 m shoreline of Lake Koko (Figure 60). But there was only a hint of correspondence between the stemmed artifacts and their prospective two-stage shorelines (Sand Ridge Lake and Lake Delaine). However, it was noticed that the distributional pattern of ground stone at the Dietz site was basically identical to that of the stemmed points, but was offset from the lithics by about 1.5 m in elevation (Figure 61).

Since most of the Western Stemmed artifacts at the Dietz site were concentrated on a steep slope at the base of Terrace #2, it was hypothesized that the post-occupational Big Cut Lake had been responsible for transporting stemmed artifacts downslope within the wave-zone along its shore. It could logically be assumed that the ground stone artifacts "belonged" with the stemmed tools because they were found with single component clusters of stemmed points 1 to 2 m upslope of the Big Cut in discrete "pure" single-component clusters. It was further assumed that the ground stone clusters, being

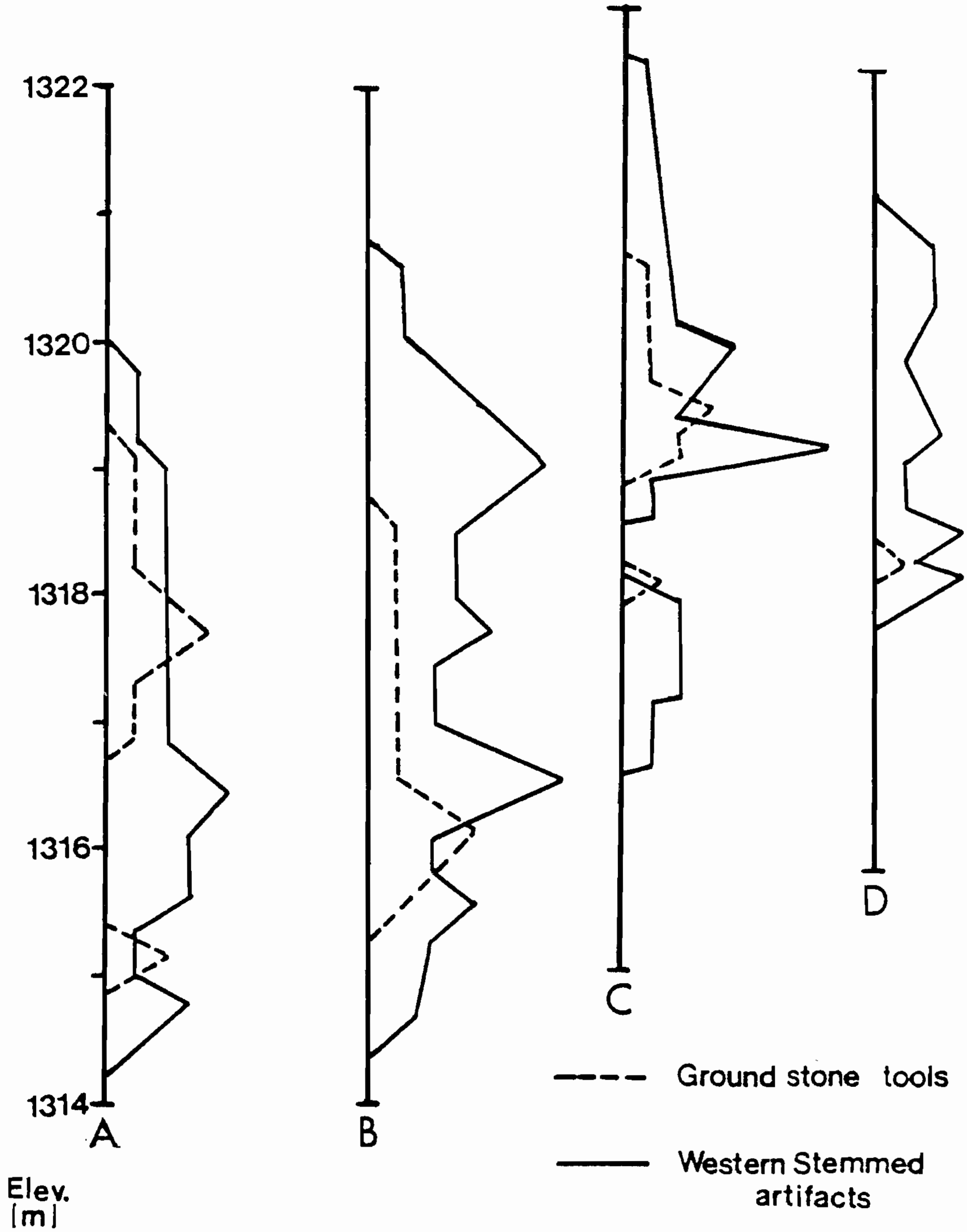


FIGURE 61. Distribution of Western Stemmed Artifacts and Associated Ground Stone Tools by Elevation in all Three Sub-basins (Uncorrected for Downslope Transport and Erosion)
A. Dietz Site; B. All Other Sites in Dietz Sub-basin; C. Chase Sub-basin; and D. Crescent Sub-basin

heavier and less subject to transport, would have remained more or less in their original position on the terrace sands upslope.

To test this downslope transport model, the elevational distributions of all time-diagnostic artifacts at the Dietz site occurring within the 1.4 m wave-cut zone of the Big Cut Lake (between 1316.6 and 1318 m elevation) were adjusted upslope until their peak and pattern of distribution matched that of the ground stone. This required an upslope correction factor of 1.2 meters, and the result was a nearly identical overlay of the projectile point distribution pattern over that of the ground stone tools (Figure 62). Using the Dietz site as a yardstick for the test, the same correction factor of 1.2 m was applied to all other stemmed sites in the Dietz sub-basin.

The Dietz sub-basin was hydrologically a single unit, meaning that the Big Lake Cut occurred at the same elevation throughout the sub-basin. In addition, the angle of slope near the wave cut (in positions similar to the Big Lake cut scarp at the Dietz site) were also similar throughout the Dietz sub-basin. Fortunately, there were also a number of single-component Western Stemmed sites that had produced clusters of ground stone in the Dietz sub-basin, and even more fortunately, their elevations had been mapped by stadia survey. A quick glance at these sites producing ground stone also indicated a similar (upslope) offset in the distributions of ground stone compared to stemmed points (Figure 61).

If the hypothesized model of post-occupation downslope transport reflected the results of a real process, then regular application of the 1.2 m correction factor to all stemmed sites in the Dietz

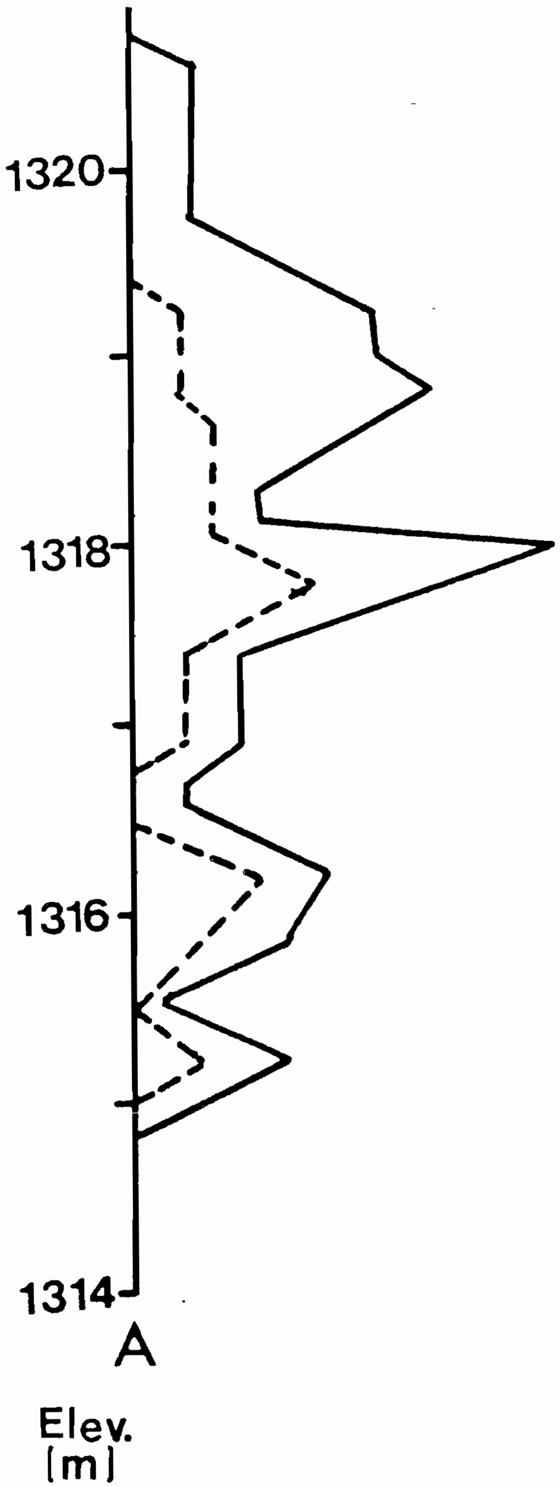


FIGURE 62. Distribution of Western Stemmed Artifacts and Associated Ground Stone Tools by Elevation in the Dietz Sub-basin (After Application of Correction Factors for Downslope Transport and Erosion)

sub-basin should produce a closer match between the stemmed point and ground stone distributions. This factor was applied with amazing success (Figure 62), and results verified that a very real process of downslope transport had in fact occurred as a result of the later, transgressive lake level. The artifact distributions at the Dietz site, and all other stemmed sites in the Dietz sub-basin, now displayed a clear two-level distribution which was already well-supported by stratigraphic evidence for a two-stage lake levels documented at 1316 m and 1315.4 m elevation, respectively.

The demonstration of two closely sequent lake levels (Sand Ridge Lake and Lake Delaine) associated with two discrete populations of Western Stemmed sites in the Dietz sub-basin held exciting implications for establishing a finer temporal resolution in relative dating of occupations within the Stemmed-era period. If the hypothesized two-stage prograding lake sequence of Western Stemmed times had really occurred, then the distributions of stemmed artifacts around the rest of the northern sub-basin would also exhibit a similar two-stage distribution with respect to a lower and higher shoreline, although not necessarily at the same absolute elevations. This hypothesis was put to the test by plotting the basin-wide distribution and elevation of stemmed artifacts, and comparing the patterns to those established at the Dietz site.

Once the process of downslope transport had been identified and tested successfully in relation to artifact distributions in the Dietz sub-basin, it was further hypothesized that this ground stone-to-projectile point adjustment in elevation would serve as a means to correlate, in time, the lake levels and occupation surfaces in all three sub-basins, despite their hydrological independence. The application of the model to the Chase and Crescent sub-basins met with great success (Figure 63), and all three sub-basins now displayed a clear two-level distribution of artifacts to two sequent lake levels.

Even though the absolute elevations of the two lakes were different in each basin their relative positions with respect to stemmed artifacts and sites and their were nearly identical. In addition, the elevational difference of 60 cm which existed between the Stage I (1316 m) and Stage II lakes (1315.4 m) in the Dietz sub-basin was also the same for the Chase and Crescent sub-basins.

The presence of two closely sequent lake stages (Sand Ridge Lake and Lake Delaine) for Western Stemmed occupation in the basin, now cross-correlated in all three sub-basins, afforded a unique opportunity to test the hypothesis of so-called transitional projectile point forms which had been identified. It was hypothesized that these transitional point types represented forms intermediate in time between the final stages of Western Stemmed occupation and the earliest stages of occupation represented by Humboldt, Elko, Pinto and Northern Side-notched points (see discussion in Chapter IV under Relative Dating of Western Clovis and Western Stemmed Cultures).

Results of basin-wide archaeological site survey produced a rich abundance of Western Stemmed sites along higher shorelines in all three northern sub-basins (Chase, Dietz and Crescent) (Figures 29 and 42). Of the 122 time diagnostic tools recovered, a total of 106 points (87%) were assignable to the Western Stemmed cultural period. Many of

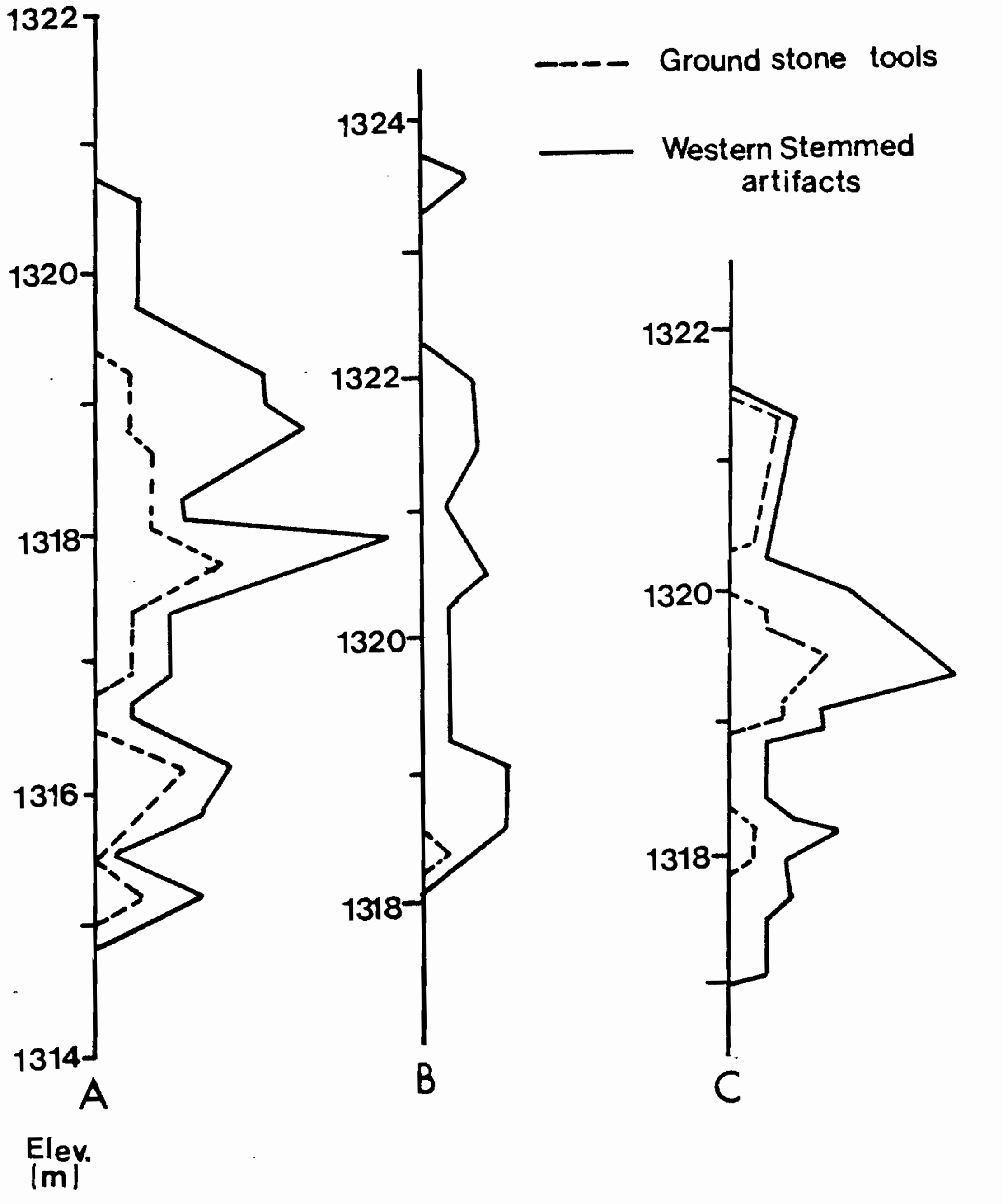


FIGURE 63. Distribution of Western Stemmed Artifacts and Associated Ground Stone Tools by Elevation in all Three Sub-basins (After Application of Correction Factors for Downslope Transport and Erosion) A. Dietz Sub-basin; B. Crescent Sub-basin; and C. Chase Sub-basin

these points displayed signs of re-sharpening and/or re-working. The various types represented are listed below and were coded as follows: Cougar Mountain (WS2), Parman (WS3), Lake Mohave (WS4), Haskett (WS5), large transitional forms (WS6), crescents (WS7), small transitional forms (WS8), Windust (WS9), Silver Lake (WS10), Cascade (CA), Plano-like concave base (PC) and Plano-like Square base (PS).

TABLE 7. Total Number of Western Stemmed Artifact Types (by Code) Recovered in the Northern Alkali Lake Sub-basin

Code	No.	Artifact Type	Comments
WS1	24	Miscellaneous stemmed bases*	1 re-sharpened
WS2	9	Cougar Mountain	1 re-sharpened
WS3	5	Parman	
WS4	18	Lake Mohave	
WS5	13	Haskett	8 re-sharpened
WS6	12	Large transitional	
WS7	12	Crescents	Both rounded and keeled
WS8	6	Small transitional	
WS9	4	Windust	4 re-sharpened
WS10	2	Silver Lake	2 re-sharpened
CA	3	Cascade	
PC	4	Plano-like Concave Base	
PS	2	Plano-like Square Base	
Total:	114		

* Most of these are probably Cougar Mountain or Parman base fragments but the specimens are too fragmentary to be identified with certainty

Results indicated that some artifacts of each type were recovered at both the 1316 m and 1315.4 m lake levels relating to Stemmed-period occupation (Sand Ridge Lake and Lake Delaine). There was a greater density of artifacts on the higher shoreline, but representative samples of all point types were still represented on the lower shoreline as well, albeit in fewer numbers. The only exceptions were Parman and Cougar Mountain types, which were exclusive to the higher shoreline. If the hypothesis of a prograding lake sequence is correct, then Cougar Mountain and Parman types have been demonstrated to be earlier in time in the Dietz sub-basin. Thus, the hypothesis of transitional forms was not verified, but some finer temporal resolution was provided for other Western Stemmed point types.

Additionally, there was a slightly higher number of Windust points along the lower shoreline, suggesting that these may be later in time. Other research in the northern Great Basin has also indicated that Windust points are later than other stemmed point types. Examples include the work of Layton (1970, 1979), work at Dirty Shame Rockshelter (Hanes 1988a, 1988b), and work at Skull Creek Dunes Locality #1, or Site 35 HA 412 (Beck 1984; Jones 1984; Wilde 1985). The implications of these data for typological studies are further discussed in Chapter IV under Relative Dating of Western Clovis and Western Stemmed Cultures).

Radiocarbon Dating of Western Stemmed Occupation

In the process of examining the numerous stratigraphic shore trenches and test excavation units throughout the northern Alkali Lake Basin, many small trace samples of charcoal, soil organics, shell and bone were sampled as hopeful candidates in producing radiocarbon determinations for both the natural and cultural deposits present.

From Locality 1 (East Shore Trench), tiny bone fragments and charcoal flecks were submitted to the Arizona Radiocarbon Laboratory for accelerator dating. Both the bone and charcoal samples proved to be too small to register a reading. However, several larger, though heavily permineralized, bone fragments were recently submitted in an effort to acquire a radiocarbon date for Locality 1 (Figures 48 and 56). The silica-cemented paleosol at the Dietz site (Locality 3) also holds some promise for producing trace charcoal flecks, and further laboratory screening and dissolution of this critical deposit may bear fruit (Figures 40 and 59).

Several samples of culturally charred bone fragments and charcoal flecks were also sampled from Locality 2 (Tucker Site Trench) on the east shore of the Dietz sub-basin (Figures 57 and 58). As discussed above, the 40-meter long backhoe trench here provided excellent stratigraphic control for cross-correlating the buried paleosol (A2 Horizon) with the artifacts in Test Unit #1 and with those actively eroding out of the Big Cut wave-scarp at 1316 m elevation at this site (Site No. 65).

The artifacts exposed along the Tucker site wave-cut scarp included large bifaces, heavy blanks, preforms and knives, scrapers, large flakes and several ground stone fragments (one mano and two metates). No time-diagnostic artifacts have been recovered from the Tucker Site, but the tool assemblage represented is identical to that recovered from all of the other single-component Western Stemmed sites in the northern sub-basin. Additionally, the elevational and stratigraphic context of the site is also identical to many of the other Stemmed-era sites -- i.e. eroding out of the interface of mid-to-late Holocene dunes and early Holocene lake-marsh deposits between 1316 m and 1317 m elevation.

Because the Tucker site occupation is associated with the higher (1316 m) shoreline hypothesized as the Stemmed-era Stage I lake (Sand Ridge Lake), it was postulated that the site would date to the earlier of two early Holocene lake developments recorded in this region, at 9,600 to 9,800 B.P. and 8,600 to 8,400 B.P., respectively (see discussion in Chapter III under Implications of the Alkali Basin Research: Regional Lake History).

This hypothesis has now been confirmed, in part, by a radiocarbon date on trace charcoal embedded within the mottled paleosol (A2 Horizon) associated with the cultural deposits at the Tucker site. The charcoal fleck (#08b) was sampled directly from the paleosol in the backhoe trench at 2.92 m west of the trench datum and 1.66 m below the surface, and produced an accelerator date of 9,610±100 B.P. (AA-3932). More work is planned to recover a larger sub-surface sample from the Tucker site which might produce a time-diagnostic Western Stemmed tool. But the dated charcoal provides compelling support for a temporally distinct two-stage Stemmed occupation in the basin, beginning with the 1316 m lake level (Sand Ridge Lake). Basin-wide chronology is further discussed in Chapter IV under Age and Historical Relationship of Western Clovis and Western Stemmed Cultures.

Summary of Lake History, Paleolandscape and Human Occupation Patterns in the Northern Alkali Lake Basin

There is much data from lakeshore sediments, soils, artifact context and site distributions in the northern Alkali Lake Basin to support the proposed model: (1) a terminal Pleistocene (Western Clovis) occupation centered around the west shore of a shallow lake and marsh; followed by (2) a substantial lakeside settlement of Western Stemmed groups in the early Holocene, oriented to two slightly deeper lakes in a two-stage prograding sequence.

The Dietz site is the largest and most complex site in the northern Alkali Lake Basin and the reason behind the extensive research which has been conducted there. The data suggest the site was occupied in three distinct phases: (1) from 11,500 to 10,000 B.P. during Western Clovis; (2) from 10,000 to 9,000 B.P. during the first stage of Western Stemmed occupation; and (3) from 8,500 to 7,000 B.P. during the later phase of Western Stemmed occupation.

Results of problem-oriented basin-wide site survey produced a rich abundance of Western Stemmed sites along the 1316 m shoreline in the Dietz sub-basin (Sand Ridge Lake), and along its elevational equivalents in the Chase and Crescent sub-basins (Figures 54 and 63). Sites later than 7,000 B.P. are rare, do not follow any particular shoreline, and seem to be associated with small deflation zones which probably held ponded water in the mid-to-late Holocene.

The high percentage of shoreline sites discovered (88%) in associated with a nearly-exclusive settlement of early Holocene campsites in the basin lends much support to the model of lake history and human settlement as proposed. These sites represent a series of lakeshore and marsh-fringe campsites and activity areas oriented to three separate shallow water bodies active in the northern sub-basin between 11,500 and 7,000 years ago.

Clovis-type fluted points have a unique distribution distinctly associated with the 1314.85 m shoreline of Lake Koko (Figure 60). It also now seems highly likely that buried remnants of Clovis-age occupation surfaces may have survived and may be demonstrable at several localities in the basin, overlain by tools diagnostic of the Western Stemmed culture.

There is now good evidence for the reconstruction of at least four distinct sets of lakeshore features which are directly associated with these human occupations. These late Pleistocene and early Holocene water bodies include: (1) Lake Koko, a shallow lake with a possible marsh fringe, located just below the 1314.85 m shoreline associated with fluted point concentrations; (2) the Sand Ridge Lake, a higher elevation (1316 m) shoreline associated with the majority of the Western Stemmed sites in the northern sub-basin, most likely during the earliest period of Western Stemmed occupation between 10,000 and 9,500 B.P.; (3) Lake Delaine, a second-stage Stemmed era lake recession at 1315.4 m elevation which probably closely followed the Sand Ridge Lake in time; and (4) the Big Cut Lake, a post-occupation, transgressive lake level at 1318.3 m elevation.

Research in the northern Alkali Lake Basin has offered a unique opportunity to increase our knowledge of the temporal relationship and paleoeconomy of these two early cultural traditions in the Far West.

Results demonstrate how successful an archaeological model can be in pluvial lake basins if designed to be sensitive to local lake history. The data suggest that application of survey-based predictions from the northern sub-basin to the central and southern sub-basins would probably be just as successful (Willig 1986).

A Narrative of Lake History and Human Settlement

Based on the data presented above, the following narrative of lake history and human occupation is offered for the northern Alkali Lake Basin (see Figures 50 and 64). This section is meant to summarize the larger picture of things as concluded from the data presented in this chapter. Chapter IV focuses upon regional integration of the Alkali Basin data as it relates the current data base of Far Western prehistory, and explores the implications of the research for addressing the major research questions and issues which were described in Chapter I.

Western Clovis Occupation: Lake Koko

It can be hypothesized that a small group of Western Clovis people occupied the northwestern shore of a shallow lake (Lake Koko) with a marsh fringe in the center of the Dietz sub-basin sometime between 11,500 and 11,000 B.P., or maybe slightly later. They would have camped on the soft silty sands of the northwestern shore, at 1314.8 m elevation, deposited by the last pluvial lake level (1320.8 m) in the basin (Lake Kevin).

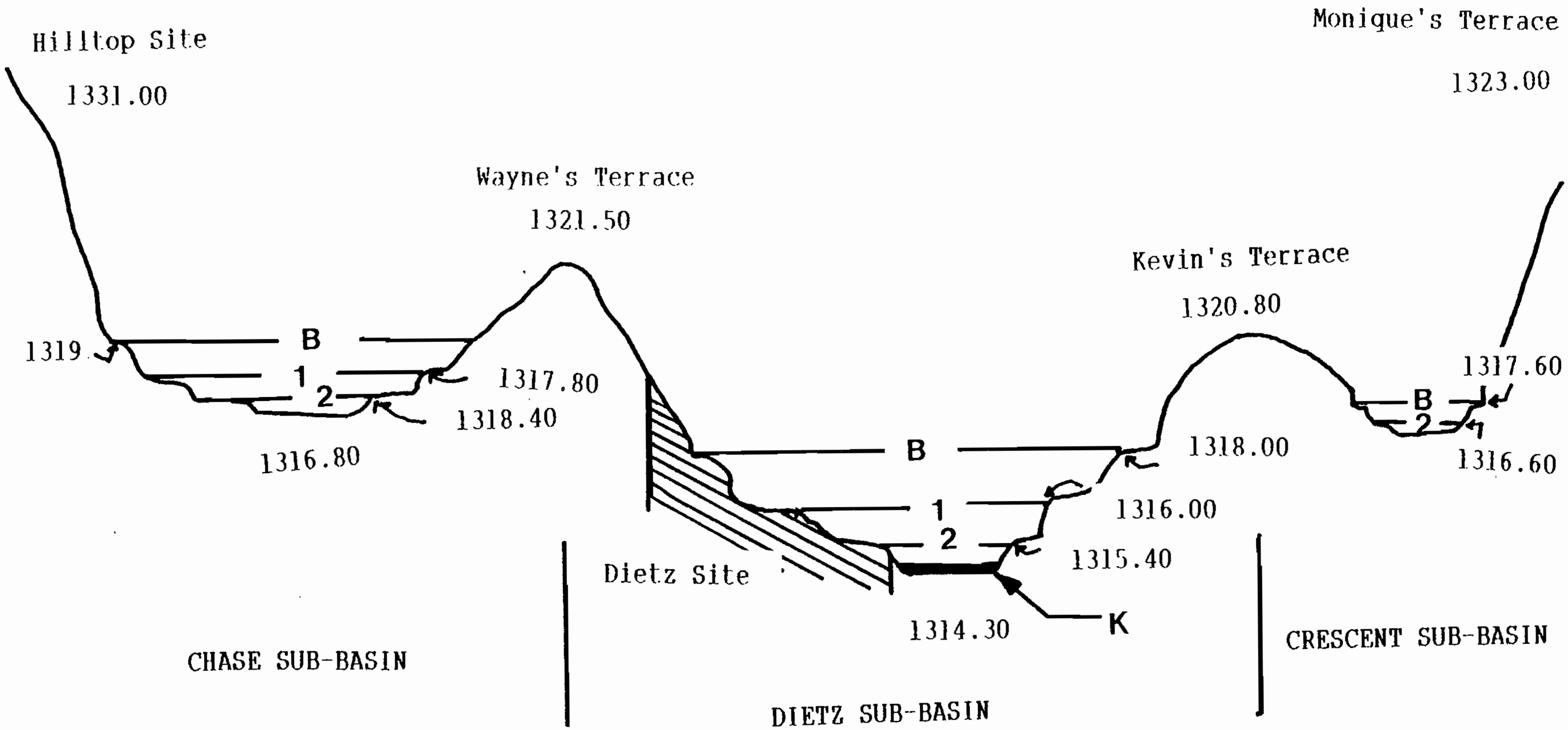


FIGURE 64. Comprehensive North-south Profile Across the Northern Alkali Basin from the Crest of the Hilltop Site (Site No. 48) in the Chase Sub-basin to the Crest of Monique's Terrace in the Crescent Sub-basin. K: Lake Koko; B: Big Cut Lake; 1: Sand Ridge Lake; and 2: Lake Delaine

Sometime after 11,000 B.P. and before 10,000 B.P., Lake Koko and its east-flanking marsh disappeared. After this, the basin remained very dry, long enough for dune sands to begin accumulating at 1320.8 m elevation throughout the northern sub-basin -- moderately re-working the upper portion of Terrace #2 sands. During this time, the more pronounced east shore scarp of the now-deserted Clovis shoreline was further modified by wind. Thin layers of aeolian silts were deposited on its crest, scoured from the Dietz sub-basin floor to the southwest.

Stage I of Western Stemmed Occupation: Sand Ridge Lake

About 10,000 to 9,500 B.P., water again returned to the northern Alkali Lake Basin, filling a much larger portion of the northern sub-basin with a lake about 2 m deep at 1316 m elevation. This water body covered most of the old Clovis shoreline with water, and buried portions of it under shallow beach sands. It can be hypothesized that this first lake (Sand Ridge Lake) existed during the early phase of Western Stemmed occupation in the basin, about 10,000 to 9,500 B.P., and remained for quite some time (about 500 to 1,000 years).

The Sand Ridge Lake must have remained long enough for a sizeable beach deposit to accumulate at the Sand Ridge, and long enough for a number of Western Stemmed campsites to become well-established along the entire perimeter of the 1316 m shoreline. The high density of stemmed artifacts and sites associated with the higher, more prominent scarp at 1316 m suggests a lengthier stillstand which would relate to one of two lengthy periods of increased moisture reported in other lake basins between 9,500 and 8,500 B.P. (Currey and Oviatt 1985;

Gehr 1980; Greenspan 1985). By 8,500 B.P., this lake had receded to the level of 1315.4 m elevation (Lake Delaine).

Stage II of Western Stemmed Occupation: Lake Delaine

Through time, with increasing aridity, the 1316 m lake level fell to 1315.4 m elevation sometime between 8,500 and 8,000, and probably remained here for a brief time (about 250 to 500 years). The stratigraphy and geomorphology of Lake Delaine's shoreline suggest that water remained at this elevation only briefly, but long enough for a few scatters of Western Stemmed sites to accumulate along the shore. The low density of stemmed artifacts and sites associated with this more subtle, lower elevation lake level, and the typology of stemmed points associated with it, suggests that the second stage of the lake was probably a relatively short-lived event, occurring sometime in the later period of Western Stemmed occupation in the Far West, lasting from about 8,500 and 8,000 B.P.

Throughout this later phase of Stemmed occupation, after 8,000 B.P., environmental conditions became increasingly arid. During the period from about 7,500 to 7,000 B.P., small groups of people manufacturing Humboldt concave based points, large side and corner-notched points and Pinto style points occasionally wandered through the Dietz sub-basin and camped on the northwestern shore of the old Clovis shoreline, perhaps when it filled seasonally with shallow ponds.

Post-Occupation Events and Processes

By 7,000 B.P., the northern Alkali Lake Basin was again dry, and the once-occupied shores of Lake Koko (1314.8 m), the Sand Ridge Lake (1316 m) and Lake Delaine (1315.4 m) lay deserted around the now-dry perimeter of the basin. The basin remained dry, and was certainly dry at the time of the eruption of Mt. Mazama 6,800 years ago. No water-laid (primary) deposits of Mazama ash have been found in the northern Alkali Lake Basin, and no substantial lenses of redeposited (secondary) Mazama ash and pumice have been found on the lee side of dunes in the basin. With no water to capture deposits of primary Mazama ash airfall, the small pumice pebbles would have "bounced around like popcorn as they fell" (as Jonathan Davis has so aptly described it), to be carried away by winds shortly after their deposition.

After 6,800 B.P. but before the onset of fully Altithermal conditions at 5,000 B.P., the northern Alkali Lake Basin was once more filled by a very large, powerful and short-lived lake (Lake Big Cut). Fed by water entering the Dietz basin through a deep stream channel located two km southwest of the Dietz site, this large and powerful lake rose to a level of 1318.3 m, and perhaps as high as 1319 m elevation. This water level averaged 4 m in elevation above the basin floor -- covering the previously occupied shore of the earlier Stemmed-era lake level (Sand Ridge Lake) by 2.5 m of water.

The coarse gravelly sediment loads of the Big Cut Lake, consisting primarily of obsidian-rich gravel and sands carried down from the upper reaches of Horse Mountain, scoured the Stemmed-era shoreline at 1318 m elevation. At a place southwest of the Dietz hill, the coarse "Umbrella-handle" shaped deposits of Big Cut Lake bury and partially truncate the Stemmed Period Sand Ridge Lake terrace at 1316 m elevation, suggesting that the Big Cut Lake must postdate Western Stemmed occupation, after 7,000 B.P. At present, the absence of buried, primary Mazama ash deposits indicates that the basin was dry when Mazama fell at 6,800 B.P., suggesting further that this later, transgressive lake must have occurred after Mazama, but before the onset of fully Altithermal conditions at 5,000 B.P.

The geomorphology of the Big Cut Lake wave scarp and "Umbrella" deposits suggest that the rise in water was fast, powerful, erosive and short-lived. When this lake receded, soon after it came, the basin remained as ephemerally dry as it is today. In late prehistoric time, occasional passers-by left Elko or Desert Side-notched points scattered throughout the basin, but no one claimed the territory (Blyth 1938; Kelly 1932; Stewart 1938, 1939; Whiting 1950).

In the last 10 or 20 years, renewed precipitation and erosional processes began cutting through the beach terrace south of Flemmer's Spit, just north of the Dietz site. Dune-building winds began to carve small deflation basins in the playa floor which held scattered patches of standing water on a seasonal basis. As erosion by wind and water increased, the fresh edges of Clovis fluted points, buried just beneath the silts and sands of the playa floor, began to appear along the now exposed surface of an old shoreline -- at 1315 m elevation.

CHAPTER IV

IMPLICATIONS OF ALKALI LAKE BASIN RESEARCH: REGIONAL INTEGRATION AND CONCLUSIONS

The Research Questions: Chronology and Adaptations

The major focus of research conducted in the Northern Alkali Lake Basin was the context and distribution of Western Clovis and Western Stemmed artifacts and sites in relation to each other, and to the paleoenvironment. Specifically, the research sought to reconstruct the Clovis and Stemmed-era landscapes and lake history, and to determine the precise distribution and context of artifacts and occupation surfaces upon that landscape.

The major issues of concern have been the age and historical relationship of Western Clovis and Western Stemmed cultures, and the economic orientations which have been hypothesized for these people. Alkali Lake Basin research has addressed these hypotheses through stratigraphic cross-correlation studies, paleolandscape reconstruction and basin-wide site survey and mapping of artifacts, lake levels and paleosurfaces. These major issues and hypotheses are briefly reviewed below, in the context of the research results.

Relative Dating of Western Clovis and Western Stemmed Cultures

Buried sites producing radiocarbon dates are rare for the period between 11,500 and 7,000 B.P. in Far Western North America. In the absence of such direct data, there are three main prospects for placing Far Western fluted and stemmed points in a relative time frame include: 1) typological comparisons of Western Clovis fluted points to dated Clovis assemblages in the Southwest and Plains which currently have a range of 11,840 B.P. to 10,620 B.P. (Haynes et al. 1984); 2) typological comparisons of Western Clovis fluted points to dated fluted points in the East which now are said to date from 10,600 B.P. to 10,200 B.P. (Haynes et al. 1984; Meltzer 1988); and 3) local typological, stratigraphic and obsidian hydration studies of Western Clovis and Western Stemmed point complexes which often co-occur at sites in the Far West. Western Stemmed complexes are currently known to date within a very broad range between 11,000 and 7,000 B.P. (Table 5; Willig and Aikens 1988).

Stratigraphic Studies

Alkali Lake Basin Research

At the Dietz site in the northern Alkali Lake Basin, Oregon, the horizontal distributions and stratigraphic context of fluted and stemmed artifacts provide compelling evidence for a Western Clovis occupation which clearly precedes that of Western Stemmed groups. Fluted and stemmed point assemblages have separate surface distributions on two sequent fossil shorelines (Willig 1984, 1985, 1986, 1988), indicating a definite spatial (horizontal) separation. In addition, a vertical separation of fluted and stemmed artifacts was documented by cross-correlating Clovis and Stemmed period occupation surfaces with time-equivalent lake deposits across the paleolandscape.

This stratigraphic cross-correlation was achieved through detailed studies of stratigraphy, geomorphic lake features and an intensive, basin-wide program of stadia mapping and site survey. Fluted points at the Dietz site are oriented around an early, low elevation shoreline at 1314.8 m elevation. In contrast, Western Stemmed points at the Dietz site and 27 other single-component sites in the basin are confined to a higher zone associated with two later shorelines at elevations of 1316.2 m and 1315.4 m, respectively.

Furthermore, a vertical superposition of Western Clovis and Western Stemmed occupation may yet be demonstrable at two localities in the basin which contain buried, flake-bearing paleosols occurring 40 to 70 cm below stemmed point clusters on the surface. No diagnostic fluted points have yet been recovered from these buried paleosols, but in-process radiocarbon samples of bone, charcoal and shell from the lower deposits may yield dates of Clovis age.

Other Research

At the Turrialba site in Costa Rica (Snarskis 1979), numerous Clovis-type fluted and stemmed (Fishtail) points have been recovered from river terrace deposits of late Pleistocene and early Holocene age. The shallow terrace deposits are undated but fluted and stemmed points can be separated on the basis of horizontal stratigraphy because they occur on separate, sequent river terraces. All of the fluted points resembling northern styles were found exclusively on the uppermost terrace which dates somewhere between 12,000-10,000 B.P. The single fluted Magellan point was found on the third or lowest terrace (Snarskis 1979).

Strikingly similar evidence for horizontal separation was noted long ago by the Campbells for Pleistocene Lake Owens in California (Campbell 1949) and the Tonopah and Mud Lake area of Nevada (Campbell and Campbell 1940; Pendleton 1979). Future studies should incorporate basin-wide programs of detailed mapping of artifacts and site distributions across the paleolandscape.

Results of the Alkali Lake Basin research strongly support the case for temporal precedence of Western Clovis over Western Stemmed occupation in the Far West. More importantly, there is still no evidence for the occurrence of Western Stemmed points in dated stratigraphic contexts which clearly precede Western Clovis, just as there are no sites in the Plains which have produced Folsom points stratigraphically below Clovis assemblages (Haynes 1987; Haynes et al. 1984).

Obsidian Hydration Studies

Numerous problems still limit the effectiveness of obsidian hydration dating, but great strides have been made in recent years to improve control over the precision, accuracy and reliability of this dating technique (Michels and Tsong 1980). Source-specific hydration measurements, when used in conjunction with typological and stratigraphic studies, hold great potential for placing assemblages into relative sequences. Ongoing work with multiple, source-specific obsidian hydration measurements is greatly refining our chronological control of Western Clovis and Western Stemmed surface sites (Basgall 1988; Bettinger 1980; Fredrickson and White 1988; Hughes 1984, 1986; Jenkins and Warren 1984; Layton 1972; Meighan 1981, 1983).

The Komodo site in Long Valley, California has produced 41 concave-based obsidian points ranging from basally thinned to fluted forms (Figure 2 in Basgall 1988). Of these, 20 are chemically attributed to the immediately adjacent Casa Diablo source. Primary hydration measurements on most tools ranged from 8 to 12 microns and averaged 2.6 microns greater than the oldest known Pinto/Little Lake series points in Long Valley (6 microns) which date to about 6,000 B.P.

The Komodo site measurements in the 8-12 micron range were translated into a radiocarbon age range of 7,000 to 9,000 B.P. based on curvilinear hydration rates recently developed for local Casa Diablo obsidian, and comparisons to micron values of other time diagnostic point types made from the same volcanic glass in Long Valley. The source-specific hydration analysis and typological comparisons were both consistent with an early Holocene age.

Recent work at the Borax Lake obsidian flow in the Clear Lake-Borax Lake area of California (Fredrickson and White 1988) suggests that human use of this quarry did not occur until the time represented by 11 microns. Fluted points and crescents from Borax Lake display hydration rinds averaging 9 microns, while wide-stemmed points had hydration readings averaging 7.2 microns. Hydration measurements of flakes from a nearby buried midden lacking time diagnostic tools (Lak-510) consistently fell between 8.4 and 10.2 microns, well within the range for Borax Lake fluted points.

At the Mostin site near Clear Lake, obsidian hydration readings have continued to place assemblages into a credible relative sequence despite initial discrepancies in radiocarbon dates (Fredrickson and White 1988). Dates on hearths and human bone collagen ranged from 7,700 to 11,000 B.P., yet hydration readings of 6 microns suggested a time range of 3,500 to 6,300 B.P., which was consistent with the recovery of Pinto style points from the site. It was later discovered that fossil carbonates feeding into Clear Lake were responsible for radiocarbon dates which were about 4,200 years too old, and this correction factor moves the site into the same time range indicated by the obsidian hydration readings and Pinto points.

Obsidian hydration studies by Layton (1970, 1972) indicate that the large stemmed points associated with Western Stemmed complexes in the Far West have a temporal range of 10,880 to 7,900 B.P. This range is well supported by available radiocarbon dates in the Far West (Table 5), and by results of various typological studies (discussed below).

Obsidian hydration studies of fluted and stemmed artifacts at the Dietz site are still in progress (Fagan 1988), but the site holds tremendous potential for verifying the model of lake history and human occupation as proposed. This paleoecological model has been tested by other indirect data in the research presented here. If the model is correct, we should expect to find that the hydration readings for Clovis (fluted) points at the Dietz site to fall into a distinct population clearly separable from those of stemmed artifacts in the northern Alkali Basin.

Similarly, if the proposed lake history reconstruction is correct, there should be a noticeable difference in the hydration values for stemmed artifacts located on the Stage I shoreline (Sand Ridge Lake) and Stage II Lakeshore (Lake Delaine). Furthermore, if some of the other early Holocene sites in the basin are really as close in time to Western Stemmed as proposed, then the hydration values of the Cascade, Pinto, Humboldt and large side-notched and corner-notched points recovered should fall in closely with the values of stemmed artifacts located on the Stage II (Lake Delaine) shoreline.

Typological Comparisons of Western Clovis Points to Clovis-Llano Forms

Most Western Clovis sites consist of single isolated specimens and only seven localities in the Far West have produced major concentrations of identifiably Clovis artifacts (see Figure 1 and references in Table 1). These include: (1) 49 points from China Lake, California; (2) 49 specimens from Tulare Lake, California; (3) 20 points from the Borax Lake and Clear Lake area of California; (4) 58 specimens from the Tonopah Lake and Mud Lake area of Nevada; (5) 21 points from the Sunshine Locality, Nevada; (6) 60 specimens from the

Dietz site in Alkali Basin, Oregon; and (7) 14 points from the recently discovered Richey-Roberts Clovis cache in central Washington.

It must be remembered that no one set of eyes has yet looked upon all known fluted points recovered from the Far West. However, published illustrations and technological studies suggest that Western Clovis points compare favorably with Clovis-Llano types from the Southwest and Plains in form, size, degree of edge and basal grinding, channel scratching and refinement of pressure flaking (Haynes 1987). There is considerable variation in size in Western Clovis points, and the degree of fluting grades from singly to multiply fluted to basally thinned, but this falls easily within the expected range of variation documented for Clovis fluted points elsewhere (Haynes 1982; Wormington 1957).

One of the major hallmarks which certifies inclusion into the "Clovis-Llano" complex (Haynes 1980; Sellards 1952) is the presence of the diagnostic Clovis fluted point. This type has been characterized by: 1) long, relatively narrow longitudinal flakes removed from both sides of the biface from a specially prepared platform at the base; 2) parallel or slightly convex sides and concave bases; 3) flutes usually extending halfway up the point from base to tip; and 4) lengths ranging from 4 to 12.5 centimeters (cm), but averaging 7.5 cm (Haynes 1982; Wormington 1957:263). But the presence of variation has always allowed for much latitude in the definition, including: 1) flutes removed from only one side, 2) multiple flutes instead of single channel flakes; 3) flutes extending the full length of the point; 4) points made on blades rather than bifaces; and 5) differences in shape, size, edge-grinding and other attributes (Haynes 1982; Wormington 1957).

Fluted points in North America display a wide range of variability in size and shape, and the width, length and number of flutes vary from multiple to single fluting to basally thinned. Fluting occurs on concave and straight based points, and even stemmed and shouldered points dating to later time periods. This range in variation, along with distinct regional styles, has been reported for assemblages as far distant as interior Alaska (Clark 1984, 1989), the Maritimes and Great Lakes regions of the Northeast (Keenlyside 1989; Storck 1984, 1989), Central America (Snarskis 1979; Willey 1966) and South America (Lynch 1983), and in the Far West as well (see discussion below).

The range of intra-site variation visible at the Clovis type site -- Blackwater Draw, New Mexico -- and at Arizona sites like Naco and Lehner (see Figures 89 and 90 in Hester et al. 1972:98-99; Figures 3 and 6 in Warnica 1966:349-350; Figures 6-7 in Haury et al. 1953:8-9; Figures 12-13 in Haury et al. 1959:16-17) can also be seen in fluted specimens illustrated from 14 Far Western sites (Figures 2 through 5 in Davis and Shutler 1969:164-167). Like other regions, Western Clovis assemblages need to be firmly dated and large samples studied before this variation can be properly assessed. But with the exception of the eared, waisted forms so characteristic of the eastern U.S. (Mason 1962; Meltzer 1988; Willey 1966), most of the observed intra-regional differences in fluted point assemblages fall within the expected range of variation for a single pan-continental Clovis cultural complex.

Studies of fluted point collections from Texas, Colorado, New Mexico, Arizona, California and Virginia reveal that the morphological variation within individual collections is as great as the variation between collections (Haynes 1964:1408). In a recent study by Carl Phagan, attributes of seven fluted points from Fort Irwin in the Mohave Desert, California were subjectively compared to Clovis points from the Plains, Rocky Mountains and Great Basin. All seven fell easily within the known range of variation for the Clovis type fluted point, especially those from the west (Warren and Phagan 1988).

At the Dietz site in the Alkali Lake Basin of Oregon, 60 fluted point fragments have been recovered, including 12 relatively complete points, eight midsections, eight base-midsection fragments, four tip fragments and 28 base fragments (Fagan 1988; Willig 1988). There is a wide range in size among the 60 point fragments recovered (Figures 3 and 4, Figures 6 through 14). Richard Hughes has noted (1988, personal communication) that this variety probably reflects the range of functional or individual variation to be expected from such a large sample. The measurable length on 14 fluted point fragments from the Dietz site has a wide spread of 2.7 to 8.5 cm, while basal width measured from 43 specimens ranges from 1.6 to 4.7 cm, averaging 2.9 cm wide.

The same wide range in size is visible in specimens reported from Borax Lake (Harrington 1948) and Tulare Lake in California (Figures 1 and 2 in Riddell and Olsen 1969:121-122) and from the Tonopah and Mud Lake areas of Nevada (Campbell and Campbell 1940:8; Pendleton 1979; Figure 3 in Tuohy 1968:30 and Figures 6-7 in Tuohy 1969:172-173). The range in size is visible in other large assemblages like those reported from Borax Lake (Harrington 1948) and Tulare Lake in California (Figures 1 and 2 in Riddell and Olsen 1969:121-122; Wallace and Riddell 1988) and from Tonopah and Mud Lakes in Nevada (Campbell and Campbell 1940:8; Pendleton 1979; Figure 3 in Tuohy 1968:30 and Figures 6 and 7 in Tuohy 1969:172-173).

Recent attribute analysis by Titmus and Woods (1988) of 12 fluted points from various southern Idaho sites, including the five specimens from the Simon site cache (Figure 3 in Butler 1963:29; Butler and Fitzwater 1965; Woods and Titmus 1985), revealed a wide range in size. There was a definite bimodal distinction in length between the Simon points (over 18.2 cm long) and all others. The authors suggest that the large size of these fluted points may reflect their possible function as grave goods for a Clovis burial, as seems to be the case at the Anzick site in Montana (Lahren and Bonnichsen 1974). A similar interpretation may also be made for the Richey-Roberts Clovis cache in central Washington, where 14 of the largest fluted points known in North America were recovered, with lengths ranging from 10 to 23 cm (Mehringer 1988a:500-503, 1989 and Figure 1 in Mehringer 1988b).

Typological Comparisons of Western Clovis Points to Eastern Fluted Forms

Western Clovis fluted points do not compare well with the more eared, waisted forms reported from eastern North America. In the 1960's, Mason (1962) and Willey (1966) noted the presence of two distinct regional styles in North American fluted points, with eared, waisted forms more characteristic in the east, as opposed to the Clovis-Llano type forms described from the Southwest and Plains.

The evidence suggests that this east-west variation in fluted point forms is temporally based -- since most fluted points in the eastern U.S. are relatively late, dating from 10,600 B.P. to 10,200 B.P. (Haynes et al. 1984; Meltzer 1988). Fluted points reported from Mexico, Guatemala, Costa Rica, and Ecuador display clear affinities to the waisted, eared eastern North American forms, suggesting that they are of equal age or even slightly younger (Lynch 1983; Snarskis 1979; Willey 1966).

Typology of Western Stemmed Points

The large stemmed, shouldered and lanceolate points characteristic of Western Stemmed complexes include a number of defined styles such as Windust, Lind Coulee, Birch Creek, Haskett, Lake Mohave, Silver Lake, Parman, Cougar Mountain, Mt. Moriah, Borax Lake Wide Stem, and Black Rock or Great Basin Concave Base (see references in Table 2). Despite this diversity of regional styles, assemblages from places as distant as northern Mexico and central Washington share strikingly similar point forms, tool kits and technology. This suggests that all of these stemmed point complexes represent one closely related, widespread Western Stemmed cultural tradition present throughout the Far West from 11,000 to 7,000 B.P.

Alkali Lake Basin research has produced one of the largest, "purest", and most diverse collections of Western Stemmed point forms yet reported in the Far West. A total of 91 sites have been found, most of which are located on a higher shoreline which postdates Clovis occupation at the Dietz site. Of the 48 sites containing time diagnostic point styles, 30 sites (63%) produced assemblages which are assignable to the Western Stemmed cultural tradition.

A total of 114 classifiable Western Stemmed points have been recovered which are illustrated here (Figures 16 through 23, and Appendix C). The major point types, listed on Table 7 in Chapter III, include Cougar Mountain, Parman, Windust, Lake Mohave, Silver Lake, Haskett, Cascade, Plano-like concave and Plano-like square-based points.

In addition, many of the non-projectile point tools represented at Western Stemmed sites in the northern Alkali Basin are strikingly similar to those reported from the C. W. Harris site (SDi-149) -- the type site for San Dieguito (Warren 1967). The variety of scrapers (ovoid, beaked, flake, end and side), knives, blanks and preforms in the Dietz sub-basin closely resemble those illustrated by Warren (1967) and Moratto (1984:98). Recent studies of Western Stemmed complexes in numerous western lake basins similar to Alkali Lake suggest that these people were related on a pan-western scale (Willig et al. 1988).

Historical Relationship of Western Clovis and Western Stemmed Cultures

Technological Distinctions

In recent years, scholars conducting technological studies in the Far West have reported distinguishing fluted from stemmed assemblages based on differences in tool kits (assemblage structure and variability), reduction sequences and flaking techniques. Work in this area at the Dietz site has been conducted and reported by Fagan (1984a, 1984b, 1986, 1988). The research involved comparative technological analysis of tools and debitage sampled from separate lithic clusters at the site which have produced Western Clovis and Western Stemmed artifacts.

Fagan concluded that tool kits, manufacturing techniques and methods of platform preparation for biface production were strikingly different for fluted and stemmed point clusters, suggesting that cultural, and possibly temporal, differences exist between the two assemblages (Fagan 1984a, 1988). Pendleton (1979) has reached similar conclusions from analysis of Lake Tonopah materials.

Pendleton's analysis of fluted and unfluted concave based points and stemmed forms from Lake Tonopah revealed marked differences in reduction sequences and manufacturing techniques between the two assemblages. Concave based points exhibited a higher degree of refinement in every stage of manufacture, with a greater degree of pressure flaking and technological control. Techno-morphological comparisons were made of seven fluted points and 40 Lake Mojave/Silver Lake points from Fort Irwin, California by Warren and Phagan (1988), especially regarding flake scar attributes. In all observations, the fluted points displayed production technologies which were substantially different from those of the stemmed points, suggesting different cultural development.

These distinctions have been interpreted by Bryan (1979, 1980, 1988) as support for the contention that the Western Stemmed tradition is distinct from, but contemporary with Clovis, and that Western Stemmed may be the more ancient of the two. Wallace and Riddell (1988) have recently stated that the observed differences in style and technology between Clovis, Lake Mohave and Pinto assemblages from Tulare Lake, California suggest three separate immigrations of unrelated cultures from outside the lake basin.

An alternative explanation would be that Western Clovis and Western Stemmed assemblages represent similar cultural and technological patterns at two different points in time. This latter interpretation is best supported by the archaeological, stratigraphic and paleoenvironmental data recovered through Alkali Basin research. In order to make possible an informed choice between these alternatives, the temporal and functional relationship of the Western Clovis and Western Stemmed complexes must be demonstrated by other means.

A Continuum of Radiocarbon Dates: The Significance of Temporal Overlap

Western Stemmed assemblages have been recovered in buried context from a number of cave sites throughout the Far West, and most of these have produced radiocarbon dates. The compilation of dates presented in Table 5 for Western Stemmed sites, the most comprehensive so far, was based on a rigorous selection of the available dates, to avoid potential problem of stratigraphic disturbance. Only dates from buried features or materials directly associated with well defined stemmed and shouldered points have been included.

The dates in Table 5 indicate that Western Stemmed complexes are spread across a broad time range from 11,140 to 7,000 B.P.; and when the dates are graphed in chronological order, rather than by site, their distribution through time is remarkably even (Figure 65). Furthermore, when the dates for Southwestern Clovis points (Table 3) are graphed together with those for Western Stemmed points (Table 5), the temporal overlap of Western Stemmed and Clovis is striking.

If Western Clovis and Western Stemmed complexes are indeed historically related, a certain amount of temporal overlap would be inherent (Carlson 1988; Willig 1989). The earliest Western Stemmed date (11,140 B.P.) from Smith Creek Cave (Bryan 1979) is about 500 years older than the youngest Clovis date of 10,620 B.P. from the Lehner site (Haynes et al. 1984), and 350 years older than the date of 10,810 B.P. from Marmes Rockshelter (Tables 3 and 5; Figure 65).

There is a narrow temporal overlap documented between Clovis and Folsom complexes in the Plains (Haynes et al. 1984), indicating that the transition from Clovis to Folsom must have been brief (Haynes 1964:1410). The above dates suggest that this temporal overlap is also present in the Far West between Clovis and Stemmed occupations. The stratigraphic context of fluted and stemmed points in the northern Alkali Basin strongly suggest that Western Stemmed complexes follow directly from, and soon after, Western Clovis complexes in the Far West.

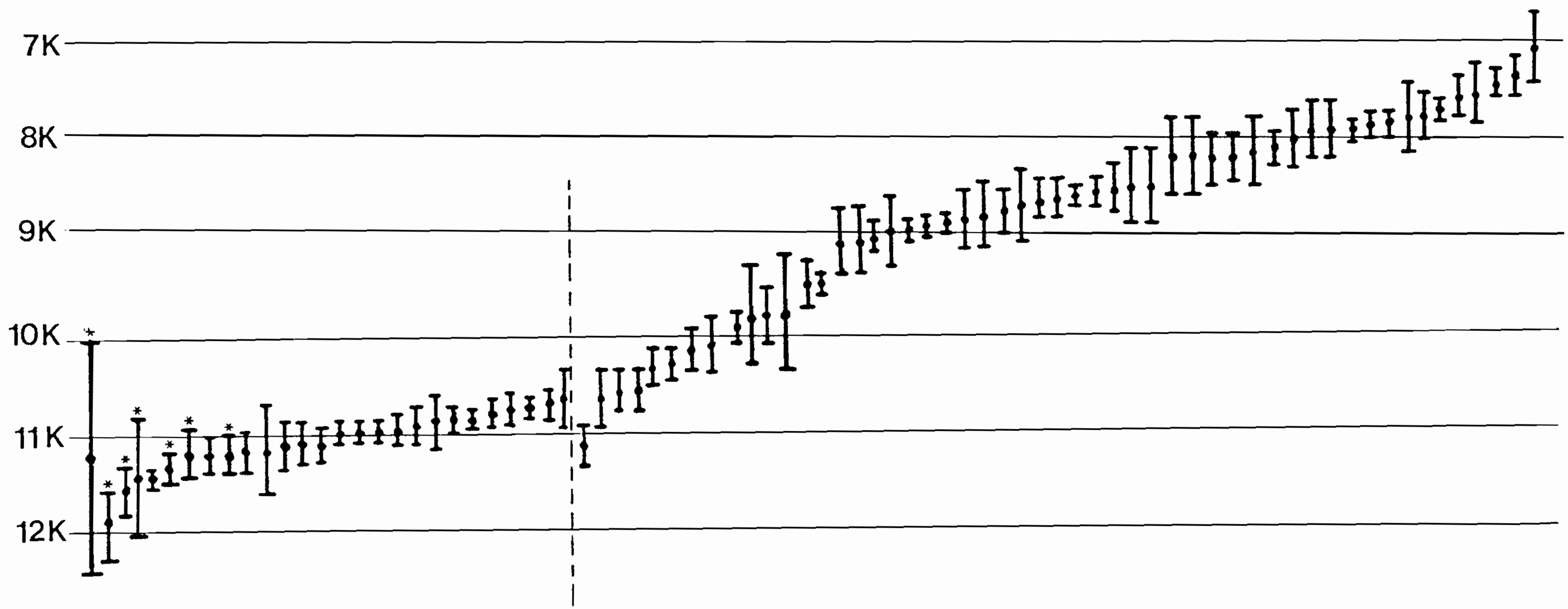


FIGURE 65. Radiocarbon Dates for Western Stemmed Complexes Graphed in Chronological Order. Dates to right of dashed line from Table 5. Dates to left of dashed line from Table 3, except for starred dates which are from Table 4. (K = Thousands of Years Ago)

A Continuum of Typological Change: The Significance of Transitional Fluted and Stemmed Point Forms at the Pleistocene-Holocene Boundary

The technological studies discussed above, in conjunction with the available radiocarbon dates (Tables 3, 4, 5 and Figure 65), suggest that fluted and stemmed point complexes are separable in time, and that Western Stemmed most likely developed out of Western Clovis -- indicating a historical relationship that is further supported by typology. The typology of early Far Western fluted and stemmed assemblages could be interpreted as representing a complete temporal continuum of forms, with fluted Clovis grading into fluted and unfluted basally thinned, concave based and stemmed and shouldered styles of later Archaic periods (Aikens 1978; Willig 1989).

As mentioned above, many scholars have reported a wide variation in size in western fluted point assemblages, with the degree of fluting grading from singly to multiply fluted, to basally thinned. As pointed out by Aikens (1978), this "continuum" of gradual blending from fluted into stemmed points and later forms is well documented from dated sequences in the Plains and Southwest (Frison 1978; Frison and Stanford 1982; Haynes 1964, 1980), where Clovis gives rise to Folsom and Plano forms. Such temporally significant transitional forms are exemplified by the Goshen complex on the Plains (Frison 1978, 1989).

Keenlyside (1989) has reported the gradual blending of styles in the transition between the Paleoindian and Archaic periods in the Maritimes region. In Great Lakes region, Storck (1984, 1989) has proposed a similar sequence with the Gainey-Parkhill-Crowfield complexes, based on technological and stylistic comparisons, thermoluminescence dating and geological associations. Similar gradational continuua have been noted by scholars in Central and South America, where fluted points often co-occur with both fluted and unfluted versions of stemmed fishtail or Magellan points which have a time range of 11,000-10,000 B.P. (Lynch 1983).

The fluted point forms from many sites in Central and South America seem to grade into the stemmed forms, with many transitional forms occurring inbetween (Figures 3.5 and 3.6 in Lynch 1983; Figures 2 and 3 in Snarskis 1979). Of the 18 fluted points recovered from the Turrialba site in Costa Rica, some resemble western Clovis (Type 2: Figure 2a,c), some resemble the waisted, eared Eastern forms (Type 1: Figures 2d, 2e, 3b) and one resembles a fluted version of stemmed fishtail or Magellan points.

If Western Clovis and Stemmed complexes in the Far West are historically related and slightly overlap in time, in the same way as Clovis-Folsom-Plano points do on the Plains, we should expect to find "transitional forms" which would reflect this (Carlson 1988; Willig 1989). As a matter of fact, many early Far Western complexes are rich in examples of intermediate forms which might reflect a historical continuum (see Figures 21 through 23).

Carlson (1988) suggests that more detailed typological studies be undertaken to explore this hypothesis and discusses three point forms in particular which could mark this transition in the Far West. One of these includes Black Rock Concave Based forms in the west (Clewlow

1968) and a second category includes specimens that are both fluted and stemmed. In fact, many of the unnamed forms described above could be considered transitional types between fluted and stemmed, or between stemmed and later forms.

Pendleton's (1979) analysis of 108 fluted and unfluted concave-based and stemmed points from Lake Tonopah revealed that they ranged in a continuum from typical fluted Clovis forms to unfluted basally thinned forms, with many transitional forms in between. All of the points studied were basally thinned while only 38 (35%) were fluted. Similar continua can be deduced from other major fluted point assemblages in the west. Of the 30 Tulare Lake points described by Riddell and Olsen (1969), 12 are unifacially fluted, eight are bifacially fluted and seven are basally thinned. Of the 20 Borax Lake finds, 14 are bifacially fluted and two are unifacially fluted (Fredrickson and White 1988; Harrington 1948; Meighan and Haynes 1970).

Some, if not most, of the "basally thinned" concave based points from the Komodo site in California closely resemble fluted points reported in the Far West. Of the 45 points, 88% are edge ground, 55% are basally ground and 77% are basally thinned -- 16% unifacially and 61% bifacially (Basgall 1988). A similar gradational continuum of fluted into stemmed forms seems to be present in a large assemblage described from Coyote Flat, Oregon (Figures 3 and 4 in Butler 1970:46-47).

Testing the Hypothesis of Transitional Forms in the Alkali Lake Basin

In the Alkali Lake Basin, data produced by basin-wide stratigraphic studies and stadia mapping suggested that Western Stemmed occupation in the northern sub-basin actually consisted of a two-stage settlement corresponding to a two-stage sequence of a prograding (or possibly retrograding) lake. The majority of Western Stemmed artifacts are associated with a higher shoreline at 1316.2 m elevation, but a smaller subset of stemmed artifacts are distributed in close association with a slightly lower shoreline at 1315.4 m elevation. It was not certain whether there was a prograding (lakeward), or retrograding (shoreward) lake sequence involved. But regardless of the direction in time, there was still sequent time represented.

The demonstration of two sequent lake stages for Western Stemmed occupations throughout the northern Alkali Lake Basin, clearly post-dating Clovis occupation there, afforded a unique opportunity to test the hypothesis of transitional projectile point forms at the Pleistocene-Holocene boundary. Two basic groups of transitional forms were identified: (1) those forms intermediate between Western Stemmed and early stages of Humboldt, Pinto, Elko-eared and Side-notched occupations; and (2) those forms intermediate between fluted and stemmed points at the Dietz site.

Transitional Forms Between Western Stemmed and Early Stages of Humboldt/Pinto Occupation in the Alkali Lake Basin

One group of points in the northern Alkali Lake Basin, referred to as small (WS-8) and large (WS-6) transitional stemmed points (Figures 18 and Appendix C) displayed affinities with early forms of Pinto, Elko eared and Northern Side-notched points (Figures 24 through 26 and Appendix C). Although the sample was small, all of the so-called late-period points recovered in the basin seemed to lean more towards "early-late".

These Humboldt/Pinto and large notched forms most resemble what is now referred to as the early stage in these point types (8,000 to 6,000 B.P.) as opposed to the later stage (such as 6,000 to 4,500 B.P.) (Hanes 1988a, 1988b; Holmer 1978, 1986; Layton 1970). This possibility was supported at one site (Site No. 13) by the presence of a Cascade point -- a type dated from 8,000 to 7,000 B.P. on the Plateau (Leonhardy and Rice 1970; Rice 1972) -- in association with several of the above-mentioned "early" forms of side-notched points.

Transitional Forms Between Fluted and Stemmed Points in the Alkali Lake Basin

As suggested by Carlson (1988), one of the best candidates for a transitional category between Western Clovis and Western Stemmed point types is the Black Rock Concave Base point (Clewlow 1968), and several of these have been found at the Dietz site (Figure 21 a-c). Likewise, a second group of points recovered from the Dietz site could be interpreted as somewhat fluted points, or as somewhat stemmed points.

This situation is well-illustrated by the two points shown in Figure 66. The clearly fluted but distinctly shouldered point (Figure 66b) reported by Mack (1975:79) from the Glass Buttes survey, conducted just a few miles north of Alkali Basin is, an intriguing form intermediate between a fluted and stemmed Windust point and a weakly shouldered Clovis type. Bedwell (1970, 1973) has identified several concave-based, basally-thinned points from the Fort Rock cave sites as being "fluted" (Figure 5).

The base fragment illustrated in Figure 66a was recovered from Level 29 of Connley Cave #5B (Figure 6 in Bedwell 1970:266; Figure 16 in Bedwell 1973:78) and defined by Bedwell as a multiply fluted point type (P-14). The Dietz site has produced some multiply fluted base fragments like this (Figures 13a and 14i; also #553-3 and #553-6). But forms like these could also represent Windust bases, as suggested by the slight shoulders on the base fragment in Figure 66a.

Since seeing is believing, I have included in this report a full-scale illustration of every potentially time-diagnostic point type recovered through the Alkali Basin research. In particular, the reader should refer to Figures 22 through 23 and Appendix C. These show excellent examples of point forms intermediate between Western Clovis and Western Stemmed.

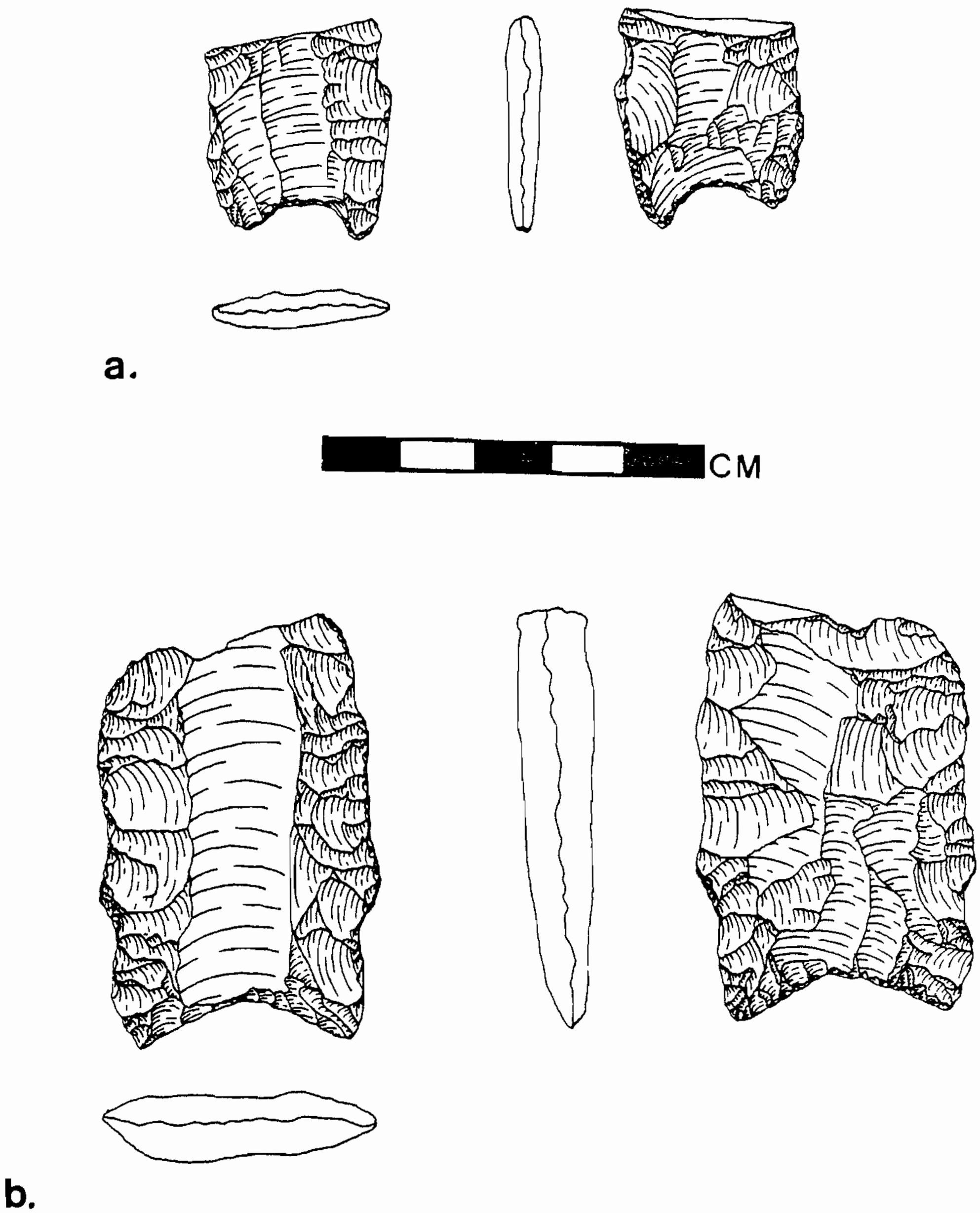


FIGURE 66. Unique Fluted and Stemmed Point Forms: a. Base Fragment from Level 29 of Connley Cave #5B (35 LK 50/5; 513-29/3-1); and b. Fluted and Shouldered Point Recovered in the Glass Buttes Survey (35 LK 326/1)

Results of Testing Transitional Forms in the Alkali Basin

The Alkali Lake Basin was an excellent opportunity to test the hypothesis of transitional forms because the sample of early Holocene point types was so "pure" and so large. In addition, detailed comparisons could be made of the basin-wide distribution and elevation of key artifacts -- in relation to each other, and to the sequent lake levels and occupation surfaces established by the research. Western Stemmed assemblages were by far the best represented in the basin, providing a large sample of previously described types, as well as numerous candidates for "transitional" forms.

When the location and elevation of the various Western Stemmed point types were plotted and compared, results indicated that some artifacts of each type were represented at both of the lake levels (Sand Ridge Lake and Lake Delaine) reconstructed for the time of Stemmed-period occupation (Figure 67). There was a greater density of artifacts on the higher shoreline at 1316 m elevation, but representative samples of all point types were still represented on the lower shoreline at 1315.4 m elevation as well.

This was true even for the small (WS-8) and large (WS-6) transitional stemmed forms that had been separately grouped for the test. The only exceptions were Parman and Cougar Mountain types, which were exclusive to the higher shoreline. If the hypothesis of a prograding lake sequence is correct, then Cougar Mountain and Parman types have been demonstrated to be earlier in time than other Western Stemmed points in the Dietz sub-basin. The hypothesis of transitional

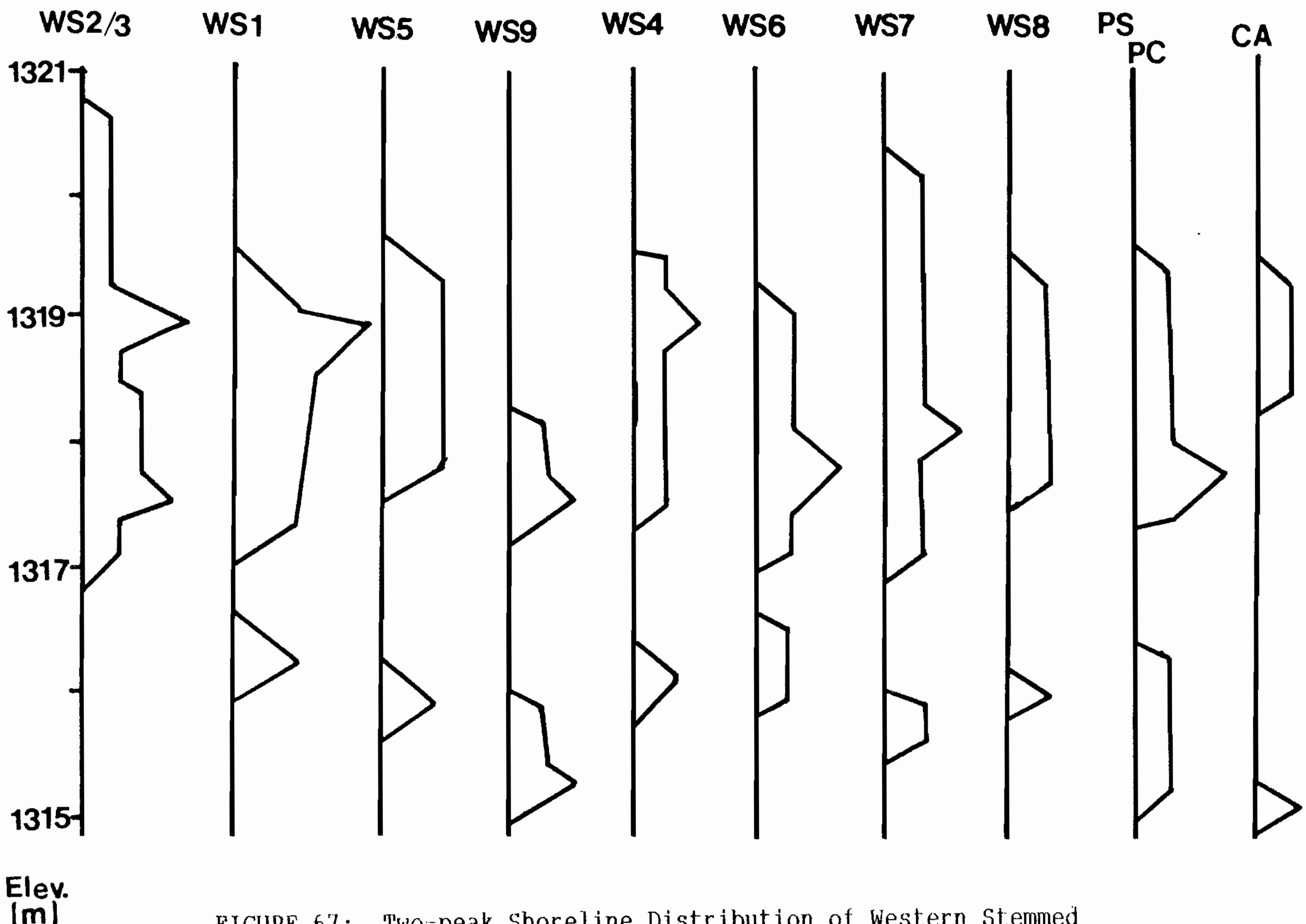


FIGURE 67: Two-peak Shoreline Distribution of Western Stemmed Point Types by Elevation at the Dietz Site

forms was not really verified in this case, but some finer temporal resolution was provided for certain Western Stemmed point types.

Three lanceolate, concave base points, referable to Black Rock Concave Base type (Clewlow 1968) were distributed across the full range of possible occupation surfaces at the Dietz site (Figure 21 a-c). One point in particular (#553-187), displayed the classic shape and form of a fluted point, but was unfluted. It is strikingly similar to the one recovered from the lowest occupation levels in Ventana Cave, Arizona which has been dated to 11,300±1200 B.P. (A-203) (Haury and Hayden 1975).

Haury notes that the Ventana Cave point is made of material which would not have permitted successful fluting, and that its manufacture from a thin flake may have been a way to make up for this deficiency (Haury 1950:180). However, the possibility still exists that these concave-based forms belong to Western Stemmed assemblages or may be transitional forms which fall between Clovis and Stemmed. At the Dietz site, the Ventana look-alike was found in the very center of the zone of overlap between fluted and stemmed points.

Finally, all three Windust points recovered at the Dietz site (#553-27, #553-29, #553-72) were found along the lower Stemmed period shoreline (Lake Delaine), suggesting that Windust may be later in time (Figure 17 c-d). Results of other research in the northern Great Basin suggest that Windust points are generally later than other stemmed point types. This is indicated by the work of Layton (1970, 1979), by excavations at Dirty Shame Rockshelter, Oregon (Hanes 1988a, 1988b) and by excavations at Skull Creek Dunes Locality #1 (35 HA 412) in Catlow Valley, Oregon (Beck 1984; Jones 1984; Mehringer and Wigand 1986; Wilde 1985).

A Continuum of Technological Change: A Hafting Tradition Model

The hafting tradition model first suggested by Bryan (1980), and developed along different lines by Musil (1988), offers a compelling explanation for the observed technological changes through time from Western Clovis to Western Stemmed, based on functional efficiency of haft element designs. Musil presents a model of three major, sequential hafting traditions for North America: (1) the fluted and lanceolate point, hafted by a split-shaft technique; (2) the stemmed point, hafted by a socketing technique; and (3) the notched point, hafted by a split-shaft technique.

The model proposed by Musil is based on the supposition that each new point form was part of a hafting tradition which offered distinct advantages over preceding forms. The improvements rendered the tools more efficient as killing implements, minimized point damage, allowed for more efficient re-use of broken points, and minimized damage to the most "expensive" item -- the wooden shaft.

From this perspective, changes in point forms through time from fluted to stemmed to notched types are not seen as representing different cultural traditions or unique environmental adaptations, but rather as changes in haft element designs which were functionally more efficient than preceding forms (Musil 1988). This model also offers an explanation for the presence of striking similarities in assemblages which are far distant in space or time, without invoking direct cultural contact.

Age and Historic Relationship of Western Clovis and Western Stemmed Cultures: Conclusions

There is much we still do not know about Western Clovis and Western Stemmed cultures in the Far West, but the technological studies discussed above indicate that fluted and stemmed complexes are separable. Alkali Basin research has addressed these issues through stratigraphic cross-correlation studies, paleolandscape reconstruction and basin-wide site survey and mapping of artifacts (Chapter III). The detailed mapping and stratigraphic studies of fluted and stemmed points recovered in the Alkali Lake Basin (Chapter III) and other western lake basins (Campbell 1949; Campbell and Campbell 1940; Pendleton 1979) have demonstrated that the two complexes have separate horizontal and vertical distributions on sequent lake terraces. The data strongly suggest that Western Clovis occupation precedes that of Western Stemmed in Far Western North America, although the two follow closely in time.

The available radiocarbon dates in the Far West, in conjunction with obsidian hydration studies, (Tables 3, 4, 5 and Figure 65) further suggest that this separation is temporally based. The implied historical relationship between Clovis and Stemmed cultures is further supported by typological studies, which suggest that Far Western complexes at the Pleistocene-Holocene boundary represent a complete temporal continuum between Western Clovis (fluted) and the gradually diversifying forms of Western Stemmed and early Archaic complexes.

Based on these data, it can be hypothesized that the earliest Western Stemmed complexes, appearing about 11,000-10,000 B.P., are local developments out of a brief but ancestral Western Clovis presence. A similar sequence can be seen with Folsom and Eastern fluted points, dating from 11,000-10,000 B.P., developing out of an earlier pan-continental Clovis presence dating from 11,500-11,000 B.P. This sequence may also come to be demonstrated at sites in Central and South America as well.

Reconstructing the Paleoeconomy and Adaptive Strategies of Far Western Cultures at the Pleistocene-Holocene Boundary

Buried sites producing radiocarbon dates and economic data like subsistence remains (seeds, bones and shell) and perishable artifacts directly related to specific economic pursuits (fishing hooks, nets, spears and traps) are extremely rare in the Far Western archaeological record from 11,000 to 8,000 B.P. (Aikens 1983a). Without such data, reconstructions of adaptive strategies must remain tentative and should be tested against indirect data from other sources.

In the absence of such direct data, however, there is much that can be learned about prehistoric adaptive strategies through studies of site distribution, settlement pattern and geomorphic context in relation to the paleolandscape and its resource constraints. From these data we can make inferences about past human land use patterns, paleoeconomy and adaptation, thereby building a fuller characterization of Western Clovis and Western Stemmed lifeways. Alkali Lake Basin research has sought to reconstruct the Clovis and Stemmed-era landscapes and lake history, and to determine the context and pattern of occupation surfaces upon that landscape.

Paleoenvironmental Context of Clovis and Stemmed Period Sites in Western Lake Basins

In the Far West, sites yielding Western Clovis and Western Stemmed assemblages are not exclusively associated with fossil lakes and marshes, but are known from a diverse range of environmental settings including coastal, montane and lowland valley zones (Aikens 1983b; Beck and Jones 1988; Fagan 1974; Fagan and Sage 1974; Price and Johnston 1988; Zancanella 1988). Nevertheless, the majority of sites containing significant concentrations of fluted and stemmed points are in pluvial lake basins, where they are situated along the lowest strandlines once occupied by shallow lakes, marshes and stream-fed deltas during the terminal Pleistocene and early Holocene.

Authors like Beck and Jones (1988) caution, of course, against the mental transformation of lakeside artifact distributions into statements on subsistence patterns without testing these statements against regional studies of land use, large scale mapping and site surveys, and analysis of functional and technological variability within assemblages. But this observed patterning is unlikely to be simply a factor of sampling bias because some fairly large portions of the Far West have now been archaeologically surveyed. In addition to

Alkali Lake Basin, large scale site surveys have been conducted along the lower shorelines in Tonopah Basin, Nevada (Campbell and Campbell 1940; Kelly 1978); Butte Valley, Nevada (Beck and Jones 1988), China Lake, California (Davis 1978a, 1978b) and, to a lesser extent, in Railroad Valley, Nevada (Zancanella 1988).

In California, lake basins investigated include Borax and Clear Lakes (Fredrickson and White 1988), Long Valley (Basgall 1988), Tulare Lake (Wallace and Riddell 1988) and the Mohave Desert region (Douglas et al. 1988; Warren and Phagan 1988). In Nevada, coverage includes Pyramid Lake (Dansie et al. 1988; Tuohy 1988a), Lake Tonopah, Lake Hubbs and the Carson River Basin (Hutchinson 1988; Tuohy 1988b), as well as Newark, Jakes, Steptoe, Railroad and Butte Valleys (Beck and Jones 1988; Price and Johnston 1988; Zancanella 1988).

In Oregon, lake basin research began early with work by Cressman (1936, 1942) and others (Cressman et al. 1940). More recently, studies include: (1) the Fort Rock and Chewaucan Basins (Beckham et al. 1979; Bedwell 1970, 1973; Greenspan 1985; Minor and Spencer 1977; Minor et al. 1979; Oetting 1989; Pettigrew 1981; Toepel et al. 1980); (2) Alvord and Catlow Basins (Beck 1984; Cannon and Wiggin 1975; Jones 1984; Pettigrew 1984; Wilde 1985); (3) Harney-Malheur Basin (Gehr 1980; Greenspan 1985) and (4) Warner Valley (Weide 1968, 1974).

The paleoenvironmental contexts and site distributions reported from these western lake basins offer valuable inferential evidence for the kinds of ecological constraints or potentials which would have existed during Western Clovis and Western Stemmed occupations in the Far West. The hydrographic and geomorphic settings of sites producing major concentrations of fluted and stemmed artifacts suggest that these particular locations in each basin would have been excellent places for containing reliable food and water resources that could have supported local human groups at the Pleistocene-Holocene boundary (Willig 1989). In almost every case, the inferred paleogeomorphic settings of sites include stream-fed deltaic marshes and shallow lakes or ponds which would have offered a variety of both riparian and littoral vegetation as well as fresh drinking water for both humans and the game they would have hunted.

At Tulare Lake, California, the Witt site is located at 59 m elevation (192 feet) along the southern shore north of Dudley Ridge -- 5 m lower than the 64 m shoreline occupied by late Archaic groups (Riddell and Olsen 1969; Wallace and Riddell 1988). There is a well-defined 56 m shoreline below the Witt site outlining a water body which would have held about 1.5 to 2 m of water (Willig 1989).

Early sites along the northeastern shore of Tonopah Lake, Nevada are located where water would have been shallowest, with the constantly shifting channels of Peavine Creek producing a rich deltaic marshland area (Campbell and Campbell 1940; Kelly 1978; Pendleton 1979; Tuohy 1988b). As the lake became progressively more saline, post-Clovis occupation shifted to the north with greater use of riverine settings (Kelly 1978). A well-defined lower strandline at 1445 m elevation in the Tonopah basin probably bounded a lake which was 1.5 to 3 m deep during Clovis time (Willig 1989).

The 12 Sunshine Well Locality sites in Long Valley, Nevada would have been situated at the juncture of three habitats (streamside, lake margin and swamp edge) which would have prevailed just after the major recession of Pluvial Lake Hubbs (Hutchinson 1988; Tuohy 1988b). The largest and most productive sites (Sites 3A-B-C) are located near the overflow point of a narrow stream channel where it would have discharged into the shallow lake. Beyond this point, the water would have spread out to form a marsh interspersed with low dunes and sand spits (Hutchinson 1988). Such a well-watered habitat would have supported a rich zone of littoral vegetation (grasses, willows, rosewood), with abundant fish, fowl and other lake margin resources.

In Railroad Valley, Nevada (Zancanella 1988), early sites are located in the northern part of the basin on relict alluvial fans and flats, lake terraces and beach berms that are heavily dissected by a once-active network of braided, perennial stream channels, which would have fed into pluvial Lake Railroad located ten miles further south. If well-watered, these areas would have supported juniper-pine patches and corridors of riparian plants, surrounded by extensive marshes and a mosaic of rushes, sedges, tules, reeds and grasses. The distribution of fluted and stemmed-era sites in relation to these paleohabitats suggests an orientation to lake, marsh and riparian resources.

In Butte Valley, Nevada (Beck and Jones 1988), detailed mapping of early sites and systematic regional survey of both upland and lowland tracts helped to identify basin-wide land use patterns. Western Stemmed sites were not solely associated with prominent shorelines (some were on the edges of stream channels and alluvial terraces well above lakeshores), but all of them were found exclusively at lower elevations on the valley floor.

There is much we can learn from the distribution and geomorphic context of major Western Clovis and Western Stemmed sites in relation to the paleolandscape, even from the broadest of parameters. Results from the above mentioned investigations of surface sites or shallow deposits in numerous western pluvial lake basins have greatly increased our knowledge and understanding of Western Clovis and Western Stemmed culture and lifeways in the Far West. But few studies have incorporated detailed contextual mapping in relation to paleo-lake history in these western lake basins.

Paleoenvironmental Context of Clovis and Stemmed Period Sites in the Alkali Lake Basin

In Alkali Lake Basin, Oregon, extensive site survey, mapping, surface collection and stratigraphic study of fossil lake features has helped to reconstruct early human settlement patterns and lake history in the basin at the Pleistocene-Holocene boundary (Chapter III). The evidence suggests a terminal Pleistocene (Clovis) occupation at the Dietz site oriented to a small, shallow lake (Lake Koko) and marsh in the center of the Dietz sub-basin (Figure 34). This was followed by a substantial settlement of Western Stemmed groups along the shorelines of two larger, and closely sequent, shallow lakes which covered large portions of the northern Alkali Lake Basin (Figure 35). The 1316 m Sand Ridge Lake hypothesized for the earliest Western Stemmed occupation in the basin (Stage I) is supported by a radiocarbon date of 9,610±100 B.P. (AA-3932) on charcoal from a buried cultural occupation surface and paleosol at the Tucker Site (Site No. 65).

Hydrologic and Paleogeographic Parameters

Like the paleogeographic settings of other early sites in the western lake basins discussed above, the presence of ecologically-productive shallow lakes and marshes during Clovis and Stemmed occupations is strongly suggested by the Alkali Basin research. First of all, the northern sub-basin profile and topography, shallow, wide and well-drained, would have been well suited for marsh development. Small rises in water would have filled large areas with shallow standing water. Based on observations of the lack of accumulated salts and chemicals in the sedimentary deposits in the basin, Jonathan O. Davis has suggested that the northern Alkali sub-basin has been leaking groundwater to the south, or leaking surficial water through the sandy terraces which divide the sub-basins.

This possibility is best illustrated by a south-to-north profile across greater Alkali Lake Basin, from the highly chemical southern sub-basin, to the Dietz site (Figures 68 and 69). The northern sub-basin, where the Dietz site is located, is much higher in elevation than the central and southern sub-basins, and the paleohydrological connections hypothesized by Davis may very well have existed. If so, the northern sub-basin would have been constantly flushed fresh of chemicals and precipitates, especially in more mesic times when the large drainage due west of the Dietz site was more active.

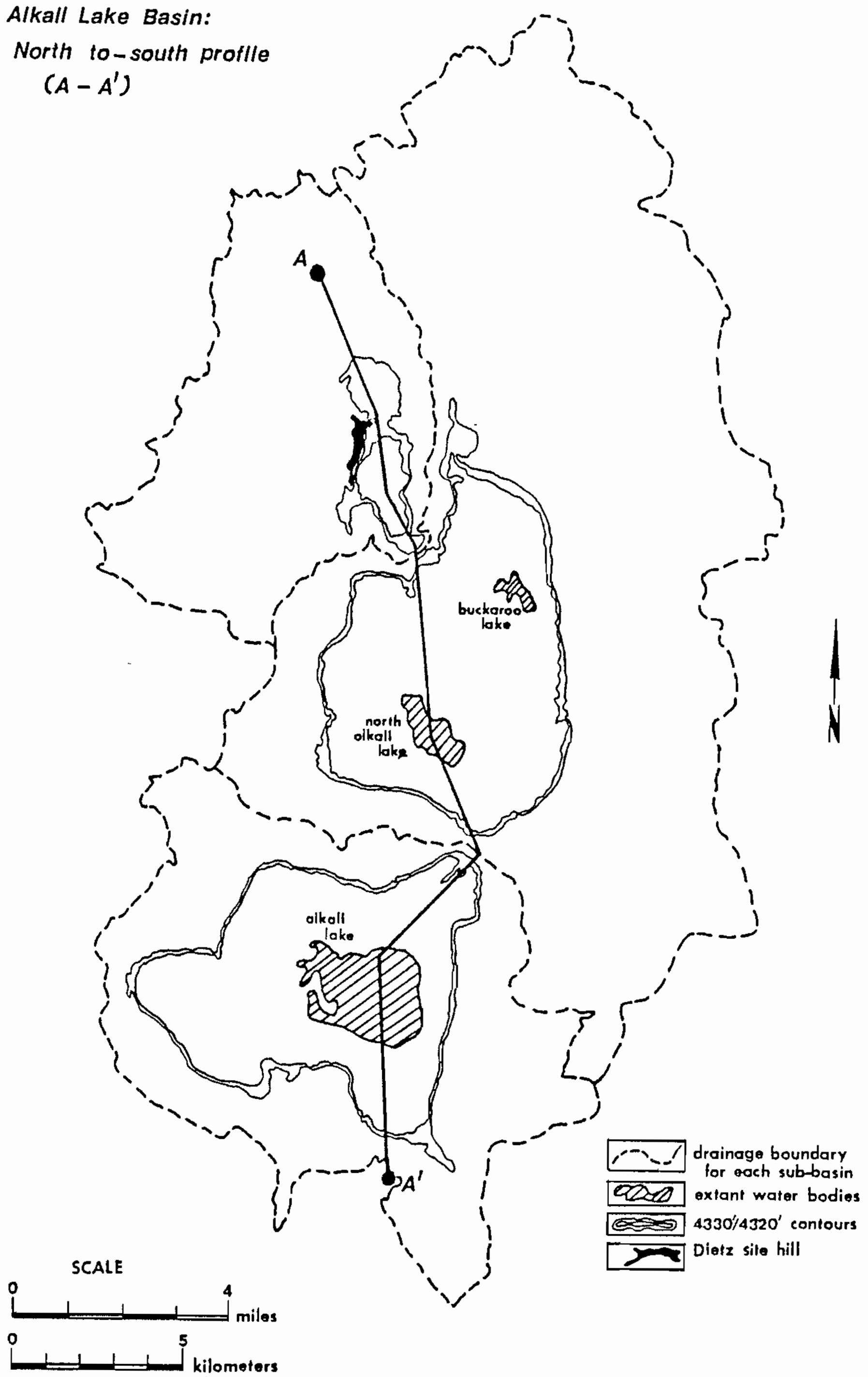


FIGURE 68. Location and Hydrological Setting of the Dietz Site in the Northern Alkali Lake Sub-basin, Showing the Location of the North-south Profile (A - A') in Figure 69

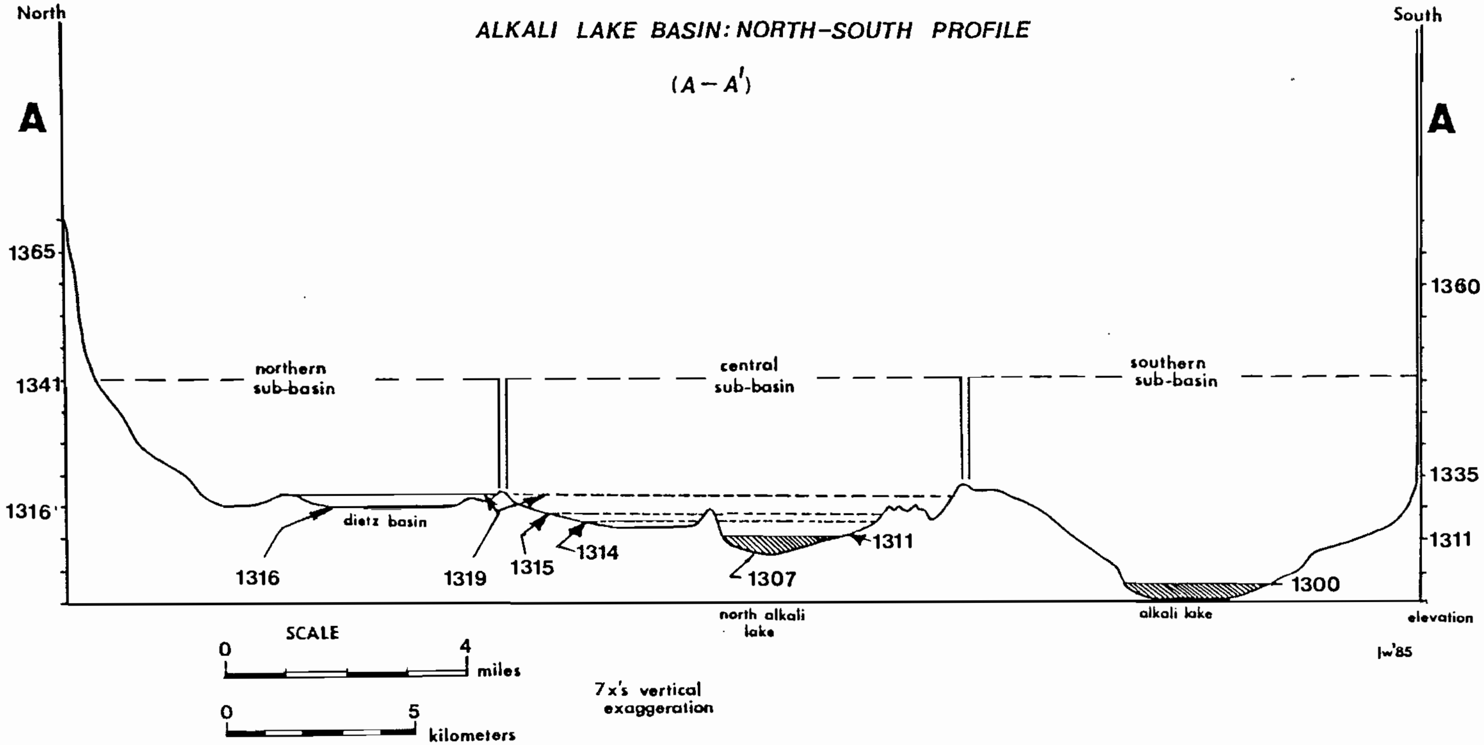


FIGURE 69. Basin-wide North-south Profile Across Greater Alkali Lake Basin, Showing Hydrological Setting of the Dietz Site in the Northern Sub-basin as Compared to the Central and Southern Sub-basins

Additionally, when the drainage divides for the three major sub-basins are examined, it is apparent that the drainage area/lake surface ratio for the northern sub-basin was at least 20 times greater than those for the central and southern sub-basins. With a lake level at 1323 m elevation (Figure 32), the drainage area/lake ratio for the central sub-basin is 3 to 1, and the ratio for the southern sub-basin is even less, at 2 to 1. This greater ratio for the northern sub-basin suggests that, all else being equal, the Dietz sub-basin would have been the best candidate for containing, and maintaining, a reliable source of water in the terminal Pleistocene.

Paleoecological Parameters of Fossil Remains

Some paleoecological information is available for the northern Alkali Lake Basin from identification of lake-marsh micro-fossils recovered from lake deposits associated with Clovis and Stemmed-era occupation surfaces. Faunal remains recovered from Unit 2 in the East Shore Trench (Locality 1) included small and large bones and fish scales. The grey ashy loam comprising Unit 2 represents the first shallow lake deposits in the basin following pluvial deep-lake conditions. The flake-bearing lakebed silts which lie immediately above Unit 2, at 1314.6 m to 1314.8 m elevation, are hypothesized as representing a buried Clovis-age occupation surface.

One large bone fragment from Unit 2 was identified by Amy Dansie of the Nevada State Museum (1987, personal communication) and by Dr. S. David Webb of the Florida State Museum (1989, personal communication). Both scholars agreed that the bone was too fragmentary for a species-level identification, but that it did represent the limb bone of a large terrestrial mammal, in the ungulate family of grazers, which could include horse, bison or camelid.

Other smaller bones from Unit 2 were identified as frog and fresh water fish by Dr. Ruth L. Greenspan of Oregon's Heritage Research Associates (1985, personal communication) and by Dr. Gerald R. Smith of the University of Michigan Museum of Zoology (1989, personal communication). In particular, Smith noted that two species of fish were represented: (1) the ceratohyal of Chasmistes breviroseris of the Catastomid family (suckers); and (2) the tooth of Gila bicolor, or tui chub, of the Cyprinidae family (minnows).

Greenspan (1985) has noted that the habitat range for Gila bicolor (tui chub) is too broad and unspecialized to be useful in paleoenvironmental reconstruction; but the parameters for Chasmistes sp. are slightly more informative. The latter species are primarily known as bottom feeders in the colder, deeper lakes of the pluvial period (Smith 1989, personal communication). The above data suggest the presence of shallow lake conditions in the northern Alkali Lake Basin just prior to Clovis occupation. This lake would have scoured the surface of older deep-water lakebed sediments, thereby incorporating fragments of cold, deep-water microfossils and late Pleistocene faunal remains into its deposits.

The Western Stemmed period paleosol at the Tucker Site (Locality 2) has been radiocarbon dated to 9,610±100 B.P. (AA-3932). The cultural deposits here produced numerous charred bones which were identified on a general level as small-to-medium mammals, probably rabbit, and some birds (Susanne J. Miller: Faunal Analysis Services, Idaho Falls, personal communication 1989). The bones provide indirect evidence for a diet which may have included small mammals and waterfowl, and further excavation is needed at this locality to obtain a larger sample of faunal remains, especially in association with cultural features and time-diagnostic point types.

Several gastropod shells were sampled from the structured lakebed silts which occur just below the Stemmed-era paleosol at the Tucker site. This silt-loam deposit may actually comprise the B-horizon of the paleosol (Figure 57). The gastropod shells were identified by Dr. Terrence J. Frest (Burke Museum, Seattle) as representing two different species: Oxyloma nuttalliana (Lea 1841) and Catinella avara (Say 1824). Both species are marsh-dwelling forms which cannot tolerate fully aquatic or fully terrestrial conditions. Living at the edges of wet springs, shallow lakes or marshes, they attach themselves to the surfaces of Scirpus sp. (bulrush) or Typha sp. (cattail). Their short lifespan of one year requires the presence of water year-round, or at least during the fall and spring. Both species are known today from The Dalles and Malheur Lake areas in Oregon.

Species of Catinella can tolerate much drier conditions than those of Oxyloma, but the presence of both species indicates relatively warm, shallow water conditions just prior to or during the first phase of Western Stemmed occupation in the basin from 10,000 to 9,500 B.P. In contrast, colder, full pluvial conditions would be indicated by recovery of the corresponding colder-water forms known from these genera; i.e. Oxyloma retusa and Catinella gelida (Frest, personal communication 1989).

Implications of Alkali Basin Lake History: How "neo" is the "Neopluvial"?

Alkali Lake Basin research has revealed the presence of four distinct sets of lake features in the basin which apparently postdate the last pluvial highstand represented by Lake Kevin (1320.8 m) and predate the onset of fully Altithermal conditions by 5,000 B.P. (Chapter III). The proposed lake sequence includes: (1) a shallow lake at 1314.8 m elevation (Lake Koko) associated with Clovis occupation from 11,500 to 11,000 B.P.; (2) two closely sequent lake levels associated with Western Stemmed occupation: the 1316 m Sand Ridge Lake dating from 10,000 to 9,500 B.P., and the 1315.4 m Lake Delaine dating from 8,500 to 8,000 B.P.; and (3) a post-occupational, transgressive lake at 1318 m (Big Cut Lake) occurring after the eruption of Mt. Mazama, about 6,500 B.P.

The data further indicate that the northern Alkali Lake Basin was not a place of choice after 7,000 B.P. and remained relatively dry until recent time. There is a conspicuous lack of cultural materials dating to time periods later than 6,000 B.P., and no evidence whatsoever for the presence of lake rises during the so-called "Neopluvial" period (4,500 to 3,000 B.P.) reported by Allison (1979, 1982) in the neighboring Fort Rock Basin.

This incongruence between the two basins was puzzling, because Alkali Basin research strongly suggests a long history of synchronous lake level fluctuations between these two basins (Chapter III). How was it possible that the two neighboring basins could share such a close correspondence in lake history for the last 12,000 years or more, and be so disjunct in the last 2500 years?

It may be hypothesized, based on the Alkali Basin research, that one of the three low-relief beach ridges described by Allison (1979:54) in the "Hand Area" of the Fort Rock Basin may correspond to the Big Cut Lake reconstructed in the Alkali Lake Basin. Allison notes that the Fort Rock Basin ridges contain secondary deposits of Mazama pumice sands and must therefore postdate the 6,800 B.P. eruption. But this does not necessarily mean that these lake levels must be as young as 4,000 to 3,000 B.P. In fact, it may be that all three of Allison's "Hand Area" lakes are of early Holocene age. These suggestions are intriguing and should be further investigated. Ongoing work in the Fort Rock Basin by Mehringer (1983) and others should provide valuable insights into these possibilities.

Lithic Sourcing Studies and Mobility Patterns of Clovis and Stemmed Period Sites in the Far West

There is much work yet to be done on lithic sourcing of early assemblages in the Far West, but this data base is growing. There is a definite preference reported for CCS at fluted point sites in southern Idaho (Titmus and Woods 1988), around China Lake, California (Davis 1978a) and Lake Tonopah, Nevada (Pendleton 1979). Source locations are not always known, but the 49 fluted points collected around Tulare Lake are made of local chert, while the 28 Lake Mohave points found in the same area include both local chert and local basalt (Riddell and Olsen 1969; Wallace and Riddell 1988).

Most of the fluted points from the Borax Lake site are made of local obsidian (Fredrickson 1987), and all of the identified sources for fluted points in the Mohave Desert are also clearly local, including both obsidian and chert (Warren and Phagan 1988). The predominance of local metavolcanic material is "nearly universal" in the Pinto-Lake Mohave sites investigated on Fort Irwin (Douglas et al. 1988). Western Stemmed points reported from Utah's Sevier Desert are also made of local obsidian (Simms 1988).

In Railroad Valley, Nevada, local basalt is preferred throughout the period from 11,000 to 7,000 B.P., with CCS preferred second and then obsidian (Zancanella 1988). Early artifacts from sites in nearby Butte Valley average 52% basalt, 32% CCS and 16% obsidian, and at least four local chert and basalt sources have been identified (Beck and Jones 1988). This pattern is the same for early sites in other nearby basin valleys (Price and Johnston 1988).

The Sunshine Locality in Long Valley, Nevada contains a wide variety of materials including obsidian, CCS and basalt, but projectile points are made primarily of basalt (48%) and CCS (37%), while CCS is the dominant material for crescents (96%) and beak-nosed gravers (90%) (Hutchinson 1988). Chert and basalt sources are locally abundant in Long Valley, and only the obsidian appears to be exotic to the area (York 1975, 1976).

In contrast, Basgall reports a broad range of obsidian sources utilized at the Komodo site, which is located directly on top of the

Casa Diablo quarry in Long Valley, California. Despite this proximity to a major source, 40% of the 34 artifacts sourced were from quarries that are 5 km, 40 km and 75 km distant, and showed a much greater source variability than later sites in the valley (Basgall 1988). Two obsidian fluted points from Tonopah were recently traced to the Queen Hill and Bodie Hill sources near the California-Nevada border (Tuohy 1988b).

At the Dietz site in Alkali Lake Basin, Fagan's (1988) analysis of debitage and artifacts from separate Clovis and Stemmed clusters at the Dietz site revealed distinctions in the use of local and exotic obsidian. Clovis clusters included numerous blanks and finished tools of exotic obsidian, with only a few blanks, scrapers, flute flakes and unfinished points made of local obsidian. The Clovis debitage suggests that numerous exotic blanks were reduced on site into finished tools, and that finished tools of exotic obsidian were resharpened, recycled or discarded on site after breakage.

In contrast, Western Stemmed clusters, although a smaller sample, indicated that numerous blanks and preforms of local obsidian were extensively reduced on site into finished tools. In both Clovis and Stemmed clusters, however, most cortex flakes were of local obsidian. These data, and those from elsewhere in the Far West, indicate that both Western Clovis and Western Stemmed groups knew the locations of local stone sources and used them frequently. Western Clovis assemblages generally include higher percentages of exotic materials than Western Stemmed sites. This is probably a reflection of greater range mobility or more extensive trade networks during the Clovis horizon.

Adaptive Strategies at the Pleistocene-Holocene Boundary: Prospects and Ruminations

Role of Early Big-game Hunting

The typology and intra-site variation of Far Western fluted point complexes compare favorably with those of Clovis-Llano, but the paleoenvironmental context and settlement pattern of major sites in western pluvial lake basins suggest that Western Clovis may also represent a regional, cultural-adaptational variant of the specialized big-game hunting tradition implied by "Llano". This lends support to earlier suggestions that the broad spectrum adaptation of later Western Archaic cultures may have its roots in Clovis time (Aikens 1978, 1983a; Daugherty 1962; Heizer and Baumhoff 1970; Jennings and Norbeck 1955). It is also in keeping with the Paleowestern and Paleoeastern distinctions in subsistence first suggested by Wormington (1957:20).

Lack of Association with Extinct Megafauna

There are still no acceptable data to demonstrate specialized hunting of large terrestrial fauna by Western Clovis or Western Stemmed people in the Far West, despite the claims that have been made (Dansie et al. 1988; Haynes 1988; Heizer and Baumhoff 1970; Jennings 1986; Jennings and Norbeck 1955). In the east, evidence for human exploitation of mastodon and mammoth is still extremely scarce, despite an abundance of both fluted point sites and proboscidean finds (Meltzer 1988:22). Only the Kimmswick site provides an unambiguous association of fluted points with mastodon remains, and yet there are other small mammals present here as well (Graham et al. 1981).

Evidence for Subsistence Diversity During Clovis Time

Many scholars have argued for a more generalized, broad spectrum subsistence strategy during Clovis time (Dent 1985; Gardner 1983; Griffin 1964; Meltzer and Smith 1986). There is evidence in the east for subsistence diversity during Clovis time (Meltzer 1988), with remains of caribou, birds and fish at Dutchess Quarry Cave (Kopper et al. 1978), giant land tortoise at Little Salt Spring (Clausen et al. 1979), and grape, hawthorn plum, hackberry and blackberry at Shawnee-Minisink (Dent 1985).

Even sites on the Plains and Southwest have produced evidence for a variety of both large and small game which would have supplemented the taking of an occasional mammoth, like the charred bear and rabbit bones recovered at Lehner, Arizona (Haynes 1980). The faunal assemblage at Blackwater Draw included deer, wolf, peccary, antelope, turtle, rodents and birds in addition to mammoth, bison, horse and camel. Haynes (1964) cautions, however, that these smaller animals could be from secondary deposits.

In the west, at Fishbone Cave, Nevada, fish, marmot and bird bones were found associated with a human burial wrapped in cedar bark which dated from 10,900±300 B.P. to 11,250±250 B.P. (Orr 1956, 1974).

At the Old Humboldt site in Nevada (26 Pe 670) one fluted point and two stemmed points were recovered from shallow alluvium in association with a small, diversified assemblage, including waterfowl egg, three species of rabbits, bison, 76 clams and one large Lahonton trout (Dansie 1987; Rusco and Davis 1987).

Furthermore, the environmental data suggest that it is also doubtful that the Far West could have ever supported extensive herds of large terrestrial grazers (Daugherty 1962; Haynes 1988; Meltzer 1988; Simms 1988), although there is evidence that such animals were present in small numbers and were probably taken opportunistically (Madsen 1982; Madsen et al. 1976). Simms (1988) points out that their availability would have been shifting and unpredictable through time and across space in the Great Basin. A strategy continuously dependent on large game would have been ecologically unlikely.

Conclusions

Based on the above data, the existence of a specialized "big-game hunting" strategy in the Far West must be seriously questioned. The data suggest that the reliance on hunting large game in the earliest periods was not significantly different from that documented for later "Archaic" periods. It is most likely that specialized big-game hunting strategy many archaeologists conceive as having been practiced by Western Clovis folk, and probably continent-wide groups as well, is more a myth than a reality.

Role of Early Lake-Marsh Adaptations

Sites yielding Western Clovis and Western Stemmed assemblages are not exclusively associated with lake or marsh features, and have been found in other environmental settings (Aikens 1983b; Beck and Jones 1988; Fagan and Sage 1974; Price and Johnston 1988; Zancanella 1988). But all of the sites containing major concentrations of fluted and stemmed points are located along the lowest strandlines of shrinking pluvial lakes or adjacent to the stream channels which would have fed these water bodies. Results of Alkali Basin research indicate a significant basin-wide lakeside settlement focus for Western Stemmed occupation, and a major lakeside camp in a similar lake-marsh setting at the Dietz site during Clovis time.

This settlement focus in relation to fossil streamside, swamp edge and lake margin habitats, and the lack of any definitive kill sites or clear association with extinct fauna, lends strong support to the notion of a "paleo-Archaic" adaptation present in the Far West by 11,000 B.P. But the demonstration of a lakeside and marsh-fringe settlement pattern for Western Stemmed, and possibly Western Clovis, occupants in the northern Alkali Lake Basin, is not being offered as a confirmation of Bedwell's concept of a specialized Western Pluvial Lakes (WPL) adaptation (*sensu* Heizer and Napton 1970; Napton 1969). Janetsky's (1986) summary provides some alternative views regarding lake-marsh adaptations in the Great Basin.

Implications of Alkali Basin Research for the WPL Concept

The unique lakeside and marsh fringe distribution of early sites in many western lake basins was the basis for Bedwell's formulation of the Western Pluvial Lakes Tradition, often referred to as WPL or WPLT (Bedwell 1970, 1973). There are two major problems embedded within the WPL concept. First of all, an economically-loaded term originally used to describe the occupants of lake systems in the southwestern Great Basin has been subsequently expanded by Hester (1973) and many others to designate Western Stemmed complexes throughout the Far West. The term "WPL" is now entrenched in the literature as a synonym for all Great Basin and California complexes containing stemmed points, regardless of their proximity to fossil lakeshores (see Price and Johnston 1988).

Moreover, the WPL concept implies a unique, specialized economic adaptation geared to lake, marsh and grassland resources which would have been abundant in southern lake systems. The facile application of an economic (adaptation-based) term to technological (typologically-based) complexes is a dangerous leap to make, especially since we know that cultures possessing nearly identical lithic complexes in the Plateau and elsewhere were clearly not lake-oriented by any means. The presence of lakeside or marsh fringe settlement patterns for the earliest inhabitants of the Far West does not necessarily confirm the specialized lake-marsh adaptation implied by the WPL concept.

Conclusions

Western Stemmed complexes have a very widespread distribution in the Far West, across many different environmental zones and ecological habitats, but there is much evidence for lake-marsh oriented settlement in many western lake basins. However, the presence of sites oriented to these lakeside or marsh-fringe settings does not automatically confirm the existence of a specialized economy geared to littoral habitats. While there is much evidence to link Western Stemmed people together on technological and cultural grounds, a specialized lakeside adaptation was not a likely possibility given the nature of climatic change at the Pleistocene-Holocene boundary.

If anything, these people seem to be linked by adaptation to a wide variety of habitats situated near these lake-marsh settings. Specifically, these lake-marsh settlement foci could represent the pivot points of flexible, wide-ranging, broad-spectrum strategies "tethered" to mesic habitats which contained reliable sources of food and water during a time of major environmental stress.

The Clovis-Archaic Interface: Myth or Reality?

The most important question which has been addressed here is that of the time depth of broad spectrum Archaic-like adaptations in the Far West. Current data suggest that Western Clovis and Western Stemmed settlement-subsistence strategies were not limited to specialized big-game hunting, lake-marsh exploitation or any other kind of narrow focus.

Broad-spectrum Archaic adaptive strategies have a very early beginning in Far Western North America (Aikens 1978, 1983a, 1983b; Jennings 1957, 1964; Jennings and Norbeck 1955). They are well established in the archaeological record by 8,500 to 7,000 B.P. at most California, Great Basin and Plateau sites, and as early as 9,000 to 10,000 B.P. at sites like the Dalles, Oregon (Cressman et al. 1960), Danger Cave, Utah (Jennings 1957) and Frightful Cave, Mexico (Taylor 1966). All of these sites fall within the time frame for the earliest Western Stemmed occupations in the Far West. There is no reason to think that this kind of strategy was not already in place by 11,000 B.P. during Western Clovis time, especially considering the temporal contiguity of the Western Clovis and Western Stemmed cultural traditions.

The absence of ground stone was once thought to be characteristic of these early complexes (Aikens 1983b; Bedwell 1970), thereby distinguishing them from later fully-developed Western Archaic cultures. But recent research has documented a significant number of occurrences of ground stone artifacts (metates and manos) in Western Stemmed assemblages (Price and Johnston 1988; Warren et al. 1989; Willig 1986, 1988, 1989). The strong and frequent co-occurrence of ground stone slabs and manos in direct association with Western Stemmed sites in the northern Alkali Basin is certainly significant in this regard.

Implications of the Paleoenvironment

The environmental history of the Far West from 12,000 to 7,000 B.P. is characterized by major, punctuated environmental change, including the desiccation of once-extensive pluvial lake systems and a steadily declining population of large terrestrial game (Benson and Thompson 1987a; Davis 1982a; Mehringer 1977, 1986; Meltzer and Mead 1983). The data suggest that changes in climate, flora and habitats at the Pleistocene-Holocene boundary were frequent, swift and dramatic, not gradual and complacent (Bryson et al. 1970). Additionally, these changes were not synchronous or uniform across the continent.

The pan-western outline of climatic change begins with terminal Pleistocene desiccation of lakes, rivers and springs from about 12,600 to 10,600 B.P., followed by a general trend toward aridity from 10,600 to 7,500 B.P. (Antevs 1925, 1948, 1955; Davis 1982a; Mehringer 1977, 1986; Morrison 1965a). But research in recent years has emphasized basin-specific reconstructions and local sub-regional variation and these studies have greatly expanded and refined our knowledge of late Pleistocene and early Holocene lake history (Aikens 1983a; Jennings 1986; Madsen and O'Connell 1982). The most recent updates of Lahontan Basin data include work by Benson and Thompson (1987b), Dansie, Davis and Stafford (1988), Thompson and others (1986) and work in the Stillwater Marsh region by Raven, Elston and others (1988). Currey and Oviatt (1985) provide a summary of Bonneville Basin data.

It is now clear that, despite an apparent synchrony of changes in lake levels, glacial episodes and atmospheric circulation patterns, there were marked differences in lake history and conditions in each basin. The expansions and recessions of lake levels in individual basins varied considerably in the rate and degree of hydrologic changes, in concert with a number of local factors, including: 1) precipitation and evaporation ratios; 2) basin geometry and geologic substrate; 3) size and elevational relief of contributing watersheds; and 4) the balance of surface to subsurface inflow (Benson 1978, 1981; Smith and Street-Perrott 1983).

In the northern Great Basin there is much environmental evidence to support the presence of extensive shallow lake and marsh habitats at the Pleistocene-Holocene boundary. But the micro-climate of each lake basin would have differentially affected local resources, which is why careful reconstruction of basin-specific lake history and environment within the Western Clovis and Western Stemmed time frame has significant bearing upon our interpretations of paleoeconomy and lifeway. Fluctuations in the size and stability of these shallow basin lakes and marshes would have greatly affected the paleo-economy and settlement pattern of local Clovis and Stemmed-era populations by controlling the abundance and distribution of critical food and water resources (Madsen 1982; Weide 1968, 1974).

Mehringer (1986:31) has eloquently described the cultural and environmental history of the Great Basin as one characterized by successive human adaptive responses to a continuum of environmental changes involving "sharp, punctuated" climatic events. In fact, the only thing which remained constant throughout the early post-glacial environmental history of the Far West was change itself. This variability may have been the most important factor in "shaping cultural or technological adaptations" (Mehringer 1977:148).

Conclusions

If the data suggest that Western Clovis and Western Stemmed groups were neither specialized big-game hunters nor free-wandering nomads (Kelly and Todd 1988), and that they practiced economies which were more diversified than was once thought, then just how different were these cultures from the lifeways described in later periods as Archaic? I maintain that the Clovis-Archaic interface is more a myth than a reality.

In a situation of punctuated change and fluctuations in lake levels, both people and fauna alike would have been attracted to dependable food and water sources for obvious reasons. But the environmental data also suggest that local distributions and availability of water, and thereby lake-marsh resources, were probably not stable and predictable enough to support the specialized lifeway assumed by Bedwell (1970, 1973).

It is hypothesized here that, during a time of increasing aridity and frequent environmental change, related cultural groups throughout the Far West would have maximized success by retaining flexible, wide-ranging, adaptive strategies geared to a broad spectrum of available resources, but "tethered" (sensu Taylor 1964) to mesic habitats containing reliable sources of food and water. In western pluvial lake basins, including those of southern Arizona and New Mexico, the pivot of this tether would have been the biotically-rich littoral zones associated with shallow lake and marsh systems, and the streams which fed them.

Paleo-Archaic Adaptations at the Pleistocene-Holocene Boundary in Far Western North America: A Model of Broad Spectrum Tethered Foraging with a Mesic Focus

Some envision the earliest cultures in North America, especially Clovis people, as wide-ranging, highly mobile generalists with a specialized focus on hunting large terrestrial mammals, but with an opportunistic stance in relation to all other food resources (Kelly and Todd 1988). This kind of strategy would be the most efficient way to accommodate periodic resource stresses caused by late Pleistocene environmental changes, and probably best explains the situation for the very brief period envisioned for initial Clovis colonizers.

But an interpretation of highly mobile "free wandering" groups (Beardsley et al. 1956) does not seem to be an accurate interpretation of the available data for Western Clovis and Western Stemmed periods in the Far West. Lithic sourcing studies conducted so far reveal a preference for local sources of tool stone by both Western Clovis and Western Stemmed people, although Clovis assemblages contain stone from a greater number of exotic locales. This implies that both populations had a specific knowledge of local resources and that they returned to them repeatedly.

In order to ensure continued survival during a time of rapidly increasing aridity and unpredictable, punctuated climatic change, the earliest Clovis folk and their successors would have had to learn about and adapt very quickly to local and regional "menus" and ecological niches. Human groups already accustomed to flexible foraging practices within a large range, would have quickly and naturally gravitated, along with the game they hunted, to places where hydrologic and geomorphic conditions were well suited for maintaining stable, concentrated patches or "sweet spots" of edible foods and fresh water.

These early people could have easily "tethered" themselves to these mesic "sweet spots" while still maintaining wide-ranging logistical foraging within each region. In well-watered settings where an abundance and diversity of resources could be found in one concentrated area, the earliest Clovis inhabitants could have practiced a diversified hunting and gathering lifeway keyed to locally available fish, fowl and vegetal foods, in addition to both large and small game animals drawn to localities as favorable watering sources. In Florida, fluted point sites distinctly cluster near limestone sinkholes containing potable water, and in close proximity to major lithic sources (Dunbar 1989). Similar scenarios are proposed for Clovis sites in the Great Lakes and Maritimes regions of northeastern North America (Keenlyside 1989; Storck 1984, 1989).

Changes in local hydrologic conditions, and therefore local resources, would have required periodic shifts in the pivot of the "tether" to more productive locations (Willig 1988, 1989). When conditions changed for the worse in one lake basin, the search would begin for a new spot. This kind of adaptive strategy would produce a few large, redundantly utilized campsites in key spots, and many small, logistical sites which are less "visible" in the archaeological record (Binford 1980) -- the pattern currently reflected in the western record.

In this light, the western lake-marsh settlement focus is not seen as a specialized strategy limited to these habitats, but as one regional manifestation of a larger, more encompassing, broad spectrum adaptation which existed throughout the Far West in the early Holocene, and probably the late Pleistocene as well. All of these early cultural groups may be seen as being linked by generalized adaptations to a wide variety of habitats situated near critical water sources. In this sense, the WPL concept is too specialized and limiting a description to encompass the full range of diversity and variability in settlement-subsistence strategies which may have been practiced by the earliest occupants of Far Western North America.

In the Plateau and other regions like the Snake River Plain, the pivot of this tethered strategy can be translated into a riverine focus. Most of the early Holocene sites are concentrated in the eastern portion of the Plateau which was wetter, cooler and ecologically more diverse (Ames 1981). The few exceptions to this pattern, like the Lind Coulee site in Washington (Daugherty 1956), are located in unique settings where atypically mesic conditions prevailed. In places where ecological conditions more closely mimicked Plains resources, like the Oywhee Uplands of Oregon and Idaho, there are Plano-like influences in early Holocene assemblages, such as those from Dirty Shame Rockshelter (Hanes 1988a, 1988b). This comes as no surprise since this region would have easily supported larger herds of bison and camel for late Plano hunters (Butler 1972, 1976).

In other places, like California's North Coast Range, conditions were perhaps too cool and mesic to support abundant food resources. There are very few sites occurring before 6,500 B.P. in the vicinity of Borax and Clear Lakes -- a low population density explainable by the presence of dense boreal coniferous forests throughout most of the area during this time, which would have placed severe constraints on early land use (Fredrickson and White 1988). The California situation is very similar to the scenario depicted by Meltzer (1988) to explain low density of Clovis populations in the southeastern United States.

Conclusions

Detailed paleoenvironmental and stratigraphic studies of Western Clovis and Western Stemmed occupation patterns in the northern Alkali Lake Basin support earlier suggestions that the broad spectrum adaptation of later Western Archaic cultures may have its roots in Clovis time (Aikens 1978, 1983a; Daugherty 1962; Heizer and Baumhoff 1970; Jennings and Norbeck 1955). It can be hypothesized that the earliest occupants of Far Western North America developed generalized, broad spectrum adaptive strategies much earlier than was once thought.

Initial Clovis colonizers, already accustomed from the outset to flexible hunting and foraging practices within a large range, would have naturally gravitated, like the game they hunted, to mesic habitats ("sweet spots") containing concentrations of food and water. Both Western Clovis and later Western Stemmed people living at the Pleistocene-Holocene boundary in Far Western North America would have had to remain flexible enough to change quickly, not gradually, in concert with the emerging mosaic of regional environmental resources so characteristic of the Pleistocene-Holocene boundary.

In western pluvial lake basins, Clovis folk would have maximized success by retaining a flexible wide-ranging strategy while "tethered" to mesic micro-environments where a wide range of food and water resources were concentrated and maintained despite increasing aridity. Such an early development of Archaic style broad-spectrum adaptation would be a natural outgrowth of the variability and regional diversity which characterizes the environmental history of the Far West over the last 12,000 years.

Over the past thirty years, the Desert Culture concept (Jennings 1957, 1964) has been the catalyst for, and focus of, lengthy and intensive criticism and debate (Aikens 1970, 1978; Jennings 1973). But if we interpret the "desert" less literally, and focus more on the basic notions of the concept -- like the inception of "Archaic" broad spectrum strategies -- it becomes apparent that this "useful hypothesis" (Jennings 1973) still retains its original value and explanatory power. The recognition of broad spectrum adaptations in the Far West as early as 11,500 B.P. extends the notions of cultural continuity and adaptability so essential to the Desert Culture concept. It means that the foundations of the Western Archaic were already in place at a time when the "desert" as we know it now was just coming into being. Diversification through time in technology and culture, in concert with environmental change, eventually culminated in the development of full-blown Western Archaic adaptations out of this basal "paleo-Archaic" foundation.

APPENDIX A

STADIA SURVEY DATA

Instruments Used and Standards of Error

Transit Level Loops

The first phase of stadia survey in the northern Alkali Lake Basin involved the establishment of a basin-wide network of datum points tied to the Dietz site datum and baseline, and to USGS benchmarks. These various datum stations were tied together through a system of closed transit level loops utilizing a K and E Paragon 1000 (Mountain) Transit.

EDM Stadia Mapping

The second phase involved the actual recording of over 1800 sub-station stadia shots made from each named datum station, such as "Elaine", "Ron" and so on. This was accomplished through the use of a T-16 Theodolite Transit, a McHenry 1E Electronic Laser Distance Meter (EDM), and a Nikkon Triple Prism.

Standards of Error

The majority of field survey and all subsequent stadia reductions and calculations were completed by Mr. Wayne R. Tucker, who has provided the following information on standards of error for Dietz Project survey and mapping. The west-east transect (150N) which was placed perpendicular to the Dietz site baseline was the basis for testing the standard of accuracy between the two above named systems of vertical measurement used in Alkali Basin survey; i.e. closed transit level loops and EDM stadia survey. Duplicate measurements of several long profiles in the basin were made using both the transit and EDM stadia methods, beginning and ending on the same set of benchmarks for comparability.

Systematic Errors

The normal acceptable standard of error is 1:5,500, or an error of one meter in every 5,500 meters distance (Tucker 1987). The standard of accuracy first calculated by Tucker in the field for the closed transit level loops was 1:10,000. But subsequent calculations and comparisons of duplicate system measurements in the laboratory demonstrated that the transit level loops had, in fact, not met the 1:5,500 standard first set in the field. Instead, it was found that the transit level loops averaged 1:1,000. This was in stark contrast to the remarkable accuracy in closures produced by the EDM stadia which averaged 1:32,000 vertically and 1:140,000 horizontally.

Human Errors

A second series of errors were discovered through comparison of duplicate measurements, most often relating to mistakes made in the reduction of stadia and calculations made in the lab, after the completion of fieldwork.

Vertical and Horizontal Adjustments

Based on multiple cross-checks using EDM data, the following rotational adjustments were made for vertical elevation values at several of the sub-station datum points:

1. All shots made from "Wayne" were internally correct, but consistently .82 m higher than the established baseline stadia system at the Dietz site. These shots (#487-603 and #1000-1040) were adjusted accordingly. New vertical values consistently matched within 1 to 2 cm with the established baseline system values. This error was a result of a poor level loop connecting "Wayne" to "Ron", with a low standard of accuracy calculated at 1:600.

2. A series of shots made from sub-station A' were internally correct, but were consistently 1.22 m higher than the established baseline system. After much cross-checking, this error was found to be of human origin. Laboratory stadia reductions for these shots had used a long-pole value (2.44 m), instead of the short-pole value (1.22 m). Reference to the original field notes confirmed the fact that a short pole, not a long pole, had been used in the field. These shots (#743-764; and #794-985) were adjusted accordingly. New vertical values consistently matched within 1 to 5 cm with the established baseline system of values.

3. A series of stadia shots from the 150N/800E sub-station (#1469-1624) and from the 130N/000E sub-station (#1625-1726) were found to be consistently correct in vertical values, but incorrect in horizontal measurements. Cross-checking indicated that the source of the error was in a reversed horizontal angle used in calculating the values in the lab; i.e human error. These shots were adjusted accordingly and the resulting horizontal values matched to within 10-30 cm with the established baseline values.

4. A series of shots made from "Elaine" (#716-721; and #1174-1214) were found to be horizontally correct but elevation values were consistently 64-78 cm too low. Further cross-checks were made, and the conclusion reached was that the error was due to poor transit loop measurements connecting "Elaine" to the basin-wide network. Resulting adjustments matched within 2-10 cm with the established baseline system of values.

Conclusions

The results of stadia mapping and survey in the northern Alkali Lake Basin revealed the following: (1) basin-wide programs like these require a great deal of preparation and fieldwork, but the rewards can be great; (2) the remarkable accuracy of the EDM suggests that only laser-quality instruments should be trusted in basin-wide programs such as these; and (3) resulting errors can be both human and systematic in origin, and can be corrected if enough duplicate shots are made from multiple stations in the field. It is recommended that other research projects incorporate as many duplicate check shots as time and logistics will allow.

APPENDIX B

ALKALI LAKE BASIN SITE DATA

Descriptions of all archaeological sites discovered and recorded through Alkali Basin research are presented below. These data were compiled as part of the National Register District Nomination prepared for the northern Alkali Lake Basin. A complete set of full size illustrations for all time-diagnostic point types and other artifacts recovered in the northern Alkali Lake Basin is included in Appendix C. All drawings are the artistic products of Wyndeth V. Moisan.

Dietz Archaeological Site (35 LK 1529)

Location: The Dietz site is the largest lithic scatter of the northern sub-basin and the reason behind the extensive research and testing which has been conducted in this vicinity since May 1983. The site is located within the now-dry northern sub-basin of Pluvial Lake Alkali in the northern Great Basin of east-central Oregon about 10 miles southwest of Wagontire, Oregon. The core area of the site occupies the crest and eastern flank of a large, prominent north-south trending volcanic fault block hill.

There are two distinct beach terraces on the hill's eastern flank: 1) a 1332 m to 1330 m erosional wave-cut bench just below the tuffaceous rock outcrops at the crest of the hill; and 2) a 1317 m to 1322 m wave-built (constructional) terrace just below this, which slopes gently down and merges with the playa floor about 150 meters to the east. The site area extends for 1.5 kilometers north-south, following the curve of the fossil shoreline, and extends as far out as 500 meters to the east out onto level playa floor.

Artifact density and distribution: The density of artifacts at the Dietz site is staggering. The core area of the site extends for over 1.5 kilometers north-south and over .5 kilometers east-west (750,000 square meters). Many, thousands of flakes, in a wide variety of raw materials, occur in discrete lithic clusters throughout the site area, with fluted artifacts tending to be concentrated along the lower elevations (as low as 1314.8 m elevation) and the Great Basin Stemmed artifacts tending to be concentrated in a wider zone which encompasses areas that are higher in elevation (i.e. above 1316 m).

It was first thought that the stemmed artifacts occurred exclusively at or above 1319 m elevation, overlapping with fluted artifacts in a very narrow zone at or near 1319 m to 1317 m elevation. However, it is now clear, from extensive shore surveys and continued additional work at the site undertaken by Willig, that the Stemmed artifacts occur over a very wide zone anywhere from points well above 1320 m elevation, as far down as 1315.4 m elevation on the playa floor (Willig 1986). Research has integrated data into a model of late Pleistocene and early Holocene lake history and settlement pattern postulated for these earliest inhabitants of the northern Alkali Lake Basin.

Vegetation: The site encompasses a variety of vegetation depending on the distance from the base of the hill and kind of substrate involved: i.e. hardpacked silty playa floor, loose dune re-worked beach sands or gravelly lithosols at the crest of the hill. In general, as one moves from the base of the Dietz hill eastward, vegetation changes from: 1) a mixed zone of rabbitbrush, greasewood and sage with some grasses (on the lower beach terrace); 2) to a zone dominated by tall sage and rabbitbrush, with some greasewood and more grasses (dune re-worked beach sands); 3) to rabbitbrush dominated playa floor, with some small greasewood and small sage.

Tools collected: To date, at least 329 artifacts have been collected and documented from the Dietz site. Of these, 60 are fluted point fragments and 32 are Western Stemmed artifacts. The rest include: 99 biface fragments, 33 non-diagnostic projectile point fragments, 18 flakes (mostly utilized flakes, with some overshot flakes and blades), 14 ground stone fragments associated directly with Western Stemmed lithic clusters, 4 large scrapers, 6 corner-notched points, 6 Humboldt concave base points, 2 Pinto points and 3 large side-notched points. In addition, the discarded remnants of a collector's stash were discovered in a historic, recent campsite (Juniper Pole Camp) near the Four Corners Well road where it transects the site along the lower beach terrace. Four very recent, small corner-notched points were found in this scatter. In addition, thousands of point-plotted flakes have been collected during the 1984 and 1985 field seasons.

Legal description: The site area covers three Sections of Township 28S, Range 23E, broken up into the following segments:

1. Northern tip: SW 1/4 SE 1/4 NE 1/4 NE 1/4 Section 6.
2. North-central portion: Almost entire portion of SE 1/4 NE 1/4 Section 6.
3. Northwestern portion:
   a. SE 1/4 NE 1/4 SW 1/4 NE 1/4 Section 6.
   b. SE 1/4 SW 1/4 NE 1/4 Section 6.
4. South-central portion:
   a. NW 1/4 NE 1/4 SE 1/4 Section 6.
   b. NE 1/4 NE 1/4 SE 1/4 Section 6.
   c. SW 1/4 NE 1/4 SE 1/4 Section 6.

5. North-central portion:
    a. NE 1/4 NW 1/4 SE 1/4 Section 6.
    b. SE 1/4 NW 1/4 SE 1/4 Section 6.
    c. Eastern portion NW 1/4 NW 1/4 SE 1/4 Section 6.
    d. Eastern half SW 1/4 NW 1/4 SE 1/4 Section 6.
6. Far eastern tip:
    a. SW 1/4 SW 1/4 SW 1/4 NW 1/4 Section 5.
    b. NW 1/4 NW 1/4 NW 1/4 SW 1/4 Section 5.
7. Southeastern portion:
    a. NW 1/4 SE 1/4 SE 1/4 Section 6.
    b. SW 1/4 SE 1/4 SE 1/4 Section 6.
8. Southwestern portion:
    a. NE 1/4 SW 1/4 SE 1/4 Section 6.
    b. SE 1/4 SW 1/4 SE 1/4 Section 6.
    c. Eastern half NW 1/4 SW 1/4 SE 1/4 Section 6.
    d. Eastern half SW 1/4 SW 1/4 SE 1/4 Section 6.
9. Southern tip: NW 1/4 NW 1/4 NE 1/4 Section 7.
10. Far southern tip: NW 1/4 SW 1/4 NW 1/4 NE 1/4 Section 7.

Because the Dietz site is over 10 acres in size, a 7-sided polygon has been drawn around the site boundaries for UTM corner measurements. Beginning in the north and moving clockwise, these 7 UTM corners are as follows:

1.	northing	4784400	easting	741280
2.	northing	4784120	easting	741320
3.	northing	4783850	easting	741540
4.	northing	4782340	easting	740770
5.	northing	4781635	easting	740725
6.	northing	4781650	easting	740520
7.	northing	4784070	easting	740780

Cultural affinity: The Dietz site is primarily a two-component site assignable to the Western Stemmed cultural tradition dating from 10,500 to 7,000 B.P. and the Western Clovis cultural tradition dating roughly from 11,500 to 11,000 B.P. The few later period point types recovered in good context (6 large corner-notched, 6 Humboldt concave base, 2 Pinto and 3 large Side-notched points) make up a very small percentage of all tools collected.

OTHER ALKALI LAKE BASIN SITES

The site descriptions that follow have been given Oregon State Museum of Anthropology accession number prefix of #490. Example: The accession number for Site No. 48 is #490-48, while the number for Site No. 49 is #490-49. Diagnostic tools collected at each site are numbered consecutively, beginning with the first tool collected from the first site (490-1-1) and ending with the last tool collected at the last site (490-92-215). The number following each site in parentheses refers to the original field designation(s) for that site.

SITE NO. 1 (Locality 2: 7-20-85):

Description: Small lithic scatter in a large fluvial wash area just 80 meters below and to the northeast of an isolated find of a Pinto style point (490-68-191) and 100 meters south of the northernmost sandy beach ridge which forms a continuation of the northern Dietz sub-basin spit.
Artifact density: 50 obsidian flakes in a 40 meter x 40 meter area (1600 square meters).
Vegetation: Very little, with a few grasses and some small rabbitbrush.
Tools collected: One stemmed point base (#490-1-1), one obsidian fluted point preform with fluting scars (#490-1-2), and one other obsidian blank/preform (#490-1-3).
Legal description: SE 1/4 SE 1/4 NE 1/4 NE 1/4 Section 6, Township 28S, Range 23E. UTM co-ordinates: northing 4784340, easting 741350.
Cultural affinity: A two-component site dating to both the Western Stemmed culture, dating from 10,800-7,500 B.P., and the Western Clovis culture, dating from about 11,500 to 11,000 B.P.

SITE NO. 2 (Locality 4: 7-20-85):

Description: Small lithic scatter located along the northernmost beach ridge about halfway across the Dietz sub-basin in an area where the ridge flattens out 400 meters due west of a southwest-to-northeast trending fenceline which transects the sub-basin.
Artifact density: 10 obsidian flakes in a 20 meter x 20 meter area (400 square meters).
Vegetation: Rabbitbrush dominates with a few large sage.
Tools collected: None because no diagnostic styles were observed.
Legal description: NW 1/4 NE 1/4 SE 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784300, easting 742100.
Cultural affinity: Unknown at this time.

SITE NO. 3 (Locality 5: 7-20-85):

Description: Small lithic scatter about 120 meters east-southeast of Site No. 2 on the same northernmost beach ridge 280 meters due west of the same southwest-northeast trending fenceline.
Artifact density: 25 obsidian flakes in a 20 meter x 20 meter area (400 square meters).
Vegetation: Rabbitbrush dominates with a few large sage.
Tools collected: None because no diagnostic styles were observed.
Legal description: West portion of site is located in the east central portion of the NE 1/4 SE 1/4 NW 1/4 Section 5, Township 28S, Range 23E. The east portion of site is located in the west central portion of the NW 1/4 SW 1/4 NE 1/4 of Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784240, easting 742210.
Cultural affinity: Unknown at this time.

SITE NO. 4 (Locality 6: 7-20-85):

Description: Small lithic scatter located where the northernmost beach ridge meets the southwest-northeast running fenceline.
Artifact density: 40 obsidian flakes in a 30 meter x 10 meter area (300 square meters).
Vegetation: Consists of an even mixture of sage and rabbitbrush.
Tools collected: Humboldt Concave Base point and midsection (#490-4-4).
Legal description: West portion of site is located in east central portion of SW 1/4 SW 1/4 NE 1/4 Section 5, Township 28S, Range 23E. East portion of site is located in west central portion of SE 1/4 SW 1/4 NE 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784040, easting 742390.
Cultural affinity: Early Humboldt Period is now said to date as early as 8,000 to 6,000 B.P. (Hanes 1988a; Holmer 1978, 1986; Layton 1970).

SITE NO. 5 (Locality 8: 7-20-85):

Description: Small lithic scatter located in the north-central portion of the southernmost dune/beach ridge 550 meters due west of the southwest-northeast trending fenceline.
Artifact density: 50 obsidian flakes in a 40 meter x 40 meter area (1600 square meters).
Vegetation: Rabbitbrush dominates with a few large sage.
Tools collected: Large corner-notched (Elko Series) projectile point of obsidian (#490-5-5).
Legal description: SW 1/4 SW 1/4 SE 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4783970, easting 741870.
Cultural affinity: Great Basin Elko Series points (Elko corner-notched) have been dated from 3500-1500 B.P., or as early as 8,000 to 6,500 B.P. (Hanes 1988a; Holmer 1978, 1986).

SITE NO. 6 (Locality 9: 7-20-85):

Description: Small lithic scatter 70 meters due west of Site No. 5 on the southern flank of the southernmost dune/beach ridge.
Artifact density: 60 obsidian flakes in a 40 meter x 40 meter area (1600 square meters).
Vegetation: Rabbitbrush dominates with a few large sage.
Tools collected: None because no diagnostic styles were observed.
Legal description: SE 1/4 SE 1/4 SW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4783970, easting 741780.
Cultural affinity: Unknown at this time.

SITE NO. 7 (Locality 10a: 7-20-85):

Description: Small lithic scatter 140 meters north-northeast of Site No. 6 near the crest of the southern dune/beach ridge.
Artifact density: 150 flakes in a 30 meter x 30 meter area (900 square meters).
Vegetation: Even mixture of large sage and rabbitbrush.
Tools collected: Cougar Mountain stemmed point base of grey-black obsidian (#490-7-6).
Legal description: West portion of site is located in the east central portion of the SW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. East portion of site is located in the west central portion of the SE 1/4 NW 1/4 of Section 5, Township 28S, Range 23E.
UTM co-ordinates: northing 4784115, easting 741820.
Cultural affinity: Western Stemmed culture dating from 10,800-7,500 B.P.

SITE NO. 8 (Locality 10b: 7-20-85):

Description: Small lithic scatter 150 meters downslope and southwest of Site No. 7 along the same southernmost dune/beach ridge.
Artifact density: 10 obsidian flakes in a 30 meter x 10 meter area (300 square meters).
Vegetation: Even mixture of large sage and rabbitbrush.
Tools collected: Large obsidian biface fragment.
Legal description: NW 1/4 SE 1/4 SW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784045, easting 741670.
Cultural affinity: Unknown at this time.

SITE NO. 9 (Locality 11: 7-20-85):

Description: Large lithic scatter located between the northern and southern beach ridges on the west flank of a fluvial wash zone which cuts into both beach ridges at this point.
Artifact density: Over 300 flakes, mostly obsidian, in an area measuring 160 meters x 40 meters (6400 square meters).
Vegetation: Very little--a few grasses, some rabbitbrush and mostly sage.
Tools collected: None because no diagnostic styles were observed.
Legal description: North central portion of the eastern half of SW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784145, easting 741730.
Cultural affinity: Unknown at this time.

SITE NO. 10 (Locality 12: 7-20-85):

Description: Small lithic scatter near the southern edge of a large, prominent southeast-northwest trending fluvial wash area -- 150 meters due east of the easternmost extent of the Dietz site (35 Lk 1359); 200 meters southwest of Site No. 9 and 100 meters due west of Site No. 8.
Artifact density: 10 obsidian flakes in a 10 meter x 20 meter area (200 square meters).
Vegetation: Very little--a few grasses, some rabbitbrush and mostly sage.
Tools collected: None because no diagnostic styles were observed.
Legal description: East central portion of the SW 1/4 SW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784000, easting 741560.
Cultural affinity: Unknown at this time.

SITE NO. 11 (Locality 13: 7-20-85):

Description: Small lithic scatter 120 meters northwest of Site No. 10 on the western fringe of a large fluvial wash zone.
Artifact density: 25 obsidian flakes in a 10 meter x 20 meter area (200 square meters).
Vegetation: Very little--a few grasses, some rabbitbrush and mostly sage.
Tools collected: None because no diagnostic styles were observed.
Legal description: NW 1/4 SW 1/4 SW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784040, easting 741475.
Cultural affinity: Unknown at this time.

SITE NO. 12 (Locality 14: 7-20-85):

Description: Large lithic scatter 120 meters due north of Site No. 11 at the northern end of the large, prominent fluvial wash area and 100 meters due east of the Dietz site lithic scatter.
Artifact density: Over 100 obsidian flakes in a 60 meter x 100 meter area (6000 square meters).
Vegetation: Very little--some grasses and rabbitbrush and mostly sage.
Tools collected: Lake Mohave-like stemmed point base (#490-12-8).
Legal description: SW 1/4 NW 1/4 SW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784155, easting 741440.
Cultural affinity: Western Stemmed culture dating from 10,800-7,500 B.P.

SITE NO. 13 (Locality 1: 7-23-85):

Description: Small lithic scatter on the southern flank of the southernmost dune/beach ridge 90 meters due east of the southwest-northeast trending fenceline and 200 meters southwest of a series of large dunes which cap the northernmost beach ridge.
Artifact density: Over 75 obsidian flakes in a 35 meter x 30 meter area (1050 square meters).
Vegetation: Rabbitbrush and sage dominate.
Tools collected: One resharpened Cascade point (#490-13-9) and a Humboldt Concave Base point (#490-13-10), both of obsidian. Tools which were observed but not collected include: one stemmed point base, one possible crescent fragment and one biface fragment.
Legal description: SW 1/4 NE 1/4 NW 1/4 SE 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4783760, easting 742480.
Cultural affinity: Transitional period between the last phase of Western Stemmed culture, with Cascade point and early Humboldt both representing the period from 8,000 to 7,000 B.P. (Hanes 1988a; Holmer 1986).

SITE NO. 14 (Locality 2: 7-23-85):

Description: Small lithic scatter located in the southeastern portion of a small dune area near the crest of the northernmost beach ridge 200 meters northeast of Site No. 13.
Artifact density: Over 100 obsidian flakes in a 50 meter x 50 meter area (2500 square meters).
Vegetation: Rabbitbrush and sage dominate with some Indian ricegrass, and other small grasses.
Tools collected: None because no diagnostic styles were observed.
Legal description: NE 1/4 NE 1/4 NW 1/4 SE 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4783890, easting 742590.
Cultural affinity: Unknown at this time.

SITE NO. 15 (Locality 3: 7-23-85):

Description: Small lithic scatter in a small dune area 140 meters north-northeast of Site No. 14 just over the crest of the northernmost beach ridge.
Artifact density: Over 50 obsidian flakes in a 50 meter x 40 meter area (2000 square meters). Some of the flakes have been washed down a small gully to the southwest.
Vegetation: Rabbitbrush and sage dominate with some Indian ricegrass and other small grasses.
Tools collected: None because no diagnostic styles were observed. However, a large rock slab of volcanic tuff (#490-15-216) was observed and appeared to have been ground; but this was not collected.

Legal description: North central portion of NW 1/4 NE 1/4 SE 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4783940, easting 742720.
Cultural affinity: Unknown at this time.

SITE NO. 16 (Locality 4: 7-23-85):

Description: Small lithic scatter located within the fluvial wash zone between two southeast-northwest trending dunes 420 meters due north of a large, prominent arm of a steep hill (similar to the "nose" at the Dietz site) where the toe of the hill meets the far eastern shoreline of the Dietz sub-basin.
Artifact density: 40 obsidian flakes, some quite large, in a 40 meter x 10 meter oblong area (400 square meters) between the two dunes. The flakes appear to be washing out of the contact zone between the base of the dunes and some consolidated lake silts and clays below the dune material, suggesting the possibility of a buried context present.
Vegetation: None.
Tools collected: None because no diagnostic styles were observed.
Legal description: SW 1/4 SW 1/4 SE 1/4 SE 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4783120, easting 742685.
Cultural affinity: Unknown at this time. However, based on comparison of stratigraphy and elevational position to other known Western Stemmed sites, especially along this far eastern shore, it seems reasonable to consider, for the moment, that this site represents the same time period (i.e. 10,800-7,500 B.P.).

SITE NO. 17 (Locality 5: 7-23-85):

Description: Small lithic scatter in a small draw or wash zone between two southeast-northwest trending dunes 100 meters due south of Site No. 16 and 320 meters due north of the above mentioned "nose" on the eastern shore.
Artifact density: Less than 40 obsidian flakes, mostly very small, in a 10 meter x 40 meter oblong area (400 square meters) between the dunes. As is the case in Site No. 16, the artifacts seem to be eroding out of the contact zone between the base of the dune sand and the underlying lakeshore deposits, suggesting the potential for a buried context.
Vegetation: None.
Tools collected: None because no diagnostic styles were observed.
Legal description: NW 1/4 NW 1/4 NE 1/4 NE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4783025, easting 742690.
Cultural affinity: Unknown at this time. However, again, because of similarities in elevational position and stratigraphy to other known Western Stemmed sites along this far eastern shore, it seems reasonable to consider, for the moment, that this site represents the same time period dating from 10,800-7,500 B.P.

SITE NO. 18 (Locality 6: 7-23-85):

Description: Small lithic scatter eroding out of a wave-cut scarp on the far eastern shore of the Dietz sub-basin just 150 meters due north of the "nose" of the prominent hill and 170 meters due south of Site No. 17. The center of the site is located near the 1797.33 North/ 150 East datum point (1/2" steel rebar) which marks the easternmost point surveyed from the north-south running baseline at the Dietz site.
Artifact density: Over 75 obsidian flakes, mostly very large, in a circular lobe shaped area 25 meters x 30 meters (750 square meters). As with the previous east shore sites described, the artifacts appear to be eroding out of the contact zone between the dune sand and the underlying lakeshore deposits, suggesting the potential for demonstrating a buried context.
Vegetation: None.
Tools collected: None because no diagnostic styles were observed. However, one large rock slab of local volcanic tuff (#490-18-217) appeared to be ground, but was not collected. In addition, several old rusty tin cans were observed but not collected.
Legal description: West portion of site is located in the NE 1/4 SE 1/4 NW 1/4 NE 1/4 Section 8, Township 28S, Range 23E. East portion of sites located in NW 1/4 SW 1/4 NE 1/4 NE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4782850, easting 742650.
Cultural affinity: Unknown at this time. However, as is the case for Site Nos. 16 and 17, similarities in elevational position/stratigraphy to other known Western Stemmed sites suggest that this site may also represent this period from 10,800-7,500 B.P.

SITE NO. 19 (Locality 7 : 7-23-85):

Description: Very large lithic scatter washing out of a small southeast-northwest trending dune; 45 meters southwest of the "nose" on the eastern shore; 200 meters southwest of Site No. 18 and 150 meters northwest of the Tucker Site (Site No. 65).
Artifact density: Over 200 flakes, mostly obsidian, in a 200 meter x 100 meter area (20,000 square meters).
Vegetation: Very little--a few short sage, some grasses and saltbush.
Tools collected: One large corner-notched point (#490-19-11) and a possible fluted point (#490-19-12). This second tool displays a crude shape, but with two long basal thinning scars removed on one side, suggesting that it may be a fluted point or preform discarded after unsuccessful fluting attempts. Also observed, but not collected, were: one broken point fragment of chert and several other obsidian biface fragments. Again, the artifacts appear to be eroding out of the contact zone between the dune sand and the underlying lakebed materials, suggesting the potential for establishing a buried context.

Legal description: Northern portion of the site is located in the south-central portion of SE 1/4 NW 1/4 NE 1/4 Section 8, Township 28S, Range 23E. Southern portion of the site is located in NE 1/4 NE 1/4 SW 1/4 NE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4782660, easting 742600.
Cultural affinity: Two component site. One tool represents a fluted point preform probably discarded during the fluting process (#490-19-12). Represents Western Clovis culture dating approximately between 11,500-11,000 B.P.. The second tool is a large corner-notched point (#490-19-11) is assignable to the Great Basin Elko Series (Elko corner-notched) dating from 3500-1500 B.P., or possibly as early as 8,000 to 6,000 B.P. (Hanes 1988a; Holmer 1978, 1986).

SITE NO. 20 (Locality 8: 7-23-85):

Description: Small lithic scatter eroding out of the base of a southeast-northwest trending dune-capped shore ridge 340 meters south of Site No. 65 (Tucker Site) along the far eastern shore of the Dietz sub-basin.
Artifact density: Less than 100 flakes in a 15 meter x 30 meter area (450 square meters). As with the other eastern shore sites, these artifacts do appear to be actively eroding out of the base of the dune and the underlying lakebed deposits, suggesting the potential for demonstration of a buried context.
Vegetation: None
Tools collected: None because no diagnostic styles were observed. One large biface midsection of obsidian was observed near the datum stake, but was not collected.
Legal description: NW 1/4 NW 1/4 NE 1/4 SE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinate: northing 4782230, easting 742700.
Cultural affinity: Unknown at this time. However, the stratigraphy and elevational position are comparable to other known Western Stemmed sites along this eastern shore, suggesting that the site may represent this time period from 10,800-7,500 B.P.

SITE NO. 21 (Locality 9: 7-23-85):

Description: Small lithic scatter on the east flank of a southeast-northwest trending dune-capped shore ridge, 20 meters below the dune crest and 150 meters southwest of Site No. 20 on the far eastern shore of the Dietz sub-basin.
Artifact density: 20 obsidian flakes in a 30 meter x 30 meter area (900 square meters). As with the other east shore sites, the artifacts appear to be eroding out of the contact between basal dune sand and underlying lakeshore deposits.
Vegetation: None
Tools collected: None because no diagnostic styles were observed.

Legal description: Southern portion of NW 1/4 NE 1/4 SE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4782140, easting 742800.
Cultural affinity: Unknown at this time; but stratigraphy/elevation suggest affiliation with the Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 22 (Locality 10 and 11: 7-23-85):

Description: Very large lithic scatter beginning at the southern end of a large L-shaped dune 50 meters south of Site No. 20 and extending south for 180 meters to a large dune-capped bowl-shaped shelf or lakeshore terrace on the east shore.
Artifact density: Over 1000 flakes, mostly obsidian, in an oblong area measuring 180 meters north-south and 100 meters east-west (18,000 square meters). Small interior flakes are most common in the northern portion of the site (originally Locality 10); while larger flakes dominate the southern portion of the site (originally Locality 11) contains mostly larger flakes.
Vegetation: Very little--some grasses and sage on the dune sand.
Tools collected: None because no diagnostic styles were observed.
Legal description: Northern portion of site is located in the SE 1/4 NE 1/4 NW 1/4 SE 1/4 Section 8, Township 28S, Range 23E. The southern portion of the site is located in the NE 1/4 SE 1/4 NW 1/4 SE 1/4 Section 8, Township 28S, Range 23 E. UTM co-ordinates: northing 4782050, easting 742660.
Cultural affinity: Unknown at this time. However, as with Site Nos. 20/21, elevational position and stratigraphy suggest that the site may represent the Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 23 (Site No. 8, 1984):

Description: Small sparse lithic scatter in a small fluvial wash zone between two southeast-northwest trending dunes 200 meters due north of the west-east fenceline which marks the section boundary between Sections 7, 8 and 9 on the north and Sections 18, 17 and 16 on the south in Township 28S, Range 23E.
Artifact density: 60 obsidian flakes in a 20 meter x 10 meter area (200 square meters).
Vegetation: None
Tools collected: One large corner-notched point fragment (#490-23-26) and two weakly shouldered stemmed point fragments (#490-23-27 and #490-23-28), all three of obsidian. As with the other east shore sites, the flakes and artifacts seem to be eroding out of a wave-cut scarp which has truncated modern dune deposits and the underlying older lakeshore deposits.

Legal description: South-central portion of the NW 1/4 SW 1/4 SE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4781660, easting 742375.
Cultural affinity: A two-component site assignable to the Western Stemmed culture (10,800-7,500 B.P.) and the Elko period, which can range from 3500-1500 B.P., or as early as 8,000 to 6,500 B.P. (Hanes 1988a; Holmer 1978, 1986).

SITE NO. 24 (Locality 1: 8-23-85):

Description: Small lithic scatter on a sandy shelf-like ridge 100 meters south of Site No. 23 and 100 meters due north of the west-east section fenceline. A large southeast-northwest trending salt-and-pepper dune marks the site's southern boundary where small deflation zones have exposed angular to subangular hillslope gravels. Unlike the other east shore sites, the artifacts at this site do not appear to be eroding out of the wave-cut scarp, but are rather entirely surficial.
Artifact density: 100 obsidian flakes in a north-south oblong area measuring 50 meters x 30 meters (1500 square meters) along the length of the shore ridge. There is a predominance of bifacial thinning flakes and many large primary (core) flakes, suggesting that the site represents a small, discrete lithic reduction workshop. One overshot flake was observed.
Vegetation: Mostly sage, with some rabbitbrush and grasses.
Tools collected: None because no diagnostic styles were observed. However, the following tools were observed, but not collected: one large ground stone slab of local volcanic rock (#490-24-218) on the western periphery of the site, one obsidian biface tip, and two other obsidian biface fragments.
Legal description: Central portion of the SW 1/4 SW 1/4 SE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4781560, easting 742400.
Cultural affinity: Unknown at this time.

SITE NO. 25 (Locality 2: 8-23-85):

Description: Small lithic scatter in a deflation or fluvial wash zone just below and to the southwest of the large southeast-to-northwest trending finger dune mentioned as the southern boundary for Site No. 24. The site begins 100 meters north of the west-east section fenceline and spills over past the fence for about 5 m to the south.
Artifact density: Flakes are widely scattered, (about 100 flakes, mostly obsidian), over an area measuring 60 meters x 40 meters (2400 square meters). There is a wave-cut scarp along the southwestern flank of the finger dune; but it is not entirely clear if the artifacts are eroding from this exposed contact.
Vegetation: Sage and greasewood, with some rabbitbrush.

Tools collected: Large side-notched point (Northern Side-notched style) was collected (#490-25-29) 30 meters south of the northwestern tip of the finger dune. Also observed, but not collected, was a medium-sized projectile point tip of obsidian 15 meters south of the northwestern tip of the finger dune.
Legal description: SW 1/4 SW 1/4 SW 1/4 SE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4781490, easting 742340.
Cultural affinity: Large side-notched points (Northern Side-notched) are not yet accepted as valid Great Basin time markers. Thomas (1981) claims they can only be assigned to anytime before 650 B.P. Warren (1968) reports them from 6,500-4,500 B.P. from Great Basin/Plateau sites; and in Surprise Valley, they date to the Menlo Phase from 6,000-5,000 B.P. (O'Connell 1975). Most recently, they are said to date as early as 8,000 to 7,000 B.P. (Hanes 1988a; Holmer 1978, 1986).

SITE NO. 26 (Locality 3: 8-23-85):

Description: Small lithic scatter 180 meters to the southwest of the southern tip of the 350-meter long finger dune described with Site No. 72 (Isolated find). The site is located on the playa floor 250 meters downslope from and due west of Site No. 27 -- a very large site to the east along the shoreline.
Artifact density: Flakes are widely scattered--about 30 flakes, mostly obsidian, in an oblong area measuring 80 meters southeast-to-northwest and 15 meters wide (1200 square meters). It is not yet clear as to whether or not the flakes are eroding out of the beach ridge or dunes located upslope and to the east.
Vegetation: Greasewood and rabbitbrush dominate.
Tools collected: None because no diagnostic styles were observed.
Legal description: Western portion of the SE 1/4 SW 1/4 NE 1/4 Section 17, Township 28S, Range 23E. UTM co-ordinates: northing 4780720, easting 742600.
Cultural affinity: Unknown at this time.

SITE NO. 27 (Localities 4 and 5: 8-23-85):

Description: Extremely large lithic scatter located within a large bowl-shaped sandy shelf-like area on the eastern shore 250 meters upslope and due east of Site No. 26.
Artifact density: Entire area is littered with thousands of flakes, mostly obsidian, and is characterized by a series of small discrete lithic clusters, ranging in size from 10 meter x 10 meter areas to 30 meter x 30 meter areas. The clusters are too dense and closely spaced to divide the locality into multiple sites. Instead, the entire area here has been subsumed into one large site. Many of the clusters contain non-diagnostic fragments of large projectile points and biface fragments of unknown affinity. The entire complex of clusters covers an oblong area measuring 400 meters southeast-to-northwest and 200 meters wide west-to-east (80,000 square meters).

Vegetation: Mostly greasewood and sage, with some small rabbitbrush.
Tools collected: One large Cougar Mountain stemmed point base (#490-27-30). Also observed but not collected, was a stemmed point midsection of a Haskett-style point.
Legal description: The site covers the entire portion of NW 1/4 NE 1/4 SE 1/4 Section 17, Township 28S, Range 23E and the entire portion of the SW 1/4 SE 1/4 NE 1/4 of the same section. In addition, the northernmost portion of the site covers the SW 1/4 NW 1/4 SE 1/4 NE 1/4 of the same section in Township 28S, Range 23E. Because the site is greater than 10 acres in area, a 5-sided polygon was drawn around the site whose five UTM corner co-ordinates (beginning clockwise from the northwest corner) are as follows:

1.	northing	4780940	easting	742730
2.	northing	4780920	easting	742820
3.	northing	4780680	easting	742990
4.	northing	4780495	easting	742990
5.	northing	4780450	easting	742755

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 28 (Site No. 1, 1984):

Description: Very large lithic scatter in dune-reworked beach deposits on the western flank of the east shore terrace 200 meters due south of the southern boundary of Site No. 27. This is in an area where the east shore beach ridge begins to curve sharply to the southwest to form the first (northernmost) of two southern east-west trending beach ridges.
Artifact density: Very dense--thousands of flakes in a wide variety of raw materials including many kinds of obsidian, basalt and some chert. Some portions of the site seem to represent miniature lithic reduction stations where large primary flakes and core fragments and large interior flakes dominate. The area covered by the site measures 300 meters north-south and 150 meters east-west (45,000 square m).
Vegetation: Sagebrush dominates, especially tall sage, with some greasewood and rabbitbrush and a few grasses.
Tools collected:

One obsidian stemmed point base	(#490-28-31)
One Lake Mohave stemmed point base (obsidian)	(#490-28-32)
One obsidian crescent	(#490-28-33)
One weakly shouldered stemmed point (obsidian)	(#490-28-34)
One long Cougar Mountain stemmed point base	(#490-28-35)

Legal description: Almost the entire portion of the SW 1/4 NE 1/4 SE 1/4 of Section 17, Township 28S, Range 23E; and most of the NW 1/4 SE 1/4 SE 1/4 of the same section. UTM co-ordinates: northing 4780210, easting 742890.
Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 29 (Site No. 9, 1984):

Description: Extremely large lithic scatter encompassing most of the eastern half southernmost beach ridge which marks the 4340-foot elevation drainage divide separating the northern Alkali Lake sub-basin from the central sub-basin, especially the northern flank of this southernmost beachridge. The beach ridge trends from the northeast to the west-southwest where it meets the main Four Corners Well road (unimproved dirt) which transects the northern sub-basin from the southeast to the northwest. At this point just west of the road, this southernmost beach ridge then begins to curve around to the northwest to form the western shore.
Artifact density: Many thousands of flakes in a wide variety of raw material occur throughout the site area, with over 100 or more clusters or areas of concentration. Some of these clusters contain primary core reduction debris and probably represent miniature lithic reduction stations. There is an abundance of diagnostic tools and only one representative of each kind was collected in an effort to efficiently characterize the site before further testing. The site covers an oblong area measuring 700 meters southwest to northeast and averaging 200 meters wide (140,000 square meters).
Vegetation: Sage dominates, with some greasewood, rabbitbrush and grasses.

Tools collected:

3 obsidian stemmed point bases	(#490-29-41; #490-29-43; #490-29-48)
2 Haskett point fragments	(#490-29-36;#490-29-45)
1 grey chert scraper	(#490-29-37)
1 red chert crescent	(#490-29-40)
2 obsidian crescent fragments	(#490-29-42; #490-29-44)
1 obsidian biface fragment	(#490-29-46)
1 obsidian base fragment of an eared point	(#490-29-47)
1 large ground stone slab (metate) of local volcanic tuff	(#490-29-49)

Legal description: (See description under site No. 30 below)

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 30 (Locality 1: 8-25-85):

Description: This site is another extremely large lithic scatter which encompasses most of the southernmost beach ridge west of the road, covering an area measuring 1200 meters southeast to northwest and averaging 300 meters wide (360,000 square meters). Because of the disturbance of deposits created by use of the Four Corners Well Road, an arbitrary line at the road was chosen to divide these two sites, although it is also possible that the two sites could be considered as one.

Note re: geomorphic context of Site Nos. 29/30: The majority of this southernmost beach ridge has been re-worked into a complex series of dunes, especially north of the beach ridgeline. It is within and upon these dunes and between the dunes in blowouts that most of the artifacts have been observed. It is not yet clear as to whether this series of campsites is oriented to the dunes themselves, or whether the clusters are eroding out of older, underlying lakeshore deposits which have been successively covered and uncovered by dune activity throughout the mid-to-late Holocene.

Artifact density: As is the case with Site No. 29, many thousands of flakes in a wide variety of raw material occur throughout the site area, with over 100 or more clusters or areas of concentration. Some of these clusters contain primary core reduction debris and probably represent miniature lithic reduction stations. There is an abundance of diagnostic tools and only one representative of each kind was collected in an effort to efficiently characterize the site before further testing.

Vegetation: Sage dominates, with some greasewood, rabbitbrush and grasses.

Tools collected:

3 Haskett obsidian points	(#490-30-53; #490-30-56; #490-30-57)
1 Lake Mohave point (obsidian)	(#490-30-55)
1 Miscellaneous stemmed point (obsidian)	(#490-30-60)
1 Cougar Mountain point (obsidian)	(#490-30-50)
1 obsidian crescent	(#490-30-52)
2 small transitional stemmed point forms (1 = resharpened)	(#490-30-54; #490-30-58)
1 large obsidian scraper	(#490-30-59)
1 obsidian Cascade point	(#490-30-51)

Legal description (both Site No. 29 and Site No. 30): The western portion of the site covers nearly the entire southern portion of NE 1/4 of Section 20, Township 28S, Range 23E; almost the entire eastern portion of the NW 1/4 of the same section, as well as the NE 1/4 NW 1/4 NW 1/4 of the same section. The far northeastern tip of the site covers the west-central portion of NW 1/4 of Section 21, Township 28S, Range 23E. Because the site is greater than 10 acres in area, a 7-sided polygon was drawn around the boundary of the site. The UTM co-ordinates of these seven corners (beginning clockwise from the northwest corner) are listed below. (Note that the last three corners coincide with the National Register District boundary UTM corners of I, J and K).

1.	northing	4779760	easting	741830
2.	northing	4779820	easting	741960
3.	northing	4779370	easting	743000
4.	northing	4779860	easting	743360
I.	northing	4779470	easting	743530
J.	northing	4779000	easting	742765
K.	northing	4779200	easting	742060

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 31 (Site No. 2, 1984):

Description: Small lithic scatter eroding out of beach sands on the east flank and base of a gently-sloping beach terrace on the southwestern shore of the Dietz sub-basin. Portions of the beach terrace have been re-worked into dunes. The site is 300 meters north-northwest of the northwestern tip of Site No. 30 and 350 meters northwest of Site No. 44 which covers a large portion of the southernmost beach ridge of the Dietz sub-basin.
Artifact density: 25 obsidian flakes in 15 meter by 10 meter area on the east-facing slope and base of a beach terrace (150 square meters). One long utilized blade-like flake was observed, but not collected.
Vegetation: Relatively open cover with sage, greasewood and rabbitbrush.
Tools collected: None because no diagnostic styles were observed. However, one large ground stone slab (metate) of local volcanic tuff (#490-31-19) was observed, and its position marked, but not collected.
Legal description: East-central portion of NE 1/4 SW 1/4 SW 1/4 Section 17, Township 28S, Range 23E. UTM co-ordinates: northing 4780120, easting 741940.

Cultural affinity: Unknown at this time, but the site's stratigraphic and elevational position is comparable to other known Western Stemmed sites in the basin, so it is highly likely that this site represents the same time period. This is somewhat re-inforced by the presence of the same kind of ground stone slab seen at other Western Stemmed sites (i.e. rough, unshaped, opportunistic use of local volcanic tuff).

SITE NO. 32 (Site No. 3, 1984):

Description: Small lithic scatter eroding out of gently-sloping beach ridge sands, some portions of which have been re-worked into dunes. The site is 250 meters northwest of Site No. 31 on the southwestern shore of the Dietz sub-basin.
Artifact density: Over 100 obsidian flakes in and around the dunes, covering an area of about 30 meters x 50 meters (1500 square meters).
Vegetation: Even mixture of short and tall sage and rabbitbrush, as well as small short grasses, including Indian ricegrass.
Tools collected: None because no diagnostic styles were observed. One large ground stone slab of local volcanic tuff was observed (#490-32-220) but not collected.
Legal description: Western portion of the SE 1/4 NW 1/4 SW 1/4 Section 17, Township 28S, Range 23E. UTM co-ordinates: northing 4780330, easting 741820.
Cultural affinity: Unknown at this time; but based on the stratigraphic and elevational position of the site compared to other known Western Stemmed period sites in the basin, it seems reasonable to consider, for the moment, that the site most likely represents this time period.

SITE NO. 33 (Site No. 4, 1984):

Description: Small lithic scatter eroding out of beach terrace sands which have been re-worked into dunes, 450 meters northwest of Site No. 32 on the southwestern shore of the Dietz sub-basin. The site is located at the northwestern terminus of a series of large prominent southeast-to-northwest trending dunes which have been formed out of older beach terrace material; and just 20 meters north of the southwest-to-northeast trending fenceline (mentioned earlier) which transects the northern sub-basin.
Artifact density: Over 100 obsidian flakes in a 30 meter x 50 meter area (1500 square meters) on the northeastern flank of the beach terrace.
Vegetation: Relatively open cover of sage, greasewood and rabbitbrush, as well as abundant grasses, including Great Basin rye grass and Indian ricegrass.
Tools collected: Two large obsidian blanks or preforms (#490-33-62 and #490-33-63).
Legal description: NW 1/4 SW 1/4 SW 1/4 NW 1/4 Section 17, Township 28S, Range 23E. UTM co-ordinates: northing 4780770, easting 741610.

Cultural affinity: Unknown at this time. However, based on the stratigraphic and elevational position of this site compared to other known Western Stemmed sites around the basin, it seems reasonable to consider, for the moment, that this site represents the same time period (i.e. dating from 10,800-7,500 B.P.). This is somewhat re-inforced by the presence of the same large obsidian roughed-out blanks or preforms which are present in great numbers and frequency at other Western Stemmed sites in the basin.

SITE NO. 34 (Locality 1: 8-26-85 and Locality 1: 7-18-85):

Description: Very large lithic scatter located in small blowout zones on the playa floor between small dunes in the southwestern portion of the Dietz sub-basin, immediately north of the west-east running section fenceline and 500 meters due west of the Four Corners Well.

Artifact density: Over 500 flakes, mostly obsidian, in an area measuring 250 meters east-west and 120 meters north-south (30,000 square meters). The site actually consists of a series of nearly contiguous lithic clusters, averaging 25 flakes in areas of about 10 meters x 15 meters. One such cluster produced the Desert-Side notched point (#490-34-64). The loose sandy surface is littered with small water-rounded obsidian and pumice pebbles which have their source in an enormous fluvial deposit shaped like an "umbrella handle" which originates in the large canyon one mile west of the Dietz hill. These rounded obsidian pebbles are not to be confused with the hundreds of culturally produced obsidian flakes which are also present.
Vegetation: Rabbitbrush and greasewood dominate.
Tools collected: One Desert side-notched projectile point of obsidian (#490-34-64) and one large obsidian scraper (#490-34-65).
Legal description: Almost the entire portion of the SW 1/4 SE 1/4 SE 1/4 Section 7, Township 28S, Range 23E. UTM co-ordinates: northing 4781490,
easting 741230.
Cultural affinity: Desert side-notched points in the Great Basin (part of the Desert series) have been dated from 1,000 to 650 B.P., up into historic time (Hanes 1988a; Holmer 1986).

SITE NO. 35 (Locality 2: 8-26-85):

Description: Small hilltop lithic scatter located on shallow, heavily weathered colluvial hillslope deposits on the northern flank of the west shore ridge at a point where the shore begins to curve sharply to the west 450 meters northwest of Site No. 33. The soil is very rocky and thin here (classic lithosol) with only a 2 to 5 centimeter cover of loose pumiceous sand covering a rocky "hardpan" colluvium. The center of the site is within 5 meters of the established basin datum point labeled as "Bob".

Artifact density: Over 200 obsidian flakes in a 20 meter x 20 meter area (400 square meters). This is a very well-contained, discrete lithic scatter representing primary lithic reduction activity. Large core flakes and nodules and primary flakes, mostly cortex flakes, dominate the scatter. Several large biface fragments of obsidian, probably blanks or preforms, were observed but not collected.
Vegetation: Very little--two large greasewood and some ground succulents.
Tools collected: One large obsidian blank/preform (#490-35-66) and one obsidian Haskett point base (#490-35-67), with a burinated tip.
Legal description: South-central portion of NE 1/4 NE 1/4 Section 18, Township 28S, Range 23E. UTM co-ordinates: northing 4781120, easting 741320.
Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 36 (Locality 3: 8-26-85):

Description: Very large lithic scatter 200 meters southwest of Site No. 40 further west along the shore ridge just east of where it begins to curve sharply to the south. The rocky soil substrate is the same shallow lithosol as described for Site Nos. 35 and 40.
Artifact density: The densest portion of the site is upslope at the southern periphery where over 500 flakes, mostly obsidian, occur in a concentrated zone measuring 40 meters x 40 meters. Portions of this concentration have begun to wash downslope to the north, forming the pear-shaped scatter outlined on the topographic map. However, the scatter is continuous throughout this zone. Overall measurements for the scatter are: 200 meters north-south and an average east-west width of 80 meters (16,000 square meters).
Vegetation: Rabbitbrush/sage dominate. Occasional very large greasewood.

Tools collected:

3 obsidian Parman point bases (#490-36-68, #490-36-69, #490-36-70)
2 Lake Mohave point fragments (#490-36-71; #490-36-73)
1 non-diagnostic point tip (obsidian) (#490-36-72)
2 miscellaneous stemmed point bases (obsidian) (#490-36-76, #490-36-77)
1 obsidian concave based point (made on a flake) (#490-36-74)
1 large obsidian blank/preform (#490-36-75)

Legal description: Majority of the site lies within the western portion of SW 1/4 NW 1/4 NE 1/4 Section 18, Township 28S, Range 23E. The very northern tip of the site lies within the SE 1/4 SE 1/4 NW 1/4 NW 1/4 NE 1/4 of the same section. UTM co-ordinates: northing 4781100, easting 740910.
Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 37 (Wallman Site):

Description: Very large lithic scatter which begins 100 meters southwest of Site No. 36 at a place where the shore ridge begins to curve sharply to the south. This is the eastern margin of a small southwestern lobe of the Dietz sub-basin.

Artifact density: The site actually consists of a series of lithic clusters, with heavy concentration zones which display high numbers of large primary and core flakes, suggesting that each is a miniature lithic reduction station. The flakes and tools are visible within and between dune-like accumulations of sand which have been formed out of the older beach terrace sands below. Density is very high, with thousands of flakes, mostly obsidian, occurring over a peanut-shaped area measuring 300 meters southwest-to-northeast and averaging 100 meters in width (30,000 square meters).

Vegetation: Many tall sage and rabbitbrush, with a variety of grasses.

Tools collected:

2 Haskett points (obsidian) (1 = re-sharpened)	(#490-37-105; #490-37-107)
1 small stemmed transitional form (obsidian)	(#490-37-106)
1 non-diagnostic point tip	(#490-37-110)
1 Lake Mohave stemmed point (obsidian)	(#490-37-113)
5 obsidian blanks/preforms	(#490-37-109, #490-37-112; #490-37-114; #490-37-115, #490-37-116)
1 obsidian scraper	(#490-37-108)
1 tan chert scraper	(#490-37-111)

Legal description: The majority of the site lies within the northern portion of the NE 1/4 SE 1/4 NW 1/4 Section 18, Township 28S, Range 23E. The northern tip of the site covers the SE 1/4 SE 1/4 NE 1/4 NW 1/4 of the same section. The northeastern tip covers the SW 1/4 SW 1/4 SW 1/4 NW 1/4 NE 1/4 of the same section. The southeastern tip of the site covers the NW 1/4 NW 1/4 NW 1/4 SW 1/4 NE 1/4 of the same section. UTM co-ordinates: northing 4780950, easting 740655.

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 38 (Localities 4 and 5: 8-26-85)

Description: Very large lithic scatter which begins 800 meters due south of Site No. 37 along the southeastern shore of the southwestern lobe of the Dietz sub-basin. The site is situated on a flat sandy beach terrace or shelf-like ridge at the base of a large butte at the northern margin of a series of active dunes at the far southwestern end of the Dietz sub-basin.
Artifact density: Some of the scatter is visible in small swales or blowout zones between the dunes. Lithic scatters in the northern portion of the site are very diffuse, and density increases to the south near the dunes. In the densest portions, there are hundreds of flakes, mostly obsidian, in each cluster, averaging 10 meters x 20 meters. The overall site area measures 450 meters southeast-to-northwest, and averages 100 meters in width (45,000 square meters).
Vegetation: Tall sage dominates with some rabbitbrush.
Tools collected: None because no diagnostic styles were observed.
Legal description: Majority of site covers the entire portion of SW 1/4 SW 1/4 SE 1/4 Section 18, Township 28S, Range 23E. The northern portion of the site covers the SW 1/4 NW 1/4 SW 1/4 SE 1/4 of the same section. The northwestern tip covers the NE 1/4 NE 1/4 SE 1/4 SW 1/4 of the same section. UTM co-ordinates: northing 4779940, easting 740850.

Cultural affinity: Unknown at this time.

SITE NO. 39 (Isolated Find No. 25; Diagnostic tool #2: 8-25-85)

Tool: 1 large obsidian corner-notched point (#490-39-61)
Location: The tool was found on the outskirts of Site No. 30 on the crest of the southernmost beach ridge which marks the southern drainage divide of the northern sub-basin, not far from a stemmed point base fragment (#490-30-50). However, neither tool was found in association with any of the lithic clusters associated with Site No. 30, therefore, this corner-notched point has been designated as an isolated find.
Vegetation: Sage dominates, with some greasewood, rabbitbrush and grasses.
Legal description: SE 1/4 SW 1/4 NE 1/4 Section 20; Township 28S, Range 23E. UTM co-ordinates: northing 4779048, easting 742732.
Cultural affinity: Great Basin Elko series (Elko corner-notched) have been dated from 3,500-1,500 B.P., or as early as 8,000 to 6,500 B.P. (Hanes 1988a; Holmer 1978, 1986).

SITE NO. 40 (Site No. 5, 1984):

Description: Very large hillslope lithic scatter on the same shallow, heavily-weathered colluvial deposits on the northern flank of the west shore ridge 250 meters west-northwest of Site No. 35. The soil is somewhat less shallow here than at Site No. 35, with about 5 to 20 centimeters of loose pumice-rich cover sand. Here also, the western shore is now oriented due west, heading into the direction of a small southwestern lobe of the Dietz sub-basin.
Artifact density: Very high percentage of diagnostic tools and point fragments with respect to flakes, suggesting that this site was a special activity camp where expended, wasted points were removed from the haft and replaced with new hafted points. A total of 27 tools were collected from this site, of which 18 are valid diagnostic styles (see list below). Despite the high numbers of diagnostic tools, flake density is also very high, with over 1000 flakes in a wide variety of raw materials, including many different kinds of obsidian, some basalt and chert. The site area measures 200 meters southwest-to-northeast, and 100 meters northwest-to-southeast (20,000 square meters).
Vegetation: Mostly sage and rabbitbrush, with many tall sage and some ground succulents.

Tools collected:

- 3 Lake Mohave point bases (#490-40-78; #490-40-84; #490-40-94)
- 3 large transitional stemmed point forms (#490-40-81, #490-40-89; #490-40-95)
- 2 miscellaneous stemmed bases (#490-40-83; #490-40-85)
- 4 Windust points (#490-40-92, #490-40-93, #490-40-96, #490-40-100)
- 6 obsidian blanks/preforms (#490-40-79, #490-40-82, #490-40-87, #490-40-88, #490-40-91, #490-40-97)
- 3 obsidian biface fragments (#490-40-80, #490-40-86 and #490-40-98)
- 3 Haskett points (green CCS, basalt, obsidian) (#490-40-99; #490-40-102; #490-40-103)
- 1 Plano-like Concave Base point (#490-40-101)
- 1 Parman point (#490-40-90)
- 1 scraper of tan chert (#490-40-104)

Legal description: Majority of the site lies within the east central portion of NW 1/4 NE 1/4 Section 18, Township 28S, Range 23E. The extreme northeastern tip of the site lies within the SW 1/4 SW 1/4 NW 1/4 NE 1/4 NE 1/4 Section 18, Township 28S, Range 23E.
UTM co-ordinates: northing 4781180, easting 741090.

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 41 (Locality 1: 8-27-85):

Description: Large lithic scatter located in the dune re-worked sands of a beach terrace at the far northwestern corner of the southwestern lobe of the Dietz sub-basin. The site is 100 meters southwest of the southern tip of the Dietz site hill, 700 meters due west across the basin floor from Site No. 37, and 450 meters due south of the west-east trending section fenceline.
Artifact density: Over 500 flakes, mostly interior flakes of obsidian, in an area measuring 100 meters x 100 meters (10,000 square meters) in a bowl-shaped area just on and below a prominent beach terrace or shelf running along the northwestern shore below and at the base of a steep sloping ridge.
Vegetation: Rabbitbrush dominates, with some grasses.
Tools collected: None because no diagnostic styles were observed.
Legal description: The majority of the site lies within the NE 1/4 NE 1/4 SE 1/4 NE 1/4 Section 13, Township 28S, Range 22E. The northern tip of the site lies within the SE 1/4 SE 1/4 SE 1/4 NE 1/4 NE 1/4 of the same section. The southwestern tip of the site lies within the NW 1/4 NW 1/4 SW 1/4 NW 1/4 Section 18, Township 28S, Range 23E. UTM co-ordinates: northing 4780940, easting 739930.
Cultural affinity: Unknown at this time. However, the stratigraphy and elevational position of the site compares closely with that of Site No. 42, just 60 meters south, which is assignable to the Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 42 (Locality 2: 8-27-85):

Description: Extremely large lithic scatter located 60 meters due south of Site No. 41 located in the same geomorphic shoreline position in the extreme northwestern corner of this southwestern lobe of the Dietz sub-basin.
Artifact density: Thousands of flakes, mostly obsidian, occurring throughout an area measuring 450 meters north-south and 200 meters east-west (90,000 square meters). As is the case with Site No. 41, the artifacts are found in loose sandy beach material which has been re-worked into small dunes. Unlike Site No. 41, the lithic scatter of this site is much more dense, and the loose pumiceous sand covering the surface has been deflated in many spots, exposing dry cracked playa floor beneath it. The lithic scatter runs parallel to the shore for the full 450 meter length of the site, and extends 200 meters east out onto the playa floor.
Vegetation: Rabbitbrush/greasewood dominate, with some sage/grasses.
Tools collected:

2 obsidian crescents (#490-42-117; #490-42-121)
2 Cougar Mountain bases (obsidian) (#490-42-118, #490-42-122)
1 large obsidian blank/preform (#490-42-120)
1 large obsidian scraper (#490-42-119)

Legal description: Three portions of the site strattle parts of Section 18, Township 28S, Range 23E:

Northeastern tip:	SW 1/4 NW 1/4 SW 1/4 NW 1/4
Northeastern portion:	Western portion SW 1/4 SW 1/4 NW 1/4
Southeastern portion:	Western portion NW 1/4 NW 1/4 SW 1/4

Three portions of the site strattle parts of Section 13, Township 28S, Range 22E:

Northwestern tip:	SE 1/4 SE 1/4 NE 1/4 SE 1/4 NE 1/4
Northwest portion:	SE 1/4 SE 1/4 NE 1/4
Southwest portion:	NE 1/4 NE 1/4 SE 1/4

Because the site is over 10 acres, a 4-sided polygon has been drawn around the site boundaries for UTM corner co-ordinates. The fourth (southwestern) corner coincides with the district boundary UTM corner co-ordinate labeled "P". Beginning with the northwest corner and moving clockwise, the four UTM corner co-ordinates are as follows:

1.	northing	4780790	easting	739860
2.	northing	4780850	easting	740065
3.	northing	4780380	easting	740120
P.	northing	4780260	easting	739930

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 43 (Locality 3: 8-27-85):

Description: Extremely large lithic scatter at the extreme southern end of the southwestern lobe of the Dietz sub-basin, beginning 100 meters southwest of the southern margin of Site No. 38. This area consists entirely of a dune complex which appears to be fairly recent and still active.

Artifact density: The flake clusters are visible in small blowout zones and swales between dunes. Very dense--thousands of flakes, mostly obsidian, over an area measuring 520 meters southwest-to-northeast, and averaging 160 meters in width (83,200 square meters).
Vegetation: Tall sage dominates with some rabbitbrush and grasses.

Tools collected: None because no diagnostic styles were observed. However, the tip fragments of several obsidian projectile points were observed, but not collected. Their size and proportion suggest very small, late-style periods.

Legal description: The majority of the site lies within the SW 1/4 and the SE 1/4 of NE 1/4 NW 1/4 Section 19, Township 28S, Range 23E. The northwestern tip of the site lies within the SE 1/4 NW 1/4 NE 1/4 NW 1/4 of the same section. The northern portion of the site lies within the southern portion of the NE 1/4 NE 1/4 NW 1/4 of the same section. The northeastern tip of the site lies within the SW 1/4 NW 1/4 NW 1/4 NE 1/4 of the same section. Finally, the southeastern tip of the site lies within the NW 1/4 SW 1/4 NW 1/4 NE 1/4 of the same section. Because the site is greater than 10 acres, a 4-sided polygon has been drawn around the site boundaries for UTM co-ordinates. Two of the corners are shared with the district boundary polygon corners of "N" and "O". Beginning with the far western corner and moving clockwise the four UTM corners are as follows:

1.	northing	4779420	easting	740380
2.	northing	4779700	easting	740600
N.	northing	4779630	easting	741020
O.	northing	4779250	easting	740470

Cultural affinity: The presence of very small projectile point tips suggest a late-period Great Basin site, no earlier than 1500 B.P., based on comparisons to the earliest known point series which would match the point tip sizes observed at the site (i.e. Rosegate series of small corner-notched points).

SITE NO. 44 (Locality 4: 8-27-85):

Description: Extremely large flake scatter in dune re-worked beach sands on the southernmost beach ridge in the Dietz sub-basin. The site covers the majority of the southwest-northeast trending beach ridge beginning 60 meters southwest of Site No. 28 on the eastern shore and ending 320 meters southeast of Site No. 31 on the western shore. The southeast-northwest trending Four Corners Well road (dirt unimproved) cuts through the center of the site.
Artifact density: The densest portion of the site is concentrated on the southern flank of this beach ridge, and on its flat shelf-like crest. The basin datum station "Kevin" marks the highest spot on the ridge crest just upslope of the densest portion of the site. The lithic scatter on the northern flank covers a broad area, sloping gently down for almost 300 meters out onto the playa floor, but the scatter here is much more diffuse. The entire site contains thousands of flakes, in a wide variety of obsidian, with some basalt and chert present. It covers an area measuring 700 meters east-west and averaging 240 meters wide (168,000 square meters), being 480 meters at its widest point.
Vegetation: Tall sage dominates, with some greasewood, rabbitbrush and a few grasses.

<u>Tools collected</u>:

1 large transitional stemmed point form (obsidian, re-sharpened) (#490-44-123)
3 miscellaneous stemmed point bases (obsidian) (#490-44-124; #490-44-125; #490-44-126)
1 Plano-like concave based point (#490-44-127)

<u>Legal description</u>: Three portions of the site strattle parts of Section 17, Township 28S, Range 23E:

Majority of site: Almost entire portion of SW 1/4 SE 1/4
Western portion: Western portion of SW 1/4 SE 1/4 SE 1/4
Far southern portion: SE 1/4 SE 1/4 SW 1/4

Three portions of the site strattle parts of Section 20, Township 28S, Range 23E:

Southwestern portion: NE 1/4 NE 1/4 NW 1/4
Southcentral portion: NW 1/4 NW 1/4 NE 1/4
Southeastern portion: NE 1/4 NW 1/4 NE 1/4

Because the site is over 10 acres, a 4-sided polygon was drawn around the site boundaries for UTM corner co-ordinates. These four UTM corners, beginning with the northernmost point and moving clockwise, are as follows:

1.	northing	4780300	easting	742570
2.	northing	4780020	easting	742920
3.	northing	4779760	easting	742720
4.	northing	4779780	easting	742100

<u>Cultural affinity</u>: Western Stemmed period dating from 10,800-7,500 B.P.

<u>SITE NO. 45 (Locality 1 : 8-29-85):</u>

<u>Description</u>: Very large lithic scatter 650 meters northwest of the northern boundary of the Dietz site (35 LK 1529). The site is situated on a shelf-like beach terrace along the eastern flank of the western shoreline in the southeastern sector of the Chase sub-basin.
<u>Artifact density</u>: Many tools and thousands of flakes, mostly obsidian, are scattered in a 100-meter wide strip which follows the curve of the western shoreline, beginning 5 meters north of the east-west powerline road (dirt unimproved) and extending for 500 meters to the northwest (50,000 square meters). Flakes are found as high up as halfway up the Flank of the hill overlooking the shoreline terrace and they extend downslope out onto the relatively level playa floor, where small dune-like accumulations of sand have been formed out of the older beach sands. The largest concentration of debris is in the center of the site near and just south of the 8-meter square collection unit (surface collected by John Fagan on August 22, 1985).

<u>Surface collection</u>: On August 22, 1985, John L. Fagan supervised the surface collection of point-plotted artifacts and flaking debris from an 8-meter square gridded area in the center of the site. The purpose of the collection was to have some comparative material from a known single-component Western Stemmed site to compare to artifact clusters at the Dietz site which were believed to be assignable to the same culture. In addition to this 8-meter unit, Fagan also collected 9 diagnostic tool fragments from the surface across the site, labeling them Tools #1-9 (see list below). Jo Reese and Bob Musil aided Fagan in the collection. Later, in my shore survey, three additional diagnostic tools were collected (Tools A-C).
<u>Vegetation</u>: Tall sage, greasewood and rabbitbrush.

<u>Tools collected</u>: (* = tools collected by and in the possession of Fagan)

8 miscellaneous stemmed point base fragments* (#490-45-131 through #490-45-137; #490-45-139)	
1 scraper*	(#490-45-138)
1 small transitional stemmed point form (re-sharpened)	(#490-45-128)
1 Plano-like concave based point fragment (obsidian)	(#490-45-129)
1 large obsidian blank or preform	(#490-45-130)

<u>Legal description</u>: Four sections of the site fall within different parts of Section 35, Township 27S, Range 22E: 1) the majority of the site covers SE 1/4 SW 1/4 SE 1/4; 2) the north-central portion of the site covers SW 1/4 NE 1/4 SW 1/4 SE 1/4; 3) the northern tip of the site covers the eastern portion of NE 1/4 NW 1/4 SW 1/4 SE 1/4; and 4) the southern tip of the site covers SW 1/4 SW 1/4 SE 1/4 SE 1/4.
UTM co-ordinates: northing 4784890, easting 740500.
<u>Cultural affinity</u>: Western Stemmed period dating from 10,800-7,500 B.P.

<u>SITE NO. 46 (Locality 1 : 8-30-85):</u>

<u>Description</u>: Very large lithic scatter 150 meters to the northeast past the northern limit of Site No. 45, along the western flank of the same western shoreline terrace, at a place where the shoreline curves sharply to the northeast around a small, but prominent hill.
<u>Artifact density</u>: Hundreds of flakes, in a wide variety of obsidian with some basalt and chert, occur in a 180-meter long scatter following the western shoreline from the flank and base of the hill extending out onto the playa floor in an area 120 meters wide (21,600 square meters). The densest part of the scatter is 25 to 30 meters southeast of the hill as it curves sharply to the northeast. Large primary flakes, many of them cortex flakes, and many large interior flakes were observed.
<u>Vegetation</u>: Rabbitbrush dominates with 5-10% sage.

Tools collected: Several large biface fragments were observed, but not collected. The two artifacts collected include:

1 possible ground stone fragment (#490-46-140)
1 large obsidian blank or preform (#490-46-141)

Legal description: Western half SW 1/4 NW 1/4 SE 1/4 Section 35, Township 27S, Range 22E. UTM co-ordinates: northing 4785310, easting 740250.

Cultural affinity: Unknown at this time. However, elevational and geomorphic position is comparable to the four other Western Stemmed sites known from the Chase sub-basin.

SITE NO. 47 (Locality 2 : 8-30-85; "Carol Site"):

Description: Very large lithic scatter 500 meters northwest of Site No. 46 along the same northwest trending shoreline of the Chase sub-basin. The center of the site is marked by the basin datum "Carol" at the top of a small, but prominent hill which protrudes out to the northeast onto the playa floor.
Artifact density: Hundreds of flakes, in a wide variety of obsidian, some basalt and chert, occur along the top of the hill, downslope along its north, east and southeast flanks, and extending out 100 meters past the base of the hill and beach terrace onto level playa floor. The area covered by the site measures 300 meters north-south and 200 meters east-west (60,000 square meters).
Vegetation: Sage and rabbitbrush equally dominate.

Tools collected:

2 obsidian Silver Lake point fragments (weakly shouldered) (#490-47-142, #490-47-143)
6 Lake Mohave stemmed points (1 = reworked into burin) (#490-47-144, #490-47-146, #490-47-147; #490-47-148; #490-47-151; #490-47-153)
1 obsidian Haskett point fragment (#490-47-145)
1 miscellaneous stemmed point base fragment (obsidian) (#490-47-154)
3 obsidian blanks or preforms (#490-47-149, #490-47-150, #490-47-151)
1 obsidian scraper (#490-47-152)

Legal description: Three portions of the site cover three different parts of Section 35, Township 27S, Range 22E: 1) The majority of the site covers the NE 1/4 SE 1/4 NW 1/4; 2) the eastern edge of the site covers the far western portion of the NW 1/4 SW 1/4 NE 1/4; and 3) the very southern tip of the site covers the NE 1/4 SE 1/4 SE 1/4 NW 1/4. UTM co-ordinates: northing 4785860, easting 740100.

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 48 (Locality 3 : 8-30-85 : "Hilltop Site"):

Description: Extremely large lithic scatter at the far northwestern corner of the Chase sub-basin along a prominent shoreline terrace. The southwest margin of the site begins 320 meters due north of Site No. 47. The site is spatially oriented to a large and very prominent north-south trending hill (thus, the name Hilltop Site) which rises conspicuously off the valley floor just west of the northwestern shoreline. The beach terrace is built into the east flank of the hill, forming a broad, flat sandy shelf at the base of the hill and extending out for about 50 meters to the east. Below this, the lower portion of the beach terrace is capped with more recent dune development and is truncated by a prominent wave-cut scarp, below which most of the artifacts are found. As is the case with the eastern shoreline sites in the Dietz sub-basin, the artifacts appear to be eroding out of the base of the dune materials and the underlying lakeshore deposits, gradually spilling out further onto the playa floor for a distance of at least 160 meters from the base of the hill. This offers great potential for discovering remains in Buried context, with good stratigraphic control.

Artifact density: This site is unusually dense and productive. There are many thousands of flakes in a wide variety of materials, including many kinds of obsidian, as well as basalt and chert varieties. The area of the site measures 440 meters southeast-to-northwest, and up to 600 meters southwest-to-northeast (264,000 square meters). Discrete clusters and workshop areas litter the site, many of which appear to be intact lithic reduction stations with core fragments lying near the core and spall flakes which were removed, providing great potential for studying detailed activity areas and re-fitting studies at the site.

Vegetation: On the broad sandy shelf, tall sage dominates with some rabbitbrush. On the top of the hill, small ground succulents and buckwheat are present. Down past the terrace and wave-cut scarp in fluvial wash zones and playa floor areas, rabbitbrush dominates, although vegetation here is very little.

Tools collected:

2 small transitional stemmed forms (obsidian) (reworked/resharpened) (#490-48-155; #490-48-166)
1 Plano-like square based point (#490-48-159)
1 Cougar Mountain stemmed point base (#490-48-169)
3 Lake Mohave stemmed point fragments (obsidian) (#490-48-157; #490-48-160; #490-48-175)
3 large transitional stemmed forms (obsidian) (weak shoulders) (#490-48-156; #490-48-165, #490-48-168)
1 obsidian knife ("hilltop" knife) (#490-48-158)
1 tan chert stemmed point base (#490-48-162)
1 obsidian Parman point (#490-48-167)
1 obsidian crescent fragment (#490-48-163)
2 large obsidian blanks/knives (#490-48-170, #490-48-171)
1 obsidian scraper (#490-48-174)
3 possible ground stone fragments (of local volcanic tuff) (#490-48-161, #490-48-172, #490-48-173)
1 abrading stone (of local volcanic tuff) (#490-48-176)
1 bevelled ground stone (mano) (of local tuff) (#490-48-164)

Legal description: Four portions of the site cover four different parts of Section 26, Township 27S, Range 22E: 1) The majority of the site covers almost the entire portion of the SW 1/4; 2) the northern tip of the site covers the SE 1/4 SE 1/4 NE 1/4 SW 1/4; 3) the northeastern portion of the site covers the western half of the NW 1/4 SW 1/4 SE 1/4; and 4) the southeast portion of the site covers the western half of the SW 1/4 SW 1/4 SE 1/4. In addition, the southern tip of the site lies within the far northern portion of the NE 1/4 NE 1/4 NW 1/4 of Section 35, Township 27S, Range 22E. Because the site is over 10 acres in size, a 5-sided polygon has been drawn around the boundary of the site for 5 UTM corner measurements. Two of these corners coincide with the first and last district boundary corners of "A" and "S", respectively. Beginning in the northwestern corner with point "A", and moving clockwise, the 5 UTM corner co-ordinates are as follows:

A.	northing	4787000	easting	739910
1.	northing	4786880	easting	740190
2.	northing	4786500	easting	740300
3.	northing	4786200	easting	740040
S.	northing	4786490	easting	739700

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 49 (Locality 1 : 9-1-85):

Description: Very large lithic scatter 200 meters due east of the easternmost extent of Site No. 48 near the northernmost point on the 4330-foot shoreline in the Chase sub-basin. The shelf-like beach terrace begins to break up in this section, but remnant portions are dune-capped and truncated by the same wave-cut scarp, below which the artifacts are found.
Artifact density: The scatter is somewhat diffuse, covering an area 250 meters southwest-to-northeast and averaging 100 meters wide (25,000 square meters). The core area of the site with the densest scatter is about 10 meters x 30 meters (300 square meters) and contains about 200 obsidian flakes. One uniface was observed but not collected. There are many interior flakes.
Vegetation: Mostly sage and rabbitbrush.
Tools collected: 1 obsidian crescent (#490-49-178)
Legal description: The northern portion of the site lies within the southern half of the SE 1/4 NW 1/4 SE 1/4 Section 26, Township 27S, Range 22E. The southern portion of the site lies within the northern half of the NE 1/4 SW 1/4 SE 1/4 of the same section.
UTM co-ordinates: northing 4786800, easting 740460.
Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 50 (Locality 2 : 9-1-85):

Description: Large lithic scatter which begins within 100 meters due east of Site No. 49 along the northern shoreline near its apex. The site appears to be eroding out of the beach terrace in large deflation zones and fluvial wash areas along the northeast shoreline in the Chase sub-basin.
Artifact density: About 200 obsidian flakes in an area measuring 180 meters east-west and averaging 80 meters wide (14,400 square meters).
Vegetation: Rabbitbrush dominates with some sage.
Tools collected: None because no diagnostic styles were observed. However, two large rock slabs of local volcanic tuff flagged in 1985 for later inspection (as possible ground stone) were re-examined in 1986, and were not considered to be valid ground stone.
Legal description: Northern half of the SW 1/4 NE 1/4 SE 1/4 Section 26, Township 27S, Range 22E. UTM co-ordinates: northing 4786940, easting 740680.
Cultural affinity: Unknown at this time, but elevational and geomorphic position is exactly the same as the four other known Western Stemmed sites discovered along this northern stretch of shoreline.

SITE NO. 51 (Locality 3 : 9-1-85):

Description: Large lithic scatter within 100 meters southeast of Site No. 50 along the north-central shoreline in the Chase sub-basin as it begins to curve to the south-southeast. The site is within 250 meters of the junction of the Christmas Valley Road and the road which outlines the Roger Chase field. As with the other north shore sites, in the Chase sub-basin, the lithic materials are visible in small blowout zones downslope of the truncated beach terrace.
Artifact density: About 200 obsidian flakes in a 100 meter x 100 meter area (10,000 square meters).
Vegetation: Rabbitbrush dominates with some sage.
Tools collected: None because no diagnostic styles were observed. However, there may be some ground stone slab fragments in the vicinity.
Legal description: The northern portion of the site covers the southern half of the SE 1/4 NE 1/4 SE 1/4 Section 26, Township 27S, Range 22E. The southern portion of the site covers the northern half of the NE 1/4 SE 1/4 SE 1/4 of the same section. UTM co-ordinates: northing 4786840, easting 740860.
Cultural affinity: Unknown at this time. However, the elevational and geomorphic position compares exactly to the other four known Western Stemmed sites along this northernmost shoreline in the Chase sub-basin.

SITE NO. 52 (Locality 4 : 9-1-85):

Description: Large lithic scatter within 100 meters due east of Site No. 51 along the north-central shoreline in the Chase sub-basin as it begins to curve to the south-southeast. The site is within 5 meters of the junction of the Roger Chase road (dirt unimproved) and the Christmas Valley road. In addition, the first of two major benchmark elevation caps used as our elevational datums for basin-wide survey of this district is located along the fence at the junction of these two roads. The elevation here is 4334.5 feet above sea level.
Artifact density: About 200 obsidian flakes in a 100 meter x 100 meter area (10,000 square meters).
Vegetation: Small rabbitbrush dominates with some sage.
Tools collected: None because no diagnostic styles were observed. However, a large uniface was observed, but not collected.
Legal description: The northern portion of the site lies within the SW 1/4 SW 1/4 NW 1/4 SW 1/4 Section 26, Township 27S, Range 22E. The southern portion of the site lies within the NW 1/4 NW 1/4 SW 1/4 SW 1/4 of the same section. UTM co-ordinates: northing 4786800, easting 741030.
Cultural affinity: Unknown at this time. However, the elevational and geomorphic position is exactly the same as four other known Western Stemmed sites discovered along this northernmost shoreline in the Chase sub-basin.

SITE NO. 53 (Locality 6 : 9-14-85):

Description: Very large lithic scatter within 20 meters due south of the Roger Chase field/fence, along the northeastern shoreline of the Chase sub-basin, and within 100 meters of the east-west powerline/section line road. The beach terrace here is heavily re-worked into dunes and the artifacts are visible in small blowout zones and fluvial wash areas between dunes.
Artifact density: Hundreds of flakes, mostly obsidian, in an area measuring 200 meters east-west and 250 meters north-south (50,000 square meters).
Vegetation: Tall sage dominates with some grasses and rabbitbrush.
Tools collected: None because no diagnostic styles were collected.
Legal description: Four portions of the site cover strattle four different areas in Section 36, Township 27S, Range 22E:

1. Northwest portion: Eastern half NE 1/4 SW 1/4 SE 1/4
2. Northeast portion: Western half NW 1/4 SE 1/4 SE 1/4
3. Southeast portion: NW 1/4 SW 1/4 SE 1/4 SE 1/4
4. Southwest portion: NE 1/4 SE 1/4 SW 1/4 SE 1/4

UTM co-ordinates: northing 4785060, easting 742240.

Cultural affinity: Unknown at this time. However, it is highly likely that the site is assignable to the Western Stemmed period dating from 10,800-7,500 B.P., based on its elevational and geomorphic position compared to all other known sites of this period in both the Chase and Dietz sub-basins.

SITE NO. 54 (Locality 7 : 9-14-85):

Description: Small lithic scatter 400 meters due south of Site No. 53 along the same dune re-worked east shore ridge dividing the Chase and Dietz sub-basins, and within 300 meters south of the east-west powerline/section line road. The site is also within 200 meters of Site No. 2, indicating that we have now come full circle in surveying the 4330-foot shoreline around the northern sub-basin.
Artifact density: About 100 obsidian flakes in an area measuring 100 meters southwest-to-northeast and averaging 50 meters wide (5,000 square meters).
Vegetation: Sage and greasewood dominate with some rabbitbrush.
Tools collected: None because no diagnostic styles were observed.
Legal description: NW 1/4 SW 1/4 NW 1/4 NE 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784485, easting 742220.
Cultural affinity: Unknown at this time.

SITE NO. 55 (Locality 1 : 8-31-85):

Description: Small lithic scatter within 100 meters of the southwest corner of Roger Chase's field and 450 meters due north of the east-west powerline/section line road in the approximate center of the Chase sub-basin. This site is not associated with any shoreline, and was discovered while surveying a long north-south transect across the northern sub-basin to purposefully cover non-shoreline area as a test to the shoreline hypothesis. In this survey, only two sites were discovered within the district boundaries: Site No. 55 and Site No. 56 located 450 meters to the northwest. This site is a very small lithic reduction station containing no diagnostic artifacts.
Artifact density: About 50 flakes of army green obsidian within a 20 meter x 20 meter area (400 square meters). This site seems to represent a self-contained lithic reduction station involving reduction of one or two nodules of the same green obsidian material in an open deflated area on the playa floor.
Vegetation: Rabbitbrush dominates.
Tools collected: None because no tools of any kind, much less diagnostic styles, were observed.
Legal description: South-central portion of SE 1/4 NE 1/4 SE 1/4 Section 35, Township 27S, Range 22E. UTM co-ordinates: northing 4785200, easting 740885.
Cultural affinity: Unknown at this time.

SITE NO. 56 (Locality 2 : 8-31-85):

Description: Small lithic scatter within 200 meters due west of Roger Chase's field/fence and 450 meters northwest of Site No. 55 in the approximate center of the Chase sub-basin. This site is not associated with any shoreline, and was discovered while surveying a long north-south transect across the northern sub-basin to cover non-shoreline area to test to the shoreline hypothesis. In this survey, only two sites were discovered within the district boundaries: Site No. 55 (described above) and Site No. 56.

Artifact density: About 50 flakes of black-grey obsidian within a 30 meter x 30 meter area (900 square meters). This site seems to represent a self-contained lithic reduction station involving reduction of one or two nodules of the same obsidian material in an open deflated area on the playa floor. The densest portion of the site is contained within a 10 meter x 10 meter area near the center of the site.
Vegetation: Rabbitbrush dominates.
Tools collected: No tools were collected. However, a midsection of a possible Haskett-style stemmed point was observed 10 to 15 meters to the northwest of the site datum.
Legal description: NE 1/4 SW 1/4 SE 1/4 NE 1/4 Section 35, Township 27S, Range 22E. UTM co-ordinates: northing 4785680, easting 740760.
Cultural affinity: Unknown at this time.

SITE NOS. 57 through 63 (Localities 1 through 7 : 9-14-85):

Description: These sites are a series of lithic reduction stations (Nos. 57-62) and one extremely large quarry site (No. 63) located well outside the district boundaries and well above the northern sub-basin drainage boundary marked by the 4340-foot contour interval. They were discovered in the north-south transect survey which was designed to discover just how many sites lay outside the northern sub-basin at higher elevations. They are not a part of the archaeological district as it is defined here and will not be included in the nomination.

SITE NO. 64 (Locality 2 : 7-18-85):

Description: Very large lithic scatter on the crest of the central shore ridge at 4318-feet elevation in the approximate center of the Dietz sub-basin along a broad flat wave-planed shelf. A large moon-shaped east-west dune has been built upon this shelf and the artifacts are eroding out of the lakebed materials on the shelf and from beneath the dune sand.
Artifact density: Less than 300 flakes, mostly obsidian in an area measuring 150 meters x 150 meters (22,500 square meters) upon and surrounding the base of the dune on the wave-planed shelf.
Vegetation: Mostly greasewood and rabbitbrush with some sage.
Tools collected:

1 obsidian Cougar Mountain point	(#490-64-179)
1 obsidian Haskett point base	(#490-64-180)
1 ground stone (mano)	(#490-64-181)
1 large ground stone slab (metate of local tuffaceous rock) (in 2 pieces)	(#490-64-182a and #490-64-182b)
1 obsidian keeled style crescent	(#490-64-183)

Legal description: The majority of the site lies within the NW 1/4 SE 1/4 SW 1/4 NW 1/4 Section 8, Township 28S, Range 23E. The very northern tip of the site lies within the SW 1/4 SW 1/4 NE 1/4 SW 1/4 NW 1/4 of the same section. UTM co-ordinates: northing 4782360, easting 741690.

Cultural affinity: Western Stemmed period dating from 10,800-7500 B.P.

SITE NO. 65 (Tucker Site):

Description: Small lithic scatter actively eroding out of a prominent wave-cut scarp on the far eastern shore of the Dietz sub-basin in a small fluvial wash zone between a southeast-northwest trending dune and the dune-capped eastern shore. The site is located 150 meters southeast of the prominent "nose" of a large hill which slopes down sharply to meet the east shore beach terraces and is 150 meters southeast of Site No. 19 on the east shore.
Artifact density: Density of flakes is very high--over 300 flakes, mostly obsidian, in a 70 meter x 15 meter oblong area (1050 square meters) between the dune and the east shore. Most of the flakes are large, mostly cortex flakes or large primary flakes. Also observed were numerous preforms or blanks, large biface fragments and several fragments of ground stone slabs of local volcanic tuff.

Stratigraphy and Testing: A 50-meter long backhoe trench was placed perpendicular to the shore ridge at the Tucker Site for stratigraphic examination; and a 1 meter x 1 meter test unit was excavated into the wave-cut scarp 15 meters due south of the backhoe trench. Preliminary analysis of stratigraphy and context of artifacts confirms the fact that the artifacts are eroding out of a buried context 1.2 to 1.3 meters below the surface at the contact between the base of the dune sand and the uppermost lakebed deposits. It is also apparent that the surface of origin is a remnant, buried A2 soil horizon which holds great potential for dating (charcoal flecks and organic debris) and environmental reconstruction.

Vegetation: None in the fluvial wash zone, but sage dominates the dune capped shoreline and dune crest which mark the east and west margins of the site.

Tools collected: A total of 13 tools were collected, none diagnostic.

- 1 large basalt biface (#490-65-13)
- 1 large obsidian biface (#490-65-14)
- 4 ground stone tools (metate fragments) (#490-65-21, #490-65-22, #490-65-23, #490-65-24)
- 5 large obsidian blanks/preforms (#490-65-15, #490-65-16, #490-65-18, #490-65-19, #490-65-20)
- 1 chert biface (#490-65-25)
- 1 large utilized basalt flake (#490-65-17)

Legal description: West-central portion of NW 1/4 SE 1/4 NE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4782550, easting 742730.

Cultural affinity: Unknown at this time; but stratigraphy suggests that occupation has to be in the late Pleistocene-early Holocene, bracketing the time range between 11,500-7,500 B.P. This implies occupation during either the Western Clovis period or the Western Stemmed period.

SITE NO. 66 (Locality 1 : 9-13-86):

Description: Small lithic scatter 50 meters north of the 4318-foot elevation shore ridge hypothesized to be the northern shore of the Clovis-era lake/marsh. In this section of the Dietz sub-basin, the 4318-foot shore ridge is covered with loose, pumiceous sands re-worked into small dune-like accumulations, and the land begins to gently slope northward towards the eroded drainage cut in the center of the Dietz sub-basin spit 500 meters to the north. This site is situated in this section of the north shore ridge that begins to slope gently northward, with sections of the old beach ridge broken up into small irregular accumulations of re-worked beach sands.
Artifact density: About 200 obsidian flakes in an area measuring 100 meters x 40 meters (4,000 square meters).
Vegetation: Sage and rabbitbrush with some greasewood and small grasses.

Tools collected:

1 obsidian Plano-like square based point (#490-66-184)
2 obsidian blanks/preforms (#490-66-185, #490-66-186)

In addition, the location of 2 other Plano-like stemmed point bases (similar to #490-66-184) were staked when this site was first discovered on 7-18-85, but upon returning to the site to map it on 9-13-86, these 2 points were not found again near their stakes.

Legal description: The western portion of the site lies within the SE 1/4 SE 1/4 SW 1/4 NW 1/4 SW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4783520, easting 741620.

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P., but probably the later period of occupatio, about 8,000 to 7,000 B.P.

SITE NO. 67 (Locality 2: 9-13-86):

Description: Large lithic scatter within 50 meters north of the 4318-foot elevation shore ridge hypothesized to be the northern shore of the Clovis-era lake/marsh. In this section of the Dietz sub-basin, the 4318-foot shore ridge is covered with loose, pumiceous sands re-worked into small dune-like accumulations, and the land begins to gently slope northward toward the drainage cut into the Dietz sub-basin spit 500 meters to the north. Like Site No. 66, this site is situated in this section of the north shore ridge that begins to slope gently northward, with sections of the old beach ridge broken up into small irregular accumulations of re-worked beach sands.
Artifact density: About 200 obsidian flakes in an area measuring 160 meters x 60 meters (9,600 square meters).
Vegetation: Sage and rabbitbrush with some greasewood and small grasses.

Tools collected:

2 obsidian Humboldt concave base points (#490-67-189, #490-67-190)

1 medium-size obsidian side-notched point fragment (#490-67-187)

1 obsidian blank/preform (#490-67-188)

Legal description: The northern portion of the site covers the SE 1/4 SE 1/4 NW 1/4 SW 1/4 Section 5, Township 28S, Range 23E. The southern portion of the site lies within the north-central portion of the NE 1/4 SW 1/4 SW 1/4 of the same section. UTM co-ordinates: northing 4783480, easting 741720.

Cultural affinity: Large side-notched points are not universally accepted as valid time markers in the Great Basin. On the Columbia Plateau and throughout the Great Basin, they have been dated from 6,500-4,500 B.P. (Warren 1968) and in Surprise Valley, California, they date to within the Menlo Phase from 6000-5000 B.P. (O'Connell 1975). It may also be that the side-notched points at this site, because of their smaller size and Elko-like shape, are Elko side-notched and belong to that series instead (3,500-1,500 B.P.). Layton (1970) places the Humboldt (Hu4) types at about 6,500 to 4,500 B.P. This site seems to represent a transitional site somewhere in time between late Western Stemmed and early Humboldt and Side-notched forms, about 7,000 to 6,000 B.P.

SITE NO. 68 (Isolated Find No. 1; Locality 1: 7-20-85):

Tool: Black obsidian Pinto shouldered point (#490-68-191).
Location: 160 meters northeast of 1250 N/0 E datum station at the northern end of the Dietz site baseline near a place where the northern Dietz site spit breaks in slope down into a large fluvial wash area.
Vegetation: Some large sage, a few grasses and some small rabbitbrush.
Legal description: NW 1/4 NE 1/4 SE 1/4 NE 1/4 Section 6, Township 28S, Range 23E. UTM co-ordinates: northing 4784280, easting 741280.
Cultural affinity: Great Basin Pinto-like points (Gatecliff Series Split Stem) have been dated from 5000-3500 B.P., possibly as early as 8000-6500 B.P. if they relate more to true "Pinto Basin" pinto style points. This site probably dates within the early period of Pinto between 8,000 and 6,000 B.P. (Holmer 1986; Thomas 1983; Warren 1986).

Site No. 69 (Isolated Find No. 2; Locality 3: 7-20-85):

Tool: Large transitional stemmed point form (transitional to side-notched forms) (#490-69-192).
Location: 200 meters south of Site No. 1 at the southern end of the same large fluvial wash area.

Vegetation: Includes a few small grasses and rabbitbrush.
Legal description: SE 1/4 NE 1/4 SE 1/4 NE 1/4 Section 6, Township 28S, Range 23E. UTM co-ordinates: northing 4784125, easting 741370.
Cultural affinity: Probably dates to within the later period of Western Stemmed Occupation, about 8,000 to 7,000 B.P.

Site No. 70 (Isolated Find No. 3; Locality 7 : 7-20-85):

Tool: Large obsidian scraper (#490-70-193).
Location: 130 meters due west of a point where the southwest-northeast trending fenceline meets the southernmost dune/beach ridge 140 meters southwest of Site No. 4.
Vegetation: Consists of an even mixture of sage and rabbitbrush.
Legal description: SW 1/4 SW 1/4 SW 1/4 NE 1/4 Section 5, Township 28S, Range 23 E. UTM co-ordinates: 4783940, easting 742280.
Cultural affinity: Unknown at this time.

Site No. 71 (Isolated Find No. 4; Diagnostic Tool #5: 7-23-85):

Tool: Large corner-notched (and basally-notched) projectile point fragment of obsidian (#490-71-194). May represent Elko-eared style (Elko series) or may represent Great Basin Pinto-like (Gatecliff Split Stem Series). The earlier Elko series has been known to date as early as 8,000 to 7,500 B.P. (Hanes 1988a; Holmer 1986; Thomas 1981, 1983).
Location: 150 meters southwest of Site No. 22 in loose sandy dune-worked beach deposits of a bowl-shaped shelf-like area located midway between the crest of the east shore dunes and the level playa floor to the west.
Vegetation: Rabbitbrush dominates with some small sage and cheatgrass.
Legal description: SE 1/4 NW 1/4 SE 1/4 NW 1/4 SE 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4781940, easting 742570.

Cultural affinity: Can be assigned to either the Early Archaic Gatecliff Series Split stem (Great Basin Pinto-like style) dating from 5000-3500 B.P. (possibly as early as 8000-6500 B.P.) or to the Mid Archaic Elko series (Elko-eared) dating from 3500-1500 B.P. (Hanes 1988a; Holmer 1986; Thomas 1981, 1983).

Site No. 72 (Isolated Find No. 5; Diagnostic Tool #1: 9-16-85):

Tool: Large obsidian corner-notched (Elko eared) point assignable to the Elko Series (#490-72-195).
Location: 5 meters below and west of basin datum point "DICK" on the northernmost tip of a long isolated finger dune which begins here and extends 350 meters to the southeast along the eastern shoreline. This location is 420 meters southeast of Site No. 25 at the fence and 300 meters due south of the same section fenceline.

Vegetation: Mostly sage and greasewood, with some rabbitbrush and grasses.
Legal description: NW 1/4 SE 1/4 NW 1/4 NE 1/4 Section 17, Township 28S, Range 23E. UTM co-ordinates: northing 4781140, easting 742570.
Cultural affinity: Can be assigned to the Great Basin Elko Series (Elko-eared) dating from 3,500-1,500 B.P., or as early as 8,000 to 6,500 B.P. (Hanes 1988a; Holmer 1986).

Site No. 73 (Isolated Find No. 6; Diagnostic Tool #5: 8-23-85):

Tool: Black obsidian crescent fragment (#490-73-196).
Location: Within 50 meters southeast of the section corner for Sections 17/16 on the north and Section 20/21 on the south in Township 28S, Range 23E on fairly level playa floor at least 150 meters southwest of the east shore beach ridge.
Vegetation: Very little--small sage, rabbitbrush and greasewood.
Legal description: NW 1/4 NW 1/4 NW 1/4 NW 1/4 NW 1/4 Section 21, Township 28S, Range 23E. UTM co-ordinates: northing 4779820, easting 743200.
Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

Site No. 74 (Isolated Find No. 7; Diagnostic Tool #6: 8-25-85):

Tool: Large corner-notched point (#490-74-197) assignable to the Great Basin Elko series (Elko corner-notched).
Location: At the very southwestern outskirts of Site No. 40, about 10 meters upslope on the hill.
Vegetation: Mostly sage and rabbitbrush, with some ground succulents.
Legal description: SW 1/4 NE 1/4 SE 1/4 NW 1/4 NE 1/4 Section 18, Township 28S, Range 23E. UTM co-ordinates: northing 4781110, easting 741050.

Cultural affinity: Great Basin Elko series (Elko corner-notched) have been dated from 3,500-1,500 B.P., or as early as 8,000 to 6,500 B.P. (Hanes 1988a; Holmer 1986).

Site No. 75 (Isolated Find No. 8; Diagnostic Tool: 8-23-85):

Tool: Obsidian blank/preform with basal thinning and square base, possibly a fluted point aborted after unsuccessful fluting (#490-75-198).
Location: On a gently sloping beach terrace at the far southern tip of the Dietz hill, within 5 meters from the basin datum station labeled "Amy".
Vegetation: Tall sage dominates, with some rabbitbrush and grasses.

Legal description: SW 1/4 NE 1/4 NE 1/4 SE 1/4 SW 1/4 Section 7, Township 28S, Range 23E. UTM co-ordinates: northing 4781680, easting 740640.

Cultural affinity: The suggestion was made that this is a fluted point preform displaying fluting scars. The tool is located on the extreme southern portion of the Dietz site, 1100 meters southwest from the 0 North/0 East Dietz site datum. The entire eastern flank of the Dietz hill from point "Amy" in the south to the 0 North/0 East datum point in the north consists of a very light, diffuse lithic scatter which ends near "Amy". This tool is best described as a Great Basin Concave Base point, which could be transitional between Western Clovis (11,500 to 11,000 B.P.) and Western Stemmed (10,800 to 7,000 B.P.).

SITE NO. 76 (Isolated Find No. 9; Diagnostic Tool #2: 8-30-85):

Tool: Large obsidian corner-notched point fragment (Elko series-Elko corner-notched). (#490-76-199)
Location: Within 80 meters of the southwestern margin of Site No. 47, further upslope on the western shore hill in the Chase sub-basin.
Vegetation: Equal mixtures of sage and rabbitbrush.
Legal description: NW 1/4 NW 1/4 SE 1/4 SE 1/4 NW 1/4 Section 35, Township 27S, Range 22E. UTM co-ordinates: northing 4785740, easting 739985.
Cultural affinity: The Great Basin Elko series (Elko corner-notched) has been dated from 3,500-1,500 B.P., or as early as 8,000 to 6,500 B.P. (Hanes 1988a; Holmer 1986).

SITE NO. 77 (Isolated Find No. 10; Diagnostic Tool # 1: 9-1-85):

Tool: Leaf-shaped Cascade obsidian point (#490-77-200)
Location: 100 meters southeast of Site No. 49 along the northern shoreline near its apex. Because of its close proximity, it may be that this point should be considered a part of Site No. 49.
Vegetation: Rabbitbrush dominates with some sage.
Legal description: NW 1/4 NW 1/4 NW 1/4 SE 1/4 SE 1/4 Section 26, Township 27S, Range 22E. UTM co-ordinates: northing 4786780, easting 740580.
Cultural affinity: The exact validity of leaf-shaped points in the Great Basin is somewhat questionable, although generally, most scholars assign these point styles to the Western Stemmed period dating from 10,800-7,500 B.P. On the Columbia Plateau, this point style is type dated from 8,000-7,000 B.P.; but leaf-shaped points of this kind were also found in association with Windust artifacts dating from 10,000-9,000 B.P. It probably represents the transitional range between 8,000 and 7,000 B.P.

SITE NO. 78 (Isolated Find No. 11; Diagnostic Tool #1: 8-29-85):

Tool: Large basally-notched obsidian point, with a possible contracting stem (#490-78-201).
Location: 100 meters downslope and due north of the northwestern tip of Site No. 44, on level playa floor.
Vegetation: Very little--a few rabbitbrush and greasewood.
Legal description: NW 1/4 SE 1/4 SE 1/4 SW 1/4 Section 17, Township 28S, Range 23E. UTM co-ordinates: northing 4779970, easting 742210.
Cultural affinity: Questionable: if a contracting stem is present, the point may be considered part of the Great Basin Gatecliff series (Contracting Stem) which have been dated from 5,000-3,500 B.P. But, based on the large size and strange morphology, it is conceivable that the point is even earlier than this, such as 8,000 to 6,000 B.P.

SITE NO. 79 (Isolated Find No. 12; Diagnostic Tool #3: 8-29-85):

Tool: Large obsidian projectile point tip (#490-79-202).
Location: 160 meters due south of the Four Corners Well and the east-west section fenceline on open playa floor in the approximate center of the Dietz sub-basin.
Vegetation: Very little. Rabbitbrush dominates with some greasewood.
Legal description: NW 1/4 SE 1/4 NE 1/4 NW 1/4 NW 1/4 Section 17, Township 28S, Range 23E. UTM co-ordinates: northing 4781260, easting 741820.
Cultural affinity: Unknown at this time. Tool is not time-diagnostic.

SITE NO. 80 (Isolated Find No. 13; Diagnostic Tool #4: 8-29-85):

Tool: Medium-size obsidian corner-notched point (Elko series: #490-80-203).

Location: Within 100 meters of a hand-dug shore trench placed perpendicular to the 4318-feet elevation central shore ridge which is hypothesized to be the eastern shore of the Clovis-era lake/marsh. The tool was found 200 meters southwest of Site No. 64 and 200 meters southeast of the quarter section brass cap for Sections 7 and 8 of Township 28S, Range 23E in the approximate center of the Dietz sub-basin.

Vegetation: Open playa floor with very little vegetation. Rabbitbrush dominates with some greasewood.

Legal description: SE 1/4 NE 1/4 NW 1/4 NW 1/4 SW 1/4 Section 8, Township 28S, Range 23E. UTM co-ordinates: northing 4782120, easting 741640.

Cultural affinity: This corner-notched point is slightly too large for the Rosegate series (basal width: 14 mm) and is an atypically small Elko eared point. The Great Basin Elko series dates from 3,500 to 1,500 B.P.; but it is possible that the point is slightly later than this, as in from 2,000 B.P. to historic time.

SITE NO. 81 (Isolated Find No. 14; Diagnostic Tool #5: 8-29-85):

Tool: Obsidian stemmed point fragment (#490-81-204).
Location: On a broad sandy ridge surrounding a large lakeshore spit which was formed off of the northeast corner of the Dietz site hill trending from the southwest to the northeast for over 500 meters. The tool was found within 100 meters southeast of Site No. 1 and within 100 meters north of Site No. 12 on the northern shore ridge east of the 1250N/0E datum station at the northern end of the Dietz site.
Vegetation: Sage dominates with some rabbitbrush and greasewood.
Legal description: NE 1/4 NW 1/4 NW 1/4 SW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784280, easting 741445.
Cultural affinity: Western Stemmed period (10,800-7,500 B.P.).

SITE NO. 82 (Isolated Find No. 15; Diagnostic Tool #6: 8-29-85):

Tool: Large transitional stemmed point form (#490-82-205).
Location: On the same broad sandy ridge surrounding the northern Dietz site spit 140 meters due north of Site No. 81 (Isolated Find No. 14).
Vegetation: Mostly sage with some rabbitbrush and greasewood.
Legal description: SE 1/4 NW 1/4 SW 1/4 NW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784420, easting 741450.
Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P., but possibly during the later period of occupation, between 8,000 and 7,000 B.P.

SITE NO. 83 (Isolated Find No. 16; Diagnostic Tool #7: 8-29-85):

Tool: Plano-like concave base point of obsidian (#490-83-206).
Location: On the same broad sandy ridge surrounding the northern Dietz site spit 100 meters northwest of Site No. 82 (Isolated Find No. 15).
Vegetation: Mostly sage with some rabbitbrush and greasewood.
Legal description: NE 1/4 NW 1/4 SW 1/4 NW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784490, easting 741420.

Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P., but probably during the later period of occupation, between 8,000 and 7,000 B.P.

SITE NO. 84 (Isolated Find No. 17; Diagnostic Tool #8: 8-29-85):

Tool: Small, miniature fluted point, similar to others recovered at the Dietz site (#490-84-207).
Location: On the same broad sandy ridge surrounding the northern Dietz site spit 240 meters northwest of Site no. 83 (Isolated Find No. 16).
Vegetation: Mostly sage with some rabbitbrush and greasewood.
Legal description: SE 1/4 SE 1/4 NW 1/4 NE 1/4 NE 1/4 Section 6, Township 28S, Range 23E. UTM co-ordinates: northing 4784530, easting 741170.
Cultural affinity: Can be definitely assigned to the Western Clovis period (probably dating from about 11,500-10,500 B.P.). It is identical to other miniature fluted points recovered at the Dietz site and could actually be considered as a continuation of the northernmost Dietz site scatter, since it is in such close proximity to the northernmost limits of the Dietz site.

SITE NO. 85 (Isolated Find No. 18; Diagnostic Tool #1: 8-31-85):

Tool: Large ground stone slab of local volcanic tuff (#490-85-208). This artifact has been shot in by EDM/transit and staked but, due to an oversight, was not collected during the 1986 summer season. J. Willig plans to collect it sometime during the summer of 1987.
Location: On the same broad sandy ridge surrounding the northern Dietz site spit 160 meters southeast of Site No. 84 (Isolated Find No. 17) and 100 meters due west of Site No. 83 (Isolated Find No. 16).
Vegetation: Mostly sage with some rabbitbrush and greasewood.
Legal description: NW 1/4 NE 1/4 SE 1/4 NE 1/4 NE 1/4 Section 6, Township 28S, Range 23E. UTM co-ordinates: northing 4784490, easting 741325.

Cultural affinity: Unknown at this time. However, based on the consistent association of local volcanic rock slabs such as these (i.e. not purposefully shaped but opportunistically utilized) with numerous other Western Stemmed sites around the lakeshore, it may be possible to assign the tool to that period (dating from 10,800-7,500 B.P.).

SITE NO. 86 (Isolated Find No. 19; Diagnostic Tool #2: 8-31-85):

Tool: Re-sharpened, re-worked point fragment. Not time-diagnostic (#490-86-209).
Location: On the same broad sandy ridge surrounding the northern Dietz site spit 120 meters northeast of Site No. 85 (Isolated Find No. 18).
Vegetation: Mostly sage with some rabbitbrush and greasewood.
Legal description: SW 1/4 NW 1/4 NW 1/4 NW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784590, easting 741380.
Cultural affinity: Unknown at this time.

SITE NO. 87 (Isolated Find No. 20; Diagnostic Tool #3: 8-31-85):

Tool: Re-sharpened, re-worked Humboldt concave based point of obsidian (#490-87-210).
Location: On the same broad sandy ridge surrounding the northern Dietz site spit 160 meters northeast of Site No. 86 (Isolated Find No. 19).
Vegetation: Mostly sage with some rabbitbrush and greasewood.
Legal description: SE 1/4 NE 1/4 NW 1/4 NW 1/4 NW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4784640, easting 741540.
Cultural affinity: Probably dates to the early Humboldt floruit dating between 8,000 and 6,000 B.P.

SITE NO. 88 (Isolated Find No. 21; Diagnostic Tool #4: 8-31-85):

Tool: Complete specimen of a white chert crescent (#490-88-211).
Location: On the flat open playa floor 160 meters northwest of Site No. 55 and within 200 meters of Roger Chase's fence, in the approximate center of the Chase sub-basin.
Vegetation: Very little. Rabbitbrush dominates.
Legal description: NW 1/4 NW 1/4 SE 1/4 NE 1/4 SE 1/4 Section 35, Township 27S, Range 22E. UTM co-ordinates: northing 4785340, easting 740820.
Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 89 (Isolated Find No. 22; Diagnostic Tool #2: 8-28-84):

Tool: Large obsidian Side-notched point with an eared base; i.e. large Elko eared (#490-89-212).
Location: On the same broad sandy ridge surrounding the northern Dietz site spit 60 meters due west of Site No. 85 (Isolated Find No. 18) and 70 meters northeast of Site No. 90 (Isolated Find No. 23).
Vegetation: Mostly sage with some rabbitbrush and greasewood.
Legal description: SE 1/4 NW 1/4 SE 1/4 NE 1/4 NE 1/4 Section 6, Township 28S, Range 23E. UTM co-ordinates: northing 4784460, easting 741260.
Cultural affinity: Large side-notched points (Northern Side-notched) are not universally accepted as valid time markers. Thomas (1981, 1983) claims they can only be assigned to periods before 650 B.P. Warren (1968) reports them from 6,500-4,500 B.P. Great Basin/Plateau sites; and in Surprise Valley, they date to the Menlo Phase from 6,000-5,000 B.P. (O'Connell 1975). Layton (1970) would place it within the 4,500-6,000 B.P. Silent Snake Phase (bifurcate stemmed points.

SITE NO. 90 (Isolated Find No. 23; Diagnostic Tool #3: 8-28-84):

Tool: Large obsidian Cougar Mountain point base (#490-90-213).
Location: On the same broad sandy ridge surrounding the northern Dietz site spit 70 meters southwest of Site No. 89 (Isolated Find No. 22) and 200 meters northeast of the 1250 North/0 East datum station at the north end of the Dietz site, in line with the Section corner (Sections 6 and 5) brass cap at the powerline road.
Vegetation: Mostly sage with some rabbitbrush and greasewood.
Legal description: SW 1/4 NW 1/4 SE 1/4 NE 1/4 NE 1/4 Section 6, Township 28S, Range 23E. UTM co-ordinates: northing 4784410, easting 741230.
Cultural affinity: Western Stemmed period dating from 10,800-7,500 B.P.

SITE NO. 91 (Diagnostic Tool # 1: 9-8-84)

Description: Small, sparse lithic scatter located near Datum 8 and the East Shore Trench in the approximate center of the Dietz sub-basin. This site has been described as Locality 2, as one of the three places in the sub-basin where it may be possible to demonstrate a stratigraphic separation of surficial stemmed period clusters from a Clovis-age paleosol 70 cm below the surface. More testing is need here to recover diagnostic tools near the surface.
Artifact density: Very low, mostly consisting of large spall flakes and several large biface fragments of obsidian. Site area measures about 20 x 30 meters (600 square meters).
Vegetation: None
Tools collected: 1 large obsidian biface ("Bart's Biface) (#490-91-214), which is not time-diagnostic.
Legal description: SE 1/4 SW 1/4 SW 1/4 Section 5, Township 28S, Range 23E. UTM co-ordinates: northing 4783050, easting 741830.
Cultural affinity: Unknown at this time, but may eventually prove to be Western Stemmed period dating to 10,800-7,500 B.P.

SITE NO. 92 (Isolated Find No. 24; Diagnostic Tool # 17: 8-30-85)

Tool: 1 large corner-notched point fragment (Elko corner notched) (#490-92-177).
Location: On southwestern outskirts of Site No. 48 ("Hilltop Site"), not in association with any of the lithic clusters at the Hilltop site. Like Site No. 39 (Isolated find on outskirts of Site No. 30 in the Crescent sub-basin), this tool was determined to be an isolate which could be considered separate from the Hilltop site.
Vegetation: In this area below the terrace and wave-cut scarp in active fluvial wash zones and playa floor areas, rabbitbrush dominates, although vegetation here is very little.
Legal description: NW 1/4 NE 1/4 NE 1/4 NW 1/4 Section 35; Township 27S, Range 22E. UTM co-ordinates: northing 4786293; easting 740000.
Cultural affinity: The Great Basin Elko series has been dated from 3,500-1,500 B.P., or as early as 8,000 to 6,500 B.P. (Hanes 1988a; Holmer 1986).

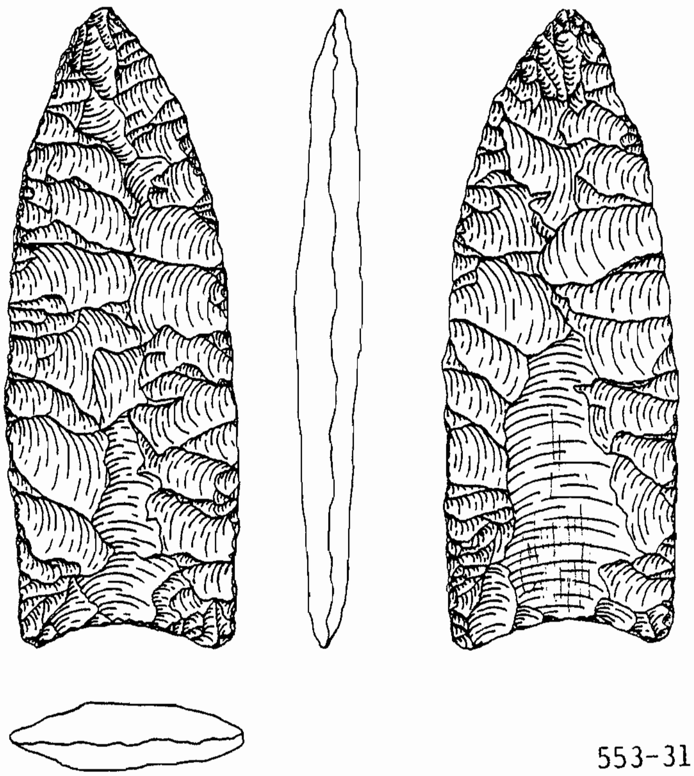
SITE NO. 93 (Isolated find No. 26; Diagnostic Tool #1: 8-6-84)

Tool: 1 large lanceolate biface, possibly Haskett, but not definitive enough to be certainly identified (#490-93-215).
Location: Found on the east side of the northeast-southwest trending fenceline just south of the powerline road near the Chase field.
Vegetation: Small amounts of sage and rabbitbrush.
Legal description: NW 1/4 NE 1/4 NE 1/4 Section 5; Township 28S, Range 23E. UTM co-ordinates: northing 4784732, easting 742659.
Cultural affinity: Unknown at this time, but might be assigned to Western Stemmed period dating from 10,800-7,500 B.P.

APPENDIX C

ARTIFACT ILLUSTRATIONS FOR ALKALI LAKE BASIN SITES

DIETZ SITE (35 LK 1529)



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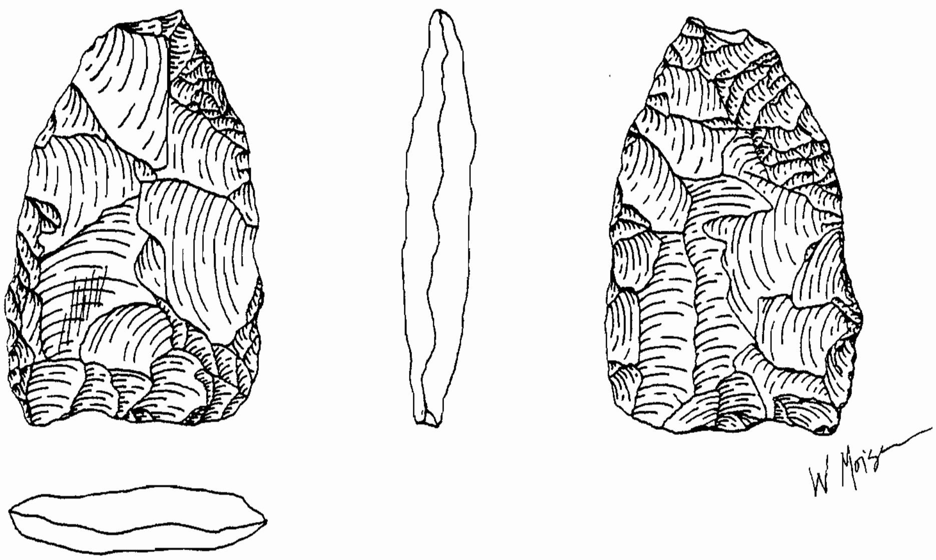

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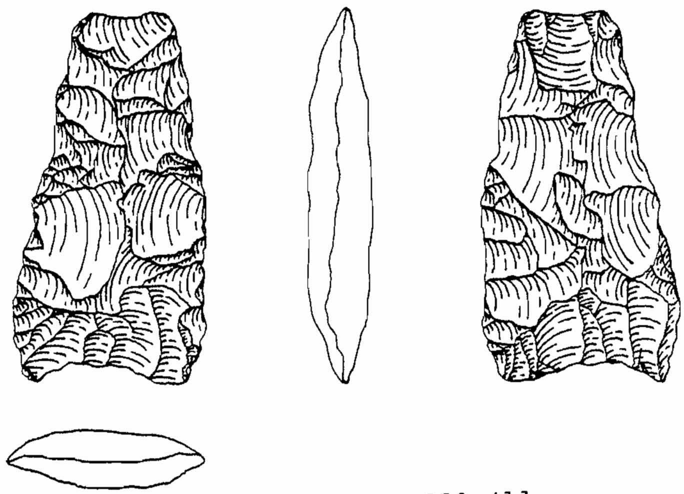

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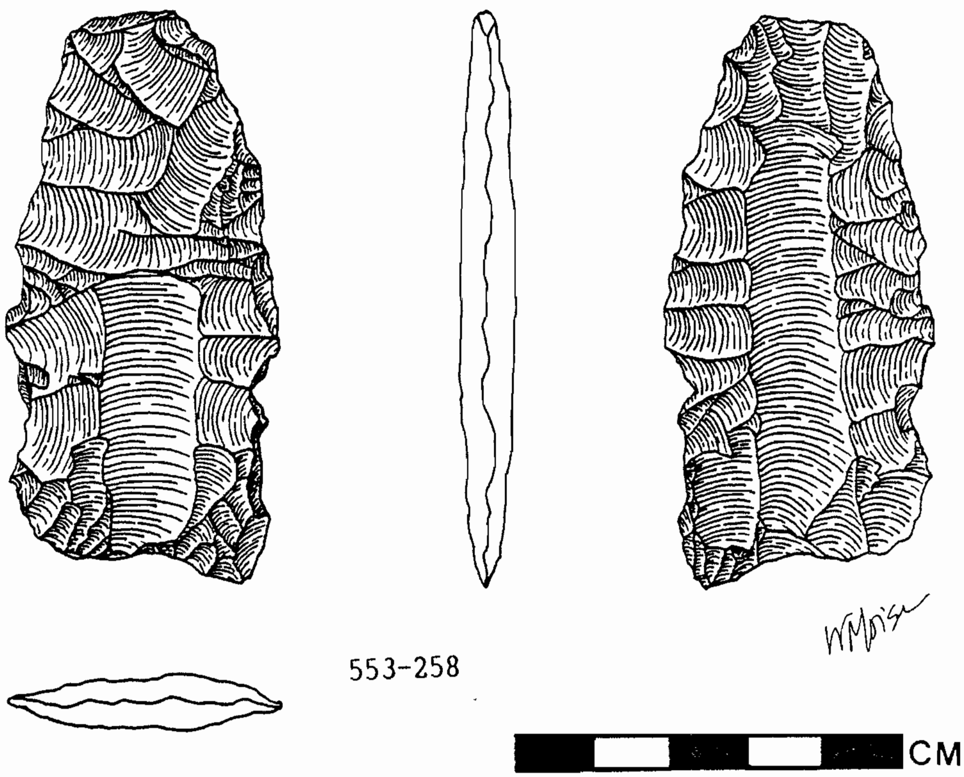

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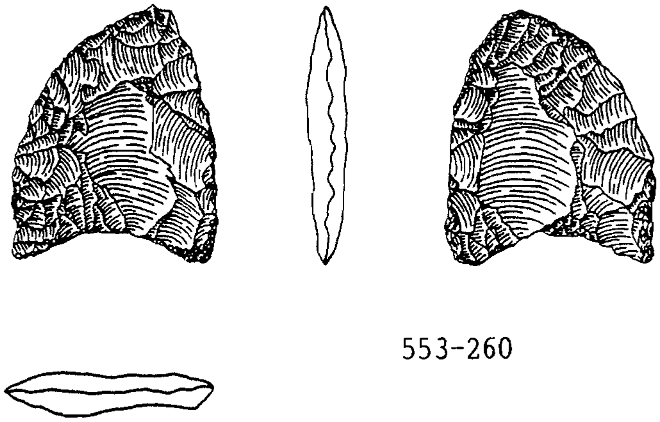

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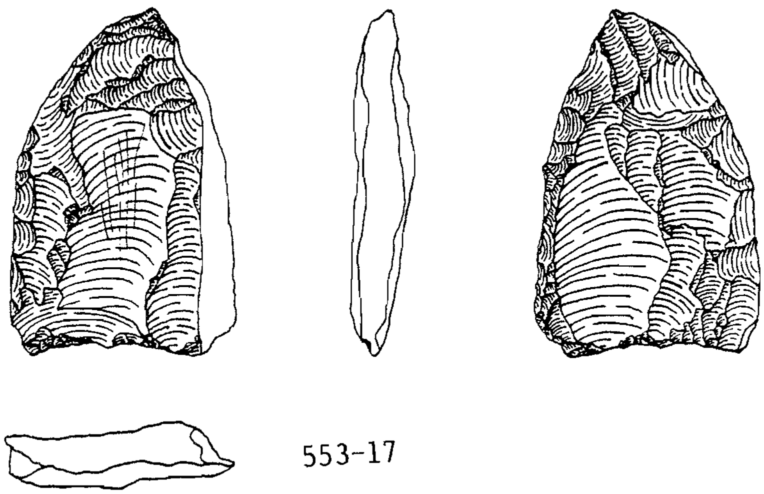

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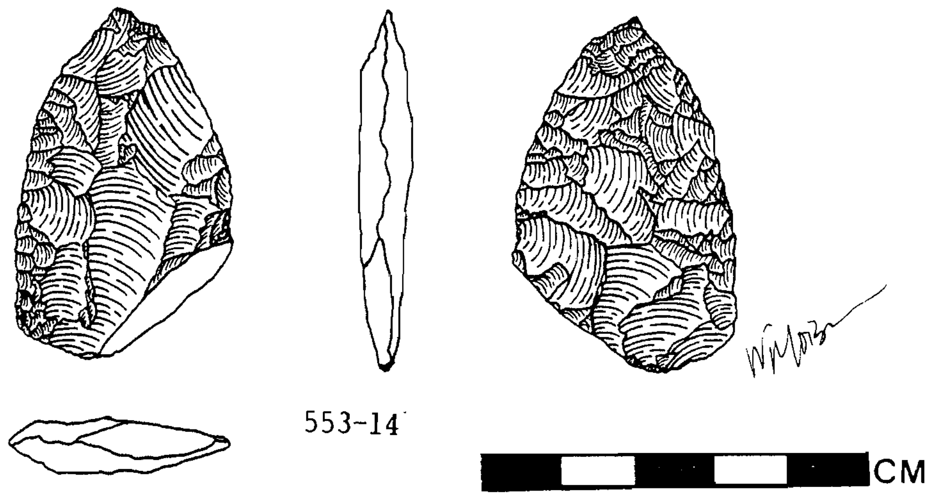

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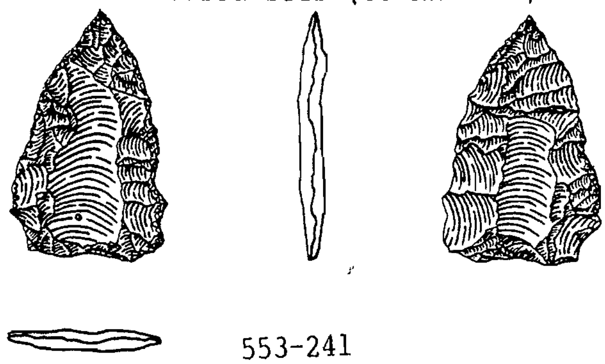

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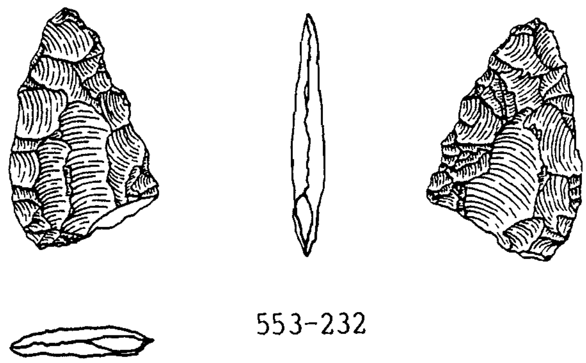

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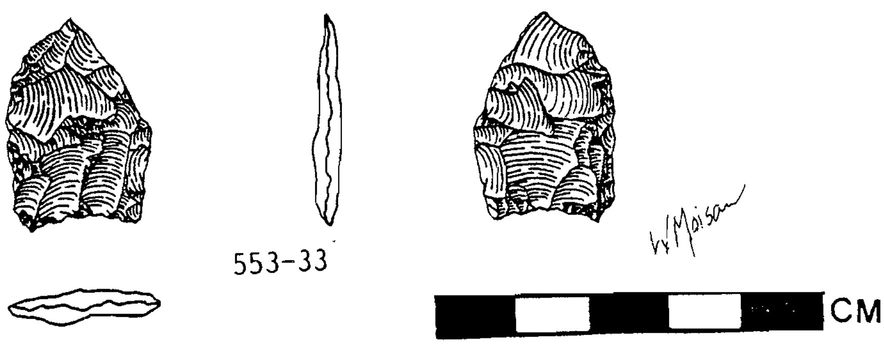

553-33

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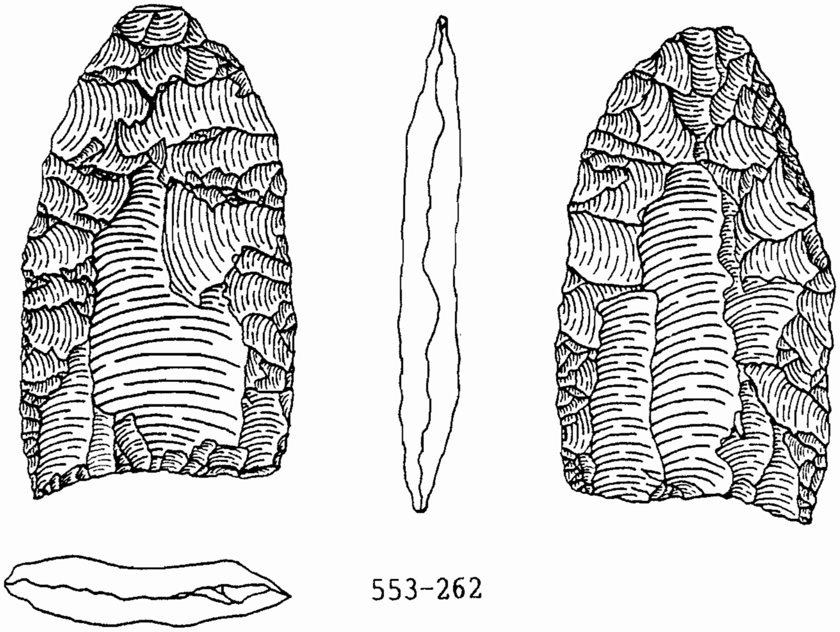

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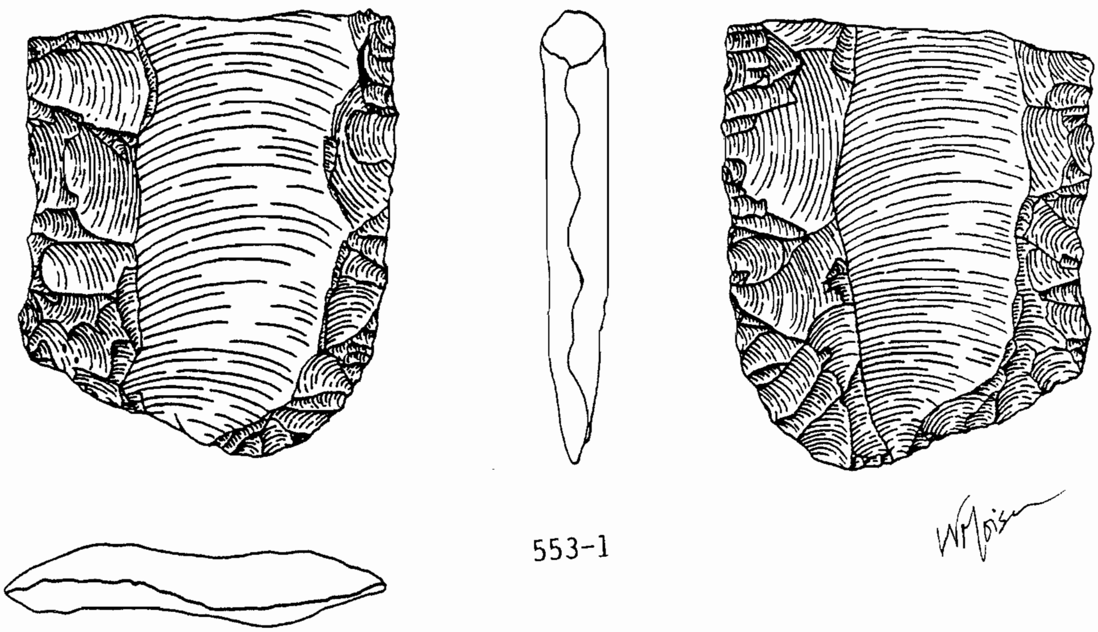
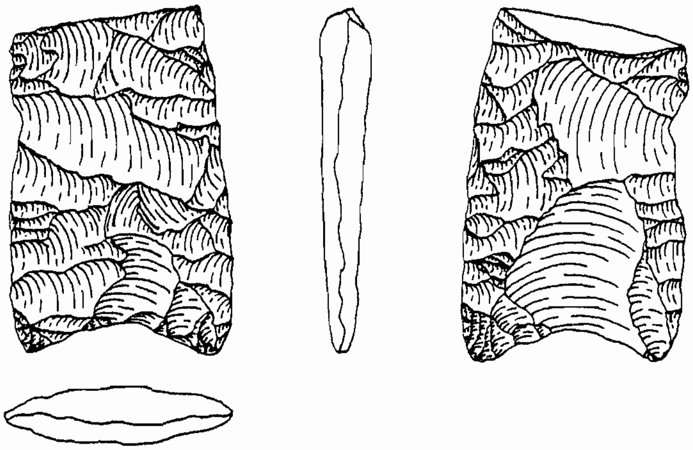


553-1

DIETZ SITE (35 LK 1529)



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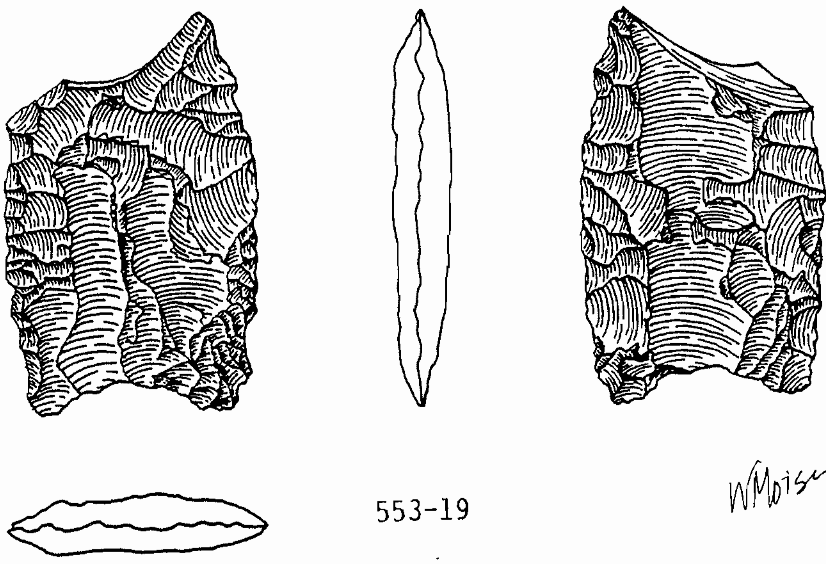
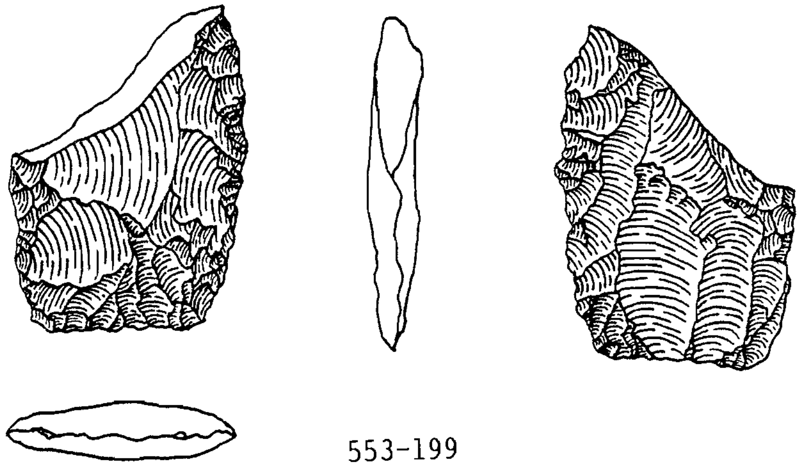


553-19

WMoise

DIETZ SITE (35 LK 1529)



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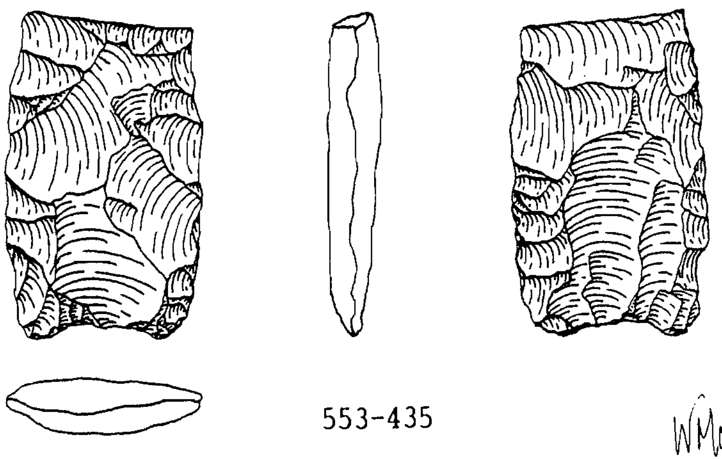

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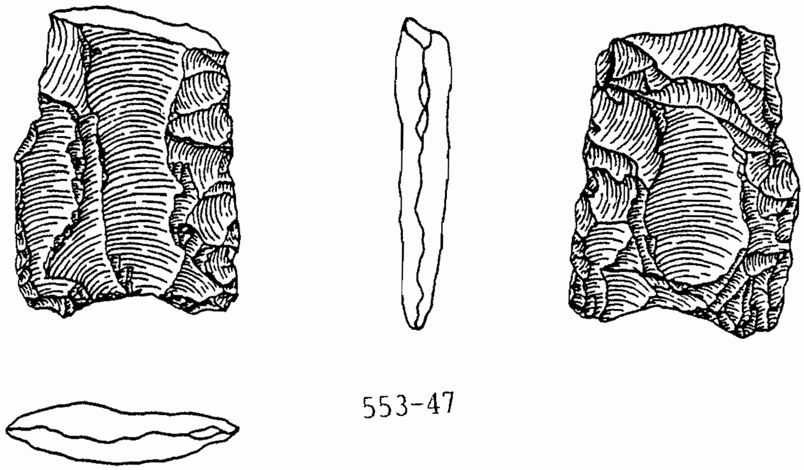
DIETZ SITE (35 LK 1529)



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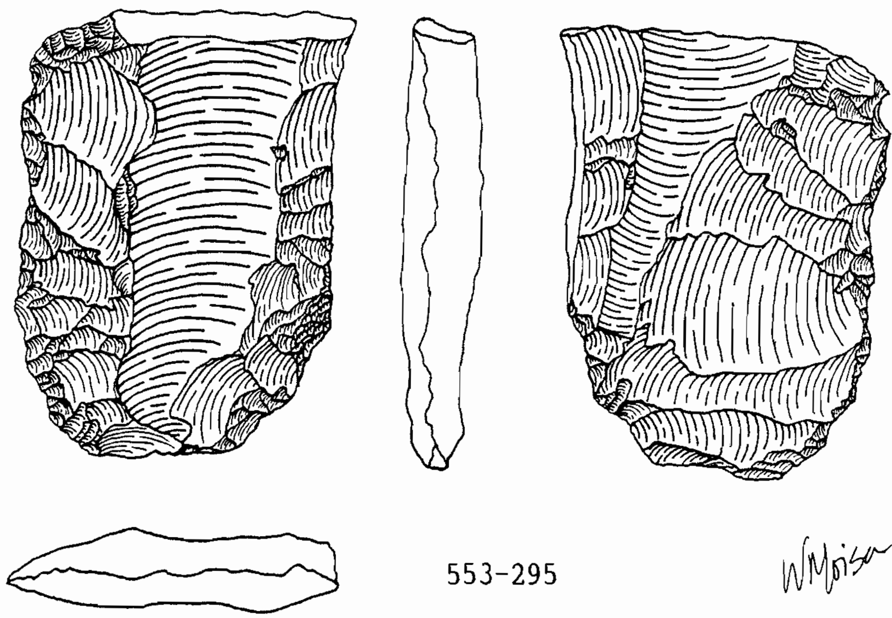

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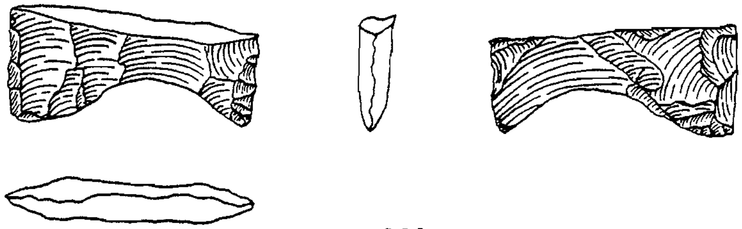
DIETZ SITE (35 LK 1529)



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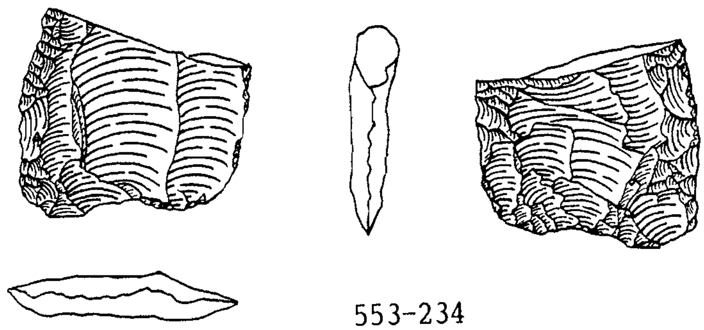

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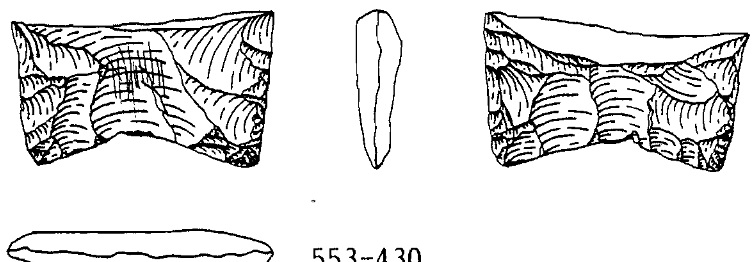
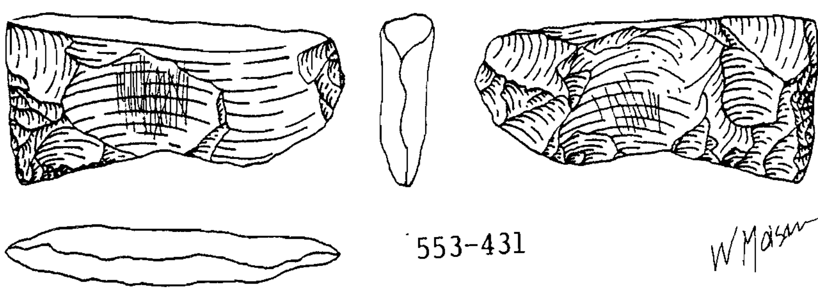


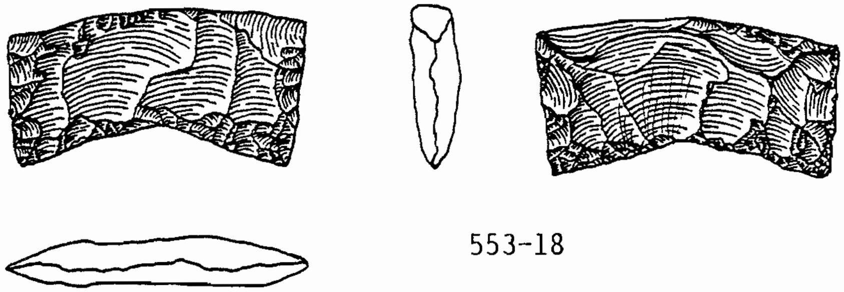
553-430



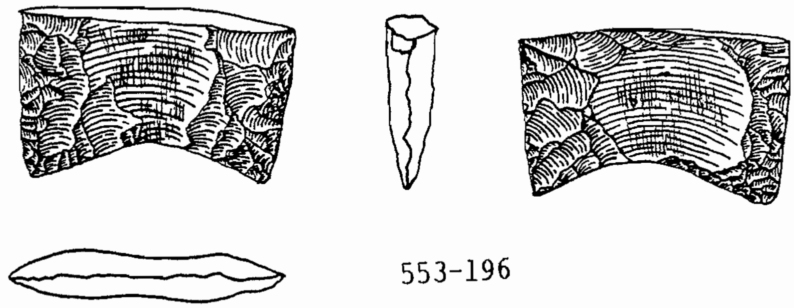
553-431

W Mason

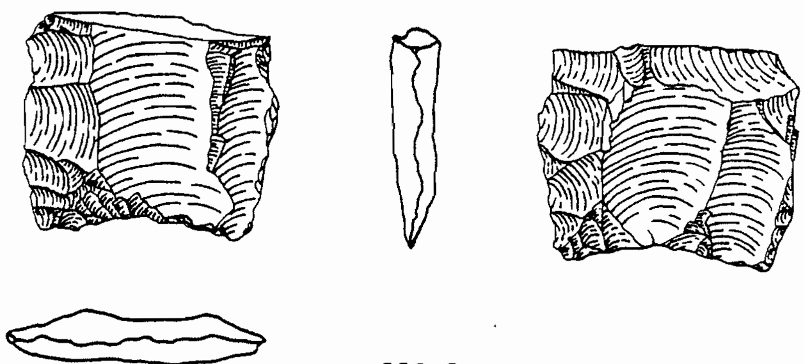
DIETZ SITE (35 LK 1529)



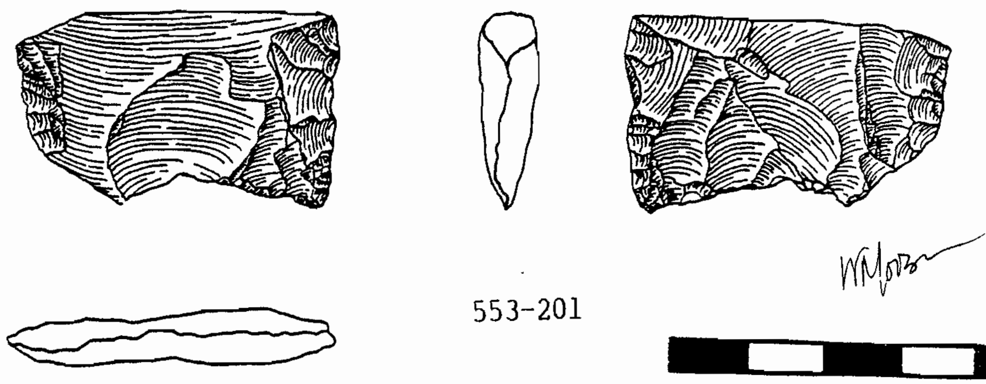
553-18



553-196



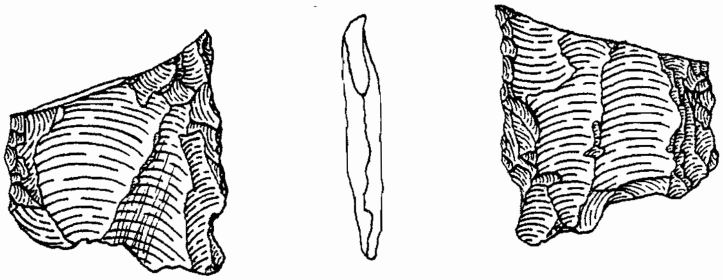
553-5



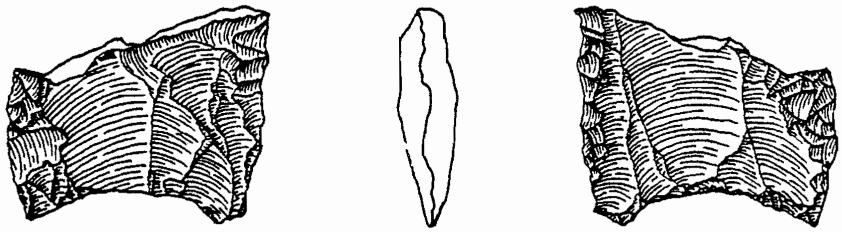
553-201

CM

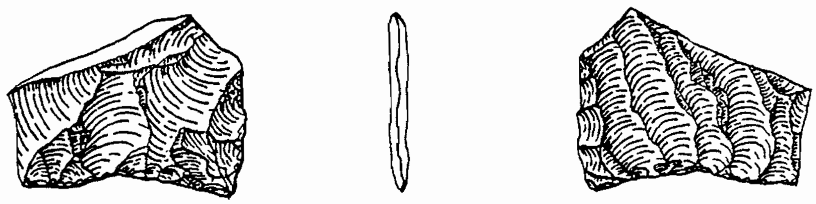
DIETZ SITE (35 LK 1529)



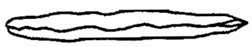
553-100

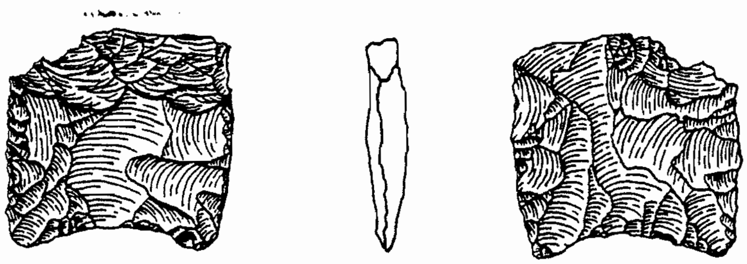


553-188

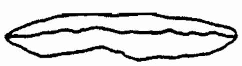


553-410





553-6



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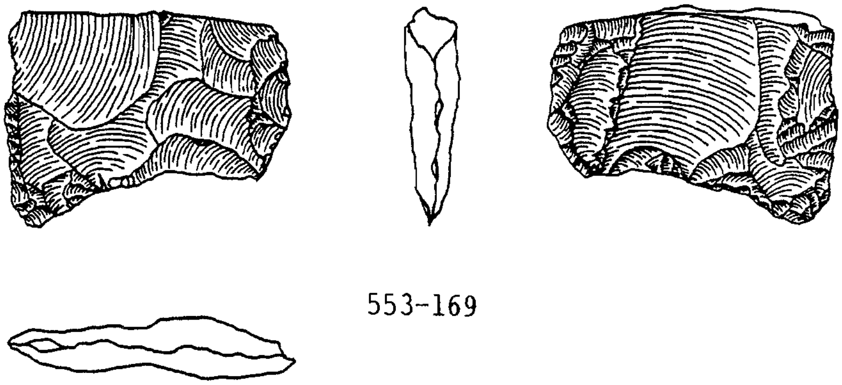
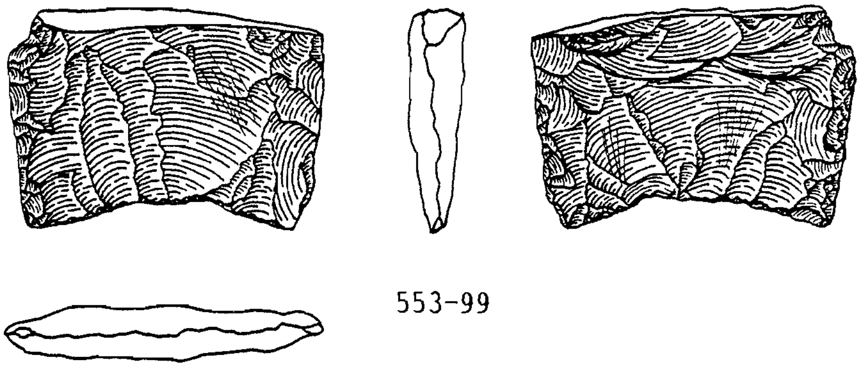
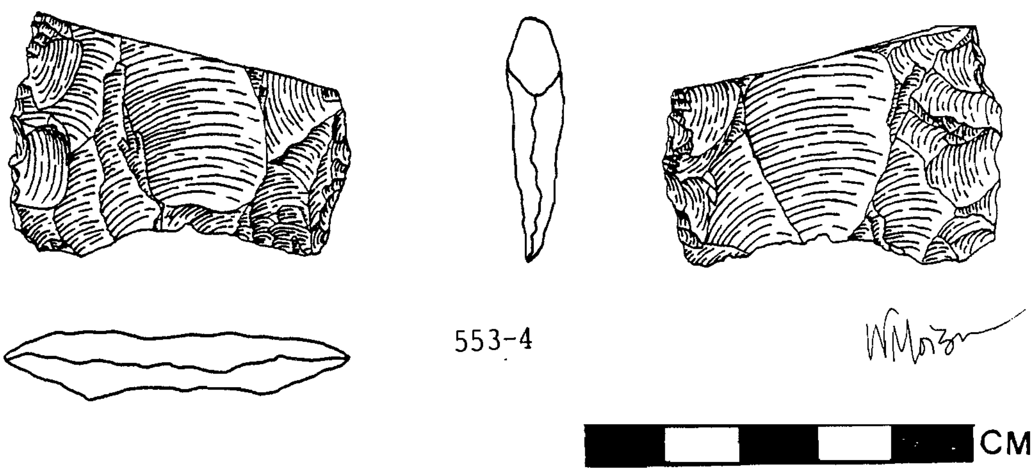


553-169

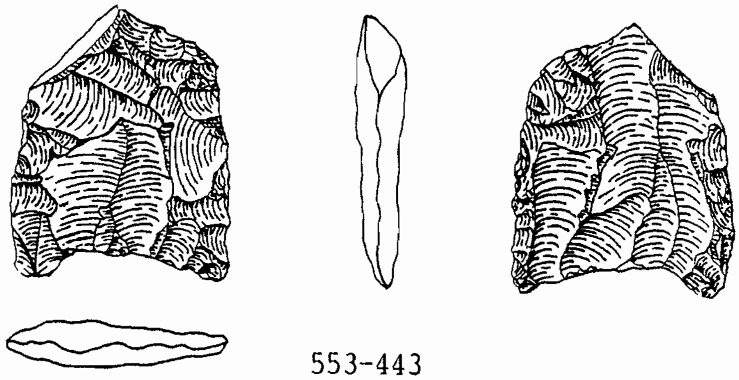


553-99

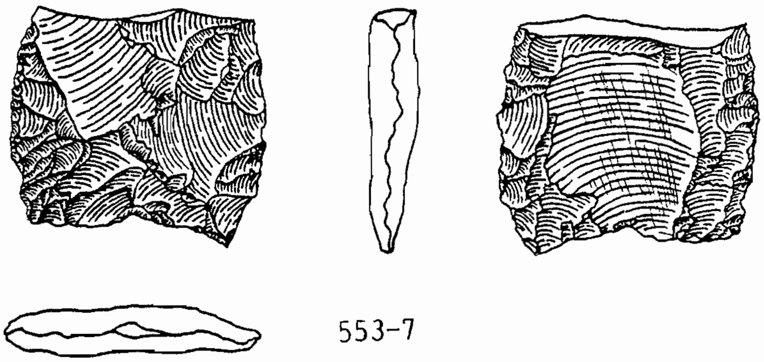


553-4

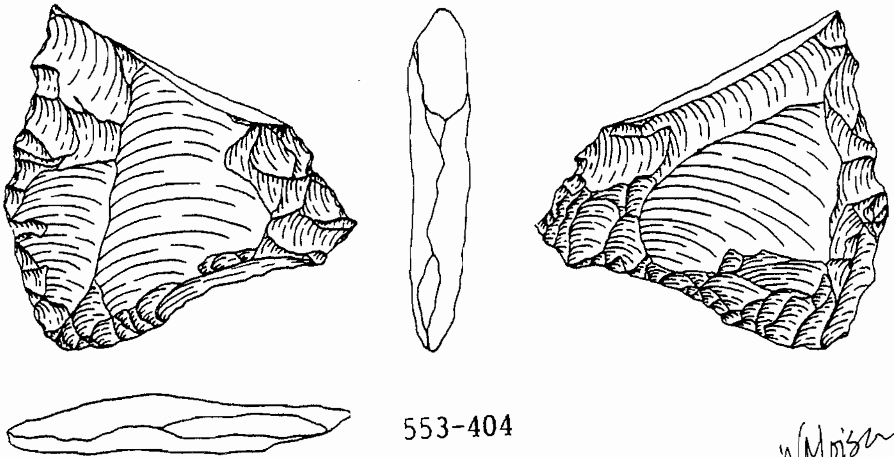
DIETZ SITE (35 LK 1529)



553-443



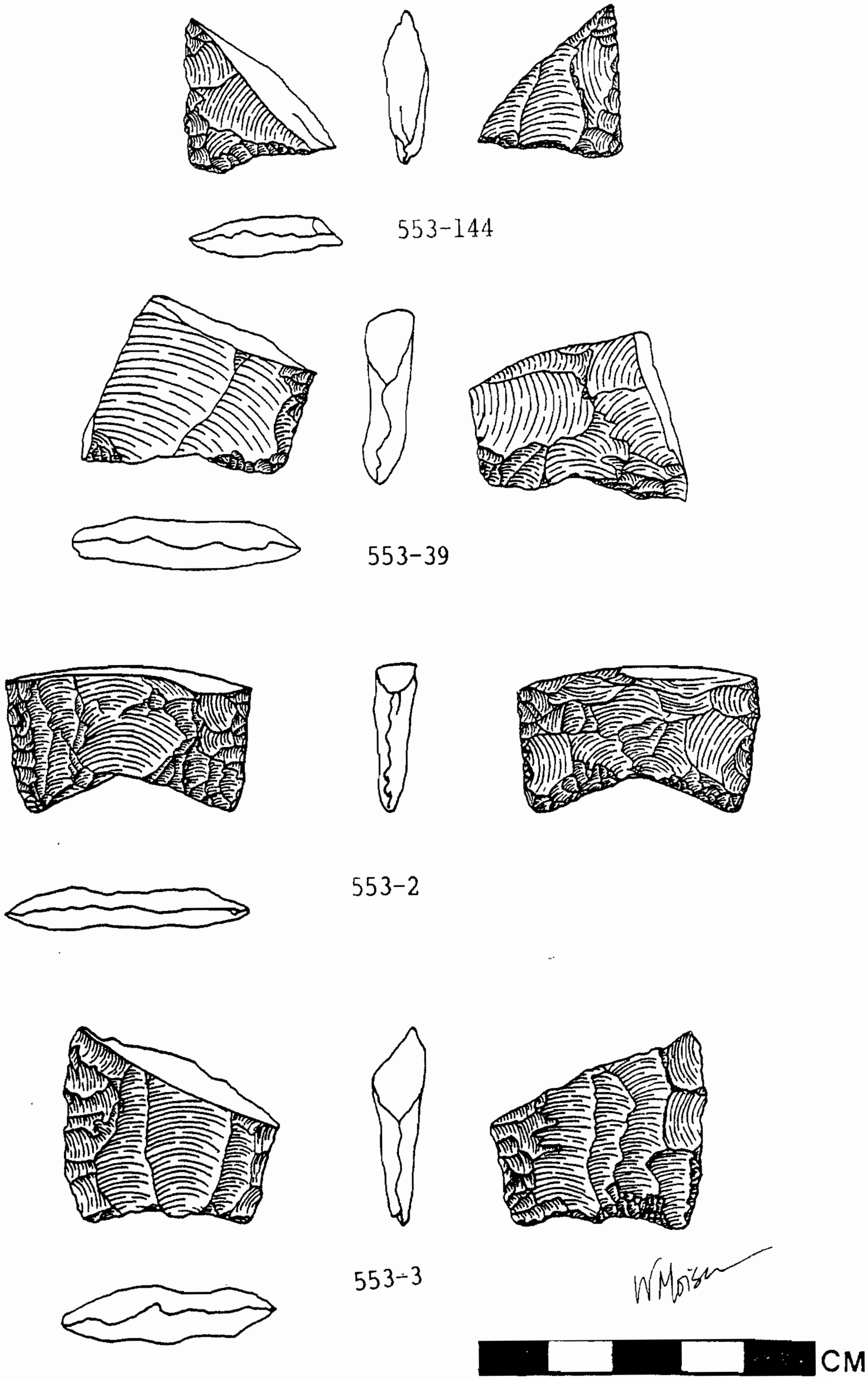
553-7



553-404

WMoise

DIETZ SITE (35 LK 1529)



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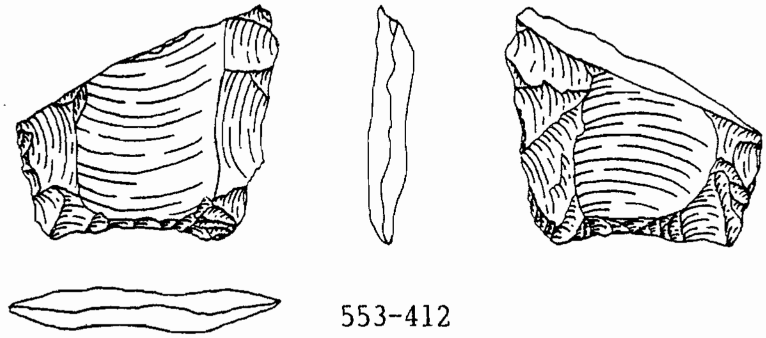
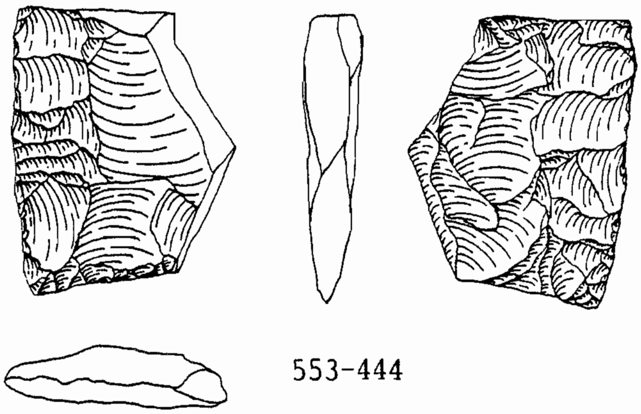
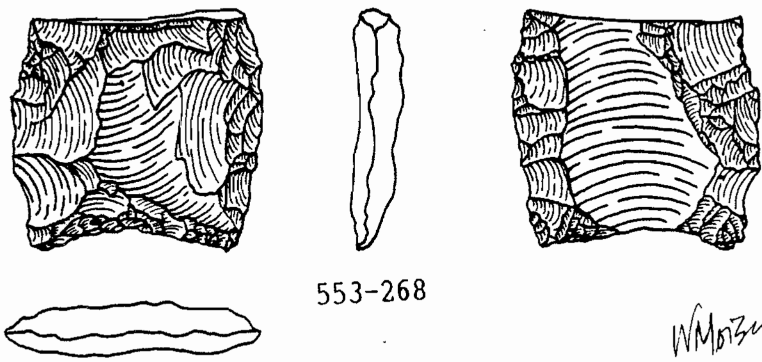


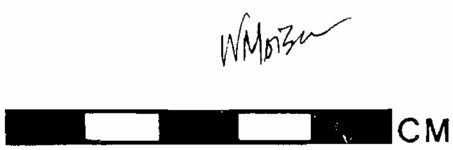
553-412



553-444



553-268



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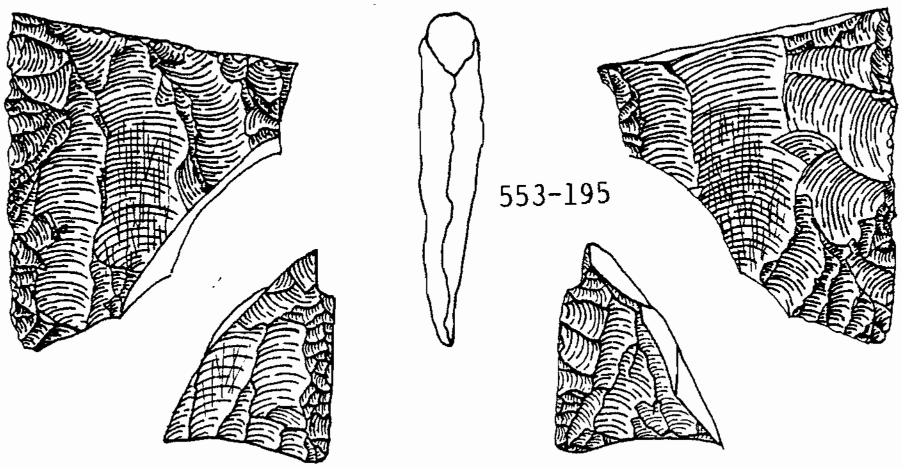
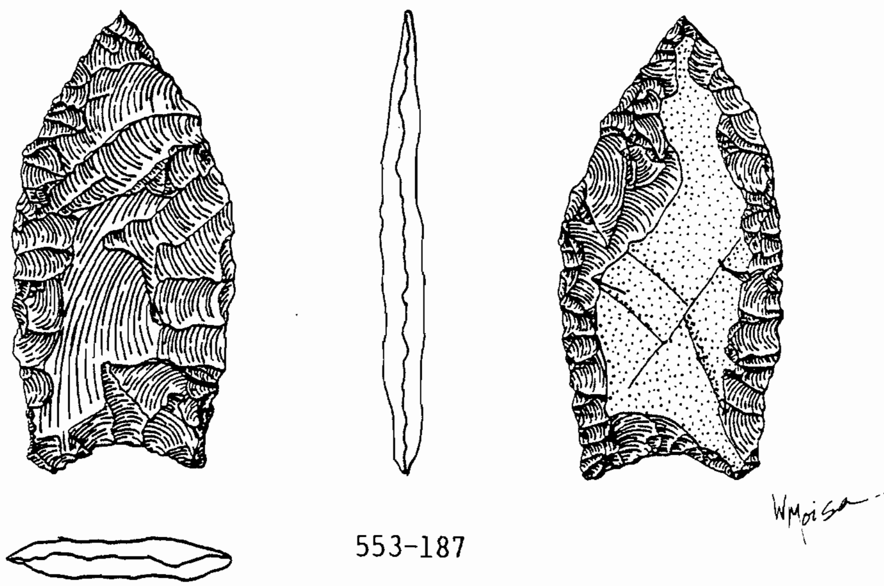


553-195

553-267



553-187

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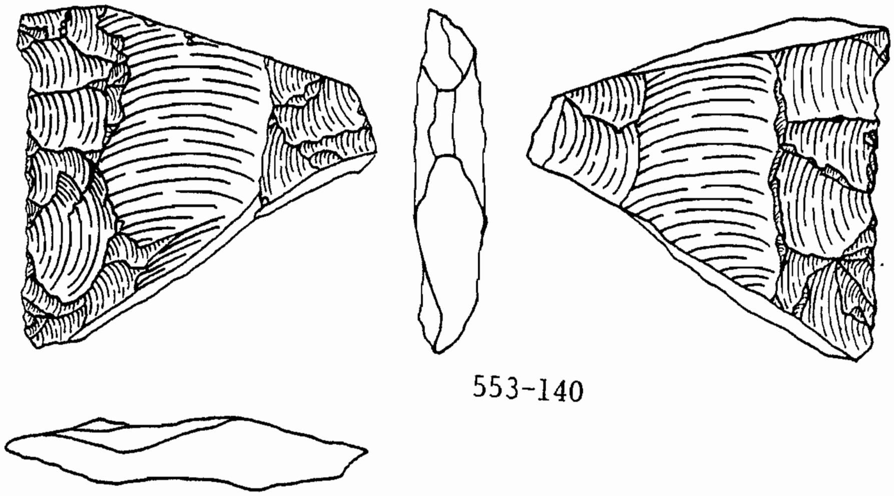
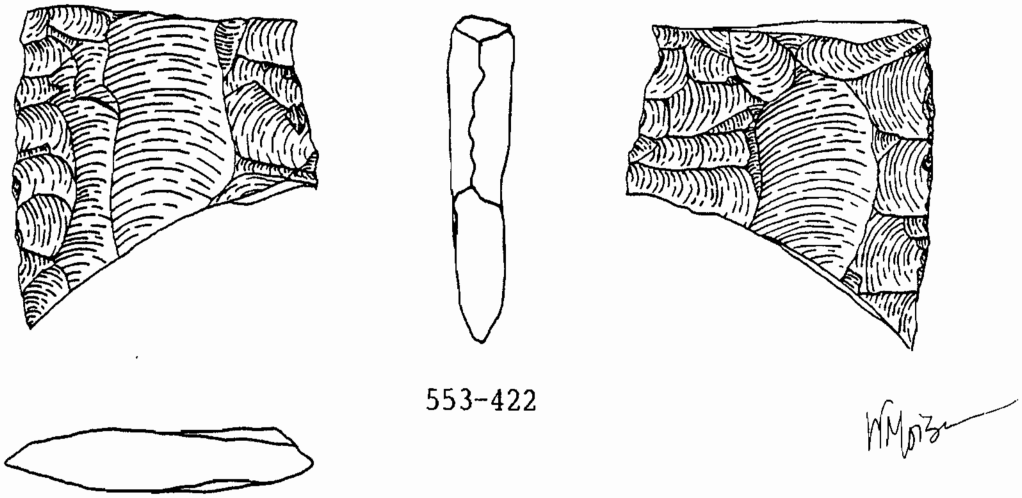


553-140



553-422

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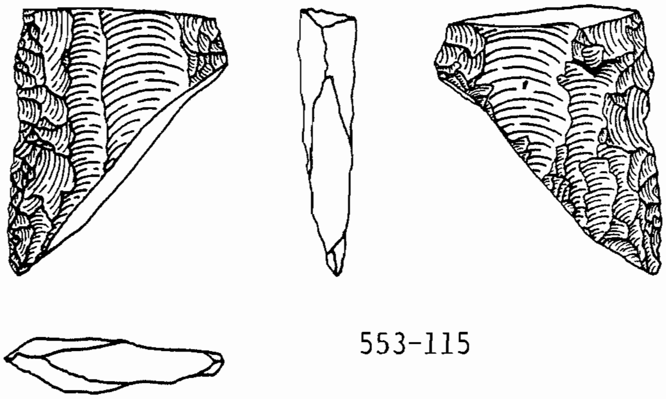
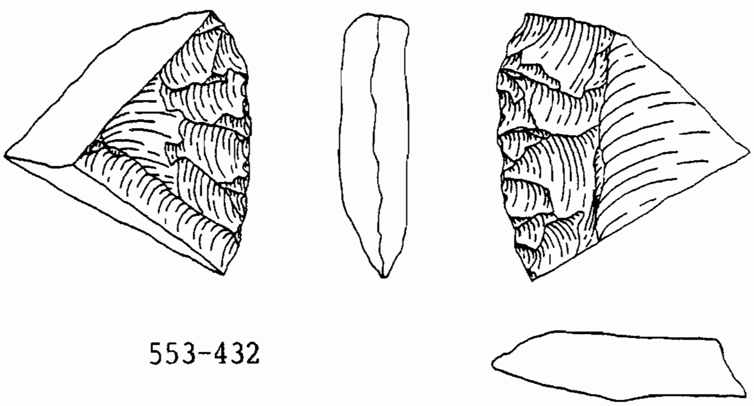


553-115



553-432

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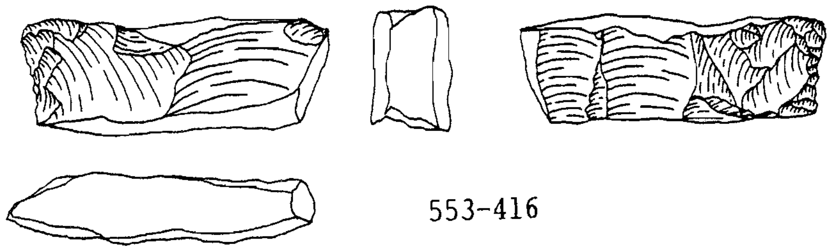

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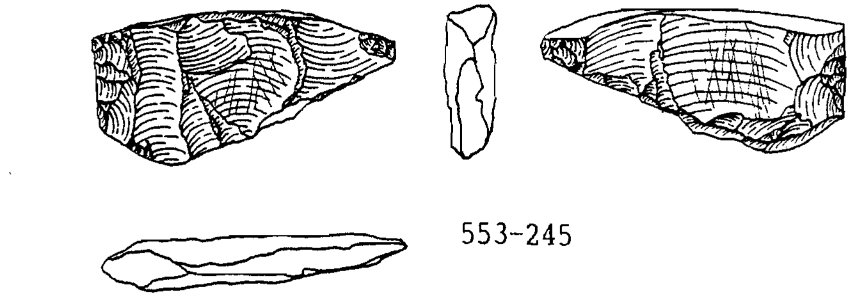
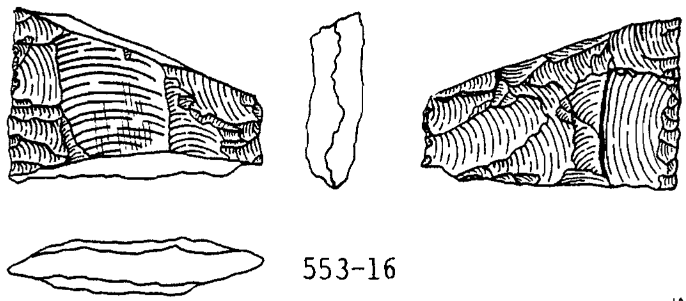


553-245



553-16

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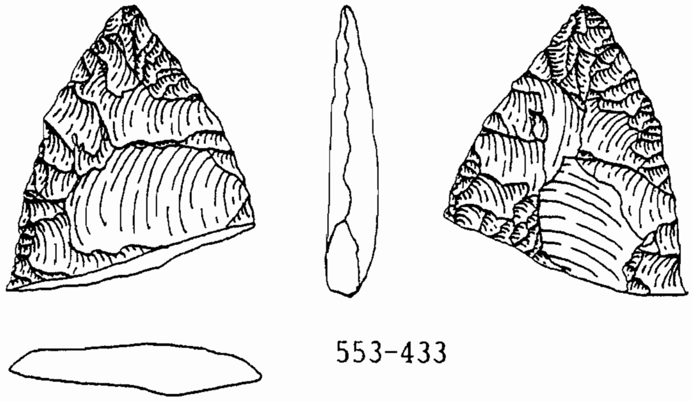
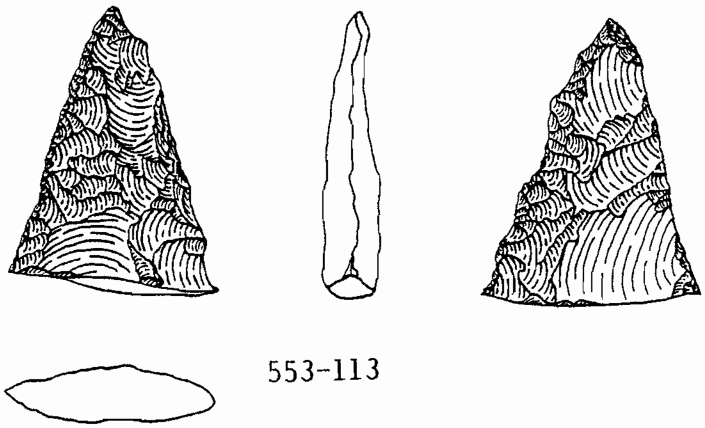
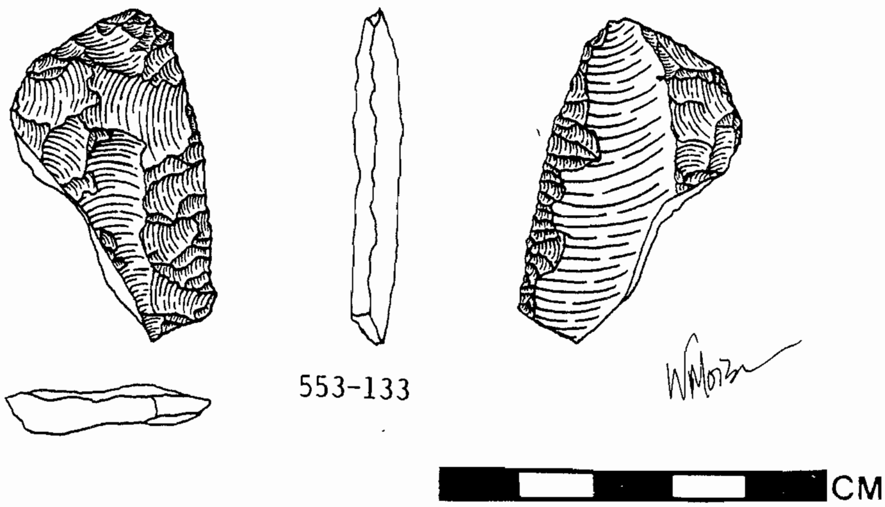


553-433



553-113



553-133

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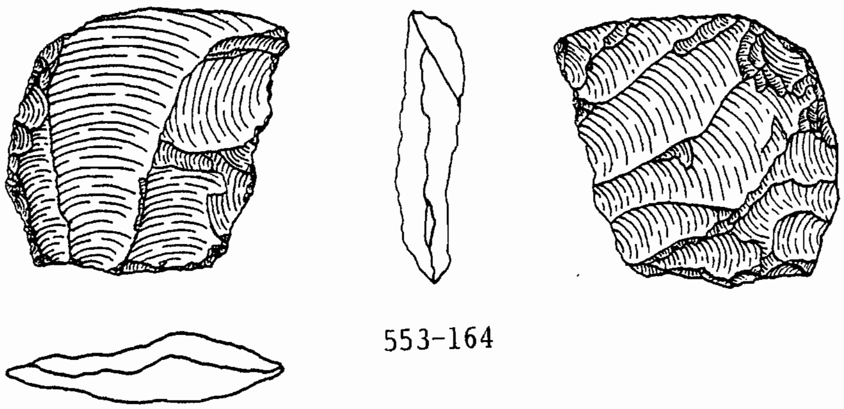
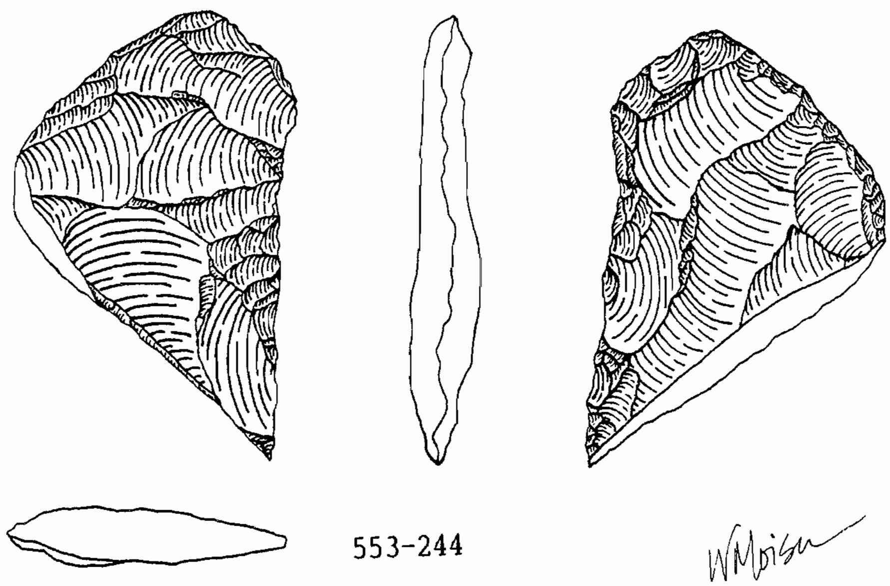


553-164



553-244

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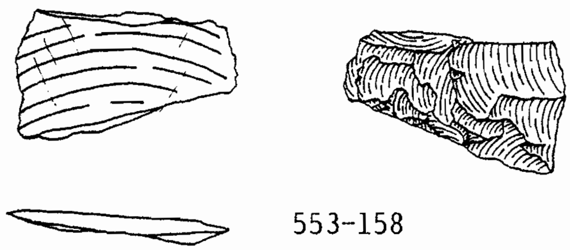
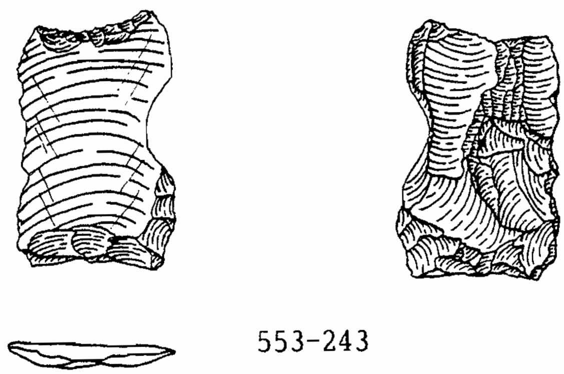
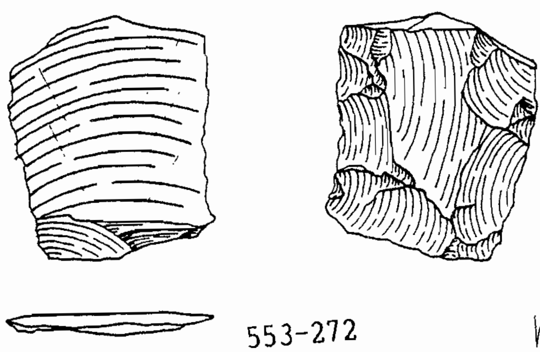


553-158



553-243



553-272

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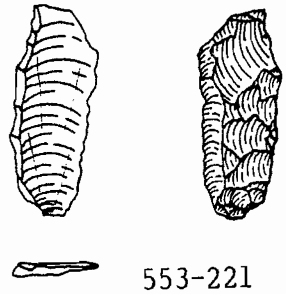
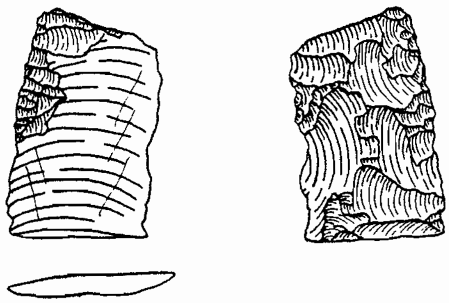


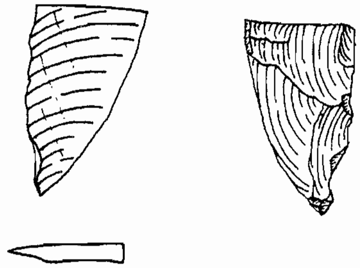
553-221



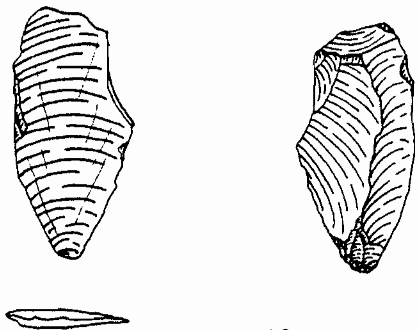
553-180

553-107

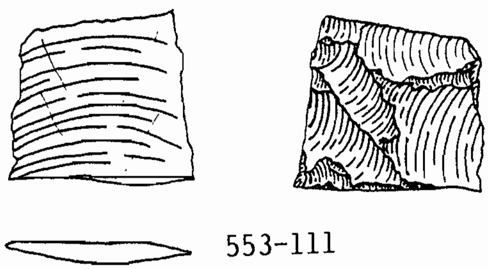
DIETZ SITE (35 LK 1529)



553-160

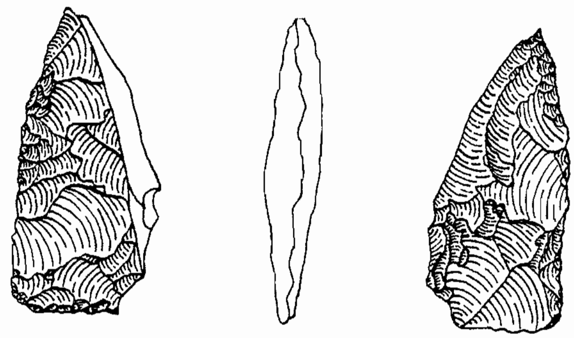


553-143

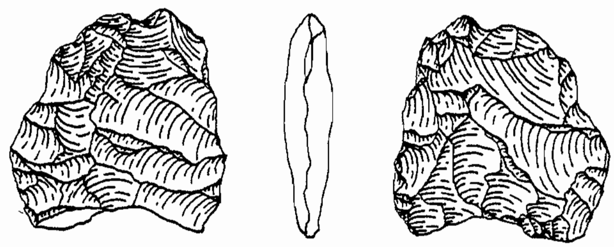


553-111

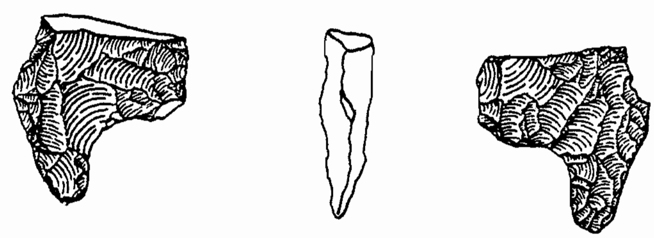
DIETZ SITE (35 LK 1529)



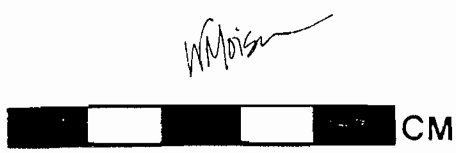
553-198 (CB)



553-407 (CB)



553-67



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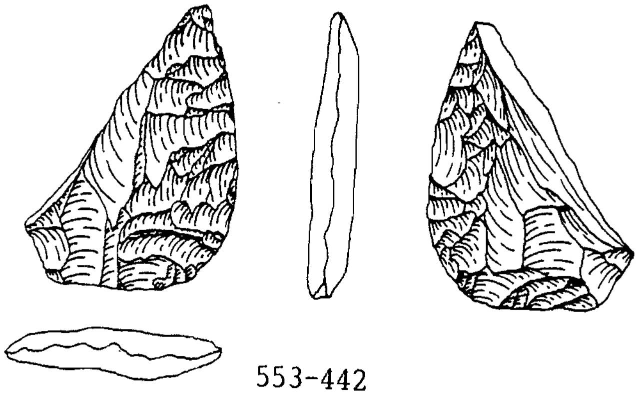
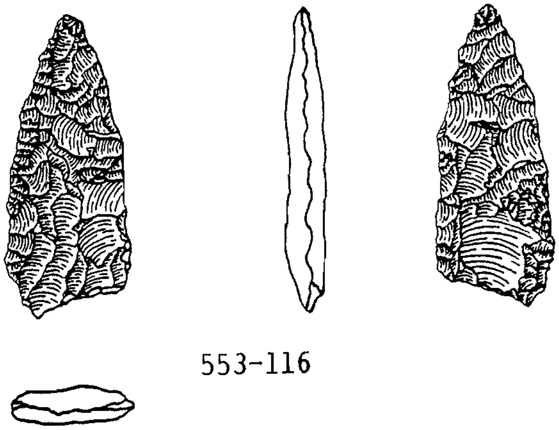
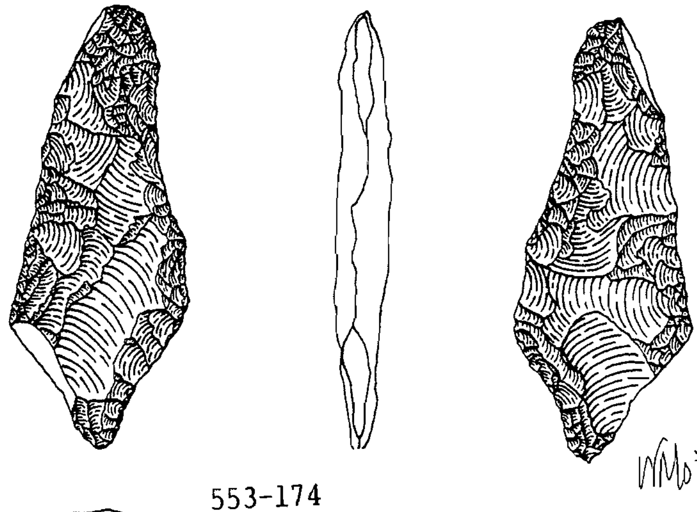


553-442



553-116



553-174

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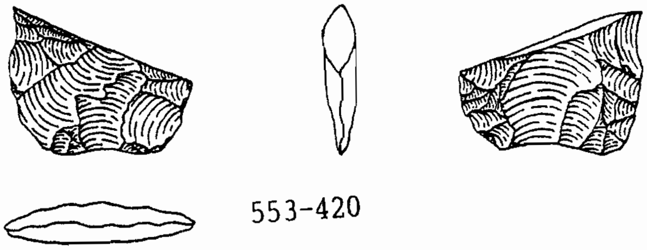
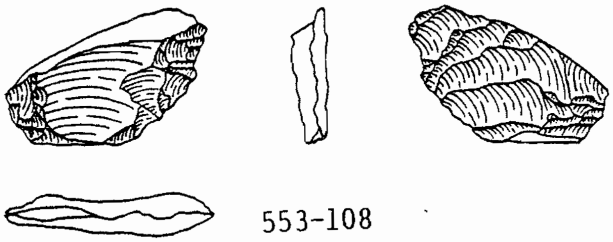
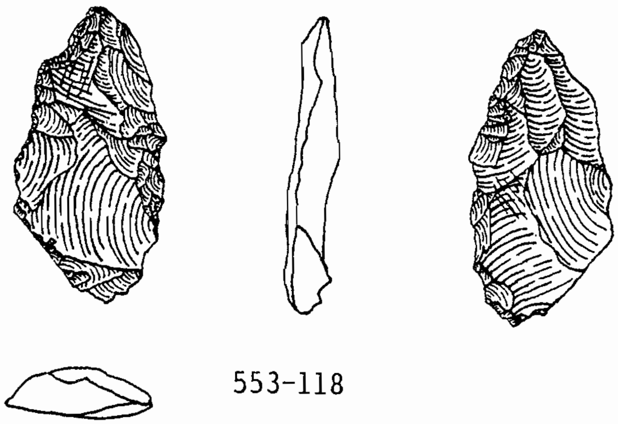


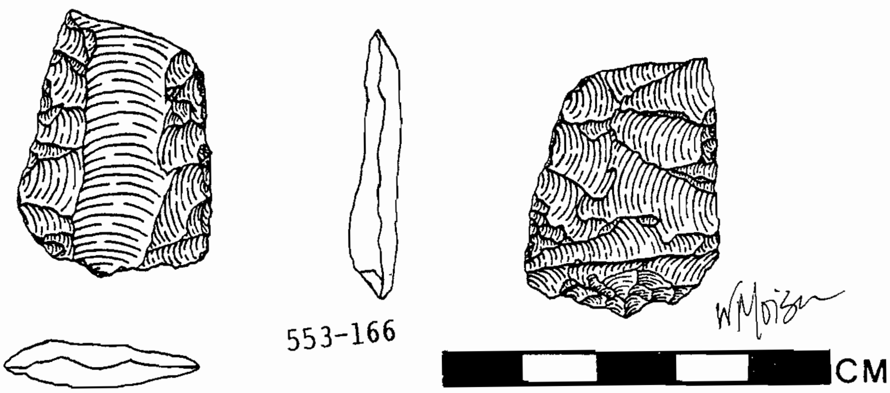
553-420



553-108



553-118



553-166

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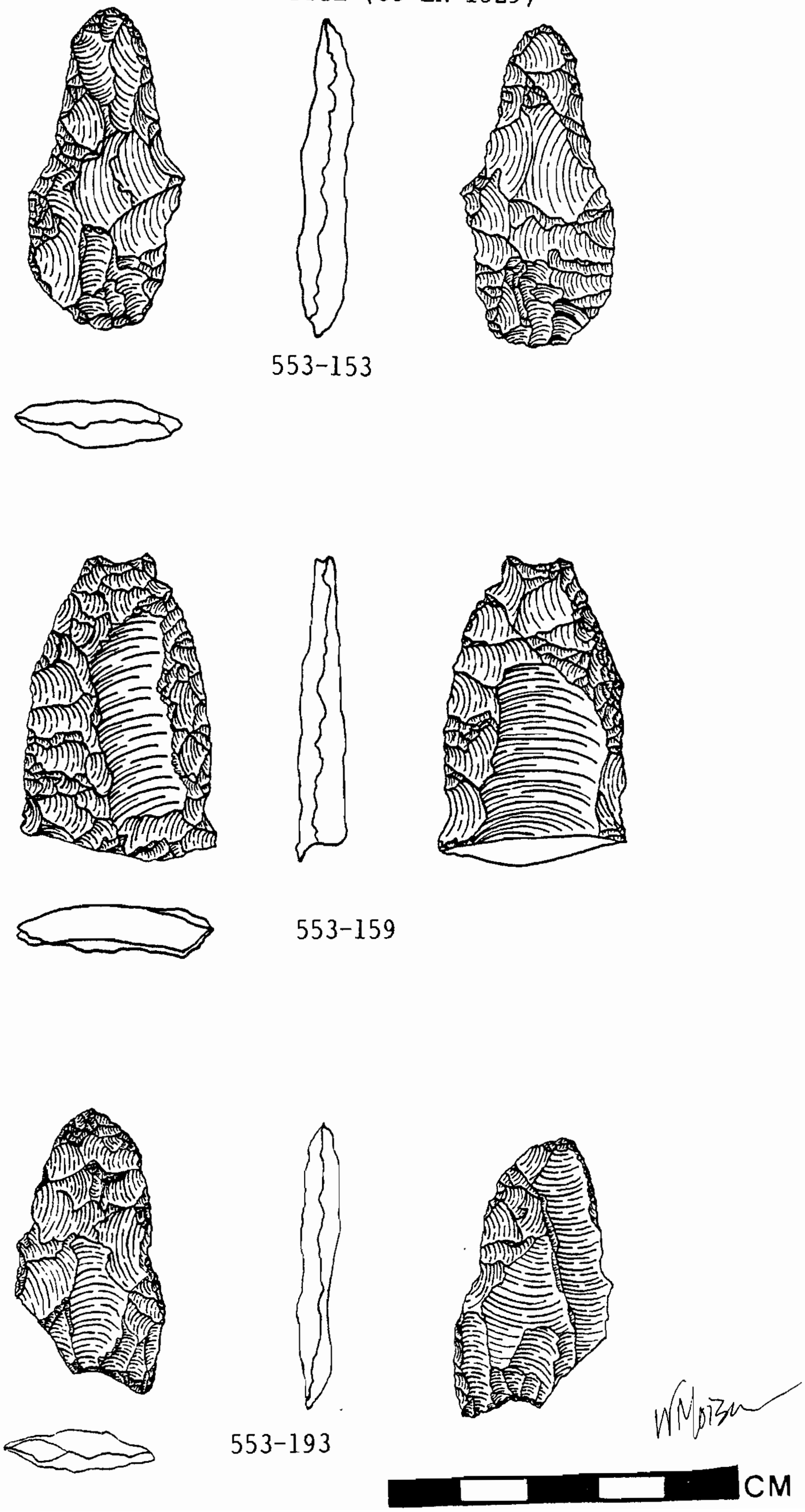

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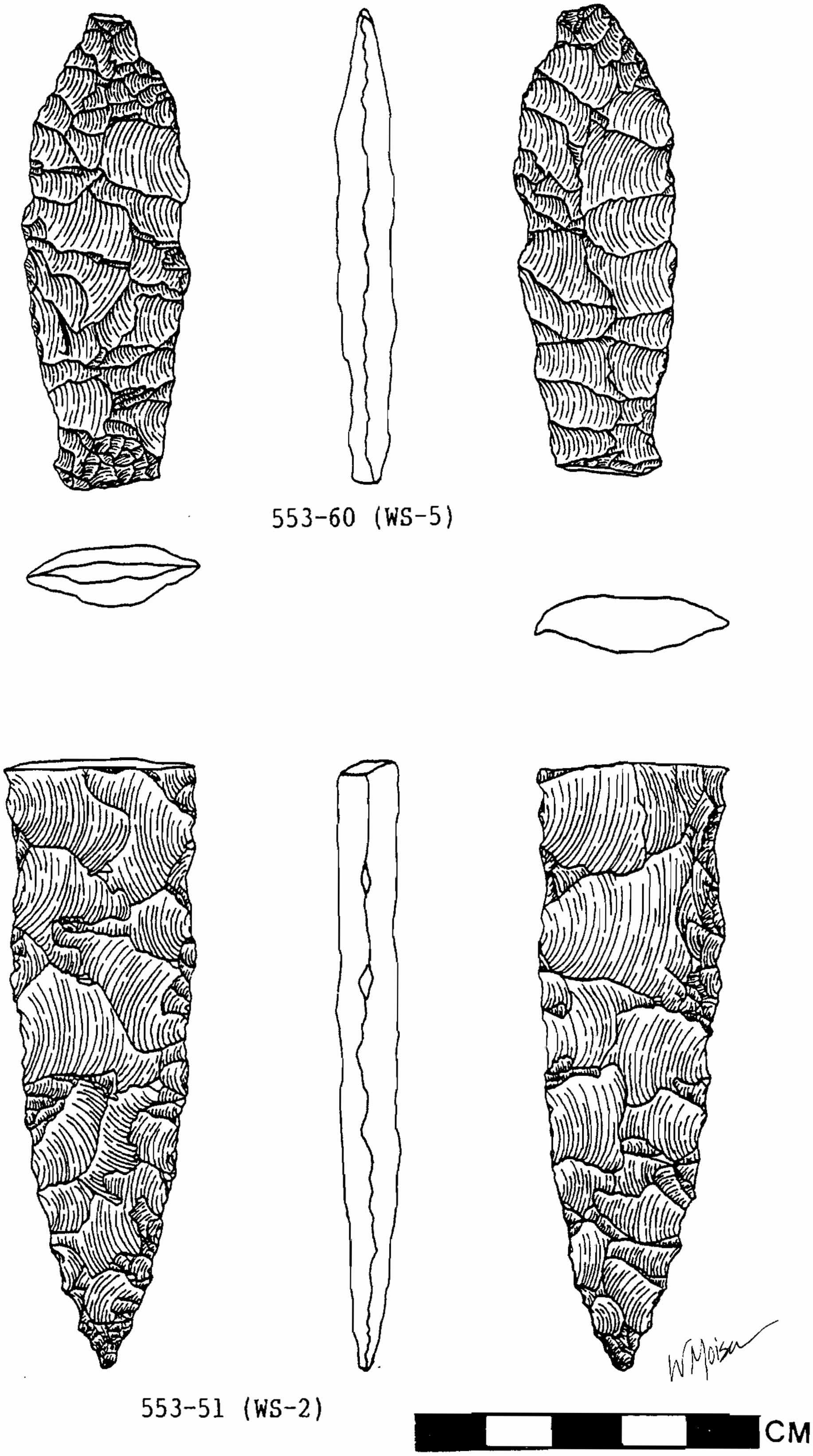

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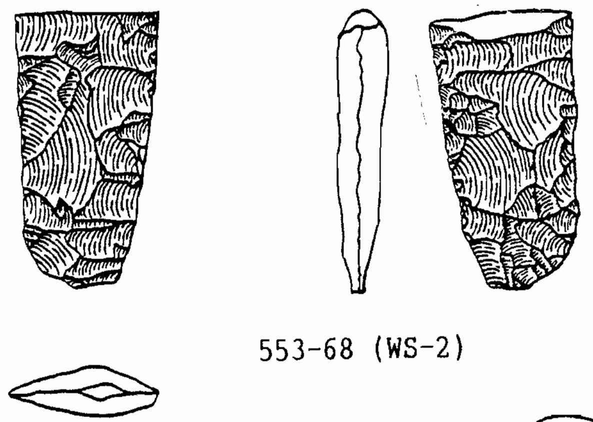
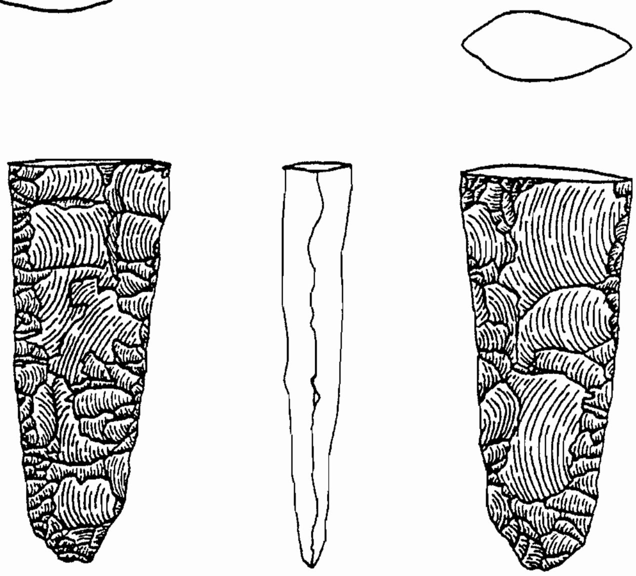
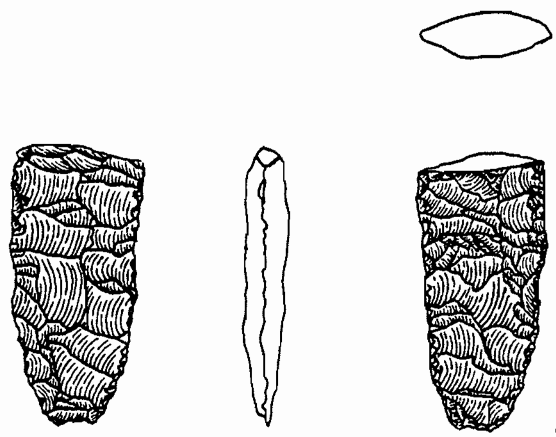


553-68 (WS-2)



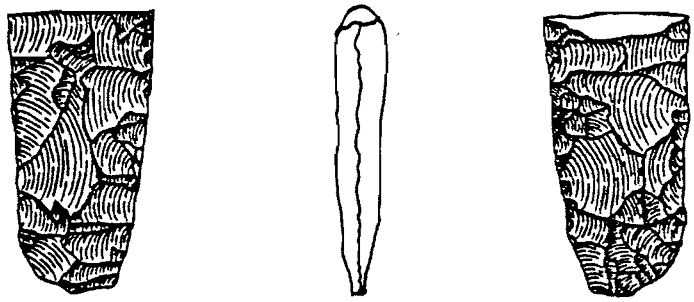
553-45 (WS-2)



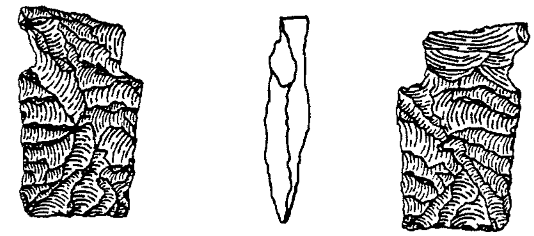
553-168 (WS-2)

CM

DIETZ SITE (35 LK 1529)

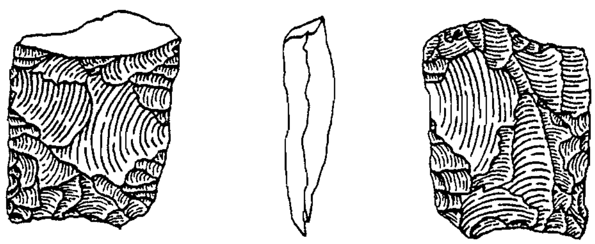


553-176 (WS-2)



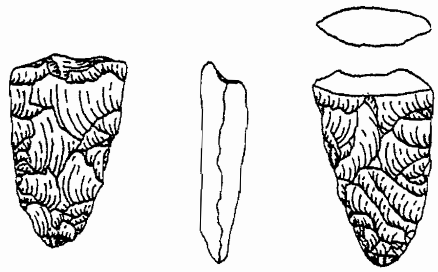
553-109 (PS)

553-211 (PS)

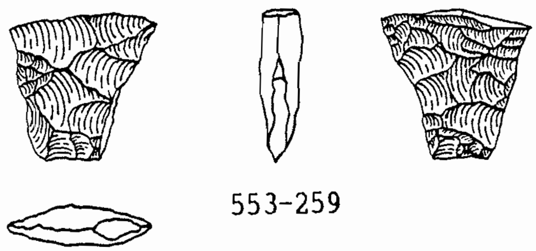


553-300 (PS)

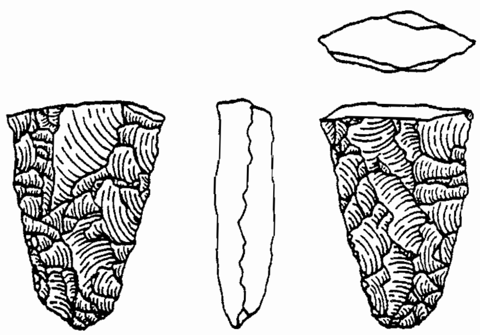
DIETZ SITE (35 LK 1529)
(WS-1)



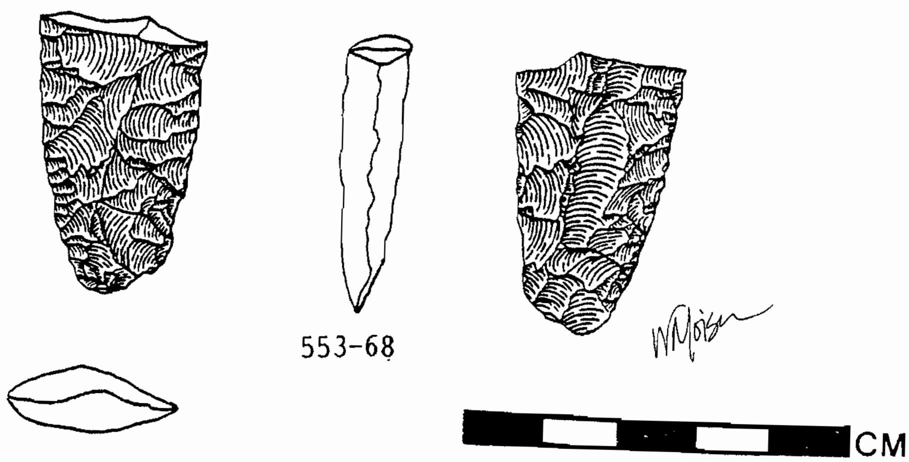
553-406



553-259



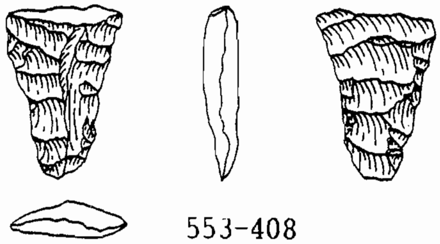
553-50



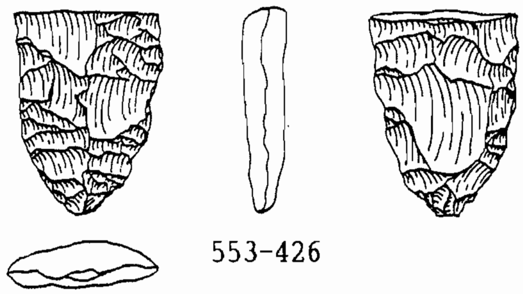
553-68

DIETZ SITE (35 LK 1529)

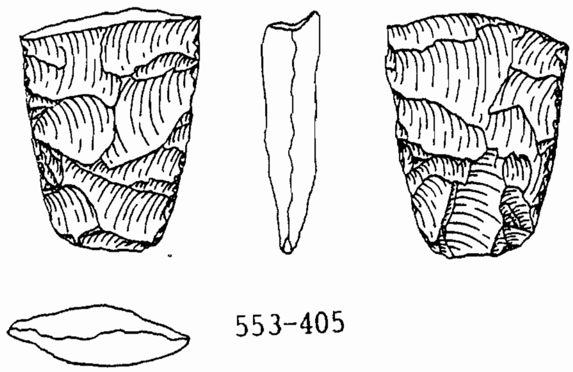
(WS-1)



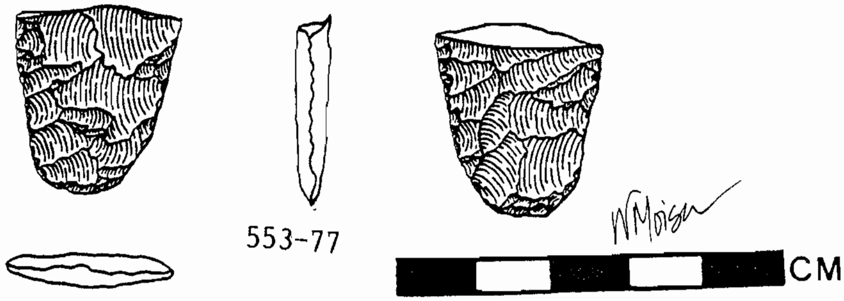
553-408



553-426

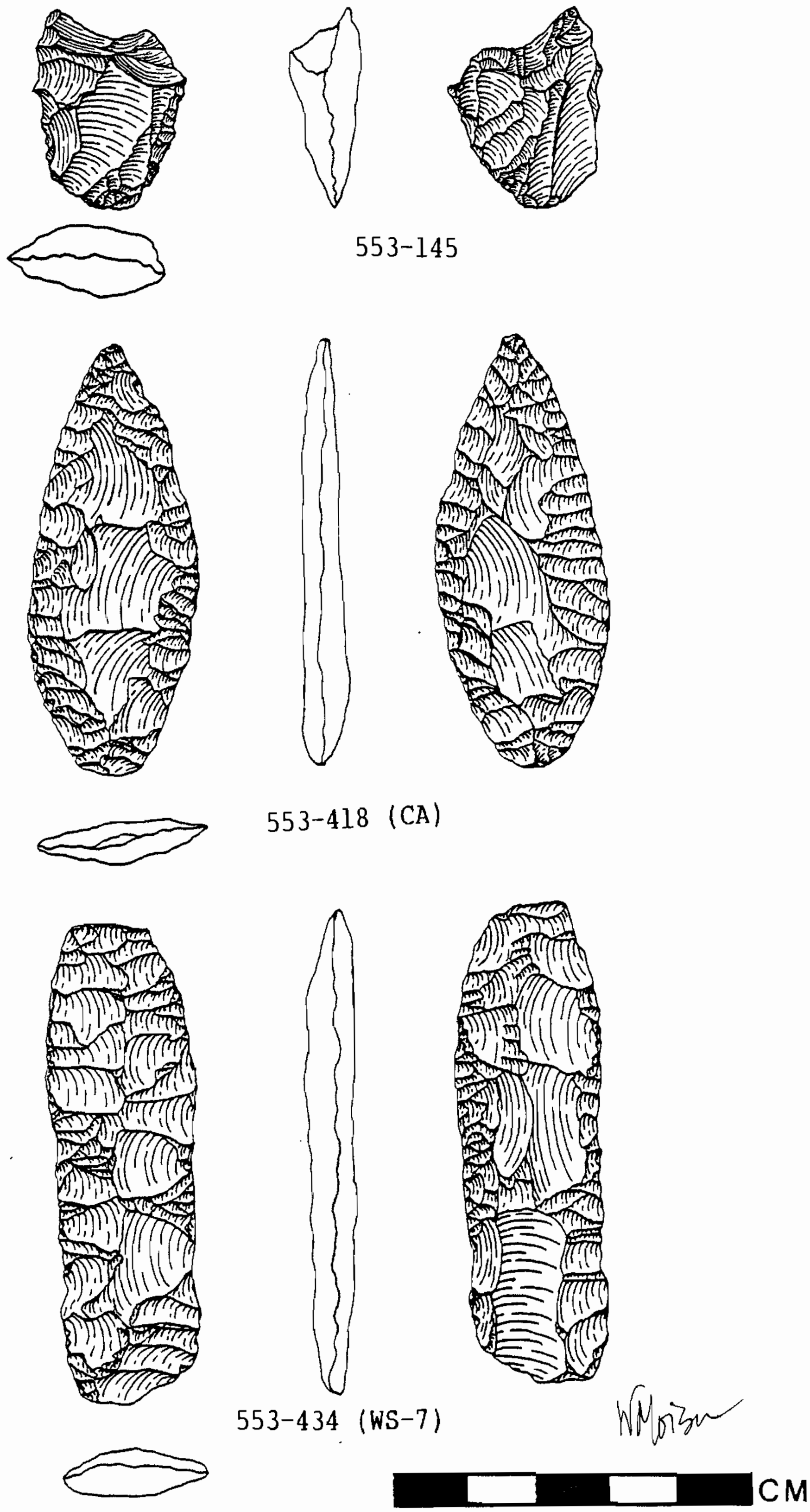


553-405



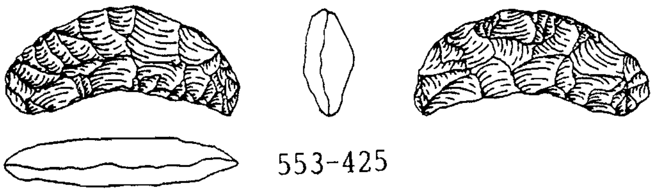
553-77

DIETZ SITE (35 LK 1529)



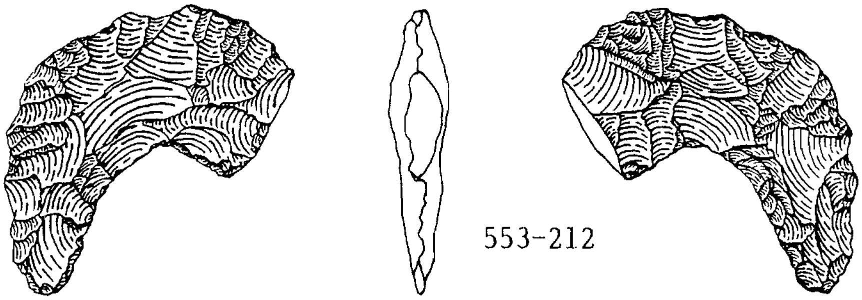
DIETZ SITE (35 LK 1529)

(WS-7)

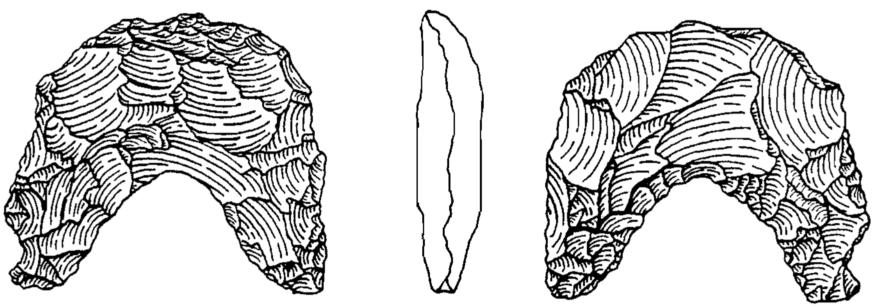


553-425

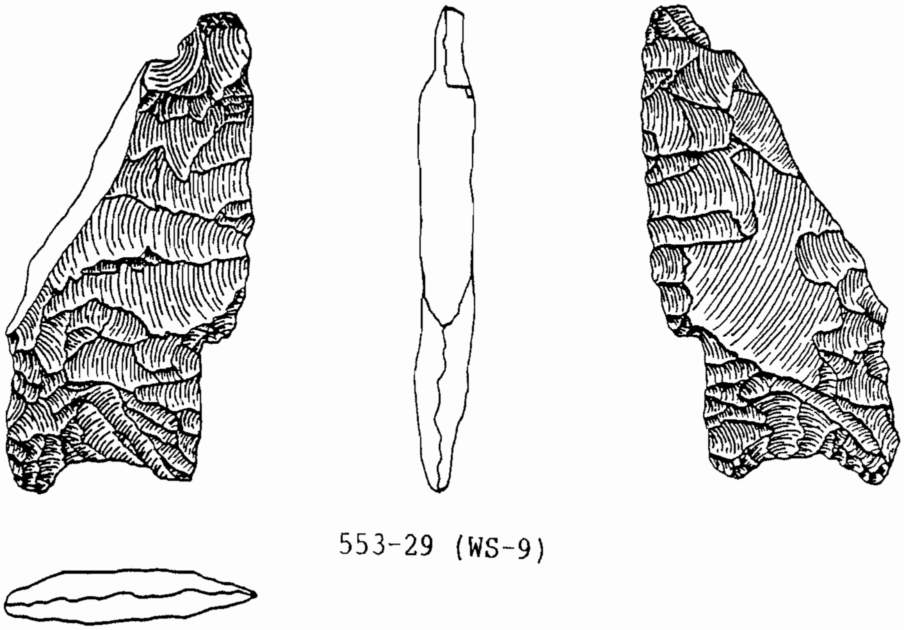
553-112



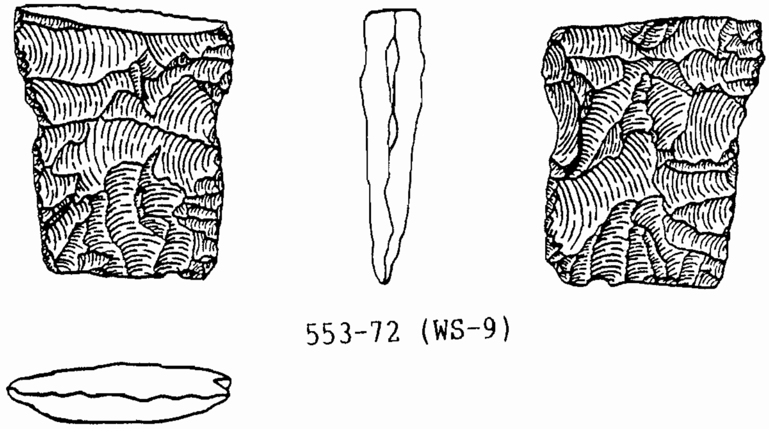
553-212



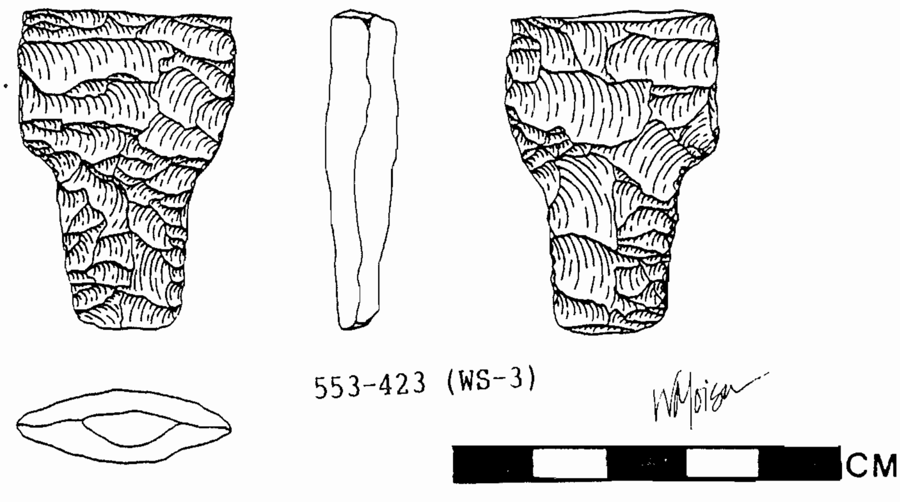
553-286



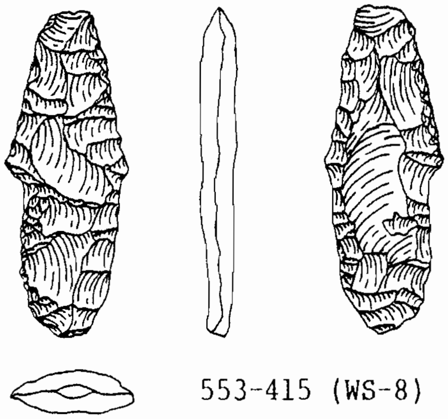
553-29 (WS-9)



553-72 (WS-9)

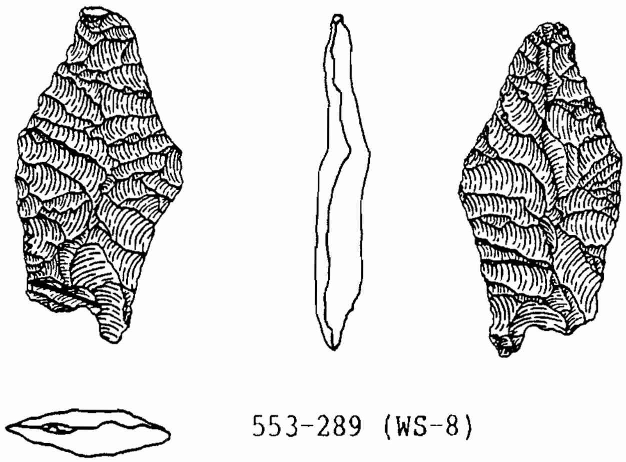


553-423 (WS-3)

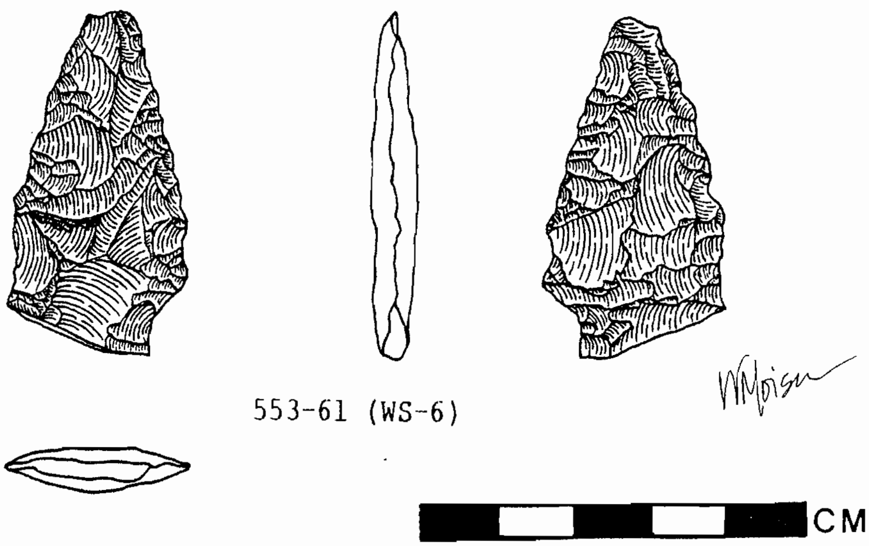


553-415 (WS-8)

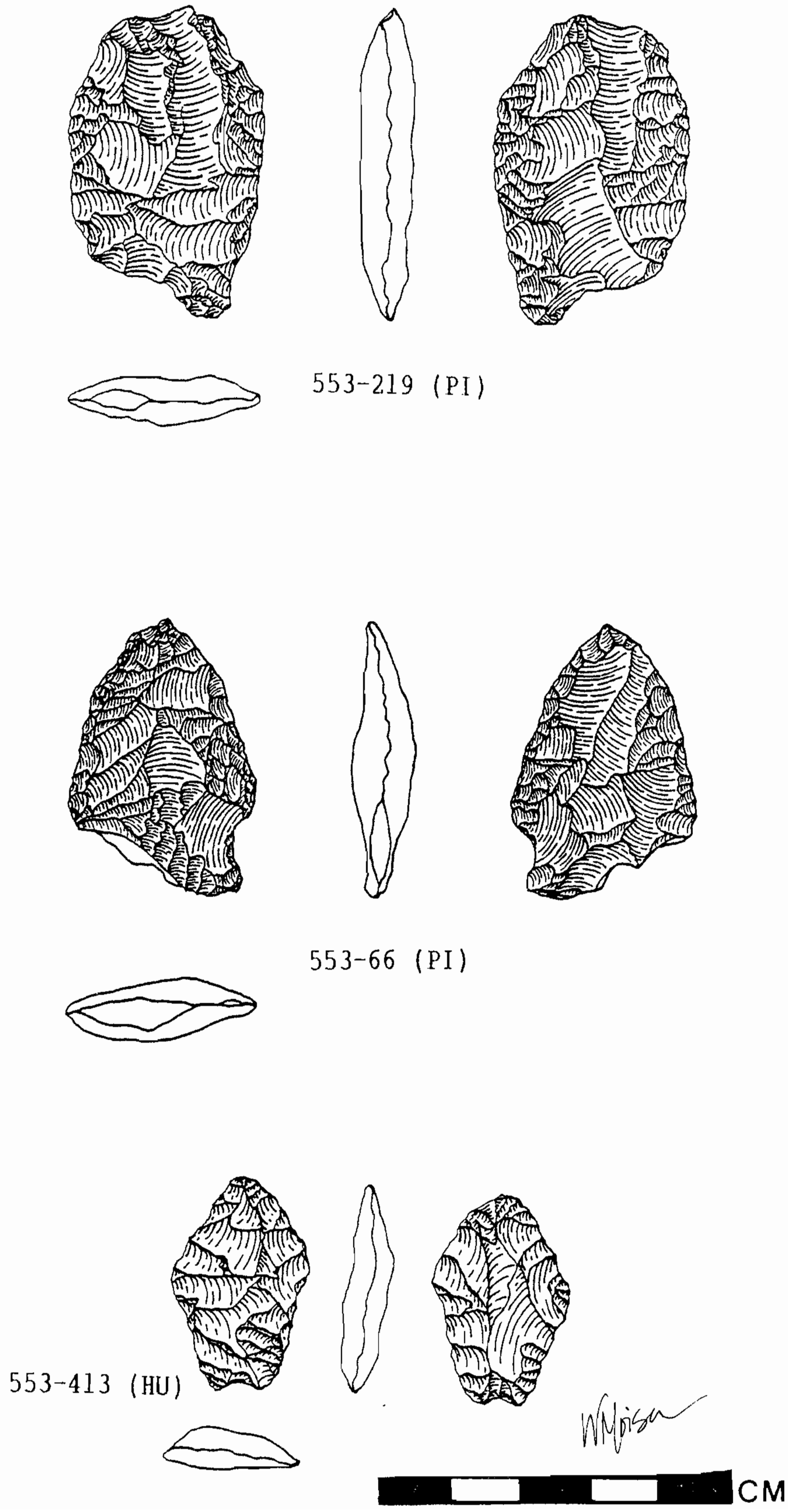
DIETZ SITE (35 LK 1529)



553-289 (WS-8)



553-61 (WS-6)



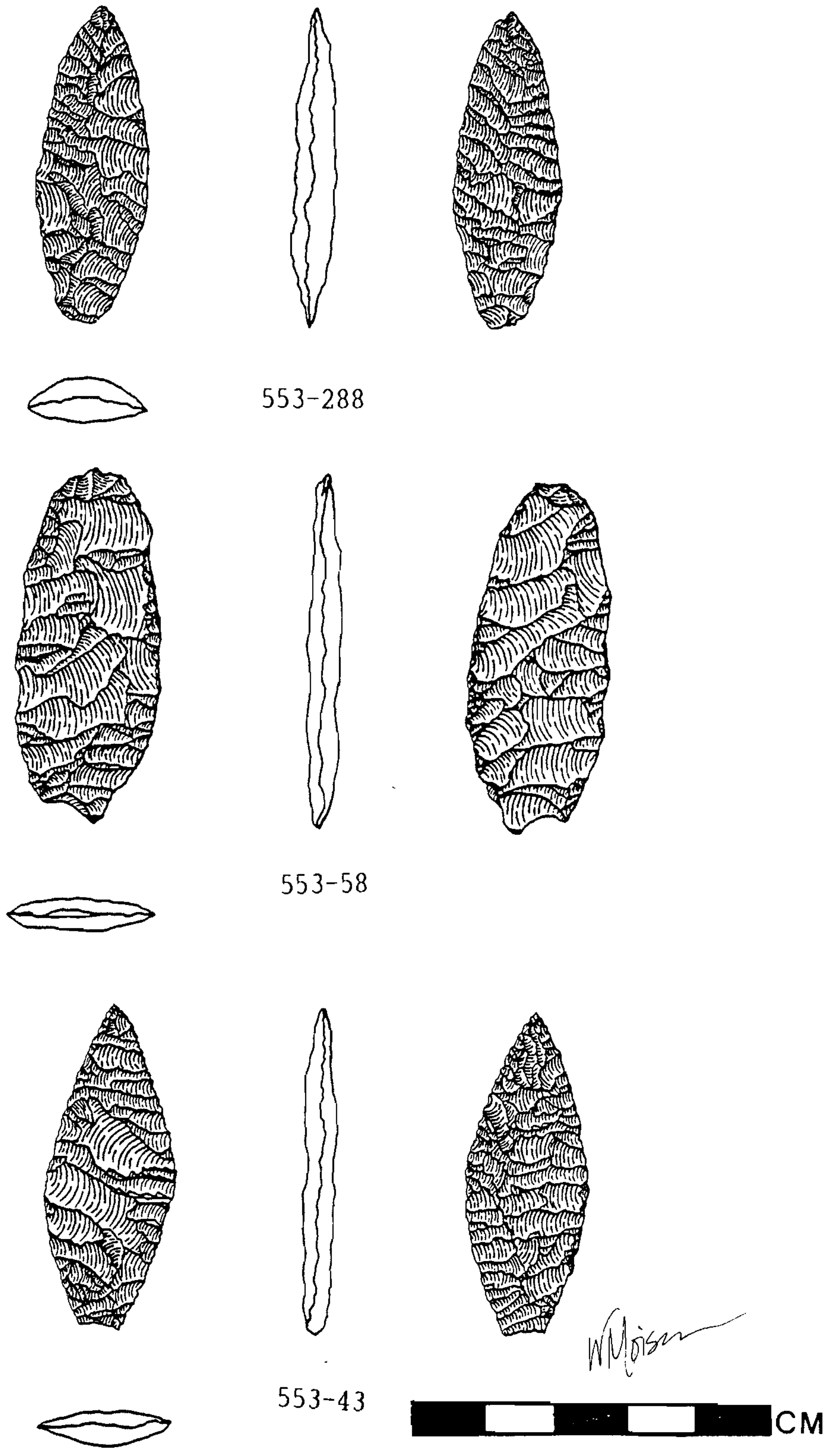
553-219 (PI)

553-66 (PI)

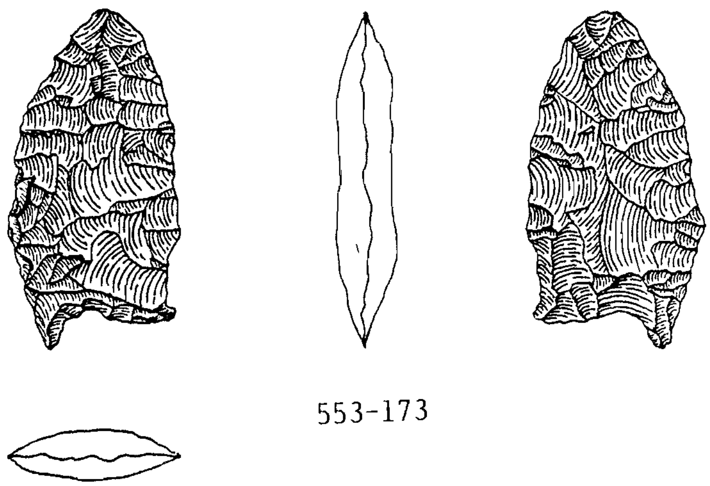
553-413 (HU)

DIETZ SITE (35 LK 1529)

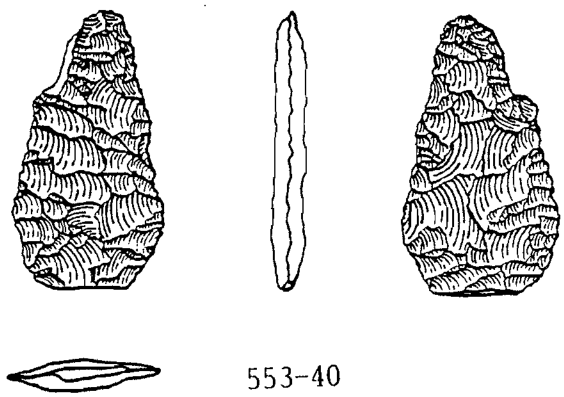
(HU)



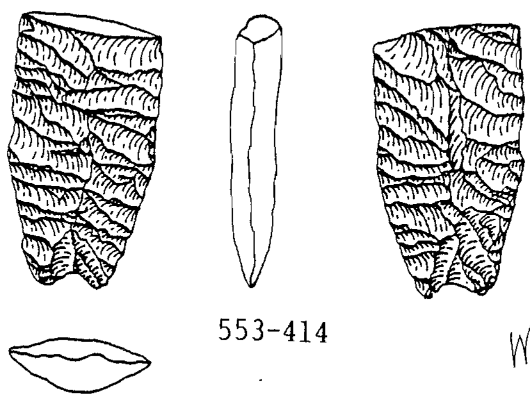
DIETZ SITE (35 LK 1529) (HU)



553-173



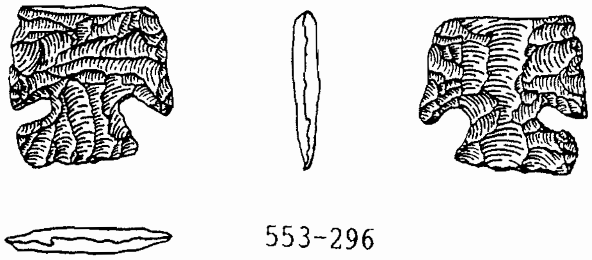
553-40



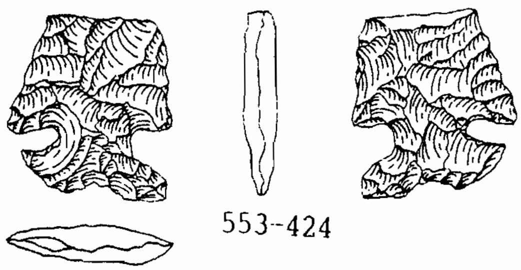
553-414

DIETZ SITE (35 LK 1529)

(SN)

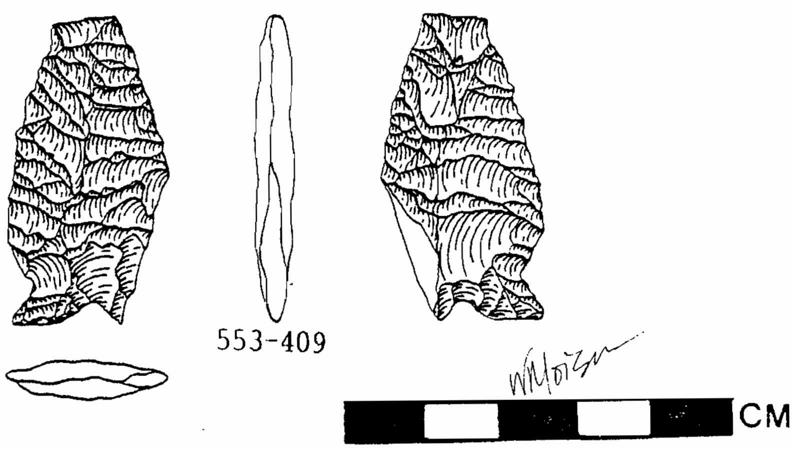


553-296



553-424

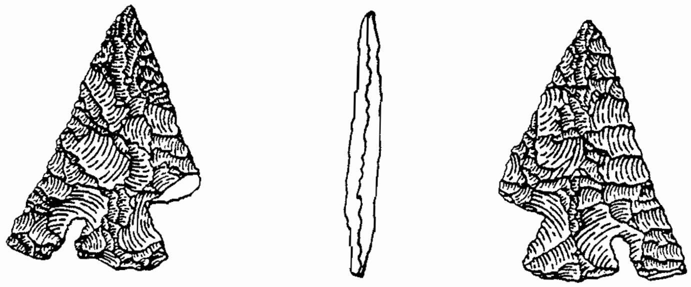
553-403



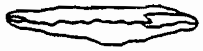
553-409

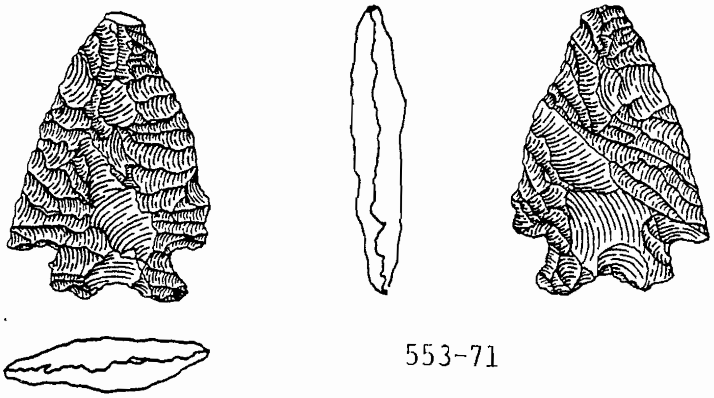
DIETZ SITE (35 LK 1529)

(CN)

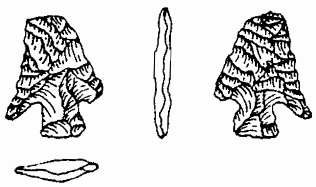


553-69

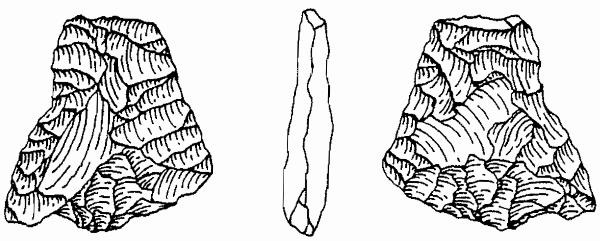




553-71

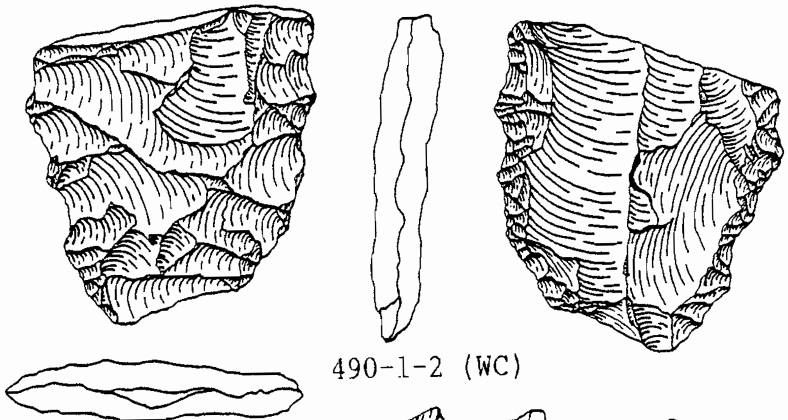


553-402

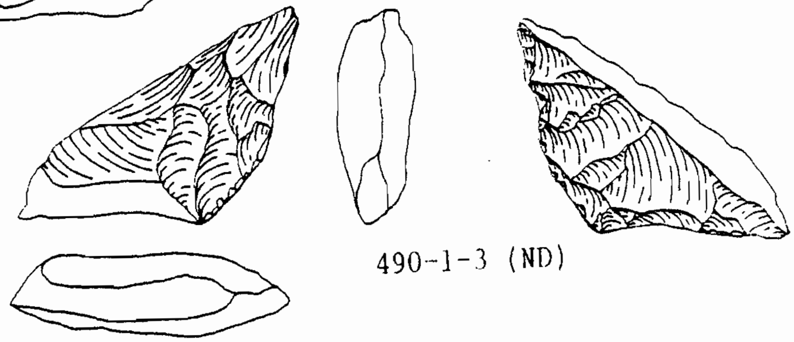


553-401

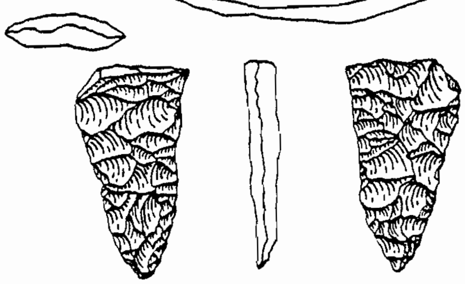
CM



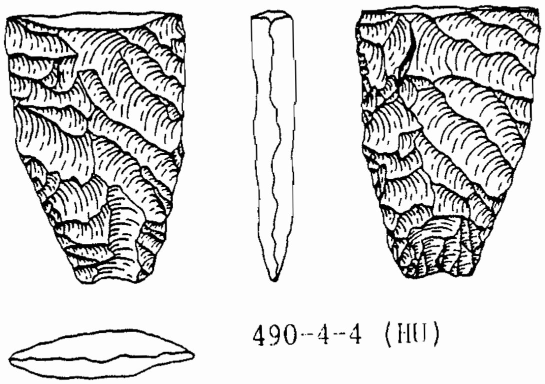
490-1-2 (WC)



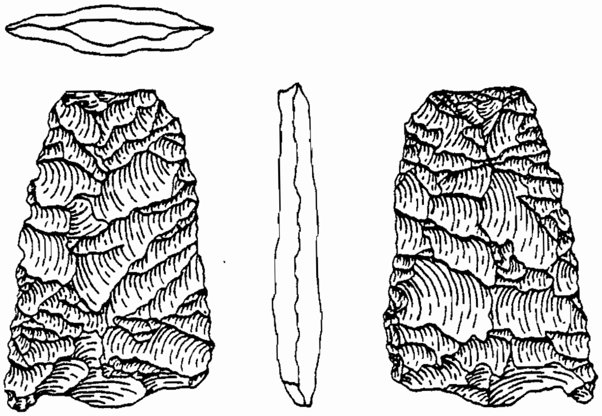
490-1-3 (ND)



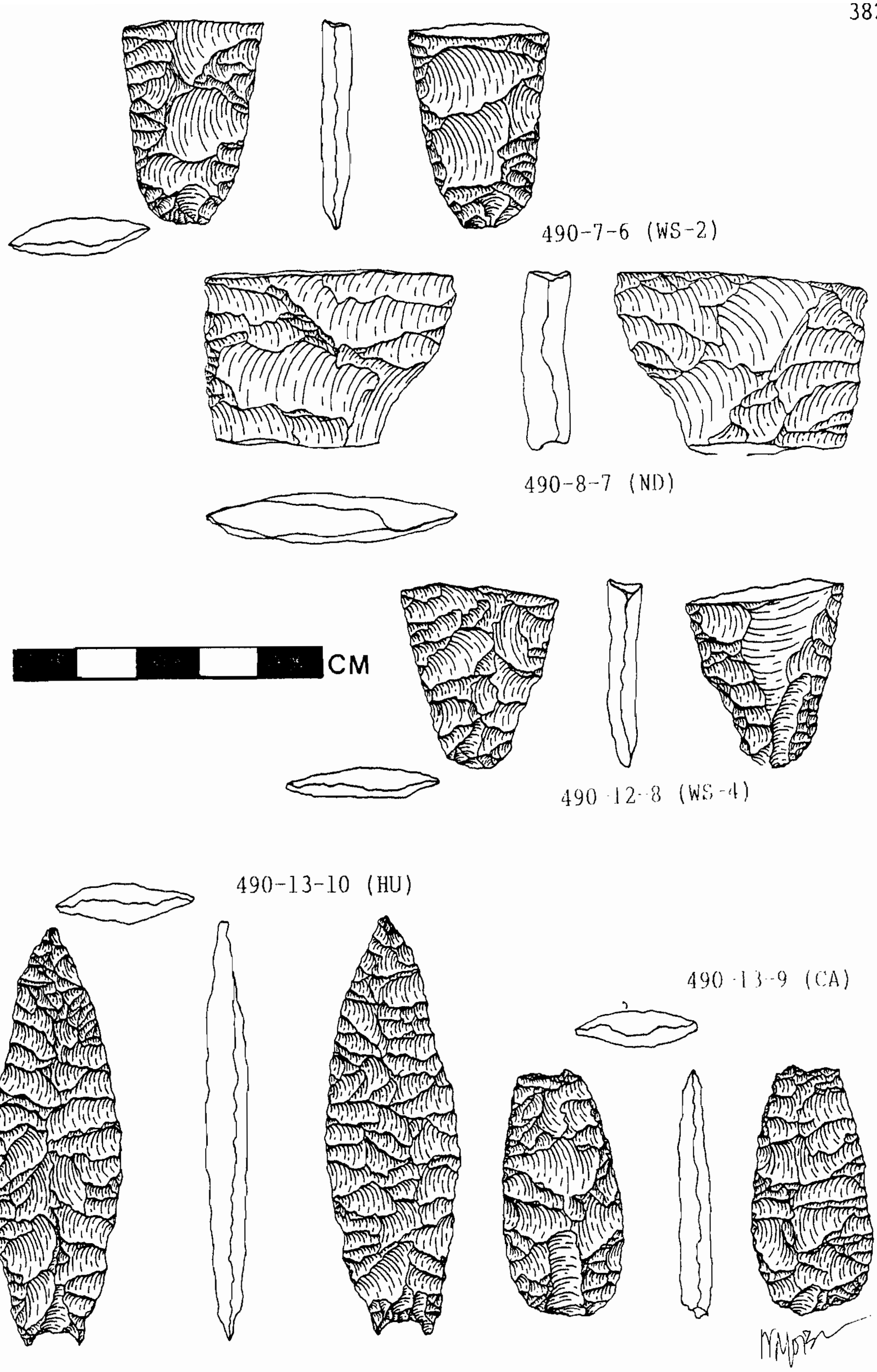
490-1-1 (ND)

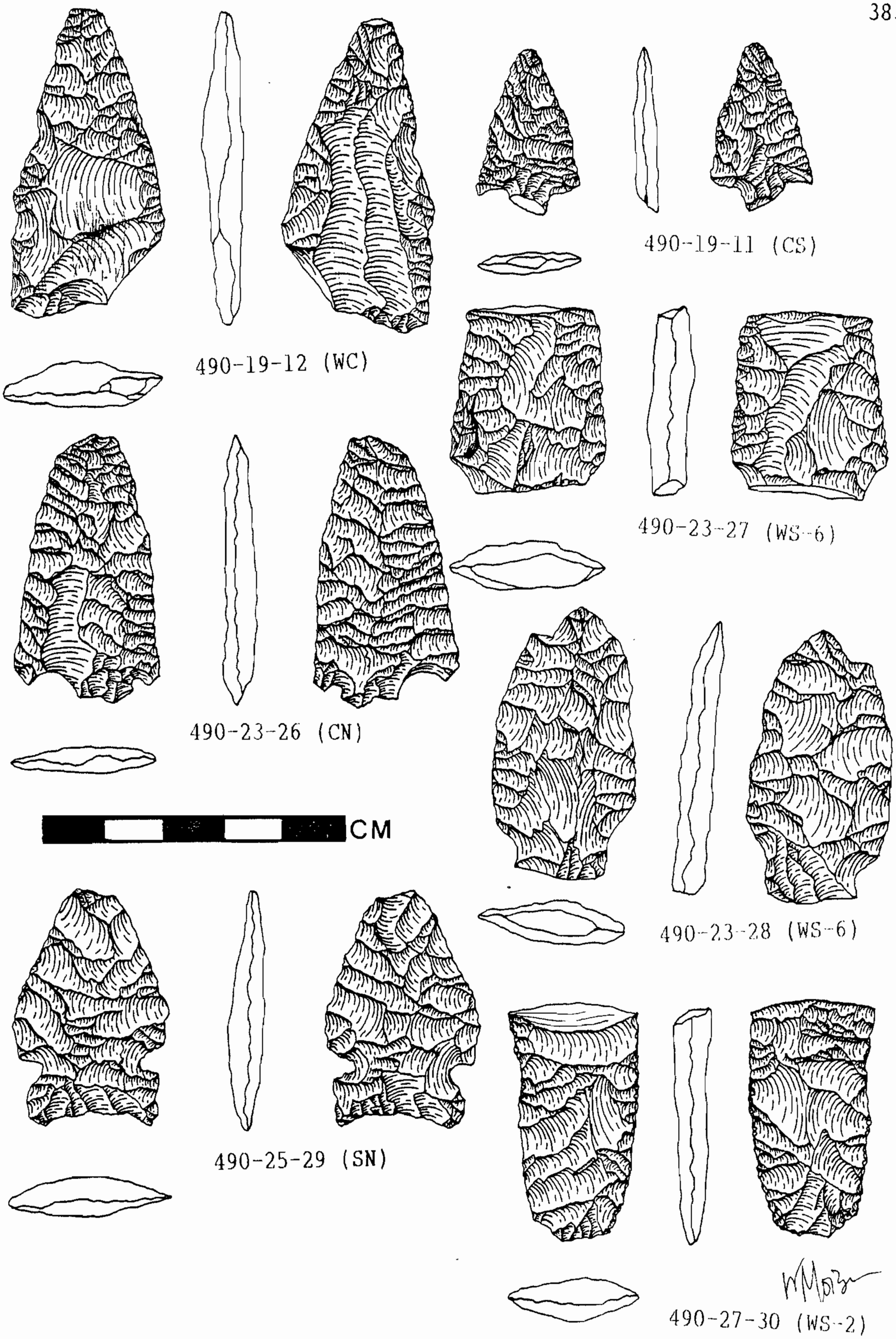


490-4-4 (HU)



490-5-5 (CN)


490-7-6 (WS-2)
490-8-7 (ND)
CM
490-12-8 (WS-4)
490-13-10 (HU)
490-13-9 (CA)



490-19-12 (WC)

490-19-11 (CS)

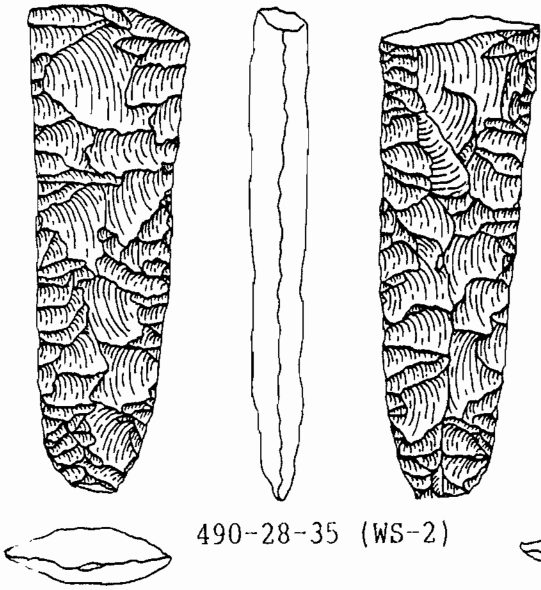
490-23-27 (WS-6)

490-23-26 (CN)

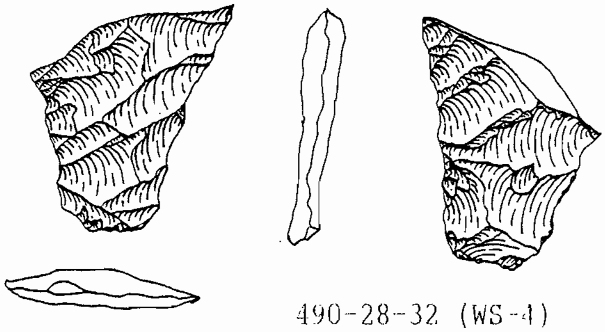
490-23-28 (WS-6)

490-25-29 (SN)

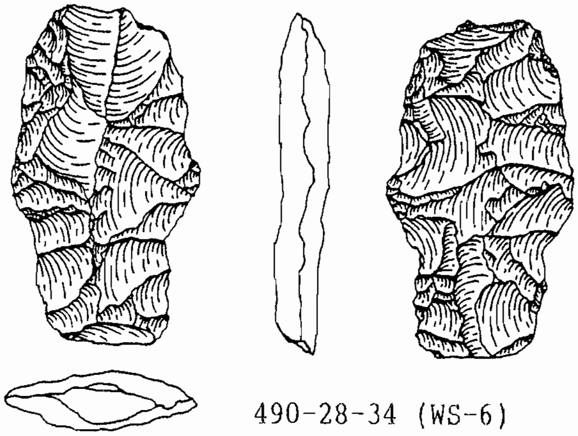
490-27-30 (WS-2)



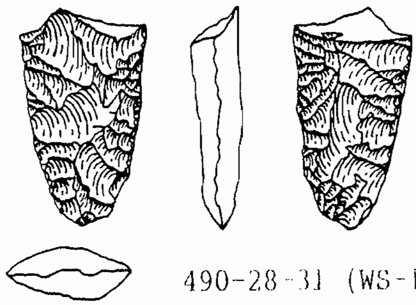
490-28-35 (WS-2)



490-28-32 (WS-4)

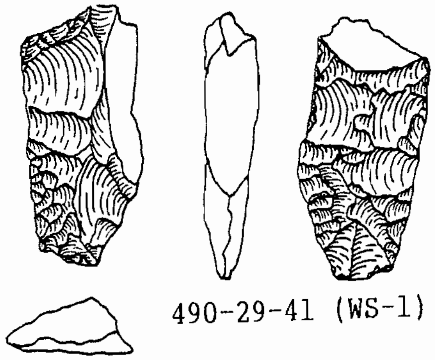


490-28-34 (WS-6)

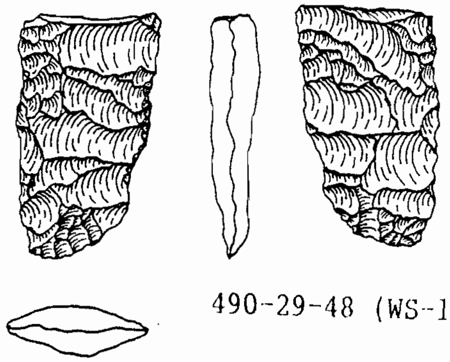


490-28-31 (WS-1)

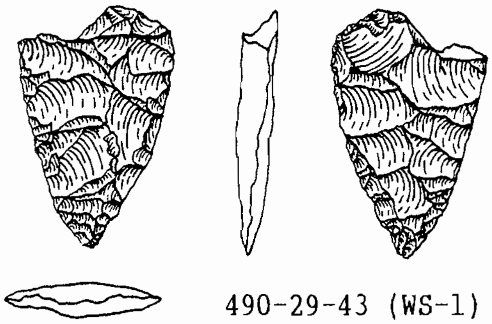
490-28-33 (WS-7)



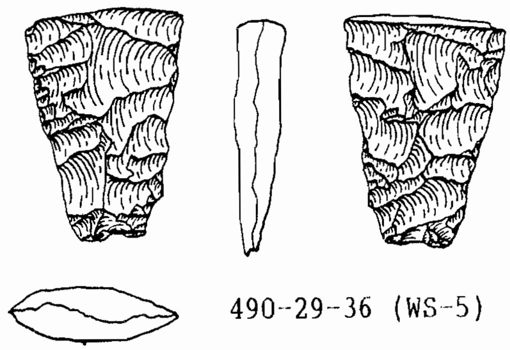
490-29-41 (WS-1)



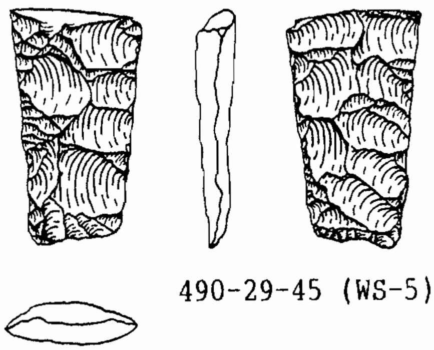
490-29-48 (WS-1)



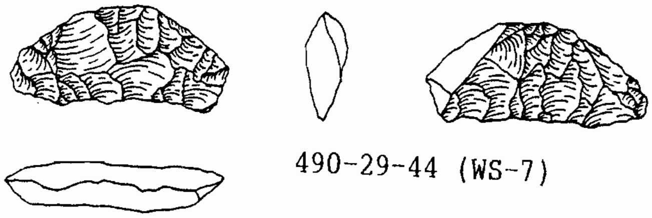
490-29-43 (WS-1)



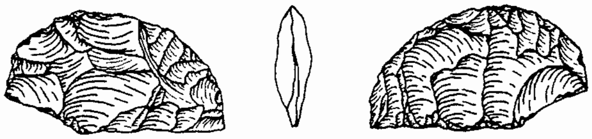
490-29-36 (WS-5)



490-29-45 (WS-5)

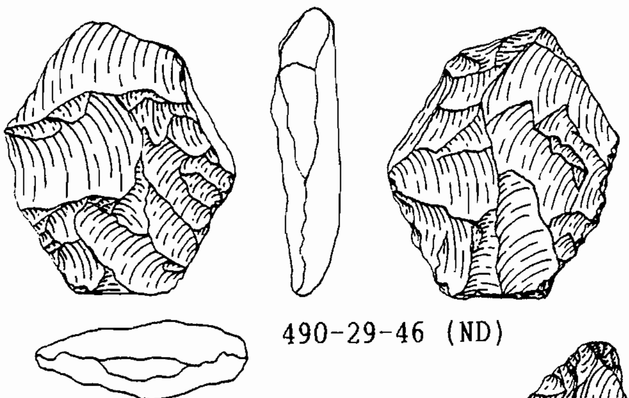


490-29-44 (WS-7)

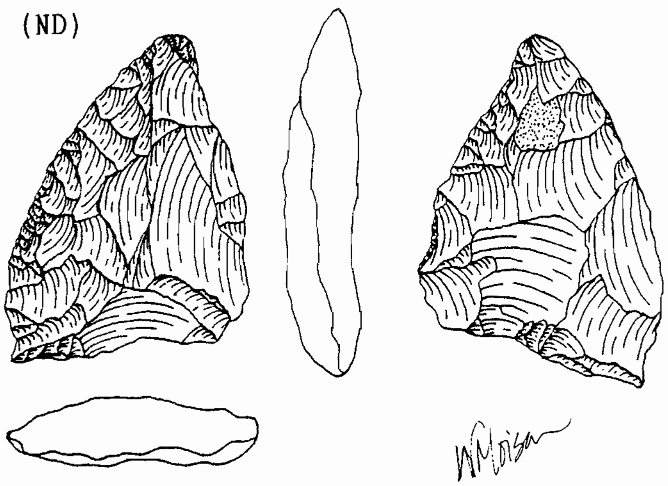


490-29-42 (WS-7)

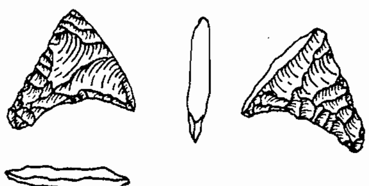
490-29-40 (WS-7)



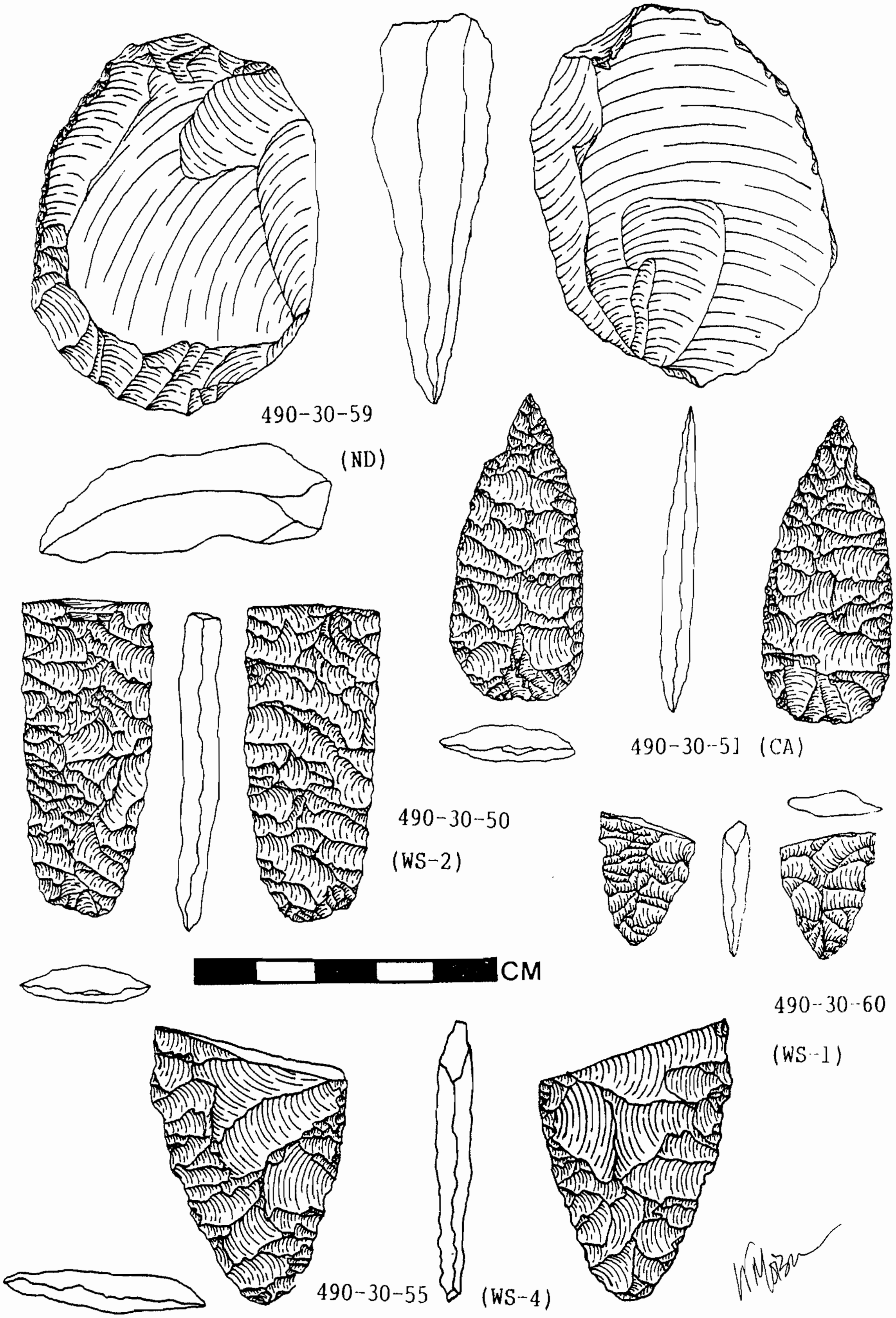
490-29-46 (ND)



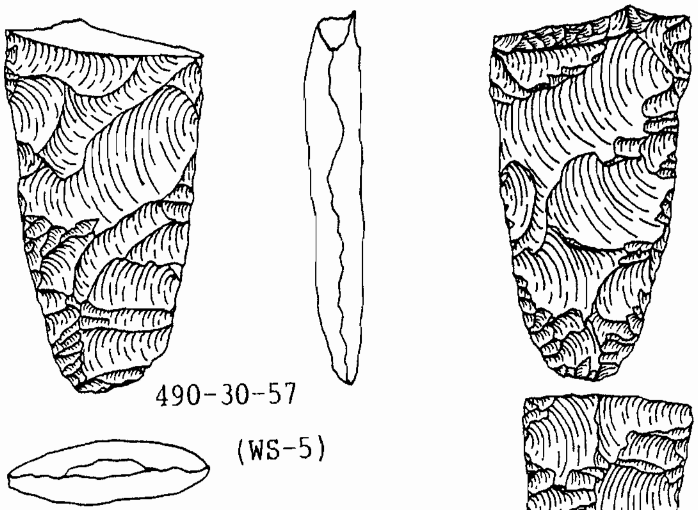
490-29-37 (ND)



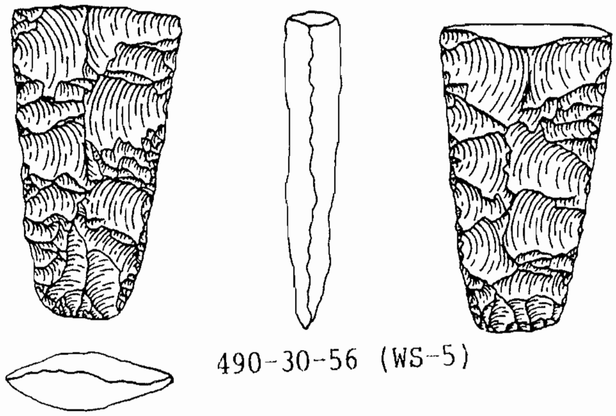
490-29-47 (ND)



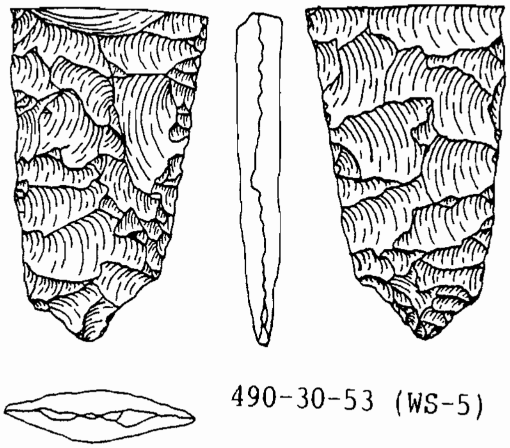
490-30-59
(ND)
490-30-51 (CA)
490-30-50
(WS-2)
CM
490-30-60
(WS-1)
490-30-55
(WS-4)



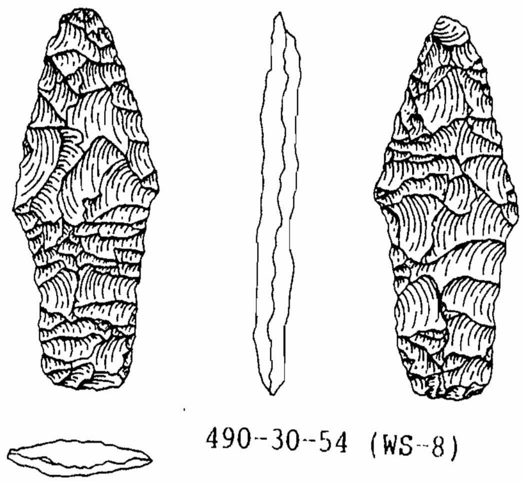
490-30-57 (WS-5)



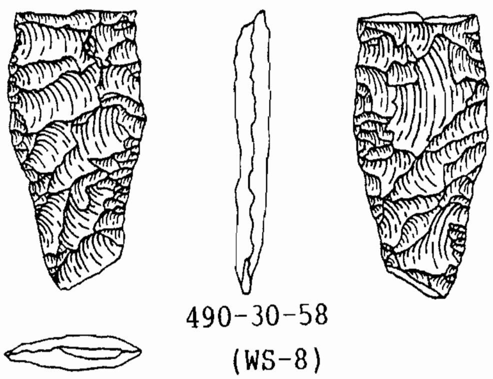
490-30-56 (WS-5)



490-30-53 (WS-5)

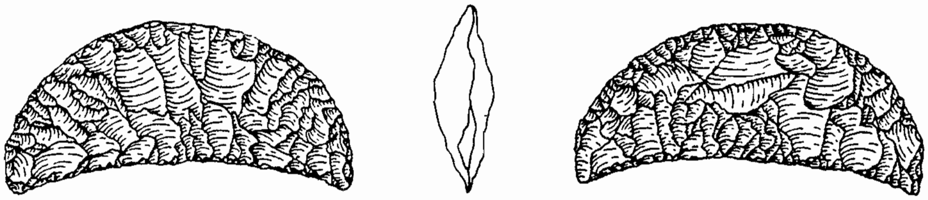


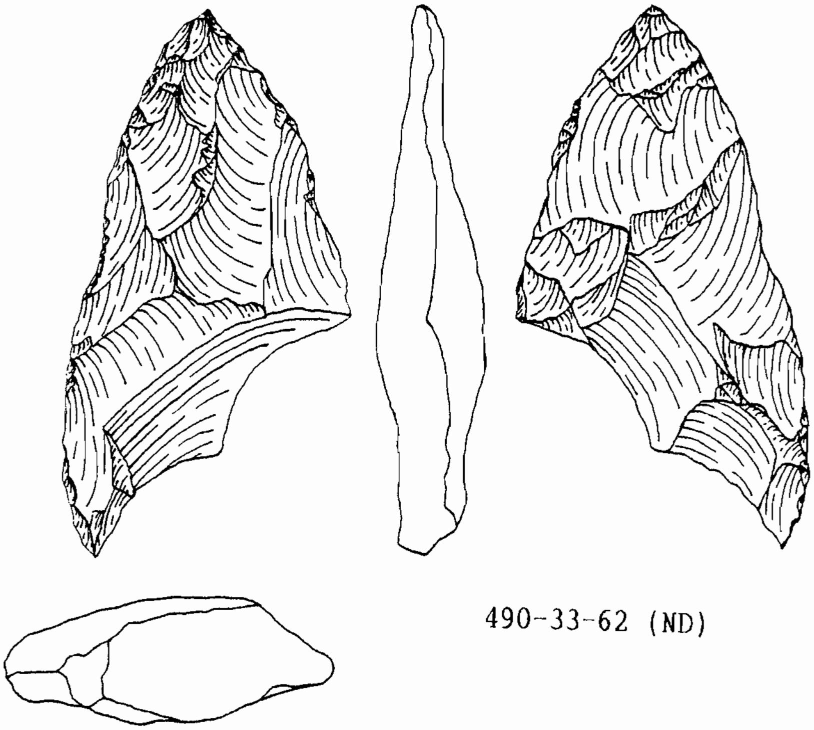
490-30-54 (WS-8)



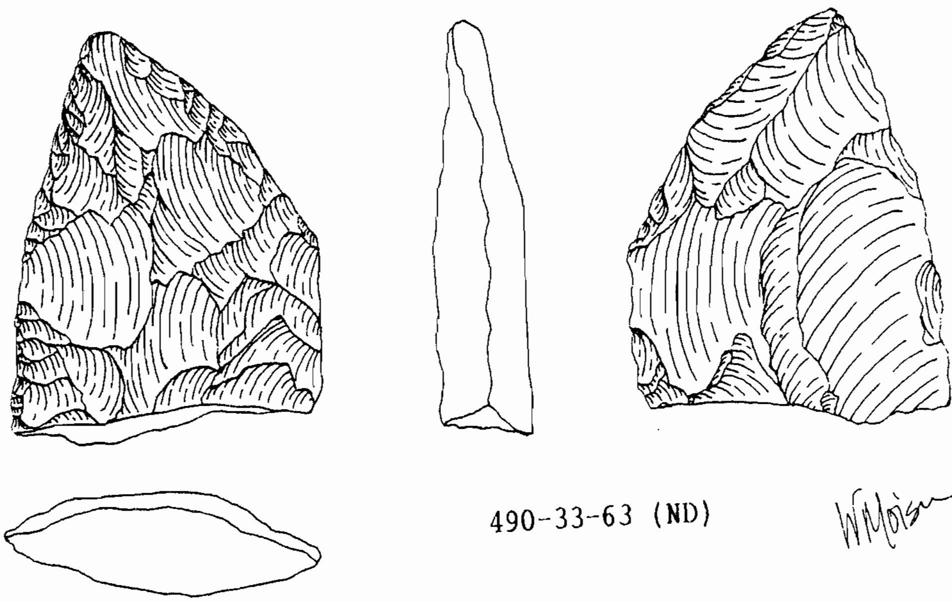
490-30-58 (WS-8)

490-30-52 (WS-7)



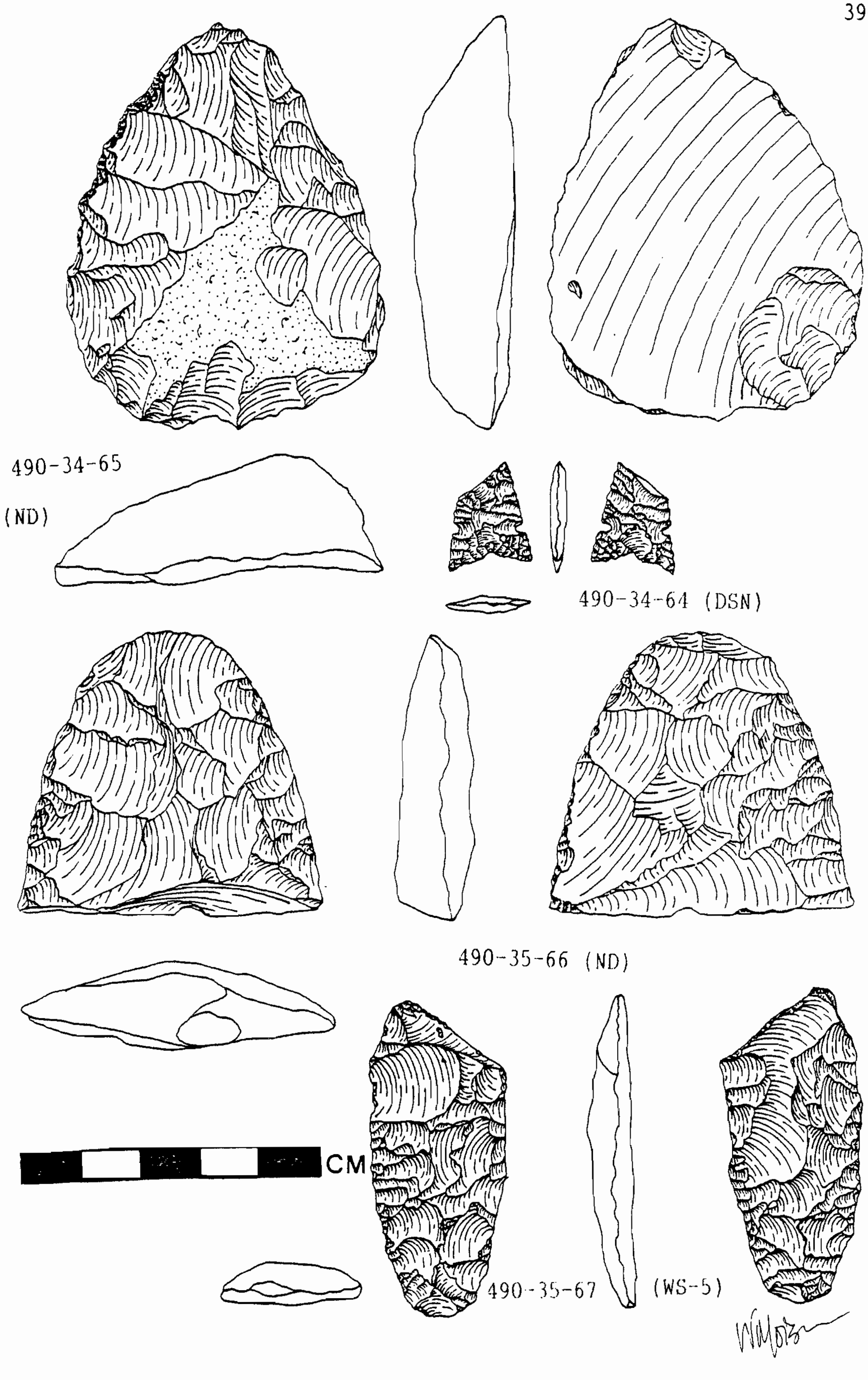


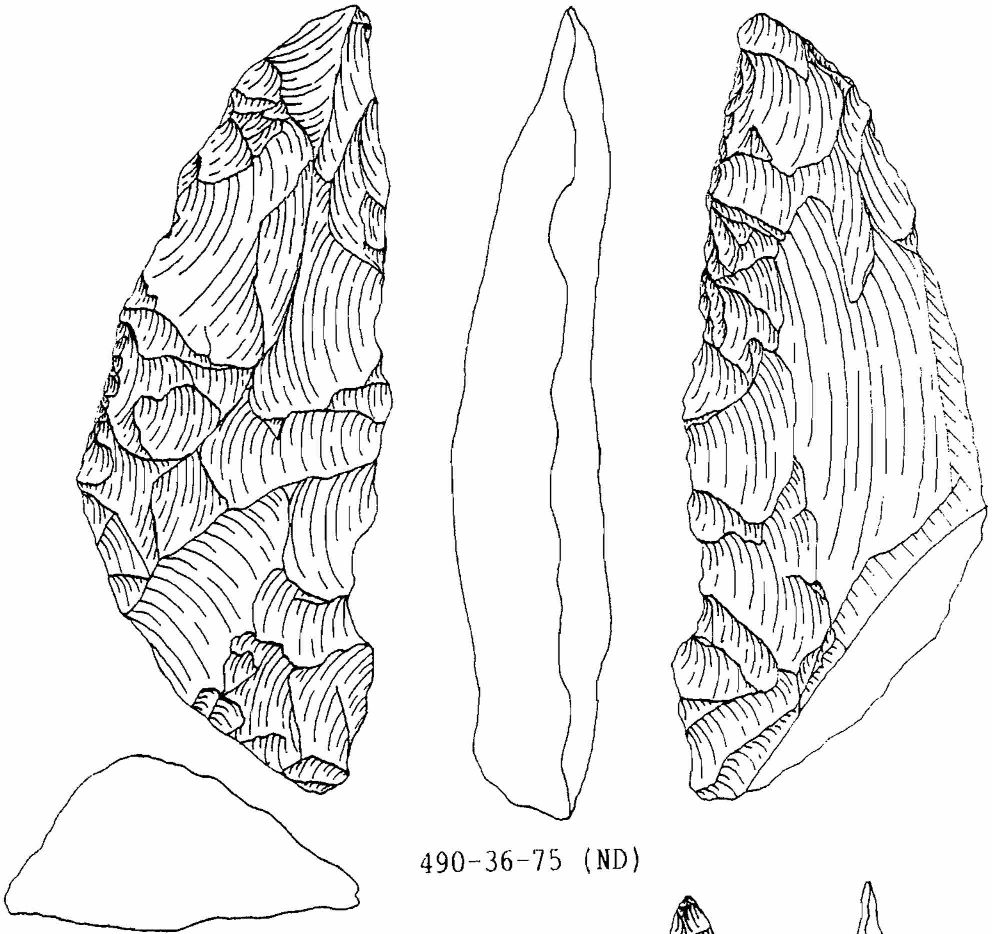
490-33-62 (ND)



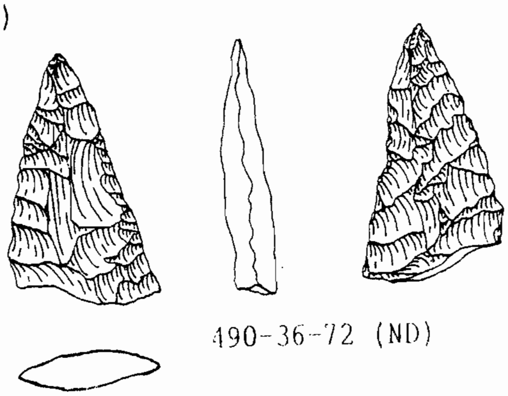
490-33-63 (ND)

CM

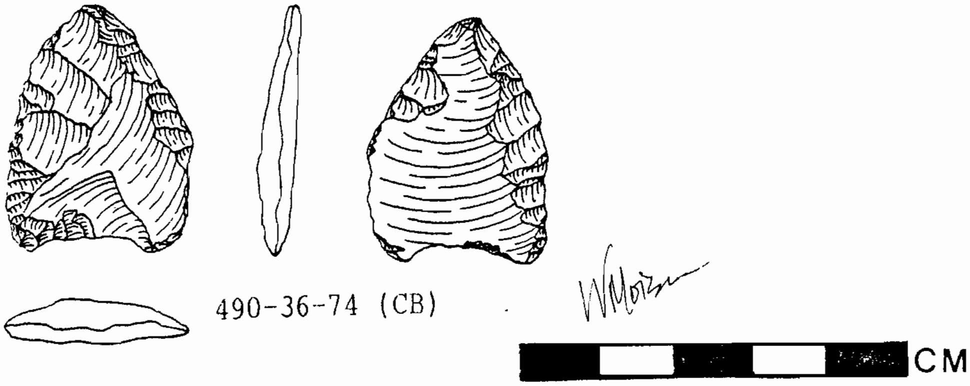

490-34-65
(ND)
490-34-64 (DSN)
490-35-66 (ND)
CM
490-35-67
(WS-5)



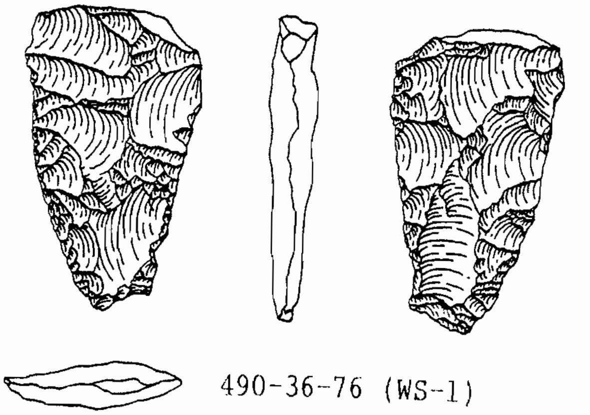
490-36-75 (ND)



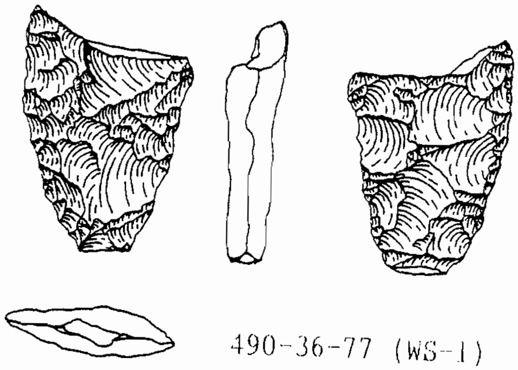
490-36-72 (ND)



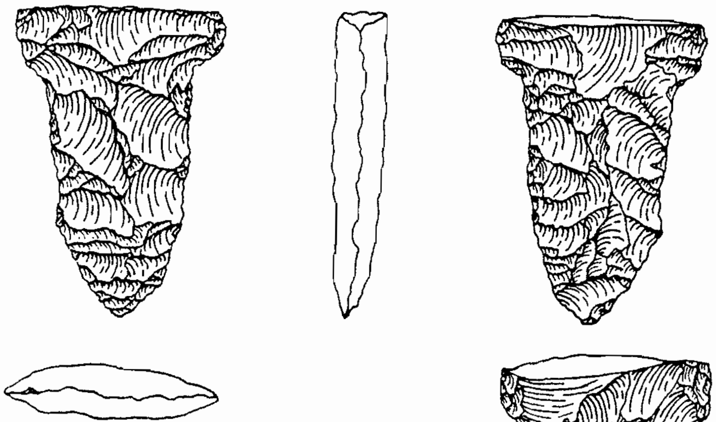
490-36-74 (CB)



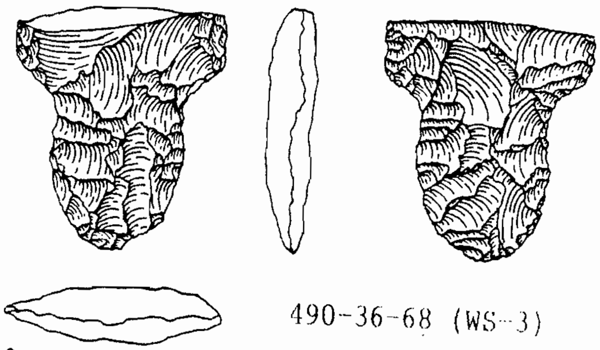
490-36-76 (WS-1)



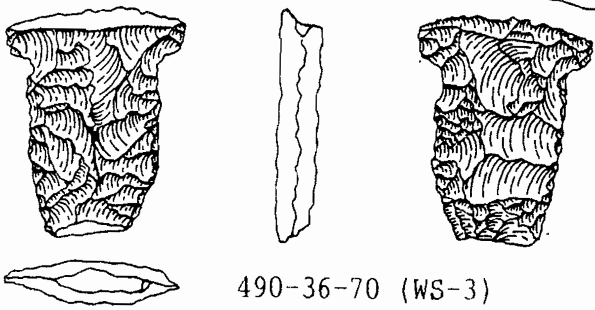
490-36-77 (WS-1)



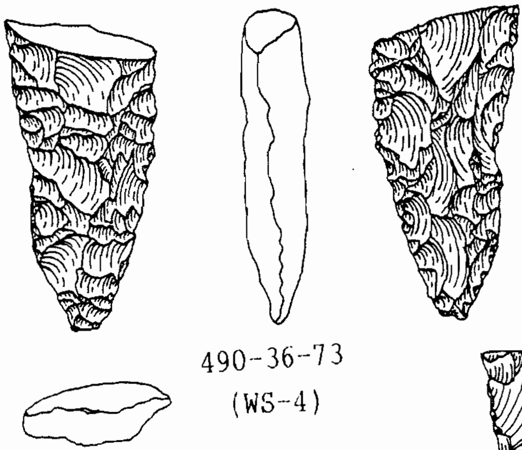
490-36-69 (WS-3)



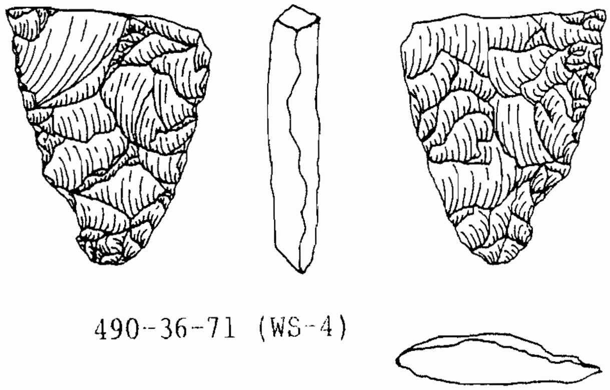
490-36-68 (WS-3)



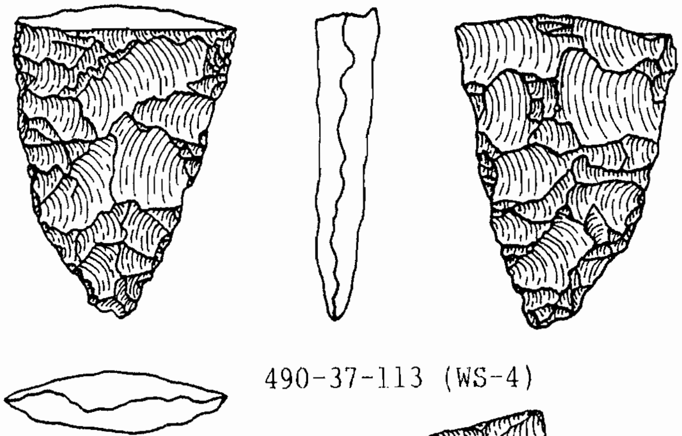
490-36-70 (WS-3)



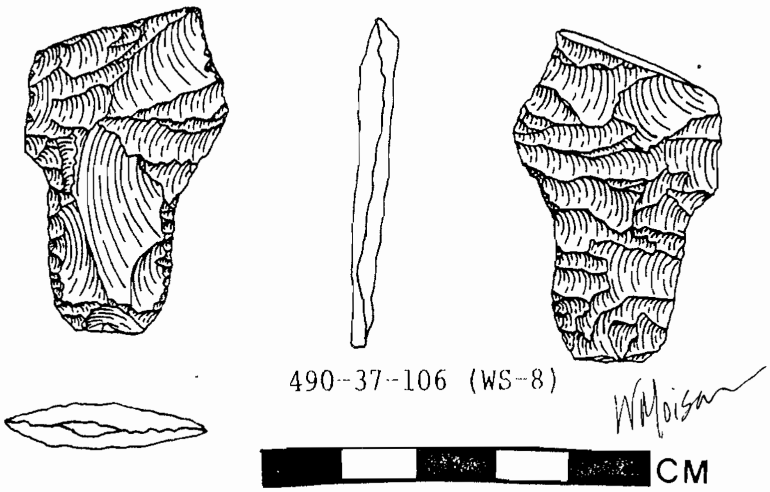
490-36-73
(WS-4)



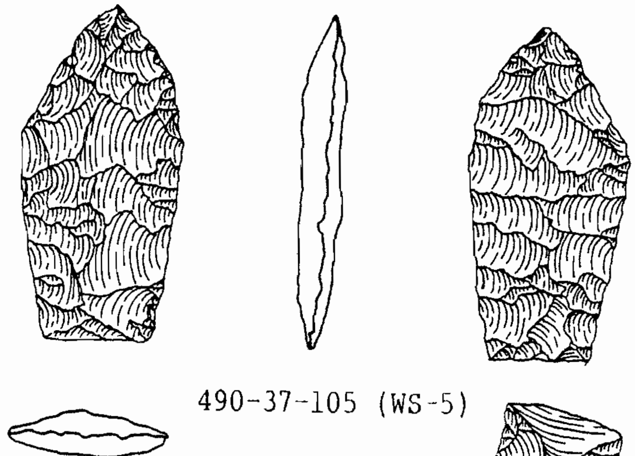
490-36-71 (WS-4)



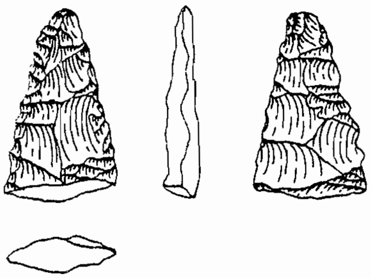
490-37-113 (WS-4)



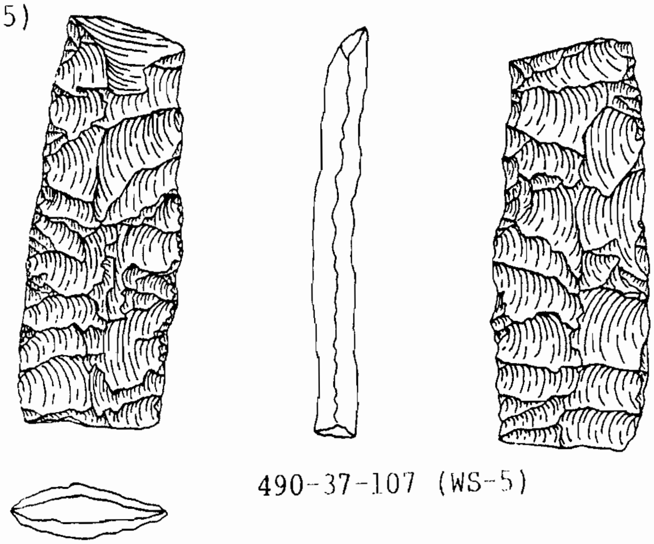
490-37-106 (WS-8)



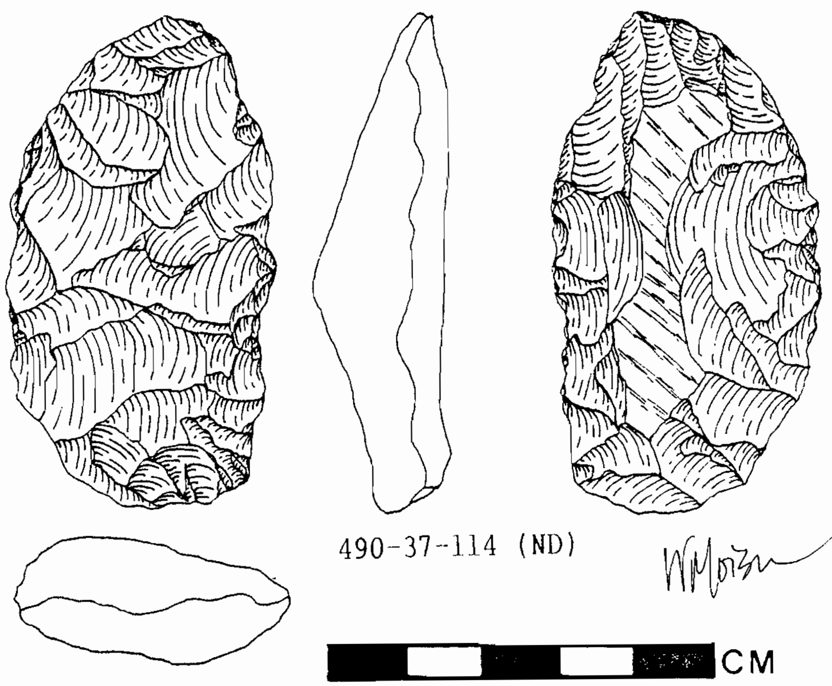
490-37-105 (WS-5)



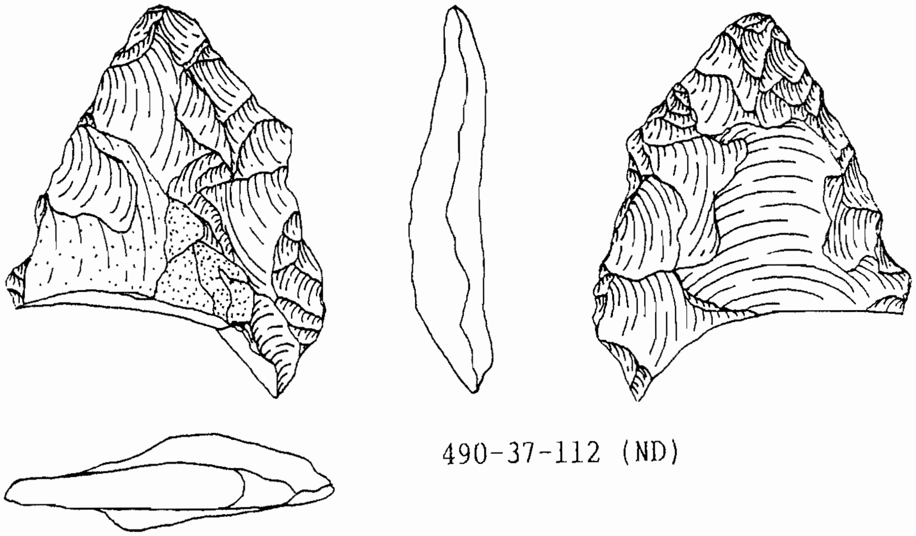
490-37-110 (ND)



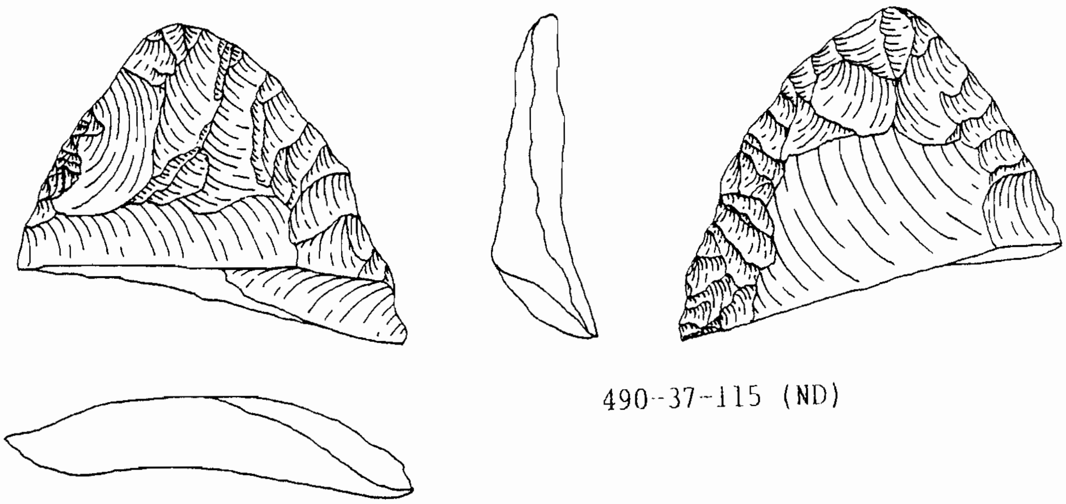
490-37-107 (WS-5)



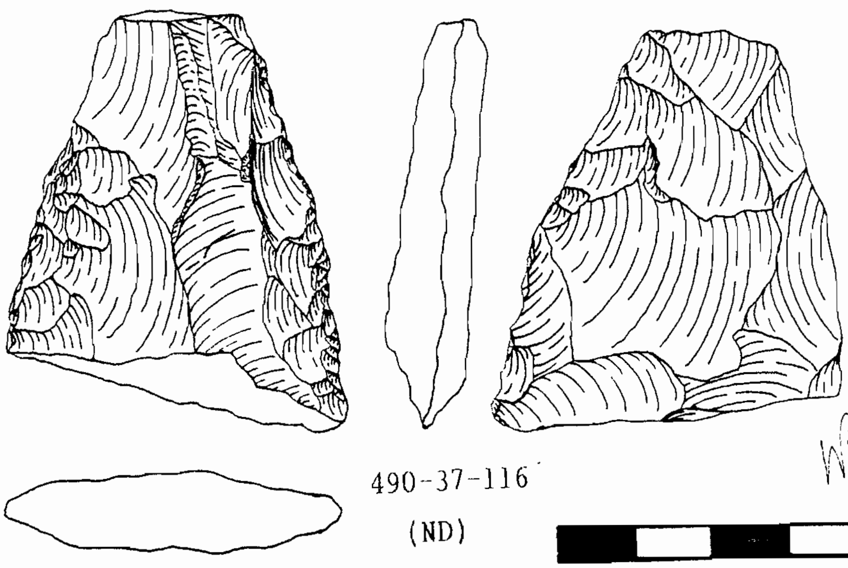
490-37-114 (ND)



490-37-112 (ND)



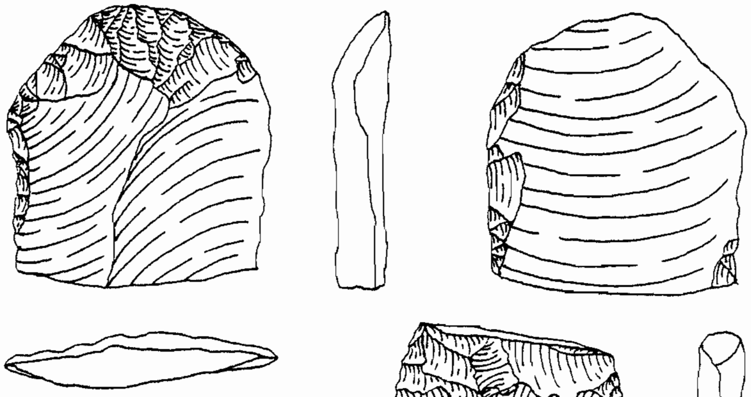
490-37-115 (ND)



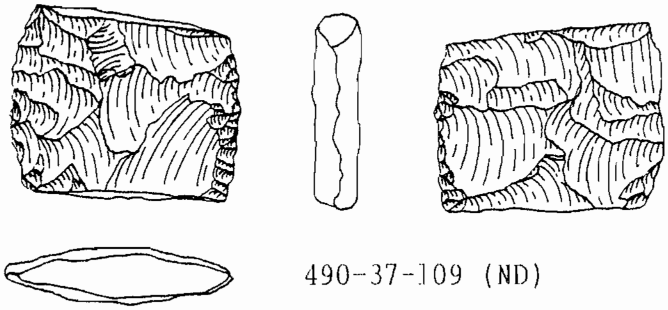
490-37-116

(ND)

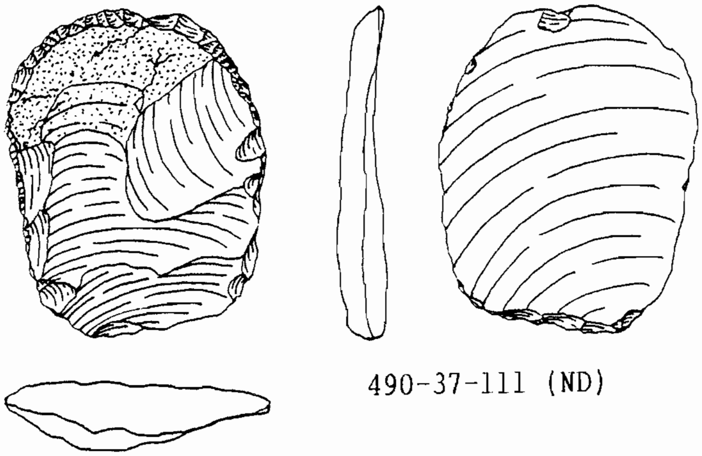
CM



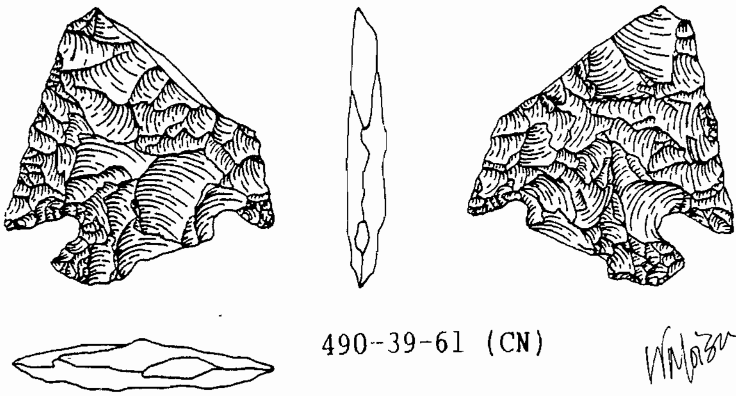
490-37-108 (ND)



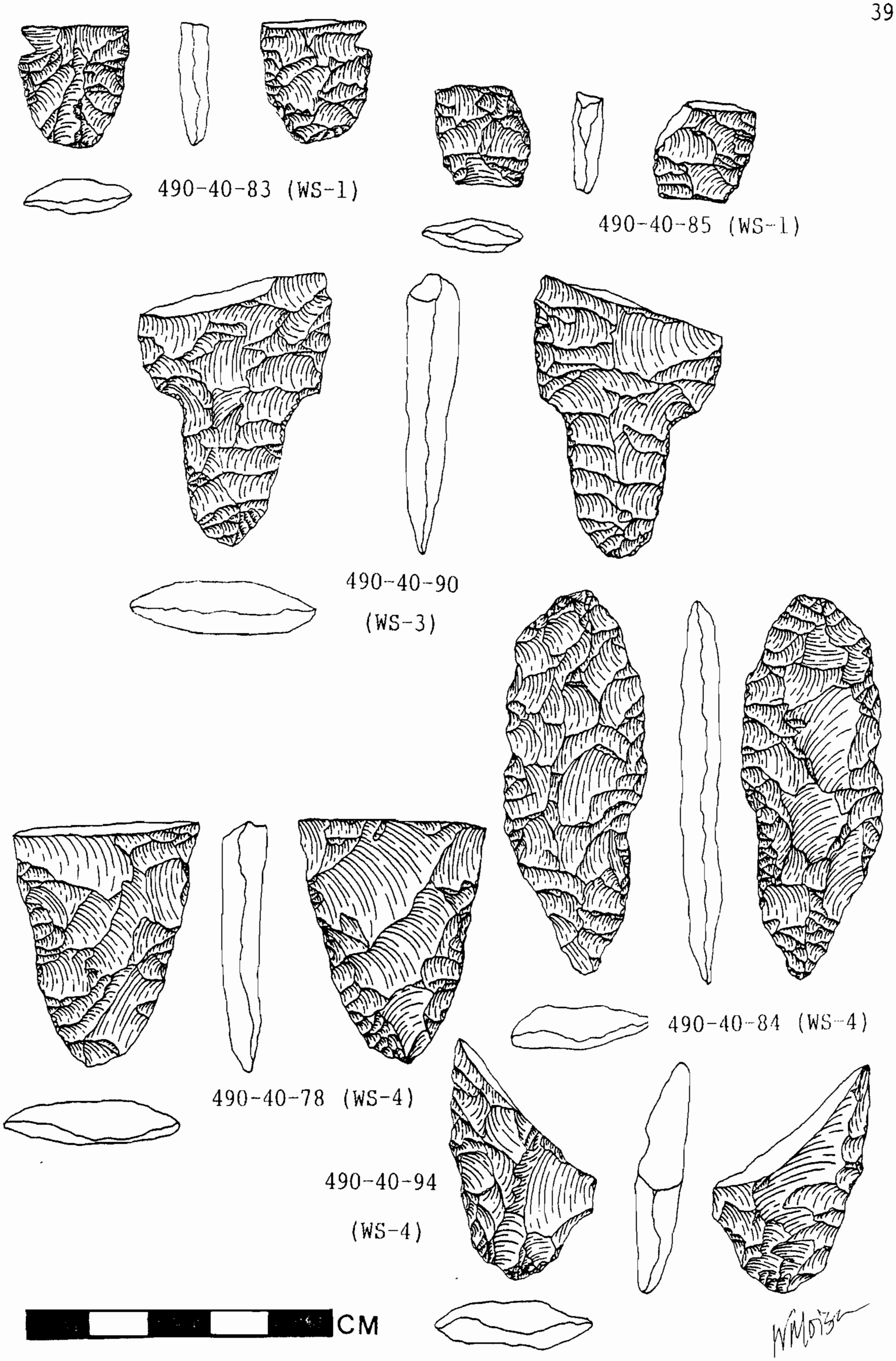
490-37-109 (ND)

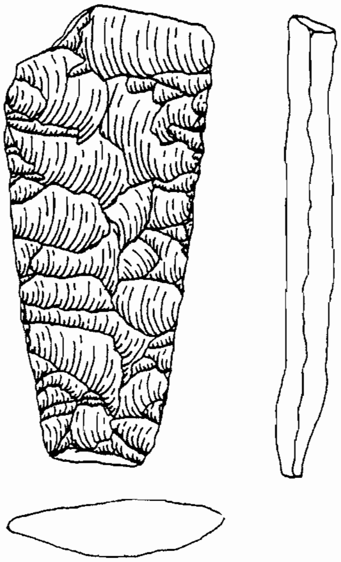


490-37-111 (ND)

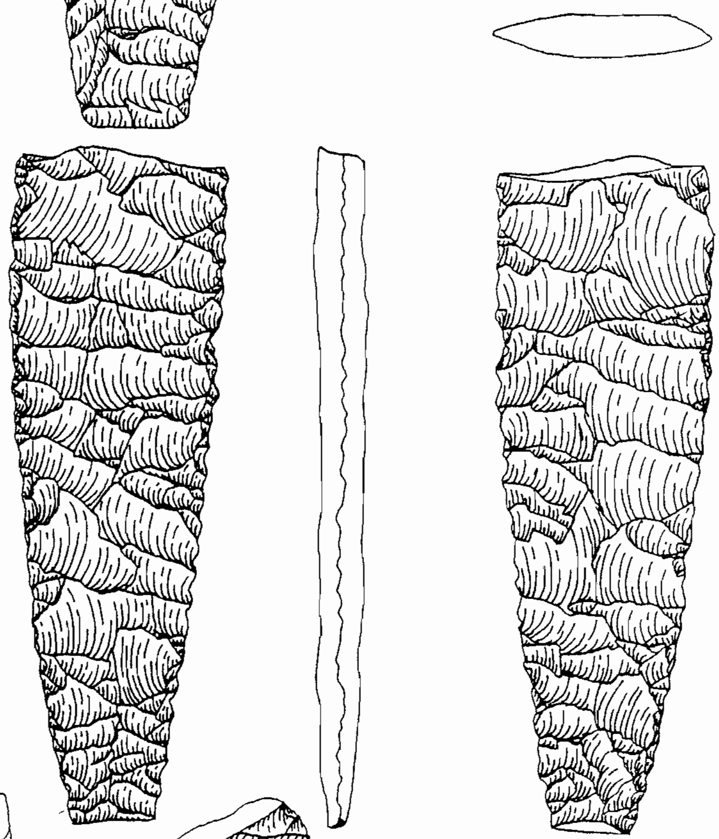


490-39-61 (CN)

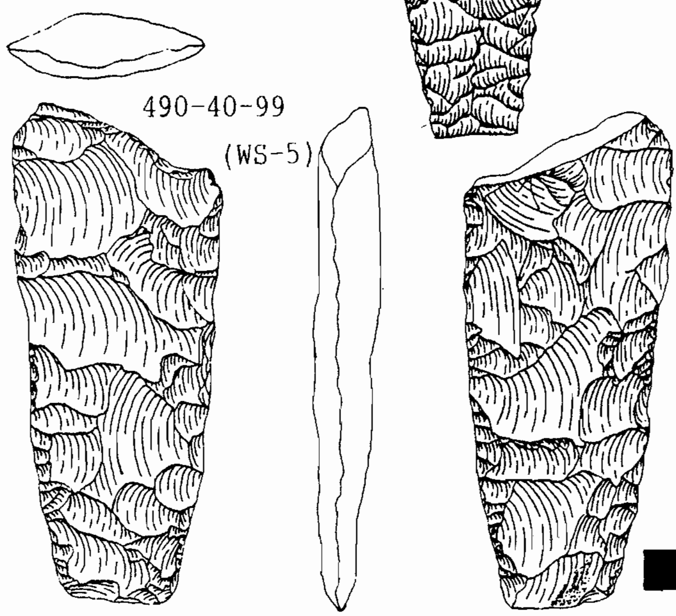

490-40-83 (WS-1)
490-40-85 (WS-1)
490-40-90
(WS-3)
490-40-84 (WS-4)
490-40-78 (WS-4)
490-40-94
(WS-4)
CM



490-40-103 (WS-5)

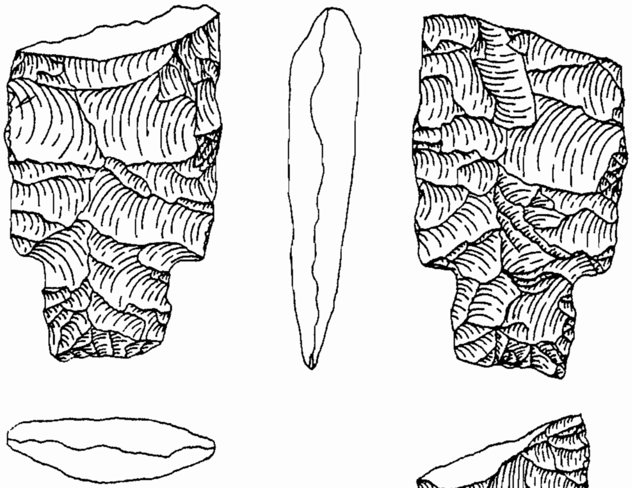


490-40-102 (WS-5)

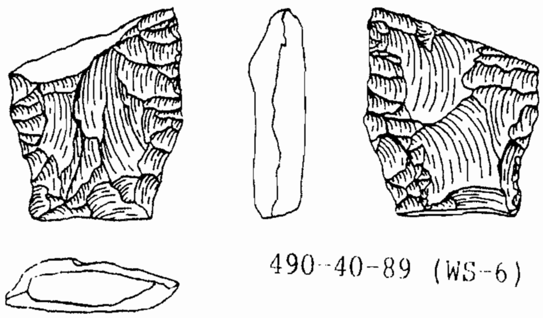


490-40-99 (WS-5)

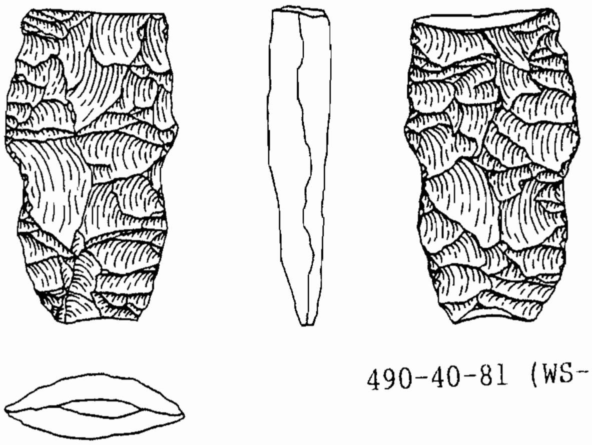
CM



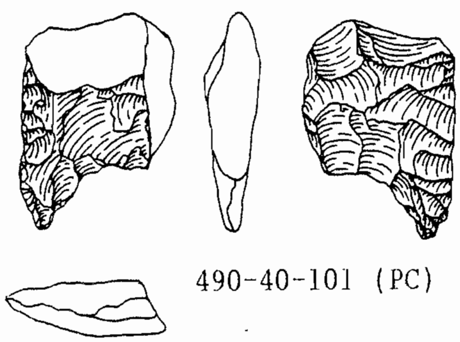
490-40-95 (WS-6)



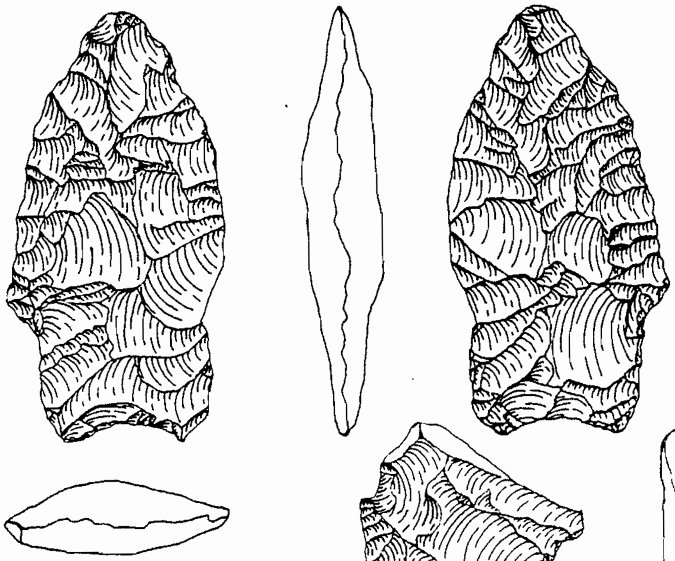
490-40-89 (WS-6)



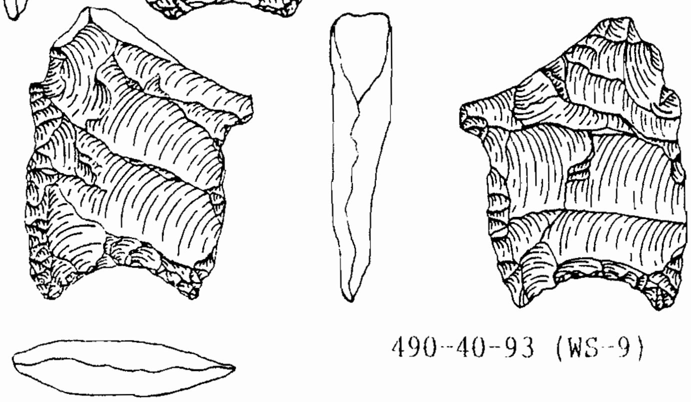
490-40-81 (WS-6)



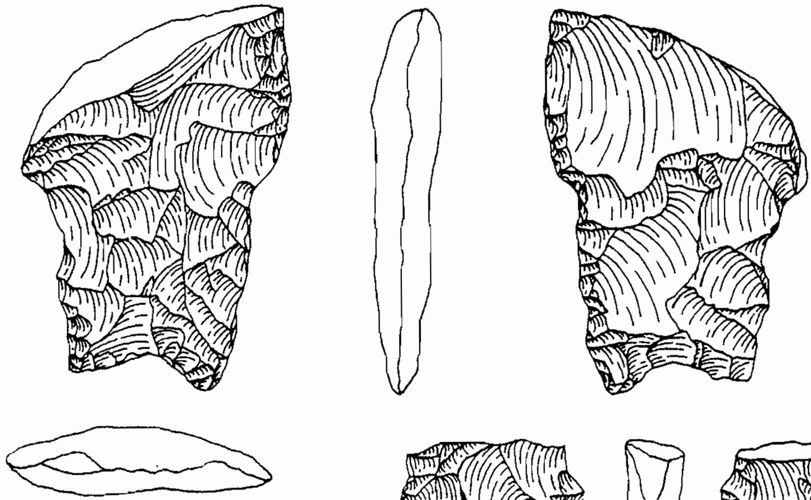
490-40-101 (PC)



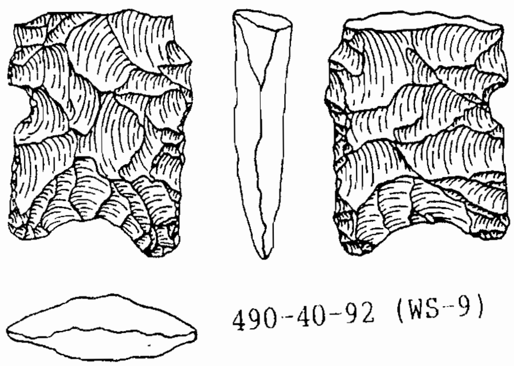
490-40-100 (WS-9)



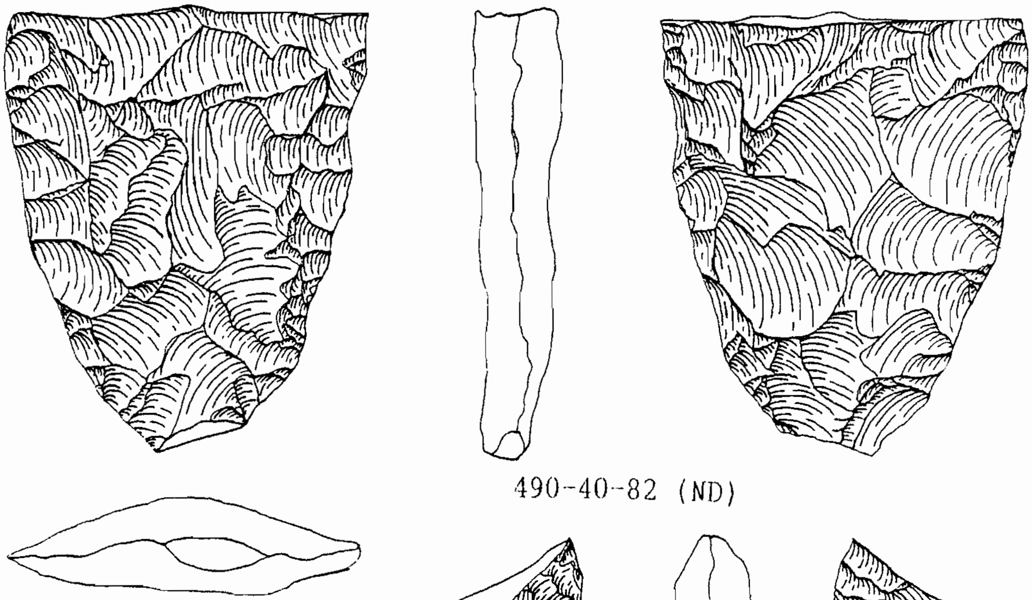
490-40-93 (WS-9)



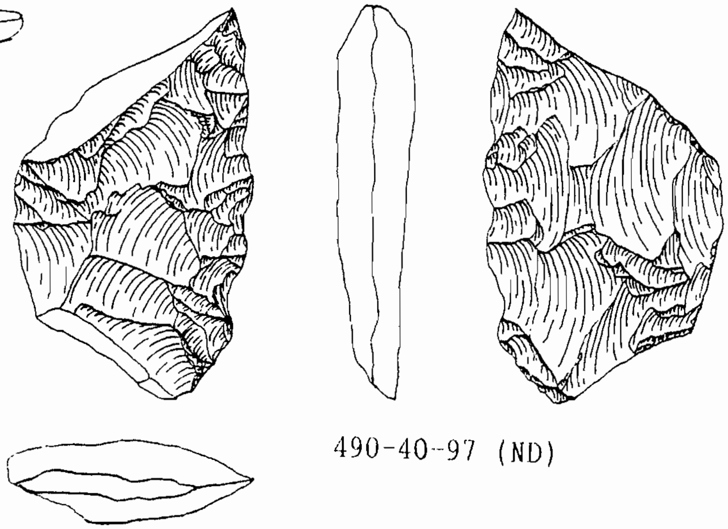
490-40-96 (WS-9)



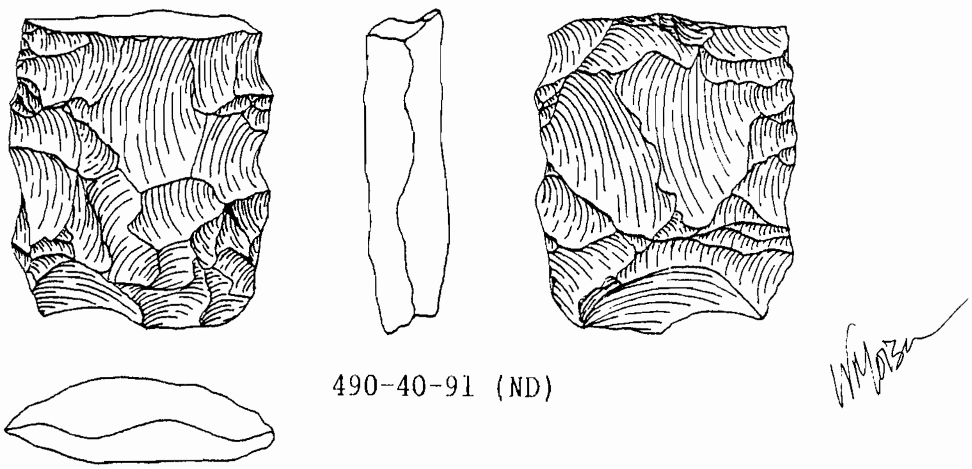
490-40-92 (WS-9)



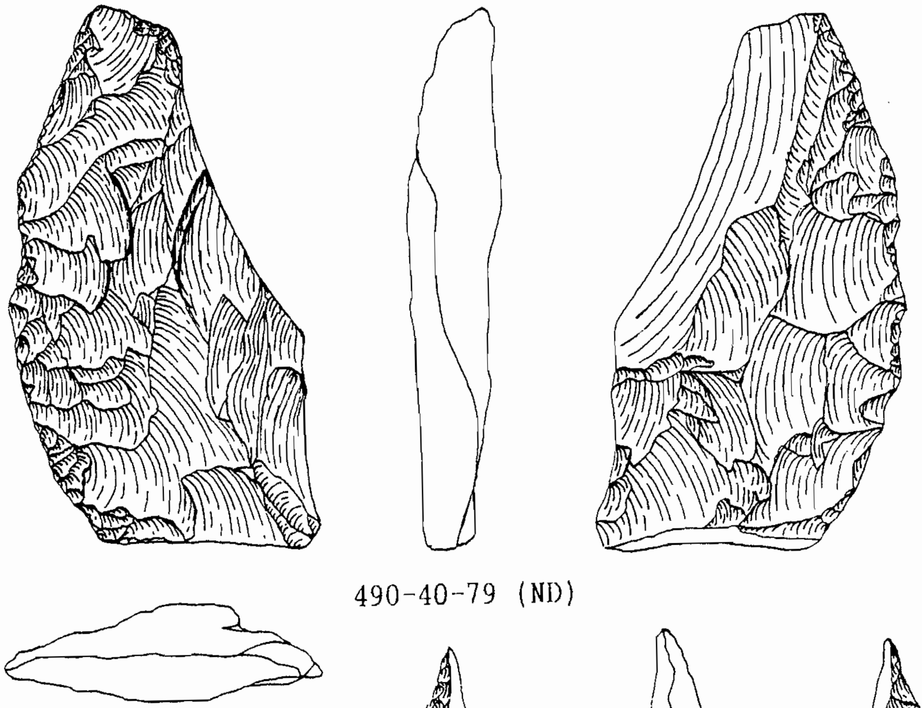
490-40-82 (ND)



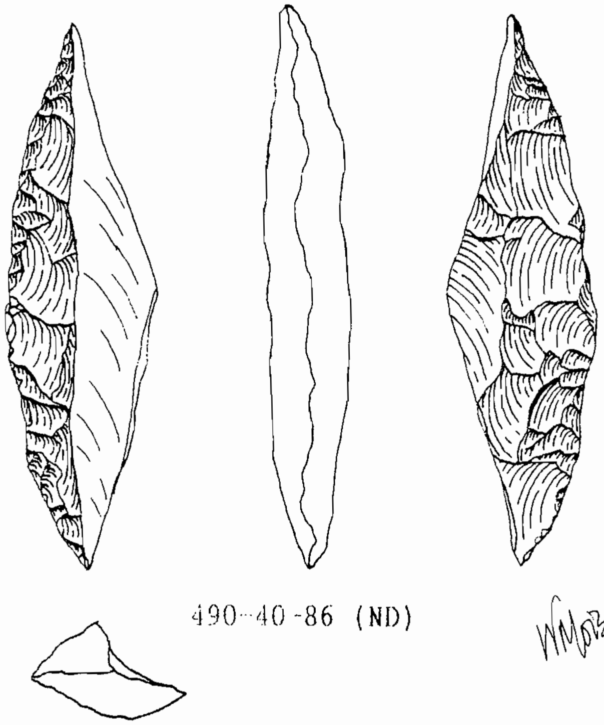
490-40-97 (ND)



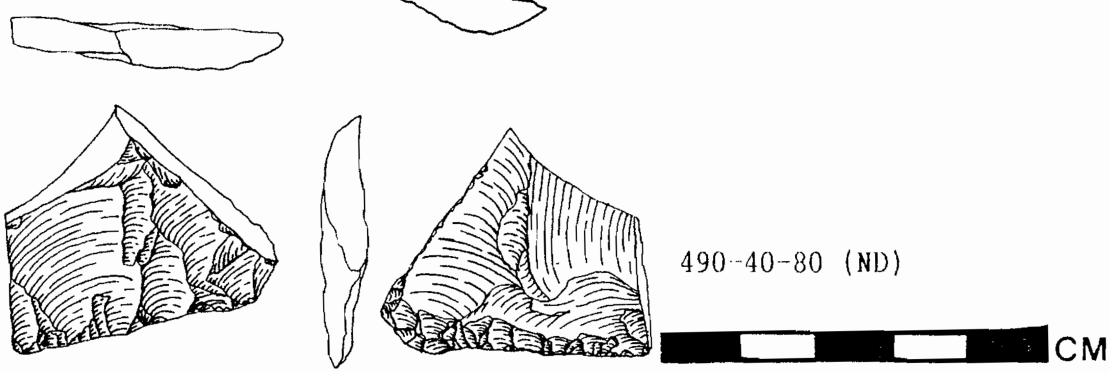
490-40-91 (ND)



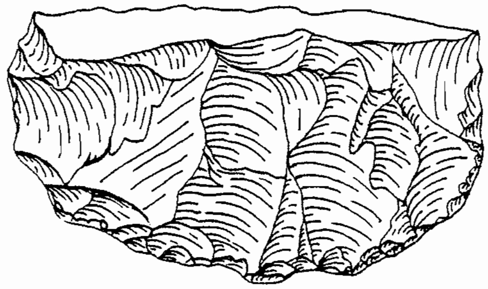
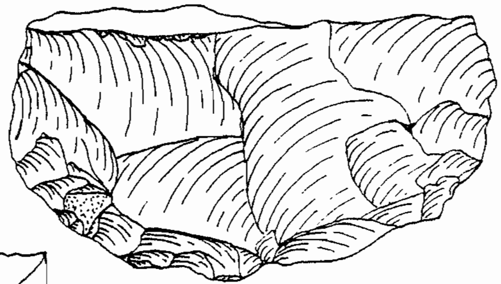
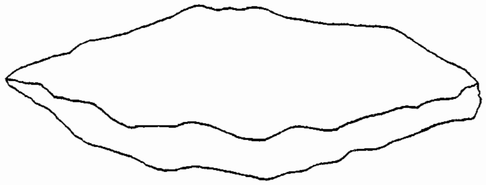
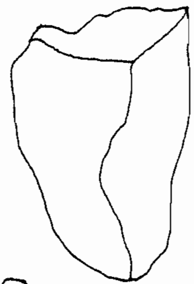
490-40-79 (ND)



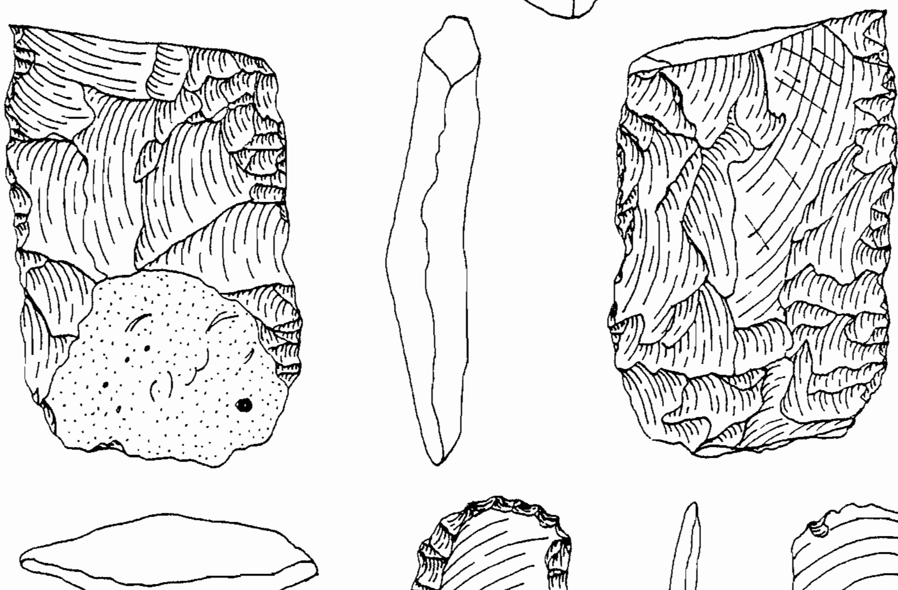
490-40-86 (ND)



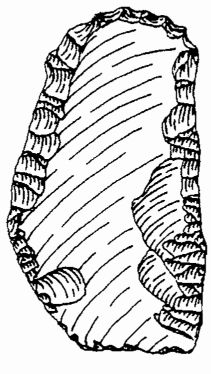
490-40-80 (ND)

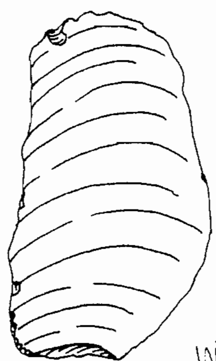





490-40-87 (ND)



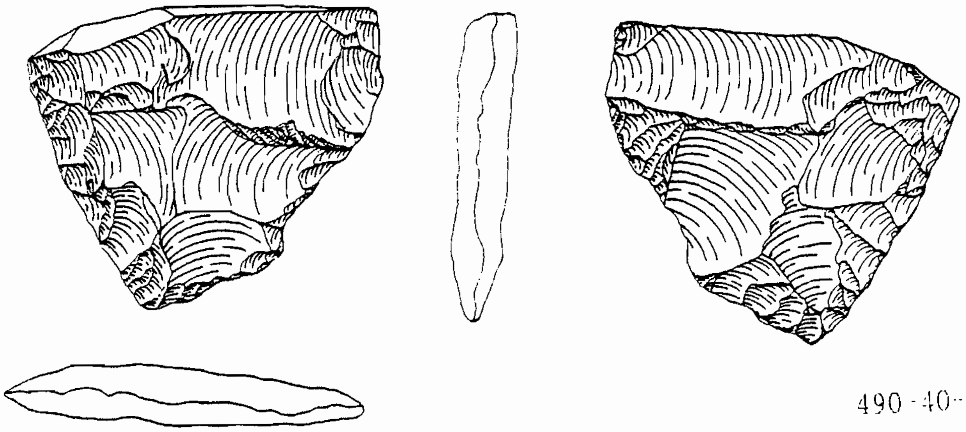
490-40-88 (ND)



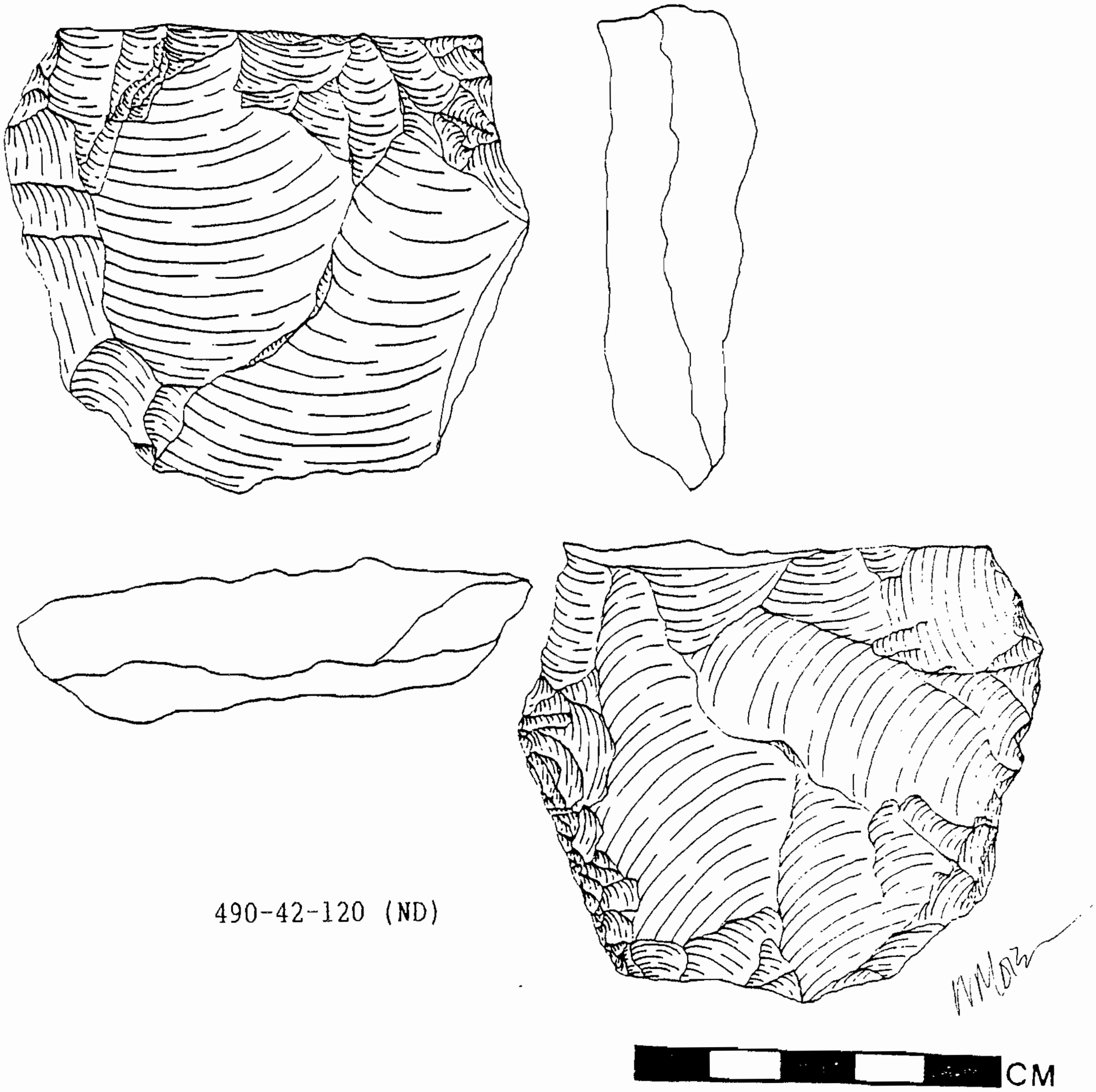



490-40-104 (ND)

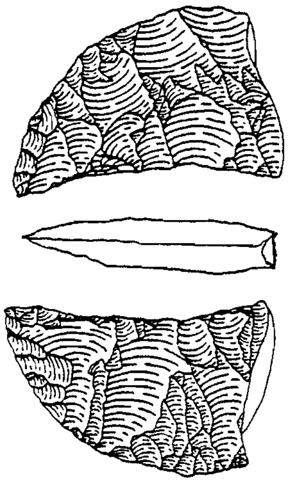
CM



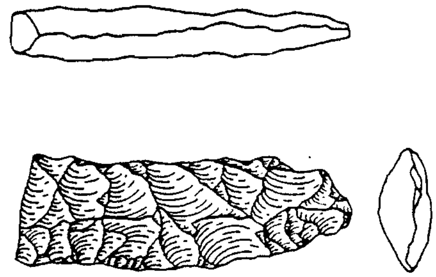
490-40-98 (ND)



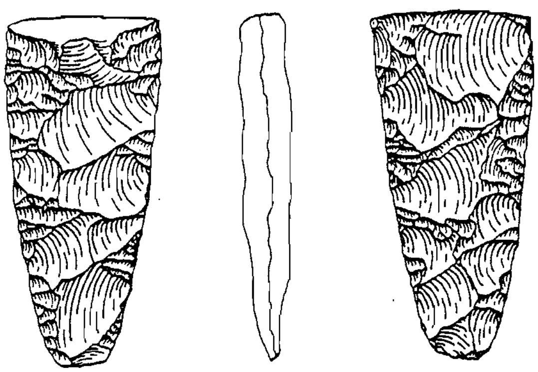
490-42-120 (ND)

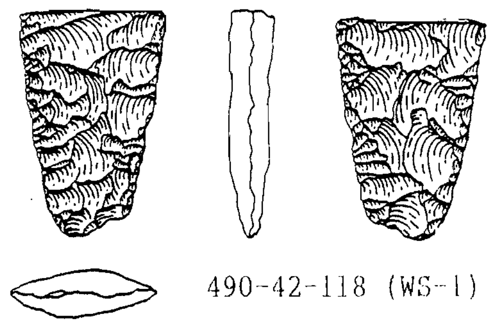


490-42-121 (WS-7)



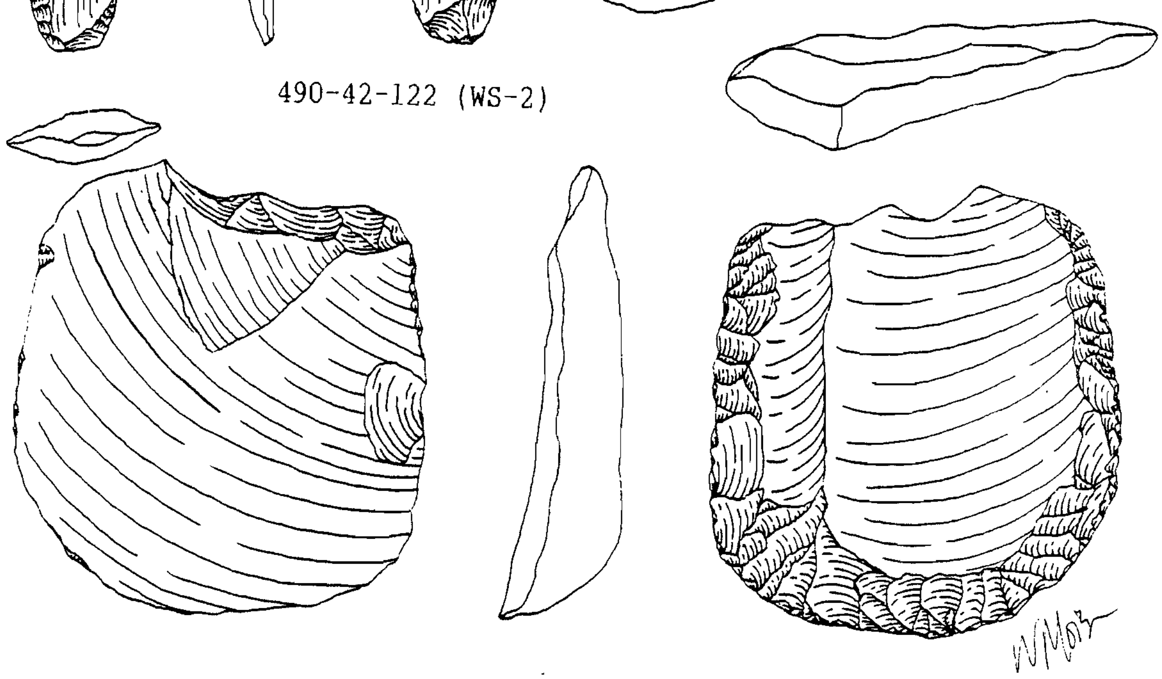
490-42-117 (WS-7)



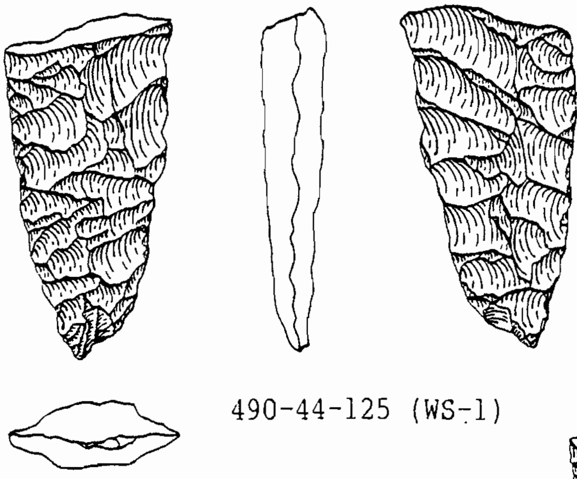


490-42-118 (WS-1)

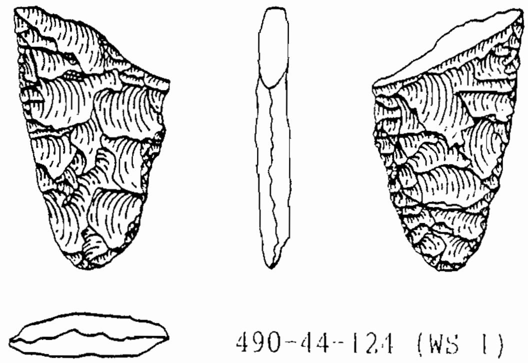
490-42-122 (WS-2)



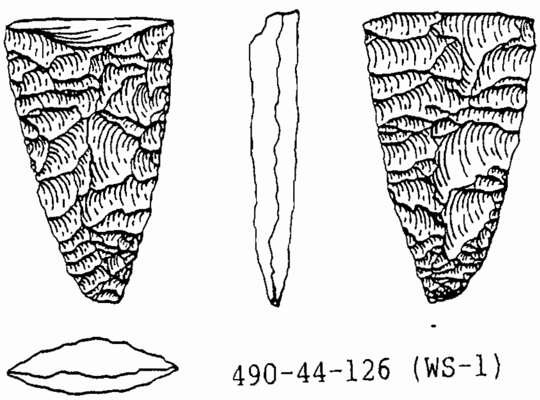
490-42-119 (ND)



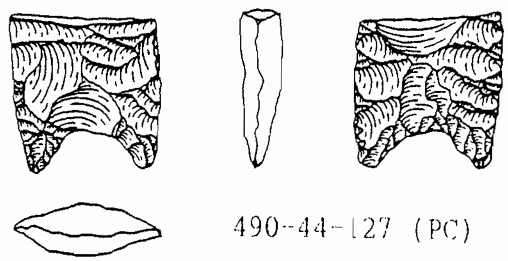
490-44-125 (WS-1)



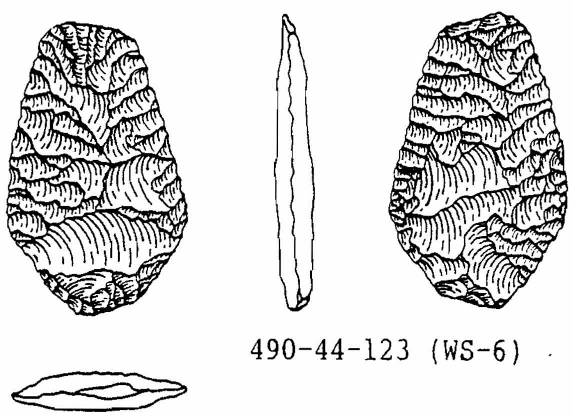
490-44-124 (WS-1)



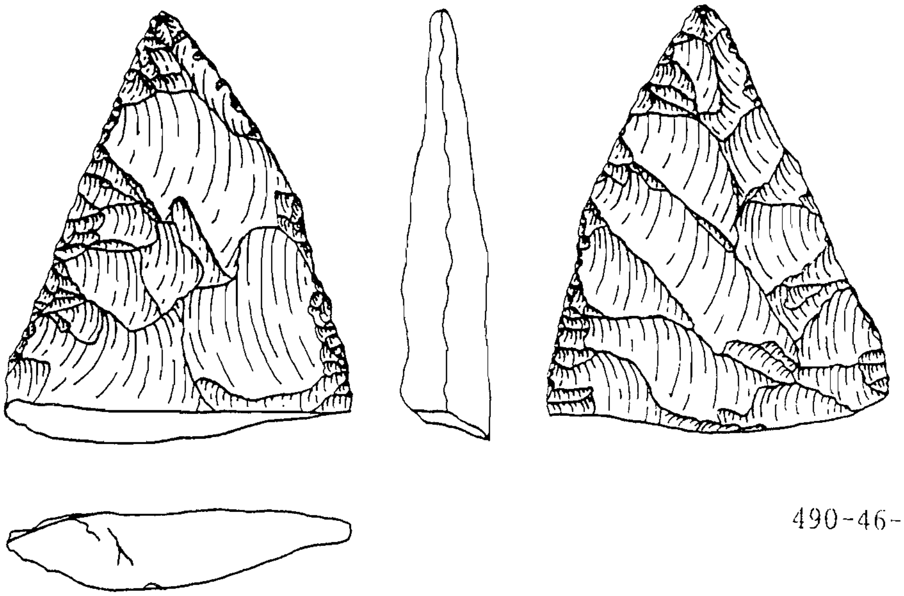
490-44-126 (WS-1)



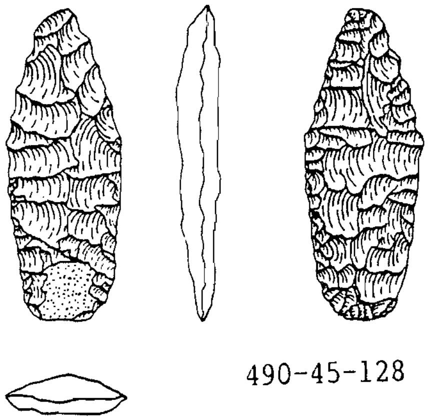
490-44-127 (PC)



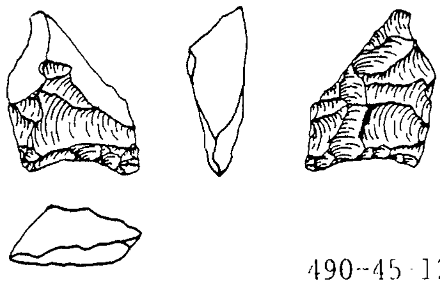
490-44-123 (WS-6)



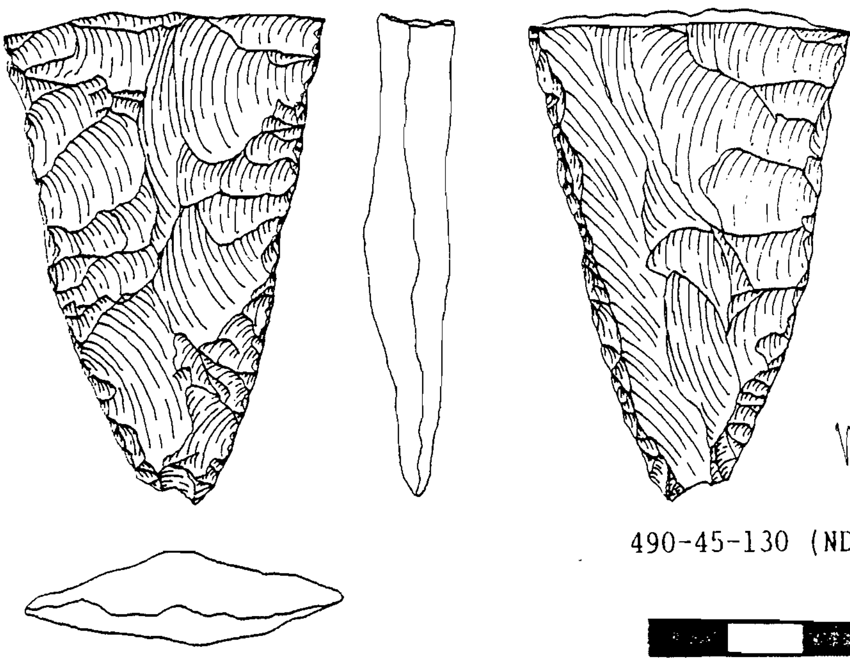
490-46-141 (ND)



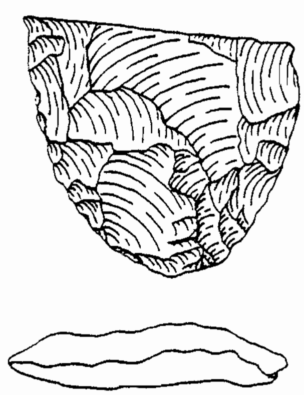
490-45-128 (WS-8)



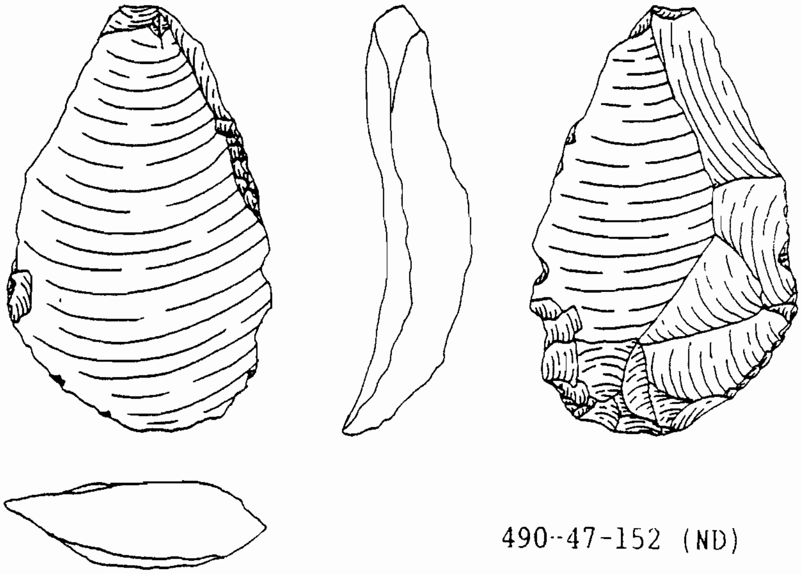
490-45-129 (PC)



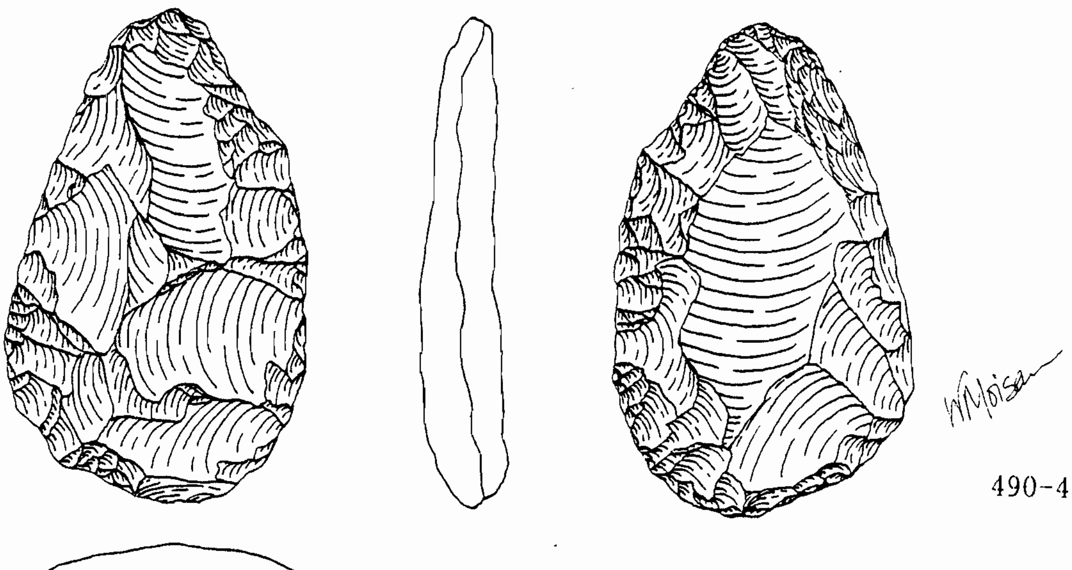
490-45-130 (ND)



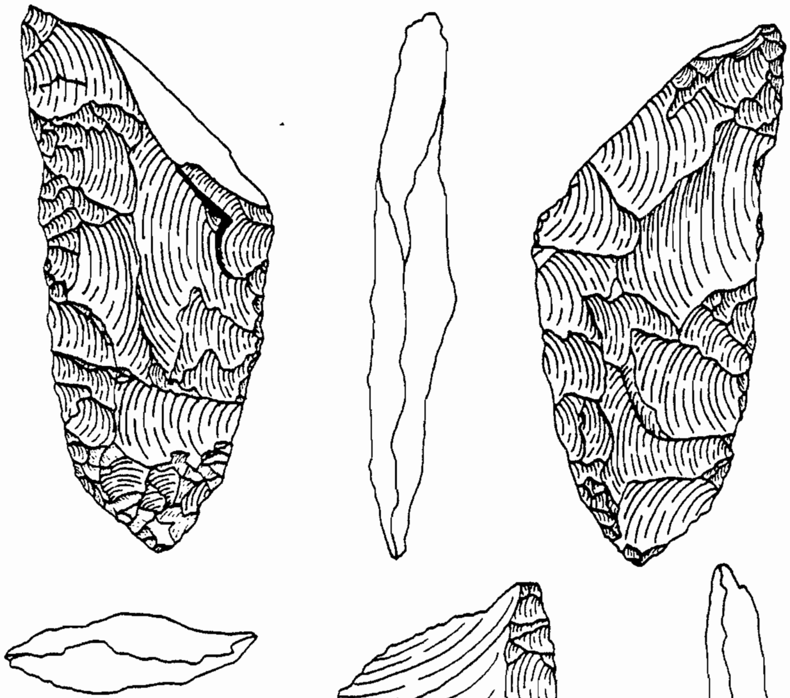
490-47-149 (ND)



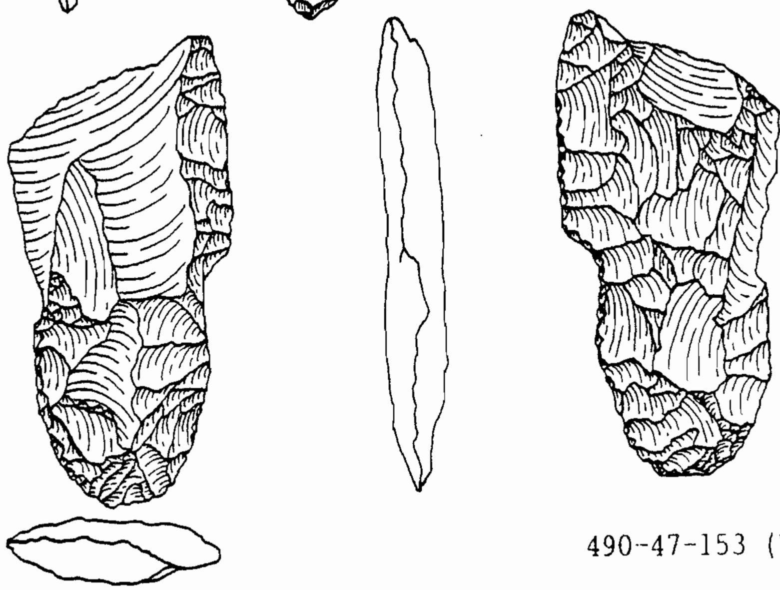
490-47-152 (ND)



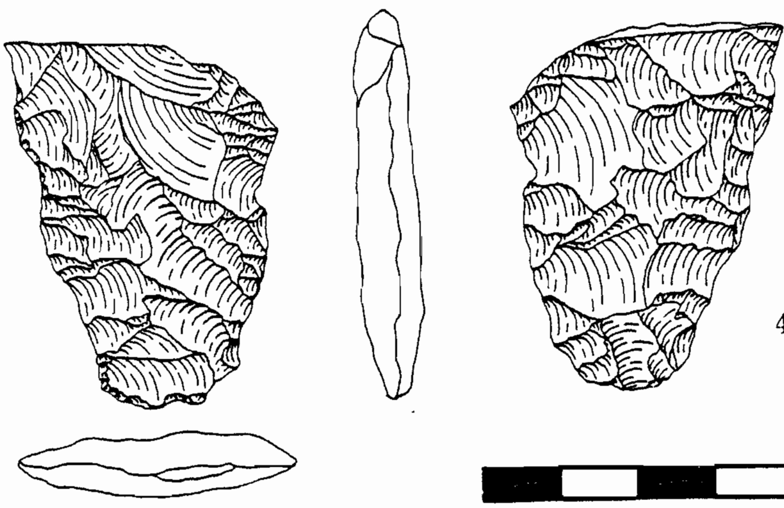
490-47-150 (ND)



490-47-144 (WS-4)



490-47-153 (WS-4)



490-47-146 (WS-4)

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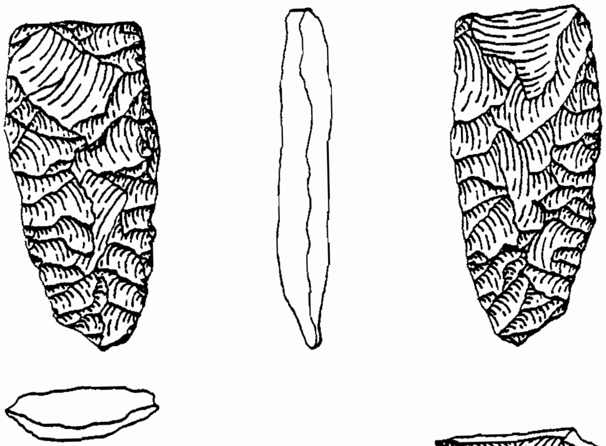
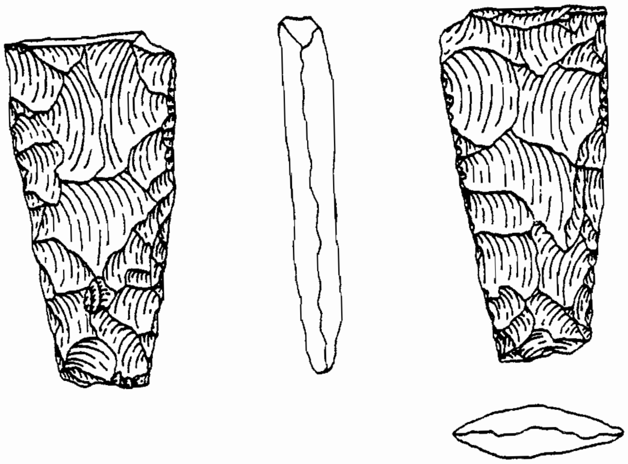
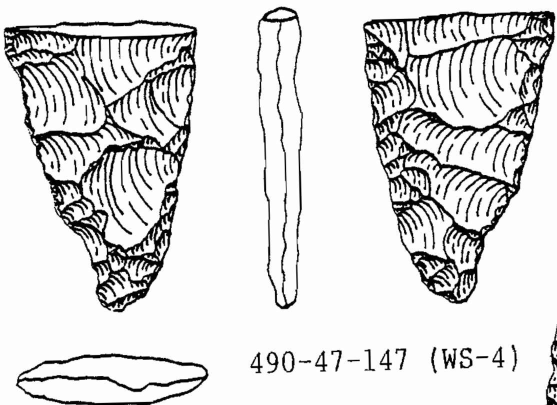


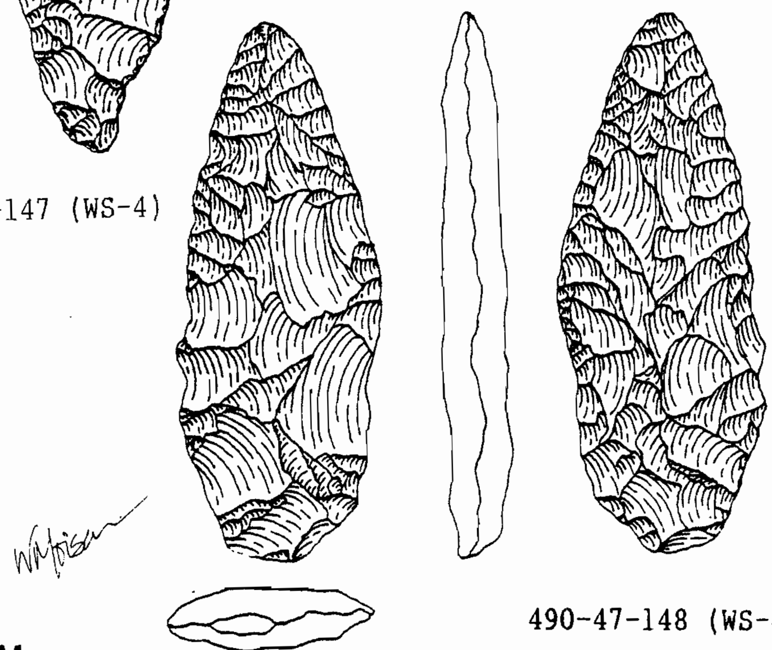
490-47-154 (WS-1)

490-47-145 (WS-5)

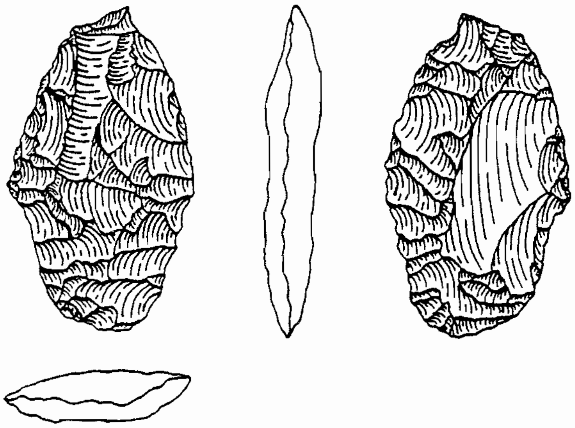




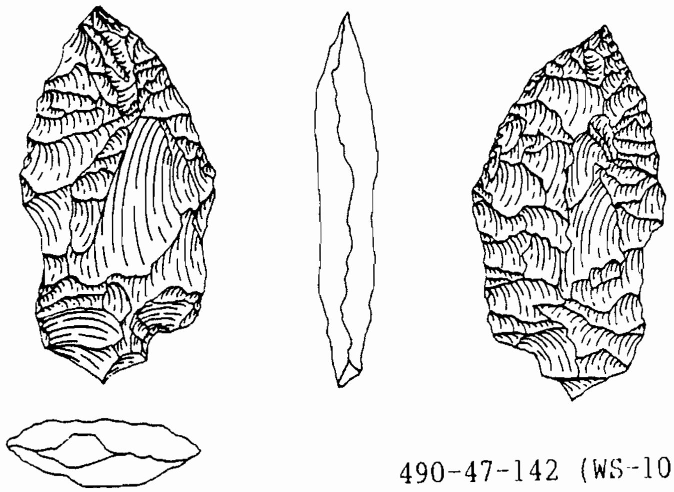
490-47-147 (WS-4)



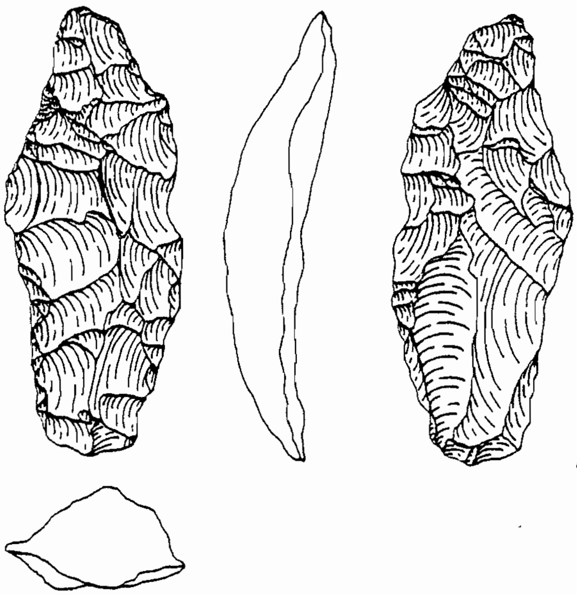
490-47-148 (WS-4)



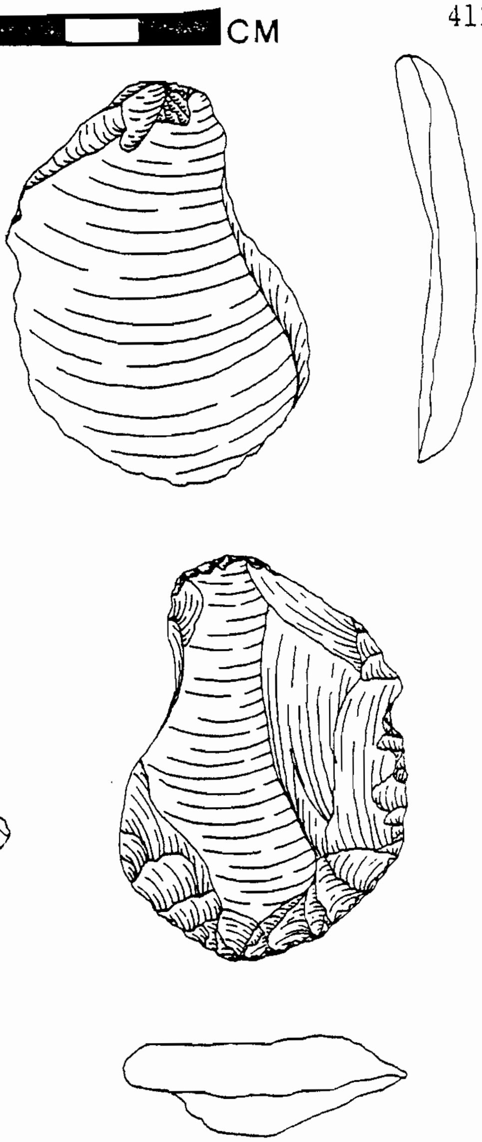
490-47-143 (WS-10)



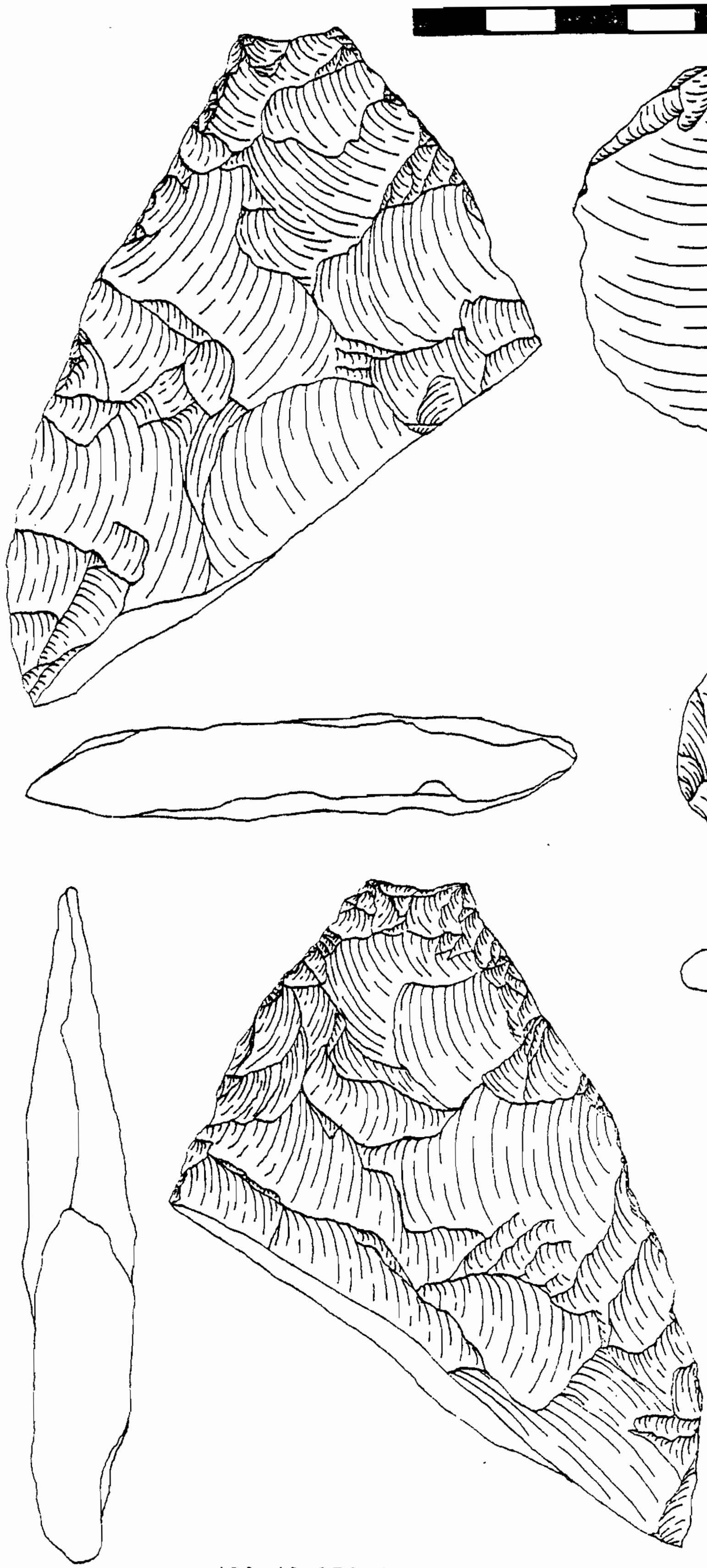
490-47-142 (WS-10)



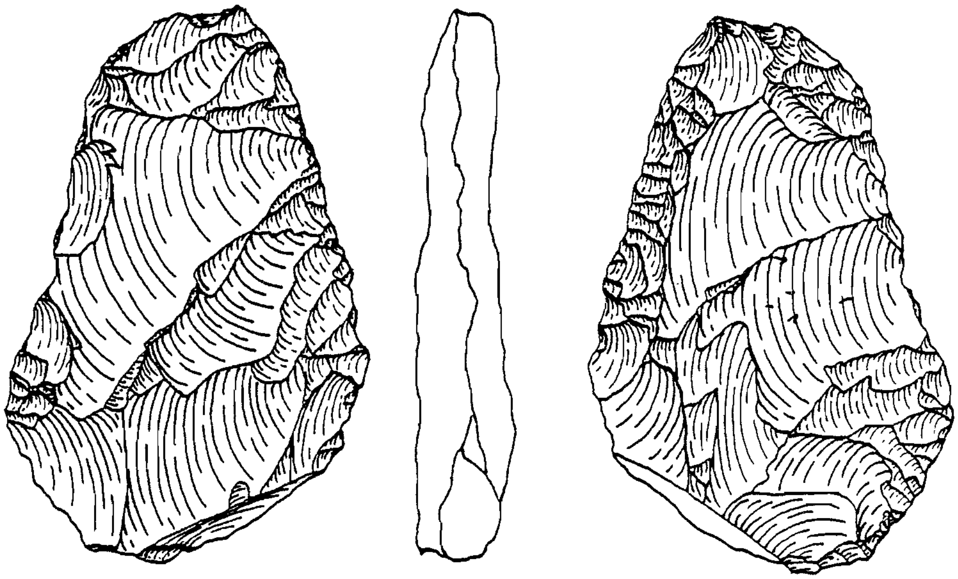
490-47-151 (WS-4)



490-48-174 (ND)

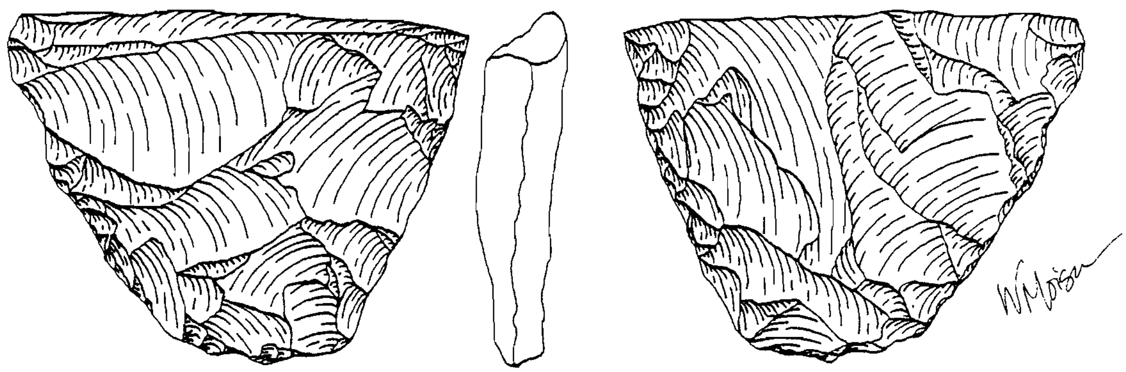


490-48-170 (ND)

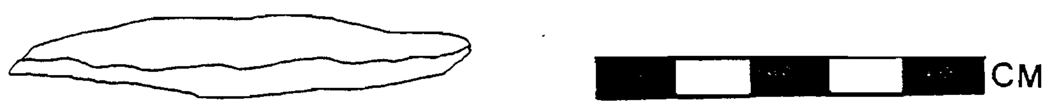


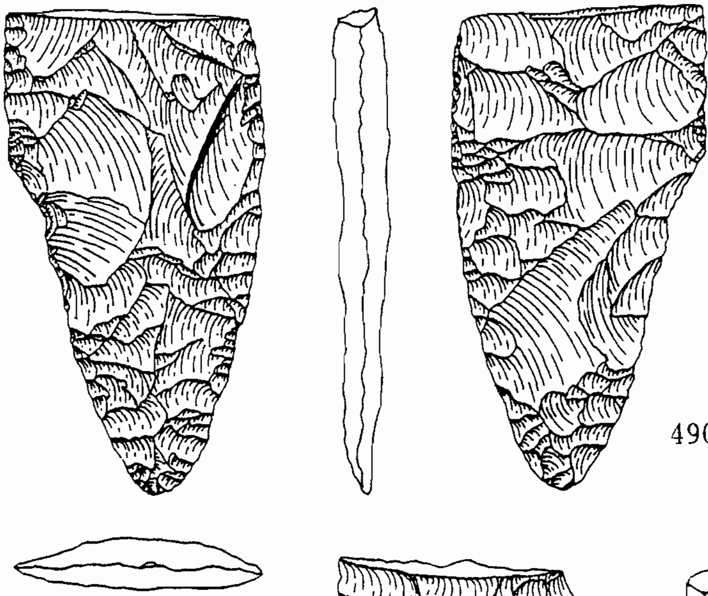
490-48-158 (ND)

490-48-163 (WS-7)

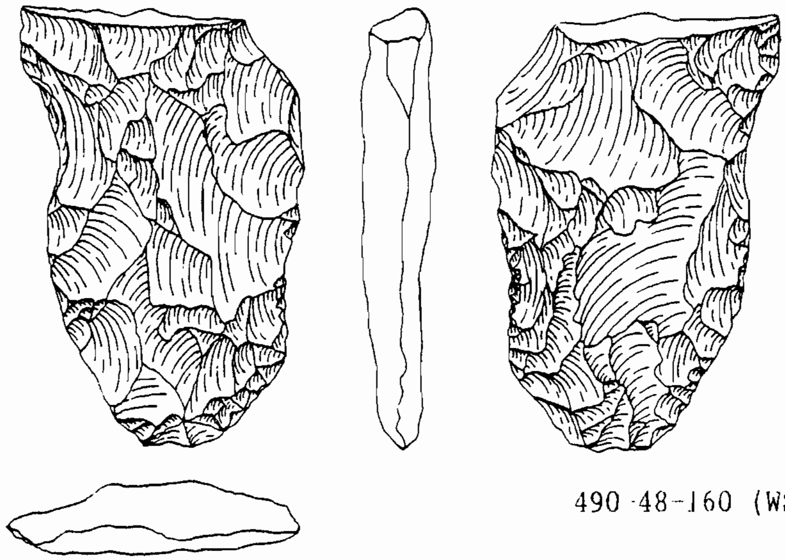


490-48-171 (ND)





490-48-157 (WS-4)



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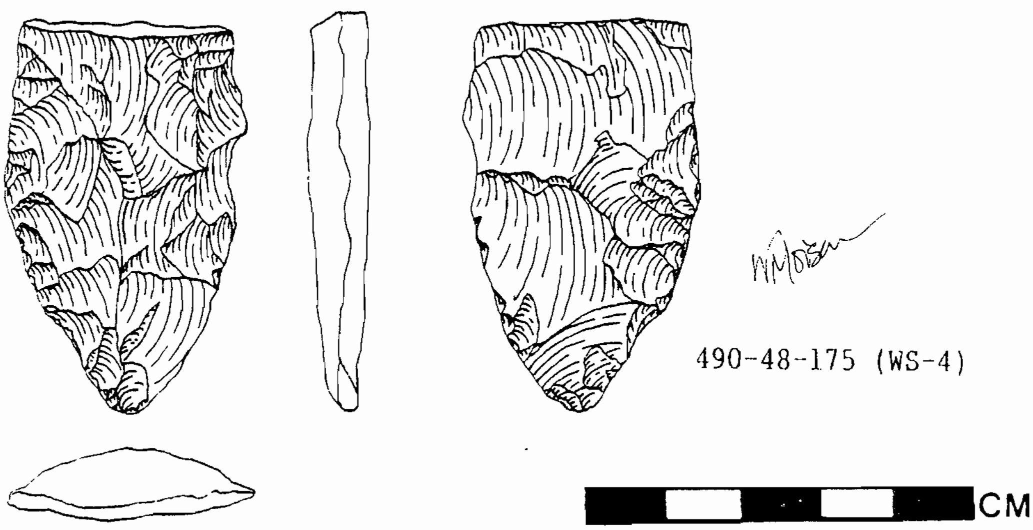

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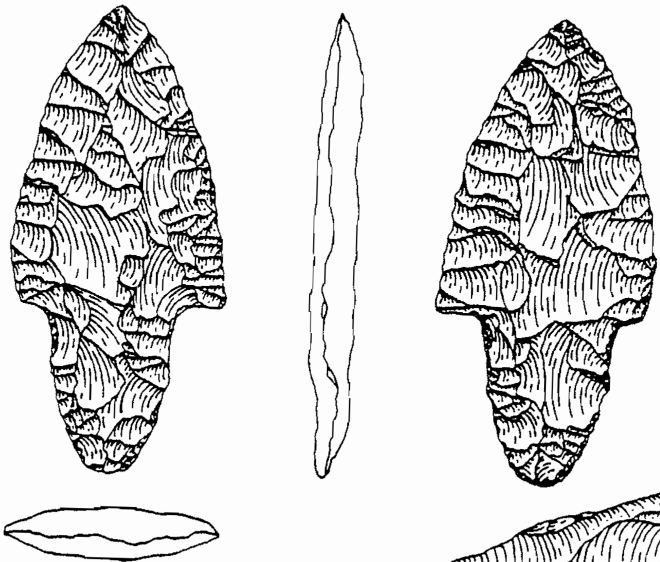

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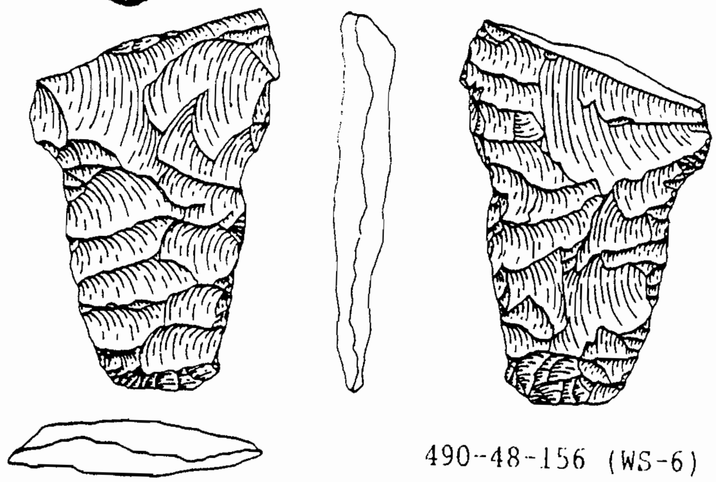

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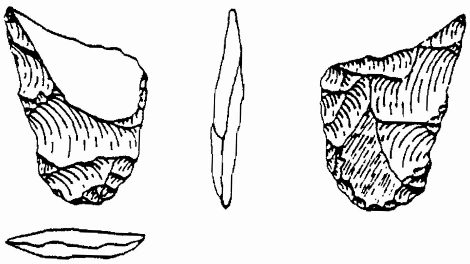

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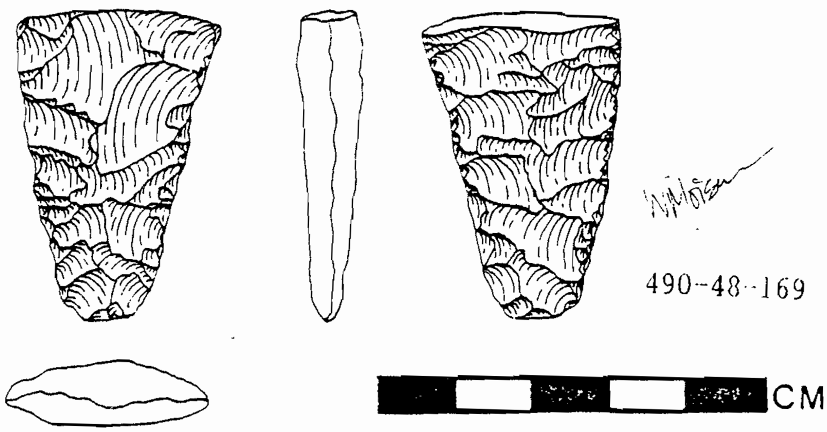

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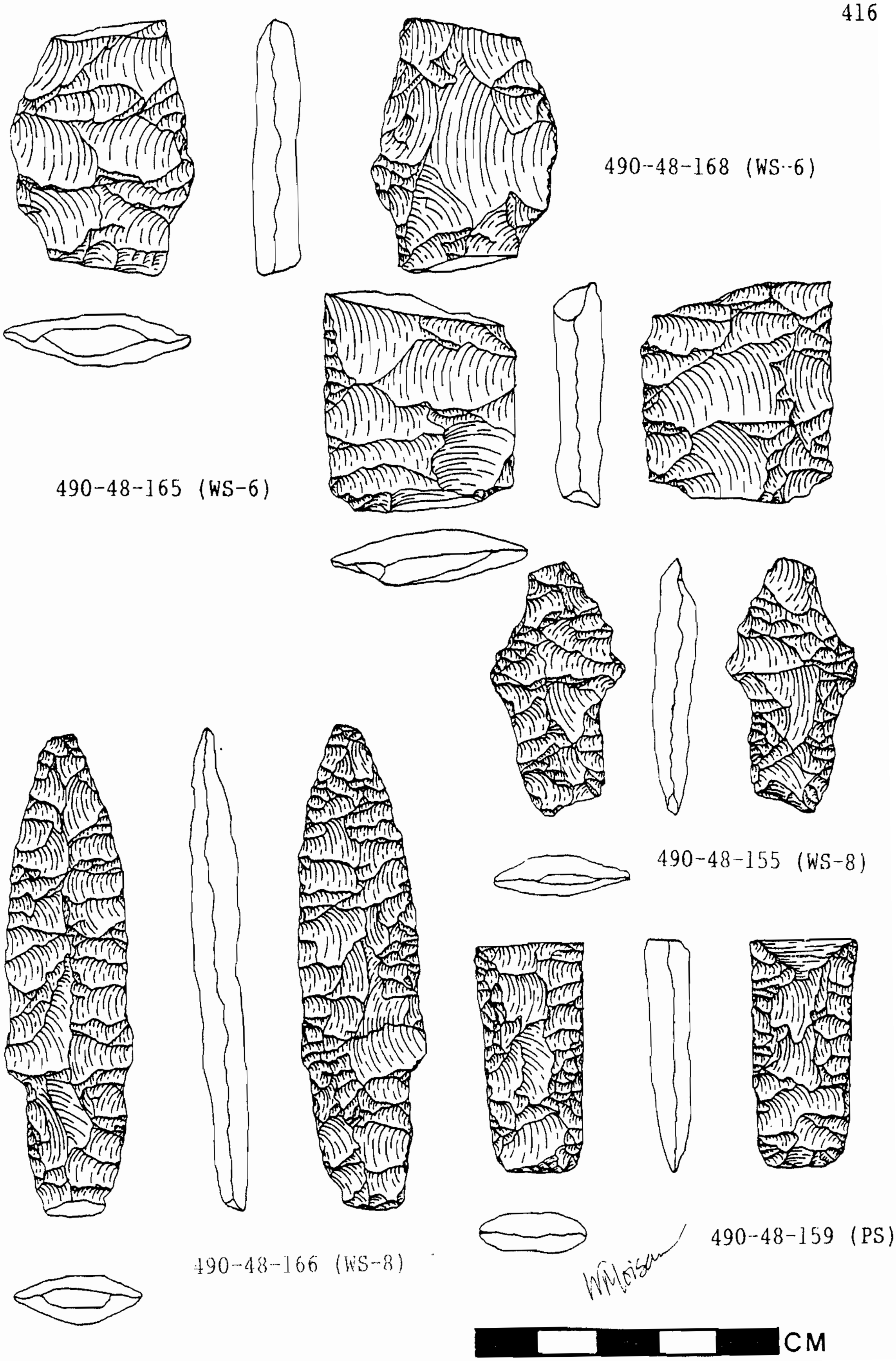
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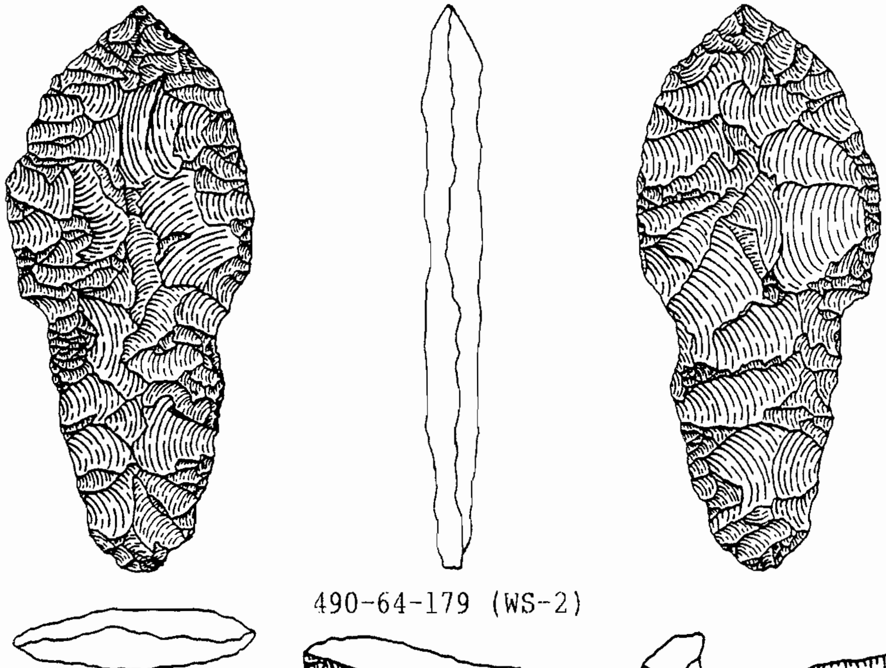

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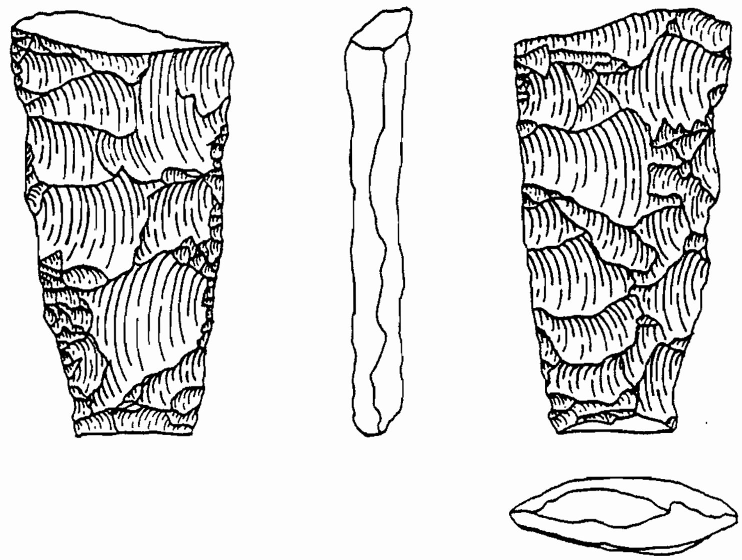

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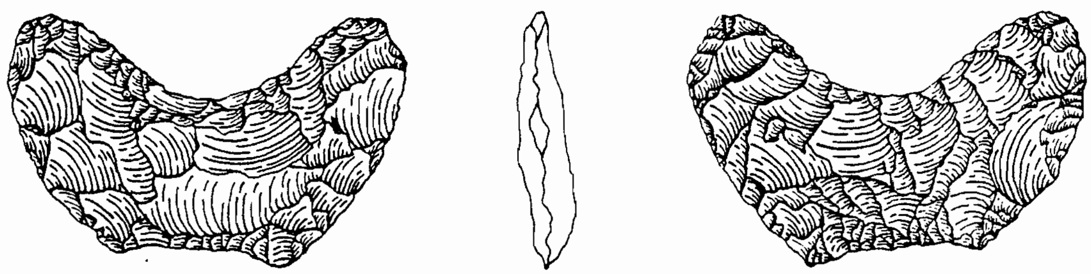

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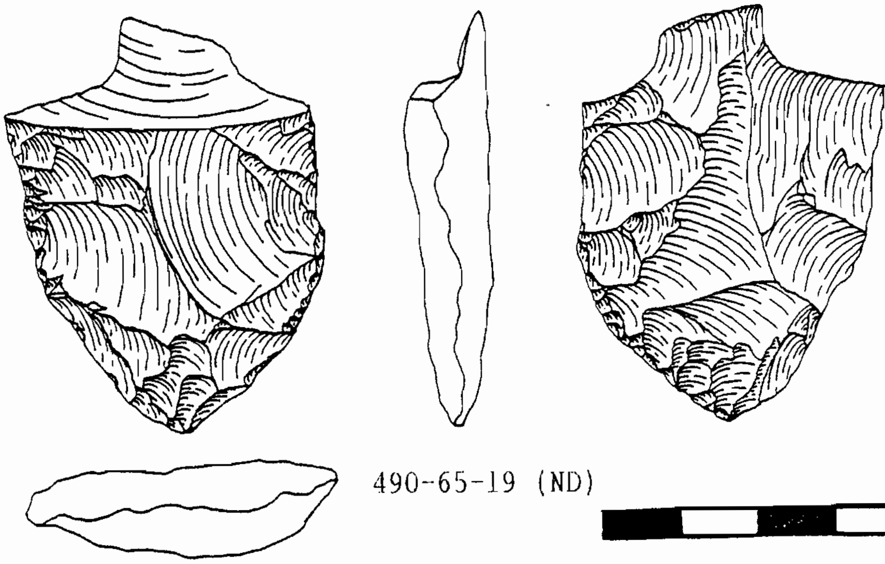

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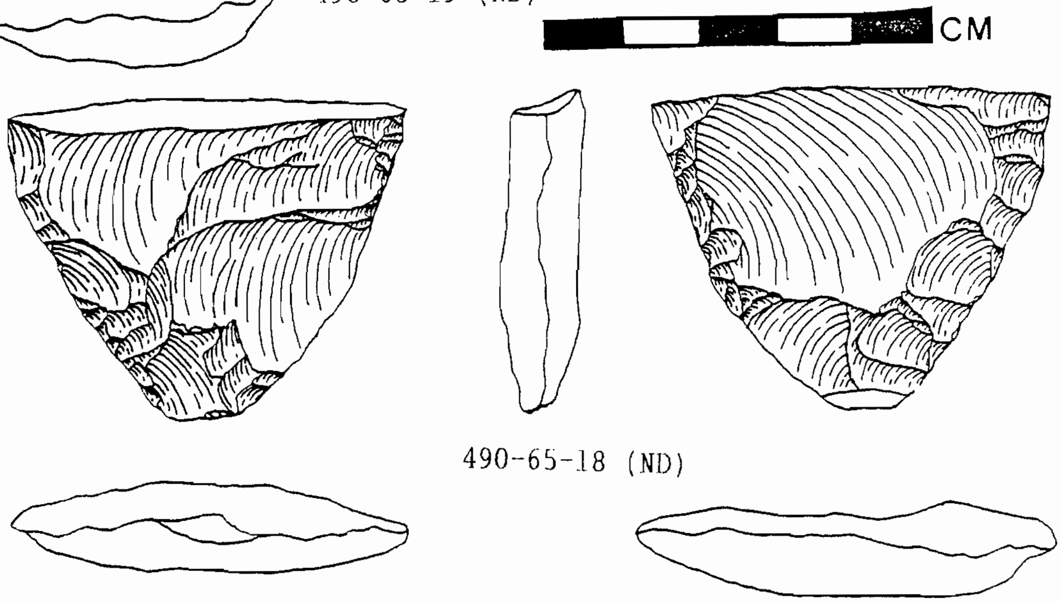

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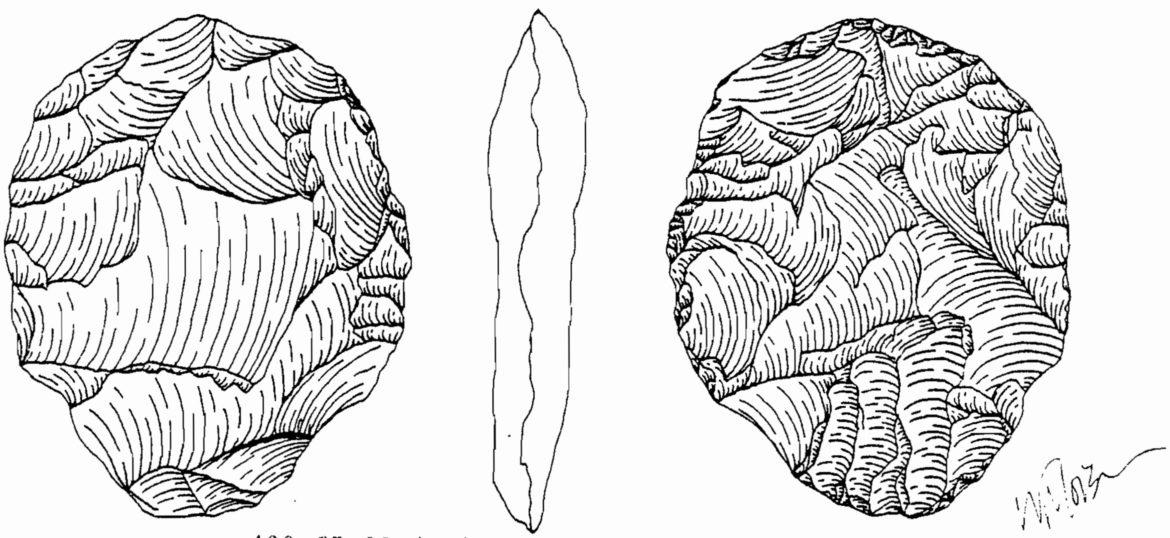

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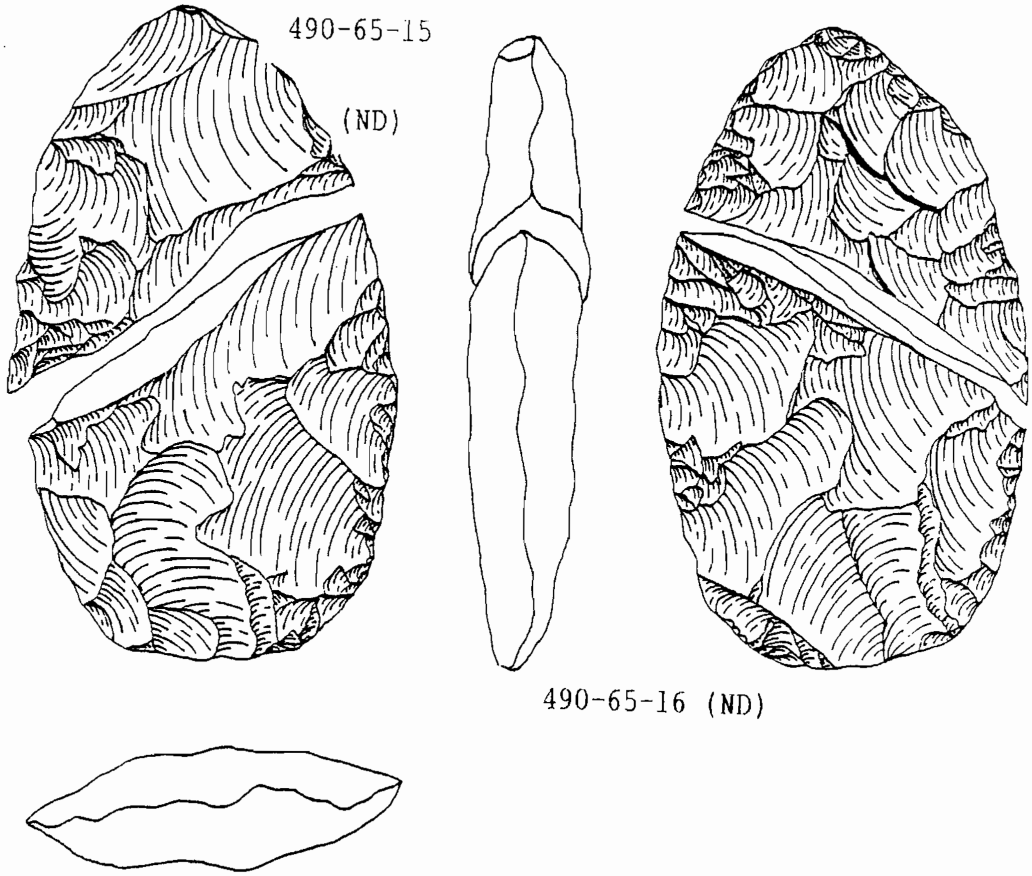

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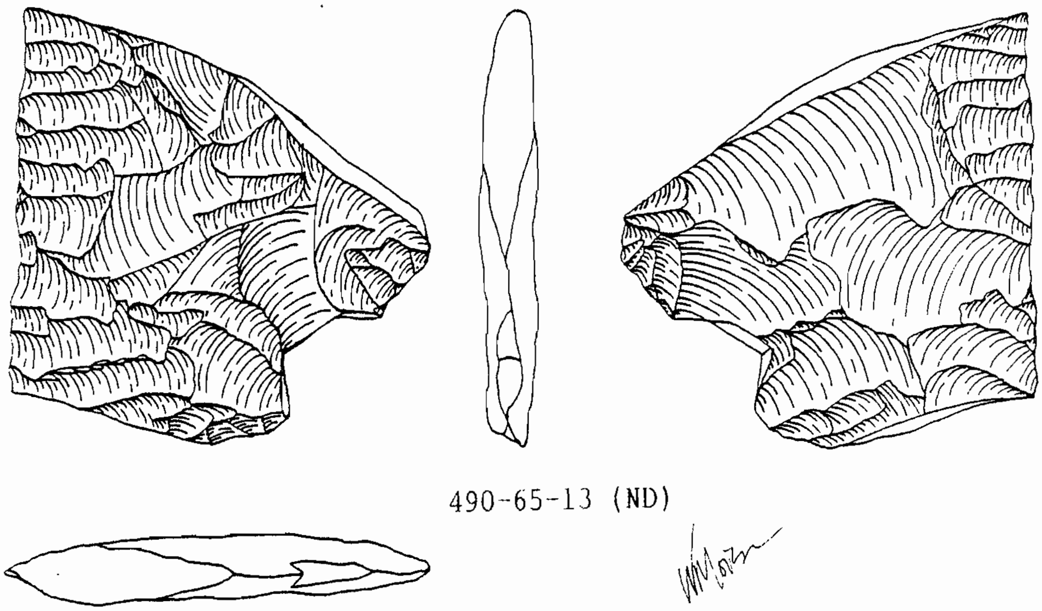

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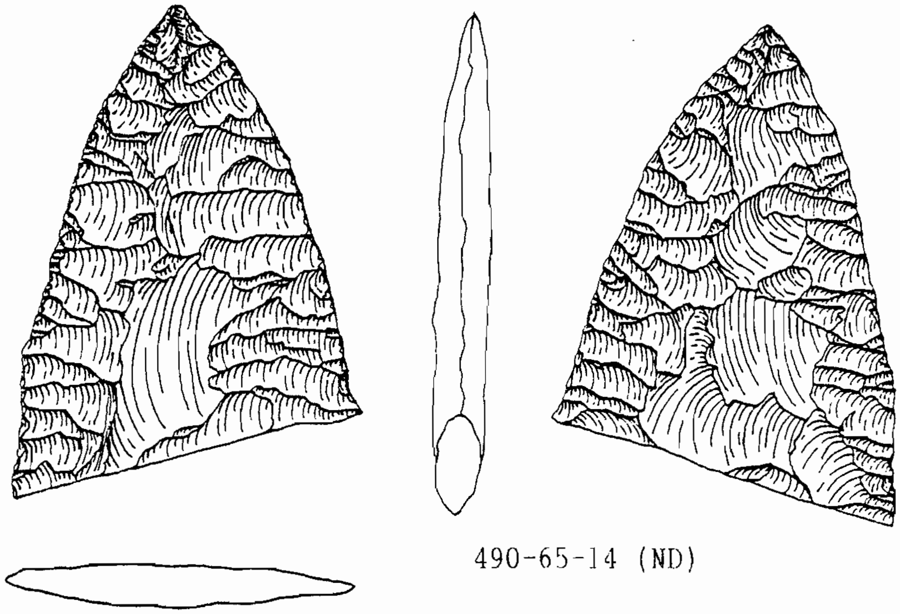

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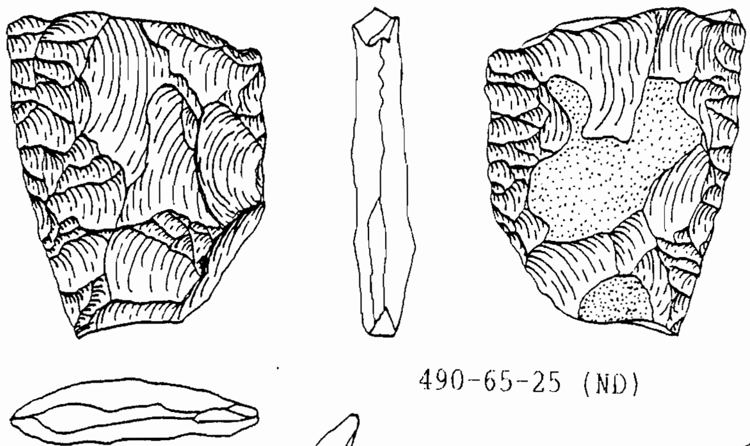

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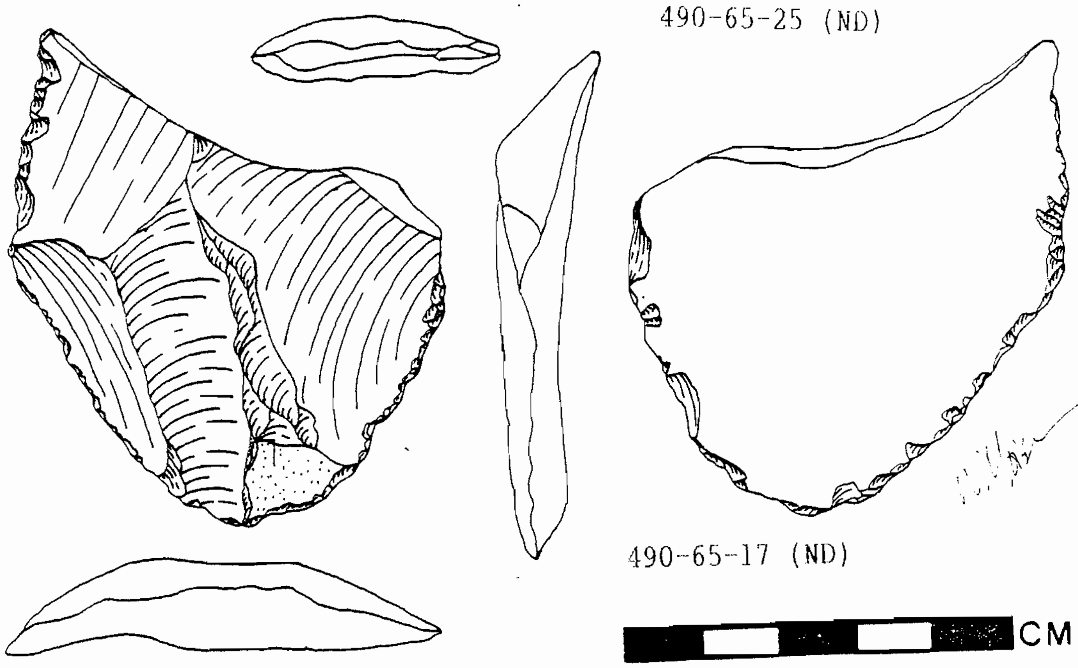

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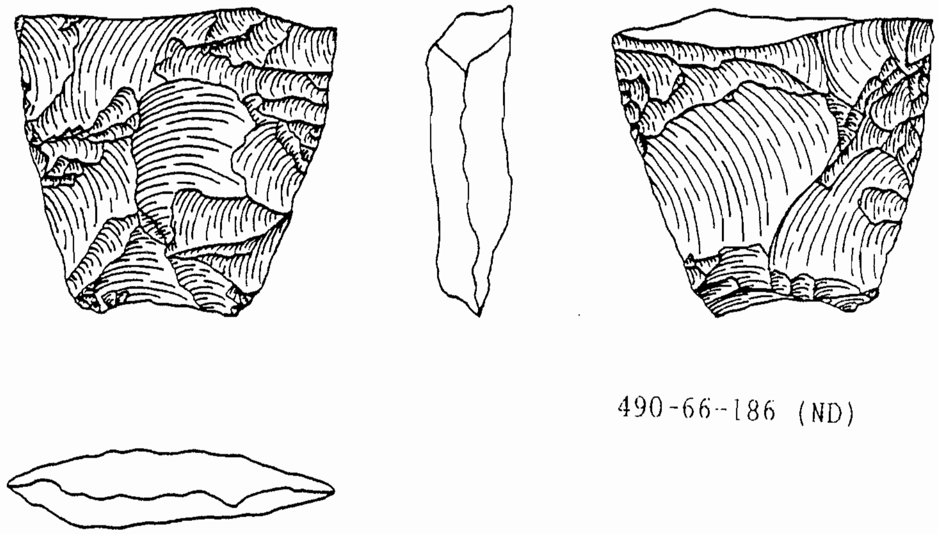

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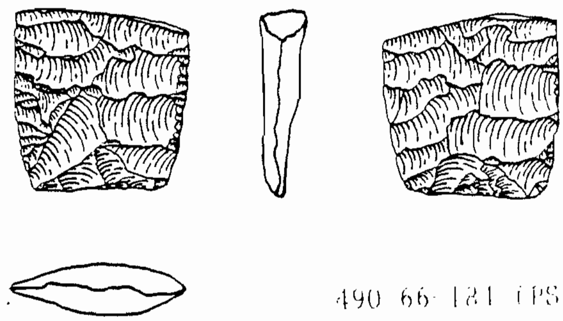

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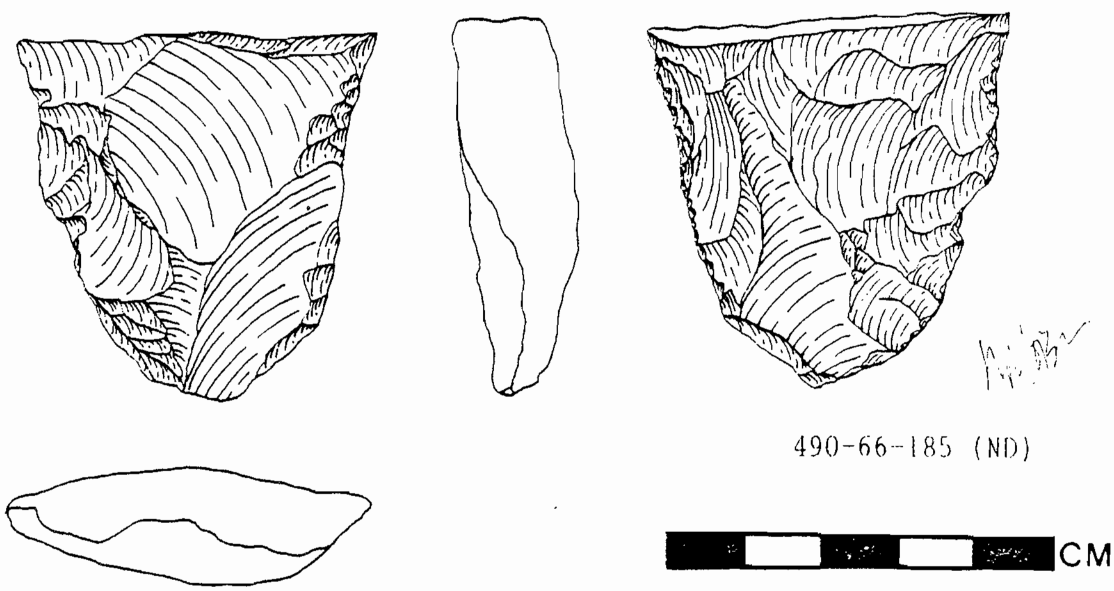

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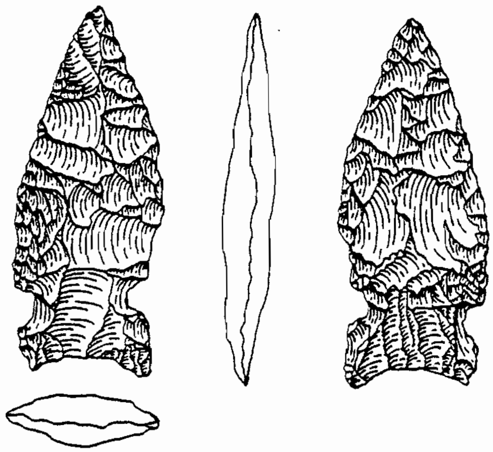

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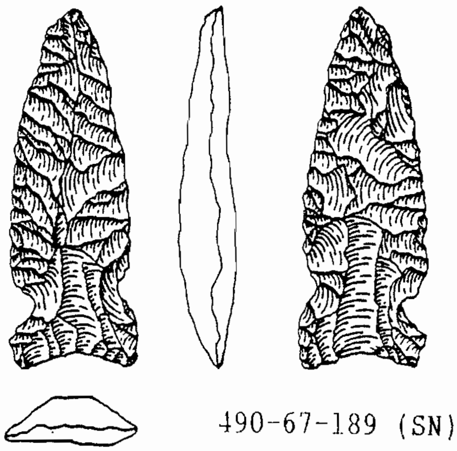

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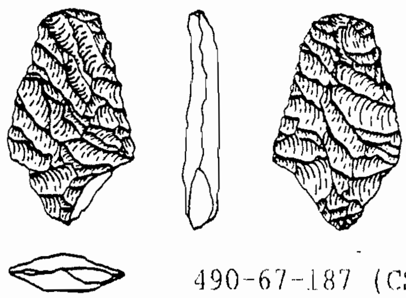

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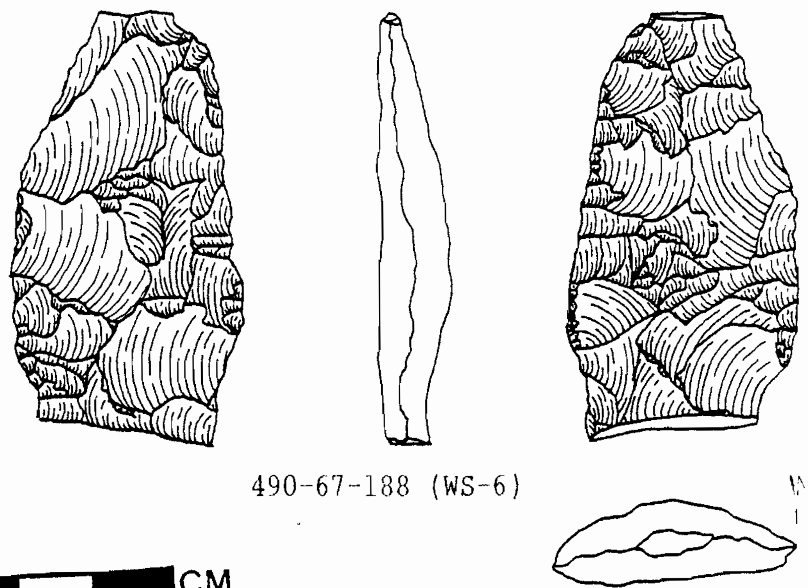

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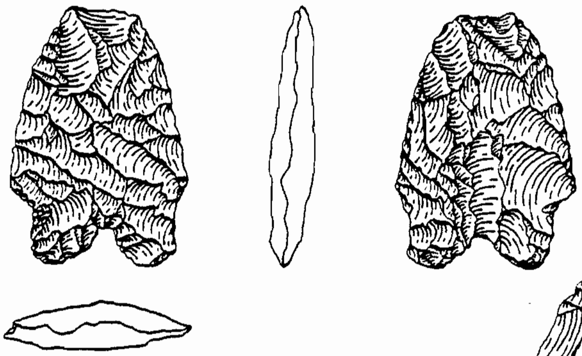

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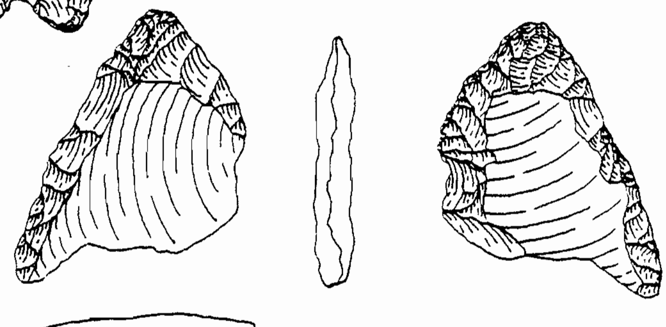

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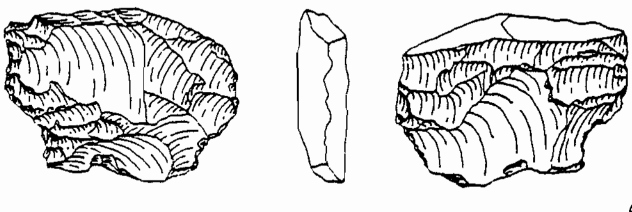

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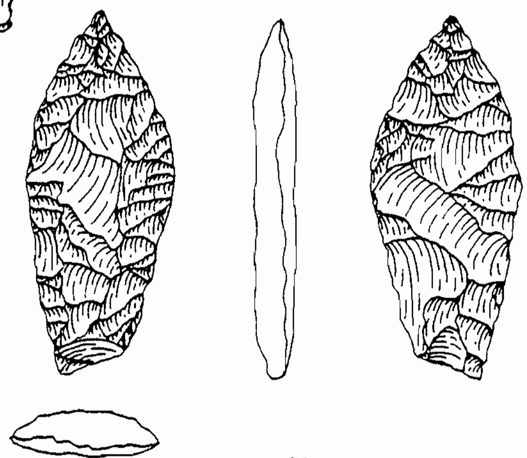

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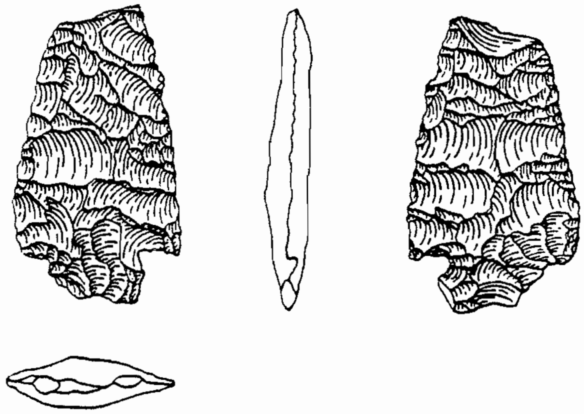

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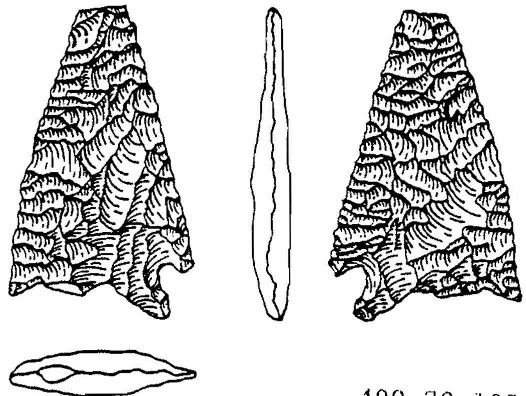

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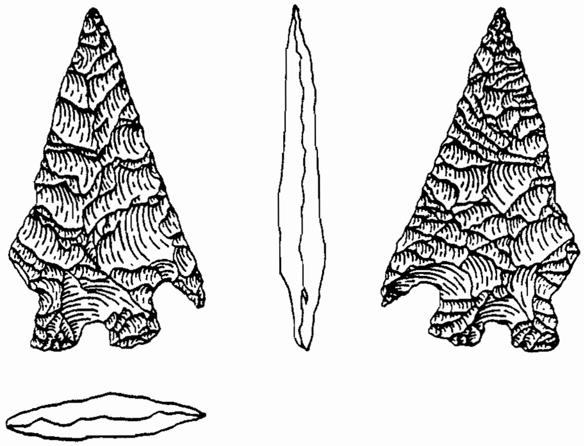

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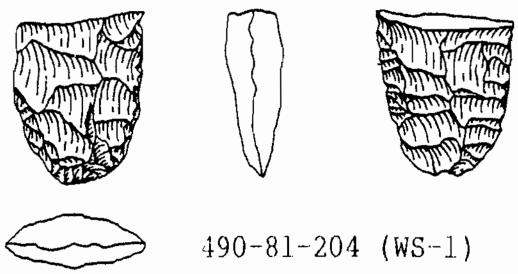

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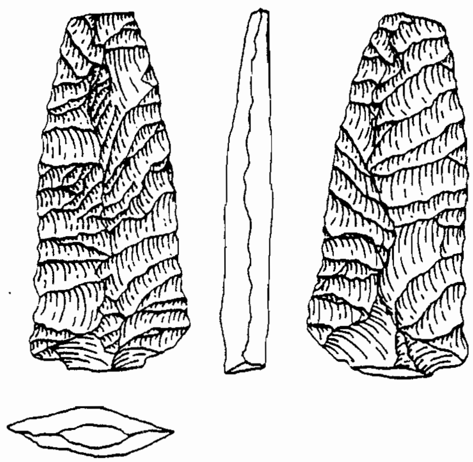

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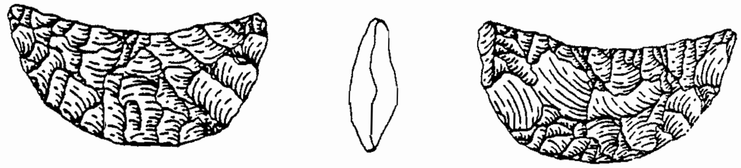

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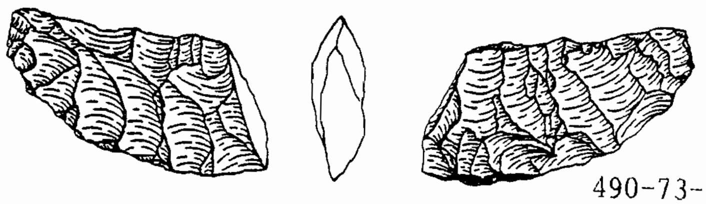

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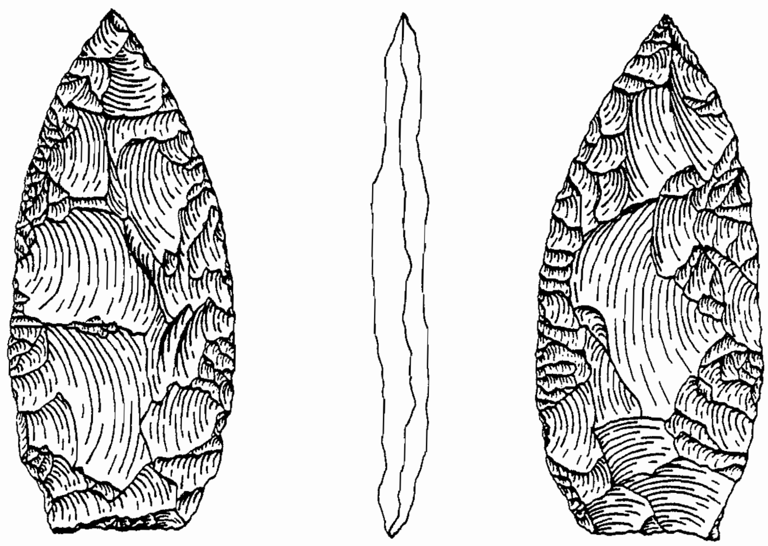

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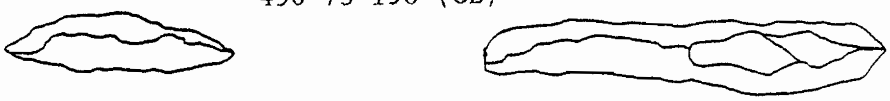

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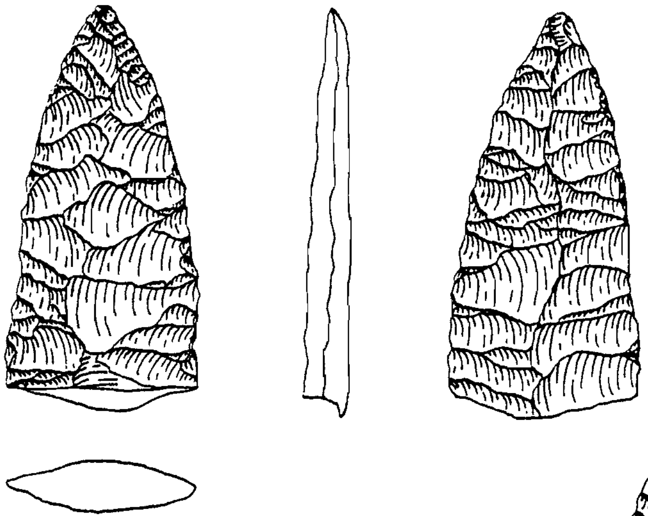

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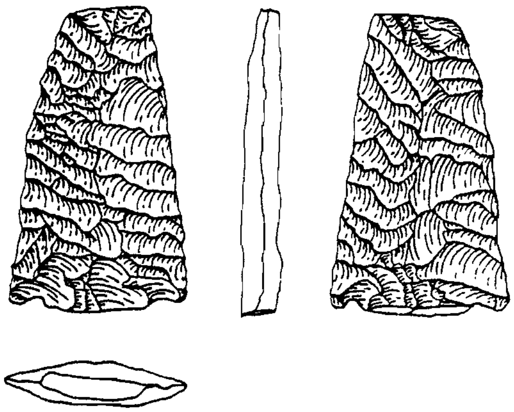

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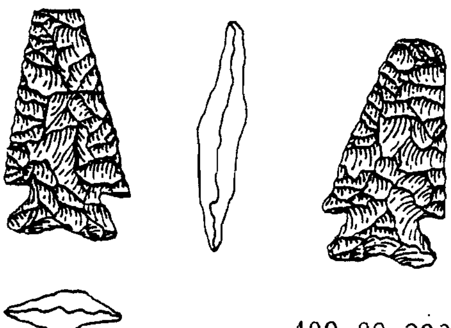

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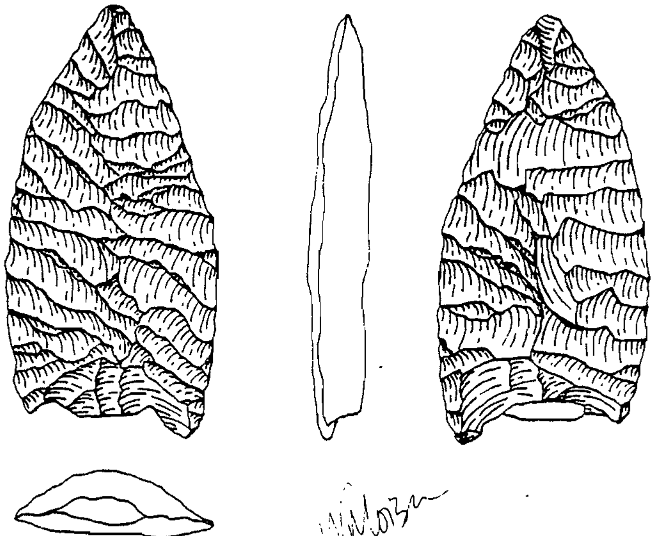

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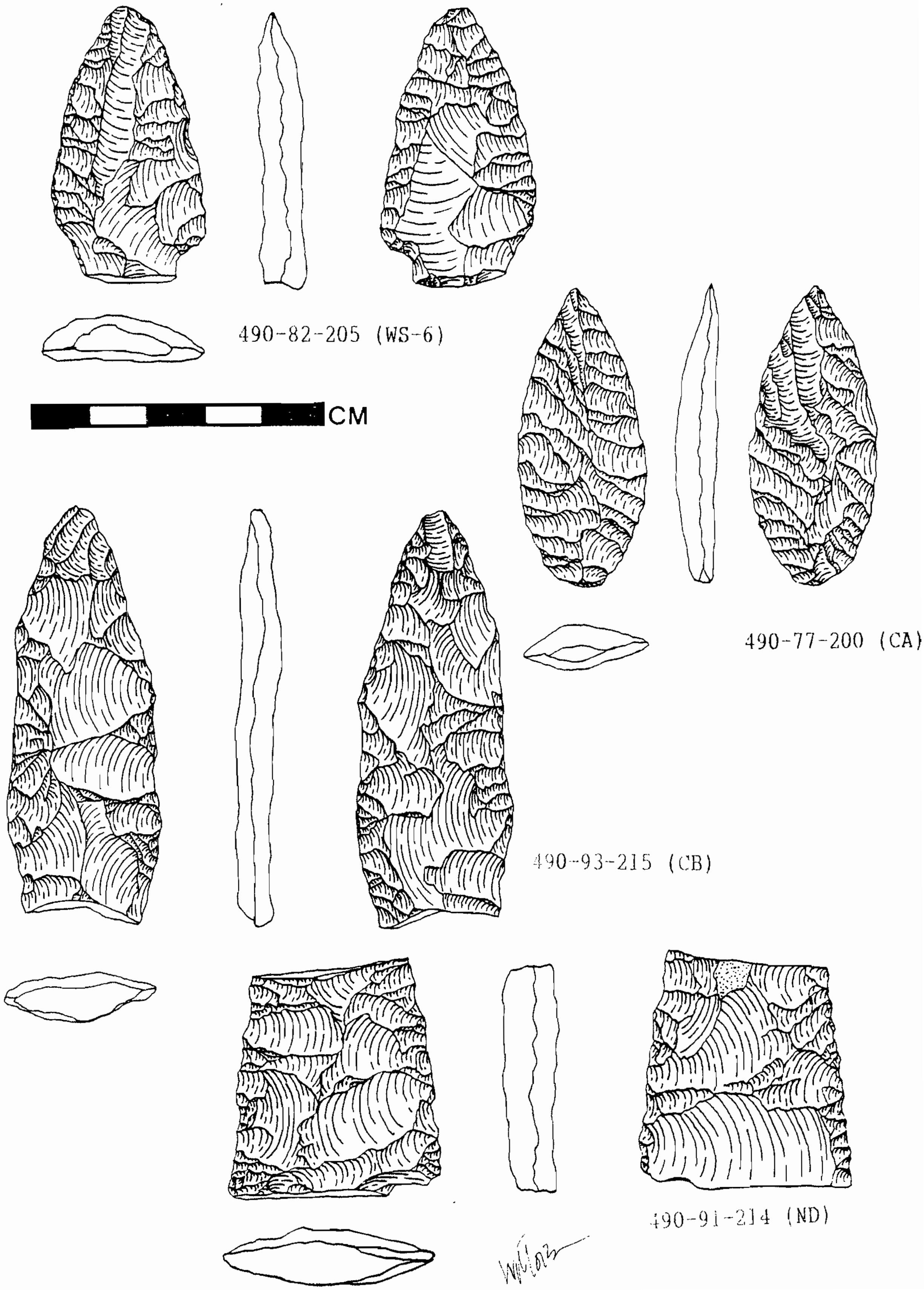
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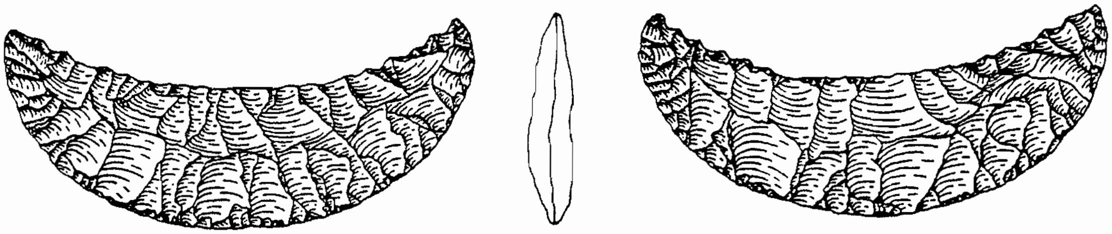

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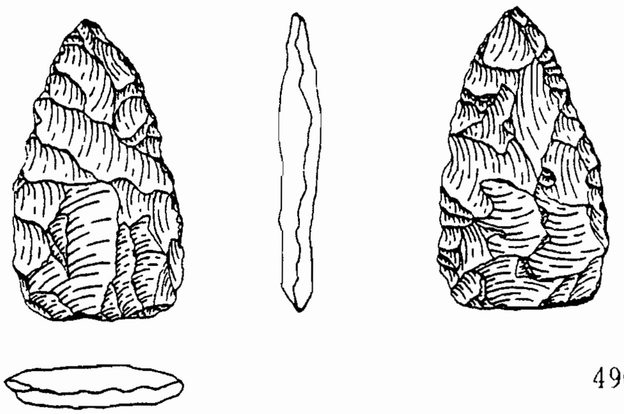

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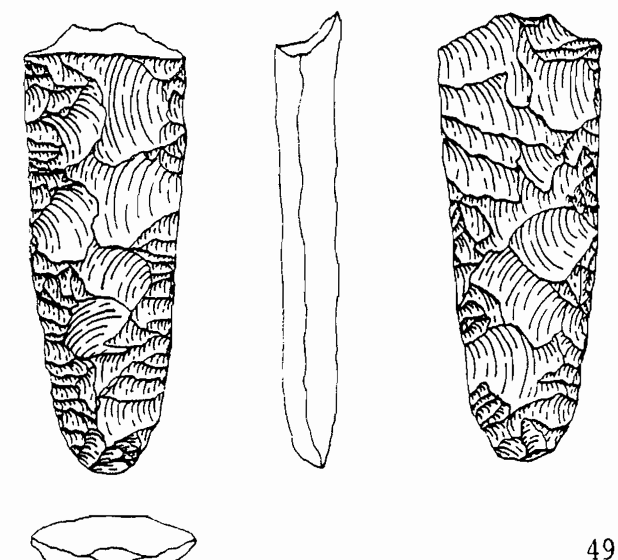

490-90-213 (WS-2)

ENDNOTE

Research into late Pleistocene human occupation in Far Western North America had an early beginning. On October 6, 1882, Mr. William John McGee discovered a large lanceolate point imbedded in well stratified Lahontan lake bed deposits 25 feet below the surface in the Walker River Valley of Nevada (McGee 1887, 1889: Figure 1, p. 305). This same deposit, and the sands below it, contained numerous fossil bones of horse, camel, ox and elephant. The intellectual climate of the time was not very favorable for the acceptance of such antiquity (Grayson 1983), but McGee took detailed notes on the microstratigraphy of the deposits, and the projectile point was painstakingly excavated under a full set of multiple working hypotheses, as advocated so eloquently by Chamberlain (1897). Ironically enough, over a century later, we are still struggling with a lack of archaeological data necessary to confirm an association of early humans with the hunting of fossil megafauna in the Far West.

There were two times in particular, during the process of the Alkali Lake Basin research, that I drew heavily upon the inspiration and example of McGee and Chamberlain. One time was when I made the dangerously tardy discovery that there were inconsistencies in the elevation values of artifacts and shoreline features recorded through stadia and transit mapping (see discussion in Appendix A). Some of the values were as much as 2 meters off, a range which easily encompassed all three of the lake levels I had hypothesized to be of relevance to early human occupation in the basin. Fortunately, it was determined that the sources of error lay not in the actual field data, but in laboratory calculations, which could be easily adjusted. But as I sweated through the process of considering as many possibilities as I could think of, I thought about how Chamberlain might have handled the situation.

Later still came the discovery that there was a potential discrepancy of 1.5 meters in elevation between ground stone tool clusters and other artifact clusters of the Western Stemmed complex at the Dietz site (see Chapter III discussions). As I began the grim process of considering that my integrative model was wrong, that there was no apparent pattern to the distributions, that specific lake levels could not be correlated with occupation surfaces and sites, I once again thought of McGee and Chamberlain and asked myself "Did I want to acknowledge certain confusion and leave it at that? Or did I want to keep searching for the truth of things?". Chamberlain and McGee would have chosen the latter. It was only after I had painfully set the model aside to search for alternative explanations, after a long and painful re-examination of the data, that the model of downslope transport was formulated. Through the process of entertaining multiple working hypotheses, a better explanation was derived which actually served to reinforce the model as proposed. There is no doubt that I resisted this process. I liked my model. But thanks to the exemplary methods set forth by McGee and Chamberlain, I think I came a little closer to the truth of things.

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