The Clovis - Archaic Interface in Far Western North America

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INTRODUCTION

The earliest human occupation accepted without controversy in Far Western North America is that represented by fluted and stemmed point complexes, referred to in this discussion as Western Clovis (*sensu* Tuohy 1974) and Western Stemmed (adapted from Bryan 1980; Layton 1970). Their currently known distribution 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). The frequent co-occurrence of fluted and stemmed points in the Far West, particularly in association with shallow lake, marsh or stream-fed delta features in pluvial lake basins, has generated questions about the age, historical relationship and economic orientation of the cultures which produced them.

The temporal and cultural relationship of the Western Clovis and Western Stemmed complexes has been unclear, but recent research in the Far West has focused upon investigating the time depth, historical relationship, economy and adaptations of these early cultures at the Pleistocene-Holocene boundary. The papers in this volume present new evidence and perspectives gained through recent research, as well as fresh re-assessments of previously gathered data. Together, they represent a major step forward in our knowledge and understanding of Western Clovis and Western Stemmed culture and lifeways in the Far West.

Much of the evidence presented here is based on investigations of surface sites or shallow deposits in western pluvial lake basins. In Nevada, these include Pyramid Lake (Dansie, Davis and Stafford; Tuohy), Lake Tonopah, Lake Hubbs and the Carson River Basin (Hutchinson; Tuohy), as well as Newark, Jakes, Steptoe, Railroad and Butte Valleys (Beck and Jones; Price and Johnston; Zancanella;). In California, coverage includes the Borax and Clear Lake areas (Fredrickson and White), Long Valley (Basgall), Tulare Lake (Wallace and Riddell) and the Mohave Desert region (Douglas, Jenkins and Warren; Warren and Phagan). In Oregon, investigations since 1983 at the Dietz site and other early sites in the Alkali Lake Basin are summarized by Fagan and Willig.

New dates from Smith Creek Cave, Nevada (Bryan) and re-investigations of stratigraphy and lithic assemblages from Dirty Shame Rockshelter in Oregon (Hanes) are also presented. Discussions of theoretical and methodological issues, as well as synthetic perspectives, are offered by Ames, Bryan, Carlson, Dansie *et al.*, Haynes, Musil, Price and Johnston, and Simms. However, most of the papers in this volume make statements about temporal, cultural and economic relationships between Western Clovis and Western Stemmed occupants of the Far West.

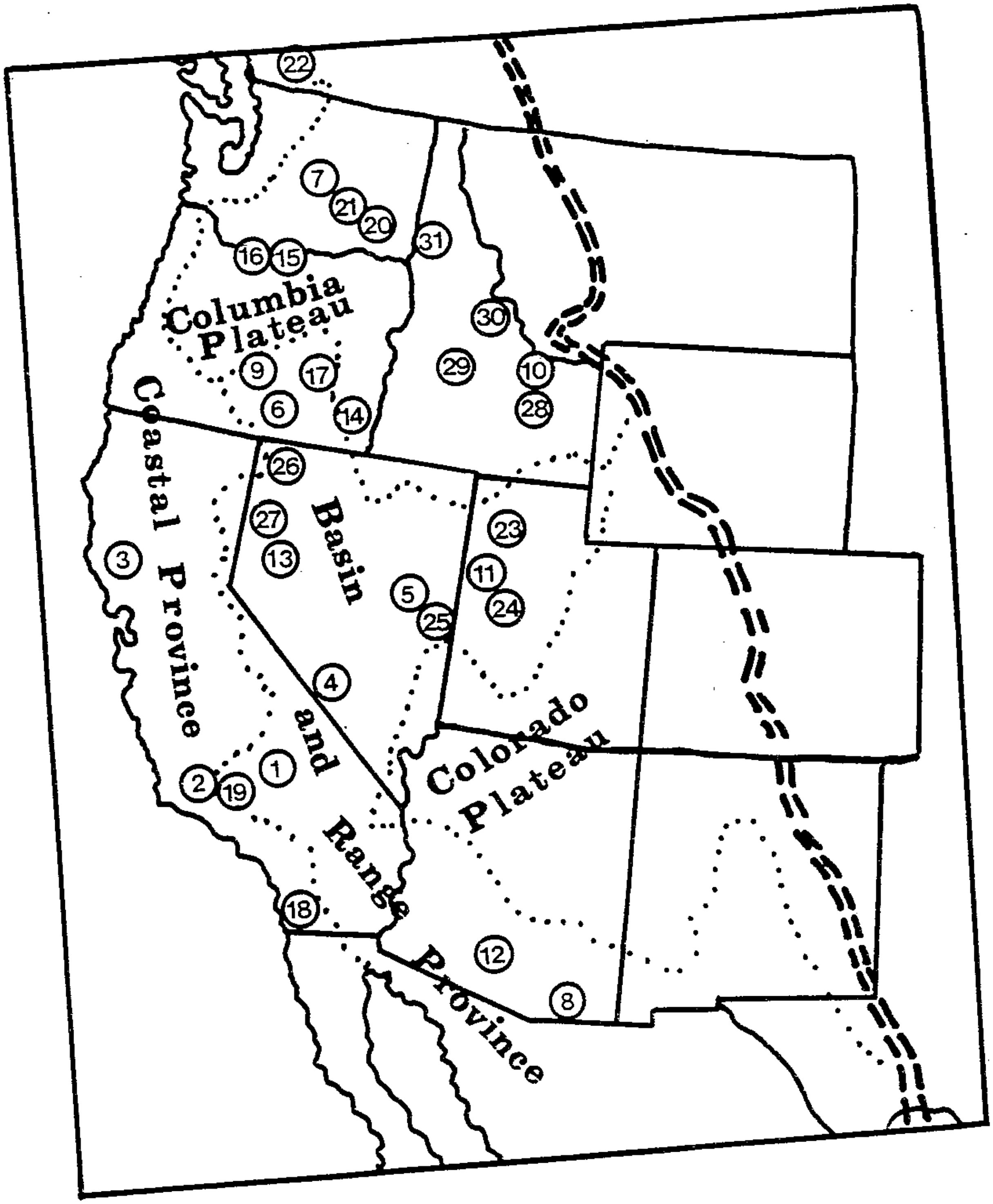

Figure 1. Map of Far Western North America showing locations of major Western Clovis and Western Stemmed Archaeological Sites discussed in text. (Adapted from Aikens 1983b and Jennings 1964). Numbers correspond to site locations listed in Tables 2A, 2B, 3 and 4.

The data and hypotheses presented fall into four major categories: (1) *dating* (carbon-14, stratigraphy, typology, obsidian hydration); (2) *technology* (lithic reduction sequences, assemblage structure and diversity, hafting traditions); (3) *paleoenvironment and settlement-subsistence patterns* (lithic sourcing, subsistence remains, site distribution and environmental context); and (4) *regional adaptive strategies* which might be inferred from the current data base. Recent advancements in our knowledge within each of these categories are summarized below, following a brief definition of terms.

DEFINITION OF TERMS

Discussions of Far Western prehistory between 12,000 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. To simplify matters, standardized terms and definitions for **Far West, Western Clovis, Western Stemmed, Paleoindian** and **Archaic** are presented below.

Far West

In this volume, the Far West includes that region of North America from 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 logically 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, and 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 they are now known from many sites throughout California, Oregon, Washington, Idaho, Nevada and Utah (Aikens 1978, 1983b; Butler 1978, 1986; Carlson 1983, 1988; Davis and Shutler 1969; Jennings 1986; Madsen *et al.* 1976; Titmus and Woods 1988; Tuohy 1968, 1969, 1974, 1985, 1986; Wallace 1978; Willig 1989a, 1989b). In tool kits, typology, and intra-site variation, Far Western and Clovis-Llano fluted point assemblages compare closely. However, 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 1988, 1989b). 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, 1983b; Bryan 1965, 1980, 1988; Carlson 1983; 1988). Referred to here as **Western Stemmed**, these complexes have been variously defined as phases, horizons, complexes, traditions, or distinct regional styles (see Table 1).

Similar stemmed and shouldered forms occur in the eastern U.S. (Kraft 1973; Mason 1962), especially the Great Lakes region (Fitting *et al.* 1966; Mason 1981), and among Great Plains Plano types (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.

Table 1: Various Terms and Designations for Western Stemmed Complexes in the Far West (from Willig 1989a)

Terms and Designations	*References*
Phases or Horizons	
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
Patterns	
Borax Lake Pattern	Fredrickson 1973, 1974
Complexes	
San Dieguito	Rogers 1939; Warren 1967, 1968
Lake Mohave	Wallace 1962
Hascomat	Warren and Ranere 1968
Traditions	
Western Lithic Co-Tradition	Davis 1967; Davis *et al.* 1969
Western Pluvial Lakes Tradition	Bedwell 1970, 1973
Stemmed Point Tradition	Bryan 1980; Layton 1970
Great Basin Stemmed Tradition	Tuohy and Layton 1977; Layton 1979
Intermontane Western Tradition	Daugherty 1962
Distinct regional styles	
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

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 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), and most of the papers in this volume provide additional new data.

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" side by side 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 under **Regional 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. Willig (1989a) proposes the term "paleo-Archaic" to designate the presence of broad-spectrum (Archaic) adaptations among the earliest (paleo) occupants of the Far West. 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.

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 (*sensu* 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 micro-environments 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, 1989a), the term "Archaic" retains its original value and explanatory power.

CHRONOLOGY OF WESTERN CLOVIS AND WESTERN STEMMED

Pre-Clovis Occupation in the Far West

Claims have been numerous for human occupation of the Far West at times much earlier than the 11,500 B.P. date usually assigned to the earliest Clovis assemblages (Haynes 1964; Haynes *et al.* 1984). But the evidence offered is questionable as to age or context of association, and in some cases even as to human workmanship of the specimens said to be artifacts (Aikens 1978, 1983b; Dincauze 1984; Jennings 1986). Interest in the possibility of an earlier presence dates back to 1879, when the geologist J. D. Whitney reported being told of a human skull found at a depth of 130 feet in a mineshaft near Angel's Camp, Calaveras County, California. It soon became clear that the find was a hoax, and that many archaeological specimens reportedly found in the Tertiary gravels of the California gold fields were in fact readily referable on typological grounds to cultures of Middle Horizon and later times (Heizer 1964; Holmes 1901).

Clements and Clements (1953) reported a number of flaked specimens they considered to be primitive artifacts, found among the angular lithic debris of a desert pavement overspreading a Wisconsinan terrace of Death Valley's pluvial Lake Manly. Carter (1957) reported flaked and broken cobbles from a gravel pit at Texas Street in San Diego that had been cut into river channel fill of probable pre-Wisconsinan age. At Calico Hills, in the Mohave Desert east of San Bernardino, massive excavations into a Pleistocene-age alluvial fan filled with flaked and broken stone have yielded a few specimens resembling artifacts (Leakey *et al.* 1972). Manly Terrace, Texas Street and Calico Hills 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. Renewed, more extensive claims have been recently made (Carter 1980), but the devastating critiques of Johnson and Miller (1958) and Haynes (1973) retain their force in showing that such finds can scarcely be accepted as evidence of early human occupation.

The Manix Lake site (Simpson 1958, 1960) near Calico Hills, and finds in the Chapala Basin of Baja California (Arnold 1957), represent another group of claims for pre-Clovis occupation in the Far West. Both localities have yielded surface finds of heavy elongate bifaces that strongly resemble the Acheulian handaxes of the Afro-European Lower Paleolithic. The artifacts have been attributed a Pleistocene age on the basis of typology, the presence of heavy patination or "desert varnish" on many specimens, and their occurrence on Wisconsinan-age terraces of pluvial lakes. Recent efforts to date Mohave Desert specimens by cation-ratio measurements (Dorn 1983) suggest some early ages, but the validity of the method remains to be demonstrated.

In any case, there is a gap of roughly 200,000 years between the youngest Acheulian assemblages known in the Old World and Simpson's suggested age of 20,000 years or so for the Manix Lake specimens. Moreover, Acheulian-like paleoliths are extremely rare in East Asia, whence the earliest American came. This makes the possibility of an Old World Lower Paleolithic connection highly implausible and prevents such claims from gaining credibility. Much more supportable is the analysis offered by Glennan (1976), showing that the Manix Lake specimens are clearly the rejected or broken remnants of primary lithic reduction activities. Comparable claims for an American Paleolithic in the southwestern Wyoming Basin, made long ago on similar evidence by Renaud (1940), were likewise compellingly refuted by Sharrock (1966) in a study based on radiocarbon evidence and lithic reduction stages and manufacturing debris at quarry sites.

Radiocarbon determinations on charred and fire-reddened areas in Wisconsinan-age deposits on Santa Rosa Island and other sites along the southern California coast have been offered as evidence for human occupation between 12,000 and more than 37,000 years ago (Carter 1957; Orr 1960, 1968). As has been pointed out however, natural burning in these wildfire-prone areas offers a more likely explanation for the observed "features" than does human agency (Cruxent 1962). At the Scripps campus site (Carter 1957), the supposedly Pleistocene-age artifact assemblage clearly resembles the La Jolla complex of early Holocene times (Wallace 1955).

The site of Tule Springs, Nevada was claimed by Harrington and Simpson (1961) as evidence of human occupation before 28,000 B.P. but was subsequently shown by extensive research to yield no artifacts demonstrably older than about 11,000 B.P. (Shutler 1967). Gypsum Cave, Nevada (Harrington 1933) produced atlatl darts and other specimens in apparent association with the dung of now-extinct giant ground sloth. Once thought to be of Pleistocene age, the site has been removed from the discussion by a radiocarbon age determination of less than 3,000 B.P. on one of the atlatl darts (Berger and Libby 1967). This brings up the problem of stratigraphic disturbance in Far Western cave deposits by both human and animal occupants, and 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).

At Falcon Hill caves in Nevada, the mandibles of Pleistocene-age shrub ox were found incorporated within cultural deposits containing textiles that dated 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 close association two large chert knives, basketry fragments and a human burial wrapped in juniper bark matting (Adovasio 1986; Orr 1956, 1974). The juniper bark burial wrapping produced two dates of 10,900±300 B.P. (L-245A?) and 11,250±250 B.P. (L-245) (Orr 1974), 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 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; Haynes *et al.* 1984) are known in the Far West from only three places: Wilson Butte Cave in Idaho, Fort Rock Cave in Oregon and Smith Creek Cave in Nevada. In all three cases, doubt has been cast on the association between artifacts and dates (Haynes 1969, 1971; Irwin 1971) -- either because of evidence that the deposits may have been disturbed (Wilson Butte), or because the artifacts resemble types known elsewhere to date later in time (Fort Rock Cave, Smith Creek Cave).

At Fort Rock Cave in Oregon (Bedwell 1970, 1973; Bedwell and Cressman 1971) a 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 unnotched projectile points, one of which clearly resembles a re-sharpened Western Stemmed form. But there is no specific documentation to either prove or disprove the possibility of intrusive mixing of later artifacts into earlier levels, so the validity of the association remains open to question (Aikens 1982:143; Haynes 1971).

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 1961, 1965). But these deposits were described as being heavily disturbed by rodent activities, rendering the association between the dated bone and artifacts questionable.

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 is the oldest reported time range for a Western Stemmed occupation in the Far West (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 zone. He contends that these new dates, along with previously reported dates ranging from 11,680 to 12,600 B.P. on non-hearth organic samples from the same zone, demonstrate that stemmed points have an antiquity greater than fluted points (Bryan 1979, 1980). But the cultural association of the hair samples cannot be guaranteed, and pine needles from the underlying sterile zone dated 12,600±170 B.P. (A-1565) (Bryan 1979, 1980:83).

As demonstrated at sites like Gypsum Cave, Tule Springs and Fishbone Cave, and by Dansie's work at Pyramid Lake (Dansie *et al.* 1988), 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, and only dates from culturally associated charcoal or artifacts themselves should be trusted (Dansie *et al.* 1988; Thompson *et al.* 1987). In sum, 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.

Absolute Dating of Western Clovis

There are still no radiocarbon dates for Clovis fluted points in the Far West that have been well documented as coming from reliable buried, stratigraphic context (see Table 2A). 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, Utah Museum of Natural History staff found one of the points 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).

A second 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 (Table 2A) have produced cultural deposits dating within the Clovis time range documented at Southwestern sites like Lehner and Murray Springs (see Table 2B), but lack the necessary association with Clovis type fluted points. 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 which is strikingly similar to one recovered at the Clovis-producing Dietz site in Oregon (See Figure 21c:69 and Appendix C:354 in Willig 1989a). 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 (Willig 1989a).

Table 2a: Radiocarbon Dates of Clovis Age in the Far West*

Site/Location†	*Date (B.P.)*	*Lab No.*	**	*References*
9. Cougar Mt. Cave 2 35Lk55/A Oregon	11,950±350	Gak-1751	CH	Bedwell and Cressman 1971 Bedwell 1970, 1973
10. Jaguar Cave Idaho	11,580±250	n.d.	CH	Butler 1978 Sadek-Kooros 1966; Wright and Miller 1976
11. Danger Cave 42To13 Utah	11,453±600‡ 10,270±650‡	C-609 M-202	US	Jennings 1957
2. Witt Site CAKin32 California	11,380±70	n.d.	BN	Riddell and Olsen 1969 Wallace and Riddell 1988
12. Ventana Cave Arizona	11,300±1200	A-203	CH	Haury 1950 Haury and Hayden 1975
13. Fishbone Cave 26P3e Nevada	11,200±250	L-245	SS	Orr 1956, 1974 Thompson *et al.* 1987
9. Connley Cave No.4B 35Lk50/4B Oregon	11,200±200	Gak-2141	CH	Bedwell and Cressman 1971 Bedwell 1970, 1973

† Site locations plotted by number on Figure 1.

* Dates are listed in general oreder 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   US = uncharred sheep dung
SS = shell   BN = bone

‡ Fluted points would be bracketed between these two dates

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 chert knives (Orr 1956, 1974).

Farther afield, four Folsom type fluted points were recovered at Owl Cave (Wasden site) in eastern Idaho. Bone collagen from the 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 occur stratigraphically above the bones 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).

Absolute Dating of Western Stemmed

Major sites producing dates for Western Stemmed occupation in the Far West are listed on Table 3. Only dates from buried components containing well defined stemmed and shouldered forms have been included, since the temporal range of more generalized leaf-shaped forms is broader and less secure. This tabulation, the most comprehensive reported so far, shows that the dates for Western Stemmed points are evenly spread across a broad time range from 11,000 to 7,500 B.P.

The Mt. Moriah points recovered from Smith Creek Cave, Nevada are the oldest Western Stemmed forms accepted by most scholars in the Far West (Bryan 1988), with five dates on culturally deposited hearth charcoal ranging from 9,940±160 B.P. (Tx-142-0) to 11,140±200 B.P. (Tx-1637) (Bryan 1979, 1980). As mentioned above, the controversial date of 13,200±720 B.P. (Gak-1738) from Fort Rock Cave in Oregon is from a level (Level 10) which produced a mano and a fragmentary point which clearly resembles a re-sharpened Western Stemmed form (Bedwell 1970, 1973), but the validity of the association is undocumented. However, cultural charcoal from an overlying level (Level 8) produced a date of 10,200±230 B.P. (Gak-2147) in undoubted association with Western Stemmed point forms (Table 3).

Continuum of Western Clovis and Western Stemmed Dates

When the dates for Far Western Clovis sites (Tables 2A, 2B) are graphed together with those for Western Stemmed (Table 3), the gradation of Western Stemmed into Clovis is striking (Figure 2). In fact, only one date seems to be out of sequence. The earliest Western Stemmed date of 11,140 B.P. on cultural charcoal from Smith Creek Cave is 520 years older than the youngest Clovis date of 10,620 B.P. from the Lehner site, but it is also 330 years older than the oldest Western Stemmed date of 10,810 B.P. from Marmes Rockshelter (Tables 2B and 3).

If Western Clovis and Western Stemmed complexes are indeed historically related, a certain amount of temporal overlap would be expected (Carlson 1988; Willig 1989). There is a temporal overlap of 150 to 200 years between Clovis and Folsom complexes in the

Plains (Haynes *et al.* 1984; Willig 1989a), indicating that the transition from Clovis to Folsom must have been brief (Haynes 1964:1410). If the early Smith Creek date is set aside, the temporal overlap between Western Stemmed and Clovis in the Far West is reduced to 190 years, which matches the Clovis-Folsom overlap in the Plains.

These data show that Western Stemmed complexes most likely post-date, but closely follow the Clovis presence 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 *et al.* 1984).

Table 2b: Radiocarbon Dates Associated with Clovis in the Southwest

Site/Location†	*Date (B.P.)*	*Lab No.*	**	*References*
Lehner Site*	11,470±110	SMU-308	CH	Haynes *et al.* 1984
	11,170±200	SMU-264	CH	"
Arizona	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	"
Murray Springs	11,190±180	SMU-18	CH	Haynes *et al.* 1984
	11,150±450	A-805	CH	"
Arizona	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

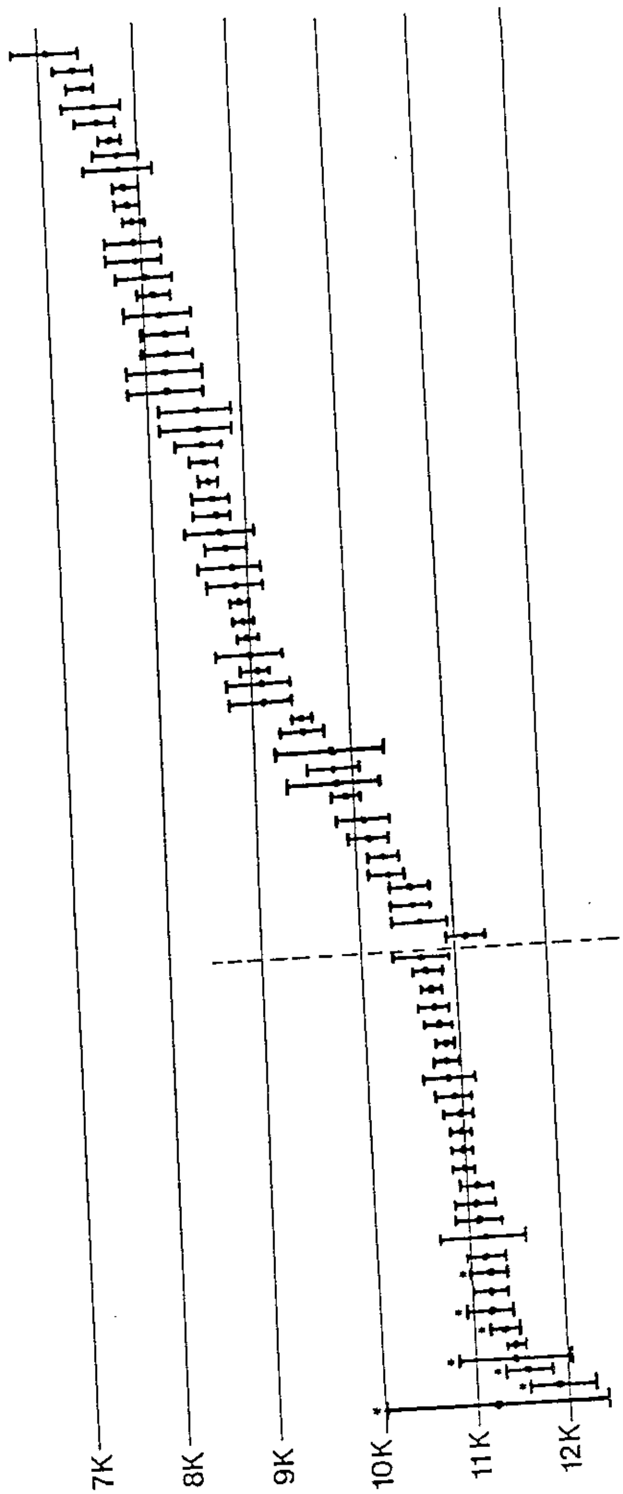

Figure 2. Radiocarbon dates for Western Stemmed complexes graphed in chronological order. Dates to right of dashed line from Table 3. Dates to left of dashed line from Table 2B, except for starred dates which are from Table 2A. (K = thousands of years ago)

Table 3. Radiocarbon Dates Associated with Western Stemmed Complexes in the Far West (from Willig 1989a)

Site/Location†	*Date (B.P.)*	*Lab No.*	**	*References*
Oregon				
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	*Radiocarbon* 1962:111
14. Dirty Shame Rock Shelter 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 and 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
California				
18. C.W.Harris Site SDi-149	9,030±350	A-722A	CH/OG	Warren 1967
	8,490±400	A-725	CH/OG	"
	8,490±400	A-724	CH/OG	"
19. Buena Vista Lake Ker-116	8,200±400	LJ-1357	SH	Fredrickson and Grossman 1977
	8,200±400	LJ-1356	SH	
	7,600±200	I-1928	SH	"

† 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 3. Western Stemmed Radiocarbon Dates (continued)

Site/Location†	Date (B.P.)	Lab No.	**	References
<u>Washington</u>				Rice 1972
20. Marmes R.S.	10,640±300*			Sheppard *et al.* 1984
45Fr50	a. 10,810±300	WSU-363	SH	" " "
	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 Coulee	8,700±400‡	C-827	BN	Daugherty 1956
45Gr97	8,720±200	WSU-1709	BN	Irwin and Moody 1978
	8,600± 65	WSU-1422	BN	" "
(‡ = average of two readings: 9,400±940 and 8,518±460)				
<u>British Columbia</u>				
22. Milliken Site DjRi-3	9,000±150	S-113	CH	Borden 1960, 1975
	8,150±310	S- 47	CH	" "
<u>Utah</u>				
11. Danger Cave 42To13	9,789±630	C-611	CH	Jennings 1957
	8,960±340	C-640	CD	"
23. Hogup Cave 42Bo36	7,815±350	GX-1287	OG	Aikens 1970
24. Sevier Desert 42Md300	9,570±430	Beta-12987	SH	Simms 1986
	7,930±110	Beta-12988	SH	Simms and Isgreen 1984
<u>Nevada</u>				
25. Smith Creek Cave 26Wp46	11,140±200	Tx-1637	CH	Bryan 1979,1980,1988
	10,600±195*			" " "
	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 Supper Cave 26Hu102	8,610±140*			Layton and Davis 1978
	a. 8,960±190	Tx-2541	CH	Layton 1970, 1979
	b. 8,260±90	WSU-1706	CH	" " "
	8,790±350	LSU 73-120	SH	" " "
	8,630±195	WSU-1431	SH	" " "

* = average of two readings (a and b, immeditately following)

Table 3. Western Stemmed Radiocarbon Dates (continued)

Site/Location†	Date (B.P.)	Lab No.	**	References
Nevada (cont)				
27. Falcon Hill Shinners Site A 26Wa198	9,540±120	UCLA-675	BA	Hattori 1982
	8,380±120	UCLA-672	BA	"
Idaho				
28. Wasden Site, or Owl Cave 10Bv30	8,160±260	WSU-560	CH	Butler 1968, 1978
	7,750±210	WSU-641	CH	Miller and Dort 1978
	7,100±350	M-1853	BN	" " "
28. Bison R.S.	10,340±830	WSU-760	BN	Swanson 1972
Veratic R.S. (Birch Creek Sites)	7,222±229	WSU-n.d	OG	"
29. Redfish Lake Overhang 10Cs201	10,100±300	WSU-1396	CH	Sargeant 1973
	9,860±300	WSU-1395	CH	"
	8,060±285	WSU-1397	CH	"
30. Beta R.S. Shoup Site	8,175±230	WSU-402	CH	Swanson and Sneed 1966
31. Hatwai I 10Np143	10,820±140	Tx-3159	CH	Ames *et al.* 1981
	10,110±720	Tx-3160	CH	"
	9,880±110	WSU-2440	CH	"
	9,850±870	Tx-3158	CH	"
	9,320±1830	Tx-3081	CH	"

Relative Dating of Western Clovis and Western Stemmed

Stratigraphic Studies

Western Stemmed points have been recovered in buried context from a number of sites throughout the Far West, and most of these have produced radiocarbon dates (see sites and dates listed in Table 3). In contrast, most Western Clovis sites 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).

Fluted points have been recovered from undated shallow depths (30-40 cm) in disturbed or deflated alluvial fan, stream or beach terrace deposits at four sites in the Far West: Borax Lake (Harrington 1948; Meighan and Haynes 1968, 1970) and the Henwood site in California (Douglas *et al.* 1988; Warren *et al.* 1989); Alkali Lake, Oregon (Fagan 1986; Willig 1984, 1988, 1989a, 1989b); the Simon site cache in Idaho (Butler 1963; Butler and Fitzwater 1965; Woods and Titmus 1985); and the Old Humboldt site (26Pe670) at Rye Patch Reservoir in Nevada (Rusco and Davis 1987). At the Old Humboldt site, 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 30 cm of alluvium which had also been subjected to aeolian infilling and animal burrowing (Rusco and Davis 1987:41).

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. and 4,360±280 B.P. (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 for Lake Mohave points. But the association of the fluted point with this Lake Mohave component has been questioned since 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).

At the Dietz site in Alkali Lake Basin, Oregon, horizontal distribution of artifacts suggests that fluted points precede stemmed points in time, because the two assemblages have separate distributions on two different, sequent fossil shorelines (Willig 1984, 1985, 1986, 1988, 1989a). Fluted points at the Dietz site are oriented around an early, low elevation shoreline from 1314.6 - 1314.8 m elevation. In contrast, stemmed points at the Dietz site, and at 30 other Western Stemmed sites in the basin, are concentrated in two zones along two later, higher shorelines above 1315 m elevation (1315.4 m and 1316.2 m respectively). In addition, a vertical separation of Western Clovis from Stemmed occupation may yet be demonstrable at two localities in the basin which contain buried, flake-bearing paleosols occurring 70 to 100 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 these lower deposits may yield dates of Clovis age (Willig 1989a).

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 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.

Typology of Western Clovis

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 (Figure 1 and Table 4). 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) 54 specimens from the Dietz site in Alkali Basin, Oregon; and (7) 14 points from the recently discovered Richey-Roberts Clovis cache in central Washington.

In addition to these major sites, new findings of fluted points include: (1) three points from two sites in Railroad Valley, Nevada (Zancanella 1988); and (2) small numbers of specimens from southern California at Little Lake (N=6), Lake Mohave (N=6), the Tiefort Basin (N=4) and Fort Irwin (N=7) in the central Mojave Desert (Warren and Phagan 1988). Some of the basally thinned, concave based points reported from the Komodo site in east-central California also resemble Clovis fluted points (Figure 2 in Basgall 1988).

It must be remembered that no one set of eyes has yet looked upon all known fluted points recovered from the Far West (Willig 1989b). 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 a wide variation in size and degree of fluting in Western Clovis points (Willig 1989a, 1989b), but this falls easily within the expected range of variation documented for Clovis fluted points elsewhere (Haynes 1982; Wormington 1957).

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 89-90 in Hester *et al.* 1972:98-99; Figures 3, 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 2-5 in Davis and Shutler 1969:164-167). 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).

Table 4: Major Far Western Clovis Sites (from Willig 1989a)

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 Clear Lake	20	Fredrickson 1973, 1974 Fredrickson and White 1988 Harrington 1948; Meighan and Haynes 1968, 1970
Nevada		
4. Mud Lake Tonopah Lake	58	Campbell and Campbell 1940 Kelly 1978; Pendleton 1979; Tuohy 1968, 1969, 1988
5. Lake Hubbs	21	Hutchinson 1988; Tuohy 1988b; York 1975, 1976
Oregon		
6. Alkali Lake	60	Fagan 1984a, 1984b, 1986, 1988 Willig 1984, 1985, 1986, 1988, 1989a
Washington		
7. Richey-Roberts Clovis Cache	14	Mehringer 1988a, 1988b, 1989
Total Points	**271**	

† Site locations plotted by number on Figure 1.

At the Dietz site in the Alkali Lake Basin of Oregon, 60 fragmentary fluted points have been recovered, including 12 relatively complete points, 7 base and 8 midsection fragments, 4 tip fragments and 28 basal fragments (Fagan 1988; Willig 1988, 1989a). Fagan considers an additional 52 artifacts to be diagnostic Clovis tools. These include 27 flute flakes and 25 blanks (Fagan 1984a, 1984b, 1988). There is a wide range of size among the 60 point fragments recovered (Figure 3 in Fagan 1988; Figures 3, 6-14 in Willig 1989a). This probably reflects the range of functional or individual variation to be expected within a large sample (Richard Hughes, pers. comm. 1988). The same wide 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 - 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).

Typology of Western Stemmed

The large stemmed, shouldered and lanceolate points characteristic of Western Stemmed complexes include a number of defined regional 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 1). Despite this diversity of regional styles, assemblages as distant as northern Mexico and central Washington share strikingly similar point forms, tool kits and technology, suggesting that all of these stemmed point complexes represent one closely related, widespread Western Stemmed cultural tradition present throughout the Far West from 10,500 to 7,500 B.P.

Concave based and stemmed/shouldered point forms (N=47) reported by Zancanella (1988) from 12 sites in Railroad Valley, Nevada resemble Lake Mohave, Silver Lake, Cougar Mountain, Parman, Black Rock and other Great Basin concave based forms. In addition, six crescents were also recovered by Zancanella. Nearly identical forms have been reported from sites in nearby Steptoe, Newark and Jakes Valleys, with the addition of Haskett types (Price and Johnston 1988). Beck and Jones (1988) recovered a total of 30 stemmed points from eight sites in Butte Valley, Nevada, including 18 Cougar Mountain and Haskett forms, six Parman points, one Silver Lake point, one Great Basin Concave Based form, and four miscellaneous stemmed forms. Two crescent fragments are also reported by Beck and Jones.

Stemmed point varieties reported from Lake Tonopah, Nevada include Parman, Haskett, Lake Mohave and Silver Lake types, as well as a wide variety of concave based forms and crescents (Pendleton 1979; Tuohy 1988b). The term "Hascomat" coined by Warren and Ranere (1968:11) for points at the Sadmat site in the Carson River Basin was inspired by the prevalence of <u>Has</u>kett and <u>Co</u>ugar Mountain styles there; but Lake Mohave points and crescents are also present (Tuohy 1988b). In addition to 130 crescents, the Sunshine Well Locality in Long Valley, Nevada has produced a total of 56 concave based points and 414 stemmed points including Haskett, Lake Mohave and Silver Lake specimens and one Plano-like lanceolate (Hutchinson 1988; Tuohy 1988b). The Mt. Moriah base fragments from Smith Creek Cave bear a striking resemblance to Cougar Mountain and Parman forms (Bryan 1979, 1988).

In Oregon, one of the largest and most diverse collections of Western Stemmed tools has been recovered from a number of early sites in the Alkali Lake Basin. At the Dietz site itself, a total of 32 Western Stemmed points have been identified by Fagan (1988) and Willig (1988, 1989a), along with 5 crescents and 14 ground stone artifacts. Systematic survey revealed the presence of an additional 74 sites in the basin, mostly single-component assemblages, located on a higher shoreline which postdates Clovis occupation at the Dietz site (Willig 1986, 1988, 1989a).

Of the 48 shoreline sites containing time diagnostic point styles, 31 sites (65%) produced assemblages which are assignable to the Western Stemmed cultural tradition. A total of 114 classifiable points include a wide variety of forms similar to Haskett, Cougar Mountain, Parman, Windust, Lake Mohave, Silver Lake, Cascade and square-based Plano-like points (see Table 7 in Willig 1989a:214). Also recovered were crescents and ground stone artifacts and other unnamed stemmed and shouldered lanceolate forms (Willig 1988, 1989a).

From the earliest deposits at Dirty Shame Rockshelter in Oregon, Hanes (1988a, 1988b) has analyzed a number of Western Stemmed point forms, including one Cougar Mountain, two Windust, two square-based Plano-like lanceolate forms, and a variety of leaf-shaped lanceolates. This assemblage is clearly a reflection of its locational position on the interface between the Great Basin, Plateau and Plains culture areas. The stylistic and technological analysis undertaken by Hanes refines the sequence of cultural zones at the site as first proposed (Aikens *et al.* 1977) and demonstrates an orderly progression from early lanceolate and stemmed points to more recent notched forms.

Cultural-historical Continuum of Western Clovis into Western Stemmed

The horizontal separation of fluted and stemmed points in basins such as Lake Tonopah (Campbell and Campbell 1940; Pendleton 1979) and Alkali Lake (Willig 1988, 1989a), in conjunction with currently available radiocarbon dates and obsidian hydration studies, strongly indicate that Western Clovis precedes Western Stemmed in time. The technological studies (see discussions below) also indicate that the two complexes are readily separable. It follows from this that Western Stemmed most likely developed out of Western Clovis -- an historical relationship strongly indicated by available radiocarbon dates (Tables 2A, 2B, 3; Figure 2) and further supported by typology.

The typology of early western 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 (Willig 1989b). 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.

Pendleton's (1979) analysis of 108 fluted and unfluted concave-based points 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 3-4 in Butler 1970:46-47). Numerous stemmed and fluted forms recovered from the Dietz site and other shoreline sites in Oregon's Alkali Lake Basin have been interpreted as "transitional" forms between Western Clovis and Western Stemmed points (Willig 1988, 1989a, 1989b).

If Western Stemmed complexes in the Far West are historically related and slightly overlap in time, in the same way as Clovis-Folsom-Plano sequences in the Plains (Aikens 1978; Frison 1978), we should expect to find "transitional" forms which reflect this temporal closeness (Carlson 1988; Willig 1989a, 1989b). Many of the unnamed forms described above could be transitional types, and Carlson (1988) suggests that more detailed typological studies be undertaken to explore this hypothesis. He discusses three candidates of point forms which could mark this transition, one of which includes Black Rock Concave Based forms (Clewlow 1968) and a second category includes specimens that are both fluted and stemmed. In fact, many early Far Western complexes are rich in examples of intermediate forms which might reflect this historical continuum.

TECHNOLOGICAL STUDIES OF WESTERN CLOVIS AND WESTERN STEMMED

Distinctions between Western Clovis and Western Stemmed

In recent years, a number of technological studies in the Far West have reported being able to distinguish fluted from stemmed assemblages based on differences in tool kits (assemblage structure and variability), reduction sequences and flaking techniques (Willig 1989b). Pendleton's (1979) 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. Fagan (1984b, 1988) has reached similar conclusions from studies of single component clusters of fluted and stemmed points at the Dietz site in Oregon. He concludes that tool kits, manufacturing techniques and methods of platform preparation for biface production are strikingly different for fluted and stemmed point clusters, suggesting that both temporal and cultural differences exist between the two assemblages.

Wallace and Riddell (1988) disagree with the notion of gradual, local evolution of Western Stemmed from Western Clovis, stating that observed differences in style and technology between Clovis, Lake Mohave and Pinto assemblages from Tulare Lake suggest three separate immigrations from outside the lake basin. But the hafting tradition model first suggested by Bryan (1980) and developed along different lines by Musil (1988) offers a compelling explanation for these observed technological changes through time based on functional efficiency of haft element designs.

Musil (1988) presents a model of three major, sequential hafting traditions for North America: (1) the fluted and lanceolate point, split-shaft technique; (2) the stemmed point, socketed technique; and (3) the notched point, split-shaft technique. The model 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 migrations or unique environmental adaptations, but rather as changes in haft element designs which were functionally more efficient than preceding forms. Musil's 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.

Comparisons within Western Stemmed

Western Stemmed assemblages collected from six separate clusters at four sites in Butte Valley, Nevada were analyzed by Beck and Jones (1988). They identified both functional and technological variability, including four stages of biface reduction. Results indicated that two separate assemblage types were represented: (1) clusters containing all four stages of biface manufacture (N=3), but with a relative scarcity of Stage 1 biface and core fragments, suggesting that this stage was completed at the quarry source; and (2) clusters containing only late-stage reduction (N=3), suggesting secondary repair and maintenance.

Ames (1988) presents results of detailed comparative analysis of assemblage structure and diversity of 13 complexes from the southern Columbia Plateau which date to the Windust (10,800-8,000 B.P.) and early Cascade (8,000-7,000 B.P.) periods. The analysis indicated that all sites contained the same basic artifact classes, suggesting similar activities; but Windust sites displayed a hierarchical pattern of low-to-high diversity assemblages while early Cascade components lacked this patterning. These results have wider implications for reconstructing prehistoric adaptive strategies (see discussion under **Regional Adaptive Strategies**).

PALEOENVIRONMENT AND SETTLEMENT-SUBSISTENCE PATTERNS

Subsistence Remains

At present, direct subsistence data from Western Clovis and Western Stemmed sites are severely limited. Currently, there are no dated subsistence remains from Western Clovis sites, although the faunal remains recovered from the Old Humboldt site (see discussion below) in Nevada offer intriguing possibilities (Rusco and Davis 1987; Dansie 1987). Many claims have been made in the Far West for associations of early human artifacts with extinct Rancholabrean fauna including horse, camel, mammoth, sloth and bison (Cressman and Laughlin 1941; Cressman 1966; Davis 1978a; Gruhn 1961), but these are always questioned as being either too surficial or indirect to be confirmed (Jennings and Norbeck 1955; Jennings 1986; Heizer and Baumhoff 1970). At present, there are no sites in the Far West containing artifacts and extinct fauna in direct, unambiguous association that clearly indicate a cultural relationship. Haynes (1988) and Dansie (Dansie *et al.* 1988) warn against making hasty assumptions about apparent association and contemporaneity of early artifacts with fossil megafaunal remains.

To expose this "myth" of cultural association, 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 and are often mistaken for culturally butchered and processed bone. 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; Dansie *et al.* 1988; Willig 1989).

Dansie, Davis and Stafford (1988) stress the need for careful taphonomic and microstratigraphic studies in conjunction with dated lake histories in each basin. 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, in conjunction with accelerator dating. Her study of taphonomy, stratigraphy and body position 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 Northern side-notched points and other tools nearby might have suggested an association with the camel but Stafford's six radiocarbon dates on amino acids from the camel bone produced an average date of 25,800 B.P. (Dansie *et al.* 1988; Tuohy 1988).

Subsistence data for the period of 10,000 to 7,000 B.P. are more completely known and dietary inferences are now possible based on a rapidly growing data base. At the Old Humboldt Site (26Pe670) in Nevada, a small highly diversified assemblage of mammals, birds, fish and molluscs was recovered in association with a fluted point and two stemmed points (Davis 1984; Davis and Rusco 1987). The assemblage included bison, waterfowl eggshell, three species of rabbits, 76 clams and one large Lahontan trout (Dansie 1987).

Faunal assemblages from four Lake Mohave-Pinto sites on Fort Irwin, California 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.

Tuohy's study (1988a) of artifacts from private collections made at ten different sites along the northwestern shore of Pyramid Lake documents a rich array of Pinto and Northern side-notched points, atlatl weights, milling stones, twined basketry fragments and fishing gear (stone sinkers and a bone fishhook). No direct subsistence remains are available, but the assemblages are clearly suggestive of a fishing industry not unlike that documented during the ethnographic period. In addition, Tuohy (1988a) reports a date of 9,660±170 B.P. (Gx-13744) on sagebrush bark fishing line from a site on one of the lowest lake levels at 3785 feet elevation.

Lithic Sourcing Studies and Mobility Patterns

There is much work yet to be done on lithic sourcing of early assemblages in the Far West, but the papers in this volume contribute greatly towards this growing data base. There is a definite preference for crypto-crystalline silicates (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 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).

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.

Site Distribution and Environmental Context

One of the most valuable contributions made by the papers in this volume is in the realm of paleoenvironmental studies and site distribution patterns. Western Clovis and Western Stemmed complexes are widely distributed across a variety of environmental settings including coastal, montane and lowland valley zones. 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 occupied by shallow lakes, marshes and stream-fed deltas during the terminal Pleistocene and early Holocene. This patterning is unlikely to be simply a factor of sampling bias because some fairly large portions of the Far West have now been surveyed archaeologically.

Large scale systematic surveys have been conducted along the lower shorelines in Alkali Lake Basin, Oregon (Willig 1988, 1989a); Tonopah Lake, 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). A cursory hydrographic and geomorphic study of these areas suggests that the basins containing major sites would have been excellent candidates for maintaining reliable food and water resources that could have supported local human groups at the Pleistocene-Holocene boundary (Willig 1984, 1989a). In almost every case, the paleogeomorphic settings 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 a fresh drinking water for both humans and the game they may have hunted.

At Tulare Lake, California, the Witt site is located at an elevation of 192 feet along the southern shore north of Dudley Ridge -- 18 feet lower than the shoreline at 210 feet elevation occupied by late Archaic groups (Riddell and Olsen 1969; Wallace and Riddell 1988). There is a well-defined shoreline below the Witt site at 185 feet elevation, outlining a water body which would have held five to six feet of water (Willig 1989d). The early sites along the northeastern shore of Tonopah Lake, Nevada are located where water was shallowest and where the constantly shifting channels of Peavine Creek would have produced 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 4740 feet elevation in the Tonopah basin probably supported a lake which was five to ten feet deep during Clovis time (Willig 1989b).

The Sunshine Well Locality consists of a series of 12 sites which are also located at the juncture of these 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).

The Sunshine Locality has produced 20 fluted points, but Western Stemmed points (N=469) and crescents (N=130) dominate the collection and Hutchinson (1988) makes interesting speculations about site functions based on the distribution of tool types near different lake and marsh features. Crescents, gravers and spurs frequently co-occur in places which would have been immediately adjacent to the water's edge. These places would have been excellent spots for the placement of duck blinds, fish weirs and fish or fowl nets. They would have also supported a rich zone of littoral vegetation (grasses, willows, rosewood) needed in basketry and wood working. Hutchinson interprets this tripartite tool kit as one well suited for the construction of blinds, weirs and netting, as well as the processing of fish, fowl and fiber resources along the lake margin.

In Railroad Valley, Nevada (Zancanella 1988), early sites are located in the northern part of the basin on relict alluvial flats, alluvial fans, 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. These landform features would have supported habitats of 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 sites in relation to these features suggests an orientation to the rich lake, marsh and riparian resources they would have supported.

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 (Willig 1984, 1985, 1986, 1988, 1989a). The evidence suggests a terminal Pleistocene Western Clovis occupation at the Dietz site oriented to a small, shallow pond or marsh (1.5 feet deep) in the center of the basin (see maps in Willig 1988). This was followed by an early Holocene Western Stemmed occupation at 30 sites around the perimeter of a larger, deeper lake (4.5 feet deep) with a wide marsh fringe. Analyses of diatoms, ostracods and faunal remains from lake deposits will help reconstruct water depth and ecological conditions during the time of occupation.

In Butte Valley, Nevada (Beck and Jones 1988), research has focused on detailed mapping of early sites and systematic regional survey of both upland and lowland tracts in order to identify basin-wide land use patterns. Western Stemmed sites were not solely associated with prominent shorelines -- some were located on the edges of stream channels and alluvial terraces well above lakeshore features. But all of the Western Stemmed sites were found exclusively at lower elevations on the valley floor. Price and Johnston (1988) also report a variety of non-lacustrine settings for Western Stemmed complexes in the same region. The environmental context for the Lake Mohave, Silver Lake and Pinto components on Fort Irwin, California include spring loci, stream terrace deposits and deep alluvium on ridges well above now-dry lake beds (Douglas *et al.* 1988).

REGIONAL ADAPTIVE STRATEGIES: PROSPECTS AND RUMINATIONS

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 11,000 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. Kirch (1980) and Meltzer (1988) point out that in the absence of direct subsistence data, 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 assemblage variability, lithic sourcing, site distribution and geomorphic context with respect to the paleolandscape and its resource constraints.

These data, when supplemented by a knowledge of ecology (Kirch 1980) and hunter gatherer theory (*sensu* Binford 1980; Kelly 1983), can greatly inform us about past human settlement and land use patterns (Meltzer 1988). From this knowledge we can make inferences about prehistoric economy and adaptation, thereby building a fuller characterization of Western Clovis and Western Stemmed lifeways. The research presented in this volume is a tribute to the value of this approach, as exemplified in the discussions of lithic sourcing, environmental context and site distributions at major Western Clovis and Western Stemmed sites.

There are three nested questions to consider in postulating adaptive strategies for cultures of the Pleistocene-Holocene boundary in the Far West (Willig 1989a). The first two involve the role, if any, of specialized big-game hunting or early lake-marsh adaptations in determining the settlement-subsistence strategies of Western Clovis and Western Stemmed people. The third addresses the broader issue of the time depth and inception of broad spectrum (Archaic) adaptations in the Far West. Is there really a Clovis-Archaic interface, or are "Clovis" and "Archaic" far more alike than previously supposed?

Role of Early Big-game Hunting

The first major question is the role of "big-game" hunting. How significant was the hunting of large terrestrial game in determining the settlement and subsistence strategies of Western Clovis and Western Stemmed people? Can the reliance on hunting large game in early periods be much different than that documented for later "Archaic" periods? 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)? Is the resolution of our data-base for the early periods refined enough to demonstrate such a distinction from later cultures which have been labeled as "Archaic"?

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. Most of the claims made have been questioned (Jennings and Norbeck 1955; Jennings 1986; Heizer and Baumhoff 1970), and early big-game hunting may be more a myth than a reality (Dansie *et al.* 1988; Haynes 1988).

It is also doubtful that the Far West could have ever supported extensive herds of large terrestrial grazers (Daugherty 1962; Haynes 1988; Meltzer 1988), although there is evidence that such animals were present in small numbers and were probably taken opportunistically (Madsen *et al.* 1976; Madsen 1982). But 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. Therefore, the existence of a specialized "big-game hunting" strategy in the Far West must be seriously questioned. The hunting of large game may have been no more significant in the earliest period than it was during later "Archaic" periods (Willig 1989a).

Role of Early Lake-Marsh Adaptations

Second is the question of how realistic are the 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, and was human reliance on these resources enough to warrant recognition of specialized lake-marsh adaptation implied by the concept of a Western Pluvial Lakes Tradition (Bedwell 1970, 1973)? Does the documentation of a lake-marsh settlement focus confirm the presence of so specialized an adaptation? Or do the lakeshore settings represent the pivot point of flexible, wide-ranging, broad-spectrum strategies "tethered" to mesic habitats which contained reliable sources of food and water (Willig 1989a)?

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, including upland springs, high mountain passes, riverine and streamside habitats, and rockshelters (Aikens 1983b; Beck and Jones 1988; Fagan and Sage 1974; Price and Johnston 1988; Zancanella 1988). Authors like Beck and Jones (1986) have cautioned 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.

In fact, however, most of the data presented in this volume are the results of such studies, and large-scale surveys undertaken in lake basins indicate that the greatest concentrations of sites containing fluted and stemmed points are indeed located along the lowest strandlines of shrinking pluvial lakes or adjacent to the stream channels which would have fed these water bodies. 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, has led a number of scholars to postulate a "pre-Archaic" lake-marsh adaptation in the Great Basin (Aikens 1978, 1983a; Clewlow 1968; Davis

1978a, 1978b; Fredrickson 1973, 1974; Heizer and Baumhoff 1970; Madsen 1982; Rozaire 1963; Wilke *et al.* 1974.

This was also the basis for Bedwell's formulation of the Western Pluvial Lakes Tradition, often referred to as WPL or WPLT (Bedwell 1970, 1973). But there are two major problems embedded within the WPL concept (Willig 1989a). First of all, an economically-loaded term originally used to describe the occupants of southern lake systems in the western Great Basin east of the Sierra-Cascade ranges has been subsequently expanded by Hester (1973) and many others to designate Western Stemmed complexes throughout the Far West (Price and Johnston 1988). 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. 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.

Moreover, the WPL concept implies a unique, specialized economic adaptation geared to lake, marsh and grassland resources which would have been abundant in these southern lake systems, but the presence of sites oriented to lakeside or marsh-fringe settings in western pluvial lake basins does not automatically confirm the existence of a specialized economy limited to littoral habitats. Instead, they could represent the pivot points of a highly flexible, wide-ranging, generalized strategy which was "tethered" (*sensu* Taylor 1964) to local mesic habitats ("sweet spots") containing concentrated sources of food and water (Willig 1989a).

Our knowledge of late Pleistocene and early Holocene lake chronologies has been greatly expanded and refined in recent years (Davis 1982; Mehringer 1986; Thompson *et al.* 1987). Dietz site research has resulted in a more refined chronology for the Alkali Lake Basin in Oregon (Willig 1988, 1989a). The most recent updates of Lahontan Basin data include work by Benson and Thompson (1987), Dansie and others (1988), Thompson and others (1986) and work in the Stillwater Marsh region by Raven, Elston and others (1988). Currey and Oviatt (1985) provide a recent summary of Bonneville Basin data.

These chronologies, and results of other environmental reconstructions, suggest that the local distribution and availability of water, and thereby lake-marsh resources, was probably not stable and predictable enough to support the specialized lifeway assumed by Bedwell. 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 1989a). In this light, the 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 (see discussion below). Janetsky's (1986) summary also provides some alternative views regarding lake-marsh adaptations in the Great Basin.

The Clovis-Archaic Interface: Myth or Reality?

Third and most important is the question of the time depth of broad spectrum Archaic adaptations in the Far West. Current data suggest that neither Western Clovis nor Western Stemmed settlement-subsistence strategies, including those in pluvial lake basins, were limited to specialized big-game hunting, lake-marsh exploitation, riverine fishing or any other kind of narrow focus. 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; Willig 1986, 1988, 1989a; Warren *et al.* 1989).

An interpretation of highly mobile "free wandering" nomads (Beardsley *et al.* 1956) does not fit the data either. 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.

If the data suggest that Western Clovis and Western Stemmed groups were neither specialized big-game hunters nor free-wandering nomads (*sensu* 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 (Willig 1989a)? Warren and Phagan (1988) make the excellent point that "before we can evaluate the Clovis-Archaic interface, we must first locate that interface". Does such an interface exist? Or is the contrast between the two an artificial one (Simms 1988)? It may be that "Clovis" and "Archaic" are far more alike than previously supposed.

The environmental history of the Far West from 12,000 to 7,000 B.P. is characterized by frequent (punctuated) climatic change, including the desiccation of once-extensive pluvial lake systems and a steadily declining population of large terrestrial game (Davis 1982; Mehringer 1977, 1986; Meltzer and Mead 1983). During a time of increasing aridity and frequent changes in local ecological conditions and resource distributions, 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 to mesic habitats containing reliable sources of food and water (Willig 1989a).

In western pluvial lake basins, the pivot of this tether would have been the littoral and semi-aquatic habitats associated with shallow lake-marsh and streamside features. In the Plateau and other regions like the Snake River Plain and California, the tether may have pivoted around riverine settings. But to attribute specialized adaptations to these early Far Western cultures would be wide of the mark. More importantly, all of these people 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 these clearly related early occupants of Far Western North America.

This pan- Western focus on mesic habitats clearly exists in the Plateau (Ames 1988). There is a pan-Plateau focus on riverine food and water resources, even in the more dry, desolate interior Plateau in the west. But most of the early Holocene sites are concentrated in the eastern portion of the Plateau which was wetter, cooler and ecologically more diverse. 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.

Ames concludes that the Windust and Cascade complexes of the southern Columbia Plateau represent regional variants of an early post-glacial culture shared by hunter-gatherers throughout a major portion of the Far West. His hypothesized adaptive strategy is one of mid-latitude collecting (Windust) and foraging (Cascade) (*sensu* Binford 1980) characterized by low population density, dispersed settlement, and high residential mobility. The material culture is characterized by no significant dependence on storage, and by expedient, portable tool kits geared to maximum flexibility and mobility. This pattern is thought to be a function of local differences in ecological productivity and possibly regional social systems as well (Ames 1988).

In places where environmental conditions more closely mimicked those of the Plains, like the Owyhee Uplands of Oregon and Idaho, there are Plano-like influences in assemblages such as those from Dirty Shame Rockshelter (Hanes 1988a, 1988b). This comes as no surprise since this area would have been at the westernmost limit of Plains-like grasslands which could have supported larger herds of bison and camel for late Plano groups more dependent upon hunting large terrestrial game (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 easily explained 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). This is very similar to the scenario depicted by Meltzer (1988) to explain the low density of the earliest populations of the southeastern United States.

CONCLUSIONS

It has long been known that broad spectrum "Archaic" strategies have a very early beginning in Far Western North America (Aikens 1978, 1983a, 1983b; Jennings 1957, 1964; Jennings and Norbeck 1955). They were well established by 8,500 to 7,000 B.P. at most California, Great Basin and Plateau sites, and as early as 10,000 to 9,000 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 fact, as this paper has argued, there is no reason to think that this kind of "Archaic" strategy was not already in place by 11,500 B.P. during Western Clovis time, especially considering the temporal closeness of Clovis and Stemmed cultural traditions.

The papers in this volume provide compelling evidence, gathered from a broad range of scientific inquiry, to suggest that the earliest occupants of Far Western North America developed generalized, broad spectrum adaptive strategies much earlier than was once thought. There is still a great need to recover direct subsistence data from buried sites to test these notions, but there is much we can infer from studies of lithic sourcing, technology, assemblage variability and site distribution with respect to the paleolandscape and its resource potentials (Willig 1989b). The most current data on early human occupation in the Far West, as presented in this volume and elsewhere (Willig 1989a), lend much support to earlier suggestions that the broad spectrum adaptation of Western Archaic cultures may have its roots in Clovis time (Aikens 1978, 1983a; Daugherty 1962; Heizer and Baumhoff 1970; Jennings and Norbeck 1955). If this is so, then the "Clovis-Archaic Interface" may be more a myth than a reality.

Already accustomed from the outset to flexible foraging practices within a large range, Western Clovis and Western Stemmed groups would have naturally gravitated, like the game they hunted, to unusually mesic habitats ("sweet spots") offering a diversity and concentration of food and water resources despite increasing aridity (Willig 1989a). These earliest peoples would have had to remain flexible enough to change quickly, not gradually, in concert with the emerging mosaic of regional environments so characteristic of the Pleistocene-Holocene boundary. In western pluvial lake basins, success could be maximized by retaining a flexible wide-ranging strategy while "tethered" to a series of changing lake-marsh habitats. Such an early development of "Archaic" adaptations 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 (Mehringer 1977, 1986).

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 concept -- 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 "paleo-Archaic" broad spectrum strategies at such an early time extends the notions of cultural continuity and adaptability so essential to the Desert Culture concept (Willig 1989a). It means that the foundations of the Western Archaic were already in place by 11,500 B.P. at a time when the "desert" as we know it now was just coming into being.

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