ARCHEOLOGY & ETHNOGRAPHY PROGRAM

Peoples & Cultures
Recording Our Heritage

Kennewick Man
Cultural Affiliation Report

Chapter 2
Section 1

Review of the Archaeological Data

Kenneth M. Ames

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Introduction

This report is part of the cultural affiliation study, under NAGPRA, of the Kennewick human remains. The circumstances of the finding of those remains, and the resulting controversies, are well enough known not to require rehearsal here. The present work reviews the extant archaeological record for the Southern Columbia Plateau (*sensu* Ames et al. 1998) (Figure 1).

Scope of Work and Methodology

The framework for this study is set out in the scope of work (SoW) dated December 9, 1999. It is important to be quite explicit about what the scope of work and the parameters of this study are. Therefore, in summarizing the SoW, I either closely paraphrase its wording, or quote extensively. The project's scope of work included:

- "Identify an "earlier group" with which the Kennewick human remains could be associated. This group is essentially defined chronologically – as the archaeological manifestations contemporary with the skeleton's age. The contract therefore specified 9500 BP (cal) or c. 7500 BC as the starting date for establishing the "earlier group." This is approximately the calibrated age of the first radiocarbon date from the skeleton. In order to develop as complete a picture as possible, however, it is necessary to examine a much broader time span, as will be seen below (Section 4).
- While "the investigation into the cultural affiliation of the Kennewick human remains must consider all present–day Indian tribes ... heightened scrutiny should be applied to the interest of present–day Indian tribes that have either claimed cultural affiliation with the Kennewick human remains or participated in on–going consultation efforts concerning their treatment. These tribes include: the Confederated Tribes of the Colville Reservation; Washington;

Confederated Tribes of the Umatilla Reservation, Oregon; Confederated Tribes and Bands of the Yakama Indian Nation of the Yakama Reservation, Washington; Nez Perce Tribe of Idaho; and the Wanapum Band, a non–Federally recognized Indian group." The SoW specified that the study should focus on indigenous peoples occupying or utilizing the Mid–Columbia region, including the Lower Snake River area. The temporal terminus for this study is the early nineteenth century. It is not the task of this work to link the peoples of the Mid-Columbia\Lower Snake Rivers in 1800 to the tribal peoples of that area today.

- The study was to "review and synthesize **existing** published and non–published information ... (emphasis mine)." The time constraints did not allow examination of museum collections. The study is, in a sense, a literature review. The available time did not permit even new manipulations and reorganization of basic, available data.
- The SoW specified examinations of the following "manifestations:"
  - Artifact styles and types;
  - Artifact manufacturing techniques;
  - Trade and other social networks;
  - Dwelling styles and manufacture;
  - Community and settlement patterns; and
  - Economic and subsistence patterns.
  - The study was not limited to these, and I have also examined what I am calling patterning in the radiocarbon record and demography. Other lines of evidence, such as rock art motifs, that might be relevant with a shorter time span, do not extend far enough back in time to be used.

The scope of work acknowledged the stringency of the time constraints available to accomplish the study, noting that much of the necessary evidence may be in reports of limited circulation, as well as being unpublished. It asked that given these constraints the study "will be as comprehensive and representative as reasonably possible."

The study was conducted between 9 December, 1999 (when the contract began) and 15 January 2000, when the draft report was due. Additional work was done between 22 February and 7 March, including revising the report and adding additional information and discussion as requested by the National Park Service (NPS) staff. The research process was primarily my reading extensively in the available literature and thinking about it. Visits were made to the libraries of the Oregon State Historic Preservation Office in Salem, Oregon, and of the Washington State Historic Preservation Office, in Olympia. I also made inquires of the Idaho SHPO for relevant studies. The libraries of the Portland District, US Army Corps of Engineers, and Archaeological Investigations Northwest were also consulted. Additionally, extensive use was made of the Interlibrary Loan Services of the Portland State University.

Additionally, the Tribal Historic Preservation Offices of the Confederated Tribes of the Colville Reservation, Confederated Tribes of the Umatilla Reservation, Confederated Tribes and Bands of the Yakama Indian Nation of the Yakama Reservation, and the Nez Perce Tribe were consulted by phone, fax and/or letter. They were asked to recommend any studies, reports, etc. that they thought important or germane to my work. Information was provided to me by the Tribal Historic Preservation Office of the Confederated Tribes of the Colville Reservation. Additionally, information that was provided to the NPS by the Confederated Tribes of the Umatilla Reservation has passed on to me. I also consulted, via telephone, email and talking directly, with the following Plateau researchers: Jerry Galm, Virginia Butler, Randall Schalk, James Chatters, Loren Davis, R. Lee Lyman, Darby

Stapp, William Andrefsky, Alan G. Marshall, Rick McClure and Max Pavesic.

Organization of This Report

The report's organization is dictated by the SoW. While I review the archaeological record of the Plateau, I do not do so in the common narrative form for cultural-historical overviews. Rather, I organized the discussion to directly address the topics raised in the SoW. The report is divided into six sections, including this one. Section 2 provides necessary background information, including discussions about the Plateau's environments, a brief history of anthropological and archaeological research on the Plateau, a summary cultural-historical chronology, and a review of the cultural-historical frameworks used over the past 40 years by archaeologists working on the Plateau. The next section, Section 3, discusses a range of substantive, theortical and methodological issues and problems relevant to this study. Sections 4 through 7 directly address the SoW. Section 4 identifies the "earlier group" with which the Kennewick remains can be associated. This association is based on temporal criteria. Section 5 addresses the archaeology of the late 18th century along the Middle Columbia–Lower Snake River. These two sections together define the beginning and end points for this analysis. Section 6 reviews relevant aspects of the Plateau's archaeological record addressing the topics specified in the SoW and the additional ones noted above –radiocarbon chronology and population dynamics. Section 7 presents the summary and conclusions.

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The Southern (Columbia) Plateau: Background

Introduction

Many of the topics of importance to this study are covered in detail in the papers in The Handbook of North American Indians, Volume 12, The Plateau, edited by Deward E. Walker Jr. (Walker 1998). The reader of this report is referred to that volume if they wish more background than given here.

Environments (cf. Chatters 1998 and references)

The Columbia Plateau (or the Southern Plateau [Figures 1 & 2]) is flanked on the west by the eastern slopes of the Cascade Mountain range, on the east by the Northern Rocky Mountains, on the north by the Okanogan Highland of northern Washington State and southern British Columbia, and on the south by the Southern Uplands, the Blue – Ochoco Mountain system of central Oregon. The central feature of the Plateau is the Columbia Basin, a depression in the center of the region filled with vast sheets of Miocene basalt, the results of multiple, volcanic eruptions. This lava plain tilts down to the west and is lowest along the eastern flanks of the Cascades. It rises gradually to the east to more than 600 meters (2000 ft). The region's rivers, including the Columbia River, the Snake River and their tributaries, are entrenched in deep canyons in the northern and eastern portions of the Plateau, but flow through relatively low terrain in some parts of the southwestern portions. The Columbia River is pinned against the Cascades by the basalt flows.

The Plateau has a continental climate, with cold winters and hot summers. Rainfall comes from the west, off the Pacific Ocean. Thus, the very low western portions of the Plateau are the driest because they lie in the Cascade's rain shadow (Figure 3). Rainfall increases to the east. The uplands flanking the basin are forested, while the basin itself is covered with a shrub and bunch grass steppe. This bald description masks great ecological diversity, particularly in the wetter and higher portions of the region (Figure 4).

Mammals of economic importance in the past include elk (*Cervus elaphas*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), bison (*Bison bison*), mountain sheep (*Ovis canadensis*), mountain goat (*Oreamnos americanus*), and pronghorn (*Antilocapra americana*). The region is most famous, of course, for its once prolific salmon runs. Three of the Northwest's five salmonid species were present in the Columbia and Snake River systems: the Chinook (*Oncorhynchus tschawytscha*), sockeye (*O. nerka*), and steelhead (*O. mykiss*). Salmon are anadromous, born in fresh water, travel to the ocean after a time, grow to adulthood in the North Pacific, and then return to the stream where they were born to spawn. Unlike Atlantic salmon, Pacific salmon die upon spawning. Other economically important fish include sturgeon (*Acipenser transmontanus*), lamprey eels (*Entosphenus tridentatus*), suckers (*Catostomus sp.*), and other resident fish. A wide range of plant material was harvested for an equally wide array of purposes. Some of this is discussed separately below (Section 6.4.)

Archaeologists on the Plateau have been considerably interested in reconstructions of paleoenvironments. Despite that, I do not attempt one here, nor do I offer a summary. This is in part due to the time constraints of this study. It also does not seem necessary for the purposes of this document. Chatters (1994, 1998) offers a recent one.

Anthropological and Archaeological Research

Several good accounts of the history of anthropological and archaeological research on the Plateau have been recently published (e.g. Campbell 1989, 1991; Reid 1991a, Lohse and Sprague 1998). The reader is referred to those works for detail, analysis[1], and sources on that history. Only a few points need to made here. The vast majority of all archaeological work on the Plateau has been CRM–related, even before there was a concept of CRM. While fieldwork on the Plateau began well before World War II, its real impetus was post-war dam construction, and the resulting River Basin Surveys of the 1950s. The great majority of projects since the 1950s has been related to dams and reservoirs. Within the last 25 years work has expanded out of the canyons and river bottoms. Virtually all of this work is also CRM related in the form of Forest Service projects, pipeline projects, etc. An impressive body of evidence has built up, but it has limitations. Excavations in the canyons, for example, focus on pithouse sites, and on the house pits themselves. We have, therefore, far more information about the contents of the structures than we do for exterior activity areas. While the earlier work often involved extensive excavations of a few major sites, more recent work has tended to be survey and tests of a wider range of sites. Clearly that corrected an earlier bias in the data, but creates one of its own if we do not have comparable samples.

While work has been extensive, four major projects have profoundly shaped what we currently know about Plateau archaeology. In the early 1960s, faculty and graduate students from Washington State University began work in proposed reservoirs in the Lower Snake River Region. This work continued into the mid-1970s along the Lower Snake and Lower Clearwater Rivers. It produced the longest and for a time, best-documented, multi-site chronology in the Southern Plateau. In the late 1970s, a massive, three season project based at the University of Washington excavated 18 sites behind the Chief Joseph Dam on the Upper Columbia, developing what is still probably the region's best, large modern data set. It is certainly among the best documented. Within a year's time of the completion of the Chief Joseph Project, an additional 13 sites in the Wells Reservoir were excavated by a consortium including Central Washington University, Washington State University, and University of Washington. These sites were located near the confluence of the Okanogan River and the Columbia River. Although methods differed, these two projects produced a data set of 31 excavated sites in the same general region. The fourth and most recent project was performed by INFOTEC, Inc, along a pipeline expansion route that ran through California, central Oregon, eastern Washington, and northern Idaho. The Oregon data in particular have been extremely important. This is not to suggest that there have no been other projects, including surveys and excavations of single and multiple sites to have made major contributions to Plateau archaeology. There have been, many of high caliber. Among these are a series of excavations and surveys across the Plateau accomplished by Eastern Washington University. However, these four data sets are the major, large blocks of data to which everyone has recourse.

The focus of early work on the Plateau (beginning in the 1940s through the end of the 1960s) was on establishing the time depth of human occupation of the Plateau, and when the "Plateau Pattern" – the archaeological manifestation of the ethnographic reconstruction (Ray 1939) of Plateau culture – began. After the 1960s, research shifted away from explicitly historical questions and focused much more heavily on questions about the evolution of hunter-gatherer adaptations, in line with broader changes in the discipline. What is important here, however, is that neither approach produced data that lend themselves to an inquiry such as this one. The earlier work depended primarily on looking for artifacts thought to indicate the Plateau Pattern. These included pithouses and some artifact types. However, these were treated as "indicator fossils." Only one was needed to document the pattern. Thus, there was not as much concern with quantification as we now think basic, nor was there much interest in artifacts not thought to be culturally sensitive. For example, Nelson (1966), in his report on the Tucannon site, only lists ground stone tools generally, and does not give counts. The later, hunter-gatherer oriented work, was little interested in historical relationships and so the taxonomic and stylistic studies of artifacts, which might yield such data, did not occur.

One last issue to be touched on here is simply the availability of the database. As someone who has a final report awaiting completion now going on 17 years, I cannot complain too loudly. I would merely support Lyman's point (Lyman 1985b, 1997) that the literature of the Plateau is very difficult to get, because so much of it is published (or not) in limited distribution reports, or in venues which are obscure, or difficult to even to find out about. Therefore, this study is limited by our success in tracking reports down rapidly, and getting them from the SHPO libraries or interlibrary loans. In many cases, we could not locate reports.

Archaeological Background

Introduction

The known archaeological record for the southern Columbia Plateau spans a period of perhaps 13,500 calendar years. Archaeologists have approached this record over the past 50 years or more from a variety of theoretical standpoints and basic assumptions. During that time, they constructed a number of cultural chronologies for the Plateau, most specific to a particular site, reservoir, or sub-drainage. There is no single, unifying sequence (but see Chatters and Pokotylo 1998). This in part reflects the piecemeal nature of archaeological research on the Plateau, but also the considerable archaeological and environmental variability across the region. In any case, it is far beyond the scope of this study to review these sequences in detail. A recent synthesis of sequences for the Southern Plateau (Ames et al. 1998) is summarized in Figure 5 and a somewhat more detailed synthesis (Galm et al. 1981) is presented in Figure 6.

It is important to understand that these phases and periods were often developed using very different methodologies and samples. For example, the construction of the Lower Snake River sequence was based on quite explicit typological procedures (Leonhardy and D. Rice 1970, D. Rice 1972, Bense 1972) that included, among other things, not using archaeological assemblages that were thought to represent mixes of assemblages from different phases. This had the effect of eliminating potential temporal and spatial variability. Additionally, the phases were defined based on geological context, and the presence and absence of certain artifacts (e.g. Cascade points), lithic technology, and other attributes. In contrast, the phases for the Chief Joseph Reservoir sequence (Kartar, Hudnut, Coyote Creek) in the South-central Plateau were defined, at least in part, on the basis of breaks in the distributions of radiocarbon dates (Salo 1985). A sequence proposed by Schalk and Cleveland (1983) was based entirely on subsistence and mobility strategies.

Despite this variation in sequences, workers on the Plateau generally see three broad periods. The divisions between the periods may be placed at somewhat different times (e.g. Figure 5) depending on the scope of the sequence (in Figure 5, the Chatters and Pokotylo sequence is for the entire Plateau, while the Ames et al. sequence is only for the Southern Plateau), and the interests of the researcher.

A Summary Chronology (based on Ames et al. 1998, Figure 5)
Period I (11,500 BC to 5000/4400 BC).
This period is divided into a Period IA and IB. IA is Clovis[2], which is weakly represented and outside the temporal parameters of this study. Subperiod IB was described as being "post-Clovis" although more recent evidence discussed below suggests that the earliest IB cultures of the region may be contemporary with Clovis. This period is discussed in greater detail in Section 3. Some of the characteristics of the period are:

- Very low population densities;
- High levels of mobility;
- Subsistence orientation emphasizing relatively mesic environments;
- Early artifact assemblages (pre–7000 BC) marked by the presence of stemmed and shouldered lanceolate projectile points. These points display:
    a. Wide bases relative to blade size;
    b. Edge grinding of the stems;
    c. Highly variable blade shape because of resharpening and reworking;
- Later assemblages (post–7000 BC) are dominated by foliate, or leaf shaped points (Cascade points), although these forms were present in small numbers earlier;
- Lithic assemblages dominated by cherts;
- During the later portions of the period, tool stone sometimes includes significant frequencies of fine–grained basalts;
- Lithic reduction includes manufacture of macroblades and flakes from prepared cores;
- Lithic technology during later portions of the period includes some instances of the Levallois prepared core technique;
- The presence of burins;
- A bone tool technology that includes small bone needles and antler wedges, as well as barbed points;
- Fishing gear includes very rare net weights;
- The presence of "bola" stones, small, girdled pebbles that some (e.g. Carlson 1996) suggest might be a form of netweight;
- Hunting of a range of large (including bison) and medium (including rabbits) mammals; some evidence for salmon fishing, no evidence for storage;
- Plant exploitation is suggested by the presence of small milling and hand stones, and, particularly after c.7000 BC, edge ground cobbles;
- Evidence for temporary shelters, including windbreaks and huts;
- After the Mazama ash fall, assemblages contain large side–notched projectile

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points (North Side Notched) that predate the ash fall in sites to the south;
- After the Mazama ash fall, some assemblages in the South-central Plateau contain microblades and microblade cores. Assemblages elsewhere in the southern Plateau do not;
- At some time during this period, the central Columbia Basin was abandoned.

Period II (5000/4400 – 1900 BC):
Ames et al. (1998) note in that in some portions of the Southern Plateau, particularly the southwest, this period differs little from the preceding Period I. However, in other areas, there is considerable change:

- Pithouses are present in the Southeastern and South–central Plateau by c. 4000 BC, if not earlier;
- These structures occur both in the river canyons and the southern uplands;
- The houses are associated with substantial deposits, indicating rather long periods of occupation;
- Mortars and pestles are present, some are massive in size. They are sometimes present in large numbers;
- Projectile points include a variety of stemmed, and corner and side-notched forms;
- Chipped stone technology sometimes lacks the investment of time and skill evident in previous periods; reduction techniques are opportunistic, although bifacial cores occur;
- There is a variety of well–made bone tools, including large needles and leister parts.
- Decorated bone objects are present;
- Mobility strategies associated with these structures are not clear and subject to debate;
- There is no obvious evidence for storage;
- While a range of mammals was taken, medium–sized mammals (e.g. rabbits) were not. The degree to which the subsistence economy focused on fish and/or roots is a matter of debate. What seems clear is that subsistence was significantly different than during previous periods.
- Settlements seem to have been small, with few contemporaneous houses.
- There appears to have been sporadic use of the central Basin. Upland areas were used for a wide range of activities.
- By the end of the period, there appears to have been a brief but virtual cessation in the construction of pithouses across the region.
- Presence of the Western Idaho Burial Complex in the far Southeastern Plateau and perhaps in other areas.

Period III (1900 BC – AD 1720):
This period is marked by a number of changes:

- The widespread presence of pithouses (which had virtually disappeared before the end of Period II), with increased variation in size;
- The apparent appearance of mat lodges after AD 500;
- Intensive exploitation of camas and probably other roots;
- Collector mobility strategies that show continuity into the Historic Period;
- Large settlements, and concentrations of houses after AD 500;
- Ubiquitous evidence for fishing, particularly with nets;
- Widespread evidence for storage, including storage pits and storage caves;
- Evidence for intensive use of salmon;
- Evidence for increased populations;
- Use of the central Columbia Basin, and expanded use of other portions of the

Plateau;
- Presence of basketry, fiber, and wood artifacts in the record;
- Small projectile points indicate the presence of the bow and arrow. However, atlatls continue in use for a considerable period, until about AD 1000;
- Appearance of cemeteries associated with house pit villages at c. 500 BC (and the disappearance of the Western Idaho Burial Complex).

Modern Period (c. AD 1720 – present):
This is not a period used in most previous discussions of Plateau prehistory (but see Ames 1991, Ames and Maschner 1999). The Modern Period extends from the appearance of the horse to the present. It is divided into two subperiods: the Early Modern, which spans the time from the appearance of the horse (c. AD 1720) to the establishment of reservations (c. 1850), and the Late Modern, which extends from the beginning of the reservation era to the present day. Characteristics of the Early Modern period are discussed below in the section entitled "Archaeology of the Early Modern Period."

Discussion
Much of this sequence is discussed in detail in the sections that follow. Here I briefly review some of the broader, cultural historical frameworks that have been proposed to explain the Plateau's archaeological record. I also will point out a few places where archaeologists have seen continuities, discontinuities and gaps in the record, so as to keep them in mind as we review that record.

The Intermontane Western Tradition (Daughtery 1962)
Daugherty presented a model of cultural development for interior western North America (between the Rocky Mountains and the Sierra Nevada–Cascades) that postulated a Desert Culture–like (Jennings 1957) basal culture for the region's initial inhabitants. Subsequent culture changes were gradual and proceeded as traits were added or subtracted from the repertoire. As time passed, the basal culture gradually differentiated into the cultures of the Plateau, Great Basin, and Southwest in response to environmental differences and the influences of adjacent culture areas. Daugherty saw no discontinuities in this record.

The Old Cordilleran Culture (B. R. Butler 1961, 1962, 1965)
B. R. Butler postulated that the Pacific Northwest was initially occupied by a cultural tradition whose subsistence focus was on the foothill/mountain region (Cascades), hence the name "Old Cordilleran." The type artifact was the foliate Cascade point. He subsequently added edge–ground cobbles to the original definition. As originally defined, the Old Cordilleran extended into northern South America, but later discussions effectively limited it to the Pacific Northwest. B. R. Butler was not concerned with how the Old Cordilleran was related to subsequent or the Early Modern cultures in the region. A number of workers have recently started applying the term to a variety of early cultures which are marked by the presence of a range of foliate–shaped points and bifaces, bone tools, and a generalized hunter-gatherer subsistence base (e.g. Bense 1972, Matson and Coupland 1995, Dixon 1999). Daugherty (1962) saw it as an area co-tradition with the Intermontane Western Tradition that was supplanted or absorbed by the latter.

"The Emergence of the Plateau Pattern" (Swanson 1962a, Nelson 1969, 1973; Smith 1977)
Swanson postulated that Plateau culture, as described by Ray (1939) did not emerge until AD 1300 or so, having been preceded by what he described as a forest–hunting culture. The emergence of Plateau culture was fueled by " a quickening pulse" which included increased trade and contacts with the coast and by climate change. His thinking stressed the differences between the preceding forest hunting culture and Plateau culture. Nelson refined and reworked Swanson's

ideas, using Nelson's excavations of the Sunset Creek site. Nelson postulated that the key event in the development of Plateau culture, which he dated to about AD 1, with the beginning of his Cayuse phase (Figure 6), was the expansion of Salish speakers from the southern Northwest Coast across the Cascades to their present position straddling the international boundary (Nelson 1973). While the evidentiary basis for Nelson's hypothesis (the relatively older ages of pithouses in British Columbia than on the southern Plateau) has been refuted, his Salish–expansion hypothesis has been recently revived on other grounds by Smith (1977). His evidence will be reviewed below.

"The View from Wenas" (Warren 1968)
Warren described Plateau prehistory as a series of patterns which evolved one into the other, based on the direction from which cultural influences flowed into the Plateau. His theory, then, was essentially diffusionist, in which the influences of other regions spread into the Plateau, and either mixed with, or replaced the traits of preceding periods. His model has had little impact, except that Browman and Munsell (1969) combined it with Daugherty's Intermontane Tradition to produce the only synthesis of Plateau archaeology to be published, until recently, in a venue of wide distribution. Browman and Munsell's formulation of Plateau culture history has also had virtually no subsequent effect on the region. It was published at a time when the interests of archaeologists were shifting from traditional culture history to more processual forms of archaeology, and only one year before the publication of Leonhardy and D. Rice 's sequence for the Lower Snake (Leonhardy and D. Rice 1970) that almost by default became the master sequence for the southern Plateau for many years.

The Lower Snake River Sequence (Leonhardy and D. Rice 1970) (Figures 5 & 6)
The Lower Snake River sequence developed by Leonhardy and D. Rice included the Snake River between its confluence with the Clearwater River and its confluence with the Columbia River. The sequence covers the entire known chronology for that region, and it is still the only sequence for the southern Columbia Plateau that spans the entire Holocene. After its initial publication, a number of doctoral dissertations and master's theses have been done to examine particular phases in detail, and to flesh out the sequence (Leonhardy 1970, D. Rice 1972, Bense 1972, Kennedy 1976, Brauner 1976, Hammatt 1976, Yent 1976, Lucas 1994, Harder 1998). Sappington (1994) essentially extended the sequence up the Clearwater, with some modifications, and workers in Hells Canyon (e.g. Reid 1991a) have used it as a master sequence.

The chronology was derived from Daugherty's Intermontane Western Tradition, but with some modifications. Leonhardy and D. Rice (1970) divided their sequence into three traditions: the Pioneer (including Windust [11,000 – 7000 BC][3] and Cascade [7000 –4500 BC] phases), the Initial Snake River (Tucannon phase [4500 – 500 BC]), and the Snake River (Harder [500 BC – AD 1000], Piqunnin [AD 1000 – 1720] phases). Their Ethnographic Tradition (Numipu phase) was a continuation of the Snake River tradition. They saw a break between the Pioneer and Initial Snake River traditions. This break was marked by:

- A change in lithic technology, with a decline in quality in Tucannon times;
- A shift away from the use of basalt as tool stone;
- Tthe appearance of a range of small stemmed and large side and corner notched points and other developments.

They saw cultural continuity from the Harder (500 BC – AD 1000) phase on. In fact, after their initial proposal, they subsequently suggested that the Piqunnin phase (AD 1000 – 1720) be dropped (Leonhardy and D. Rice 1980) because they saw no significant changes from c. AD 500 to the appearance of the horse. The Early Modern Numipu phase (post– AD 1720) was essentially Harder phase people with the horse: i.e. Nez Perce. Considerable subsequent work (Kennedy 1976, Ames 1984, Lucas, 1994) has focused on the Tucannon phase (4500 – 500 BC), since it was, and remains, the fuzziest of these phases.

Recent Cultural Historical Frameworks: Carlson (e.g. 1983,1996,1998)
More recently, Carlson has argued that the Pacific Northwest, including the Plateau and the Northwest Coast, were initially occupied by three different cultural traditions: the Microblade Tradition on the northern Northwest Coast, the Stemmed Point tradition on the Plateau (Lind Coulee/Windust) and the Pebble Tool tradition. An earlier Fluted Point tradition (Clovis) may also have been present. These traditions are seen as distinct before 7000 years ago, though some sites have overlapping characteristics of both. Of interest here is that the Pebble Tool tradition includes what B. R Butler (1961). called Old Cordilleran, and includes foliate points and bifaces, cobble tools and net weights. It is thus what workers on the Plateau call Cascade. His division of the early materials from the interior into a pebble tool tradition and the stemmed point tradition would imply different origins for Windust and for Cascade. Dixon (1999) provides a somewhat different organization of these materials.

Recent Settlement and Subsistence models
Schalk and Cleveland (1983) presented a sequence of what they termed hunter-gatherer land use strategies in the Pacific Northwest. They recognized three periods, based on land-use practices and subsistence activities: broad–spectrum foraging, semi–sedentary foraging, and equestrian foragers. The first spans the period from the earliest occupants to the appearance of pit houses, the second from the earliest pit houses until the introduction of the horse, and the last, the post-horse period until the reservation period. Although Reid (1991a) has questioned the utility of these broad periods, this represents the first attempt to order Plateau archaeology on some basis other than temporally sensitive artifacts and perceived similarity to the "Plateau Pattern." Chatters (1995) has developed a second such model, and it is the most germane here. Both Chatters (1989, 1995) and Ames (1988a, 1991) have observed that there were gaps in the radiocarbon dates for pit houses on the Plateau, particularly between 2400 B.C. and 1600 B.C. There are a very few dated houses in this period, but far fewer than previously or subsequently. There are also contrasts in house form, size, variability and associated mobility patterns before and after those dates. Chatters (1989) proposed that these differences reflect the establishment of a form of sedentism around 3000 B.C. marked by the presence of pithouses (Pithouse 1). This pattern lasted until about 2400 B.C. when it was widely abandoned (both events results of climate changes). A different form of sedentism (Pithouse 2), accompanied by collector mobility strategies was established around c. 1600 BC, a pattern that then lasted with some changes until contact. Ames (1991) suggests more fluctuations in mobility patterns over the past several thousand years than does Chatters. In any case, Chatters posits three abrupt, region-wide shifts in settlement patterns between 3000 BC and 1600 BC.

Discussion
Different researchers have seen different patterns in the region's archaeological record. However, what emerges from the summary chronology and the review of cultural-historical frameworks is a series of general issues that need to be addressed in this report:

- Relationship of Cascade to earlier/subsequent manifestations;
- Relationship of Tucannon to earlier and later manifestations;
- Change to Pithouse 1 and to Pithouse 2;

- Microblades in south–central Plateau;
- Evidence for warfare and conflict (Smith 1977/Chatters 1988);
- Possibilities of abrupt subsistence changes;
- Changes in material culture (shifting projectile point styles, disappearance of edge-ground cobbles, appearance of large grinding tools, etc.).

This list is not exhaustive, and other shifts need to be addressed. However, these do provide a framework within which to examine the record. The next section also is intended to provide a framework for this study, but instead of looking specifically at the Plateau, issues of continuity/discontinuity and gaps in the record are addressed more generally.

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[1]Campbell 1991 is particularly useful for this study.

[2]Recently, several researchers, including Grayson (1993), Beck and Jones (1997) and Dixon (1999) have applied the term "Western Fluted" to materials west of the Rocky Mountains that has previously been termed Clovis. In the Northwest, the materials recovered from the Wenatchee (or Richey-Roberts) cache appear to be classic Clovis, while the Dietz site materials from southcentral Oregon would be termed Western Fluted.

[3]Non–archaeologist readers of the final rough draft of this report found it difficult to keep track of all the phases names and their ages. Therefore, phase names will be followed by their age range throughout the rest of the report. The age ranges are those used in Figure 5, which are based on calibrated dates.

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Peoples & Cultures
Recording Our Heritage

Kennewick Man

Cultural Affiliation Report

Chapter 2
Section 3

Review of the Archaeological Data

Kenneth M. Ames

Issues and Problems

Introduction

A range of issues and problems must be addressed before proceeding. The basic task of this study is to review the archaeological record for the southern Columbia Plateau, and identify continuities and discontinuities in that record that may be relevant to linking the Kennewick skeleton to Indian people living along the Mid-Columbia and Lower Snake Rivers in c. AD 1800. The fundamental problems are 1) what constitutes continuities and discontinuities in the record (indeed, what exactly is a continuity and discontinuity?), and 2) how is their relevance to affiliation to be determined? Perhaps an even more fundamental issue, an elemental issue, is whether the archaeological record is even capable of answering either of those questions. In this section, I will follow what may seem like a rather circuitous route to answering at least the first two questions. It is also perhaps useful at this point to remind the reader that establishing genetic or anatomical connections is not part of this particular study. That is being pursued by others in parallel work. The possible linkages explored here are historical and cultural, and they are linkages between the "early group" and early 19th century groups. These possible linkages then are between groups, or, to be precise, between an archaeological complex dating to the eight millennium BC and human groups of the early 19th century. The relationships between archaeological manifestations and actual ancient human groups or societies that produced them are, at best, indirect.

Recognition of Continuities/Discontinuities and Empirical Gaps in the Record.

Monitoring Position

Thomas (1983, 21) describes what he calls a "Doppler–effect operating in the archaeology of hunter-gatherers ... although one may be able to project the archaeological consequences of foraging and collecting strategies, *it is still necessary to consider the monitoring position from which that strategy is observed archaeologically* (emphasis his)." He discusses monitoring position in terms of hunter-gatherers, but the concept is more broadly applicable in archaeology. For

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example, people monitoring economic and social change among the Classic Maya from the archaeology of rural populations see much less change during that entire period (e.g. Webster et al. 1999) than do those monitoring it from the standpoint of the epigraphic record (Schele and Freidel 1990).

In terms of this study, there are at least two major implications of monitoring position. Much of the archaeology discussed below focuses on settlement patterns and land use systems. We can imagine two such systems that are markedly different, but which overlap at only one place or one activity. If, by some chance, we archaeologically monitor both systems primarily from this one point, then we may conclude they are very similar or identical, when, in fact they were not. This could be a place, or an entire region. For example, Swanson (1972) postulated long–term stability in regional cultures in southeastern Idaho based on his excavations in the Birch Creek Valley, a moderately high elevation montane valley in the southern edge of the Northern Rocky Mountains. However, Swanson's archaeological monitoring position was hunting camps, a manifestation that, given the available technology, the terrain, and the animals, was likely to remain quite stable throughout the Holocene, regardless of organizational and cultural changes elsewhere. Thus what looks like long-term stability may only reflect stability in that one place. On the Columbia Plateau, until recently, our monitoring position was from the bottoms of canyons. Thomas (1983) stresses that large regional samples are necessary, though not sufficient by themselves, to control for monitoring position.

Another aspect of monitoring position to be considered here is the degree to which the archaeological data we have informs us about what we want to know. In Prince Rupert Harbor, on the northern coast of British Columbia, the vast majority of artifacts are pointed bone tools of one kind or another. They probably armed spears, arrows, liesters, fishhooks and toggling harpoons, as well as being used as awls, punches, needles and a variety of other ways. They do not change at all over a span of 4000 years or so (Ames 1976), a period marked by a series of major social and economic changes, including ongoing warfare during the past 1000 years or more, which included one period when the harbor was abandoned, and perhaps even one group of people being replaced by another. However, this category of artifact does not monitor those changes. Other categories of material culture do monitor the changes, but this archaeologically most common category does not.

Homologies/Analogies and Equifinality

A key distinction that needs to be drawn here is that between homologies and analogies. These distinctions address the causes of similarities between two entities. The causes are either historical (homologies) or functional (analogies). The distinctions are clearest in biology. Ernst Mayr defines a homologous feature as "A feature in two or more taxa is homologous when it is derived from the same (or a corresponding) feature of their common ancestor (Mayr 1982, 45)." A classic example of a homology is the human arm and the pectoral flipper of a whale; both are derived from the forelimb of a remote mammalian ancestor, although they are presently used in markedly different ways. Analogies, in contrast, are features whose similarities (which may be quite surficial, or may be quite profound) are due to common function. The wings of birds and insects are analogous structures that share common functions, although they are structurally very different. Another example is the mammalian eye and that of the octopus. Analogies then are functional convergences. Homologies are historical similarities preserved despite functional divergences.

Turning from biology to culture, homologous cultural traits are evidence of the presence of a common cultural ancestry. Analogous traits would indicate independent but similar solutions to similar problems. Their existence also implies that there may be only a limited array of solutions to particular functional problems.

Flight is impossible without wings. There is a variety of ways to build wings (insect wings, bird wings, bat wings, airplane wings, helicopter rotors) and ways they can work to power flight, but wings themselves are essential.

While these terms are easy to define, they are much more difficult to operationalize, particularly in dealing with humans, who can borrow traits as other creatures cannot. Whales are not likely to have borrowed their forelimbs from the remote ancestors of humans, for example. The parliamentary systems of Britain and the USA are homologous — while they are different in many details, they share a common and now somewhat ancient ancestry. On the other hand, the US constitution has recently been widely borrowed by societies with which the USA has no deep historical connection.

To use an example perhaps more relevant to this study, semi-subterranean houses (pithouses) were a very common form of house throughout much of interior western North America over the past several thousand years. The question is whether these structures are a homologous trait (they were widespread because all of the peoples who built them shared a common, although perhaps remote, cultural ancestor who also built pit dwellings) or an analogous trait (pit dwellings were a common solution to the problem of shelter and were invented many times independently).

The situation is more complex than this short discussion can cover. I observed above that analogies exist in part because there may be a limited array of solutions to functional problems – there is no alternative to wings. While not the case for wings, shared common ancestry and history can be one of the reasons for a limited range of solutions. Pithouses may be so common in the archaeology of western North America because they were part of the basic cultural repertoire of the ancestral culture(s). When the region's ancient occupants were deciding whether to build permanent shelter or not, and what kind of shelter to build, they did not have the full array of all human shelters available to them to choose from, they had the options that their culture provided, or which they invented. In short, pit houses were common because 1) people had a common functional problem to solve (analogy) and 2) their shared history (homology) provided them with a common solution to that problem.

In a broader sense, analogies are examples of equifinality. Processes that are equifinal may begin at very different starting points, but their end products are extremely similar because only a limited number of outcomes are possible. While analogies are found in the living world, including culture, equifinality occurs throughout the material world, living and not.

For the moment, however, it is primarily important to bear the basic distinctions between analogies and homologies in mind: similarities due to common function and to common ancestry respectively. There are also similarities, continuities, due to common environment, to common structures (e.g. Braudel 1972). That is the topic of the next section.

Long-Term Structures and Matters of Scale: Sources of Stability and Variation

We can recognize three different scales of variation and stability: those of short duration that occur in a matter of days, weeks, months, or perhaps a few years; medium term events that span decades or a very few centuries, and long term ones that may include many centuries, or even millennia (Braudel 1980, Ames 1991a). Archaeology can rarely measure changes at the level of short duration events, sometimes events of medium duration, and most often long duration events. Events also have geographic scales; some are quite local, some regional, and others almost continental and global in scope. Understanding the temporal and geographic scales of events, variation, and stability is crucial in understanding cause. People in their decision-making, of course, respond to short–term and to shorter medium-term events. Few of us plan at the scale of centuries or millennia (e.g. Boyd and Richerson 1992).

Geography and Resources
Certain features of the region's topography were stressed in the background section on the environment. These features have not changed over the past 9500 years, regardless of the documented changes in climate, stream regimes, and distributions in vegetation and animals. Among these are the distributions of rainfall across the Plateau, environmental patchiness, and possible locations of trails and travel routes.

As noted above, rainfall levels increase across the Plateau from west to east. The low rainfall in the west is a consequence of the rain shadow of the Cascade Mountain range. The increase in rainfall results from increased distance from the mountains and the slow increase in elevation to the east. These circumstances are invariant; therefore, easterly, higher areas have probably always been **relatively** wetter in dry periods as well as in wet periods. In the same way, the complexity of the topography, and environmental patchiness, increases to the east, (and the southeast) as elevations rise, canyons become relatively deeper, and mountain ranges intervene. From the human standpoint, then, the easterly portions of the Plateau probably have always had the highest ecological productivity in their terrestrial environments. Like terrestrial environments, the region's riverine environments also have some geographic invariances.

Researchers have investigated considerable changes in river regimes during the past 10,000 years, in flow levels, depositional regimes, postulated variations in water temperature and so on (e.g. Chatters and Hoover 1992). There has been particular focus on salmon, and potential causes for variation in salmon productivity, principally declines in productivity. Potential causes of declines include human over-use (Schalk 1987, Campbell 1989, but also see Hewes 1973); increased water temperature and declining water levels during the Holocene thermal maximum (V. L. Butler and Schalk 1986, Chatters et al. 1991) and spawning conditions (V. L. Butler and Schalk 1986). However, some aspects of the riverine environments have not changed much, and cannot change.

One of these is the relationship between the structure of a drainage basin, and the productivity and stability of salmon runs (Schalk 1977). Salmon runs in the main stem or in major tributaries are larger, less subject to variation, and last longer then runs on lesser tributaries. The main stem runs are the aggregate of all the runs in the drainage basin. Runs on tributaries are more subject to failure or decline, in that sense; they are less predictable and less stable. Their fish runs will be of shorter duration. Salmon do not eat once they enter fresh water, so the quality and caloric content of their flesh often declines the farther upstream they are. On the other hand, fish in small tributaries may be much more accessible than those in main stems. This is particularly so in very large rivers, such as the Columbia, where the most productive fisheries were located at a very few places where the river narrowed and went over falls or through rapids (e.g. Hewes 1947, Sneed 1971, Schalk 1977, Romanoff 1992, Kennedy and Bouchard 1992).

V. L. Butler and Schalk (1986) predict possible changes in the salmon runs during the Holocene, based on a broad reconstruction of Holocene climates. They suggest that before 10,000 years ago (Late Pleistocene\Early Holocene) the distribution of salmon was shifted south to an unknown extent. As glacial conditions ameliorated in the basin, salmon behavior may have been similar to that currently exhibited in the most northerly portions of the fish's range: high levels of anadromy (smolts move quickly to salt water) and very short summer runs. Spawning areas may have been limited. V. L. Butler and Schalk (1986) predict that a warmer and drier climate after

10,000 years ago may have had these effects: 1) elimination of some spawning grounds as water levels fell, 2) decline of runs on smaller tributaries 3) anadromy declined (smolts linger in fresh water), 4) runs were spread–out through the year, but 5) overall productivity would have been low because of general water conditions. One effect of lowered overall water levels during this period may have been increased access to fish in areas where currently fish are not particularly accessible. Thus, while the premier-fishing places, such as The Dalles and Kettle Falls, probably continued to be the major fishing localities, they may have been less important in the regional economy, as fish were more generally accessible. For the cool/wet interval between c. 5000 and 2500 BP, they speculate that salmon runs would have become more like those currently to the north, with increased anadromy, and shorter runs concentrated in the summer time. After 2500 BP, in their model, the salmon resource would have achieved its structure during the Early Modern period (AD 1720 – 1850).

Fresh water mussels are another class of resource that would have been affected by changes in water temperature and sediment load. Mussels were exploited throughout the Holocene. Leonhardy and D. Rice (1970) suggest that their use expanded for a period in the Middle Holocene (see also Lyman 1980). However, mussels were locally important, probably as sources of animal protein.

The rivers and their tributaries are generally deeply entrenched, and have little scope for lateral movement. Unlike the Mississippi, for example, the Columbia, without significant help, cannot dramatically shift its course. "Significant help" here refers to geological processes on the scale of orogeny and the Missoula flood events. In any case, there are a number of consequences of this: nowhere in the region are there the kinds of broad alluvial bottomlands that are often associated with drainages of the scale of the Columbia's. Areas next to, or close, to the rivers have always been close to the rivers, though their suitability for human use will vary according to what the river is doing at that time. Good access to and from the rivers, and travel routes across the Plateau, have also not likely changed in the last 9500 years (at least until the arrival of the horse).

Another consequence of the general restriction of the Columbia's flood plain is that its annual fluctuation in base level is among the most extreme of the world's rivers (Dietrich 1996), even in non–flood years. The strength and timing of this annual fluctuation has probably been affected by regional changes in rainfall amounts and the timing of rainfall, however.

The potential of the river for navigation has also probably varied with changes in effective moisture. It is not known how important navigation and movement of goods on the rivers was to the early peoples of the Columbia Plateau. However, before the horse, people only had themselves and dogs to move freight of any size and weight. In the early 18th century, as amply demonstrated by Lewis and Clark, it was possible to move people and material rapidly downstream along the Clearwater, Snake and Columbia to the upstream end of the gorge. Thus, variation in water levels could potentially affect trade and exchange at least along the river courses.

Changes in terrestrial environments include not only shifting vegetation patterns, outlined previously, but potentially changes in the distribution of crucial animal resources and turn over in fauna (extinctions and additions of new forms) as well. Zooarchaeologists have looked at both issues for the Holocene on the Plateau, but with limited success (e.g. Lyman 1992, Dixon and Lyman 1996). Archaeological sites provide virtually the only source of data about Holocene animal distributions, and therefore questions about sampling and monitoring position affect conclusions that can be drawn as will be illustrated below in the discussion of bison. Given these strictures, the following very general statements can be made. The period covered in this report post-dates the major Late Pleistocene extinction wave in North America that includes mastodon, mammoth, and other megafauna. This event may have occurred as much as 4000 years before the Kennewick individual's life. However, a number of species did disappear locally before the arrival of Euroamerican settlers on the Columbia Plateau. These include wolves (*Canis lupus*), grizzly bears (*Ursus arctos*), bison (*Bison bison*), pronghorn antelope (*Antilocapra americana*), and mountain sheep (*Ovis canadensis*) (Schroedl 1973, Lyman 1985c). The reasons for these local extinctions are not currently known. Other than these species, there was probably no other significant turn–over in large fauna during the period covered by this report, with one possible major exception – bison. This does not mean that the spatial distributions of animals such as deer, elk, and antelope did not alter during the Holocene. They must have. Bison illustrate the issues and problems involved in understanding changing faunal distributions on the Plateau. It is also a problem particularly germane to interpreting the cultural and economic context of the Kennewick individual. Interpretations about bison hunting revolve around questions of climate changes, hunter-gatherer responses to those changes, but also whether the perceived pattern is merely a sampling problem.

Bison (*Bison bison*) were probably present on the Plateau throughout the Holocene, but in very small numbers during most of that period. Mack and Thompson (1982) demonstrate that the steppe grasslands of the Plateau could never have supported large herds of bison, like those on the Great Plains. However, bison bones do occur in large numbers in archaeological sites in the period between c. 500 BC and AD 500 (Figure 7). Two additional assemblages are slightly younger (at 45AS80), and one is much older. Large numbers of bison bones were recovered at the Lind Coulee site that is located to the east and north of the Kennewick locality[4]. The Lind Coulee materials are only somewhat older than the Kennewick individual (see below).

The debate here is whether the changing frequencies of bison bones reflects an actual increase in bison abundance between 500 BC and c. AD 500/ 1000 (e.g. Schroedl 1973, Schalk and Olson 1983, Chatters et al. 1995), or sampling (Lyman 1985c). Lyman (1985c) does present evidence that suggests shifting proportions of pronghorn and bison on the Plateau during the Holocene as effective moisture decreased, then increased. Bison declined as the climate became warmer and drier in the Early Holocene and the amount of grass decreased, while antelope increased. As the climate subsequently cooled and became wetter, grasses expanded as did bison, and antelope declined. However, he concludes by arguing that none of the available interpretations is supportable given the present data.

Hunting and Gathering

While Marshall (1999) has recently argued that Early Modern (AD 1720 – 1859) Plateau economies were, in a manner, horticultural, over the past 9500 years, they were hunter-gatherer economies. However, hunter-gatherers are extremely variable (Kelly 1994) in time and space in their cultures, subsistence economies, and social organization. During the past 10,000 years, worldwide, they were even more variable than is accommodated by Kelly's book. Archaeological practice on the Columbia Plateau over the past 20 years has approached that variability within the framework of Binford's distinctions between "foragers" and "collectors" (Binford 1980, e.g. Ames, 1988b; Chatters 1984a, 1995; Schalk and Cleveland 1983). These distinctions have proved extremely useful for understanding the histories of hunter-gatherer mobility and subsistence patterns on the Plateau. Anthropologists have also drawn other, somewhat similar distinctions among hunter-gatherers. While these distinctions obscure important and interesting variations, they are also heuristically powerful, providing a language with which to characterize and discuss hunter-gatherers, a basis for building models of ancient hunter-gatherer systems and for making predictions about the archaeological record. The first part of this section summarizes some of the distinctions made among hunter-gatherers useful to this study, and the second briefly discusses their relevance here. These distinctions are based on features common to many hunter-gatherer societies across time and space. Such features are thus most probably analogous ones.

Immediate Return/Delayed Return (Woodburn 1980, 1982; Barnard and Woodburn 1988; Burch and Ellanna 1994). Woodburn (1982, 432) defines immediate return hunter-gatherer systems as having:

> (T)he following characteristics. People obtain a direct and immediate return from their labour. They go out hunting or gathering and eat the food obtained the same day or casually over the days that follow. Food is neither elaborately processed nor stored. They use relatively simple, portable, utilitarian, easily acquired, replaceable tools and weapons made with real skill but not involving a great deal of labor.

He adds elsewhere (Woodburn 1982, 434):

> The social organization of these societies has the following characteristics:

- Social groupings are flexible and constantly changing in composition.
- Individuals have a choice of whom they associate with in residence, in the food quest, in trade and exchange, in ritual contexts.
- People are not dependent on specific (emphasis his) other people for access to basic requirements.
- Relationships between people, whether relationships of kinship or other relationships, stress sharing and mutuality but do not involve long–term binding commitments and dependencies of the sort that are so familiar in delayed return systems.

He also stresses that immediate return hunter – gatherers are "egalitarian, profoundly egalitarian." Egalitarian societies are those in which there are as many positions of prestige as there are people to fill them, there are no positions that possess power, and everyone has equal access to resources (Fried 1967).

Delayed–return societies, in contrast, have these characteristics:

> People hold rights over valued assets of some sort, which either represent a yield, a return for labour applied over time or, if not, are held and managed in a way which resembles and has similar social implications to delayed yields on labour. In delayed–return hunting and gathering systems, these assets are of four main types, which may occur separately but are more commonly found in combination with one another and are mutually reinforcing:

- Valuable technical facilities used in production;
- Processed and stored food or materials usually in fixed dwellings;
- Wild products which have themselves been improved or increased by human labour;
- Assets in the form of rights held by men over their female kin.

Woodburn also stresses that these are very general characteristics, and that the form that a particular society will take cannot be predicted. They do provide a basis, however, for developing general expectations about past hunter-gatherer societies. Binford's distinctions between foragers and collectors were developed by him to permit developing very explicit expectations.

Foragers and Collectors (Binford 1980): Binford, like Woodburn, classified hunter-gatherers into two ideal types. However, Binford's types, forager and collector, are based primarily on their mobility strategies: on how they moved themselves across the landscape to get access to resources. However, there is a great deal of overlap between the two systems. Foragers have these characteristics:

- "(F)oragers typically do not store foods but gather foods daily (Binford 1980, 5)."
- "(T)here may be considerable variability among foragers in the size of the mobile group as well as in the number of residential moves that are made during an annual cycle (Binford 1980, 5)."
- Foragers practice "residential mobility" – they move their residential camps to resources. They exploit an area around the camp, and then move on. Bulk processing occurs in camp. Foragers move their residential camps to places where particular resources are available and exploit those resources from those camps. Thus, they may harvest different resources sequentially through a year, shifting camps each time.

A number of expectations follow from these points about the archaeological record of foragers. Suffice it to say here that because they may move frequently, their camps may have low archaeological visibility[5], and because the activities pursued at each camp reflect only what people were doing at the camp, there may be considerable variability from campsite to campsite. However, there is likely to have been a range of activities pursued at any camp that can be reflected archaeologically. Binford also identifies a second site type – localities – where low-level bulk extraction might occur. These would also have low-level archaeological visibility (Binford 1980, 9).

Collectors, in contrast, are logistically organized. They position their residential bases centrally, and exploit resources with task groups that make trips to resource localities, where they acquire whatever resource it is, process it, and return to the main residential base. For example, the residential base may be situated to provide access to fishing localities, berry gathering grounds, and root gathering grounds. Task groups leave the residential base, and go, for example, to a berrying locality. The berries are gathered, smoked and dried there, and brought back to the base camp. Fish are caught and dried at the fishing camp, and the dried fish, placed in baskets, are returned to the main camp. Thus, collectors harvest several resources at the same time, and collector strategies are most common in parts of the world where resource availability is limited to one part of the year, and many resources must be harvested at once. Another consequence of strong seasonality is that collectors often practice storage, and therefore, unlike foragers, they harvest and process large amounts for both immediate consumption and to store.

Binford predicts that collectors will generate a very different archaeological record than that of foragers. Their residential bases will be occupied for longer periods, thus they will generate more debris. There are more likely to be facilities such as houses and containers for stores. A wide range of activities will occur at these sites since they are occupied for longer periods than are the residential bases of foragers. Collector localities are archaeologically much more visible, since they were often regularly reoccupied, large volumes of material harvested and processed and so on. Specialized localities are also expected. Places will be consistently revisited by task groups for the same purpose. Binford suggests there may be additional site types as well.

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In many respects, Binford's and Woodburn's types are two sides of the same coin: foragers/immediate return and collectors/delayed return. Both authors stress that many groups are not easily accommodated into these ideal types, having some qualities of both.

Discussion: These concepts will be important both in the presentation of the Plateau's archaeological record and in the analysis that follows. Suffice it to say here that the presence through time of either forager strategies or collector strategies on the Columbia Plateau cannot be taken as evidence for homologies. Resource distributions and seasonality on the Plateau are such that collector systems are to be expected, particularly with population increases. However, homologies may exist in the specific arrangements of particular collector systems through time. In contrast, an archaeological search for homologies in forager/immediate return systems may be quite difficult, since one of their major traits is their fluidity. Any forager system is likely to be very fluid, while different collector systems may potentially organize themselves differently on the same landscape. Of course, such organizational differences through time can be the result of the same group reorganizing itself. At least one researcher, however, has seen such differences as indicating cultural differences (Bettinger 1978). This possibility is discussed in more detail in the next section.

Theoretical and methodological approaches to continuities and discontinuities. Before the 1960s archaeologists often explained what were seen as discontinuities in the archaeological record as evidence for migrations or perhaps diffusion. Such discontinuities could include the replacement of one style of projectile point with another. After the mid-1960s, migration as an explanatory device passed from favor, until quite recently, though some thought was devoted to it (Rouse 1987). *In situ* development was generally assumed on the Plateau and elsewhere. Discontinuities were generally taken to reflect problems in sampling, or abrupt changes in organization of some kind. The issue here is not demonstrating migration but the identification of continuities. In short, there is not much literature to guide one in identifying and evaluating continuity and discontinuity in the archaeological record. The literature for the Great Basin region of North America is a significant exception. Archaeologists there have been investigating what they term the Numic expansion (Madsen and Rhode 1994a, b). The correlates they have developed for investigating this hypothetical expansion[6] provide a set of expectations of varying strength to examine the Plateau's archaeological record. The Thule expansion in the Arctic provides another useful example. The intention here is not to imply that there may have been population movements onto the Plateau, or that all of the correlates are good ones. Hughes (1992, 1994) offers a number of caveats against linking continuities and discontinuities in the archaeological record as indicating continuities and discontinuities in what he terms enthnolinguistic groups.

Hughes (1994a) observes that archaeologists have long assumed that continuity in material culture in an area indicates continuity of people in that area. By people he means ethnolinguistic groups. He argues, however, that much of the continuity that archaeologists see is in the areas of subsistence and settlement settlements systems, aspects of human life that may have little relationship to language and ethnicity. He suggests that archaeologists need to, in his words, disentangle, "or correctly recognize, those aspects of archaeological assemblages that refer most directly to subsistence from those related to ethnolinguistic identity (Hughes 1994a, 68). He also suggests that claims that attempt to relate material culture to ethnicity or language are very difficult to disprove, or falsify, i.e. they are hard to test. I agree with these cautions. This section is devoted to these issues.

My purpose here is review the kinds of continuities and discontinuities archaeologists have used to provide a set of measures to use against the archaeological record of the Plateau in order not to approach the Plateau record in an *ad hoc* manner. Some of these measures are stronger than others. Most, if not all, of these are controversial in the discipline. In this study, they act merely as a checklist of the kinds of discontinuities our colleagues look at. They also make explicit the kinds of evidence archaeologists have used, without having to cull that information from the Plateau literature.

The distributional pattern of Numic or Shoshonean languages across the Great Basin and beyond has long suggested a population expansion. The reality, causes, and timing of this expansion have been major research questions on the Great Basin for some time. A recent edited volume on the topic (Madsen and Rhode 1994) provides a compilation and discussion of approaches to the problem. I will here only summarize the kinds of evidence employed. These can be grouped into classes of evidence. Examples from other regions will also be used.

Abrupt changes in material culture/entire subsistence economy: Perhaps the most dramatic archaeological example of the replacement of one hunter-gatherer population with another is actually not the Numic spread, but that of the Dorset culture of the Canadian Arctic by Thule culture around AD 1000 – 1300 (McGhee 1984, Grayson 1994). In this instance, there are major changes in material culture, including subsistence gear and house form, and in subsistence and economic practices, from the animals pursued to overall economic organization. McGhee also argues that the origin point of the migration is known. In most areas, the alteration seems so abrupt as to indicate population replacement. While McGhee describes the change from Dorset to Thule as swift, there are suggestions of periods of interaction between Dorset and Thule peoples (e.g. Fitzhugh 1994), at least in the extreme eastern Arctic. In McGhee's model, the expansion is fuelled by a climate change allowing Thule peoples to expand their range at the expense of Dorset until most of the Canadian Arctic is occupied by Thule groups. This is followed by a period of adjustment and diversification as Thule people adapt to both their new, local environments, and to broader climatic changes that forced them to alter their original economy in many areas. Thus the Thule expansion does appear to meet Rouse's criteria for demonstrating a migration (Rouse 1987).

In the southeast Great Basin, a mixed farming/hunting-gathering economy is replaced by hunting and gathering, suggesting a population change. In other places, one kind of hunting and gathering economy appears to have been replaced by another. It is this latter aspect of the Great Basin research, in fact, that makes it relevant to the Columbia Plateau. The most thorough model building (but still quite controversial [e.g. Thomas 1994]) for this is that of Bettinger (Bettinger 1978, 1994; Bettinger and Baumhoff 1982). Bettinger's approach, which is rooted in evolutionary ecology, is based on yet another binary distinction among hunter-gatherers: travelers and processors (Bettinger and Baumhoff 1982). In their model, and his subsequent exegesis of it (Bettinger 1994), there are significant differences between these two strategies, involving differences in mobility patterns, frequency and distance of movements, decision–making and strategies for which resources to exploit and how (sometimes the same resources, but in different ways), technology and the sexual division of labor. These distinctions are much finer grained than those between forager and collector, although travelers are more forager–like and processors more collector/delayed–return like. What matters most here is his argument that a shift from traveler to processor is not an adaptive shift by the same people, either by developing it themselves, or borrowing it. Bettinger asserts that the elements of these strategies are so deeply and functionally intertwined that it would be impossible to borrow or invent just one part of the strategy – it is all or nothing. In any case, a wholesale change of subsistence economy, even of one hunting-gathering economy by another, may be evidence for discontinuity, if the change is abrupt and if the two economies seem disparate enough that one does not seem as though it could be ancestral to the other.

There is also an implication here that complex economies replace more simple economies, but not the obverse, though Bettinger certainly has never characterized travelers in that way. He argues only that processing will support more people than traveling. In any case, there is a deep-seated notion that things can get more complex, but not more simple. This is not the case. There are well-documented cases of highly mobile foragers swiftly becoming relatively sedentary collectors, and then, after a considerable length of time, some at least becoming foragers again (e.g. Bar-Yosef 1998), with no accompanying evidence of a major cultural discontinuity.

Another implication of Bettinger's work is that economic differences may almost be what could be termed stylistic differences between societies. He made this argument explicitly in 1978 (Bettinger 1978), but has not returned to it. Other archaeologists in other regions of North America are quite explicit about this (e.g. Mitchell 1988). Such differences can include differences in economic emphasis (terrestrial vs. riverine or marine), differences in artifact assemblages (organizational and/or stylistic), and differences in mobility and land use patterns. Generally, one of these may not be seen as sufficient evidence for cultural replacement, though it can be.

Demographic Fluidity: Models of Thule and Shoshonean expansion generally envision replacement of one human population by another through migration, although both populations may be closely related biologically, as in the case of McGhee's Thule model (McGhee 1984). Simms (1994) describes an alternative, which he terms "demographic fluidity." Hunter-gatherers are well known for their mobility, both as individuals and as groups. Nunamuit males in northern Alaska, for example, may cover an area of 300,000 km^2 in their lifetimes (Binford 1983). Kelly (1994) discusses factors controlling hunter-gatherer mobility. Ames and Marshall (1980) described levels of group and individual mobility for the southeastern Plateau. Individuals move according to the information they may have about resource productivity, to find mates, to be closer to friends or relatives, and to get away from friends and relatives. They also travel to acquire information about the environment. Such fluidity may be impossible to detect archaeologically, but it might be reflected in some of the patterns archaeologists have sometimes seen as "influences" from different areas, or as diffusion. Such shifts may also be reflected in changes in settlement densities. Reid (1991a, 1991b), for example, argues that in the southeastern Plateau there have been shifts in settlement densities between the canyons and the uplands because of droughts. The canyons are the center of gravity for settlement in wet periods and the uplands in dry periods. These shifts would not be migrations or transhumant movements, but alterations in the movements of individuals, of what Marshall has called "habitation patterns (Ames and Marshall 1980)."

Inferred stylistic differences in material culture, the organization of technology or in "diagnostic" artifacts: "Style" plays a significant role in discussions such as these. It is a vexed issue for archaeologists, and there is a vast theoretical literature that is well beyond the scope of this study. These debates are generally quite "academic" though they now have important implications for the broader society (e.g. Barker and Pinto 1994).

Bettinger et al. (1996) summarize the style literature very crisply. They suggest archaeologists see three causes of variation in artifact form: 1) differences in the utilitarian functions of tools, 2) differences in form due not to function, but to what they call "rote social learning."[7] This can be termed "passive style." Among the

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peoples of the northern Northwest Coast, for example, a well–crafted wooden object was often given its finishing touch by lightly adzing the surface, producing long, shallow adz grooves. Among European peoples, a good craftsman finishes a piece by sanding it. These differences reflect the tools and conventions of good work: "This is how it is done." Such differences may even have their roots in different motor skills; and 3) what they term arbitrary, iconic and symbolic traits. These latter are widely seen by archaeologists as a form of information or communication, and it is in that way that I will treat it here. This can be termed "active style."

Archaeologists see active style as communicating social information, including group membership. Such style may be "active" in the sense that stylistic differences can arise out of people actively trying to indicate group differences, or it may be "passive" in the sense that stylistic differences may exist simply because of learning different ways of doing something. Thus, some archaeologists (e.g. Croes 1989, Adovasio and Pedlar 1994) argue that basketry is sensitive to group differences. Different groups of people will make the same kind of basket (a storage basket, for example) but these baskets will differ in many details, not only in decoration, but in the techniques used to make them. They also argue that such differences, which at some level may reflect differences in learned motor habits, can persist for long periods. Basketry, then, can differ in both active and passive styles. However, such assertions can be difficult to prove, particularly in the absence of large historical collections of such artifacts, or in the absence of analysis of historical collections.

Such differences can include then not only the shape and decoration of an object, but how objects are made, and are even sometimes extended to entire technological systems. Microblades have long been regarded as evidence for the presence of Athabascan speakers, in western Canada and Alaska, for example. Sometimes, a single artifact type is thought to indicate socio-linguistic differences (e.g. Holmer 1994).

Discussion

It is essential to be very clear at this point about how "continuities" and "discontinuities" are understood in this work. After considerable thought, I settled on two basic ways. In the first, there are demonstrated (or demonstrable) continuities or discontinuities in a cultural tradition through time. Cultural continuities, at base, means that cultural transmission of a particular suite of cultural traits from one generation to another was continuous. This does not mean that the cultural traits did not change. The first culture might have been quite different from the last. It means that transmission was continuous from one generation to another. A discontinuity means that one cultural system ceased to be transmitted, and was replaced for whatever reason by another, in Hughes' terms, one ethnolinquistic group replaced another. The replacement of Dorset people by Thule people in the central and eastern Arctic seems to be an example of the latter, while the political development of Great Britain since the Norman Conquest is an example of the former. Change by itself then is not evidence for discontinuity; even abrupt change does not necessarily imply discontinuity. Establishing such continuities would seem to require being able to trace changes in active styles (the decorations on baskets), and to be able to distinguish continuity in passive style (homologies) from continuity in function (analogies).

The second kind of continuity/discontinuity is the presence or absence of gaps, breaks in the chain of evidence. The focus in this report is on the latter. Gaps in the record may reflect cultural discontinuities, or they may not. Lengthy gaps between radiocarbon dates are one example of such a discontinuity, abandonment of a site for a time another. Such gaps are scale dependent. In the process of the analysis of the Hatwai site materials, I observed a gap in the radiocarbon record in the houses, particularly House 1 that was not obvious in the depositional record. The question that followed from this was whether the gap was specific to Hatwai – the site was abandoned for several hundred years – or more general. I found to my satisfaction that it was more general (the temporal break between early houses and later ones), but many such abandonment events occur only at one site. There are very few sites on the Columbia Plateau which contain the full temporal sequence; the sequence is stitched together from bits and pieces from all over. Therefore, some gaps are to be expected. The entire Plateau has a record of continuous occupation through the entire Holocene, but the central Basin appears to have been virtually unused for a few millennia, the Upper Columbia in the area of the Wells and Chief Joseph Reservoirs have no appreciable record for Period I, and there are gaps after that (between the Kartar [4500 –1500 BC] and Hudnut [1500 BC – AD 1] phases, for example). Assessing cultural continuities/discontinuities is dependent on having a sufficiently continuous empirical record.

Breaks in the record, discontinuities, may be evidence for discontinuities in the historical connection between ancestral and descent cultures; they may be evidence for cultural change; or they may just be breaks in the record. Endzweig (1994) uses discontinuities in site occupations to argue for shifting settlement patterns in the southern uplands. Presumably, if the break represents a cultural discontinuity, cultural traits will differ on either side. Of course, rapid cultural change will also produce such differences. On the other hand, similar traits on either side do not necessarily mean continuity across the gap in the record. An inference of cultural continuity will hinge on the kind of traits on either side of the gap and on our monitoring position – from what vantage point are we seeing the gap. Recalling Swanson's argument for cultural stability in the Birch Creek Valley (Swanson 1972), upland hunting camps of different hunter-gatherer cultures may look very much alike: i.e. that particular set of traits may be quite insensitive to culture change, as were bone tools in Prince Rupert Harbor.

A continuous archaeological record can be, but is not necessarily, evidence for cultural continuity. There are many tells in the Middle East that preserve a record of continuous occupation that can include major cultural shifts and even different human populations. Of course, the archaeological record, although continuous, may be markedly different on either side of that change. In the section on long-term structures, I discussed aspects of the Plateau's environment that could produce continuities regardless (within limits) of who occupied it. A good trail down to the river is a good trail down to the river, especially when everyone is on foot, regardless of ethnicity.

Another distinction needed here is between models and evidence. Chatters and I have presented models to explain what we see as real patterns in the occupational history of the Plateau. However, those models are not the evidence itself. Others (Reid 1991a, Schalk et al. 1998) suggest what we see as a major behavioral pattern to be explained may just be a sampling problem, and therefore not requiring explanation beyond that. Such models are not evidence, though they lead us to focus on particular kinds of evidence as opposed to other kinds of evidence. Most models and explanations are the best we can do at a particular time with the data we have and all will be supplanted in time. They are all wrong in some way. They may also come to take on a reality altogether unjustified by the evidence. Debates over models and evidence are part of the normal research process; they are what lead to increased knowledge. Science requires what may be termed a "positive skepticism" about the knowledge claims of one's peers and one's self.

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[4]Morgan (1993) illustrates three Early Holocene bison localities, but does not name them. She also illustrates the wide distribution of late bison sites in the eastern Plateau. I will give the age range at

first mention of a phase in a paragraph, or when its seems necessary. I will not give them for every mention of a phase.

[5]Activities at these sites will have been transitory, leaving little in the way of debris.

[6]It has never been proven that the Numic expansion happened.

[7]This is Sackett's isochrestic style (Sackett 1982).

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ARCHEOLOGY & ETHNOGRAPHY PROGRAM

Peoples & Cultures
Recording Our Heritage

Kennewick Man
Cultural Affiliation Report

Chapter 2
Section 4

Review of the Archaeological Data

Kenneth M. Ames

"Earlier Group"

Introduction

Five bone samples from the Kennewick skeleton have been submitted for radiocarbon dating, including the first date of 8410 ± 60 (Taylor et al. 1998) or 7590 – 7320 B.C. The other four dates are: 8130±40 (UCR-3807/CAMS 60684), 8410±40 (Beta-133993); 6940±30 (UCR-3806/CAMS-60683), and 5750±100 (AA-34818). The two "young" dates are from samples taken from the skeleton's left tibial crest. These are regarded as too young (McManamon 2000). The report on Beta-133993 (Beta-Analytic 1999) indicates the value of that sample's 13C/12C ratio is elevated, suggesting that the person had either a diet of C4 plants, or marine organisms. If the latter, the date may be too old, because of the marine reservoir effect. The age could be several hundred years too old. However, data to be presented below indicate that the individual could also have been eating bison, which would elevate his 13C/12C ratio (also see Carlson 1998). In any case, the calibrated age spans of the two additional accepted dates are 7575 – 7450 BC (Beta 133933) and 7185 – 7053 BC (UCR – 3807/CAMS 60684).

In terms of the regional cultural historical sequences, these three dates place the individual in the middle of Ames et al.'s Period 1B, which includes the Windust (11,000 – 7000 BC) and the Cascade (7000 – 4500 BC) phases of the Lower Snake River, and the Philippi phase (11,000 – 7000 BC) of the John Day Reservoir, and the Vantage phase (7000 – 4500 BC) of the Middle Columbia region (Galm et al. 1981). The individual is actually earlier than the beginnings of the Cascade and Vantage phases. At present, the artifact in the skeleton's hip is the only dated cultural manifestation along that stretch of the Columbia River of that age (Figure 8).

Given the age of the skeleton and the possible typological affinities of the projectile point fragment in the hip (Fagan 1999), both the Windust (11,000 – 7000 BC) and Cascade/Vantage (7000 – 4500 BC) phases are reviewed here (Figure 5). The Philippi phase (Dumond and Minor 1983) will be treated as part of the Windust phase. Leonhardy and D. Rice (1970), D. Rice (1972), Bense (1972) and Ames (1988b) have reviewed the Windust and Cascade phases in detail. Nelson (1969) and Galm et al. (1981) are the primary sources for the Vantage phase. Aspects of this period are also discussed by Schalk and Cleveland (1983), Chatters (1984), and Chatters and Pokotylo (1998). Hess (1997) discusses mobility and obsidian use in the southern uplands of the Columbia Plateau, Pettigrew and Hodges (1995) and Schalk et al. (1995) discuss aspects of mobility and resource use in the same region, while Connolly (1999) provides significant new data for the Windust phase.

Chronology

The terminus for this lengthy cultural period is the Mazama ash fall, produced by the eruption of Mt. Mazama, which also created Crater Lake in the southern Oregon Cascades. This event is variously dated between c. 7000 and 6700 radiocarbon years ago, or c. 5800 – 5600 BC, and it marks the boundary between the Early Cascade (7000 –5700 BC) and Late Cascade (5700 – 4500 BC) subphases of the Lower Snake River sequence. This is not entirely arbitrary, as we will see in subsequent discussions. The terminus of the Windust phase (and beginning of the Early Cascade phase) is generally given as c. 8000 BP or about 7000 BC.

The earliest reported dates for Windust materials are from the Copper's Ferry site on the Lower Salmon River in central Idaho. Almost equally early dates, particularly when calibrated, have been produced at Hatwai, Wildcat Canyon and Marmes (Table 1). The Marmes dates, however, are shell dates. Sheppard et al. (1987) reports these as being as reliable as the Marmes charcoal dates.

Table 1 Calibrated Earliest Windust Phase Dates.

Site	Lab Number	Radiocarbon Date	2 Sigma Calibrated Age Range	Source
Cooper's Ferry	TO-7349	11,410 ± 130	11,900 – 11050 BC	Davis 1998
Cooper's Ferry	Beta-114949	11,370±40	11550 –11115 BC	Davis 1998
Hatwai	TX–3159	10820+140	11250 – 10650 BC	Ames et al. 1981
Wildcat Canyon	GAK- 1322	10600±200	11200 – 9800 BC	Dumond and Minor 1983
Marmes	WSU-363	10810±300	11600 – 9700 BC	Sheppard et al. 1987
Marmes	WSU–211	10750±300	11500 – 9600 BC	Sheppard et al. 1987

Not included in this table is the Lind Coulee site, the Windust phase (11,000 – 7000 BC) site temporally closest to the Kennewick individual. Moody (1978) dates Lind Coulee to c. 8700 BP. Chatters and Pokotylo (1998, *in passim*) observe that Moody's reconstruction of the site's environment is at variance with regional environmental reconstructions for this time. Moody reconstructs the depositional environment as a permanent flowing stream while Chatters (1998) sees this period as very warm and dry. Moody's age assignment is based primarily on a dated Mt. St. Helens ash contained within the cultural deposits. The ash, Mt. St. Helens J, is radiocarbon dated to 8900±300 (W-2991), or 8900 – 7200 BC, overlapping slightly with the Kennewick date. Several other radiocarbon dates are reported for the site. Daugherty, in the original report (Daugherty 1956), discusses two dates, one of 9400 ± 940, and the second 8518 ± 400. Fryxell dated humic acid from the site that was dated to 8600 ± 65 (Sheppard and Chatters 1976, cited in Moody 1978). Excavations at the site by Irwin and Moody (Irwin and Moody 1977, 1978; Moody 1978) produced additional dates, both on aggregated bone samples. The first, 12,830 ± 1,050 (WSU-1707), is from a bison scapula immediately below the St. Helens J ash. The second is 8720 ± 1709 (WSU-1707). Moody concludes that while none of these is, individually, a strong date, the preponderance of available evidence indicates the St. Helens J date is a reasonable date for the site.

Phase Characteristics

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The type characteristics of the Windust (11,000 – 7000 BC) and Cascade (7000 –4500 BC) phases are summarized above (Period 1B) and listed in Figure 5 (Galm et al. 1981). For the Windust phase, these include stemmed and shouldered lanceolate points (Figure 9) which are generally similar to points found throughout the far western United States, and which are sometimes subsumed under the terms "Western Pluvial Lake Traditions" and "Western Stemmed Tradition" (Ames 1988b, Beck and Jones 1997, Dixon 1999). Windust and Early Cascade\Vantage (7000 – 5700 BC) phases differ very little in their artifact contents. Ames (1988b) summarizes the assemblage contents of 13 Windust and Early Cascade components from the Lower Snake River (Table 2). Basic tools were recovered in all 13, secondary tools in five to eight components and rare tools in one or two. Antler wedges were found in four.

Differences in material culture between the Windust (11,000 – 7000 BC) and Early Cascade\Vantage phases (7000 – 5700 BC) are limited, but present. The major differences are projectile point forms (Figures 9 & 10), the presence of burins in Windust assemblages, the relative frequencies of one artifact class, edge – ground cobbles (higher in the Cascade\Vantage phase) – and a greater reliance on basalt for tool stone during the latter phase. There are also subtle differences in settlement patterns that suggest a shift from more collector–like mobility strategies during the Windust Phase, to more forager–like strategies during the Early Cascade\Vantage phase (Ames 1988b) (see below).

Table 2 Assemblage contents of 13 Windust and Early Cascade components

Basic Tools	Secondary Tools	Rare Tools
Projectile Points Scrapers Cobble Tools Utilized Flakes Piercing tools (burins/gravers) Knives Bifaces Cores	Awls Bone Points Ceremonial artifacts Clothing related artifacts Edge Ground Cobbles Hammerstones Ornaments Pounding Stones Antler Wedges	Abraders Anvils Fishing Gear Flaking Tools Milling Stones

Cascade points are present in assemblages during the Windust phase (11,000 –7000 BC) (Lohse 1985, 1995). At Hatwai, for example, Cascade points may date as early as 10,000 BC, and as late as 7600 BC in one context (Ames et al. 1981). The beginning of the Cascade\Vantage phase (7000 –4500 BC) is marked by a reduction in the variety of projectile point forms that characterizes the Windust phase. Only Cascade points are present during the Early Cascade\Vantage phase (7000 – 5700 BC). Lind Coulee is the last major site with relatively large stemmed and shouldered points, for example. It is likely that all of these point types armed atlatl darts. The changes in projectile point styles and reduction in diversity suggests that there was a fair amount of diversity in weaponry during the Windust phase, but that gradually one form, that armed by Cascade points, became the most common. Lohse (1985, 1995) does recognize three classes of Cascade point, but the differences among these are not great.

Core and blade technology was employed. Lithic reduction techniques also produced large thin flakes. The bone technology included a range of forms, including the very small bone needles.

Edge–ground cobbles are a diagnostic artifact of the Cascade phase (7000 – 4500 BC) (B. R. Butler 1961, 1965; Leonhardy and D. Rice 1970). They are present, however, in small numbers in Windust components, as well as very occasionally in later components (Keeler 1973, Yent 1976). Their function is unknown, although a number of suggestions have been made (e.g. Sims 1971). The causes of increased proportions of basalt tools in Early Cascade\Vantage (7000 – 5700 BC) assemblages are not known.

To the south, in central Oregon, archaeologists have recovered a distinctive form of sandal in dry caves (the Fort Rock style). The sandals are woven from sagebrush bark. Radiocarbon dates for these sandals cluster between 9000 and 7300 BC (Connolly and Cannon 1999). They may occur as late as 5000 BC, however, but no later. There is little or no temporal overlap with the subsequent woven sandals[8].

Demography, subsistence, and mobility patterns

While it cannot presently be firmly proven, it is reasonable to think that population levels were very low during this period. Ames predicted that the Columbia Plateau might have held as few as two and as many as 20 maximal bands during this period (Ames 1988b). Maximal bands range in size from 175 to approximately 500 people (Wobst 1974). It is also a reasonable inference that these groups were highly mobile.

A number of researchers have examined mobility patterns for all or portions of this period, usually the Early Cascade\Vantage subphase (7000 – 5700 BC), as opposed to the Windust phase (11,000 – 7000 BC). Bense (1972) examined the excavated Cascade phase assemblages from the Lower Snake River and concluded that Cascade mobility patterns were, overall, similar to those of 19th century Nez Perce, in that sites were regularly reoccupied, winters were spent in the canyons and people dispersed into the uplands in the other seasons to acquire resources. She did not postulate winter villages. Sites were small. She also found no difference in mobility and settlement patterns before and after the Mazama ash fall. Ames (1988b) examined the reported assemblage contents of Windust and Early Cascade sites and concluded that Windust mobility patterns were somewhat more collector-like than Early Cascade patterns which fit expectations of foragers. He also postulated that mobility levels were high and that groups covered a great deal of ground.

More recent analyses generally support Ames' results. Some of this recent work is based on lithic procurement, usually of obsidian[9], and on the organization of lithic technology, including reduction techniques and artifact use-lives (e.g. Hess 1997). Hess concludes, for example, that in the southern uplands during the Early Cascade\Vantage phase (7000 – 5700 BC), that groups moved perhaps 10 km over the "short run" but they might move as much 150 km, and even over 400 km over a "long run" of two or three years. Connolly, for example (1999) (Figure 11) shows that the average distance for obsidian procurement[10] at the Paulina Lake site was 50 km – some distances were greater. Hess compared this pattern with mobility figures for the Early Modern period (AD 1720 – 1850) and concluded that the distances moved were similar, although he thought the early peoples had moved more frequently. However, his Early Modern sample included maritime peoples on the northern Northwest Coast, an inappropriate comparison since boats allowed them to move distances pedestrian hunter-gatherers would find daunting.

Hess used obsidian sourcing data to reconstruct movements. He concluded that people moved between the major rivers and the uplands by following major drainages, but once in the uplands often moved across drainages. Data generated by INFOTEC from the Pipeline Expansion Project also indicated considerable movement through the uplands (Hess drew on their data, so the similarity in conclusion is not surprising. However, they looked at a wider array of raw material types, although obsidian was the principal one).

There is strong evidence (e.g. Ames 1988b, Schalk et al. 1995, Connolly 1999) that mobility and subsistence patterns during this period focused on wetlands. Overall site distributions on the Plateau (Figure 8) shows them to be concentrated in the wetter portions of the Plateau. Finer–grained settlement studies (e.g. Schalk et al. 1995) have also shown this.

While the evidence convincingly shows movements from the rivers into the southern and eastern uplands, and use of the uplands, there is little evidence for human use of the central Columbia Basin during this period. This includes the general region in which the Kennewick individual was found. With the exception of Lind Coulee, which is located on what was a permanent watercourse when it was occupied, there are no Windust sites in the central Basin, nor is surface Windust material reported from surveys. Cascade materials, including sites and surface finds are reported, but with one possible exception, they are located very close (within a mile) to the Columbia River (Chatters 1980, Galm et al. 1981). The single exception is Meyers Cave (Bryan 1955), where what may be the base of a Cascade point was recovered at the bottom of the deposits, which appear to span the Middle and Late Holocene. There is no Cascade material out in the middle of the Basin. It is not until the beginning of Period II (4500 – 1500 BC) that projectile points and other materials are found away from the rivers, and these in only small numbers until c. AD 1.

Evidence indicates that a range of both large and medium mammals was taken during the Windust (11,000 – 7000 BC) and Cascade (7000 – 45000 BC) phases, including bison (only at Lind Coulee), elk, deer, antelope (only in Cascade phase sites), rabbits, and other medium mammals. There is scattered evidence for fishing, including a notched net weight in the Windust component at Hatwai (Ames et al. 1981), and fishing gear and fish at Bernard Creek Rockshelter in Hells Canyon (Randolph and Dahlstrom1977). While salmon are present at Bernard Creek, other fish are also present.

The major evidence for fishing during this period comes from the Five Mile Rapids site, near The Dalles, Oregon, at the upstream end of the Columbia River Gorge. The site, excavated in the 1950s by Luther Cressman and others (Cressman et al. 1960), produced some 150,000 salmon bones in its basal deposits, which are dated to c. 10,200 – 8500 BC (9785±220 BP) by a composite radiocarbon date collected from throughout a two–meter thick deposit. V.L. Butler recently re–exposed portions of Cressman's excavations, including the levels where his crews recovered the salmon bones. She dated nine samples collected from the entire deposits she exposed. Based on her dates and stratigraphic work, V. L. concludes that a minimum age for the salmon–rich deposits would be c. 5940 – 5540 BC, and the maximum age is c. 7260 – 6500 BC (V.L. Butler n.d.). This is significantly younger than Cressman's estimate of the age of these deposits. Given the potential errors in a composite date collected across a two–meter profile, V. L. Butler's estimate seems far more likely to be correct. Schalk and Cleveland (1983) questioned whether the salmon deposit was a natural or cultural deposit. V.L. Butler (1990) demonstrated conclusively that the bone deposit was produced by humans. However, the site has proven problematic since the dense salmon deposits are not replicated elsewhere in the Plateau, deposits above the salmon–rich strata have few or no salmon bones, and it has proven difficult over the years to tie the reported sequence of cultural materials to other sequences in the region (e.g. Nelson 1969). V. L. Butler's recent work raises additional questions about the site and its relevance to this early period.

Five Mile Rapids is not the only site with fish bones. At least 13 sites along the Columbia and Snake Rivers have fish bones dating to this period (Hess 1997, Randolph and Dahlstrom 1977). The available evidence suggests that fishing occurred on the main stems. The evidence also suggests that Five Mile Rapids aside, salmon were not the main emphasis of fishing activities. It also seems likely that fishing was not a major emphasis of subsistence practices, except in some places.

Evidence for plant exploitation in this period is even more limited. There has been no significant work on plant remains associated with sites of this age. Most work was done before appropriate techniques were available. Archaeologists presume that the presence of manos and milling stones, edge ground cobbles, and the occasional pestle and mortar indicate that a range of plant foods was exploited.

The next section reviews the archaeology of the Early Modern Period (AD 1720 – 1850). The intervening period is discussed in Section 6, which addresses the specific topics requested by the SoW.

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[8] The relevance of these sandals might be questioned, since they were recovered to the south of the region discussed here. However, they were found in the Fort Rock Basin, which is not far south of Paulina Lake, which is relevant. Of course, no sandals are associated with Windust materials in the Plateau, so we do not know that this style of sandal was worn in that area.
[9] Archaeologists on the Plateau have little success in sourcing cherts.
[10] There has been little sourcing of chert sources on the Plateau.

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Kennewick Man

Cultural Affiliation Report

Chapter 2
Section 5

Review of the Archaeological Data

Kenneth M. Ames

Archaeology of the Early Modern Period: The Other End of the Sequence

In some respects, this task is reminiscent of much of the archaeological work on the Plateau over the past 50 years. A dominant concern has been to trace through the archaeological record the development of what has usually been called "The Plateau Pattern " in order to establish the time depth of 19th century Plateau culture as described in 20th century ethnographies (e.g. Daugherty 1962; Swanson 1962a, b; Warren 1968; Sanger 1967; Nelson 1969, 1973). In general, these used the Direct Historical Approach, and relied on Ray's (1939) account of Plateau settlement and subsistence patterns, and material culture as their base. At the most basic level, the Plateau Pattern for most of these studies was the Early Modern (AD 1720 – 1850) pattern of winter sedentism along the main rivers based on stored foods, with dispersal across the landscape during the rest of the year to acquire resources. Nelson is perhaps the most explicit in this regard (Nelson 1969). Further, most, but not all, of these archaeologists assumed continuity and also assumed that the direct historical approach was the appropriate methodology. The goal here is quite different.

The Early Modern Period was defined as the period between the appearance of the horse, c. AD 1720, and the beginning of the reservation period. We are concerned in this study with the early portions of that time, from 1720 until the beginning of the 19th century, which marks the start of documented face–to–face contact between Indian people and Europeans. However, there may have been a longer period of indirect contact. Stapp (1984, 1985) demonstrates the presence of trade copper in the region before direct contact and argues for a precontact period beginning around AD 1600. Discovery of an iron adz in sediments dating to AD 1440[11] on the Lower Columbia River (Ames et al. 1999) shows that metal objects were present in the Northwest before the permanent presence of Europeans in the Western Hemisphere.

Archaeologists have paid relatively little attention to this period, primarily because they think its archaeological record is poor. Campbell (1989) reviews that record and concludes that there is sufficient data to conduct fruitful research. Her research problem was to try to determine whether there had been smallpox epidemics in the

Northwest before the mid to late 1700s, when smallpox is documented for the region (Boyd 1998). Campbell was interested in testing Doybn's hypothesis that a major smallpox epidemic occurred in North America starting in the Aztec capital of Tenochtitlan in 1520, with the Spanish Conquest (Dobyns 1983). Ramenofsky (1987) had also tested this hypothesis with archaeological data in other portions of the continent with mixed results. Campbell found what could be interpreted as evidence of a population decline in central Washington in the period between AD 1520 and 1540. Campbell's method (and indeed the work of Dobyns and many others) has been scathingly criticized by Henige (1998). Suffice it to say here, there is evidence, both weak and strong, to suggest that the impacts of European contact and the expansion of Euroamericans west from the eastern seaboard were probably felt here well before face–to–face contact, and before the arrival of the horse. So, while what I am calling the Early Modern Period begins c. AD 1720, a proto-Modern Period beginning as early as AD 1600 must be recognized (see also Collins 1997 for her discussion of this period).

Reid (1991b) provides a chart covering the last several hundred years for Hells Canyon (Figure 12). One distinctive feature of Reid's reconstruction of this period is the late date he assigns to full-equestrian culture. Most workers assume the full impact of the horse to have occurred during the mid-1700s. Reid places it after 1800.

Assemblages are usually assigned to this period based on the presence\absence of trade goods. Stapp (1984, 1985) and Campbell rightfully criticize this, since trade goods were probably rare at first. Therefore, assemblages dating to the earliest Early Modern, or the proto-Modern, period may mistakenly be seen as pre-contact. Similarly, assemblages with trade goods, particularly metal, may be mistakenly assigned to the post-contact period. Of course, the issue then becomes how to date such assemblages independently of the trade goods. The period after AD 1500 is notoriously difficult to date using radiocarbon dates, for example. There is no immediate or simple solution to that problem.

The impact and affects of post-horse contact is also a matter of debate. For example, most assume that the appearance of the horse on the Plateau led to rapid changes (e.g. Josephy 1997), but Reid (1991a) argues that the full impact of the horse may not have been felt until the late 18th century – early 19th century. The traditional view in ethnography has long been that while contact had serious impacts on the cultures of the region (e.g. Kroeber 1938, Ray 1939), Plateau cultures were conservative, surviving relatively intact into the mid-19th century and even later. Thus, it was thought that ethnographic accounts written in the early 20th century provided an excellent basis for reconstructing precontact cultures. More recent workers have challenged that viewpoint, arguing that depopulation, in particular, caused serious disruptions (e.g. Campbell 1989). Much of this debate is beyond the scope of this study since it ends at 1800. However, it must be born in mind.

The approach taken here is to look for continuities and discontinuities between archaeological manifestations, rather than between an archaeological manifestation and cultures documented through historical documents, oral traditions, and ethnographic observations. In other words, what are the known material manifestations of late 18th-early 19th century Native American cultures along the Middle Columbia and Lower Snake Rivers and are there links between these and the "earlier manifestation"?

Walker (1998:3) provides a general picture, similar to the "Plateau Pattern" of earlier workers:

1. Riverine focus (linear settlement patterns along the major rivers);
2. Reliance on a diverse subsistence base of anadromous fish and extensive game and root resources;
3. A complex fishing technology similar to that seen on the Northwest Coast;
4. Mutual cross-utilization of subsistence resources among the various groups comprising the populations of the area;
5. Extension of kinship ties through extensive intermarriage throughout the area;
6. Extension of trade links throughout the area through institutionalized trading partnerships and regional trade fairs;
7. Limited political integration, primarily at the village and band levels, until adoption of the horse;
8. Relatively uniform mythology, art styles, and religious beliefs and practices focused on the vision quest, shamanism, life-cycle observances, and seasonal celebrations of the annual subsistence cycle.

Traits listed by other authors in the Handbook (Walker 1998) include: winter villages (in the horse period, large summer aggregations can also be expected) with long houses made of poles and mats. Some of these were up to 20 to 30 meters long, 10 meters wide, with a row of hearths down the middle. These structures were placed over pits 1 to 1.5 meters deep. The summerhouse was a mat lodge, which was a tipi–like structure, with pole frame, covered in mats. Food storage was in "pit houses" near villages. Other structures associated with villages/aggregations were sweat lodges and menstrual huts. The people of the Plateau made use of a complex bone technology, which was part of their fishing/hunting tackle. Harpoons were single barb toggling harpoon ("single prong"). Bone tools were also used for making and repairing nets, since netting made from traditional fibers was not very durable (Hewes 1998), requiring constant repair. Tapered hollow bone tubes were also part of the stick game (Brunton 1998), a definitive Plateau trait. Digging stick handles of antler/bone were also distinctive parts of the material culture. Roots were cooked in earth ovens.

I also culled Jorgensen's (1980) compilation of traits of Native American societies in western North America for ones that might be archaeologically visible. These traits are not necessarily exclusive to the Plateau, however, some being variously shared by groups to the south. Many are not archaeologically visible. People, myself included, will also debate some of the specifics of this list.

These trait lists can provide a general orientation and a guide, but they are not archaeological correlates for the archaeological record of the Early Modern or the proto-Modern periods. It is not possible to both devise such correlates in the time allotted for this study and to search the published record for the evidence for them. There are some archaeological studies that do cover the pre-contact and Early Modern Periods. These include Yent (1976), Stapp (1984, 1989), Campbell (1989), Reid (1991a), and Endzweig (1994). Yent's and Endzweig's studies are particularly useful. I will return to them below.

Finally, there are no studies available for the Plateau similar to Fowler's (1994) analysis of Great Basin material culture in museum collections, Adovasio's analyses of basketry styles, or similar analyses on the Northwest Coast (e.g. Croes, 1989 Bernicke 1998). The appropriate perishables are very rare in Plateau archaeological collections, where neither dry caves occur (or have been discovered) in any numbers, nor have wet sites been found. There are studies of Modern period Plateau basketry (e.g. Conn and Schlick 1998). Coiled and twinned basketry fragments are reported for the Five Mile Rapids site, perhaps dating in excess of 9000 years. However, as Conn and Schlick note, these manufacturing styles are common world–wide. We would need a sequence of decorations which are unique to the Plateau.

As has been noted, prior to the 1970s, archaeologists working on the Plateau, sought to establish the time depth of what was termed the "Winter Village Pattern" – the archaeological manifestation of what was thought of as the ethnographic pattern. Nelson's is the most explicit (Nelson 1969, 1973):

1. Storage facilities, usually pits, within the village or nearby rock shelters;
2. Burial, with some exception, in cemeteries associated with villages;
3. A complex cycle of religious rituals with its focal point in the winter village, often producing tangible remains, such as pictographs, petroglyphs, rock alignments and sweat baths;
4. Winter villages linked to a series of task–related satellite camps located at important resource localities;
5. The winter village would be substantially larger than the task sites, which would lack evidence of structures;
6. Winter hunting to supplement stored fish and roots, and carcasses returned to the village whole;
7. Winter collection of fresh water mussels;
8. The winter village would contain the widest possible array of artifacts.

Many of the features he describes are characteristics of collectors generally (4, 5, 6, 7 and 8), and duplicate traits listed by Walker and Jorgensen. However, the specifics are not (collection of mussels as winter food). Of archaeological interest, however, is that animals hunted during the winter were not field processed, implying they were taken within the foraging radius of the winter village itself. The presence of winter storage is a standard collector feature, although, again, the use of storage caves is specific to the Plateau.

Table 3 Plateau material culture traits (Jorgensen 1980)
Dug-out canoes
Portable nets for mammals
Log Deadfalls – Nez Perce
Gill nets and seines
Fish weirs with traps
Leisters
Single point harpoons
No seed baskets
No seed parching implements
No milling stones
Stone boiling of food
Crutch handled digging sticks
Wooden mortars in sides and ends of logs
Portable stone mortars, both hollowed and slab
Meat dried by smoking or over fire
Food storage in pits, caves, rockshelters, in houses, house roofs, platforms and other special structures
Semi-subterranean house dominant house type
Conical dwellings, three and four pole construction
Structures covered in hide, woven and sewn mats
Houses covered in unprocessed earth or sod
Basketry: both twining and coiling (equally)
Domesticated dog
Aquatic animals (fish) important to diet (50- 100%)
Fish/fish by products, aquatic mammals procured "extra-locally" 1 – 10 % of diet
Hunting of secondary/tertiary importance; Medium/large mammals dominant
Estimates 11 – 50% diet locally hunter mammals and birds
Gathered plants of secondary importance
26 – 50% of diet locally gathered plant foods
Plant foods gathered: herbs, roots, tubers, seeds, berries, fruits
Extra-local procurement of plant foods: 1 – 10% of diet
Transportation (pre – horse) humans and dogs
Medium craft used for rivers
Food storage 7 – 12 months
Claims no ownership of key gathering sites
Some ownership of hunting sites
Equal reciprocity of food and chattels
Redistribution: individual to non-kin
Bargain with strangers, gifts to friends
Gift exchange: between any and all
Access to resources, generally open
Bargaining with everyone in trade between communities
Settlements described as "semi-nomadic"
Compact villages of camps
Community sizes (winter) 50 – 99
Population densities 1 – 5/m^2
Residential kin group/village maximal political unit
Leadership: inherited from "privileged group" wealth, quality
Raiding rare (0- 1/year) to moderate (2 – 4/year)

[11] The adz is dated by six radiocarbon dates, including one on charcoal recovered within 10 cm of the adz in the same depositional lens.

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ARCHEOLOGY & ETHNOGRAPHY PROGRAM

Peoples & Cultures
Recording Our Heritage

Kennewick Man

Cultural Affiliation Report

Chapter 2
Section 6

Review of the Archaeological Data

Kenneth M. Ames

Review of the Archaeological Record: Continuities, Discontinuities and Gaps

Radiocarbon dates and population dynamics in time and space

Evidence from radiocarbon dates.
Archaeologists have long been interested in population changes on the Plateau. Early workers were aware, for example, of greater numbers of sites post-dating 2000 years ago, and assumed that reflected significant population growth. Coupled with this has been an interest in population dispersion: i.e. where were people concentrated during particular times during the Holocene and why? Of course, population dispersion is related to settlement patterns, and the long-standing interest in establishing when the Early Modern (AD 1720 – AD 1850) settlement pattern system developed. This interest has been hampered until the last decade or two because most archaeology on the Plateau was focused in areas to be flooded by dams. Thus while there was considerable knowledge about occupation along the rivers, there was correspondingly little about occupations elsewhere. This has changed, particularly in some portions of the Central Basin, and the Southern Highlands.

Earlier estimates of population size and dispersion were based on the spatial and geological distributions of diagnostic artifacts, house pits, and sites, as well as the numbers and sizes of house pits and sites. All of these measures are affected by a variety of site formation processes, including erosion. Hammatt (1976), for example, suggests that variation in site numbers during some periods in the Lower Snake River region are the result of the river's depositional cycles. Researchers have more recently turned to radiocarbon dates as a surrogate measure of human populations. The basic assumption in using radiocarbon dates as an indirect measure of human numbers is that there is a relationship between the number of people in an area, or during a period of time, and the amount of archaeological charcoal that is present, i.e. more people = more charcoal. There are two additional assumptions: there is a direct, positive relationship between the amount of archaeological charcoal and the number of radiocarbon dates; and that there has been no loss of charcoal with time.

(e.g. Rick 1987. See also Erlandson and Moss [1999] who discuss some of the formation process issues associated with use of radiocarbon dates.).

Chatters (1995) has pointed out that destruction of old archaeological charcoal by a variety of processes and sampling error will produce a sample of 14C dates heavily biased towards recent than older dates. With regards to sampling error, the available sample of early sites primarily reflects a combination of skill and luck, in the sense that there has been no structured search for "old dirt" across the Plateau. Thus, old deposits are likely to have been "under–sampled." To control for loss of charcoal with increasing age resulting from site formation and destruction processes, Chatters proposes a correction factor. However, as yet, he has not provided the empirical basis for that correction. On that ground alone, I elected not to correct for loss. Further, the inherent "spikiness" of a plot based on a small sample will be exaggerated by any correction factor. Finally, the correction factor removes us one more step from the original data and may itself be subject to unknown sources of error. On the other hand, I agree with Chatters that great caution is needed in interpreting 14C data sets.

For this report, a database of 969 radiocarbon dates was developed. These dates are primarily from the radiocarbon databases of the Washington and Oregon SHPOs. These databases are for their entire states. The dates used here are from the counties covered by this study: in Washington, all counties east of the Cascade mountains, while in Oregon, the counties along the Columbia and Snake Rivers. To this sample was added the catalogue of radiocarbon dates in Sappington (1994) for the Clearwater River drainage. The Washington/Oregon databases are current to 1998, Sappington's to 1994. The Oregon database did include Paulina Lake (Connolly 1999). The Washington database was further limited by removing all except charcoal dates. Thus, for example, the data base for this report does not include the early shell dates from Marmes (Sheppard et al. 1987), or the bone dates from Lind Coulee. The Oregon database did not provide information on dated material, so the dates used here still may include shell, soil, and other materials in Oregon. The exclusion of shell and bone dates from the database reduces the number of very early dates by removing, for example, nine early shell dates from Marmes, two bone dates and a soil date from Lind Coulee, among others. Altogether, 80 shell dates were removed, spanning a period from 1210±70 to 10810±275. The majority of shell dates predate 4000 BP. Archaeologists chose shell to date when they need a date and charcoal is unavailable. The removal of shell and other non-charcoal dates is appropriate for a number of reasons, including the underlying assumption of these analyses that the amount of archaeological charcoal is a surrogate measure of human numbers. The graphs also do not include the very early dates from Cooper's Ferry listed in Table 1.

All dates were calibrated using the OxCal version 3.3 calibration program. This program was selected because of ease of data entry and reading results. Only two-sigma age ranges were used. Where dates were calibrated in the sources, but only single sigma age ranges provided, the dates were recalibrated. One set of graphs use uncalibrated dates, for reasons explained below.

The dates are graphed here in three ways. In the first pair of graphs (Figures 13 & 14) the uncalibrated intercept dates are plotted in 50-year increments. In the first of these, a two–unit (100 years) moving–average line was fitted to the raw counts. In the second, the percentage of the total dates was plotted/50 year period. In the third graph (Figure 15) the total sample of calibrated dates is graphed as high-low graphs. In the fourth graph (Figure 16), the number of dated sites/250 year period is plotted. Usually when this is done (e.g. Chatters 1995), intercept dates are used, and the number of intercept dates/time unit is charted. However, this procedure can be biased when sites have produced a large number of dates in a particular time span. The alternative is to count sites with dates during a particular period; thus a site with one date and another with 300 during the period each count as one. With age spans, the situation is a little more complicated. In this case, we used 250-year spans, and counted sites with calibrated age spans that fell entirely within a 250-year period. If a site had a single date, with a wide sigma, it could fall into several 250-year periods. It was counted as one site in each increment. This has the effect of exaggerating the presence of that site, but to eliminate dates with wide age-ranges would eliminate many more early dates than had already been removed. Using age spans also has the effect of smoothing curves, and making them more conservative. Finally, a series of radiocarbon date plots developed by Chatters (1995) (Figures 17 & 18), Hess (1997) (Figures 19 & 20), and Ames (Ames 1991) (Figures 21 & 22) are presented and discussed.

The uncalibrated dates were plotted for two reasons: first, they are the raw data upon which this entire discussion is based. Secondly, most of the discussion in the literature is based on calibrated dates. However, calibrating dates (converting radiocarbon dates to calendar dates) is not a straightforward matter, despite the ready availability of calibration programs, such as OxCal. In analyses of the kind discussed here, researchers increasingly use calibrated dates so that the temporal duration of demographic events revealed by plotting the dates is closer to their actual date and duration. However, the act of calibration does not ensure that the patterns in the data reflect events in the past. It may, but calibrating radiocarbon dates can itself create patterning, for reasons relating ultimately to long–term variations in atmospheric ^{14}C.

The question then is whether this particular data set is robust enough to support inferences about demographic trends or shifts. As would be expected from a small sample the temporal distribution of dates before 5000 BP is spotty (there are only 92 charcoal dates earlier than 5000 BP). Some of the peaks before 5000 BP can be partially accounted for by sampling: multiple early dates from Hatwai, Paulina Lake (Connolly 1999), and 35JE49 (Horne 1995). Five sites are reflected in the peak of dates at c. 9800. This peak includes multiple dates from Hatwai. The peak at 8000 BP also includes a range of sites, including Paulina Lake, Wildcat Canyon, Five Mile Rapids, and others, but also multiple dates from single sites such as Paulina Lake. Site sampling affects the graph. The gaps between dates also probably reflect sampling, particularly given the small sample of excavated sites, and the likely loss of datable charcoal. However, some of the gaps could also be "real" in the sense that they point to a break in the record.

The vast majority of dates fall after 4000 BP (2400 BC); 52 % of all dates are later than 2000 BP (AD 1), and 47 % post-date 1700 BP (c. AD 350). While this overall distribution of dates probably reflects human population sizes, it also is a consequence of other factors as discussed above. The numbers of dates begins to increase irregularly after 4500 BP. This increase occurs in three episodes, one just before 4000 BP, a second 3500 and 2500 BP and a third between 1700 and about 700 BP. There is a major dip in dates just before 2000 BP This dip in dates corresponds to a "kink" in the 14C curve (Figure 23) that may partially account for the relatively few dates in that period, suggesting that the pattern should be regarded with caution.

Turning from the raw dates to the calibrated dates, in Figure 16, the numbers of dated sites are steady between c. 11,000 BC until 8000 BC, when there may have been a slight decline (remember that this plot was constructed in a way that minimized spikiness). This decline is followed by a period between 8000 BC and 4250 BC of higher, but slightly fluctuating numbers. The number of dated sites begins to rise exponentially until about 3000 BC where there is a brief plateau in numbers for 750 years. They then increase, reaching a bimodal peak between 1250

BC and 500 BC. The numbers of dated sites plummet sharply, achieving a nadir between 250 BC and AD 250. They increase again rapidly, reaching a second, complexly bimodal peak between 250 AD and 1000 AD, after which they plummet. The complexity of this latter period is also reflected in the raw dates.

Chatters (1995) plotted calibrated intercept dates in 20-year spans (Figure 17). His graph contains two lines, one representing the calibrated dates, the second the dates corrected for loss of charcoal. His unadjusted plot is similar in its overall shape to my plot of uncalibrated dates, though quantification techniques differ. His correction for progressive loss of charcoal with time has a significant impact on the graph, increasing its overall spikiness before 4500 BP. The apparently small increase in dates around 4000 BP becomes quite large in his graph. The other impact of the correction is to lessen the impact that the large number of post-2000 BP dates has on Figures 13, 14, and 16. The demographic implication of these three figures is that human populations on the Southern Plateau were several orders of magnitude larger during the past 2000 years than they had been previously, the base population was much higher and the region had experienced exponential population growth between 3500 BC and 500 BC. Chatters' figures suggest that while populations were overall higher in the last 4500 years or so, the base population was not orders of magnitude larger than it had been previously.

Most recently, Hess (1997), following Chatters' approach, plotted first the calibrated intercept dates for dates from the Washington and Oregon SHPO radiocarbon databases. That graph (Figure 19) is very similar to the one produced for this study (Figure 13). He then plotted a least-squares best-fit line to the first graph, and plotted the residuals (Figure 20). He also used Chatters' correction factor for charcoal loss with increasing age. Hess' plot shows an early Holocene peak at c. 6000 – 5500 BC. The residuals then fluctuate, but slowly decline (rather than remain steady). Hess' graph shows a marked Holocene nadir at about 4800 – 4600 BC. Hess' early Holocene peak may be an artifact of multiple dates from single sites. His plot does show exponential growth at 3500 BC with a higher subsequent population, as well as fluctuations over the past 3000 years.

What can we conclude about demographic changes on the Plateau from all of this? Before answering that question, I want to raise two other factors that might account for some of the apparent patterning. Site formation processes is one of these factors. Fluctuations in conditions conducive to or inimical to the preservation of sites will be reflected in the graph. Hammatt (1976) argues, for example, that the relatively low numbers of Tucannon sites on the Lower Snake River is a reflection of alluvial cycles, not human numbers. Presumably, since this sample is for a broad region, it should be relatively insensitive to such local conditions.

Another, and important, factor affecting the shape of this graph is settlement patterns, or put another way, our monitoring position. If a small number of people are widely dispersed on the landscape, they will generate more sites; if a larger number are concentrated in a few places, they will produce fewer sites. While our underlying assumption is that number of people = amount of charcoal, our measurement of that will be affected by archaeological sampling practices. Archaeologists may only date a few samples from a massive, deep residential site, while they may run samples from each of many small sites, producing more dates for the smaller population. Finally, if we sample one landform more than we do others, patterning in our sample may reflect fluctuating uses of that landform, not numbers. For example, if the bulk of the radiocarbon sample is taken from river canyons, then the numbers of dates will go down during periods when settlement patterns are focused in under sampled upland areas.

We can return to the question, then, what do these analyses tell us about demographic processes on the Plateau? First, it is clear that the sample is sensitive to plotting technique. This is sharpest in the contrasts between Figure 16, which is based on age ranges, and the figures based on intercepts. The apparent pattern will also be affected by the interval in which dates are plotted (20 years, 50 years, 250 years). This sensitivity to quantification technique suggests that these data are not robust, and conclusions must be drawn cautiously. Given these cautions, the analyses taken together seem to show that populations were lower during the Early Holocene, perhaps falling (or fluctuating) to a low point around 4800 BC. Exponential growth may have begun after 3500 BC, depending on whether Chatters' correction is used or not. Schalk et al. (1995) using dates based on obsidian hydration rinds suggests that the increase in population in the Middle Holocene is real, but that it began about 5000 BC, at least in northeast Oregon. This technique may provide an independent check on the 14C–based curves. Finally, all analyses indicate some degree of demographic flux during the past 3000 years, and even within the last 1500 years.

A more refined analysis could, and should, be done, in which the geographic distribution of dates during particular periods is analyzed as a measure of changing dispersion during different periods. Such an analysis was also beyond the temporal constraints on this study. Reid (1991a, Figure 24) has contrasted the numbers of radiocarbon dates in the uplands and canyon bottoms for the Lower Snake River drainage for the last 5000 years, suggesting the patterns may point to shifts towards the uplands during dry periods, and back towards the canyon bottoms in wet periods. There is evidence for population shifts in the southern highlands.

Based on evidence produced by the Pipeline Expansion Project through central and northeast Oregon, Schalk et al. (1995) conclude that there was what they term a "pause in land use" between 3200 and 2000 BC. Their evidence suggests the region for which they have data was not used or was only lightly used during that period, which corresponds to the beginning of Pithouse 2.

For a more recent period, Endzweig (1994) suggests, based on radiocarbon dates and regional climate records, that there were shifts in population distribution in the southern highlands during the past 2000 years. Endzweig (1994), Pettigrew and Hodges (1995), Schalk et al. (1995), and Hess (1997) all suggest that there may have been a general shift from villages scattered through the uplands to villages concentrated along the rivers, during the past 2000 years (which may explain the increased number of dates, given that most excavated sites are residential sites along the rivers). The uplands were not abandoned, but use may have shifted more to logistical task groups. Schalk et al. (1995) also argue for the formation of major population aggregations – large villages – at this time, using the Miller site (Cleveland 1976, Schalk 1983a) near the confluence of the Columbia and Snake Rivers as an example of a very large village that formed at this time. Radiocarbon date plots for the Chief Joseph Reservoir also show gaps in that record (Figure 25).

In reviewing the causes archaeologists propose for these changes, they are all fundamentally ecological, except for the last 1000 years or so when the Numic expansion is sometimes invoked (e.g. Reid 1991a). As far as I am aware, no one has invoked major population incursions to explain periods of growth. However, swift changes in subsistence organization of the kind Bettinger (1994) proposed to mark the Numic expansion in the Great Basin have been proposed (see below).

Other Long-term Evidence for Population Distribution

As noted above (Section 4) the central Columbia Basin is the only portion of the region that appears to have been at least partially unoccupied for any period during the Holocene. During Period 1B (11,000 – 4500 BC), population distribution appears to have been controlled by effective moisture (Ames 1988b), with sites located in areas we would expect to have been moister, or areas that had moist, edaphic conditions (e.g. Lind Coulee). As the climate became increasingly warm and dry after c. 9000 BC, people may have withdrawn from most of the central Basin. One site, Meyers Cave, has a projectile point sequence that appears to span the last 7000 years or so, but it, again, may reflect local edaphic conditions (Bryan 1955). Surveys of the central Basin (Greene 1976, Chatters 1984, Galm et al. 1981) have failed to find materials that date to the period between ca. 9500 BC (or before) and perhaps 4000 BC. Galm et al. (1981) note some materials that may be as old as those latter dates, but it does not appear to be until after c. 1000 BC that people begin to make extensive use of this dry, interior area. As discussed above, the available evidence suggests that what little activity there was in this area prior to c. 4000 BC occurred within about a mile of the Columbia River.

Discussion

While we do not have strong control over the human demography of the Plateau, it is clear from the evidence cited above, and yet to be discussed below, that people have shifted around on the Columbia Plateau landscape during the Holocene. However, there seems to be no evidence of a major Plateau–wide break in occupation during that time.

Material Culture

As observed above, little of Early Modern (AD 1720 – 1850) material culture on the Plateau has received the kind of archaeological or anthropological attention that would allow homologies in the form of both active and passive styles to be traced back in time. Further, the available archaeological sample of perishables for the Plateau is quite small (e.g. Mills and Osborne 1952, Cressman 1960, Swanson 1962). In contrast, on the Northwest Coast, for example, it is possible to trace some styles back in time as much as 4000 years using a combination of materials from both dry (e.g. Holm 1990) and wet sites (e.g. Croes 1989). Even there, however, the archaeological sample of objects bearing design motifs is quite small (Ames and Maschner 1999), limiting the kinds of inferences that can be made. Further, such analysis requires visits to museums and curatorial centers, and study of the objects themselves. Such an analysis has never been done for the Southern Plateau, to my knowledge, though decorated objects do occur archaeologically. In fact, there has been little attention to material culture among archaeologists working on the Plateau.

Early workers (e.g. Daugherty, B. R. Butler, Nelson, Swanson) viewed material cultural style as informing about historical relationships, with an emphasis on temporally sensitive artifacts. However, as noted above, this interest did not translate into a research program that emphasized material cultural distributions in time and space. In the late 1960s and early 1970s, with the shift in interest to questions about land-use, subsistence, and ecology, artifacts were de-emphasized, except as they could inform about subsistence practices. While this may be read as a criticism, it is not. No one could anticipate the necessity of studies such as this one. Additionally, a thorough, coherent study of material culture changes on the Plateau would require a great deal of time and resources to accomplish, absent a long research tradition of such work. Such a study is beyond the scope of the present effort, though it would be very germane. As a consequence, it is not possible to reliably trace most elements of Early Modern material culture back in time, except for a few artifact types that have received emphasis, and except for a very few studies that have focused on doing that.

Yent (1976) analyzed the recovered assemblages from the Wawawai site on the Lower Snake River. Her interest was to compare assemblages that pre and post-dated contact and to test Leonhardy and D. Rice's distinctions between the

Harder (500 BC – AD 1000), Piqunnin (AD 1000 – 1720) and Numipu (post – 1720) phases. The site contained three components assignable to the Early Modern (AD 1720 – 1850) and Late Modern (post- 1850) periods. The most recent post-dated AD 1860, a second was thought to date between c. AD 1840 and 1860, and the oldest was dated to the late 1700s based on the presence of trade goods. The pre-contact assemblages were derived primarily from houses and were radiocarbon dated to c. AD 1000, if not somewhat earlier (Yent 1976). Yent also used earlier assemblages from Alpowai (Brauner 1976) in her analysis. These latter assemblages were also from houses and dated to as early as c. AD 1 – 100. Her analysis was restricted to non-perishable tools, such as projectile points, cobble tools, etc.

She concludes there is strong, overall continuity among these assemblages during the period covered by her analysis. The only trends or changes she observed include:

- Changes in the relative proportions of medium and small projectile points (see below);
- Absence of L-shaped scapula awls at Wawawai, while they are present earlier at Alpowai;
- Matting needles less common at Wawawai;
- House pits at Alpowai change from round to oval, and become shallower. Earlier house pits are c. 1 m deep, while later ones are about .6 m – .8 deep;
- The changes in house pit profile (becoming shallower) and hearths are absent at Wawawai where house form is stable.

The change in house pit form is widespread on the Plateau and is discussed below in the section (Section 6.4) on houses[12]. The changes in projectile point forms are also discussed in the next section. The other trends she observes (excluding the presence of trade goods) could be due to sampling, since only two sites are involved in her study. The artifacts she examined are utilitarian, profoundly utilitarian. It is quite unlikely that these tools would display active style. Any stylistic variation in their form is likely to have been passive style. Given their utilitarian nature it could be argued that the continuity she observed is continuity among a restricted range of activities, among a restricted range of functional alternatives, and therefore the continuity reflects analogies rather than homologies. Many of the forms are widespread and are common types of stone tools, again probably reflecting a limited array of options (there are only so many ways to make an end scraper). However, the continuities she observes include almost the entire material record, and the only changes are ones which occur across the entire Plateau, or which may simply be the result of sampling.

Collins (1997) examined changing gender roles on the Southern Plateau, using burial data. She divided grave goods into utilitarian and non-utilitarian artifacts. While burial practices are outside the scope of this study, she also concludes that there is continuity over this lengthy period.

Projectile Points, Styles, and Function
As in many places in North America, projectile points have been the focus of most analyses of artifact style because they vary in time and space, and, in the absence of other chronological controls, are essential to dating archaeological sites. There are debates in the archaeological literature over what this variability means. Some of it may be functional, while some of it is certainly due to repair and reworking after the object has broken in use (e.g. Flenniken and Raymond 1986, Thomas 1986), changes in hafting methods (e.g. Musil 1988), and in weapon systems (e.g. shift from atlatl to bow and arrow). However, archaeologists also sometimes argue that

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contemporaneous variation (usually in hafting element) that cannot be explained functionally may reflect ethnic differences (e.g. Reid 1991a). Thus, the presence of the small Desert Side Notched point of the Great Basin is often taken on the Plateau to be evidence for either contact with, or the presence of, Numic speakers including Shoshone and Northern Paiute.

Despite the importance of projectile points, there has been remarkably little analytical attention paid to them on the Plateau. Lohse's work (Lohse 1985, 1995) remains the only formal analysis of a large collection of Plateau projectile points. The foliate Cascade point is an important example here. As a type, it was first defined by B. R. Butler (1961), and the definition refined by Nelson (1969). The type is central to both the notion of the Old Cordilleran Culture concept, and Leonhardy and D. Rice 's Cascade phase (7000 – 4500 BC). It is a major time-stratigraphic marker. However, foliate points have a very broad time span in the Pacific Northwest, sometimes being recovered in sites much younger than the end of the Cascade Phase (e.g. Baxter 1986). This sometimes has been interpreted as "cultural conservatism" (B.R. Butler 1962). However, often points are classed as Cascade points without reference to the original type definition, nor, aside from Lohse' analysis, have there been studies of variability within the class "Cascade Point." Thus, there is no guarantee that different collections of artifacts classed as Cascade points contain typologically comparable specimens. These comments can be extended to almost all classes of projectile points on the Plateau, and have been (Lohse 1995).

However, the picture is not quite so bleak. First, Lohse (1985) did an extensive analysis of a large sample of projectile points, which has internal consistency. Second, most archaeologists working on the Lower Snake River during the 1960s – early 1990s were trained at Washington State University, primarily by Frank C. Leonhardy and his students, producing a common approach to classification. While this does not ensure typological consistency, it indicates at least a common approach. Unfortunately, there has been no study of eastern Plateau projectile points similar to Lohse's.

Lohse (1985) defined 19 projectile point styles for the Western Plateau (essentially our South-central Plateau) and established their broad temporal distribution (Figure 26). This temporal distribution of types, very broadly defined (i.e. large stemmed, Cascade, Large Side-Notched, etc) extends across the Plateau, though details differ. Windust (stemmed, lanceolate) points (Figure 9) are the earliest, as they are everywhere on the Plateau. Lohse recognized three varieties of Cascade point (Figure 26), although some analysts might include his Cascade B as a Windust variant. Lohse regards his Cascade C as the "classic" Cascade point of B. R. Butler (1961) and Cascade A as a common variant. Both were in use a long time. Evidence from Marmes Rockshelter and Paulina Lake indicate a relatively smooth shift from Windust to Cascade forms during this period of time (Figures 27 and 28).

Cold Springs side notched points are the first notched points on the Plateau and are present in deposits above the Mazama ash, though they also occur below Mazama ash in sites in Hells Canyon (Pavesic 1971, Randolph and Dahlstrom 1977). Lohse (1995) and others regard them as the Plateau variant of Northern Side notched points (see Lohse 1995), which also occur at this time in the Southeastern Plateau, where they are the only trait separating the Early Cascade (7000 – 5700 BC) and Late Cascade (5700 – 4500 BC) subphases in Leonhardy and D. Rice 's original formulation (Leonhardy and D. Rice 1970, Bense 1972). The style appears to have originated in the Great Basin. Lohse (1995) regards them as part of a widespread shift to notched hafting elements that begins in the Early Holocene. The foliate lanceolate points drop out of collections after 2000 BC (but not completely, e.g. Ames et al. 1981[13]). Medium-sized stemmed and corner notched forms appear and

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persist until c. AD 1, when they are replaced by a variety of small stemmed and notched forms.

As noted above, in the Eastern Plateau, where the sequence is longer, Windust points may be present as early as 11,900 BC, though certainly by 11,000 BC. Cascade points are present at Hatwai in sediments dating as early as 10,000 BC. The major difference in regional projectile point sequences, however, appears to be during the Middle Holocene, or the Late Cascade(5700 – 4500 BC)\Tucannon (4500 – 500 BC) phases, when at least one point type not included in Lohse's analyses is common. According to Leonhardy and D. Rice , the type projectile points for the Tucannon phase include a point with an expanding stem, side-corner notching, and short barbs (Leonhardy and D. Rice 1970, 11). This is Lohse' Columbia Corner notched A (Lohse 1985, 349). Leonhardy and D. Rice also describe a point with "a short blade, varying shoulders and contracting stem." Kennedy (1976) found this point to be most common along the Lower Snake River below its confluence with the Clearwater River. These points can be assigned to Lohse's Nespelem Bar type. However, assemblages from about 17 miles below Clarkston (Brauner 1976) up the Clearwater, and into Hells Canyon, contain a very different point, with low side-corner notches, a variable blade, thick cross-section, no shoulders and marked ears on the base, that Ames (Ames 1984, Ames et al. 1981) has dubbed the "Hatwai-eared point". Brauner (1976) first described them at Alpowai, and thought them reminiscent of Elko-eared points in the Great Basin. However, in an analysis using Thomas' approach for measuring Great Basin points (Thomas 1981), Ames (n.d.) has shown the points are metrically not Elko-Eared, though formally similar. This point spans a period from as early as 3800 BC to about 1000 BC.

In addition to this east-west difference, Lohse (1985) notes north/south differences in projectile point distributions on the Plateau at about this period, with Rabbit Island stemmed points more common in sites in the central and northern portions of the Southern Plateau, while Columbia Corner Notched are more characteristic of assemblages on the Southern Plateau. We will return to geographical variation below.

Figure 26 suggests a relatively orderly change of projectile point forms over time, with most forms having some temporal overlap. These changes follow broader patterns of replacement of projectile point styles in western North America (e.g. Lohse 1995), including the appearance of a range of small points around AD 1, although larger forms persist for a few hundred years. These small points are clearly associated with the introduction (or acceptance) of the bow and arrow at that time. However, there are some problems with these inferences.

Deciding whether a point is an arrow point or a dart (atlatl) point depends on the artifact's size, including its weight, shoulder width, and neck width. Thomas (1978) metrically analyzed arrows and darts in a museum collection to determine if points could be consistently assigned to one class or the other on a metric basis. More recently Shott (1997) investigated the utility of four measurements (length, shoulder width, thickness and neck width) to separate arrow from dart points, and determined that shoulder width is the best single measurement for separating arrow from dart points. Mean shoulder width for arrows in his study was 23.1± 4.6 mm, and for darts it was 14.4 mm ±3.4 mm, and for neck widths it was 9.8±2.6 and 15.2 ± 3.3 respectively. The mean measurements for neck width and maximum width are presented in Figure 26 (Lohse's closest measurement to maximum width is shoulder width. From his diagram of where he took measurements, he generally measured maximum width across the shoulders [Lohse 1985]). From these measurements, Plateau dart and arrow points appear to be quite small relative to specimens elsewhere in North America. I did not, however, apply Shott's classification functions to Lohse's measurements to test that suggestion. The small size of these points is

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also suggested by Ames' analysis of Hatwai-eared points (Ames 1990). Using Thomas' measurements for distinguishing arrows and darts, Hatwai-eared points are arrow size except in their thickness. While it is unlikely that they are all arrow points, this does suggest that hunting tackle on the Plateau has been relatively small and light for the last 11,000 years.

There are some tantalizing correspondences between the timing of the introduction of general projectile point styles and the possible demographic shifts discussed previously. Side and corner notched points first appeared on the Plateau at about the same time as the major episode of population growth around 3500 BC, and the bow and arrow came into use in the period (250 BC – AD 250) between the two apparent peaks in population (or aggregation) during the late Holocene.

Microblades

Microblades are small blades usually struck from a prepared core. At the Ryegrass Coulee site (discussed below), complete blades are less than 2 cm in length. These small blades were hafted into the ends and/or sides of bone, antler and wooden handles and shafts to produce an array of cutting and piercing tools. To the north, microblades are present in interior British Columbia, and on the central and northern Northwest Coast, and are, in fact, diagnostic of the Archaic period (10,000 – 6500 BC) in that region. They are also found in Alaska as well as Siberia (see papers in Carlson and Dalla Bona 1996). They have great antiquity in Northeast Asia. The circum-North Pacific distribution of microblades plays an important role in some scenarios of the peopling of the New World (Dixon 1999, also see papers in West 1996). On the northern Northwest Coast, they are generally absent, with some exceptions, after 4000 BC (Ames and Maschner 1999). Microblades occur on the southern Northwest Coast between about 1500 BC and 600 BC. The temporal distribution of microblades in interior British Columbia is the subject of some ambiguity (Pokotylo and Mitchell 1998). They may be present as early as 6500 BC and fall out of use after 2000 BC. However, there is also some evidence for microblades there during the last 2000 years (Pokotylo and Mitchell 1998).

Microblades and microblade cores[14] are not found throughout the Southern Plateau. They occur in sites along the Upper Columbia River upstream from Vantage and in sites in Grand Coulee (Galm et al. 1981). In the Chief Joseph Reservoir sites, they date between c. 5000 BC to 1000 BC (Campbell 1985). The largest assemblage of microblades on the Southern Plateau was recovered at the Rye Grass Coulee site (Munsell 1968) where 235 microblades and seven complete and fragmentary cores were recovered. The microblades were associated with a late Vantage/Cascade phase (5700 –4500 BC) assemblage that included Cascade points, Mahkin Shouldered (Lohse 1985) and Cold Springs Side Notched points, edge-ground cobbles and milling stones. The site produced three radiocarbon dates, two on charcoal, one on shell. The earliest charcoal dates are from a composite sample recovered immediately below what was identified in the field as Mazama ash. The date (UW-114) is 6790 ± 340 (cal 2 sigma age span of 6400 – 4900 BC[15]), and given the sigma is reasonable for an early date associated with Mazama ash. The shell date (UW-113) is 6480±80. The second charcoal date is 3525±145 (UW-112) (cal 2 sigma age span of 2300 – 1500 BC). This is taken by Munsell to closely date the site's last occupation. While they are uncorrected, these dates are generally contemporaneous with the dates on microblades recovered farther upstream in the Chief Joseph Reservoir.

Microblades and microblade cores have also been recovered farther west in two sites near Mt. St. Helens in the southern Washington Cascade Mountains. Occupations at both sites are contemporaneous with Ryegrass Coulee. Twelve cores and 43 blades were recovered at Layser Cave (Daugherty et al. 1987a) and

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19 cores and 23 flakes were recovered from the Judd Peak Rockshelters (Daugherty et al. 1987b). The oldest date at Layser Cave is 6650±120 b.p (WSU 3593) which calibrates to 5780 – 5360 BC. The lowest date at Judd Peak is 5970±100, (5250 – 4550 BC). The Layser Cave represents perhaps 1000 or 2000 years of occupation. The Judd Peak occupation spans the rest of the Holocene. Microblades are present through its deposits.

Sanger (1968) suggests that the Plateau microblade tradition was distinct from those on the coast or to the north, although it must, he thought, ultimately derive from the north. Microblades have sometimes been attributed to Athabascan speakers (their presence reflecting a passive style of tool manufacture associated with Athabascans (see discussion in Pokotylo and Mitchell 1998), and their temporal and geographic distribution taken as a measure of the movement of that language family. However, there is also an array of functional, formal and technological issues that surround them (Campbell 1985 Hicks 1997, papers cited in Pokotylo and Mitchell 1998, papers and bibliography in Carlson and Dalla Bona 1994) – it is not altogether clear how and why they were used, and under what circumstances.

In the Chief Joseph Reservoir sample, their distribution seems to be restricted to sites that are classed as field camps and stations/locations (following Binford's terms [Binford 1981]), not residential sites. However, these sites are more generalized than the specialized localities expected of collectors. Campbell (1985) suggests that microblades might have been employed because they were an efficient means of transporting raw material and producing expedient tools. Hicks (1997) was unable to find support for this argument.

Other Chipped and Ground Stone Material Culture

Aside from projectile points, there are really only three categories of artifacts that are distinctive or unique to the Windust (11,000 – 7000 BC)/Cascade (7000 – 4500 BC) phases: small hand milling stones, edge-ground cobbles, and small, finely–made bone needles. The Cascade phase is further distinguished by a heavier reliance on basalt for tool stone than during preceding and subsequent periods and the presence of the Levallois prepared core technique.

Small milling stones are relatively common in Windust sites sometimes in large numbers (e.g. Warren et al.1963, Connolly 1999), and occur in Cascade assemblages (Bense 1972). They drop out of assemblages in the Middle Holocene, at about the same time that mortar bases and pestles appear in the record. It is usually assumed that this pattern reflects a shift in plant processing, an assumption which may or may not be justified. Large, heavy mortars, mortar bases and pestles are associated with some of the earliest houses on the Plateau, and are present in the record after c. 4000 – 3500 BC. Pestles are generally columnar in profile and not extensively shaped and decorated. Mortar bases are often slabs of stone with the mortar depression in the center. These also occur in other contexts besides houses.

In addition to its milling stones, the pre-Mazama occupation at Paulina Lake also yielded large numbers of what the investigators term "abraders." Some of these are flat stones with abrasion striae, while others are grooved pieces of pumice (Connolly 1999). This is virtually unique for a pre-Mazama assemblage, but suggests extensive working of perishable materials. Some of the abraders with striations may also have served other functions. Such tools do occur occasionally in subsequent assemblages. However, while rare, they occur throughout western North America.

Edge–ground cobbles were key attributes of the Cascade phase (7000 – 4500 BC) (Leonhardy and Rice 1970) and diagnostic artifacts of the Old Cordilleran Culture (B. R. Butler 1961). They do occur in Windust assemblages (at Marmes, for example [D. Rice 1972]). They also occur in assemblages dating to the last 2500

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years as well (e.g. Greene 1976, Yent 1976). However, as with Cascade points, the type "edge-ground cobble" may not be consistently applied. Sims (1971), following Sprague and Combes (1966), distinguishes two kinds of cobbles with edge working: edge–ground and edge–battered and proposes several uses for these types, including root grinding and hide working for the former, and as cores for the latter. His distinction is rarely made in subsequent work, however, and so it is difficult to know whether all edge–ground cobbles through time are typologically the same. In early assemblages they are generally taken to indicate plant processing.

Grooved stones, sometimes called "bola" stones, are also associated with Windust (11,000 – 7000 BC) and Cascade (7000 – 4500 BC) phase components (Leonhardy and D. Rice 1970, Figure 3; Bense 1972) and contemporaneous manifestations (e.g. Five Mile Rapids [Cressman et al. 1960). Their function is presently unknown, although they may have been net weights (e.g. Hess 1997). They also may have been bola stones. They are not present in later assemblages. However, a notched (by chipping) cobble net weight is present at Hatwai, in a deposit that probably predates 10,000 BC. Net weights have also been recovered at Kettle Falls, on the Columbia River in the Northern Plateau. These predate the Mazama ash fall. Net weights are very rare in Plateau assemblages until the last 2000 to 3500 years (Johnston 1987).

Generally, most chipped–stone tools on the Plateau are made from a variety of stones archaeologists commonly call "cryptocrystaline" – cherts. Basalt tools that are not cobble tools are rare, except in the Cascade phase (7000 – 4500 BC), when fine–grained basalts were quarried (e.g. Womack 1977) and used, often to produce foliate bifaces of varying form and sizes. While Cascade points were sometimes made of basalt, they are most commonly of chert. Basalt Windust points also occur. The reasons for this preference for basalt are unknown and somewhat controversial (e.g. Andrefsky 1995, Reid 1997). Additionally, the amount of basalt in Cascade assemblages is variable (e.g. Andrefsky 1995). The debate between Andrefsky and Reid also relates to interpretations of Cascade phase (7000 – 4500 BC) mobility: whether Early Cascade (7000 – 5700 BC) peoples were focused towards the river bottoms (Bense 1972) or uplands (see also Morrsion 1996). Muto (1976) originally proposed that the Levallois technique was used as a method of working basalts. Use of the technique appears also to be highly variable, but it seems never to be the most common method of producing and working cores. For example, Bense (1972), in her synthesis of Cascade phase assemblages from the Lower Snake River, reports only nine Levallois cores.

There has been little formal attention to chipped–stone manufacturing techniques on the Southern Plateau. Some local studies have invested considerable effort in it (e.g. Womack 1977), but there have been no general synthetic studies. One of the distinctions Leonhardy and D. Rice (1970) draw between the Tucannon phase (4500 – 500 BC) and earlier phases is in what they see as the craftsmanship of chipped stone tools. Chipped–stone tools from the Windust (11,000 – 7000 BC) and Cascade (7000 – 4500 BC) phases are generally much better made than those of the Tucannon phase, particularly projectile points. (However, assemblages of all of these phases have large numbers of utilized flakes.) They concluded from this, and other evidence, that there was no continuity between the Cascade and Tucannon phases. Tucannon phase chipped–stone technology, at least as reflected in its bifaces, is quite opportunistic (e.g. Nelson 1991). Hatwai–eared points, for example, can be quickly and easily made; they are, in a sense, disposable projectile points. However, these changes are those many lithics specialists expect with increased sedentism (e.g. Morrow and Jeffries 1989, but see also Kelly 1992), which is associated with the Tucannon phase (see below).

Bone Technology

Bone tools are present throughout Plateau prehistory. Early Modern Plateau material culture was characterized by a single point (barb) harpoon, leisters and the needles, shuttles, etc. required to make and maintain nets. A range of awls is present after Windust, but assemblages vary in the types present. Lyman (1976) summarizes the temporal distributions of some bone tool types from the Lower Snake River region. Ulna awls, metapodial awls, and antler wedges are present in the Cascade phase (7000 – 4500 BC), while metapodial awls and wedges are present in the Tucannon phase (4500 – 500 BC). The Harder phase (500 BC – AD 1000) is marked by metapodial awls, L-shaped scapula awls, and perforated elk teeth. The Piqunnin phase (AD 1000 – 1720) (then poorly represented) had no bone tools, while only antler wedges are present in the Early Modern period (post – 1720). However, as Yent (1976) notes, bone tools may have been among the first tools replaced by metal tools obtained through trade.

The temporal distribution of bone tools is difficult to evaluate, since they are generally rare in assemblages, even in those from deposits with good bone preservation. Thus, while compilations such as Lyman's are informative, they are problematic. Further, many bone tool types, such as metapodial awls, are widely distributed in North America and in the world. Scapula awls, on the other hand, are much less common. Such tools are probably analogous cultural traits where encountered, rather than homologous ones. Thus, their presence provides little information of the kind needed here.

Very small bone needles have been recovered in the early deposits at Marmes (D. Rice 1972) and in association with the Buhl burial in southern Idaho (Green et al. 1998). The Buhl burial is earlier than the time under consideration here, but the grave goods associated with her are typologically Windust. Such small needles do not occur in subsequent assemblages.

Randolph and Dahlstron (1977) recovered what they regarded as leister parts and fishhook barbs in pre-Mazama deposits at the Bernard Creek Rockshelter in Hells Canyon. On the Upper Columbia River, toggling harpoons (both the valves[16] and points) are reported to be present in Kartar phase (4500 – 1500 BC) assemblages, although they are exceedingly rare until the Coyote Creek phase (AD 1 – 1800). Barbed points are present at Lind Coulee, and in Kartar and Hudnut (1500 BC – AD 1) components. Generally, in the Pacific Northwest, including the Plateau and Coast, large, barbed points are the earliest such tools found. They are usually too fragmentary to determine whether they are barbed points, or harpoon heads. Toggling harpoons generally appear across the entire region after 6500 BC (Ames and Maschner 1999).

Jorgensen (1980) lists the "crutch–handled" digging stick as a significant trait of the Columbia Plateau. While they do also occur in the Great Basin, they are primarily found throughout the Plateau. These are often made of hardwood with an antler handle (the crutch part). The handles were a common grave good in late pre-contact graves (Hayden and Schulting 1997). The earliest handle that I am aware of is a decorated one recovered at the Hymer site (Draper 1986b) on the Upper Columbia. On the basis of associated projectile points, Draper dates the site to c. 1850 – 500 BC. A significant bone artifact that I cannot trace through time is the small, hollow bone tube traditionally used as part of the stick game (Brunton 1998). These are also present in late graves (e.g. Hayden and Schulting 1997), but have not been traced back through time, if that could reliably be done.

Discussion

Most of the diagnostic artifacts of the Windust (11,000 – 7000 BC) and Cascade\Vantage (7000 – 4500 BC) phases do not carry forward through time. When they do, edge–ground cobbles, for example, questions about typological consistency cloud the issue. On the other hand, the pattern that emerges is of material culture replacement. Tool forms generally do not drop abruptly from the record. Projectile points seem to typify the history of material culture on the Plateau, as in the overlap between the use of darts and bows and arrows, and the overlap between foliate lanceolate points and notched points. Formal variation in projectile points also displays an interesting geographic dimension, which Reid (1991a) has suggested may reflect broadly defined social groups. The limited spatial and temporal distribution of microblades on the Plateau (in contrast with the Cascades) is also interesting, if poorly understood. Forms generally persist for very long periods. Of course, this may in part be a reflection of the capacity of archaeological classifications to measure the kinds of change of interest here.

I have stressed throughout this section that material culture has not received much emphasis in regional archaeological work, despite reports filled with artifact classifications. One area of material culture, houses, is an important expectation. The next section treats houses, community patterns, residential mobility, and settlement patterns. These topics are inextricably mixed in the regional literature.

Houses, communities, and mobility patterns

Houses

The appearance of pit dwellings on the Plateau is presently widely seen as evidence for changes in subsistence and mobility strategies, including increased semisedentism. In the past, they were viewed as **the** diagnostic indicator of the appearance of the "Plateau Pattern," indicating the historical appearance of Early Modern Plateau culture. The presence of houses and villages was assumed to indicate the land-use practices of the immediate pre-horse period, with winters spent in villages and the summers having people dispersed across the landscape in camps and task groups. However, as the initial age of the structures has been pushed back , and their widespread distribution in western North America more fully appreciated, that view has become much less tenable. The timing of the appearance of houses, how they appear, and the associated mobility and subsistence strategies are central issues in Plateau archaeology and very germane to the issues addressed in this study.

Early Modern Houses

H. Rice's (1985) is the most complete study of Plateau houses and other structures. H. Rice distinguishes among long lodges, conical dwellings, excavated dwellings (subterranean and semi subterranean), plank houses, and temporary shelters. He also describes what he terms attendant structures: arbors, scaffolds, and racks. The most common form of long lodge is what he calls an inverted V lodge.

Inverted V-lodges were pole structures with rounded ends. The frame of the house was a series of crossed poles tied together, with their ends placed in the ground. A more elaborate arrangement of poles at the ends of the house and a ridgepole connecting the paired poles provided stability. They were covered with mats of bark or tule. In the southern Plateau, they were often built over a pit about a meter deep. The interior was open, since there were often no central support poles or subdivisions. This open interior usually had a row of hearths in its middle. The houses could be 1.2 m (4 ft) to 1.8 m (6 ft) high and over 9 m (30 ft) long. Some of these structures may have had a central row of interior poles supporting the roof ridge, a variant that H. Rice terms a "double lean–to." Other variants of the long lodge include the flat-topped mat lodge (built at fishing sites), and a gable-roofed form with vertical walls. This latter form was found primarily among the Tenino, Yakima, and Klikitat. Long lodges were the most common form of winter dwelling during the Early Modern (AD 1720 – 1850) Period and were used well into the Late Modern Period (AD 1850 – present).

Conical dwellings include both hide and mat covered structures. Hide–covered structures are tipis, and are commonly thought to have been introduced from the Plains, as part of the cultural complex accompanying the horse. The mat lodge is not a mat-covered tipi. It is built around a foundation cone of three or four poles, which are covered with tule or cattail mats, over which more poles are placed to hold the mats down. While they were used as houses, H. Rice also notes they were used also for storage. The structures were sometimes placed over shallow excavations 30 cm (12") or so deep. The structures range in diameter between about 3 m (10 ft.) to some 6 m (20 ft.). During the Early Modern Period (AD 1720 – 1850), they were used widely on the southern Plateau, particularly as a summer dwelling, and as a house for family sized groups.

H. Rice describes two basic types of excavated dwellings: subterranean and semi subterranean, the former fully underground, the latter only partially. Pithouses are not well documented for the Early Modern Period, when they were not the primary form of dwelling on the Southern Plateau. Ray (1939) provides measurements for some of these structures in the Early Modern Period, and they range in size from 3 m (10 ft.) to 6.1 m (20 ft.) in diameter, and from 1.2 m (4 ft.) to 3 m (10 ft.) in depth. Subterranean houses were deep enough that the roof was laid on the ground, resting on a support of timbers, the whole being covered over by dirt. According to H. Rice 's sources, this kind of structure was variously used as a menstrual hut, a sweat lodge, and a dormitory for boys and unmarried men. It is also possible that such structures were used as storage facilities.

Semi subterranean houses appear to have been far more common. In more northerly areas, probably with heavy snowfall, they had quite substantial roofs, and heavy interior roof supports (Figure 29) while in the Southern Plateau and deep canyons, the roof support was much lighter (Figure 30). In some areas of the South-central and Southwestern Plateau, a dome or hemispherical roof was placed over the pit (H. Rice 1985). Houses with substantial roofs had roof entrances, those with lighter roofs, side entrances.

H. Rice also describes plank houses, which were restricted to the eastern end of the Columbia Gorge, and on down the river. These houses were built of a frame of posts with cedar cladding. Unlike coastal areas, they had bark roofs (see also Hajda 1994). While plank houses were geographically restricted, planking and split wood were used in structures across the Southern Plateau (see Galm and Masten 1985). In addition to these houses, H. Rice discusses temporary shelters (small mat lodges), and other structures. Finally, he develops detailed expectations about how these various structures might appear archaeologically. While I will not rehearse those expectations here, I will refer to them in the following discussion. Of particular concern will be the presence/absence of a pit, the planview, and cross–section of the pits, its size and evidence of a superstructure.

The Archaeological Record of Houses on the Plateau

The earliest documented structure in the region is what is probably a small hut or wind break exposed at the Paulina Lake site (Connolly 1999). It may have been ovoid in planview. The structure had a central hearth. Excavators also recovered the charred fragments of at least five posts. The dwelling is part of a complex of features that included many manuports that might have been used to weigh down the covering. Age ranges for the hearth dates are 10,040 – 9970 BC and 9980 – 9680 BC. Dates for the posts are 9850 – 9490 BC, 9530 – 9440 BC, and 9500 – 9380 BC. While the dates on the posts are slightly younger than the hearth dates, the post dates are extremely tight, and may be taken to date the structure. The older hearth dates may be a consequence of old wood. As has been noted previously, The Paulina Lake Windust occupation contains an array of artifacts, including

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stemmed and foliate lanceolate points, abraders, milling stones and manos. While it shares these artifacts with other, contemporaneous sites, this is the only excavated Windust site that is clearly residential. The poor organic preservation has probably cost us an interesting bone and antler assemblage, given the large number of abraders, presumably used to shape bone, antler and wood. In any case, it is Connolly's thought that this is a long-term residential base (Connolly 1999), a reasonable inference. Similar but somewhat younger structures are reported for the Upper Columbia region (Chance and Chance 1985b, Chatters 1986a).

The oldest pithouses in western North America are found not on the Columbia Plateau, but in southwestern and south-central Wyoming (Larson 1997), where 28 sites produced some 45 structures. While one structure has a date of 6400 – 5700 BC (7160±150, Larson 1997, Table 3), the majority of many of the dates fall between 4800 BC – 3000 BC (6000 and 4500 B.P). A few structures are present through the rest of the sequence in that area. The early dwellings have interior hearths, as well as interior and exterior storage pits. In these respects they differ from many, but not all, of the earliest houses on the Plateau. Similarities with the earliest Plateau structures include ground stone tools (80% of structures), occasionally, an array of bone tools and ornaments. The ground stone tools appear to be associated with seed processing (she does not specify the type of tools). In reviewing the evidence for seasonality of occupation, she suggests the houses may have been occupied in the summer and then used as storage caches during the rest of year. She also notes similar houses in other parts of the western USA. Among these is a structure at the King's Dog site in Surprise Valley, California, just south of the border of California and Oregon that is dated to c.4850 – 4050 BC (O'Connell 1975, 33).

The oldest pit structures on the Southern Plateau overlap with these in age. The Johnson Creek site (Pettigrew and Hodges 1995), in the southern uplands, produced the oldest dated pit structure on the Plateau. It is an oval structure about 5m by 4m, and 30 to 50 cm deep. It is dated by four dates, the oldest of which is 5500 – 4300 BC (5960±250, Pettigrew and Hodges 1995) from what they interpret as a structural member. The other three are younger and date close to 3800 BC. House 6 at Hatwai also dates to c. 4600 – 2900 BC (Ames et al. 1981). House 1 at Givens Hot Springs in southern Idaho dates to c. 4000 – 2600 BC (Green 1993). After this, a series of sites have pit dwellings that date between 4000 BC and c. 2000 BC, though the bulk of the age spans begin around 3000 BC and end at c. 2500 BC (Ames 1991, Chatters 1995).

Chatters (1989, 1995) and Ames (1988a, 1991) have argued that pit house construction ceased on the Plateau around 1800 BC. Both Chatters' and Ames' plots of dated house floors (Figures 18 & 22) show that gap. After that gap, pithouse construction resumes, and pithouses become ubiquitous in the record, although Ames (1991) argues that there are subsequent fluctuations in pit house construction. However, as observed above with regard to the variation in radiocarbon dates, some of that apparent fluctuation may be due to shifts in settlement patterns into and away from the river canyons. Some archaeologists (e.g. Reid 1991a, Schalk et al. 1998) are skeptical of the reality of the gap at 1800 BC and argue that pithouse construction is continuous after they first appear. Schalk et al. (1998) rightly note that there are many gaps in the regional and local radiocarbon dates (e.g. Figure 25) and the gap in house dates could just be an artifact of that. There is also debate over the causes of their initial appearance, and I will return to that issue below.

Virtually all of the structures before AD 500 are semi subterranean pithouses. The earliest long lodge in the archaeological record was located in the Calispell Valley of northeastern Washington and dates to c. AD 500 (Ames 1991). The appearance of long lodges in the record should be marked by depressions longer than wide, and oval in planview. The appearance of oval plan views in the millennium after AD 1 occurs in as disparate areas as the Lower Snake River (Brauner 1976, Yent 1976) and the southern uplands (Endzweig 1994), and marks the presence of long houses. Small, shallow circular depressions also occur, probably indicating the use of conical mat lodges. Evidence for superstructures is virtually always absent. This has suggested to most archaeologists working on the Southern Plateau that roofs were therefore light. There is little evidence for the deep subterranean houses that H. Rice describes.

Because evidence for superstructures is usually absent, archaeologists have turned to the pit of the house for information about house form and household organization. Plateau pit structures lack the defined floors, hearths and other fittings of Mogollon pit dwellings, for example. Floors are invariably earthen, and sometimes remarkably difficult to recognize in the field. Hearths can be present or absent. When present, they are often only a stain. Structures sometimes have what appear to be stabilizing walls of stone or shell. Some structures have earthen interior benches; many do not. In some sites, such as Hatwai, the structures contain numerous large stones as site furniture, while others may have almost no site furniture. In 1991, Ames examined a sample of 226 house pits (Ames 1991). They displayed considerable variability through time (table 4). Area was calculated using either the diameter of a circular pit, or the length and width. Volume was estimated with area and depth. This sample was collected in the late 1980s and does not include the Johnson Creek house, for example. Nevertheless, it is large enough, particularly for the later periods, that it should still accurately reflect temporal trends.

Table 4. Area and Volumes of a sample of house pits (Ames 1991).

Years BP (Calibrated)	6000 – 5000 (4800 – 3800 BC)	5000 – 4000 (3800 – 2500 BC)	4000 – 3000 (2500 – 1250 BC)	3000 – 2000 (1250 BC – AD 1)	2000 – 1000 (AD 1 – 1000)	1000 – 120 (AD 1000 – 1750)
Area						
N	4	12	17	19	65	71
Mean	54.7	70.7	51.8	35.7	50.5	62.9
Sigma	25.7	30.0	30.3	27.8	42.1	51.9
Min	28.3	28.3	15.2	7.1	12.6	3.1
Max	90.0	121.0	113.1	95.0	227.0	283.0
Volume						
N	4	12	14	19	49	51
Mean	36.1	39.3	28.9	31.5	36.7	72.6
Sigma	12.9	21.4	20.2	37.7	38.1	123.2
Min	24.0	13.6	4.6	1.2	2.5	0.5
Max	54.0	85.5	66.0	142.6	172.5	737.2

The earliest houses are rather moderate in area, though the sample is small. The Johnson Creek structure would no doubt lower the mean. Houses during the next period have the largest mean area of any period. Variability in area, as measured by the standard deviation, is similar to that of the next two periods. Between 4000 BC and AD 1, mean house size shrinks, while the standard deviation remains stable. Houses begin to become both larger in area and more variable after AD 1. Volume follows the same general trends, although variability in volume (pit depth) begins to increase after 1250 BC. In addition, minimum volumes become quite small after

2500 B.C. and very small in the last 1000 years. Variability in volume becomes quite strong in that same period, probably reflecting the simultaneous presence of long lodges (some of which could be quite long) and small, conical mat lodges. The changes in mean house sizes and in the amount of variability among houses during any given period must, in part, relate to shifts in household organization (Ames 1991, Reid 1991a). Long lodges could almost be extended infinitely (H. Rice 1985) as groups fluctuated in size through time. They also could be large enough, and sometimes were, to house an entire village in one structure. They were much more flexible in this way than a pithouse could be. Another reason for increasing variation in pit size would be increased functional differentiation of the pits. Many smaller pits classed as house pits may have been storage pits. Evidence presented above indicates that pithouses were used for storage.

Differences in house sizes and form could also reflect emerging status differentials, as Hayden (e.g. 1997b) has argued for the Keatley Creek site on the Northern Plateau. He argues that status inequality emerged across the Plateau during the Late Pacific Period. Archaeologists on the Northwest Coast also argue that differentials of house sizes can reflect status differentials (Coupland 1985) between house groups.

Community size, organization, and structure are usually measured by the number of contemporaneous houses a village contained and the spatial arrangements among the houses (e.g. Warren 1960). All the available evidence suggests that until the last two millennia or so, communities consisted of only one, or perhaps two or three houses (Ames 1991). Large aggregations do not appear to develop on the Plateau until the last 1500 years or so. This occurs seemingly simultaneously on both the Southern Plateau (e.g. Cleveland 1976, 1978; Schalk 1983a) and in British Columbia (Hayden 1997b). Villages were not structured spatially, as they were on the Northwest Coast (Ames and Maschner 1999), though houses were usually laid out along the river bank (Warren 1960).

Mobility Patterns

In 1972, Bense argued that Cascade phase (7000 – 4500 BC) mobility patterns were already very like those of the Nez Perce during the Early Modern (AD 1720 – 1850) period. However, more recent evidence strongly indicates otherwise. In 1988, Ames argued that both Windust (11,000 – 7000 BC) and Cascade peoples were very mobile, and that individual groups probably utilized rather large regions. Obsidian sourcing data from Paulina Lake, for example, indicate the mean distance from which the stone was transported to the site was 50 km, with some distances even greater (Connolly 1999) (Figure 11), in contrast to post-Mazama transport distances, which were much smaller (Figure 31).

Ames also found in his comparative analysis of Windust (11,000 – 7000 BC) and Cascade (7000 – 4500 BC) assemblages that while Cascade period patterns seemed to be those of midlatitude foragers, shifting residential bases to resources, Windust strategies were somewhat more collector-like. Recent work in the southern upland supports that inference, particularly the discovery of the Windust residential camp at Pauline Lake (Pettigrew and Hodges 1995, Schalk et al. 1995, Hess 1997, Connolly 1999).

In contrast, Late-Cascade\Vantage (5700 – 4500 BC) phase mobility and residential strategies are not well known, and there is little evidence for residential camps of any kind, for storage, or other appurtances of collector life. Presumably, people remained foragers during this period.

Several researchers (Campbell 1985c, Lohse and Sammons–Lohse 1986, Ames 1991, Chatters 1995) have concluded that the mobility patterns associated with the earliest houses differed to some degree from Late Pacific (AD 500 – first contact) or Early Modern (AD 1720 – 1850) strategies. Ames (1988a, 1991) and Chatters (1989, 1995) recognize two separate episodes of house pit construction, which Chatters has termed Pithouse 1 and Pithouse 2, while Campbell (1985c) and Lohse-Sammons-Lohse seem to see continuity with subsequent patterns, albeit quite attenuated.

Pithouse 1 appears to represent a period of sporadic house pit construction on the flood plains of the main rivers, as well as upland tributaries. Lohse and Sammons-Lohse, and Chatters see it as what might be termed "settled foraging," or "settled immediate–return." People practiced residential mobility, but were able to maintain residential bases in one place over several years. Campbell argues that they were collectors, albeit weak ones, who exploited rather large territories. She argues that there was some storage, though direct evidence is again weak. Non-residential sites are rare, but do occur in a variety of environments (Ames 1991, Chatters 1995). There are, however, few clear-cut stations or seasonal camps, in contrast to later times. Although this is variable, most residential sites contain mortars and pestles, sometimes quite large ones, sometimes many large ones – indicating some investment in the residential locality.

Pithouse 2 is markedly different. Initially, houses were smaller and occupational duration shorter (only a few years). Annual occupation of residential sites may have been shorter. In Pithouse 1, most investigators conclude the houses were sometimes lived in year–round, while in Pithouse 2, most dwellings were winter houses. There is stronger evidence for logistical mobility, both in the frequency with which residential sites are shifted[20], and in the far greater diversity of other sites on the landscape. There are specialized task-oriented sites in the dry central Basin and elsewhere (e.g. Chatters 1980, Campbell 1985c). Pithouse 2 is also accompanied by evidence for storage, greater numbers of fishing tackle and so on. Thus, residential and subsistence patterns are much closer to the historic forms, though, again, there is increasing variation in house size and form after about AD 500.

Discussion

Pithouse 1 appears to have evolved out of previous land use patterns. While Campbell (1985c) and Lohse and Sammons–Lohse (1986) do not consider its beginnings, that conclusion seems implicit in their thinking. Both Chatters and Ames are quite explicit. Ames suggests that pithouses were probably in sporadic use from the earliest occupations in the region. The earliest pit structures in the Western Hemisphere are reported from the coast of Peru (Sandweiss et al. 1998), where they are contemporary with early Windust sites here. That and the widespread distribution of such structures in northeast Asia suggests that either pithouse construction was a part of the cultural repertoire of some of the earliest peoples to enter the Americas, or it has been reinvented many times. Ames also sees the appearance of pit houses on the Plateau as the local aspect of a very wide spread development in western North America. This event is represented by, among other things, the pit houses in Wyoming and shell middens on the Northwest Coast (Ames and Maschner 1999). Ames has not yet, however, demonstrated that. Chatters (1995), in contrast, explains these shifts in terms of regional environmental changes specific to the Plateau. Ames argues that, ultimately, the appearance of pithouses was caused by population growth, while Chatters argues that dramatic population growth followed the beginnings of Pithouse 1.

The not–quite–complete abandonment of pithouses must represent a shift back to full forager mobility. Chatters explains it as one consequence of a major population collapse that was in turn caused by environmental changes that were occurring during the latter years of Pithouse 1, but which reached a "critical mass" at the end of the period. He suggests the crucial shift was increasing seasonality of resource availability, not an overall decline in productivity. He sees the evolution of Pithouse 2 as a very rapid reorganization of the adaptation as a consequence (Chatters 1995, 390). Other workers, writing before the formulation of the earlier pithouse period (e.g. Galm et al. 1981, Schalk and Cleveland 1983, Campbell 1985c) argue that it was the result of population growth, not a response to environmental stress. Ames has yet to publish a model to explain these changes.

These changes in residential strategies are both marked and not marked, by material culture changes. On the Lower Snake River, for example, Pithouse 1 includes both Late Cascade and Tucannon assemblages. Sites such as Hatwai and Alpowai will have both Cascade points and the later side and corner notched forms that Leonhardy and D. Rice (1970) thought to indicate a different cultural tradition. Most of the point styles of the early Holocene[21], with few exceptions[22], do not survive Pithouse 1. Cold Springs side notched points are present before Pithouse 1 and do not persist into Pithouse 2. On the other hand, Nespelem Bar points correspond temporarily with Pithouse 1 and last into Pithouse 2. Hatwai–eared points are present in both Pithouse 1 and early Pithouse 2. Rabbit Island Stemmed A and Columbia Corner Notched A appear at about the end of Pithouse 1 and persist well into Pithouse 2. Edge ground cobbles become less common to rare, with occasional exceptions. Microblades disappear from the western Plateau not long after the beginnings of Pithouse 2. On the other hand, mortars and pestles appear in Housepit I assemblages and persist through the rest of the Holocene.

In sum, there were changes in material culture associated with both Pithouse 1 and Pithouse 2. The changes in projectile point styles probably reflect changes in hunting tackle that were already underway, and which continued. The turnover in projectile point styles is relatively much more rapid after 2000 BC than before. The appearance of mortars and pestles seems to have been an innovation, though pestles are occasionally reported earlier (Bense 1972), and occur widely throughout North America.

Thus, while some of these changes appear to have been abrupt[23], they do not seem analogous to either the Thule or postulated Numic spreads. This does not preclude Simms' "demographic fluidity." Brauner (1976), in his initial discussion of what Ames later called Hatwai–eared points, noted what he saw as similarities between Elko-eared points of the Great Basin, and the Hatwai–eared forms. He suggested this formal similarity might reflect increased contact between Plateau and northern Great Basin peoples in the central uplands. He argued that the Tucannon phase (4500 – 500 BC)was marked by an increased upland subsistence focus, which led to this increased contact. While Ames shows elsewhere (Ames 1990) that Hatwai-eared and Elko points are metrically not the same, this does not rule out the possibilities of contact and movement.

Subsistence and Economy

Introduction

Changes in subsistence have played a major role in archaeologists' explanations of culture change on the Plateau. Reconstructions of ancient economies are based on a mix of evidence, including artifacts, settlement patterns, and faunal and floral remains. Some of this evidence has already been reviewed. This section focuses primarily on faunal and floral remains. Actually, it focuses on faunal remains. Extensive archaeobotanical work on the Plateau is in its infancy (e.g. Lepofsky et al. 1996), and there is no data set of sufficient temporal and geographic scope to be useful here. Inferences about plant use are based almost exclusively on assumptions about artifact functions. There is some direct evidence that will be reviewed below. There are also problems with the record of animal exploitation,

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which will be briefly discussed below.

Research into Plateau subsistence patterns has been guided by two intertwined sets of questions: 1) When and why did the Early Modern (AD 1720 – 1850) subsistence economy develop? 2) How and why did Plateau subsistence economies change through time? While these seem like the same questions, in ways they are not. In the first, subsistence economy is a marker of the Plateau Pattern, much the same as winter villages are a marker. In this case, the diagnostic traits are heavy reliance on salmon (e.g. Sanger 1967), (or, alternatively, on roots and\or salmon [e.g. Ames and Marshall 1980, Thoms 1989, Peacock 1998]) and storage.

The second approach is more generally grounded in hunter-gatherer theory (e.g. Schalk and Cleveland 1983, Atwell 1989), and drawing on evolutionary ecology (e.g. Hess 1997), although work on the first question can also be so grounded, approaching the first question using the methods of the second approach (e.g. Thoms 1989).

The data requirements for each approach have been different. In the first, at least in the early years of research on the Plateau, the presence of large numbers of salmon bones alone was evidence for the historic pattern (e.g. Cressman et al. 1969), even though the assemblage was perhaps 9000 to 10,000 years old, and subsequent deposits at the site (Five Mile Rapids) lacked salmon bones, or any evidence for fishing. The second approach focuses more on documenting and explaining variability in the record.

At the same time, recovery and analytical techniques have changed. I have been told, for example, that on some early projects the excavators only collected materials they thought identifiable. In reports, species were often listed as present or absent, without information as to which bones were present or how many. In some projects, excavated dirt was dry–screened through 1/4" mesh, while in others it was water–screened, probably with different recovery outcomes. More recently, sediment is screened through smaller meshes (most commonly 1/8" mesh). The change in mesh size alone has significant effects on recovery, particularly of small–boned animals and many fish species.

The mesh size issue also has important implications for interpreting faunal collections made over many years. Chatters (1995), for example, proposes marked differences in hunting patterns between his Pithouse 1 and Pithouse 2 periods. He argues that Pithouse 1 diets were broader and more inclusive than those of the later period. The faunal data he uses are central to his conclusions that there was a major reorganization of subsistence practices after Pithouse 1. Schalk et al. (1998) demonstrate that much, if not all, of this pattern is the result of differing screen sizes: most of the Pithouse 2 assemblages were screened using 1/8" mesh, while most of the Pithouse 1 faunal assemblages were screened through 1/4" mesh. They also show a significant difference in salmon recovery using the different mesh sizes.

There has also been an increasing awareness of site formation and taphonomic issues, such as differential bone preservation (e.g. V. L. Butler and Chatters 1994). One issue, for example, is whether a low frequency of salmon cranial bones relative to vertebrae can be used as an indicator of salmon storage. V. L. Butler and Chatters discovered that cranial bones have lower bone densities than vertebrae, and so are more likely to be lost from the archaeological record. Caution in interpreting cranial bone/vertebrae ratios is necessary. On the other hand, V. L. Butler (1990) was able to show that the salmon bones recovered at Five Mile Rapids by Cressman had been butchered by people, rather than being a natural accumulation (Schalk and Cleveland 1983).

Finally, monitoring position becomes an overwhelming issue. Hunter-gatherer economies are not site specific; resources are drawn from a range of habitats. Further, we know that during the Early Modern Period (AD 1720 – 1850) at least, processed foods were traded widely on the Plateau (e.g. Anastasio 1975). The economy in that period was regional in scope. Archaeological sites reflect the subsistence economy in one place, and sometimes at only one period of the year. This issue becomes particularly pertinent here because one aspect of ancient Plateau economies that seems to be emerging as an issue is regional diversity. The general assumption has long been that subsistence economies were uniform across the Plateau. This appears not to be the case, at least during Pithouse 1 times, as will be briefly discussed below. With this preamble, I will briefly summarize a conservative reconstruction of the history of subsistence economies and then equally briefly address salmon, roots, and some problems in interpreting the record.

Plateau Subsistence Economies (Ames et al. 1998)
Early Period IB (Windust) economies harvested a range of animals, including both large (e.g. elk, deer and bison) and medium mammals (e.g. marmots, rabbits) (Lyman 1983, Atwell 1989). Evidence for animal use derives from faunal remains. They probably also harvested plants, but the only evidence for this are manos, small milling stones (presumably for seeds) and edge ground cobbles. Fishing is indicated by the presence of salmon bones at Five Mile Rapids and a notched net sinker at Hatwai.

Later Period IB (Cascade\Vantage) economies are similar, except the medium mammals drop from the economy. Atwell (1989) and others (e.g. Schalk and Cleveland 1983) see this period as marked by a very diffuse, broad economy, while Chatters (1995) suggests it to be somewhat narrower than the following Pithouse 1 (Period II [4500 – 1500 BC) economies. It is during Period II that there may be marked regional differences in economies. Atwell compared faunal remains from the Lower Snake River–Clearwater (Hatwai), with those from the Chief Joseph Reservoir and the Wells Reservoir projects on the Upper Columbia. The Hatwai fauna (which included Hatwai and Alpowai) reflect a strong, almost exclusive focus on deer (74%)[24], and to a lesser extent, elk (8%), and canids (5%). Fish remains were rare. At Wells Reservoir at this time, the economy was extremely diffuse, with a broad range of harvested resources, including rabbits (16%), deer, antelope, salmonids, minnow, elk, and suckers in descending order of frequency. The contemporary Kartar phase (4500 – 1500 BC) fauna from Chief Joseph reservoir is about half deer (45%), minnows (16%), salmon (12%), and marmots (8%). Chatters reconstructs the economy of this period as extremely diffuse (he did not include the Hatwai data, while Hatiuhpuh was not available at the time Atwell did his work, and Chatters could not use all of it). This period is also thought to represent a period of increased use of roots because of the presence of hopper mortar bases and pestles in most of the houses of the period (Ames and Marshall 1980, Lohse and Sammons-Lohse 1986).

There is little disagreement among researchers that the subsequent Period III (1500 BC – AD 1720) is marked by a very broad and diverse subsistence base. It is generally argued that it was during this period that heavy reliance on salmon developed and that there is good evidence for storage. Reid (1991a), for example, reviews the available evidence for storage facilities in the Southeastern Plateau, finding that storage pits become numerous at this time and storage caves come into use (Figure 32). It is also during Period III that we see the evidence of increased bison exploitation between c. 500 BC and 500 AD, an issue reviewed above.

Salmon
The available evidence is that fishing, including salmon fishing, occurred continuously on the Plateau from its earliest occupation. I have already described

the earliest netweights. Salmon are present during Period IB (11,000 – 4500 BC) at a number of sites along the Columbia, Lower Snake River, and Upper Columbia. Hess (1997) reviews these data, finding fish bones, including those of salmon, reported at 12 of the 50 sites of the period he examined. Additionally, he found mollusks at 11 of the 50, indicating use of riverine resources by Period 1B peoples. On the other hand, a great many sites along the rivers have no salmon bones at all.

Fish, including salmon, are present in all subsequent periods. Using Atwell's figures (Atwell 1989), fish, including salmon, are present in small numbers in Period II (4500 – 1500 BC) assemblages along the Lower Snake River, very common in Intermediate Period assemblages in the Wells Reservoir, and moderately common in Kartar (4500 – 1500 BC) assemblages in the Chief Joseph Reservoir. They become more common in Period III (1500 BC – AD 1720) assemblages in the Southeastern Plateau . These figures are difficult to compare to other areas, because most of these sites were excavated prior to the wide spread use of 1/8" mesh.

In a review of the distribution of fishing tackle, Johnston found that most of it post–dates 2000 years ago. Johnston organized his data temporally by millennia, not by phase. Of 2130 reported netweights on the Southern Plateau, almost 86% post–date AD 1. Interestingly, 53% of the total date to between AD 1 and AD 1000. While quite rare before AD 1, they are present in assemblages after 7000 BC. He documents harpoons as early as 6000 – 5000 BC, and the earliest toggling harpoon he dates between 3000 and 2000 BC. His data did not include the Chief Joseph project where toggling harpoons may be present in the Kartar phase (4500 – 1500 BC). However, bone tools have a similar frequency distribution to that of netweights, not becoming common until after AD 1. He also reviewed the temporal distribution of storage pits with salmon or fish remains. With the exceptions of a couple at Marmes Rockshelter and Five Mile Rapids, all such features post–date AD 1. In sum, Johnston's review suggests that reliance on fishing, presumably salmon fishing, increased dramatically after AD 1.

Johnston's conclusions accord well with the conclusions of others (e.g. Galm et al. 1981, Schalk and Cleveland 1983). Chatters places increased reliance on salmon fishing and storage earlier, with the beginnings of his Pithouse 2 period. Ames (Ames 1991) also places it at about that same, earlier time. There are, however, problems with Johnston's data.

One of these problems is he does not control for site numbers/period. Thus, his data show a decline in the number of netweights after 1000 AD. There is also a decline in the number of radiocarbon dates during that same period. This pattern could be due to increased site loss due to modern development, and therefore fewer netweights and charcoal, or, conceivably, to fewer people. Campbell (1989) has challenged the idea that the heavy reliance on salmon in the 19th century characterized earlier periods. She suggests that with population loss due to epidemics, people focused more heavily on salmon in the 18th and 19th centuries, an argument echoing one made earlier by Craig and Hacker (1947) and Hewes (1947, 1973). Schalk (1986) reviews this notion and finds it unlikely. Schalk also rejects Hewes' suggestion that peoples on the Plateau may have depressed salmon numbers through over-exploitation. But, in any case, Johnston's figures may be sample–size dependent.

In sum, then, there is evidence for fishing on the Plateau perhaps as early as 10,000 BC, but definitely from 7000 BC on. Fish production may have been intensified as early as around 1800 BC but certainly after AD 1. There is some discussion over whether fishing practices of the mid to late 19th century and early 20th centuries reflect the intensity of fishing before AD 1800.

Roots
Recent research has shown the importance of roots to Modern (AD 1720 – present) Plateau economies (e.g. Marshall 1977, Hunn and French 1981, Thoms 1987, Hunn 1990, Peacock 1998, and references in all). On the Southern Plateau, these included camas (*Camassia quamash*), cous (*Lomatium cous*), several other members of the species *Lomatium* including *Lomatium canbyi*, bitterroot (*Lewisia rediviva*), and other members of the Lily family. Ongoing ethnographic research on both the Southern Plateau (e.g. Marshall 1977, Hunn 1990) and Northern Plateau (e.g. Peacock 1998) also emphasizes the cultural centrality of root collection, cooking and serving.

As observed above, there is very little direct archaeological evidence for plant use. Surrogate measures are therefore used. These include artifacts thought to be plant-processing tools (e.g. mortars and pestles) and features produced by cooking. Among these latter are earth ovens, in which the roots are steamed. Cooking in earth ovens produces pits filled with, or surrounded by, thermally altered rock, charcoal from the fuel and the wet plant material used to shield the roots from heat and produce steam, and, sometimes, the charred roots themselves. The charcoal can be dated to provide reliable dates on when the oven was used.

The largest sample of dated ovens was excavated in the Calispell Valley of northeastern Washington, a valley that has always lacked a salmon run. Thoms and Burtchard excavated a large number of ovens as part of a project there in the mid-1980s (Thoms and Burtchard 1986, 1987). Thoms embodied the data into his dissertation on root-crop intensification by hunter-gatherers generally. The dated ovens span the last 6300 years. There are sporadic dates between about 4300 BC and 1800 BC (Thoms, 1987, 441). Dated ovens peak at 1250 BC, and then decline sharply, reaching a nadir at c. AD 1, after which their numbers increase to AD 500 where they essentially stabilize. The low point in dated ovens corresponds to the same low point in radiocarbon dates in Chatters' and Ames' date samples (Ames, 1991, Chatters 1995) that could be a product of fluctuation of atmospheric ^{14}C. It could also reflect a population decline. Peacock (1998) dated a series of ovens in southern British Columbia and reviewed other projects there. In that area, the bulk of earth ovens post-date c. 350 BC, and their numbers actually peak at AD 1 (although the sample of dated ovens is relatively small). Elsewhere, in the southern Willamette Valley, Connolly has dated ovens as c. 8000 to 9000 BC, but the great bulk of dated ovens post-date 4500 BC (Connolly et al. 1997). His dates tend to cluster between 4500 and 2000 BC, and after AD 500, although he has a number of ovens dating to c. 1000 BC. Thus the available evidence (which is thin), including both mortars and pestles and dated ovens, indicates the heaviest use of roots after 4500 BC. However, the evidence also indicates at least some use extending back several millennia.

Finally, Peacock (1998) notes one difference between Early Modern root processing areas and older ones. The older ones sometimes contain storage facilities, which are not present in the more recent collection areas.

Discussion
It is clear that, at the most general level of inference, Plateau economies approximated their Early Modern (AD 1720 – 1850) form by c. AD 1, although many crucial economic subsistence practices had become important much earlier. It is also clear that there was considerable regional local variation in economy, which is not well understood by archaeologists. Finally, any inferences that can be made, or conclusions relevant to this study, are severely limited by the nature of the database, and by methodological issues. These later problems are not restricted to

the collection and analysis of fauna from archaeological sites; they are, perhaps, just more visible.

Exchange and Interaction

Trade was deeply embedded in Plateau life (e.g. Anastasio 1975, Erickson 1990, Stern 1998b). The region appears to have been integrated into a single interaction sphere with strong ties to the Northwest Coast, the Great Basin, California, and, at least after adoption of the house, the Great Plains. The interaction sphere had at least one, if not more, major nodes. The primary center for exchange on the Southern Plateau was at The Dalles, Oregon, at the upstream end of the Columbia River Gorge and close to some of the best salmon fishing places on the globe. Other centers for trade and exchange were at Lytton – Lilloett at the confluence of the Fraser and Thompson Rivers in British Columbia (Galm 1994b, Hayden and Schulting 1997), Kettle Falls on the Columbia River in far northeastern Washington and at Wenatchee, Washington, near a low pass across the Cascades to Puget Sound (Galm 1994b) (Figure 33). A great range of objects was exchanged, including processed foods (Anastasio 1975), wealth items (Hayden and Schulting 1997), and obsidian and shell, among other things (Figure 34).

The distribution and age of marine shell in archaeological deposits on the Plateau is currently the best-controlled measure of the extent and timing of interaction. There is increasingly intense research on sourcing obsidian, but obsidian is generally rare in assemblages north of the Columbia River. Central and southern Oregon and southwestern Idaho have many exposures of obsidian that were quarried and used over the past 10,000 years or more. Obsidian moved from central Oregon as far north as Puget Sound, southern Vancouver Island, and in one instance, the central British Columbia coast between c. 4800 and 2500 BC (Carlson 1994)[25]. Chert is the most common tool stone used on the Plateau, but it has proven very difficult to source.

Galm (1994b) reviews the evidence for the presence of obsidian on the Plateau, and finds that it has been present there through most of the sequence. Most Plateau obsidians originate in central and southern Oregon, southwestern Idaho, and northern California. He postulates a long-term exchange relationship with those directions, perhaps at its most intense during the late part of Period IB (Late Cascade\Vantage (5700 – 4500 BC). This connection might be marked, according to Galm, by not only obsidian but by the presence of Northern Side Notched and Cold Springs Side notched points. This is similar to Brauner's suggestion (Brauner 1976) that the similarities between Hatwai–eared points and Elko–eared points also reflect strong southward interaction. He suggests the trade in obsidian was in blanks, and perhaps finished points. There appears to be more obsidian present in sites in later periods and perhaps an expanded trade in obsidian (e.g. Hess 1997). Galm resists plotting the spatial distribution of obsidian by source.

Marine shell was also traded into and around the Plateau from at least 7500 B.C. on. Erickson (1990) exhaustively reviews this trade. Four kinds of marine mussel shells are present in Plateau sites: *Olivella biplicata*, *Dentalium pretosium*, *Haliotis fulgens*, and *Glycermis subobsoleta*. Anastasio (1975) also lists abalone. Olivella (*Olivella biplicata*) is present at Marmes Rockshelter in association with Windust phase (11,000 – 7000 BC) burials (D. Rice 1972). Olivella is virtually the only marine shell present on the Plateau until c. 1000 BC – AD 1. The olivella shells show little modification. Erickson (1990) and Galm (1994b) suggest it entered the Plateau primarily from the south, ultimately from California. Erickson notes that the presence and distribution of olivella on the Plateau is quite similar to that in the Great Basin during the same period. However, olivella lives along the Pacific Coast from

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Vancouver Island to Baja California, although, according to Erickson, it is more common along the Oregon and California coasts than to the north.

After 1000 BC, dentalium becomes increasingly frequent in sites. The primary sources for dentalium in western North American are beds off the western coast of Vancouver Island, where the shell was collected during the Early Modern Period (AD 1720 – 1850) by NuuChahNuulth people. There are no dentalium processing sites in that area, however (Ames and Maschner 1999). Other marine mollusks appear, and there is a greater variety of shaped objects. There may also have been trade in shell adz blades from the coast beginning perhaps 1500 years earlier (Benson 1986). Assemblages are dominated by dentalium until c. AD 1350 – 1750, when the number of marine shell objects and their diversity again increases markedly. The number of forms of beads and other objects also increases. Dentalium was a major trade item in western North America, and was traded across the Rockies and to the Plains. The shift from olivella to dentalium suggests a change in at least some external trade connections around 1000 BC to 1 AD, if not earlier.

In addition to shell, a great many other kinds of objects circulated, including native copper items; objects of steatite, serpentine and nephrite, including adze blades; and whale bone clubs. Hayden and Schulting (1997) document the distribution of these and other objects in Late Period III (AD 1000 – 1720) and Early Modern (AD 1720 –1850) contexts across the Plateau, demonstrated the centrality of The Dalles and the Lytton–Lillooett nodes. However, they also include the distributions of other widespread items of Plateau material culture, such as digging stick handles, arguing they are status markers. Hayden and Schulting suggest that the distributions of these objects reflect the development of status inequalities on the Plateau, which, in turn, would lead to the formation of an interaction sphere. If they were correct in this, then the increasing numbers and variety of shell ornaments entering the Plateau after 1350 AD would suggest that regional elites formed just before that date.

The archaeological data on exchange are limited, despite its importance in the Early Modern Period. What little evidence there is suggests that interaction beyond the Plateau may have been orientated towards the south and west before about 1000 B.C. After that date, exchange with the Northwest Coast became more important, and connections to the south apparently less so. However, the data are not robust.

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[12]Reid (1991a) challenges her conclusions, arguing there is greater diversity of house sizes in the Harder phase than during the preceding Tucannon, or subsequent Piqunnin (Late Harder, in Yent's terms).
[13]The presence of Cascade points in younger deposits at Hatwai could be due to sediment mixing caused by construction of houses. There is also evidence at Hatwai of the deliberate collection of older artifacts by more recent occupants.
[14]The presence of microblade cores in archaeological deposits is necessary to demonstrate the presence of microblade technology.
[15]These calibrated dates should be viewed with great caution, although they are generally comparable with dates on microblades elsewhere in the Pacific Northwest).
[16]The object illustrated as a valve in Lohse 1984, plate 3-8, x, pg. 165, does not appear to be a valve, however.
[17]All these dates are from Connolly (1999 Table 9.5). I use his calibration results. He reports only the single sigma and intercept calibrations.
[18]The proportions of this structure, its shallowness, and overall planview actually fit H. Rice's archaeological correlates for long houses, not a semi subterranean pit house. Unfortunately, there is insufficient super structural evidence to reconstruct the rest of the dwelling.
[19]The younger dates from the site were averaged, producing a date of 5089±44, which was then calibrated.
[20]Residential sites also appear to be occupied for shorter periods of time (Ames 1991).
[21]Cascade and Mahkin stemmed, using Lohse' terms (Lohse 1985) throughout (Figure 26).

[22]As noted above, foliate points do persist in many areas. However, it is an open question whether such points are Cascade points.
[23]While I agree with Chatters that the changes between his Pithouse 1 and Pithouse 2 were abrupt, I do not necessarily agree with his explanation. I am particularly skeptical of the population collapse.
[24]Atwell's figures are all Number of Identified Specimens, or NISP.
[25]Hess (1997) dismisses Carlson's summary of obsidian sources and distributions on the Northwest Coast, but without adequate explanation (citing two papers by Richard Hewes).

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Chapter 2
Section 7

Review of the Archaeological Data

Kenneth M. Ames

Conclusions

Before proceeding, I remind the reader of the discussions in Section 3, particularly of the issues relating to monitoring position; the distinctions between analogies and homologies; of Hughes' strictures of making inferences from data about subsistence and settlement patterns to ethnolinquistic groups, and the two levels of continuity and discontinuity identified at the end of that section. I distinguished between historical continuities and discontinuities (presence or absence of cultural links between ancestral and descendant groups) and continuities and gaps in the archaeological record. This report has focused on gaps and continuities in the record itself.

Based on my review of the available evidence, the empirical gaps in the record preclude establishing cultural continuities or discontinuities, particularly before about 5000 BC. I will provide one example of the difficulties. The Lind Coulee site, the closest major site both geographically and temporally to the Kennewick individual contains a somewhat distinctive variety of stemmed Windust points (they are not the style of the point embedded in the Kennewick individual's hip). These are also about the last such points on the Plateau. Recently, Davis recovered very similar points[26] at the Copper's Ferry site in Idaho that are 2000 years older than the Lind Coulee site. Does this mean continuity in this point style on the Plateau during this long period? Alternative explanations are that Davis' dates or the Lind Coulee dates are wrong. I noted above problems in firmly dating the Lind Coulee site. If Davis' dates prove to be reliable, then it will be necessary to reevaluate the age of Lind Coulee. If there was a big sample of Lind Coulee points from multiple, well-dated sites, this issue might not even arise. However, there is no such sample.

The sample of radiocarbon dates for this early period is small and marked by gaps. These gaps may reflect the sample's size, or, like the gap in house floor dates at Hatwai, point to something else. The sample is also sensitive to archaeological sampling practices. It is also sensitive to different quantification and graphing techniques that produce differing apparent patterns in the data. The sample is therefore not very robust and conclusions drawn from it must be viewed cautiously. In spite of these problems, all available data do suggest very low populations for the period before the Mazama ash fall.

The period's material culture has a number of features which do not carry forward, including bola stones, edge ground cobbles, core and blade technology, the fine bone needles, and perhaps the Ft. Rock–style sandals among others. Their subsequent disappearance is probably (to my mind) due to culture change, not to cultural replacement. However, I cannot preclude that possibility. On the other hand, there are continuities in the forms of end scrappers, and the presence of utilized flakes and cobble tools, among others. However, these may be analogous or functional similarities, and therefore not evidence for cultural continuity. Methodological issues, such as whether classifications of artifacts are consistent, also cloud some possible long-term continuities (e.g. edge-ground cobbles present in a very few late assemblages). A key issue here is the general absence of occupation of the central Basin, except immediately along the river. The riverside occupation in the immediate area is probably somewhat later, however, than the Kennewick individual's lifetime. The occupation record is continuous to the east, along the Lower Snake River and its tributaries.

The major changes that occurred after 4000 B.C. also make it exceedingly difficult to trace connections forward in time. Many of these changes, such as the initiation of pit house construction, are probably related to broad–scale changes in western North America, and so do not indicate population replacement. However, they do point to a period of significant culture change and reorganization. Other changes include the reorientation of the region's interaction patterns from apparently tending towards the south to the west and the coast. There are also puzzles during this period, such as microblades, and what they represent.

Chatters' proposed explanatory model for the changes between Pithouse I and Pithouse 2 approximates the expectations of (and shares some common ideas with) Bettinger's model for what the Shoshonean expansion should look like archaeologically (Bettinger 1994). However, these remain models, not evidence. Nor is there any suggestion in the evidence of a migration. However, it does seem evident that there was a major reorganization of subsistence and settlement systems during this period.

The evidence is overwhelming that many aspects of the "Plateau Pattern" were present between 1000 BC and AD 1, and that the Pattern itself, as described by Nelson (1973) and Walker (1998), was probably fully in place by AD 1, although change continued to occur (e.g. the appearance and spread of long-lodges). However, evidence from the southern uplands (Endzweig 1994, Schalk et al. 1995, Hess 1997) indicates considerable movement and shifting around of peoples in the region. These changes may include aggregating down along the Columbia in the last 1000 to 1500 years in large villages, with an accompanying reduced use of the uplands.

These conclusions emphatically do not mean that to my mind there was not cultural continuity between the people of the Columbia Plateau in1800 and earlier peoples on the Plateau. At the beginning of this section, I wrote that the empirical record precludes establishing cultural continuities or discontinuities across increasingly remote periods. However, if the available evidence cannot be used to show continuity, it is equally refractory for demonstrating discontinuity. Such evidence, either way, might be developed by an extensive review of both the published literature and of museum collections, and through continued fieldwork.

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[26] I have not seen the points. Davis and Jerry Galm have independently informed me of the similarities between Lind Coulee and the Copper's Ferry points.

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Chapter 2
Bibliography

Review of the Archaeological Data

Kenneth M. Ames

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Kennewick Man
Cultural Affiliation Report

Chapter 2
Figures

Review of the Archaeological Data

Kenneth M. Ames

Figures

Kennewick Man

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Chapter 2

Figure 1

Review of the Archaeological Data

Kenneth M. Ames

Figure 1

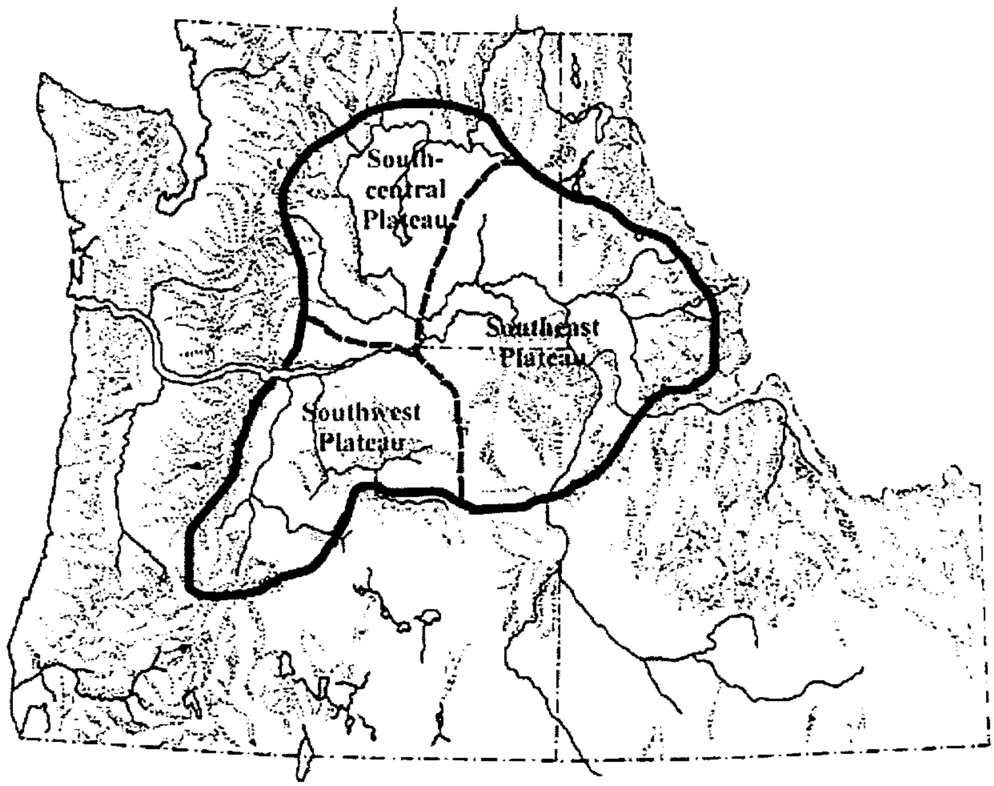

Figure 1. The Columbia (Southern) Plateau and subregions (after Ames et al. 1998).

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Chapter 2
Figure 2

Review of the Archaeological Data

Kenneth M. Ames

Figure 2

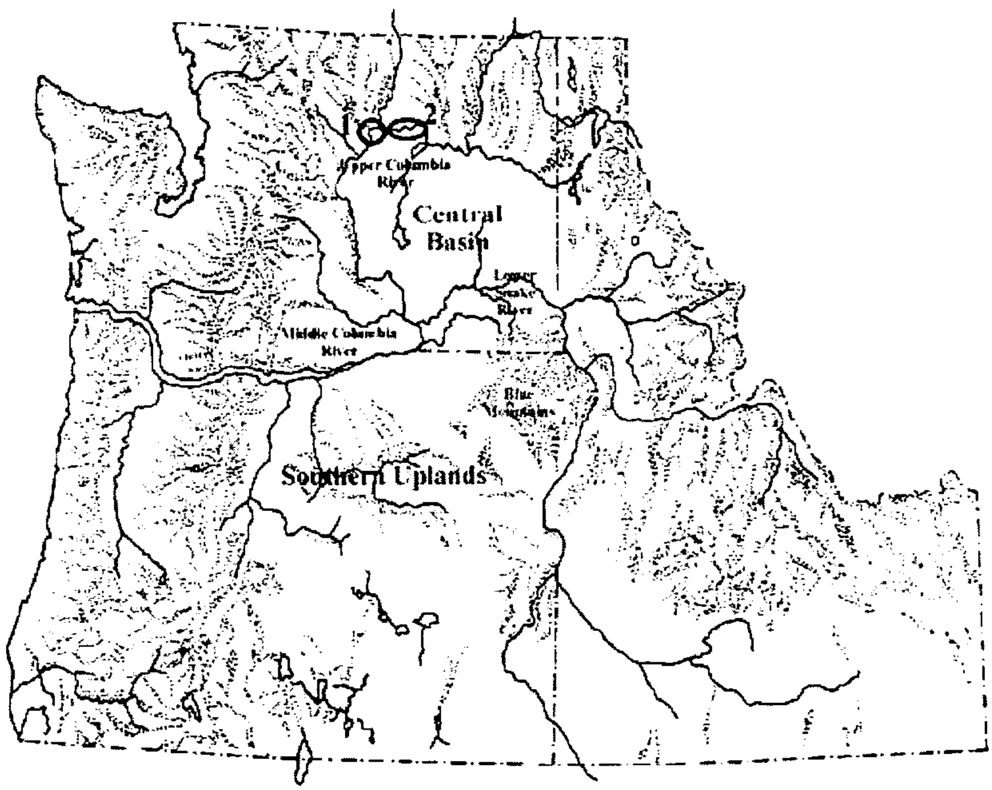

Figure 2. Areas and localities within the Southern Plateau mentioned in the text. Area 1 is the Wells Reservoir Project Area; Area 2 is the Chief Joseph Project Area.

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Chapter 2
Figure 3

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Figure 3

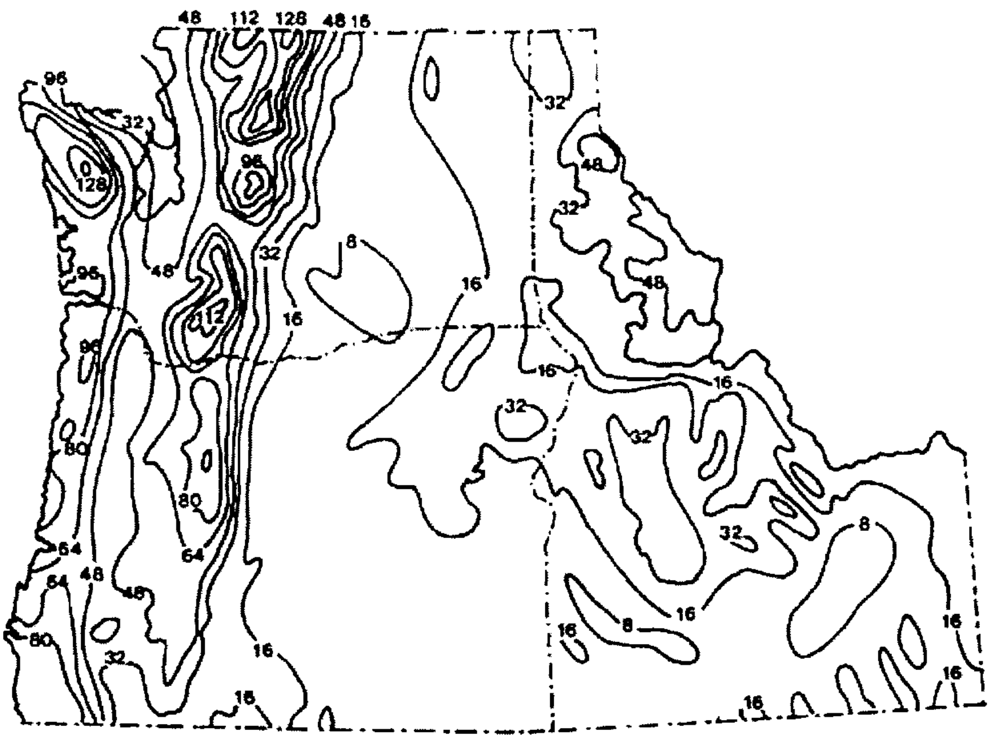

Figure 3. Rainfall patterns in the Pacific Northwest (from Ames 1988). Reproduced courtesy of the Nevada State Museum Anthropology Papers No. 21.

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Figure 4. Distribution of vegetation zones on the Columbia Plateau to illustrate degree of environmental complexity relative to elevation and rainfall.

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Figure 5

Age	Period Chatters & Pokotylo 1998	Period (Ames et al. 1998)	Southwest Plateau	Southcentral Plateau	Southeast Plateau
AD 1800	Late Late Period	Early Modern	Historic	Coyote Creek	Nimipu
1500		Period III	IIIB Quinton	IIIB Coyote Creek	IIIC Piqunnin
1000					
500	Middle Late		IIIA Wildcat		IIIB Harder
AD 1					
500 BC	Early Late Period			IIIA Hudnut	
1000					IIIA Tucannon
1500			?		
2000		Period II		Kartar	Tucannon/ Late Cascade/ Hatwai (Lower Clearwater)
2500	Late Middle Period				
3000					
3500					
4000	Early-Middle Period				
4500			Canyon		
5000		Period IB		Late Vantage	Late Cascade
5500 Mazama Ash					
6000	Early Period	Period IB	?	Early Vantage	Early Cascade
6500					
7000					
7500			Philippi ?	(Windust?) ? ?	Windust
8000					
8500					
9000					
9500					
10000					
10500					
11000					
11500		Period IA	PaleoIndian\Windust?		

Figure 5. Phase sequences for the Southern Plateau from Chatters and Pokotylo 1998 and Ames et al. 1998.

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Figure 6

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Figure 6

DATE (B.P.)	SNAKE RIVER SEQUENCE[a] PHASE	 ARTIFACT ASSEMBLAGE
PRESENT	NUMÍPU	EUROAMERICAN TRADE GOODS DECREASE IN ABORIGINAL TECHNOLOGIES
250 500 1000 1500 2000 2500	LATE SUBPHASE HARDER EARLY SUBPHASE	SMALL CORNER NOTCHED POINTS LANCEOLATE & PENTAGONAL KNIVES SMALL END SCRAPERS PESTLES NET WEIGHTS BONE BEADS UTILIZED FLAKES RECTANGULAR STEMMED POINTS COMPOSITE HARPOON ELEMENTS TWINED BASKETRY & CORDAGE EXPANDING STEMMED POINTS COBBLE SPALL SCRAPERS HOPPER MORTAR BASES BONE AWLS & NEEDLES PERFORATED ELK TEETH DECORATED PESTLES BONE MATTING NEEDLES SHELL ARTIFACTS (*OLIVELLA* & *DENTALIUM*)
3000 3500 4000 4500	TUCANNON	CONTRACTING STEMMED POINTS CORNER & SIDE NOTCHED POINTS SIDE & END SCRAPERS NET WEIGHTS PESTLES UTILIZED COBBLE SPALLS BONE AWLS BONE SHUTTLES POUNDING STONES HOPPER MORTAR BASES COBBLE SPALL SCRAPERS UTILIZED FLAKES ANTLER WEDGES
5000 5500 6000 6500 7000 7500 8000	LATE SUBPHASE CASCADE ca 6700 MAZAMA ASH EARLY SUBPHASE	COLD SPRINGS SIDE NOTCHED POINTS LANCEOLATE (LEAF-SHAPED) POINTS LARGE LANCEOLATE & TRIANGULAR KNIVES TABULAR & KEELED SCRAPERS LARGE COBBLE SPALL SCRAPERS SMALL GRINDING STONES EDGE GROUND COBBLES BONE ATLATL SPURS BONE NEEDLES LARGE UTILIZED FLAKES POUNDING STONES MANOS ATLATL WEIGHTS BONE AWLS *OLIVELLA* BEADS
8500 9000 9500 10,000 10,500 11,000	? WINDUST ?	STRAIGHT OR CONTRACTING STEMMED POINTS UNIFACE & BIFACE LANCEOLATE POINTS LANCEOLATE & OVAL KNIVES MULTIPLE FACETED BURINS LARGE COBBLE SCRAPERS UTILIZED FLAKES BONE ATLATL SPURS SCRAPERS UNIFACE & BIFACE CHOPPERS UTILIZED SPALLS BONE NEEDLES/AWLS *OLIVELLA* BEADS

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DATE (B.P.)	MID-COLUMBIA SEQUENCE[b] PHASE	ARTIFACT ASSEMBLAGE
PRESENT	HISTORIC	EUROAMERICAN TRADE GOODS DECREASE IN ABORIGINAL TECHNOLOGIES
250 500 1000 1500 2000 2500	LATE SUBPHASE CAYUSE EARLY SUBPHASE	Late: SMALL CORNER NOTCHED POINTS; COMPOSITE HARPOONS; HOPPER MORTAR BASES; SHELL ARTIFACTS (*OLIVELLA* & *DENTALIUM*); EXPANDING STEMMED POINTS; THREE PRONGED SPEARS; BONE/ANTLER TOOLS Early: LANCEOLATE & PENTAGONAL KNIVES; GRAVERS/DRILLS; UTILIZED FLAKES; TWINED BASKETRY & CORDAGE; SCRAPERS; MICROBLADES (?)
3000 3500 4000 4500	? FRENCHMAN SPRINGS	LEAF SHAPED POINTS; STEMMED PROJECTILE POINTS; KNIVES; GRAVERS; DRILLS; CORE TOOLS; TWINED BASKETRY & CORDAGE; LANCEOLATE POINTS; TRIANGULAR POINTS; SCRAPERS; MICROBLADES & MICROCORES; CORE SCRAPING PLANES ?; UTILIZED FLAKES; *OLIVELLA* ARTIFACTS
5000 5500 6000 6500 7000 7500 8000	LATE SUBPHASE VANTAGE EARLY SUBPHASE	Late: "LEAF"-SHAPED PROJECTILE POINTS AND KNIVES; STEMMED PROJECTILE POINTS; OVATE KNIVES; MORTARS; HAMMERSTONES; UTILIZED FLAKES; MICROBLADES; MANOS; ATLATL WEIGHTS; CORE TOOLS; BONE AWLS/NEEDLES ? Early: *OLIVELLA* BEADS
8500 9000 9500 10,000 10,500 11,000	? WINDUST ?	? STRAIGHT OR CONTRACTING STEMMED POINTS; UNIFACE & BIFACE LANCEOLATE POINTS; LANCEOLATE & OVAL KNIVES; MULTIPLE FACETED BURINS; LARGE COBBLE SCRAPERS; UTILIZED FLAKES; BONE ATLATL SPURS; SCRAPERS; UNIFACE & BIFACE CHOPPERS; UTILIZED SPALLS; BONE NEEDLES/AWLS; *OLIVELLA* BEADS

Figure 6. Phase sequence for the Southern Plateau (Galm 1981). Reproduced courtesy of the author.

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Dated archaeofaunas with bison

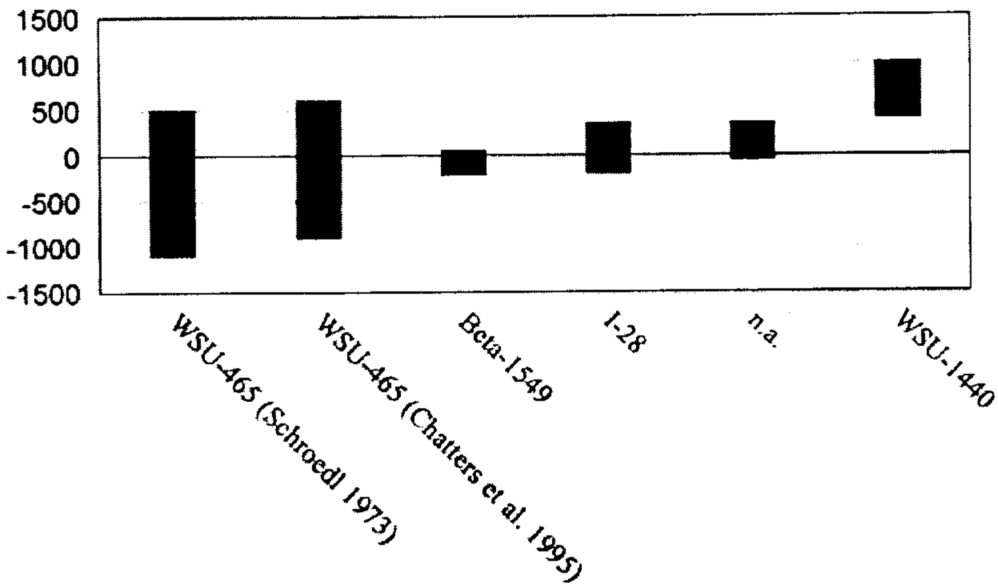

Figure 7: Dated Archaeofaunas with bison from the Late Holocene.

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Figure 8

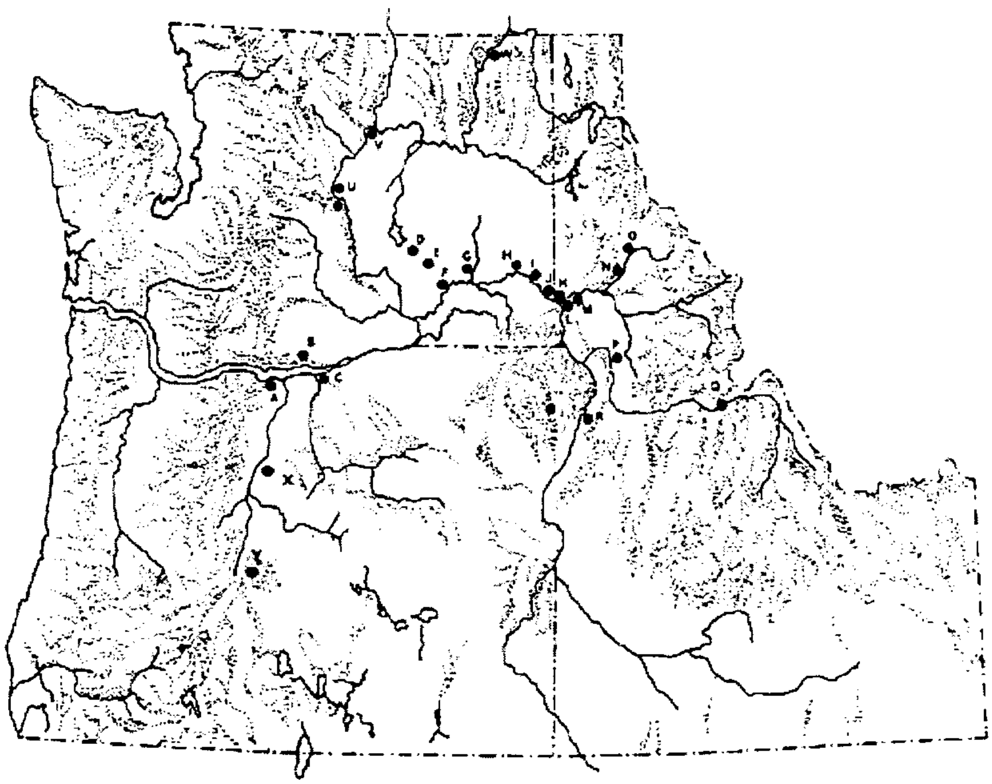

Figure 8. Distribution of Pre-Mazama Period 1B sites on the Columbia Plateau.
Key: A. The Roadcut Site (Five Mile Rapids); B. Goldendale; C. Wildcat Canyon; D. Lind Coulee; E Meyers Cave; F. Windust Caves; G. Marmes; H. Wexpusnime; I. Thorn Thicket; J. Granite Point; K. Hatwai; L. Spaulding Park (Lapwai); M. Lenore; N Upper Terrace, North Fork of the Clearwater; O. Weitas Creek; P. Cooper's Ferry; Q. Shoup Rockshelter; R. Bernard Creek Rockshelter; S. Pilcher Creek; T. Plew; U. Avey's Orchard' V. Rock Island Overlook; W. Kettle Falls; X.35JE49; Y. Paulina Lake.

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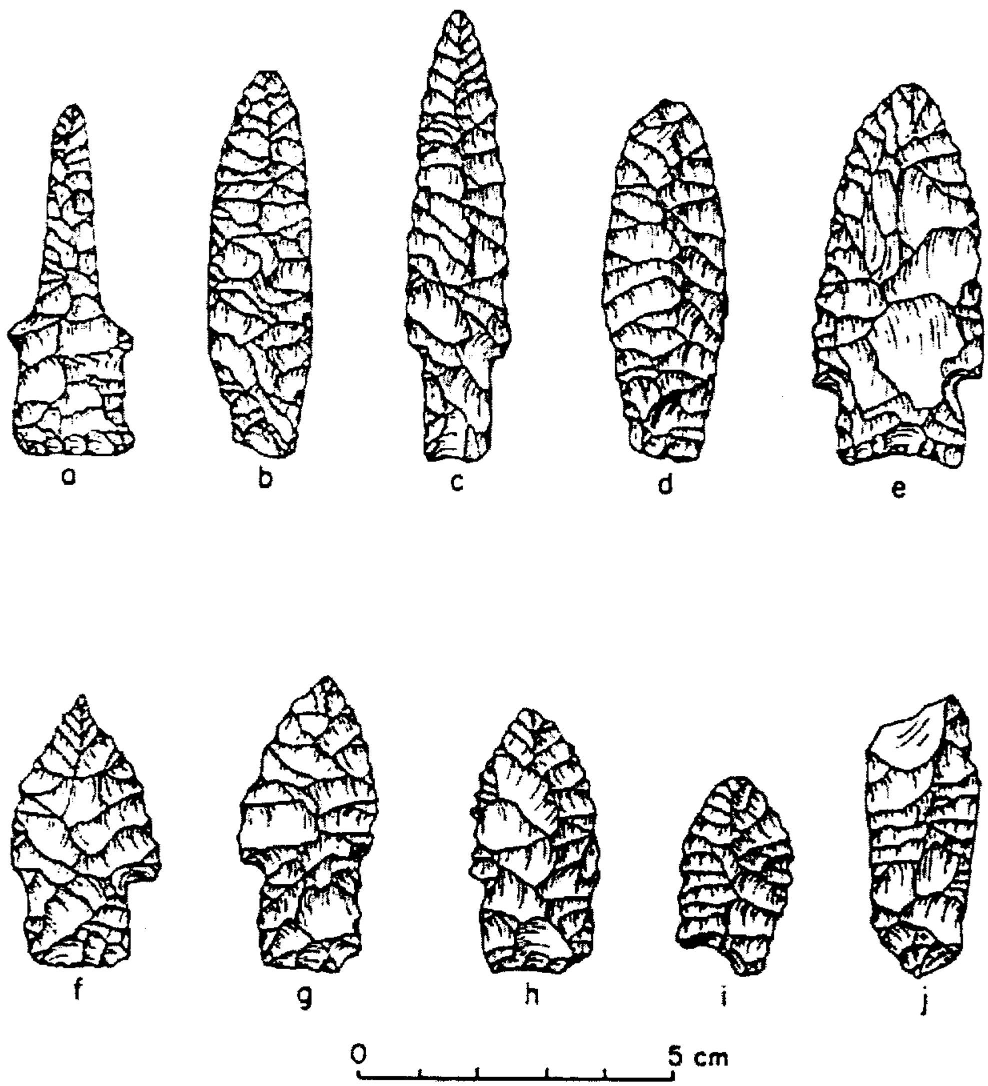

Figure 9. Windust Points from Hatwai (Sappington 1994). Reproduced courtesy of the author.

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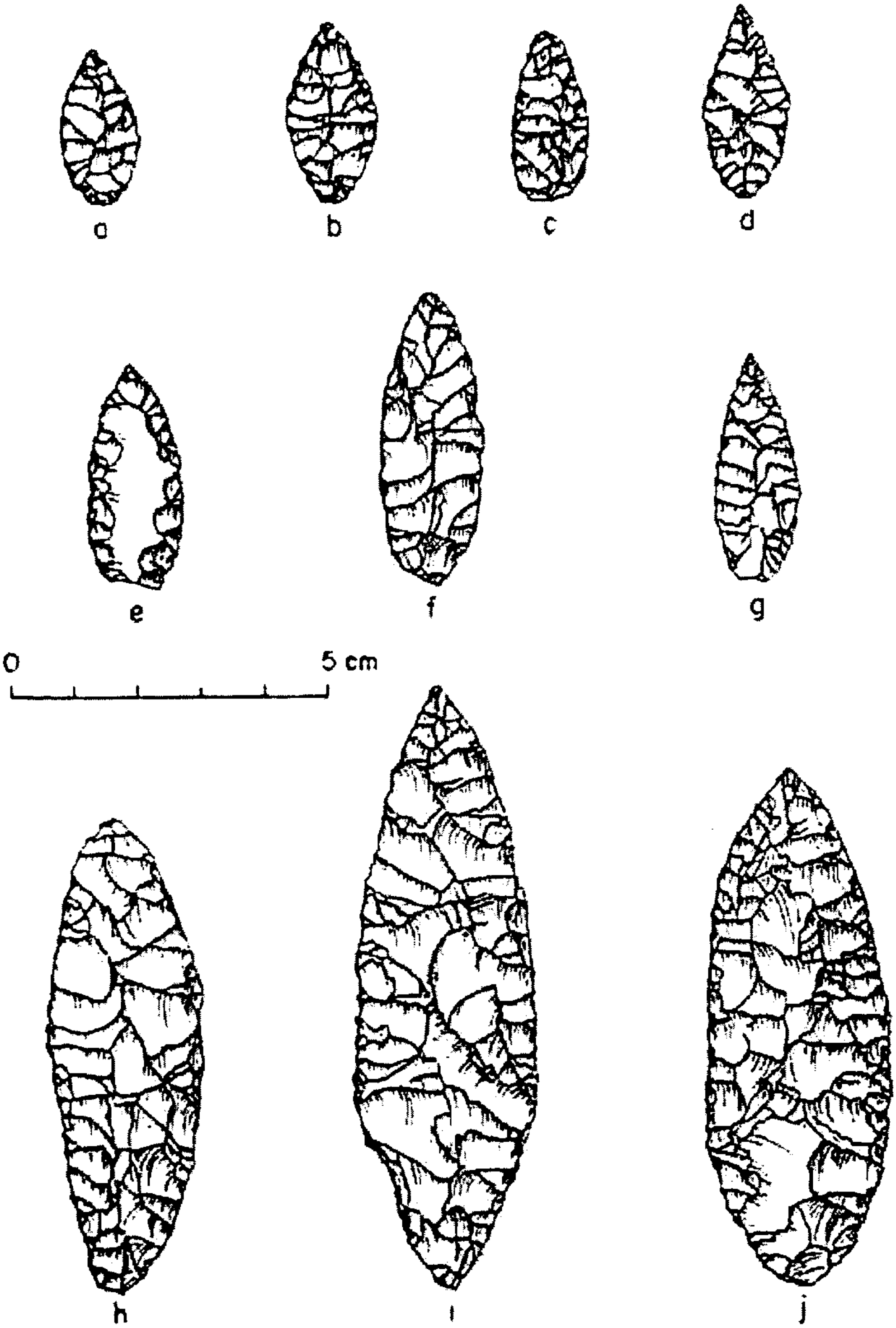

Figure 10. Examples of Cascade Points from the Clearwater River Area (from Sappington 1994). Reproduced courtesy of the author.

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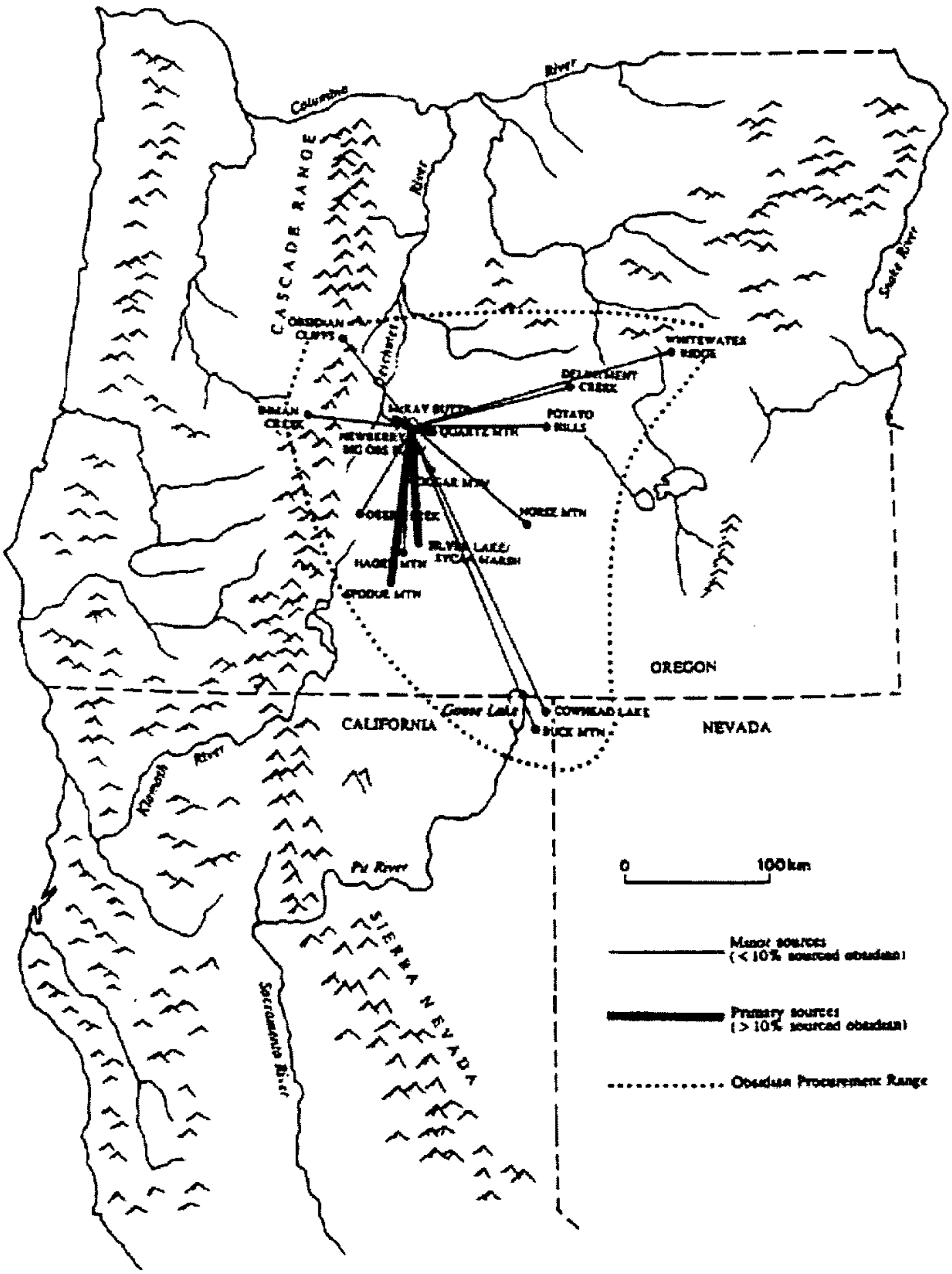

Figure 11. Distances to obsidian sources from Paulina Lake (Connolly 1999). Reproduced courtesy of the University of Utah Press.

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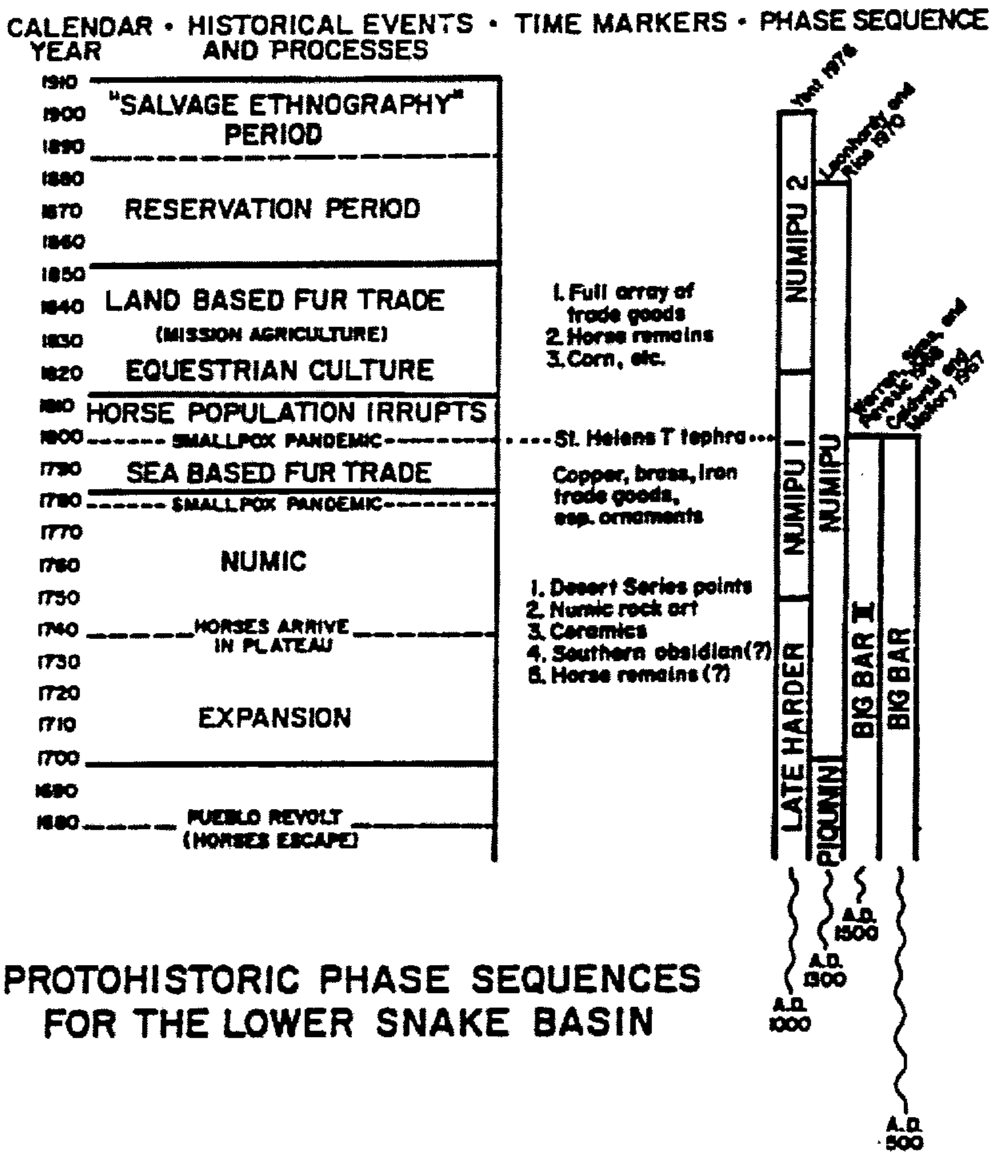

Figure 12. Sequence of events before and during the Early Modern Period for the Lower Snake River Region (Reid 1991a). Reproduced courtesy of the author.

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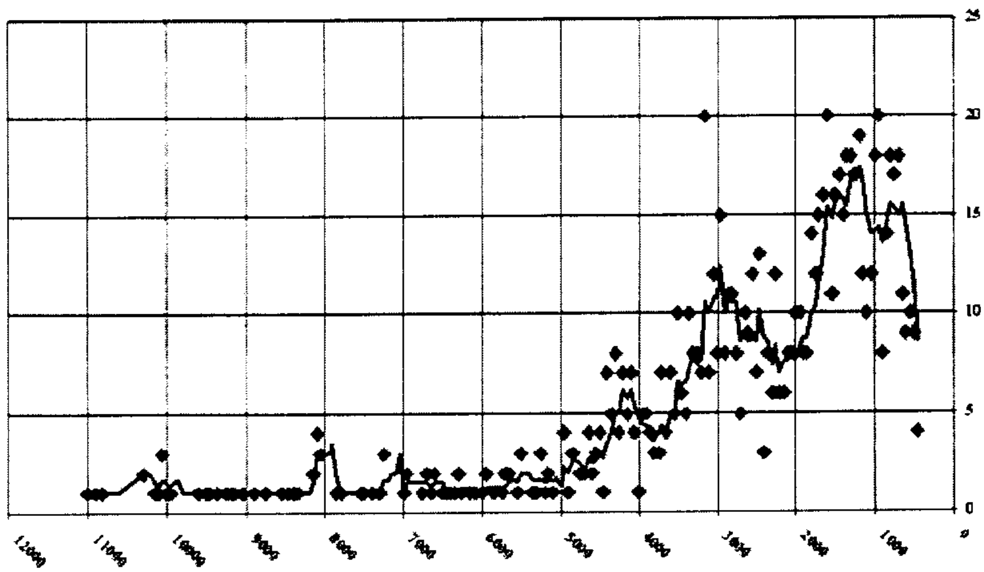

Figure 13. Temporal Distribution of uncorrected intercept dates/50 increment with a 200 year moving average.

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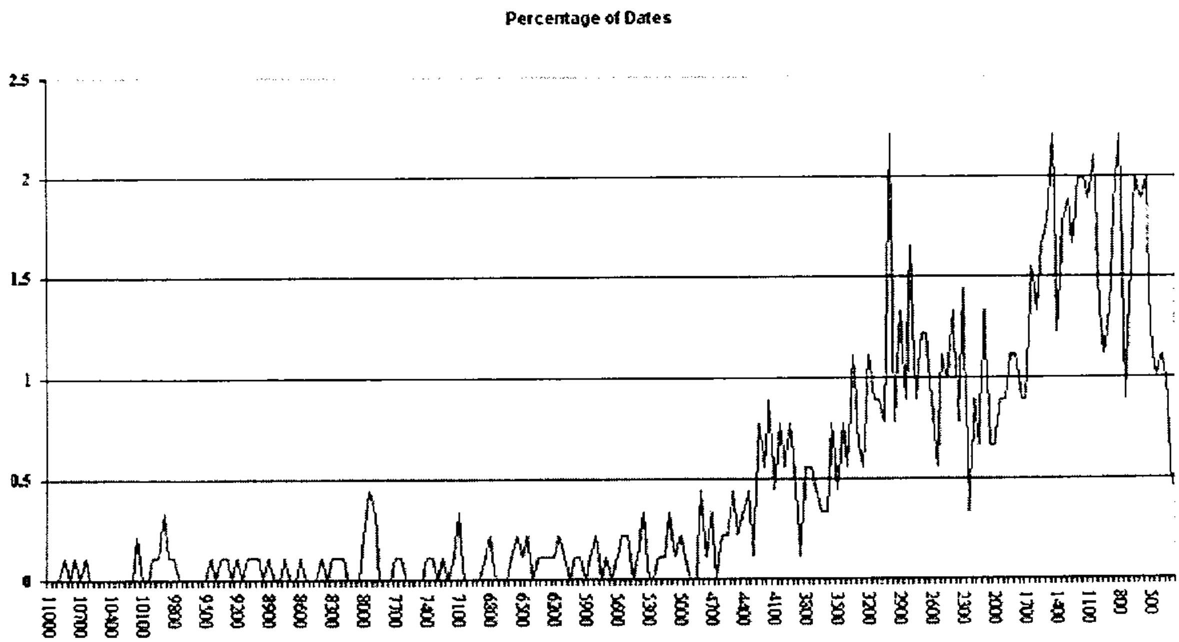

Figure 14. Percentage of uncorrected intercept dates/50 increment.

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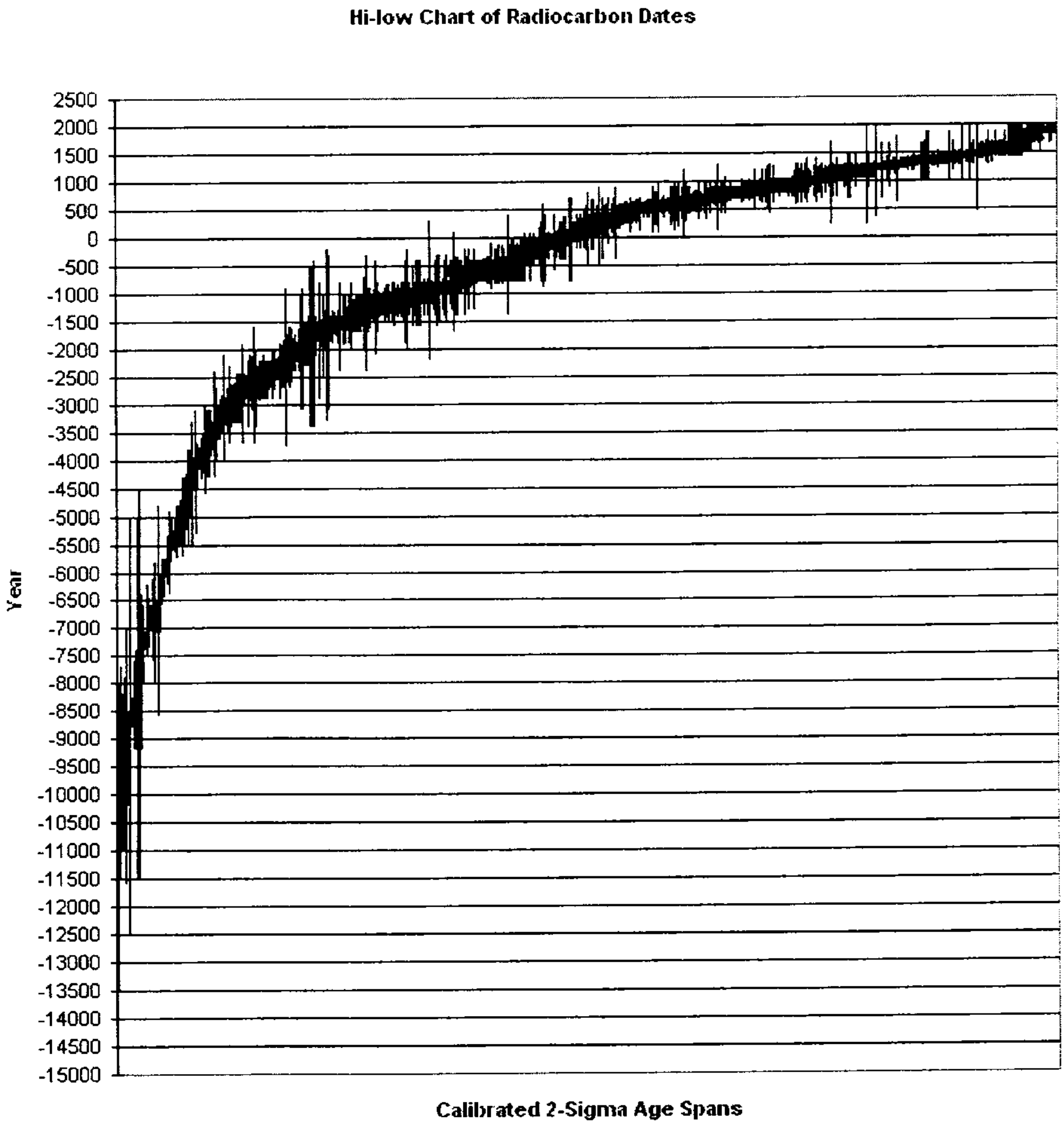

Figure 15. Calibrated age ranges of radiocarbon dates from the study area.

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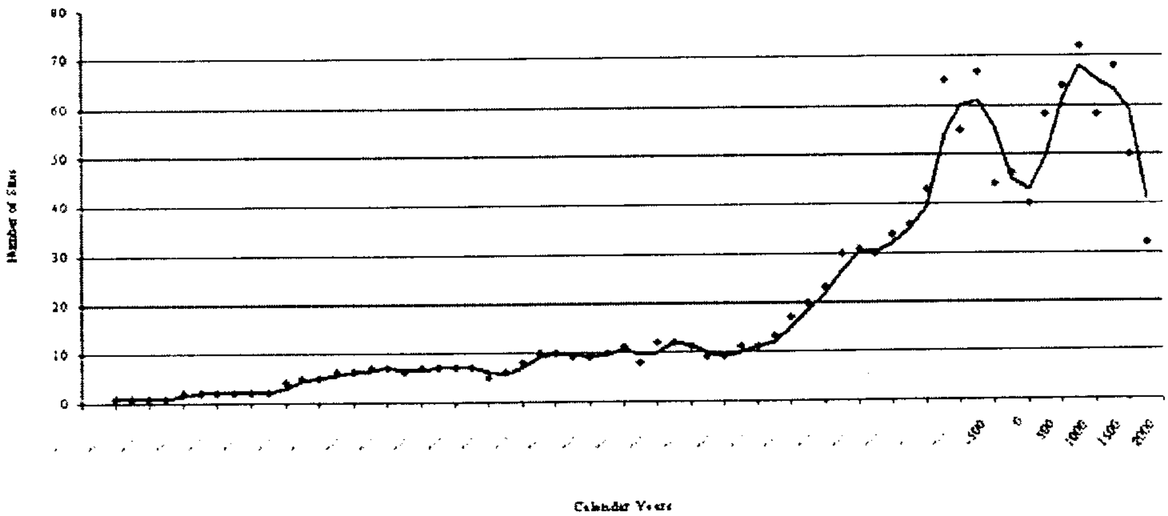

Figure 16. Number of sites \250 year increments. The counts are based on tallying the number of sites\increment with a calibrated dates (two sigma age spans), not on tallying number of dates. The trend line is based on a 500 year moving average.

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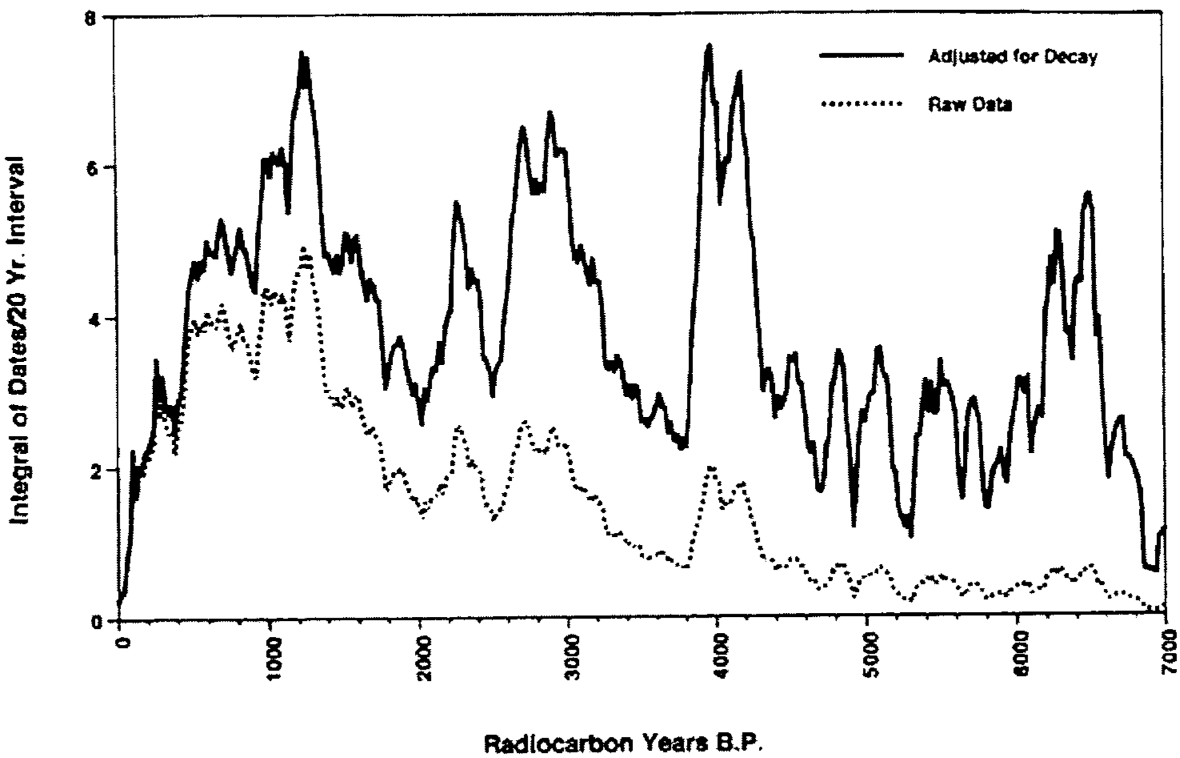

Fig. 8. The distribution of radiocarbon dates on charcoal and bone from the Southern Plateau. Data are presented as an integral of the normal distribution for each date based on raw data (dotted line) and data corrected for progressive destruction and masking (solid line). The solid line is used as a proxy for ordinal population change over the past 6000 years.

Figure 17. Chatters' plot of intercept dates/20 years for radiocarbon dates from the Columbia Plateau (Chatters 1995). Reproduced courtesy of the author and Kluwer Academic/Plenum Press, *Journal of World Prehistory*.

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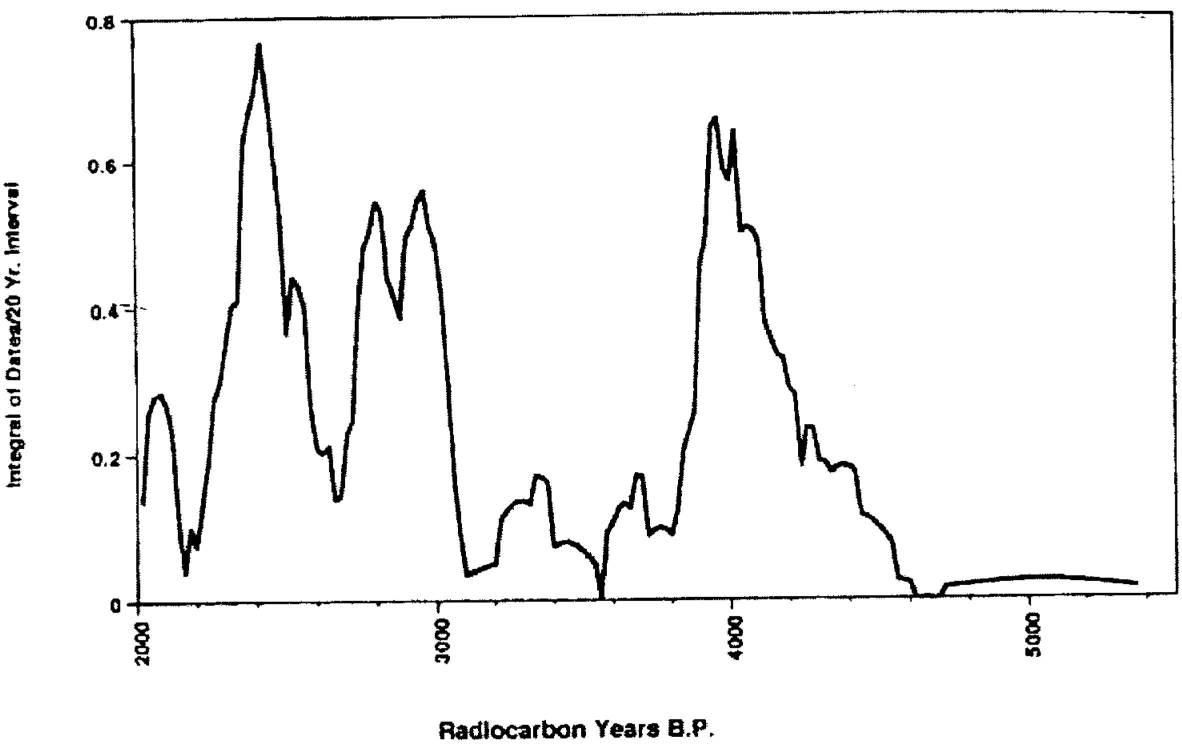

Fig. 3. The temporal distribution of Southern Plateau house floors between 5500 and 2000 B.P., presented as the integral of the normal curves of the youngest radiocarbon date from each floor.

Figure 18. Chatters' plot of radiocarbon dates from house floors on the Columbia Plateau (Chatters 1995). Reproduced courtesy of the author and Kluwer Academic/Plenum Press, *Journal of World Prehistory*.

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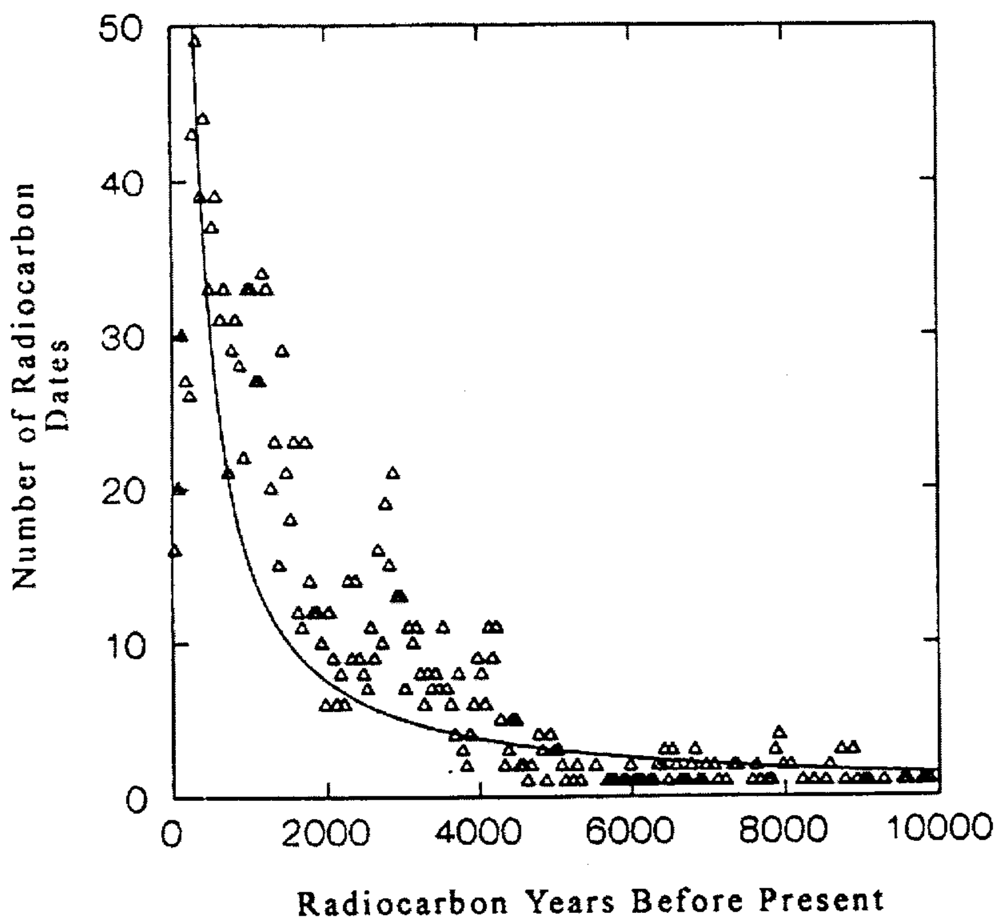

Figure 19. Hess' scatter plot of intercept radiocarbon dates/50 year increment (Hess 1997). Reproduced courtesy of the author.

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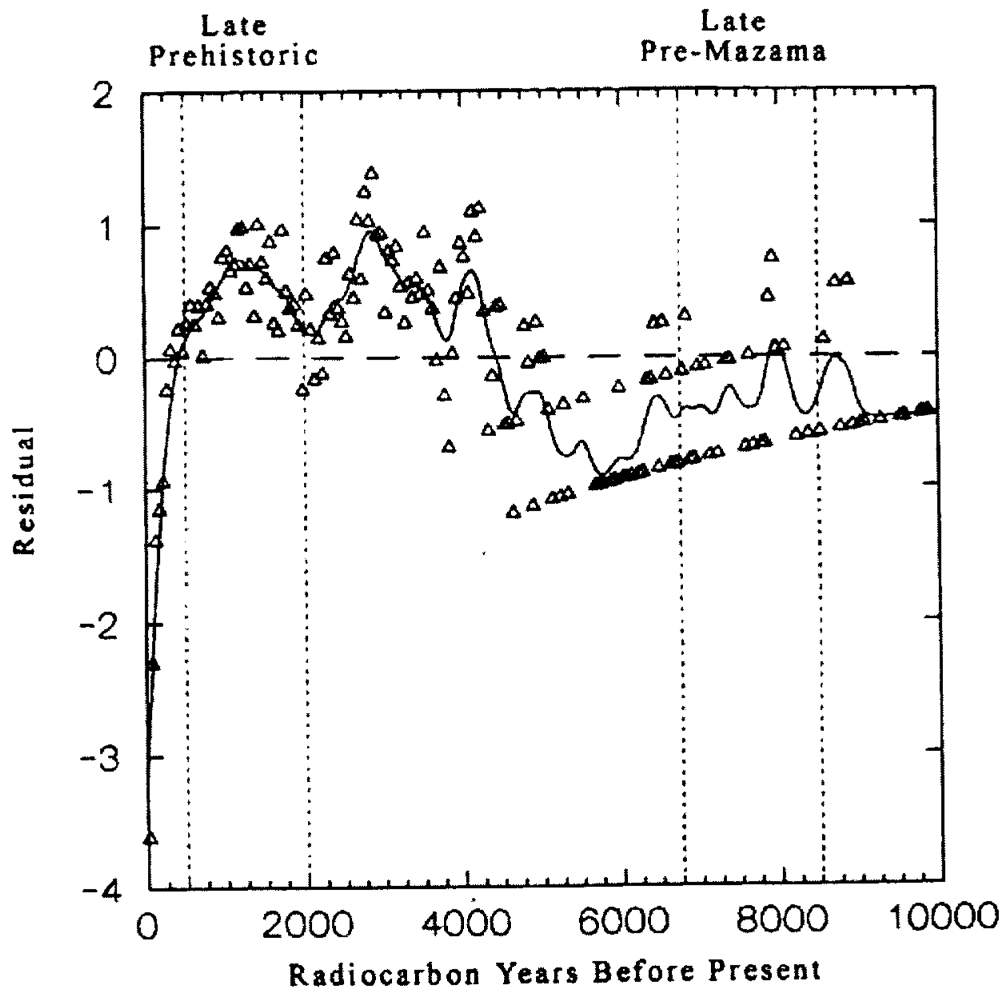

Figure 20. Hess' scatter plot of residuals (Hess 1997). Reproduced courtesy of the author.

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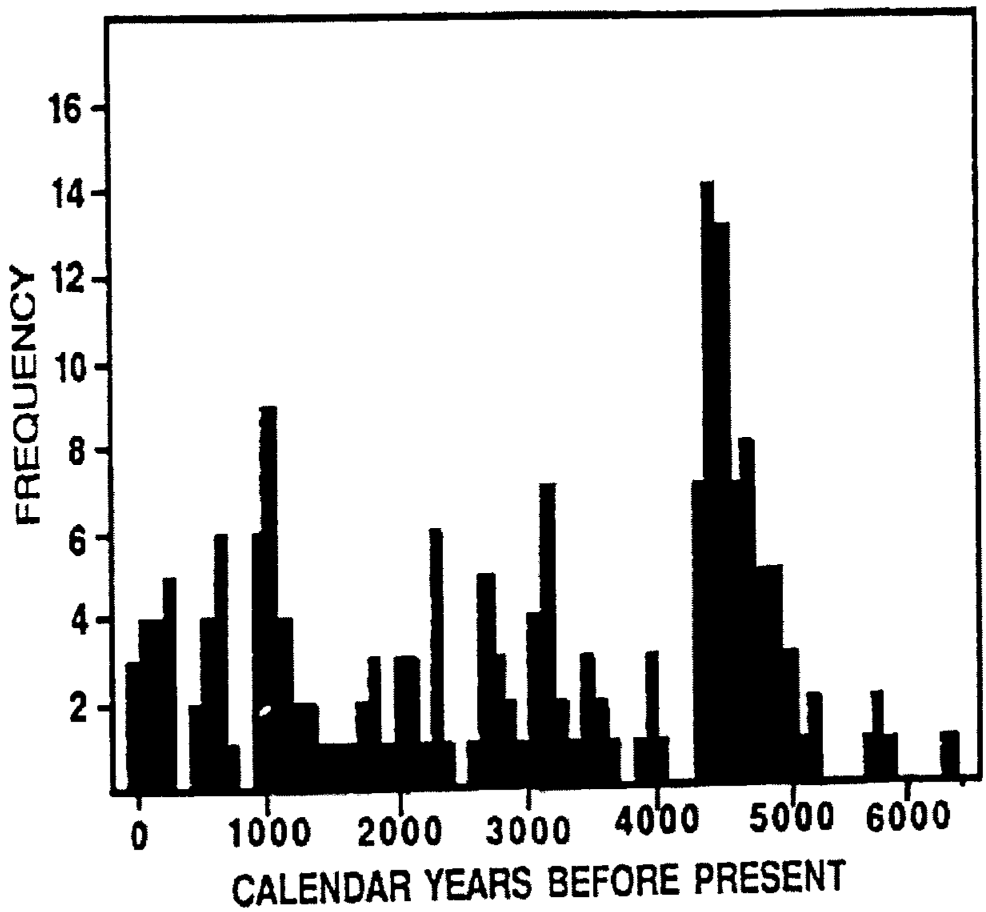

Figure 21. Raw counts of calibrated radiocarbon dates from Plateau Pithouses (Ames 1991). Reproduced courtesy of and Copyright 1991 by the Board of Trustees, Southern Illinois University. All rights reserved.

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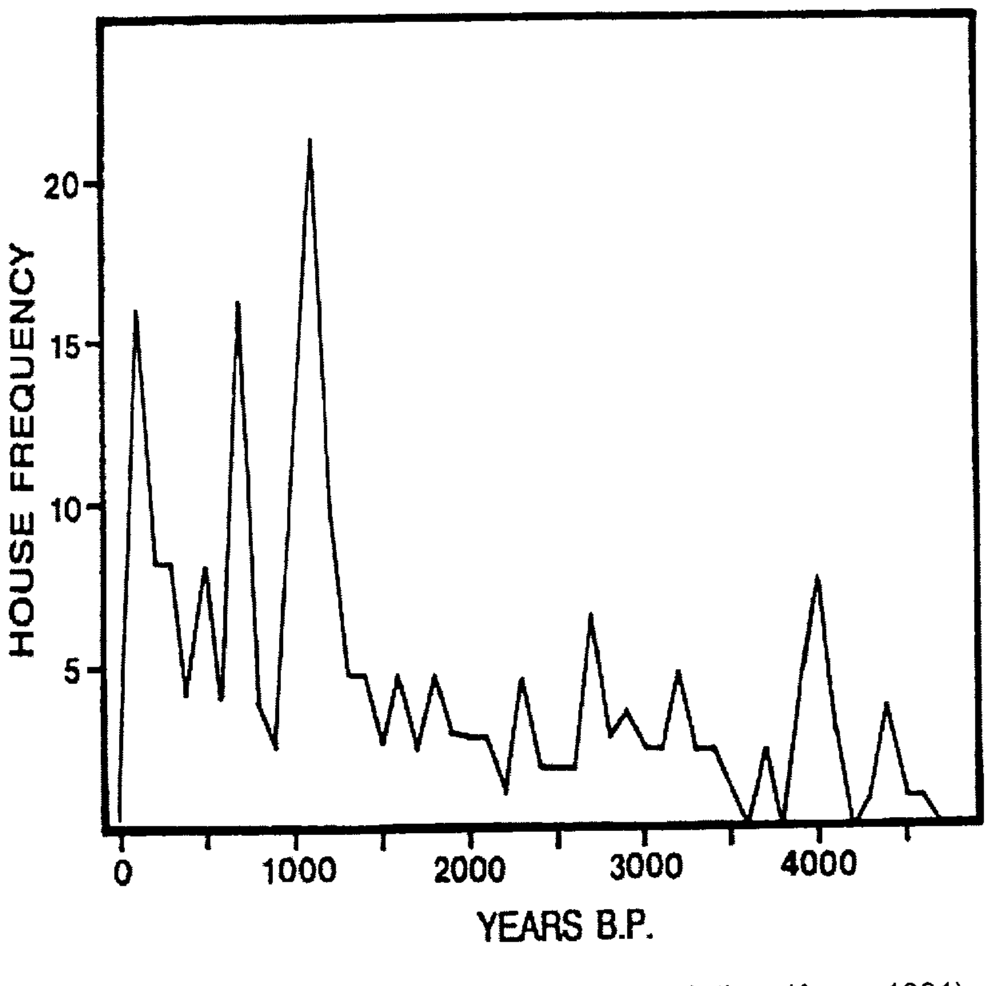

Figure 22. Ames' plot of Plateau house numbers through time (Ames 1991). Reproduced courtesy of and Copyright 1991 by the Board of Trustees, Southern Illinois University. All rights reserved.

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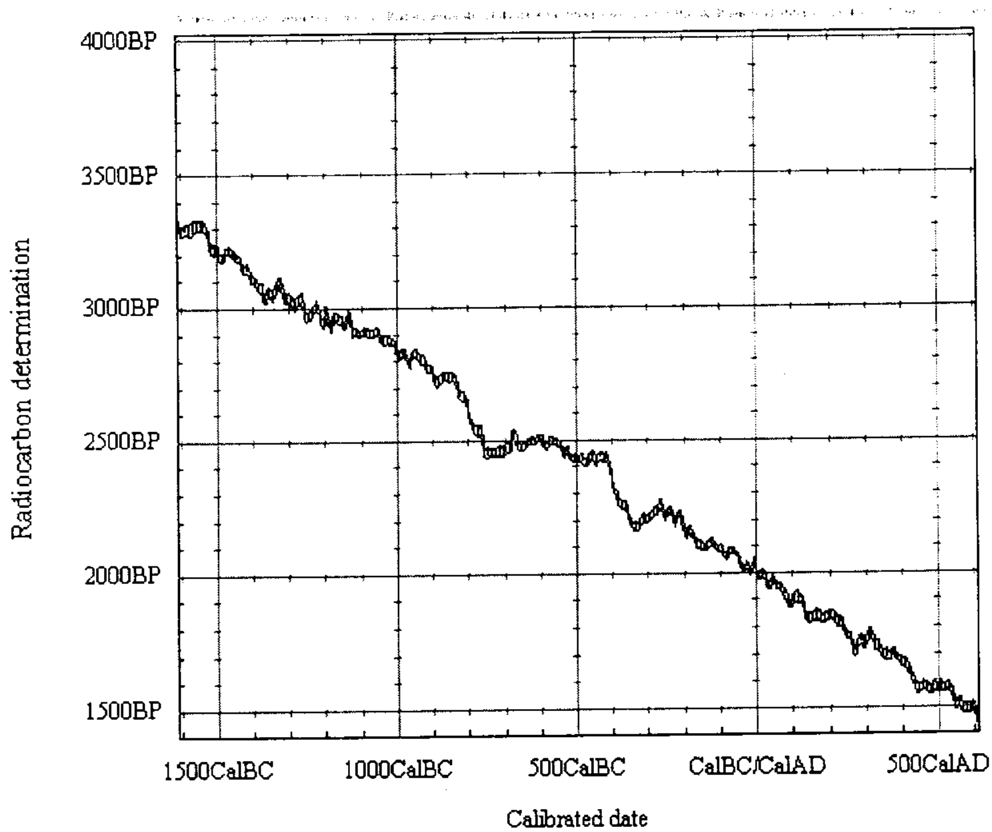

Figure 23. The radiocarbon curve at c. 2500 BP. Reproduced from OXCAL courtesy of the Oxford Radiocarbon Accelerator Unit.

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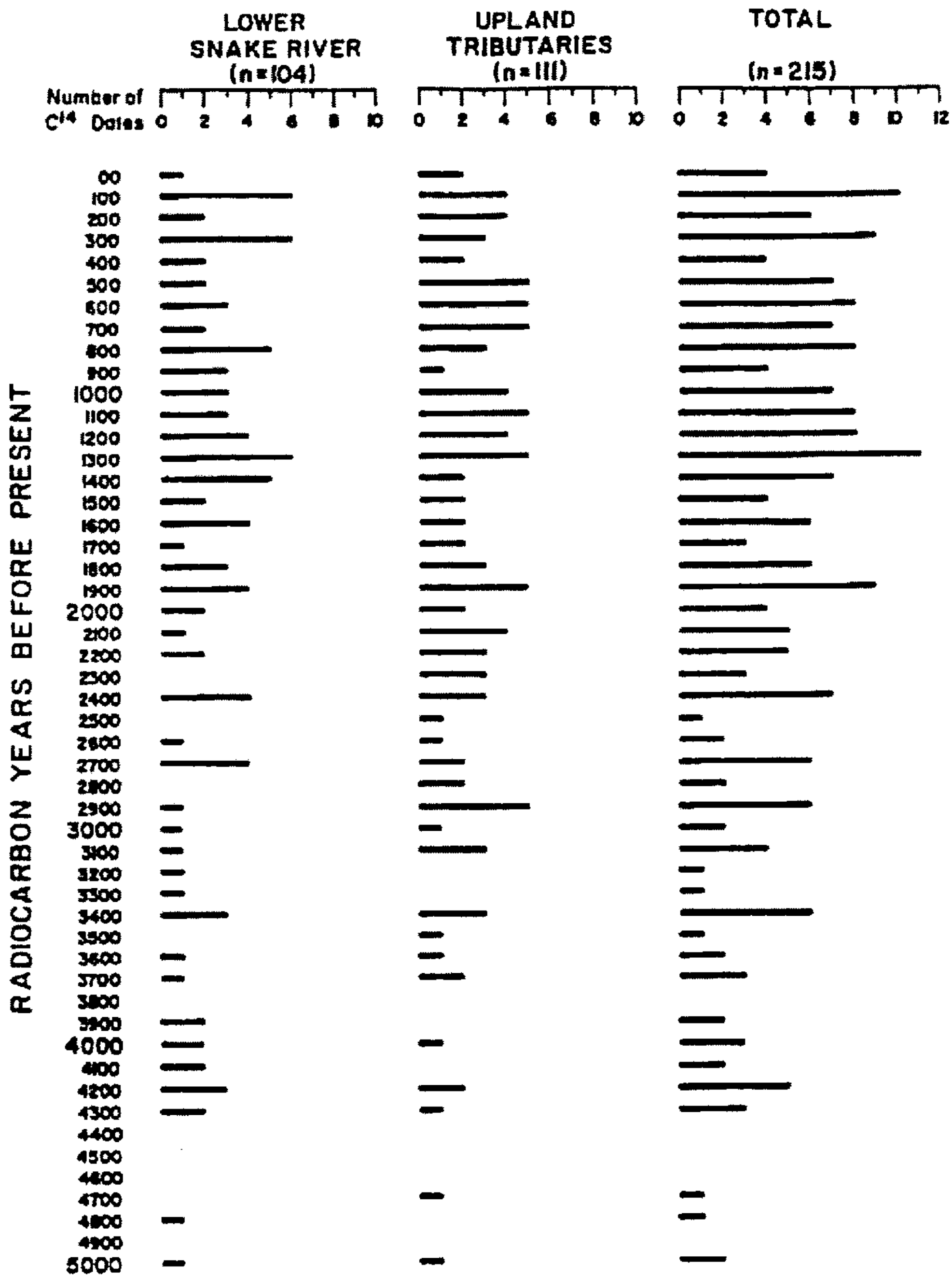

Figure 24. Distribution of 215 late Holocene radiocarbon dates from the Lower Snake River (from Reid 1991a). Reproduced courtesy of the author.

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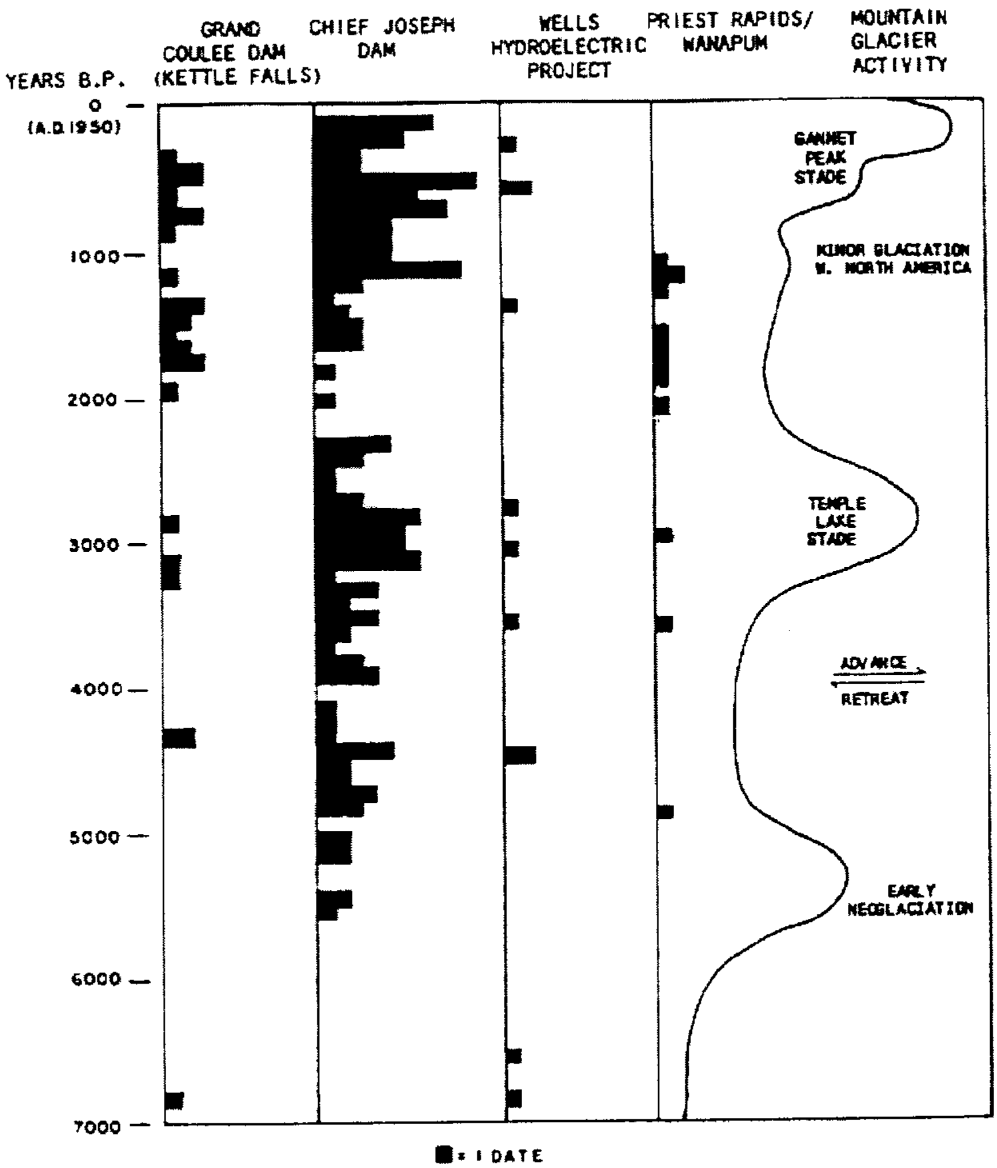

Figure 25. Temporal distribtion of radiocarbon dates from the Chief Joseph Reservoir project and other projects on the Upper Columbia River (Salo 1985). Reproduced courtesy of the author.

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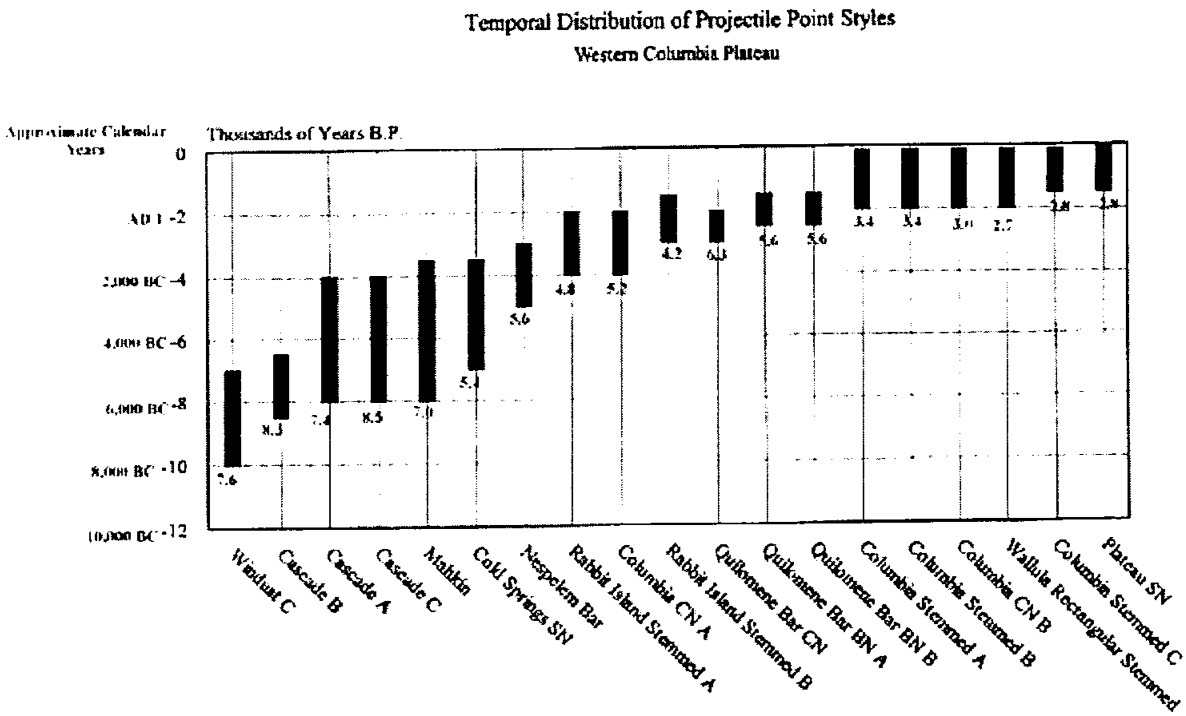

Figure 26. Age ranges of Projectile Point classes (adapted from Lohse 1985). Reproduced courtesy of the author.

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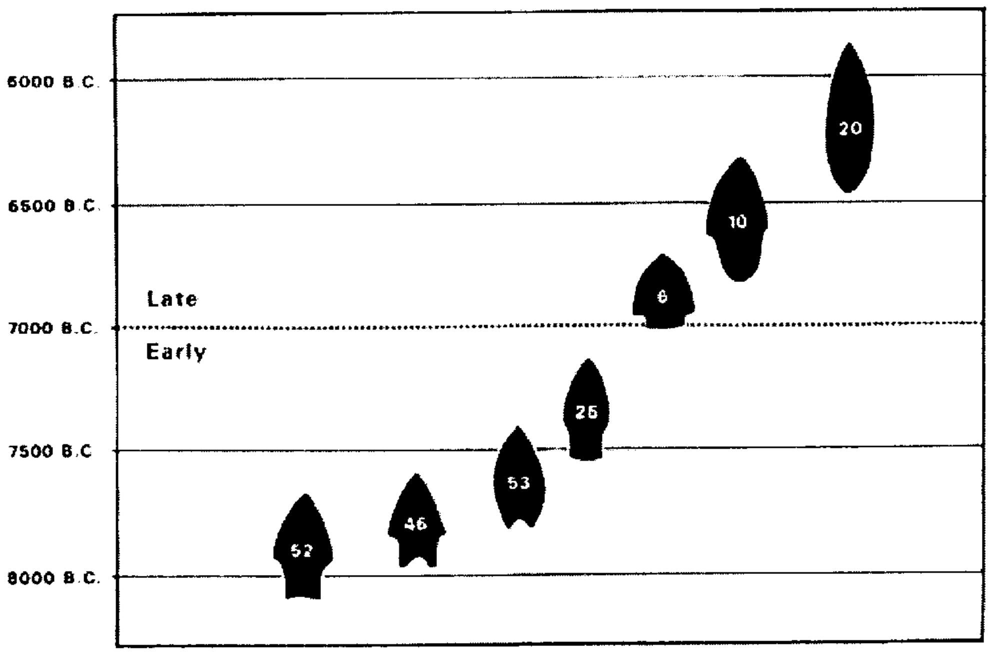

Figure 27. Project Point sequence from Marmes Rockshelter (Rice 1972). Reproduced courtesy of the author.

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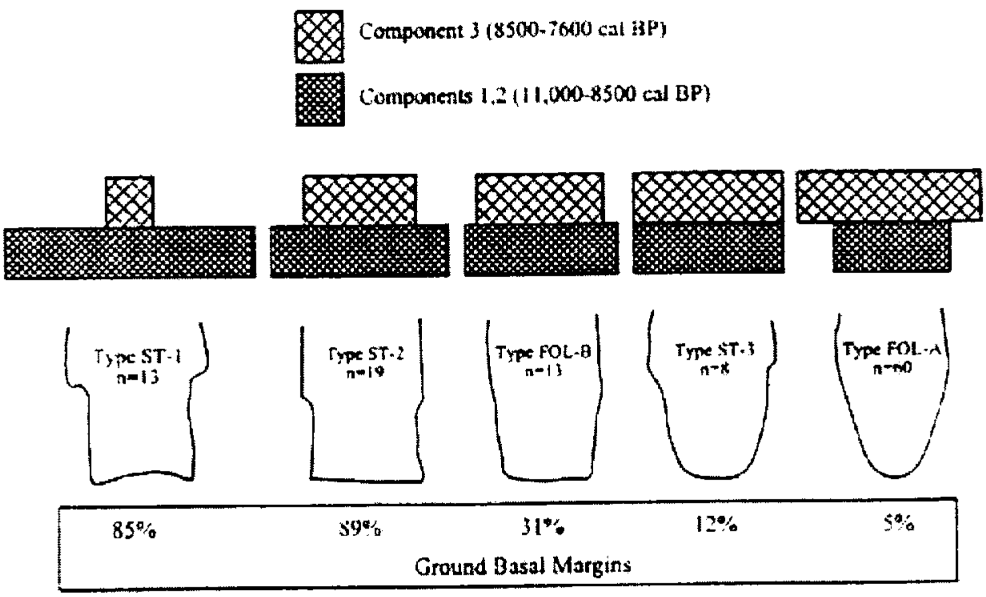

Figure 28. Connolly's Sequence of Projectile Point Bases from Paulina Lake (Connolly 1999). Reproduced courtesy of the University of Utah Press.

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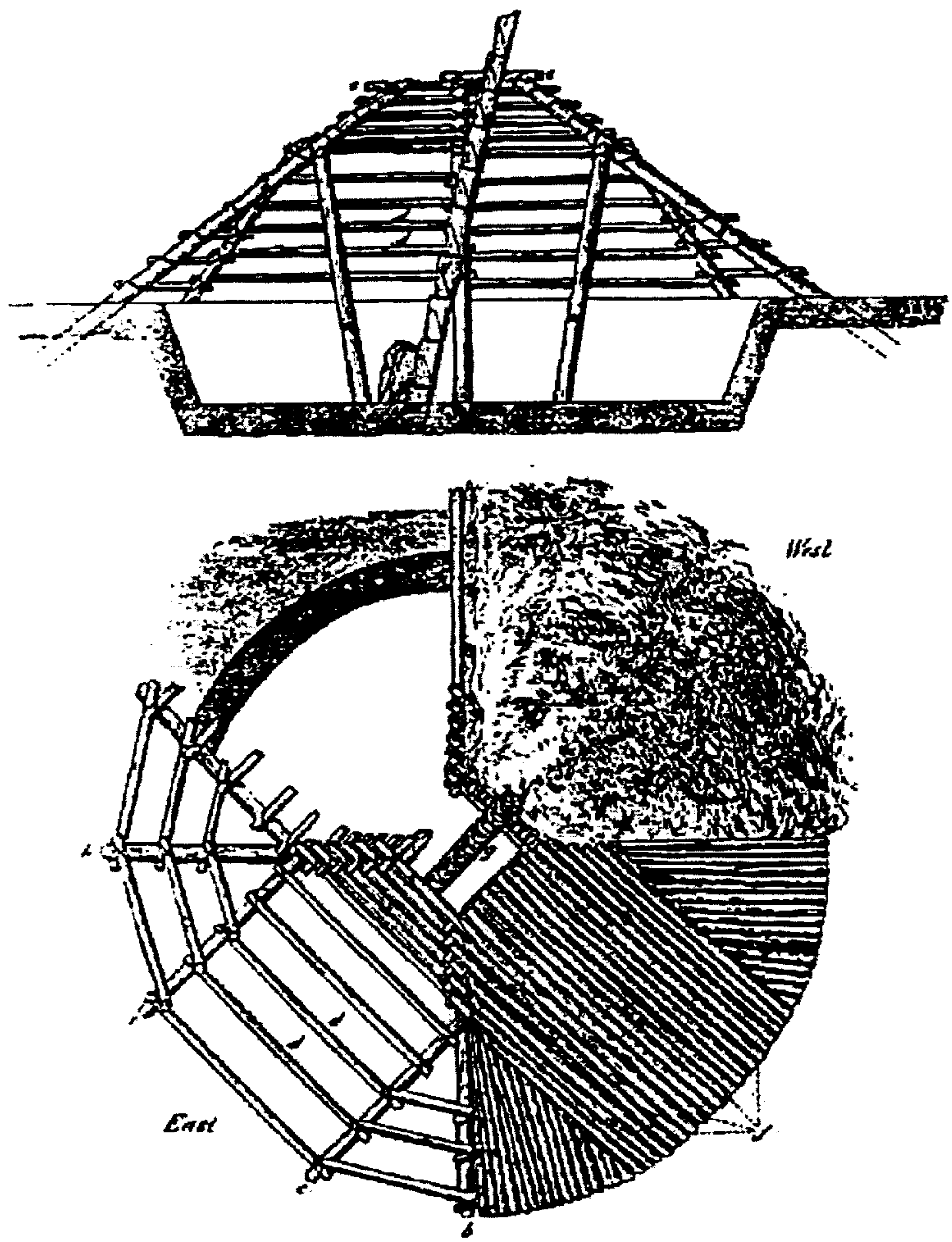

Figure 29. Pit house form on the Northern Plateau, British Columbia (Teit 1928).

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Figure 30

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Figure 30

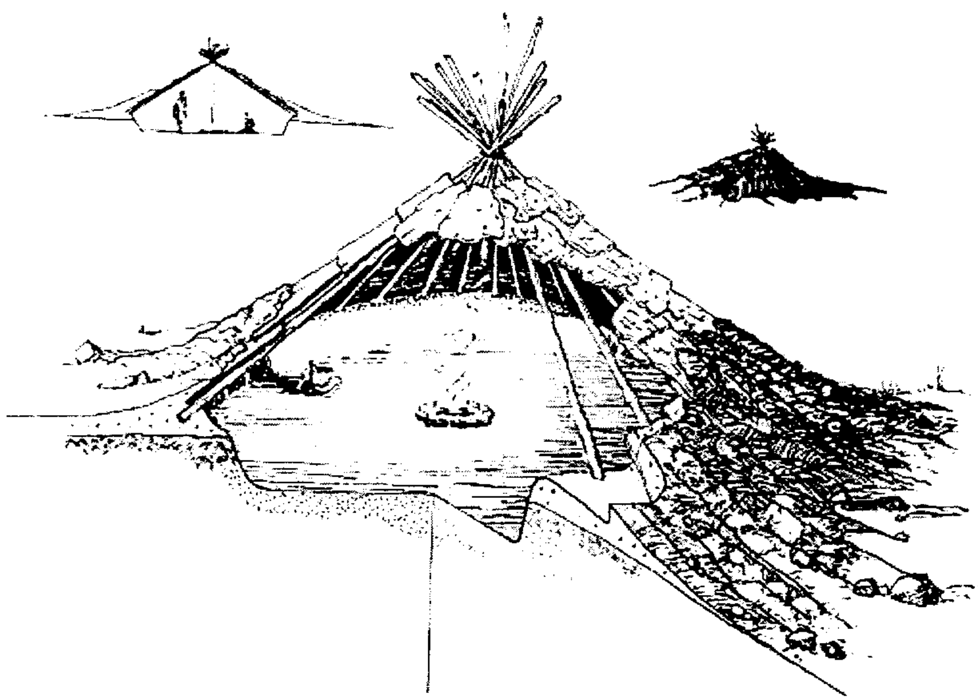

Figure 30. Roald Fryxell's recontruction of a Harder Phase house on the Lower Snake River (Leonhardy and Rive 1970). Reproduced courtesy of *Northwest Anthropological Research Notes.*

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Figure 31

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Figure 31

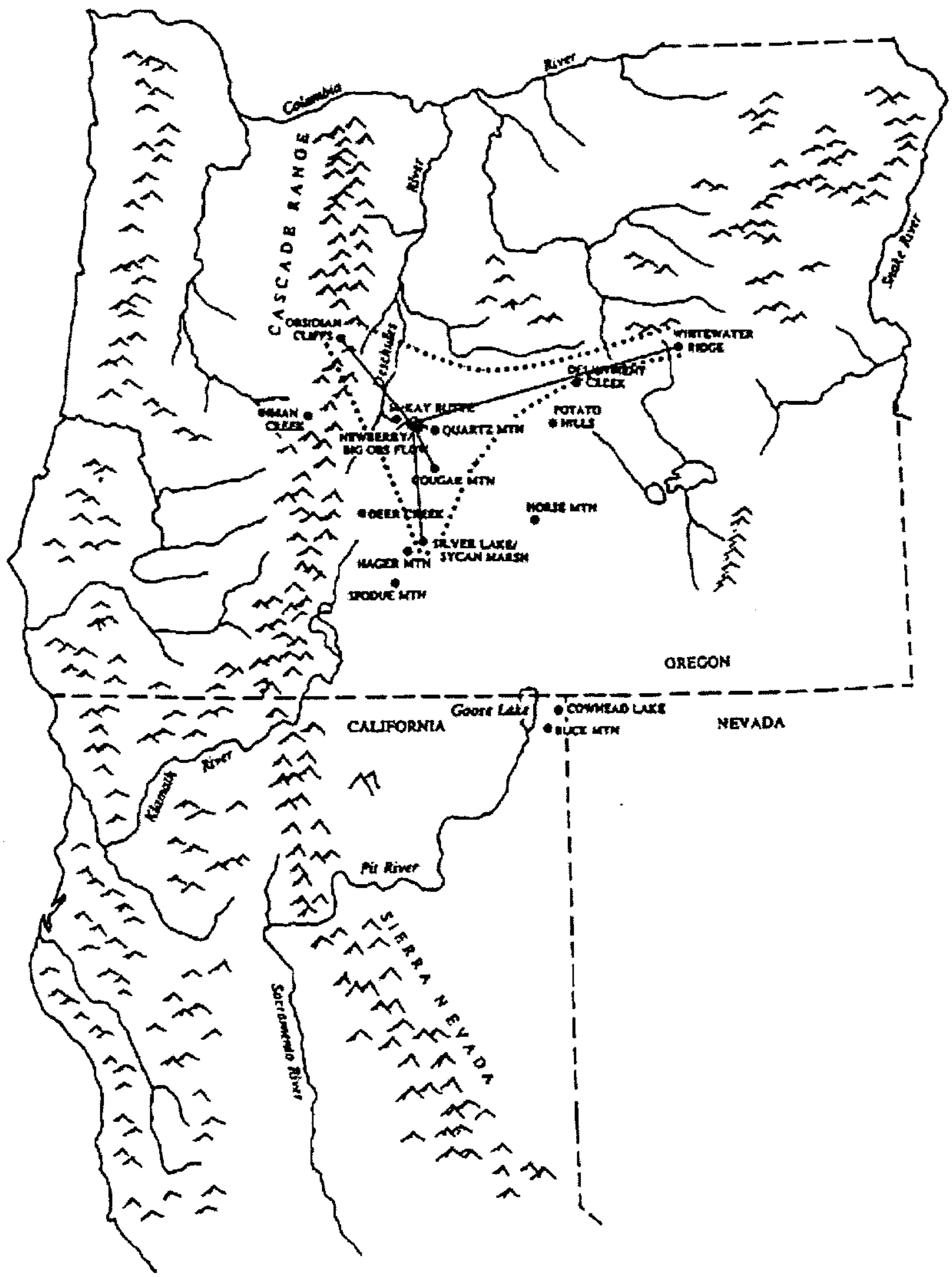

Figure 31. Distance to obsidian sources from post-Mazama localities in the Newberry Crater area (Connolly 1999). Reproduced courtesy of the University of Utah Press.

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Figure 32

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Figure 32

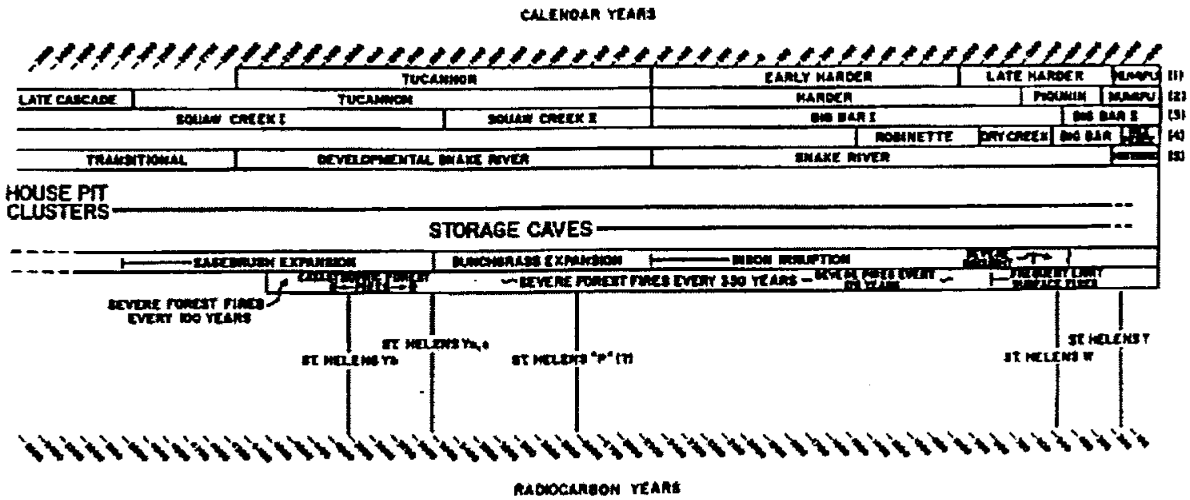

Figure 40. Relationship between house pit clusters ("winter villages"), storage caves, environmental change, and cultural chronologies during the late Holocene along the lower Snake River. The numbered chronological sequences are those of (1) Yent 1976; (2) Leonhardy and Rice (1970); (3) Warren, Sims, and Pavesic 1968; (4) Caldwell and Mallory (1967); and Daugherty (1962). (Reproduced from Reid et al. 1991.)

Figure 32. Reid's developmental sequence for the Lower Snake River (Reid 1991a). Reproduced courtesy of the author.

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Figure 33

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Figure 33

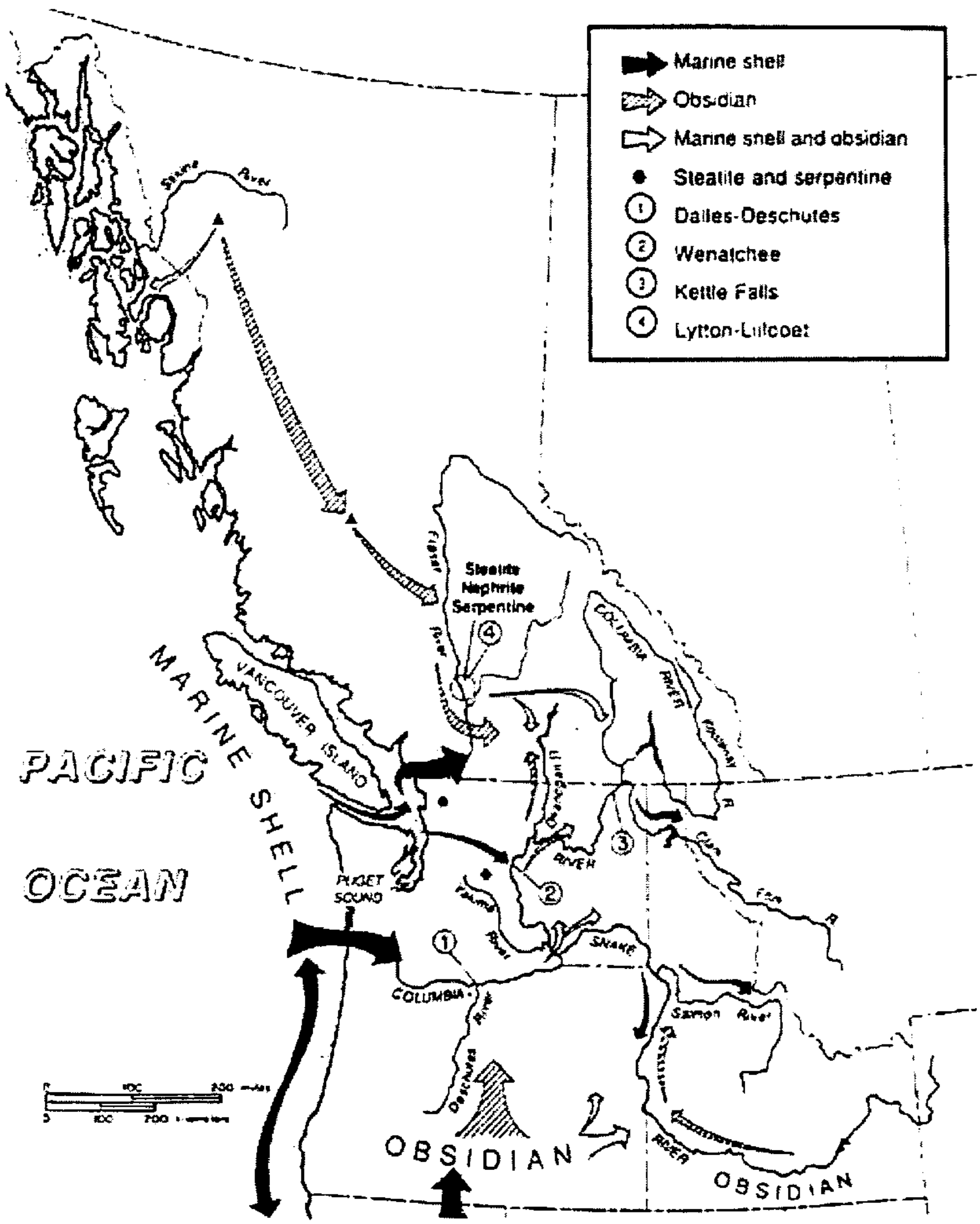

Figure 33. Reconstructed trade routes into and across the Plateau (Galm 1994). Reproduced courtesy of the author and Kluwer Academic/Plenum Press

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Figure 34

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Figure 34

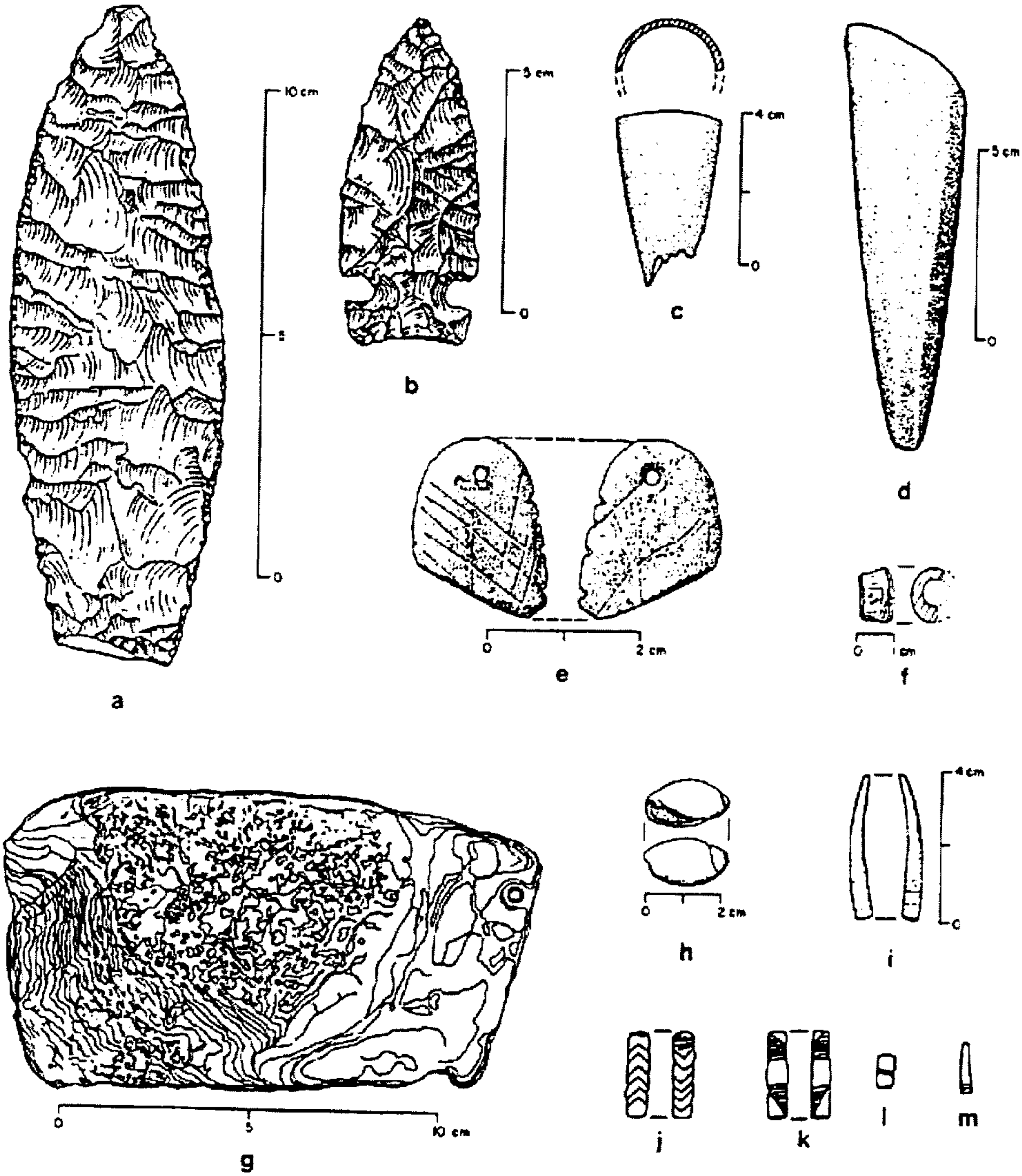

Figure 34. Examples of Plateau trade goods (Galm 1994). Reproduced courtesy of the author and Kluwer Academic/Plenum Press.

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