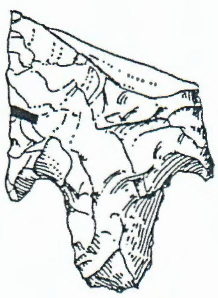
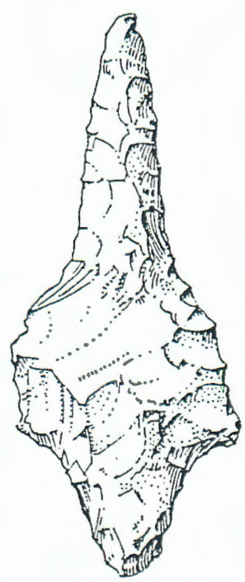
# Perspectives on Behavior Gained from Lithic Analysis and Archaeological Investigations near Bridgeport, Mono County California





David G. Bieling

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Perspectives on Behavior Gained from Lithic Analysis

and Archaeological Investigations near Bridgeport

Mono County, California

by

David G. Bieling

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in

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ABSTRACT

Purpose of the Study:

This project summarizes the results of archaeological investigations conducted near Bridgeport, California by the Anthropological Studies Center, SSU. Results are synthesized within a regional chronologic scheme and incorporated into models of human behavior to posit explanations for observations.

Procedure:

Materials recovered during field investigations were classified and analyzed. Obsidian hydration testing and geo-chemical source assignment were used to examine assemblage constituents and variability. Topics relevant to studies of behavior were addressed within an investigatory framework seeking to explicate issues relevant to social organization.

Findings:

Occupational variability, a strategy of frequent residential mobility, and technological organization are factors posited to account for variability evidenced in Archaic Period archaeological assemblages.

Conclusions:

Social organization during the Archaic Period was marked by mobility strategies and toolstone technology designed to optimize energy extraction from the environment. A flexible technology is posited as an adaptive response to subsistence variables. This technology, coupled with frequent residential shifts to new environmental patches, is consistent with proposals of optimal foraging theory.

Chair: David A. Fredrickson

M.A. Program: Cultural Resource Management
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Acknowledgements

So many colleagues and associates were instrumental in various phases of the research conducted in relation to this project from its outset that it would take several pages to thank them all individually. Although Dr. Fredrickson, who served as Field Director and Principal Investigator, has acknowledged their contributions in the reports constituting the final drafts for the project, their efforts bare repeating. Personnel included Allen Bramlette, Jane Caputo, Bruce Dahlstrom, Kathy Dowdall, Jennifer Ferneau-Lion and Vera-Mae Fredrickson, Jefferson Haney, Sunshine Psota, Suzanne Stewart, Nelson (Scotty) Thompson, Kim Tremaine, and myself. Our local Native American advisors were David Rambeau and Maurice Crawford.

My friends and colleagues at the Anthropological Studies Center contributed their efforts during initial fieldwork, follow-up analyses, and in our many discussions and debates regarding methods, theory, and interpretations. I am indebted to all of them for their respective and significant contributions. Bruce Dahlstrom and Eric Allison are thanked for their invaluable assistance when I encountered problems with computer programs, printer drivers, and defective or unpredictable portable strombulators.

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Valerie Levulett is thanked for authorizing several of us to present papers at scientific meetings using the data generated by these studies prior to preparation of the final report. Although the data was often based on preliminary studies and small samples, the results agreed well with those of the final product.

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Laura McKirn, Kathleen Hull, and Joe Mundy of Yosemite National Park generously provided me with their observations and some recent unpublished material regarding sites with Bodie Hills and Casa Diablo obsidian in the park. Dr. Tom Layton of San Jose State University provided guidance regarding archaeological assemblages in the western Great Basin. Greg White shared his valuable insights into cultural behavior and the organization of flaked stone technology based on his considerable experience.

Much of the ideas I've developed regarding the relationships between flaked stone systems and land-use strategies can be attributed to the superior intellects and vast experience of my predecessors and mentors. To the careful and informed reader, the influences of these individuals will be readily apparent. I thank them for their insights and their effect on my intellectual development, and gratefully acknowledge their contributions. I alone, of course, am responsible for the form in which these ideas appear in this thesis, correct or not.

I greatly appreciate the efforts of my committee members, Dave Fredrickson (PhD.), Dwight Simons (PhC.), and Michael Rondeau. Each has contributed their significant skills, expertise, insights, and thoughtful suggestions to this product, vastly improving upon the original form. Their questions and comments challenged me and, hopefully, stimulated greater clarity. I hope their concerns were addressed thoroughly and respectfully. They are thanked for their inspiration and efforts on my behalf.

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My special thanks also go to the members of my family who gave their support and confidence over the years. It goes without saying that my deepest appreciation goes to Sunshine, my V.S.O. (very significant other) who contributed her skills, support, and advice during all phases of this project. She tolerated my moments of doubt, confusion, and frustration; politely ignored the often vacant look in my eyes ("the light's on but nobody's home"); and stimulated my thinking and refined my interpretation of the data with our many discussions. Thanks, Kiddo.

In closing, I dedicate this thesis to the memory of my father, Albert G. Bieling, whose kindness, skills, and patience provided me with the abilities and commitment required to see this through.

Words, once uttered,
run faster than horses.

\- Japanese proverb

Table of Contents

List of Figures

# Chapter 1
# Introduction

In June 1989, as part of an inter-agency agreement with California Department of Transportation (Caltrans), the Anthropological Studies Center (ASC), Sonoma State University, conducted archaeological investigations at seven prehistoric sites located near Bridgeport, Mono County, California. These sites are recorded as CA-MNO-564, CA-MNO-566, CA-MNO-2456, CA-MNO-2457, CA-MNO-2466, CA-MNO-2488, and CA-MNO-2489. Hereafter, the state designation is omitted for brevity's sake. Where more than one site trinomial with the same county designation appears, only the first site retains the county abbreviation.

The project was conducted to determine if these sites, excluding MNO-2489 which was outside the project area, were potentially eligible for inclusion on the National Register of Historic Places (NRHP), under criteria defined in CFR Part 60 of the National Historic Preservation Act, and to evaluate possible adverse impacts resulting from proposed highway improvements. It was determined the research potential of the six archaeological sites was achieved by virtue of the size, diversity, and representativeness of the samples recovered from them. Significantly different information would not be generated through further excavation. Given these results, none of the sites evaluated were determined eligible for NRHP inclusion.

## Statement of Purpose

The present study has 2 primary objectives:

(1) The first goal is to summarize results of the Bridgeport investigations by the ASC. This synthesis is limited to areas of investigation pertinent to a regional archaeological analysis. Site specific results of the ASC investigations are presented in detail elsewhere (see

Fredrickson 1991a, 1991b) and will not be repeated here. Assemblages defined during ASC studies are elaborated upon here, in part, by virtue of intra- and inter-site comparisons. The present study also benefits from the addition of more hydration readings obtained during ASC investigations but not reported in summary fashion at that time due to the scope of those projects.

Subjects incorporated into the present study include definition of flaked stone assemblages, variability in artifact forms and land-use patterns, and correlation of hydration ranges with previously proposed temporal periods. Occupational variability is suggested as one factor affecting artifact discard rates and potential inherent difficulties in interpretation. For detailed discussions of analytic methods, site-specific results, and management recommendations, the reader is again referred to Fredrickson (1991a & 1991b).

(2) The second goal is to outline a model that presents assumptions about past patterned behaviors of toolstone acquisition, use, transport, and discard. On the basis of these assumptions, an explanatory framework for artifact patterns that could have resulted is constructed. The assumptions are built upon a review of Bodie Hills obsidian use.

Topics considered include curation rates, tool use-life, material deposition, technological organization, and adaptive strategies. Taphonomic processes affecting material distributions are not considered here since the emphasis is on elucidating behavioral processes. Major studies that recovered Bodie Hills materials are reviewed, and brief discussions of some of the archaeological sites or regions in which this material has not been recovered in significant numbers presented. The findings of the ASC investigations are integrated into these explanations.

The discussion in the present chapter reviews concepts, models, and studies pertinent to analysis of flaked stone assemblages, and concomitant behaviors responsible for their occurrence. Spatial, temporal, and structural variability are addressed through examination of inferences regarding raw material acquisition, modification, use, discard, and recycling. Research domains important to the study of these materials include lithic technology, subsistence, and economics. Models for interpreting past human behavior are summarized, and a framework designed to serve as a basis for behavioral interpretation is developed.

Chapter 2 reviews background information pertinent to the regional analysis. Brief discussions about environmental, ethnographic, and archaeological contexts are included. Regional temporal patterns are also reviewed, and temporal ranges for archaeological assemblages in the Bridgeport locality defined. Following these summaries is discussion of the regional geographic distribution of Bodie Hills obsidian.

The third chapter considers artifact classification methods, and summarizes select artifact classes recovered during the ASC investigations. Projectile points and other tool forms are described, and recovered debitage briefly summarized. These flaked stone material classes are examined because of their potential as temporal indicators and assemblage markers.

Chapter 4 discusses temporally specific archaeological assemblages in the Bridgeport locality. Hydration ranges for specific settlement patterns, defined previously in Chapter 2, are presented. Temporally specific assemblages are defined, and settlement variability identified. Temporally specific flaked stone trajectories are proposed as means of providing enhanced interpretation of land-use systems.

The final chapter summarizes the results of the investigation, and compares these to assumptions made about patterned behavior defined in Chapter 1. Variability in land-use systems and assemblage content are also discussed.

Conclusions focus on problems and prospects, directions for future investigations, and predictions about artifact use and deposition.

## Modeling Processes Characterizing Toolstone Technology

During the past few decades, archaeological researchers have become increasingly dissatisfied with restricting their studies to the identification of empirical patterning. The linking of empirical observation through middle-range research has enabled archaeologists to use behavioral models as a response to this dissatisfaction (Thomas 1986). The importance of behavioral models lies in their abilities to clarify the strategies and cultural processes producing the empirical patterning (Thomas 1983a:11). Models, as used here, conform to Clarke's (1968b) broad definition:

> In general, models serve as heuristic devices for manipulating observations and hypotheses; they may also act as visualizing devices, comparative devices, organizational devices, explanatory devices or devices for the construction and development of theory. Models are usually idealized representations of observations, they are structured, they are selective, they simplify, they specify a field of interest and they offer a partially accurate predictive framework. . . . Models are often partial representations, which simplify the complex observations by the selective elimination of detail incidental to the purpose of the model. The model may thus isolate the essential factors and interrelationships which together largely account for the variability of interest in the observations; in this way the model may even share a similarity in formal structure with the observations. (Clarke 1968b:2)

During the last two decades, flaked stone analyses have considered lithic materials as a significant resource important for hunter/gatherer populations (e.g., Binford 1979; Ericson 1984; Rondeau 1982a, 1982b, 1990; Thomas 1983a, 1988). Some studies have been concerned solely with aspects of technology (e.g., Callahan 1979; Newcomer 1971; Patterson 1982a, 1983) and/or social organization (Fredrickson 1969, 1974, 1989). Others have combined analyses of technology with consideration of economics (Johnson 1979; 1984), subsistence (Tringham et al. 1974), or adaptive strategies (Parry and Kelly 1987). Recently, some have used technological studies as a means of investigating archaeological methods (e.g., Flenniken and Raymond 1986; Flenniken and Wilke 1989; Patterson 1990; Kalin 1981; Towner and Warburton 1990). These works and others exemplify increased recognition of the importance of flaked stone materials for addressing questions about behaviors of past hunter/gatherer populations. Since flaked stone often constitutes the dominant material in many prehistoric archaeological sites in western North America, models concerned with cultural processes such as adaptive strategies, social organization, energy efficiency, tool use lives, curation rates, and material deposition behavior are of especial importance and will be examined.

Aspects of lithic technology emphasized in the present study include the following: (1) variability of primary forms, i.e., those characteristic of early stages, or, as in the case of projectile points, those lacking evidence of excessive repair or rejuvenation; (2) staged modifications; (3) waste materials; and (4) end products, including discarded forms. This analysis also considers temporal, spatial, and source-specific dimensions of morphological variability as expressed in: (1) flaked stone debitage; (2) projectile points (including "types", rejuvenation, and inferred extent of curation); (3) biface forms (including morphological groups, rejuvenation, and curation); and (4) other tool and core forms. Additionally, evidence of use patterns on specific tool forms are tabulated (use-wear studies were not conducted), and discard/deposition patterns identified.

Exchange and toolstone resource procurement patterns, including possible acquisition, modification, and distribution trajectories, were considered. This included an emphasis upon delineating the functioning of associated economic systems. These systems were examined through analysis of: (1) material variability within classes of debitage and tool forms, and (2) source-specific examination of morphological attributes of selected tool forms and associated debitage. These studies were based on specific assumptions about reduction technology discussed in detail below.

Systemic Modeling

Lithic production systems have been analyzed with respect to procurement, exchange, technology, and social organization (Ericson 1984). The term `lithic production system' has been defined as "the total of synchronous activities and locations involved in the utilization and modification of a single source-specific lithic material for stone tool manufacture and use in a larger social system" (Ericson 1984:3). This definition of lithic production system is similar to the concept of trajectory (cf. Clarke 1968a; Elston et al. 1974), but differs in scope. Trajectory is defined here as the total synchronic record of a single item or group of like items traced through a cultural system from acquisition or manufacture to discard. It is characterized specifically by variations in use, modification, repair, and possibly re-use. Individually identifiable trajectories collectively characterize a lithic production system. While both concepts are important at the theoretical level, they are difficult to operationalize at the methodological level. Thus, they must rely heavily upon inference. Stated another way, empirical findings may be compared to examples of systemic cultural behavior formulated in broadly scoped models.

Technological organization is a term recently applied to archaeological studies of past behavior (cf. Binford 1979; Kelly 1988; Wiant and Hassan 1985). It is defined as

> [T]he spatial and temporal juxtaposition of the manufacture of different tools within a cultural system, their use, reuse, and discard, and their relation not only to tool function and raw-material type and distribution, but also to behaviorable variables which mediate the spatial and temporal relations among activity, manufacturing, and raw-material loci. Research on the organization of technology aims to elucidate how technological changes reflect large-scale behavioral changes in a prehistoric society. (Kelly 1988:717)

Although similar to the term `lithic production system', it incorporates greater associations of behavior, such as those defining adaptive strategies and culture change. It is used in the present study to suggest the systemic organization of toolstone technology, in part, by assuming the articulation of various trajectories.

The term behavior can be applied to a range of processes, such as activities specific to manufacture of stone tools, or principles of social organization structuring inter-group exchange. Here, behavior is used both as a descriptive term and to articulate the realm of activities with complex social processes. That is, it is assumed that much of human actions are infuenced by over-riding guidelines of behavior. Thus, on one level, the manufacture of a projectile point may occur as a response to the need to procure food. This activity may be classed under technological behavior. Factors affecting that process, on another level however, may include

1. Social distance (see Kay 1975; Wilmsen 1973): The structure of inter-group relationships may influence or dictate what material is used for the projectile tip. Certain materials may be unavailable to one group due to poor relations with another.

2. Adaptive strategy: Populations characterized by high residential mobility may schedule tool material replacement at a number of lithic sources (Gramly 1980). The resulting material variability may, in some instances, extend to specific tool classes.

3. Technological organization: As a response to adaptive strategy, mode of technological organization may include greater or lesser degree of material curation (see Binford 1979; Kelly 1988; Shott 1989b. This assumption has implications for the origin of the projectile point blank and the tool's perceived use-life.

It is presumed these social processes stem from motivating forces imposed by the interaction of human groups with their environment. Environment is used in the broadest sense to describe the natural environment, social environment, and even less tangible, spiritual environment (for the latter, see Gould et al. 1971:161-162). It is recognized all may affect the technological organization of a group and the resulting depositional patterning of flaked stone materials. The present study does not presume to explain in detail the complex interaction of these influences. Rather, the purpose is to incorporate the study of material remains recovered within a possible regional framework with consideration of behavioral processes.

In California and the Great Basin, various models have been developed to account for variability in flaked stone materials recovered from different types of sites (e.g., Rondeau 1982a, 1982b; White 1984, 1989). It has been proposed this variability results from: (1) reduction activities (such as those characterizing tool production, maintenance, and rejuvenation); (2) use (i.e., game procurement and resource processing); (3) exchange; (4) social organization and complexity; (5) adaptive strategy (seasonality, mobility, core technology); and (6) curation, or a combination thereof (e.g., Ammerman and Feldman 1974; Bamforth 1991; Goodyear 1979;

Flenniken and Raymond 1986; Flenniken and Wilke 1989; Fredrickson 1969, 1974, 1989; Kelly 1988; Parry and Kelly 1987; Rondeau 1982a, 1982b, 1990; Rondeau and Rondeau 1990; Thomas 1983a, 1983b; White 1984, 1989). Some of these processes may play a greater role than others in formation of specific assemblages.

In a model addressing lithic assemblage composition in prehistoric sites in the Sierra Nevada, morphology and source material types are among several kinds of variability considered . The model is structured also to explain the function of flaked stone materials within a hunter-gatherer seasonal round subsistence strategy (Rondeau 1982b:171; Binford 1979; Goodyear 1979; Gould and Saggers 1985). Specifically, as a community's seasonal round progresses to greater and greater distances from a toolstone source area, assemblages of discarded flaked stone materials change to reflect site-specific behaviors of tool users (Rondeau 1982a, 1982b; White 1984). For example, as hunting groups deplete their initial tools and raw materials as a result of increased distance from source, primary reduction of local lithic materials co-occurs with tertiary reduction debris from previousy obtained quarry materials. Additionally, potential exchange items, generally in the form of projectile points, are predicted to have followed seasonal round routes when hunting groups encountered one another in hunting localities (Rondeau 1982b).

Although there are a number of behavioral complexities responsible for transport, use, and discard of flaked stone materials, it is proposed, following the principle of least effort, that certain patterns are recognizable (Rondeau 1982a, 1982b; White 1984). These are expressed in the following set of postulates:

1. Evidence of primary reduction characterizes quarry sites as well as nearby workshop and/or habitation sites.

2. Broken bifaces and bifacially edged flakes occur in greatest numbers at habitation sites.

3. Biface flakes occur in low numbers at quarries, but cortical material is common.

4. At sites increasingly distant from a source, broken bifaces are less likely to occur, cores are rare, and materials from other source areas are likely to be represented in greater amounts.

5. As a result of exchange practices, projectile points, and a concomitant assemblage of small flakes, are found at great distances from their material source, often with the absence of other items from that source.

6. Fragmented projectile points most often occur in areas characterized by procurement of large game and also at habitation sites where retooling and carcass dismemberment occurred. (Rondeau 1982a, 1982b; Thomas 1988; White 1984; see also Goodyear 1979).

It has been suggested (Goodyear 1979; Parry and Kelly 1987; White 1984) varying degrees of mobility and/or sedentism correlate with different types of flaked stone systems, producing distinct artifact assemblages. For example, settlement strategies characterized by high levels of mobility require portable tool kits and access to appropriate materials found at locations often situated at great distances from source areas (Goodyear 1979; Gramly 1980; Kelly 1988; Kornfeld et al. 1990; Minor and Toepel 1990; Parry and Kelly 1987; Thomas 1983a; White 1984). Extensive use of bifaces during the Archaic Period across much of North America is cited as of one such option for highly mobile populations (Parry and Kelly 1987). Caching of bifaces, preforms, and/or projectile points probably is also a response to raw material needs (Kornfeld et al. 1990; Minor and Toepel 1990; Thomas 1983a, 1985).

Variability of Reduction Strategies

Recently, White (1989:G.2) summarized axioms applying to flaked stone reduction sequences, and the variability manifested in tool use lives:

> (a) There is no necessary relationship between tool function and site function because tools were carried, used, and discarded from place to place. (b) Because tools and tool material were transported, production, maintenance, use, and discard was distributed between sites. In addition, discard related to production, maintenance, and use evolved at different rates on different parts of a flaked stone assemblage. Consequently, there is no necessary `behavioral chain' connection within and between the residues of production, maintenance, and use in a given archaeological deposit. Each element may relate to independent episodes, such that it is contingent on analysis to demonstrate, rather than assume that trajectory elements such as `stages' and `refuse' are in fact related. (c) In general, flaked stone tools were discarded only after they were too broken or worn to serve a recognized purpose. In other words, breakage patterns present in a class of flaked stone tools are more likely a product of breakage incidental to use and not of directed technological behavior. Regularities in the patterns of breakage should relate to regularities in production, maintenance, and use. (1989:G.2)

Given these axioms, it is assumed flaked stone materials (particularly debitage) found at multi-component sites or other complex site assemblages frequently represent accumulation of waste materials derived from a series of potentially unrelated events. These range from initial core reduction to maintenance and repair of curated tools (curated defined here as retained in anticipation of future use). Additionally, tool re-use, i.e., scavenging, cannot be ruled out. Also it is expected accumulation of these debris often occurred at different rates throughout an extended period of time. This is seen as a consequence of occupational variability of a site (e.g., frequent, seasonal, yearly, or less frequent use), resulting from the structure of a group's adaptive strategy, and long or short term environmental productivity, as well as a host of unknown factors (e.g., Ammerman and Feldman 1974; Binford 1982; Bamforth 1986; Barton 1990; Rondeau 1990; Rondeau and Rondeau 1990).

Tool Use-Lives, Curation and Deposition Behavior

Behavioral principles concerned with tool use lives, curation rates, and deposition processes are closely linked. These are not easily deciphered in the archaeological record, however. Curation, as defined by Binford, refers to ". . . the practice of maximizing the utility of tools by carrying them between successive settlements" (Shott 1989b:24). Curated technologies differ from expediently organized technologies in the amount of energy investment and expenditure required to accomplish specific tasks (cf. Binford 1979; Parry and Kelly 1987; Shott 1989b).

Flaked stone tools characterized by long use lives, that is, those that could be re-shaped and re-sharpened many times, are likely to be curated as long as practical (Kelly 1988). Simple tools, such as flakes, required for an expedient task, probably are not subject to curation; and, instead, are immediately discarded upon completion of the task (Barton 1990; Murray 1980). Other flaked stone tool forms, such as certain unifacial variants, cores, and "formal" flake tools, were probably perceived as either expedient or curatable items depending upon their users (Kelly 1988). Curation rates and, consequently, perceived use lives, even among simple flake tools, probably increase in areas with limited access to suitable stone tool materials, as well as in social groups having high mobility (Barton 1990; Goodyear 1979; Gramly 1980; Kelly 1988; Parry and Kelly 1987).

Thus it is reasonable to suggest items perceived as having long use lives are most subject to curation. As procurement and manufacturing costs increase, increasing investments of energy are expected to correspond with increased amounts of curation (Jelinek 1976; Murray 1980;

Shott 1989b:24, Figure 3). As stated above, forms of social organization characterized by high rates of residential mobility often are characterized by biface core technologies. These provide a means of maximizing immediate access to fresh material with a great degree of usable cutting edge (Goodyear 1979; Johnson 1979; Kelly 1988; Parry and Kelly 1987).

Conversely, logistical mobility, characterized by greater sedentism, is often accompanied by increased use of expedient core technologies. These require less investment of energy than production of standardized cores (Parry and Kelly 1987). Both adaptive strategies undoubtedly entail tool or material caching, another form of curation, to ensure access to toolstone materials at greater distances from base camps (Binford 1979; Kornfeld et al. 1990).

## Artifact Deposition and Discard Practices

Although items may enter the archaeological record through unintentional activities, the majority of cultural items recovered from an archaeological context result from purposeful discard of broken or exhausted tools, or useless materials such as reduction byproducts (Shott 1989b; Murray 1980). Depositional processes include: (1) breakage in production; (2) abandonment during or after production; (3) loss or breakage in use; (4) recycling; (5) abandonment in use; and (6) depletion (Murray 1980; Shott 1989b:17-19). These processes include both deliberate and unintentional discard processes (Murray 1980). Depletion and the two forms of abandonment, result from intentional discard. In contrast, production breakage and loss/breakage in use, are forms of unintentional discard. Since it constitutes deliberate re-use of a discarded item and thus re-introduction of the item into a cultural system, recycling is more difficult to identify definitively (see Skinner, 1988, for examination of temporally disjunct recycling).

Two other forms of material deposition can be subsumed under these general categories. One of these is classed as unintentional abandonment describing items contained in unretrieved caches. The other pertains to intentional deposition characterizing items used as burial offerings. Sometimes these are highly modified artifacts characterized by high investments of energy and possessing considerable remaining use lives.

Assemblage Variability

Recent discussions of occupation variability, defined in part by the "sample-size effect" phenomenon, identify a potential for certain misconceptions in archaeological interpretation (Ammerman and Feldman 1974; Dewar 1991; Rhode 1988; Shott 1989a; Thomas 1983b, 1986). These studies have some bearing on the present investigation. Sites identified as contemporaneous via archaeological dating methods, were not necessarily occupied synchronically, and certainly not by a group of fixed size. More particularly, synchronic land-use patterns of certain groups can entail both infrequent use of some sites and repetitive use of others.

This phenomenon may be particularly evident when comparing assemblages in diverse environments. Environments rich in specific or diverse resources, e.g., coastal zones, lakeshores, and flaked stone sources, may be characterized by assemblages marked by high variability as a result of frequent occupation and/or greater duration of use. Conversely, sites in environments marked by less resource diversity may be characterized by low assemblage variability resulting from limited occupancy and more specific tasks.

Synchronic occupational variability may often result from groups of changing size, engaged in different seasonal tasks. These factors, among others, contribute to the creation of morphologically and quantitatively diverse cultural assemblages by affecting discard rates. Sample size effect can be described as follows: the larger the sample size, the more diverse the assemblage. Conversely, the smaller the sample is, the less diverse the assemblage will be

(Rhode 1988). As a consequence, data bases developed from varying size samples characterizing different sites or intra-site deposits often are not directly comparable (Thomas 1983b). Thus, as stated by Shott (1989a:284), it can no longer be assumed that, ". . . assemblage diversity faithfully reflects behavioral diversity".

Small sites (i.e., those classified as minor lithic scatters or seasonal campsites), often characterized by a paucity of debitage and a few broken bifaces or other tools, probably are the result of a limited number of possibly unrelated occupations. In turn, each of these occupations might have contributed a few items to the site's artifactual "assemblage" (Ammerman and Feldman 1974). The size and diversity of these "assemblages" could also be dependant upon the nature of curation activities, and the degree of material conservation employed by site occupants.

In contrast, larger lithic scatters, often occurring near a lithic source area, classified as secondary reduction sites or workshops, probably represent more numerous sequential occupations. Multiple seasonal occupations eventually resulted in discard of most examples of items comprising the aboriginal toolkit with many manifesting variable amounts of reduction. Since these sorts of deposits often occur near material sources, they probably indicate the degree of material conservation practiced.

## Curation Behavior

Since different artifact classes of flaked-stone materials represent different activity sets, the amount of energy invested in a particular artifact class and the return expected through energy extraction in general approximates the degree to which the item is curated (Ammerman and Feldman 1974; Binford 1979, 1982; Gramly 1980; Jelinek 1976; Schiffer 1978; Shott 1989b). Adaptive strategies, limitations imposed by processing activities, hafting, availability of raw material, seasonality, and duration of site occupation are among the factors probably contributing to the energy investment in and curation rate of stone tools (Binford 1979; Goodyear 1979; Gould et al. 1971; Keeley 1982; Kelly 1988; Parry and Kelly 1987). Since curation rates and expectations about duration of use-life differ with artifact class, as well as with the variables noted above, it is presumed flaked-stone debitage and projectile points comprise different ends of a continuum. Debitage represents minimal energy investment, little likelihood of curation, and little loss of energy through discard. In contrast, projectile points and other formal tools, exhibit a greater amount of energy investment, higher expected yield, greater likelihood of curation, and higher loss of inherent energy through loss or depletion.

## Operationalizing the Model

### Identifying Processes of Discard and Curation

As previously indicated, the classification schemes used here are designed to integrate several important concepts. These include tool use life, curation, breakage patterns, tool rejuvenation, and deposition processes. These, in turn, are recognized as intrinsically tied to adaptive strategies, and reflect a series of often dependant variables such as core technology, occupational variability, assemblage variability, and land-use patterns. Unfortunately, very little information exists concerning expected use lives of various tools, or rates at which flaked stone reduction proceeded in given situations (see Shott 1989).

Reduction trajectories employed by human populations stressing residential mobility might emphasize a curation strategy in which tool modification predominantly was characterized by maintenance rather than manufacture (Barton 1990; Jelinek 1976). When such a system is viewed archaeologically, items classified as "roughouts" or "blanks", i.e., minimally-shaped percussion forms, (implying these items were discarded prior to becoming functional tools) could have (1) functioned as cores for smaller pieces of raw material

(Kelly 1988:720); (2) provided a serviceable cutting edge as needed; or (3) been employed as a tool blank when needed (Barton 1990; Goodyear 1979; Thomas 1988). Given these observations, different production strategies may have limited predominant manufacturing activities at quarries to replenishing the supply of transportable cores (Kelly 1988:720). This approach, followed by minimal reduction over several seasons or longer, would have produced extended use life of bifaces, an organizational strategy consistent with population mobility. Emphasizing careful reduction in times of need or as required for maintenance of tool edges, fabrication of this type of artifact also could be geared towards eventual production of a refined ("thinned") biface knife or dart-size projectile point, barring unanticipated breakage (i.e., a flexible technology; Goodyear 1979).

Following this line of reasoning, many flaked stone artifacts recovered from non-quarry archaeological contexts thus do not necessarily represent finished tool forms or items broken during "manufacture". Instead, many, if not most, probably result from maintenance-related breakage occurring on tools already curated for months or years, which possibly have been modified at many sites within the seasonal round (Barton 1990; Towner and Warburton 1990). Morphological mutability in flaked stone materials, the often extreme modification of certain tool forms resulting from multiple reduction episodes, is expected to occur in most archaeological circumstances. This phenomenon characterizing multiple rejuvenation has been termed the "Frison effect" (Jelinek 1976:22). This seems especially the case for assemblages created by groups having a greater degree of residential mobility (Barton 1990; Flenniken and Wilke 1989; Murray 1980; Rolland and Dibble 1990).

The conceptual models presented above contrast with the Europeanist Tradition defined by the "paleontological paradigm" (i.e., the index fossil approach derived from paleontology; Rolland and Dibble 1990; Barton 1990). This paradigm presumes most tools represent finished forms or "types" not heavily maintained or rejuvenated to extend their use life. Conversely, postulation of extensive tool maintenance and/or rejuvenation requires studies emphasizing stylistic factors be applied judiciously to selected flaked stone artifact groups or attributes after careful examination and classification (Jelinek 1976; Flenniken and Raymond 1986; Flenniken and Wilke 1989). It is recognized style, function, adaptive pose, and reduction trajectory all play a role in the morphological variability of flaked stone materials.

The obsidian materials recovered during the ASC investigations are assumed to represent residues of the lithic production systems of those who utilized the sites. That is, these materials are assumed to represent culturally patterned behavior not only because of the technological processes that produced them, but also because of their contexts of procurement and utilization (cf. Ericson 1984). As discussed previously, a lithic production system is composed of a number of both independent and dependant reduction trajectories (see Clarke 1968a; Elston et al. 1974). Trajectories are presumed to have often been spatially disjunct. Episodes within individual trajectories often occured at a variety of locations during the use life of the tool. The following model defines possible temporally specific obsidian reduction trajectories presumed to be representative of the Bridgeport locality.

## Reduction Trajectories and Reduction Models

Flaked stone replication experiments traditionally have provided information regarding attribute variability. In turn, this serves as the basis for assumptions regarding reduction processes. These are organized into a series of suppositions characterizing reduction sequences. A reduction model for flaked stone tools can be described by observing morphological changes reflected in specific attributes (Collins 1975). For example, a reduction model for production of a flake blank which proceeds to a "finished" bifacial knife or preform can be outlined as follows:

1. Blade margins beginning as unmodified on larger flake blanks become sinuous with continued percussion modification.
2. The area of original flake detachment scar will diminish.
3. If thinning is an objective, margin sinuosity will diminish as reduction progresses.
4. Evidence of the original detachment scar may be removed during later phases of modification.
5. Width, thickness, and width/thickness ratios will change.
6. Areas of remnant cortex will be removed or reduced.
7. Spine plane angles and angles of blade margin constriction probably will decrease.
8. Cross-sections may approach biconvexity.
9. Flake scar size will decrease.

A reduction model tracing manufacture of a projectile point from a smaller flake blank differs from the above example in some respects.

1. Thickness, margin sinuosity, and spine plane angles probably will show little change, but width/thickness ratios will vary.
2. Cross-sections probably will be altered from biplano or plano-convex to more biconvex, but probably infrequently become lenticular.
3. As reduction progresses, the angle of blade constriction will decrease.
4. Areas of remnant cortex and detachment scars likely will decrease in size. The latter often will not be obliterated.

Further reduction, such as that characterizing maintenance activities during use life of a tool, might result in either:

1. Increasing or decreasing angles of blade constriction.
2. Lower width/thickness ratios as width is reduced.
3. Increased spine plane angle.
4. Increased concavity or convexity of blade margins.
5. Greater obliteration of the primary detachment scar.

The following discussion of "stages" in the reduction of flaked stone tools is organized for analytical convenience to highlight activities relevant to procurement, transport, modification, use, and discard of flaked obsidian tools and debitage. This analytic approach provides a foundation for systemic modeling of flaked stone trajectories, and proposed temporally specific land use systems. Stage descriptions are based in part on those used by Callahan (1979). Since Callahan's model concerns the manufacture of fluted projectile points, these stage descriptions have been altered because of differences in the final product. Final products associated with the present archaeological context are presumably often stemmed and concave base points, which frequently have been reworked prior to discard.

Due to the bias favoring thinning to produce some tools, the stage concept, discussed elsewhere (Fredrickson 1991a & 1991b; Dahlstrom and Bieling 1990), is unilinear in part. Specimens which do not fit the present model are considered either as reduction failures, sometimes for items approaching the end of their use lives, or as the result of decision making processes, e.g., bifaces unsuitable for continued thinning or shaping which could function in other contexts (General Purpose Bifaces in Chapter 3; and Chapter 5). It is recognized this model is primarily limited to biface reduction trajectories. Other reduction systems require specific models beyond the scope of this project.

A Replication-Based Model for Stages:

Stage 1: Obtaining the blank: This pertains to production or acquisition of the initial piece, termed the blank. Blanks may be cobbles, flakes removed from cobbles, previously quarried pieces, or chunks obtained from flows. Acquisition may entail direct quarry access; selection of materials from river beds, hillsides, cobble fields, or flows; or exchange of minimally shaped forms via intermediaries. Assaying the quality of material often occurs at this level. Off-quarry transport may occur at this stage, and may be represented by flakes marked solely by edge abrasion or few percussion scars.

Stage 2: Initial edging: This stage refers to creation or modification of the blank's edge, initial trimming to produce platforms and strengthen the edge, and further assaying of the quality of the material. To enhance further reduction, edge angles of thicker pieces might be standardized to between 55° and 75° (Callahan 1979). Thin primary pieces, however, might not require such modification. Most flake scars do not extend across the mid-line of the piece. Thus width/thickness ratios might be about 2.0 or 3.0 depending on the original form. Breakage takes the form of bends, perverse fractures or radial breaks, particularly on thinner items.

Stage 3: Primary thinning: The objective during this stage is to decrease areas of mass and create a lenticular cross-section by removal of thinning flakes extending from opposing edges across the mid-line of the face of the piece, thereby overlapping previous scars. This increases the width/thickness ratio, usually to between 3.0 and 4.0, and reduces edge angles to between 40° and 60° (Callahan 1979; see comments above). At this time, step and hinge terminations and humps, may be created and/or removed, preparing the form for additional thinning.

Callahan (1979:114) calculated about 6-12 major flake removals occurred during this stage (average=9). Again, as items become thinner, breakage may entail bends, perverse fractures or radial-type breaks. Bifacial overshot may occur as a result of excessive and poorly controlled force. Some forms, such as those classed as GPBs), may not have reached Stage 4, but, instead, become narrower through use and resharpening. Although no direct evidence for use of these items has been developed, experiments suggest Stage 3 bifaces can be used efficiently for butchering and processing game, digging, and wood-working (Callahan 1979:115).

Stage 4: Secondary thinning (for more formalized tools): This stage usually entails further thinning of the form, creating edge angles close to 25° and 45°, and provide width/thickness ratios near 4.0 and 5.0 (Callahan 1979). All surface irregularities are removed during this stage. Callahan (1979:151) determined about 12-24 major flake removals occurred during this stage (average=16.2). Breakage may consist of bends, perverse fractures or radial breaks, particularly on thinner items. Bifacial overshot may occur from excessive, poorly controlled force. Bifacially edged flakes also may be common, perhaps as a result of improper application or location of force. Some forms may not have reached Stage 5, but instead have become narrower through use and re-sharpening. Callahan's (1979:153) experiments concluded Stage 4 items could be used for a variety of tasks such as skinning, cutting, sawing, slicing, and scraping.

Stage 5: Shaping (for most formalized tools; includes preforming): This stage, some portions of which can be assigned to the previous stage, consists of final alteration of the plan outline of the form to achieve its desired shape. This is particularly true for projectile points made from bifacial preforms. Consequently, this stage represents the terminal one for those items scheduled for formal use as knives. Proximal ends are squared off in preparation of details, such as notching and basal thinning, and distal ends flaked to a point termination. Since less force is applied and smaller areas of mass are removed, unintentional breaks should be infrequent. Occasional bending breaks may occur.

Stage 6: Forming haft element (e.g., notching, basal thinning): This stage involves preparation of the haft element. Corners, sides, or bases are thinned and notched, and blades serrated. Consequently, barbs and stems are broken, and blades snapped. Discard of unacceptable or unrepairable forms may occur.

Stage 7: Repair and maintenance (where discernible): This stage includes reduction activities resulting from maintenance of tools and concomitant errors resulting in tool discard. Edge angles may be increased during sharpening. Length may decrease resulting in greater values for Maximum Width Position (see Thomas 1981). Blade constriction angles may either decrease or increase given the strategy followed for tip rejuvenation. Blade margins may be altered from straight or excurvate to incurvate or incurvate/excurvate. Broken distal ends, blades, and barbs might be rejuvenated altering width/thickness ratios. The ratios are usually reduced since items frequently become narrower, but not necessarily thinner. Tool function may change as a result of modification options. Discard of exhausted or unacceptable forms may occur.

## Conclusion and Discussion

The preceding discussion has sought to describe various processes relevant to flaked stone materials as systemic elements and provided an example of a stage-based model useful for operationalizing certain propositions. A limited attempt has been made to articulate the variability displayed by these processes with higher level theory, by defining modes of social organization and adaptive responses. Recent studies which incorporate social and ecological theories as explanation of archaeological assemblages examine intra-site spatial organization and optimization of resource-energy extraction (Jones and Hayes 1989; Thomas 1983a, 1983b, 1988; White 1988, 1989).

Many of these and other recent studies have incorporated the tenets of optimal foraging theory. A biological model based on the tenets of economic theory (the minimax assumption), optimal foraging theory asserts populations acting as predators evaluate the cost of energy expended for a given resource against benefits gained in energy extracted from that resource. Additionally, they evaluate the energy value of the given resource in relation to other resources in their environment, and schedule their activities to optimally exploit these resources (Bettinger 1980, 1987, 1991; Smith 1983; Thomas 1986). Although originally applied to animal populations and their ecological requirements, optimal foraging models have been adapted to anthropology and archaeology. Consequently, they have become encumbered but enhanced by consideration of a variety of social factors having bearing upon energy cost and energy yield. Among these are variables such as storage, exchange, raiding, and socio-political alliances, which are possible adaptive responses to either resource shortage or to optimal exploitation of available resources (Dyson-Hudson and Smith 1978).

Structuring the factors discussed above into units applicable to formulation of testable hypotheses geared towards definition of human response to environmental variables requires broad survey of extant literature and existing archaeological collections, as well as development of systemic land-use models. These tasks, unfortunately, extend far beyond the range of this thesis. In anticipation of future studies, however, these topics are addressed briefly in the final chapter.

# Chapter 2
# Investigation Context

## Project Environment

### Project Location and Environment

Prehistoric archaeological sites MNO-2456, -2489, -564, -2488, -2455, -566, and -2466 are situated along portions of Highway 395 extending west and northwest of Bridgeport, California, along the eastern slope of the Sierra Nevada Mountains, southwest of the Sweetwater Mountains (Figure 1). All sites were adjacent or in close proximity to seasonal or perennial watercourses incising Quaternary glacial deposits (Anderson 1990). These drainage systems flow in a southerly direction, ultimately feeding into the Bridgeport Valley. The Bridgeport Valley is a large meadow formed by the outflow of several streams fed by seasonal snow-melt and springs. Swauger Creek, a perennial stream, flows into the present-day Bridgeport Reservoir from the north, and extends through the study area.

Elevations south to north ranged from 1999 - 2256 meters above sea level (m ASL) (USGS 7.5' series topographic quadrangle Mt. Jackson, Mono County, California; provisional, 1989). Much of the surrounding geology is characterized by Pliocene and later volcanics (Anderson 1990). Volcanic activities in the region have affected local topography and climate, locations of sources of fresh water and thermal springs, abundance and distribution of plant and animal species, and also have created a variety of sources of raw material available to prehistoric human inhabitants. Effects of vulcanism on human activities in the western Great Basin have been examined in detail by other researchers and will not be reviewed here (see Jackson 1985; Hall 1983 for details).

The climate and floral and faunal communities of the Bridgeport locality are strongly influenced by the rainshadow effect created by the Sierra Nevada range. This creates an environment typically characterized by cold winters, hot summers, generally low humidity, and large daily and seasonal temperature ranges. Vegetation consists of a mosaic of sagebrush steppe communities, with interspersed piñyon-juniper woodland (Küchler 1977). Many plant taxa making up these communities are sclerophyll species, adapted to seasonally-limited water supplies.

Fauna endemic to the locality include a variety of large and small mammals, reptiles, birds, and fishes. Large mammals which use the area for summer range land and as a migration corridor to and from the Sierra Nevada include mule deer, mountain sheep, and pronghorn. Predators, such as bobcat, grey fox, coyote, and mountain lion, also frequent the area, surviving on small mammals such as jackrabbit, cottontail, ground squirrels, pocket gophers, kangaroo rats, and other rodents. Avifauna include year round residents such as sagehen, sage sparrow, and California quail, and seasonal visitors (i.e., several species of migratory waterfowl). Various species of raptors also inhabit the region (Storer and Usinger 1963). In addition to these taxa, a variety of fish, reptiles, and insects, some of which served as important seasonal food resources for native peoples, were found in the region (Davis 1965; Fowler and Liljeblad 1986).

Paleoclimatic changes in seasonal temperatures and rainfall have influenced past and current ecological conditions in the Bridgeport locality. Alternating periods of cooler and warmer weather, both possibly characterized by variable moist and/or dry conditions, probably changed the distributions and composition of plant and animal communities, although specific examples are unavailable at this time. Glacial advance, increased vulcanism, or fluctuating rainfall may have directly or indirectly affected human populations dependent upon local flora and fauna by disrupting resource levels and established activity patterns (Moratto et al., 1978; Fredrickson 1991a).

Ethnographic Background

Ethnographic data suggest historically the Bridgeport locality was inhabited by native peoples speaking the Kuzedika dialect of the Northern Paiute language (Davis 1965; Miller 1986). Kuzedika is also known as Kutsaidokado (Fowler and Liljeblad 1986; see also Merriam 1955; Steward 1939, 1941). The Mono Lake locality south of Bridgeport and the Walker River area north of Bridgeport also was reportedly used by the Washo (d'Azevedo 1986; Price 1962) as peripheral lands for gathering specific resources, possibly on a seasonal basis. Direct use of the Bridgeport locality by these and other peoples, therefore, cannot be ruled out (Fowler and Liljeblad 1986; Levy 1976).

In general, the Northern Paiute followed a subsistence pattern characterized by high seasonal mobility, moving their residence on average between 30 - 40 times a year (data from Kelly 1932 [in R. Kelly 1983]). This high degree of residential mobility occurred in response to factors characterizing available resource biomass and resource predictability (Kelly 1983; see also Dyson-Hudson and Smith 1978). For instance, Bettinger has stated

> Basic to the forager-collector model is the proposition that where access to resources is limited temporally or spatially a variety of measures will be taken to extend the economic utility of those resources; absent such limitations, these utility-extending behaviors are unlikely. (Bettinger 1987:125)

Kuzedika Paiute re-located themselves frequently as resources in a given area became available. In winter, they relied mostly on stored goods (Davis 1965), or established camps near rivers to fish, a winter activity (Fowler 1989). During spring, the Kuzedika occupied an area located near the eastern base of the Sierras where plant and animal resources were abundant and, also to maximize access to westerly-migrating deer herds. When the snowbound high mountain passes cleared, interaction with people and resource areas to the west commenced. Summer months were spent in base camps located along the eastern edge of the Sierras or hunting at higher elevations. The Kuzedika reportedly occupied camps as distant as Walker Lake (Nevada), Mono Lake, and Yosemite Valley (Davis 1965).

Toolstone Resources

A number of obsidian sources are present in the western Great Basin, particularly in the highly volcanic region north and south of Mono Lake (Figure 2). Availability of high quality volcanic glasses was an important factor in development of prehistoric cultures in this region (Hall 1983; Jackson 1985). Major sources include Bodie Hills (BH) and Mt. Hicks (MH), situated about 19 km east of the study sites; and Casa Diablo (CD) and Queen/Truman Meadows (QT), less than 31 km south and southeast. Less important sources, either as a result of quantity or quality of available material, include Pine Grove Hills (PG) and Fletcher (north and northeast of Bodie Hills), and Mono Craters (MC) and Mono Glass Mountain (MGM; south of Mono Lake). The Fish Springs source (FS) in the Owens Valley (about 62 km south), and the Coso source, even farther south, appear to have added little to assemblages obtained from sites in the Mammoth Lakes and Bridgeport areas (see Goldberg et al. 1990; Hall 1983; Jackson 1985). Contributions from other stone sources suitable for shaping into flaked tools are notable by their rarity in the area. Specifically, rhyolites, basalts, and other miscellaneous volcanics are represented only by generally sparse distributions of limited quantity and variable quality.

The Bodie Hills volcanic glass source, CA-MNO-612, is situated approximately 2 km east of Bridgeport, 6-9 km east of the study sites. It occurs in hills characterized by elevations near 2591 m ASL in a sagebrush environment. This source was first characterized geochemically by Jack and Carmichael (1976). Subsequent characterization and development of methods for distinguishing Bodie Hills glass from other sources have been conducted by Jackson (1974) and Hughes (1985).

During different prehistoric temporal periods, movement of materials from certain obsidian sources was limited in a north-south direction, but extensive along an east-west axis (Bouey and Basgall 1984; Ericson 1977; Jackson 1985; Jackson 1974). This distributional pattern may have varied over time as a result of changing adaptive strategies concomitant with shifts in land-use and resource procurement (Basgall 1988, 1989). Recently, Hughes (1990a) has cautioned about acceptance of geochemical source characterizations as becoming embedded within branches of the scientific community as "conventional knowledge". Occurrence of this phenomenon was demonstrated through re-examinations of previously characterized obsidian sources. These found identifiable intra-source variability in two major sources, the Coso volcanic field and Casa Diablo, and developed means for distinguishing the Mono Craters and Mono Glass Mtn. sources (Hughes 1990a & b). Complicating this issue is the presence of many small glass nodule scatters in the vicinity of larger sources. Thus, obsidians are assigned to most likely source, given the caveat currently uncharacterized sources could possess similar geochemical composition.

Bodie Hills glass has been described as consisting of "clear-gray, banded, and dense black varieties, occasional pieces of mottled brown and black (`mahogany obsidian'), and a clear variety with crystalline inclusions" (Singer and Ericson 1977). Raw material found at this source consists of angular material from terrace outcrops, and obsidian cobbles up to about 20cm in size, many in the 5 - 15 cm range (Singer and Ericson 1977; personal observation). Prehistoric human use of the Bodie Hills source is represented by various quarrying and manufacturing remains; such as bifaces in various stages of reduction, flake blanks of variable sizes, projectile points, cores, and debitage (Singer and Ericson 1977). Hydration analysis of these materials show an emphasis on reduction occurred during the micron (μ) span 6.5 - 3.5 (about 3950 - 1277 years before present [y.b.p.]; BH/CD rate), with a noticeable increase in intensity between about 6.0 μ and 5.0 μ (3417 - 2450 b.p.; BH/CD rate; see Singer and Ericson 1977).

On-site reduction included production of prismatic (i.e., percussion) blades 3 - 15 cm in length as flake blanks, and stage manufacture of bifaces including cores, roughouts, and finished partially retouched forms (Singer and Ericson 1977). The presence of a few bifaces and some debitage made from non-local cherts, chalcedony, jasper, petrified wood and fine-grained volcanics indicate repair and replacement of curated tools also occurred. Little is known about the extent to which flake blanks or bifaces at the quarry were prepared for transport off-site, but predictions about various production trajectories are made on the basis of materials present at the Bridgeport sites (see Chapter 5).

Investigation Summary

Although recovery strategies varied at a few of the archaeological sites, their testing generally involved surface mapping of artifacts, features, and changes in material densities; collection of surface artifacts; and excavation of 10cm-deep surface transect units (STU) with 1/4" screen followed by selective placement of vertical units (VU) using either 1/8" or 1/4" screen (see Fredrickson 1991a & 1991b for more detail). Although a high number of artifacts were recovered from the site surfaces, this was not duplicated in subsurface units (Figure 3). For example, approximately 470 pieces of debitage per cubic meter were recovered from selected VU at Locus 3, MNO-566, while the artifact amount was one item.

Obsidian accounted for 98% of all flaked stone material recovered (n=16,029). Debitage comprised 97% of this group (n=15,624). Non-obsidian flaked stone was recovered at all sites. The greatest amount, 74% (n=175), was derived from the southern complex, defined here as MNO-564, 2455, 2456, 2488, and 2489 (see Chapter 4).

Delineation of archaeological assemblages and postulation of inferences about past human behavior for this study were achieved in large part by analysis of obsidian hydration data and x-ray fluorescence analysis. Visual sourcing of regionally local obsidian, although fairly reliable for non-archaeological specimens (Psota 1990), was found to be ineffective for archaeologically recovered materials (Hull 1988). Given results from selective XRF testing, however, it seems reasonable to assume the overwhelming majority of obsidian is derived from the Bodie Hills locality (i.e., 87% of material tested by XRF was assigned to BH). A higher proportion of BH (96%; n=48) characterized the debitage sample tested (see Appendix A). Obsidian hydration testing of 748 specimens yielded 691 usable rim readings (Figure 4). These results are discussed further in Chapters 4 and 5.

## Archaeological Context

### Temporal Periods and Hydration Ranges:

Temporal periods delineated for the Mammoth Lakes locality and much of the eastern Sierra Nevada were applied to the study area during this investigation (Bettinger 1982; Bettinger and Taylor 1974). Although ranges for the proposed temporal periods vary somewhat between different chronological schemes developed for the region, the general trend is not disputed. Obsidian hydration studies conducted in the region lend added support to the established chronology.

The Mojave Complex has been defined as being prior to 5,500 b.p. Its occurrence is marked by Mojave and Silver Lake point types (Bettinger 1982; Bettinger and Taylor 1974). Hydration results and stylistic studies for materials from the Komodo site, MNO-679, in the Long Valley caldera, indicate early use of the area by peoples inhabiting it prior to the Mojave Period (Basgall 1987; 1988; 1989). Twenty-two projectile points made of Casa Diablo obsidian were characterized by hydration values spanning 7.5 - 12.2 µ, with a mean value of 9.6 µ (Basgall 1987). An age in excess of 8,000 years has been posited to account for these readings. The entire assemblage was characterized by a greater variability of obsidian source materials than that typifying later Archaic Period assemblages. This observation supports extant models of Paleo-Indian/Early Archaic Period mobility strategies (Goodyear 1979).

The Little Lake Period follows a possible hiatus or change in site use (Bettinger and Taylor 1974), and extends from about 5,500 - 3,200 b.p. It is characterized by points assigned to the Little Lake and Pinto series. This time period (i.e., the Altithermal/Xerothermal), probably was characterized by warmer, drier conditions than those preceding it (Elston 1982). It is believed to have ended with the onset of cooler, moister conditions. Little Lake Period use of the region is represented at several sites, including quarries and adjacent flaked stone reduction areas and camps, by occurrence of appropriate hydration values and diagnostic points (Basgall 1989; Hall and Jackson 1990; Jackson 1985; Lanning 1963; Singer and Ericson 1977). Obsidian source data from INY-30, located approximately 81 km south of the Bridgeport locality along the base of the eastern escarpment of the Sierra Nevada range, show Little Lake Period use of flaked stone was also characterized by high material diversity. Specifically, 51% of the assemblage derived from sources other than the closest source, the Coso volcanic field (Basgall 1989).

From about 3,200 - 1,400 b.p., a period marked by a warming, drying trend, the Newberry Period occurred in the region. Stemmed points often classified as Elko and Gatecliff series, were the dominant projectile point types in use. Evidence of site use during the Newberry Period is abundant, given possibly increased use of biface cores/tools and attendant reduction and maintenance of these items (Basgall 1983; Jackson 1985; Mone and Adams 1988; Thomas 1986; Singer and Ericson 1977). Multi-component sites in the region, characterized by both Newberry Period and later Haiwee/Marana assemblages, often appear to exhibit very intensive use during the earlier time period, and little use during the latter (Basgall 1983; Fredrickson 1991a; Jackson 1985; Kelly 1988; Parry and Kelly 1987). Hydration spans at the Bodie Hills quarry typifying periods of peak use represent the latter portion of the Little Lake Period and all of the Newberry Period, with the dominant peak corresponding to the earlier portion of Newberry.

The Haiwee Period, which extends from about 1,400 - 700 b.p., is marked by regional introduction of the bow and arrow. This is indicated by the occurrence of smaller point types belonging to the Rose Spring and Eastgate series (i.e., Rosegate; Lanning 1963; Thomas 1981). Haiwee Period use of the region is marked by a decline in the frequency of occurrence of hydration values at many sites. Camps are often associated with piñyon pine exploitation (Elston 1982). In general, cooler climatic conditions appear to have prevailed.

The Marana Period represents the time span from about 700 b.p. to historic times. It is marked by Cottonwood Triangular and Desert Side-Notched points. Greater complexity of social organization is postulated for this period (Elston 1982). Like the preceding period, this period is also marked by low frequencies of hydration values.

As noted above, flaked obsidian materials, particularly projectile points, from the Mono Lake/Mammoth Lakes area yield hydration values consistent with other chronologic studies (Jackson personal communication 1991). Hydration data for 234 projectile points made from Casa Diablo obsidian were used in a study by Hall and Jackson (1989) to develop a calendric rate conversion formula for this glass. Their formula is stated as:

$y = 129.656x^{1.826}$ where y = years before present and x = hydration value. This helps define temporal periods of obsidian use where stratigraphic correlation or carbon dating are not possible or reliable (Hall and Jackson 1989; Thomas 1981; see Figure 5).

Establishment of Hydration Rates and Ranges:

To enhance the research potential of flaked obsidian materials, the ASC conducted experiments in induced hydration and use of soil temperature probes as a means of testing variables effecting hydration processes (Tremaine 1991a & b). Results of these studies are discussed in greater detail in Fredrickson (1991a), and are briefly summarized here. Experiments in induced hydration were carried out to develop formulas enabling comparison of hydration values obtained from Bodie Hills, Casa Diablo, Napa Valley, and Borax Lake glasses; sources often found together in archaeological sites from the western Sierra Nevada range and the mid-Central Valley to the Monterey Bay region (Jackson 1974; Jones and Hylkema 1988).

Similar experiments have shown various volcanic glasses apparently develop hydration bands at individual, mathematically constant rates (Tremaine 1989). Relationships between hydration rates of individual glass types can be determined by artificially inducing the hydration process at set temperatures for set periods of time for a given number of obsidian source samples. The mathematical formula converting the hydration value of one source to that of another is termed a "comparative constant" (Tremaine 1989). Recent experiments show that at the same experimental temperatures, hydration rates of BH and CD materials are virtually identical. Additionally, the relationship of BH:CD was found to be 0.95:1, with a standard deviation of 0.09 (Tremaine 1991b:298).

Data generated from soil temperature probes placed in the archaeological sites for 1 year were used to test the effects of temperature and humidity on hydration rates (Tremaine 1991b). It was found temperature, which decreased with depth, and relative humidity, which increased, did not vary significantly with horizontal placement. Although variability by depth should affect the hydration process, the particular depositional history of a specific artifact coupled with the effects of bioturbation may act to cancel each other out (Tremaine 1991a:278).

Hydration Chronometrics:

Regardless of XRF assignment or lack of testing, all hydration data for this project have been combined for analysis. Although it has not been demonstrated through direct sourcing, it is assumed the majority of obsidian used in the hydration analysis came from the Bodie Hills source. As noted above, 87% of the material tested by XRF was assigned to the Bodie Hills geochemical group. Most of the items tested were non-debitage. It is assumed, following findings of this and other investigations, tool forms are characterized by greater source variability than debitage, and that the majority of debitage belongs to the dominant material source identified for tools, but to a greater proportion. Although hydration rates for all obsidian sources in the region have not been identified, and only a small amount of material in the hydration sample has been assigned to geochemical groups (22%), it would be unproductive to exclude non-Bodie Hills material from most parts of analysis. Thus, source-specific hydration contemporaneity is assumed with the understanding that the level of error caused by non-Bodie Hills obsidians is low.

Hydration ranges were defined for the present study on the basis of frequencies of occurrence. Low numbers were interpreted as hydration span breaks. Low frequencies of hydration values may reflect changes in land use patterns by past inhabitants, temporarily diminished use of obsidian, or sampling error. Hydration ranges for the temporal periods used here are defined without the overlap identified by Jackson (1985), but closely approximate those defined for the ASC project (Figures 6 and 7). These hydration spans are generalized, but provisionally ascribed to previously defined temporal periods with the understanding future investigations may generate data useful for further refinements and/or redefinition. Variability existing in these hydration spans at each site or locus is discussed in subsequent chapters.

## Regional Distributions of Bodie Hills Obsidian

The following sections review a number of studies relevant to an understanding of the distribution of Bodie Hills material. Although the movement of this material throughout prehistory was probably subject to a number of factors, many of the studies used here were not subjected to temporally specific analysis of flaked stone material variability, although many are dominated by Archaic Period assemblages. Their inclusion may be seen as providing a basis for future investigations. Given variability in adaptive strategy and technological organization, it is recognized artifact form such as projectile point, biface, debitage, etc., may have some bearing on the distributional systems responsible for the occurrence of this material. Therefore, this subject is addressed where possible. For these reasons, it is also important to examine briefly archaeological assemblages which have low proportions of Bodie Hills obsidian in order to define regional distributions of this material.

### Investigations in the Bridgeport Area:

Several other archaeological investigations, varying in scope, have been conducted in the general area north of Bridgeport. These studies are briefly discussed to compare their results with those of the ASC investigations. An excavation conducted at two sites situated on a bluff above MNO-2456, yielded point types classed as Humboldt, Elko, Rosegate and Desert Side-notched (Gerry 1979). Other items recovered from this site included flake scrapers, cores, bifaces, manos, utilized flakes, and other tools.

Recent archaeological survey along two sections of Highway 395, including portions of the Bridgeport and Huntoon valleys, by the California Department of Transportation (Jones and Grantham 1990) resulted in the recording of 11 sites and re-recording five previously recorded sites. All these sites have prehistoric components. They were of variable size, and characterized by varying densities of materials, including flaked obsidian, basalt, and crypto-crystalline debitage, occasional tools, and groundstone. Points in the Rosegate and Desert series were identified, as well as a stemmed form, and a fragment of a chalcedony concave base form.

An excavation conducted by Caltrans at MNO-2213 near Fales Hot Springs north of Huntoon Valley (Noble personal communication) has generated a suite of hydration readings. These range from at least 5.2 - 1.4 μ, mostly made on BH obsidian. Small amounts of CD and MH obsidian also are identified. In addition to debitage, tool types include bifaces and points classed as Cottonwood, Desert Side-notched, concave base, and contracting stem.

<u>Assemblages Dominated by Bodie Hills Obsidian:</u>

Flaked stone materials from archaeological sites situated in the Sierra Nevada Range west of the Bridgeport locality are frequently dominated by BH obsidian (Ericson 1977; Jackson 1974). This material often represents the dominant source south to the Tuolumne River drainage, at which point CD often becomes the dominant source (Jackson 1974:64). Although BH dominates sources in the Northern Sierra Nevada throughout most time periods, an influx of western sources occurs during the Late Period (Jackson 1974:64 in reference to AMA-56, CAL-237, PLA-101; Waechter 1989). It has been argued geography was not the sole reason for these and other temporal shifts observed in obsidian source proportions (Jackson 1974:69).

In studies conducted for the New Don Pedro Reservoir area (TUO-279, 298, 300, 314, and 326) BH was found to dominate the obsidian assemblage. Approximately 80% of the specimens were assigned to this source (Jackson 1974:80).

Archaeological studies of sites in the Mokelumne River drainage also report a high incidence of BH obsidian, beginning about 2500 b.p., and continuing until about 150 b.p. (Cleland 1988). Projectile point series for these temporal periods mirror those defined for the eastern Sierra Nevada. Elko Series points and some Martis Series points mark the Blue Lakes Phase (about 2500 - 1500 b.p.). Rosegate Series characterize the Early Kings Beach and Mokelumne phases (1500 - 750 b.p.); while Desert Series mark the Late Kings Beach and Amador phases (750 - 150 b.p.).

In Yosemite National Park, where 99% of the cultural material recovered is obsidian, overall source proportions for BH are lower. Specifically, proportions for BH material are identified as about 21%, 67% is represented by CD, and the remaining 12% is composed of MH, QT, MGM/MC, and unknown (Hull 1988). The proportion of BH in the projectile point class alone, however, is greater (31%). Casa Diablo represents 55% and MGM/MC and MH comprise the remainder. Preliminary results of a recent investigation conducted by the Park Service in Virginia Canyon, north of Tuolumne Meadows, indicate high proportions of BH and CD material in artifacts (McKirn-Laird personal communication 1991). Artifact forms identified included several items belonging to the following categories: concave base points, contracting stem points, expanding base points, Desert and Rosegate Series points, and bifaces. Classification by visual sourcing indicates these categories might also include small amounts of MH and MGM materials.

Recent data from the Stanislaus National Forest support the reported high volume of BH obsidian utilized in this portion of the western Sierra Nevada. Of 318 pieces tested by XRF analysis, 307 (97%) were assigned to BH (Meacham-Francis personal communication 1991; see Figure 8). Six of the sites used in that study were situated at elevations between about 1829 - 2012 m ASL (ALP-109, 149, 152, 192, Tuo-1289, and 1607), while three others were between 1036 - 1341 m ASL (Forest Service sites 05-16-54-891, 894, and 903). Hydration values obtained from 290 specimens (207 from the high elevation sites and 83 from those at the lower elevations) exhibit a range of variability somewhat comparable to those from the eastern Sierra Nevada (Basgall 1983; Goldberg et al. 1990; Jackson 1985; Mone and Adams 1988). Projectile points, obtained only from the high elevation sites, exhibit expected hydration ranges and means. DSNs, although characterized by a range of 1.0 - 4.0 µ, had a mean of 1.7 µ. Non-classified stemmed points had a range of 3.0 - 5.0 µ, and a mean of 4.2 µ, suggesting possible contemporaneity with contracting stem points from the Bridgeport locality. Concave base points exhibited variability similar to that evidenced by the Bridgeport sample. Specifically, a wide hydration range was identified (1.5 - 6.9 µ), but it was marked by a mean value of 4.3 microns.

A cumulative histogram for the Stanislaus National Forest sites distinguishing between high elevation and low elevation sites shows a possible "offset" in hydration value modes requiring discussion. The arbitrarily defined hydration range 3.3 - 5.7 µ (comparable to the Newberry Period hydration span for the Bridgeport locality) was characterized by a 4.7 µ mean value for high elevation sites and a 4.3 µ mean value for low elevation sites. This modal range is virtually the reverse of that expected if contemporaneity is presumed, since materials at lower elevations should hydrate at a faster rate due to higher effective temperature. Given the approximately 610 - 914 m elevation difference, it appears materials from low elevation sites may have greatly accelerated hydration values. Thus some of the low elevation hydration values within the defined range may be associated with a time period later than that of the early modal range represented at the high elevation sites. Part of this low elevation modal range may be associated with a time period characterized by Rosegate Series points. Moratto et al. (1988:323, cited in Waugh and Rondeau 1990) for instance, place mean hydration for New Melones area Rosegate Series points at 3.5 microns.

Temporally diagnostic assemblages from other sites situated at lower elevations from Tuolumne and other foothill counties also sometimes exhibit higher hydration values than sites at higher elevations. Desert Series points from TUO-2194 and TUO-2197 had a hydration range of 1.2 - 3.7 µ (BH/CD), with a mean value of 2.4 µ (Waugh and Rondeau 1990). Time sensitive projectile points from higher elevations in Yosemite National Park manifest a slower rate of hydration marked by smaller values than those from the Mammoth Lakes locality. Respectively in the two regions, Desert Series points were characterized by mean values of 1.65 µ and 1.88 µ; Rosegate had means of 2.60 µ and 3.21 µ; and Elko Series had means of 3.84 µ and 4.18 µ (Hull 1988). The same point series recovered during investigations at lower elevations in El Portal (about 914 m ASL) exhibit wider ranges and greater means.

At CAL-991, however, situated at 1006 m ASL, 26 hydration values, most presumed to be on BH obsidian, were characterized predominantly by small values, consistent with the dominant Late Period materials recovered. Two Late Period components marked by arrow points in the Desert Series, were characterized by means of 1.5 µ (n=6) and 1.3 µ (n=17). An earlier component marked by 3 hydration values, had a mean of 4.4 µ, but a greater overall range and standard deviation (White 1988:58).

Obsidian use during a Pre-Rosegate temporal period in the western Sierra foothills is proposed for assemblages from TUO-2192 (North Locus) and the Skyrocket Site (CAL-629/630). At TUO-2192, a hydration sample of 45 BH specimens yielded a mean value of 4.5 µ (sd= 0.60; Waugh and Rondeau 1990). At the Skyrocket site, situated at about 300m ASL, BH material was the dominant obsidian represented (Pryor and Weisman 1991). Hydration values obtained on 57 specimens during initial studies ranged from 1.1 - 8.7 µ (mean = 5.5 µ; sd = 1.68).

Archaeological sites in the Central California coastal region and East San Francisco Bay region also contain variable, but often small amounts of BH material, mostly from pre-Late Period contexts (Jones and Hylkema 1988; Jackson 1974). Hydration readings and XRF analyses of materials from several Monterey Bay region sites shows an emphasis on Casa Diablo and Napa Valley obsidian occurred during most temporal periods. At these sites, BH accounts for a very small amount along with a few other western Great Basin sources (Jones and Hylkema 1988). East Bay sites also are characterized by low numbers of eastern sources (Jackson 1974; Holman and Clark 1982).

In Nevada, one archaeological site in particular deserves consideration. Hidden Cave (26-Ch-16), situated about 160 km north of Bridgeport, California, is described as a cache cave, characterized by minimal occupation and mainly used as a storage facility for people passing through the area (Thomas 1985). A total of 176 artifacts were subjected to XRF analysis. Of these, 153 were projectile points (Gatecliff Series=106). The remainder consisted of untypable point fragments, biface fragments, and three flakes, among which MH was most prevalent (Hughes 1985). Of the typable projectile points, MH was the dominant source, accounting for 39% (n=60). Bodie Hills, the second most prevalent source, comprised 20% (n=30). Twenty five Majuba Mountain specimens represented the next highest proportion at 16 percent. Sources deriving from volcanics in the Mono Lake region, excluding Garfield Hills, together accounted for 71% of the typable points. Only one item, however, was assigned to CD, and no MGM/MC was identified (Hughes 1985).

The total flaked stone assemblage consisted of 201 typable points, 16 classifiable bifaces, seven biface fragments, seven drills, one core, and 56 pieces of debitage (Thomas 1985). Obsidian accounted for 140 points, 14 classifiable bifaces, five biface fragments, four drills, and 26 pieces of debitage. It is clear in all material categories, artifact classes indicative of early and middle manufacturing stages are not present in representative proportions. Thus the proportions are virtually the reverse of those expected for a habitation site. Presence of "southern" obsidians in the form of cached points, types associated mostly with the Archaic Period, and absence of other toolkit elements commonly found with assemblages from that period, raises questions about the transport systems of these materials (see Chapter 5).

Assemblages Dominated by Non-Bodie Hills Materials:

A review of sites marked by low numbers or an absence of BH specimens enhances an understanding about regional distributions. Archaeological investigations of a pronghorn antelope trap complex within the Toiyabe National Forest in Mineral County, Nevada, about 100 km SE of Bridgeport, California, revealed a Late Period emphasis. The assemblage was dominated by Desert Series (DSN and CT) and Rosegate Series (RS and EG) points (Parr 1989). XRF analysis of a small sample of these suggested primary reliance on the nearby QT source, and secondary reliance on the MH source. Of 20 projectile points tested, 13 (65%) were assigned to QT (one of these was "QT?"), five (25%) were MH, one was BH and one was MGM (Jackson 1989). Of 15 of the items tested, 10 were DSNs (seven concave base, three basal-notched), and five were RG. A total of 60% of the DSNs were made of QT/QT?, 20% were MH, and BH and MGM were each represented by one item. Rosegate points were composed of three QT and two MH.

Excavations of an archaeological deposit situated along Highway 359 near the California border close to Mono Lake by the Nevada Department of Transportation, revealed 80% of the flaked stone was obsidian. Most of the obsidian tested was assigned to MH (Moore personal communication 1991). Of 12 obsidian artifacts recovered from a housefloor, 11 were assigned to MH, and one was from an unknown source. Given the material variability exhibited in other regional assemblages, it is expected a larger XRF sample will reveal greater diversity.

Gatecliff Shelter, situated approximately 220 km east-northeast of the Bodie Hills source, was characterized by a flaked stone assemblage dominated by local chert (Thomas 1983:394). Obsidian accounted for only 3% of all projectile points, and about 2% of all other bifacial artifacts, figures consistent with the central Nevada area (Thomas 1983:394). Particle Induced X-ray Emission analysis (PIXE) was employed on 200 obsidian samples from Gatecliff Shelter (Thomas 1983:394). This method proved unsuccessful for identifying most sources other than the local Box Spring source (Thomas 1983:399).

XRF analysis of 54 artifacts by Hughes concluded about 74% were assignable to known geochemical groups, including BH (n=2), CD (n=1), QT (n=23), and Crow Spring (n=2) (Hughes 1983:407 in Thomas 1983). Queen obsidian dominated the stratigraphic horizons attributed to the Devil's Gate Phase (about 5300 - 3000 b.p.). Obsidian from the Box Spring source, a source of float material situated in Monitor Valley, is the dominant source of obsidian during the Reveille Phase and retains some of its importance during later phases as well. Although hydration analysis of two small samples was conducted, 11 items from Gatecliff Shelter and 13 surface-recovered items from the Reese River Valley, results were considered unpromising and this method of investigation not pursued further (Thomas 1983).

A locality approximately 200 km north of Gatecliff shelter has yielded obsidians from the Mono Lake region. Archaeological investigations by the Nevada Department of Transportation at seven sites in Pine Valley, near Elko found that although most of the material was locally obtained chert (90-95%), the obsidian present was assignable to MH, PG, and Paradise Valley. No BH was identified (Moore personal communication 1991). Although the Paradise Valley source is situated near these archaeological sites, the presence of more distant sources has implications for mobility and/or exchange systems (see Chapter 5).

Archaeological investigations at three prehistoric sites at Rye Patch Reservoir, Pershing County, Nevada, included XRF analysis of about 84 items, and hydration testing of an additional 20 items from PE-366, 450, and 670 (Rusco and Davis 1987). A total of 23 items (points, biface fragments, and flakes) and hydration testing of these and one additional specimen from PE-670 indicated 59% were attributable to the Majuba Mountain source. One flake was assigned to Pine Grove Hills, and another to Casa Diablo. Remaining items were assigned to two northwest Nevada sources, Duck Flat and Summit Lake (Rusco and Davis 1987:51). Hydration data from Majuba Mountain items exhibit a range of 5.4 - 9.2 μ, with a mean value of 6.85 microns.

Diachronic studies at PE-366 and 450 using radiocarbon dating and hydration analysis support the chronologic range of point types recovered. Projectile points included those belonging to Desert series (DSNs and CTs), Rosegate series, Elko series, Gatecliff series, and Humboldt series (see Figure 9). XRF analysis of 61 points from PE-366 and 450 showed the dominant source of obsidian was again Majuba Mountain (44%). PG comprised 25%, BH was 5%, and Duck Flat comprised 7 percent. Cow Head Lake, Dry Valley, Sugar Hill, Box Spring, and the Coso source each comprised 2%, while an additional 11% were not assignable to known sources. Items sourced to BH included 2 DSNs, with hydration rim values of 1.8 μ and 2.5 μ; and a Rye Patch Miniature, characterized by a hydration value of 2.5 microns. The latter form if a very small stemmed point morphologically similar to Rose Spring, but presumably restricted geographically, also similar to Carson points (see Kelly 1983).

Investigations by the Nevada Department of Transportation at Steamboat Springs between Carson City and Reno, found flaked stone tools were made of a variety of materials, including miscellaneous obsidians. Projectile points were fabricated from both BH and MH obsidian (Moore personal communication 1991). Of 50 pieces of flaked stone, 21 were MH, four were BH, three non-obsidian, nine were unknown, and 13 required further testing. Since the site is closer to the BH source than it is to MH, the low numbers of materials assigned to BH is unexpected.

The Komodo Site, MNO-679, is situated on the Long Valley caldera in close proximity to the Casa Diablo obsidian source. The deposit is characterized by a Paleoindian flaked stone assemblage, provisionally assigned to the early Holocene (Basgall 1987). A hydration range of 7.5 - 12.2 µ, obtained from 22 projectile points made of Casa Diablo obsidian, was characterized by a mean value of 9.6 microns. Although most of the flaked stone was obsidian, some cryptocrystalline materials, mostly small-size debitage, were also recovered. Reduction of this material on-site was probably restricted to maintenance of transportable curated tools (Basgall 1983). XRF source characterization of a sample of obsidian tools indicated a large proportion (32% - 60%) of the items in each tool class (point, biface, uniface) were derived from non-local (i.e., non-Casa Diablo) sources (Basgall 1989). None of the obsidians tested were assigned to sources north of Mono Lake. Variability in material sources is ascribed to an adaptive strategy characterized by a high degree of mobility (Basgall 1989).

Other sites in the Long Valley region south of Mono Lake are also characterized by high proportions of CD obsidian (Basgall 1983, 1984; Mone and Adams 1988). Studies conducted by R. Jackson for the Inyo National Forest found the ratio of projectile points (n=82) made of CD to other obsidian was 1:1. Of the 50% non-CD specimens, QT comprised 22%, MGM/MC was 12%, FS was <9%, and BH and MH were each <4 percent (Jackson 1985). Artifacts from non-quarry/workshop sites were tested, revealing 60% made of MGM/MC, 18% CD, 14% QT, 6% MH, and <3% BH (total n=108). Of 378 pieces of obsidian debitage collected from occupation sites and temporary camps subjected to XRF testing, 89% was CD, 8% was MGM/MC, 2% was QT. Only 1 item was BH. The variability in source proportions was attributed to sampling strategies, site type, and geographic location relative to source area.

At INY-30, a multi-component site located about 200 km south of Bridgeport, Coso obsidian dominates the flaked stone assemblages from the four temporal periods identified. Overall, Coso comprises 74% of the obsidian. Casa Diablo is the second most represented source at 11% (Basgall 1989:117). By contrast, BH is represented only by two items (~2%).

## Conclusions

Temporally specific source proportions of toolstone materials can provide evidence of possible past transport systems. Simple equations based on distance-decay hypotheses or relative proportions of materials represented may not adequately explain the variability observed. Temporally specific mobility strategies and exchange systems may produce assemblages which appear anomalous given the present sample. These factors and a summation of the geographic distribution of BH are discussed further in Chapter 5.

# Chapter 3
# Flaked Stone Materials Recovered

This chapter discusses methods of artifact analysis and classification system used in the present study, and describes the materials recovered. Certain conventions and procedures were used during the ASC archaeological investigations and for this thesis require explanation. Some of the procedures used in the ASC investigations subtly differ from those employed here. For example, projectile point types used as assemblage time markers for the Little Lake Period are not referred to as Gatecliff or Elko series points as they were in the ASC reports. This is done to avoid confusion with types used as time markers of the later Newberry Period. This change is of a terminological nature and does not significantly alter conclusions reached by other studies discussed below.

## Classification Methods and Results

### Projectile Points:

Items were identified as projectile points if they retained a diagnostic hafting element. Elements lacking sufficient diagnostic attributes to be classified as points were subsumed within an appropriate biface category. It is recognized, however, some of the items classified here as points may have functioned as hafted thrusting spear points or knives. Additionally, some items classified as bifaces and fragments probably represent portions of projectile points and are discussed in greater detail below.

Projectile points recovered during the ASC investigations were classified according to the typological key developed by Thomas (1981) for materials from Monitor Valley, Nevada. His key was essentially morphological, but was also used to identify temporally discrete types. Although useful as a classificatory device, misinterpretations about cultural chronology may occur if it is used indiscriminately to define temporal ranges. For example, some point types, such as those assigned to the Desert Series, have been found to be temporally diagnostic. Others, however, such as points in the Humboldt Series, were used throughout a broader time range in many parts of western North America, making them less reliable as temporal markers. Contracting stem forms, classified as Gatecliff points by Thomas (1981), occur throughout the Sierra Nevada, western Great Basin, and Central Valley of California. There they are sometimes associated with archaeological assemblages temporally and geographically divergent from the Monitor Valley region.

Two of the stemmed types defined by Thomas, i.e., those assigned to the Gatecliff and Elko series, are characterized by a considerable degree of morphological overlap with points classed in many parts of the western Great Basin as Pinto, Gypsum, or Little Lake Split-stem (Hall and Jackson 1989; Holmer 1986). Differences in classification have resulted in some of these stemmed point forms, being referred to as Elko Contracting Stem and Gypsum Contracting Stem points (see Jackson 1985, and Hall and Jackson 1989 for details). This assignment concurs with Heizer and Baumhoff (1961). Thomas, however, distinguished the Gatecliff and Elko series by applying metrical analysis to stratigraphically discrete assemblages (1981, 1983b). This method provided operational criteria for classification, something lacking in earlier schemes.

At Gatecliff Shelter, Gatecliff and Elko series points were associated with distinct stratigraphic soil horizons. Specifically, the former characterized the earlier Devil's Gate Phase, while the latter was predominantly associated with the temporally later, stratigraphically superior Reveille Phase (Thomas 1981, 1983b). It is noted here that although Thomas's key was designed to be used on projectile points post-dating the circa 6800 b.p. eruption of Mt. Mazama in Oregon, the majority of points classified in his key (about 375 points), and in fact, virtually all the stemmed forms, appear to have been recovered from deposits no older than about 3400 b.p. (cf. Holmer 1986:97). Given obsidian hydration results generated during the ASC investigations, some of the points recovered from the Bridgeport locality may be as much as 1000 years older than the stemmed forms obtained from Monitor Valley, making their classification according to Thomas's key problematic.

Although most stemmed forms recovered during ASC investigations classified as Elko and Gatecliff series had hydration values consistent with the proposed span of the Newberry Period (approximately contemporaneous with Thomas's Devil's Gate and Reveille periods), several classed as such were characterized by hydration values placing them within the Little Lake Period (possibly contemporaneous with an early Devil's Gate Phase; Thomas 1983b:177, 186). Therefore, when the term "Gatecliff" is used in the ASC reports (and herein to describe these items), it was not meant to suggest archaeological, cultural, or temporal relationships to assemblages elsewhere. Instead it's use was intended solely to describe a similar form (Holmer 1986).

Given the objectives of the project, potential affinities to other assemblages of "Gatecliff" forms were not fully investigated. Hydration results for projectile point types recovered during the ASC studies and other investigations vary from the chronological scheme proposed by Thomas (Ferneau and Bieling 1990; Hall 1983; Hall and Jackson 1989; Jackson 1985). This confusion over typological assignments is seen as the result of at least four factors. These include: (1) a limited chronological inventory by Thomas (see Thomas 1981, 1983; Holmer 1986); (2) a small sample of series-specific diagnostic points from the Bridgeport locality; (3) obsidian hydration and source variability; and, (4) Archaic Period tool rejuvenation resulting in some significant changes in point morphology (see Flenniken and Raymond 1986; Flenniken and Wilke 1989).

Given the above reasoning, projectile points characterized by hydration values greater than 5.3 μ herein are referred to as Little Lake, temporally distinguishing them from Gatecliff/Elko series forms. The term Gatecliff is used here to identify certain straight, contracting stem forms associated with the Newberry Period (Holmer 1986). Morphological and metrical attributes distinguishing these "types" are discussed in greater detail below.

This section describes and discusses the 61 projectile points which were recovered (Figures 15 - 18). Most of the projectile points (92%) had suffered some form of damage, most often to the tip and blade elements. Damage also occurred along barbs and basal portions. Only five points were undamaged. Of these, three appeared to have resharpened distal blade elements (89-19-10, -458, -530). The two undamaged non-resharpened items (89-19-55 and -300) are classified as Desert Side-notched and Gatecliff Contracting Stem types, respectively.

Specimens classified as projectile points were characterized by an average angle of blade margin constriction of 38° (n=38). Modal range of this angle is about 20° - 40° (n=25). Two points, 89-19-61 and 89-19-530, possessed remnant cortex, with each retaining about 10 percent. The former, a Gatecliff Contracting Stem form made of Casa Diablo obsidian, exhibits use damage, and retains a small area of remnant cortex on the face of its basal element. The latter, the only non-obsidian diagnostic point, is made from basalt. It is characterized by incurvate blade margins, and appears to be an extensively resharpened Gatecliff form.

<u>Desert Series</u>

Desert Side-Notched: Lanning (1963:253), following Baumhoff (1957) and Baumhoff and Byrne (1959), defined Desert Side-notched points as "small triangular points with notches high on the sides"; generally weighing 1.5g or less. These point styles have a widespread distribution during the late prehistoric period. They have been identified in the Great Basin, Sierra Nevada, northeastern and central California, and as far west as the coastal region of California. Four subtypes were defined by Baumhoff and Byrne. These included the General subtype, with a concave base; the Sierra subtype, having a centrally notched base; the Delta subtype, characterized by a V-shaped basal concavity; and the Redding type, exhibiting comma-shaped side notches and a bell-shaped basal concavity.

Four items, all made from BH obsidian, were classified as Desert Series projectile points (89-19-55, 89-19-536, 89-20-52, 89-21-2; Figure 17). Three were small side-notched specimens. One (89-21-2) was either a Cottonwood triangular point or small unnotched preform, presumably for a DSN. Only one was intact (89-19-55). Two were characterized by bending breaks (89-19-536, 89-21-2), and one appeared to have an impact scar on the distal end and missing one barb (89-20-52).

Specimen 89-19-55, is a General subtype point. It lacked evidence of reworking, and was marked by complete scar coverage on both faces and straight margins. Its side notches are shallow and narrow. An obsidian hydration value of 1.3 μ (BH) was obtained.

Specimen 89-19-536, made of BH obsidian, showed evidence of the original flake detachment scar. It yielded a hydration value of 5.0 μ from one of the basal blade margins. Since this hydration value might have indicated possible re-use of this artifact, a second cut was made on one of the lateral notch flake scars. This second test yielded a 4.8 μ value. These readings are statistically identical. Basal width, blade width, thickness, width/thickness ratio, and BIR are similar to the metrical range characterizing small concave base specimens recovered from the same site, CA-MNO-566. Since hydration values indicate contemporaneity with the concave base assemblage, it is believed that hydration rim development has been accelerated.

The third small side-notched point, 89-20-52, was recovered from Locus 3 at CA-MNO-564. This portion of the site is characterized by several Marana Period hydration readings. Made of BH obsidian, this item lacked a visible hydration band. This point most closely resembles small side-notched points of the southerly oriented Mojave Desert "Amargosa II" assemblages, which have deeply notched V-shaped bases and well-defined expanding barbs (see Moratto 1984:357, Fig. 8.6). It also has the lowest W/T value of the three Desert series points, which indicates it is narrower relative to its thickness than the others. Additionally, its notch opening index (NOI=80°) is much greater than the other two notched points, calculated at 20° and 35° (Figure 19).

Cottonwood Triangular: Defined as a small, thin, unnotched, triangular point form, Cottonwoods exhibit similar temporal and geographic ranges to Desert Side-notched points. It has been noted both forms often co-occur in the same sites (Heizer and Hester 1978:11). Cottonwood points often exhibit variability of form with blade margins ". . . ranging from moderately convex to deeply concave or even notched" (Jackson 1985:62). Lanning (1963) recognized two types, the Cottonwood Triangular and Cottonwood Leaf-shaped. Later, Heizer and Clewlow (1968) described a third variety, the Cottonwood Bipointed.

The single point classified as belonging to this type retained evidence of its original flake detachment scar, had slightly irregular margins, and exhibited a tendency towards diagonal flaking. The irregular margin outline, and lack of clear evidence of use, are consistent with its classification as a preform, possibly snapped during reduction. An obsidian hydration value of 1.3 μ (BH) was calculated. This places it within the latter portion of Jackson's (1985) hydration range for Desert series points, and at the mean value for the Marana Period.

Rosegate Series

Rosespring and Eastgate: This point series encompasses two previously distinguished forms, Rosespring and Eastgate. These were combined by Thomas (1981) on the basis of general morphological similarities and temporal equivalence. Following Lanning (1963), these points were described as small and corner-notched, with a slightly expanding stem. Basal width should be less than or equal to 10.0mm, with proximal shoulder angle between 90° and 130°, and neck width less than or equal to the basal width (plus up to 0.5mm).

Three items, one from CA-MNO-2456 (89-21-1), and two from CA-MNO-566 (89-19-8, -136), were classified as Rosegate points (Figures 17 and 19). One (89-19-8), is similar to the originally defined Eastgate type. It was characterized by a 3.2 μ value (BH). The other two, similar to the Rosespring form, were also made from BH obsidian, but were characterized by a diffuse hydration front, and lack of a visible band.

Gatecliff and Elko Series

Typological classification of Elko points has varied since Heizer and Baumhoff (1961) defined three types: Corner-notched, Eared, and Contracting Stem. A fourth variant, Elko Side-notched, was added several years later (Heizer et al. 1968). Elko Contracting Stem was later changed to Gatecliff Contracting Stem, and grouped with points previously lumped as Pinto, some of which are now classed as Gatecliff Split Stem or Little Lake Split Stem (e.g., Hall and Jackson 1989; Holmer 1986; Thomas 1983b). Together, these comprise the Gatecliff Series (Thomas 1981). Some points, similar to those now defined as Gatecliff Contracting Stem, were originally often classified as "Gypsum Cave". Split stem points were, and still are, commonly identified as Pinto (Holmer 1986; Meighan 1981, 1990; Thomas 1981).

Problems in terminology are exemplified by the classification (and probable mis-classification) of points termed as Pinto (Meighan 1981). These problems will not be detailed here except so far as the following. Expectations regarding use of Pinto projectile points as time markers have proven unsuccessful. The series incorporating items classified as Pinto spans several thousand years. Those defined as individual Pinto "types" are characterized by broad and non-contemporaneous periods of use in diverse geographic areas (Holmer 1986; Meighan 1990).

Elko Series points are defined by Thomas (1981, 1983) as large, corner-notched forms, with a basal width greater than 10.0mm, and a proximal shoulder angle (PSA) between 110° and 150°. Corner-notched are distinguished from Eared on the basis of basal indentation ratio (BIR). The former have a BIR greater than 0.93, while the latter are characterized by a BIR less than or equal to 0.93.

Gatecliff Series points are medium to large contracting stem forms, weighing more than 1.0g (Thomas 1981). The Contracting Stem form is further defined by possessing a PSA less than or equal to 100°, or a notch opening index greater than 60°. The Split Stem form is defined by including a BIR less than or equal to 0.97. Selected attributes for stemmed point metric data from Thomas (1983), including basal width, neck width, and thickness, are presented here for comparative analysis with the Bridgeport locality materials (Figure 10).

Four items were classified as belonging to the Elko Series (Figures 15, 16, and 19). Twenty-one items were assigned to the Gatecliff Series (Figures 15 and 17). Three others were typed as Gatecliff/Elko given their lack of diagnostic elements. The four points identified as Elko exhibit a wide range of metric and morphological variability. Basal widths range from 12.9mm to 18.1mm (mean = 15.7mm), and neck widths from 8.8mm to 13.1mm (mean = 10.8mm; Figure 19). Two were made from BH obsidian, one from CD, and the third, unassigned at the time of this analysis, was not BH. Gatecliff Series points, also greatly variable in overall configuration, were characterized by basal widths ranging from 3.0mm to 13.3mm (mean = 8.9mm), and neck widths from 7.0mm to 16.8mm (mean = 12.3mm; Figure 19). Bodie Hills accounted for 71% of these by material type; two were CD; one was MH; one was QT; and one was basalt.

The three specimens not classifiable as to type were provisionally assigned to the general level of either Elko or Gatecliff series (Figures 15 and 19). One was from CA-MNO-564 (89-20-2), one from MNO-566 (89-19-2), and the other from CA-MNO-2455 (89-23-8). All were made from BH. It is also possible that 89-19-2, and marked by diffuse hydration, represents a damaged Rosegate point or a preform for this type since it is thin and made on a flake. The amount of damage, however, is suggestive of use.

Elko Eared and Variants: Items classified here as Newberry Period Elko Series points included one from the southern complex and three from CA-MNO-566 (Figure 16). Another item from CA-MNO-2466, keyed out as Elko Corner-notched, characterized by a hydration value of 1.5 µ (BH), may represent re-use. One of the points recovered from CA-MNO-566 (89-19-1), and the one from the southern complex (89-20-26), were classed as Elko Eared Variants, given the amount of basal expansion, measured as PSA (Figure 19).

Gatecliff Contracting Stem and Split Stem: The majority of Gatecliff Series points associated with the Newberry Period were recovered from CA-MNO-566 (n=21; Figures 15 and 16). An additional contracting stem form keyed out as Gatecliff, but was characterized by a 1.7 µ (BH) hydration value. Although the hydration value may be an anomaly, the item is omitted from Newberry Period Gatecliff metric data. All except one (89-19-84) were classified as Contracting Stem forms. The other was a Split Stem (BIR = 0.93).

Many of these items are characterized by a variety of fractures including medial bending breaks, missing barbs or portions of basal elements, or facial scarring, margin sectioning (i.e., spalling from distal impact), and/or step fractures originating from the distal end. Weights for four complete items range from 2.8 - 12.1 grams (mean = 6.0g; Figure 19). PSA modal ranges for Gatecliff Contracting Stem points are characterized by three clusters: 84° - 95° (mean =

89°; n=8), 75° - 82° (mean = 80°; n=8), and 40° - 70° (mean = 58°; n=5).

<u>Little Lake Series</u>

Projectile points eventually classified as Little Lake were first recovered at the Stahl (INY-182) site south of Owens Valley. Originally, they were called Pinto by Harrington (see Jackson 1985:54, Meighan 1981). Lanning (1963:251) distinguished a similar point type recovered at the Rose Spring site (Iny-372) from the Pinto Basin points. He suggested the two series might be contemporaneous. Like Pinto points, a variety of point types recovered throughout the western Great Basin show similarity to Little Lake (Jackson 1985:55; Holmer 1986; Meighan 1981). Bettinger and Taylor (1974) assigned these points to the Little Lake Period 6000 - 3200 b.p. (later revised to 5500 - 3200 b.p.; see Jackson 1985:55). Similar point forms have been termed Bare Creek Eared and Gatecliff Split Stem (Bettinger 1989:59; Holmer 1986).

Bettinger (1989:59) defined Little Lake points as "large and shouldered with parallel-sided stems and notched or concave bases". Citing Harrington, Jackson (1985:55) states these points are often defined on the basis of a high frequency of serrated blades and evidence of extensive resharpening. He also notes six points classified as Little Lake from the Mammoth Lakes area were characterized by non-patterned pressure flaking, and were quite thick (6.3 - 8.2mm; mean = 7.4mm). Basal widths ranged from 13.9 - 22.0mm (mean = 17.1mm), and neck widths from 13.2 - 17.7mm (mean = 15.1mm). Width/thickness ratios ranged from 3.06 - 4.02 (mean = 3.45). All were marked by indented bases (BIR = 0.90), keying out as Gatecliff Split Stem (Jackson 1985:68). Mean hydration for four CD Little Lake points was 5.6 μ. A MGM specimen yielded a 4.8 μ reading. A QT item had a 7.9 μ value.

Little Lake: Seven items are included here in the Little Lake Series (Figure 17). All are stemmed points characterized by hydration values in excess of 5.2 µ (mean = 6.2 µ). As defined here, these items were characterized by variable basal widths (14.4 - 20.0mm, mean = 16.2mm), and neck widths (7.5 - 14.5mm; mean = 11.8mm). They also tend to be thick (4.4 - 7.0mm; mean = 5.8mm; see Figure 19). Many of these items appear to exhibit extensive resharpening (w/t ratios range from 1.6 - 3.9; mean = 2.9). Five were made from BH, one was MH, and one was QT.

Humboldt Series

Humboldt Concave Base: Points in this series are defined as unnotched, lanceolate, concave base forms of variable size. They had a basal width/maximum width ratio generally less than or equal to 0.90, and BIR less than 0.98. Their weights are often greater than 1.5g, with lengths often equal to or exceeding 40.0mm, and thicknesses greater than or equal to 4.0mm (Thomas 1981). In the past, Humboldt Series points were subdivided into Humboldt Concave Base A, Humboldt Concave Base B, and Humboldt Basal-notched. Although there is a morphological difference between these forms, a temporal distinction yet to be sufficiently identified. Instead, the class is often used as a residual category (Thomas 1981).

Concave bases from the present sample are characterized by basal widths ranging from 8.3mm to 23.1mm (mean = 14.5mm) and BIRs from 0.73 to 0.95 (mean = 0.85; Figures 17, 18, and 19). Eight have basal notching, defined as the removal of one or more flakes from the base in order to create a narrow notch. This kind of modification, coupled with morphological attributes, suggests basal-notched forms began as narrow lanceolate or squared narrow-based bifaces, which were derived either from fully bifacial items or moderately shaped flake blanks. These contrast with the broader based forms marked by the removal of several flakes.

Items in the basal-notched group are characterized by basal widths less than 14.0mm, as contrasted with four specimens classed as concave base forms (Figures 17, 18, and 19). In an analysis of materials recovered from MNO-561 that included 18 narrow-based concave base points, Hall (1983) found 12 made of CD obsidian were characterized by a range of 3.5 - 5.9 µ (mean = 4.4 µ). Four others made of QT obsidian had a range of 2.3 - 4.6 µ (mean = 3.0 µ). Basgall (1983), reports on two small basal-notched specimens from MNO-1529 near Mammoth, California. Both were marked by hydration values of 3.8 µ, though one was made from CD, and the other made from FS, obsidians with highly disparate hydration rates. These findings are consistent with the hydration data characterizing the narrow-base group identified during the present study. Excluding one item made from MH obsidian (89-19-117) with a hydration value of 3.7 µ, the remaining seven made from BH were characterized by a range of 1.1 - 5.2 µ (mean = 3.9 µ). With the 1.1 µ-specimen omitted as a statistical outlier, the mean value is 4.4 µ. Including the MH specimen, the mean is 4.3 µ; which is not statistically different.

Items representing concave base forms are characterized by greater basal widths and more extensive flaking to shape the concavity than those classed as basal-notched. Basal widths in the concave base category range from 18.5 - 23.1mm (mean = 19.9mm; Figures 17, 18, and 19). Two specimens from the southern complex (89-20-77, 89-20-91) are characterized by a lack of basal thinning and slightly excurvate basal tangs. One of these was grouped with the Little Lake forms and the other was suggested as being similar to those forms. The third specimen from the southern complex (89-20-223) was also provisionally classed as having potential Little Lake affinities, but lacked a useable hydration band. A complete concave base point from CA-MNO-566 is thin relative to its width, marked by removal of several flakes from the basal concavity to enhance thinness, and possibly resharpened as evidenced by a tapering distal half, resulting in a BW:MHW ratio of 1.00. It's hydration value (3.8 µ BH) places it temporally within the Newberry Period.

Untypable Points

Three items could not be classified using the Monitor Valley key. One, characterized by a hydration value of 5.6 µ, is a possible wide-stem form from CA-MNO-564 (89-20-81; Figure 18). It lacks diagnostic elements other than incurvate margins defining upward sloping shoulders. A second, a possible lanceolate form or preform from CA-MNO-566 (89-19-85), is characterized by a hydration value indicative of contemporaneity with many of the Gatecliff Series and Humboldt Basal-notched points recovered from that site (Figure 15). This item appears to be a preform for a smaller Gatecliff/Elko Series point, similar to points 89-19-60 or 89-19-131. This specimen has virtually complete scar coverage, and one basal margin has slight incurvation with flake scars suggestive of possible thinning prior to notching. The other basal margin is characterized by a possible bend break at a thicker location. This is possibly the result of a preparatory notch-thinning failure. The tip of this point is also broken. Characterized by a 4.2 µ value (BH), it is contemporaneous with, but morphologically distinct from 89-19-114, the biface form classified as a corner-notch preform. The third item, 89-19-2, which lacks sufficient basal elements necessary for classification, was discussed above in the Gatecliff Series (Figure 15).

Bifaces, Unifaces, and Selected Edge-modified Forms:

A total of 208 items were studied in the analysis. Among these were all bifacially modified items, several unifacially percussion and pressure-flaked items, and several minimally modified (edge-abraded and/or minimally pressure flaked) flake forms. These latter two groups were included to examine possible trajectories of biface and uniface reduction.

Possible inter-relationships between these and other forms are tested by metrical and morphological comparisons of attributes, and through obsidian hydration testing.

Classification was achieved primarily by characterizing attributes of size, shape, amount of flake scar coverage, and width-thickness ratio (Figure 20). Most of the items included in this analysis represent production/reduction and/or use-related failures. Approximately 90% are fragments. About 84% of these are characterized by presumably non-impact breaks, i.e., bending, perverse, and radial fractures. The latter type of break is defined here as a non-intentional fracture characterized by multiple fracture planes, presumably caused by bend forces interacting with material inclusions. The high proportion of bending breaks on non-formal or less modified items are interpreted as the result of mis-directed percussion blows during thinning, shaping, and/or maintenance. Bending breaks characterizing some of the more formal items are presumed to be reduction mistakes. Similar breaks, often more than one, on others (e.g., mid-sections) could occur from remote fracturing caused by projectile impact during use (cf. Odell and Cowan 1986; Titmus and Woods 1986; White 1984).

### Definition of Bifacial and Unifacial Forms

Modified flaked stone recovered during the ASC investigations is organized into general categories. Many of these categories are founded on functional terminology related both to assumptions about reduction sequences and specific tool use. It is acknowledged that the term "flake blank" as used here implies classification both as a minimally-modified tool form of unrealized potential and an item that may already have served as a tool or raw material core for intentional production of a flake. This system of terminology has been adopted, however, to simplify what could have been a complex array of designations had strict morphological categories such as "broad thin biface," "short thick biface," etc., been employed. Given the number of items included, the semantic confusion such classification schemes can engender may have overwhelmed any potential interpretations of the data.

Flake Blanks: Items classified as flake blanks are minimally modified along lateral or distal edges. Invasive flake scars are limited in number. Blanks are distinguished from flake tools and core forms by their size, shape, and/or kind of modification. Items thus classified should be large enough to sustain further reduction into specific tool forms represented on the site or found at other contemporaneous sites. Minimally-modified edges should be convex, straight, and/or regular, not, for instance, incurvate-excurvate which could, given other attributes, be used to term the item a flake tool. Some specimens may be carefully abraded and/or pressure flaked along the margins to achieve the desired shape, or to establish regular edges and edge angles for reduction. Others may have minimal percussion shaping as their initial modification.

A total of 36 items were classified as possible flake blanks. One of these items was made of cryptocrystalline material, the rest were obsidian. The greatest number of these items were recovered from MNO-566 (n=27). The remainder came from the southern site complex (n=9). These items were highly variable in morphology. Their widths ranged from 18.3 - 41.0mm (mean = 31.0mm; Figure 20). Thicknesses were between 4.0 - 14.6mm (mean = 8.8mm), while width/thickness ratios ranged from 2.27 - 7.83 (mean = 3.88). Fourteen (39%), all obsidian, retained areas of cortex.

Cores: Cores are bifacial, unifacial, or multi-directional masses from which several flakes have been removed (Crabtree 1972). To be classified as a core, an item should: (1) retain sufficient mass for removal of flakes suitable for tool use or tool blanks; or, (2) be characterized by size and shape conducive to further reduction into a more-formalized tool (thus, also interpretable in a stage reduction model as a biface blank; see Kelly 1988). "Core" represents an arbitrary definition in regards to most bifacial forms. By definition and assumed functions, it overlaps with flake blank and general purpose biface (see below), and is used here only for larger items. They are further defined here as being either thick or thick relative to their width, i.e., having low width/thickness ratios. All core forms recovered during this investigation were termed bifacial.

All items classified as cores were made from obsidian (n=18). These were recovered from MNO-566 (n=8), and also from the southern complex (n=10). They were marked by thicknesses ranging from 10.20 - 24.3mm, and width/thickness ratios lower than 4.3 (mean = 2.9; Figure 20). Cortex was present on 8 items (44%).

Attributes characterizing these specimens contrast with those defined for knives. Cores, although potentially useful for cutting, are presumed to be too thick with less regularized blade margins and steep edge angles to be used for certain tasks, such as skinning. Thus by virtue of their morphological attributes, cores and knives are functionally differentiated. Presumably the former more often functioned as crude cutting, chopping implements; as a source of expedient flakes; or as blanks to be reduced over time into more formalized items. In contrast, knives would not retain sufficient mass for use as a core, and presumably would not withstand the stress incurred by their use as a chopper.

Knives: Ethnographic use of items as knives is discussed in Park's notes on the Northern Paiute of Western Nevada (Fowler 1989). Although some exceptions were noted, accounts agree knives were used without handles. Width/thickness ratios on ethnographic examples appear to average 3.0 - 4.0. Lengths and widths respectively may be about 75.0 - 132.0mm and 40.0 - 50.0mm (Fowler 1989:40, 72-73).

In a study of items classified as knives recovered at Gatecliff Shelter, Thomas (1983) determined about 69% (i.e., 11 of 20) were characterized by signs of wear. A few had attributes suggesting multi-purpose use. Although this correlation supports classification of bifacial tools as knives, it does not prove the case since other factors that may have caused wear-like attributes were not investigated. Thomas (1983:326) also correctly points out flakes could serve to cut material while retaining little evidence of use.

Knives are characterized by regularized margins, and generally more uniform flaking. Width/thickness ratios tend to be high relative to other classes. Given their relative thinness and low edge angles, items classified as knives probably had functions dominated by cutting/slicing actions. Because the model described here predicts many tools were employed in a wide variety of tasks, often rejuvenated, and then used again, it follows examination of use-wear may only characterize the last use to which the tool, or part of the tool, was applied. Thus it is presumed working edges of tools are both subjected to multiple tasks and frequently maintained. Multiple tasks may occur in rapid succession, i.e., tools used to prepare a wood haft may soon be used to scrape bone or hide. For these reasons, among others, use-wear studies were considered unreliable and unproductive.

Formal Knives (FK): These specimens (n=9), all obsidian, are characterized by more uniform and thorough flaking than other items. They also have less sinuous margins, frequently thin lenticular cross-sections, and regular outlines. These tools are thin relative to their width, and presumably are too thin to function as cores. They are, however, still suitable for percussion or pressure flaking when maintenance is required (width range = 32.3 - 51.0mm; mean = 41.0mm). Given their specific combinations of attributes, some of these specimens could be preforms. Items classified as FKs were characterized by thicknesses ranging from 5.3 - 13.2mm (mean = 8.2mm), and width-thickness ratios greater than 3.9 (mean = 4.7; Figure 20). Four (44%) were characterized by remnant cortex. All were recovered from MNO-566.

Less Formal Knives (LFK): These items (n=36), all obsidian, are characterized by less uniform and thorough flaking than formal knives, more sinuous margins, thin lenticular cross-sections, and less regular outlines. They are also thin relative to their width, too thin to function as cores, but still suitable for percussion or pressure flaking when maintenance is required (width range = 18.9 - 49.0mm; mean = 30.7mm; Figure 20). Some could have been blanks for formal knives or other formal tools. Specimens classified as LFKs were marked by thicknesses ranging from 4.9 - 12.3mm, and width-thickness ratios greater than 2.9 (mean = 4.0). Five (19%) retained cortex. MNO-566 yielded 14 of these items, 21 came from the southern complex, and one was from MNO-2466.

General Purpose Bifaces (GPB): GPBs are defined as items marked by modification on opposing surfaces but lacking morphological or metrical attributes necessary to be classed in other groups. Flake scars often cover much of the surfaces of both faces, particularly around the circumference. GPB, knife, and projectile point fragments were distinguished through attributes of size, flake scar size, nature of modification, width/thickness relationships, fracture types, and blade constriction angle. They have width/thickness ratios ranging from low to middle values (range = 1.6 - 4.5; mean = 2.8; Figure 20). They may be thin enough to function as knives, but probably retain enough mass to function as cores for small flake removal and/or extended resharpening (thicknesses range = 5.7 - 14.4mm; mean = 9.6mm; widths range from 15.4 - 38.4mm; mean = 25.9mm). As such, they represent one of the most dominant classes of tools recovered (n=38). One item classed as GPB, a medial section, was basalt. Another, a proximal end, was made of breccia. The remainder were obsidian. Fourteen (37%) of these, all obsidian, retained cortex. These items were recovered both from MNO-566 (n=21), and the southern site complex (n=17).

Preforms: As used here, the term preform is restricted to items presumably one stage removed from a projectile point. Preforms have been shaped into the desired outline, and require only creation of a haft element to be completed. Only one item recovered was classified as a diagnostic preform (for an Elko or Gatecliff Series point). Several others could have functioned as such for these or other point types, but were too fragmentary to classify with greater certainty. This obsidian item, recovered from MNO-566, was characterized by an incomplete length (34.6mm), a width of 32.0mm, a thickness of 5.9mm, and a 5.5 width/thickness ratio (Figure 20). No cortex was present.

Non-Diagnostic Formal Tools (NDF): These specimens comprise a general category mostly made up of formal specimens that may represent projectile point fragments, knives, or preforms. They can not be assigned to any specific group because they are too fragmentary or lack diagnostic attributes (n=38). All were characterized by complex surfaces and regularized edges consistent with formally modified tools. These specimens ranged in thickness from 4.3 - 10.5mm (mean = 6.4mm), in width from 12.4 - 27.2mm (mean = 19.2mm), and had W/T ratios from 2.0 - 4.4 (mean = 3.2; Figure 20). With the exception of one item, a distal end made of cryptocrystalline material, all were obsidian. Three (8%), all obsidian, retained cortex. These items were recovered from MNO-566 (n=23), and the southern complex (n=15).

Non-Diagnostic Points (NDP): These specimens comprise a general category consisting of elements which probably are projectile point fragments (n=22). This conclusion is reached since they generally exhibit a combination of projectile point attributes such as: (1) remnant notching scars or basal tangs; (2) remnant impact fractures; (3) low angle of blade constriction; (4) biconvex cross-sections; (5) medium to high width/thickness ratios; and in some instances, (6) steep edge angles and/or incurvate margins on distal blade elements (interpreted here as resharpening). However, NDPs lack the diagnostic haft elements required for formal typological classification. Most had complex surfaces and regularized edges consistent with formally modified tools. These items ranged in thickness from 3.2 - 7.4mm, and possessed W/T ratios ranging from 2.4 - 4.3 (mean = 3.3; Figure 20). One distal end was made of basalt. One obsidian NDP (5%) was marked by remnant cortex. NDPs were recovered from MNO-566 (n=12), and from the southern complex (n=10).

Unifacial Forms: Items classed here as unifaces vary from those lacking any modification to the ventral face (i.e., modified solely on the dorsal face) to forms characterized by a few ventral face arrises (n=11). The latter might have functioned in a manner differing from those only having unifacial modification. Shaped unifaces were recovered from MNO-566 (n=6), and the southern complex (n=5). Morphological variability was evident in the ranges of widths (17.8 - 35.5mm), thicknesses (7.3 - 14.6mm), and associated width/thickness ratios (1.92 - 3.81; mean = 2.47; Figure 20). Three of these (27%), all obsidian and all from the southern site complex, retained cortex. One item (89-19-149), a complete form characterized predominantly as unifacial, was made of basalt. Its metrical attributes placed it within the mean width range of these forms (27.8mm), but its thickness and width/thickness ratio were (12.9mm and 2.16, respectively).

Debitage:

The study of flaked-stone debitage is becoming a significant aspect of archaeological analyses in North America (Jackson 1985, 1986a, 1986b; Rusco 1987; Rondeau 1990; Sullivan & Rosen 1985). Debitage has been defined as "residual lithic material resulting from tool manufacture" (Crabtree 1972). Manufacture, as used here, is defined as a dynamic process, which includes all phases of reduction, maintenance, and re-use, not simply a single event beginning with primary reduction and resulting in a "finished" item.

Debitage may be represented by items intentionally removed from a lithic mass during shaping processes, or may be produced incidentally during tool use and related maintenance.

As evidenced by the volume of related articles in the published literature (e.g., Dibble 1985; Duvall and Venner 1979; Fladmark 1982; Magne and Pokotylo 1981; Newcomer 1971; Patterson 1981, 1983; Patterson et al. 1987; Sullivan and Rozen 1985; Wilmsen 1970), identification of attributes of flaked-stone debitage useful for developing interpretations of past human activities has been a subject of considerable debate among lithic analysts. These studies address variables such as size, weight, remnant cortex, dorsal surface complexity, and various flake detachment angles. Some of these appear to possess more behavioral significance than others (Magne and Pokotylo 1981). The present study employs those attributes considered most pertinent to understanding production, use, discard, and exchange, as well as attendant relationships to behavior.

As identified in the replication study presented in one of the final reports for these investigations (Fredrickson 1991b), flake size, weight, shape, dorsal surface complexity, and amount of residual cortex are attributes considered potentially most capable of yielding significant information about reduction processes. These attributes are examined as polythetic sets, and used to deduce the nature of past activities. Three general assumptions about the movement of obsidian as both raw material and finished product are incorporated into the research design. These include: (1) the amount of cortex present in archaeological assemblages decreases with distance from the lithic source; (2) the frequency of a lithic source decreases with distance from source; and, (3) the size of source-specific materials diminishes with distance from source.

These assumptions directly relate to the distance/decay hypothesis: i.e., the amount of a given attribute is greatest nearest the source and decreases in proportion to its distance from the source. Sociocultural conditions affecting obsidian flow cause greater complexities, of course, than simple equations based on geographic distance. For example, commodities such as obsidian are frequently affected by factors such as supply and demand; social distance, social organization, and political affinities; land-use systems; and access to source (Fredrickson 1989; Ericson 1984; Rondeau 1982a, 1982b, 1990; White 1984). Additionally, not all raw materials are obtained at quarries, but instead may be procured from nearby drainage channels or cobble scatters. Items recovered in this fashion might be geochemically indistinguishable from materials obtained from other locations. In general, however, these three assumptions should be valid for a large variety of situations. Since the sites presently under investigation were characterized predominantly by a single obsidian source, these assumptions are presumed to be particularly applicable.

It is generally assumed the amount and location of cortex present on debitage provides an indication of the intensity of specific phases of flaked stone reduction at a given site. It is further expected obsidian obtained from distinct sources will be subjected to certain reduction activities and not others, given a variety of factors including population mobility, quality of material, size and form of unmodified material, etc. (Kelly 1988; Parry and Kelly 1987; Rondeau 1982). A correlation thus might or might not exist between cortical debitage and tool forms, with the presence of cortex dependant upon the variability of stone reduction activities. This conclusion, however, needs to be demonstrated on a case by case basis.

Size-sorting of debitage, when used in conjunction with other analyses, has been shown to be an efficient, effective method of determining the nature of stone reduction at archaeological sites (Kalin 1971; Newcomer 1971; Patterson 1982a, 1982b; Patterson and Sollberger 1978; Rondeau 1990; Stahle and Dunn 1982). Flake sizing has been practiced using a variety of techniques, each subject to specific criticisms. Techniques range from making accurate measurements on complete flakes to sorting all debitage through a series of graduated screens (Patterson 1982a, Patterson and Sollberger 1978, Stahle and Dunn 1982). It has been found certain size flakes frequently dominate a debitage assemblage, in part as a result of recovery methods, suggesting particular reduction activities are emphasized, sometimes to the exclusion of others (see Jackson 1986a, 1986b).

Dorsal surface complexity, i.e., the number of scars present on the dorsal side of a flake, has also often been assumed to represent specific reduction activities (Magne and Pokotylo 1981). If medium to large flakes have few dorsal surface scars, they have been suggested to represent early reduction processes or "core" reduction. In contrast, if flakes are small, it is often held they result from later stage manufacture/maintenance processes, such as pressure flaking. Flakes with many dorsal scars are presumed to derive from tools characterized by greater surface complexity such as formal bifaces, preforms, and possibly projectile points.

Taken alone, none of the attributes listed above can be used to accurately interpret flaked stone reduction activities. Flake size, weight, and shape are often dependant variables. These attributes in combination can provide important information about reduction processes (Fredrickson 1991a and 1991b). Size, dorsal complexity, source material, type, condition, and presence/absence and amount of cortex all need to be considered to make an assessment of past activities. Combinations of the above listed attributes, i.e., polythetic sets, thus provide the greatest explanatory power.

A total of 15,871 pieces of flaked stone debitage was recovered during ASC investigations: 6,836 pieces from the southern complex; 8,982 pieces from MNO-566; and 53 pieces from MNO-2466. Obsidian accounted for 98% of the debitage from MNO-2466, 99% of the debitage from MNO-566, and 97% of the debitage from the southern complex. Temporally specific debitage analysis was conducted for materials from MNO-566 and MNO-2466 (see Chapter 4 for summation of these studies). Given the absence of single component areas at the southern complex, temporal resolution of debitage assemblages was not achieved. For more information regarding provenience specific distributions of these materials, the reader is referred to Fredickson 1991a and 1991b).

# Chapter 4.
# The Bridgeport Locality: Assemblage Definition

Investigations of seven prehistoric sites by Sonoma State University has produced a suite of hydration readings spanning the Little Lake through Haiwee periods (Figures 4 and 6). A small number of these hydration values also inconclusively hint at an earlier period of site use during the Mojave Period. A number of reasonable alternatives could be posited to account for these (see below and Chapter 5). The sites being considered, from south to north, are MNO-2456, 2489, 564, 2488, 2455, 566, and 2466. Given their suite of early hydration values, the first five are designated as the southern complex. Sites comprising the southern complex were situated near the western margin of the Bridgeport Valley. MNO-566 consisted of several material concentrations on the west side of the Huntoon Valley, about 7 km north of the Bridgeport Valley. The final site, MNO-2466, was located a few kilometers north of the Huntoon Valley (Figure 1). Hydration statistics are found in Figures 11, 12, 13, and 14.

## Mojave Period

Five hydration values, all derived from debitage obtained from the southern site complex, occurred within a range defining this temporal period (mean = 8.7 μ; sd = 0.46). One piece was derived from MNO-2488 at 40-50cm below surface. Four were from MNO-564, all from within the 0-10cm level. These values are statistically insignificant when compared to the full range of hydration readings obtained from these sites. It is also possible they result from factors such as hydration variability, curation, scavenging behavior, or even technician error (identified as +/- 0.3 μ). Their low frequency and geographic association may be consistent with expectations about human behavior and site formation processes during this time period (see Basgall 1987, 1988, 1989).

Although the hydration values hint at pre-Little Lake Period use of the area, the available evidence is not compelling.

Little Lake Period

Little Lake Period use of the sites predominated in the southern area adjacent to the Bridgeport Valley. A total of 143 hydration readings, 39% (n=367; mean = 6.4 μ), from these five sites are associated with this period (Figures 4, 11, and 13). Specimens from MNO-566 generated an additional 10 hydration values falling within this range (mean = 6.0 μ). The majority of hydration values associated with this span (57%) are derived from MNO-564 (mean = 6.6 μ).

MNO-2488, a possible activity locus marked by flaked stone materials, is situated at the northern end of the southern complex. This site was also characterized by evidence of sustained use during this period. At this site, 25 hydration values, 17% of the sample from the southern complex, fell within the defined range (mean = 6.2 μ). Little Lake Period use of MNO-2456, a diffuse scatter south of MNO-2488, is represented by 12 hydration values (8%). These were obtained from specimens dispersed across a large area (mean = 6.4 μ).

At MNO-564, Little Lake Period use of the site appears to have been concentrated predominantly in the area defined as Locus 2 (i.e., the northern portion of this site). A total of 45 hydration values (52%) are associated with this locus. Locus 3 yielded 29% (n=25) of the readings from this site. Less than 20% (n=17) came from Locus 4, west of Highway 395.

Projectile points assigned to this time period include stemmed and concave base forms (Figure 18). All came from southern complex sites. Given their lack of hydration bands, bands of variable width, or hydration value outside the defined range, five of the 16 specimens included in this category are considered provisional. As discussed in the previous chapter, certain morphological attributes distinguish them from other projectile point classes defined for later periods. Tips, mid-sections, and non-diagnostic basal portions also were considered as potential projectile point fragments, but could not be typed.

Other tool forms assigned to this temporal span include 30 bifaces, two flake blanks, and three thick flake tools, reminiscent of items frequently classified as "core scrapers" or "domed scrapers". All but seven of these items came from the southern site complex. At MNO-566, six bifaces and one flake blank associated with this time were recovered. On the basis of morphological attributes, these items were interpreted as bifacial cores or roughouts, flake blanks, general purpose bifaces, thick unifacial flake tools, and a variety of non-diagnostic point fragments, knives, or preforms (Figure 21).

Although the sample is characterized by selection biases and component mixing, initial assessment of material variability for this period can be made. Of 16 items representing projectile points and possible point fragments, XRF analysis assigned 10 to the BH source, two to PG, two to QT, one to MH, and one to CD. Fourteen items classed as cores, flake blanks, bifaces, knives, and non-diagnostic points fragments were assigned by XRF as follows: BH (n=11), MH (n=1), and unknown (n=2). Thus among both formal and less-formal, less diagnostic tool categories, BH dominated the assemblage with a range of 63% - 79%. Total use of BH among all tool classes was 70 percent. Of 18 pieces of debitage assigned to this hydration span, 89% were attributed to BH; one was assigned to MH; and one was assigned to MGM. Overall, about 76% of tested obsidian materials are made of BH.

As stated above, evidence for reduction activities during the Little Lake Period was established primarily by obsidian hydration testing and associated materials from the southern complex. Several projectile points and fragments from these sites were assigned to the Little Lake Period on the basis of hydration value and/or morphology. Although the following propositions must remain provisional given the lack of well-defined single component areas, the evidence is synthesized to enhance interpretation of temporally specific activities.

Early stage flake blanks and biface cores are represented by both large and small items. Initial reduction, probably at the quarry, may have begun with production of cortical flakes. Then the item was either bifacially percussion flaked to establish a "rough-out", or first edge-abraded, and then percussion flaked on the dorsal face. Modification from edge grinding, primary shaping, and occasional thinning took place either at the quarry or elsewhere. The specimens may have been transported to the study sites as biface roughouts, minimally shaped blanks, or unifacial cores.

At the study sites, reduction activities included further shaping, edge preparation, and/or thinning. These activities, however, could have occurred over an extended period if materials were curated and transported between sites within the context of seasonal rounds. A small flake blank (89-20-186), associated with this period, was not assignable to a known geochemical source. It presumably was derived from an unclassified source within the Bridgeport locality, or from a known source, but from part of the flow characterized by a different chemical composition. Although somewhat thick relative to its width, the specimen could represent an early-stage form for one or more of the identified projectile point types. A medium flake blank (89-21-14) is within a size range compatible with manufacture of items classed either as less formal knives or projectile points (Figure 22).

Reduction of early and middle stage items probably occurred on-site as evidenced by recovery of medium to large size simple flakes, some with cortex, and bifacially edged flakes. Five less formal knives are represented by this hydration span. Later reduction stages are represented by four non-diagnostic formal items, one non-diagnostic point medial section, and projectile points and fragments. Although three of the projectile points are too fragmentary to provide definite substantiation, they show no evidence of reworking. Of these, the stemmed point, 89-20-1, characterized by a possible impact-related bending break, and NDP 89-20-82, appear to be the most representative of limited use life.

The projectile point classified as a large stemmed form of unknown type, 89-20-81, was sourced to Pine Grove Hills. This item, although not part of a Bodie Hills obsidian reduction system, may have been modified on-site prior to final use and discard. Three formal flake tools were characterized by hydration band values within this defined range. Two appear to derive from small multi-faceted cobble cores. The other, marked by remnant cortex, is a thick cortical flake struck from a small cobble. These and early stage items could represent discard of general tool/core forms or maintenance/replacement of toolkit elements.

Most of the diagnostic projectile points falling within this hydration span are presumed to have been reworked during their use lives as evidenced by attributes such as shorter blade lengths, steep edge angles, less acute blade angles, low w/t ratios, and/or amount of damage. As noted above, these items are characterized by material variability. Given that almost half of the diagnostic points were non-Bodie material and most points exhibit evidence of heavy maintenance, it is concluded tool curation was an essential component of the Little Lake Period adaptive strategy (see Chapter 5).

Newberry Period

The greatest number of hydration readings corresponded to the Newberry Period (n=422; 61%; Figures 4, 11, and 13). Of these, 250 came from MNO-566 specimens (mean = 4.2 µ). They comprised 82% of the hydration values from that site, and 59% of all Newberry Period values for the locality. The southern site complex yielded the second highest amount of Newberry Period hydration values (n=171; 41%). Mean hydration values for specimens deriving from these sites were 4.4 µ

(MNO-564 and MNO-2455); 4.6 µ (MNO-2456 and MNO-2488); and 4.5 µ (MNO-2489).

Newberry Period use within the southern site complex may have been focused most intensively at MNO-2488. This is represented by 36% (n=61) of the hydration readings from this vicinity. At MNO-564, use during this period was most evident at Locus 3. This is in contrast to Little Lake Period use of this site, which may have been more focused at Locus 2. A total of 78% (n=28) of the hydration values from MNO-564 associated with this period came from Locus 3. Of the remainder, six were obtained from Locus 2 and two from Locus 4. MNO-2489, also situated along Swauger Creek, also may represent a focus of activity during this temporal period, since 35 hydration readings (70% from this site) were associated with this time span.

Specimens presumed to be associated with this temporal period are characterized by a predominance of BH obsidian. Of those tested, 89% were XRF-assigned to BH and the remaining 11% assigned to other geochemical obsidian groups. One specimen assigned to this temporal period, a heavily re-sharpened contracting stem point, was made of basalt. Groundstone elements possibly associated with this temporal period or with the preceding time span include two handstones from MNO-2488 (one edge-pecked and one possible hammer), four manos from MNO-566, and two handstone fragments and two millingslab fragments from MNO-564.

Although the Newberry Period is represented by a large number of items recovered from MNO-564, MNO-2456, MNO-2488, and MNO-2489, characterization of temporally specific flaked stone reduction systems is best approached from MNO-566 as it is dominated by nearly single component deposits. Early stage elements of the reduction system include small to large flake blanks and bifacial cores initiated at the Bodie Hills quarry. Production of large flakes, frequently marked by decortication, occurred solely at the quarry. No evidence of cobble reduction was identified within the analyzed debitage sample. Minimal modification such as edge grinding, primary shaping, and occasional thinning occurred either at the quarry or a site nearby. Edge-modified flake blanks, roughouts and/or cores were then transported to MNO-566.

Early and middle stage reduction at the study site probably included shaping, edge preparation, and some thinning. Further shaping is evidenced by the high number of broken and discarded early-stage elements (see Figures 23 and 24). Again, these activities were not common at the site, and could have occurred over an extended period of time. The earliest stage at which items might have been subject to curation and inter-site transport cannot be determined from this study. This subject must be addressed through regional analyses.

Middle stage reduction on site is represented by percussion thinning and edge-trimming, as evidenced by medium to large size simple flakes, some with cortex. Small cortical flakes, bifacially edged flakes, and bifacial overshot flakes also attest to this type of modification. Later reduction stages included shaping items by trimming edges and regularizing the outline. It is likely, though undemonstrable, pressure flaking was employed for greater control of flake removal during shaping and/or maintenance activities. Potentially curated items such as knives and preforms, could have been produced and maintained on site.

Final stages in the manufacture of projectile points consisted of controlled pressure thinning and shaping, and development of haft elements (stems and barbs) through notching. Some items reduced to smaller forms as a result of maintenance during their use life, might have been shaped into point preforms. Other preforms might have been made directly from a flake blank. Projectile points damaged during use or maintenance were resharpened and redefined into similar, but smaller forms with shortened blade elements. This is evidenced by a number of specimens without barbs (see basalt Gatecliff Series point 89-19-530).

The foregoing describes a general pattern of reduction activities that might have occurred but does not account fully for the morphological variability of artifact forms recovered. A large number of the items were classified as GPBs, relatively small and medium-size specimens, marked by narrow widths and low width/thickness values. The number of broken and discarded middle stage GPBs, already quite narrow relative to thickness, might indicate they were either not suited for or intended for continued thinning. Others, presumably thinner relative to width, were thinned further. Given the small size of these items, thinning was probably accomplished during later stages by pressure flaking. This strategy might have resulted in manufacture of some of the formal items interpretable as knives or elements functioning as blanks for projectile point preforms. Given that GPBs do not appear to fit well within a production system, it is likely they were curated tools designed to perform a variety of tasks. Additionally, many of the flake blanks were also small and often thin. Given their morphological attributes it is unlikely they were scheduled for further modification within a projectile point reduction trajectory. For these reasons, it is conceivable, though undemonstrated, they also functioned as knives or other tools.

The reduction pattern outlined above also does not consider the relationship between concave base projectile points and other assemblage items. Recovered mostly within Locus 5, these points are characterized by evidence of both complete flake scar coverage and remnant detachment scars. Although no diagnostic concave base preforms were identified, some of the items recovered within Locus 5 might fit within this trajectory. Narrow, thin lanceolate shaped biface fragments as well as other items, could represent elements within this reduction trajectory.

Figure 25 shows locus specific classified tool types correlated by general degree of reduction, defined as reduction stage. In total, early, middle, and late stage items occur in near equivalent proportions: 29%, 34%, and 37%, respectively. Locus specific differences, most evident between Loci 2 and 3, and Locus 5, may indicate variable activities.

Locus specific variability at MNO-566:

During field work, MNO-566 was observed as being comprised of several material concentrations distributed over an area about 0.24 km east-west by 1.25 km north-south. At that time, site loci were numbered 1 - 6, but certain changes subsequently were made as a result of analyses. Locus 1 was redefined as an area too sparse to be interpreted as a material concentration. At this location, approximately 36 items were recovered within an area about 50m x 120m. Another area, defined by material recovered from one STU on a terrace at the north end of the site, is identified here as North STU or Locus 7. This locus lacked hydration values associated with the Newberry Period.

Materials recovered from low density areas were classified as non-loci specimens during analysis, and are not elaborated upon in discussion of hydration data unless they are diagnostic artifact forms. In summary, non-locus hydration readings were characterized by a high proportion attributable to the Newberry Period. Of these, 93% (n=13) yielded a mean value of 4.5 microns. Discussions pertaining to Loci 2 and 3 are combined because of similarities between their material assemblages. Following locus summaries, further discussion examines contrasts between Loci 2 and 3, and Locus 5.

Seven hydration values from the area originally defined as Locus 1 (78%; 2% of the total sample from MNO-566) were assigned to the Newberry Period (Figure 12). Of these, four were from debitage, two from bifaces, and one from a projectile point.

Fifty-nine values from Locus 2 (83%) and 62 values from Locus 3 (83%) were associated with the Newberry Period

(Figures 12 and 14). Combined, these readings represent 40% of the total hydration sample for MNO-566. Both Loci 2 and 3 were characterized by stemmed projectile point forms, a lack of concave base forms, a single shaped mano, high flake-to-tool ratios (approximately 283:1 and 427:1), and similar amounts of material obtained per excavated cubic meter of earth (mean = 475 pieces of debitage/m3).

A total of 21 hydration values (84%) from Locus 4 were attributed to this period. These comprised 7% of the total sample from MNO-566. Among approximately 227 other items (217 were debitage), one concave base point was recovered from this locus. Although three vertical units within this locus yielded 170 pieces of debitage, the volume per cubic meter was low overall (n=60).

Locus 5 was characterized by 67 hydration values (83%) for the Newberry Period, 22% of the total MNO-566 sample. Unlike Loci 2 and 3, this area yielded seven small basal-notched, unshouldered points. Only one stemmed form, a short, heavily resharpened contracting stem point, was recovered nearby. Compared to Loci 2 & 3, recovery rates per cubic meter were characterized by about twice the volume of debitage and four times the number of artifacts. The flake-to-tool ratio was also high (216:1). Like Loci 2 and 3, one shaped mano was recovered.

Locus 6 yielded 21 (84%) hydration values assigned to this span, representing 7% of the total site sample. Projectile points recovered from this locus included one small basal-notched concave base form and two contracting stem forms. This locus was characterized by a lower debitage recovery rate per cubic meter than Loci 2, 3, or 5 (n=166). Since no artifacts were recovered from excavation units, and debitage volumes were low (165.6 per cubic meter), an accurate flake-to-tool ratio could not be calculated based on excavated materials.

Further Discussion about Loci 2, 3, & 5:

Similarities and differences between the stemmed point component (Loci 2 and 3) and the concave base component (Locus 5) are intriguing. Both components are marked by evidence of similar activities (Figure 25). Evidence for tool repair, maintenance, and replacement is represented by damaged points, and points broken during reduction (both maintenance and initial manufacture). Additionally, a variety of staged items such as flake blanks and edge-modified flakes, thick irregular shaped bifacial cores, and thinned and trimmed bifacial knives and/or preforms attest to general tool/gear maintenance and tool replacement (Ferneau and Bieling 1990). Other biface forms include small items which are predominantly unifacial, with most percussion shaping occurring on the dorsal face, and small percussion shaped GPBs.

Debitage from 6mm-screen recovery units were characterized by 88% non-cortical material. Of these, 65% of the flakes were in the 3 - 9mm size range. Debitage from 3mm-screen recovery units yielded 94% non-cortical material, with 80% of the items in the 3 - 9mm range. Large numbers of small size flakes, bifacially edged flakes in various sizes, high proportions of complex flakes in the larger size categories, high length/width ratios on complete flakes, and low amounts of remnant cortex, little of it on flakes wider than 18mm, support the above interpretations regarding reduction activities.

A variety of other debitage forms were identified during initial material processing, including a low number of bifacial overshot flakes, from both early and later reduction stages, and a few early-stage cobble reduction items. These, however, were not included in the analysis, given the sampling strategy. Although flake characteristics were quite similar across the entire site, Locus 5 may also have witnessed more early and middle stage reduction than other locations. This conclusion is based upon the high proportion of simple flakes in larger size ranges characterized by low length/width ratios at this locus.

As noted above, a single shaped mano was recovered from each of these loci. Their rarity suggests either that vegetal processing was not a significant activity or that archaeological recovery strategies were focused on non-vegetal processing areas. It is concluded, however, that activities responsible for formation of the archaeological assemblages were similar. The cultural materials recovered suggest a focus on activities pertaining to direct subsistence such as game procurement and resource processing, as well as those oriented towards gearing up for seasonal forays, presumably into the Sierra Nevada.

Haiwee Period

Compared to the preceding period, the Haiwee Period is marked by a decrease in the number of hydration readings. Of the total number of values obtained, 56 (8%) were assigned to this time period. The majority of these values, 52% (n=31), were derived from the southern complex. As for the others, 25 were obtained from MNO-566, and two from MNO-2466. The greatest numbers of hydration values for this period from MNO-566 were obtained from Loci 2 (n=8), 3 (n=9), and 5 (n=4); areas characterized by the highest recovery rates. Although the sample is very small (n=8; 73%), it is possible at MNO-564 Haiwee Period use may have been focused at Locus 3. Some evidence of obsidian reduction during this period was also found at MNO-2455 (n=2), MNO-2456 (n=5), MNO-2488 (n=7), and MNO-2489 (n=3).

One Rosegate point (89-19-8), was recovered from the surface of Locus 2 at MNO-566. It was characterized by a hydration value of 3.2 µ (BH). Two other Rosegate forms, both lacking measurable hydration bands, were recovered. One came from the southern periphery of Locus 5 at MNO-566. The other was from MNO-2456.

Marana Period

Hydration values assigned to the Marana Period hydration span were distributed between sites in similar proportions to those of the preceding period, with one notable exception. MNO-2466 was characterized by 17 hydration values within this span (mean = 1.5 μ; sd = 0.30), 85% of the values obtained from this site. MNO-566 had 19 values from this span. Like those of the preceding temporal period, the greatest numbers of hydration values for this period from MNO-566 were obtained from areas characterized by high recovery rates. In particular, three were derived from Locus 2 and seven from Locus 5. Locus 3, however, had no readings for this period.

The southern site complex manifested 19 values (35%) from this span. The majority of these (n=12; 63%) were obtained from MNO-564. Both Haiwee Period and Marana Period use may have been concentrated at the area defined as Locus 3. The earlier of these periods at this locus was delineated by eight hydration values (73%), and the latter by 10 (83%).

A Cottonwood Triangular point from MNO-2456, and three Desert Side-Notched points, one from Locus 3 at MNO-564 and two from MNO-566, are associated with this temporal span. A contracting stem form from Locus 6 at MNO-566 (89-19-122), and a small stemmed form from MNO-2466, presumed to represent a scavenged Elko Corner-notched point (89-22-5), have hydration values within this span (1.7 μ BH and 1.5 μ BH, respectively). Three bifaces and a flake blank also yielded hydration values falling within this span.

Several fragments of pottery, a variant of Owens Valley Brownware, were recovered from Locus 2 at MNO-2456. Local volcanic material was used as temper (see Fredrickson 1991a:88). Given evidence from INY-30 where the overwhelming majority of pottery was found only in contexts firmly dating subsequent to 700 b.p. (Basgall & McGuire 1988), this pottery, representing portions of a single vessel, probably is associated with the Marana Period. Groundstone, also presumed to be associated with this time span, includes three bedrock mortars (BRMs) at MNO-2456, three rocks containing BRMs on the east side of MNO-564 overlooking Swauger Creek, and four BRM outcrops at MNO-566. A red-on-white glass bead, and a copper cylinder, believed to represent an ornament, were recovered from Locus 3 at MNO-564. These items may represent Contact Period or Late Marana Period use of the area.

Conclusions Regarding Temporal Use

Use of the Bridgeport locality through time appears characterized by occupational variability, insofar as obsidian hydration values monitor actual site use. Additionally, all time periods or assemblages present are not equally represented. Early use of the locality is indicated by limited representation of Little Lake assemblages. These manifestations appear in significant numbers only at sites situated along the northwestern periphery of the Bridgeport Basin.

The majority of cultural materials, site areas/deposits, and hydration values are attributed to the Newberry Period. Intra-period variability may be indicated in two fashions: (1) presence of spatially discrete and somewhat diverse material assemblages represented by Loci 2/3 and 5 at MNO-566; and (2) occurrence of geographically discrete bimodal distribution of hydration values. These are represented by a suite of "early Newberry" values dominating the southern complex, and a range of "late Newberry" values characterizing MNO-566 (Figures 4 and 11). Presence of multiple cultural units in the region, settlement differences as a result of environmental factors, and hydration sampling are posited as potential explanations for this phenomena (see Chapter 5).

Although obsidian frequencies may not provide an accurate barometer of use, initiation of the Haiwee Period at about 1100 b.p. appears associated with a marked decline in use of the area. For example, site occupancy appears less represented either by hydration values or concentrations of cultural materials. The Marana Period also is represented by lower frequencies of hydration values and diagnostic tool types. The configuration of associated material concentrations, however, indicates more focused use of some sites by small family groups. This is suggested by the presence of milling features, pottery, and ornamentation. Temporally diagnostic materials and hydration values associated with this period are concentrated at Locus 3 of MNO-564; at the northern end of MNO-566 (North STU), as well as in the vicinity of Locus 5; and at MNO-2466.

Flaked stone assemblages associated with all time periods exhibit certain similarities as well as distinctive differences. For example, reduction activities often were devoted primarily to latter stages of biface reduction and tool finishing and repair. In contrast, fabrication activities specific to early reduction stages may have occurred infrequently. Additionally, greater emphasis on tool curation may characterize earlier time periods in the region. The small sample of late period assemblages, however, makes this proposition problematic.

During Newberry and Marana times, occurrences of handstones, millingslabs, and bedrock mortars with flaked stone assemblages, suggest sites functioned as camps from which tasks involving both hunting and vegetal food processing were carried out. These activities indicate spring and fall use of the area. Interestingly, both seasons are characterized by deer migration through the vicinity and occurrence of a diverse availability of plant resources. To the extent flaked stone materials are equated with game procurement activities, hunting appears to have been most important during the Newberry Period. The final chapter examines these relationships in greater detail.

# Chapter 5.
# Conclusions

## Summary and Interpretation of Bridgeport Locality Hydration Ranges and Assemblages

Hydration values generated for the Bridgeport locality exhibit considerable variability in frequency during the temporal periods represented. High frequencies overall characterize the Newberry Period, while lower frequencies and smaller ranges distinguish Haiwee and Marana times. Relatively low frequencies marked by possible "episodic" peaks may denote Little Lake times. The few values in excess of 8.8 μ (n=5) represent too small a sample to be reliably considered evidence of pre-Little Lake use. Late period use of the area is manifested predominantly by low hydration frequencies with the exception of a peak at about 190 b.p. during Marana times. Since 38% (n=10) of the hydration values forming this peak (range = 1.2 - 1.4 μ) were obtained from a single site, MNO-2466, however, the peak may be the result of sample selection biases or temporal variability in flaked stone reduction technology. The nature of this variability and potential contributing factors are discussed below.

Several variables, including sampling strategy biases discussed below, may affect cumulative hydration results. Inclusion of obsidians with different or unestablished hydration rates, i.e., those other than BH or CD here, also can contribute to variability. The degree to which this may be responsible, however, has yet to be determined. Also, some variability can be derived from the degree of technological precision in measuring hydration band width. To minimize this factor, hydration bands characterized by variable width were omitted. Those having multiple bands were included as individual values because each may characterize a period of use.

Correlating these frequency variables with factors such as proposed timing of paleoclimatic episodes, periodic fluctuations in volcanic activity, or changes in regional patterns of cultural use is risky and subject to a number of biases. For instance, selection of hydration samples during archaeological investigations are often based on attempts to address specific research questions, themselves guided by particular biases (see Goldberg et al. 1990). Paramount among these is the use of projectile points as time sensitive artifacts (see Hall and Jackson 1989). Many investigations follow a particular, but variable, pattern when selecting hydration samples. This is often dependant upon research questions and amount of available funds. The frequently used approach is to, first, submit all or most projectile points; second, to include other "tools" and debitage samples; third, to address spatially discrete areas believed to be single component, and so on.

Other biases may result from over-selection of certain material classes and under-representation of others. For example, flakes attributable to biface reduction, presumed to be a dominant technology during the Archaic Period, often overwhelm most debitage assemblages given higher relative amounts of larger size materials. Conversely, small pressure flakes generated from maintenance of arrow points, represented in proportionately lesser amounts at many sites, may characterize much of the reduction activities occurring during later times. These may not be selected for hydration testing as often as the "larger" elements, however (see Tremaine et al. 1986). The intensity of scavenging or "site mining" by later occupants, although difficult to measure, also has been shown to be an important factor in hydration sample selection and interpretation (Skinner 1988).

These sample selection practices, or variations on them, thus can "weight" the resulting cumulative hydration histogram in favor of specific temporal periods. Additionally, small-scale investigations might be economically restricted in numbers of hydration specimens submitted, producing disproportionate or otherwise biased samples. It remains to be seen whether or not this non-random sampling has a significant cumulative affect on comparative studies.

Little Lake Period:

Points grouped within the Little Lake Series were characterized by a variety of traits distinguishing them from other points classed as Newberry Period Elko and Gatecliff series. Thirteen items are included here in the Little Lake Period point assemblage. Seven of these were diagnostic points characterized by hydration values in excess of 5.2 µ. One was a basal ear with a 7.7 µ value. One was a possible concave base point ear (5.8 µ). One was a possible wide-stem form. Three other stemmed forms lacking hydration bands, exhibit similar morphological attributes. A concave base point (89-20-91) was also marked by a hydration value within the Little Lake range (6.4 µ QT). All of these specimens were recovered from the southern complex. Hydration calculations converted to years using Hall and Jackson's formula (1989), not accounting for obsidian source variability, shows Little Lake points to range from 2,725 - 4,528 years b.p. (mean = 3,620 b.p.) - preceding the maximum age for the Bridgeport locality Gatecliff, Elko, and Humboldt basal-notched series.

The morphological, metric, hydration, and material variability characterizing these artifacts are attributes consistent with those proposed for a residentially mobile society (see Basgall 1988). Compared to other stemmed points series from the Bridgeport locality, the Little Lake points were generally thicker, had lower width/thickness ratios, greater basal widths and neck widths, and, as an assemblage were marked by a higher proportion of non-BH obsidian (45%). Metric ranges of basal width, neck width, and thickness fall within the ranges characterizing Thomas's Elko Series samples from Gatecliff shelter (Figure 10). The seven Bridgeport locality Little Lake points exhibit a greater mean value for thickness.

Three factors are posited to explain the variability evidenced by the points associated with the Little Lake Period, and the assemblage as a whole:

1. Greater population mobility can result in increased tool material conservation. This increase in curation time is manifest in greater numbers of rejuvenation episodes including multiple events of blade resharpening and barb and base repair.

2. Horizon "slope", greater temporal duration of a cultural tradition, results in more time for morpho-stylistic changes to occur (Willey and Phillips 1958:34). Thus an extended temporal period, here the Lower and Middle Archaic periods, characterized by a single adaptive strategy might show little change in overall assemblage content, but greater variability in certain individual tool forms.

3. Larger size points are characteristic of a flexible technology, providing greater options for reduction strategies and rejuvenation (Goodyear 1979). This assertion is contrasted with attributes characterizing many forms of small, thin arrow points. Given these conclusions, arrow points are presumably: (A) easily broken and less amenable to repair; (B) more often lost or destroyed completely during hunting episodes; and (C) easily replaced requiring a lower level of material curation. The low numbers of arrow points recovered during ASC investigation, however, make these propositions difficult to test.

As stated in Chapter 3, it should be recognized that although Thomas's key was designed to be used on projectile points post-dating approximately 6800 b.p., the majority of the artifacts employed in his key (about 377 points), and virtually all the stemmed forms, may be no older than about 3400 b.p. (see also Thomas 1983b:186). Obsidian hydration results of the present investigation indicate some specimens recovered near Bridgeport Valley may be as much as 2000 years older than the stemmed forms from Monitor Valley.

Although some researchers associate the Split Stem with a pre-Elko/Contracting Stem assemblage (see Hall and Jackson 1989), data from the Bridgeport locality, Gatecliff Shelter, and other areas show the Split Stem and Contracting Stem Gatecliff forms to be contemporaneous. For instance, obsidian hydration data from Hidden Cave in Nevada for the Split Stem form (BH n=5; mean = 3.6 µ; see Thomas 1985) are within the upper ranges of those defined at Bridgeport. Differences between these localities are presumably a function of effective hydration temperature within the cave or locality. Mean hydration values generated on 17 Split Stems and 17 Contracting Stem forms made from BH (n=7), MH (n=14), QT (n=3), PG (n=1), Majuba Mt. (n=4), Garfield Hills (n=3), Nye Springs (n=1), and unknown (n=1) was 3.1 µ for each point type. Although lumping different obsidian sources for this analysis may be unjustified, the results are intriguing. These results suggest difficulties with point typologies, dating methods, and typological nomenclature for the western Great Basin are still unresolved.

Newberry Period:

Newberry Period Gatecliff forms from the Bridgeport locality are characterized by basal widths, neck widths and thicknesses similar to those from Gatecliff Shelter (Figures 15, 16, and 19). Greater morphological homogeneity exists among the Gatecliff Series and Humboldt series points recovered from CA-MNO-566 than among Little Lake Series points from the southern complex. As noted above, this may be attributable in part to sample size and recovery strategies, or to curation, tool use life, and/or social organization. Basal elements, particularly those items postulated to represent earlier stages of use-life and not subject to extensive repair, are characterized by similar metrical dimensions within the PSA, neck width, hafting length, and thickness categories. Of all Newberry Period stemmed points recovered, 95% were classified as contracting stem. Variability in stem form can be interpreted to a degree as a factor of stylistic, technological, or in part, hafting diversity.

Reduction trajectories during the Newberry Period were most evident at MNO-566. Several lines of evidence argue for indicating the presence of articulated reduction stages:

1. Presence of specimens characteristic of (a) "early" stage reduction (i.e., items interpreted here as flake blanks and cores; 33% and 50% with cortex, respectively), (b) "middle" stage reduction (elements characterized by thinning and shaping; 40% with cortex), and (c) "late" stage reduction (knives, preforms, points).

2. Occurrence of "late" stage reduction elements including: (a) broken projectile points lacking evidence of use or resharpening; (b) projectile points marked by breaks, inferred as resulting exclusively from manufacture (i.e., barb removal, single lateral snaps on unreworked points); and, (c) at least one specimen which appears to be a preform for certain projectile point types identified on-site.

3. Recovery of "late" stage production items, characterized by evidence of use and repair.

4. Appearance of debitage types identified as resulting from both early and middle stage biface reduction.

5. Presence of debitage types inferred to represent middle and late stage reduction activities, including maintenance.

Although debitage analyses indicate an emphasis on later stage modifications such as maintenance and repair, all phases of reduction appear represented at the sites but with important exceptions. Large flake blanks representing early stages of reduction for larger bifaces were not recovered.

Additionally, elements of cobble reduction were not identified.

Reduction Trajectories and Curation Rates:

Although it is recognized morphological variability often results from a number of decisions or options pursued by an individual toolmaker, some of the assumptions presented above regarding reduction attributes can be applied to interpreting artifact functions. For example, the angle of blade constriction on the projectile points recovered averages 38°, and mean width/thickness ratio was 3.6 (Figure 19). If these figures are distinctive, that is, are not associated with other classes of tools, items classed as non-diagnostic formal bifaces, marked by compatible blade angles and width/thickness ratios, can reasonably be interpreted as being projectile point fragments, taking into account other attributes as well, such as remnant scars from impact fractures (Figure 20).

Although not capable of discriminating resharpened specimens, diagnostic projectile point attributes can be summarized as follows: W/T ratios >3.11 and angles of blade constriction <55°. Some formal biface fragments described above also possess these attributes. Other attributes may be used to further distinguish items likely used as projectile points, and those which may better be characterized as non-diagnostic formal tools. The following discussion, first applies certain assumptions regarding tool reduction solely to the Newberry Period stemmed projectile points, then incorporates data from other biface classes to examine past behavior.

One basalt and 17 obsidian projectile points were used for this analysis. These stemmed obsidian points, classified as Gatecliff/Elko series, were comprised of 13 made of BH material, two made of CD, and one each made of QT and MH. All had hydration band values between 4.8 µ and 3.4 µ (2274 to 1211 b.p.; BH/CD rate), with a mean of 4.1 µ (1705 b.p.; BH/CD rate). One other point (89-19-122), fashioned from Bodie Hills obsidian, which had similar morphology was omitted, given its hydration value of 1.7 µ (342 b.p.; BH/CD rate). This item may have been subject to re-use or may represent a later use of the same point style.

Given the length of the basalt item (89-19-530), and similar blade widths and angles of blade margin constriction on several broken specimens (89-19-13, 89-19-62, 89-19-63, 89-19-84, 89-19-378, 89-19-419), it is proposed the original dimensions of many of these specimens were as follows: Length=5.0 - 7.0cm; Width=2.0 - 3.0cm. These figures are supported in part by the configuration of the one item classified as a probable stemmed point preform (89-19-114; BH 3.8 µ; 1484 b.p., BH/CD rate). It is very close in size to the stemmed point 89-19-13. If complete, the preform would have been about 5.0cm in length.

At least three, and possibly six, of the specimens can be characterized by low amounts of secondary modification, such as would result from resharpening (89-19-62, 89-19-63, 89-19-84, 89-19-13, 89-19-378, 89-19-419; see Figure 15). For example, item 89-19-419 appears to have a barb break generated from the notch, and a bending break on the blade. The latter is interpreted as probably resulting from a notching failure and a possibly related snap. Item 89-19-13 exhibits some evidence of tip rejuvenation and a bending break. It can not be determined, however, whether the two events are related. Specimen 89-19-378 is missing so much of the blade it can not be determined whether or not rejuvenation occurred. Since most lack significant amounts of repair, all are presumed to be more representative of the primary manufactured form than other specimens.

Several specimens are characterized by missing barbs, rounded, shortened blade elements, incurvate blade margins, and bending breaks. Combinations of some of these attributes are interpreted as evidence of point rejuvenation, extending use life. These specimens include 89-19-7, 89-19-9, 89-19-11, 89-19-61, 89-19-86, 89-19-87, 89-19-120, 89-19-131, 89-19-300, and 89-19-393 (Figures 15 and 16). Specimens 89-19-3 and 89-19-4, are too fragmentary to include. Both, however, are characterized by severe scarring and sectioning of blade elements.

Of the non-BH obsidian artifacts represented, the basalt specimen exhibits incurvate blade margins. A MH specimen has a shortened blade and snapped barb and base. One CD specimen has a rounded, shortened blade and broken barbs. The other CD specimen has a bending break across the blade, but no evidence of rejuvenation. A QT artifact is characterized by facial scarring from the distal end, and missing blade portions.

It is concluded few of the points discussed here represent their primary form. Presence of the one diagnostic preform plus the few unrejuvenated points, suggests tool replacement occurred at the site. This probably accompanied discard of more highly curated points and remnants. It is possible point replacement was achieved by both a combination of complete reduction from the flake blank, as well as by final shaping of potentially curated knives/preforms.

Many of the mid-section elements classified as non-diagnostic formal items (NDF), and non-diagnostic points (NDP), are characterized by narrower widths than those typifying stemmed point specimens (Figure 20) but may represent variations of these types. One NDP fragment (89-19-57), however, is derived from a corner-notched form, similar to those classified in the Elko/Gatecliff series. Its breakage pattern, characterized by lateral sectioning from the distal end, i.e., splitting, probably is the result of impact damage.

Given the data regarding projectile point reduction activities, and considering the high number of rejuvenated points, points and NDPs with impact damage, and NDF mid-sections, the condition of artifacts comprising the projectile point assemblage is interpreted as resulting primarily from hunting activities. These could have occurred prior to people's arrival at the site or during the period of site occupancy. The numbers of points and point fragments suggest the latter (n=37; 61%). The presence of rejuvenated non-BH material points probably represents off-site tool manufacture, or acquisition and curation until discard at the site, either intentionally or unintentionally. These interpretations are consistent with the hypothesized curation/extended use life model.

## Site Use: Integration of Middle-Range Research with Behavioral Models

### Curation and Material Variability:

Another perspective on curation behavior can be examined by analyzing variability of flaked stone material in tool forms and debitage (see Basgall 1988, 1989). It is expected that material variability is most evident in formal tool types, such as projectile points and other formal bifaces, and least evident in non-formal tools, such as those characterized by little modification. Debitage often reflects reduction patterns of tool forms modified on-site. Although it is likely formal tool types were modified on-site during shaping and maintenance activities, debitage from early and middle stage items will tend to dominate the recovered assemblage do to these generally larger size classes which are more readily captured during screening.

Since many tool types are sourced while few debitage specimens are tested, selectivity in x-ray fluorescence analysis of obsidian items, operating without the benefit of visual source identification, tends to produce an imbalanced perspective in variability studies. Similarly, all non-obsidian materials were identified during analysis, but not all obsidian items assigned to geochemical source groups (Figure 26). Given these caveats, it is proposed during the Newberry Period, Bodie Hills obsidian was used for tool forms at least three times as often as non-Bodie Hills materials (Figures 27, 28, and 29). Since non-Bodie Hills items are characterized by a higher proportion of tools than debitage (Fredrickson 1991b), it is reasonable to presume they were probably obtained as a result of either *ad hoc* exchange or direct access during seasonal mobility.

Items identified at the Bridgeport sites as flake blanks and certain more formalized tools provide information about primary forms and activities that produced them. Given the nature of the core, mode of reduction, objective, and other factors, width, thickness, and width/thickness ratios of flake blanks may vary considerably. At the study sites, smaller flake blanks were characterized by widths ranging from 16.5mm to 39.3mm, and w/t ratios ranging from 2.3mm to 7.8mm. Among larger primary elements, widths and w/t ratios were 41.0mm/3.3 (89-19-53), or 49.0mm/6.2 (89-19-40), or 51.2mm/2.1 (89-19-35). The largest of the most modified forms was 51.0mm/3.9 (a formal knife, 89-19-14). Although it might seem reasonable to presume many of the smaller flake blanks were produced on-site from large biface cores or smaller cores derived from previously tested cobbles, specific observations argue most primary reduction occurred off-site. These factors include very small amounts of debitage classified as shatter, the lack of cobble or non-biface core fragments, and the low number of medium to large size flakes with cortex.

Two highly modified items (89-19-22 and 89-19-111) retained evidence of detachment scars (i.e., identifiable ventral face), which approximated 50% of these surfaces. Dorsal surface modification was nearly complete on both. Both, however, retained small areas of cortex. Given their thinness (6.9mm and 8.2mm), broad widths (43.9mm and 34.8mm), and high w/t ratios (6.3 and 4.3), these fragments, comprising distal portions of decortication flakes, were classed as formal knives. Possessing hydration values of 3.7 µ and 4.4 microns, both were associated with the Newberry period. These items also attest to the variability evidenced in reduction trajectories, as they represent formal tool forms characterized by attributes associated both with early and late-stage reduction (see Skinner and Ainsworth 1990).

Several of the flake blank forms represented in the Bridgeport assemblage are consistent with descriptions and photographs of Bodie Hills obsidian quarry materials (Singer and Ericson 1977). Others may have been derived from large biface cores or small cobble cores. Since none of the artifacts had remnant cortex on both faces, it is presumed none were made by bifacial cobble modification. Given the small percentage of debitage characterized by remnant cortex, the small size of cortical flakes, presence of simple flakes, and medium to large decortication flakes, and general lack of shatter, it is presumed materials arrived at the sites as already prepared flake blanks and biface roughouts. This does not preclude that more formalized bifaces made at the quarry were transported to the sites (Fowler 1989:71 for examples of ethnographic Paiute behavior). No evidence indicative of biface "sectioning" (i.e., production of "plates") was identified (see Goldberg et al. 1990).

Adaptive Strategies and Toolstone Technology:

Given the materials recovered and the patterns of deposition identified, it is concluded site use, in all instances, was characterized by activities associated with hunting camps. Additionally, high proportions of early, middle, and late stage artifacts recovered are presumed affiliated with the activities necessary for "gearing up", and thus suggest seasonal transhumance. Occupational variability, i.e., frequent site occupation, also explains the assemblage diversity identified at MNO-566 and the southern complex. These interpretations may be most demonstrable with materials ascribed to the Newberry Period as these provide the most analytically useful data sets.

Assuming the twice yearly deer migrations through the Bridgeport basin have changed little since the close of the Altithermal Period, it is likely these migrations were included in the schedule of human subsistence activities. In the months succeeding winter, game herds would have relied on the abundant new vegetation along the lower escarpment, migrating upslope as plant species ripened in succession. Human groups either spent the winter in the vicinity or moved in with the ripening of plants and the return of animal species. As game herds followed the succession of ripening plants upslope into the Sierra Nevada, human populations could have re-located to maximize access to plant resources and to deer herds before significant dispersal had occurred (see Woolfenden 1988).

These scheduling strategies, imposed in part by the climatic variability of the region and its effects on subsistence resources, also may have influenced acquisition, use, and discard of toolstone materials. During the winter months, for example, the regional obsidian quarries likely would have been inaccessible. Also the subsistence needs of the native peoples may have been more immediate. Thus it is likely to suppose acquisition of toolstone would have occurred during late spring or autumn. This may have occurred either in response to activities initiated prior to increased seasonal mobility, or as an adjunct to tool replacement following a period of seasonal mobility.

Seasonality of site use also may correspond with toolstone material discard rates. Greater amounts of projectile point damage, maintenance, loss, and discard can be presumed to have occurred during seasons when large game procurement was emphasized. Likewise, great amounts of debitage would have been produced during these periods as a result of general tool maintenance and replacement. Deer, pronghorn, mountain sheep, bear, and rabbits were hunted from fall to spring (Fowler 1989:11). Hunting of deer was initiated around late September, following the mating season when deer were fat (Fowler 1989:12). Individuals were often hunted at night with follow-up tracking during the day (Fowler 1989:12, 13).

Conversely, pronghorn were best hunted in early spring after they coalesced into large groups during the winter (Fowler 1989:14). Hunts might have occurred during any of the non-winter seasons, however, if people were short of meat (Fowler 1989:17; Parr 1989; Steward 1938, 1941). These animals were often taken through organized communal drives (Fowler 1989; Steward 1941). Mountain sheep were generally taken individually in fall or early winter (Fowler 1989:19). Given these hunting seasons, late spring and summer probably were characterized by lower rates of projectile point loss or discard as a result of decreased levels of communal or individual hunts and as a consequence of human groups ranging farther from preferred toolstone sources.

## Summary of Geographic Distribution of Bodie Hills Obsidian

Ample evidence exists for historic period social interaction between peoples occupying the western Great Basin and those occupying the Sierra Nevada foothills and Central Valley (Davis 1961). Identification and historic documentation of trans-Sierran trail networks between California and the Great Basin, along with ethnographic evidence of inter-mountain exchange networks, supports the contention exchange and Sierran transhumance were common (Davis 1961). Jackson (1974:80-81), for instance, visually identified BH material in evidence along a trail in the vicinity of Sonora Pass. There, artifacts of the material were seen in "various stages of completion". Likewise, a large body of data has been amassed indicating BH and other obsidians were a major source of toolstone material used throughout the last several thousand years in the central portion of the western Sierra Nevada (Jackson 1974). Behavioral systems responsible for the movement of this material are still debated (e.g., Ainsworth and Skinner 1988; Jackson 1984, 1988).

Although BH dominates assemblages from the Bridgeport locality and is the dominant obsidian represented in many archaeological sites situated due west in the Sierra Nevada Mountains, presence or absence of this material in other sites more distant from the source can not be explained easily. Several hypotheses can be posited to account for the proportions evidenced in the studies cited herein:

1. Proximity to source. Certainly, geographic proximity to a toolstone source is a significant factor in prehistoric technological organization. Many hunter-gatherer archaeological sites thus are dominated by toolstone materials derived from the closest source. Given the variable quality of all toolstone materials, tool type and function sometimes correlate with different locally available materials. These variables also result from site function, such as at Hidden Cave (see Thomas 1985). Frequent occurrence of obsidian caches in parts of the Sierra Nevada mountains also may be cited as an indication of the perceived value of this material over other closer toolstone sources.

2. Exchange systems. Differences in population size, technological requirements, and mode of social organization influenced the degree of *ad hoc* exchange and the development of more regularized exchange (Bouey and Basgall 1984; Fredrickson 1974; Webb 1974). Evidence for regularized exchange of toolstone materials is usually defined by high proportions of specific non-local materials Non-local materials often are represented by formal tool classes, and debitage indicative of maintenance activities. Association of items of non-local material with burials and implications for status ascription are also suggested (see Fredrickson 1974).

3. Mobility strategies. Adaptive strategies, reflected in degree of population mobility may also account for movement of seemingly great quantities of toolstone materials. Postulated use of a predominantly biface core technology during the Archaic Period for instance, could result in deposition of toolstone materials at apparently great distances from source as a result of general maintenance

activities (Gramly 1980; Parry and Kelly 1987; White 1984). Given this possibility, archaeological sites dominated by BH in the Sierra Mountains west of the Bridgeport locality can be interpreted as "fallout" from the transportable toolkit of peoples pursuing a pattern of seasonal transhumance, particularly for the Archaic Period during which greater population mobility is posited. Non-BH materials in these assemblages thus can be regarded, in part, as resulting from occasional replenishing of toolstone materials as a result of BH depletion of toolkit items.

It should be clear from the foregoing examples, however, that no single explanation serves in all instances. A combination of variables thus may best describe certain cases and not others. Generating criteria necessary to test these propositions, particularly distinctions between ad hoc exchange and population mobility, unfortunately are beyond the scope of the present study.

Archaic Period Bridgeport locality assemblages are best explained by arguing a combination of proximity to toolstone source and wide-ranging mobility strategy. These propositions thus have implications for identification of past geographic ranges of different populations insofar as toolstone material and assemblage attributes may define specific human groups. By example, the overwhelming dominance of BH material in the Bridgeport locality and the dominance of CD in the Mammoths Lakes locality suggest geographically distinct use of the region by at least two groups. The quantities of non-BH materials occurring in the Bridgeport locality and non-CD materials in the Mammoths Lakes locality do not appear to represent the amounts necessary to suggest regional occupation by a single wide-ranging group or by groups utilizing both areas. If the latter were true, it is expected that greater amounts of CD would be recovered in the Bridgeport locality and vice versa, since people would discard tools at the location they replaced them, i.e., they would not travel far without toolkits (Gramly 1980). Similar proportions of dominant and secondary materials found in the Sierra Nevada support this contention (e.g., Hull 1988; Jackson 1974; Waugh and Rondeau 1990). Detailed definition of prehistoric land-use patterns is, of course, far more complex than this simplistic example (see Jackson 1985; Dyson-Hudson and Smith 1978).

## Summary

This final chapter has summarized archaeological findings of the ASC investigations and, to a limited degree, synthesized available data from other parts of the region. Certain conclusions are proposed. Material variability appears to mark the Little Lake assemblage to a much greater degree than it does Newberry assemblages. Given the absence of substantial single component deposits, Haiwee and Marana assemblages are much less defined for the Bridgeport locality. Formal Little Lake tools, specifically projectile points, are presumed to be characterized by attributes suggestive of a higher degree of curation, implying potentially greater population mobility.

Little Lake Period use of the region appears to be limited in terms of numbers of sites and diagnostic artifacts. Although a notable sample of hydration values associated with this period were identified, the overwhelming majority derive from a restricted geographic locality. Environmental use during this period appears to have been focused on the lacustrine resources available in wetlands along the western edge of the Bridgeport basin. Biotic communities characterizing wetland/foothill ecotones would have contained a high diversity a plant and animal resources. Since the availability of many of these resources was unpredictable given environmental conditions characterizing the late Altithermal, their exploitation probably required scheduling and frequent re-location of base camps (Dyson-Hudson and Smith 1978; Kelly 1983a). At this time, it would appear site relocation may have occurred over a wide area, given the lack of additional evidence of occupation in the region.

Newberry Period projectile points and possibly other biface forms are also suggestive of intensive curation. Other assemblage attributes, i.e., a high degree of morphological variability and evidence of intensive reduction episodes, are inferred to represent frequent seasonal "gearing up" for trans-Sierran foraging. Although extended curation and population mobility also mark the Newberry Period, it may do so to a lesser degree than formerly, as indicated by a lower proportion of non-Bodie Hills material.

As discussed in the conclusions of the previous chapter, Newberry Period obsidian hydration value frequencies characterizing MNO-566 and the southern complex show a tendency for bimodal distribution. The frequency histogram of hydration values for MNO-566 exhibit two peaks interpretable as periods of greater obsidian or site use separated by a possible decline in use of one or both (Figures 4 and 11). Normally, this could be the result of factors other than those of a cultural origin, given the range of variability expected in hydration history, degree of precision in measurement, etc.

Hydration frequencies characterizing the southern complex, however, also exhibit similar bimodal patterning. The southern sites appear to be marked by a peak in obsidian use or occupational intensity during the earlier half of the Newberry Period, and decline during the latter half. Cumulative hydration frequencies for all sites suggest a sustained period of use during the first half of the Newberry Period, about 2500 - 1800 b.p., followed by a marked decline about 1700 b.p., and a resurgence peaking at about 1450 b.p. This patterning may be either coincidental resulting from sampling, or be a product of environmental variables and in some way associated with aspects of human behavior.

Possible re-cycling of earlier tool forms by both Newberry Period and later populations is suggested by eight instances of double hydration bands. All but one of these specimens were associated with the southern complex of sites. The other is derived from MNO-566. Of these seven, smaller hydration values were characterized by a mean of 3.9 µ. The larger values had a mean of 6.5 microns. One occurrence of a double band was associated with the Marana Period. This reading also came from the southern complex. This piece of debitage had values of 1.8 µ and 6.0 microns. The geographic association of these occurrences of double bands with the southern complex and Little Lake Period materials, suggests they are the product of human behavior, and are not due to hydration variability or technician error.

Variability in technological organization has been postulated as an empirically definable factor associated with organization of mobility strategies and adaptive response (Bettinger 1987; see also Murray 1980). Greater technological efficiency, such as that supposedly characterized by caching and curation, has been equated with collector systems (Bettinger 1987). The same can be said, however, of highly mobile populations employing flexible technologies (Bamforth 1986, 1991; Goodyear 1979; Kelly 1988; Minor and Toepel 1990).

Technological efficiency can be examined through optimal foraging theory (as defined in Chapter 1; see also Rondeau 1982a). Toolstone sources, much like any resource required for optimal survival, may not be readily available or accessible at all times of the year or in all land-use strategies. As noted above, the Bodie Hills obsidian source, like many of those in the western Great Basin and elsewhere, is inaccessible during the winter months. Seasonal variability in weather conditions thus tether human populations requiring this resource to the environment. This, in turn, creates conditions necessary for implementation of scheduling.

Scheduling is required in order to ensure human populations, and the plant, animal, or other resources they depend upon for survival, are in the same place at the same time. For instance, deer migrations, characterized by short-term seasonal movement from one locality to another, often coincide with ripening of certain plant species. Human populations, often pursuing the same or other plant species coinciding with seasonal ripening, can efficiently maximize caloric and nutritional requirements by monitoring movements of game dependant upon the same resources (Woolfenden 1988). This corresponding exploitation of plant and animal resources was probably accomplished by division into gender-specific tasks.

## Conclusions

Prehistoric raw material needs and game procurement technologies were characterized by different strategies, given the temporal period and adaptive pose (see Basgall 1989; Parry and Kelly 1987). Groups defined by logistical mobility might have relied on manufacture or acquisition of preforms and finished projectile points, with additional material needs supplied by unshaped cores or even scavenged material (Parry and Kelly 1987; Skinner 1988). Direct exploitation of toolstone materials at quarries thus would not have been as intensive as earlier times. The reduction sequence and series of options characterizing small Late Period arrow points are very different from those associated with most Archaic Period dart points. The initial blank is different in size and may require different procurement and reduction strategies to achieve the desired product. Consequently, tool fabrication incorporates different options regarding use and maintenance activities.

Theoretically, greater residential mobility is optimized by a higher degree of technological flexibility (Goodyear 1979; Parry and Kelly 1987). Larger Archaic Period projectile points, such as those of the Elko, Gatecliff, and some Humboldt Concave Base series, which require larger bifaces or flake blanks for initial reduction stages, are more conducive to multiple rejuvenation episodes and functional applications than small arrow points made from thin flakes (see Goodyear

1979). Thus it is expected certain temporal or stylistic "types" exhibit greater morphological variability than others. Factors relevant to curation practices and discard will differ from those of other point types.

Given that debitage and projectile points often represent distinct artifact classes characterizing different levels of energy investment and curation rates, cultural behaviors governing aspects of their use and discard are highly disparate and produce diverse discard patterning. This assumption can be applied to other material tool classes identified archaeologically. Although many of the assumptions and examples noted above are subject to variability given temporal period, adaptive strategy, and geographic distribution of toolstone sources, it is expected discard patterning is characterized by similar attributes. In addition to examples listed in Chapter 1, the following propositions are offered:

1. Debitage, often the product of multiple, temporally disjunct episodes, will be discarded at its place of creation or "use" (see Murray 1980). Excluding taphonomic processes, it will rarely be subject to significant intra- or inter-site relocation, with perhaps the exception, of scavenging behavior, which has yet to be adequately defined.

2. Small proportions of debitage with cortex will occur in areas geographically distant from material sources. This may result from (1) incidental removal during tool maintenance, particularly by populations employing strategies characterized by greater mobility; (2) temporally disjunct scavenging; or, (3) greater social distance between groups, i.e., restricted exchange.

3. Bifaces and unifaces (i.e., cores, roughouts, and/or blanks) and fragments will be found in various reduction stages at sites geographically distant from material source. This will result from unintentional breakage, loss, and/or intentional discard processes (e.g., tool caching,

abandonment). This includes minimally-modified forms with cortex since they are not exclusively "early-stage tool" forms, but often functional items important to mobility strategies and *ad hoc* exchange (see Thomas 1988).

4. Extensive reduction, re-use, and temporally disjunct recycling will be evident at sites geographically or socially distant from abundant toolstone materials (see Skinner 1988).

5. Projectile point forms for any given temporal period and geographic locality will vary morphologically as a result of general maintenance and repair. Highly curated technologies will exhibit the greatest variability.

Recently, a number of justifiable cautions and criticisms have been made regarding inadequate treatment of flaked stone remains (Basgall 1989; Dunnell 1980, 1982, 1984; Jackson 1986a; Thomas 1986). Thomas (1986:247) has succinctly asserted ". . . contemporary lithic studies seem in danger of chasing rainbows rather than providing archaeology with the theory so obviously lacking". Basgall (1988) echos a similar concern regarding the importance of addressing behavioral studies in early Holocene assemblages:

> Only when the focus shifts away from particulars of tool technology, chronology, and taxonomy will there be any real growth in our understanding of early Holocene cultural systems. How does assemblage variability relate to facets of group organization, settlement stability, subsistence strategies, and characteristics of the natural environment? . . . It [is] necessary to maximize the behavioral potential of the broken tools and flakes that dominate such collections. By looking at artifact discard patterns, source profiles, and technological disjunctions in even small assemblages, it should be possible to characterize the subsistence-settlement organization of early populations in the absence of extensive site inventories and direct subsistence data. (116-117)

Models incorporating a wide variety of examples of human behavior characterizing different aspects of a cultural system, are expected to possess greater explanatory power than those restricted to univariate perspectives. The examples discussed above provide a means for addressing certain aspects of assemblage variability through consideration of curation rates, technological organization, occupational variability, and adaptive strategies, among others. Quantitative methods for measuring variability in the archaeological record as a means of identifying variations in strategies of technological organization, however, have not been addressed here or adequately defined elsewhere (e.g., Jelinek 1976).

Given conditions of differential preservation of archaeological materials in much of California and the Great Basin, use of general models such as optimal foraging in combination with articulated assumptions about technological systems and land-use strategies provides the most robust foundation for interpretation. Difficulties in operationalizing such models have been addressed by Bettinger (1983; see also Fredrickson 1991a:44). Since optimal foraging models . . .

> [A]re energetically based, at its simplest the problem entails measurement of caloric returns and expenditures for particular resources. In archaeology, where there are uncertainties about the tactics employed in resource procurement, this is complicated enough. The uncertainties are compounded as estimates of search time within specific patches and the distribution of patches within habitats are added. It remains to be seen whether the rapid accumulation of these uncertainties in even the simplest of models will render optimal foraging models useful as anything more than rough analogies in archaeology; in the end, optimal foraging may find a role in paleoanthropology similar to that of systems theory - more as a way of looking at things than as a source of rigorous quantitative models. . . . Even where these models fail to predict subsistence behavior, they will sharpen our perception of the economic, political, and social structures that may take precedence over caloric efficiency in determining adaptive strategies. (Bettinger 1983:640-641)

Occupational variability, and changes in mobility and resource extractive technologies, may result in diverse lithic assemblages from temporally distinct, but often behaviorally similar episodes. Identifying temporally specific assemblages is often hampered by lack of chronological control. The overwhelming predominance of obsidian in these flaked stone assemblages enhances our ability to identify certain behavioral relationships between the proposed data sets. It is necessary, however, to apply a certain level of inference based on precepts outlined in Chapter 1 in order to develop a more well-rounded explanation of site specific activities and human behaviors. Methodological implications for this approach have been discussed in this chapter.

One objective of the present study was an attempt to place the Bridgeport locality archaeological assemblages in time and space relative to regional assemblages in the eastern Sierra and western Great Basin. Temporally specific archaeological assemblages were defined for the Bridgeport locality. Statistical calculations of hydration data provide precision for further testing of these temporal ranges. It is hoped information generated by these studies will be used and built upon by other researchers.

Part of the methodology used here employed examination of temporally specific BH material whenever possible. Although it has been partially successful, it should be clear a great deal of work still remains to be done. Future regional syntheses could emphasize examination of spatially discrete contemporaneous assemblages, such as those identified at MNO-566, an investigation well beyond the scope of the present study.

Another objective, interpretation of Bridgeport locality materials and variability in cumulative hydration frequencies, was achieved by integrating specific assumptions about adaptive strategies and land use systems with the accumulated data. Assemblage diversity has been ascribed to occupational variability, technological organization, and mobility strategy. These somewhat dependant variables are difficult to establish with any degree of certainty, given the scope of this project. Variability in land-use patterns during the Newberry Period, evidenced by hydration frequencies characterizing the southern complex and MNO-566, cannot be fully explained with the present sample. Changing land use systems, temporally overlapping patterns of joint use of the area, or hydration sampling bias are all plausible explanations at this stage.

Contemporaneous, morphologically discrete projectile point assemblages identified at MNO-566 suggest its occupancy by diverse populations employing similar, if not identical, adaptive strategies possibly occurring within the same environmental niche. These are evident in the virtually identical flaked stone toolkits and groundstone identified at each locus (Ferneau and Bieling 1990). Delineating regional patterning of these assemblages could be an important research objective of future investigations.

Variations in proportions of specific obsidian sources evident by comparison of the Bridgeport locality to the Mammoth Lakes locality has been cited as an example of social organization. It is suggested these regions were inhabited by different human groups employing similar adaptive strategies. These groups exploited a resource base characterized by a variety of plant and animal taxa and dependable sources of toolstone material. These conclusions have implications for future examinations of resource catchment areas, mobility strategies, and hypothesized temporal changes in technological organization.

It is clear from the examples cited in Chapter 1 and much of the current literature human behavior is characterized by a great number of complexities. Consequently, it is difficult to provide finely scaled characterizations of this variability through broadly scoped models. Most of the investigations cited contain assertions open to specific criticisms. The interpretations presented here are certainly no exception. It must be remembered analyses of individual sites and their assemblages may contribute specific biases to our understanding of past human behavior. For example, land use systems can only be defined by the examination of many contemporaneous sites within a region. Consequently, understanding cultural systems through archaeological investigation is limited by the robustness of the "middle-range" theory linking data with inference. It is necessary to continue to test these propositions in a variety of analytic contexts in order to develop more robust interpretations.

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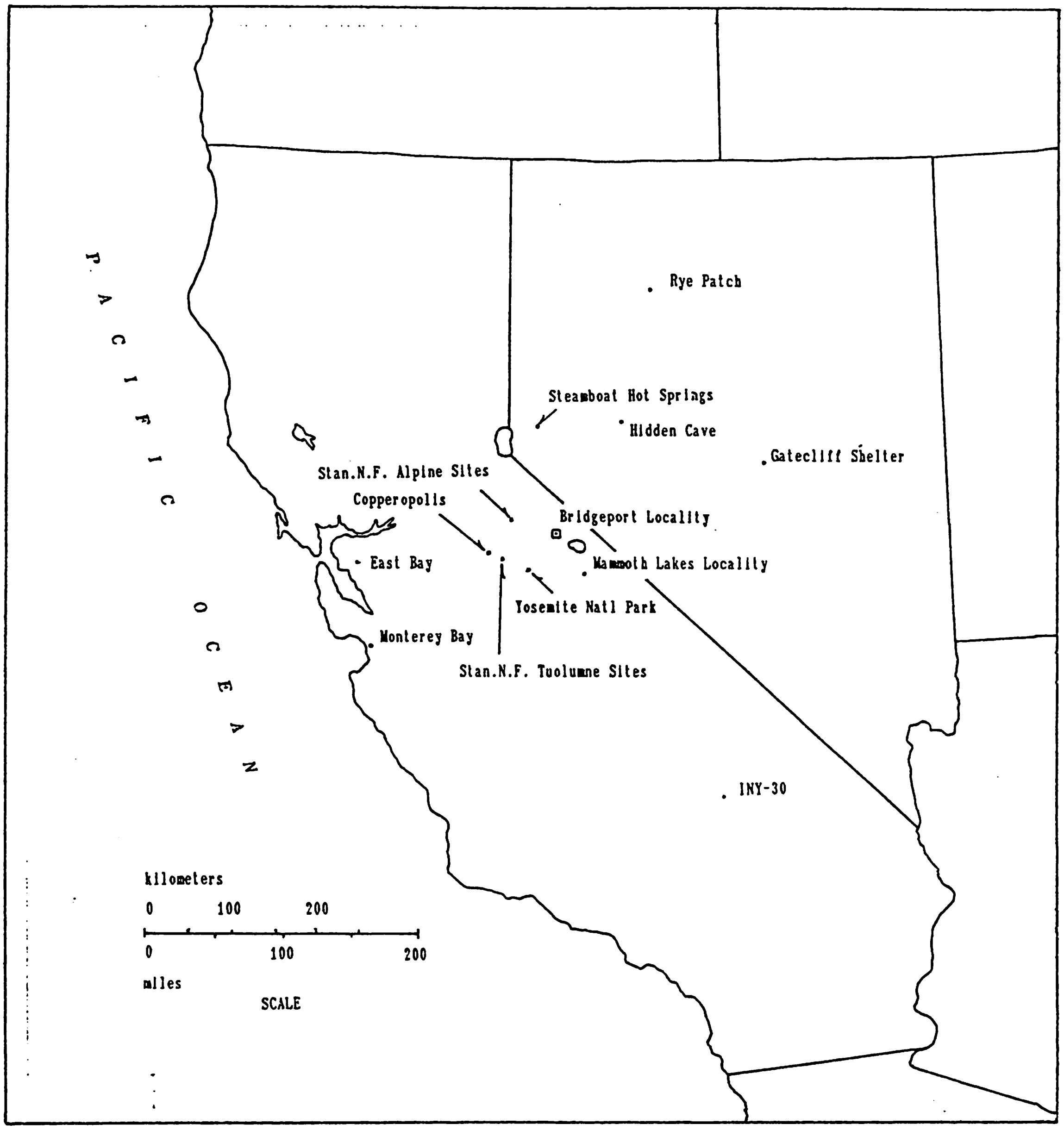


Figure 1. Project Location and Localities Discussed in Text

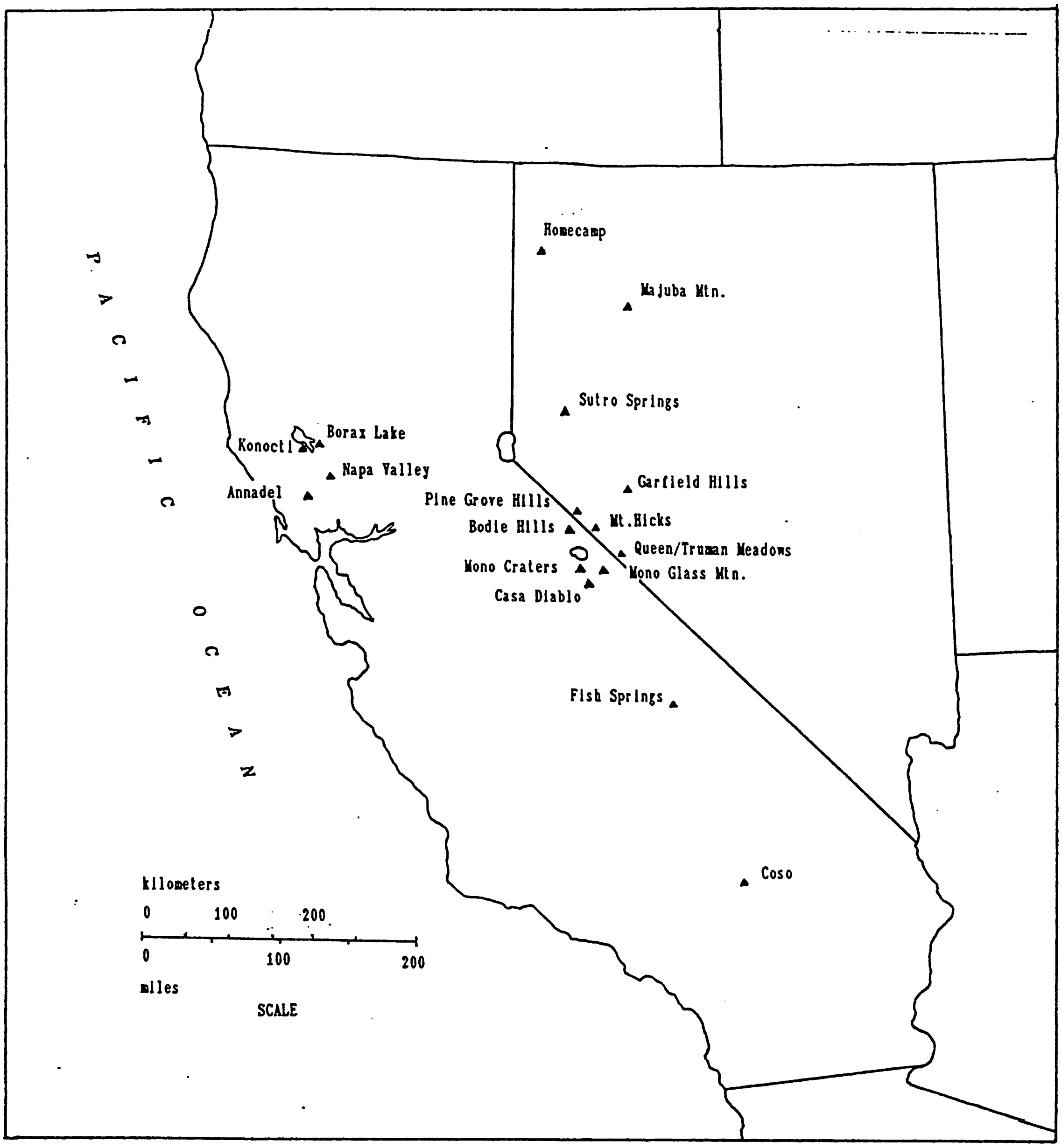


Figure 2. Major Obsidian Sources Discussed in Text

Figure 3. Summary of Selected Materials Recovered and Volume Excavated at Sites.

| Site | Materials | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pts | Bif | Deb | Mill | BRM | Beads | Pottery | CubM |
| Non-site* | 5 | 32 | 62 | | | | | 3.4 |
| 2456 | 3 | 23 | 265 | | 3 | | 7** | 6.0 |
| 564 | 6 | 35 | 3767 | | 4 | 1 | | 6.0 |
| 2488 | 1 | 17 | 2435 | | | | | 2.8 |
| 566 | 40 | 152 | 8982 | 4 | 4 | | | 30.2 |
| 2466 | 1 | 1 | 56 | | | | | 2.1 |

* Outside site boundaries within southern complex.
** Fragments probably from single vessel.
No excavation was conducted at MNO-2455, only surface recovery

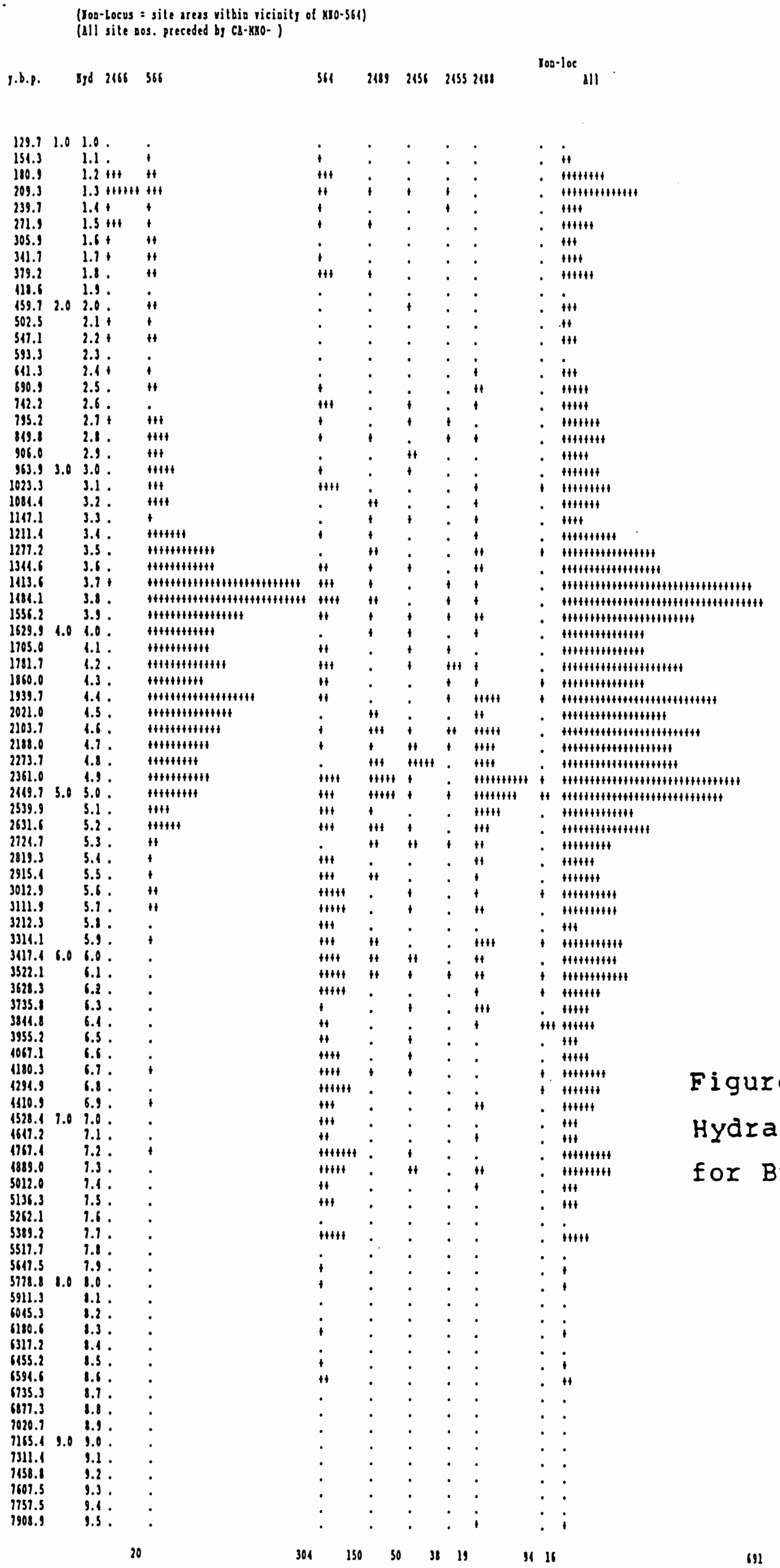


Figure 4. Cumulative Hydration Data for Bridgeport Locality

Figure 5. Hydration and Calendric Ranges of Projectile Point Series. (from Hall and Jackson 1989)

| Series * | Hydration Range | Temporal Period |
|---|---|---|
| DSN/CT | 1.3 - 2.6 | P.IV: 650-100 BP |
| EG/RS (RG) | 2.1 - 3.9 | P.III: 1250-650 BP |
| E/GCS/H (GCS/GSS) | 3.3 - 5.3 | P.II: 3250-1250 BP** |
| LLSS | 4.5 - 7.5 | P.I: 4950-3250 BP*** |
| LM/SL/P/GBS | 6.0 - 9.0 | |
| GBCB | 9.0 - 10.0 | |

All Casa Diablo material recovered in Mono County, elev. 2000-3000m
* Desert Side-notched/Cottonwood Triangular; Eastgate/Rose Spring; Elko/Gypsum Contracting Stem/Humboldt; Little Lake Split Stem; Lake Mohave/Silver Lake/Parman/Great Basin Stemmed; Great Basin Concave-base.
** Corresponds approx. to Thomas's Devil's Gate/Reveille and Reveille phases.
*** Includes later portion of Thomas's Devil's Gate Phase.

Figure 6. Proposed Hydration Ranges for Temporal Periods

| Period | Hyd. Span | Mn | n | sd | var |
|---|---|---|---|---|---|
| Marana | 1.1 - 2.2 | 1.5 | 55 | 0.31 | 0.10 |
| Haiwee | 2.3 - 3.2 | 2.9 | 56 | 0.24 | 0.06 |
| Newberry | 3.3 - 5.3 | 4.3 | 422 | 0.55 | 0.30 |
| Little Lake | 5.4 - 8.1 | 6.4 | 153 | 0.67 | 0.45 |
| Mojave | 8.2 - ? | 8.7* | 5 | 0.46 | 0.21 |

* based on 5-item sample

Figure 7. Calendric Ranges for Temporal Periods Based on Hydration Results

| Period | y.b.p. | Calendric |
|---|---|---|
| Marana | 154 - 547 | A.D. 1836 - A.D. 1443 |
| Haiwee | 593 - 1084 | A.D. 1397 - A.D. 906 |
| Newberry | 1147 - 2725 | A.D. 843 - 735 B.C. |
| Little Lake | 2819 - 5911 | 829 B.C. - 3921 B.C. |
| Mojave | 6045 - ? | 4055 B.C. - ? |

# Figure 8. Cumulative Hydration Data for Stanislaus National Forest

With the exception of 11, all are BH

Hydration Data Correlated with Elevation
Not shown: ALP-149 had one hyd. value of 9.5

| | Elevation | |
|---|---|---|
| Hyd | High | Low |
| 0.9 | 1 + | 0 . |
| 1.0 | 4 ++++ | 0 . |
| 1.2 | 1 + | 1 + |
| 1.3 | 6 ++++++ | 5 +++++ |
| 1.4 | 2 ++ | 0 . |
| 1.5 | 7 +++++++ | 1 + |
| 1.6 | 5 +++++ | 0 . |
| 1.7 | 8 ++++++++ | 2 ++ |
| 1.8 | 2 ++ | 0 . |
| 1.9 | 0 . | 1 + |
| 2.0 | 1 + | 0 . |
| 2.1 | 1 + | 1 + |
| 2.2 | 6 ++++++ | 1 + |
| 2.3 | 3 +++ | 1 + |
| 2.4 | 5 +++++ | 1 + |
| 2.5 | 4 ++++ | 0 . |
| 2.6 | 10 ++++++++++ | 1 + |
| 2.7 | 2 ++ | 1 + |
| 2.8 | 2 ++ | 0 . |
| 2.9 | 1 + | 2 ++ |
| 3.0 | 2 ++ | 0 . |
| 3.1 | 4 ++++ | 0 . |
| 3.2 | 7 +++++++ | 0 . |
| 3.3 | 2 ++ | 1 + |
| 3.4 | 0 . | 1 + |
| 3.5 | 2 ++ | 2 ++ |
| 3.6 | 3 +++ | 5 +++++ |
| 3.7 | 2 ++ | 4 ++++ |
| 3.8 | 4 ++++ | 7 +++++++ |
| 3.9 | 3 +++ | 0 . |
| 4.0 | 3 +++ | 3 +++ |
| 4.1 | 3 +++ | 7 +++++++ |
| 4.2 | 5 +++++ | 6 ++++++ |
| 4.3 | 0 . | 2 ++ |
| 4.4 | 9 +++++++++ | 5 +++++ |
| 4.5 | 4 ++++ | 3 +++ |
| 4.6 | 9 +++++++++ | 1 + |
| 4.7 | 10 ++++++++++ | 2 ++ |
| 4.8 | 1 + | 3 +++ |
| 4.9 | 2 ++ | 3 +++ |
| 5.0 | 7 +++++++ | 1 + |
| 5.1 | 11 +++++++++++ | 1 + |
| 5.2 | 8 ++++++++ | 2 ++ |
| 5.3 | 9 +++++++++ | 0 . |
| 5.4 | 4 ++++ | 0 . |
| 5.5 | 9 +++++++++ | 4 ++++ |
| 5.6 | 3 +++ | 1 + |
| 5.7 | 2 ++ | 1 + |
| 5.8 | 0 . | 0 . |
| 5.9 | 0 . | 0 . |
| 6.0 | 0 . | 0 . |
| 6.1 | 1 + | 0 . |
| 6.2 | 1 + | 0 . |
| 6.3 | 1 + | 0 . |
| 6.4 | 0 . | 0 . |
| 6.5 | 0 . | 0 . |
| 6.6 | 1 + | 0 . |
| 6.7 | 1 + | 0 . |
| 6.8 | 0 . | 0 . |
| 6.9 | 1 + | 0 . |
| 7.0 | 0 . | 0 . |
| 7.1 | 0 . | 0 . |
| 7.2 | 1 + | 0 . |
| 7.3 | 1 + | 0 . |
| 7.4 | 0 . | 0 . |
| 7.5 | 0 . | 0 . |
| Total | 207 | 83 |

Figure 9. Hydration Values for Projectile Points made of Majuba Mountain Obsidian from PE-366 and PE-450.

| Series | n | mean | range |
|---|---|---|---|
| Desert | 2 | 2.35 | 1.9 - 2.8 |
| Rosegate | 13 | 2.57 | 2.0 - 4.3 |
| Elko | 2 | 3.20 | 3.2 - 3.2 |
| Gatecliff | 4 | 3.48 | 1.6 - 4.4 |
| Humboldt | 2 | 5.10 | 5.0 - 5.2 |

Figure 10. Stemmed Points from Gatecliff Shelter (after Thomas 1983).

| Type | | BW* | NW* | T* |
|---|---|---|---|---|
| Elko C-N | | | | |
| | n | 208 | 209 | 210 |
| | min | 10.0 | 7.0 | 2.3 |
| | max | (29.0) | (21.0) | 8.2 |
| | mn | 15.6 | 11.4 | 5.2 |
| | sd | 3.07 | 2.25 | 2.24 |
| Elko E. | | | | |
| | n | 58 | 59 | 59 |
| | min | (12.6) | 8.2 | 2.6 |
| | max | (27.0) | (20.0) | 7.2 |
| | mn | 17.6 | 12.9 | 4.7 |
| | sd | 3.08 | 2.39 | .96 |
| GCS | | | | |
| | n | 24 | 24 | 24 |
| | min | 4.6 | 6.5 | 3.4 |
| | max | 12.5 | (16.0) | 6.6 |
| | mn | 7.9 | 9.8 | 4.9 |
| | sd | 1.90 | 2.43 | .87 |
| GSS | | | | |
| | n | 22 | 22 | 22 |
| | min | 8.0 | 7.9 | 3.4 |
| | max | (15.2) | 14.6 | 6.9 |
| | mn | 12.0 | 11.7 | 4.8 |
| | sd | 1.90 | 1.95 | .94 |

Measurements in mm
() = Incomplete Dimension used in calculations.
BW = Basal Width
NW = Neck Width
T = Thickness
C-N = Corner-Notched
E = Eared
GCS = Gatecliff Contracting Stem
GSS = Gatecliff Split-Stem

Figure 11. Bridgeport Hydration Statistics

| Site | | Marana | Haiwee | Newberry | Little Lake | All |
|---|---|---|---|---|---|---|
| MNO-2466 | | | | | | |
| | n: | 17 | 2 | 1 | 0 | 20 |
| | mn: | 1.46 | 2.55 | 3.70 | | 1.69 |
| | sd: | .30 | .21 | | | .64 |
| MNO-566 | | | | | | |
| | n: | 19 | 25 | 250 | 10 | 304 |
| | mn: | 1.63 | 2.90 | 4.19 | 6.02 | 3.98 |
| | sd: | .35 | .23 | .50 | .65 | .92 |
| MNO-564 | | | | | | |
| | n: | 12 | 11 | 36 | 87 | 150 |
| | mn: | 1.44 | 2.84 | 4.38 | 6.56 | 5.40 |
| | sd: | .27 | .25 | .58 | .71 | 1.86 |
| MNO-2455 | | | | | | |
| | n: | 2 | 2 | 14 | 1 | 19 |
| | mn: | 1.35 | 2.75 | 4.36 | 6.10 | 3.96 |
| | sd: | .07 | .07 | .45 | | 1.20 |
| MNO-2456 | | | | | | |
| | n: | 2 | 5 | 19 | 12 | 38 |
| | mn: | 1.65 | 2.82 | 4.57 | 6.44 | 4.78 |
| | sd: | .49 | .16 | .56 | .60 | 1.50 |
| MNO-2488 | | | | | | |
| | n: | 0 | 7 | 61 | 25 | 94 |
| | mn: | | 2.73 | 4.61 | 6.22 | 4.95 |
| | sd: | | .31 | .52 | .61 | 1.17 |
| MNO-2489 | | | | | | |
| | n: | 3 | 3 | 35 | 9 | 50 |
| | mn: | 1.53 | 3.07 | 4.55 | 5.97 | 4.53 |
| | sd: | .25 | .23 | .62 | .36 | 1.16 |
| non-Locus* | | | | | | |
| | n: | 0 | 1 | 6 | 9 | 16 |
| | mn: | | 3.10 | 4.52 | 6.28 | 5.42 |
| | sd: | | | .58 | .38 | 1.15 |
| Total Southern Complex | | | | | | |
| | n: | 19 | 29 | 171 | 143 | 367 |
| | mn: | 1.47 | 2.83 | 4.52 | 6.43 | 5.03 |
| | sd: | .27 | .25 | .56 | .67 | 1.56 |

Figure 12. MNO-566 Hydration Statistics

| Locus | | Marana | Haiwee | Newberry | Little Lake | All |
|---|---|---|---|---|---|---|
| Locus 1 | | | | | | |
| | n: | 1 | 1 | 7 | 0 | 9 |
| | mn: | 1.3 | 2.7 | 4.1 | | 3.7 |
| | sd: | | | .4 | | 1.1 |
| Locus 2 | | | | | | |
| | n: | 3 | 8 | 59 | 1 | 71 |
| | mn: | 1.5 | 2.9 | 4.1 | 6.9 | 3.9 |
| | sd: | .2 | .2 | .5 | | .8 |
| Locus 3 | | | | | | |
| | n: | 0 | 9 | 62 | 4 | 75 |
| | mn: | | 3.0 | 4.1 | 6.3 | 4.1 |
| | sd: | | .1 | .5 | .8 | .8 |
| Locus 4 | | | | | | |
| | n: | 2 | 2 | 21 | 0 | 25 |
| | mn: | 1.6 | 2.8 | 4.1 | | 3.8 |
| | sd: | .3 | .6 | .6 | | .9 |
| Locus 5 | | | | | | |
| | n: | 7 | 4 | 67 | 2 | 81 |
| | mn: | 1.8 | 2.8 | 4.3 | 5.8 | 4.0 |
| | sd: | .4 | .2 | .5 | .2 | .9 |
| Locus 6 | | | | | | |
| | n: | 1 | 1 | 21 | 2 | 25 |
| | mn: | 1.2 | 3.1 | 4.4 | 5.6 | 4.3 |
| | sd: | | | .5 | .1 | .9 |

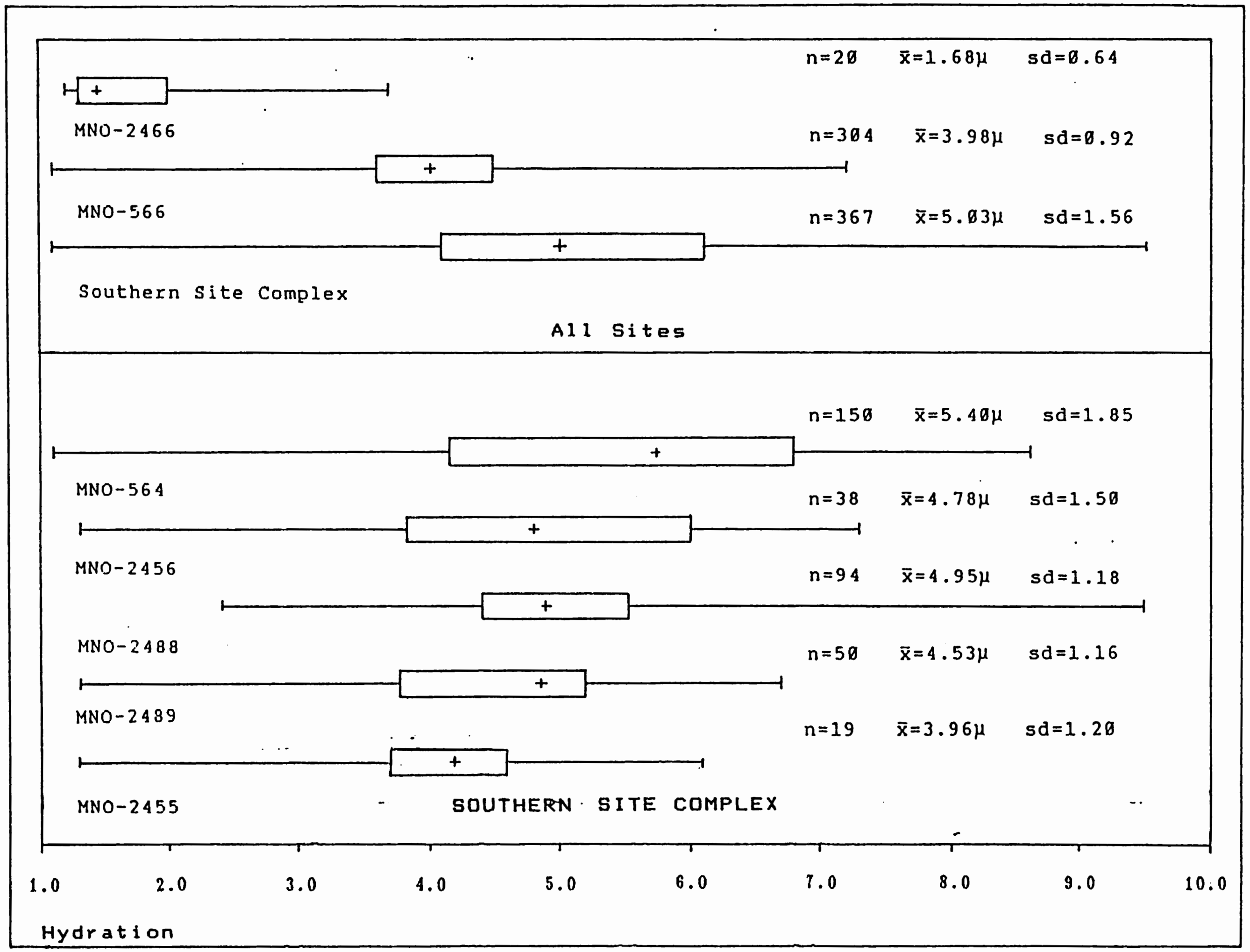


**Figure 13. Bridgeport Hydration Statistics: Box and Whiskers Plots**

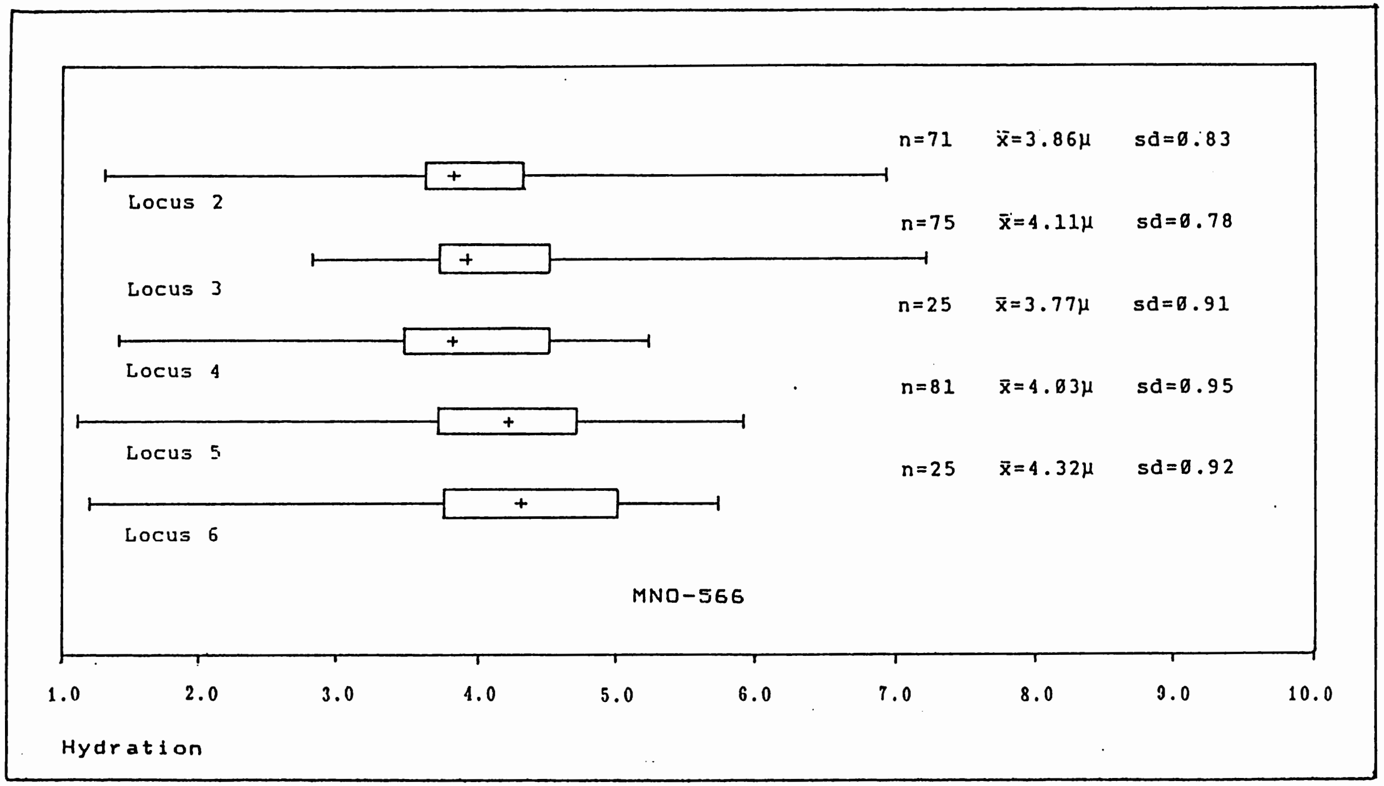


Figure 14. MNO-566 Hydration Statistics:
Box and Whiskers Plots

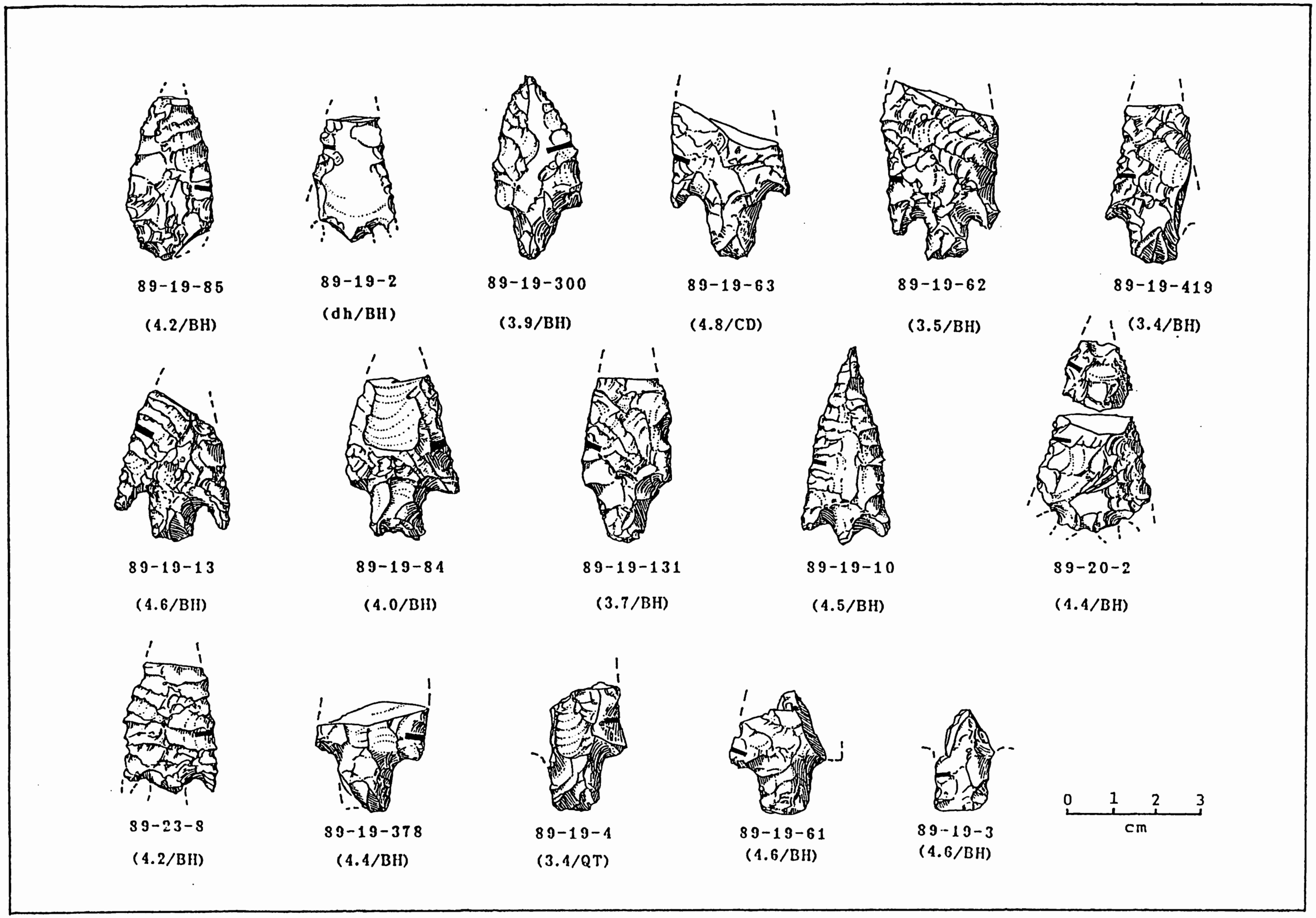


Figure 15. Projectile Points

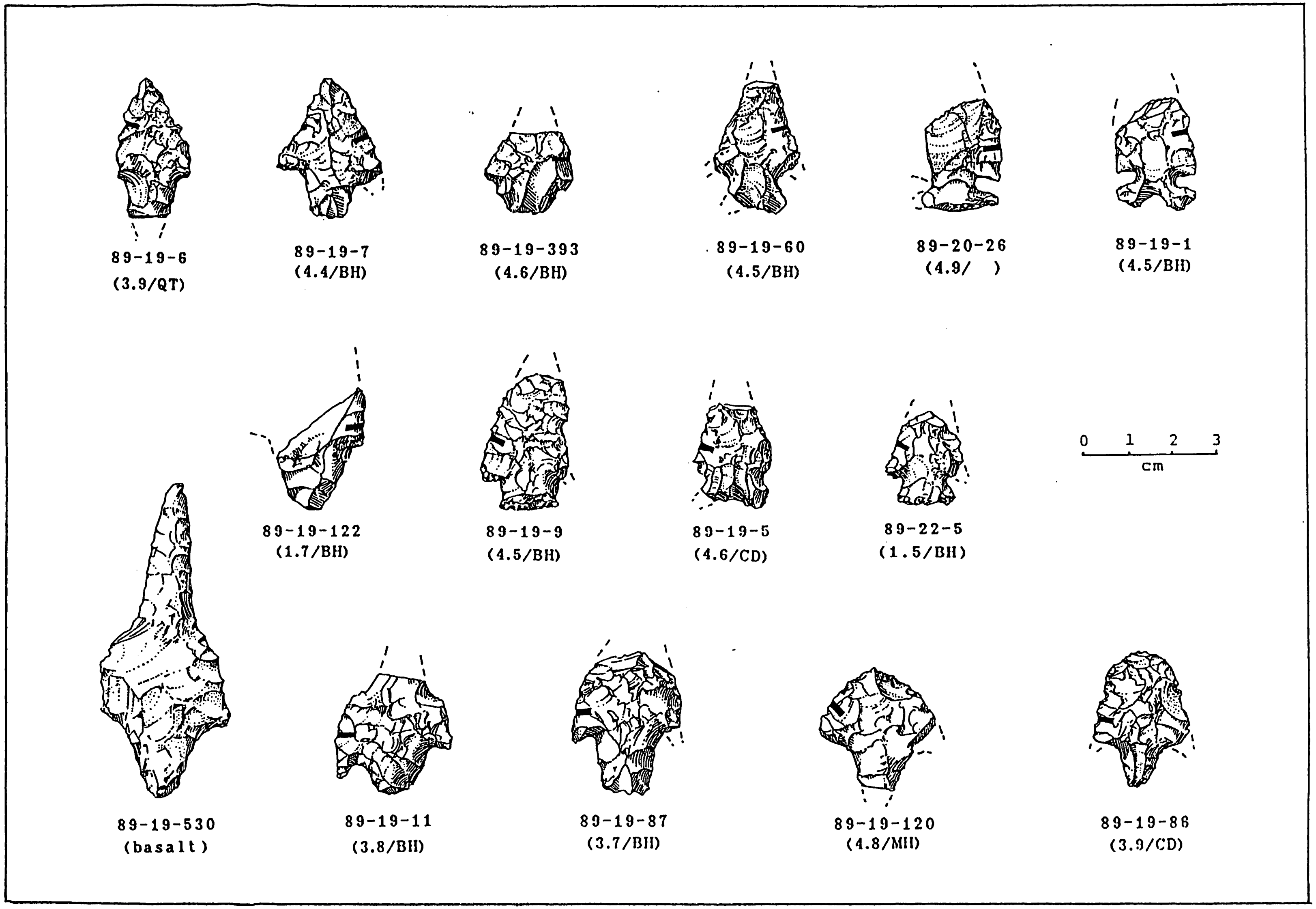


Figure 16. Projectile Points

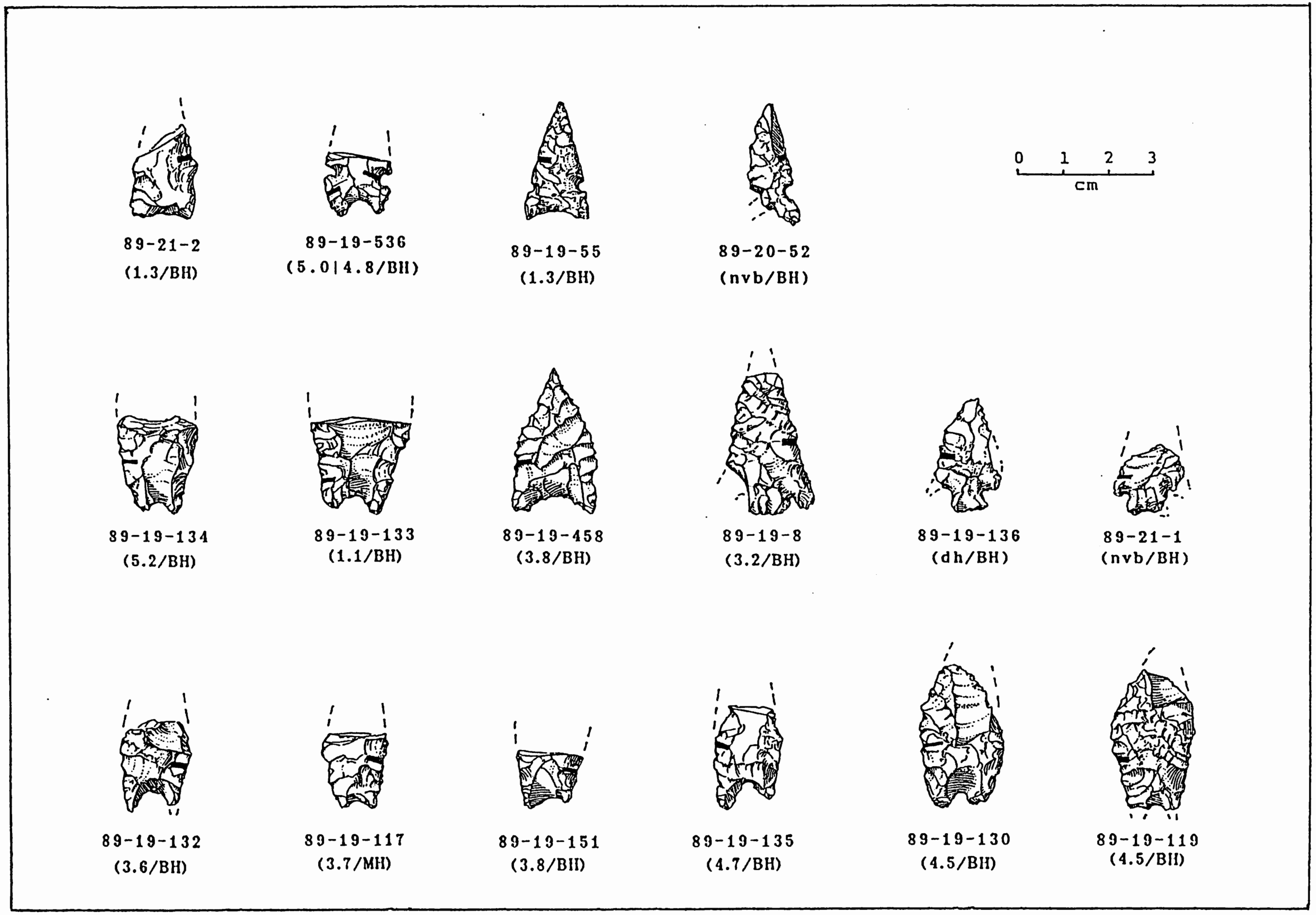


Figure 17. Projectile Points

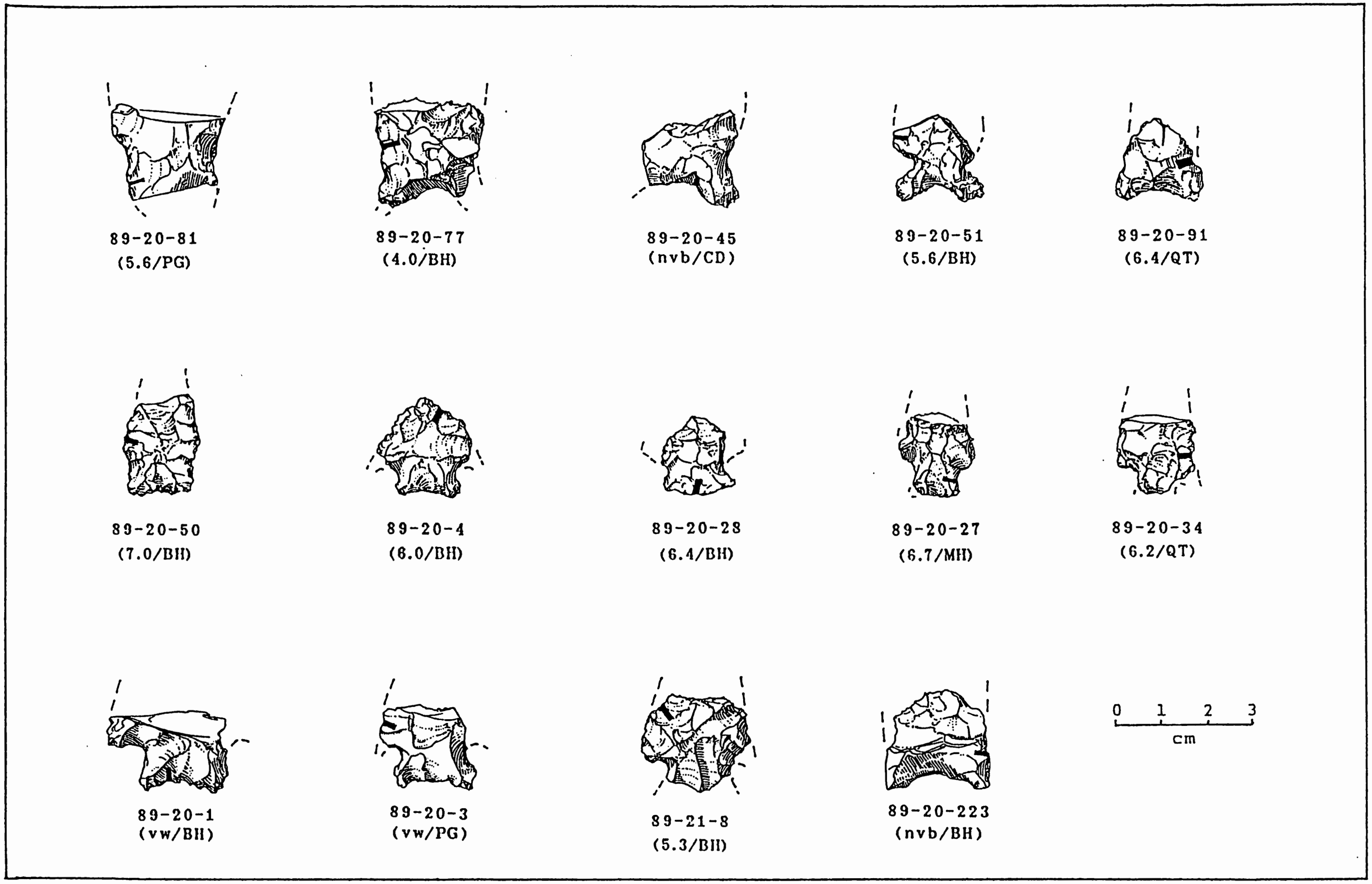


Figure 18. Projectile Points

Figure 19. Metric Data for Projectile Points

| Cat. No. | Series | Length | Width | Thick | Weight | Hyd. | XRF/Mat. | BasWid | NeckWid | PSA | DSA | BIR | NOI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 89-19-1 | Elko E. Variant | 24.70 * | 18.10 | 4.48 | 1.90 | 4.5 | BH | 18.10 | 8.50 | 160 | 180 | 0.81 | 20 |
| 89-19-2 | Elko/Gatecliff | 28.05 * | 7.50 * | 3.99 | 2.30 | | BH | | | | | 1.00 | |
| 89-19-3 | Gatecliff | 23.10 * | * | 6.57 | 1.90 | 4.6 | BH | 10.72 | 12.20 | 90 | | 1.00 | |
| 89-19-4 | Gatecliff | 29.04 * | 18.20 * | 6.24 | 3.30 | 3.4 | QT | 10.60 | 12.60 | 85 | | 0.97 | |
| 89-19-5 | Elko | 24.00 * | 17.60 | 5.68 | 2.60 | 4.6 | CD | 15.30 | 13.12 | 130 | 230 | 0.93 | 100 |
| 89-19-6 | Gatecliff | 31.30 * | 10.71 | 4.52 | 2.40 | 3.9 | QT | 9.50 | 10.50 | 80 | 200 | 1.00 | 120 |
| 89-19-7 | Gatecliff | 30.90 | 24.00 | 5.64 | 2.80 | 4.4 | BH | 8.30 | 10.78 | 84 | 170 | 1.00 | 86 |
| 89-19-8 | Rosegate | 32.00 * | 18.70 * | 3.50 | 1.60 | 3.2 | BH | 8.53 | 8.20 | 90 | 120 | 0.06 | 30 |
| 89-19-9 | Gatecliff | 31.20 * | 20.10 | 5.67 | 3.30 | 4.5 | BH | 13.34 | 12.20 | 95 | 160 | 1.00 | 40 |
| 89-19-10 | Gatecliff | 44.85 | 20.20 | 6.48 | 4.90 | 4.5 | BH | 3.00 | 7.00 | 40 | 150 | 1.00 | 110 |
| 89-19-11 | Gatecliff | 26.48 * | 26.80 | 5.53 | 3.90 | 3.8 | BH | 6.30 | 15.90 | 70 | 120 | 1.00 | 50 |
| 89-19-13 | Gatecliff | 34.15 * | 26.75 | 5.71 | 4.40 | 4.6 | BH | 9.50 | 12.50 | 85 | 120 | 1.00 | 35 |
| 89-19-55 | Desert | 26.00 | 11.70 | 2.78 | 0.90 | 1.3 | BH | 14.30 | 9.74 | 175 | 210 | 0.93 | 35 |
| 89-19-60 | Elko | 29.23 * | 19.20 | 5.23 | 2.70 | 4.5 | BH | 12.90 | 10.60 | 130 | 210 | 0.98 | 80 |
| 89-19-61 | Gatecliff | 27.94 * | 22.20 * | 6.85 | 3.60 | 4.6 | BH | 11.20 | 12.70 | 80 | 185 | 1.00 | 105 |
| 89-19-62 | Gatecliff | 40.20 * | 25.10 | 5.72 | 6.20 | 3.5 | BH | 9.80 | 9.30 | 90 | 130 | 1.00 | 40 |
| 89-19-63 | Gatecliff | 35.80 * | 26.90 | 6.22 | 4.70 | 4.8 | CD | 9.80 | 13.80 | 80 | 132 | 1.00 | 52 |
| 89-19-84 | Gatecliff | 37.00 * | 25.60 | 6.75 | 5.10 | 4.0 | BH | 12.60 | 11.40 | 95 | 150 | 0.93 | 55 |
| 89-19-85 | Unknown | 36.88 * | 20.40 * | 6.06 | 4.20 | 4.2 | BH | | | | | 1.00 | |
| 89-19-86 | Gatecliff | 30.04 * | 21.60 | 6.05 | 2.90 | 3.9 | CD | 4.40 | 9.20 | 75 | 185 | 1.00 | 110 |
| 89-19-87 | Gatecliff | 31.90 * | 23.60 | 6.23 | 4.70 | 3.7 | BH | 10.30 | 13.20 | 82 | 154 | 1.00 | 72 |
| 89-19-117 | Humboldt | 16.00 * | 15.00 | 5.74 | 1.20 | 3.7 | MH | 8.30 | | | | 0.91 | |
| 89-19-119 | Humboldt | 30.74 * | 18.50 | 7.52 | 5.00 | 4.5 | BH | 11.30 | | | | 0.94 | |
| 89-19-120 | Gatecliff | 27.02 * | 25.70 | 6.88 | 3.70 | 4.8 | MH | 8.88 | 14.00 | 80 | 200 | 0.93 | 120 |
| 89-19-122 | Gatecliff | 28.60 | 19.30 | 5.40 | 1.00 | 1.7 | BH | 5.30 | 16.20 | 70 | 200 | 1.00 | 130 |
| 89-19-130 | Humboldt | 30.82 | 18.30 | 6.04 | 3.20 | 4.5 | BH | 12.30 | | | | 0.91 | |
| 89-19-131 | Gatecliff | 37.30 * | 20.00 | 6.96 | 5.40 | 3.7 | BH | 7.89 | 13.60 | 80 | 210 | 1.00 | 130 |
| 89-19-132 | Humboldt | 19.55 * | 15.60 | 4.92 | 1.60 | 3.6 | BH | 12.10 | | | | 0.77 | |
| 89-19-133 | Humboldt | 21.19 * | 22.00 | 5.00 | 2.30 | 1.1 | BH | 12.39 | | | | 0.80 | |
| 89-19-134 | Humboldt | 22.14 * | 18.52 | 6.66 | 2.50 | 5.2 | BH | 11.00 | | | | 0.95 | |
| 89-19-135 | Humboldt | 22.94 * | 14.50 | 3.57 | 1.40 | 4.7 | BH | 13.10 | | | | 0.73 | |
| 89-19-136 | Rosegate | 25.20 | 14.50 | 3.43 | 1.00 | | BH | 8.00 | 6.90 | 125 | 180 | 1.00 | 55 |
| 89-19-151 | Humboldt | 12.53 * | 14.50 | 6.00 | 0.90 | 3.8 | BH | 10.75 | | | | 0.79 | |
| 89-19-300 | Gatecliff | 41.20 | 20.20 | 6.00 | 4.10 | 3.9 | BH | 4.50 | 11.90 | 60 | 190 | 1.00 | 130 |
| 89-19-378 | Gatecliff | 24.50 * | 25.10 | 6.21 | 3.10 | 4.4 | BH | | 13.08 | 80 | 166 | 1.00 | 86 |
| 89-19-393 | Gatecliff | 18.40 * | 20.00 | 4.65 | 1.70 | 4.6 | BH | 7.53 | 13.80 | 60 | 190 | 0.97 | 130 |
| 89-19-419 | Gatecliff | 36.10 * | 17.30 * | 6.31 | 3.70 | 3.4 | BH | 10.20 | | 85 | 160 | 1.00 | 65 |
| 89-19-458 | Humboldt | 31.60 | 17.20 | 4.13 | 2.00 | 3.8 | BH | 18.49 | | | | 0.89 | |
| 89-19-530 | Gatecliff | 71.10 | 28.90 | 7.10 | 12.10 | | (BASALT) | 7.40 | 16.80 | 60 | 210 | 1.00 | 150 |
| 89-19-536 | Desert | 14.50 * | 14.70 | 3.86 | 0.80 | | BH | 10.74 | 10.16 | 170 | 190 | 0.65 | 20 |
| 89-20-1 | Gatecliff | 17.40 * | 16.90 * | 5.40 | 2.50 | | BH | 20.18 | 8.50 | 100 | 175 | 0.84 | 75 |
| 89-20-2 | Elko/Gatecliff | 37.40 * | 25.50 | 5.47 | 5.40 | 4.4 | BH | | 13.50 | | | | |
| 89-20-3 | Elko | 18.10 * | 18.47 * | 6.04 | 2.30 | | PG | 18.47 | 14.15 | 140 | 200 | 0.96 | 60 |
| 89-20-4 | Elko | 22.12 | 20.70 | 5.33 | 2.20 | 6.0 | BH | 14.35 | 12.76 | 130 | 230 | 0.96 | 100 |
| 89-20-26 | Elko C-N Variant | 24.40 * | 17.50 * | 4.84 | 2.10 | 4.9 | | 16.60 | 9.82 | 160 | 160 | 1.00 | -10 |
| 89-20-27 | Gatecliff | 18.50 * | 10.69 | 6.70 | 1.90 | 6.7 | MH | 10.69 | 9.77 | 100 | 210 | 1.00 | 105 |
| 89-20-28 | Elko | 17.70 | 14.30 * | 4.44 | 1.20 | 6.4 | BH | 15.52 | 12.50 | 110 | 200 | 1.00 | 90 |
| 89-20-34 | Gatecliff | 18.00 * | 16.90 | 5.17 | 1.60 | 6.2 | QT | 7.50 | 7.50 | 100 | 160 | 1.00 | 50 |
| 89-20-45 | Elko | 21.40 * | 21.20 * | 8.02 | 3.40 | | CD | | 18.70 | 120 | 240 | 0.64 | 120 |

Figure 19. Metric Data for Projectile Points

| Cat. No. | Series | Length | Width | Thick | Weight | Hyd. | XRF/Mat. | BasWid | NeckWid | PSA | DSA | BIR | NOI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 89-20-50 | Gatecliff | 22.30 * | 15.06 | 7.02 | 2.80 | 7.0 | BH | 15.06 | 14.10 | 95 | 250 | 0.95 | 140 |
| 89-20-51 | Elko | 18.90 * | 18.00 * | 4.98 | 1.50 | 5.6 | BH | 19.99 | 11.69 | 125 | 200 | 0.81 | 75 |
| 89-20-52 | Desert | 26.97 | 10.20 | 3.74 | 0.80 | | BH | | 5.49 | 130 | 210 | 0.86 | 80 |
| 89-20-77 | Humboldt | 24.60 * | 25.00 | 7.51 | 4.60 | 4.0 | BH | 19.33 | 13.70 | | | 0.78 | |
| 89-20-81 | Unknown | 21.00 * | 26.20 * | 8.27 | 4.90 | 5.6 | PG | | 19.90 | 80 | 220 | 0.81 | 140 |
| 89-20-91 | Humboldt | 18.00 * | * | 7.45 | 2.10 | 6.4 | QT | 18.76 | | | | 0.87 | |
| 89-20-223 | Humboldt | 21.50 * | * | 5.86 | 2.60 | | BH | 23.06 | | | | 0.86 | |
| 89-21-1 | Rosegate | 15.00 * | 14.60 * | 3.50 | 0.70 | | BH | 8.60 | 3.30 | 110 | 150 | 0.99 | 40 |
| 89-21-2 | Desert | 20.40 * | 15.00 | 3.35 | 1.10 | 1.3 | BH | 15.00 | 13.70 | | | 0.76 | |
| 89-21-8 | Gatecliff | 21.10 * | 23.40 * | 6.92 | 3.10 | 5.3 | BH | 14.50 | 14.50 | 95 | 140 | 0.92 | 45 |
| 89-22-5 | Elko | 21.24 | 17.00 | 4.94 | 1.60 | 1.5 | BH | 12.50 | 9.47 | 110 | 170 | 1.00 | 60 |
| 89-23-8 | Elko/Gatecliff | 28.70 * | 21.40 | 4.45 | 2.70 | 4.2 | BH | | 8.00 | | 135 | 0.96 | |

* = incomplete dimension   PSA = Proximal Shoulder Angle   DSA = Distal Shoulder Angle
BasWid = Basal Width   BIR = Basal Indentation Ratio   NOI = Notch Opening Index

Figure 20. Metric Data for Artifacts

| Catalog No. | Classification | Length | Width | Thick | W/T | Weight | Cortex | Mat. | Fracture |
|---|---|---|---|---|---|---|---|---|---|
| MNO-2455 | | | | | | | | | |
| 89-23-5 | G.P.Biface | 33.25 * | 15.59 | 6.78 | 2.30 | 3.00 | 0.00 | obs | i |
| 89-23-1 | Uniface* | 31.41 | 23.33 | 8.36 | 2.79 | 5.20 | 0.00 | obs | |
| MNO-2456 | | | | | | | | | |
| 89-21-4 | Bif. Core | 40.10 * | 19.54 * | 12.02 | 1.63 | 7.00 | 0.10 | obs | p |
| 89-21-11 | Bif. Core | 37.71 * | 35.06 | 14.31 | 2.45 | 13.60 | 0.00 | obs | i |
| 89-21-17 | Bif. Core | 40.55 * | 43.36 | 13.04 | 3.33 | 19.90 | 0.10 | obs | bb |
| 89-21-14 | Flake Blank | 36.49 | 35.52 | 12.88 | 2.76 | 17.40 | 0.25 | obs | bb |
| 89-21-33 | Flake Blank | 14.32 * | 16.49 * | 3.17 | 5.20 | 0.40 | 0.25 | obs | bb |
| 89-21-12 | G.P.Biface | 27.58 * | 19.49 | 8.97 | 2.17 | 3.80 | 0.00 | obs | bb |
| 89-21-13 | G.P.Biface | 26.88 * | 36.09 | 11.02 | 3.27 | 9.20 | 0.00 | obs | bb |
| 89-21-20 | G.P.Biface | 33.41 * | 33.81 | 10.62 | 3.18 | 9.10 | 0.00 | obs | bb |
| 89-21-61 | G.P.Biface | 29.80 * | 38.40 | 10.55 | 3.64 | 11.10 | 0.00 | obs | bb |
| 89-21-3 | Ls.For.Knife | 15.59 * | 29.19 | 8.00 | 3.65 | 3.50 | 0.00 | obs | bb |
| 89-21-6 | Ls.For.Knife | 29.09 * | 30.69 * | 6.29 | 4.88 | 6.00 | 0.00 | obs | bb |
| 89-21-9 | Ls.For.Knife | 44.48 * | 22.11 * | 4.85 | 4.56 | 2.80 | 0.00 | obs | bb |
| 89-21-16 | Ls.For.Knife | 14.21 * | 26.37 * | 5.99 | 4.40 | 1.90 | 0.00 | obs | bb |
| 89-21-19 | Ls.For.Knife | 44.90 * | 18.92 * | 12.25 | 1.54 | 7.00 | 0.00 | obs | bb |
| 89-21-41 | Ls.For.Knife | 22.43 * | 22.37 | 5.25 | 4.26 | 2.50 | 0.00 | obs | bb |
| 89-21-54 | Ls.For.Knife | 24.53 | 21.07 | 6.51 | 3.24 | 2.40 | 0.00 | obs | i |
| 89-21-65 | Ls.For.Knife | 27.86 * | 46.30 | 8.18 | 5.66 | 12.70 | 0.00 | obs | bb |
| 89-21-69 | Ls.For.Knife | 33.67 * | 18.94 | 6.53 | 2.90 | 3.40 | 0.00 | obs | bb |
| 89-21-5 | Non-Diag.For. | 11.94 * | 19.98 | 6.32 | 3.16 | 1.70 | 0.00 | obs | bb |
| 89-21-7 | Non-Diag.For. | 15.66 * | 26.20 | 9.17 | 2.86 | 3.40 | 0.00 | obs | bb |
| 89-21-15 | Non-Diag.For. | 32.57 * | 26.07 * | 8.07 | 3.23 | 6.70 | 0.00 | obs | bb |
| 89-21-31 | Non-Diag.For. | 17.26 * | 19.78 | 8.82 | 2.24 | 2.70 | 0.00 | obs | bb |
| 89-21-38 | Non-Diag.For. | 10.75 * | 14.65 | 4.78 | 3.06 | 0.60 | 0.00 | obs | p |
| MNO-2466 | | | | | | | | | |
| 89-22-6 | Ls.For.Knife | 20.48 * | 26.34 * | 6.10 | 4.32 | 3.10 | 0.00 | obs | bb |
| 89-22-36 | overshot | 39.48 | 35.33 * | 14.73 | 2.40 | 13.10 | 0.10 | obs | |
| MNO-2488 | | | | | | | | | |
| 89-20-10 | | 37.77 | 37.65 | 13.14 | 2.87 | 16.00 | 0.10 | obs | |
| 89-20-181 | | 45.74 | 20.43 | 14.28 | 1.43 | 9.50 | 0.10 | obs | |
| 89-20-9 | Bif. Core | 59.18 | 36.90 | 21.38 | 1.73 | 34.20 | 0.10 | obs | bb |
| 89-20-213 | end (r) | 10.05 * | 11.82 * | 3.90 | 3.03 | 0.70 | 0.00 | obs | bb |
| 89-20-333 | end (r) | 16.31 * | 9.10 * | 6.77 | 1.34 | 0.90 | 0.10 | obs | bb |

Figure 20. (cont) Metric Data for Artifacts

| Catalog No. | Classification | Length | Width | Thick | W/T | Weight | Cortex | Mat. | Fracture |
|---|---|---|---|---|---|---|---|---|---|
| 89-20-11 | Flake Blank | 33.48 * | 29.45 | 8.51 | 3.46 | 9.50 | 0.00 | obs | bb |
| 89-20-186 | Flake Blank | 47.35 | 33.11 | 14.60 | 2.27 | 18.90 | 0.10 | obs | |
| 89-20-190 | Flake Blank | 26.80 * | 24.58 | 9.14 | 2.69 | 5.60 | 0.10 | obs | bb |
| 89-20-8 | G.P.Biface | 38.92 | 26.97 | 14.44 | 1.87 | 10.60 | 0.50 | obs | |
| 89-20-189 | G.P.Biface | 25.95 * | 26.19 * | 10.40 | 2.52 | 7.80 | 0.00 | obs | bb |
| 89-20-5 | Ls.For.Knife | 26.01 * | 29.12 * | 5.99 | 4.86 | 3.80 | 0.00 | obs | bb |
| 89-20-206 | margin (d) | 22.07 * | 7.82 * | 4.50 | 1.74 | 0.60 | 0.00 | obs | p |
| 89-20-335 | margin (nd) | 19.39 * | 12.02 * | 6.00 | 2.00 | 0.80 | 0.00 | obs | |
| 89-20-182 | margin (r) | 16.02 * | 4.49 * | 5.87 | 0.76 | 0.30 | 0.00 | obs | bb |
| 89-20-6 | medial (r) | 9.95 * | 20.80 * | 7.47 | 2.78 | 1.70 | 0.00 | obs | bb |
| 89-20-7 | medial (r) | 42.37 * | 22.45 * | 13.97 | 1.61 | 8.40 | 0.10 | obs | bb |
| 89-20-12 | Non-Diag.For. | 22.82 * | 20.74 | 6.69 | 3.10 | 2.90 | 0.00 | obs | p |
| 89-20-218 | Non-Diag.Pt. | 13.12 * | 9.72 | 3.32 | 2.93 | 0.20 | 0.00 | obs | bb |
| 89-20-341 | overshot | 33.42 * | 12.85 * | 5.09 | 2.52 | 1.10 | 0.00 | obs | |
| MNO-2489 | | | | | | | | | |
| 89-20-90 | Bif. Core | 34.49 * | 32.71 * | 13.39 | 2.44 | 11.70 | 0.00 | obs | bb |
| 89-20-173 | end (i) | 6.87 * | 7.92 | 5.27 | 1.50 | 0.20 | 0.00 | obs | i |
| 89-20-49 | Ls.For.Knife | 40.96 * | 29.06 | 9.04 | 3.21 | 8.20 | 0.10 | obs | p |
| 89-20-303 | margin (i) | 16.53 * | 4.06 * | 2.58 | 1.57 | 0.10 | 0.00 | obs | i |
| 89-20-89 | Uniface* | 35.25 * | 27.82 * | 7.30 | 3.81 | 4.50 | 0.10 | obs | bb |
| MNO-564 | | | | | | | | | |
| 89-20-18 | | 39.46 | 34.70 | 12.46 | 2.78 | 15.80 | 0.00 | obs | |
| 89-20-53 | | 30.14 | 23.60 | 17.10 | 1.38 | 9.90 | 0.00 | obs | |
| 89-20-66 | | 47.33 | 32.25 | 17.16 | 1.88 | 20.30 | 0.25 | obs | |
| 89-20-331 | | 32.95 | 39.42 | 16.34 | 2.41 | 16.00 | 0.00 | obs | p |
| 89-20-56 | Bif. Core | 38.34 * | 25.63 | 16.11 | 1.59 | 11.10 | 0.00 | obs | p |
| 89-20-68 | Bif. Core | 29.90 * | 29.50 | 10.24 | 2.88 | 7.10 | 0.00 | obs | bb |
| 89-20-79 | Bif. Core | 39.39 * | 24.57 | 16.16 | 1.52 | 12.80 | 0.00 | obs | bb |
| 89-20-266 | Bif. Core | 35.51 * | 44.04 | 16.23 | 2.71 | 18.80 | 0.25 | obs | p |
| 89-20-17 | BTF | 23.92 * | 28.85 * | 7.90 | 3.65 | 4.60 | 0.10 | obs | |
| 89-20-46 | BTF | 28.09 * | 34.76 * | 16.06 | 2.16 | 8.30 | 0.00 | obs | |
| 89-20-47 | BTF | 16.67 * | 14.92 * | 4.29 | 3.48 | 0.90 | 0.00 | obs | |
| 89-20-60 | BTF | 24.57 | 28.78 | 7.18 | 4.01 | 3.50 | 0.00 | obs | |
| 89-20-267 | end (i) | 7.74 * | 8.84 | 3.97 | 2.23 | 0.20 | 0.00 | obs | i |
| 89-20-256 | end (r) | 20.63 * | 11.18 * | 7.26 | 1.54 | 1.40 | 0.00 | obs | bb |
| 89-20-32 | Flake Blank | 33.22 | 18.28 | 6.82 | 2.68 | 3.60 | 0.10 | obs | |
| 89-20-163 | Flake Blank | 22.86 * | 30.05 * | 9.56 | 3.14 | 3.40 | 0.00 | obs | bb |
| 89-20-244 | Flake Blank | 27.53 | 23.86 | 4.62 | 5.16 | 2.50 | 0.00 | obs | bb |
| 89-20-57 | G.P.Biface | 28.68 * | 24.57 | 14.36 | 1.71 | 5.90 | 0.10 | obs | bb |
| 89-20-58 | G.P.Biface | 19.40 | 15.42 | 6.89 | 2.24 | 2.20 | 0.00 | obs | p |

Figure 20. (cont) Metric Data for Artifacts

| Catalog No. | Classification | Length | Width | Thick | W/T | Weight | Cortex | Mat. | Fracture |
|---|---|---|---|---|---|---|---|---|---|
| 89-20-63 | G.P.Biface | 36.09 | 20.88 | 8.58 | 2.43 | 6.90 | 0.00 | obs | bb |
| 89-20-92 | G.P.Biface | 43.90 * | 22.17 * | 10.60 | 2.09 | 9.90 | 0.10 | obs | bb |
| 89-20-263 | G.P.Biface | 31.90 * | 25.91 | 5.72 | 4.53 | 3.20 | 0.00 | obs | i |
| 89-20-268 | G.P.Biface | 28.51 * | 21.71 | 12.08 | 1.80 | 5.70 | 0.10 | obs | bb |
| 89-20-44 | Ls.For.Knife | 30.40 * | 33.39 | 7.98 | 4.18 | 5.10 | 0.00 | obs | bb |
| 89-20-61 | Ls.For.Knife | 26.12 * | 30.86 * | 7.73 | 3.99 | 7.40 | 0.00 | obs | bb |
| 89-20-62 | Ls.For.Knife | 18.60 * | 23.39 | 6.85 | 3.41 | 2.40 | 0.00 | obs | bb |
| 89-20-65 | Ls.For.Knife | 32.37 * | 31.92 | 6.21 | 5.14 | 6.00 | 0.00 | obs | bb |
| 89-20-248 | Ls.For.Knife | 22.22 * | 18.30 * | 6.74 | 2.72 | 2.80 | 0.00 | obs | bb |
| 89-20-337 | margin (d) | 22.60 * | 10.03 * | 4.67 | 2.15 | 0.90 | 0.00 | obs | p |
| 89-20-336 | margin (i) | 17.55 * | 10.73 * | 7.06 | 1.52 | 1.30 | 0.00 | obs | i |
| 89-20-340 | margin (i) | 23.93 * | 9.44 * | 4.09 | 2.31 | 1.00 | 0.00 | obs | i |
| 89-20-332 | margin (nd) | 28.47 * | 15.39 | 10.59 | 1.45 | 2.80 | 0.00 | obs | |
| 89-20-80 | margin (r) | 30.79 * | 10.64 * | 9.30 | 1.14 | 2.60 | 0.00 | obs | bb |
| 89-20-33 | Non-Diag.For. | 20.58 * | 18.25 * | 9.36 | 1.95 | 4.10 | 0.00 | obs | bb |
| 89-20-48 | Non-Diag.For. | 19.49 * | 22.11 | 6.35 | 3.48 | 3.50 | 0.00 | obs | bb |
| 89-20-59 | Non-Diag.For. | 18.83 * | 24.44 * | 5.57 | 4.39 | 2.60 | 0.00 | obs | bb |
| 89-20-67 | Non-Diag.For. | 23.24 * | 22.58 | 10.47 | 2.16 | 6.20 | 0.00 | obs | bb |
| 89-20-251 | Non-Diag.For. | 15.07 * | 21.74 | 7.18 | 3.03 | 2.30 | 0.00 | obs | bb |
| 89-20-35 | Non-Diag.Pt. | 18.44 * | 17.39 | 4.51 | 3.86 | 1.40 | 0.00 | obs | bb |
| 89-20-54 | Non-Diag.Pt. | 15.34 * | 17.77 * | 6.02 | 2.95 | 1.20 | 0.00 | obs | bb |
| 89-20-64 | Non-Diag.Pt. | 23.66 * | 14.42 | 4.82 | 2.99 | 1.00 | 0.00 | obs | p |
| 89-20-78 | Non-Diag.Pt. | 28.25 * | 13.22 | 5.61 | 2.36 | 1.90 | 0.00 | obs | fc |
| 89-20-338 | Non-Diag.Pt. | 15.28 * | 16.44 * | 6.96 | 2.36 | 1.80 | 0.00 | obs | p |
| 89-20-235 | overshot | 34.18 * | 29.42 * | 11.29 | 2.61 | 6.20 | 0.00 | obs | |
| 89-20-339 | Uniface | 27.21 * | 17.18 | 8.96 | 1.92 | 3.10 | 0.00 | obs | bb |
| 89-20-19 | Uniface* | 38.60 * | 22.39 | 10.11 | 2.21 | 8.10 | 0.00 | obs | bb |
| 89-20-20 | Uniface* | 28.04 * | 21.86 | 9.91 | 2.21 | 3.40 | 0.00 | obs | bb |
| MNO-566 | | | | | | | | | |
| 89-19-17 | Bif. Core | 42.26 * | 44.61 | 13.31 | 3.35 | 20.30 | 0.25 | obs | bb |
| 89-19-35 | Bif. Core | 35.15 * | 51.23 | 24.25 | 2.11 | 35.30 | 0.25 | obs | bb |
| 89-19-88 | Bif. Core | 43.92 * | 36.20 | 15.91 | 2.28 | 19.80 | 0.00 | obs | bb |
| 89-19-100 | Bif. Core | 41.04 * | 53.41 | 12.58 | 4.25 | 33.60 | 0.00 | obs | bb |
| 89-19-107 | Bif. Core | 49.15 * | 42.55 | 12.14 | 3.50 | 33.20 | 0.10 | obs | bb |
| 89-19-138 | Bif. Core | 51.13 * | 32.96 | 13.46 | 2.45 | 16.80 | 0.00 | obs | bb/lsc |
| 89-19-146 | Bif. Core | 28.31 * | 51.14 | 12.03 | 4.25 | 18.50 | 0.10 | obs | bb |
| 89-19-492 | Bif. Core | 37.61 * | 41.30 | 10.48 | 3.94 | 14.00 | 0.00 | obs | bb |
| 89-19-34 | BTF | 46.17 * | 21.11 * | 9.79 | 2.16 | 8.10 | 0.10 | obs | i |
| 89-19-44 | BTF | 19.95 * | 10.43 * | 4.01 | 2.60 | 0.80 | 0.00 | obs | bb |
| 89-19-59 | BTF | 22.18 * | 25.52 * | 6.44 | 3.96 | 3.20 | 0.00 | obs | bb |
| 89-19-69 | BTF | 19.44 * | 30.18 * | 8.68 | 3.48 | 3.70 | 0.00 | obs | i |
| 89-19-143 | BTF | 22.28 * | 17.41 * | 5.49 | 3.17 | 2.70 | 0.00 | obs | bb |

Figure 20. (cont) Metric Data for Artifacts

| Catalog No. | Classification | Length | Width | Thick | W/T | Weight | Cortex | Mat. | Fracture |
|---|---|---|---|---|---|---|---|---|---|
| 89-19-425 | BTF | 10.90 * | 5.43 * | 1.72 | 3.16 | 0.10 | 0.00 | obs | C |
| 89-19-532 | BTF | 30.67 * | 32.39 * | 7.40 | 4.38 | 4.30 | 0.00 | obs | bb |
| 89-19-500 | end (d) | 14.49 * | 28.39 * | 5.29 | 5.37 | 1.60 | 0.00 | obs | p |
| 89-19-68 | end (r) | 13.29 * | 23.89 * | 5.86 | 4.08 | 1.60 | 0.10 | obs | bb |
| 89-19-423 | end (r) | 9.27 * | 10.27 * | 5.07 | 2.03 | 0.50 | 0.00 | obs | bb |
| 89-19-24 | Flake Blank | 22.97 * | 32.14 | 4.82 | 6.67 | 3.60 | 0.90 | obs | bb |
| 89-19-25 | Flake Blank | 26.91 * | 26.60 | 5.82 | 4.57 | 4.60 | 0.00 | obs | bb |
| 89-19-27 | Flake Blank | 35.64 * | 20.22 | 8.15 | 2.48 | 5.80 | 0.00 | obs | bb |
| 89-19-43 | Flake Blank | 30.82 * | 34.32 | 11.62 | 2.95 | 11.40 | 0.25 | obs | bb |
| 89-19-45 | Flake Blank | 39.79 | 28.77 | 7.65 | 3.76 | 8.10 | 0.00 | obs | |
| 89-19-46 | Flake Blank | 22.24 * | 39.33 | 5.02 | 7.83 | 5.40 | 0.00 | ccr | bb |
| 89-19-49 | Flake Blank | 28.15 * | 34.07 | 8.08 | 4.22 | 7.60 | 0.00 | obs | bb |
| 89-19-50 | Flake Blank | 53.58 | 35.33 | 7.31 | 4.83 | 12.90 | 0.00 | obs | |
| 89-19-53 | Flake Blank | 56.62 * | 41.00 | 12.61 | 3.25 | 24.40 | 0.25 | obs | bb |
| 89-19-74 | Flake Blank | 33.62 | 24.03 | 4.01 | 5.99 | 3.60 | 0.00 | obs | |
| 89-19-77 | Flake Blank | 49.48 * | 27.68 | 7.33 | 3.78 | 11.20 | 0.25 | obs | bb/fc |
| 89-19-78 | Flake Blank | 45.89 | 36.70 | 9.85 | 3.73 | 14.10 | 0.00 | obs | |
| 89-19-80 | Flake Blank | 25.42 * | 26.63 * | 6.44 | 4.14 | 4.00 | 0.00 | obs | bb |
| 89-19-81 | Flake Blank | 26.07 * | 34.59 | 10.09 | 3.43 | 9.90 | 0.10 | obs | bb |
| 89-19-94 | Flake Blank | 34.87 * | 31.60 | 8.69 | 3.64 | 7.60 | 0.00 | obs | bb |
| 89-19-126 | Flake Blank | 29.22 * | 36.49 | 11.63 | 3.14 | 13.10 | 0.00 | obs | bb |
| 89-19-139 | Flake Blank | 29.07 * | 32.43 * | 10.07 | 3.22 | 9.60 | 0.00 | obs | bb/lsc |
| 89-19-145 | Flake Blank | 32.66 * | 27.16 * | 10.72 | 2.53 | 8.80 | 0.00 | obs | bb |
| 89-19-188 | Flake Blank | 23.23 * | 27.92 | 4.26 | 6.55 | 3.40 | 0.00 | obs | bb |
| 89-19-441 | Flake Blank | 32.55 * | 28.13 | 8.84 | 3.18 | 8.40 | 0.00 | obs | bb |
| 89-19-539 | Flake Blank | 11.78 * | 31.31 * | 9.97 | 3.14 | 1.90 | 0.00 | obs | bb |
| 89-19-540 | Flake Blank | 33.13 * | 23.00 | 6.50 | 3.54 | 5.50 | 0.10 | obs | bb |
| 89-19-541 | Flake Blank | 36.05 * | 37.42 | 12.73 | 2.94 | 11.20 | 0.00 | obs | bb |
| 89-19-545 | Flake Blank | 35.44 * | 33.74 | 12.74 | 2.65 | 12.70 | 0.25 | obs | bb |
| 89-19-548 | Flake Blank | 43.13 * | 33.67 | 11.38 | 2.96 | 15.80 | 0.10 | obs | bb |
| 89-19-550 | Flake Blank | 11.08 * | 21.94 * | 6.56 | 3.34 | 1.60 | 0.00 | obs | bb/lsc |
| 89-19-557 | Flake Blank | 14.19 * | 23.56 * | 4.32 | 5.45 | 1.10 | 0.25 | obs | bb |
| 89-19-14 | For. Knife | 65.42 * | 50.96 | 13.19 | 3.86 | 37.40 | 0.00 | obs | bb |
| 89-19-22 | For. Knife | 55.26 * | 43.91 | 6.94 | 6.33 | 12.10 | 0.10 | obs | bb |
| 89-19-28 | For. Knife | 31.47 * | 41.97 | 8.80 | 4.77 | 15.30 | 0.00 | obs | bb |
| 89-19-29 | For. Knife | 43.13 * | 32.32 | 8.30 | 3.89 | 11.30 | 0.10 | obs | bb |
| 89-19-32 | For. Knife | 37.95 * | 38.21 * | 5.33 | 7.17 | 5.80 | 0.10 | obs | bb |
| 89-19-39 | For. Knife | 43.72 * | 39.84 * | 6.60 | 6.04 | 8.30 | 0.00 | obs | bb |
| 89-19-58 | For. Knife | 34.77 * | 33.02 | 7.88 | 4.19 | 8.60 | 0.00 | obs | bb |
| 89-19-111 | For. Knife | 53.01 * | 34.78 | 8.15 | 4.27 | 11.20 | 0.10 | obs | bb |
| 89-19-113 | For. Knife | 28.20 * | 50.20 | 8.61 | 5.83 | 11.30 | 0.00 | obs | bb |
| 89-19-23 | G.P.Biface | 31.45 * | 31.80 | 9.54 | 3.33 | 7.50 | 0.00 | obs | bb |
| 89-19-56 | G.P.Biface | 26.00 * | 26.18 | 12.22 | 2.14 | 8.00 | 0.00 | obs | bb |
| 89-19-71 | G.P.Biface | 41.18 * | 22.96 | 10.69 | 2.15 | 10.30 | | bre | ts |

Figure 20. (cont) Metric Data for Artifacts

| Catalog No. | Classification | Length | Width | Thick | W/T | Weight | Cortex | Mat. | Fracture |
|---|---|---|---|---|---|---|---|---|---|
| 89-19-73 | G.P.Biface | 53.94 * | 30.00 | 8.84 | 3.39 | 11.60 | 0.50 | obs | bb |
| 89-19-105 | G.P.Biface | 40.33 * | 28.78 | 8.83 | 3.26 | 10.80 | 0.00 | obs | bb |
| 89-19-124 | G.P.Biface | 34.44 * | 37.01 | 9.62 | 3.85 | 11.30 | 0.10 | obs | bb |
| 89-19-125 | G.P.Biface | 31.68 * | 22.52 * | 10.96 | 2.05 | 7.00 | 0.00 | obs | bb |
| 89-19-127 | G.P.Biface | 31.44 * | 28.19 | 7.18 | 3.93 | 5.50 | 0.10 | obs | bb |
| 89-19-128 | G.P.Biface | 32.51 * | 31.74 * | 7.54 | 4.21 | 9.20 | 0.10 | obs | r |
| 89-19-140 | G.P.Biface | 16.20 * | 19.10 | 8.51 | 2.24 | 2.40 | 0.10 | obs | bb |
| 89-19-142 | G.P.Biface | 27.68 * | 20.63 | 13.35 | 1.55 | 4.60 | 0.00 | obs | bb |
| 89-19-147 | G.P.Biface | 38.04 * | 25.27 * | 9.90 | 2.55 | 6.80 | 0.00 | obs | r |
| 89-19-152 | G.P.Biface | 26.41 * | 28.97 | 9.20 | 3.15 | 4.40 | 0.00 | obs | bb |
| 89-19-154 | G.P.Biface | 38.01 * | 26.25 | 6.62 | 3.97 | 6.50 | 0.25 | obs | bb |
| 89-19-155 | G.P.Biface | 18.27 * | 42.99 * | 10.10 | 4.26 | 8.90 | 0.00 | obs | bb |
| 89-19-261 | G.P.Biface | 17.43 * | 18.55 * | 6.46 | 2.87 | 1.80 | 0.00 | obs | bb/lsc |
| 89-19-356 | G.P.Biface | 15.23 * | 26.68 | 7.73 | 3.45 | 2.40 | 0.25 | obs | bb |
| 89-19-490 | G.P.Biface | 33.28 * | 18.17 | 10.93 | 1.66 | 4.00 | 0.10 | obs | bb |
| 89-19-535 | G.P.Biface | 34.01 * | 32.33 | 11.05 | 2.93 | 14.50 | 0.10 | obs | bb |
| 89-19-537 | G.P.Biface | 51.42 * | 24.79 * | 9.68 | 2.56 | 11.40 | 0.25 | obs | lsc |
| 89-19-563 | G.P.Biface | 31.59 * | 26.81 | 7.68 | 3.49 | 6.70 | 0.00 | obs | bb |
| 89-19-16 | Ls.For.Knife | 34.20 * | 18.94 | 6.06 | 3.13 | 4.80 | 0.00 | obs | bb |
| 89-19-19 | Ls.For.Knife | 34.22 * | 37.75 | 11.73 | 3.22 | 10.00 | 0.00 | obs | bb |
| 89-19-30 | Ls.For.Knife | 32.78 * | 23.56 | 6.70 | 3.52 | 5.60 | 0.00 | obs | bb |
| 89-19-40 | Ls.For.Knife | 23.54 * | 49.01 | 7.86 | 6.24 | 9.30 | 0.50 | obs | bb |
| 89-19-51 | Ls.For.Knife | 20.17 * | 44.71 * | 9.12 | 4.90 | 7.20 | 0.00 | obs | bb |
| 89-19-66 | Ls.For.Knife | 29.68 * | 31.09 | 5.97 | 5.21 | 4.20 | 0.00 | obs | bb |
| 89-19-72 | Ls.For.Knife | 25.96 * | 46.67 | 7.62 | 6.12 | 8.20 | 0.00 | obs | bb |
| 89-19-96 | Ls.For.Knife | 43.75 * | 27.91 | 7.79 | 3.58 | 8.40 | 0.10 | obs | bb |
| 89-19-98 | Ls.For.Knife | 42.16 * | 31.16 | 10.20 | 3.05 | 14.00 | 0.00 | obs | bb |
| 89-19-108 | Ls.For.Knife | 25.76 * | 26.72 | 8.47 | 3.15 | 5.70 | 0.10 | obs | bb |
| 89-19-129 | Ls.For.Knife | 30.43 * | 24.51 | 7.14 | 3.43 | 5.60 | 0.00 | obs | bb |
| 89-19-158 | Ls.For.Knife | 33.86 * | 37.17 | 8.96 | 4.15 | 9.60 | 0.00 | obs | bb/lsc |
| 89-19-162 | Ls.For.Knife | 36.84 * | 36.59 | 9.88 | 3.70 | 12.30 | 0.00 | obs | bb/? |
| 89-19-268 | Ls.For.Knife | 40.16 * | 24.10 | 6.61 | 3.65 | 8.00 | 0.10 | obs | bb |
| 89-19-26 | margin (r) | 32.34 * | 15.43 * | 9.59 | 1.61 | 4.20 | 0.00 | obs | bb |
| 89-19-67 | margin (r) | 35.53 * | 11.76 * | 6.88 | 1.71 | 2.30 | 0.00 | obs | bb |
| 89-19-70 | margin (r) | 28.56 * | 12.21 * | 5.58 | 2.19 | 2.10 | 0.10 | obs | bb |
| 89-19-93 | margin (r) | 39.78 * | 18.77 * | 6.04 | 3.11 | 5.70 | 0.00 | obs | bb |
| 89-19-123 | margin (r) | 33.28 * | 17.80 * | 7.04 | 2.53 | 3.10 | 0.00 | obs | bb |
| 89-19-172 | margin (r) | 17.88 * | 12.04 * | 4.41 | 2.73 | 0.80 | 0.10 | obs | bb |
| 89-19-303 | margin (r) | 22.04 * | 11.38 * | 7.26 | 1.57 | 1.30 | 0.00 | obs | bb |
| 89-19-322 | margin (r) | 15.70 * | 10.07 * | 5.16 | 1.95 | 0.85 | 0.00 | obs | bb |
| 89-19-323 | margin (r) | 19.04 * | 10.00 * | 4.68 | 2.14 | 0.70 | 0.00 | obs | bb |
| 89-19-497 | margin (r) | 22.40 * | 8.92 * | 4.59 | 1.94 | 0.90 | 0.00 | obs | bb |
| 89-19-543 | margin (r) | 39.51 * | 15.83 * | 11.28 | 1.40 | 3.90 | 0.10 | obs | bb |
| 89-19-551 | margin (r) | 23.35 * | 9.23 * | 6.93 | 1.33 | 1.00 | 0.00 | obs | bb |

Figure 20. (cont) Metric Data for Artifacts

| Catalog No. | Classification | Length | Width | Thick | W/T | Weight | Cortex | Mat. | Fracture |
|---|---|---|---|---|---|---|---|---|---|
| 89-19-553 | margin (r) | 16.32 * | 8.23 * | 4.69 | 1.75 | 0.40 | 0.00 | obs | bb |
| 89-19-554 | margin (r) | 17.85 * | 8.26 * | 3.76 | 2.20 | 0.40 | 0.00 | obs | bb |
| 89-19-555 | margin (r) | 37.30 * | 14.17 * | 9.87 | 1.44 | 2.60 | 0.00 | obs | bb |
| 89-19-15 | Non-Diag.For. | 40.44 * | 15.63 | 5.38 | 2.91 | 4.10 | 0.00 | obs | bb |
| 89-19-21 | Non-Diag.For. | 32.77 * | 21.88 | 9.07 | 2.41 | 7.40 | 0.00 | obs | bb |
| 89-19-33 | Non-Diag.For. | 27.88 * | 19.60 | 5.36 | 3.66 | 3.70 | 0.00 | obs | bb/r |
| 89-19-52 | Non-Diag.For. | 24.52 * | 17.50 | 5.95 | 2.94 | 2.50 | 0.00 | obs | bb |
| 89-19-54 | Non-Diag.For. | 18.89 * | 16.99 | 4.70 | 3.61 | 1.50 | 0.00 | obs | bb |
| 89-19-64 | Non-Diag.For. | 33.79 * | 20.66 | 5.73 | 3.61 | 3.90 | 0.00 | obs | bb |
| 89-19-76 | Non-Diag.For. | 22.82 * | 14.21 | 5.56 | 2.56 | 2.40 | 0.00 | obs | bb |
| 89-19-89 | Non-Diag.For. | 16.22 * | 15.06 | 5.41 | 2.78 | 1.10 | 0.10 | obs | bb |
| 89-19-92 | Non-Diag.For. | 35.27 * | 19.75 * | 5.52 | 3.58 | 3.65 | | ccr | p |
| 89-19-99 | Non-Diag.For. | 24.68 * | 20.80 | 4.85 | 4.29 | 2.30 | 0.10 | obs | bb |
| 89-19-103 | Non-Diag.For. | 33.25 * | 21.41 | 5.99 | 3.57 | 4.40 | 0.00 | obs | ts/bb |
| 89-19-104 | Non-Diag.For. | 17.32 * | 17.99 | 5.05 | 3.56 | 1.50 | 0.00 | obs | bb |
| 89-19-109 | Non-Diag.For. | 44.36 | 20.19 | 7.59 | 2.66 | 5.90 | 0.00 | obs | fc |
| 89-19-112 | Non-Diag.For. | 41.18 * | 17.89 | 4.30 | 4.16 | 3.40 | 0.00 | obs | ts/bb |
| 89-19-115 | Non-Diag.For. | 29.88 * | 20.70 | 5.23 | 3.96 | 2.90 | 0.00 | obs | bb |
| 89-19-118 | Non-Diag.For. | 12.87 * | 12.54 | 6.35 | 1.97 | 1.10 | 0.10 | obs | bb |
| 89-19-121 | Non-Diag.For. | 27.55 * | 17.40 | 5.02 | 3.47 | 2.50 | 0.00 | obs | bb |
| 89-19-141 | Non-Diag.For. | 18.18 * | 16.07 | 5.93 | 2.71 | 1.40 | 0.00 | obs | bb |
| 89-19-153 | Non-Diag.For. | 21.69 * | 18.61 | 5.39 | 3.45 | 2.60 | 0.00 | obs | bb |
| 89-19-302 | Non-Diag.For. | 16.80 * | 14.44 | 4.92 | 2.93 | 0.80 | 0.00 | obs | bb |
| 89-19-473 | Non-Diag.For. | 32.43 * | 26.20 | 5.92 | 4.43 | 4.90 | 0.00 | obs | bb |
| 89-19-485 | Non-Diag.For. | 11.58 * | 12.38 | 5.25 | 2.36 | 0.70 | 0.00 | obs | bb |
| 89-19-534 | Non-Diag.For. | 32.75 * | 27.18 | 8.36 | 3.25 | 4.70 | 0.00 | obs | r |
| 89-19-12 | Non-Diag.Pt. | 30.80 | 16.85 | 5.20 | 3.24 | 2.50 | 0.00 | obs | lsc |
| 89-19-31 | Non-Diag.Pt. | 31.55 * | 17.23 | 4.50 | 3.83 | 2.10 | 0.00 | obs | bb |
| 89-19-36 | Non-Diag.Pt. | 31.88 * | 14.01 * | 5.36 | 2.61 | 2.30 | 0.00 | obs | ts/bb/lsc |
| 89-19-57 | Non-Diag.Pt. | 26.75 * | 15.06 * | 5.29 | 2.85 | 2.60 | 0.00 | obs | bb/lsc |
| 89-19-65 | Non-Diag.Pt. | 44.43 | 23.09 | 7.30 | 3.16 | 6.30 | 0.00 | obs | |
| 89-19-95 | Non-Diag.Pt. | 21.77 * | 11.48 | 3.20 | 3.59 | 0.70 | 0.00 | obs | bb |
| 89-19-106 | Non-Diag.Pt. | 33.62 | 16.54 | 6.01 | 2.75 | 3.80 | 0.00 | obs | |
| 89-19-110 | Non-Diag.Pt. | 33.94 * | 22.90 | 7.10 | 3.23 | 5.90 | 0.10 | obs | bb/fc |
| 89-19-137 | Non-Diag.Pt. | 24.80 * | 15.35 | 4.47 | 3.43 | 1.70 | 0.00 | bas | r |
| 89-19-160 | Non-Diag.Pt. | 37.36 * | 15.78 | 3.64 | 4.34 | 2.20 | 0.00 | obs | bb |
| 89-19-544 | Non-Diag.Pt. | 15.67 * | 7.72 * | 4.83 | 1.60 | 0.50 | 0.00 | obs | bb |
| 89-19-564 | Non-Diag.Pt. | 34.71 | 17.73 | 4.70 | 3.77 | 2.70 | 0.00 | obs | |
| 89-19-37 | overshot | 52.91 * | 30.44 * | 8.28 | 3.68 | 9.10 | 0.00 | obs | bb |
| 89-19-48 | overshot | 44.68 * | 16.38 * | 8.15 | 2.01 | 4.50 | 0.00 | obs | r |
| 89-19-184 | overshot | 28.43 * | 14.45 * | 7.36 | 1.96 | 2.00 | 0.10 | obs | C |
| 89-19-310 | overshot | 47.46 * | 25.85 * | 5.35 | 4.83 | 2.70 | 0.00 | obs | C |
| 89-19-498 | overshot | 32.77 * | 12.00 * | 4.34 | 2.76 | 1.40 | 0.00 | obs | bb |
| 89-19-531 | overshot | 45.78 * | 26.04 * | 5.95 | 4.38 | 4.40 | 0.00 | obs | bb |

Figure 20. (cont) Metric Data for Artifacts

| Catalog No. | Classification | Length | Width | Thick | W/T | Weight | Cortex | Mat. | Fracture |
|---|---|---|---|---|---|---|---|---|---|
| 89-19-542 | overshot | 30.49 * | 12.49 * | 3.08 | 4.06 | 0.70 | 0.00 | obs | bb |
| 89-19-114 | Preform | 34.57 * | 32.01 | 5.87 | 5.45 | 7.30 | 0.00 | obs | bb |
| 89-19-149 | Uniface* | 59.75 | 27.75 | 12.85 | 2.16 | 20.20 | 0.00 | bas | |
| 89-19-150 | Uniface* | 22.52 * | 20.59 * | 9.09 | 2.27 | 3.90 | 0.00 | obs | bb |
| 89-19-157 | Uniface* | 28.70 * | 28.90 * | 12.20 | 2.37 | | 0.00 | obs | r |
| 89-19-161 | Uniface* | 42.56 * | 22.20 | 9.43 | 2.35 | 8.00 | 0.00 | obs | bb |
| 89-19-533 | Uniface* | 21.70 * | 35.53 | 14.55 | 2.44 | 10.00 | 0.50 | obs | bb |
| 89-19-547 | Uniface* | 21.18 * | 25.85 | 9.65 | 2.68 | 5.40 | 0.10 | obs | bb |
| w/in orig. 564 | | | | | | | | | |
| 89-20-14 | | 43.43 | 36.63 | 20.26 | 1.81 | 25.20 | 0.00 | obs | |
| 89-20-87 | | 37.57 | 30.90 | 6.89 | 4.48 | 8.40 | 0.00 | obs | |
| 89-20-70 | Bif. Core | 19.17 * | 39.32 | 12.53 | 3.14 | 8.90 | 0.00 | obs | bb |
| 89-20-332 | end (r) | 20.86 * | 32.47 * | 10.51 | 3.09 | 7.00 | 0.00 | obs | bb |
| 89-20-30 | Flake Blank | 37.63 * | 35.25 | 10.27 | 3.43 | 11.50 | 0.00 | obs | bb |
| 89-20-29 | G.P.Biface | 21.95 * | 16.97 | 10.14 | 1.67 | 3.40 | 0.00 | obs | i |
| 89-20-72 | G.P.Biface | 49.30 * | 29.50 | 8.93 | 3.30 | 12.50 | 0.00 | bas | bb |
| 89-20-83 | G.P.Biface | 36.42 | 23.15 | 9.85 | 2.35 | 6.10 | 0.00 | obs | |
| 89-20-84 | G.P.Biface | 28.18 * | 23.46 | 7.23 | 3.24 | 4.90 | 0.00 | obs | bb |
| 89-20-16 | Ls.For.Knife | 26.33 * | 34.29 | 10.60 | 3.23 | 8.00 | 0.00 | obs | bb |
| 89-20-37 | Ls.For.Knife | 28.90 * | 21.61 * | 9.17 | 2.36 | 6.40 | 0.00 | obs | bb |
| 89-20-76 | Ls.For.Knife | 42.03 * | 30.47 | 8.30 | 3.67 | 13.70 | 0.00 | obs | bb |
| 89-20-85 | Ls.For.Knife | 38.12 * | 31.81 * | 8.20 | 3.88 | 10.80 | 0.00 | obs | bb |
| 89-20-86 | Ls.For.Knife | 18.18 * | 26.44 * | 6.07 | 4.36 | 3.00 | 0.00 | obs | bb |
| 89-20-102 | margin (d) | 18.85 * | 12.03 * | 7.06 | 1.70 | 1.70 | 0.00 | obs | lsc |
| 89-20-15 | margin (r) | 33.88 * | 15.94 * | 9.85 | 1.62 | 2.70 | 0.00 | obs | bb |
| 89-20-31 | Non-Diag.For. | 26.34 * | 20.75 | 8.12 | 2.56 | 4.30 | 0.00 | obs | bb |
| 89-20-38 | Non-Diag.For. | 28.45 * | 25.83 * | 7.75 | 3.33 | 5.20 | 0.00 | obs | bb |
| 89-20-39 | Non-Diag.For. | 22.48 * | 23.07 | 5.60 | 4.12 | 3.70 | 0.00 | obs | bb |
| 89-20-40 | Non-Diag.For. | 18.81 | 17.64 | 6.32 | 2.79 | 1.70 | 0.00 | obs | i |
| 89-20-23 | Non-Diag.Pt. | 33.58 * | 23.70 | 7.35 | 3.22 | 6.50 | 0.00 | obs | bb |
| 89-20-82 | Non-Diag.Pt. | 24.15 * | 18.71 | 6.58 | 2.84 | 2.50 | 0.00 | obs | bb |
| 89-20-88 | Non-Diag.Pt. | 20.43 * | 19.25 | 5.13 | 3.75 | 1.90 | 0.00 | obs | bb |
| 89-20-112 | Non-Diag.Pt. | 11.28 * | 10.50 * | 3.41 | 3.08 | 0.30 | 0.00 | obs | bb |
| 89-20-69 | overshot | 19.82 * | 35.78 | 10.02 | 3.57 | 3.50 | 0.00 | obs | |

BTF = biface trimming flake (d) = direct fracture (r) = remote fracture bb = bending break
lsc = lateral sectioning i = indeterminate C = complete p = perverse fc = facial channelling
r = radial-like break ts = tip snap nd = no data * = dimension incomplete obs = obsidian
ccr = cryptocrystalline bas = basalt bre = breccia

Figure 21. Artifact Types Correlated by Site (Acc#): All Sites

| | Acc.# | | | | | |
|---|---|---|---|---|---|---|
| | MNO-566 | [ southern complex | | ] | MNO-2466 | |
| | 89-19 | 89-20 | 89-21 | 89-22 | 89-23 | ALL |
| Flake Blank | 27/.22 | 7/.11 | 2/.08 | | | 36/.17 |
| Bif. Core | 8/.07 | 7/.11 | 3/.13 | | | 18/.07 |
| Uniface | | 1/.02 | | | | 1/.01 |
| Uniface* | 6/.05 | 3/.05 | | | 1/.50 | 10/.05 |
| G.P.Biface | 21/.17 | 12/.19 | 5/.21 | | 1/.50 | 39/.19 |
| Lss.Fml.Knife | 14/.12 | 12/.19 | 9/.37 | 1/1.00 | | 36/.17 |
| Fml. Knife | 9/.07 | | | | | 9/.04 |
| Non-Diag.For. | 23/.19 | 10/.16 | 5/.21 | | | 38/.18 |
| Non-Diag.Pt. | 12/.10 | 10/.16 | | | | 22/.11 |
| Preform | 1/.01 | | | | | 1/.01 |
| ALL | 121/1.00 | 62/1.00 | 24/1.00 | 1/1.00 | 2/1.00 | 210/1.00 |

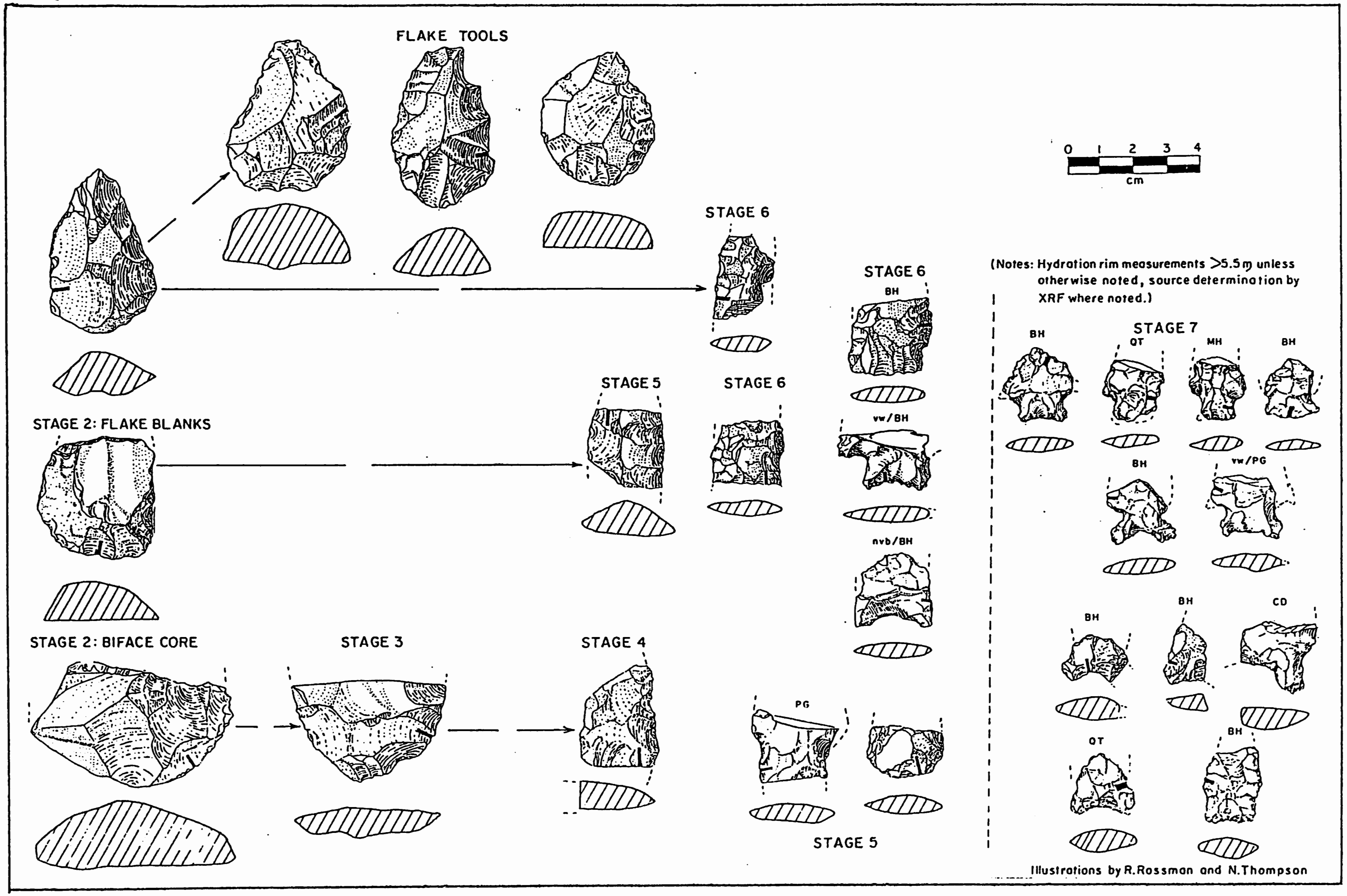


Figure 22. Possible Reduction Trajectories and Assemblage Definition: Little Lake Period Materials from MNO-564, -2456, -2488, and -2489

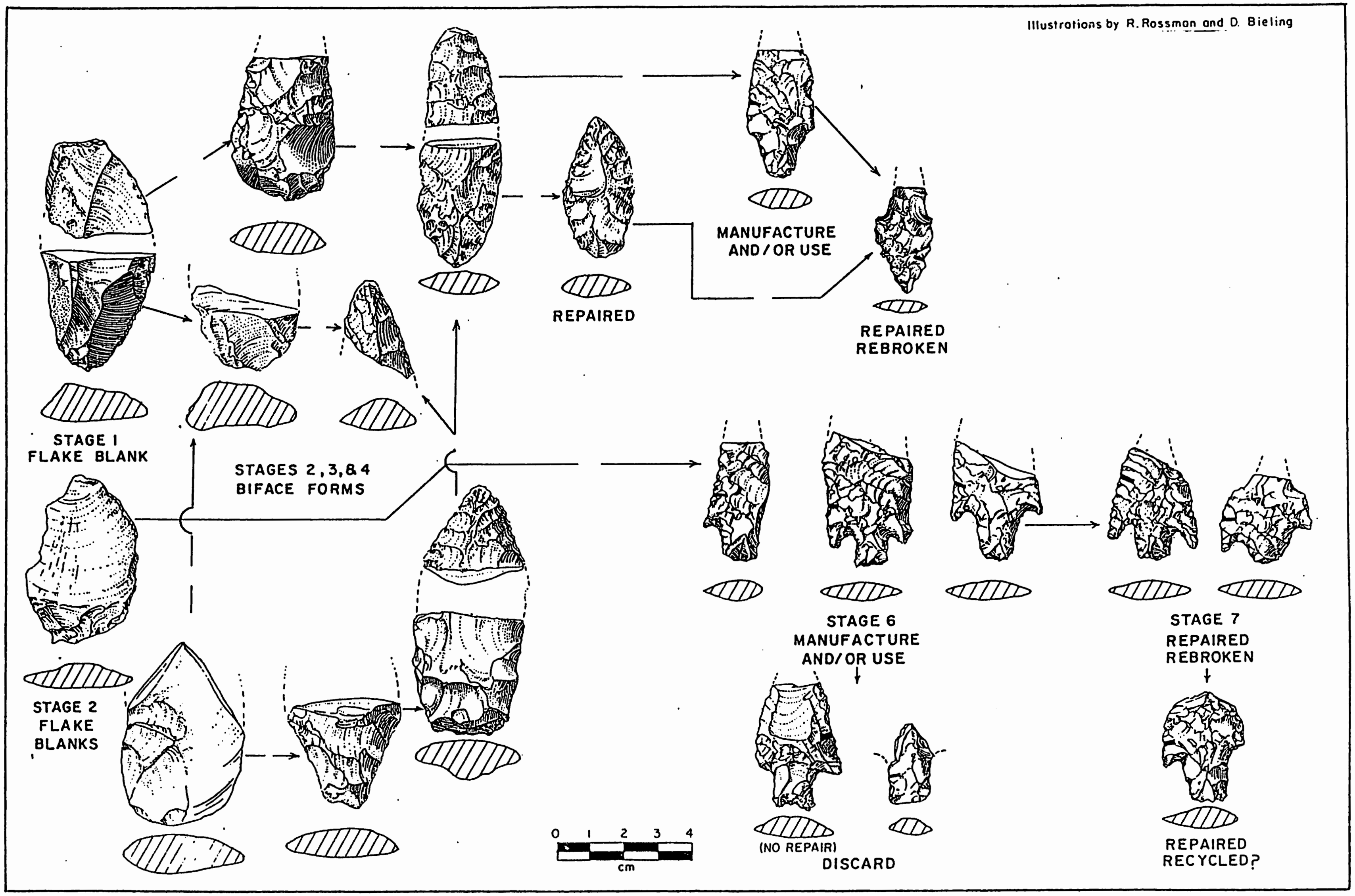


Figure 23. Examples of Possible Reduction Trajectories: Newberry Period Materials from MNO-566

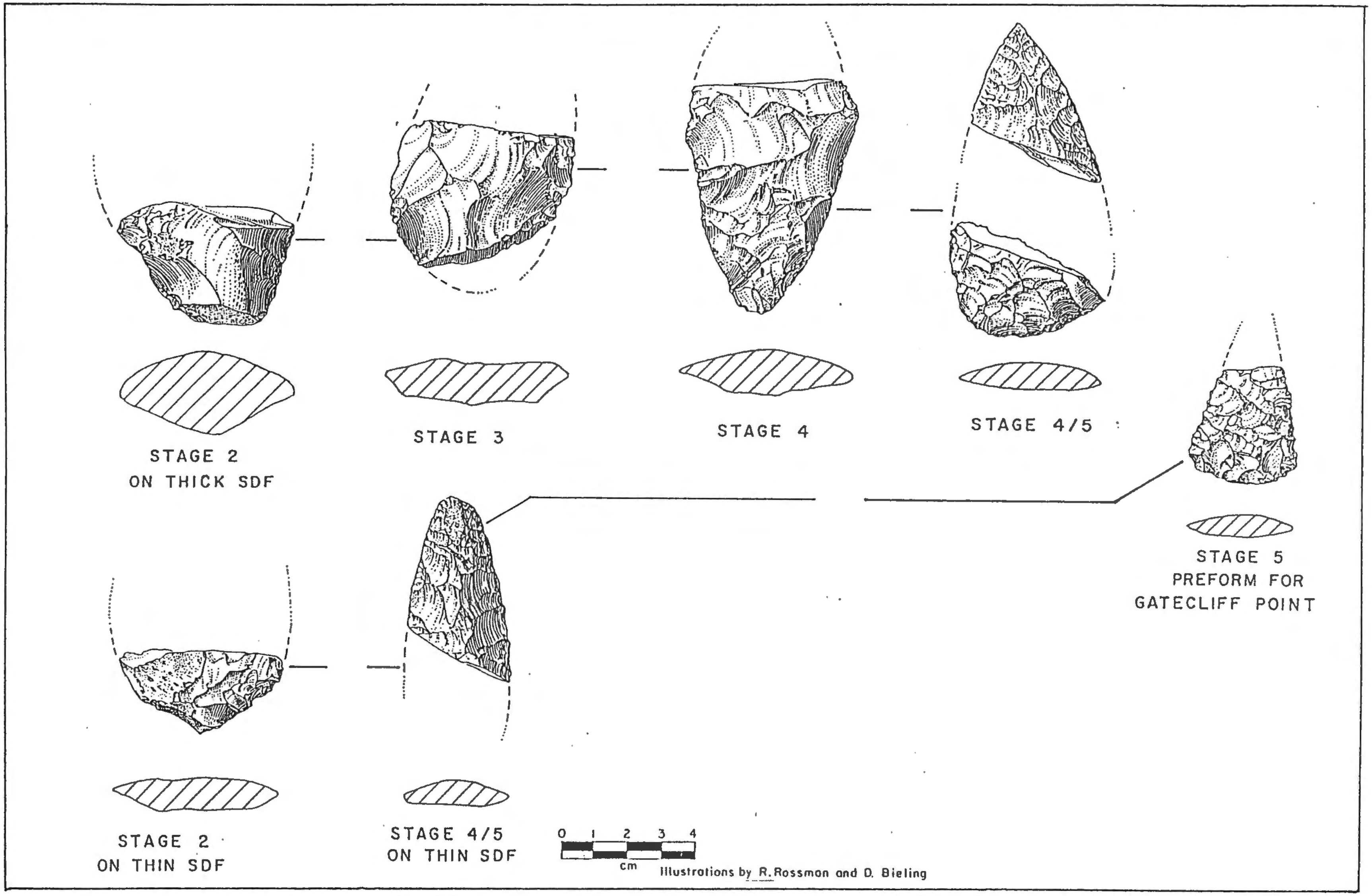


Figure 24. Examples of Possible Reduction Trajectories: Newberry Period Materials from MNO-566

Figure 25. Locus Specific Proportions of Selected Artifacts from MNO-566*

| | Locus 0 | 1 | 2 | 3 | 4 | 5 | 6 | ALL |
|---|---|---|---|---|---|---|---|---|
| EARLY STAGE | | | | | | | | |
| Bif. Core | 2 | 1 | 2 | 1 | | 1 | 1 | 8 |
| Flake Blank | 2 | 1 | 5 | 10 | 5 | 3 | 1 | 27 |
| SUM: | 4 | 2 | 7 | 11 | 5 | 4 | 2 | 35/0.29 |
| MIDDLE STAGE | | | | | | | | |
| Lss.For.Knife | 5 | | 4 | 3 | 1 | 1 | | 14 |
| G.P.Biface | 4 | | 2 | 3 | | 10 | 2 | 21 |
| Uniface* | 3 | | | 2 | | 1 | | 6 |
| SUM: | 12 | 0 | 6 | 8 | 1 | 12 | 2 | 41/0.34 |
| LATE STAGE | | | | | | | | |
| For. Knife | 3 | 1 | 2 | 1 | 1 | 1 | | 9 |
| Non-Diag.For. | 5 | 2 | 5 | 3 | 2 | 5 | 1 | 23 |
| Non-Diag.Pt. | 6 | | 1 | 3 | | 2 | | 12 |
| Preform | 1 | | | | | | | 1 |
| SUM: | 15 | 3 | 8 | 7 | 3 | 8 | 1 | 45/0.37 |
| ALL | 31 | 5 | 21 | 26 | 9 | 24 | 5 | 121 |

* underlined numbers emphasize loci distinctions.

Figure 26. Material Identification and Hydration Sample: Biface/Uniface Forms - All Sites

| Material | n/% | Hydration Sample n/% |
|---|---|---|
| Basalt | 3/0.01 | |
| Breccia | 1/0.01* | |
| CCR | 2/0.01 | |
| Obsidian | 203/0.97 | 130/0.64 |
| Total | 209/1.00 | |

| Obsidian: | | Hydration Sample |
|---|---|---|
| Sourced | 52/0.26 | 48/0.92 |
| BH | 47/0.90 | 43/0.91 |
| CD | 1/0.02 | 1/1.00 |
| MH | 1/0.02 | 1/1.00 |
| QT | 1/0.02 | 1/1.00 |
| UNK | 2/0.04 | 2/1.00 |

* <0.01

Figure 27. XRF Source Variability per Temporal Period

| | | | XRF | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Period | * | BH | CD | MGM | MH | PG | QT | unk | ALL | % |
| Marana | | 10 | | | | | | | 10 | .06 |
| Haiwee | | 12 | | | | | | | 12 | .07 |
| Newberry | 1 | 79 | 4 | | 2 | | 3 | | 89 | .53 |
| Little Lake | | 35 | 1 | 1 | 3 | 2 | 2 | 2 | 46 | .28 |
| na | | 10 | | | | | | | 10 | .06 |
| ALL | 1 | 146 | 5 | 1 | 5 | 2 | 5 | 2 | 167 | 1.00 |
| % | <1 | 87 | 3 | <1 | 3 | 1 | 3 | 1 | 1.00 | 1.00 |

* = source not yet assigned
na = not assigned

| | BH | Other |
|---|---|---|
| Marana | 1.00 | 0.00 |
| Haiwee | 1.00 | 0.00 |
| Newberry | 0.89 | 0.11 |
| Little Lake | 0.76 | 0.24 |
| na | 1.00 | 0.00 |

Figure 28. Material Variability at MNO-566

XRF and/or Material

| TYPE | BH | MH | CD | QT | BAS. | BREC | CCR | ALL |
|---|---|---|---|---|---|---|---|---|
| **EARLY STAGE** | | | | | | | | |
| Flake Blank | 7 | 1 | | | | | 1 | 9 |
| Bif. Core | 3 | | | | | | | 3 |
| Uniface | | | | | 1 | | | 1 |
| Total: | 10 | 1 | | | 1 | | 1 | 13 |
| **MIDDLE STAGE** | | | | | | | | |
| G.P.Biface | 1 | | | | | 1 | | 2 |
| Ls.For.Knife | 1 | | | | | | | 1 |
| Total: | 2 | | | | | 1 | | 3 |
| **LATE STAGE** | | | | | | | | |
| For. Knife | 5 | | | | | | | 5 |
| Non-Diag.For. | 1 | | | | | | 1 | 2 |
| Non-Diag.Pt. | | | | | 1 | | | 1 |
| Preform | 1 | | | | | | | 1 |
| Diag.Points* | 28 | 2 | 3 | 2 | 1 | | | 36 |
| Total: | 35 | 2 | 3 | 2 | 2 | | 1 | 45 |
| ALL | 47 | 3 | 3 | 2 | 3 | 1 | 2 | 61 |

* Includes all points except Desert Series and Rosegates (Late Period points)

Figure 29. Ratio of Bodie Hills to Non-Bodie Hills: MNO-566*

| Stage | BH n / % | Non-BH n / % | All n / % | Ratio BH \| Non-BH |
|---|---|---|---|---|
| Early | 10 / 0.77 | 3 / 0.23 | 13 / 1.00 | 3.3 \| 1 |
| Middle | 2 / 0.66 | 1 / 0.33 | 3 / 1.00 | 2.0 \| 1 |
| Late | 35 / 0.78 | 10 / 0.22 | 45 / 1.00 | 3.5 \| 1 |
| All | 47 / 0.77 | 14 / 0.23 | 61 / 1.00 | 3.4 \| 1 |

* Includes all points except Desert Series and Rosegates (Late Period points)

# Appendix

Appendix A
Hydration Data

Hydration Project No.: 89H-849

| Hydration Item No. | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | | Source |
|---|---|---|---|---|---|---|---|---|
| 86 | | | | | | | omitted | |
| 87 | | | | | | | omitted | |
| 177 | | | | | | | omitted | |
| 307 | 89-20-16 | biface | non-locus | | surface | 6.2 | | |
| 285 | 89-20-23 | biface | non-locus | | surface | 5.0 | | |
| 301 | 89-20-31 | biface | non-locus | | surface | 5.0 | | |
| 309 | 89-20-37 | biface | non-locus | | surface | 6.4 | | |
| 181 | 89-20-39 | biface | non-locus | | surface | 6.4 | | BH |
| 185 | 89-20-70 | biface | non-locus | | surface | 3.1 | | BH |
| 303 | 89-20-82 | biface | non-locus | | surface | 6.1 | | |
| 312 | 89-20-85 | biface | non-locus | | surface | 3.5 | 2 bands: 3.5/5.9 | |
| 312 | 89-20-85 | biface | non-locus | | surface | 5.9 | *2 bands: 3.5/5.9 | |
| 549 | 89-20-241 C | debitage | | L2-4 | 10-20cm | | 6.6 re-cut HLN 213 | |
| 544 | 89-20-255 B | debitage | | L3-2 | 10-20cm | | DH re-cut HLN 218 | |
| 545 | 89-20-255 E | debitage | | L3-2 | 10-20cm | | NVB re-cut HLN 221 | |
| 546 | 89-20-255 F | debitage | | L3-2 | 10-20cm | | 1.5 re-cut HLN 222 | |
| 547 | 89-20-282 B | debitage | | L4-1 | 10-20cm | | 7.1 re-cut HLN 224 | |
| 548 | 89-20-294 C | debitage | | L5-1 | 10-20cm | | 4.6 re-cut HLN 230 | |
| 541 | 89-20-14 | flake tool | non-locus | | surface | 6.8 | | |
| 54 | 89-20-223 | proj. pt. | no prov. | | surface | | NVB, weathered | BH |
| 43 | 89-20-26 | proj. pt. | non-locus | | surface | 4.9 | | * |
| 44 | 89-20-27 | proj. pt. | non-locus | | surface | 6.7 | | MH |
| 45 | 89-20-28 | proj. pt. | non-locus | | surface | 6.4 | | BH |
| 39 | 89-20-2A | proj. pt. | non-locus | | surface | 4.4 | | BH |
| 40 | 89-20-2B | proj. pt. | non-locus | | surface | 4.3 | | BH |
| 41 | 89-20-3 | proj. pt. | non-locus | | surface | | VW, weathered | PG |
| 52 | 89-20-81 | proj. pt. | non-locus | | surface | 5.6 | | PG |

MNO-564

| Hydration Item No. | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | | Source |
|---|---|---|---|---|---|---|---|---|
| 289 | 89-20-112 | biface | Locus 4 | | surface | 2.7 | | |
| 191 | 89-20-244 | biface | Locus 3 | L3-1 | 0-10cm | 2.6 | | BH |
| 306 | 89-20-251 | biface | Locus 3 | L3-2 | 0-10cm | 6.7 | | |
| 192 | 89-20-266 | biface | Locus 3 | L3-5 | 0-10cm | 1.2 | | BH |
| 308 | 89-20-33 | biface | Locus 4 | | surface | 3.8 | 2 bands: 3.8/7.3 | |
| 308 | 89-20-33 | biface | Locus 4 | | surface | 7.3 | *2 bands: 3.8/7.3 | |
| 193 | 89-20-338 | biface | Locus 3 | L3-4 | 0-10cm | 7.7 | | BH |
| 286 | 89-20-35 | biface | Locus 4 | | surface | 5.4 | | |
| 182 | 89-20-44 | biface | Locus 2 | | surface | 6.3 | | BH |

Appendix A
Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | | Source |
|---|---|---|---|---|---|---|---|---|
| 86 | | | | | | | omitted | |
| 87 | | | | | | | omitted | |
| 177 | | | | | | | omitted | |
| 307 | 89-20-16 | biface | non-locus | | surface | 6.2 | | |
| 285 | 89-20-23 | biface | non-locus | | surface | 5.0 | | |
| 301 | 89-20-31 | biface | non-locus | | surface | 5.0 | | |
| 309 | 89-20-37 | biface | non-locus | | surface | 6.4 | | |
| 181 | 89-20-39 | biface | non-locus | | surface | 6.4 | | BH |
| 185 | 89-20-70 | biface | non-locus | | surface | 3.1 | | BH |
| 303 | 89-20-82 | biface | non-locus | | surface | 6.1 | | |
| 312 | 89-20-85 | biface | non-locus | | surface | 3.5 | 2 bands: 3.5/5.9 | |
| 312 | 89-20-85 | biface | non-locus | | surface | 5.9 | *2 bands: 3.5/5.9 | |
| 549 | 89-20-241 C | debitage | | L2-4 | 10-20cm | | 6.6 re-cut HLN 213 | |
| 544 | 89-20-255 B | debitage | | L3-2 | 10-20cm | | DH re-cut HLN 218 | |
| 545 | 89-20-255 E | debitage | | L3-2 | 10-20cm | | NVB re-cut HLN 221 | |
| 546 | 89-20-255 F | debitage | | L3-2 | 10-20cm | | 1.5 re-cut HLN 222 | |
| 547 | 89-20-282 B | debitage | | L4-1 | 10-20cm | | 7.1 re-cut HLN 224 | |
| 548 | 89-20-294 C | debitage | | L5-1 | 10-20cm | | 4.6 re-cut HLN 230 | |
| 541 | 89-20-14 | flake tool | non-locus | | surface | 6.8 | | |
| 54 | 89-20-223 | proj. pt. | no prov. | | surface | | NVB, weathered | BH |
| 43 | 89-20-26 | proj. pt. | non-locus | | surface | 4.9 | | * |
| 44 | 89-20-27 | proj. pt. | non-locus | | surface | 6.7 | | MH |
| 45 | 89-20-28 | proj. pt. | non-locus | | surface | 6.4 | | BH |
| 39 | 89-20-2A | proj. pt. | non-locus | | surface | 4.4 | | BH |
| 40 | 89-20-2B | proj. pt. | non-locus | | surface | 4.3 | | BH |
| 41 | 89-20-3 | proj. pt. | non-locus | | surface | | VW, weathered | PG |
| 52 | 89-20-81 | proj. pt. | non-locus | | surface | 5.6 | | PG |

MNO-564

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | | Source |
|---|---|---|---|---|---|---|---|---|
| 289 | 89-20-112 | biface | Locus 4 | | surface | 2.7 | | |
| 191 | 89-20-244 | biface | Locus 3 | L3-1 | 0-10cm | 2.6 | | BH |
| 306 | 89-20-251 | biface | Locus 3 | L3-2 | 0-10cm | 6.7 | | |
| 192 | 89-20-266 | biface | Locus 3 | L3-5 | 0-10cm | 1.2 | | BH |
| 308 | 89-20-33 | biface | Locus 4 | | surface | 3.8 | 2 bands: 3.8/7.3 | |
| 308 | 89-20-33 | biface | Locus 4 | | surface | 7.3 | *2 bands: 3.8/7.3 | |
| 193 | 89-20-338 | biface | Locus 3 | L3-4 | 0-10cm | 7.7 | | BH |
| 286 | 89-20-35 | biface | Locus 4 | | surface | 5.4 | | |
| 182 | 89-20-44 | biface | Locus 2 | | surface | 6.3 | | BH |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 302 | 89-20-48 | biface | Locus 3 | | surface | 5.9 | |
| 183 | 89-20-54 | biface | Locus 2 | | surface | 5.8 | BH |
| 305 | 89-20-59 | biface | Locus 3 | | surface | 4.9 | |
| 184 | 89-20-61 | biface | Locus 3 | | surface | 4.2 | BH |
| 310 | 89-20-62 | biface | Locus 3 | | surface | 4.3 | |
| 287 | 89-20-64 | biface | Locus 3 | | surface | 7.4 | |
| 311 | 89-20-65 | biface | Locus 3 | | surface | 2.6 | |
| 304 | 89-20-67 | biface | Locus 3 | | surface | 6.8 | |
| 288 | 89-20-78 | biface | Locus 3 | | surface | 4.1 | |
| 580 | 89-20-105 A | debitage | Locus 4 | STU | 0-10cm | 1.2 | |
| 581 | 89-20-105 B | debitage | Locus 4 | STU | 0-10cm | 8.6 | |
| 582 | 89-20-105 C | debitage | Locus 4 | STU | 0-10cm | DH, weathered | |
| 583 | 89-20-105 D | debitage | Locus 4 | STU | 0-10cm | 7.2 | |
| 584 | 89-20-105 E | debitage | Locus 4 | STU | 0-10cm | 6.1 | |
| 585 | 89-20-105 F | debitage | Locus 4 | STU | 0-10cm | 7.1 | |
| 586 | 89-20-107 A | debitage | Locus 4 | STU | 0-10cm | 7.7 | |
| 587 | 89-20-107 B | debitage | Locus 4 | STU | 0-10cm | 6.6 | |
| 588 | 89-20-107 C | debitage | Locus 4 | STU | 0-10cm | 5.7 | |
| 589 | 89-20-107 D | debitage | Locus 4 | STU | 0-10cm | 4.9 | |
| 590 | 89-20-107 E | debitage | Locus 4 | STU | 0-10cm | 7.9 | |
| 591 | 89-20-146 A | debitage | Locus 2 | STU | 0-10cm | 6.8 | |
| 592 | 89-20-146 B | debitage | Locus 2 | STU | 0-10cm | 7.3 | |
| 593 | 89-20-146 C | debitage | Locus 2 | STU | 0-10cm | 7.5 | |
| 594 | 89-20-146 D | debitage | Locus 2 | STU | 0-10cm | 6.2 | |
| 595 | 89-20-146 E | debitage | Locus 2 | STU | 0-10cm | 6.4 | |
| 601 | 89-20-178 A | debitage | Locus 2 | STU | 0-10cm | 6.0 | |
| 602 | 89-20-178 B | debitage | Locus 2 | STU | 0-10cm | 6.6 | |
| 603 | 89-20-178 C | debitage | Locus 2 | STU | 0-10cm | 8.5 was re-cut | |
| 604 | 89-20-178 D | debitage | Locus 2 | STU | 0-10cm | 7.3 | |
| 605 | 89-20-178 E | debitage | Locus 2 | STU | 0-10cm | 7.2 | |
| 264 | 89-20-233 A | debitage | Locus 2 | L2-3 | 10-20cm | 7.7 | |
| 265 | 89-20-233 B | debitage | Locus 2 | L2-3 | 10-20cm | 2.5 | |
| 280 | 89-20-233 C | debitage | Locus 2 | L2-3 | 0-10cm | 7.4 | |
| 281 | 89-20-233 D | debitage | Locus 2 | L2-3 | 0-10cm | 1.7 | |
| 282 | 89-20-233 E | debitage | Locus 2 | L2-3 | 0-10cm | NVB | |
| 283 | 89-20-233 F | debitage | Locus 2 | L2-3 | 0-10cm | 7.2 | |
| 284 | 89-20-233 G | debitage | Locus 2 | L2-3 | 0-10cm | 5.9 | |
| 317 | 89-20-233 H | debitage | Locus 2 | L2-3 | 0-10cm | 6.0 | |
| 318 | 89-20-233 I | debitage | Locus 2 | L2-3 | 0-10cm | 5.7 | |
| 319 | 89-20-233 J | debitage | Locus 2 | L2-3 | 0-10cm | 7.2 | |
| 320 | 89-20-233 K | debitage | Locus 2 | L2-3 | 0-10cm | 7.7 | |
| 321 | 89-20-233 L | debitage | Locus 2 | L2-3 | 0-10cm | 6.1 | |
| 322 | 89-20-233 M | debitage | Locus 2 | L2-3 | 0-10cm | 4.4 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 323 | 89-20-233 N | debitage | Locus 2 | L2-3 | 0-10cm | 7.3 | |
| 324 | 89-20-233 O | debitage | Locus 2 | L2-3 | 0-10cm | 6.5 | |
| 325 | 89-20-233 P | debitage | Locus 2 | L2-3 | 0-10cm | 5.8 | |
| 326 | 89-20-233 Q | debitage | Locus 2 | L2-3 | 0-10cm | 7.7 | |
| 360 | 89-20-233 R | debitage | Locus 2 | L2-3 | 0-10cm | 4.9 | BH |
| 361 | 89-20-233 S | debitage | Locus 2 | L2-3 | 0-10cm | 8.0 | MH |
| 362 | 89-20-233 T | debitage | Locus 2 | L2-3 | 0-10cm | 5.7 | BH |
| 363 | 89-20-233 U | debitage | Locus 2 | L2-3 | 0-10cm | 6.2 | BH |
| 364 | 89-20-233 V | debitage | Locus 2 | L2-3 | 0-10cm | 7.0 | BH |
| 365 | 89-20-233 W | debitage | Locus 2 | L2-3 | 0-10cm | 6.8 | BH |
| 366 | 89-20-233 X | debitage | Locus 2 | L2-3 | 0-10cm | 6.7 | BH |
| 367 | 89-20-233 Y | debitage | Locus 2 | L2-3 | 0-10cm | 6.8 | BH |
| 261 | 89-20-234 A | debitage | Locus 2 | L2-3 | 10-20cm | 6.9 | |
| 262 | 89-20-234 B | debitage | Locus 2 | L2-3 | 10-20cm | 6.7 | |
| 263 | 89-20-234 C | debitage | Locus 2 | L2-3 | 10-20cm | 3.1 | |
| 327 | 89-20-239 A | debitage | Locus 2 | L2-4 | 0-10cm | 3.7 2 bands: 3.7/6.7 | |
| 327 | 89-20-239 A | debitage | Locus 2 | L2-4 | 0-10cm | 6.7 *2 bands: 3.7/6.7 | |
| 328 | 89-20-239 B | debitage | Locus 2 | L2-4 | 0-10cm | 7.3 | |
| 329 | 89-20-239 C | debitage | Locus 2 | L2-4 | 0-10cm | 7.2 | |
| 330 | 89-20-239 D | debitage | Locus 2 | L2-4 | 0-10cm | 7.2 | |
| 671 | 89-20-239 E | debitage | Locus 2 | L2-4 | 0-10cm | 6.8 | |
| 672 | 89-20-239 F | debitage | Locus 2 | L2-4 | 0-10cm | 5.2 | |
| 673 | 89-20-239 G | debitage | Locus 2 | L2-4 | 0-10cm | 7.5 | |
| 674 | 89-20-239 H | debitage | Locus 2 | L2-4 | 0-10cm | 6.1 | |
| 675 | 89-20-239 I | debitage | Locus 2 | L2-4 | 0-10cm | 6.1 | |
| 211 | 89-20-241 A | debitage | Locus 2 | L2-4 | 10-20cm | NVB, weathered | BH |
| 212 | 89-20-241 B | debitage | Locus 2 | L2-4 | 10-20cm | 6.9 | BH |
| 213 | 89-20-241 C | debitage | Locus 2 | L2-4 | 10-20cm | 6.6 | BH |
| 214 | 89-20-241 D | debitage | Locus 2 | L2-4 | 10-20cm | 5.1 | BH |
| 215 | 89-20-241 E | debitage | Locus 2 | L2-4 | 10-20cm | 5.2 | BH |
| 216 | 89-20-241 F | debitage | Locus 2 | L2-4 | 10-20cm | 6.6 | BH |
| 676 | 89-20-245 A | debitage | Locus 3 | L3-1 | 0-10cm | 6.0 | |
| 677 | 89-20-245 B | debitage | Locus 3 | L3-1 | 0-10cm | 5.7 | |
| 678 | 89-20-245 C | debitage | Locus 3 | L3-1 | 0-10cm | DH | |
| 679 | 89-20-245 D | debitage | Locus 3 | L3-1 | 0-10cm | 5.2 | |
| 680 | 89-20-245 E | debitage | Locus 3 | L3-1 | 0-10cm | 3.6 | |
| 291 | 89-20-252 A | debitage | Locus 3 | L3-2 | 0-10cm | 5.1 | |
| 292 | 89-20-252 B | debitage | Locus 3 | L3-2 | 0-10cm | 1.4 | |
| 293 | 89-20-252 C | debitage | Locus 3 | L3-2 | 0-10cm | 3.1 | |
| 294 | 89-20-252 D | debitage | Locus 3 | L3-2 | 0-10cm | 3.1 | |
| 295 | 89-20-252 E | debitage | Locus 3 | L3-2 | 0-10cm | 1.2 | |
| 296 | 89-20-252 F | debitage | Locus 3 | L3-2 | 0-10cm | 6.2 | |
| 297 | 89-20-252 G | debitage | Locus 3 | L3-2 | 0-10cm | 3.8 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 298 | 89-20-252 H | debitage | Locus 3 | L3-2 | 0-10cm | DH | |
| 299 | 89-20-252 I | debitage | Locus 3 | L3-2 | 0-10cm | 2.8 | |
| 300 | 89-20-252 J | debitage | Locus 3 | L3-2 | 0-10cm | 1.8 | |
| 217 | 89-20-255 A | debitage | Locus 3 | L3-2 | 10-20cm | 3.9 | BH |
| 218 | 89-20-255 B | debitage | Locus 3 | L3-2 | 10-20cm | DH | BH |
| 219 | 89-20-255 C | debitage | Locus 3 | L3-2 | 10-20cm | 3.1 | BH |
| 220 | 89-20-255 D | debitage | Locus 3 | L3-2 | 10-20cm | NVB | BH |
| 221 | 89-20-255 E | debitage | Locus 3 | L3-2 | 10-20cm | NVB | BH |
| 222 | 89-20-255 F | debitage | Locus 3 | L3-2 | 10-20cm | 1.5 | BH |
| 313 | 89-20-255 G | debitage | Locus 3 | L3-2 | 10-20cm | 5.4 | |
| 314 | 89-20-255 H | debitage | Locus 3 | L3-2 | 10-20cm | 3.8 | |
| 315 | 89-20-255 I | debitage | Locus 3 | L3-2 | 10-20cm | 1.3 | |
| 316 | 89-20-255 J | debitage | Locus 3 | L3-2 | 10-20cm | 5.5 | |
| 681 | 89-20-259 A | debitage | Locus 3 | L3-4 | 0-10cm | DH | |
| 682 | 89-20-259 B | debitage | Locus 3 | L3-4 | 0-10cm | 6.9 | |
| 683 | 89-20-259 C | debitage | Locus 3 | L3-4 | 0-10cm | 5.0 | |
| 684 | 89-20-259 D | debitage | Locus 3 | L3-4 | 0-10cm | 5.4 | |
| 685 | 89-20-259 E | debitage | Locus 3 | L3-4 | 0-10cm | 6.1 | |
| 686 | 89-20-259 F | debitage | Locus 3 | L3-4 | 0-10cm | 5.9 | |
| 687 | 89-20-259 G | debitage | Locus 3 | L3-4 | 0-10cm | 3.4 | |
| 688 | 89-20-259 H | debitage | Locus 3 | L3-4 | 0-10cm | 5.6 | |
| 689 | 89-20-259 I | debitage | Locus 3 | L3-4 | 0-10cm | 5.5 | |
| 690 | 89-20-259 J | debitage | Locus 3 | L3-4 | 0-10cm | 5.8 | |
| 258 | 89-20-270 A | debitage | Locus 3 | L3-5 | 0-10cm | DH, weathered | |
| 259 | 89-20-270 B | debitage | Locus 3 | L3-5 | 0-10cm | DH | |
| 260 | 89-20-270 C | debitage | Locus 3 | L3-5 | 0-10cm | 4.6 | |
| 691 | 89-20-270 D | debitage | Locus 3 | L3-5 | 0-10cm | 4.9 | |
| 692 | 89-20-270 E | debitage | Locus 3 | L3-5 | 0-10cm | 1.8 | |
| 693 | 89-20-270 F | debitage | Locus 3 | L3-5 | 0-10cm | DH, weathered | |
| 694 | 89-20-270 G | debitage | Locus 3 | L3-5 | 0-10cm | 5.1 | |
| 695 | 89-20-270 H | debitage | Locus 3 | L3-5 | 0-10cm | 5.0 | |
| 696 | 89-20-270 I | debitage | Locus 3 | L3-5 | 0-10cm | 4.1 | |
| 697 | 89-20-270 J | debitage | Locus 3 | L3-5 | 0-10cm | 2.6 was re-cut | |
| 698 | 89-20-270 K | debitage | Locus 3 | L3-5 | 0-10cm | 4.7 | |
| 699 | 89-20-270 L | debitage | Locus 3 | L3-5 | 0-10cm | DH, weathered | |
| 700 | 89-20-270 M | debitage | Locus 3 | L3-5 | 0-10cm | 1.8 was re-cut; 2nd = 6.5 | |
| 700 | 89-20-270 M | debitage | Locus 3 | L3-5 | 0-10cm | 6.5 *2 bands: 1.8/6.5 | |
| 701 | 89-20-270 N | debitage | Locus 3 | L3-5 | 0-10cm | 3.9 | |
| 702 | 89-20-270 O | debitage | Locus 3 | L3-5 | 0-10cm | lost | |
| 703 | 89-20-270 P | debitage | Locus 3 | L3-5 | 0-10cm | 4.2 | |
| 704 | 89-20-270 Q | debitage | Locus 3 | L3-5 | 0-10cm | was used up | |
| 705 | 89-20-270 R | debitage | Locus 3 | L3-5 | 0-10cm | 3.7 | |
| 706 | 89-20-270 S | debitage | Locus 3 | L3-5 | 0-10cm | was re-cut; DH | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 707 | 89-20-270 T | debitage | Locus 3 | L3-5 | 0-10cm | 4.4 was re-cut | |
| 708 | 89-20-270 U | debitage | Locus 3 | L3-5 | 0-10cm | 1.1 | |
| 709 | 89-20-270 V | debitage | Locus 3 | L3-5 | 0-10cm | 4.3 | |
| 710 | 89-20-270 W | debitage | Locus 3 | L3-5 | 0-10cm | 5.0 was re-cut | |
| 251 | 89-20-275 A | debitage | Locus 3 | L3-5 | 10-20cm | 3.0 | |
| 252 | 89-20-275 B | debitage | Locus 3 | L3-5 | 10-20cm | 3.7 | |
| 253 | 89-20-275 C | debitage | Locus 3 | L3-5 | 10-20cm | 1.3 | |
| 254 | 89-20-275 D | debitage | Locus 3 | L3-5 | 10-20cm | 4.2 | |
| 255 | 89-20-275 E | debitage | Locus 3 | L3-5 | 10-20cm | 3.8 | |
| 256 | 89-20-275 F | debitage | Locus 3 | L3-5 | 10-20cm | 5.6 | |
| 257 | 89-20-275 G | debitage | Locus 3 | L3-5 | 10-20cm | 3.6 | |
| 711 | 89-20-281 A | debitage | Locus 3 | L3-5 | 0-10cm | 8.6 | |
| 712 | 89-20-281 B | debitage | Locus 3 | L3-5 | 0-10cm | 5.6 | |
| 713 | 89-20-281 C | debitage | Locus 3 | L3-5 | 0-10cm | 7.0 | |
| 714 | 89-20-281 D | debitage | Locus 3 | L3-5 | 0-10cm | 7.2 | |
| 715 | 89-20-281 E | debitage | Locus 3 | L3-5 | 0-10cm | 8.3 | |
| 223 | 89-20-282 A | debitage | Locus 4 | L4-1 | 10-20cm | 5.7 | BH |
| 224 | 89-20-282 B | debitage | Locus 4 | L4-1 | 10-20cm | 7.1 | BH |
| 225 | 89-20-284 A | debitage | Locus 4 | L4-2 | 10-20cm | 6.8 | BH |
| 226 | 89-20-284 B | debitage | Locus 4 | L4-2 | 10-20cm | 5.5 | BH |
| 227 | 89-20-284 C | debitage | Locus 4 | L4-2 | 10-20cm | VW (6.0-8.5) | BH |
| 228 | 89-20-284 D | debitage | Locus 4 | L4-2 | 10-20cm | 7.5 | MGM |
| 542 | 89-20-18 | flake tool | Locus 4 | | surface | 6.2 | |
| 543 | 89-20-66 | flake tool | Locus 3 | | surface | 5.6 2nd band=8.5-10.0 VW | |
| 46 | 89-20-34 | proj. pt. | Locus 4 | | surface | 6.2 | QT |
| 42 | 89-20-4 | proj. pt. | Locus 4 | | surface | 6.0 | BH |
| 47 | 89-20-45 | proj. pt. | Locus 2 | | surface | NVB | CD |
| 48 | 89-20-50 | proj. pt. | Locus 2 | | surface | 7.0 | BH |
| 49 | 89-20-51 | proj. pt. | Locus 3 | | surface | 5.6 | BH |
| 50 | 89-20-52 | proj. pt. | Locus 3 | | surface | NVB | BH |
| 53 | 89-20-91 | proj. pt. | Locus 3 | | surface | 6.4 | QT |

MNO-566

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 133 | 89-19-100 | biface | Locus 3 | | surface | 4.4 | BH |
| 378 | 89-19-103 | biface | Locus 3 | | surface | 4.4 | |
| 522 | 89-19-104 | biface | Locus 4 | | surface | 4.8 | |
| 538 | 89-19-106 | biface | non-locus | | surface | 4.6 | |
| 134 | 89-19-107 | biface | Locus 6 | | surface | 5.7 | BH |
| 336 | 89-19-109 | biface | Locus 2 | | surface | 4.6 | |
| 353 | 89-19-110 | biface | Locus 5 | | surface | 4.4 | |
| 359 | 89-19-111 | biface | Locus 5 | | surface | 4.4 | |
| 355 | 89-19-112 | biface | Locus 5 | | surface | 5.1 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 135 | 89-19-113 | biface | non-locus | | surface | 4.1 | BH |
| 136 | 89-19-114 | biface | non-locus | | surface | 3.8 | BH |
| 537 | 89-19-118 | biface | non-locus | | surface | 4.3 | |
| 533 | 89-19-121 | biface | Locus 6 | | surface | 3.7 | |
| 534 | 89-19-124 | biface | Locus 6 | | surface | 3.7 | |
| 351 | 89-19-125 | biface | Locus 5 | | surface | 4.4 | |
| 347 | 89-19-127 | biface | Locus 5 | | surface | 4.8 | |
| 527 | 89-19-128 | biface | Locus 5 | | surface | 5.6 | |
| 348 | 89-19-129 | biface | Locus 5 | | surface | 4.9 | |
| 123 | 89-19-14 | biface | non-locus | | surface | 4.0 | BH |
| 352 | 89-19-142 | biface | Locus 5 | | surface | 4.9 | |
| 349 | 89-19-147 | biface | Locus 5 | | surface | 4.9 | |
| 536 | 89-19-15 | biface | non-locus | | surface | 4.8 | |
| 528 | 89-19-152 | biface | Locus 5 | | surface | 4.5 | |
| 356 | 89-19-153 | biface | Locus 5 | | surface | DH | |
| 137 | 89-19-158 | biface | no prov. | | surface | 5.3 | BH |
| 331 | 89-19-17 | biface | Locus 2 | | surface | 4.5 | |
| 138 | 89-19-188 | biface | Locus 3 | | surface | DH | BH |
| 333 | 89-19-19 | biface | Locus 2 | | surface | 4.6 | |
| 338 | 89-19-21 | biface | Locus 2 | | surface | 6.9 | |
| 124 | 89-19-22 | biface | Locus 2 | | surface | 3.7 | BH |
| 509 | 89-19-23 | biface | Locus 2 | | surface | 2.5 | |
| 125 | 89-19-25 | biface | Locus 3 | | surface | 4.2 | BH |
| 531 | 89-19-261 | biface | Locus 5 | STU | 0-10cm | 4.0 | |
| 345 | 89-19-28 | biface | Locus 3 | | surface | 4.4 | |
| 126 | 89-19-29 | biface | Locus 4 | | surface | 3.8 | BH |
| 524 | 89-19-30 | biface | Locus 4 | | surface | 3.7 | |
| 337 | 89-19-302 | biface | Locus 2 | L2-3 | 60-70cm | 3.5 | |
| 512 | 89-19-31 | biface | Locus 3 | | surface | 4.2 | |
| 502 | 89-19-32 | biface | Locus 1 | | surface | 2.7 | |
| 505 | 89-19-33 | biface | Locus 1 | | surface | 4.1 | |
| 127 | 89-19-35 | biface | Locus 1 | | surface | weathered | BH |
| 128 | 89-19-39 | biface | Locus 2 | | surface | 4.4 | BH |
| 334 | 89-19-40 | biface | Locus 2 | | surface | 4.3 | |
| 129 | 89-19-43 | biface | Locus 3 | | surface | 4.7 | BH |
| 139 | 89-19-473 | biface | Locus 5 | L5-1 | 20-30cm | 4.1 | BH |
| 357 | 89-19-485 | biface | Locus 5 | L5-2 | 20-30cm | 4.2 | |
| 346 | 89-19-492 | biface | Locus 5 | L5-2 | 50-60cm | 4.4 | |
| 130 | 89-19-50 | biface | Locus 3 | | surface | 4.4 | BH |
| 339 | 89-19-51 | biface | Locus 3 | | surface | 4.5 | |
| 519 | 89-19-52 | biface | Locus 3 | | surface | 2.8 | |
| 358 | 89-19-534 | biface | Locus 5 | | surface | 2.0 weathered | |
| 350 | 89-19-535 | biface | Locus 5 | | surface | 4.3 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 141 | 89-19-540 | biface | non-locus | STU | 0-10cm | 5.0 | BH |
| 140 | 89-19-541 | biface | non-locus | | surface | 4.9 | BH |
| 354 | 89-19-544 | biface | Locus 5 | STU | 0-10cm | DH | |
| 342 | 89-19-56 | biface | Locus 3 | | surface | 5.0 | |
| 142 | 89-19-563 | biface | Locus 5 | | surface | 5.4 | BH |
| 343 | 89-19-564 | biface | Locus 3 | L3-6 | 40-50cm | 4.0 | |
| 344 | 89-19-64 | biface | Locus 3 | | surface | 4.7 | |
| 539 | 89-19-65 | biface | non-locus | | surface | 3.8 | |
| 511 | 89-19-66 | biface | Locus 2 | | surface | DH | |
| 340 | 89-19-72 | biface | Locus 3 | | surface | 5.2 | |
| 516 | 89-19-73 | biface | Locus 3 | | surface | 5.7 | |
| 131 | 89-19-74 | biface | Locus 3 | | surface | 6.7 | MH |
| 523 | 89-19-76 | biface | Locus 4 | | surface | 4.6 | |
| 132 | 89-19-77 | biface | Locus 4 | | surface | 4.5 | BH |
| 332 | 89-19-88 | biface | Locus 2 | | surface | 5.2 | |
| 504 | 89-19-89 | biface | Locus 1 | | surface | 4.8 | |
| 335 | 89-19-95 | biface | Locus 2 | | surface | 4.4 | |
| 510 | 89-19-96 | biface | Locus 2 | | surface | 3.8 | |
| 341 | 89-19-98 | biface | Locus 3 | | surface | 4.1 | |
| 508 | 89-19-99 | biface | Locus 2 | | surface | 3.9 | |
| 414 | 89-19-212 A | debitage | Locus 3 | STU | 0-10cm | 3.0 | |
| 415 | 89-19-212 B | debitage | Locus 3 | STU | 0-10cm | 4.7 | |
| 416 | 89-19-212 C | debitage | Locus 3 | STU | 0-10cm | 4.7 | |
| 417 | 89-19-212 D | debitage | Locus 3 | STU | 0-10cm | 5.0 | |
| 418 | 89-19-212 E | debitage | Locus 3 | STU | 0-10cm | 3.1 | |
| 419 | 89-19-229 A | debitage | Locus 3 | STU | 0-10cm | 3.5 | |
| 420 | 89-19-229 B | debitage | Locus 3 | STU | 0-10cm | 4.4 | |
| 421 | 89-19-229 C | debitage | Locus 3 | STU | 0-10cm | 3.8 | |
| 422 | 89-19-229 D | debitage | Locus 3 | STU | 0-10cm | 3.8 | |
| 423 | 89-19-229 E | debitage | Locus 3 | STU | 0-10cm | 4.0 | |
| 424 | 89-19-239 A | debitage | Locus 6 | STU | 0-10cm | 3.8 | |
| 425 | 89-19-239 B | debitage | Locus 6 | STU | 0-10cm | 5.1 | |
| 426 | 89-19-239 C | debitage | Locus 6 | STU | 0-10cm | DH | |
| 427 | 89-19-239 D | debitage | Locus 6 | STU | 0-10cm | 5.0 | |
| 428 | 89-19-239 E | debitage | Locus 6 | STU | 0-10cm | 3.1 | |
| 429 | 89-19-259 A | debitage | Locus 6 | STU | 0-10cm | 5.2 | |
| 430 | 89-19-259 B | debitage | Locus 6 | STU | 0-10cm | 4.9 | |
| 431 | 89-19-259 C | debitage | Locus 6 | STU | 0-10cm | 5.0 | |
| 432 | 89-19-259 D | debitage | Locus 6 | STU | 0-10cm | 5.1 | |
| 433 | 89-19-259 E | debitage | Locus 6 | STU | 0-10cm | 4.9 | |
| 434 | 89-19-264 A | debitage | Locus 5 | STU | 0-10cm | 5.1 | |
| 435 | 89-19-264 B | debitage | Locus 5 | STU | 0-10cm | 4.9 | |
| 436 | 89-19-264 C | debitage | Locus 5 | STU | 0-10cm | 2.2 weathered | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 437 | 89-19-264 D | debitage | Locus 5 | STU | 0-10cm | 1.6 | |
| 438 | 89-19-264 E | debitage | Locus 5 | STU | 0-10cm | DH weathered | |
| 439 | 89-19-270 A | debitage | North STU | STU | 0-10cm | 1.2 | |
| 440 | 89-19-270 B | debitage | North STU | STU | 0-10cm | DH | |
| 441 | 89-19-270 C | debitage | North STU | STU | 0-10cm | 2.2 | |
| 442 | 89-19-270 D | debitage | North STU | STU | 0-10cm | 1.7 | |
| 443 | 89-19-270 E | debitage | North STU | STU | 0-10cm | 1.8 | |
| 143 | 89-19-272 A | debitage | Locus 1 | L1-1 | 0-10cm | 3.8 | |
| 144 | 89-19-272 B | debitage | Locus 1 | L1-1 | 0-10cm | 3.6 | |
| 145 | 89-19-274 A | debitage | Locus 1 | L1-2 | 10-20cm | 4.0 | |
| 146 | 89-19-274 B | debitage | Locus 1 | L1-2 | 10-20cm | 4.2 | |
| 147 | 89-19-277 | debitage | Locus 1/2 | L1/2-1 | 0-10cm | 4.5 | |
| 550 | 89-19-279 A | debitage | Locus 2 | L2-1 | 10-20cm | 4.1 | |
| 551 | 89-19-279 B | debitage | Locus 2 | L2-1 | 10-20cm | 4.9 | |
| 552 | 89-19-279 C | debitage | Locus 2 | L2-1 | 10-20cm | 4.1 | |
| 553 | 89-19-279 D | debitage | Locus 2 | L2-1 | 10-20cm | 3.6 | |
| 554 | 89-19-279 E | debitage | Locus 2 | L2-1 | 10-20cm | 3.7 | |
| 555 | 89-19-287 A | debitage | Locus 2 | L2-2 | 10-20cm | 3.4 | |
| 556 | 89-19-287 B | debitage | Locus 2 | L2-2 | 10-20cm | 1.3 | |
| 557 | 89-19-287 C | debitage | Locus 2 | L2-2 | 10-20cm | 3.7 | |
| 558 | 89-19-287 D | debitage | Locus 2 | L2-2 | 10-20cm | 3.6 was re-cut | |
| 559 | 89-19-287 E | debitage | Locus 2 | L2-2 | 10-20cm | 3.7 | |
| 148 | 89-19-295 A | debitage | Locus 2 | L2-3 | 10-20cm | 4.3 | |
| 149 | 89-19-295 B | debitage | Locus 2 | L2-3 | 10-20cm | 4.3 | |
| 150 | 89-19-295 C | debitage | Locus 2 | L2-3 | 10-20cm | 4.2 | |
| 151 | 89-19-295 D | debitage | Locus 2 | L2-3 | 10-20cm | 3.3 | |
| 152 | 89-19-295 E | debitage | Locus 2 | L2-3 | 10-20cm | 3.5 | |
| 153 | 89-19-295 F | debitage | Locus 2 | L2-3 | 10-20cm | 4.6 | |
| 444 | 89-19-306 A | debitage | Locus 2 | L2-3 | 80-90cm | 2.9 | |
| 445 | 89-19-306 B | debitage | Locus 2 | L2-3 | 80-90cm | 3.0 | |
| 446 | 89-19-306 C | debitage | Locus 2 | L2-3 | 80-90cm | 4.2 | |
| 447 | 89-19-306 D | debitage | Locus 2 | L2-3 | 80-90cm | 4.7 | |
| 448 | 89-19-306 E | debitage | Locus 2 | L2-3 | 80-90cm | 3.9 | |
| 560 | 89-19-307 | debitage | Locus 2 | L2-4 | 0-10cm | 2.8 was re-cut | |
| 561 | 89-19-308 A | debitage | Locus 2 | L2-4 | 10-20cm | 2.8 was re-cut | |
| 562 | 89-19-308 B | debitage | Locus 2 | L2-4 | 10-20cm | 4.9 | |
| 563 | 89-19-308 C | debitage | Locus 2 | L2-4 | 10-20cm | 3.7 | |
| 564 | 89-19-308 D | debitage | Locus 2 | L2-4 | 10-20cm | 3.7 | |
| 565 | 89-19-326 A | debitage | Locus 2 | L2-6 | 10-20cm | 3.8 | |
| 566 | 89-19-326 B | debitage | Locus 2 | L2-6 | 10-20cm | 4.3 | |
| 567 | 89-19-326 C | debitage | Locus 2 | L2-6 | 10-20cm | 1.6 | |
| 568 | 89-19-326 D | debitage | Locus 2 | L2-6 | 10-20cm | 4.2 | |
| 569 | 89-19-326 E | debitage | Locus 2 | L2-6 | 10-20cm | 3.6 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 449 | 89-19-334 A | debitage | Locus 2 | L2-6 | 60-70cm | 4.8 | |
| 450 | 89-19-334 B | debitage | Locus 2 | L2-6 | 60-70cm | 3.8 | |
| 451 | 89-19-334 C | debitage | Locus 2 | L2-6 | 60-70cm | 3.7 | |
| 452 | 89-19-334 D | debitage | Locus 2 | L2-6 | 60-70cm | 3.8 | |
| 453 | 89-19-334 E | debitage | Locus 2 | L2-6 | 60-70cm | 3.7 | |
| 570 | 89-19-338 A | debitage | Locus 2 | L2-8 | 10-20cm | 3.6 | |
| 571 | 89-19-338 B | debitage | Locus 2 | L2-8 | 10-20cm | 5.0 | |
| 572 | 89-19-338 C | debitage | Locus 2 | L2-8 | 10-20cm | 3.6 | |
| 573 | 89-19-338 D | debitage | Locus 2 | L2-8 | 10-20cm | 3.7 | |
| 574 | 89-19-338 E | debitage | Locus 2 | L2-8 | 10-20cm | 4.1 | |
| 454 | 89-19-351 A | debitage | Locus 2 | L2-8 | 100-110cm | 2.7 | |
| 455 | 89-19-351 B | debitage | Locus 2 | L2-8 | 100-110cm | 3.2 | |
| 456 | 89-19-351 C | debitage | Locus 2 | L2-8 | 100-110cm | 3.6 | |
| 457 | 89-19-351 D | debitage | Locus 2 | L2-8 | 100-110cm | 3.9 | |
| 458 | 89-19-351 E | debitage | Locus 2 | L2-8 | 100-110cm | NVB | |
| 154 | 89-19-377 A | debitage | Locus 3 | L3-1 | 10-20cm | 3.5 | |
| 155 | 89-19-377 B | debitage | Locus 3 | L3-1 | 10-20cm | DH | |
| 156 | 89-19-377 C | debitage | Locus 3 | L3-1 | 10-20cm | 3.9 | |
| 157 | 89-19-377 D | debitage | Locus 3 | L3-1 | 10-20cm | 3.9 | |
| 158 | 89-19-377 E | debitage | Locus 3 | L3-1 | 10-20cm | 2.9 | |
| 159 | 89-19-377 F | debitage | Locus 3 | L3-1 | 10-20cm | 4.4 | |
| 379 | 89-19-386 A | debitage | Locus 3 | L3-2 | 10-20cm | 3.8 | |
| 380 | 89-19-386 B | debitage | Locus 3 | L3-2 | 10-20cm | 3.8 | |
| 381 | 89-19-386 C | debitage | Locus 3 | L3-2 | 10-20cm | 3.8 | |
| 382 | 89-19-386 D | debitage | Locus 3 | L3-2 | 10-20cm | 3.8 | |
| 383 | 89-19-386 E | debitage | Locus 3 | L3-2 | 10-20cm | DH | |
| 384 | 89-19-395 A | debitage | Locus 3 | L3-3 | 10-20cm | 4.3 | |
| 385 | 89-19-395 B | debitage | Locus 3 | L3-3 | 10-20cm | DH | |
| 386 | 89-19-395 C | debitage | Locus 3 | L3-3 | 10-20cm | 3.2 | |
| 387 | 89-19-395 D | debitage | Locus 3 | L3-3 | 10-20cm | 3.1 | |
| 388 | 89-19-395 E | debitage | Locus 3 | L3-3 | 10-20cm | DH | |
| 389 | 89-19-409 A | debitage | Locus 3 | L3-5 | 10-20cm | 5.6 | |
| 390 | 89-19-409 B | debitage | Locus 3 | L3-5 | 10-20cm | 3.9 | |
| 391 | 89-19-409 C | debitage | Locus 3 | L3-5 | 10-20cm | 3.9 | |
| 392 | 89-19-409 D | debitage | Locus 3 | L3-5 | 10-20cm | 3.8 | |
| 393 | 89-19-409 E | debitage | Locus 3 | L3-5 | 10-20cm | 3.8 | |
| 459 | 89-19-417 A | debitage | Locus 3 | L3-5 | 60-70cm | 4.5 | |
| 460 | 89-19-417 B | debitage | Locus 3 | L3-5 | 60-70cm | 3.0 | |
| 461 | 89-19-417 C | debitage | Locus 3 | L3-5 | 60-70cm | 3.8 | |
| 462 | 89-19-418 A | debitage | Locus 3 | L3-5 | 70-80cm | 3.5 | |
| 463 | 89-19-418 B | debitage | Locus 3 | L3-5 | 70-80cm | 3.5 | |
| 394 | 89-19-422 A | debitage | Locus 3 | L3-6 | 10-20cm | 3.9 | |
| 395 | 89-19-422 B | debitage | Locus 3 | L3-6 | 10-20cm | 4.5 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 396 | 89-19-422 C | debitage | Locus 3 | L3-6 | 10-20cm | 3.9 | |
| 397 | 89-19-422 D | debitage | Locus 3 | L3-6 | 10-20cm | 3.0 | |
| 398 | 89-19-422 E | debitage | Locus 3 | L3-6 | 10-20cm | 3.7 2 bands: 3.7/7.2 | |
| 398 | 89-19-422 E | debitage | Locus 3 | L3-6 | 10-20cm | 7.2 *2 bands: 3.7/7.2 | |
| 464 | 89-19-431 A | debitage | Locus 3 | L3-6 | 60-70cm | 4.4 | |
| 465 | 89-19-431 B | debitage | Locus 3 | L3-6 | 60-70cm | 3.4 | |
| 466 | 89-19-431 C | debitage | Locus 3 | L3-6 | 60-70cm | 2.9 | |
| 467 | 89-19-431 D | debitage | Locus 3 | L3-6 | 60-70cm | 3.6 | |
| 468 | 89-19-431 E | debitage | Locus 3 | L3-6 | 60-70cm | 4.0 | |
| 160 | 89-19-434 A | debitage | Locus 4 | L4-1 | 10-20cm | 5.0 | |
| 161 | 89-19-434 B | debitage | Locus 4 | L4-1 | 10-20cm | 5.2 | |
| 162 | 89-19-434 C | debitage | Locus 4 | L4-1 | 10-20cm | NVB | |
| 163 | 89-19-451 A | debitage | Locus 4 | L4-2 | 10-20cm | 4.5 | |
| 164 | 89-19-451 B | debitage | Locus 4 | L4-2 | 10-20cm | 4.9 | |
| 165 | 89-19-451 C | debitage | Locus 4 | L4-2 | 10-20cm | DH | |
| 575 | 89-19-454 A | debitage | Locus 4 | L4-3 | 10-20cm | 4.1 | |
| 576 | 89-19-454 B | debitage | Locus 4 | L4-3 | 10-20cm | 3.5 | |
| 577 | 89-19-454 C | debitage | Locus 4 | L4-3 | 10-20cm | 3.9 | |
| 578 | 89-19-454 D | debitage | Locus 4 | L4-3 | 10-20cm | 4.0 | |
| 579 | 89-19-454 E | debitage | Locus 4 | L4-3 | 10-20cm | 1.4 | |
| 469 | 89-19-460 A | debitage | Locus 4 | L4-3 | 60-70cm | 3.2 | |
| 470 | 89-19-460 B | debitage | Locus 4 | L4-3 | 60-70cm | 3.8 | |
| 471 | 89-19-460 C | debitage | Locus 4 | L4-3 | 60-70cm | 3.4 | |
| 472 | 89-19-460 D | debitage | Locus 4 | L4-3 | 60-70cm | 3.5 | |
| 473 | 89-19-460 E | debitage | Locus 4 | L4-3 | 60-70cm | 3.4 | |
| 474 | 89-19-462 A | debitage | Locus 4 | L4-3 | 80-90cm | 3.5 | |
| 475 | 89-19-462 B | debitage | Locus 4 | L4-3 | 80-90cm | 1.8 | |
| 476 | 89-19-462 C | debitage | Locus 4 | L4-3 | 80-90cm | 3.8 | |
| 368 | 89-19-466 A | debitage | Locus 5 | L5-1 | 0-10cm | 3.7 | BH |
| 369 | 89-19-466 B | debitage | Locus 5 | L5-1 | 0-10cm | 4.4 | BH |
| 370 | 89-19-466 C | debitage | Locus 5 | L5-1 | 0-10cm | 5.3 | BH |
| 371 | 89-19-466 D | debitage | Locus 5 | L5-1 | 0-10cm | 4.6 | BH |
| 372 | 89-19-466 E | debitage | Locus 5 | L5-1 | 0-10cm | 3.4 | BH |
| 373 | 89-19-466 F | debitage | Locus 5 | L5-1 | 0-10cm | 2.8 | BH |
| 374 | 89-19-466 G | debitage | Locus 5 | L5-1 | 0-10cm | 2.5 | BH |
| 375 | 89-19-466 H | debitage | Locus 5 | L5-1 | 0-10cm | 3.9 | BH |
| 376 | 89-19-466 I | debitage | Locus 5 | L5-1 | 0-10cm | 5.9 | BH |
| 377 | 89-19-466 J | debitage | Locus 5 | L5-1 | 0-10cm | 4.7 | BH |
| 399 | 89-19-471 A | debitage | Locus 5 | L5-1 | 10-20cm | 3.0 | |
| 400 | 89-19-471 B | debitage | Locus 5 | L5-1 | 10-20cm | 1.5 | |
| 401 | 89-19-471 C | debitage | Locus 5 | L5-1 | 10-20cm | 4.6 | |
| 402 | 89-19-471 D | debitage | Locus 5 | L5-1 | 10-20cm | 3.5 | |
| 403 | 89-19-471 E | debitage | Locus 5 | L5-1 | 10-20cm | 3.9 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 477 | 89-19-480 A | debitage | Locus 5 | L5-1 | 50-60cm | 4.0 | |
| 478 | 89-19-480 B | debitage | Locus 5 | L5-1 | 50-60cm | 3.7 | |
| 479 | 89-19-480 C | debitage | Locus 5 | L5-1 | 50-60cm | 4.6 | |
| 480 | 89-19-480 D | debitage | Locus 5 | L5-1 | 50-60cm | 4.3 | |
| 481 | 89-19-481 A | debitage | Locus 5 | L5-1 | 60-70cm | 2.1 | |
| 482 | 89-19-481 B | debitage | Locus 5 | L5-1 | 60-70cm | 3.6 | |
| 483 | 89-19-481 C | debitage | Locus 5 | L5-1 | 60-70cm | 4.0 | |
| 484 | 89-19-481 D | debitage | Locus 5 | L5-1 | 60-70cm | DH weathered | |
| 166 | 89-19-483 A | debitage | Locus 5 | L5-2 | 10-20cm | 5.0 | |
| 167 | 89-19-483 B | debitage | Locus 5 | L5-2 | 10-20cm | 5.0 | |
| 168 | 89-19-483 C | debitage | Locus 5 | L5-2 | 10-20cm | 3.7 | |
| 169 | 89-19-483 D | debitage | Locus 5 | L5-2 | 10-20cm | 3.9 | |
| 170 | 89-19-483 E | debitage | Locus 5 | L5-2 | 10-20cm | 2.7 | |
| 171 | 89-19-483 F | debitage | Locus 5 | L5-2 | 10-20cm | 4.4 | |
| 404 | 89-19-483 A | debitage | Locus 5 | L5-2 | 10-20cm | 2.0 | |
| 405 | 89-19-483 B | debitage | Locus 5 | L5-2 | 10-20cm | 4.5 | |
| 406 | 89-19-483 C | debitage | Locus 5 | L5-2 | 10-20cm | 4.4 | |
| 407 | 89-19-483 D | debitage | Locus 5 | L5-2 | 10-20cm | 3.6 | |
| 408 | 89-19-483 E | debitage | Locus 5 | L5-2 | 10-20cm | 4.9 | |
| 485 | 89-19-493 A | debitage | Locus 5 | L5-2 | 50-60cm | 4.2 | |
| 486 | 89-19-493 B | debitage | Locus 5 | L5-2 | 50-60cm | 4.2 | |
| 487 | 89-19-493 C | debitage | Locus 5 | L5-2 | 50-60cm | 3.7 | |
| 488 | 89-19-493 D | debitage | Locus 5 | L5-2 | 50-60cm | 3.7 | |
| 489 | 89-19-493 E | debitage | Locus 5 | L5-2 | 50-60cm | 3.8 | |
| 490 | 89-19-502 A | debitage | Locus 5 | L5-2 | 90-100cm | 3.7 | |
| 491 | 89-19-502 B | debitage | Locus 5 | L5-2 | 90-100cm | 4.7 | |
| 492 | 89-19-502 C | debitage | Locus 5 | L5-2 | 90-100cm | 4.2 | |
| 493 | 89-19-505 A | debitage | Locus 5 | L5-2 | 110-120cm | 3.7 | |
| 494 | 89-19-505 B | debitage | Locus 5 | L5-2 | 110-120cm | 4.2 | |
| 495 | 89-19-505 C | debitage | Locus 5 | L5-2 | 110-120cm | 4.0 | |
| 496 | 89-19-507 A | debitage | Locus 5 | L5-2 | 130-140cm | 4.0 | |
| 497 | 89-19-507 B | debitage | Locus 5 | L5-2 | 130-140cm | 3.6 | |
| 498 | 89-19-507 C | debitage | Locus 5 | L5-2 | 130-140cm | 3.8 | |
| 499 | 89-19-507 D | debitage | Locus 5 | L5-2 | 130-140cm | 3.5 | |
| 500 | 89-19-507 E | debitage | Locus 5 | L5-2 | 130-140cm | 3.8 | |
| 172 | 89-19-510 A | debitage | Locus 6 | L6-1 | 10-20cm | DH | |
| 173 | 89-19-510 B | debitage | Locus 6 | L6-1 | 10-20cm | 4.2 | |
| 174 | 89-19-510 C | debitage | Locus 6 | L6-1 | 10-20cm | 4.3 | |
| 175 | 89-19-510 D | debitage | Locus 6 | L6-1 | 10-20cm | 4.4 | |
| 176 | 89-19-510 E | debitage | Locus 6 | L6-1 | 10-20cm | 4.3 | |
| 409 | 89-19-520 A | debitage | Locus 6 | L6-2 | 10-20cm | 3.9 | |
| 410 | 89-19-520 B | debitage | Locus 6 | L6-2 | 10-20cm | 3.7 | |
| 411 | 89-19-520 C | debitage | Locus 6 | L6-2 | 10-20cm | 4.1 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 412 | 89-19-520 D | debitage | Locus 6 | L6-2 | 10-20cm | 4.8 | |
| 413 | 89-19-520 E | debitage | Locus 6 | L6-2 | 10-20cm | 1.2 | |
| 525 | 89-19-126 | flake blank | Locus 5 | | surface | 4.7 | |
| 532 | 89-19-139 | flake blank | Locus 6 | | surface | 5.5 | |
| 526 | 89-19-145 | flake blank | Locus 5 | | surface | 5.2 | |
| 513 | 89-19-27 | flake blank | Locus 3 | | surface | 4.7 | |
| 506 | 89-19-45 | flake blank | Locus 2 | | surface | 4.1 | |
| 514 | 89-19-49 | flake blank | Locus 3 | | surface | 4.1 | |
| 520 | 89-19-53 | flake blank | Locus 4 | | surface | 2.4 | |
| 521 | 89-19-78 | flake blank | Locus 4 | | surface | 3.8 | |
| 503 | 89-19-80 | flake blank | Locus 1 | | surface | 1.3 | |
| 515 | 89-19-81 | flake blank | Locus 3 | | surface | 3.8 | |
| 507 | 89-19-94 | flake blank | Locus 2 | | surface | 3.7 | |
| 1 | 89-19-1 | proj. pt. | Locus 1 | | surface | 4.5 | BH |
| 10 | 89-19-10 | proj. pt. | Locus 3 | | surface | 4.5 | BH |
| 11 | 89-19-11 | proj. pt. | Locus 3 | | surface | 3.8 | BH |
| 22 | 89-19-117 | proj. pt. | Locus 5 | | surface | 3.7 weathered | MH |
| 23 | 89-19-119 | proj. pt. | Locus 5 | | surface | 4.5 | BH |
| 24 | 89-19-120 | proj. pt. | Locus 5 | | surface | 4.8 | MH |
| 84 | 89-19-122 | proj. pt. | Locus 2 | | surface | 1.7 | BH |
| 12 | 89-19-13 | proj. pt. | Locus 3 | | surface | 4.6 | BH |
| 25 | 89-19-130 | proj. pt. | Locus 6 | | surface | 4.5 | BH |
| 26 | 89-19-131 | proj. pt. | Locus 6 | | surface | 3.7 | BH |
| 27 | 89-19-132 | proj. pt. | Locus 5 | | surface | 3.6 | BH |
| 28 | 89-19-133 | proj. pt. | Locus 5 | | surface | 1.1 weathered | BH |
| 29 | 89-19-134 | proj. pt. | Locus 5 | | surface | 5.2 | BH |
| 30 | 89-19-135 | proj. pt. | Locus 5 | | surface | 4.7 | BH |
| 31 | 89-19-136 | proj. pt. | Locus 5 | | surface | DH | BH |
| 32 | 89-19-151 | proj. pt. | Locus 5 | | surface | 3.8 | BH |
| 2 | 89-19-2 | proj. pt. | non-locus | | surface | DH | BH |
| 3 | 89-19-3 | proj. pt. | non-locus | | surface | 4.6 | BH |
| 85 | 89-19-300 | proj. pt. | Locus 2 | L2-3 | 50-60cm | 3.9 | BH |
| 33 | 89-19-378 | proj. pt. | Locus 3 | L3-1 | 20-30cm | 4.4 | BH |
| 34 | 89-19-393 | proj. pt. | Locus 3 | L3-3 | 0-10cm | 4.6 | BH |
| 4 | 89-19-4 | proj. pt. | Locus 2 | | surface | 3.4 was re-cut | QT |
| 35 | 89-19-419 | proj. pt. | Locus 3 | L3-6 | 0-10cm | 3.4 | BH |
| 36 | 89-19-458 | proj. pt. | Locus 4 | L4-3 | 50-60cm | 3.8 | BH |
| 5 | 89-19-5 | proj. pt. | Locus 2 | | surface | 4.6 | CD |
| 37 | 89-19-536 | proj. pt. | no prov. | | surface | DH (~5.0) | BH |
| 746 | 89-19-536 | proj. pt. | no prov. | | surface | 4.8 was re-cut; see HLN 37 | BH |
| 13 | 89-19-55 | proj. pt. | non-locus | | surface | 1.3 | BH |
| 6 | 89-19-6 | proj. pt. | Locus 2 | | surface | 3.9 | QT |
| 14 | 89-19-60 | proj. pt. | non-locus | | surface | 4.5 | BH |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|---|
| 15 | 89-19-61 | | proj. pt. | Locus 3 | | surface | 4.6 | BH |
| 16 | 89-19-62 | | proj. pt. | Locus 3 | | surface | 3.5 | BH |
| 17 | 89-19-63 | | proj. pt. | Locus 3 | | surface | 4.8 | CD |
| 7 | 89-19-7 | | proj. pt. | Locus 2 | | surface | 4.4 | BH |
| 8 | 89-19-8 | | proj. pt. | Locus 2 | | surface | 3.2 | BH |
| 18 | 89-19-84 | | proj. pt. | Locus 2 | | surface | 4.0 | BH |
| 19 | 89-19-85 | | proj. pt. | Locus 2 | | surface | 4.2 | BH |
| 20 | 89-19-86 | | proj. pt. | Locus 3 | | surface | 3.9 | CD |
| 21 | 89-19-87 | | proj. pt. | Locus 3 | | surface | 3.7 weathered | BH |
| 9 | 89-19-9 | | proj. pt. | Locus 2 | | surface | 4.5 | BH |
| 501 | 89-19-4 | | see HLN 4 | | | | | |
| 535 | 89-19-140 | | uniface | Locus 6 | | surface | 4.2 | |
| 517 | 89-19-161 | | uniface | Locus 3 | | surface | 3.7 | |
| 529 | 89-19-490 | | uniface | Locus 5 | L5-2 | 40-50cm | 3.7 | |
| 518 | 89-19-533 | | uniface | Locus 3 | | surface | 4.7 | |
| 530 | 89-19-547 | | uniface | Locus 5 | L5-2 | 10-20cm | DH | |

MNO-2455

| Hydration Item # | Catalog No. | | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|---|
| 96 | 89-23-1 | | biface | Locus 1 | L1 | surface | DH | BH |
| 97 | 89-23-5 | | biface | Locus 3 | L3 | surface | 4.2 | BH |
| 99 | 89-23-2 | A | debitage | Locus 1 | L1 | surface | 4.2 | |
| 100 | 89-23-2 | B | debitage | Locus 1 | L1 | surface | 5.0 | |
| 101 | 89-23-3 | C | debitage | Locus 2 | L2 | surface | 1.4 | |
| 754 | 89-23-3 | Q | debitage | Locus 2 | L2 | surface | 6.1 | |
| 755 | 89-23-3 | R | debitage | Locus 2 | L2 | surface | 1.3 | |
| 102 | 89-23-6 | D | debitage | Locus 3 | L3 | surface | 3.8 | |
| 103 | 89-23-6 | E | debitage | Locus 3 | L3 | surface | 2.7 | |
| 104 | 89-23-6 | F | debitage | Locus 3 | L3 | surface | DH | |
| 105 | 89-23-9 | G | debitage | Locus 4 | L4 | surface | 4.3 | |
| 106 | 89-23-9 | H | debitage | Locus 4 | L4 | surface | 2.8 | |
| 107 | 89-23-9 | I | debitage | Locus 4 | L4 | surface | 3.7 | |
| 108 | 89-23-9 | J | debitage | Locus 4 | L4 | surface | 4.6 | |
| 109 | 89-23-9 | K | debitage | Locus 4 | L4 | surface | 4.4 | |
| 110 | 89-23-9 | L | debitage | Locus 4 | L4 | surface | 5.3 | |
| 756 | 89-23-9 | M | debitage | Locus 4 | L4 | surface | 3.9 | |
| 757 | 89-23-9 | N | debitage | Locus 4 | L4 | surface | 4.1 | |
| 758 | 89-23-9 | O | debitage | Locus 4 | L4 | surface | 4.7 | |
| 759 | 89-23-9 | P | debitage | Locus 4 | L4 | surface | 4.6 | |
| 59 | 89-23-8 | | proj. pt. | | | surface | 4.2 | BH |

MNO-2456

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|---|
| 198 | 89-21-11 | | biface | not prov. | | surface | 4.2 | BH |
| 199 | 89-21-13 | | biface | not prov. | | surface | 6.5 | BH |
| 200 | 89-21-15 | | biface | not prov. | | surface | 6.7 | BH |
| 201 | 89-21-20 | | biface | not prov. | | surface | 4.9 | BH |
| 202 | 89-21-31 | | biface | not prov. | | 0-10cm | 3.3 | CD |
| 194 | 89-21-4 | | biface | not prov. | | surface | 2.9 | BH |
| 195 | 89-21-5 | | biface | not prov. | | surface | 6.1 | unk |
| 196 | 89-21-6 | | biface | not prov. | | surface | 6.0 | BH |
| 91 | 89-21-61 | | biface | Locus 2 | STU | 0-10cm | DH | BH |
| 203 | 89-21-65 | | biface | Locus 3 | L3-1 | 0-10cm | 5.6 | BH |
| 204 | 89-21-69 | | biface | not prov. | | surface | 2.7 | BH |
| 197 | 89-21-9 | | biface | not prov. | | surface | 3.0 | BH |
| 88 | 89-21-22 | A | debitage | Locus 1 | STU | | 6.6 | |
| 89 | 89-21-22 | B | debitage | Locus 1 | STU | | 7.3 | |
| 90 | 89-21-22 | C | debitage | Locus 1 | STU | | 6.3 | |
| 66 | 89-21-59 | | debitage | Locus 2 | STU | 0-10cm | DH, weathered | |
| 67 | 89-21-60 | A | debitage | Locus 2 | STU | 0-10cm | 4.1 | |
| 68 | 89-21-60 | B | debitage | Locus 2 | STU | 0-10cm | DH, weathered | |
| 72 | 89-21-63 | A | debitage | Locus 3 | L3-1 | 0-10cm | 4.7 | |
| 73 | 89-21-63 | B | debitage | Locus 3 | L3-1 | 0-10cm | 7.2 | |
| 74 | 89-21-63 | C | debitage | Locus 3 | L3-1 | 0-10cm | 2.6 | |
| 75 | 89-21-63 | D | debitage | Locus 3 | L3-1 | 0-10cm | 6.0 | |
| 76 | 89-21-66 | A | debitage | Locus 3 | L3-1 | 10-20cm | 5.7 | |
| 77 | 89-21-66 | B | debitage | Locus 3 | L3-1 | 10-20cm | 4.0 | |
| 78 | 89-21-66 | C | debitage | Locus 3 | L3-1 | 10-20cm | 5.2 | |
| 79 | 89-21-66 | D | debitage | Locus 3 | L3-1 | 10-20cm | 5.3 | |
| 80 | 89-21-66 | E | debitage | Locus 3 | L3-1 | 10-20cm | 5.0 | |
| 81 | 89-21-67 | A | debitage | Locus 3 | L3-1 | 20-30cm | 4.8 | |
| 82 | 89-21-67 | B | debitage | Locus 3 | L3-1 | 20-30cm | 4.6 | |
| 83 | 89-21-67 | C | debitage | Locus 3 | L3-1 | 20-30cm | 3.9 | |
| 60 | 89-21-70 | A | debitage | Locus 1 | L1-1 | 0-10cm | 2.0 | |
| 61 | 89-21-70 | B | debitage | Locus 1 | L1-1 | 0-10cm | 4.8 | |
| 62 | 89-21-70 | C | debitage | Locus 1 | L1-1 | 0-10cm | 2.9 | |
| 63 | 89-21-70 | D | debitage | Locus 1 | L1-1 | 0-10cm | 4.8 | |
| 64 | 89-21-70 | E | debitage | Locus 1 | L1-1 | 0-10cm | 4.8 | |
| 65 | 89-21-70 | F | debitage | Locus 1 | L1-1 | 0-10cm | 4.7 | |
| 92 | 89-21-76 | | debitage | Locus 2 | L2-2 | 0-10cm | 4.8 | |
| 69 | 89-21-79 | | debitage | Locus 2 | L2-3 | 0-10cm | DH, weathered | |
| 93 | 89-21-80 | | debitage | Locus 2 | L2-3 | 0-10cm | 3.6 | |
| 70 | 89-21-82 | | debitage | Locus 2 | L2-4 | 0-10cm | NVB, weathered | |
| 94 | 89-21-82 | A | debitage | Locus 2 | L2-4 | 0-10cm | DH | |
| 95 | 89-21-82 | B | debitage | Locus 2 | L2-4 | 0-10cm | DH | |
| 71 | 89-21-83 | | debitage | Locus 2 | L2-5 | 0-10cm | DH, approx. 6.6 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 540 | 89-21-14 | flake blank | not prov. | | | 7.3 | |
| 55 | 89-21-1 | proj. pt. | not prov. | | | NVB, weathered | BH |
| 56 | 89-21-2 | proj. pt. | not prov. | | | 1.3 | BH |
| 57 | 89-21-8 | proj. pt. | not prov. | | | 5.3 | BH |
| MNO-2466 | | | | | | | |
| 98 | 89-22-6 | biface | | STU | 0-10cm | 1.3 | BH |
| 749 | 89-22-12 O | debitage | | STU | 0-10cm | 2.7 | |
| 750 | 89-22-12 P | debitage | | STU | 0-10cm | 1.3 | |
| 751 | 89-22-12 Q | debitage | | STU | 0-10cm | 1.3 | |
| 752 | 89-22-12 R | debitage | | STU | 0-10cm | 2.1 | |
| 753 | 89-22-12 S | debitage | | STU | 0-10cm | 2.4 | |
| 111 | 89-22-7 A | debitage | | STU | 0-10cm | 1.3 | |
| 112 | 89-22-7 B | debitage | | STU | 0-10cm | 1.4 | |
| 113 | 89-22-7 C | debitage | | STU | 0-10cm | 1.6 | |
| 114 | 89-22-7 D | debitage | | STU | 0-10cm | 3.7 | |
| 115 | 89-22-7 E | debitage | | STU | 0-10cm | 1.7 | |
| 116 | 89-22-7 F | debitage | | STU | 0-10cm | 1.3 | |
| 117 | 89-22-7 G | debitage | | STU | 0-10cm | 1.2 | |
| 118 | 89-22-7 H | debitage | | STU | 0-10cm | 1.2 | |
| 119 | 89-22-7 I | debitage | | STU | 0-10cm | 1.5 | |
| 120 | 89-22-7 J | debitage | | STU | 0-10cm | 1.5 | |
| 121 | 89-22-7 K | debitage | | STU | 0-10cm | 1.2 | |
| 122 | 89-22-7 L | debitage | | STU | 0-10cm | NVB, weathered | |
| 747 | 89-22-7 M | debitage | | STU | 0-10cm | 1.3 | |
| 748 | 89-22-7 N | debitage | | STU | 0-10cm | 2.2 | |
| 58 | 89-22-5 | proj. pt. | | STU | 0-10cm | 1.5 | BH |
| MNO-2488 | | | | | | | |
| 180 | 89-20-12 | biface | Locus 1 | | surface | 6.0 | BH |
| 189 | 89-20-186 | biface | Locus 1 | L1-1 | 0-10cm | 6.4 | unk |
| 190 | 89-20-190 | biface | Locus 1 | L1-1 | 20-30cm | 4.9 | BH |
| 290 | 89-20-218 | biface | Locus 1 | L1-5 | 10-20cm | 3.4 | |
| 178 | 89-20-5 | biface | Locus 1 | | surface | 3.7 | BH |
| 179 | 89-20-9 | biface | Locus 1 | | surface | 7.3 | BH |
| 244 | 89-20-183 A | debitage | Locus 1 | L1-1 | 0-10cm | DH, weathered | |
| 245 | 89-20-183 B | debitage | Locus 1 | L1-1 | 0-10cm | 5.0 | |
| 246 | 89-20-183 C | debitage | Locus 1 | L1-1 | 0-10cm | DH, weathered | |
| 247 | 89-20-183 D | debitage | Locus 1 | L1-1 | 0-10cm | DH, weathered (~6.8) | |
| 248 | 89-20-183 E | debitage | Locus 1 | L1-1 | 0-10cm | DH | |
| 606 | 89-20-183 F | debitage | Locus 1 | L1-1 | 0-10cm | 3.9 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 607 | 89-20-183 G | debitage | Locus 1 | L1-1 | 0-10cm | DH, weathered | |
| 608 | 89-20-183 H | debitage | Locus 1 | L1-1 | 0-10cm | 5.2 | |
| 609 | 89-20-183 I | debitage | Locus 1 | L1-1 | 0-10cm | NVB | |
| 610 | 89-20-183 J | debitage | Locus 1 | L1-1 | 0-10cm | 4.4 | |
| 241 | 89-20-187 A | debitage | Locus 1 | L1-1 | 10-20cm | 4.9 | |
| 242 | 89-20-187 B | debitage | Locus 1 | L1-1 | 10-20cm | 4.6 | |
| 243 | 89-20-187 C | debitage | Locus 1 | L1-1 | 10-20cm | 2.5 | |
| 249 | 89-20-187 D | debitage | Locus 1 | L1-1 | 10-20cm | 2.5 | |
| 250 | 89-20-187 E | debitage | Locus 1 | L1-1 | 10-20cm | 6.3 | |
| 611 | 89-20-187 F | debitage | Locus 1 | L1-1 | 10-20cm | 4.4 | |
| 612 | 89-20-187 G | debitage | Locus 1 | L1-1 | 10-20cm | 5.0 | |
| 613 | 89-20-187 H | debitage | Locus 1 | L1-1 | 10-20cm | 4.9 | |
| 614 | 89-20-187 I | debitage | Locus 1 | L1-1 | 10-20cm | 4.8 | |
| 615 | 89-20-187 J | debitage | Locus 1 | L1-1 | 10-20cm | 4.5 | |
| 616 | 89-20-191 A | debitage | Locus 1 | L1-1 | 20-30cm | 5.2 | |
| 617 | 89-20-191 B | debitage | Locus 1 | L1-1 | 20-30cm | 4.7 | |
| 618 | 89-20-191 C | debitage | Locus 1 | L1-1 | 20-30cm | 4.8 | |
| 619 | 89-20-191 D | debitage | Locus 1 | L1-1 | 20-30cm | 3.1 | |
| 620 | 89-20-191 E | debitage | Locus 1 | L1-1 | 20-30cm | 4.7 | |
| 621 | 89-20-191 F | debitage | Locus 1 | L1-1 | 20-30cm | DH | |
| 622 | 89-20-191 G | debitage | Locus 1 | L1-1 | 20-30cm | 4.6 | |
| 623 | 89-20-191 H | debitage | Locus 1 | L1-1 | 20-30cm | 5.1 | |
| 624 | 89-20-191 I | debitage | Locus 1 | L1-1 | 20-30cm | 4.6 | |
| 625 | 89-20-191 J | debitage | Locus 1 | L1-1 | 20-30cm | 5.0 | |
| 626 | 89-20-193 A | debitage | Locus 1 | L1-1 | 40-50cm | 5.1 | |
| 627 | 89-20-193 B | debitage | Locus 1 | L1-1 | 40-50cm | 4.3 | |
| 628 | 89-20-193 C | debitage | Locus 1 | L1-1 | 40-50cm | 4.7 | |
| 629 | 89-20-193 D | debitage | Locus 1 | L1-1 | 40-50cm | 4.9 | |
| 630 | 89-20-193 E | debitage | Locus 1 | L1-1 | 40-50cm | DH | |
| 631 | 89-20-193 F | debitage | Locus 1 | L1-1 | 40-50cm | 5.9 | |
| 632 | 89-20-193 G | debitage | Locus 1 | L1-1 | 40-50cm | 9.5 | |
| 633 | 89-20-193 H | debitage | Locus 1 | L1-1 | 40-50cm | 5.1 | |
| 634 | 89-20-193 I | debitage | Locus 1 | L1-1 | 40-50cm | 5.0 | |
| 635 | 89-20-193 J | debitage | Locus 1 | L1-1 | 40-50cm | 3.2 | |
| 636 | 89-20-194 A | debitage | Locus 1 | L1-1 | 50-60cm | 5.9 | |
| 637 | 89-20-194 B | debitage | Locus 1 | L1-1 | 50-60cm | 5.4 | |
| 638 | 89-20-194 C | debitage | Locus 1 | L1-1 | 50-60cm | 5.9 | |
| 639 | 89-20-194 D | debitage | Locus 1 | L1-1 | 50-60cm | 5.7 | |
| 640 | 89-20-194 E | debitage | Locus 1 | L1-1 | 50-60cm | 6.1 | |
| 641 | 89-20-194 F | debitage | Locus 1 | L1-1 | 50-60cm | 5.7 | |
| 642 | 89-20-194 G | debitage | Locus 1 | L1-1 | 50-60cm | 6.1 | |
| 643 | 89-20-194 H | debitage | Locus 1 | L1-1 | 50-60cm | 5.5 | |
| 644 | 89-20-194 I | debitage | Locus 1 | L1-1 | 50-60cm | 5.9 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 645 | 89-20-194 J | debitage | Locus 1 | L1-1 | 50-60cm | 6.0 | |
| 267 | 89-20-197 A | debitage | Locus 1 | L1-1 | 60-70cm | 7.4 | |
| 268 | 89-20-197 B | debitage | Locus 1 | L1-1 | 60-70cm | 7.1 | |
| 269 | 89-20-197 C | debitage | Locus 1 | L1-1 | 60-70cm | 7.3 | |
| 270 | 89-20-197 D | debitage | Locus 1 | L1-1 | 60-70cm | 6.9 | |
| 266 | 89-20-198 | debitage | Locus 1 | L1-1 | 70-80cm | 6.2 | |
| 646 | 89-20-203 A | debitage | Locus 1 | L1-4 | 0-10cm | 4.4 | |
| 647 | 89-20-203 B | debitage | Locus 1 | L1-4 | 0-10cm | 4.9 | |
| 648 | 89-20-203 C | debitage | Locus 1 | L1-4 | 0-10cm | 4.9 | |
| 649 | 89-20-203 D | debitage | Locus 1 | L1-4 | 0-10cm | 3.5 | |
| 650 | 89-20-203 E | debitage | Locus 1 | L1-4 | 0-10cm | 4.7 | |
| 205 | 89-20-205 A | debitage | Locus 1 | L1-4 | 10-20cm | 4.8 | BH |
| 206 | 89-20-205 B | debitage | Locus 1 | L1-4 | 10-20cm | 4.0 2 bands: 4.0/5.6 | BH |
| 206 | 89-20-205 B | debitage | Locus 1 | L1-4 | 10-20cm | 5.6 *2 bands: 4.0/5.6 | BH |
| 207 | 89-20-205 C | debitage | Locus 1 | L1-4 | 10-20cm | 3.8 | BH |
| 208 | 89-20-205 D | debitage | Locus 1 | L1-4 | 10-20cm | 4.4 | BH |
| 209 | 89-20-205 E | debitage | Locus 1 | L1-4 | 10-20cm | 4.6 | BH |
| 210 | 89-20-205 F | debitage | Locus 1 | L1-4 | 10-20cm | 5.0 | BH |
| 651 | 89-20-205 G | debitage | Locus 1 | L1-4 | 10-20cm | 3.6 | |
| 652 | 89-20-205 H | debitage | Locus 1 | L1-4 | 10-20cm | 3.5 | |
| 653 | 89-20-205 I | debitage | Locus 1 | L1-4 | 10-20cm | 5.1 | |
| 654 | 89-20-205 J | debitage | Locus 1 | L1-4 | 10-20cm | 3.9 | |
| 655 | 89-20-205 K | debitage | Locus 1 | L1-4 | 10-20cm | 3.6 | |
| 656 | 89-20-205 L | debitage | Locus 1 | L1-4 | 10-20cm | 4.5 | |
| 657 | 89-20-205 M | debitage | Locus 1 | L1-4 | 10-20cm | 4.6 | |
| 658 | 89-20-205 N | debitage | Locus 1 | L1-4 | 10-20cm | 4.9 | |
| 659 | 89-20-205 O | debitage | Locus 1 | L1-4 | 10-20cm | 5.2 | |
| 660 | 89-20-205 P | debitage | Locus 1 | L1-4 | 10-20cm | 5.0 | |
| 661 | 89-20-208 A | debitage | Locus 1 | L1-4 | 20-30cm | 4.4 | |
| 662 | 89-20-208 B | debitage | Locus 1 | L1-4 | 20-30cm | 6.3 | |
| 663 | 89-20-208 C | debitage | Locus 1 | L1-4 | 20-30cm | 5.4 | |
| 664 | 89-20-208 D | debitage | Locus 1 | L1-4 | 20-30cm | 5.1 | |
| 665 | 89-20-208 E | debitage | Locus 1 | L1-4 | 20-30cm | 5.0 | |
| 666 | 89-20-208 F | debitage | Locus 1 | L1-4 | 20-30cm | 5.3 | |
| 667 | 89-20-208 G | debitage | Locus 1 | L1-4 | 20-30cm | 3.3 2 bands: 3.3/5.3 | |
| 667 | 89-20-208 G | debitage | Locus 1 | L1-4 | 20-30cm | 5.3 *2 bands: 3.3/5.3 | |
| 668 | 89-20-208 H | debitage | Locus 1 | L1-4 | 20-30cm | 4.2 | |
| 669 | 89-20-208 I | debitage | Locus 1 | L1-4 | 20-30cm | DH, weathered | |
| 670 | 89-20-208 J | debitage | Locus 1 | L1-4 | 20-30cm | 4.9 | |
| 277 | 89-20-214 A | debitage | Locus 1 | L1-5 | 0-10cm | 2.4 | |
| 278 | 89-20-214 B | debitage | Locus 1 | L1-5 | 0-10cm | 2.6 | |
| 279 | 89-20-214 C | debitage | Locus 1 | L1-5 | 0-10cm | 6.3 | |
| 271 | 89-20-219 A | debitage | Locus 1 | L1-5 | 10-20cm | 5.0 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 272 | 89-20-219 B | debitage | Locus 1 | L1-5 | 10-20cm | 6.9 | |
| 273 | 89-20-219 C | debitage | Locus 1 | L1-5 | 10-20cm | 4.9 | |
| 274 | 89-20-219 D | debitage | Locus 1 | L1-5 | 10-20cm | 4.9 | |
| 275 | 89-20-219 E | debitage | Locus 1 | L1-5 | 10-20cm | 2.8 | |
| 276 | 89-20-219 F | debitage | Locus 1 | L1-5 | 10-20cm | 4.8 | |
| 38 | 89-20-1 | proj. pt. | Locus 1 | | surface | VW, weathered | BH |

MNO-2489

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 186 | 89-20-76 | biface | Locus 6 | | surface | 2.8 | BH |
| 187 | 89-20-88 | biface | Locus 6 | | surface | 3.4 | QT |
| 188 | 89-20-90 | biface | Locus 5 | | surface | 6.7 | BH |
| 596 | 89-20-159 A | debitage | Locus 5 | STU | 0-10cm | 3.2 2 bands: 3.2/5.3 | |
| 596 | 89-20-159 A | debitage | Locus 5 | STU | 0-10cm | 5.3 *2 bands: 3.2/5.3 | |
| 597 | 89-20-159 B | debitage | Locus 5 | STU | 0-10cm | 5.2 | |
| 598 | 89-20-159 C | debitage | Locus 5 | STU | 0-10cm | 1.8 2 bands: 1.8/6.0 weathered | |
| 598 | 89-20-159 C | debitage | Locus 5 | STU | 0-10cm | 6.0 *2 bands: 1.8/6.0 weathere | |
| 599 | 89-20-159 D | debitage | Locus 5 | STU | 0-10cm | 5.0 | |
| 600 | 89-20-159 E | debitage | Locus 5 | STU | 0-10cm | 3.2 | |
| 229 | 89-20-294 A | debitage | Locus 5 | L5-1 | 10-20cm | 4.9 | BH |
| 230 | 89-20-294 B | debitage | Locus 5 | L5-1 | 10-20cm | 4.6 | BH |
| 231 | 89-20-294 C | debitage | Locus 5 | L5-1 | 10-20cm | 4.6 | BH |
| 232 | 89-20-294 D | debitage | Locus 5 | L5-1 | 10-20cm | 4.6 | BH |
| 233 | 89-20-294 E | debitage | Locus 5 | L5-1 | 10-20cm | 4.8 | BH |
| 234 | 89-20-294 F | debitage | Locus 5 | L5-1 | 10-20cm | 5.2 | BH |
| 716 | 89-20-300 A | debitage | Locus 5 | L5-2 | 0-10cm | 6.1 | |
| 717 | 89-20-300 B | debitage | Locus 5 | L5-2 | 0-10cm | 6.1 | |
| 718 | 89-20-300 C | debitage | Locus 5 | L5-2 | 0-10cm | 6.0 | |
| 719 | 89-20-300 D | debitage | Locus 5 | L5-2 | 0-10cm | 5.5 | |
| 720 | 89-20-300 E | debitage | Locus 5 | L5-2 | 0-10cm | 5.9 | |
| 721 | 89-20-300 F | debitage | Locus 5 | L5-2 | 0-10cm | 5.9 | |
| 722 | 89-20-300 G | debitage | Locus 5 | L5-2 | 0-10cm | 5.0 | |
| 723 | 89-20-300 H | debitage | Locus 5 | L5-2 | 0-10cm | 4.8 | |
| 724 | 89-20-300 I | debitage | Locus 5 | L5-2 | 0-10cm | NVB | |
| 725 | 89-20-300 J | debitage | Locus 5 | L5-2 | 0-10cm | 5.1 | |
| 726 | 89-20-300 K | debitage | Locus 5 | L5-2 | 0-10cm | 5.2 | |
| 727 | 89-20-302 A | debitage | Locus 5 | L5-2 | 10-20cm | 5.0 | |
| 728 | 89-20-302 B | debitage | Locus 5 | L5-2 | 10-20cm | DH | |
| 729 | 89-20-302 C | debitage | Locus 5 | L5-2 | 10-20cm | 4.9 | |
| 730 | 89-20-302 D | debitage | Locus 5 | L5-2 | 10-20cm | 3.9 | |
| 731 | 89-20-302 E | debitage | Locus 5 | L5-2 | 10-20cm | 5.3 | |
| 732 | 89-20-305 A | debitage | Locus 6 | L6-1 | 0-10cm | 1.3 | |
| 733 | 89-20-305 B | debitage | Locus 6 | L6-1 | 0-10cm | 4.5 | |

Hydration Data

Hydration Project No.: 89H-849

| Hydration Item # | Catalog No. | Description | Locus/Provenience | | | Hydration/Remarks | Source |
|---|---|---|---|---|---|---|---|
| 734 | 89-20-305 C | debitage | Locus 6 | L6-1 | 0-10cm | 3.8 was re-cut | |
| 735 | 89-20-305 D | debitage | Locus 6 | L6-1 | 0-10cm | 3.6 | |
| 736 | 89-20-305 E | debitage | Locus 6 | L6-1 | 0-10cm | 1.5 | |
| 737 | 89-20-305 F | debitage | Locus 6 | L6-1 | 0-10cm | NVB, weathered | |
| 235 | 89-20-310 A | debitage | Locus 6 | L6-1 | 10-20cm | 4.9 | BH |
| 236 | 89-20-310 B | debitage | Locus 6 | L6-1 | 10-20cm | 5.5 | BH |
| 237 | 89-20-310 C | debitage | Locus 6 | L6-1 | 10-20cm | 4.7 | BH |
| 238 | 89-20-310 D | debitage | Locus 6 | L6-1 | 10-20cm | 3.3 | BH |
| 239 | 89-20-310 E | debitage | Locus 6 | L6-1 | 10-20cm | 4.5 | BH |
| 240 | 89-20-310 F | debitage | Locus 6 | L6-1 | 10-20cm | 4.9 | BH |
| 738 | 89-20-319 A | debitage | Locus 6 | L6-1 | 30-40cm | 4.8 | |
| 739 | 89-20-319 B | debitage | Locus 6 | L6-1 | 30-40cm | 3.5 | |
| 740 | 89-20-319 C | debitage | Locus 6 | L6-1 | 30-40cm | 3.5 | |
| 741 | 89-20-319 D | debitage | Locus 6 | L6-1 | 30-40cm | 3.7 | |
| 742 | 89-20-327 A | debitage | Locus 6 | L6-1 | 70-80cm | 3.8 was re-cut | |
| 743 | 89-20-327 B | debitage | Locus 6 | L6-1 | 70-80cm | 4.9 | |
| 744 | 89-20-327 C | debitage | Locus 6 | L6-1 | 70-80cm | 5.0 | |
| 745 | 89-20-327 D | debitage | Locus 6 | L6-1 | 70-80cm | 5.0 was re-cut | |
| 51 | 89-20-77 | proj. pt. | non-locus | | surface | 4.0 | BH |

Total Submitted: 768