

ARCHAEOLOGICAL INVESTIGATIONS AT THE SKYROCKET SITE

CA-Cal-629/630

THE ROYAL MOUNTAIN KING MINE PROJECT

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ABSTRACT

The Skyrocket Site is a large, well stratified, multi-component site located in the Central Sierra Foothills. This paper is a preliminary discussion of findings from the 1988 and 1989 excavation seasons. The primary focus of these excavations has been the respectful discovery and removal of several hundred Native American burials threatened by open pit mining activities. In addition to burials, the site contains a variety of occupation related artifacts and features, dating from the early Archaic through the Protohistoric Period. Deeply buried deposits containing large stemmed points and milling equipment related to the Western Stemmed Complex have been radiocarbon dated at more than 9000 BP. Bodie Hills obsidian from these 9000 year old deposits consistently exhibits hydration rim readings between 7.3 and 7.5 microns. Hydration and source data from the Skyrocket Site are used to evaluate published hydration rates, and a revised site specific rates is proposed.

INTRODUCTION

Location and Environment

The Skyrocket Site is located in the Salt Spring Valley in southwestern Calaveras County, approximately 40 miles east of Stockton (Figure 1). The Salt Spring Valley is in the lower foothills of the Sierra Nevada, on the eastern periphery the Central Valley. The valley is situated at an elevation of about 300 meters above sea level, which is high enough to escape the winter fog yet low enough to be below the snow line. This area normally receives about 450 mm of precipitation annually, primarily in the form of winter rainfall. The Salt Spring Valley is drained by several small intermittent streams, Littlejohns

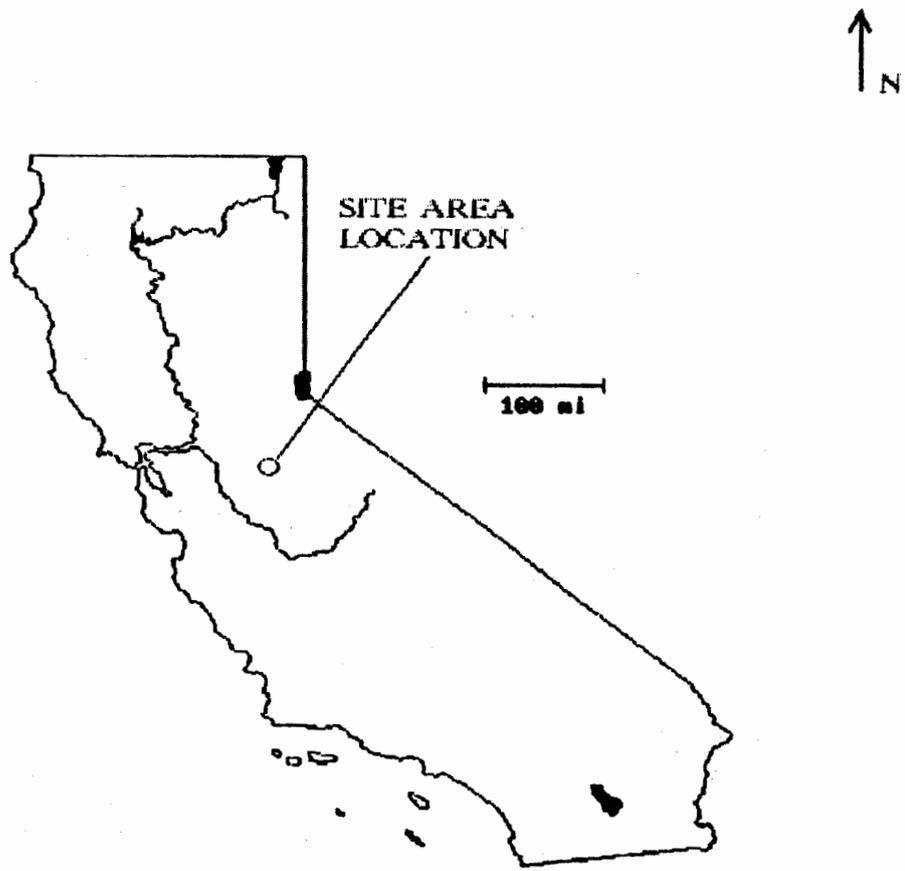


Figure 1. Location of the Skyrocket site.

Creek, Rock Creek, and Dry Creek, which are part of the San Joaquin watershed.

The Skyrocket Site (CA-Cal-629/630) is located at the confluence of Littlejohns and Underwood Creeks, opposite the historic gold mining town of Hodson. Several small springs, emerge from fractured bedrock beneath the site. These springs not only provided the inhabitants of the Skyrocket Site with a reliable water source, but also were instrumental in the development and maintenance of a rich riparian environment along the stream bank. Spring fed pools adjacent to the site support a variety of economically important plant and animal species.

Terrain in the valley floor near the site is relatively flat, with parallel NW-SE trending ridges rising 500-1500 feet above the valley to the east and west of the site. The valley is in the Upper Sonoran life zone, and modern vegetation consists of grassland with isolated groves of oaks. The surrounding hills support stands of oaks, scattered gray pines, and patches of chaparral.

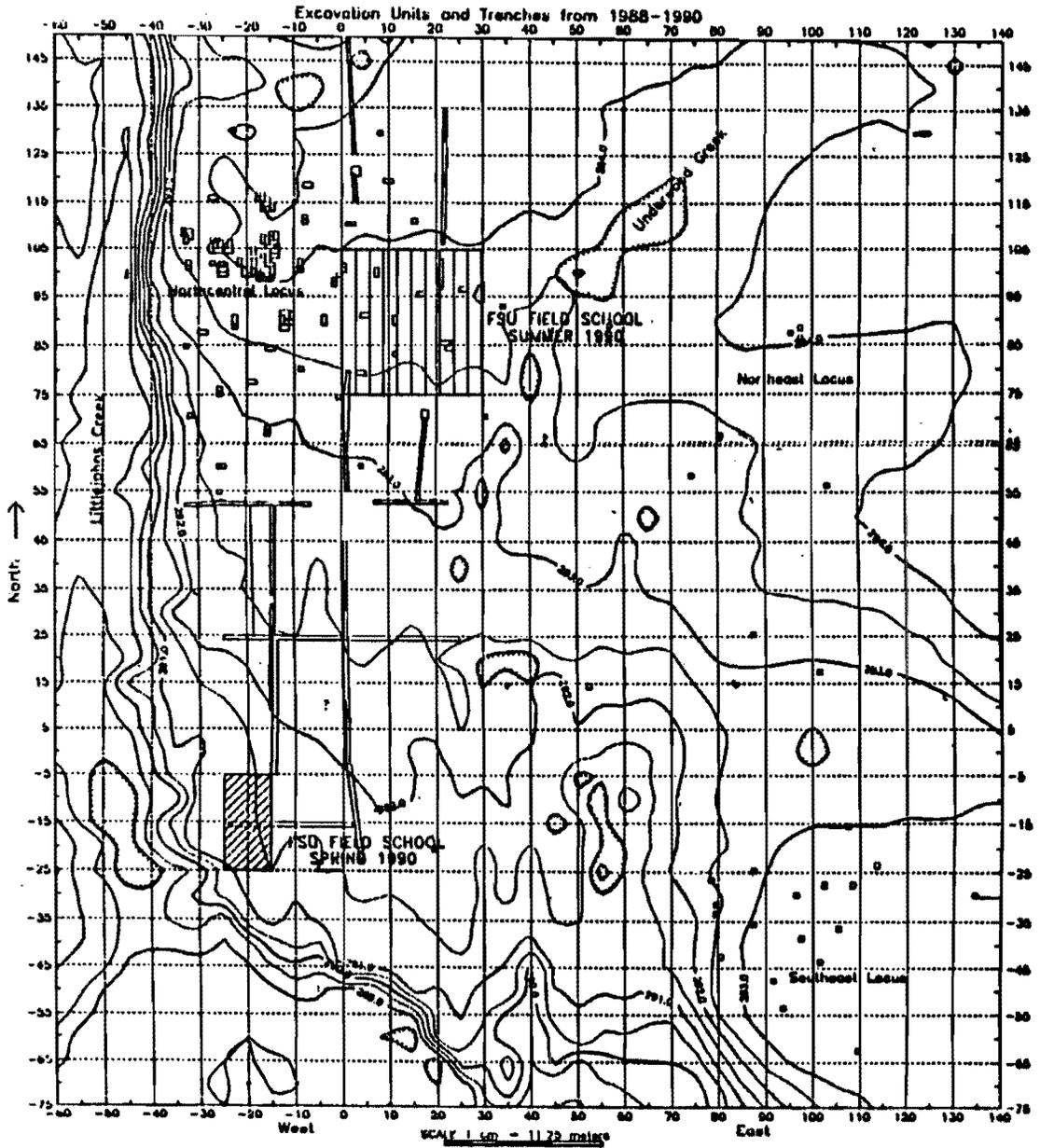
Project History

CA-Cal-629/630 was originally recorded in the mid-1970s by D.C. Candini during a survey of the Littlejohns Creek, and was later reinspected by Susan Lindstrom (1980). Intensive archeological study of the area was initiated in 1987 as part of the environmental impact process for the Royal Mountain King Mine, an open pit gold mining project developed by Meridian Gold Company. The Royal Mountain King Mine project area covers approximately 2,000 acres. Initial survey of the areas of direct impact was conducted by Infotec Research, Inc. (Van Buren et al. 1987). Archaeological Services, Inc. (ASI) subsequently undertook an additional survey and testing program in June 1987 (Werner and Costello 1987). As a result of these surveys, 12 prehistoric archaeological sites were identified, with CA-Cal-629/630 ranking as the largest and most complex.

The Skyrocket Site covers approximately 4 hectares and includes 4 geographically distinct midden loci (referred to as the West, Northcentral, Northeast and Southeast Loci) as well as several bedrock mortar loci (Figure 2). The site derives its name from the Skyrocket Mine, an historic gold mine located nearby.

Since planned development of the Skyrocket Pit at the Royal Mountain King Mine would result in complete destruction of the Skyrocket Site, ASI began a program of data recovery there in June of 1988. These excavations were guided by a Treatment Plan submitted to the Bureau of Land Management and the State Water Resources Control Board, Division of Water Rights (Werner 1988). Work on the Northeast and Southeast Loci was completed by July of 1988. During the summer of 1988 Native American burials were discovered at both the Northcentral and West Loci. Fieldwork at

The Skyrocket Site, Ca-Cal 629/630



Map shows excavation units and trenches from both 1988 and 1989. 1/31/90 floor

Figure 2. Site map, CA-Cal-629/630.

the West Locus progressed through the fall of 1988 using a combination of both mechanical and hand excavation methods. These efforts ultimately resulted in complete excavation of the West Locus in order to insure that all burials had been located and removed. In the process, more than 100 archaeological features were also recorded, including postholes and prepared floor remnants from at least 1 large prehistoric structure. Prior to the on-set of winter rain, additional fieldwork was completed at the Northcentral Locus, aimed at estimating the size and density of the cemetery area and removing any human remains encountered.

In May of 1989, ASI resumed data recovery efforts at the Northcentral Locus of the Skyrocket Site. The focus of the 1989 excavation season was divided between burial excavation and systematic sampling of the archeological deposits. The goal of these excavations was to recover artifacts from a controlled 2% sample of the locus and also to find and remove for reburial all of the graves.

In 1-by-2 meter units excavated outside the cemetery, several organically stained strata containing artifacts were discovered between 1.5 to 3 meters below the surface. A distinctive dark clay stratum dated at 9240 ± 150 (Beta-32415) and 9040 ± 250 (Beta-33001) ^{14}C yr BP was found to contain pollen and some macro-botanical remains in association with chert and obsidian debitage, large stemmed points, and milling equipment. The extensive cultural material in this Early Holocene layer appears to relate to the Western Stemmed Complex (Willig and Aikens 1988).

By the end of the 1989 field season more than 575 cubic meters of deposits at the Skyrocket Site had been excavated, nearly 200 features had been recorded and over 325,000 pieces of cultural material had been recovered.

During the 1988 and 1989 field seasons, Native American observers Margaret Franklin and William Franklin supervised the recovery of 59 burials from the Northcentral Locus. Burial excavations were conducted under the terms of a Burial Agreement between the Royal Mountain King Mine and the Miwok Elders. The burial agreement provides for the dignified and respectful removal of all burials from the Skyrocket Site, with provisions for appropriate scientific study and analysis. After excavation and study the burials will be reburied along with all of their plausibly associated artifacts in a nearby location.

In order to be certain that all burials have been found and recovered for reburial, it will be necessary to excavate the entire area surrounding the cemetery, and eventually the entire site. Total excavation of a large site like CA-Cal-629/630 requires the use of both hand and mechanical excavation techniques. The excavation of the Skyrocket Site has been

expedited by careful use of a Caterpillar 235 excavator with a wide straightedge bucket. With a skilled operator proceeding at a slow, carefully monitored pace, it has been possible to remove much of the overburden surrounding burials using this machine.

We estimate, based on a 10% sample of the burial area, that the Northcentral Locus contains up to 500 burials. The densest concentration of burials appears to be in a grove of ailanthus trees near the north end of the site. Recovery of burials in the ailanthus grove has been hampered by a dense system of roots. Because tree roots are intertwined with many of the burials, it was concluded that the entire area around the trees (600 square meters) would require hand excavation. The cost of completing this undertaking has placed an enormous financial burden on Meridian Gold.

In order to expand the sample of features and cultural materials from the lower components, and yet not divert funds needed to complete the burial recovery, ASI developed a recovery plan for the 1990 field season that makes use of closely supervised field school and volunteer groups to recover data from the deeply buried archaeological deposits. The first of these field schools, offered through Fresno State University, was taught by Dr. John Pryor during the spring of 1990.

The spring field school focused on an organically enriched clay stratum, located about 140 cm below the surface in the southern part of the Northcentral Locus. A 10-by-20 meter block was mechanically excavated down to the top of the dark clay, and 12 2-by-2 meter units were then hand excavated into the organic soil. In addition to the block excavation, 2 1-by-2 meter control units were dug adjacent to the block in order to sample the strata above the buried deposit (Figure 2). All sediments from these excavations were wet screened.

The field school excavations yielded relatively few artifacts, however a remarkable number of features were discovered. These include a linear array of rock concentrations (possibly the foundation for a "track" across a marshy area), a rock "pavement" containing numerous pieces of broken milling equipment, a sand lined pit possibly associated with acorn leaching, and a large concentration of ash charcoal and burned bone. Initially it was believed that this buried clay stratum might be contemporaneous with the 9000 year old material located farther north at the site, however the recovered artifacts include side notched points, and shaped bowl mortars that suggest a much later period of occupation. Radiocarbon dates and obsidian hydration readings from this area are needed to determine the actual age of these deposits. Fortunately excellent samples for both kinds of analysis have been recovered. A program of trenching and stratigraphic mapping is planned for the 1990 season so that strata found in the southern part of the locus can be correlated with those in the northern area.

During the summer of 1990, a 6-week field school offered by Fresno State University will undertake additional excavations in the Early Holocene deposits at the Northcentral Locus (Figure 2).

LOCI WITHIN THE SKYROCKET SITE

West Locus

The West Locus consisted of a dark floury midden located on a low rise on the west bank of Littlejohns Creek. This portion of the site covered approximately 1300 square meters (Figure 3). The West Locus midden was between 20 to 120 cm thick and rested on soft schist bedrock. Numerous ash features and fragments of structure floor were recorded in the midden. A number of features were also found excavated into the soft bedrock, including several basins and over a hundred post holes.

The West Locus was disturbed by activities associated with the mining town of Hodson, and by numerous rodent tunnels. Although historic artifacts were found in all levels of the midden deposit, from the surface to bedrock, the West Locus contained many intact features including articulated Native American burials. Twenty-two Native American burials believed to date from both the Late Archaic and Emergent Periods were recovered from the West Locus, along with fragmentary remains of as many as 100 additional individuals. Three dog burials believed to be associated with Native American occupation of the area were also excavated.

Lithic debitage from the West Locus suggests that tool maintenance rather than manufacture was a primary activity conducted at this portion of the site. Bifaces from the West Locus are primarily Emergent Period forms (Desert Side Notched, Gunther Barbed like, Rose Springs, Cottonwood Triangles and Stockton Serrate) (Figure 4), some of which show signs of reworking and rejuvenation. Some examples of Archaic point forms were also recovered (Large Side-notched, Stem Series Points, and an Eared Concave Base projectile point, bipoints) (Figure 5).

Several kinds of milling equipment were found at the West Locus, however the assemblage is dominated by mortars and pestles. Bedrock mortars occur adjacent to the West Locus in the bed of Littlejohns Creek.

Beads from the West Locus are also primarily from the Emergent or Historic Period (trade beads [IIa-1, IIa-3, IIa-4, IVa-1, MPIIa-1, MPIIa-2] Olivella disc beads [H1a, H1b, H2, H3], clam disc bead [A1a, A1c, A2a, A2b], Olivella cupped bead [K1], Olivella bushing bead [K2], Olivella saddle beads [F2a], Olivella lipped bead [E1a, E2a]) and Olivella spire lopped [A1a, A1b, A1c]). However some beads also suggest an Upper Archaic component (Olivella ring beads [G3, G3b], Olivella saucer beads

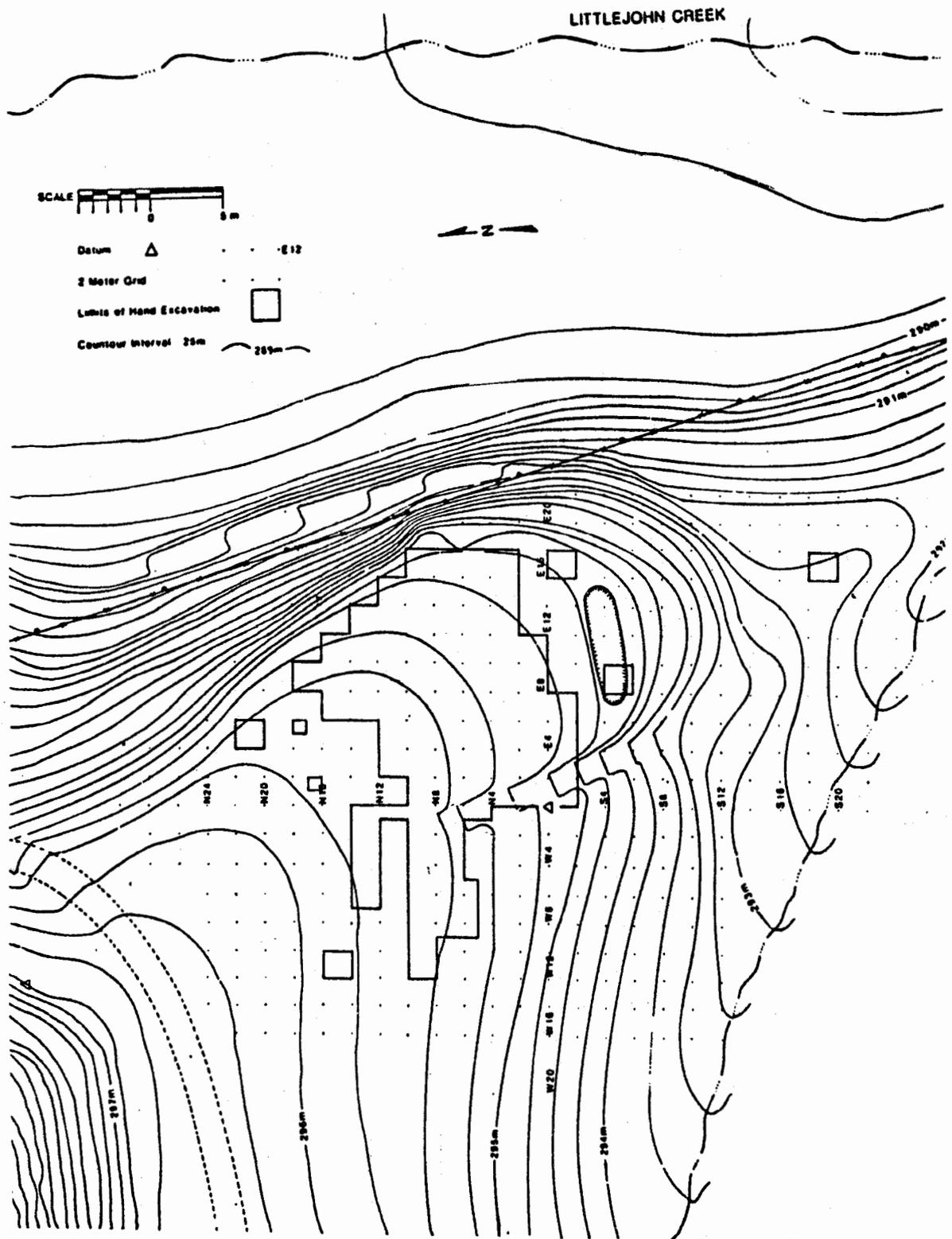


Figure 3. West locus site map and excavation plan 1988.

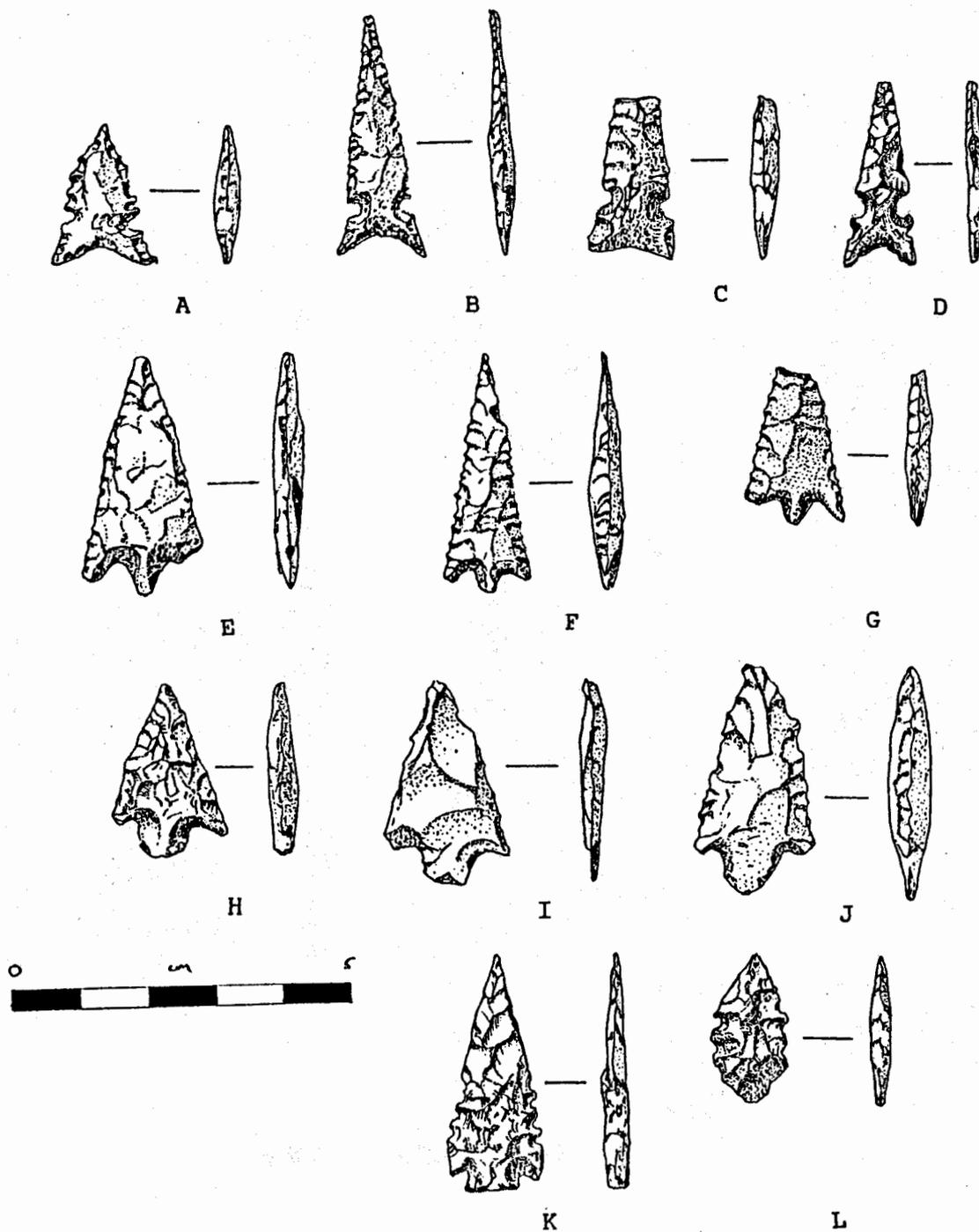


Figure 4. West locus Emergent period projectile points. A=88-6677 (chert), B=88-5364 (chert), C=88-1458 (chert), E=88-1577 (chert), F=88-6177 (chert), G=88-5913 (chert), H=88-5093 (obsidian), I=88-7417 (greenstone), J=88-928 (greenstone), K=88-7456 (obsidian), L=88-1640 (obsidian). Drawings by Dennis Leinfelder.

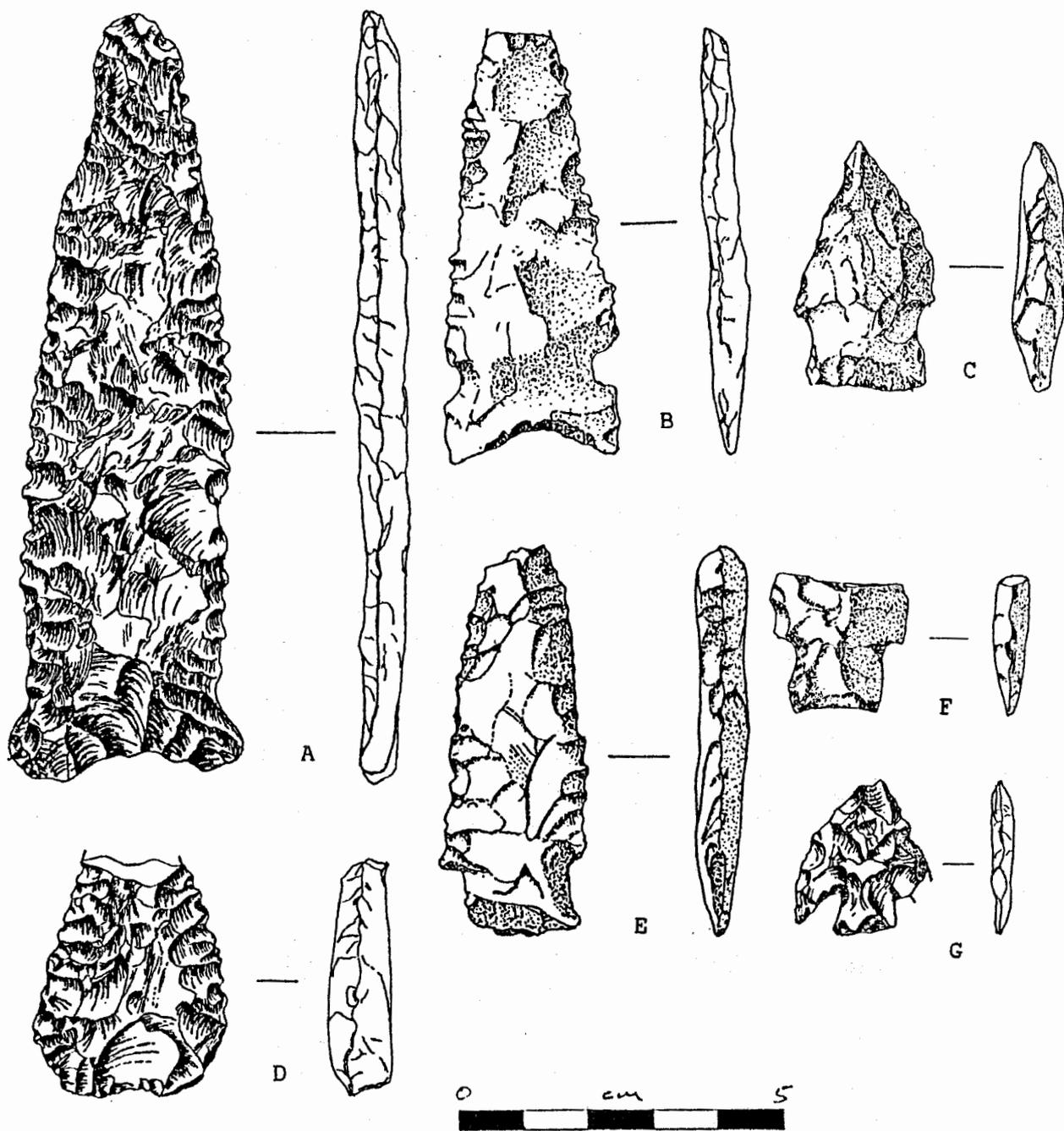


Figure 5. West locus Archaic period projectile points. A=88-6288 (obsidian), B=88-6396 (chert), C=88-7422 (basalt), D=88-6355 (obsidian), E=88-2086 (chert), F=88-1066 (chert), G=88-6517 (obsidian). Drawings by Dennis Leinfelder.

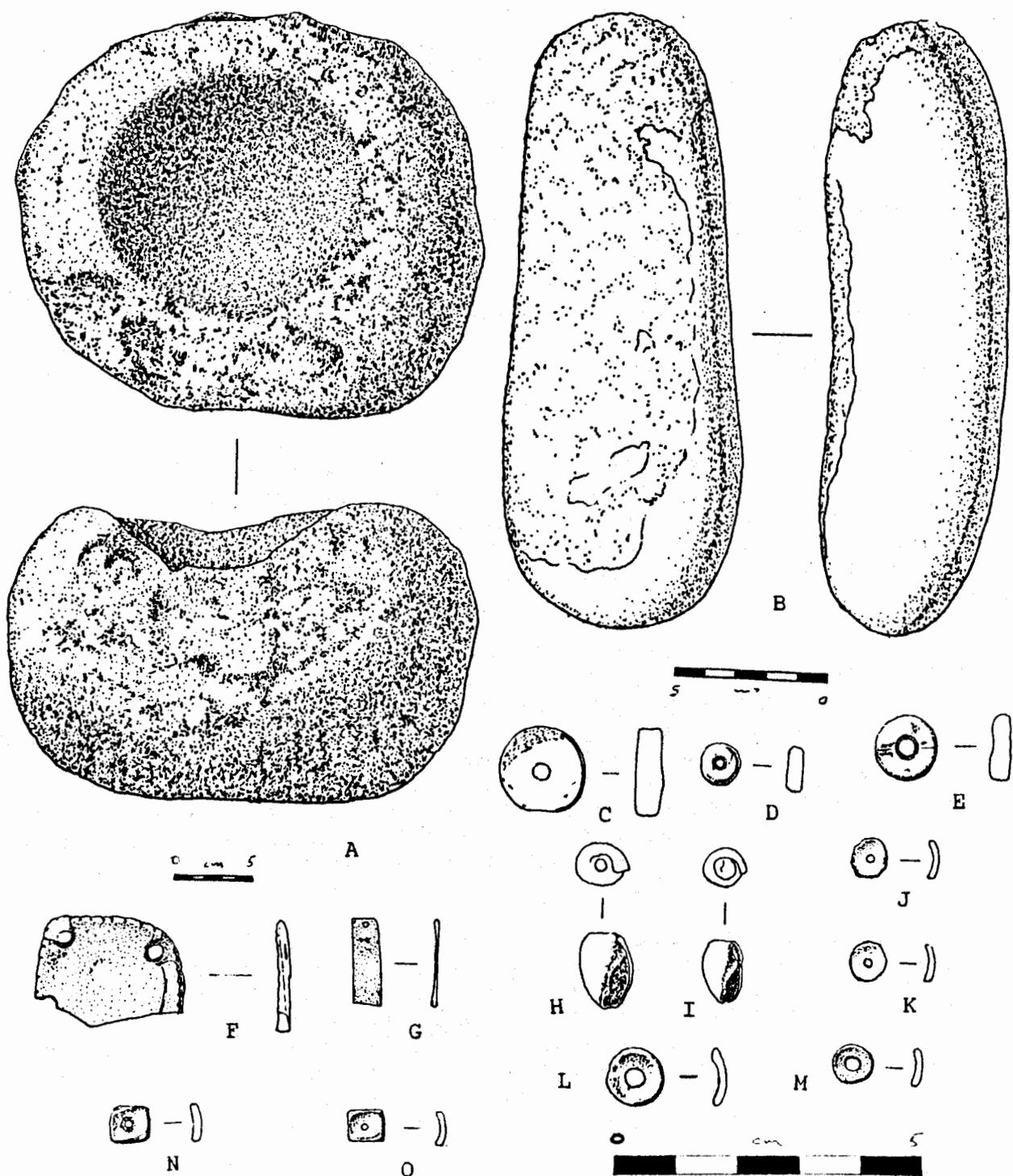


Figure 6. Artifacts from the West locus. A=88-7397A (basalt), B=88-7396A (basalt), C=88-5344 (clam disc), D=88-1244 (clam disc) E=88-782 (clam disc) F=88-5168 (abalone), G=88-7513 (abalone), H=87-134 (olivella spire lopped), I=88-6898 (olivella spire lopped), J=88-1494 (olivella disc), K=88-1496 (olivella disc), L=88-6321 (olivella saucer), M=88-6299 (olivella saucer), N=88-1785 (olivella rectangle), O=88-5525 (olivella rectangle). Drawings by Dennis Leinfelder.

[G2a, G2b, G6]). In particular, 53 Olivella saucer beads were found with 1 individual in a multiple interment. In addition, there was 1 thick Haliotis rectangle bead (L2b) (Figure 6). The midden also contained small fragments of animal bone and fresh water shell.

These artifacts suggest that the majority of the deposit at the West Locus dates from the Emergent Period, with some evidence of an Archaic occupation. The only Radiocarbon date available thus far was taken from charcoal recovered below a prepared floor remnant, however this sample yielded a statistically modern date. Over 100 obsidian samples are in the process of being analyzed at this time, and should be helpful in clarifying the dating of the West Locus deposits.

Southeast Locus

The Southeast (SE) Locus covers an area of about 4000 square meters east of the confluence of Littlejohns Creek and Underwood Creek (Figure 2). Cultural deposits at the SE Locus are between 20 and 60 cm thick and rest directly on bedrock. The sediments at the SE Locus consist of a yellow gravelly clay capped by a thin layer of light surface loam.

The SE Locus can be characterized as a medium density lithic scatter. The bifaces from the SE Locus are primarily lanceolate and leaf forms made from greenstone, although 1 desert side notch and 1 small corner notched point were also recovered. The ground stone assemblage is dominated by seed grinding implements (hand stones and milling slabs), but there is also some evidence of acorn processing technology (1 bowl mortar fragment and a pestle fragment). No bone was recovered from the SE Locus, which may be attributable to a poor preservation environment. No features were identified at the SE Locus.

Since no charcoal or other culturally derived organic material was recovered from the SE Locus, the activities represented there cannot be radiocarbon dated. Twelve pieces of obsidian from the SE Locus have been sourced and examined for hydration. The rim readings on Bodie Hills obsidian flakes range from 4.9 to 6.4 microns, values similar to those from the lower levels in the midden at the Northcentral Locus. A small number of additional hydration samples will be examined.

Northeast Locus

The NE Locus is located on the eastern bank of Underwood Creek, north of the SE Locus (Figure 2). It consists of a low density lithic scatter over an area of about 7000 square meters. The sediments at this locus are from 20 to 70 cm thick, and consist of a yellow gravelly clay capped by a thin layer of light surface loam.

The NE Locus has yielded little more than lithic debitage. Few formed tools and no groundstone artifacts were recovered. No

faunal or botanical remains were found, and no features were encountered.

The few temporally diagnostic artifacts recovered from the NE Locus are most similar to those recovered from the SE Locus. The temporal relationship between these loci cannot be confirmed by radiometric analysis, since no organic material was recovered. We will rely on obsidian hydration to gauge the temporal placement of activities at the NE Locus.

Northcentral Locus

The Northcentral (NC) Locus is located between Littlejohns Creek and Underwood Creek, above their confluence. The NC Locus is approximately 220 meters long and 75 meters wide (11,200 square meters). In addition to being the largest area of the site, the NC Locus also the deepest and stratigraphically the most complex part of the Skyrocket Site. Cultural deposits extend from the surface to depth of more than 3 meters, and contain a record of more than 9000 years of site use and occupation. A more detailed description of the various strata and artifacts recovered from these strata is presented below. The northern end of the NC Locus contains 3 principle stratigraphic units: surface midden, gravelly clay, and dark clay.

Midden Strata (light, medium, and dark surface loam)

The midden component in the NC Locus consists of a deposit of loose dark sediment up to 1 meter in thickness, distributed over an area of about 5500 square meters. This deposit contains heat-altered rock, bone, fresh water shell, beads, ornaments, and a dense scatter of lithic debitage and stone tools. The density of cultural material increases from south to north in the midden area, with the highest concentration of material near the northern end of the locus (Figure 7). The dark surface loam/midden also contains a large number of Native American burials.

It is estimated that the cemetery component of the NC Locus contains between 400 and 500 individuals, who were buried over a span of at least 1500 years. Burials in the NC Locus are predominately primary interments of single individuals in a flexed position, although some multiple burials and several extended burials and 1 cremation have also been found. Burials are generally encountered between 40 and 120 cm below the surface. Bone preservation is quite variable, ranging from fair to good. To date, no preferred orientation or alignments have been detected.

Osteometric data were collected in the field during the excavation of all burials and the bones were later examined for pathologies by a Dr. Roger LeJeunesse. With the permission of the Miwok Elders small samples of bone from each of the burials have been taken for chemical analysis. The Nitrogen and Fluorene

Skyrocket Site, Ca-Cal 629/630, North Central Locus

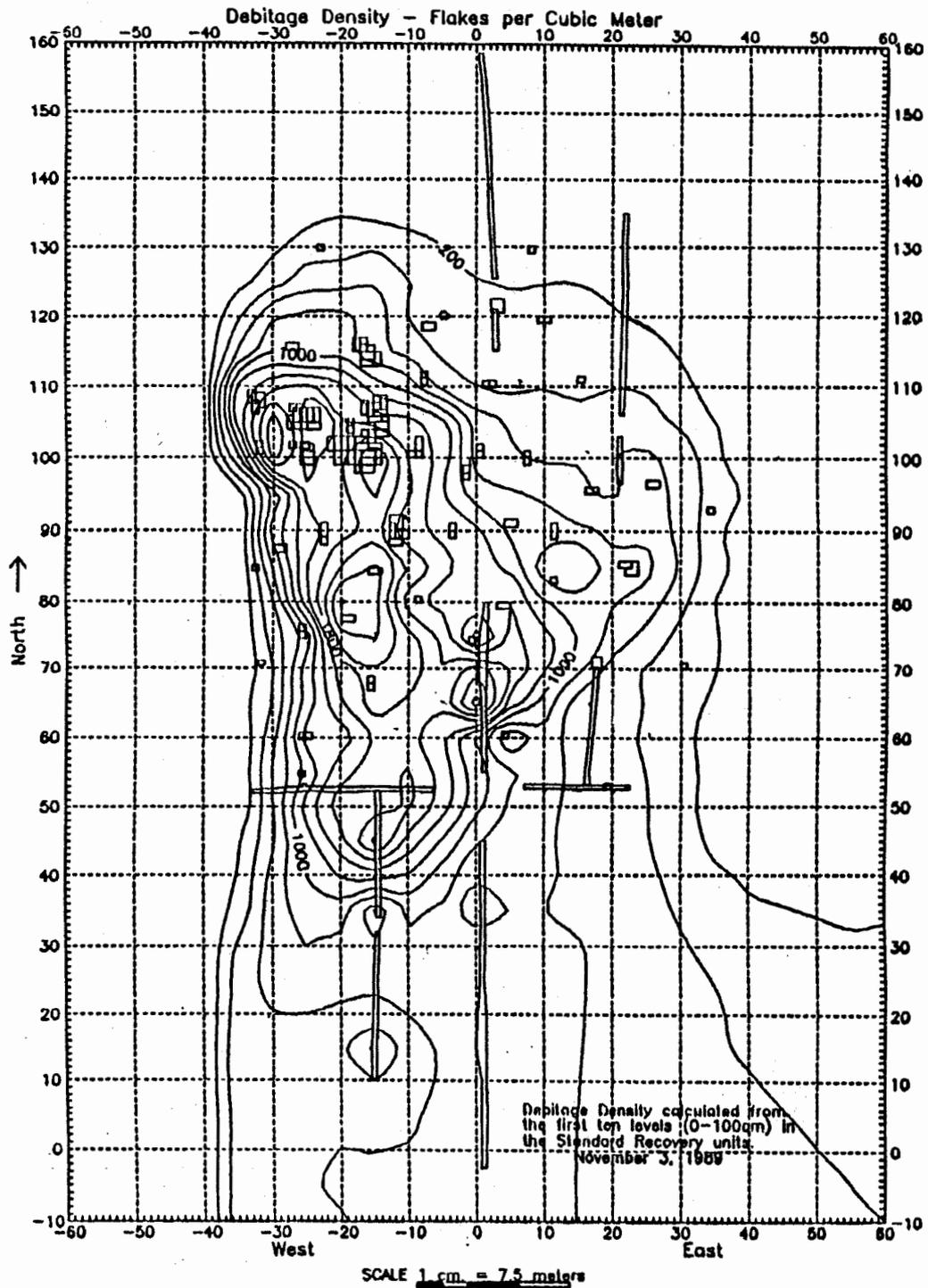


Figure 7. Map of debitage density at the Northcentral locus.

content of each bone sample will be measured in an attempt to develop a relative chronology and sequence of interments. This relative sequence will be temporally anchored with 5 AMS ^{14}C dates on human bone from burials that appear to span the temporal range of the burial population.

In addition to the Native American occupation, there are historically documented occupations at the NC Locus by families of Euro-American farmers and ranchers, who lived at the site from the 1850s until the 1920s. Volney Brooks originally claimed the land sometime before 1856 and resided there until 1865. Around 1870, Philip and Rosetta Swank moved to the site where they raised 7 children in addition to hogs, cattle, sheep, horses, and poultry. The property was sold in 1892 to J.D. McCarty, who rented it to various tenants until the 1920s (Costello and Cunningham 1987). This historic component, known as the Swank Ranch, has been recorded as a separate site, numbered CA-Cal-1135H. Artifacts from the Historic Period occupation are generally confined to the upper 40 centimeters of the midden. Two hand dug stone lined wells and a stone foundation have been located, along with a trash pit and possible privy. These features will be recorded, sampled and removed during the 1990 field season.

Although several prehistoric features have been recovered from the midden deposits in the NC Locus, the ash features characteristic of the West Locus are nearly absent. The most interesting non-burial feature from the midden levels was an oval rock pavement (180 by 165 cm), possibly representing the floor a small sweat lodge. Many of the rocks in the pavement were broken and inverted milling slabs. Burned earth and a small amount of ash was found along 1 edge of the feature. Unfortunately, no temporally diagnostic artifacts were found in direct association, however, the feature maybe datable as a result of its stratigraphic relationship with nearby burials (Figure 8). An area containing a possible hearth and postholes will be investigated further during the upcoming field season.

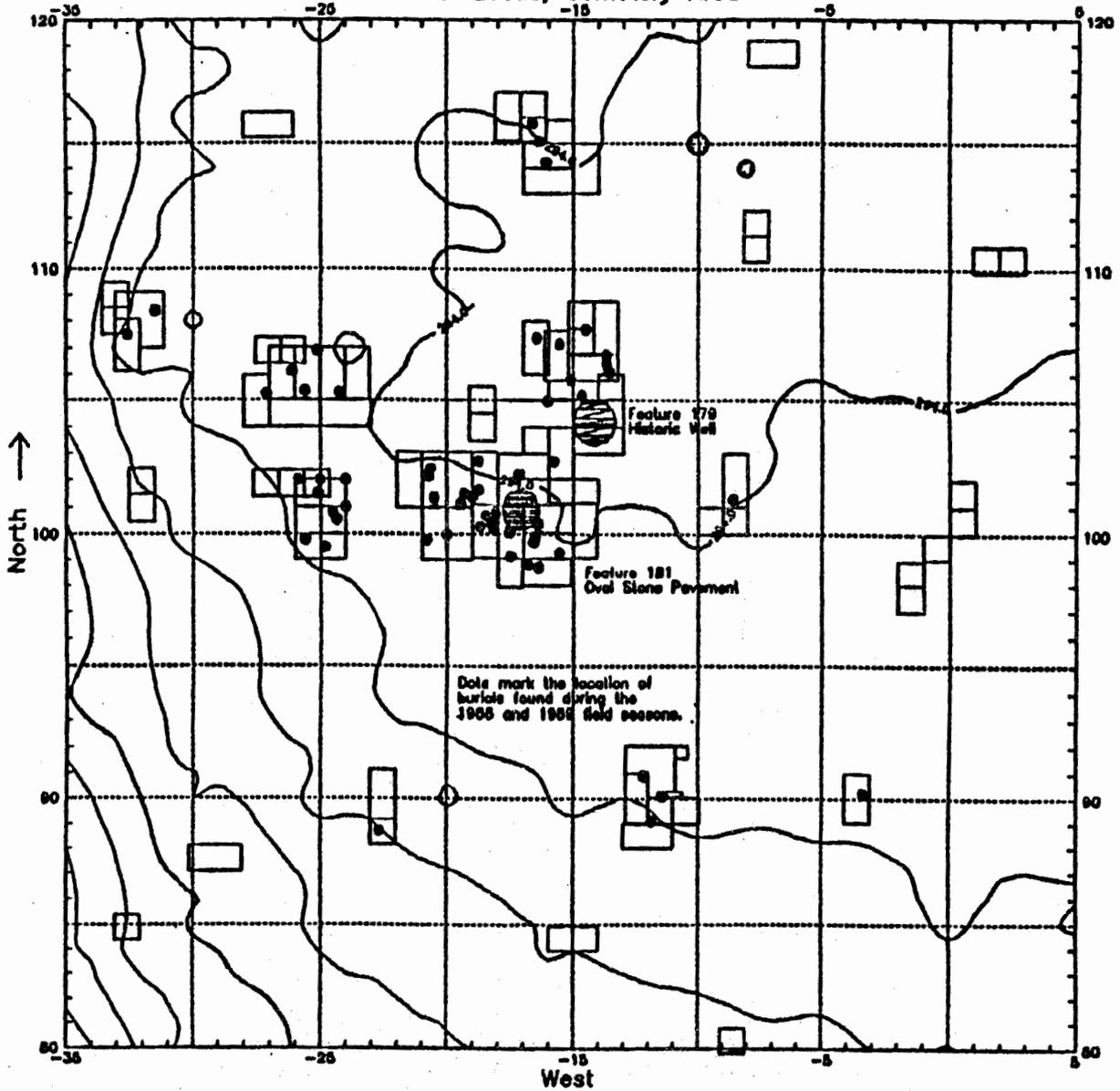
The midden contains temporally diagnostic artifacts that span a wide range of time (from historic trade beads and Desert Side-notch points, to Contracting Stem and Stem Series Points) (Figures 9 and 10). Milling equipment including handstones and milling slabs has been recovered as well as bowl mortars and pestles (Figures 11 and 12).

Beads from the NC Locus are primarily from the Emergent and Historic Periods and include glass trade beads [type II-a1, IIa-2, IIa-3, IIa-5, M-1, MPIIa-1], Olivella disk beads [H1b, H2], Clam disk beads [A1a, A1b, A1c], and Olivella cupped beads [K1, K2], although some (Olivella saucer [G2a] may also date to the Archaic Period (Figure 13).

Locally available greenstone (fine grained siliceous

The Skyrocket Site, Ca-Cal 629/630

Northcentral Locus, Cemetery Area



SCALE 1 cm. = 2.5 meters

Contour Interval 25cm

This map shows excavation units from the 1988 and 1989 field seasons. RMW 2/1/1990

Figure 8. Map of the Cemetery at the Northcentral Locus

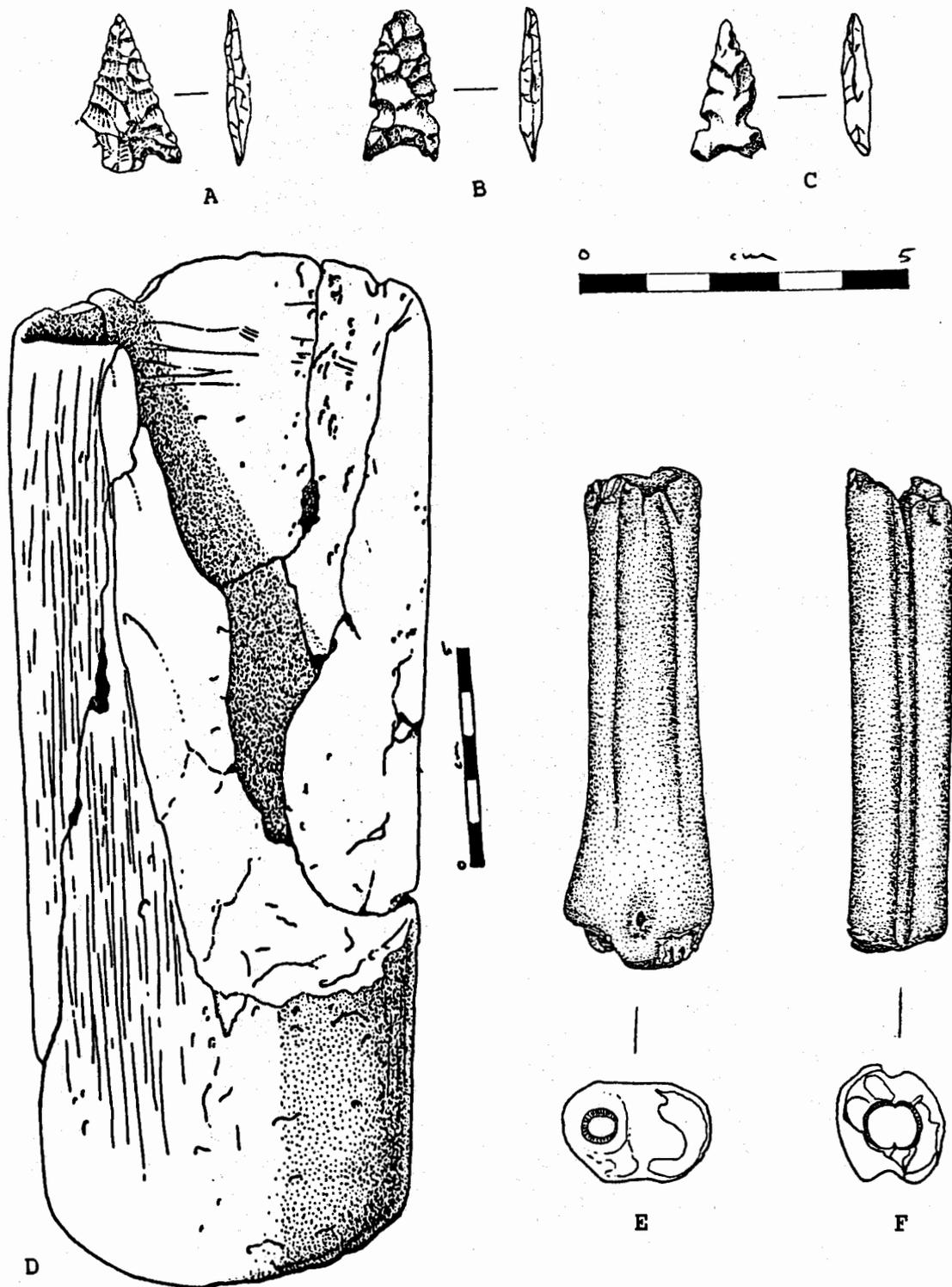


Figure 9. Emergent period artifacts from the Northcentral locus. A=88-9467 (obsidian), B=88-8141 (chert), C=88-3354 (chert), D=89-6841 (steatite), E=89-6677 (gambling bones), F=89-6679 (gambling bones). Drawings by Dennis Leinfelder.

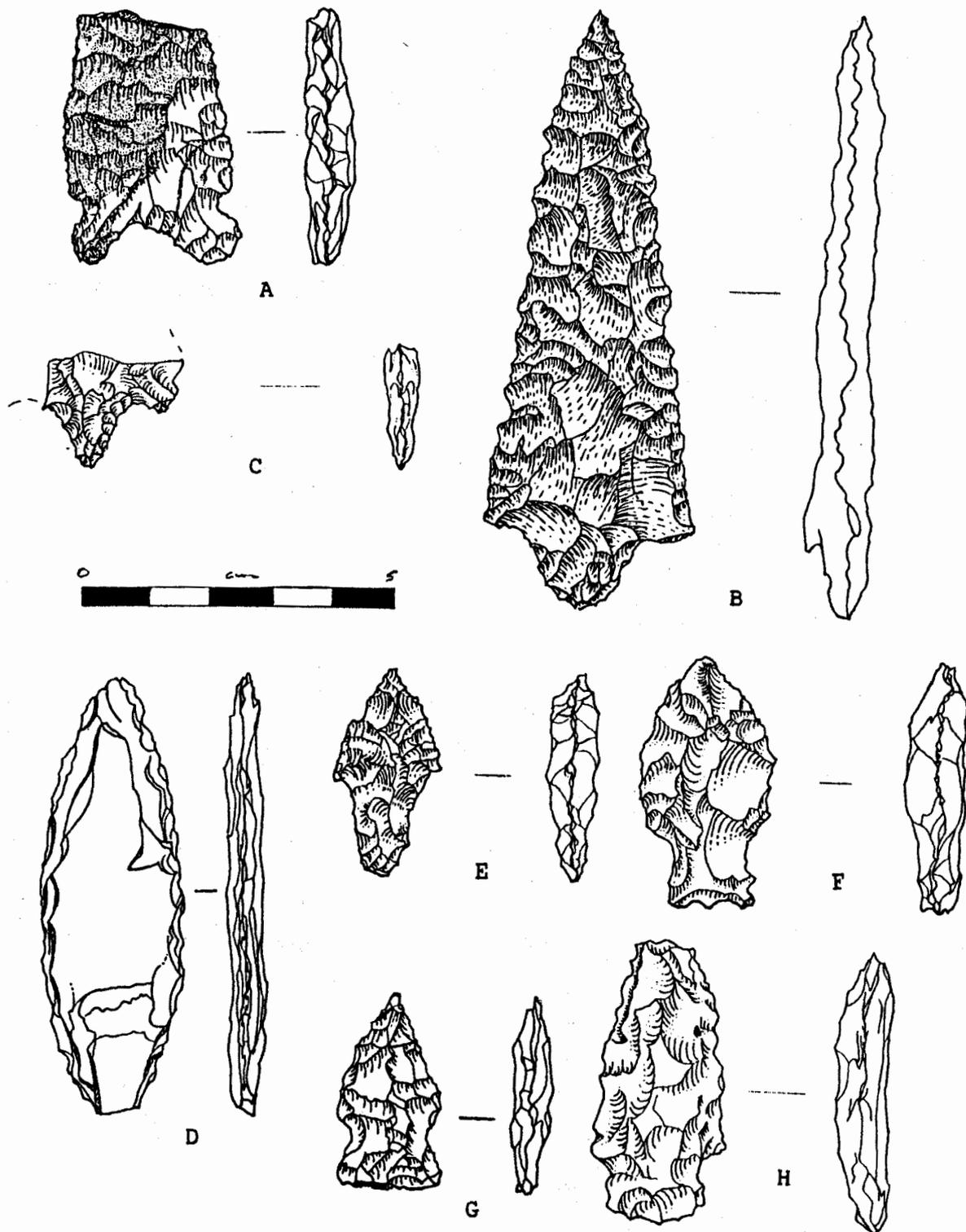


Figure 10. Archaic period bifacial tools from the Northcentral locus. A=89-5649 (chert), B=89-3789 (obsidian), C=89-848 (obsidian), D=89-5646 (greenstone), E=89-2933 (obsidian), F=89-578 (obsidian), G=89-9285 (greenstone), H=89-886 (chert). Drawings by Marion Pratt.

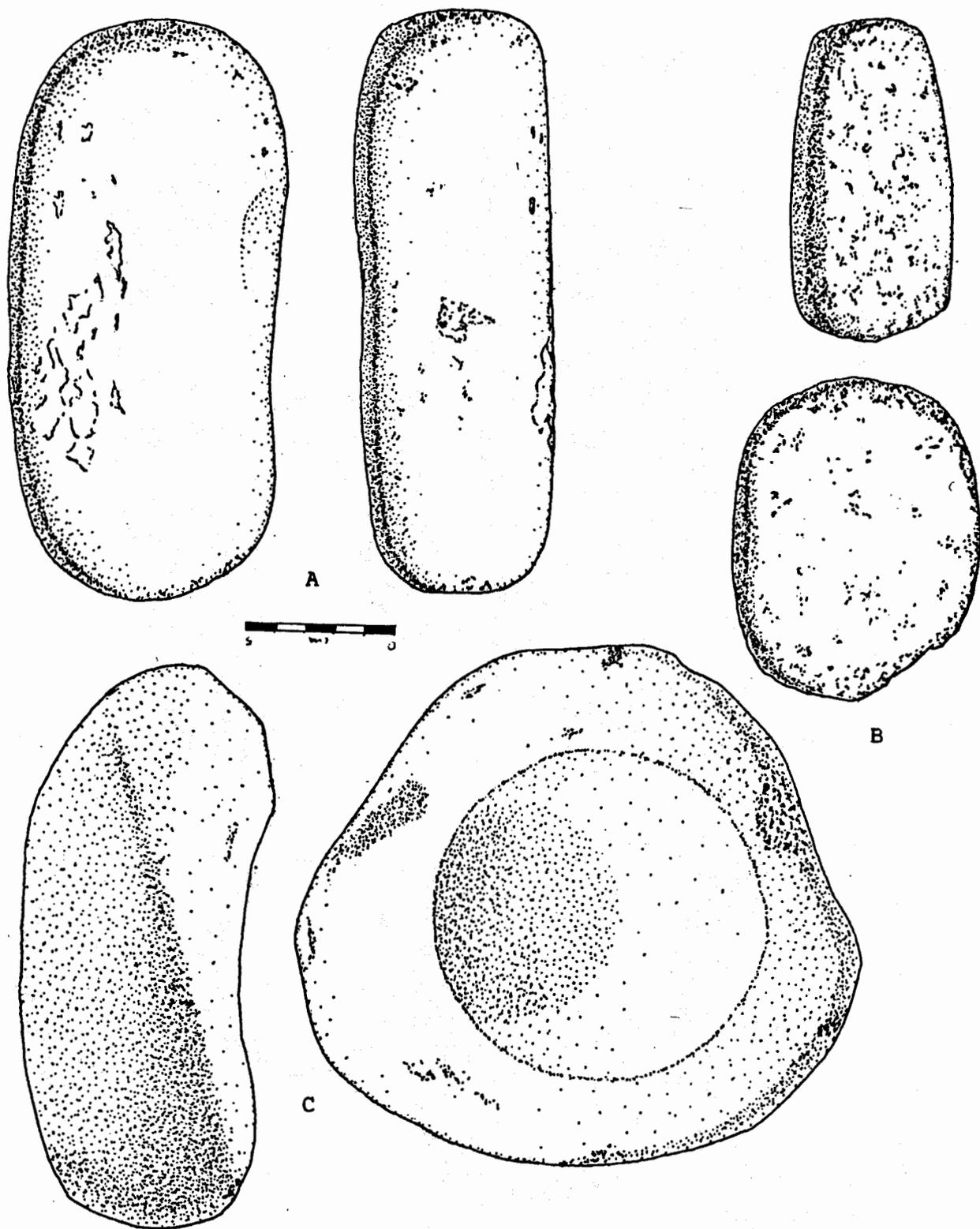


Figure 11. Emergent period ground stone artifacts from the Northcentral Locus. A=89-6640 (granite), B=88-10094 (granite), C=89-8642 (granite). Drawings by Dennis Leinfelder.

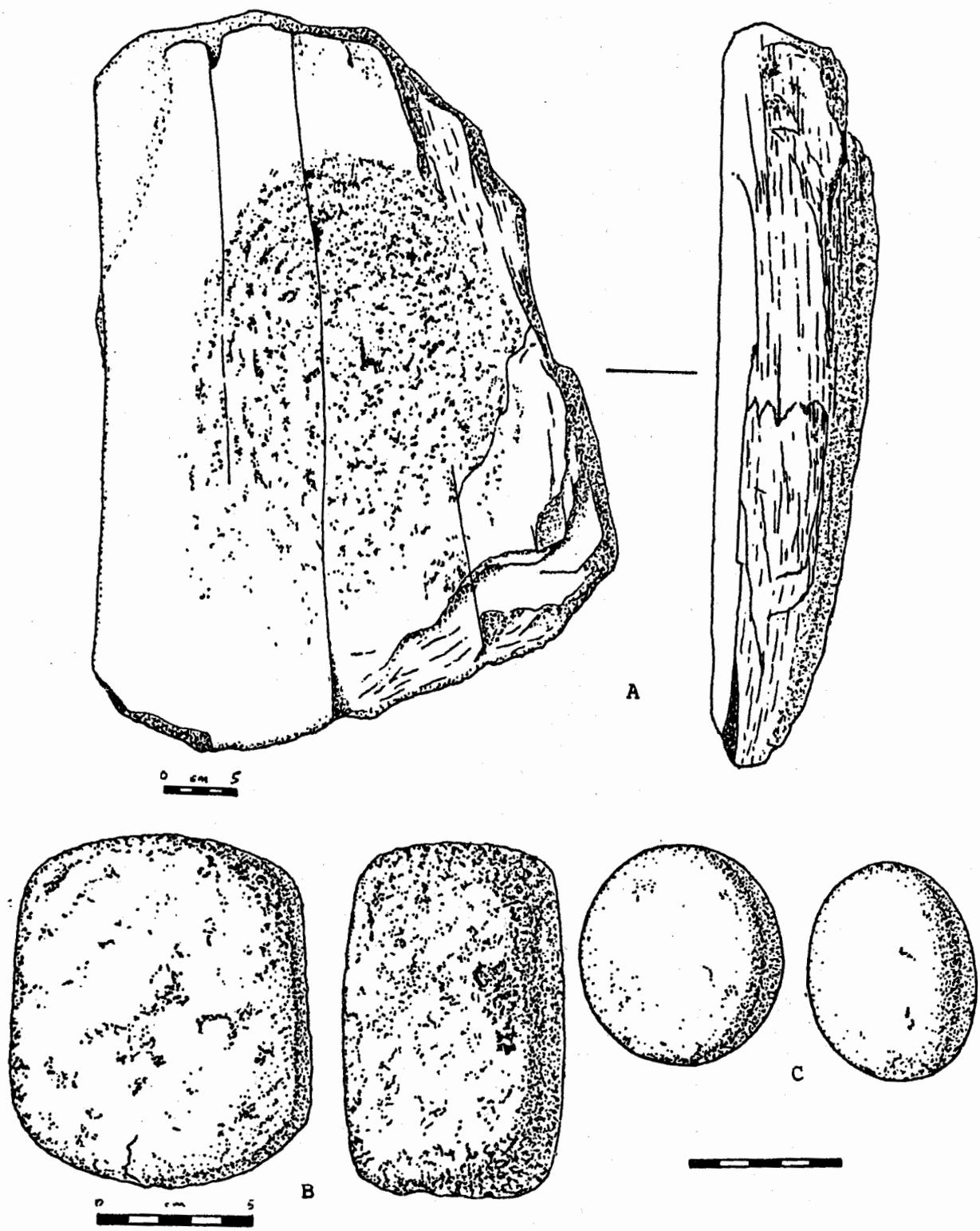


Figure 12. Archaic period ground stone artifacts from the Northcentral locus. A=89-9073 (schist), B=89-9260 (granite), C=89-5807 (granite). Drawings by Dennis Leinfelder.

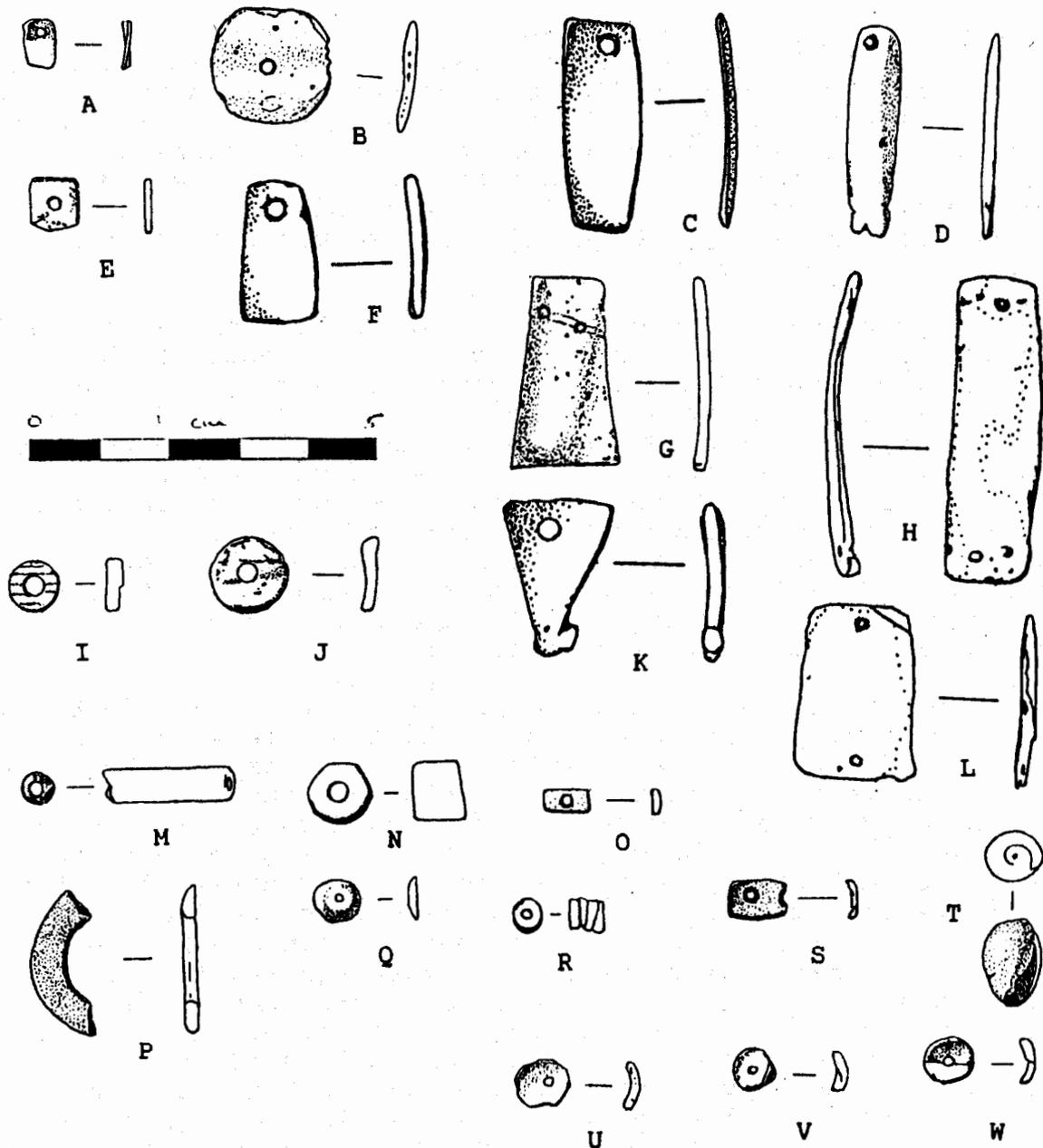


Figure 13. Shell beads and pendants from the Northcentral locus. A=89-3446 (abalone rectangle), B=89-6661 (abalone bead), C=89-6670 (abalone), D=88-10721 (abalone), E=88-2443 (abalone rectangle), F=89-6672 (abalone), G=88-8201 (abalone), H=89-1899 (abalone), I=89-3140 (clam disc), J=88-10563 (clam disc), K=89-6673 (abalone), L=89-6682 (abalone), M=89-3292 (steatite), N=89-5881 (steatite), O=89-3840 (olivella rectangle), P=88-4063 (steatite), Q=88-4458 (steatite), R=89-3146 (olivella large bushing), S=89-3841 (olivella rectangle), T=89-3149 (olivella spire lopped), U=89-262 (olivella disc), V=89-3163 (olivella disc), W=3359 (olivella disc). Drawings by Dennis Leinfelder.

metavolcanic rock) is the dominant material in the debitage assemblage, but chert, chalcedony, basalt, quartz, and obsidian are also present. Non-obsidian debitage occurs in densities up to 2600 flakes per cubic meter, and as many as 300 obsidian flakes per cubic meter have been recovered. The highest concentration of debitage is found at the base of the midden. A large number of cores, bifacially and unifacially worked flakes, edge-modified flakes, and bifacially worked tools have been collected from the midden.

The hydration rim readings on Bodie Hills obsidian found in the midden range from 1.9 to 7.1 microns, with most of the values clustering between 3.5 and 5.5 microns. This range overlaps with the range (4.9-6.4 microns) for Bodie Hills obsidian from the SE Locus. It appears from this evidence that debitage in the midden was deposited over a long period of time, from the Archaic through the Emergent Periods. Bodie Hills obsidian appears to be the dominant obsidian source throughout the occupation, comprising at least 80% of the obsidian debitage in every assemblage. Casa Diablo material makes up about 10% of most assemblages, and lesser amounts of Napa Valley, Annadel, and Mt. Hicks material have also been identified.

The occupation activities responsible for obsidian debitage in the midden component do not appear to completely overlap temporally with all of the burials. At least some of the burials appear to be late prehistoric/protohistoric, based on association with chipped disk beads, desert side notched points and indirect association with glass beads. It is interesting to note that while beads recovered from the NC Locus are primarily from the Emergent Period, most of the projectile points are Archaic forms (Figures 10 and 13). Very few late-period points have been recovered in non-burial contexts, and most rim readings on midden obsidian are larger than 3 microns. Data from the Stanislaus River area (Chartkoff 1989), Yosemite (Hull 1989), and many other parts of California (Jackson 1984b), as well as the rate calculated for the Skyrocket Site all suggest that obsidian associated with this late period should yield readings of less than 3 microns. Thus the occupation activities responsible for midden development appear to predate at least some of the burials. Either occupation ceased while the cemetery remained active, or occupation continued but little obsidian was being worked at the NC Locus at that time.

Stylistically late obsidian projectile points (Desert Side Notched and "Gunther Barbed" variants (see Figure 4)) have been recovered from the West Locus. Our working hypothesis is that by the Emergent Period most of the occupation related activities at the Skyrocket Site had shifted away from the NC Locus. Perhaps across the creek to the West Locus, while the NC Locus continued to be used as a cemetery. This seems to be supported by the distribution of temporally diagnostic artifacts, preliminary obsidian hydration results, and ethnohistoric information on

burial practices, which indicate a separation between Miwok living areas and cemeteries.

Gravelly Clay Stratum

Below the midden deposit is a layer of gravelly clay that ranges from approximately 80 to 120 cm in thickness. In contrast to the midden strata this deposit contains less organic material and few artifacts. The debitage counts never reach zero but, rarely are greater than 50 flakes per 10 cm level. This deposit does contain at least 1 layer in which there is a significant increase in lithic debitage (as much as 100 flakes per 10 cm level in a 1-by-1 meter unit). In some units this pulse in artifact counts co-occurs with a faint band of darker organically enriched soil about 20 cm thick.

The few hydration rim readings available for this stratum include values (5.9-6.8 microns) intermediate between those from the midden and the more deeply buried deposits. The hydration data suggest that cultural materials in the gravelly clay deposits are not simply the result of mixing from adjacent layers.

An attempt to radiocarbon date this layer using small pieces of wood charcoal yielded an anomalous late date of 390 ± 50 ^{14}C yr BP (Beta-33001). This charcoal was obtained from a unit in an area with very high concentrations of charcoal in the near surface levels and we assume that the dated material was intrusive.

The flakes from this layer are primarily of local, coarse grained greenstone. Few formal tools have been recovered from the gravelly clay, with the exception of 1 milling slab.

Additional sampling of in this stratum will be carried out by the 1990 summer field school.

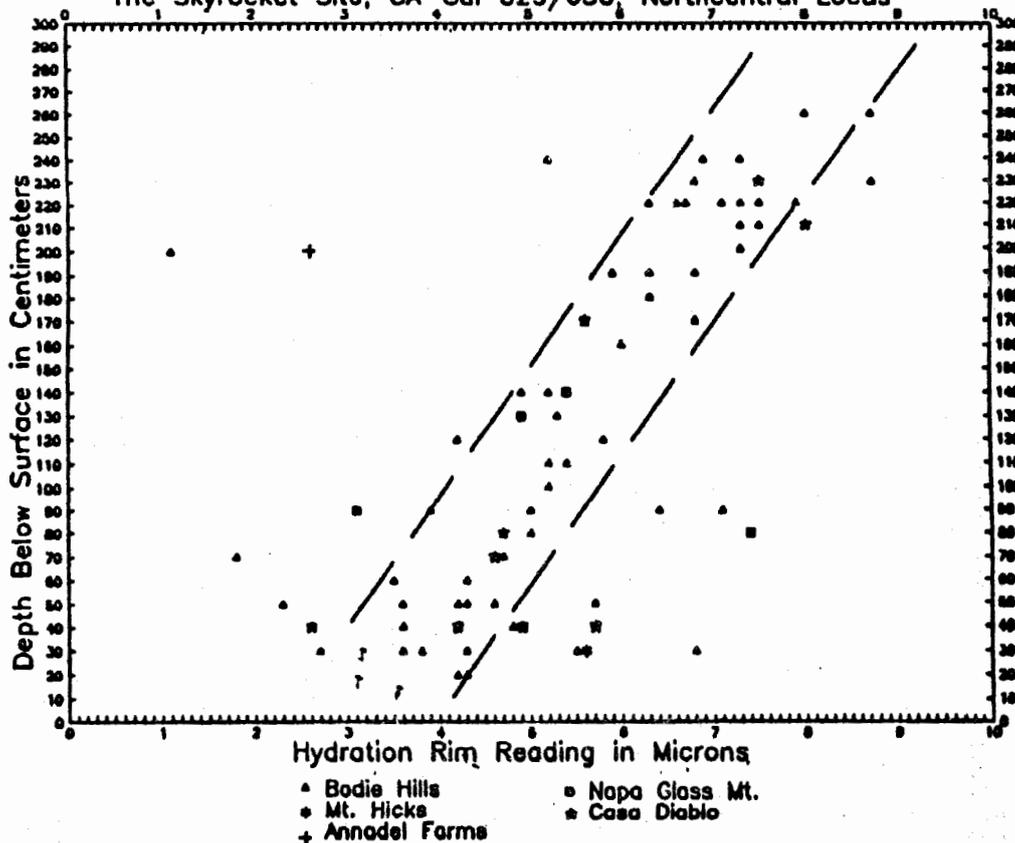
Deeply Buried Dark Clay Stratum

Underlying the gravelly clay in the NC Locus is an organically enriched dark clay "midden like" sediment approximately 20 to 35 cm thick containing quantities of charcoal and debitage. This stratum occurs between 190 to 280 cm below the present ground surface over an area of more than 1200 square meters. Locally, artifacts occur below this dark clay, possibly representing an even earlier component. The highest artifact density (>500 flakes per 10 cm level) occurs in an area believed to border the edge of a buried spring.

Two radiocarbon dates have been obtained for the Early Holocene components at the Skyrocket Site. One bulk soil date of 9240 ± 150 ^{14}C yr BP (Beta-32415) on dark clay containing charcoal, debitage and ground stone, and another date 9040 ± 250 ^{14}C yr BP (Beta-33001) on small pieces of wood charcoal collected from excavation levels, including the dark clay layer, 200-250 cm

Plot of Obsidian Hydration Rim Reading VS Depth

The Skyrocket Site, CA-Cal 629/630, Northcentral Locus



This diagram illustrates the relationship between hydration rim thickness and depth, for obsidian debitage from the Northcentral Locus at the Skyrocket Site. Note the positive correlation between rim thickness and depth. This correlation reflects the stratigraphic integrity of the deposits at this site. The thicker hydration rims theoretically corresponding to older material, are consistently overlain by thinner younger material.

Deposits at the Northcentral Locus are somewhat mixed as a result of both cultural and natural processes, and artifacts have moved both upward & downward in the sediment column. This diagram can be used to estimate the degree of vertical mixing. The surface midden deposits (0-100cm) appear more mixed than the deeply buried strata. Overall the deposits appear to be 75% intact, with about equal amounts of upward and downward displacement. 14 of 60 Flakes have clearly moved (8 up and 6 down)

Figure 14. Plot of obsidian hydration rim readings vs. depth.

below the surface in unit 96N/18E.

Obsidian hydration readings on debitage recovered from the dark clay stratum range from 6.0 to 8.5 microns for Bodie Hills obsidian, with the majority of the readings falling into the 6.8 - 7.5 micron range. A few readings in the 8.0 - 8.7 micron range come from flakes recovered from beneath the dark clay, suggesting the possibility of even earlier component (Figure 14).

The hydration values from the NC Locus are remarkably consistent, and show a strong positive correlation with depth (Pearsons $r = .73$). Although cultural materials have moved both up and down in the sediment column, the hydration data indicate minimal mixing into the deeply buried strata. Faunalurbation of these sediments may be limited by the locally high watertable, the compact nature of the clay sediments and perhaps by periods of rapid deposition shortly after to the initial period of occupation.

The hydration values and radiocarbon dates from the dark clay can be used to estimate the hydration rate for obsidian at the Skyrocket Site (Figure 15). A nearly logarithmic power function rate derived from the diffusion equation $K=tx^2$ is favored here, based on its goodness of fit with both hydration theory and existing data (Hull 1989; Jackson 1984a, 1984b; Stevenson et al. 1989). Radiocarbon dated Bodie Hills obsidian from the Yosemite (Hull 1989) and Stanislaus River areas (Chartkoff 1989; Chartkoff and Chartkoff 1988) plots very close to the rate curve in Figure 15 which is based on material from the Skyrocket Site dated at 9200 BP.

Because temperature plays an important roll in the rate at which obsidian hydrates we are currently collecting stratum specific temperature data (with 7 pairs of temperature and relative humidity cells deployed in the midden, gravelly clay, and dark clay strata) in order to refine our hydration rate calculations. Groundwater temperatures are also being monitored as an additional means of assessing the effective hydration temperature for obsidian in the dark clay stratum. Preliminary measurements suggest that obsidian in the dark clay has been exposed to stable groundwater temperatures of about 16° Centigrade since the time of deposition 9000 years ago.

Only a few formal chipped-stone tools have been recovered from the dark clay. Scrapers, large edge-modified flakes and fragments of large lanceolate bifaces (possible preforms) broken during manufacture are common (Figures 16a and 16b). A large stemmed point of fine-grained greenstone and a heavily reworked obsidian projectile point (a concave base form, possibly a Pinto) are the only complete bifacial artifacts recovered (Figure 16bA). The tools are well crafted by soft-hammer percussion, primarily from fine grained greenstone. Discard of exhausted tools and reworking of obsidian tools suggests that tool replenishment was

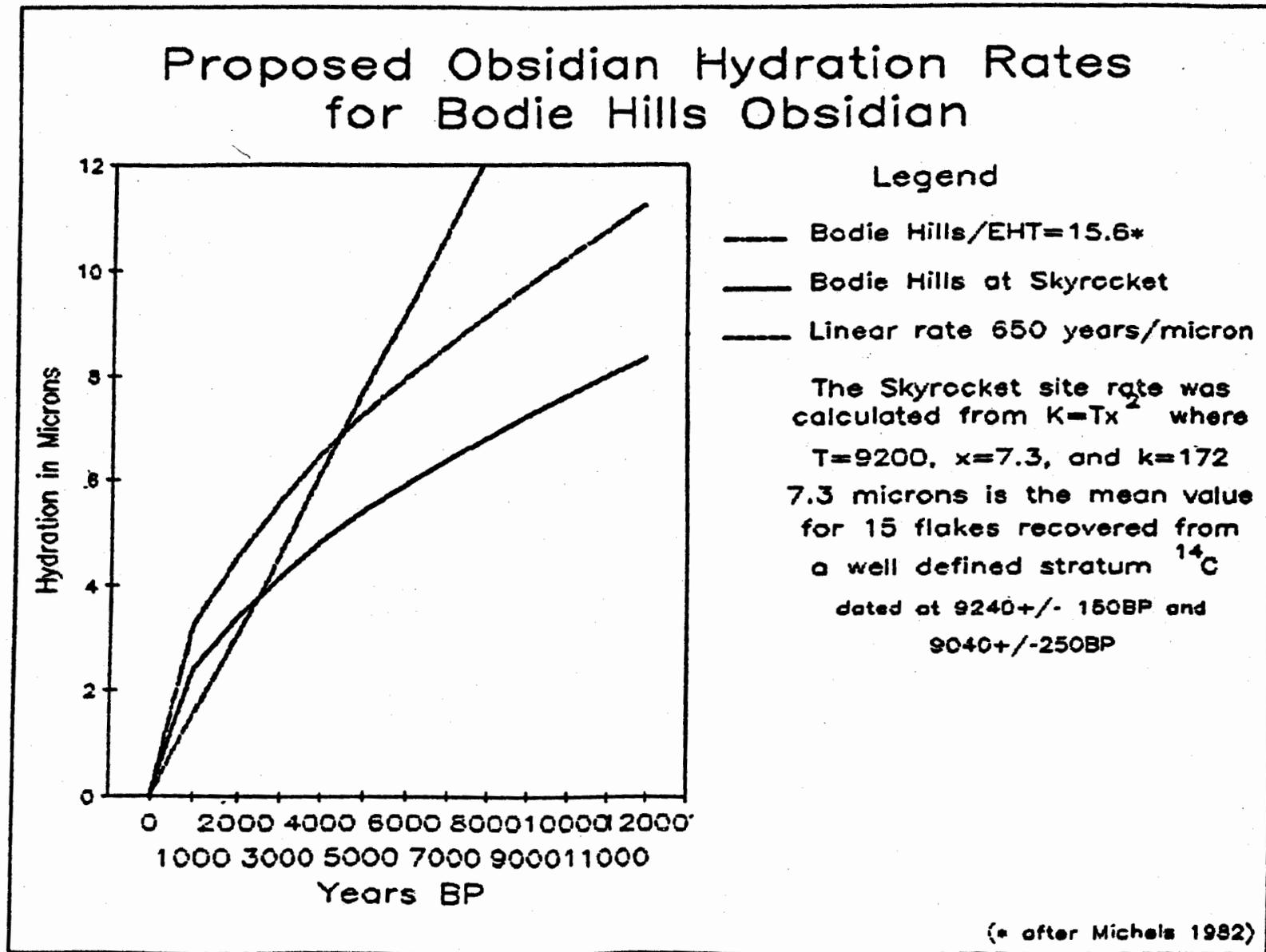


Figure 15. Proposed obsidian hydration rate for Bodie Hills obsidian.

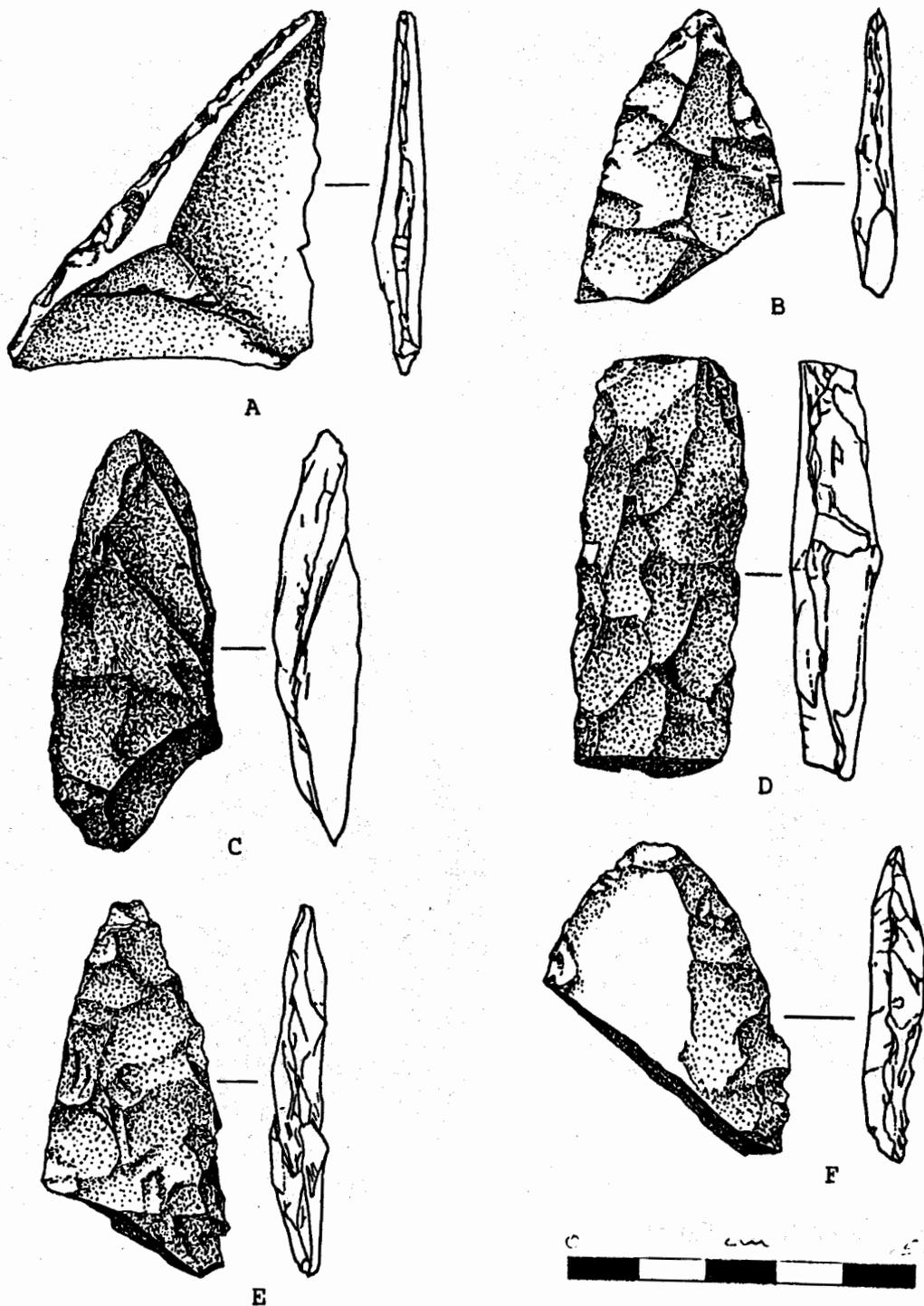


Figure 16a. Bifacial lithics from the deeply buried dark clay stratum. A=89-2166 (chert), B=89-2169 (chert), C=89-2832 (greenstone), D=89-1511 (greenstone), E=89-2118 (greenstone), F=89-2164 (chert). Drawings by Dennis Leinfelder.

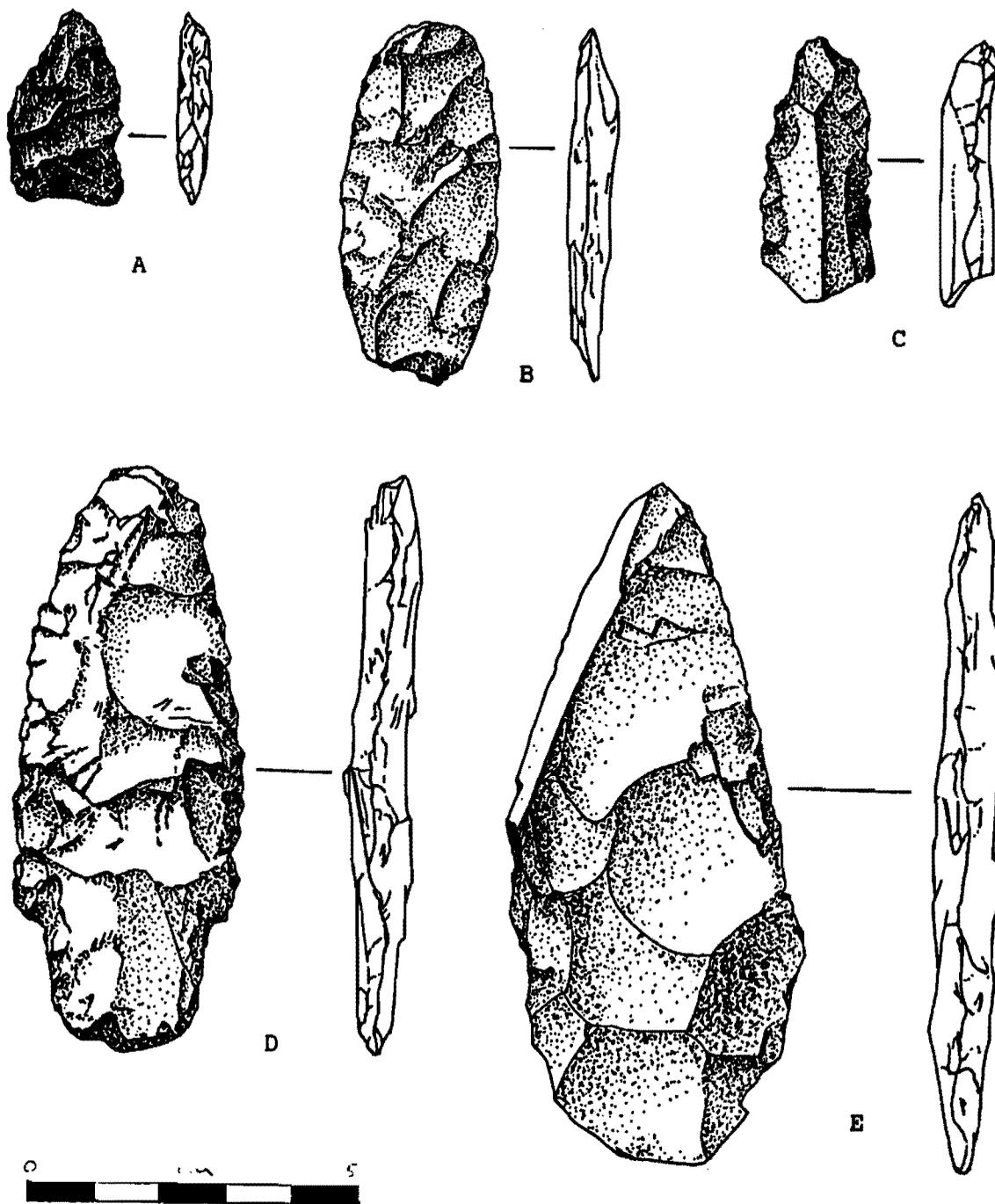


Figure 16b. Bifacial lithics from the deeply buried dark clay stratum. A=89-2781 (obsidian), B=89-2215 (chert), C=89-2540 (greenstone), D=89-2830 (chert), E=89-2213 (chert). Drawings by Dennis Leinfelder.

an important on-site activity.

A rock pavement (Feature 183) containing ground stone fragments and a possible atlatl weight, is associated with this component. Plans call for the complete exposure of this feature by the 1990 summer field school. One other possible pit feature was encountered in the dark stratum.

Debitage consists primarily of large greenstone flakes with carefully prepared striking platforms. The emphasis appears to be on fine-grained greenstone available at several locations within a 15 kilometer radius, rather than grainy/laminar greenstone that is more immediately available. Obsidian debitage occurs rarely (75 total items from 2.3 cubic meters, comprising approximately 1% of the debitage). Obsidian is primarily from the Bodie Hills source, although material from Napa Valley and Casa Diablo are also present.

Two types of milling equipment have been recovered. One specimen is narrow and exhibits a worn surface with a single radius of curvature like a metate, while the other (recovered just above the dark clay layer at the base of the gravelly clay) is a milling slab with a dished center. Loaf-shaped handstones are also present in the assemblage (Figure 17).

Preliminary analysis of pollen and macrobotanical material from the dark clay stratum suggests an environment dominated by weedy plant species with a small amount of oak, pine and juniper (Wigand 1989). We hope to recover additional pollen and plant microfossils during the summer field school excavations. This material could provide valuable information needed for dietary and environmental reconstruction.

CONCLUSIONS

Two seasons of excavation at the Skyrocket Site have produced a wealth of artifacts and other information relating to over 9000 years of human activity in the Salt Spring Valley. Years of thoughtful study and analysis are necessary before a full and proper integration and interpretation of these data can be offered. The descriptions, interpretations and conclusions advanced here are preliminary and often speculative, and will no doubt be reconsidered and revised as the analysis proceeds. Archaeological Services plans to complete a final report on the Skyrocket Site excavations by 1994, and hopes eventually to distribute that report through Coyote Press. While the final report is in preparation we intend to present the more interesting aspects of our findings in regional meetings and journals.

The final season of excavation at the Skyrocket Site in 1990 promises to produce a substantial amount of new and interesting

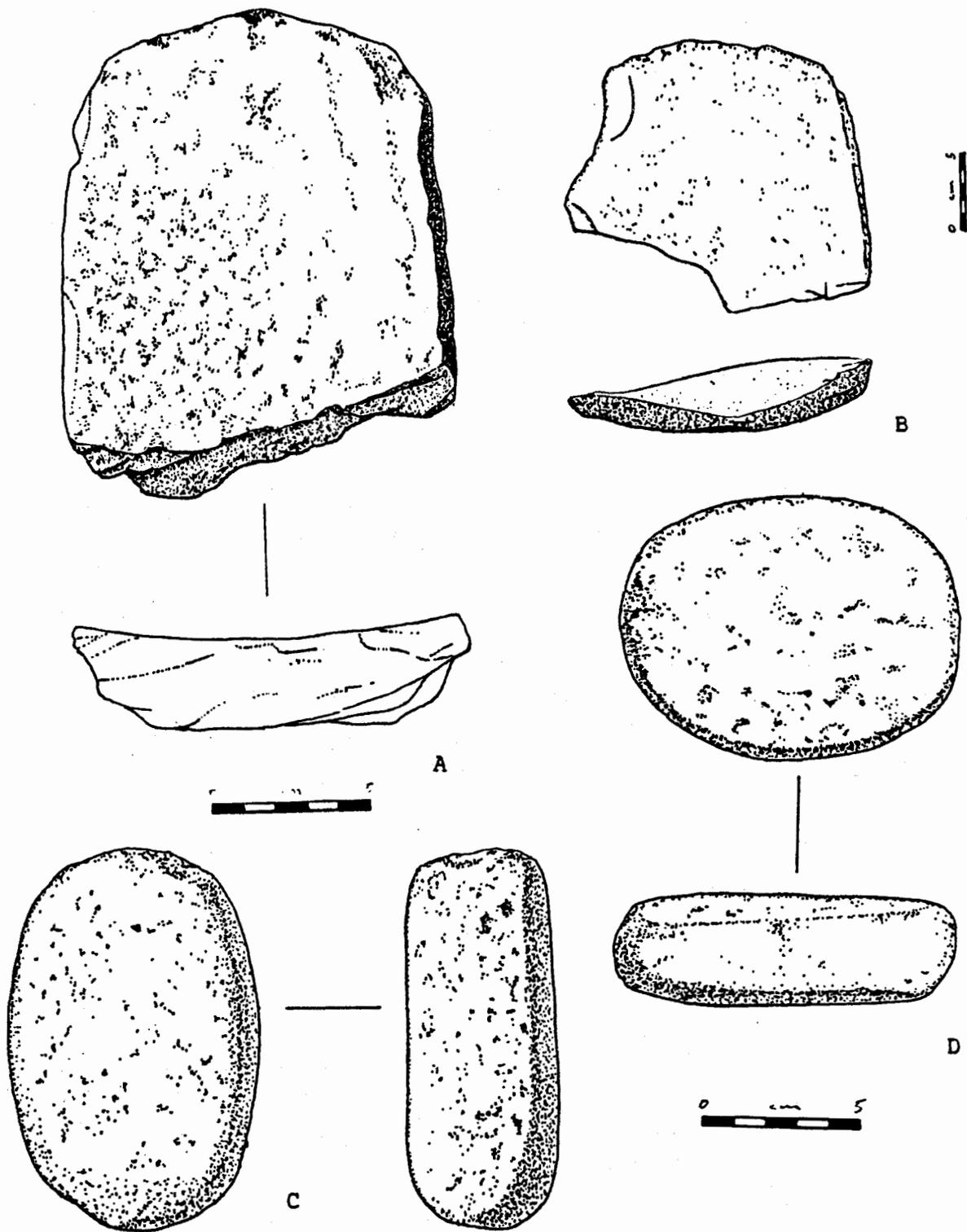


Figure 17. Ground stone artifacts from the deeply buried dark clay stratum. A=89-2181 (schist), B=89-2108 (greenstone), C=89-2681 (granite), D=89-7224 (quartz). Drawings by Dennis Leinfelder.

information, particularly concerning the cemetery population and Early Holocene components in the NC Locus. The potential to recover intact artifact assemblages, features and macrobotanical remains from the Early Holocene components is very exciting. Milling tools from the early deposits at the Skyrocket Site should provide additional evidence to support current revisions in subsistence models for the early Archaic. Obsidian collected from these deposits is expected to be particularly valuable for establishing firm source and temperature specific hydration rates, and for assessing patterns of procurement, mobility and interaction during the early Archaic.

NOTES

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