ARCHAEOLOGICAL INVESTIGATIONS AT KAHO'OLAWE SITE 109, KAHO'OLAWE ISLAND, HAWAI'I

Introduction

A series of archaeological investigations were performed at archaeological site 50-20-97-109 on the island of Kaho'olawe, Hawaii, in 1976 and 1978. The project was conducted by the State of Hawaii under contract with the United States Navy during the first phase of the Kaho'olawe Cultural Resources Survey. This is a long-term project sponsored by the U.S. Navy which currently utilizes portions of the island for military training pruposes. The survey was conducted in order to identify and evaluate the cultural resources o of Kaho'olawe (most of which consist of prehistoric Hawaiian archaeological sites). By sponsoring the survey and cultural resource evaluation the U.S. Navy is fulfilling its responsibilities under Federal Exectutive Order 11593 and the National Historic Preservation Act of 1966.

Fieldwork was initially performed on site 109 on the 19th through 23rd of November, 1976, by a research team consisting of the principal investigator, Dr. Robert J. Hommon, Archaeologist of the Historic Sites Section, State Parks Division of the Hawaii State Department of Land and Natural Resources; Farley Wtanabe, Historic Sites Specialist fo the same office; Dr. Maurice Morgenstein, Geologist and President of Hawaii Marine Reserach, Inc., Honolulu, Hawaii (a private research firm); and Dr. Patrick McCoy, Staff Archaeologist of the B.P. Bishop Museum, Honolulu, Hawaii.

The purpose of this investigation was to record, preserve, and assess the cultural information available in site 109 through the controlled recording, collection, and analysis of retrievable cultural remains. This was to be performed in order to provide a context within which to assess and interpret the nature and significance of hundreds of similar cultural features situated in the central highlands of Kaho'olawe. An auxilliary purpose of this investigation was to test archaeological recording and retrieval methodologies on such types of sites and then to assess the effectiveness of these methodologies towards deriving maximal cultural information on the sequence and types of activities which had taken place in the past.

ENvironmental Setting

Kaho'olawe is the smallest of the eight major Hawaiian Islands, having a land area of approximately 45 square miles (c. 116 square kilometers). The highest point on the island is at the summit of Lua Makika crater at 1477 ft.(c. 450 m.) elevation. The island is ▪ the most arid of the major Hawaiian Islands largely becuase its low refief limits orographic rainfall and because it is located within the rain shadow of 10,023 ft.(c. 3,055 m.) Haleakala, the volcanic peak which forms the eastern portion of the island of Maui. Haleakala is situated across a narrow channel approximately 7 miles (c. 11.3 kilometers) north of Kaho'olawe thus deflecting much of the prevailing moisture-laden northeast trade winds from the island.

The estimated average rainfall on Kaho'olawe varies from less than 10 inches (254 mm) at Kealaikahiki Point on the west end to slightly more than 25 inches (635 mm) at Lua Makika crater. The dominant vegetation on most of the island at the present time includes the exotic kiawe (Prosopis pallida) tree, and various grasses, including pili (Heteropogon contortus) and indigeneousxxx grass species that was used by the prehistoric Hawaiians as a thatching material.

About one-quater (c. 7,750 acres or c. 3,135 hectares) of the surface of kaho"olawe has been subjected to severe erosional processes. The most eroded areas of the island which are centered in the southwest quadrant with major extensions to the north and west consist of saprolitic hardpan. This area is almost totally devoid of vegetation and what little is present is limited to isolated, small remnant earthen hummocks. Most of the eroded area can be loosely described as forming the central plateau of the islqand. It generally slopes very gently from the eastern peaks of the isalnd to about the 750 ft (c. 229 m.) contour. At this point there is a general steep drop-off towards the narrow coastal plain.

SITE 109

Site 109 is situated on gently sloping (around a 7% grade) eroded saprolitic hardpan approximately 6,000 ft. (c. 1.83 km) northeast of Kamohio Bay and 2,100 ft. (c. 0.6 km) east of Kaneloa Gulch at about 1,060 ft. (c. 323 m) elevation. Thougb kiawe trees and various grasses are found on nearby remnant soil hummocks and along the side slopes of some of the larger gulches in the vicinity, the site itself is totally devoid of vegetation.

Site 109 consists of four discrete cultural features.which ~~generally of illustrative of the majority of~~ ,generally, is indicative of the range of the majority of features found in the central highlands of Kaho'olawe. All of these features have been erosionally lagged; that is, the soil matrix which once formed the stratigraphic context for the currently visible cultural remains has been totally eroded away. The result is a scatter of largely non-perishable cultural debris resting directly upon the denuded saprolitic hardpan. The resultant cultural assemblage tends to be mostly consisting of lithic material and perhaps marine molluscan shells. Presembably missing or removed from the assembalge on such sites have been those perishable items that have decayed afetr exposure to natural weathering agents and/or those non-perishable items light enough to be mechanically removed from the immediate vicinity through slopewash runoff and wind.

The overall boundaries of site 109 ~~measure by ft. (by m) or sq.ft. (sq. m.), and was~~ were determined by the proximity of the constituent features (A through D) and the absence of other features for considerable distances. The features are relatively easily discerned through the visual concentration of archaeological material lying on the denuded saprolite hardpan.

A brief descritpion of the constituent features of Kaho'olawe site 109 is presented in the following sections.

Feature A. The main concentration of cultural material lying on the surface which forms the boundaries of this site measures approximately 72 ft.(22 m) on a northeast-southwest axis and 102 ft. (31m) on a northwest-southeast axis. A very sparse scatter of cultural material could be found discontinuously downslope (towards the southeast) from the boundaries of the feature for a distance exceeding 984 ft.(300 m).This is probably a result of

intense overland runoff or slopewash erosion transport. The cultural assemblage present at the feature includes artifacts of basalt and basaltic glass, pieces and chunks of unwaorked basalt, coral fragments, and marine mollusc shells. In addition a great amount of metal fragments (mostly bomb fragments) are present scattered throughout the feature. All of this cultural material forms a discernible concentration suggesting that spatial patterning ~~of~~ indicative of cultural activities at the feature may not have been destroyed by the removal of the soil matrix but rather may be horizontally distorted. This feature encompassed the largest areal concentration of cultural remains and the most diverse archaeological assemblage of the four ~~features~~ features at site 109.

Feature B. The scatter of cultural material present at this feature covers an area measuring 75 ft.(23 m) northeast-southwest and (69 ft. 21 m) northwest-southeast. Most of the material is concentrated in a 23ft. (7 m) by 43 ft. (13 m) section near the middle of the feature with the remainder of the cultural remains discontinuosly scattered throughout. Almost all of the cultural material present at the feature consists of unworked basalt chunks and pieces which are probably the result of firecracking. A few scttered marine mollusc shells are present scattered downslope (southest) of the feature but considerably outside of the boundaries. This may have been initially deposited at the feature and then removed from the vicinity by slopwwsah erosion.

Feature C. This feature is very similar to feature B except it is smaller (measuring 10 by 10 meters) and contains a very less dense of unworked basalt pieces. Extensive slopewash transport seems to have taken place at the feature.

Feature D. This entire feature measures ~~x~~ 52 ft. (16 m) on the northeast-southwest axis and 92 ft. (28 m) on the nowthwest-southeast axis. Most of the cultural material present consists of a dense scatter of unworked basalt peices, particularly concentrated in a 29 by 33 ft (9 by 10 m) area towards the northern portion of the feature. A small concentration of basaltic glass flakes and cores is present approximately 19 ft.(6 m) southeast, and downslope, from this concentration of unworked basalt. The basaltic gla s concentration may also be the result of slopewash transport from the primary deposition area.

Methodology

A standard mthodology was formulated for the recording of cultural material on all four of the features of Site 109. This involved the application of a grid pattern over the entire feature to which all recording and collection procedures were referenced for horizontal provenience. A 2 by 2 meter grid system was used for 109A in order to initailly test the ease of applying such a grid under field conditions, the speed and accuracy of the cultural material recording, and in order to rpovide a comparative base for the remaining recording procedures. These procedures were slightly altered on the remaining features in response to the characteristics of each features cultural assembalge and areal extent. A brief summary of the methods applied at each of the features of Site 109 and a synopsis of the recovered cultural remains is presented below.

Feature A. Within the boundaries of the feature, a 2 by 2 meter grid oriented with magnetic compass directions was established to provide horizontal control for recording and collection.(figure 2). Each grid sqaure was assigned a letter and number designation indicating its direction and distance from an origin point established arbitrarily near the center of the feature. The first part of the grid square designation indicates whether it is north (N) or south (S) of the origin point; the second indicates the distance from the origin point in 2 by 2 meter sqaures; the third indicates whether it is east (E) or west (W) of the origin; and the fourth indicates the distance from the origin point in 2 by 2 meter squares. Thus grid square N3W5 is in the third rank north of the origin point and the fifth row west of the origin point.

A total of 6913 cultural items were ercorded in 123 grid squares during the investigation of feature 109A. Of these, 1263 were fragments of metal, all of which evidently are remains of ordnance depsoited since 1941 when Kaho'olawe first became a target range. The remaining 5650 are archaeological remains, all of which were evidently deposited during the prehistoric Hawaiian use of the feature. A total of 751 of these items were artifacts, that is objects that were worked or modified by humans. The remaining 4402 items include unworked basalt pieces, marine mollusc shells, and shell and coral fragments. All of the artofacts as well as the

mollusc shell andcoral fragemnts plus three stones that appear to have been water-worn, were collected and returned for laboratory analysis in Honolulu. The remaining items were counted, recorded as to their grid provenience, and left in place (Table 1.).

Feature B. A 1 by 1 meter grid, oriented with magnetic compass directions, was established over the main concentration of cultural material in order to provide horizontal control for recording and collection (figure 3). The remainder of the feature was divided into three broad collection and recording sections- north, south, and southeast. The grid numbering system employed for 109B was somewhat different from that used in 109A in order to minimize some recording error and confusion which was encountered during the initial investigation. An aribtrary datum point was selected outside of the boundaries of the feature which was used as a center point for the grid system. A line was extended to the west of this point with each 1 meter section given consequtive number designations. Another grid line was extended at a right angle to south and each 1 meter increment was given consequtive letter designation. This made the identification of individual collection/recording grids much easier, i.e. grid K7 is the 16th grid point to the south and the 7th to the west. A similar form of grid system was maintained for the remaining features of Site 109. The 1 by 1 meter collection grid was confined to only a restricted portion of the feature because of the concentration of cultural material in this region and the sparseness of it throughout the remainder of the feature.

A total of 1529 items were recored in the entire 353 square meters investigated at 109B. All of this material consisted of unworked basalt pieces, most if not all of which showed indications of having been either heat-affected or firecracked. This is probably indicative of their use for fireplace or hearth constructions. Although the 1 by 1 meter grided section contained only 23% of the total collected area (82 sq. meters) it contained 86% of the total collected material (1321). All of the material present on the surface of 109B was bagged in the field, given a grid designation, and returned to Honolulu for laboratory analysis. This analysis consisted of the counting and weighing of individual

pieces, determining whether the material had been heat affected or altered, and distinguishing between vesicular and non-vesicular basalt raw material (Table 2). Therefore the entire feature was collected and removed from the archaeological context.

Feature C. The same procedures employed at 109B were applied to the recording and collection of cultural material from this feature. The entire feature was contained within a 1 by 1 meter grid system oriented to magnetic directions (figure 4). All of the recovered material consisted of unworked basalt pieces (141 total) which was bagged in the field according to its grid location and returned to Honolulu for further analysis. Analysis of this material consisted of counting, weighing, and determining whether it was vesicular or non-vesicular basalt (Table 2).

Twenty-nine (29) 1 by 1 meter grid units were collected which accounted for 52 %(73) of the total cultural assemblage. An area covering 18 sq. meters was collected as a single unit (designated the North collection area) because of the sparcity of cultural material present. A nother area (the South collection area) containing 8 sq. meters was similarly collected.

Feature D. The same basic procedures were extended to this feature as well as the previous two. A 1 by 1 meter magnetically-oriented grid system was projected over the entire feature area to which all collection of cultural material was referenced. Both the unworked probable firecracked basalt pieces and several flakes and cores of basaltic glass (11 total) were bagged in the field and returned to Honolulu for analysis. A total of seventy-six (76) 1 by 1 meter collection grids were established in the northern portion of the feature. This afea represented the densest concentration of cultural material. The remainder of the feature was collected as a unit (designated the South scatter) except for a small concentration of basaltic glass which was collected seperately (figure 5). (7 pieces total) The same laboratory analyses as that already described was performed on this material.

A total of 929 pieces of unworked basalt were recovered from the feature in addition to the basaltic glass flakes and cores. The area of main concentration where the 1 by 1 meter grid was most stringently applied accounted for 66 %(613) of this assemblage.

Chronological Data

A total of sixty-one (65) basaltic glass items were collected from Site 109 and subjected to hydration rind analysis in order to obtain chronological information on the probable prehistoric periods of occupation and use of the site (Table 3). Of this total 83% (54) were obtained from 109A and the remainder were from 109D.

Hydration rind analysis id used widely in Hawaii in order to obtain age estimations on archaeological samples. A hydration rind is a chemically altered zone of the basaltic glass that begins to form when a fresh surface is exposed to the atmosphere. The thickness of the hydration rind, which expands inward from the surface of the basaltic glass, is related in a known way to the length of time that has passed since the fresh surface was exposed. Because fresh surfaces are almost always exposed during the flaking process used to produce basaltic glass artifacts, the approximate date of production of most artifacts, cores, and waste flakes can be determined by measurement of rind thickness in thin section. The rind of each sample is measured in a number of places, producing a range of thicknesses, which reflects a range of possible dates. For convienence, basaltic glass hydration age estimations ranges are usually presented in the form of the median date with a plus-or-minus factor in years. Thus for example, A.D. 1442± 20 represents a range of A.D. 1442 to 1462, during which the hydration rind being neasured began to form. The flake scar may have been formed in 1422 or 1462 or in any year bewteen these two dates (cf. Morgenstein and Riley 1974).

Hydration rinds were measured on two different flake scars on each of the two artifacts from 109A, so that a total of 63 date-ranges appear in Table 3. Five additional hydration rind measurements were attempted on basaltic glass samples from 109A as well. The range from one of these samples approximated 12,000 B.P.(Before Present) and may represent the original formation of the glass or an early natural fracture. No hydration rind could be detected on the other four samples analyzed.

The dated basaltic glass samples from 109A are from eleven grid units in the northeast quadrant of the feature. These dates range from A.D. 1406± 16 to 1640±18 (A.D. 1390 to 1658). The dated samples seem to cluster towards the end of the occupation of the feature and tend to indicate that six possible periods of use

or occupation had occurred at the feature (discussed in a later section). This progression would seem to indicate that the intensity of working basaltic glass, or more importantly the re-working of basaltic glass, increased with time at 109A. This actvity would then seem to have ceased in the early 1600's.

The eleven (11) dated samples from 109D are ~~a~~ from the concentration present in the south portion of the feature and from 4 grid units. The age determinations obtained from these samples would indicate that this site was used from at least A.D. 1593± 19 to 1662±17 (A.D. 1574 to 1679). These sequence of age estimations seem to indicate that this feature was used for a basaltic glass workshop somewhat later in time than that indicated by 109A. Three discrete periods of use seem to be characterized through the age estimations- two conforming to the end of the noticeable sequence of the 109A occupation and one post-dating that sequence. Such activities (basaltic glass working) taking place at Site 109 would seem to have ceased by the end of the 17th Century.

Spatial Distribution of Cultural Remains

Analysis of the spatial distribution of the cultural remains at the features of Site 109 would seem to provide valuable information pertaining to the prehistoric actvities taking place here, as well as illucidating some of the probable effects on the patterning resulting from the removal of the material from the original stratigraphic context and subsequent transport by erosional agents. Garnering data relevant to these factors is essential in order to gain a full understanding of the nature of all such highly eroded sites in the interior uplands of Kaho'olawe. This can not help but to further explain the prehistory of human habitation and activity on the entire island.

In order to determine whether there was any spatial patterning to the distribution of the cultural remains within the constituent features of Site 109, all of the recorded data was plotted according to density of occurrence within the grid systems for a particular feature. The result is a contour representation of the density of occurrence indicating the association or lack of association between the discrete grid units. This tends

to lessen the degree of skewing of the data due to recording error and/or grid placement. All of the recorded data for the features shows definite spatial patterning which would indicate that it is a result of human activity, and deposition, and not a random scatter of debris. A brief description of the noticeable cultural remains patterning for each of the features of Site 109 is presented below.

Feature A. The quantitative distribution of the cultural material recorded from 109A is summarized below (and in Table 1):

1. 4759 unworked basalt pieces were distributed throughout 98% (120) of the grid units.
2. 626 basaltic glass artifacts were distributed throughout 51% (63) of the grid units.
3. 125 basalt artifacts were distributed throughout 46%(56) of the grid units.
4. 140 marine mollusc shells and shell and coral fragments were distributed throughout 47%(58) of the grid units.

In order to determine the degree of meaningful spatial patterning each of the above categories of cultural remains were spatially plotted. A contour map was performed utilizing grid recoding unit totals in order to illustrate areas of least or most density and association.

The unworked basalt pieces form the most numerous and pervasive material cultural remain throughout the feature. The density of these remains were plotted to 10 and 20 piece contours (figure 6). Three main areas of concentration can be discerned through this procedure near the center of the feature. All of these remains are of firecracked basalt pieces, preseumbably originating from in situ fireplace or oven (imu) constructions. A fourth , but more tenuous, consentration may be present in the extreme northern portion of the feature and may as well be the remains of a more disturbed fireplace. The effects of sheet and slope wash erosional processes can also be discerned in this representation through the elongated shape of the distribution. This foollows one of the steep slope zones in the immediate vicinity.

The density and distribution of the basaltic glass artifacts shows a much more constricted but similarly shaped occurrence to that of the unworked basalt (figure 7). The similar shape would seem to attest to a uniform effect of natural erosional forces

upon the spatial distribution of these two classes of cultural material. This is very significant for the basaltic glass artifacts are generally much smaller and lighter than the unworked basalt pieces. Therefore, if the overland transport through wind, slopewash or sheet wash was a amjor disturbing or skewing factor factor in the spatial distribution of the cultural remains it is not eveident in this instance. The basaltic glass artifacts tend to be very much more restricted than the unworked basalt in their spatial extent. They are concentrated primarily with the two probable fireplaces in the northern sector of the feature and are almost totally absent from the other two.

Two main association areas of basalt artifacts seems to be present on the feature (figure 7). Both of these however are conatined within the high density boundaries of the basaltic glass. One (towards the west) concentration of basalt artifacts is directly associated with one of the presumed fireplaces. The similarity in shape of major density of basalt artifacts serves to further substantiate and illustrate the uniformity of the effects of the natural erosional agents upon the distribution of the artifacts.

The marine mollusc shell and coral fragments tend to exhibit the same patterning noticed with the other categories of cultural remains (figure 9). This is probably a result of the combination of cultural activities (primary depsoition) taking place at the feature and the overland transport (post-depositional) of the remains.

Feature B. The distribution and density of the unworked basalt pieces (the only recoverable remains) within the main concentration of this feature were plotted in a similar fashion as to that for the cultural materials present on 109A (figure 10). The contour representation of the spatial distribution of these remains throughout the feature would seem to indicate that there are at least three main discernible concentrations of firecracked rock. The very large, elongated concentration present would seem to be indicative of either a large stone oven (imu) or of the construction of two or more single, smaller fireplaces within the same constricted area. The other two concentrations present within the feature are probably indicative of single fireplaces. The overall scatter of firecracked basalt within the concentration is very well-defined with sharp boundaries delimiting the low density areas.

No inferences can be made on the sequence of construction of the internal fireplaces or of their contemporaneity because of the lack of other types of cultural remains.

The effects of slopewash or erosional overland transport on the post-depositional cultural remains cen be discerned through the spatial patterning. There is a definite elongation of the scatter tpwards the south-southeast which is the prominent degree of slope.

Feature C. The distribution of the unworked firecracked basalt was similarly plotted for this feature as with the previous (figure 11). Only a single major concentration of materials is discernible which is probably the remains of a single fireplace. The scarcity of the unworked basalt would argue for only a single or very intermittent use of this feature, which is in sharp contrast to that displayed on the other features of Site 109. A slight deformation in spatial patterning of the remains is probably indicative of the effects of erosional transport down the degree of slope.

Feature D. The spatial distribution and density of unworked basalt pieces was plotted in a similar fashion as to the cultural remains present on the remainder of Site 109 (figure 12). Two primary concentrations of firecracked rock can be discerned which are most likely the remains of two small fireplaces. An area towards the northeast from these occurrences, however, contains several small concentrations of unworked basalt which may represent much more disturbed fireplaces or an extension of one of the other fireplaces. The effect of overland ersoional transport on this feature seems to have been much greater or severe than that immediately evident on the other features of Site 109.

Interpretation and Conclusions

On the basis of the mapping, dating, and analysis of the cultural remains from Site 109 some conclusions can be made regarding the archaeological context of this site. By interpreting the forms and types, as well as the duration, of human behaviors which had taken place at this site an evaluation of the significance of the site towards an understanding of the archaeological patterning of Kaho'olawe island can be made.

On the basis of presently available information, Site 109 was evidently occupied during a major expansion of population into and a greatly increased utilization of the inland zone of Kaho' olawe. This expansion seems to have begun around A.D. 1400. The intensive use of the interior sections of the island then appear to have lessened or been curtailed by around the mid-to-late 17th century ( ). As noted previously, the occupation of Site 109 at features A and D neatly bracket almost this entire time period.

The degree of residental permanence in habitation sites is a major problem or question in Hawaiian archaeology. This is a vital research topic because of the apparent discrepency bewteen the high socio-economic development present within Hawaii during prehistoric periods, on the one hand, and the settlement pattern which seems to consist largely of small, insubstantial, and apparently temporary habitation structures. An accurate assessment of the degree of ancient prehistoric Hawaiian residential permanence is essential to an understanding of a wide variety of variables such as economic productivity, population density, and social ranking.

Site 109, in both its present appearance and with the evidence for its utilization for over a span of at least 200 years provides data for considerable residental permanence on prehistoric Kaho'olawe. The features composing this site, like nearly all other inland Kaho' olawe featyres, appears to be the remains of a campsite or a series of campsites since they are relatively small and conatin relatively little cultural material (considering the nearly two century span of utilization) and include no evidence of permanent stone structures.

All of the features, except for 109C, show eveidence for repeated, perhaps intermittent, use by the inhabitants of prehistoric Kaho' olawe. If no chronological data were available, two or three relatively short term uses of these features during a few deciades would explain the distribution of the archaeological contents.(as it may indeed have taken place on feature C). However, the overall span of the basaltic glass chronological data as well as the sample ranges are continuous throughout the indicated period of use. These indicate that there may have been numerous occupations of all of the Site 109 features which may have been seperated by considerable periods of time. If the hypothesis of intermittent use is accurate

then it is apparent from the dated samples that they may represent at least seven distinct occupations of the site. This minimum figure is arrived at by determining the smallest number of years dates that would include some part of the ranges of all dated samples, (Table 3) These approximate year dates possibly indicate of sequential habitation and/or use of the site are:

I. A.D. 1410
II. A.D. 1440
III. A.D. 1480
IV. A.D. 1530
V. A.D. 1595
VI. A.D. 1625
VII. A.D. 1655

It is apparent from this sequence that Site 109 was probably occupied by individuals or small groups of individuals ranging up to as long as 65 years. The postulated seven occupations listed above are seperated by an average of 40.8 years.

At the present time, the site and its immediate environment offer little evidence that would explain or give reason to its repeated reuse during this portion of Hawaiian prehistory. No evidence of stone structures other than probable fireplaces were found. The feature appears never to have been situated on a prominent physiographic point and it is highly unlikely that a fresh water source was ever in the vicinity. The slight rise in the hardpan to the north of the site probably is a remnant of a similar rise when the postulated soil mantle was intact in the 15th and 16th Centuries. This rise may have afforded some protection from the trade winds making this locality somewhat favorable and sheltered for a campsite. It might be postulated that trees or brush could provide more protection, yet there seems no reason why such vegetation would grow restricted in this location during prehistoric periods and not in the surrounding area.

On the basis of presently available evidence, it is suggested that a reason for the repeated use of Site 109 was the presence of raw materials for the various activities that took place on or around the site. In other words, once a set of activities had taken place at the site, leaving the remains or the debris from those activities at this site, there was a reason for the subsequent reoccupation of the

of the site. For example, unworked basalt stones formerly used for lining and filling fireplaces and imu (underground ovens) occur rarely today on the saprolitic hardpan except in archaeological features. It would have been conceivably more convienent for the prehistoric inhabitants of Kaho'olawe to have reused the stones at the features of Site 109 than to have carried new basalt rocks from Kaneloa Gulch, the nearest source of naturally occurring stones in the vicinity. In a similar fashion, cores and flakes of basalt and basaltic glass lefton the site by earlier inhabitants may have been further flaked and utilized by later occupants of the feature. This could be a means of expalining the absence of some of the cultural material classes from some of the features of Site 109. In such a process, once a campsite is established, the campsite itself becomes the raw amterial initiating and sustaining further use of the area,.

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All of the features of Site 109 conatin evidence for the construction of fireplaces and/or imu. If the apparent number of such constructions on each feature can be equated with the degree of reuse or intensity of use at that feature there is considerable variation present within the site boundaries. Feature A shows at least 3 or 4 and possibly more such constructions, feature B has 3 or more, feature C has probably only one, and feature D possibly contains 2 or more. The correlative significance of these multiple constructions toward inferring intensity or duration of use at the feature is at present uncertain. Definite evidence for the consumption of the meat or the use of the shells of marine molluscs is present at 109A and possibly 109B. The working of basaltic galss or the use of basaltic glass artifacts is in evidence on several of the features, while the similar use of basalt artifacts and/or their manufacture is much more restricted (feature A only).

Most of the peices of unworked basalt, both vesicular and non-vesicular, are angular rather than rounded by erosion. Evidence from a number of archaeological features on Kaho'olawe demonstrate that the angular fractures were caused by exposure to heat in fireplaces and imu. The site 109 fireplaces probably served for cooking and the production of heat and light. If any imu were present (most likely in 109B) they were used in baking (as derived from ethnographic and historic sources).

Several of the basaltic glass and some possible basalt samples recovered from this site show eveidence of utilization as implements. The presence of two basalt adz preforms from 109A suggests that part of the adz-manufacturing process may have taken place here. These adz preforms were probably carried from one of the adz quarries situated in the vicinity of Moaula, 1.3 to 2.0 miles to the northwest of the site.

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Evidence for subsequent reuse or recurrent occupation of Site 109 can be garnered from the spatial distributions of the cultural remains at feature A. The basaltic glass artifacts, basalt artifacts, and shell and coral remains all cluster in the same restricted area of the feature. This area is north of two probable firepits but contains the intermixed remains of one or two others. This may be indicative of the resue of the feature but the abandonment of older fireplace alignements or constructions. The cleaning out of the two "newer" fireplaces and the dumping of this debris on top of the older would explain the mixing of the other cultural remains at the feature. Thus an inference as to the general sequence of fireplace construction at the feature can be derived from the spatial patterning of cultural debis.

It is of interest to note that nearly three-quaters of the basaltic glass items collected from this site were identified as being cores rather than flake debitage. This suggests that relatively few of the cores were worked at the site or that the majority of the flakes produced from them were carried elsewhere for use. It is also possible that more flakes than cores have been transported away from the site by overland sheetwash but this is not deemed likely to have happened in the present study.

A amjor hypothesis of the research design of the Kaho'olawe archaeological survey is that the complex and extensive inland settlement pattern on the island was based on the agricultural use of this area. Sweet potato is postulated as having been the staple crop and the land is believed to have been prepared through slash-and-burn (swidden) agricultural techniques. While a variety of activities are demonstrated or strongly indicated by the cultural remains that form the site, no direct evidence for agricultural activities is available.

The field sampling and collection design used during this investigation of Site 109 was suprisingly successful. As stated previously, this site is highly characteristic or indicative of a very large number of other archaeological features present on the interior uplands of Kaho'olawe. These archaeological manifestations have presented somewhat of a quandry to the archaeolgoist. The sites have been deprived of their vertical, stratigraphic provienence which is often vital to archaeological interpretation. Instead, the full preserved portion of an entire occupation sequence is presented horizontally. Many of these features, when encountered under field conditions, appear as amorphous scatters of cultural debris, eg. firecracked rock, marine mollusc shells, basalt artifacts, basaltic glass artifacts, etc. No seemingly discernible spatial patterning appears to be present. Through the application of the present, or amended, techniques, however, it has been proven that patterns indicative of prior human activities can be garnered from these sites. Informative data pertaining to possible sequences of occupation, number of constrcutions conatined within the site, etc., can be obtained which would contribute greatly toward elucidating the human prehistoric use of Kaho'olawe.

A subsidiary result of this present investigation has been to suggest that the natural erosional agents, which seem so rife on Kaho'olawe, have perhaps not obliterated or obviated the possibilities of performing informative, productive research on these interior sites. The present investigation seems to suggest that these natural effects on the spatial patterning of the cultural remains may not be as severe as expected. Therefore, by performing similar such investigations on a number of the inland archaeological features a areal patterning of human behavior may be constructed.