Stratigraphic Correlation and Non-Recoverable Datasets at the Gerstle River Site, Central Alaska

Ben A. Potter

I read a variant of **Ben Potter's** paper in Liège. Like Mickle Zhilin's paper, and perhaps Warren *et al*., Ben presents subject matter which – geographically – may seem somewhat exotic; like Nathalie Fourment and María Ruiz del Árbol, he reports on the kinds of geo-archaeological approaches discussed by Fechner *et al*. And like Richard Greatorex, Reuben Thorpe, Marika Mägi, etc., he describes problems with trying to make sense out of site data recorded using different systems and terminology…

Apparently even within the smaller, more "scientific" field of geoarchaeology, there are problems with terminology, and a lack of standardised documentation. For some reason I had never expected this (see also my introductions to Warren/Warren *et al.* and Fechner *et al.*). Add to this the problems, sometimes, of gaining access to the original site records, and the situation seems ripe for the kind of system Richard Greatorex outlines in his Lisbon paper.

Ben gives a fairly detailed overview, here, of the problems involved with correlating and interpreting stratigraphic and other data from a site in Alaska. The recurring theme of trying to reconcile different datasets is obviously a problem from the beginning. Add to this the fact that Single Context Recording (the default cure-all championed in so many of the other papers) might not be of much use on this type of site…

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Digging in the Dirt

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Recent excavations at the Gerstle River Site Lower Locus have revealed four archaeological components in deeply stratified (>4 m) contexts. This paper integrates and synthesizes stratigraphy, radiocarbon dates, and archaeological components from previous investigations at both Upper and Lower Loci in order to reconcile various interpretations and integrate the 1999 and 2000 materials and radiocarbon dates into their appropriate contexts. Six components are present at this site, dating from ~11,200 to 4,200 cal BP. Three of the components exhibit microcore and blade technology indicative of the Denali complex.

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INTRODUCTION

Background

The Gerstle River Site is an important multi-component site situated between the Tanana and Gerstle Rivers in Interior Alaska. Although this site offers a rare opportunity to examine site structure and artifact patterning in stratified contexts relatively free from cryoturbation and other post-depositional disturbances, the majority of the excavation data has never been collated and synthesized. Several ambiguities regarding radiocarbon dating and component correlation occur in the published record. Small discrete components such as those present at Gerstle River Site Lower Locus are useful in delineating artifact clusters from which behavior can be inferred. However, the Upper Locus data must be synthesized in order to position future data from the Lower Locus in the proper context. The purpose of this paper is to collate and synthesize the stratigraphic and archaeological data of the Upper and Lower Loci.

This synthesis is based on the four published “gray literature” reports of the site (Holmes and Dilliplane 1976, Rabich and Reger 1978, Kimura et al. 1989, and Holmes 1998), original field notes, stratigraphic profiles, spatial artifact data from the 1985 excavation by Kotani and the 1996 testing by Holmes, and Potter’s 1999 and 2000 excavations (Holmes and Potter 2000). Kimura et al. 1989 is published in Japanese, and the translation has been achieved with the help of Hiroko Ikuta. The 1996, 1999, and 2000 artifact collections are currently being analyzed at the University of Alaska Fairbanks Department of Anthropology by the author, but attempts to access the 1976, 1977, 1983, and 1985 data have failed. Currently, the latter collections, while accessioned to the University of Alaska Museum, are now in Japan, probably at Nagoya University. While those collections are not large (n=3,070 lithic items), they are essential to place the artifacts recovered in the 1999 and 2000 excavations in their fullest contexts. Given these limitations, the synthesis presented here documents as fully as possible the nature of the stratigraphic record at this site.

Physical Environment

The site is located on a southern knob of a hill rising 137 meters above the surrounding outwash plain one mile east of the Gerstle River, a large braided river in the middle Tanana basin (Figure 1). Surrounding vegetation is typical bottomland spruce forest, though the southern exposures contain some xeric flora. It is difficult to reconstruct the original contours of the southern part of the hill due to past quarrying activity. Much of the lower area has been blasted and a caterpillar trail was made (which led to the discovery of the site in 1976 through artifacts eroding from the upper area). The site was named for the rip rap quarried by the Alaska Department of Transportation; it is not a lithic quarry site. Current vegetation at the Upper Locus is characterized by a closed white spruce (*Picea glauca*) forest with a sphagnum moss understory, and at the Lower Locus by disturbed vegetation, primarily aspen (*Populus tremuloides*) and grass.

History of Research

The Gerstle River Quarry Site has been investigated several times since its discovery in 1976 (Figure 2). The site was discovered and briefly tested by Charles Holmes in 1976 (Holmes and Dilliplane 1976). In 1977, Holmes excavated 12 m^2, finding two components in stratified contexts (Rabich and Reger 1978). In 1983 and 1985, Japanese researchers under the general direction of Yoshinobu Kotani excavated 71 m^2 from the Upper Locus, recovering thousands of artifacts, faunal remains, and probable features. The only report on these investigations is a Japanese-language report published by the Japanese Museum of Ethnology in 1989 (Kimura et al. 1989). This paper has recently been translated, thus allowing the full synthesis presented here. However, the paper only details lithic artifact distributions of the 1985 excavation, with minimal information on artifacts recovered in 1983, and no data on the faunal remains. No features were mentioned in the paper, though the original plan-views of several excavation units illustrate concentrations of bone, charcoal, and artifacts. It is possible that hearths were excavated in the 1985 excavation of A and G-grids. In 1996, Holmes conducted further testing at the Upper Locus and excavated the first test pit at the Lower Locus, recovering fauna and artifacts from multiple strata. In 1999, Potter excavated 36 m^2 in the Lower Locus, documenting four components, two of which predate the lowest component found in the Upper Locus (Potter and Holmes 2000). In 2000, Potter excavated 16 m^2 at the Lower Locus.

With a total of 150 m^2 excavated, 22 radiocarbon dates,

Unit	Description
O horizon	*Sphagnum* moss mat at the Upper Locus, absent at Lower Locus
A horizon	silt, dark grayish brown (10YR 4/2), cumulative A horizon. A light brownish gray (10YR 6/2) tephra overlies the A horizon.
B horizon	silt, dark yellowish-brown (10YR 4/4), B horizon of modern cryochrept soil
R1-R5	silt loess, reddish-brown (7.5 YR 4/4), discontinuous Ab horizons overlying Bwb horizons, consisting of decomposed organic material and abundant charcoal fragments; lower contacts generally wavy and grading, upper contacts generally horizontal and sharp
Y1-6	aeolian silt, grades from silt (Y1, Y2) to sandy loam (Y3, Y4) to sand (Y6), yellowish brown (10YR 5/4), massive, with compressed wood stringers and continuous and discontinuous charcoal lenses, some rootlets
S1	sand, discontinuous at the Lower Locus, not present at the Upper Locus
Paleosol 1	silt loess, Abk horizon, paleosol complex
Paleosol 2	silt loess, Abk horizon, very discontinuous
Lower Sand	sand, yellowish brown (10 YR 6/2), angular pebbles near the base of sand at contact with underlying bedrock
Bedrock	weathered granobiotite in grus matrix, grayish-brown (10 YR 5/2)

over 5,000 lithic artifacts, and hundreds of faunal remains in 6 components spanning the entire Holocene, this site offers an important, complex dataset for examining various current issues in Alaskan archaeology (see Hamilton and Goebel 1999; Mason et al. 2001). However, the data must be synthesized and the varying interpretations reconciled in order to place the artifacts and faunal remains in their appropriate contexts.

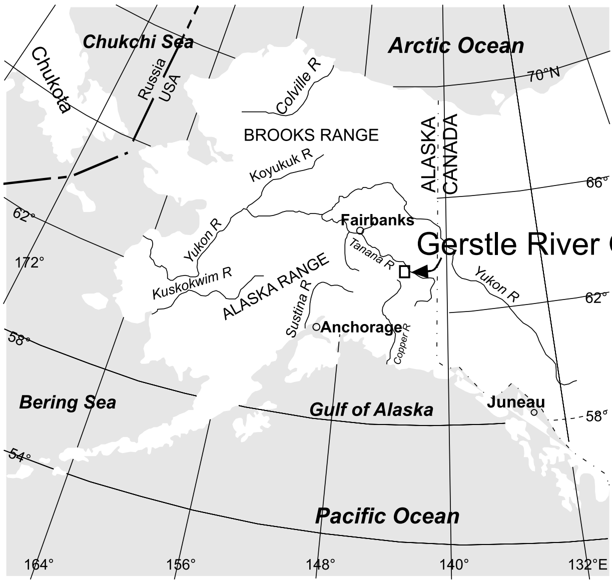
Stratigraphy and Deposits

The stratigraphy at the site consists of a series of aeolian sediments (silt and sand) up to four meters thick overlying a weathered granodiorite bedrock (Figures 3 – 8). There are several buried weathered B horizons, probably representing decreasing loess accumulation and soil development, dating from about 9000 to 5000 years BP. Two paleosol complexes, the upper one dating to 10,000 BP, are situated in the lower loess. Thomas Dilley has described the surface geology at the Gerstle River Quarry Site (Dilley 1998: 230-233; 278). His interpretations have been largely substantiated by further work. The tephra present below the modern soil was tentatively identified as the northern lobe of the White River Ash (Dilley 1998: 233). James Begét recently conducted microprobe analysis on a specimen of this tephra, and has noted that it displays an unknown composition (Begét, 2000 personal communication). The stratigraphic unit descriptions generally follow Dilley (1998: 232-233) and Holmes (1998: 7), with loss-on-ignition and particulate size analyses of the Lower Locus sediments by the author.

Stratigraphic disturbances are present in various forms at the Upper and Lower Locus. Krotovinas were noted within the lower loess (Y5) at both areas. No krotovinas were observed in the 1999-2000 excavation units, though one was noted aproximately 15 m away in the lower silt (Y5). A number of microfaults (slip faults) of limited dimension were observed in both loci, but were more extensive at the Upper Locus. These faults extended from Y2 to R4 and Y2 to Y3 on the A-grid north wall; R4-R5 on the C-grid east wall, Surface 2 to R3 on the G-grid east wall; R2-R4 on the Test Pit 1 east wall; R3 to R4 on the Test Pit 3 east wall; and R1 to Y2 on the Block C north wall. The faults were minor with a slippage of 3 to 11 cm, and in no case did they obfuscate strata delineation. Machine scraping related to quarrying has turbated and removed some of the upper strata at the Lower Locus. Prior to the 1999 excavation, the Lower Locus was bladed down by bulldozer to the undisturbed sediments. The total depth of overburden varied from less than a meter to 1.5 m. Swallows nest extensively in the bluff edge at the Lower Locus. Several nests were exposed in the course of the 1999 and 2000 excavations, and all tunnels were mapped, but none affected the distributions of artifacts or strata delineation. There is little evidence of cryoturbation in the form of solifluction lobes or ice wedge pseudomorphs, and strata were horizontal for the most part with gently undulating contacts. There was evidence of a minor change in topography at the Lower Locus between 10000 and 8300 BP, possibly relating to changes in local wind patterns (see Figure 6, N48E39-41). The vast majority of artifacts were horizontal, including large bones and boulder spall scrapers, with little evidence of post-depositional turbation. The three-dimensional plotting of artifacts from all components at the Lower Locus and plots of artifacts at the Upper Locus indicate unimodal distributions with little vertical variation. Thus, the effects of cryoturbation and other disturbances are deemed minimal at both loci.

STRATIGRAPHIC CORRELATION

Stratigraphic Data



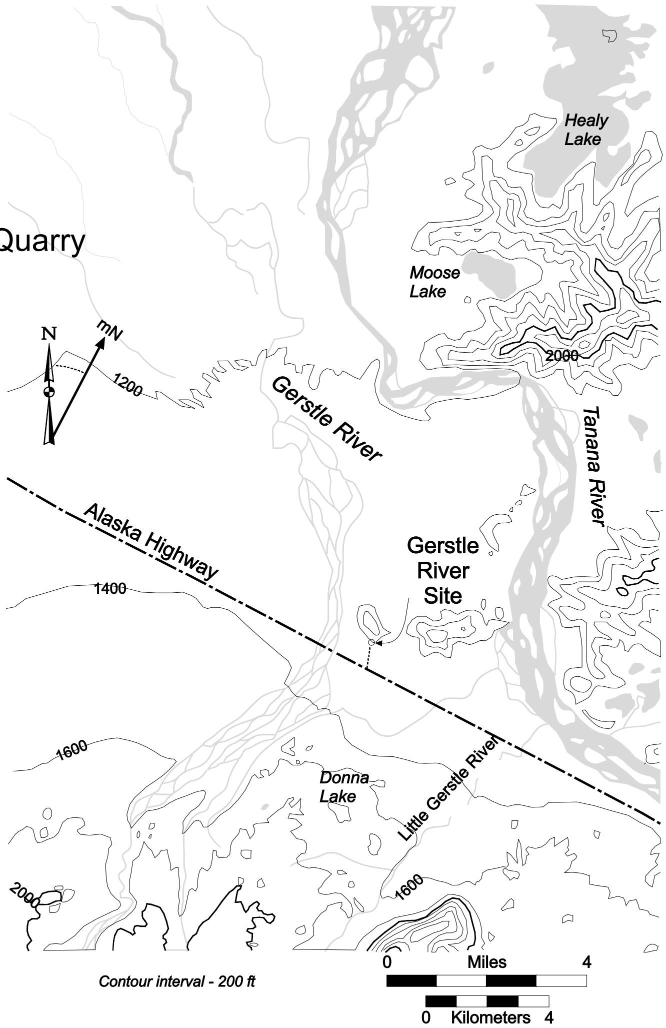


Figure 1: Maps of Alaska and the Gerstle River Valley

Each investigation generated stratigraphic data in the form of profile drawings, which allow comparisons among the various excavations. The 1976 report provided a single 50 cm wide profile drawn from the eastern edge of the bulldozed area (Holmes and Dilliplane 1976: VII-10). A total of 60 linear meters of stratigraphic profiles have been obtained from the Upper Locus: 16 m for the 1977 excavation, none for the 1983 excavations, 33 m for the 1985 excavation, and 11 m for the 1996 testing. Forty-four linear meters of profiles have been obtained from the Lower Locus: 3 m from the 1996 testing and 41 m from the 1999-2000 excavations. There are three differing interpretations of the 1985 stratigraphic data and subsequent radiocarbon date associations: the original field profiles, Kimura et al. (1989), and Kotani (n.d.) Photographs of excavation units and profiles are available for the 1996, 1999, and 2000 investigations.

Strata Terminology

Stratigraphic intrasite comparisons between the upper and lower loci are difficult but possible, largely due to the number and nature of the various weathered B horizons, field-identified as R1-5, following all previous publications (see Rabich and Reger 1978: I-3; Kimura et al. 1989 Figures 3 and 4; Holmes 1998 Figure 4; Holmes 1999 pers. comm.). Previous stratigraphic interpretations are provided below. In the original 1976 report, a soil profile was drawn from a cleaned bulldozer exposed section near the eastern edge of the disturbed area (Holmes and Dilliplane 1976: VII-10). Three reddish oxidized loess zones were described, the lower two yielding artifacts. This is the only report of the three major reports on the Upper Locus that links the Bwb horizons with cultural components. This discrepancy could be the result of the compression of strata at the southern edge of the bluff (see Figures 2 and 4), and this interpretation has been superceded by subsequent work (see especially Kimura et al. 1989; Holmes 1998).

The 1977 investigation reported 11 stratigraphic units, including three red loesses and one reddish mottled loess identified in only one square (N2W13), and no field labels were used. The 1983 and 1985 investigations have yielded three different interpretations (see below). The oxidized layers were termed first through fifth red loess. Though nine red loesses were reported at G-grid, the original field profiles were generally internally consistent among units. Each excavation unit is analyzed separately here. The 1983 and 1985 excavations are critical to deciphering strata designation and cultural component position, as a large area was excavated, thousands of artifacts from multiple components were recovered, 6 radiocarbon dates were obtained, and 33 meters of profiles were drawn. There are, however, disagreements among the original field profiles, the profiles presented in Kimura et al. 1989, and Kotani's undated composite profile. Ostensibly, these three profile sets are the result of a single investigation. An added difficulty is terminology used for the upper strata. The 1985 stratigraphic profiles listed these as "Surface 1" (almost certainly the root mat), "Surface 2" (possibly the

A horizon from the modern soil), and "Surface 3" (possibly the B horizon from the modern soil). The B-Grid profile (Figure 3) and Test Pit 5 (Figure 5) are the closest units from the 1985 and 1996 investigations. The organic mat is somewhat thicker on Test Pit 5 and the B horizon is indistinct from R1 and R2. In other test pits excavated in 1996, there is only a single layer between the root mat and the first Red layer. The G-grid profiles explicitly have the tephra equivalent to Surface 2. A tentative working hypothesis is that Surface 1 is equivalent to the root mat, Surface 2 is equivalent to the modern A horizon, and Surface 3 is equivalent to the modern B horizon, which often shares an indistinct lower boundary with the first Red layer. Without further excavation and sediment analyses at the Upper Locus, it is unclear as to the relative identity and depth of "Surface 1-3".

The 1996 and 1999 investigations used the same strata field designations, generated by Holmes (1998). The 2000 investigation used the modified strata field designations of the data synthesis presented below.

Methods

In this analysis, the 1976 data have too little stratigraphic control and are not used. The remaining stratigraphic profiles were scanned, traced as line drawings, and grouped into units for the analysis on the basis of spatial position on the hill. Table 1 presents each group, the number of linear meters and ordinal directions of stratigraphic profiles, and the references available. North and South walls run parallel to the hill edge while East and West walls transect the hillside (see Figure 1). In the 1985 investigation, no artifacts were recovered in C, D, and F-grids, and no profiles were obtained for D and F-grids, so the latter are not analyzed here.

Hypotheses and test implications were constructed prior to analysis based on the published interpretations. A-Grid was analyzed first due to the varying interpretations and the large amount of data. A model was constructed based on A-Grid patterns and was tested against each grid block from east to west (Grids A, A-B, B, C, E, and G). The model was expected to be strained the further west the model was extended (i.e., the further from the model's generational data). Conclusions in the form of acceptance, tentative acceptance, or rejection of the A-Grid model were reached for each block.

The correlations were based on several criteria, including patterns of continuity/discontinuity of various layers, percent presence in all stratigraphic profiles, average thicknesses of the Y and R layers, distributions of radiocarbon dates, artifacts, other features such as tephra, charcoal clusters, and organic stringers, and spatial patterns in relation to the terrain. Munsell strata color designations were obtained from the 1985, 1996, and 1999 excavations, the first two from original profile notes. While there were some variation in Munsell determinations among investigators, there were overall similarities in reddish versus yellowish loesses (ranging from 5YR 3/3 to 10YR 5/3 for the former and 2.5Y 6/4 to 10YR 5/6 for the latter).

Hypotheses

For the following hypotheses, the stratigraphic labels are those defined by Holmes (1998). Table 4 provides the lab numbers, material dated, provenience, and reference for each radiocarbon date. The A-grid model developed in Section 4 differs from the strata labels used by Holmes (1998). Holmes' R1a is R1 in the model, R1b is R2, R2 is R3, R3 is R4, and R4 is R5. The labels for the yellow loess (Y1-5) remain the same.

- Hypothesis 1 (H1) is derived from the stratigraphic analyses of Holmes 1998. In this interpretation, R1b dates to 3,390 BP, R2 dates to 6200-7600 BP, R3 dates to 8300 BP, P1 dates to 10000 BP. In this hypothesis, two radiocarbon dates obtained in 1996 are anomalous (a date of 2111 BP on Y2, and 6470 BP on Y4), as these disagree with the majority of the dates thus far acquired.
- Hypothesis 2 (H2) is based on the Kotani's interpretation of A-Grid north wall (n.d.). In this interpretation, the R1b/Y1 interface dates to 3800 and 4120 BP, R1a dates to 5050 BP, R2 dates to 6400 BP, and Y5 dates to 7660 BP. H2 is consistent with H1 with the exception of the 7660 BP date on Y5.
- Hypothesis 3 (H3) is based on Kimura et al. 1989. In this interpretation, Y1 dates to 3800 BP, R2 dates to 5050 BP, R3 dates to 6400 BP, Y4 dates to 6040, 6090 BP, and Y5 dates to 7660 BP. The dates on R2, R3, Y4, and Y5 are inconsistent with H1, and all the date assignments except Y5 are consistent with H2.
- Hypothesis 4 (H4) states that the strata and radiocarbon dates cannot be correlated due to insufficient data. A subsidiary hypothesis (H4a) states that the strata and dates cannot be correlated due to lack of stratigraphic consistency.

Further hypotheses can be developed based on the subsequent analyses, including some combination of the preceding four hypotheses.

RESULTS

A-Grid

The A-grid is the most self-consistent and complete segment and is associated with the majority of the artifacts from the Upper Locus (Figure 3). The A-grid north wall (Kimura 1989: 211) was derived directly from the field profiles of N10/W8-11. The A-grid west wall (Kimura 1989: 211) was not among the profiles given to Holmes by Kotani (personal communication). The west wall was not identified by coordinates, though it is

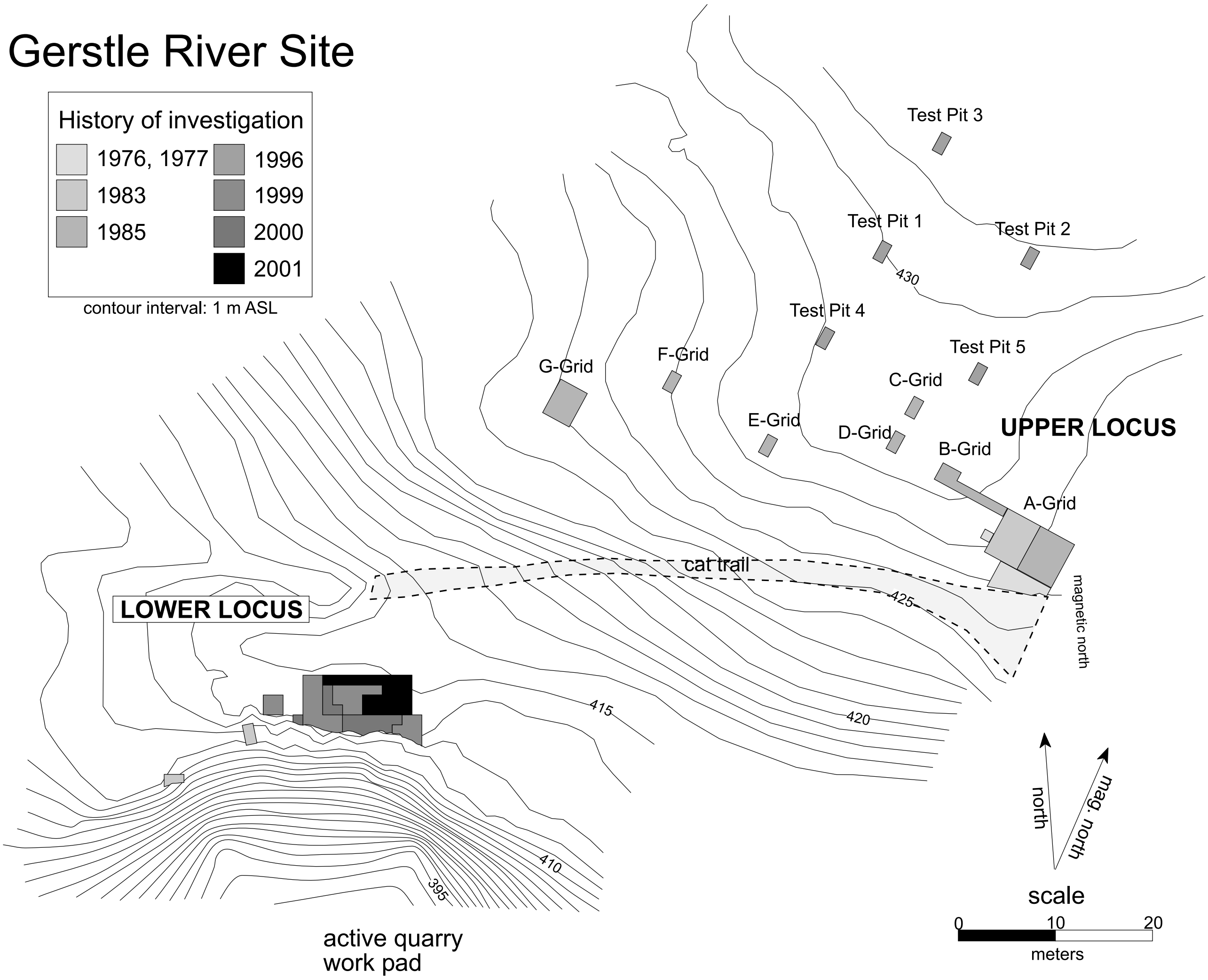


Figure 2: Site plan map

consistent with the corner of N10/W11 section (the north wall of A-grid). However, there are some discrepancies, including 3 red layers in place of two in the north section and different end-of-excavation levels. There are differences between Kimura's presentation of the north wall and the original field north wall profile: RV (R5) in the original profile is designated Y6b (yellowish mottle) in Kimura 1989.

Kotani's undated generalized profile is derived from the north wall of the A-grid (listed as 'major excavation') from below the lowest red loess to the surface, but it does not correspond to the north wall of the 1985 excavations. It possibly represents the north wall from 1983. In this profile, R1 is split into an upper and lower red loess (R1a and R1b). Y1 appears as a discontinuous loess layer in between R1a and R1b. Therefore, the sequence is R1a-Y1-R1b-Y2-R3-Y3, etc.; essentially this is the reverse of Kimura, et. al. 1989 whose sequence is Y1-R1a-R1b-Y2-Y3, etc.

Table 2 shows the published version of the general profile from the 1985 excavation, based on a 4 meter section (N10/W8-11). The original field drawing with designations is in the second column, with the single generalized profile given by Kotani to C. Holmes.

It is somewhat difficult to reconcile the generalized stratigraphic profile drawn by Kotani with the field profiles drawn in 1985 (the source material for Kimura general profile). In addition, the Kimura profile has changed from the field notes to publication. These discrepancies could be crucial in understanding the provenience on several radiocarbon dates.

The following observations represent the general stratigraphic patterns following the original field profile designations and his hereby designated the A-Grid model:

1) R1 and R2 are separated by a discontinuous Y1.
2) R2 is well developed.
3) R3 is continuous, well developed, and separated from R2 by continuous/discontinuous Y2.
4) Y3 is structurally complex with many thin organic stringers, charcoal concentrations and flecks, and

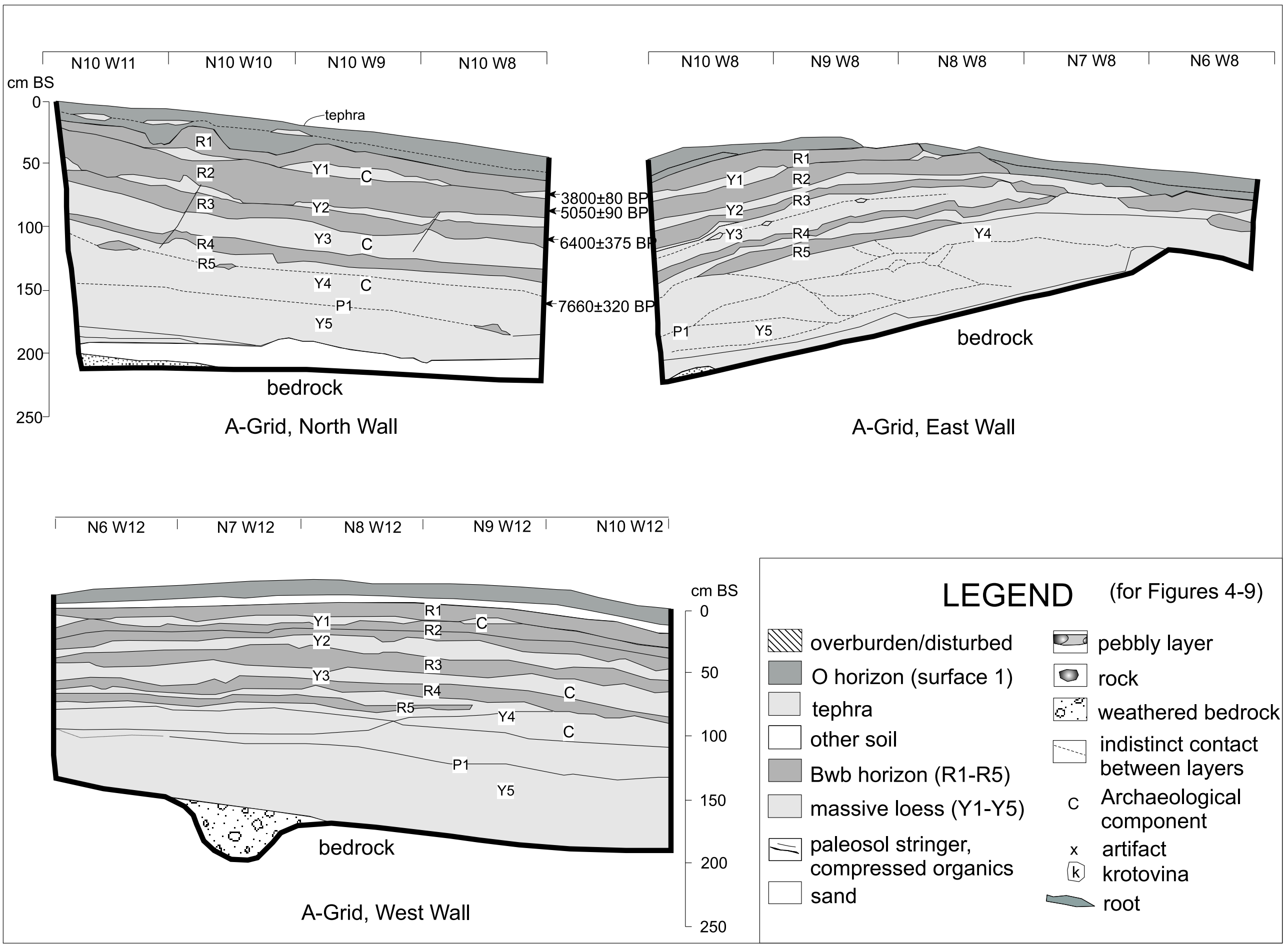


Figure 3: A-Grid stratigraphic profiles (1985)

compressed wood fragments.

5) R4 is continuous and well separated by Y3 and Y4 from R2 and R5 respectively.
6) R5 is discontinuous and less developed than R4.
7) Paleosol 1 is discontinuous but appears in most profiles.
8) Bedrock was reached in most areas and sand layers directly overlay the bedrock.
9) Artifacts were found associated with various layers (component designations are based on Kimura et al. 1989).

There are differences between Kimura et al. 1989 and Kotani n.d. component placements. Kimura et al. place the Upper component within R1, the middle component within Y3, and the lower component in Y4, and R4, whereas Kotani places the upper component within Y1 (which in his profile divides R1), the middle component within Y3, and the lower component in Y4, R5, and Y5.

No data relevant to artifact location is provided on the field profiles, but Kimura et al. 1989 include three-dimensional graphs (pp. 215-217) of all three components recovered. From the vertical distributions, it is clear that these components are clearly separated and each has a unimodal vertical distribution. The upper component artifacts recovered in 1983 and 1985 consist of one black chert point base (of an unknown type), 2 obsidian secondary processing flakes, and a number of large flakes. Only one aziolite microblade was recovered from the middle component artifacts in 1983. Middle component artifacts recovered in 1985 include 64 flakes, primarily of black chert, 1 rhyolite sidescraper, and 1 endscraper of unstated material. The sidescraper was found in two pieces 10 cm apart. According to Kimura et al. 1989: 213, charcoal excavated from this layer dates to 5050±90 BP (N-4958), though in the accompanying figures, this date is associated with R2 (1989: Figure 3 and Table 1). The lower component artifacts recovered in 1983 consist of three concentrations in the southern part of A-grid, including 1 microblade core, about 40 microblades, and 160 flakes. In the 1985 excavation, 80 microblades and about 1,400 flakes in four concentrations were recovered in the lower component. A large sample of artifacts were given material type designations, and these descriptions were consistent with Component III material types at the Lower Locus and from the 1977 excavation, primarily black and gray chert, with small amounts of obsidian and rhyolite flakes. (Kimura et al. 1989: 209-213). Several clusters of bone, teeth, and charcoal were found in association with the lithic artifacts, but no data regarding these

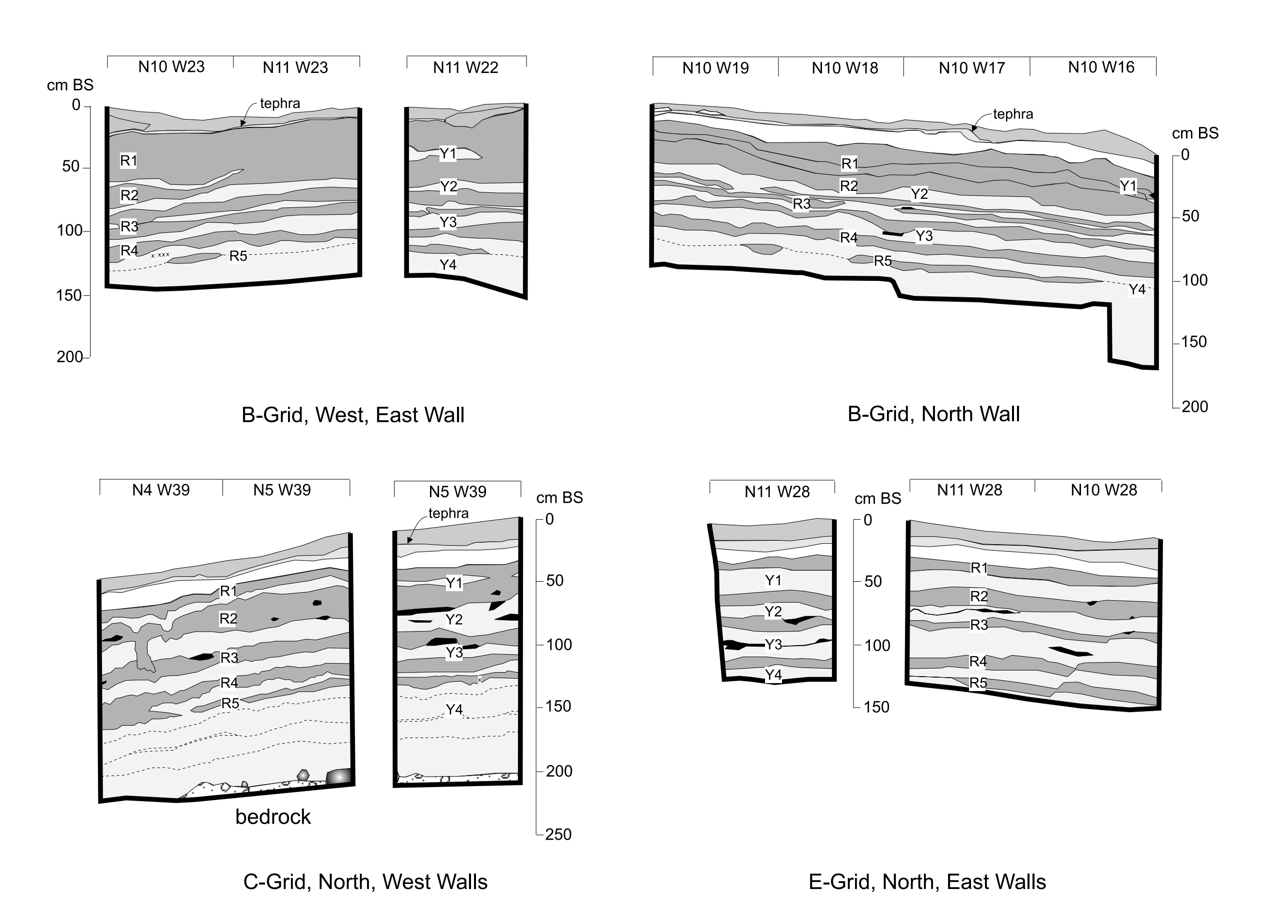


Figure 4: B, C and E Grid stratigraphic profiles (1985)

concentrations were given in the 1989 report. The A-model correlates the upper component with Y1, the middle component with Y3, and the lower component with Y4.

Kimura et al. 1989 correlates the following strata with the radiocarbon data: 3800±65 BP (N-4959) with Y1, 5050±90 BP (N-4958) with R2, 6400±370/380 BP (DIC-2849) with R3, 6040±110 (N-5225) and 6090±75 BP (N-5226) with Y4, and 7660±310/330 BP (DIC-2848) with Y5 (1989: 213). Thus, according to Kimura et al. 1989, the upper component is dated to 3800 BP, the middle component to between 5050 and 6400 BP, and the lower component to between 6000 and 7660 BP. Kotani's profile contains five radiocarbon dates, including the date obtained by Rabich and Reger 1978 and excluding the 6040 and 6090 BP dates. Kotani agrees with Kimura et al. on the 3800 BP date, but on none of the others. The 5050 BP date is associated with R1a, the 6400 BP date is associated with R2, and the 7660 BP date is associated with Y5 (labeled as Y6c in Kimura et al. 1989). The radiocarbon date associations are more consistent with Kotani, especially since Y4-R4-Y5 sequence does not appear on the North wall of the A-grid according to Kimura et al. 1989: 211.

The strata tend to compress at the south of A-grid as illustrated in the east wall profile, and in the 1978 excavations (see Figures 2 and 4). The A-grid east wall profile is consistent with the A-grid model using the same terminology for the original North wall; however, the southernmost area is difficult to discern. R4 (labeled) could be either R3 or R4, though most likely R3 given the discontinuous nature of R4. R1 and R2 has eroded, and Surface 1 and 2 remain.

B-Grid

The B-grid is a continuation of A-grid to the west in the form of a trench 7 meters long by 1-2 meters wide (Figure 4). N10/W16-19 apparently was not excavated to the bedrock, perhaps due to permafrost. There are several differences with the A-grid model as developed above: Y1 is not present, except at the extreme east; R3 consists of 3 thin red layers; and Y3 is not as complex and is represented as a single yellow layer. However, there are more similarities with the A-grid model: there is general agreement on number, position, thickness, and continuity of the R layers, the tephras relate, and Surfaces 1-2 relate. The main B-grid (N10-11/W23) strata consist of a west and east wall. Differences with the A-grid model include the separation of R3 into three thin red layers, and Surface 2 is not present. In this profile, the sod appears to be equivalent to Surface 1 and

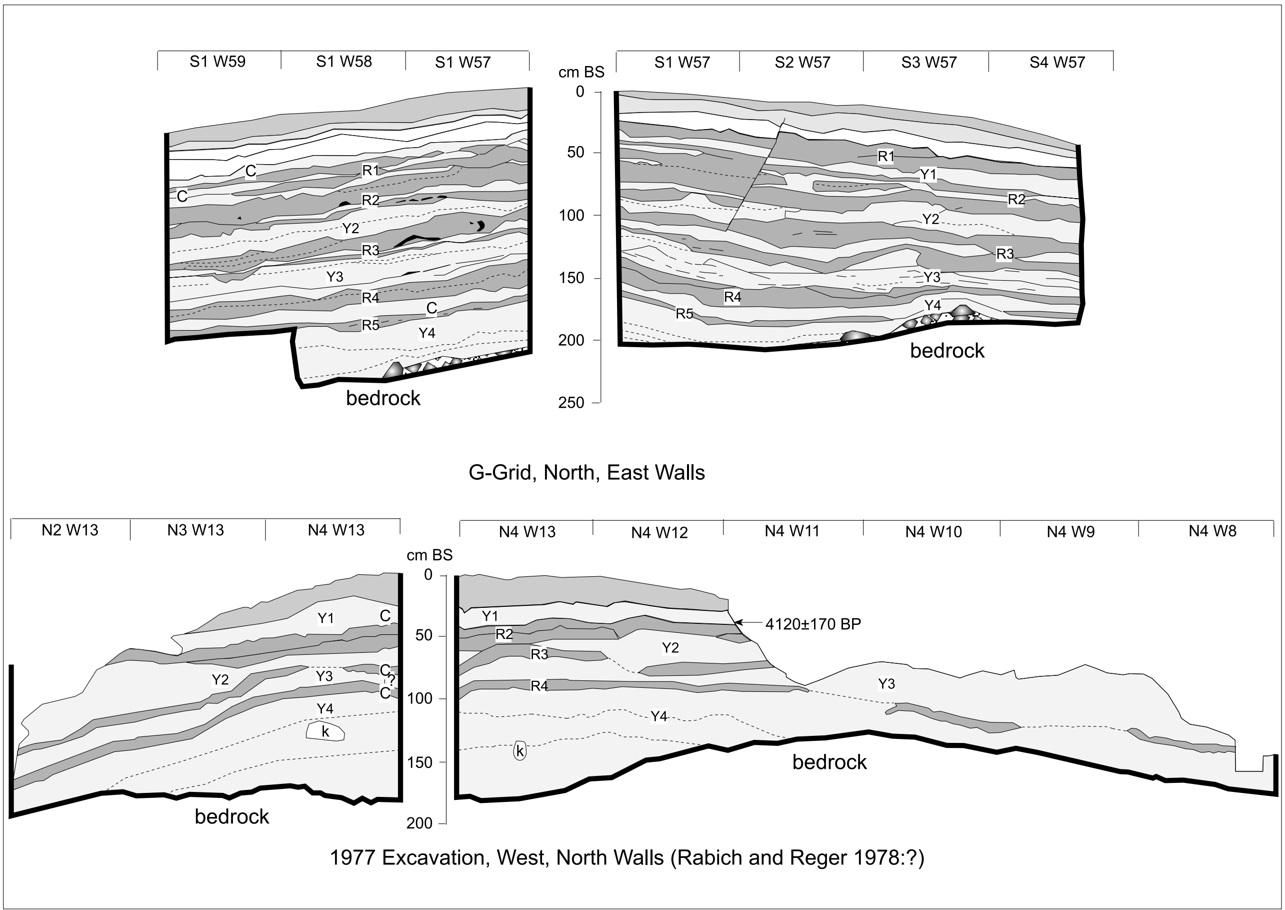


Figure 5: G-Grid (1985) and 1977 excavation stratigraphic profiles

2 from the A-grid. However, there are general similarities to the model, including agreement on number, position, thickness, and continuity of the R layers, and the tephra. Flakes are present within Y4, similar to the A-grid model, probably representing the lower component, the largest from the A-grid excavations.

C-Grid

The C-grid is located 5 m west of B-grid (Figure 4). Differences with the A-grid model include different spacing of R layers; R1 is much thinner (12 vs 35 cm in B-grid), C-grid is not excavated to bedrock (and thus the presence of all the R layers is uncertain), and Y1 is structurally more complex and generally thicker. Similarities with the model include a continuous R4 and discontinuous R5, a complex Y3 with many charcoal fragments, and an overall agreement of the R layers. No artifacts were recovered in C-grid. The conclusion is tentative consistency with the A-grid model.

E-Grid

The E-grid is located 11 m west of C-grid, and 16 m west of B-grid (Figure 4). Differences with the A-grid model include R4 and R5 contact with each other for 50 cm and a discontinuous Y4; Y3 is not as complex; Y2 is more complex and includes many organic-rich layers; and the severe turbation discussed below. Similarities with the model include a general agreement of the R layers, continuous R4, discontinuous R5, the general thickness of R layers match (i.e. R2 is the thickest, then R3, then R1). Bedrock was reached in this unit. The conclusion is tentative consistency with the A-grid model.

G-Grid

The G-grid is located 18 m west of E-grid, 29 m west of C-grid, and 34 m west of A-grid (Figure 5). This unit is mostly excavated to bedrock. This unit has the most complexity and divergent strata by far at the Upper Locus, and indeed the entire site. R5 appears to be stronger and continuous, and thicker as it trends rest (it was field labeled R9). Paleosols are not present, and Y5 and below is much condensed (field labeled as Y9). Table 3 gives the original G-grid field labels, the A-grid model equivalent, and the various depths.

Though no data was presented on G-grid artifacts in Kimura et al. 1989, the plan-views of three components were among the original field notes in possession of the author. Unfortunately, these maps have small “x” marks that almost certainly represent flakes or microblades, and

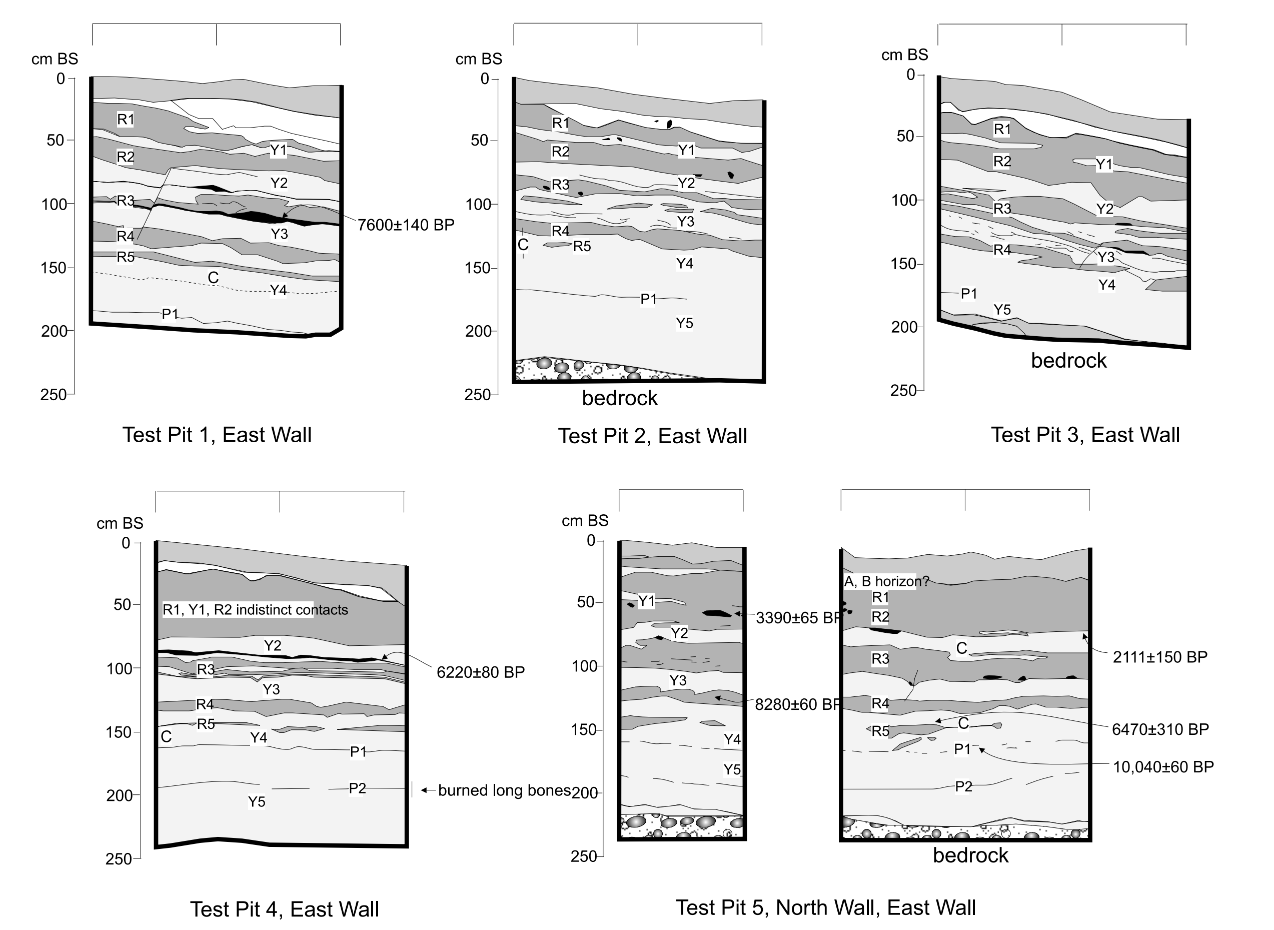


Figure 6: Test Pits 1-5 stratigraphic profiles (1996)

larger line drawings that could represent cobbles or bone fragments but which are clearly associated with the flakes. With each flake is a number probably representing a field specimen number. The lowest component is associated with Y8 and consists of 16 marks and 1 larger piece (either bone or large artifact). The middle component is associated with 2R-2Y and consists of 279 marks and 10 larger pieces. The upper component is associated with 2Y and consists of 10 marks and 7 large objects. The upper component occurs in one concentration at S4, W58, whereas the middle component occurs in two concentrations, the main cluster (n=190 marks) at S2, W58, and a smaller one (n=60 marks) at S3-4, W58. It is possible that – given the complex and thin layers at G-grid and the partial spatial separation of the components – these artifacts may actually represent a single component. The A-grid model correlates the upper component with Y1, the middle component with R2, and the lower component with Y4.

Two hypotheses can be made regarding unit designation. The first is that the G-grid labeled units of R1 are equivalent to A-grid model R1, Y1 to Y1, and G-grid R2 through R5 to A-grid R2. The second hypothesis is that G-grid R1 through R2 are equivalent to A-grid R1, G-grid Y2 is equivalent to A-grid Y1, and G-grid R3 through R5 are equivalent to A-grid R2. The lower units are as presented in Table x. Both are supported based on the artifact distributions. The component labeled as upper in Kimura et al. 1989 is present within Y1 in the A-grid. Artifacts are present in both Y1 and Y2 (G-grid designators). The stronger support seems to be for the second hypothesis because R1 and R2 are joined for a longer stretch (75 cm vs 20 and 30 cm), thus agreeing more closely with the A-grid model. Similarities with the A-grid model include the agreement of G-grid Y7a-c with A-grid Y3 because of the presence of many organic stringers, and although R9 (equivalent to A-grid R5) is mainly continuous, it is much thinner than R8 (A-grid R4). There is a general agreement with the R layers, the tephra appears in a similar stratigraphic position, Surface 1-3 are similar, Y8 (A-grid Y4) contains artifacts, and Y1 and Y2 (A-grid Y1) contain artifacts. The conclusion for G-grid is tentative acceptance of the model pending further investigation.

Test Pit 1

Test Pit 1 was excavated by Holmes in 1996 and lies 25 m northwest of A-grid and 20 m NW of B-grid (Figure 6). Artifacts appear in Y5, consistent with the model.

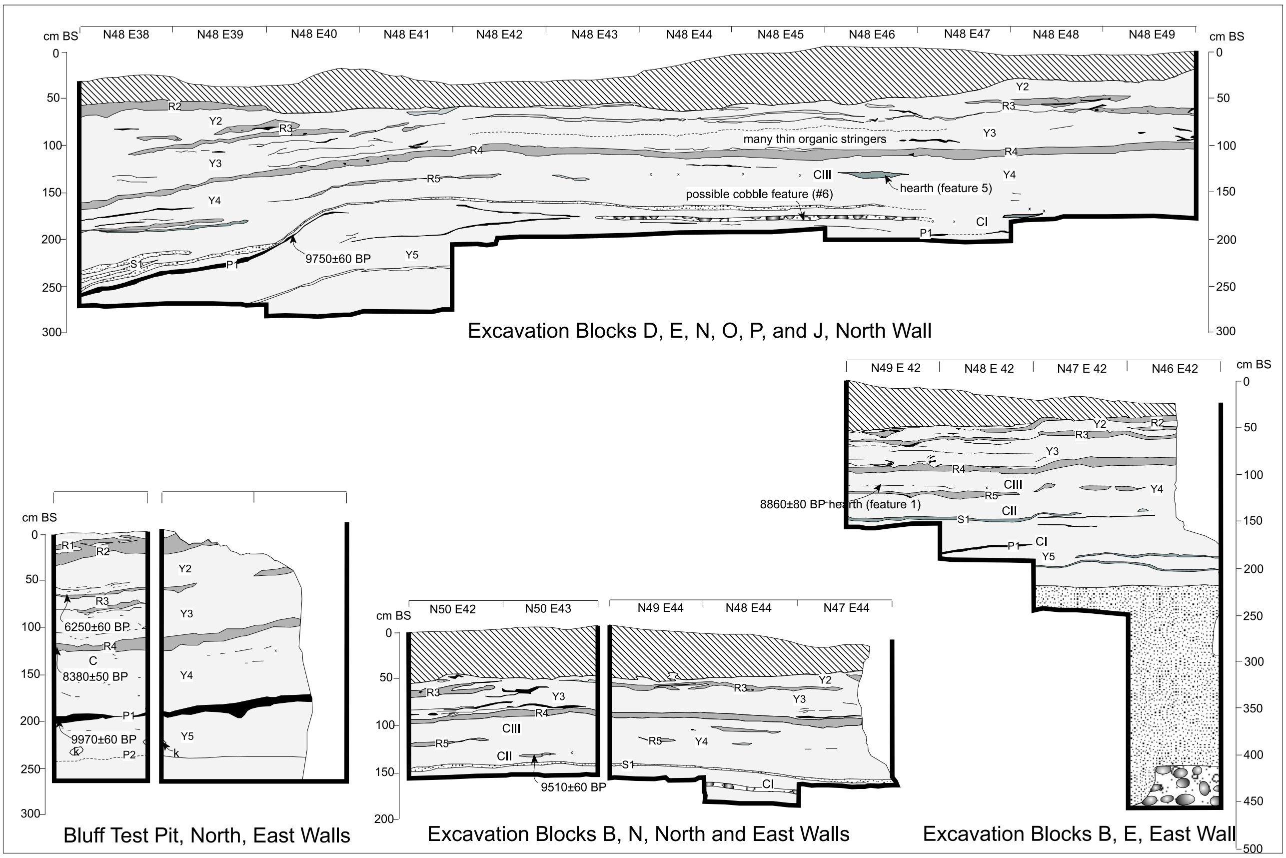


Figure 7: Lower Locus stratigraphic profiles (1996, 1999, 2000)

This unit was not excavated to bedrock due to permafrost. A radiocarbon date of 7600±140 (WSU-4888) was obtained from the lower part of R3. This is consistent with Kotani (n.d.) and Holmes (1998) chronologies (H1 and most of H2), but is inconsistent with Kimura et al. 1989 (H3). Flakes were located at 140-150 cm BS, within Y3 (see Holmes 1998: 6). The strata labeled “disturbed A horizon” on the original profile probably correlates to Surface 2 and possibly 3, R1 to Y4 are identical to the model, “mottled red” is equivalent to R5, and “P” to P1. Similarities to the A-grid model include relatively similar sequence of R layers; consistent artifact location at Y5; R5 is continuous, but thinner than R4. Dissimilarities with the model include: Y5/Y6 are listed above P1 (P1 should separate them); Y2 and Y3 appears more complex. The conclusion is acceptance of the A-grid model.

Test Pit 2

Test Pit 2 was excavated in 1996 and lies 24 m northwest of the A-grid (Figure 6). This unit was excavated to bedrock. Similarities with the A-grid model include general position agreement of the R layers, R5 (labeled as “red silt stringer”) is discontinuous, Y3 is complex with many organic stringers, the paleosol is discontinuous but present, and the cultural component is in Y4 between R4 and R5. Differences with the model include cultural material in R4, perhaps related to the Y4 component, no tephra is present, and a compact olive brown silt lies near the bottom of the unit. A microblade core fragment was recovered at 114 cm BS, but most artifacts were found between 125 and 140 cm BS, within Y3 (see Holmes 1998: 6). The stratum labeled “disturbed zone” appears to correlate to Surface 3. The conclusion is acceptance of the A-grid model.

Test Pit 3

Test Pit 3 was excavated in 1996 and lies 35 m NW of A-grid (Figure 6). No R or Y layer is labeled below R2. R3 is especially fragmented (OW) into 3 to 4 small red loess layers. Y3 (not labeled here) contains many organic stringers. R4 and R5 are not labeled, and R4 could be one red layer. The “A soil horizon” could represent Surface 2 and 3. No artifacts were recovered, but a *Cervus* tibia was found in the lower part of R3. R1 and R2 are only partially separated by Y1. R4 is continuous, but is apparently in direct contact with R5. A butchered elk tibia was found at 109 cm BS, within Y3, but no artifacts were found (see Holmes 1998: 6). The A-grid model holds for R4 and above, but is poor for the R4-Y4-R5 sequence.

Test Pit 4

Test Pit 4 was excavated in 1996 and lies 25 m west of A-grid (Figure 6). This unit contains strata thicknesses very different from nearby C-grid, and is similar to Test

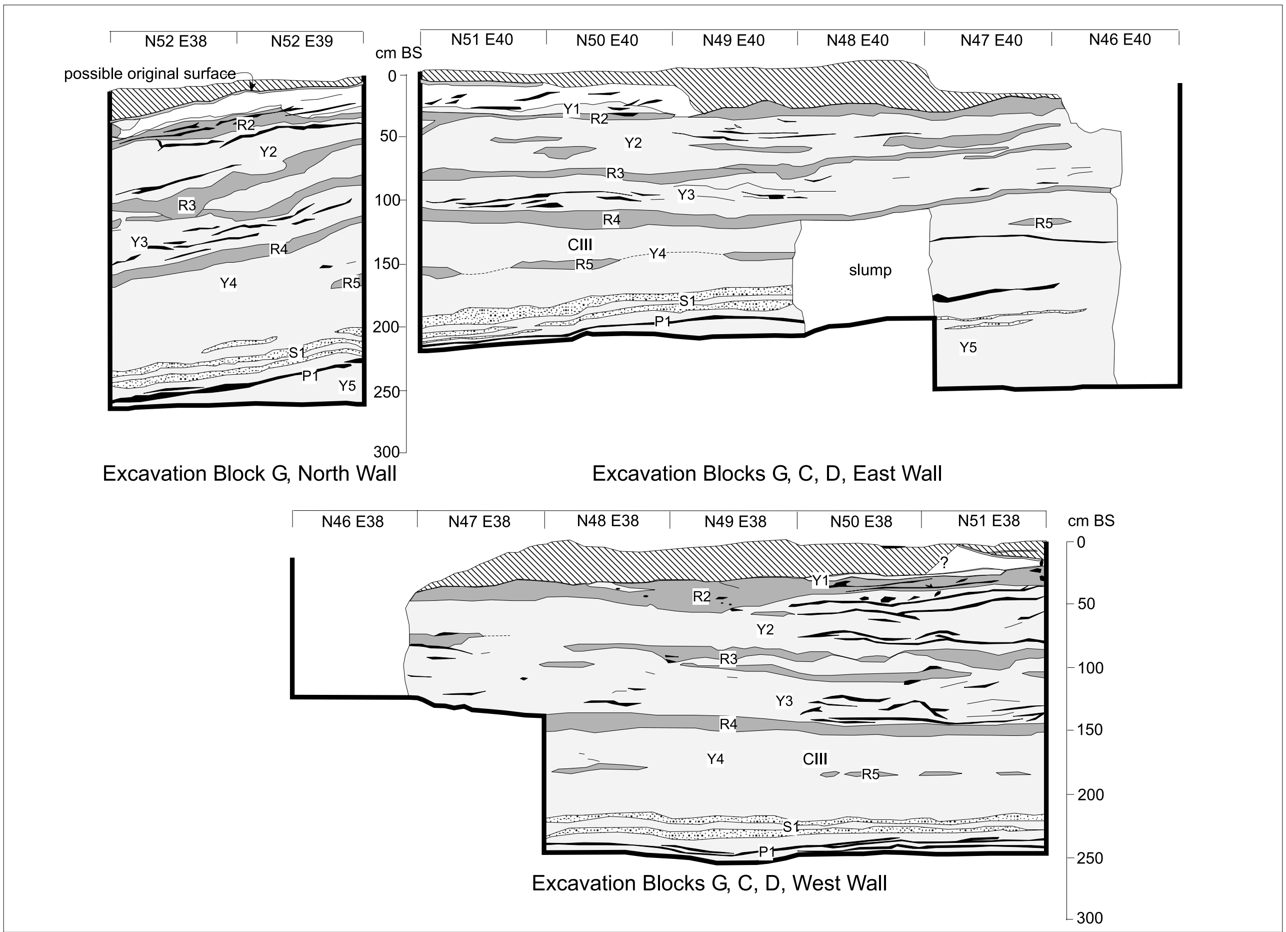


Figure 8: Lower Locus stratigraphic profiles (1999)

Pit 1. The unit was not excavated to bedrock. Strata are not labeled below R2 but the correlation appears relatively straightforward here. R1-Y1-R2 boundaries are indistinct and cannot be separated. The general stratigraphic sequence below R2 is consistent with the A-grid model. R3 is composed here of two smaller red loess layers. A radiocarbon date of 6220±80 BP (WSU-4892) was obtained from the upper part of R3, and is in perfect agreement with the date from the Bluff Test Pit and H1 and H2, but contradicts H3. Flakes were found at 137 cm BS and 155 cm BS, within the lower contact of R4/Y4 and the contact between Y4/R5 respectively (see Holmes 1998: 6). It is unknown if these depths are means or single measures, thus we do not know if they represent one or more components Burned bone was found within the lower paleosol and is the only occurrence at the site of fauna associated with this stratum. Bones were found within R4, like Test Pit 2 artifacts. The stratum labeled “disturbed A horizon” probably represents Surface 2 and 3. The conclusion is that the A-grid model works well for R2 and below.

Test Pit 5

Test Pit 5 was excavated in 1996 and lies 11 m north-northwest of A-grid and 7 m north of B-grid (Figure 6). This unit was excavated to bedrock. Y1 is discontinuous, and there is a general agreement of the R and Y layer sequence. There is no equivalent to Surface 3, but this may be related to the A horizon. Artifacts were recovered from Y2 and Y4, both agreeing with the A-grid model. A date of 3390±65 BP (WSU-4890) was recovered from R2 (labeled in TP5 as R1b), though sample provenience was not included on the profile. This date is too recent given the general suite of radiocarbon dates if the dated material was within R2. It is possible that this assay dates material within Y1, given the indistinctness of the upper R boundaries (Holmes 2000, personal communication). This date would therefore be consistent with those already obtained from Y1. A date of 2111±150 (WSU-4891) was associated with Y2, but this too appears recent. A date of 8280±60 (ß-98434) was associate with R4 (labeled in TP5 as R3), which is consistent with Holmes 1998 and Potter 1999 dates and H1 but inconsistent with H2 and H3. A date of 6470±310 (WSU-4893) was associated with Y4 that is consistent with H2 and H3 but inconsistent with H1. A date of 10,040±60 (ß-98436) was associated with the paleosol (P1) that is consistent with all of the hypotheses. A notched pebble was found 60 cm BS (within Y2), and boulder spalls, microblades, flakes, gastroliths, and bones were recovered within Y4 (see Holmes 1998: 6). The conclusion is that the A-grid works for the strata below R2 with the proviso that two of the dates appear too recent given the bulk of the other dates, and several dates are inconsistent with at least one hypothesis.

1977 Excavation

The 1977 excavation yielded 16 linear meters of stratigraphic profiles (see Figure 5). These units were on the edge of the eroding bluff and were situated immediately south of the 1983 and 1985 A-grid. For the purposes of this analysis, the 1977 units are considered part of the A-grid. There is apparently only one excavation unit that connects both 1985 and 1977 excavations. N6W8 (east wall) and N5W8 (north wall) have one corner (NE) which contacts. The only R layer appearing at that interface is R4. As the 1977 profile continues west, other upper R layers appear. Several differences are apparent between the 1977 and 1985 profiles. R1 is apparently absent, there is no tephra or paleosol present, and artifacts are not within Y4 alone. However, the stratigraphic profiles are in general agreement with the A-grid model. Similarities include a general agreement on R layers, R2 is made up of two red loess layers, somewhat similar to the A-grid west wall, R4 is the lowest continuous R layer, and R5 is not present. Artifacts recovered from R3 through R4 possibly center on Y4. These probably represent those appearing in the larger and more controlled excavations of Kotani in 1983 and 1985 as components located in Y4 and Y3 respectively. The upper cultural component described by Rabich and Reger 1978 (I-4) was associated with Y1 (the mottled loess overlying the top oxidized stratigraphic layer), which agrees with Kimura et al. 1989 and Kotani n.d. The lower component was associated with R3 and R4 (middle and lowest oxidized units), and the excavators note that "it is possible that there are two distinct components, but that the distribution of each overlaps" (Rabich and Reger 1978: I-4). Given the relative vertical proximity of the middle and lower components observed by Kimura et al. 1989 (see Figure 8), it is likely that Rabich and Reger recovered artifacts from both the middle and lower components in 1977. A radiocarbon date of 4120±170 BP (Gx-4950) was obtained at 24-32 cm below the surface within soil unit 2 "mottled loess." This date, at the lower limit of Y1 is consistent with the 3800±65 BP date on Y1 from the 1985 excavation and appears to be a good lower limiting date on the upper component. The conclusion is tentative acceptance of the A-Grid model, though more work is needed on artifact component assignment.

Lower Locus

A total of 41 linear meters of profiles have been drawn for the Lower Locus in the course of the 1999 and 2000 investigations (see Figures 7 and 8). An additional 3 meters with associated radiocarbon dates were provided in the 1996 investigation (Holmes 1998: 7). Stratigraphic profiles included a 12 meter long section parallel to the eroding edge of the bluff. The research design for the Lower Locus excavation in 1999 and 2000 consisted of 4 m2 excavation blocks with vertical control provided by stratigraphic profiles. Field identification consisted of R layers identified by Holmes 1998. Excavation was conducted by natural strata from the surface to the R4/Y4 interface. Excavation below this interface was conducted in 10 cm increments due to the discontinuity of R4 and the lack of differentiation in Y4, Y5, and Y6. The purpose of this was as an independent check and correlation with earlier work. Buried surface contours were noted, drawn, and measured. There are special problems with stratigraphic analyses at the Lower Locus, primarily relating to the nature and thickness of the overburden deposition. At the start of the 1999 investigation, it was unknown when and how this overburden was deposited.

In general, the surficial deposits are similar to the Upper Locus, consisting of a massive yellow silt interbedded with buried Bw horizons (Dilley 1998; Holmes 1998). Although the number and position of R layers are similar to the Upper Locus, there are several differences. The R layers are generally thinner, suggesting that the vegetation was not as well established on this promontory as the Upper Locus. R1 does not appear on any of the profiles drawn thus far for the Lower Locus. Y4 through Y6 are difficult to distinguish given the discontinuity of R4 and P1. The Lower Locus has received a greater influx of sediments over comparable time spans than the Upper Locus, probably due to its location nearer the present Gerstle River and presumably the ancient river that flowed immediately south of the site. Though sediment analyses have not been completed for the Upper Locus, particulate size analysis of sediments at the Lower Locus indicate a greater proportion of sand from R1 to Y4. The vertical distance between R4 and bedrock is much larger, 3 meters vs 1 meter at the Upper Locus. The presence of a saiga antelope humerus, and various *Equus* remains – including a radius dating to 15,090±70 BP (ß-109267) – eroding out of the lower sand suggest a late Pleistocene age for these lower sediments.

The original surface may be revealed in the profiles of Excavation Block G (Figure 8). R1 does not appear on any of the Lower Locus profiles, though it is possible that R1 is indistinct from R2 on the north wall of Excavation Block G. Pockets of tephra were found within the buried root mat in this block, perhaps indicating reworking or disturbance of the root mat. Given the small sample, it is difficult to interpret any sediments above Y1 at the Lower Locus.

Correlations of archaeological components with the radiocarbon dates and stratigraphy is not difficult at the Lower Locus. All three stratigraphic dates from the 1996

Lower Locus tests correspond to Upper Locus dates. A date of 6250±60 BP (ß-98435) was recovered near the top of R3, corresponding to similar dates at Test Pits 4 and 5. A date of 8380±50 BP (ß=98433) recovered within R4 corresponds to a date from Test Pit 5. A date of 9970±60 BP (ß-98432) on paleosol 1 corresponds to a date from Test Pit 5. A date of 7325±200 BP (WSU-4894) was recovered from an unknown provenience at the Lower Locus and must be discounted. Holmes dated an *Equus* radius found eroding out of the lower sands to 15090±70 BP (ß-109267), which probably offers a realistic age of the lower sediments at the Lower Locus.

Three components were recovered in clear stratigraphic contexts during the 1999 excavation. A hearth associated with microblades, burins, scrapers, and retouched flakes from Component III yielded a radiocarbon date of 8860±70 BP (ß-10206). Another hearth from CIII cross-section is present on the north wall of N48E46 (Figure 7). This component is separated from Component II by a discontinuous Bwb horizon (R4). A hearth associated with microblades and core parts from Component II yielded a radiocarbon date of 9510±50 (ß-11108). This component is separated from Component I by a discontinuous sand layer (S1). The lowest component, CI, remains undated at present, though a lower limiting date of 9740±50 BP (ß-133751) was obtained on the paleosol (P1) directly underlying CI artifacts. This date, when calibrated, corresponds to earlier dates on P1 at both the Upper and Lower Loci (11228-11112 calBP vs. 11912-11223 and 12096-11257 calBP). CI appears to be stratigraphically associated with a pebbly layer of limited dimension (Figure 7, N48E43-47; N48E44). Given multiple years of research, stratigraphic, radiocarbon, and artifactual data at the Lower Locus are remarkably consistent.

DISCUSSION

There is a remarkable congruity between the 1996 and 1999-2000 radiocarbon dates, and these carry more weight due to exact provenience information in relation to the field profiles. With the exception of three dates within Test Pit 5 and one date with uncertain provenience at the Lower Locus bluff face, the majority of dates (n=11) are internally self-consistent. The lack of exact provenience data for the radiocarbon samples obtained from the 1983 and 1985 excavations renders final correlations difficult at best. A list of all radiocarbon dates obtained from the Gerstle River Site is provided in Table 4. The concordant suite for the A-grid model at both loci is provided in Table 5. Of the major hypotheses considered, the data suggest that a slightly modified version of Hypothesis 1 is most parsimonious. Given the large amount of decomposed organic matter and charcoal fragments throughout the soils at this site, it is possible that contamination from recent forest fires affected the radiocarbon assays. The small suite of ~6000-7660 BP dates on Y4 (n=4) are more difficult to explain, but as most of these have no exact provenience and given the considerable discrepancies among researchers during the 1985 excavation, these dates may be misleading.

The stratigraphic correlations of the A-grid model and the radiocarbon date and archaeological component distributions generally support H1 and contradict H2 and H3. The dates appear to be adequate to yield preliminary age estimates on four of the six components present at the site. Component I (Lower Locus), located within Y4 and bounded by S1 and P1, has stratigraphic bracketing dates of 9510±50 BP (CII) and 9470±50 BP (P1), yielding an average of 11,200 cal BP. Artifacts consist of <100 small tertiary reduction unmodified chert flakes.

Component II (Lower Locus), located within Y4 and bounded by R4 and S1, yielded a firepit date (Feature 2) of 9510±50 BP (10,800 cal BP). Cultural material consists of a single firepit feature and associated cluster of microblades, core tablets (platform rejuvenation flakes) and facet rejuvenation flakes from wedge shaped microblade cores, burin spalls, and modified and unmodified flakes. Component II is most similar to clusters A, B, C, G, and N from Dry Creek, Component II, and thus falls within Denali Complex parameters (Powers et al. 1983, West 1967).

Component III (Upper and Lower Locus), located 10-20 cm below R4 within Y4, yielded a hearth date (Feature 1) of 8860±70 BP (9920 cal BP). Cultural material consists of three firepits and associated clusters of microblades, boulder spall scrapers, a burinated endscraper, burins, burin spalls, fractured cobbles, modified flakes, and unmodified primarily tertiary flaking debris. In addition, a single worked rod of mammoth ivory was recovered in association with Firepit Feature 1. Multiple individuals of *Bison* and *Cervus* were also recovered in association with the lithics and features. Component III is most similar to clusters A, B, C, G, and N from Dry Creek, Component II, and thus falls within Denali Complex parameters (Powers et al. 1983, West 1967).

Component IV (Upper Locus), located within Y3, has stratigraphic bracketing dates of 8280±60 BP and 7600±140 BP, yielding an average of 8200 cal BP. Artifacts consist of microblades, sidescrapers and endscrapers, and modified and unmodified flakes.

Component V, located within Y2, has stratigraphic bracketing dates of 6220±80 BP and 5050±90 BP, yielding an average of 6300 cal BP. The associated artifacts consist of a single notched pebble found at the Upper Locus.

Component VI (Upper Locus), located within Y1 and at the contact of Y1/R2, has a date of 3800±80 BP (4200 cal BP) associated with Y1 and a lower limiting date of

4120±170 BP. Artifacts consist of a projectile point base (of unknown design), 1 biface fragment, and a number of unmodified flakes.

This exercise in stratigraphic correlation among a number of investigations occurring over a span of 25+ years underscores the importance of producing detailed excavation reports. Excavation involves destruction. In this case, stratigraphic data and interpretation resembles archaeological feature data and interpretation in that once gathered, they are, in effect destroyed. Further excavation at the Upper Locus may answer a few questions regarding artifact distribution, but will probably be unable to help decipher some of the stratigraphic and dating interpretations of earlier researchers given the large block excavations of 1983 and 1985. For illustration, Test Pit 5 (Figure 7) was the closest unit to the A-Grid (Figure 4), and yet differences between the profiles abound. In the absence of detailed notes or site reports, stratigraphic data and interpretations could represent non-recoverable datasets. In order to more fully reconcile the various interpretations, a number of new radiocarbon dates would need to be run on precisely provenienced samples from the Upper Locus; the resulting data would then in fact replace (rather than reconstruct) the previous interpretations.

Lithic, faunal, spatial, and sedimentary analyses are ongoing at the Lower Locus, and preliminary results indicate significant spatial patterning of artifacts, features, and fauna that probably delineate activity areas (Potter 2000a). The plan-view data for the Upper Locus (A and G-grids) indicates that similar artifact clusters were encountered there, especially within Component III. The vertical distribution data from both loci indicates very little post-depositional disturbance and the coincidence of all these factors makes Gerstle River a crucial dataset in understanding early to middle Holocene adaptations in Alaska. The stratigraphic, radiocarbon, and artifactual correlations presented here are a first step in placing the cultural material recovered from 1999 and 2000 in their relevant contexts.

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