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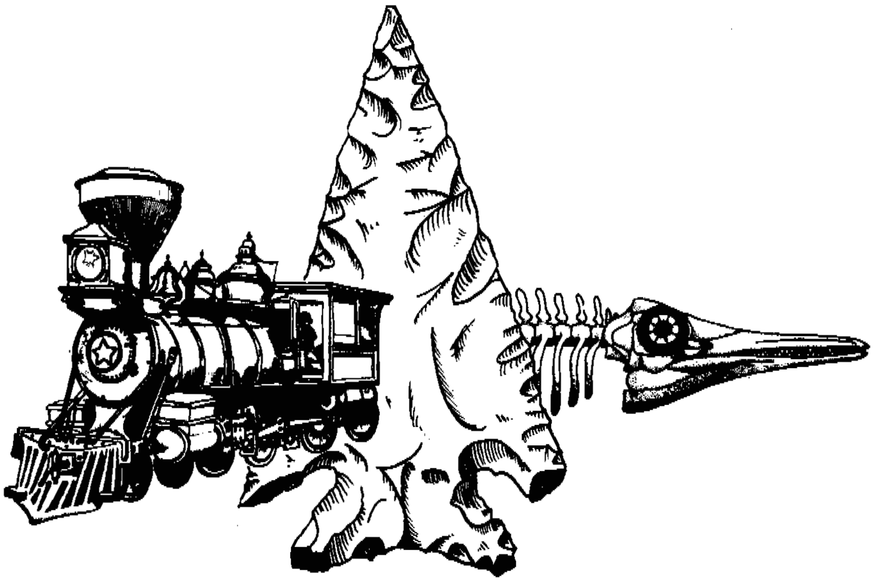

ARCHAEOLOGICAL INVESTIGATIONS AT PANACA SUMMIT

Robert G. Elston
Kenneth Juell

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FORWARD

The Panaca Summit Archaeological Investigations were funded by the Williams Telecommunications Company, Tulsa, Oklahoma as part of The Bureau of Land Management's compliance with Cultural Resource Protection Mandates. Unlike most previous investigations on the public lands in Southeastern Nevada, this particular survey encompassed ecological types from the valley floor to the uplands, resulting in a greater insite into the diversity of prehistoric activities. The classifications and evaluations of the various sites are also examined through the application of a functional site type key, and systematic relationships in the data are explored. Both the findings and the evaluative techniques have implications for the direction of future studies and management of cultural resources in Southeastern Nevada.

Lynda L. Waski Armentrout
Bureau of Land Management
Reno, Nevada
June 1987

ARCHAEOLOGICAL INVESTIGATIONS AT PANACA SUMMIT

by

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April 1987

INTERMOUNTAIN RESEARCH
REPORTS

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The research reported here was funded by Williams Telecommunications Company, Tulsa, Oklahoma.

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INTRODUCTION

Williams Telecommunications Company (WILTEL) proposed the construction of an interstate fiber optic cable transmission system from the midwestern United States to Los Angeles, California. Woodward-Clyde Consultants was contracted to address cultural resources and environmental concerns on behalf of the project. Woodward-Clyde subcontracted Intermountain Research to investigate cultural resources along the Nevada segment of the cable route.

Project History

The WILTEL project began in the spring of 1986 with the preparation of a cultural resources overview of the fiber optic cable route which identified known historic and prehistoric archaeological sites within a half mile wide corridor extending between the Nevada-Utah and the Nevada-California state lines; the overview was reported by Zerga and Stornetta 1986. Subsequently, in the summer and fall of 1986, an intensive archaeological survey of the cable route was accomplished, examining a corridor that varied between 100 and 400 feet in width; this work is reported by Stornetta (1987).

Previous work in the Cedar Range (Fowler et al. 1973; Matranga 1979; Bunch 1983) suggested a high prehistoric site density in the Panaca Summit area. Intensive survey (Stornetta 1987) confirmed it; survey of a transect 400 feet wide paralleling the north side of State Route 319 recorded 59 prehistoric sites in 11 miles. Thus, the Panaca Summit Archaeological District was identified, although its northern and southern extents remain unknown; east-west across the Cedar Range, the district extends from the Nevada-Utah state line west to Ninemile Rocks.

It was determined that fiber optic cable placement would affect seven sites in the district. These sites, listed below, became the subject of the present study.

Smithsonian Trinomial	Temporary Field Number
Pending	71W-3
26Ln21	71W-2
26Ln3356	70W-8
26Ln3357	67W-4/5
26Ln3358	62W-2
26Ln3359	62W-7
26Ln1775	61W-1

Report Organization

The present report represents a revised edition of one submitted to the Bureau of Land Management Las Vegas District office in fulfillment of cultural resources management requirements (Elston and Juell 1987). The results of certain ceramics analyses, unavailable to the earlier document, have been included herein; details of cultural resources management considerations appearing in the earlier version have been omitted.

Following this introduction, Chapter 2 describes the environmental setting of the study area, and Chapter 2 summarizes regional cultural history as background to the field investigations. Chapter 3 presents research objectives. Field and laboratory methods, and analytic techniques are discussed in Chapter 4. Prehistoric artifacts are classified and described in Chapters 5, 6, 7, and 8. Chapter 9 classifies all sites recorded by survey in the study area, and Chapter 10 describes the results and findings of intensive investigation at seven sites. Concluding comments appear in Chapter 11.

Chapter 1. ENVIRONMENTAL SETTING
by Robert G. Elston

The present investigation is concerned with archaeological sites along an 11 mile long corridor between the Nevada-Utah state line west to Ninemile Rocks (Figure 1). The corridor traverses the Escalente Desert and the Cedar Range and extends into Panaca Valley.

The Escalante Desert is centered in southeastern Utah, with its western margin in the Nevada project area. During the Pleistocene, a southern extension of Lake Bonneville filled northern Escalante Valley, but did not extend into Nevada (Snyder, Hardman, and Zdenek 1964:Map I-416). Modern streamflow trends east in ephemeral drainages, ultimately into the Great Salt Lake (USDI-USGS 1975). The desert basin is 90 miles east-west by 65 miles north-south; the Cedar Range separates the basin from Panaca (Meadow) Valley at Panaca Summit (McLane 1978:34; USGS 1975).

Panaca (Meadow) Valley, west of the Escalante Desert, drains south through perennial Meadow Valley Wash, into Spring Valley Creek to the Colorado River, as it did in pluvial times (Snyder, Hardman, and Zdenek:1964). Thermal waters flow north of Panaca at Owl (Panaca) Springs, and cool water is found to the north at Delmue's and Flatnose Ranch Springs (Garside and Schilling 1979:Plate 1).

The Cedar Range is a small, fault block mountain range rising to 7600 feet (2316 m) just north of Panaca Summit, composed of volcanic rocks (mostly rhyolite and tuff) and intravolcanic sedimentary rocks (Tschanz and Pampeyan 1970:113). The western slopes are relatively short and steep compared to the gentler eastern slopes. The sandy soils of the Cedar Range are shallow and drainages are well developed. Springs exist only at higher elevations in the Cedar Range. Table 1 shows the condition of four springs within five kilometers of the project area.

Figure 1. Study region.

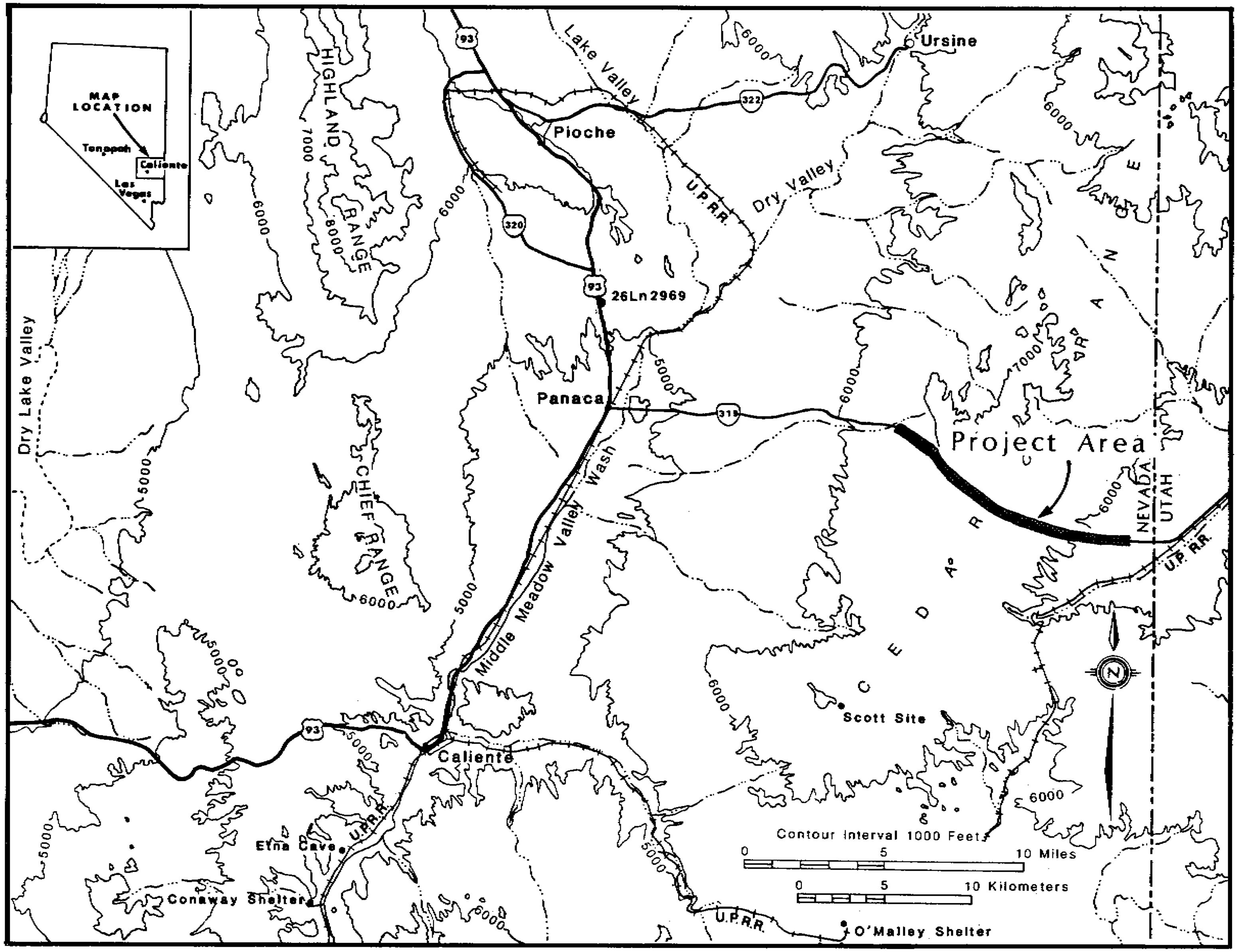

MAP LOCATION
Tonopah
Caliente
Las Vegas
HIGHLAND RANGE
CHIEF RANGE
CEDAR RANGE
Dry Lake Valley
Lake Valley
Dry Valley
Middle Meadow Valley Wash
Ursine
Pioche
26Ln2969
Panaca
Caliente
Etna Cave
Conaway Shelter
Scott Site
O'Malley Shelter
Project Area
NEVADA
UTAH
U.P.R.R.
93
322
320
319
5000
6000
7000
8000
Contour Interval 1000 Feet
0 5 10 Miles
0 5 10 Kilometers
N

Table 1. Condition of Springs in Cedar Range.

Name	Date of visit	Condition
Kiln Spring	8/86	seep; dig for water
Dow Spring	12/86	barely flowing
Sheep Spring	12/86	flowing
Summit Spring	8/86; 12/86	flowing, both visits

Except for springs, surface water in the Cedar Range is available only as runoff immediately after rainstorms or as snow in winter.

Geology and Soils

The Cedar Range is composed of Tertiary volcanic and intravolcanic sedimentary rocks deposited in local basins (Tschanz and Pampeyan 1970:71-74; 103). The oldest volcanic rocks are andesites or latites, overlain by a thick unit of biotite tuff, and capped by resistant rhyolite. A unit of intravolcanic sedimentary rock is mapped, but not specifically described, just west of the summit (Tschanz and Pampeyan 1970: Plate 2). In general, intravolcanic sedimentary rocks in the Caliente region include sandstones and color-banded siltstones with intercalated thin rhyolite tuffs. The sandstones on Panaca Summit often weather into flat slabs which can be employed for grinding stones. Some of this sedimentary material is silicified and is suitable for the manufacture of flaked stone artifacts.

Nodules and chunks of translucent chalcedony and variously colored cherts suitable for tool manufacture were commonly observed in alluvium in the Panaca Summit area. Most of this material appears to have formed in solution cavities and cracks in the volcanic and sedimentary bedrock. A perlite source is mapped on the east side of the Cedar Range, about eight kilometers north of SR319 (Tschanz and Pampeyan 1970: Plate 1), but it is not described. Generally, perlite sources in the region contain small (2 inches maximum diameter) nodules of obsidian (Tschanz and Pampeyan 1970:74). Such nodules were observed in alluvial deposits on the east side of the summit. We collected larger (fist-sized) nodules in weathering detritus at Devil's Gap on the Nevada-Utah border.

This suggests that perlite deposits and obsidian nodules are relatively common in the Cedar Range, although material size is small.

Soils in the project area have been mapped as either Aned, Decan, or Itca Series (Borup and Bagley 1976). These are classified within the order of Mollisols, which are dark colored mineral soils typically found on steppes. Mollisols usually are formed in late Pleistocene or Holocene deposits beyond the limits of glaciation.

A representative soil profile (see Borup and Bagley 1976; 17-40) consists of a 4 to 5 inch (10 to 13 cm) A horizon comprised of grayish brown stony loam. This overlies an argillic B horizon of variable thickness which, in turn, caps a silica indurated duripan at a depth of 10 to 26 inches (25.4 to 66 cm) below surface, or bedrock at a similar depth. Parent material is ignimbrite or various tuffs whose high silica content contributes to the formation of the duripan.

Due to the nature of the project area soils, runoff ranges from slight to moderate, with an erosion hazard that is slight to severe. The occurrence of an argillic B horizon suggests relative antiquity, so that cultural materials most likely would be confined to the A horizon.

Climate

The study area lies within a region of the Great Basin dominated by summer precipitation, with the greatest amount from August thunderstorms (Houghton et al. 1975:46-48). On Panaca Summit, annual precipitation may be as much as 18 inches, and between 5 and 8 inches in the valleys (Borup and Bagley 1976:3). Although Houghton et al. (1975: Fig. 28) suggest that the growing season for southeastern Nevada generally varies between 120 and 140 days, this is influenced by local topography and the presence of strong inversions. For instance, frost free days in Spring Valley at 6,000 feet may be as few as 70, increasing to 100 days on alluvial fans up to 7,000 feet, and between 80 and 100 days above 7,000 feet (Borup and Bagley 1976:3).

Vegetation and Fauna

The basin-range topography of the region creates considerable biotic variety within a relatively small area. In the following discussion, floral and faunal species named are those observed during field work; other species common to the communities discussed are listed in Henningson, Durham and Richardson (1980a, 1980b). The Cedar Range is included in the Northern Sonoran (cold) Desert. Although both Pinyon-Juniper Woodland and Great Basin Sagebrush plant communities are present in the Cedar Range, the project area is entirely within the former.

In eastern Nevada, the Pinyon-Juniper Woodland Community occurs between 5,000 and 8,000 feet where annual precipitation, mainly in the form of snow, is about 12-18 inches. In the Cedar Range between 5720 and 5970 feet, the woodland is dominated by juniper, with a sagebrush understory on the long, gentle eastern slope. Sagebrush, a common understory plant throughout the Pinyon-Juniper community, dominates older burned areas before the trees are reestablished. Common invasive species on young burns are beeplant and Indian tobacco. Above 5970 feet, bitterbrush and cliff rose are added to the understory, while pinyon is dominant. In the vicinity of Panaca Summit, above 6650 feet, Rocky Mountain (Gamble) oak is scattered through the woodland as well. Plants common in the Panaca Summit area include the following:

Scientific Name	Common Name
Juniperus osteosperma	Utah juniper
Pinus monophylla	singleleaf pinyon
Artemisia spp.	sagebrush species
Chrysothamnus spp.	rabbitbrush
Cowania mexicana	cliff rose
Ephedra viridis	Mormon tea
Quercus gambelii	Rocky mountain oak
Prunus andersonii	desert peach
Purshia tridentata	antelope brush
Cleome serrulata	beeplant
Nicotiana bigelovii	Indian tobacco
Agropyron spp.	wheatgrass species
Oryzopsis hymenoides	Indian rice grass
Sitanion hystrix	squirreltail

Fauna (or faunal indicators) observed in this community included:

Scientific Name	Common Name
Sylvilagus audubonii	Audubon cottontail
Lepus californicus	black-tailed jackrabbit
Ammospermophilus leucurus	antelope ground squirrel
Spermophilus lateralis	golden-mantled ground squirrel
Aphelocoma coerulescens	scrub jay
Gymnorhinus cyanocephalus	pinyon jay
Pica pica	black-billed magpie
Canis latrans	coyote
Eremophila alpestris	horned lark
Corvus corax	raven
Buteo jamaicensis	red-tailed hawk
Crotalus viridis lutosus	Great Basin rattlesnake
Eutamias minimus	least chipmunk
Circus cyaneus	marsh hawk
Sceloporus spp.	lizard species

Chapter 2. CULTURAL SETTING
by Kenneth E. Juell

The region surrounding the study area has been occupied by Great Basin peoples for the last 8000 years. The prehistory of southeastern Nevada is discussed below in chronological order: Archaic, Horticultural, and Ethnographic periods.

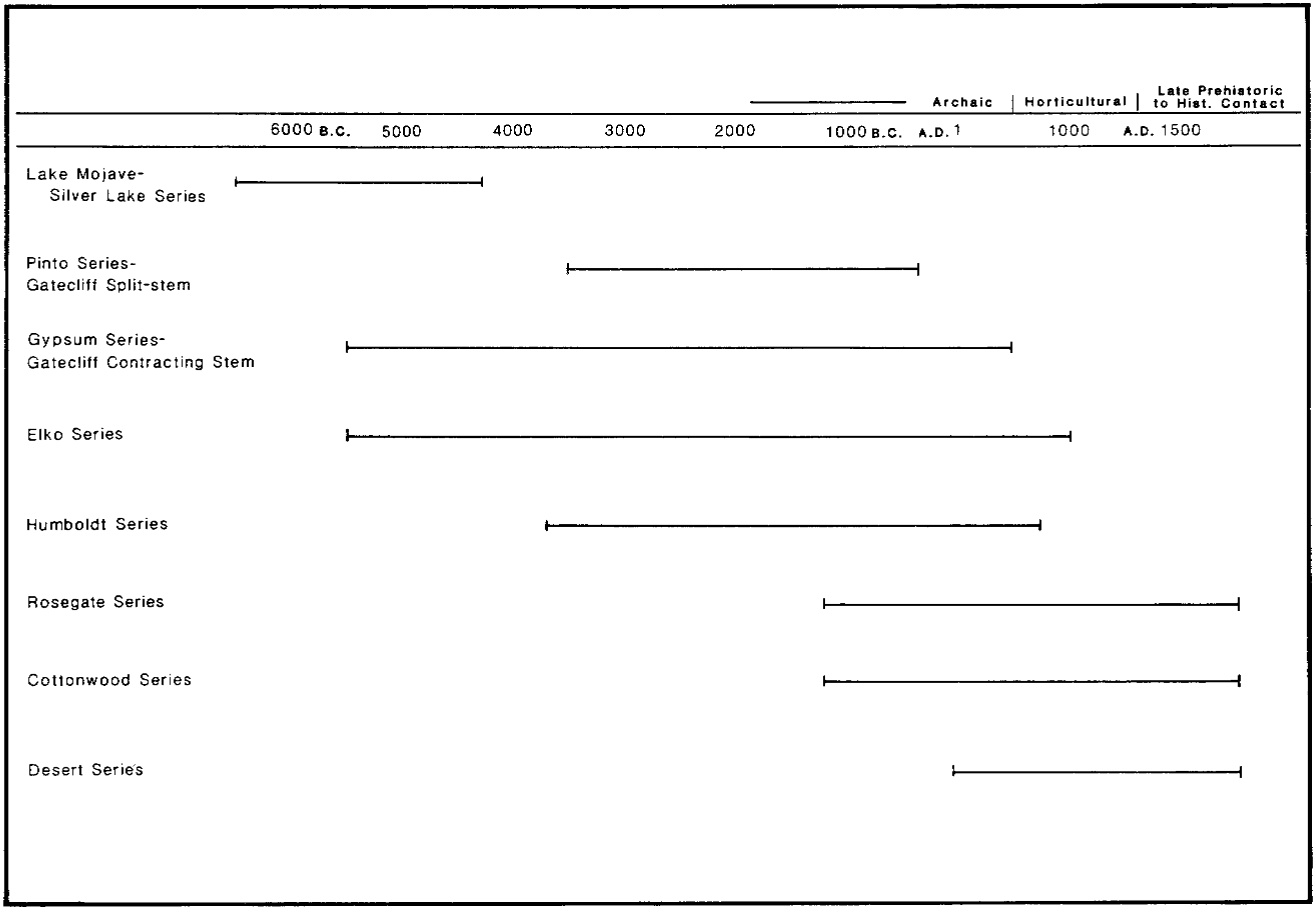
Archaic Period

The Archaic in southeastern Nevada is dated from about 6000 B.C to A.D. 500 (Fowler and Madsen 1986:174). As in other areas of the Great Basin, the Archaic period sequence is based primarily on projectile point chronologies, supported by carbon-14 age determinations (Figure 2). Southeastern Nevada projectile point chronologies are similar to those documented for western Great Basin areas, with Early and Middle Archaic projectile points having relatively long temporal ranges (Fowler et al. 1973:Figure 7a,b; Fowler and Madsen 1986:174; Holmer 1978). Long time spans documented for Gypsum, Elko, and Humboldt series projectile points diminishes their reliability as relative time markers in the southeastern Great Basin.

Present information is derived primarily from the study of rockshelter sites such as O'Malley and Conaway shelters (Fowler and Madsen 1986:174; Fowler et al. 1973:impassim). Several intuitive surveys of particular valleys and adjacent uplands have been undertaken in southeastern Nevada, but there are few quantitative settlement pattern data and these have not been related to subsistence practices (Fowler et al. 1973:Appendix A; Fowler and Madsen 1986:175). Most Archaic period sites are interpreted as temporary camps occupied during an annual seasonal round, a pattern common throughout the Great Basin (Fowler and Madsen 1986:174).

O'Malley Shelter, located ten miles (16 km) south of the project area, represents the most informative stratigraphic occupational sequence in the region. Occupied initially about 5150 B.C., the shelter was used periodically until around 4500 B.C. and again from about 2600 to 1000 B.C. (Fowler et al. 1973:7-56). The first Archaic occupation is characterized by grinding stones, bone fragments from a variety of animals, large amounts of waste flakes, and stone tools such as projectile points, drills, scrapers, and utilized flakes. Large projectile points observed indicate the use of atlatls. Site inhabitants hunted bison, bighorn sheep, mule deer,

Figure 2. Radiocarbon date ranges for projectile points in Southeastern Nevada.


Archaic
Horticultural
Late Prehistoric to Hist. Contact
6000 B.C.
5000
4000
3000
2000
1000 B.C.
A.D. 1
1000
A.D. 1500
Lake Mojave-Silver Lake Series
Pinto Series-Gatecliff Split-stem
Gypsum Series-Gatecliff Contracting Stem
Elko Series
Humboldt Series
Rosegate Series
Cottonwood Series
Desert Series

birds, rabbits, and rodents, and gathered and processed seeds and, possibly, roots and tubers (Fowler et al. 1973:71). The second Archaic occupational sequence at O'Malley Shelter is much the same as the first, although bison was apparently not taken (Fowler et al. 1973:72).

Conaway Shelter reveals a third, brief Archaic occupation of the area around A.D. 1. After the third occupation, there was an apparent hiatus until about A.D. 1000 when the Virgin Branch Anasazi began to utilize the area south of the study area.

Horticultural Period

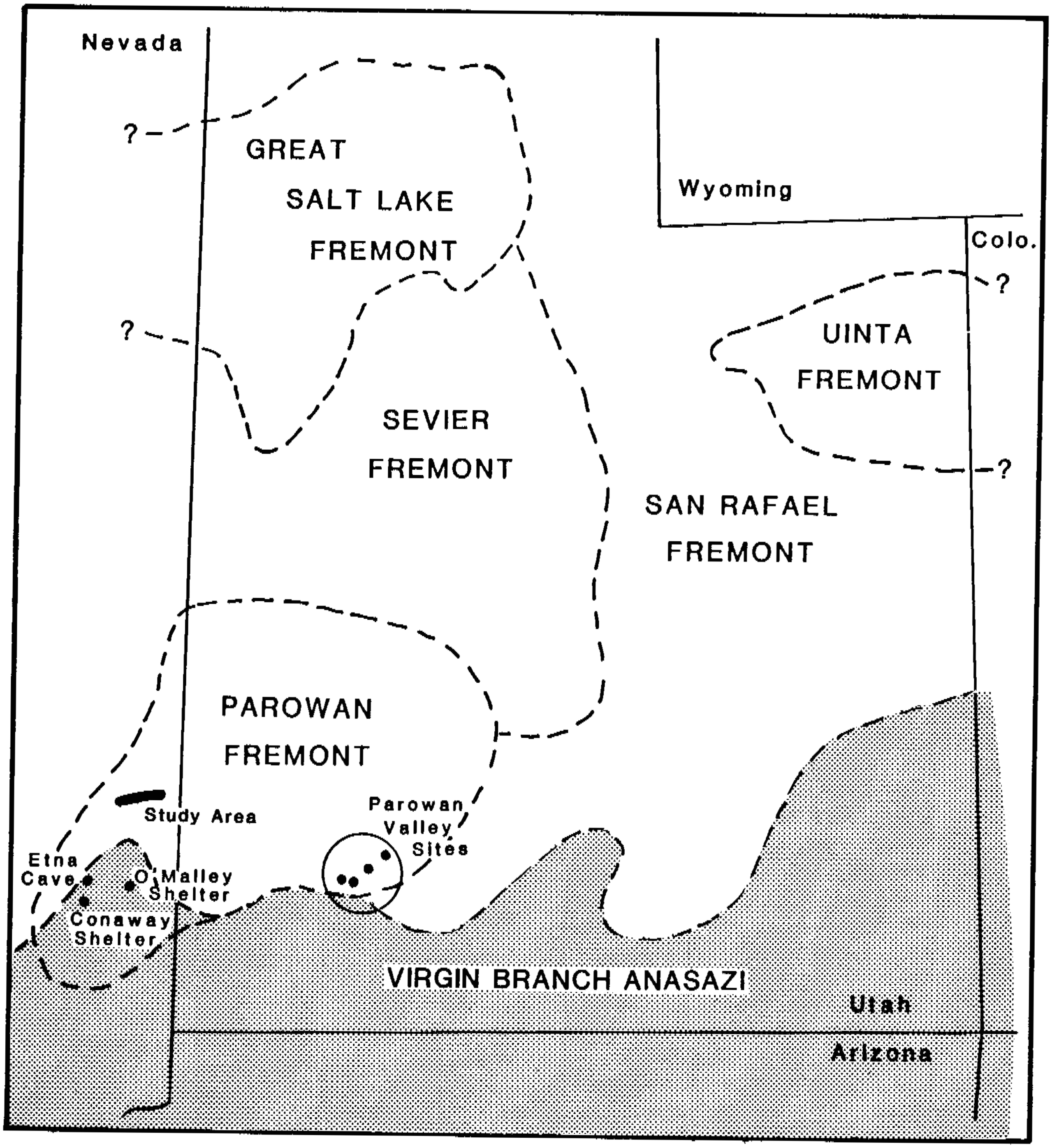
From ca. A.D. 530 to A.D. 1100, southern Nevada was occupied by the Virgin Branch Anasazi and the Parowan Fremont, both horticultural groups (Fowler et al. 1973:tables 1, 19; Soule 1975:18, 1976:12). The Virgin Branch Anasazi centered in the lower Virgin and Muddy River drainages far to the south and east of the project area (Shutler 1961:5), but intermittent occupations extended northward into the upper reaches of Pahranagat Valley and Meadow Valley Wash, immediately south of Caliente, Nevada (Fowler et al. 1973). Meadow Valley Wash occupations date between A.D. 1000 and A.D. 1080 (Fowler et al. 1973:tables 1, 19). The Parowan Fremont occupied southwestern Utah along the southern edge of the Wasatch Front in present-day Parowan Valley (Figure 3). The Parowan Valley occupational sequence has been dated from A.D. 900 to A.D. 1250 (see Marwitt 1970:138-139).

Virgin Branch Anasazi

In Meadow Valley Wash, Anasazi occupation is visible archaeologically as isolated or small potsherd assemblages often intermixed with Fremont material in rockshelter deposits, or as Fremont and Archaic debris at surface sites. Virgin Branch Anasazi village occupations further to the south, such as the Lost City Complex in the Muddy River drainage (Shutler 1961), are absent in the vicinity of the project area. A mixed economy of horticulture, wild plant seed gathering, and hunting was practiced at these southern villages. Domesticates included corn, beans, and squash, and possibly sunflowers and amaranth (Lyneis 1982:178; Shutler 1961).

The only well-documented Virgin Branch Anasazi occupation near the project area is within Stratum V at Conaway Shelter, south of Caliente in Meadow Valley Wash. Representing the

Figure 3. Fremont and Anasazi regions in relation to the study area.


Nevada
Wyoming
Colo.
GREAT
SALT LAKE
FREMONT
UINTA
FREMONT
SEVIER
FREMONT
SAN RAFAEL
FREMONT
PAROWAN
FREMONT
Study Area
Parowan
Valley
Sites
Etna
Cave
O'Malley
Shelter
Conaway
Shelter
VIRGIN BRANCH ANASAZI
Utah
Arizona

most intensive occupation, nearly 4500 waste flakes, 460 pottery sherds (85% Virgin Branch), 41 projectile points, 40 bifaces or biface fragments, 15 grinding stones, 10 bone awls, 679 discarded bone fragments, and numerous cores, hammerstones, drills, and scrapers were recovered. A radiocarbon date of 940 ± 100 BP, or A.D. 1010, was obtained from a hearth near the bottom of Stratum V (Fowler et al. 1973:61-67; Tables 19-24). The authors interpreted the occupation as "simply... a single group of Virgin branch people who followed up Meadow Valley to hunt" for brief periods (Fowler et al. 1973:72).

Today, this deposit seems to suggest a greater occupational intensity and duration than was first surmised. An alternative hypothesis is that the Virgin Branch Anasazi moved north to establish limited-scale horticulture in middle Meadow Valley Wash, utilizing an existing rockshelter rather than building a pueblo. The area may have become unsuitable for Anasazi agriculture subsistence pursuits by A.D. 1100, when a documented climatic trend toward winter-dominant precipitation occurred (see below). A similar hypothesis is suggested by Fowler et al. (1973:72) for later Fremont utilization of the same drainage (see below). The Fremont may have succeeded at limited-scale agriculture where the Anasazi could not because of their Fremont Dent variety of corn, a strain resistant to drought and extremes of climate, adapted to a short growing season (Winter 1973).

Parowan Fremont

Parowan Fremont inhabited small villages consisting of several circular (early phase) or quadrilateral (late phase) pithouses and numerous coiled-adobe surface structures. They grew corn, beans, and squash on alluvial fans where mountain streams entered valleys. The positioning of villages suggests that summer flood-water farming was practiced (Berry 1974:58), and villages evidently were occupied over long periods, attesting to the stability of their horticultural adaptation (Jennings 1978:206-213).

Fremont Settlement and Subsistence in the Project Area Vicinity

The region of the project area was entered by the Parowan Fremont, presumably from the Parowan Valley in Utah, about A.D. 1000. Occupation areas included Panaca Summit, Meadow Valley Wash from north of Ursine to south of Caliente, and Pahranagat Valley (Fowler et al. 1973:73, 97-136). Fremont subsistence and settlement adaptations in the area are not well understood at present. Fremont Dent corn cobs and corn tassels were recovered from site 26Ln402 (Fowler et al. 1973:Appendix C), along with beans and pumpkins; and corn cobs and kernels, beans, and squash were found in Fremont occupation levels at Etna Cave (Fowler et al. 1973:72; Wheeler 1942). The presence of these domesticates suggest that Fremont peoples practiced horticulture to some degree, possibly on the alluvial flats of Meadow Valley Wash (Fowler et al. 1973:72).

Although the Fremont inhabited the area and probably practiced limited-scale horticulture, they apparently did not build villages or pueblos there. This may indicate a seasonal occupation of the area, with small groups moving in from the east or north during spring and summer, to return to their villages in Parowan Valley or Hamlin Valley during fall and winter. Alternatively, Fremont occupations may have been permanent but small, with the people occupying rockshelters rather than building villages (Fowler et al. 1973:72). Numerous small camps in the pinyon-juniper of the study area may suggest the possibility of some reliance on pinyon nuts (Fowler et al. 1973:97-137).

Partial clarification of the issue may be found in the Parowan Valley. At Evans Mound, changes in the pollen sequence suggest a decline in effective moisture about A.D. 1000 (Dalley 1972 in Berry 1974:44-46), which is supported by Parowan Valley geological evidence (Weide 1970). Further, such changes are reflected in tree-ring indices for several areas on the Colorado Plateau at A.D. 1000 and A.D. 1100 (Berry 1982:Figure 13). The decline most likely represents a shift from summer-dominant to winter-dominant precipitation rather than a decrease in annual totals (Berry 1974:48). At Evans Mound, two occupational phases are present that are approximately equal in duration. A marked decline in construction during the later phase, beginning about A.D. 1100, may reflect decreasing sedentism and increasing mobility (Berry 1974:31).

The success of Southwest corn varieties is relative to length of frost-free growing season, mean summer temperature and nightly temperature minimums, and available summer season moisture (Castetter and Bell 1942; Hack 1942; Jenkins 1941 in Berry 1974:52,58). Present-day conditions suggest the Parowan Valley is potentially unstable for corn production (Berry 1974:31-32). The valley currently is positioned along a gradient roughly marking equivalent contributions of winter and summer moisture (Lindsey 1986:233;Figure 1), so that a fluctuation toward winter-dominant precipitation would be potentially disastrous for corn agriculture there.

In prehistoric times, low crop yields (or failure) for two consecutive years in Parowan Valley would have resulted in a total depletion of stored agricultural resources (Berry 1974:71-73), creating a demand for a storable winter resource alternative. Pinyon nuts are a storable food that are known ethnographically, to have been relied on for winter sustenance (Steward 1938). Pinyon is presently scarce in the uplands surrounding Parowan Valley, but abundant in the Cedar Range. (Kuchler 1964 in Berry 1974:81).

Berry (1974:84) suggests that Fremont pinyon-juniper encampments in southeastern Nevada can be viewed as winter occupations by Parowan Valley groups during years when crop yields were insufficient to sustain life in Utah villages. Berry (1974:83) believes that such groups returned to their eastern villages in time for spring planting. As climatic variables became more unpredictable after A.D. 1000, and as annual precipitation shifted toward a winter-dominant pattern by A.D. 1100, the more likely it was that agriculture was abandoned altogether (Berry 1974:71). The change to a hunting and gathering adaptive strategy is suggested by Fremont seasonal occupations in valley lowlands and mountain uplands in southwestern Utah and southeastern Nevada (Berry 1974:Figure 8).

Thus, two hypotheses address Fremont adaptations in southeastern Nevada. The first relates Fremont occupations in pinyon-juniper areas to pinyon nut procurement during years of low corn crop yields. The second has some Fremont groups, as a result of climate change abandoning full-time agriculture and shifting to a subsistence strategy based on hunting and gathering, supplemented by limited horticulture (Berry 1974:74). The two hypotheses are not necessarily mutually exclusive, considering the range of adaptive strategies available to Parowan Fremont at any one time. In a trend of gradual climatic degradation, the adaptive strategy corresponding to hypothesis 1 may have been used prior to that of hypothesis 2. Both hypotheses are supported by the large number of Fremont sites observed in pinyon-juniper areas in the Cedar Range and Hamlin Valley. Hypothesis 2 is supported by evidence of horticulture in Meadow Valley Wash (Berry 1974; Fowler et al. 1973:71-713).

Both hypotheses can be tested by examining temper and clay paste sources for ceramics found at southeastern Nevada sites. If hypothesis 1 obtains, ceramics from southeastern Nevada Fremont sites are likely to have been transported there from Parowan Valley; temper and clay sources should be essentially the same in both places, in roughly equivalent proportions. If hypothesis 2 obtains, ceramics were likely to have been manufactured locally in southeastern Nevada. Temper and clay should reflect local sources, and ceramic assemblages from southeastern Nevada sites and Parowan Valley sites should reflect different temper and clay sources (Berry 1974:95-96). The presence of unfired pottery in Fremont occupations at O'Malley and Conaway shelters lends support for local pottery manufacture (Fowler et al. 1973:17, 62). Petrographic analysis of samples of ceramic assemblages from all these sites should determine temper and clay source variability.

Numic Expansion

Sometime around A.D. 1000, carriers of Shoshonean culture and presumed ancestors of the ethnographic Southern Paiute, entered the study region from the southwest. Evidence from O'Malley and Conaway shelters indicates that both Fremont and Shoshonean groups occupied the area concurrently. It is also apparent that two coexisting ceramic traditions (Fremont and Shoshonean) were present in the area some time after A.D. 1000. By A.D. 1200, Fremont inhabitants had abandoned the area, while Shoshonean occupations persisted into the ethnographic period (Fowler et al. 1973:73; Fowler and Madsen 1986:182).

The arrival of Shoshonean people into southeastern Nevada would have increased competition for winter resources (i.e., pinyon nuts). Parowan Fremont groups attempting but failing at agricultural production in Parowan Valley would have been at a distinct disadvantage for access to pinyon groves (Berry 1974:83). Shoshoneans residing in southeastern Nevada and practicing a seasonal subsistence round would have been aware of productive grove locations and could have secured them prior to the arrival of non-local Fremont groups; and they may have been better able to defend groves should push come to shove (Berry 1974:90).

What happened to the Fremont after A.D. 1200? Two hypotheses for their demise are proposed by Berry (1974:82): hunter-gatherer Fremont groups merged with Shoshoneans and eventually lost all vestiges of Fremont material culture traditions, or competition for the same resources resulted in Fremont extinction or Fremont abandonment of southeastern Nevada. Evidence to support either hypothesis is inconclusive at present.

Ethnographic and Ethnohistoric Period

The study area is located within the ethnographic territory of the Southern Paiute, and was inhabited by the Panaca band. Few specifics are known about the Panaca band other than their approximate territorial boundaries. Panaca territory was bounded on the north by the northern extremes of the Snake, Cedar, and Bristol ranges, and on the south by the Mormon Mountains and Tule Springs Hills. The western boundary included the North and South Pahroc ranges and Delamar Valley, while the eastern boundary was Hamlin Valley and the present-day Utah-Nevada border (from Kelly 1934:Map 1, p. 554). In the absence of specific settlement and subsistence information for the Panaca band, an overview of Southern Paiute adaptations is presented here.

Southern Paiute groups occupied portions of southern California, southern Nevada, southern Utah, and northern Arizona (Euler 1966:2). Southern Paiutes speak a Numic language, a branch of the Uto-Aztecan language family (Lamb 1958). They practiced a hunting and gathering way of life, although some practiced limited-scale horticulture in wetter environments of the region. They lacked territorial-wide political organization, although the group did have a relatively uniform culture (Euler 1966:2). Economic life was carried out by extended family camp groups, each usually consisting of a small number of households (Euler 1966:103).

Southern Paiute groups were foragers, moving almost daily in search of game and plant foods. Often, particular bands ranged through elevations of several thousand feet and, therefore, had a wide diversity of plants and animals available to them for subsistence (Euler 1966:13). They exploited numerous seed plants, including Indian rice grass, sunflower, and wheat grass; acquired yucca, agave, screwbean, and mesquite; collected pinyon nuts in late fall for winter consumption; hunted a variety of small game, from mice to rabbits; exploited numerous species of insects, lizards, and snakes; and acquired large game such as mountain sheep and mule deer whenever possible (Euler 1966:21-28). Southern Paiutes moved in a seasonal subsistence and settlement round as resources became available.

Southern Paiute bands are unique among ethnographic Great Basin aboriginal groups in their practice of limited-scale horticulture. Southern Paiute groups farmed along the Santa Clara and Virgin rivers and Beaver Dam Wash in southwestern Utah, and along the lower Muddy and Virgin rivers in southern Nevada. They cultivated corn and squash prior to and at the time of historic contact (Euler 1966:54-55, 112), adopting beans between 1831-1848 and potatoes after 1852 (Euler 1966:97-98). Agriculture probably was introduced to the Southern Paiutes through their prehistoric contacts with the Anasazi or Fremont, ca. A.D. 1150 (Euler 1966), and not by later Europeans as Steward (1938:53) suggested.

Chapter 3. THEORETICAL APPROACH
by Kenneth E. Juell

Site content was assessed through physical examination and analysis: intensive reconnaissance, mapping, controlled surface collection, subsurface testing, artifact typology, and descriptive analyses. Problems of site function, site classification, and variability within and among sites were addressed through theoretical models of hunter-gatherer subsistence and economics developed from Binford (1980), Thomas (1983a), Zeier (Zeier and Stornetta 1984), and Elston (Elston and Budy 1987).

Site Classification

Cultural systems are dynamic, internally differentiated systems (Binford 1983:143), but an archaeological site is the static remains of past dynamic activity. A major goal of archaeological research is to reconstruct past cultural patterns using data derived from individual sites. Archaeological site classification provides a mechanism for organizing descriptive site data that will assist analysis of variability in cultural behavior.

Prehistoric sites are classified on the basis of their function as inferred from recorded observations of assemblage content and structure. Functional site types are derived in large part from Binford's (1980) theoretical synthesis of hunter-gatherer subsistence patterns which views the organization of resource acquisition as a continuum of logistical complexity.

At the least complex end of the continuum are foragers who position themselves relative to resources by a series of residential moves. Foragers use a "mapping on" strategy; that is, they move from one resource patch to another as the occupied patch becomes exhausted and a new patch becomes productive (Binford 1980:5). Foragers "typically do not store foods but gather foods daily; group movement closely follows a seasonal pattern of resource availability. They range out gathering food on an 'encounter' basis and return to their residential bases each afternoon or evening" (Binford 1980:5).

Among foragers, there are apt to be two basic types of spatial context for the discard or abandonment of artifactual remains: one is the residential base, the other is the location. The residential base is "...the hub of subsistence activities, the locus out of which foraging parties originate and where most processing, manufacturing, and maintenance activities take place" (Binford 1980:9). A location is a short-term, special use area "where extractive tasks are exclusively carried out" (Binford 1980:9).

Collectors rank higher than foragers along the continuum of logistical complexity. Collectors "...are characterized by......the storage of food for at least part of the year and ....logistically organized food procurement parties" (Binford 1980:10). While special task groups may exploit any resource they encounter, these groups are organized to procure specific resources in specific contexts. Collectors differ from foragers because they "...move goods to the consumers with generally fewer residential moves" (Binford 1980:15).

Collectors generate site types that reflect the logistical character of their procurement strategies. In addition to residential bases and locations, collectors use field camps, stations, and caches (Binford 1980:10). "A field camp is a temporary operational center for a group. It is where a task group sleeps, eats, and otherwise maintains itself while away from the residential base" (Binford 1980:10). Stations are particularly characteristic of logistically organized systems; they are sites "...where special purpose task groups are localized when engaged in information gathering..." (Binford 1980:12). For example, hunting blinds and ambushes may be used to observe game movement and to plan capture strategies, but not necessarily execute them. Caches are temporary storage facilities that are common components of collector logistics: they are a necessary feature of a procurement strategy whereby small groups procure resources in bulk for use by large groups.

In actuality, hunter-gatherer groups frequently combine several modes of logistical organization; normally, this is reflected in some "...seasonal differentiation in the relative roles of residential versus logistical mobility" (Binford 1980:18). In the Great Basin, many aboriginal groups congregated in winter residential settlements where stored foods were relied on to a significant degree, but split into small foraging parties during summer months. The Fremont horticultural pattern may also have varied, depending on the nature of their response to periods of decreased annual effective moisture (i.e., droughts) (cf. Berry 1974). In a series of dry years, the Fremont may have depended almost entirely on wild resources, returning to horticultural settlements only during wet periods. It is important to view logistical and residential mobility, not as opposing principals, but as "organizational alternatives which may be employed in varying mixes in different settings" (Binford 1980:19).

The functional classification system employed in the present study recognizes the difficulty in distinguishing between foraging base camps and collector field camps (as well as distinguishing Fremont seasonal procurement locations, field camps, or foraging base camps). A favored locality reoccupied over many years by small groups of people for short periods of time (field camps) will become a palimpsest, or overlapping accumulations of cultural remains, which may give the appearance of a large site occupied for long periods by many people (residential base). Palimpsest accumulations often can be recognized through assemblage content and relative assemblage diversity (Thomas 1984; Budy and Elston 1986).

Functional Site Types

Zeier (Zeier and Stornetta 1984) identifies six artifact groups which can be used to differentiate functional site types:

> Residential Equipment: shelters, hearths, fire-cracked rock, firemaking equipment, woodworking tools (axes and adzes), permanent water source or water control features nearby, recreational items (i.e., gaming pieces, smoking pipes), rock alignments or stone structure components, storage features.
>
> Food Processing Equipment: milling equipment, ceramic and basketry vessels, eating utensils, bifaces.
>
> Fabricating or Processing Tools (tools used to make other items): flakers, hammerstones, drills, awls, gravers, cores, bifaces, scrapers.
>
> Food Acquisition Tools: projectile points, fish hooks, nets, snares and traps, pinyon hooks, trays, burden baskets, grass cutting tools (i.e., flake tools and bifaces).
>
> General Utility Tools: bifaces, scrapers, utilized and modified flakes, choppers.
>
> Storage Features: stone rings, cache pits, mounds.

These criteria can be used to segregate functional site types into residential bases, short-term camps, and locations. Behavioral manifestations of settlement types are defined as a series of expectations, as derived from Binford (1980), Thomas (1983a), and Zeier (Zeier and Stornetta 1984):

> Residential Base: A large seasonal habitation site, usually occupied by several families. Residential bases are identified archaeologically by the presence of many of the following attributes: residential equipment and perhaps storage features; fabricating, food acquisition and processing, and general utility tools; perhaps middens and site furniture; high bulk tools (i.e., boulder metates); multiple activity areas; diversified tool fabrication and repair with high proportion of fabrication discard and spent or broken tools; relatively high lithic raw material diversity; low proportions of primary reduction and high proportions of tertiary reduction flakes (unless near material source).

> Short-Term Camp: This site type includes both small forager residential bases and collector field camps. Short-term camps are identified archaeologically by unprepared hearths, fire-cracked rock, simple structures, highly curated personal gear; food acquisition and processing equipment biased toward either plant or animal resources at collector field camps, but both present at small forager residential base; small artifact inventory with little primary manufacture; staged artifacts (i.e., Stage I bifaces) if near material source; relatively few spent or broken tools with low proportion of fabricating tool discard; little lithic raw material diversity; moderate amounts of lithic debitage with primary flakes rare or absent and relatively many tertiary flakes (unless near raw material source).

> Location: A task specific, daily resource procurement and extraction locus. Locations are identified archaeologically by few, but specialized, food acquisition and general utility tools; food processing tools not present or rare; little artifact repair. Quarries were used for procuring lithic tool fabricating materials; by definition, they include a natural source of knappable lithic material. Small lithic reduction workshops are other kinds of locations.

Chapter 4. METHODS OF INVESTIGATION
by Robert G. Elston

Field Methods

Mapping

One or more datum points were established on each site which then was mapped with transit and stadia rod at a contour interval of 0.5 m. The locations of collection and excavation unit corners, and most artifacts and features, were established with the transit. In some cases, artifacts were mapped using tape and compass from a local datum which was shot in with the transit.

Surface Collection

The field crew walked over each site at close intervals (1-3 m) so that the entire site was examined closely. Pin flags were used to mark the positions of individual artifacts, concentrations, or other surface features of interest.

With the exception of certain groundstone items at site 26Ln3357, all flagged artifacts (cores, lithic tools, incised stones, ceramics) were collected. In addition, systematic collections from one or more 5 x 5 meter surface collection units were made at each site. These units were delineated with collapsible frames made of white 3/4 inch PVC tubing. Rather than random selection of collection units, attempts were made to sample artifact concentrations in areas of highest surface density, particularly those associated with putative cultural features such as hearths and concentrations of groundstone.

Groundstone implements were collected at sites 26Ln1775, 26Ln3358, and 68W-7/8. Since most grinding stones at 26Ln3357 were large boulder metates, none was collected. Instead, these artifacts were mapped, described using the morphological attributes employed for collected implements, photographed, and left in place. A grinding stone collected from the cable right-of-way at site 68W-7/8 during construction monitoring (see Stornetta 1987:Appendix C) is here included in the groundstone analysis (Chapter 6). Finally, one shaped, bifacially ground mano recorded at 26Ln1775 during survey could not be found at the time of test excavations. The mano is included in the analysis of groundstone from site 26Ln1775 (see Chapter 6); descriptive attributes were derived from notes, sketches, and a photograph taken of the implement during survey (see Stornetta 1987).

Test Excavation

One or more test pits were excavated at each site. At least one unit measured 1 x 1 m; others measured 1 x .5 m. Test units were placed so as to section surface features and surface artifact concentrations or to examine potential depositional situations. Each unit was excavated in arbitrary 10 cm levels parallel to the surface.

Excavation was accomplished with picks, shovels, and trowels. When a potential cultural feature was encountered, excavation was conducted with trowels, ice picks, and brushes. In several units at site 26Ln1775, vertical excavation continued until bedrock was encountered. Elsewhere, the few flakes encountered in levels below major cultural deposits were obviously not in situ, but had been introduced to deeper deposits by noncultural turbation. In such cases, excavation was discontinued as soon as artifact yield dropped off.

Charcoal samples for radiocarbon dating, taken whenever possible, were collected with a clean trowel and wrapped in aluminum foil. Very little charcoal was recovered during excavation or flotation.

Stratigraphic profiles were drawn of selected excavation unit walls. Generally, all walls with features were drawn. Soil descriptions from representative site profiles follow conventions set forth in the USDA Soil Survey Manual (1951) and Supplement (1962). Soil colors are described using Munsell Soil Color Charts (1971).

Field Documentation

A reference number system was used to maintain control over recovered samples. A unique reference number was assigned to each unit of provenience: for instance, each cluster of mapped surface artifacts, surface collection unit, excavation unit level, cultural feature. Individual artifacts or bulk samples within each reference number lot were assigned specimen numbers. Reference numbers were assigned from a reference number log which documents the unit to which each number was assigned and other pertinent data. Each assigned reference number is included on all associated field records and artifact bags.

Records documenting the progress of excavation, methods used, and findings were maintained on a daily basis, using standardized forms and field notebooks. Surface features, vegetation, and other observations at each 5 x 5 m collection unit were recorded on a standardized collection unit record. Each mapped surface artifact was placed in its own plastic bag with a provenience slip giving the site number, reference number, specimen number, and location. Debitage generally was collected in bulk sample except for occasional pieces with technologically diagnostic features; these were treated as individual artifacts.

Excavation unit/level records, completed for every level, include horizontal plan views, description of findings, a list of samples collected, and soil descriptions. Excavated materials were placed in plastic bags with provenience slips. These then were placed in paper level bags marked with site number, excavation unit, level, date, collection personnel, reference number, and bag number.

Color and black and white 35 mm photographs document all phases of the field work; photo logs were maintained. Slides, prints, and negatives are indexed and stored in plastic sleeves.

Laboratory Methods and Analyses

Processing and Cataloging

At the conclusion of field work, the collections were transported to the laboratory where they were cleaned, sorted, labeled, and cataloged by trained technicians. Artifacts were cleaned by wet or dry brushing, as appropriate. Special care was taken with faunal specimens, perishable items, and artifacts with high blood residue potential (bifaces and projectile points).

Carbon samples were weighed, then manually cleaned of soil and allowed to air dry. The sample was then weighed again, placed in clean aluminum foil in a plastic bag.

Bulk soil samples were processed using a froth flotation system. The process effectively separates small organic and cultural materials from soil matrix. Bulk samples were weighed prior to flotation, then processed, and the remaining heavy and light fractions allowed to air dry. The samples were then sorted for organic and small cultural remains. Seeds and other floral remains were placed in plastic vials. Other materials were placed in plastic bags. Bone and other organic artifacts were wrapped in tissue and stored in air-flow paper bags when appropriate.

Each distinctive item was assigned a catalog number comprised of site, reference, and specimen numbers. When possible, the number was applied directly to the artifact using indelible white or black ink covered with clear lacquer. Debitage, bone fragments, and other bulk sample items were cataloged in lots.

All artifacts recovered during excavation will be curated at the Museum of Anthropology, Department of Anthropology, University of Nevada, Reno. Analytic and master catalogs, field notes, and photographs will accompany the collection.

Lithic Analyses

A specialized terminology of lithic tool production is used throughout this report, as defined below (after Crabtree 1972; Elston 1986).

Heat Treated, or thermally altered chalcedony, chert, and other cryptocrystalline rocks is indicated by changes in color, luster, and fracture strength (cf. Crabtree and Butler a1964; Purdy and Brooks 1971; Rick 1978; Rick and Chappell 1983). Contrasts in color and luster are easiest to recognize, along with potlids, crazing, and crenated fractures created when chert is exposed to high temperatures (Purdy 1975:133-141). These indicators are rare in the Panaca Summit assemblages.

Reworking is a general term for the modification of a lithic artifact after it has been broken, expended, or otherwise abandoned, either during manufacture or use. Such modification can involve either redirection or recycling (see also scavenging below).

Redirection is a term applied to an unfinished artifact (blank, core, preform) when it is subjected to further reduction after additional reduction procedures not included in the original trajectory. For instance, the fragments of a biface truncated by end shock may be redirected to the same or a new reduction trajectory subsequent to procedures necessary to recover from the truncation.

Rejuvenation, or resharpening, maintains the edge or point of a tool without changing its function. Tools can be rejuvenated until they are broken or exhausted (used up). However, a tool exhausted in terms of one function may still contain usable lithic raw material which can be recovered through recycling.

Recycling employs an expended tool as a core or blank for a tool of different morphology and/or function, such as a biface used as a core for the production of flake tools, or a broken projectile point made into a drill. Reuse is a kind of recycling whereby a discarded tool is recovered and employed for the same function for which it was used prior to discard.

Scavenging is the procurement of lithic items from some previous occupation for use or as raw material. Scavenged artifacts can be reused, reworked, rejuvenated, and/or recycled.

Lithic Material Identification

Volcanic and intravolcanic sedimentary rocks in the Cedar Range provide a variety of material suitable for the manufacture of flaked stone artifacts. The abundance and distribution of these rocks varies throughout the area. Most flaked stone artifacts at the Panaca Summit sites are made of obsidian, chalcedony/chert, or silicified, laminated siltstone and sandstone. Rhyolite and basalt were employed also, but much less frequently. Since lithic material classifications acceptable to all geologists can be accomplished only through thin-sectioning, we opted for the more generalized, operational definitions listed below.

Chert is a broad classification used to describe opaque, cryptocrystalline, siliceous materials (often referred to as CCS). Chert occurs in tuff, rhyolite, and intravolcanic sedimentary rocks, and in associated alluvial and colluvial deposits. Chert can be banded and vuggy, but more often has several fracture planes oriented in different directions. On Panaca Summit, these rocks occur as fist-sized to slightly larger tabular, angular, and rounded cobbles in colluvial slopes and stream gravels.

Chalcedony is translucent cryptocrystalline quartz. It often contains open or crystal-filled vugs, and commonly occurs as bands in partially silicified, waterlain tuff or sandstone, or as small geodes and pebbles in alluvial deposits on the east side of Panaca Summit.

Laminated Siltstone is interbedded silicified silt and fine-grained, tuff sandstone. It is apparently one of the intravolcanic rocks of the upper, eastern part of the Cedar Range, but seems particularly abundant in the vicinity of site

26Ln3358. This material is comprised of alternating flat, parallel layers of siltstone and fine-grained tuff (probably tephra deposited in water). Both materials have been silicified; layers range in thickness from 0.1 mm to 2.0 mm. The siltstone is dark brown and vitreous. The sandstone is white to very pale brown and has a grainy texture. This material is not an ideal medium for flaked stone tools because it tends to resist breakage perpendicular to the bedding planes. However, thin tabular pieces can be reduced bifacially by removing flakes parallel to the bedding planes.

Obsidian is a volcanic glass. In the study area, it occurs in small nodules associated with deposits of perlite, and seems most abundant in alluvial deposits on the upper slopes on the east side of the Cedar Range but also is associated with outcrops of tuff at Devil's Gap, just east of the Nevada-Utah border. Most obsidian nodules observed were small (less than 2 in. dia.), but some fist-sized or larger examples were noted. Obsidian bifaces from sites in the project area have been made on flake blanks struck from larger nodules. Most obsidian is banded gray to black, but some mahogany (red and black) occurs in the collection in low frequencies.

Other rocks used for the manufacture of stone artifacts on Panaca Summit include Basalt, a fairly broad category used to describe various fine-grained, dark-colored, igneous rocks. Rhyolite is a reddish, grainy volcanic rock (the volcanic equivalent of granite). Rhyolitic sandstone is a cemented detrital sediment (primarily quartz and rhyolitic grains).

Projectile Point Classification

Classification of projectile points is based on the morphological key defined by Thomas (1981). Attributes observed include length, width, thickness, and weight, along with stem and notch angles. Various ratios between attributes are calculated. In addition to morphological attributes, evidence of heat treatment and reworking were noted.

Biface Stage Analysis

Bifaces were analyzed using the "stage form" concept developed by Muto (1971, 1976), as modified by Elston et al. (1977). Muto divides biface reduction into four distinct stages:

selection of a blank of the correct size and shape;
creation of regular cross and longitudinal sections and outline;
controlled thinning which leads to final section and outline form; and
creation of haft element and treatment of edge.

This sequence represents the basic trajectory of tool production from bifacial cores; it has been operationalized through the description of three biface stage forms (Elston et al. 1976, 1977). Stage I bifaces exhibit only minimal modification. Original flake or core surfaces (and often cortex) may still be evident on the artifact. Modification usually is oriented toward regularizing the cross section and outline in order to allow controlled thinning in subsequent reduction stages. Flake scars often do not cross the midline of the piece. Stage II bifaces are characterized by controlled thinning; flake scars usually cross the midline; and evidence of original flake or blank morphology has been obliterated. The biface begins to resemble the final form. Stage III bifaces exhibit controlled thinning and shaping; creation of haft elements (if any) and final edge treatment (arris reduction) are apparent.

Debitage Analysis

Analysis of lithic debitage was undertaken in order to assess which steps in the lithic reduction continuum are represented at the Panaca Summit sites. Similar analyses have been conducted by Clerico and Elston (1981), Zeier and Elston (1986), Elston et al. (1981, 1982), and Elston and Budy (1987).

Each debitage item was assigned to one of seven debitage classes based on the following characteristics:

Shatter are angular pieces of toolstone that appear cultural but lack identifiable flake morphology. Shatter most often is generated during primary reduction or by over-exposure to heat during thermal alteration (thermal shatter).

Primary reduction flakes are those removed from the exterior of cobbles and pebbles. Cortex frequently is present, and the flakes seldom have more than two dorsal flake scars.

Secondary reduction flakes are removed next. Some cortex may be present (often on platforms); they typically have more than two dorsal flake scars. They exhibit wide, often prepared, platforms that are perpendicular to the long axis of the flake. Thick, shattered bulbs of percussion are common.

Biface thinning flakes have bifacial platforms, multiple and bidirectional dorsal arrises, and are longitudinally curved with expanding, feathered distal terminations. Biface thinning flakes may result from both Stage II and Stage III biface reduction; cortical patches may be present.

Tertiary reduction flakes are produced during the final stage of production or during tool rejuvenation (i.e., "finishing" or "retouch" flakes), usually by means of pressure flaking. These generally are small and thin, have parallel edges and bifacial platforms, and are feathered distally.

Flake Fragments are portions of flakes lacking sufficient information to be classified to a particular reduction stage. Usually these are medial or distal portions. Flakes without platforms were classified as fragments.

Potlids are small, circular, lens-shaped flakes generated by exposure to heat, and, as such, lack bulbs of percussion.

Debitage was analyzed by provenience lots. Items in each lot were counted, then sorted into the material types described above. Debitage collections from two sites (26Ln3356 and 26Ln3357) were large; debitage lots with more than 200 items were sampled. All other debitage was analyzed.

To sample debitage lots, each lot was placed on a table, mixed lightly, arranged in a long pile, and divided into quarters. Two quarter subsamples were randomly selected, and each was analyzed separately. Sampling error was checked by comparison of debitage class distributions between the two subsamples with the Kolmogorov-Smirnov two sample test (K-S test) (Blalock 1979) at the 0.05 level of significance. In one case, where the two initial subsamples were significantly different (lot 302-24, site Ln3357), an additional subsample was drawn randomly, classified, and measured. Using the K-S test, this subsample was not significantly different from either of the original subsamples. Samples used in analyses of debitage, then, are the combined subsamples for each lot. These are now stored in separate plastic bags.

Items in each material class were counted, weighed, sorted into debitage types, and sized. Flake size was determined using a series of circular templates graduated in 2 mm increments from 4 mm to 52 mm, and in 5 mm increments from 55 mm to 70 mm; flakes larger than 70 mm were measured to the nearest millimeter. An item of debitage had to fit entirely within a circle in order to receive that size designation. Other attributes observed during debitage analysis included presence or absence of cortex (positive occurrence for cortex was recorded if any cortical material was present), and evidence of heat treatment.

Groundstone Analysis

Grinding stones were sorted initially as metates, metate fragments, manos, palettes, and burnishers. Provenience information was listed for each specimen and a series of morphological attributes recorded, including overall dimensions, mass, condition, shaping, shape in cross section, shape in plan outline, facial use, profile of use surface(s), degree of use wear, and presence of fire alteration. These descriptive attributes are used to characterize the range of variability within assemblages, to infer functions of various classes, and to evaluate the relative significance of seed processing at the sites.

In order to identify use-wear locations, grinding stones were examined macroscopically; implements exhibiting light wear then were examined under low-power magnification (7-15x). The relative intensity of use is broadly inferable from the kind and degree of wear, as indicated by three levels of use damage:

light use - abrasion polish is present on about one-half the surface area of the available grinding surface;

moderate use - a well-developed planar facet is present with abrasion polish covering the entire available grinding surface; and,

heavy use - a slight trough has developed and the grinding surface has been pecked to increase the desired abrasive quality (resharpened).

Ceramics Analysis

Ceramics were described and typed according to observations of color, decorative technique and style, method of forming and shaping, and firing methods, as well as microscopic qualities of paste and temper. Vessel shape was inferred when enough fragments were present; reconstructions were attempted whenever feasible (Shepard 1954).

Ceramic sherds were identified at the University of Utah Archaeological Center, using Fremont and Numic ceramic comparative collections. Temper, or crushed minerals added to clay paste during pottery manufacture, is considered most important in determining Fremont types. Each sherd was typed by direct comparison to known sherds, by examining a fresh break under a binocular microscope (25-30x). Fremont type definitions are reported in Madsen (1977). A Numic Brownware sherd was identified by examining temper, color, and surface manipulation.

Examples of two unknown ceramic types, along with examples of known types, were sent to Patricia Dean, a recognized Fremont Pottery expert, who conducted petrographic thin-sectioning and analysis of tempering minerals to determine similarities or differences of known and unknown types, and to determine if unknown types could be classified to other Fremont or non-Fremont types.

Tabulated descriptive attributes include ceramic type, color, firing atmosphere (reduced or oxidized), surface additives/modifications (painting, hematite wash, corrugation), maximum length and thickness, rim or body sherd, and shaping.

Vessel numbers and forms were investigated at site 26Ln1775. The following criteria, in decreasing order of importance, were used to determine vessel numbers: provenience; design elements and technological attributes; color of interior surface, exterior surface, and internal paste (exposed in wall cross section); articulations of sherds; and vessel wall thickness. The procedure worked remarkably well, although it was problematic in a few instances. When problems could not be easily resolved, sherd groups were lumped.

Finally, vessel form was determined by cross-sectional profiles of neck and rim sherds. Using this information, and discussions of Fremont vessel shapes (see Madsen 1977: impassim; James 1986: 109-113), vessel function was inferred from vessel form.

Faunal Analysis

The faunal analysis generally follows that outlined by Lyman (1979). Recovered faunal remains were identified and quantified, then analyzed to derive dietary and behavioral inferences related to subsistence strategies.

Recovered faunal remains were identified to one of seven levels. Fragments are classified as unidentifiable or approximately unidentifiable when only size, size and skeletal element, or size, skeletal element and side of element can be determined. Fragments are classified as identifiable when skeletal element and side of animal can be determined and further identified to Class, Order, or Family, to taxonomic genus, or to taxonomic species or sub-species.

Faunal remains were quantified on an ordinal level using the number of identified specimens (NISP) rather than the more problematical minimum number of individuals (MNI). The NISP is a more reliable indication of taxonomic frequency and is most practical when small faunal assemblages are encountered. A number of factors were considered in the interpretation of faunal remains, including differential weathering, depositional environment, and survivability, as well as cultural versus natural introduction.

All faunal remains were examined for the presence or absence of striae indicating skinning, butchering and utilization, or preparation for use as a tool. The degree of weathering and mineralization (an indication of natural or cultural introduction) was also noted and the archaeological context and ethnographic analogies considered.

Carbon Dating

Except at non-cultural site 71W-3, very little charcoal was recovered. Material appearing to be carbonized organic residue (perhaps pitch) was present on several potsherds from Locus H in site 26Ln1775; a sample of this material was submitted to Beta Analytic, Inc. for accelerator dating. In processing the sample, Beta Analytic determined that the deposit appeared to be mostly mineral with a carbon content too low for dating, even by linear accelerator. Thus, no radiocarbon dates were secured for the Panaca Summit archaeological sites.

Obsidian Sourcing

Obsidian sourcing was performed by Richard Hughes, University of California, Davis. Culturally modified obsidian is sourced through trace element analysis using the X-ray fluorescence method (Hughes 1983). We expect that projectile points will exhibit greater source variability than debitage or other artifacts because points apparently were traded widely. By looking at covariation between two or more geographically separate sources, chronological shifts in procurement or trade strategies over time may be evident.

Blood Residue

Lithic tools were screened for blood residue by scanning with low power microscopy. Blood-like residue was noted on only one artifact. Further examination under high power magnification showed the material, which remains unidentified, is not blood.

Chapter 5. FLAKED STONE ARTIFACTS
by Robert G. Elston

Flaked stone artifacts from the Panaca Summit sites are classified into several broad techno-functional categories, including debitage, cores, bifaces, drills, scrapers, and flake tools, and into subclasses within each major category.

Debitage

A detailed treatment of debitage, on a site by site basis, appears in Chapter 10. However, it is worth noting here the extreme amount of damage (crushing and nibbling) found on the edges of virtually all obsidian flakes. In most cases this damage made it impossible to distinguish utilized obsidian flake tools from obsidian debitage. The cause of the damage is enigmatic. Battering during alluvial transport is ruled out by the context of the sites on ridge tops or slopes. Contemporary trampling seems the most likely agent, but this would seem to require treading on every flake several times.

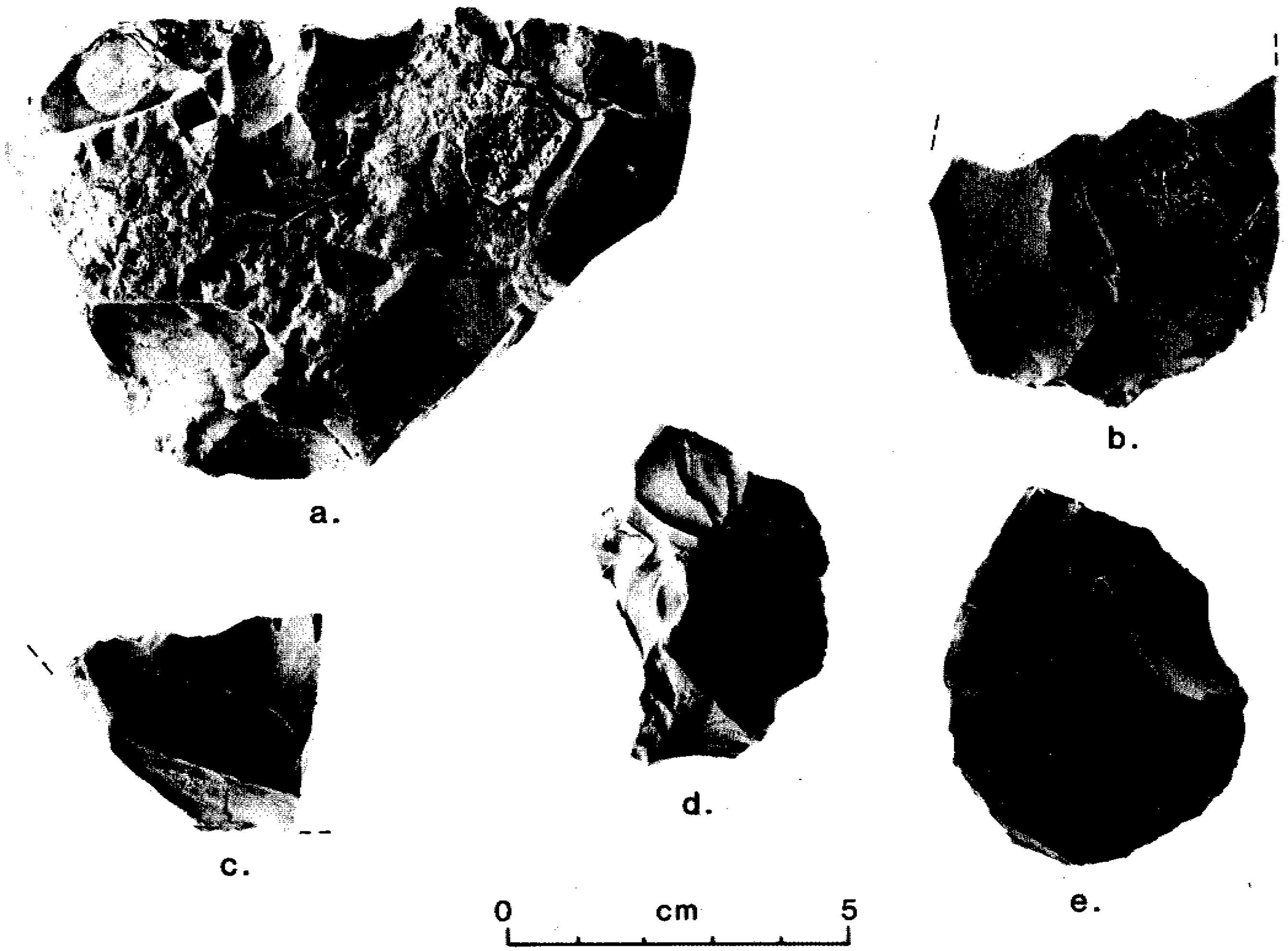
Cores

Size, shape, and quality of raw materials are all factors influencing the ways in which cores are reduced; different reduction strategies were practiced for different materials.

Tabular Cores

Tabular cores present special problems to knappers because the edges are "open" or "flat" and meet the faces at 90 degree angles. In order to get from the flat or open edge of the tabular blank to the common edge of a biface, flakes were struck from one face (for example, face A), parallel to the flat edge, either adjacent to the edge or on the face/edge corner. These tend to increase in thickness toward the distal end, and the resulting beveled edge was used as a platform for flake removal on the opposite face (face B). This flake scar was used as a platform for flake removal on face A, and so on in alternation until a closed edge eventually was produced. Flakes also were struck from the flat edge parallel to a face. This produced a wide, expanding flake scar which often hinge terminated, but which sometimes would feather out and thin the core (Figure 4b).

Figure 4. Cores from Panaca Summit. a., b. tabular cores; c., d. irregular cores; e. split cobble.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Silicified siltstone typically occurs in tabular cobbles (Figure 4a; see Figure 5a,b) as, less frequently, does chert (Figure 4b) and chalcedony. Chalcedony is also present as bands in angular cobbles, sandwiched between layers of grainy and/or vuggy material. The poor quality material was removed and the "liberated" chalcedony band treated as a tabular core. Some (perhaps most) tabular cores were bifacially reduced (Figure 4a). However, only a few of the chert or chalcedony bifaces (see Figure 6a-c) are large enough to have been reduced from tabular cores, rather than flake blanks.

Two laminated siltstone cores seem to have been associated with flake production, rather than bifacial reduction. Specimen 26Ln1775-703-2 is a large chunk from which two or three flakes have been removed, both with and across the grain. Specimen 26Ln3358-502-2 is a small fragment of a larger piece from which flakes have been removed with the grain.

Attributes of tabular cores are given in Table 2.

Table 2. Attributes of Tabular Cores.

		Millimeters			Grams
Specimen No.	Material	Length	Width	Thickness	Weight
26Ln3358					
500 01 03	Siltst.	101.3	66.5	19.2	164.5
500 03 00	Siltst.	41.6	52.1	19.8	54.6
502 02 00	Siltst.	31.0	48.9	24.3	31.6
26Ln1775					
702 03 00	Siltst.	50.2	32.6	24.5	32.8
703 02 00	Siltst.	102.8	49.9	48.5	261.5
704 01 00	Siltst.	79.0	33.1	15.2	45.8
903 01 00	Chert	76.0	26.3	15.7	38.3
1000 01 00	Chert	43.8	31.8	23.5	39.2
1000 04 03	Chert	59.6	62.5	25.5	94.7
1005 06 00	Chert	45.6	25.3	14.7	13.0
1006 05 00	Chert	38.9	31.6	19.5	32.2
1055 05 00	Chert	75.6	39.2	24.6	67.8
1100 18 02	Siltst.	48.6	21.3	10.2	11.4
1300 06 02	Chert	65.8	49.5	28.9	88.4

Irregular Cores

Irregular cores (Table 3) of chalcedony or chert recovered from sites in the study area are mostly angular fragments created from application of too much force during reduction or from thermal shock during heat treatment. Very few chert or chalcedony cores show any formal organization, probably because the poor quality of these materials required an opportunistic reduction strategy. Some pieces of stone were merely split or minimally flaked, such as specimen 26Ln1775-1005-7 (Figure 4d), and then heat treated. Heat treatment often failed, causing artifacts to explode, generating fragments with such features as crenated surfaces on specimens 26Ln3358-500-3 and 26Ln1775-1006-5 (Figure 4b, c), and crazing. The small size of several chert and chalcedony irregular cores suggests bipolar reduction, although other diagnostic features were not observed.

Obsidian specimen 26Ln1775-1200-5 (see Figure 11i) is an obsidian flake fragment that has been reduced with bipolar technique. The flake was broken, and at least two flakes struck down the dorsal face from the truncation. The last flake was outrepasse, removing the end of the flake. The piece then was reversed and several smaller flakes removed from the "distal" end on the ventral face. One lateral margin is formed by burin facets struck from the truncation. Small artifact size and the presence of ring cracks, crushing, and sheared cones suggest these modifications were accomplished with bipolar technique.

Table 3. Attributes of Irregular Cores.

		Millimeters			Grams
Specimen No.	Material	Length	Width	Thickness	Weight
26Ln1775					
700 12 00	Chert	54.2	32.8	22.2	33.1
700 13 00	Chert	50.0	45.1	26.1	63.1
703 04 00	Chert	52.0	36.8	28.5	35.8
1000 02 00	Chert	33.9	32.8	23.8	21.1
1000 04 01	Chert	90.9	53.8	30.0	123.2
1001 04 00	Chert	38.0	31.6	30.0	36.1
1005 07 00	Chert	51.7	34.2	19.9	33.3
1005 08 00	Chert	46.6	34.6	18.6	33.2
1200 05 00	Obsidian	24.0	26.2	07.4	5.1
1300 08 00	Chert	85.8	57.2	45.4	200.6
1500 08 04	Chert	39.2	26.8	16.0	14.0

Split-Cobble Obsidian Cores

Relatively few obsidian cores were recovered during the present project, but all are split nodules or cobbles (Table 4). Specimen 26Ln3357-301-4 (Figure 4e) is a split nodule, flaked on the ventral surface. Specimen 26Ln21-100-1 is a quartered pebble; specimen 26Ln21-100-6 is a quartered pebble with bifacial flaking on the margin formed by the intersection of the two interior faces. Maximum dimensions of all three objects is about 6 cm. Specimen 26Ln3357-302-9 is an angular split nodule core remnant on which two scraper edge units have been created (further described below). Specimen 26Ln3357-300-25 is technically a piece of debitage. It is an outrepasse flake from an opposed platform core made on a split cobble, probably about 6 cm long. The proximal end of the flake is missing; the fracture plane has curved under and removed the opposite platform.

It is assumed that the main object of obsidian core reduction was the production of flake blanks for biface manufacture. There is little direct evidence for the manufacture of such blanks, especially those for large obsidian bifaces. We assume that their production involved first splitting the nodule, then striking large, wedge-shaped flakes parallel to the split surface.

Table 4. Attributes of Split Cobble Cores.

		Millimeters			Grams
Specimen No.	Material	Length	Width	Thickness	Weight
26Ln21					
100 01 00	Obsidian	59.0	25.7	21.9	33.2
100 06 00	Obsidian	58.9	29.2	16.1	29.4
26Ln3357					
301 04 00	Obsidian	56.2	44.4	19.4	43.9
302 09 00	Obsidian	43.2	49.1	22.3	29.6

Bifaces

Biface manufacture was a significant activity at many of the sites in the study area, focused on the raw material available at each site. Bifaces in the study area tend to be either large or small.

Large Bifaces

Large bifaces are manufactured with percussion technique from two types of blank. One type of blank was a tabular piece of either laminated siltstone or cryptocrystalline material, the other a large flake.

With the exception of specimen 26Ln1775-900-8 (Figure 5h), all bifaces made from tabular cores of laminated siltstone are from site 26Ln3358. Lithic technology at site 26Ln3358 focused on the manufacture of leaf-shaped or triangular bifaces with convex bases. First, a tabular piece of siltstone was selected, probably hand-sized and between 1.0 and 2.0 cm thick. In the case of the laminated siltstone material, a layer of sandstone usually formed the surface of at least one face. Attempts to remove this material involved striking wide, expanding flakes from the flat edge parallel to a face (Figure 5b). A common or closed edge was created through alternate flaking (Figure 5a). Hinge terminations of flakes in the laminated siltstone were so common (Figure 5c) that "islands" often were built up on one or both faces, preventing further flake removal (Figure 5d-f).

A common failure mode was loss of the tip end through end-shock. If the basal end was large enough, attempts were made for its salvage through closure of the truncation (truncation surfaces are typically flat or open). Closure techniques included striking flakes from the truncation on one or both surfaces, alternating flaking (usually beginning at the "corner" formed by the truncation surface and a common edge), and burination (all observed on the specimen illustrated in Figure 5e).

Specimen 26Ln3358-500-10 (Figure 5f) is an intact, triangular biface whose proportions (short and wide) suggest it was made from a broken biface fragment. Specimen 26Ln3358-500-8 (Figure 5g) is the result of a successful attempt to remove an "island" and thin a broken biface. It is a longitudinal flake struck from a truncation surface toward the base. Tips also may have been salvaged, perhaps with more success, because only one specimen (26Ln1775-900-8 [Figure 5h]) was found in the present project.

Roughly the same reduction techniques were used with tabular cores of light colored chert. Specimen 26Ln1775-1000-10 (Figure 6a) is a stage 1 biface with evidence of alternate flaking in unsuccessful reduction of flat edges. Item 26Ln3358-500-12 (Figure 6b) represents an attempt at resharpening a truncated stage 1 biface.

Figure 5. Laminated siltstone. a-c. laminated cores; d-h. laminated siltstone.

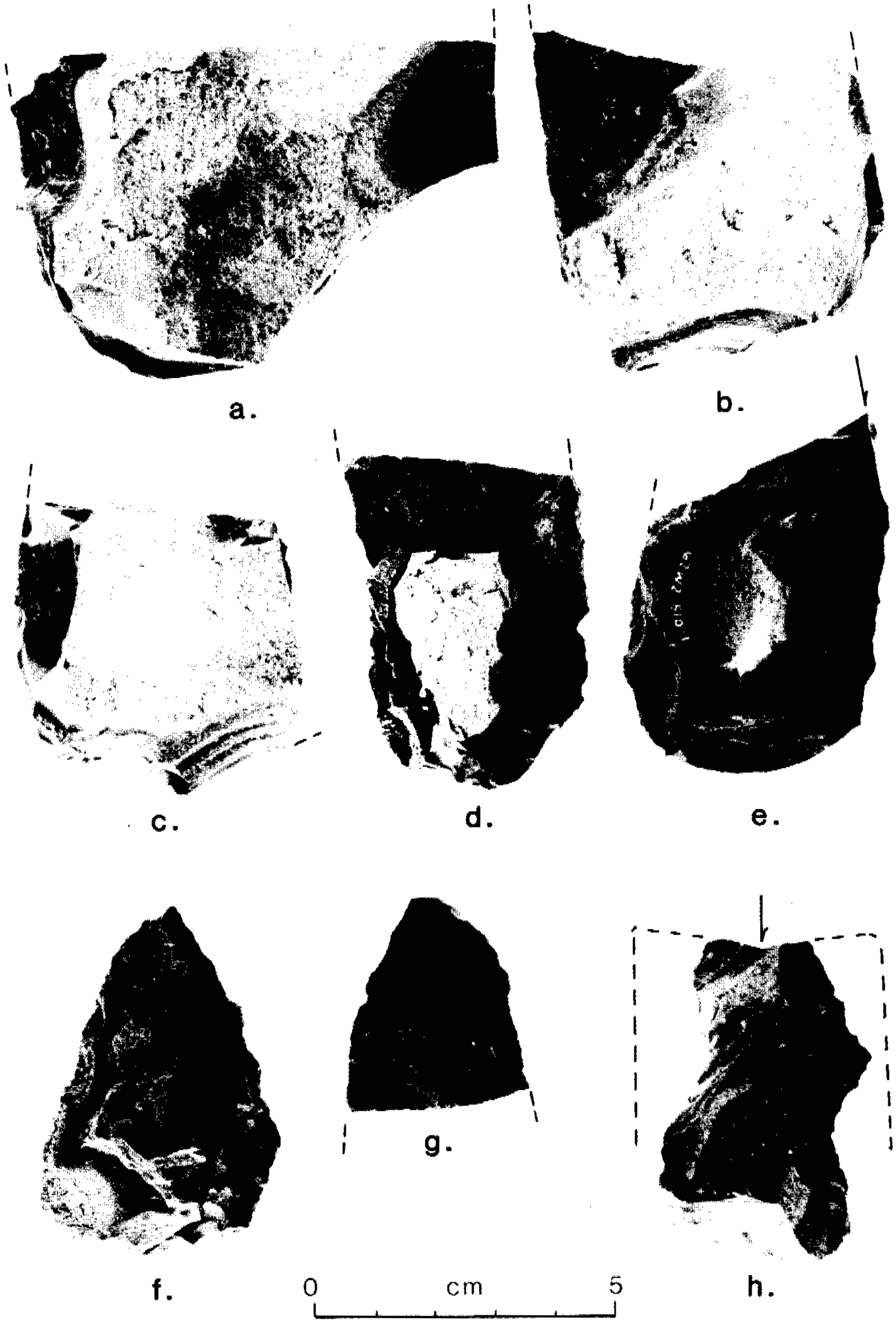
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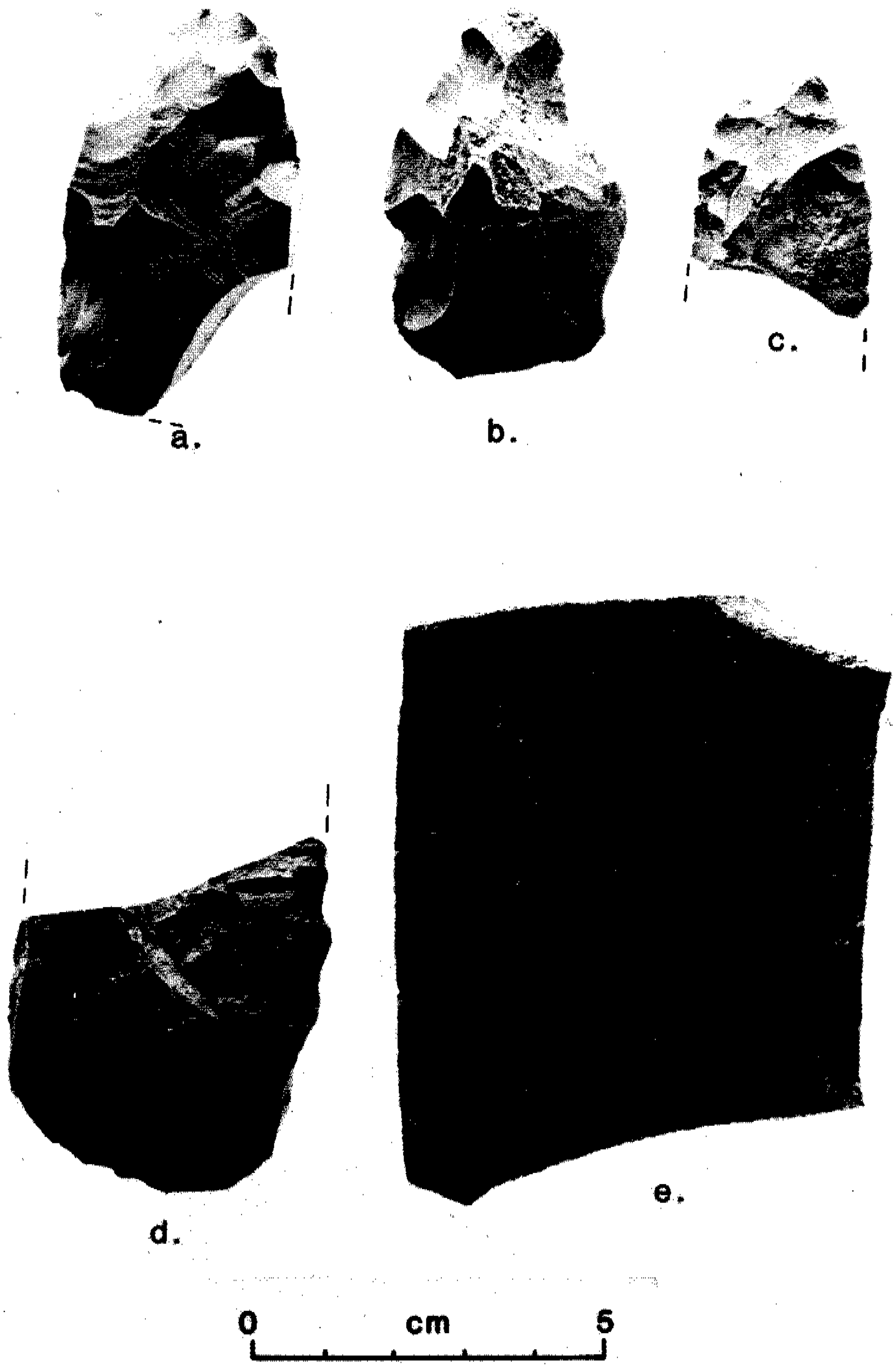
Figure 6. Bifaces and palette from Panaca Summit. a-b. Large chert bifaces; c. Large siltstone biface; d. Large basalt biface; e. Flaked sandstone palette.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Specimen 26Ln1775-1100-9 (Figure 6c) is a tip fragment of a stage 2 biface similar in size and shape to the laminated siltstone biface 26Ln1775-900-8 (Figure 5h).

Manufacture of bifaces from local obsidian was a major activity in the study area. After debitage, obsidian bifaces are the most abundant artifact class at many of the archaeological sites in the Panaca Summit area. All obsidian bifaces in our collection are fragments, but maximum dimensions can be estimated. Maximum size was constrained by the nature of the local obsidian, which occurred in small nodules for the most part. Thus, the maximum size was 8 or 9 cm, although most were shorter.

A similar strategy of flake blank reduction was employed, regardless of the size of the flake blank. First, the margin of the flake was scrubbed, producing a platform on the ventral surface. Next, flakes were struck from this platform off the dorsal surface (Figure 7a). Generally, the dorsal surface was regularized before reduction of the ventral surface began (Figure 7b). For percussion reduced bifaces, thinning flake scars are wide and expanding, tending toward collaterality (Figure 7d; Figure 8b,c). Although obsidian bifaces are triangular in planview, base shape is variable. Most larger percussion flaked bifaces have either straight (Figure 7g-i) or slightly convex bases (Figure 8a; specimen 26Ln3356-200-8) Figure 8b has a convex base, subsequently modified with a broad, U-shaped notch. Specimens 26Ln21-100-3 and 26Ln3357-300-3 (Figures 7e and 7f) appear at first glance to have more or less straight bases and converging lateral edges. However, the "bases" are probably repaired tip truncations.

Specimen 26Ln3357-300-11 (see Figure 6d) is a fragment of a stage 1 biface made on a large flake blank. It is the only basalt biface in the Panaca Summit collection.

Attributes of Large Bifaces are given in Table 5.

Figure 7. Large obsidian bifaces.

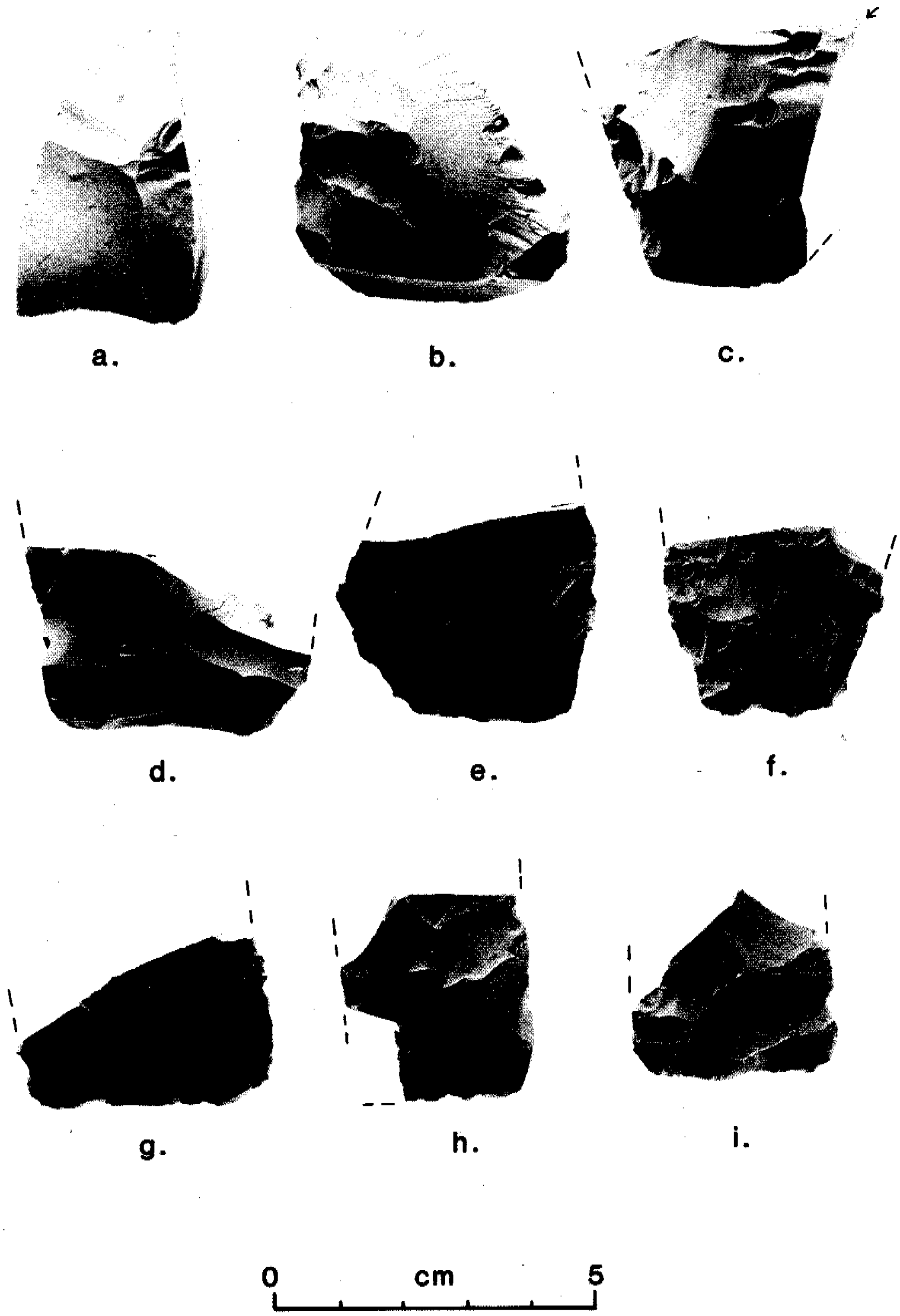

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Figure 8. Obsidian bifaces. a.-f. Large obsidian bifaces; g.-j. Small obsidian bifaces.

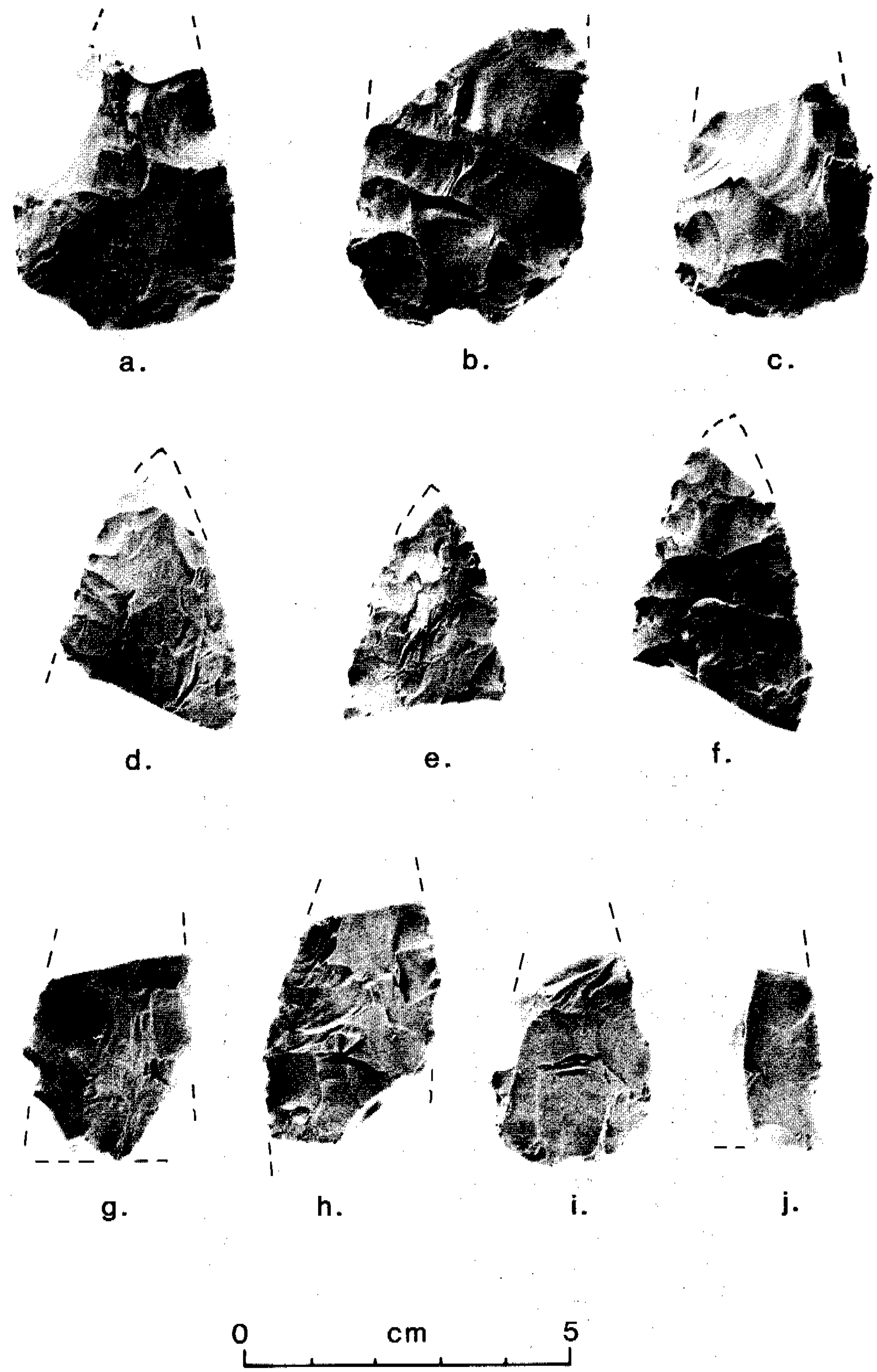
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Table 5. Attributes of Large Bifaces.

Specimen No.	Material	Millimeters Length	Width	Thickness	Grams Weight
26Ln21					
100 03 00	Obsidian	34.8	42.0	9.0	12.8
100 04 00	Obsidian	16.1	33.3	6.6	-
100 07 00	Obsidian	16.6	21.1	4.7	1.9
103 01 00	Obsidian	51.6	17.4	7.8	6.6
103 02 00	Obsidian	19.1	31.6	6.4	4.3
26Ln3356					
200 02 00	Obsidian	39.8	42.4	10.9	17.8
200 03 00	Obsidian	43.7	46.2	10.3	20.0
200 04 00	Obsidian	44.4	34.4	10.0	16.8
200 06 00	Obsidian	26.3	29.0	6.0	4.1
200 07 00	Obsidian	22.6	21.0	4.4	2.1
200 08 00	Obsidian	45.4	37.5	6.4	11.6
201 04 00	Obsidian	17.3	18.1	5.1	1.6
201 01 00	Obsidian	18.8	20.0	4.3	1.4
201 03 00	Obsidian	13.4	21.6	3.6	0.9
201 02 00	Obsidian	24.4	25.9	6.0	3.6
26Ln3357					
300 03 00	Obsidian	30.3	34.6	7.4	7.3
300 04 00	Obsidian	32.3	26.4	4.9	3.7
300 05 00	Obsidian	29.4	22.4	4.5	2.9
300 07 00	Chert	16.4	24.7	5.3	2.8
300 11 00	Basalt	52.2	47.9	17.5	35.5
300 12 00	Obsidian	22.4	29.7	7.6	5.9
300 13 00	Obsidian	32.3	31.1	7.0	6.5
300 14 00	Obsidian	26.5	41.0	6.8	7.8
300 17 00	Obsidian	32.6	26.2	7.4	7.0
300 19 00	Obsidian	33.0	30.1	8.0	7.9
300 20 00	Obsidian	20.4	14.6	5.2	1.5
300 21 00	Obsidian	28.5	25.7	6.4	3.1
300 22 00	Obsidian	25.6	27.6	10.2	4.4
300 23 00	Obsidian	32.4	17.6	5.9	3.1
300 27 00	Obsidian	47.1	30.9	9.7	13.6
300 28 00	Obsidian	23.8	36.4	7.9	5.7
300 29 00	Obsidian	28.4	46.0	9.7	13.7
300 33 00	Obsidian	41.3	29.6	5.6	6.2
300 34 00	Obsidian	37.9	19.7	6.4	3.9
300 35 00	Obsidian	34.9	27.0	8.5	8.0
300 36 00	Obsidian	26.4	30.0	8.1	7.7
301 02 00	Obsidian	30.7	29.7	6.1	4.6
301 07 00	Obsidian	19.8	20.8	4.9	2.3
302 01 00	Obsidian	14.9	21.5	5.5	1.8

Table 5. continued

Specimen No.	Material	Millimeters Length	Width	Thickness	Grams Weight
302 03 00	Obsidian	30.3	32.3	6.1	5.5
302 04 00	Obsidian	27.0	18.0	10.3	4.6
302 05 00	Obsidian	21.7	24.0	6.2	2.3
302 06 00	Obsidian	12.0	13.8	4.7	0.8
302 07 00	Obsidian	17.5	37.4	6.8	4.3
302 08 00	Obsidian	13.2	17.0	5.3	-
302 12 00	Obsidian	19.3	15.6	4.8	1.2
302 13 00	Obsidian	15.3	5.4	4.2	0.4
302 18 00	Obsidian	28.2	24.7	8.2	6.3
302 19 00	Obsidian	28.4	20.5	7.1	4.3
302 21 00	Obsidian	5.2	23.4	4.3	1.7
302 22 00	Obsidian	45.5	14.2	11.5	6.5
26Ln3358					
500 01 01	Obsidian	23.7	18.1	5.4	1.7
500 01 02	Siltst.	54.9	82.2	12.2	63.9
500 02 01	Siltst.	61.2	43.8	11.0	23.4
500 07 00	Siltst.	57.5	41.1	10.6	27.1
500 10 00	Siltst.	58.2	40.0	10.0	18.2
500 11 00	Siltst.	48.7	50.6	11.5	37.5
500 12 00	Chert	53.0	35.2	17.2	24.6
502 03 00	Siltst.	56.3	55.3	14.3	60.1
510 01 00	Siltst.	62.8	42.3	10.5	29.7
26Ln3359					
601 01 00	Obsidian	21.4	15.8	3.7	1.0
26Ln1775					
704 05 00	Obsidian	16.3	8.7	5.4	-
900 08 00	Siltst.	35.3	31.0	8.6	9.1
902 01 00	Siltst.	10.0	8.5	4.4	-
1000 10 00	Chert	59.7	35.3	14.6	30.1
1100 09 00	Chert	35.6	26.2	9.2	7.6
1300 09 03	Obsidian	22.7	12.6	3.5	1.0
1400 08 06	Obsidian	13.4	23.1	5.4	1.8

Small Bifaces

Small bifaces were manufactured on flake blanks struck from cores. All but one are triangular in outline; one is square. With the exception of specimen 26Ln1775-1500-3-4 (Figure 9b), a stage 2 basal fragment with a slightly concave base, all the triangular bifaces have convex bases. Four specimens are stage 3 or completed bifaces. Specimen 26Ln1775-804-2 (Figure 9d) is intact; resharpening the margins above the haft created concave lateral edges. Use damage has broken or blunted the tip, a feature shared by chert specimen 26Ln1775-1200-7 (Figure 9f) and obsidian specimen 26Ln1775-1200-1 (Figure 9g). Specimen 26Ln1775-1100-1 (Figure 9e) is missing its tip, but the edges do not appear to have been resharpened. Three specimens (Figure 9a, c, d) employ the technique of longitudinal thinning from the base.

Item 26Ln3358 500-6 (Figure 9a) is a bifacial implement made on a secondary chert flake. Bifacial pressure flaking of the proximal end removed the platform and much of the bulb. Bifacial pressure flaking of the distal end created a convex edge with an acute edge angle (25-40 degrees). Rounding of the edge apex and bifacial polish on arrises adjacent to the edge suggest its use as a knife.

Several small bifaces were made on obsidian flake blanks. With one exception, the obsidian specimens are triangular with convex bases. Specimen 70W8-200-1 (Figure 9h) is a broad triangular biface with a concave base the correct size and shape for an Elko Series projectile point preform. Several other specimens are probably early stage point preforms (see Figure 8e,g-i). Specimens 26Ln1775-1400-8-4 and 26Ln1775-1400-8-5 (see Figure 9i,j) are stage 2 bifaces with incompletely reduced ventral surfaces. Specimen 26Ln3357-302-16 (see Figure 9k) is the basal section of a completed or stage 3 biface. 26Ln1775-1200-1 (see Figure 9g) is a completed biface with a basal truncation. The tip is blunt, as on the chert specimens. Attributes of Small Bifaces are given in Table 6.

Figure 9. Small bifaces from Panaca Summit. a. Small square biface; b.-k. Small triangular bifaces.

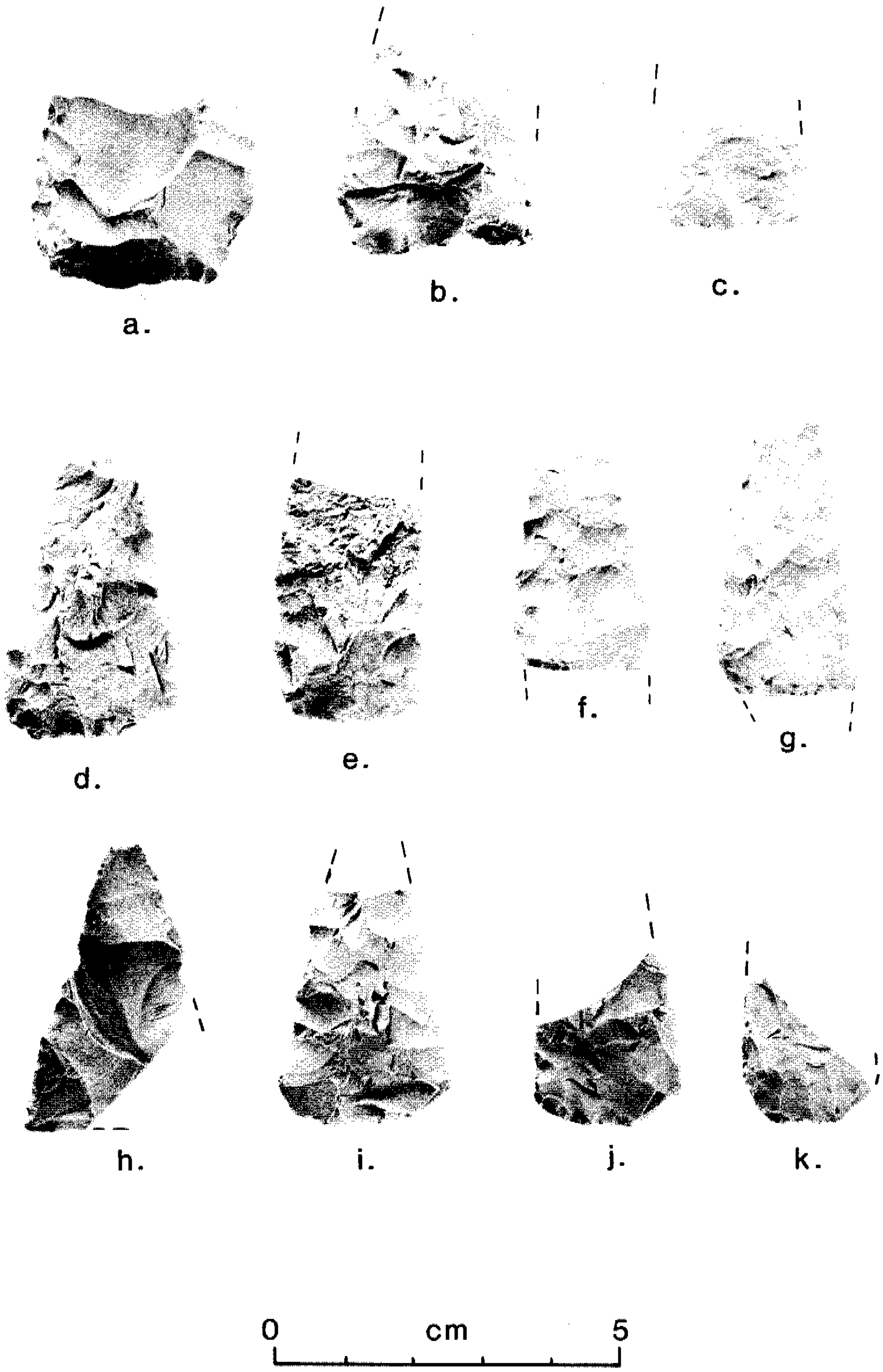
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Table 6. Attributes of Small Bifaces.

Specimen No.	Material	Millimeters Length	Width	Thickness	Grams Weight
26Ln3356					
200 01 00	Obsidian	42.2	24.9	5.0	3.8
26Ln3357					
300 08 00	Obsidian	32.9	25.8	5.7	5.0
300 16 00	Obsidian	36.7	30.7	6.8	8.7
300 26 00	Obsidian	38.4	26.8	7.0	6.6
302 10 00	Obsidian	33.4	26.6	6.2	4.7
302 16 00	Obsidian	21.6	19.5	14.6	1.6
302 17 00	Obsidian	28.9	14.0	4.0	2.1
26Ln3358					
500 06 00	Chert	33.3	35.1	6.2	7.9
26Ln1775					
804 02 00	Chert	41.5	26.6	5.9	6.3
1100 01 00	Chert	35.7	22.5	5.7	4.9
1200 01 00	Obsidian	42.4	20.1	5.8	5.2
1200 07 00	Chert	37.7	20.7	4.4	3.3
1400 08 04	Obsidian	34.9	25.6	6.5	5.0
1400 08 05	Obsidian	25.9	21.8	3.5	2.0
1500 03 04	Chert	31.4	30.0	7.6	6.7

Drills

Attributes of drills are given in Table 7. Specimens 26Ln1775-1400-8-3, 26Ln1775-800-14-2 and 26Ln1775-1000-12 (Figure 10a-c) are small, expanded base drills made on flake blanks. The edges of the bits are crushed and abraded as expected for drills.

Specimen 26Ln1775-804-3 (Figure 10d) is made on a sharp chunk of chert shatter. The natural point on one end was minimally retouched. Use has produced rounding, polish, and concentric stria.

Specimen 26Ln3357-300-9 (Figure 10e) is a small, leaf-shaped biface with a single shoulder and a constricted tip. This artifact superficially resembles a projectile point in size and shape, but it is thicker than most points and its lateral edges are extremely crushed and abraded, suggesting its application as a drill.

Table 7. Attributes of Drills.

Specimen No.	Material	Millimeters Length	Width	Thickness
26Ln3357				
300 09 00	Obsidian	34.3	13.7	5.5
26Ln1775				
800 14 02	Obsidian	21.8	13.0	5.3
804 03 00	Chert	28.7	10.5	8.3
1000 12 00	Obsidian	18.9	13.4	3.1
1400 08 03	Chert	30.0	15.6	3.9

Scrapers

Several scraper types are represented in the Panaca Summit collection, as described below. Descriptions here and elsewhere rely on the term "edge unit" or, more often, EU. An edge unit is a portion of a tool edge which appears to have been used.

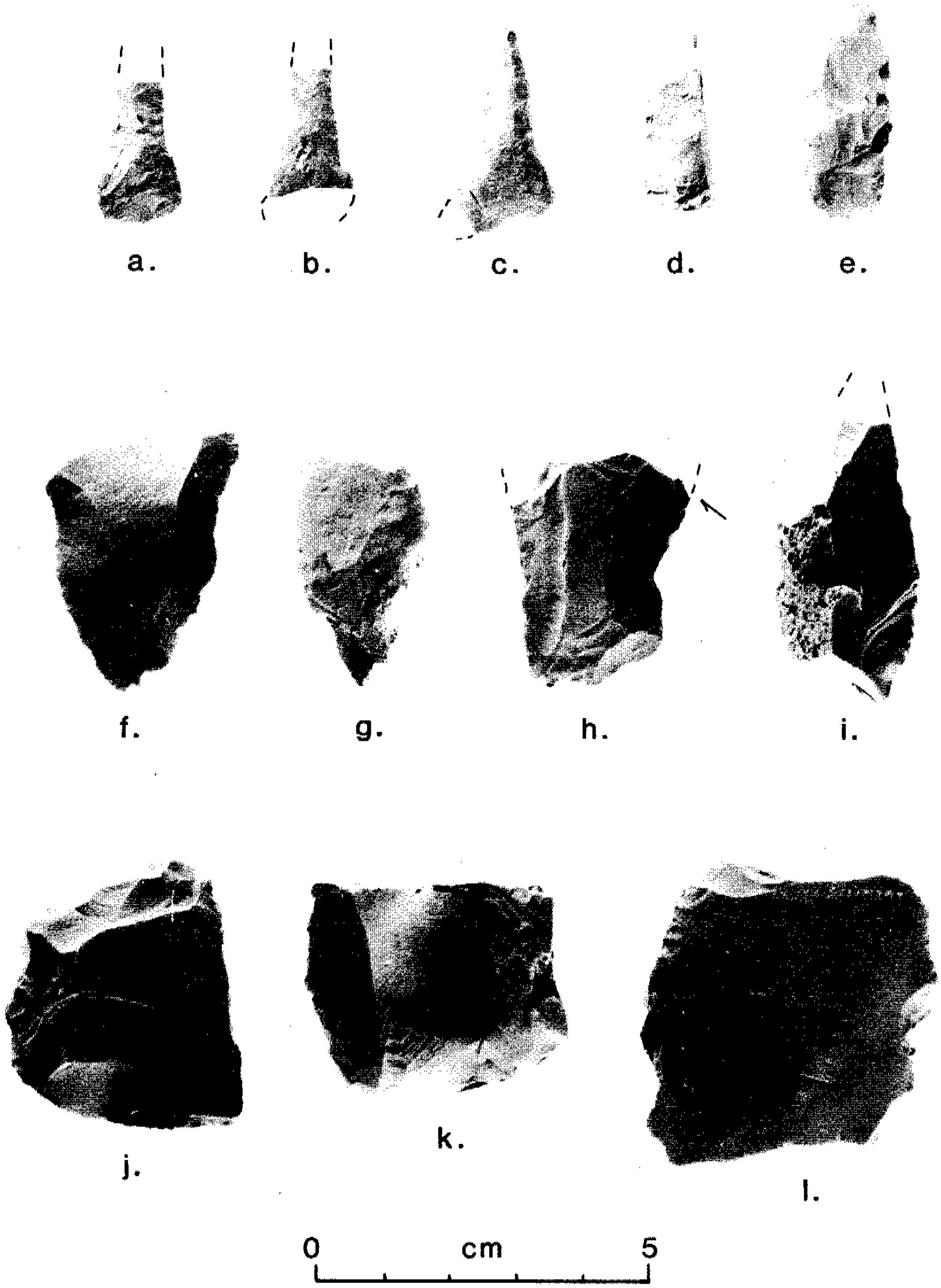
Expedient Scraper on Angular Chert Chunk

Item 26Ln3358-500-9 is an angular chunk of white, grainy chert. One edge is unifacially flaked to an angle of 81 degrees.

Flake Scrapers

Three obsidian scrapers are made on thick, secondary flakes. Edge angles and degree of wear suggest use on hard materials such as wood or bone. Unifacial retouching on the lateral-dorsal margin of specimen 26Ln3357-301-5 (see Figure 10k) and the distal-dorsal margin of specimen Ln3357-302-20 (see Figure 10j) has created scraping edges with edge angles of 61 and 64 degrees, respectively. Specimen 26Ln1775-700-24 (see Figure 10l) is a large, secondary flake with unifacial ventral retouching at the corner formed by the platform and lateral margin. This EU has an angle of 74 degrees. Specimen 26Ln3357-300-30 (see Figure 10i) is an obsidian scraper made on a narrow, keeled, blade-like flake. Both lateral margins are retouched; one edge has an edge angle of 45 degrees, the other has an edge angle of 60 degrees. All these EUs exhibit

Figure 10. Drills and scrapers from Panaca Summit. a-b. Drills; f.-h. End scrapers; i-l. Flake scrapers.



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crushing, nibbling, and rounding typical of use on relatively hard materials.

Specimen 26Ln3357-300-15 (see Figure 11h) is made on a secondary flake with cortex; at least one lateral margin was bifacially modified before the piece was truncated transversely by end shock. The other lateral margin is also a truncation surface. Bipolar technique was used to strike flakes from the transverse truncation on the dorsal surface, but these all hinge terminated. Much of the lateral truncation surface was removed by flakes struck from the end opposite the transverse truncation.

End Scrapers

Three specimens are end scrapers, probably used for processing hides. Specimen 26Ln1775-1100-18-1 (see Figure 10f) is a curved biface thinning flake of grainy gray chert; specimen 26Ln3357-302-23 (Figure 10g) is a secondary flake of heat treated white chert with embedded quartz grains that make the surface glitter. Distal-dorsal retouch on both specimens has created EUs with edge angles of 77 and 63 degrees, respectively. Specimen 26Ln3357-302-23 (Figure 10g) has been resharpened after a period of use. This created a serrated edge with small portions of the previous edge preserved on the points between the flake scars which are rounded, polished, and striated perpendicular to the edge.

Specimen 26Ln1775-1500-8-3 (see Figure 10h) is an end scraper made on an expanding obsidian secondary flake which still retains cortex on the dorsal surface. We assume that this tool once had a unifacial, distal-dorsal EU like those of the chert specimens described above. However, this has been removed by at least two burin blows from the lateral margin. The angle formed by the burin facet and ventral surface is obtuse and may have been unsatisfactory. The new edge was not retouched and was used only enough to produce a little crushing and abrasion before the tool was discarded. This artifact also bears organic residue on the ventral surface adjacent to the burin facet.

Cobble Scrapers

Specimen 26Ln3357-300-2 is a scraper made on a fist-sized split cobble of basalt. The scraper edge has been created by striking a series of large percussion flakes off one side from the margin of the split face. The tool has an edge angle of 70 degrees, and the edge is rounded and polished.

Specimens 26Ln1775-704-2 and 26Ln1775-704-3 are two large chunks of vuggy, gray chalcedony recovered together from Station 4 at site 26Ln1775. Each is a split cobble with one flaked margin. In size and shape, these artifacts resemble the basalt tool described above. However, they lack rounding and polish on the flaked margin.

Scrapers on Tool Fragments

Several tool fragments previously described were used or fashioned into scrapers. Specimen 26Ln3357-302-9 is an angular, obsidian nodule core fragment. Two scraper EUs have been created by fine percussion flaking followed by pressure retouch. One edge angle is 62 degrees, the other 76 degrees.

Three obsidian stage 1 biface fragments were used as scrapers. On specimens 26Ln3357-300-27 (see Figure 7a) and 26Ln3356-20-5, the lips of transverse end shock truncations are rounded and abraded. Specimen 26Ln3356-8-200-2 (see Figure 7c) is a fragment with two intersecting bifacial edges and two intersecting truncations. Both bifacial edges are rounded and abraded suggesting scraping use. The intersecting truncations form a beak-like point which is crushed and abraded as if used as a graver.

Attributes of Scrapers are given in Table 8.

Table 8. Attributes of Scrapers.

Specimen No.	Material	Type	Length (Millimeters)	Width (Millimeters)	Thickness (Millimeters)
26Ln3357					
300 15 00	Obsidian	Flk.	36.0	20.0	10.3
300 30 00	Obsidian	Flk.	43.7	22.1	12.0
300 32 00	Basalt	Cob.	83.2	73.8	70.9
301 05 00	Obsidian	Flk.	34.2	39.0	0.8
302 20 00	Obsidian	Flk	40.9	34.8	9.8
302 23 00	Chert	End	37.3	21.2	5.9
26Ln3358					
500 09 00	Chert	Exp.	65.0	45.9	20.5
26Ln1775					
700 24 00	Obsidian	Flk.	51.1	44.4	10.9
704 02 00	Chert	Cob.			
704 03 00	Chert	Cob.			
1100 18 01	Chert	End	40.2	30.0	5.2
1500 08 03	Obsidian	End	35.3	27.6	7.6

Exp. = Expedient Scraper   Flk. = Flake Scraper
End = End Scraper   Cob. = Cobble Scraper

Miscellaneous Flake Tools

Several artifacts are modified or utilized flakes. As previously mentioned, non-cultural edge damage was so extensive on obsidian flakes from sites on Panaca Summit that, in most cases, any evidence of use wear was completely destroyed. Consequently, only a few utilized and modified flake tools could be recognized with any confidence.

Six specimens have unifacial nibbling and rounding on one or more edges. Specimen 26Ln1775-1300-4-1 (Figure 11a) is made of obsidian. Specimens 26Ln1775-804-7, 26Ln1775-1001-3, 26Ln3358-500-7 (Figure 11d-f) are chert, while specimens 26Ln3357-300-18 (Figure 119g) and 26Ln1775-703-12 are basalt.

Specimen 26Ln1775-801-6 (Figure 11c) is a utilized flake of opaque reddish brown chert. Discontinuous nibbling, rounding, and polish characterize the distal margin; polish on a small projection suggests use as a graver. Similar edge damage is found on both lateral margins and the distal tip of specimen 26Ln1775-1400-8-19 (Figure 11b), a blade-like flake of laminated siltstone.

Two specimens are flakes removed from cores made on chert and chalcedony pebbles. Specimen 26Ln1775-703-12 (Figure 11j) is made of gray and tan chalcedony with a buff-colored cortex; specimen 26Ln1775-1500-8-4 is a red chert with white veins. Both flakes removed a prominent ridge on the core during an early stage in reduction, and both subsequently were modified on the ventral surface.

Specimen 26Ln3357-302-15 is a flake fragment with a steeply modified, scraper-like edge.

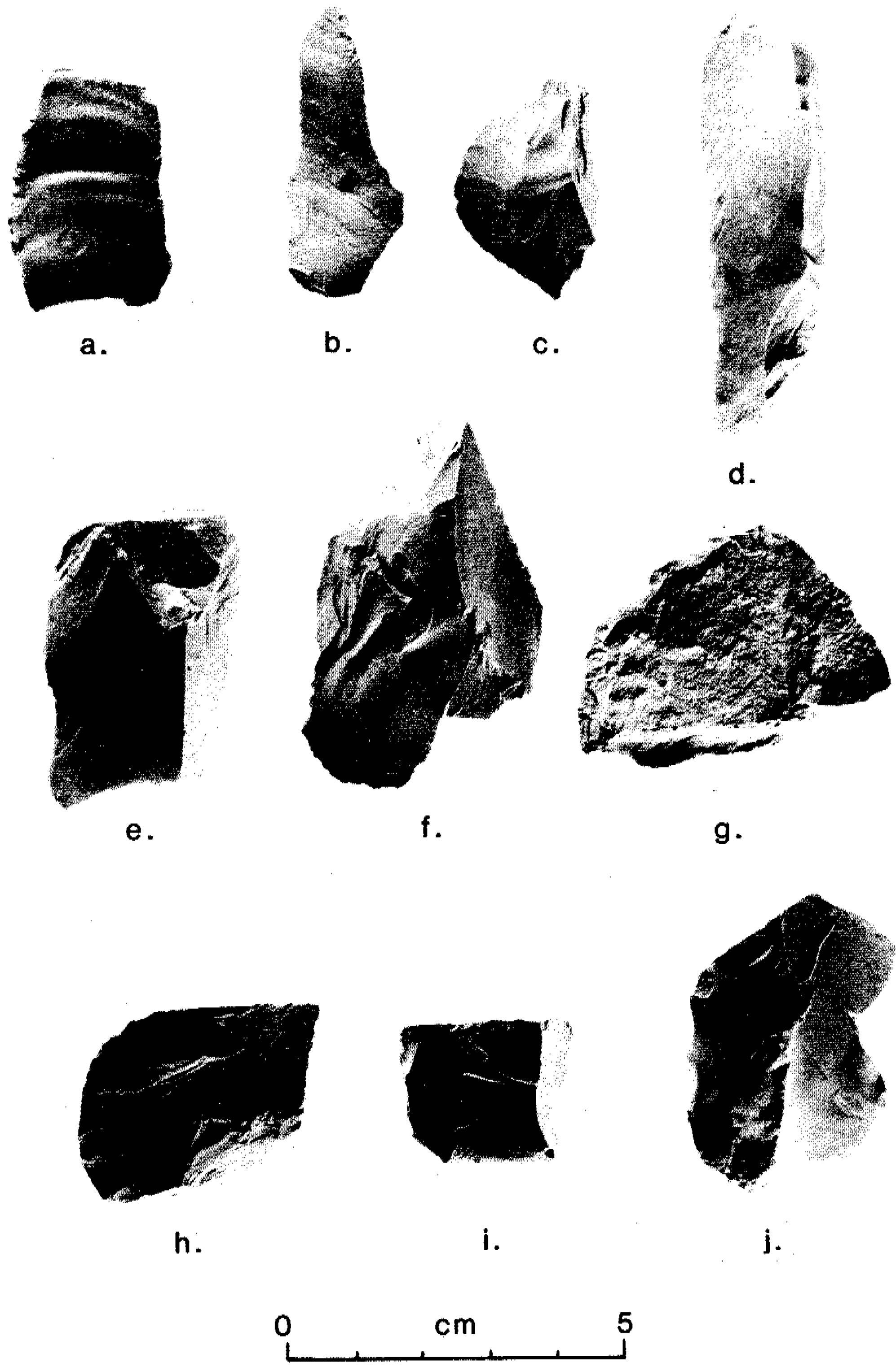
Attributes of flake tools are given in Table 9.

Table 9. Attributes of Flake Tools.

			Millimeters		
Specimen No.	Material	Type	Length	Width	Thickness
26Ln21					
100 02 00	Obsidian	Mod.	32.6	23.0	7.0
100 05 00	Basalt	Util.	58.7	37.0	12.3
103 03 00	Obsidian	Mod.	28.0	24.7	7.8
26Ln3356					
200 05 00	Obsidian	Util.	50.3	14.4	9.4
26Ln3357					
300 11 00	Basalt	Mod.	52.2	47.9	17.5
300 18 00	Basalt	Util.	33.6	47.6	11.5
301 08 00	Obsidian	Mod.	21.4	25.7	3.7
301 09 00	Obsidian	Mod.	21.0	19.4	7.2
302 15 00	Obsidian	Mod.	25.9	17.4	11.0
26Ln1775					
703 12 00	Chert	Mod.	46.7	30.4	14.4
1001 03 00	Chert	Util.	46.1	30.0	13.9
1300 04 01	Obsidian	Util.	37.5	25.3	6.2
1400 00 00	Chert	Util.	43.6	18.8	4.7

Mod. = Modified Util. = Utilized

Figure 11. Lithic tools from Panaca Summit. a-g. Utilized flake tools; h. Flake scraper; i. Modified flake; j. Bipolar core.


a.
b.
c.
d.
e.
f.
g.
h.
i.
j.
0
cm
5

Hammerstones

Four artifacts exhibit the battered surfaces characteristic of hammerstones. Two specimens are made on small nodules of cryptocrystalline material. Specimen 26Ln1775-703-5 is a subangular pebble of vuggy, reddish brown chert. All margins are rounded from battering. Specimen 26Ln1775-800-1 is a small, chalcedony geode. The piece has been shattered, exposing the central cavity partially filled with small quartz crystals. One hemisphere is intact; its surface extensively battered.

Specimen 26Ln3357-302-11 is a subrectangular, tabular pebble of grainy, vuggy, banded chert. Margins at either end are rounded from battering. Specimen 26Ln3357-302-11 is an angular pebble of white, vuggy chert. One end is truncated, the other battered.

Attributes of Hammerstones are given in Table 10.

Table 10. Attributes of Hammerstones.

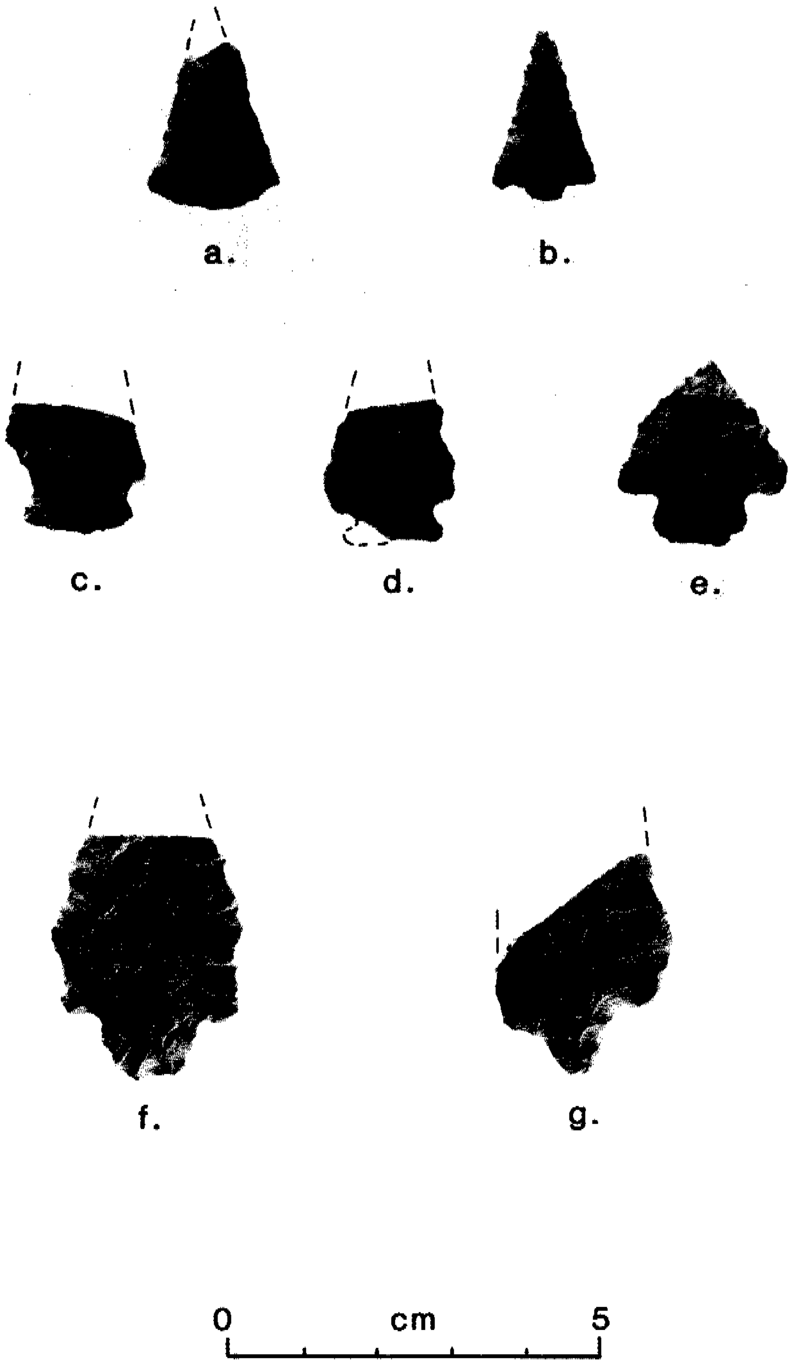
		Millimeters			Grams
Catalog No.	Material	Length	Width	Thickness	Weight
26Ln335					
302 11 00	Chert	60.5	52.2	28.4	110.0
26Ln1775					
703 05 00	Chert	60.4	50.4	42.0	156.7
800 01 00	Chert	40.5	41.3	36.7	81.8
1300 06 01	Chert	81.4	58.7	32.8	174.1

Projectile Points

Typable projectile points are not abundant on Panaca Summit sites. Most points are small, untypable fragments, but seven specimens could be classified using the key developed by Thomas (1981) and references to relevant eastern Great Basin point types (Adovasio 1979; Cozzens 1982, Holmer 1978, 1985; Holmer and Weder 1980).

The Horticultural Period (perhaps Numic Period) is represented by a Cottonwood Triangular point (Figure 12a). This specimen is a bit too large and heavy, and is actually rejected by the Thomas (1981) key. Perhaps it is an unfinished preform.

Figure 12. Projectile points. a. Cottonwood triangular; b. Parowan basal notched; c-e. Elko Corner Notched; f-g. Gatecliff contracting stem.


a.
b.
c.
d.
e.
f.
g.
0
cm
5

The Horticultural Period is also represented by a Parowan Basal Notched point (Figure 12b). Although this specimen resembles points in the Rosegate Series, it is also rejected by the Thomas (1981) key. It is, however, similar to points associated with Parowan Fremont sites in Utah.

The Late Archaic is represented by three items. Specimens 26Ln1775-1300-12 (Figure 12c) and 26Ln3357-305-4 (Figure 12d) are difficult to key because of extensive breakage, but they both appear to have corner notches and are the right size for Elko Series points. Specimen 26Ln21-100-8 (Figure 12e) is rejected by the key, but appears to be an Elko Corner-notched point with an extensively resharpened blade.

The Middle Archaic is represented by two Gatecliff Contracting Stem points (Figure 12f,g). In light of recent work by Flenniken and Raymond (1986) suggesting the possibility that contracting stem points can be the result of stem repairs to originally corner-notched points, both specimens were examined closely. Specimen 26Ln3357-300-37 (Figure 12f) does not appear to have been reworked. However, the small size of the stem and the flaking pattern on specimen 26Ln3357-300-2 (Figure 12g) perhaps indicates stem maintenance. It cannot be said whether the point was originally corner-notched or simply had a broader contracting stem.

Attributes of projectile points are given in Table 11.

Table 11. Attributes of Projectile Points.

Specimen No.	Material	Type	Millimeters Length	Width	Thickness	Grams Weight*
26Ln21						
100 08 00	Obsidian	ECN	25.0	22.7	5.3	2.3
26Ln3357						
300 02 00	Obsidian	GCS	27.3	26.3	5.5	3.4
300 06 00	Obsidian	NT	20.4	19.2	4.3	-
300 09 00	Obsidian	NT	34.3	13.7	5.5	-
300 24 00	Obsidian	ECN	19.2	17.8	4.3	1.6
300 31 00	Obsidian	NT	16.3	17.9	3.7	-
300 37 00	Obsidian	GCS	33.6	26.0	5.1	4.2
301 03 00	Chert	NT	8.0	4.6	4.3	-
302 02 00	Obsidian	NT	21.4	17.3	4.3	-
302 14 00	Obsidian	NT	12.0	12.3	3.2	-
26Ln1775						
800 11 00	Obsidian	PBN	22.7	14.0	3.0	-
1005 05 00	Obsidian	CWT	22.0	17.8	4.3	-
1006 04 00	Obsidian	NT	14.0	9.7	2.5	-
1100 18 03	Obsidian	NT	11.9	11.0	2.3	-
1300 12 00	Obsidian	ECN	17.0	19.8	3.5	1.4

NT = Not Typable
CWT = Cottonwood Triangular
PBN = Parowan Basal-notched
ECN = Elko Corner-notched
GCS = Gatecliff Contracting Stem

* not given for untypable point fragments.

Flaked Palette

Specimen 26Ln1775-100-20 (see Figure 6e) is unique. It is made on a rectangular (8 x 7 cm), thin (0.9 cm), tabular piece of laminated sandstone, similar to the material used for incised stones and metates. Both faces are grainy; one is relatively uneven, and the other is smooth. A band of fine-grained material is in the center of the piece. Both lateral edges have been flaked on the smooth face. The purpose of this flaking is not obvious, unless it was to check the quality of the finer material sandwiched between the outer, grainy layers.

Chapter 6. GROUNDSTONE ARTIFACTS
by Kenneth E. Juell

Groundstone implements were collected and/or observed at four Panaca Summit sites, including 26Ln1775, 26Ln3357, 26Ln3358, and site 68W-7/8. Relatively large assemblages are documented at sites 26Ln1775 (n=18) and 26Ln3357 (n=9), while only one groundstone implement was found at 26Ln3358. Inferred functions for groundstone tools include seed grinding, pigment reduction, and pottery burnishing. Site assemblages are presented separately, then discussed together at the end of the chapter. Morphological attributes and provenience for each implement are shown in Table 12.

Site 26Ln1775

Eighteen groundstone specimens were recorded at the site, including 12 metates, 1 mano, 4 palettes, and 1 burnisher; all implements except the mano were collected (see below). All specimens, with one exception, are made from rhyolite tuff or rhyolitic sandstone (redeposited tuffs) available locally. Most groundstone artifacts are unshaped and exhibit moderate to heavy use. Two tools are fire-altered, indicating their re-use as hearth or boiling stones.

Metates

The 12 metates from 26Ln1775 are classified as shaped and unshaped forms for purposes of description and discussion.

Shaped Metates

Four shaped metates were collected, all thick (1.7 - 5.9 cm) tabular implements made of rhyolitic sandstone. Cross-section shapes include two rectangular, one plano-convex, and one plano-concave. The one complete metate (26Ln1775-703-6) has a subrectangular plan outline. Three implements are unifacially ground, and one is bifacially ground. Three of five utilized grinding surfaces have slightly concave use-surface profiles, and two have planar surface-profiles. Three grinding surfaces, two concave and one planar, exhibit heavy use-wear; two surfaces, one concave and one planar, show moderate use. The two concave surfaces exhibiting heavy use were produced by intensive grinding, while the one concave surface with moderate wear was naturally concave prior to use. The three heavily used surfaces have been pecked by another

TABLE 12. PROVENIENCE AND ATTRIBUTES OF GROUNDSTONE ARTIFACTS.

Site No.	Reference Number	Type	Provenience	Level	Condition	Shaped?	Cross Section	Plan Outline	Use Facial Use	Surface Profile(s)	Use Wear	Fire Affected	Length (cm)	Width (cm)	Thickness (cm)	Mass (g)
26Ln1775	700-11	Me	Locus A, surface collection	0	F	N	SR	U	B	P,P	2,2	N	(10.0)*	(9.8)	1.6	251.9
	700-14	Me	Locus A, surface collection	0	F	N	PC	U	B	P,C	3,2	N	(27.1)	(13.6)	2.7	1069.8
	703-1	Me	Locus A, Test Unit 1	1	F	N	PC	U	U	C	1	N	(13.5)	(13.0)	1.8	578.3
	703-6	Me	Locus A, Test Unit 1	1	C	Y	SR	SR	B	C,C	3,2	N	32.5	23.0	2.4	2400
	900-9	Me	Locus M, Station 7	0	F	Y	P	U	U	P	2	Y	(3.6)	(3.1)	1.7	13.9
	950-1	Me	Locus M, Test Unit 3	1	F	N	PC	U	U	C	2	N	(11.7)	(6.4)	2.5	230.7
	950-4	Me	Locus M, Test Unit 3	1	F	N	PC	U	U	C	2	N	(8.2)	(3.8)	2.7	109.9
	950-5	Me	Locus M, Test Unit 3	1	F	N	PC	U	U	C	2	N	(4.0)	(3.4)	3.3	76.0
	1100-15	Me	Locus M, surface Collection	0	F	Y	SR	U	U	P	3	N	(17.5)	(13.8)	5.9	1346.2
	1200-6	Me	Locus E, surface Collection	0	F	N	SR	U	U	P	3	N	(7.8)	(3.9)	2.1	86.5
	1300-7	Me	Station 1, surface Collection	0	F	N	R	U	B	P,P	2,2	N	(11.5)	(5.2)	2.9	273.7
	1400-6	Me	Locus K, surface Collection	0	F	Y	PC	U	U	C	3	N	(13.7)	(6.5)	2.2	323.1
	#1	Ma	Locus E, vandalized	0	C	Y	SR	O	B	P,P	3,2	N	13.5	10.1	3.6	-
	950-3	P	Locus M, Test Unit 3	1	C	Y	R	T	U	P	1	Y	6.9	6.0	0.8	40.2
	1100-16	P	Locus M, Test Unit 3	1	F	N	R	U	U	P	1	N	(7.9)	(4.7)	0.7	37.2
	1300-13-2	P	Station 1, surface Collection	0	C	N	R	T	U	P	1	N	6.7	3.8	1.0	40.7
	1500-8-1	P	Locus B, surface Collection	0	C	N	R	SR	U	P	2	N	9.9	8.6	1.4	236.7
	1300-14-1	B	Station 1, surface Collection	0	C	N	R	SR	U	P	2	N	4.6	3.3	0.6	12.3
26Ln3357	#1	Me	See Map	0	C	N	SR	SR	U	C	2	N	40	28	20	-
	#2	Me	See Map	0	C	N	SR	S	U	C	1	N	36	36	14	-
	#3	Me	See Map	0	F	N	SR	U	U	P	1	N	(21)	(10)	(7)	-
	#4	Me	See Map	0	F	N	SR	U	U	P	2	N	(17)	(13)	(11)	-
	#5	Me	See Map	0	C	N	SR	PT	U	P	1	N	32	22	16	-
	#6	Me	See Map	0	F	N	R	U	U	P	1	N	(19)	(19)	7	-
	#7	Me	See Map	0	C	N	SR	SR	U	C	1	N	40	19	10	-
26Ln3358	500-4	Ma	See Map	0	C	Y	P	SR	B	V,I	3,2	N	12.5	8.6	5.0	954.0
63W-7/8	#1	Ma	None	0	C	Y	SR	SR	U	V	3	N	21.9	6.0	5.9	1262.0

KEY:

Type
- Me = Metate
- Ma = Mano
- B = Burnisher
- P = Palette

Condition
- C = Complete
- F = Fragment

Shaped?/Fire Affected
- N = No
- Y = Yes

Shape in Cross-Section, Plan Outline
- O = Ovoid
- P = Plano-convex
- PC = Plano-concave
- PT = Pentagonal
- R = Rectangular
- S = Square
- SR = Subrectangular
- T = Trapezoidal
- U = Indeterminate

Facial Use
- B = Bifacial
- U = Unifacial

Profile of Use Surfaces
- C = Concave
- I = Irregular
- P = Planar
- V = Convex

Degree of Use Wear

1 = Light use, polish present on approximately one-half of surface area
2 = Moderate use, ground facet developed, polish present over entire surface
3 = Heavy use, slight trough developed, pecked to resharpen surface

*Incomplete dimensions in parentheses

Mass
- – = Not Recovered

stone, probably to increase abrasive quality (i.e., resharpening; see Dodd 1979). One metate fragment (26Ln1775-900-9) is fire-cracked and burned.

Metates were shaped using one of three methods: the periphery (sides) and edge of the grinding surface were pecked by another stone: the periphery was pecked, then smoothed by grinding with another stone: or the periphery was percussion flaked. Two metates (26Ln1775-703-6, 26Ln1775-1400-6) were shaped by method 1. On specimen 26Ln1775-703-6, pecking depressions occur around the periphery and extend inward from the edge 4.2 cm to 6.2 cm, where they have been obliterated by the grinding facet. Pecking produced a rounded periphery and flattened surfaces around the edge of the grinding facet. On specimen 26Ln1775-1400-6, pecking depressions occur on the extant periphery and extend inward from the edge 6.1 cm, where they have been obliterated by the grinding facet; the produced shape is similar to specimen 26Ln1775-703-6.

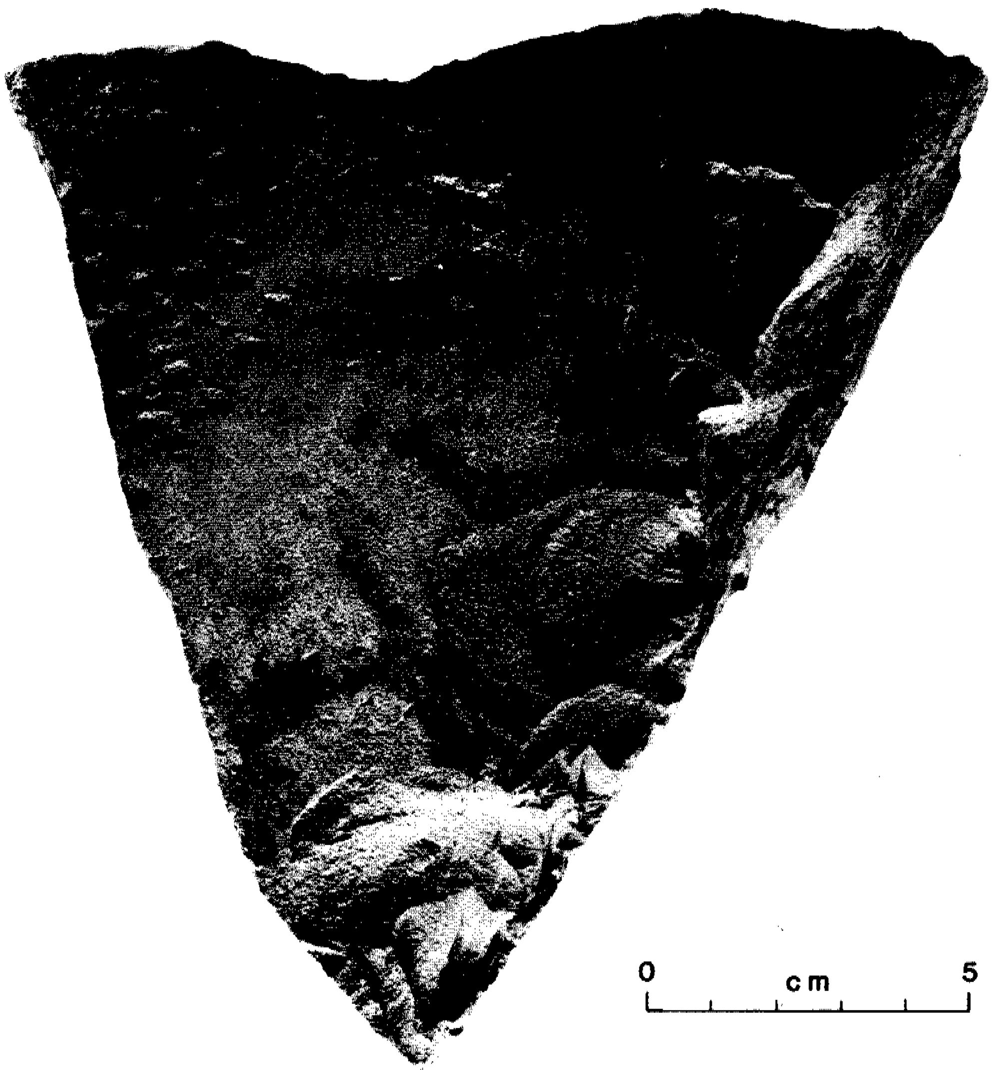
Specimen 26Ln1775-900-9 was shaped using method 2. The periphery was pecked by another stone, then ground smooth. Shallow pecking depressions are still visible along the extant periphery. The finished periphery has an abrupt-angle change (90 degrees) on the top edge, and the bottom edge is rounded. Specimen 26Ln1775-1100-15 (Figure 13) was shaped using method 3. The piece is a metate corner fragment, shaped by percussion flaking, with negative flake scars present on the extant periphery. A similar technique was used to shape several metates at Gatecliff Shelter (Kramer and Thomas 1983:231).

Unshaped Metates

Eight metate fragments, represent six unshaped metates. Three fragments (26Ln1775-950-1-4-5) are from one tool. Described separately in Table 12, they are considered as one implement in the present discussion. With one exception (26Ln1775-700-14), all metates are made of rhyolitic tuff or rhyolitic sandstone (redeposited tuff) acquired locally. Selected cross sections of the naturally tabular implements include three plano-concave (50.0%), two subrectangular (33.3%), and one rectangular (16.7%); all are fragments possessing an extant periphery but indeterminate plan outlines.

Three metates are unifacially ground and three are bifacially ground. Of nine utilized grinding surfaces, six (66.7%) have planar use-surface profiles and three (33.3%) have slightly concave surface profiles. Seven surfaces

Figure 13. Tabular metate fragment; shaped by flaking.


0
cm
5

(77.8%) exhibit moderate use, and two (22.2%) show heavy use-wear. One slightly concave grinding surface (26Ln1775-700-14) exhibits heavy use-wear, indicating the profile shape was produced by intensive grinding. Otherwise, use-surface shapes reflect profiles selected from locally available natural cobbles. Relatively thin (1.6 - 3.3 cm) tabular slabs with one or two flat to slightly concave surfaces were selected as metate blanks.

One unshaped metate fragment is particularly noteworthy. Specimen 26Ln1775-700-14 is made from a light gray intrusive volcanic rock that has large (0.5 to 3.5 mm diameter) blue-green crystals present in the matrix. Intrusive volcanic rocks are rare in the Cedar Range and apparently absent from the Panaca Summit area, suggesting the artifact was imported. The nearest surface-mapped exposure of intrusive rocks is a Tertiary-age diorite deposit near Little and Blue mountains, 16 km (10 mi) south-southwest of 26Ln1775 (Tschanz and Pampeyan 1970:Plate 2). The implement is bifacially ground, with one surface exhibiting heavy use. The surface was pecked to increase abrasive quality (Dodd 1979), indicating intensive use that relates to tool curation.

Shaped Mano

One complete mano was recorded at 26Ln1775 during an earlier survey (see Stornetta 1987). Descriptive attributes are taken from field notes, artifact illustrations, and a photograph of the implement. The mano has a subrectangular cross section and an ovoid plan outline. The periphery was shaped by pecking with another stone, producing two slightly out-curved sides with rounded ends. The mano was bifacially ground, with two planar use-surface profiles. One surface exhibited heavy use, and the other moderate use. A shallow, oval pit pecked in the center of the heavily used surface suggests it was used as an anvil, perhaps for cracking nuts or for use in lithic reduction. Elaborate shaping and extended use indicate the implement was curated equipment.

Palettes

Four small, thin (0.7 to 1.4 cm) grinding slabs, or palettes, were collected at 26Ln1775 (Figure 14a-b). Three are complete implements and one is fragmentary. All four have rectangular cross sections, and plan outlines include two trapezoids, one subrectangle, and one indeterminate shape (due to fragmentation). Three are unshaped, and one apparently is

Figure 14. a, b. Sandstone palettes. c. Smoothed stone

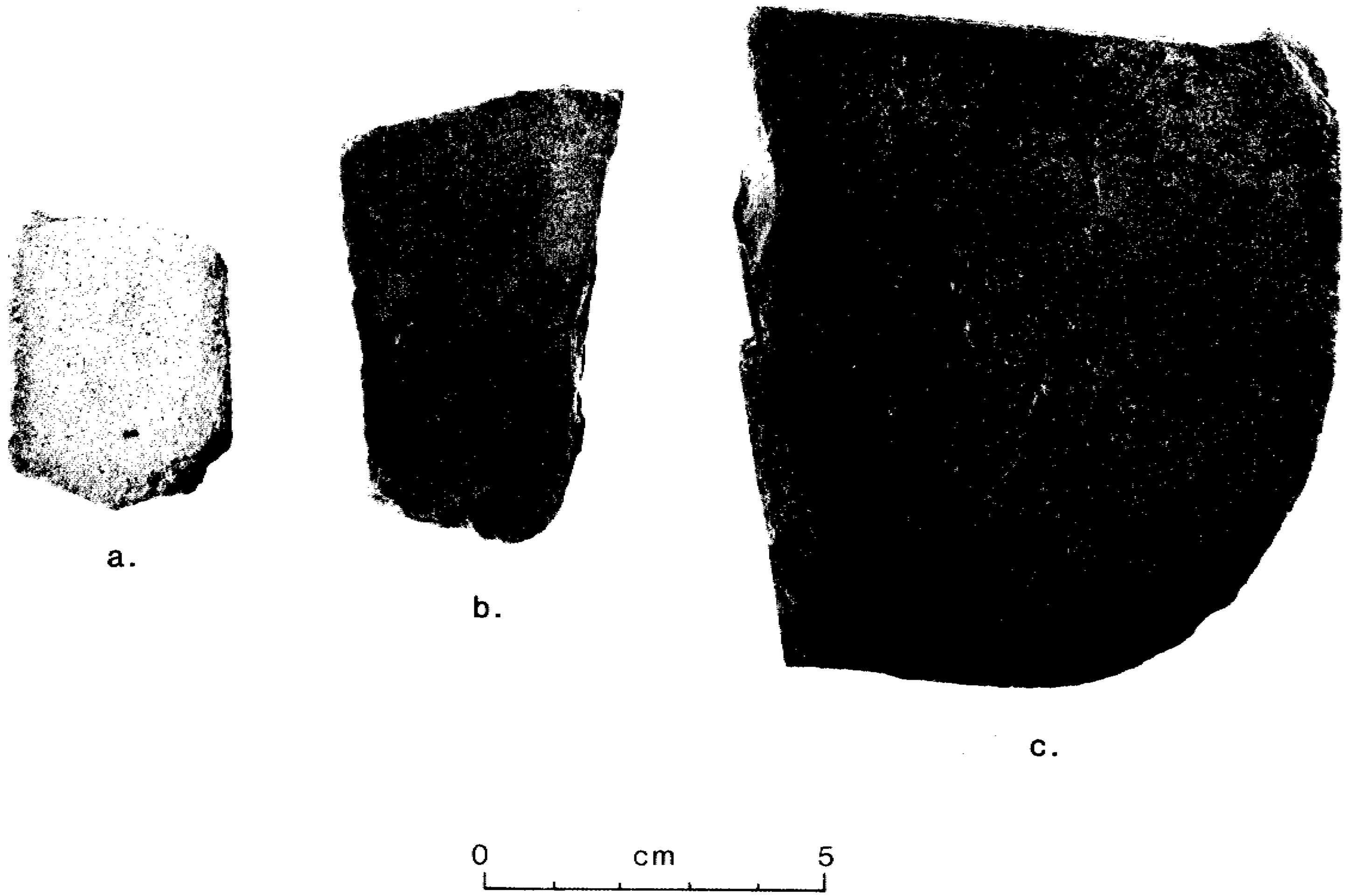
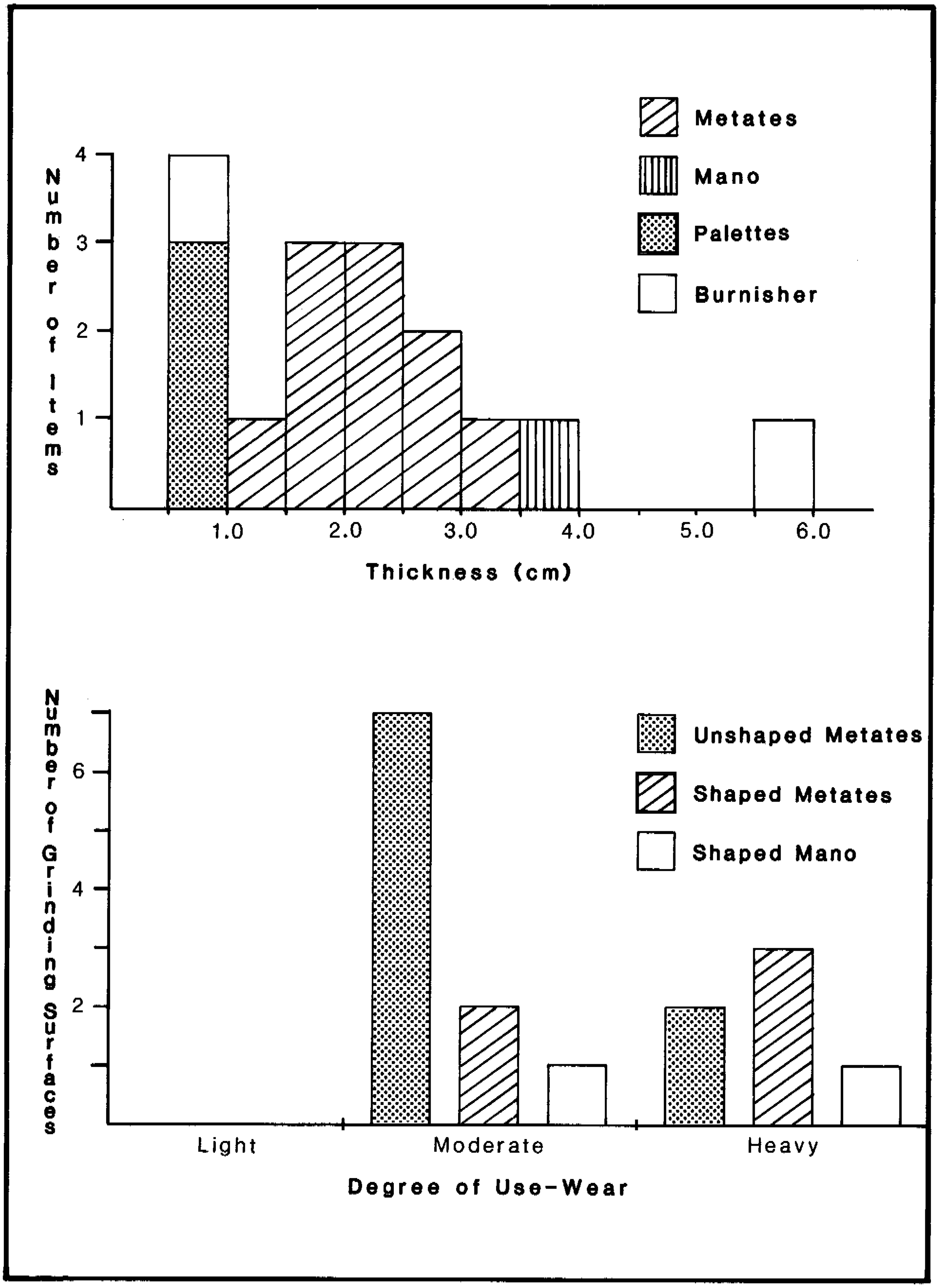

a.
b.
c.
0 cm 5

Figure 15 (upper). Groundstone thickness by type (26Ln1775).

Figure 16 (lower). Use intensity by groundstone type (26Ln1775).


Metates
Mano
Palettes
Burnisher
Number of Items
4
3
2
1
1.0
2.0
3.0
4.0
5.0
6.0
Thickness (cm)
Unshaped Metates
Shaped Metates
Shaped Mano
Number of Grinding Surfaces
6
4
2
Light
Moderate
Heavy
Degree of Use-Wear

tuffaceous sandstone. The observation that all grinding stones at the site are tabular forms may be only a reflection of local toolstone availability, since natural tabular rocks abound in the immediate site vicinity. On the other hand, the prevalence of lightweight, tabular metates may indicate that potential transport was an important consideration for site inhabitants.

The only mano found at the site was elaborately shaped and heavily used, indicating a high degree of tool curation. Moreover, the ratios of broken versus complete metates (9:1), and of metates and palettes to manos (14:1) seemed high. This suggests that intact metates and manos were transported away from the site when it was abandoned.

Seed processing was an important activity at the site, as indicated by the high intensity of grinding stone use (Figure 16). Most grinding surfaces (n=10, 62.5%) have a developed grinding facet indicative of moderate use, and the remainder (n=6, 37.5%) have heavily used facets that have been resharpened. Shaped metates exhibit a greater degree of use than unshaped metates, an index of tool curation.

Site 26Ln3357

Nine metates were observed at site 26Ln3357; seven metates were described and photographed during site testing; none was collected. All seven metates are large, unshaped rhyolitic tuff boulders which were acquired locally. Four metates are complete, and three (42.9%) are fragmentary. Selected natural cross-section shapes include subrectangular (n=6) and rectangular (n=1), with the distinction relating to rounded versus squared corners. Plan outline shapes are slightly more diverse, with two rectangular, one square, and one pentagonal; three fragments have indeterminate outlines.

All seven metates are unifacially ground. Five (71.4%) exhibit only light use-wear, while two (28.6%) show moderate use. Four (57.1%) have planar use-surface profiles, while three (42.9%) have slightly concave use-surfaces. Cross-section shape, thickness, and degree of use-wear indicate that thick (7 to 20 cm), subrectangular boulders with one relatively flat to slightly concave surface were selected for use as metates.

Boulder metates generally are regarded as non-portable (see Elston 1971), suggesting that the transport potential of metates was not an important consideration to inhabitants of site 26Ln3357. On the other hand, a complete lack of manos at the site may indicate that handstones were curated. The intensity of use wear on grinding stones at the site (Figure 17), suggests that either seed processing was not a major site activity, or it was important but site occupation was brief.

Site 26Ln3358

One complete mano (26Ln3358-500-4) was collected at the site. The implement has a plano-convex cross section and a subrectangular plan outline. The periphery was shaped by pecking, producing four slightly convex edges with abrupt corner angles (Figure 18a). The mano is bifacially ground, with one heavily used, rocker-shaped use surface profile, and one moderately used, irregularly planar use-surface. The latter is generally flat, but has an elevated portion in one corner; the elevated surface has a heavily used grinding facet.

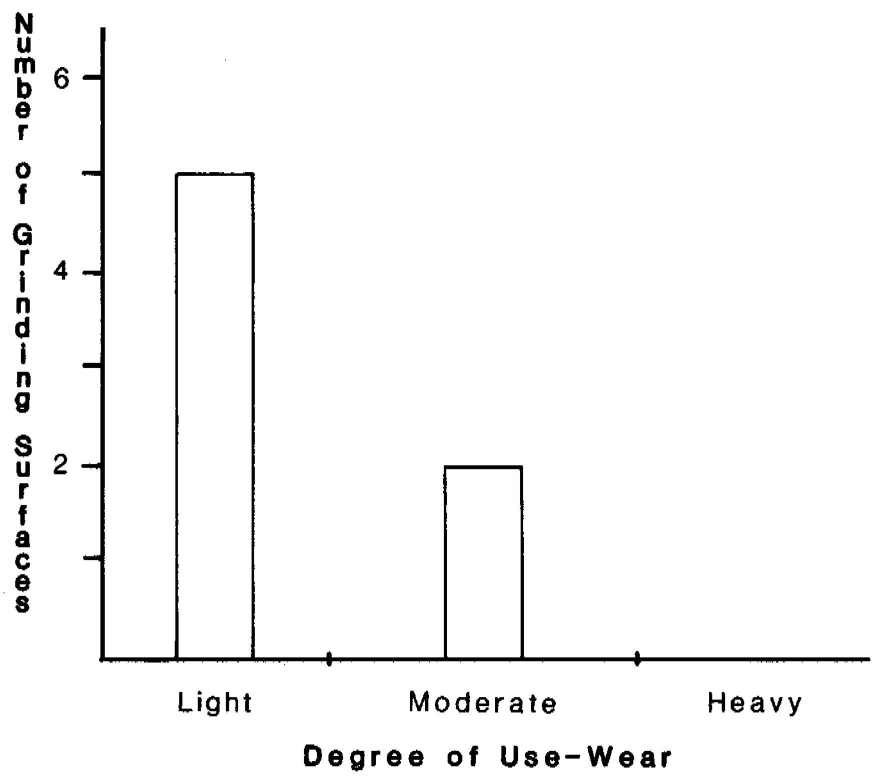
Elaborate shaping and heavy-use indicates curation of the implement. The mano is made of coarse-grained quartz sandstone, a material unknown in lithologic deposits of the Cedar Range and in the surrounding region of present-day Lincoln County (Tschanz and Pampeyan 1970:Plate 2).

It is interesting to note that quartz sandstone grinding stones occur widely at Parowan Valley Fremont villages in southwestern Utah. Quartz sandstone comprises 53% of the groundstone collection at Evans Mound (Dodd 1982:72) and is also present at nearby Median Village (Marwitt 1970:90).

Site 68W-7/8

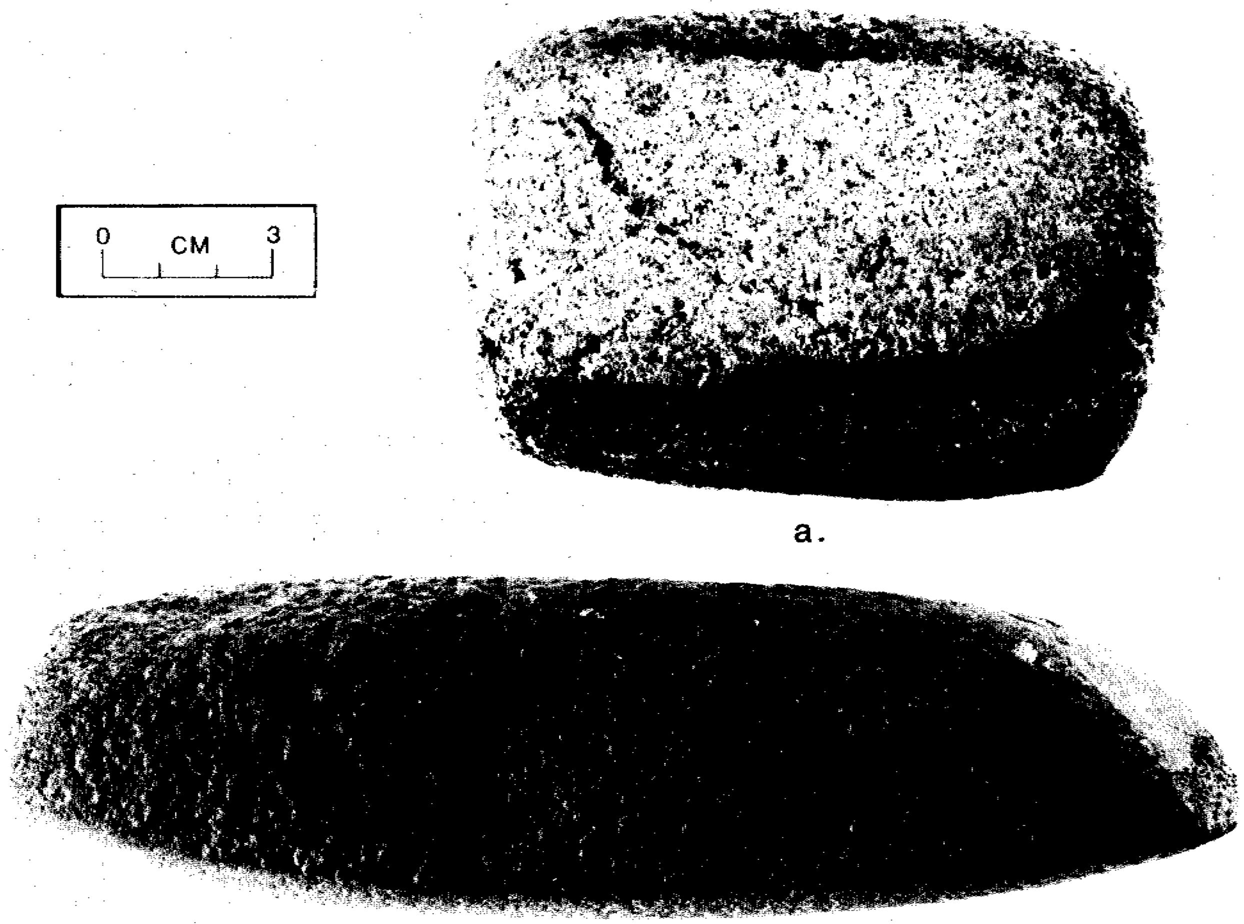
Finally, one complete, elongated mano (Figure 18b) was collected from Site 68W-7/8 during an earlier survey (see Stornetta 1987). The implement, made of rhyolitic tuffaceous sandstone, is elaborately shaped and unifacially ground. The three unground sides were pecked intensively to produce two relatively flat longitudinal sides and a slightly convex top surface. The grinding facet exhibits heavy use-wear and has a convex use-surface profile both parallel and perpendicular to the long-axis of the implement; profile shape indicates the mano was used with a trough or basin-shaped metate. Pecked depressions are also present on the grinding surface, either to shape the stone preform or to resharpen the surface. One end of the mano is lightly battered.

Figure 17. Use intensity of metates (26Ln3357).



Number of Grinding Surfaces
6
4
2
Light
Moderate
Heavy
Degree of Use-Wear

Figure 18. Manos. a. Subrectangular quartz sandstone mano; b. Elongated mano.



a.

b.

One longitudinal edge shoulder of the grinding surface is slightly beveled. The wear pattern is inferred to have resulted from greater pressure applied on the trailing edge by the heel of the hand. The mano is, therefore, considered a two-handed implement, used in a back-and-forth motion perpendicular to the tool's long axis. Intensive shaping suggests tool curation.

Conclusions

Twenty-nine groundstone implements from four Panaca Summit sites were studied. The 26Ln1775 groundstone assemblage is largest (n=18) and exhibits the greatest diversity with metates (n=12), palettes (n=4), a mano, and a possible burnishing stone. Site 26Ln3357 yielded only metates (n=9), and sites 26Ln3358 and 68W-7/8 yielded one mano each.

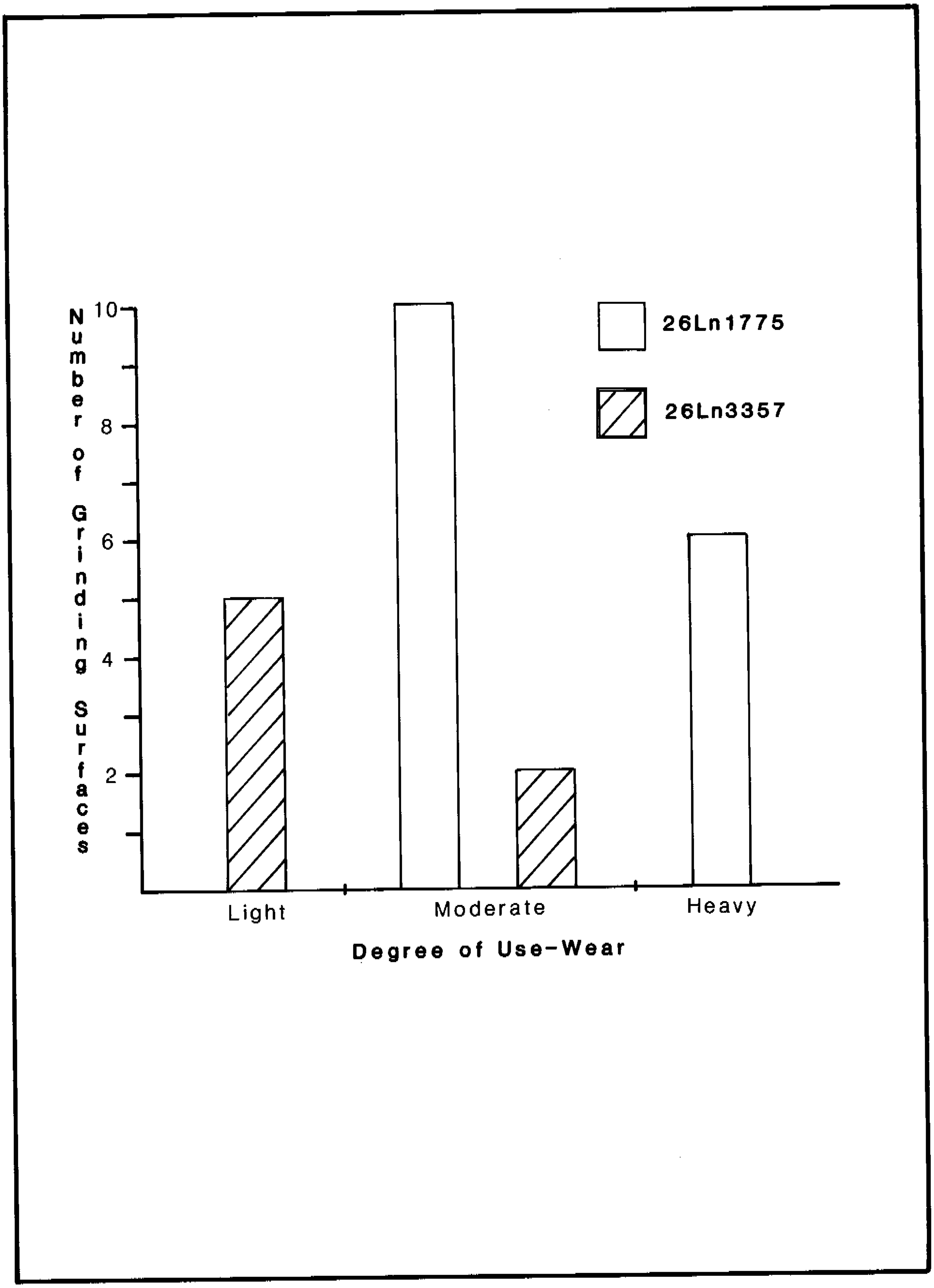
Most (n=27, 93.1%) groundstone tools are made of rhyolitic tuff or rhyolitic tuffaceous sandstone acquired locally. Two implements (6.9%) made from "exotic" stone that does not occur in the study region are believed to have been transported from other areas.

The contrast in metate forms between sites 26Ln1775 and 26Ln3357 is worth noting. At 26Ln1775, all 10 implements represented are tabular forms. But at site 26Ln3357, all nine metates are boulder forms. While the contrasting forms may relate to the relative mobility of groups occupying these sites, it is also possible they may be nothing more than a reflection of local toolstone availability.

Use-wear indices were used to evaluate the relative significance of seed processing activity at sites 26Ln1775 and 26Ln3357 (Figure 19). The majority (62.5%) of grinding surfaces (metate and mano) at 26Ln1775 exhibited moderate use, while the remainder showed heavy use (37.5%); no lightly used surfaces were present. Grinding surfaces at 26Ln3357 exhibited relatively less use-wear, with the majority (71.4%) showing light use and the remainder having moderate use (28.6%). These distributions point to an emphasis on seed processing at 26Ln1775. One or a combination of two factors may explain the differing distributions: reliance on seed resources was greater at 26Ln1775 than at 26Ln3357, and/or duration of occupation was longer at 26Ln1775 than at 26Ln3357.

Manos and metates were used intensively at site 26Ln1775 and, with one exception, only broken metates were abandoned there. Transport of manos and metates thus seems to have been

Figure 19. Use intensity of seed grinding equipment, sites 26Ln1775 and 26Ln3357.


Number of Grinding Surfaces
10
8
6
4
2
26Ln1775
26Ln3357
Light
Moderate
Heavy
Degree of Use-Wear

an important concern to Fremont inhabitants at 26Ln1775, and may relate to a high residential mobility in the settlement/subsistence round. While this does fit with the classification of 26Ln1775 as a residential site (see Chapter 10), the concern with groundstone portability may be related to other aspects of the seasonal round.

The general paucity of manos in the study area, and the elaborate attention to details of shaping and maintaining paid to those observed, supports the hypothesis of grinding stone transport and curation. The Panaca Summit area has a high prehistoric site density, however, and manos may have been scavenged from older sites by later prehistoric inhabitants (see Simms 1985) or by contemporary collectors.

Chapter 7. INCISED TABLETS AND POLISHED STONES
by Elizabeth E. Budy

Thirteen artifacts, representing two incised, polished stones, portions of eight incised stone tablets, and a carved stone pipe were recovered from the Panaca Summit sites. All but two were found at site 26Ln1775.

Incised stones have a widespread distribution and great antiquity in both the Old and New worlds (Schuster 1968). In the Great Basin, incised tablets have been recovered from numerous rockshelter sites, often in large numbers; they date from at least 3300 B.C. (at Gatecliff Shelter) and may continue into the protohistoric period (T. Thomas 1983a; Tuohy 1967; Perkins 1967). Sizeable collections are reported from Hogup Cave (Aikens 1970:79-84), Swallow Shelter (Dalley 1976:46-48), Promontory Caves (Steward 1937), Cowboy Cave (Hull and White 1980:120-121), and Gatecliff Shelter (T. Thomas 1983a:246-278); and a few specimens were found at Etna Cave (Wheeler 1973:37), Gypsum Cave (Harrington 1933:139-140), and Lovelock Cave (Loud and Harrington 1929:108). A great many incised stones from open sites in southern Nevada appear in amateur collections (Santini 1974; Perkins 1967), but they rarely are reported from systematic excavations of open sites (see Bunch 1986:Plate 6, as an exception). The eleven fragments from site 26Ln1775 are unusual in this regard. They were recovered by controlled excavation of an open surface site in a pinyon-juniper woodland; moreover, the stones were associated with Fremont ceramics.

Attributes of Incised Stones

The incised tablets from Panaca Summit are made from small, thin (< 0.78 cm) pieces of fine-grained, native sandstone (Table 13). Several specimens are fragments of somewhat larger tablets, but projections along unbroken edges indicate most specimens are close to original size at the time they were incised. All but one stone can be enclosed easily within the palm of the hand.

Table 13. Attributes of Incised Stones

Specimen No.	Max Length	Max Width	Max Th	Wt gm	No. Incised Surfaces	No. Tool Tracks
26Ln3358-500-5	(6.86)	(4.43)	0.47	14.3	1	1
*26Ln1775-700-1/4	11.10	7.47	0.61	78.0	2	1
26Ln1775-700-2	5.12	1.51	0.58	8.4	2	0
26Ln1775-700-7	(4.82)	3.89	0.51	13.7	1	1
26Ln1775-703-7	(3.20)	4.12	0.38	7.3	1	1
26Ln1775-900-11	6.72	4.26	0.41	22.1	1	2
26Ln1775-903-3	3.81	1.80	0.61	4.5	1	1
26Ln1775-1100-2	(5.84)	4.43	0.42	13.6	1	2
*26Ln1775-1100-7/11	(12.59)	(10.49)	0.72	98.4	1	2
26Ln1775-1200-3	(6.32)	2.94	0.78	21.4	1	2

* measurements represent two reconstructed fragments

(measurements in parentheses are on incomplete dimensions.)

The incisions were made on naturally tabular pieces with flat surfaces; however, many surfaces, though flat, are far from smooth. Natural irregularities, such as water-worn ridges and depressions where thin layers of surface laminae have chipped off, were largely ignored by the carvers; more often than not, designs simply were incised over rough spots. However, the surface of at least one stone tablet (specimen 26Ln1775-1200-3) was intentionally smoothed.

The stones are generally light in color (yellowish-tan to pinkish-grey), and incisions on the small tablets are thin and shallow, providing little contrast to the light background. This suggests that, for many stones, obscurity was intentional. On the other hand, the distinctive, elaborately carved, large specimen (26Ln1775-1100-7/11) is deeply (and prominently) incised.

In addition to the unshaped tablets, two small polished stones also were incised, albeit minimally. Included in the collection is a carved stone pipe. No other incised items were recovered from the Panaca Summit sites.

Stylistic Attributes

The description of stylistic attributes uses terms as defined by T. Thomas (1983a:252). The incised line is the basic unit of marking, usually straight, more rarely curved. Elements are the simplest units of design construction, formed by combining one or more straight or curved lines. Motifs are configurations formed by combining elements in characteristic ways.

Design elements on the small tablets consist of simple incised lines with little elaboration of arrangement. Compositions are built up of single lines with simple convergences or intersections, parallel line pairs, or rows of short lines. Several pieces have a primary bisecting element which dominates the design. Simple arrangements of incised lines (and primary bisecting elements) are the most commonly reported motifs on incised stones from the central Great Basin (T. Thomas 1983c), and are characteristic of all periods represented at Gatecliff Shelter (T. Thomas 1983a). Similar abstract patterns are common as petroglyph designs, falling within Heizer and Baumhoff's (1962) widespread Great Basin Abstract Rectilinear tradition.

Only one stone (in two fragments) was bifacially incised. One surface is covered with an elaborate crosshatch pattern. The other consists of a simpler series of deeply carved "baselines," suggesting it may have been discarded before completion. The crosshatch pattern is a common motif on portable incised stones (cf. T. Thomas 1983a:264-265; Santini 1974:10-11), as well as on non-portable rock art (cf. Heizer and Baumhoff 1962:Plates 17, 18); it is included within the Great Basin Abstract Rectilinear tradition.

The design on one stone, (specimen 26Ln1775-1100-7/11), is distinct from others in the collection. Though built up primarily with simple incised lines, the pattern consists of a series of carefully repeated motifs enclosed within a formally organized compositional space. No analogs have been found for this unique specimen, but the complexity of design, if not the pattern per se, is strongly reminiscent of Fremont ceramic designs.

Technological Attributes

The incised stones were examined microscopically for wear patterns (differential rounding and polish), order of incision (superposition of elements), and variability in tool track width, depth, and cross section.

Microscopic observation of tool tracks on stones from Gatecliff Shelter distinguished the different tools used and the build-up of design elements over time (T. Thomas 1983c:338-339). Differences among tool tracks were conspicuous on several specimens from Panaca Summit, but few differences in wear patterns among elements were detected (see Table 15). Unlike many Gatecliff specimens, each of the stones from Panaca Summit apparently was made during a single incising episode (with one possible exception). This seems true even of the elaborately carved tablet (specimen 26Ln1775-1100-7/11).

Microscopic observations of tool tracks were verified by a simple, expedient method using clay impressions. The incised surface was pressed gently into soft modeling clay which is sensitive to the most subtle differences in stone texture, and which clearly reveals the shape of all but the shallowest tool tracks (caution must be used so that portions of the incised surface are not removed by the clay). Tool track variation (i.e., depth, width, and cross section shape) was rendered visible and easily compared. The clay impression also reveals the order in which overlapping elements were incised. Variation in the amount of pressure exerted on the incising tool, i.e., the relative depth of an incision along a line element, was also observed in the clay impressions. Frequently, lines are cut more deeply along one edge of the stone (at the point of initiation), but pressure is reduced where the line is discontinued and appears to "trail off" near the termination point. From these observations, it was possible to infer the direction of stroke and the order of incising elements.

Incised Stone Tablets

Artifact orientation references (e.g., right, left, top, bottom, vertical, horizontal) parallel artifact orientation in the illustrations accompanying this narrative. The orientation references are arbitrary, since there is no way to determine the true design orientation in any absolute sense. The only clear directional indicators are inferred from the pressure of the cutting stroke, but, as described below, incisions were initiated from all available edges (the stone likely was turned several times to orient it to the cutting tool).

Specimen 26Ln3358-500-5 is made on a small, wedge-shaped piece of medium brown, fine-grained sandstone. The top, left, and right margins are broken, but only the break at the top clearly interrupts the design. The piece is estimated to be about two-thirds complete.

The design is simple, but reflects a balanced pattern and systematic method of construction. The design was built up with an initial series of three, evenly spaced, parallel horizontal lines which then were cut by a primary vertical bisection (Figure 20a). The vertical bisection was used, in turn, as a baseline for an angled row of short parallel lines filling the space on the right; and a lightly inscribed intersection was added to the space on the left (Figure 20b). There is no apparent tool track variation; all incisions were made with a thin, V-shaped tool edge. Though the natural stone is of a medium range brown color, the shallow incisions do not penetrate the patinated surface layer and so the design is inconspicuous.

Specimen 26Ln1775-1100-2 is a very pale whitish-yellow, fine-grained sandstone tablet. The lower half of the stone is complete, but portions of the top appear to have been broken recently. None of the design elements is interrupted by the breaks; the arrangement and composition of elements suggest the stone is nearly complete.

The formal arrangement of parallel elements and central bisection are similar to those described above for specimen 26Ln3358-500-5; however, the stones were found at two sites ca. 1.5 km apart. Perhaps they were made by the same craftsman.

The initial design elements consist of a row of closely spaced, angled horizontal lines which were incised with a relatively wide, bifurcated tool edge (Figure 21a). The primary vertical bisecting line was incised over the horizontal row using a thin, sharp V-shaped tool edge (Figure 21b). An intersecting element then was incised at an opposing angle over the vertical line, apparently using the same V-shaped tool edge (Figure 21c). The shallow incisions on the light colored surface make this design nearly invisible, except at rather close range.

Specimen 26Ln1775-700-7 is the smallest of the nearly complete incised tablets. It was made on a light tan, fine-grained sandstone whose margins are outlined by a natural, dark iron oxide stain. The surface is quite irregular, with natural ridges most prominent near the unmarked left edge. Small sections on the right and left edges are broken, and several incised elements, centered near the right edge, were interrupted by the break.

Figure 20. Order of incised line elements on specimen 26Ln3358-500-5. a. Three horizontal lines were incised before the vertical bisecting line; b. The vertical bisection was used as a baseline for the angled row on the right of the piece.

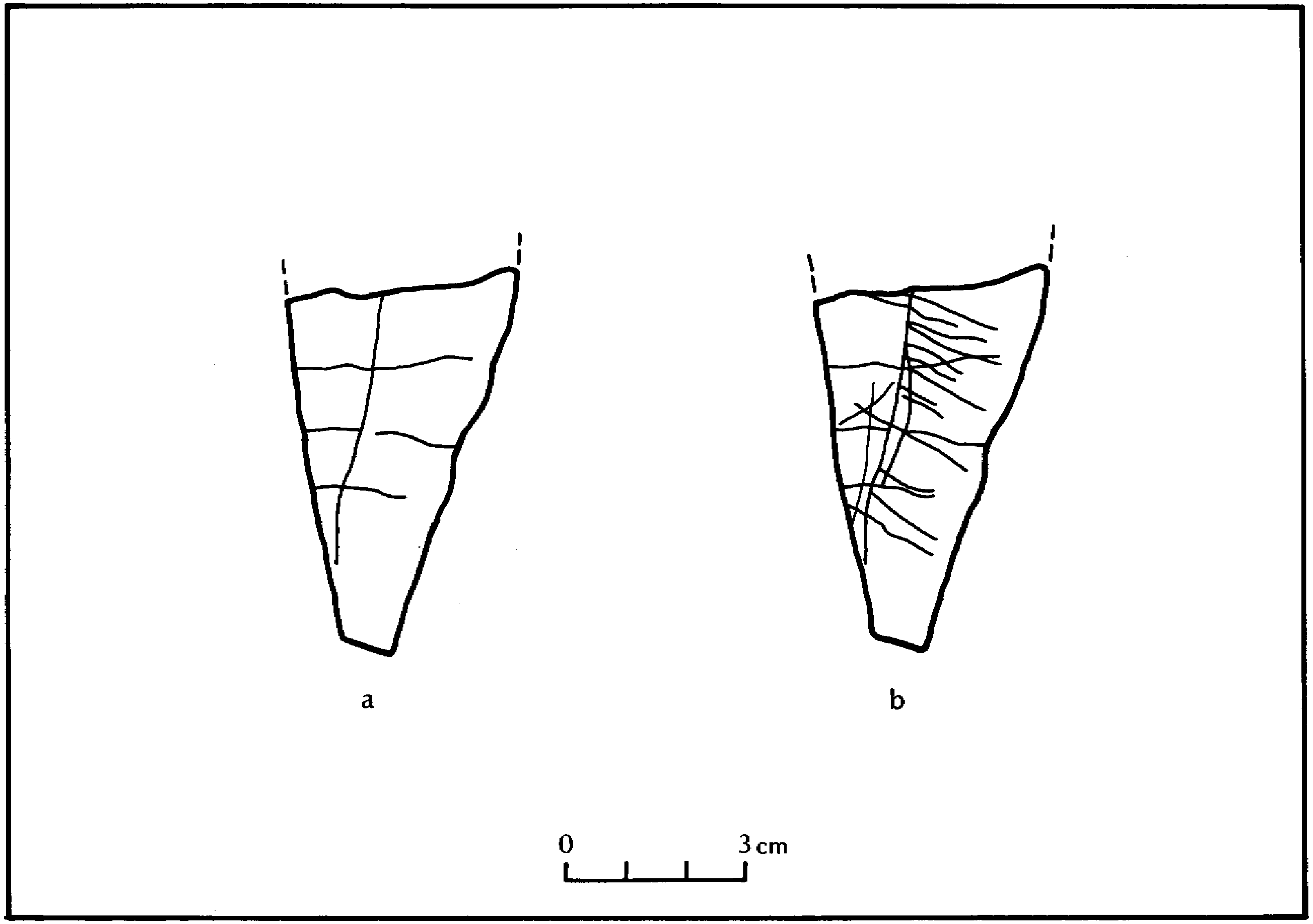
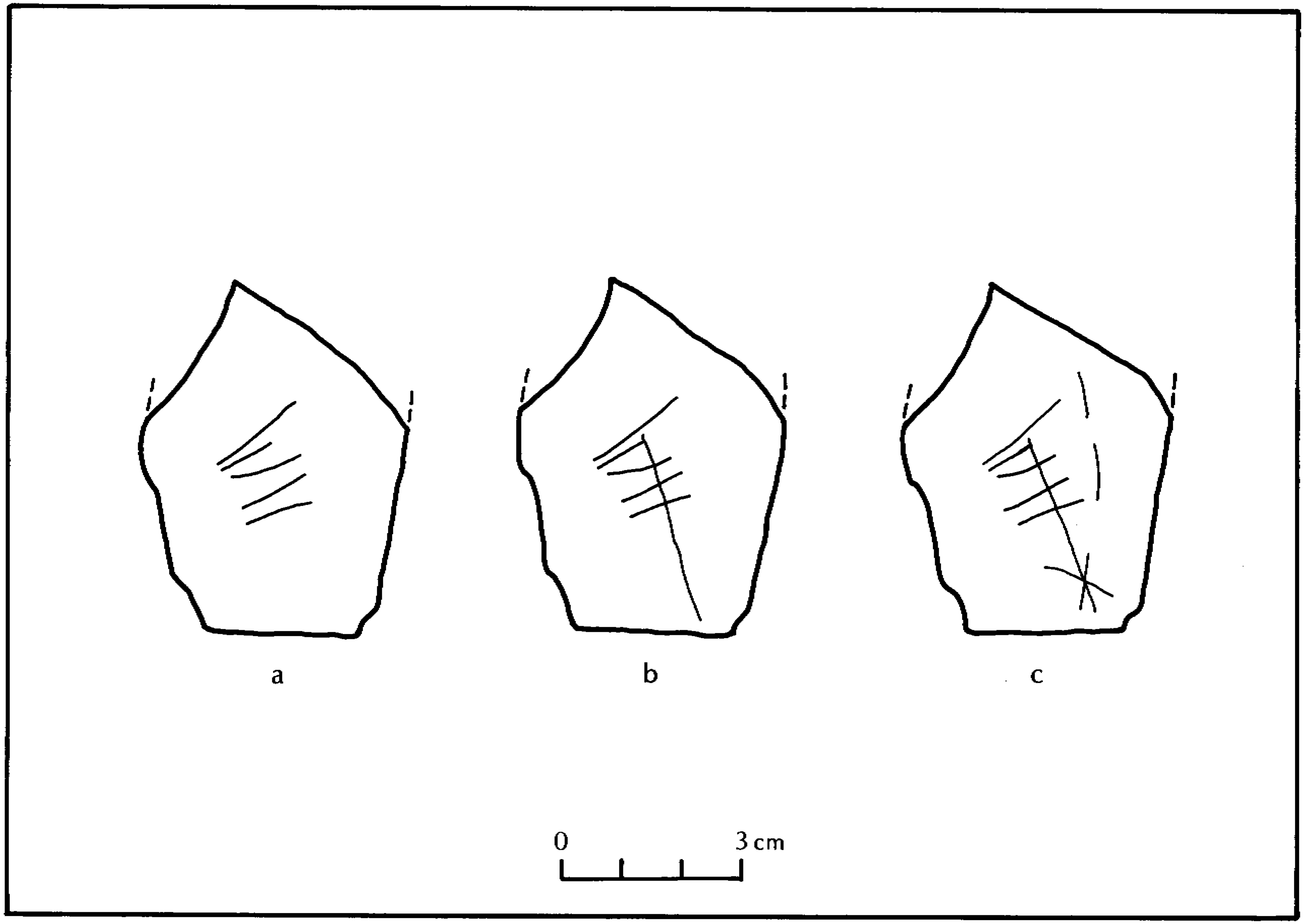


Figure 21. Order of incised line elements on specimen 26Ln1775-1100-2. a. An initial row of horizontal lines was cut with a bifurcated tool edge; b. then, vertical bisecting line was cut with a V-shaped tool edge; and c. final lines were added with V-shaped tool edge.


a
b
c
0
3 cm

All incisions were made with a sharp, V-shaped tool edge, which produced fairly deep, but very thin incisions. The design is the most nearly invisible of any in the collection. There is conspicuous variation in depth of incision; central horizontal elements are deep and sharp on the right side of the piece, but continue across center as faint, shallow lines. The direction of these cuts is inferred to be from the right, originating beyond the point of break.

The design was built up with a series of parallel line pairs, most of which are truncated by the right side break. The order of superposition of intersecting lines indicates that a roughly parallel line pair near the top was incised first (Figure 22a), followed by a third line at the top, made more nearly parallel with the lower pair element (Figure 22b). These then were intersected by two narrowly spaced parallel line pairs (Figure 22c); and two lines near the bottom were added before the vertical line was cut (Figure 22d).

Specimen 26Ln1775-1200-3 is a medial fragment of a narrow, formerly longer, tablet made on a medium to fine grained, pinkish-brown sandstone. The somewhat coarse texture of this stone may account for the evident surface preparation between incising elements. The top central portion of the stone is quite smooth, in contrast to the lower edges, and high spots across the surface have flat, polished facets. The surface also has numerous pits and gouges, all very irregular in width and uneven in cross section, seemingly a consequence of abrasion (or coarse particle removal) during surface preparation.

Several incised lines were made before the surface was smoothed, and the edges of these incisions are quite rounded and "worn". These consist of two converging line sets near the bottom right and a short parallel pair near the top left; all evidence deep, fairly wide tool tracks (Figure 23a). A single, thin line was added (with a different tool edge) to the converging elements after the surface was prepared (Figure 23b).

The left and right sides of the stone were broken recently, interrupting the cluster of grooves and pits on the left and the series of incised lines on the right. Consequently, a significant portion of the design may be missing.

Specimen 26Ln1775-703-7 is a fragment that represents a portion of a larger piece; rough, sharp edges along the right margin define the angle of the break. The left edge is

Figure 22. Order of Incised line elements on specimen 26Ln1775-700-7. a. Initial parallel line pair is cut; b. top line drawn over as if to make it more parallel; c. narrowly spaced parallel line pairs are added; d. finally, vertical intersecting element is superimposed over horizontal series (shaded area indicates recessed break in surface).

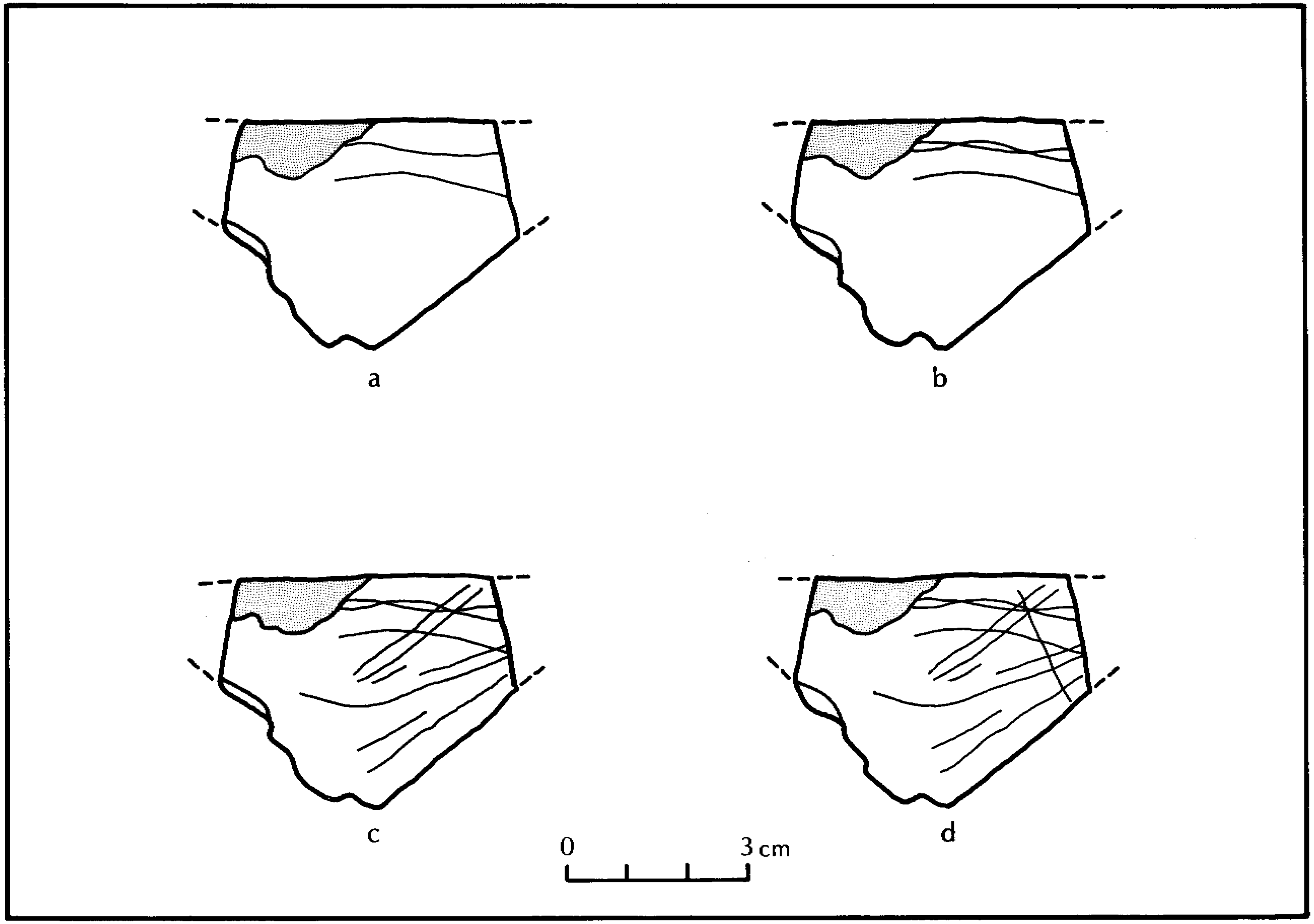
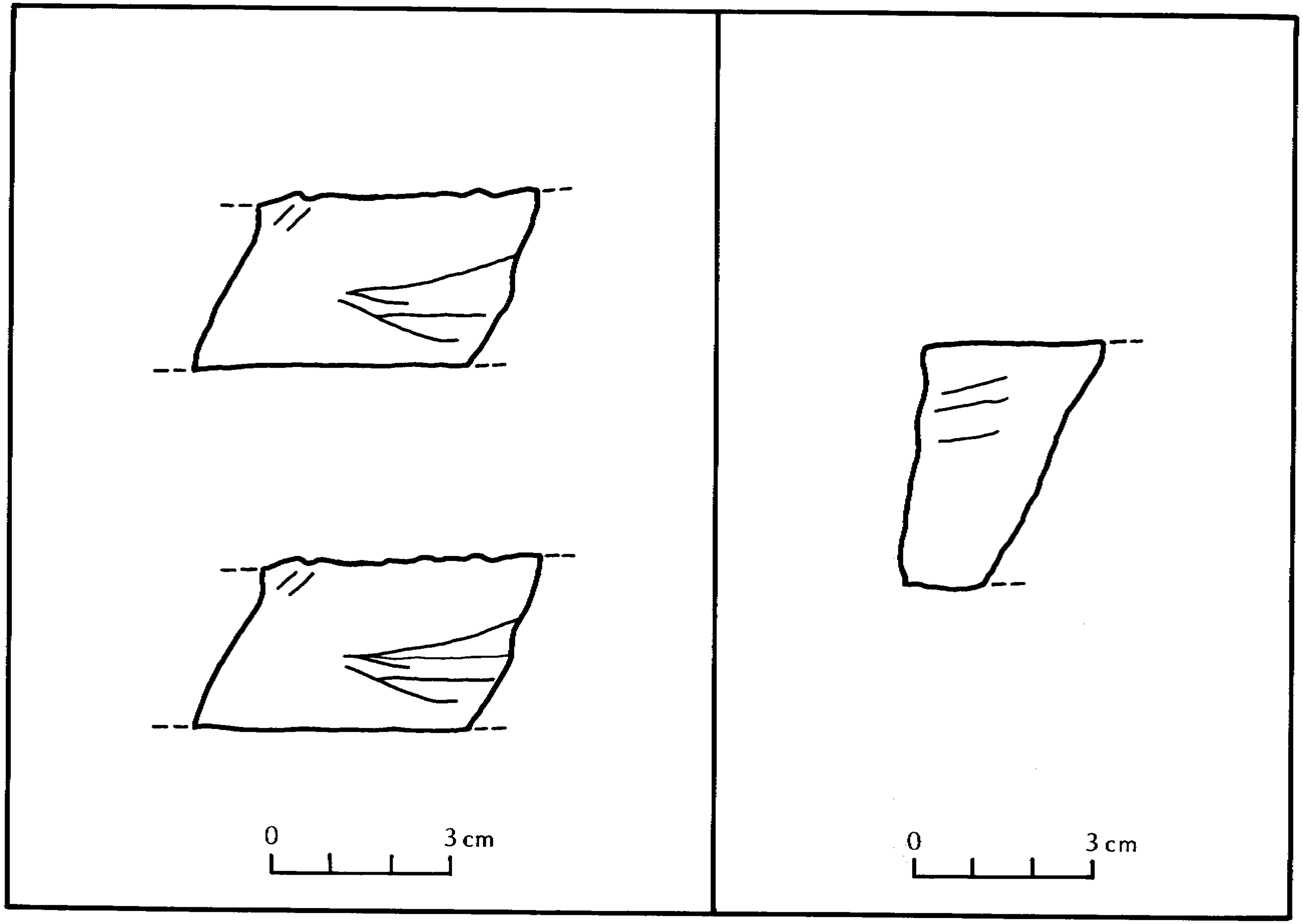

a
b
c
d
0
3 cm

Figure 23. Order of incised line elements on specimen 26Ln1775-1200-3. a. Heavily worn incised lines, cut with a wide tool edge; b. Final element added over worn surface to converging horizontal elements.

Figure 24. Incised tablet, specimen 26Ln1775-103-7, is a fragment of larger tablet with simple design elements.


0
3 cm
0
3 cm

stained by a natural dark red mineral pigment; the upper and lower edges are naturally rounded and retain faint pigment stains.

The incised surface is very smooth (water worn?), but shallow natural grooves in the stone are visible; many grooves are highlighted by residual mineral pigment. Incisions were made with a single sharp cutting tool; these are distinguished from the natural grooves by regular cross sections and lack of mineral staining. Incised elements consist of three short parallel horizontal lines on the upper left (Figure 24). A significant portion of the original design may have been removed with the break.

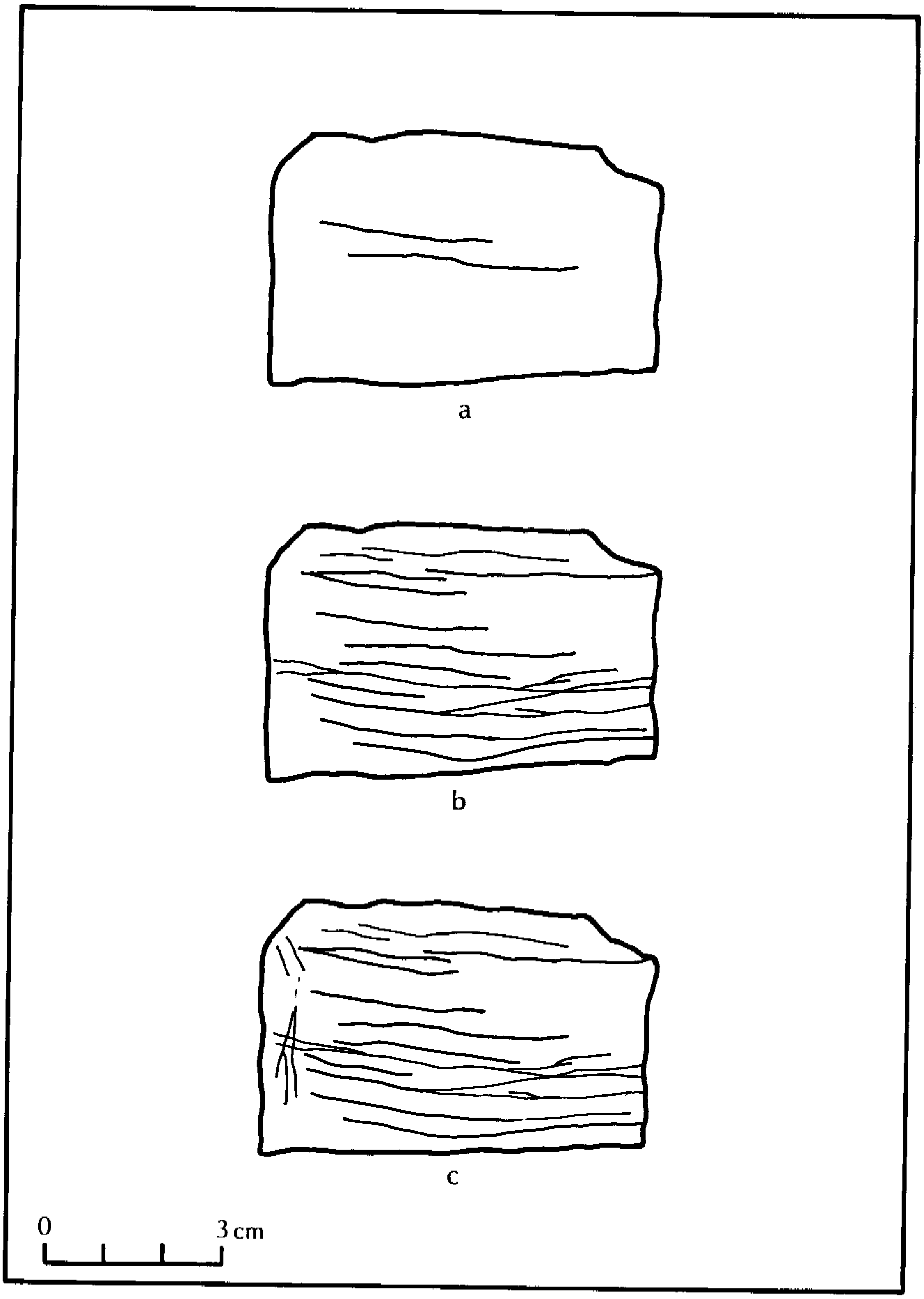
The opposite surface is rough and contains a series of deeply scored radiating grooves. The cross sections of the grooves are generally wide and deep, but width along any single line varies considerably. The base of each track is uneven and rough. The grooves apparently were produced by some kind of natural abrasion, rather than by a cutting tool. (Similar, but less visible, naturally produced grooves are present on the incised smoothed surface). Perhaps these natural patterns, together with the pigmentation in the native stone, may have figured in the selection of this tablet for incising.

Specimen Ln1775-900-11 was made on a very thin slab of fine-grained, light grey sandstone. A faint overlay of natural iron oxide stain is found along the top margin, and top and bottom edges are thickly covered with the pigment. The left edge is smooth and rounded, apparently intentionally; the right edge is broken, but the degree of wear (and soil staining) suggests this occurred before it was incised. The lack of design interruption further suggests this stone is essentially complete.

Few elements are superimposed, so that only the general organizational patterns can be segregated. Two incised lines at left center (Figure 25a) were made with a wide tool; edges and incisions are worn smooth. These elements may have been incised initially, with the remainder added at a later date.

The remaining design is composed of a series of fine, more or less parallel, horizontal scratches, of varying length and depth; all apparently were made with the same tool edge (Figure 25b). Several are incised more deeply on the left, trailing off near center. On the left margin, a short angled parallel line pair, and a vertical converging set, were incised over several of the horizontal lines, suggesting the

Figure 25. Order of incised line elements on specimen 26Ln1775-900-11. a. Initial horizontal lines are worn; b. series of horizontal elements added, using a sharp V-shaped tool edge; c. vertical elements on left are superimposed over horizontal lines.


a
b
c
0
3 cm

left margin was filled in after most of the remaining design had been completed (Figure 25c).

Specimens 26Ln1775-700-1 and 26Ln1775-700-4 are two fragments from the same tablet which was broken along the centerline. The reconstructed stone apparently is complete. Both surfaces are incised: one side is inscribed with a crosshatch pattern; the other side has a more open, less regular series of lines. The incised surfaces of both fragments are discolored by contact with the soil and/or smoke blackening, so that each has a light and a darkened surface; however, the surface of the fragment that is darkened in one case is light in the other. Specimen Ln1775-700-1 is discolored on the surface bearing the crosshatch design, so that the lighter incised lines are enhanced. Specimen 26Ln1775-700-4 is more severely darkened (on the side with the simpler pattern), obscuring incisions as well as surface.

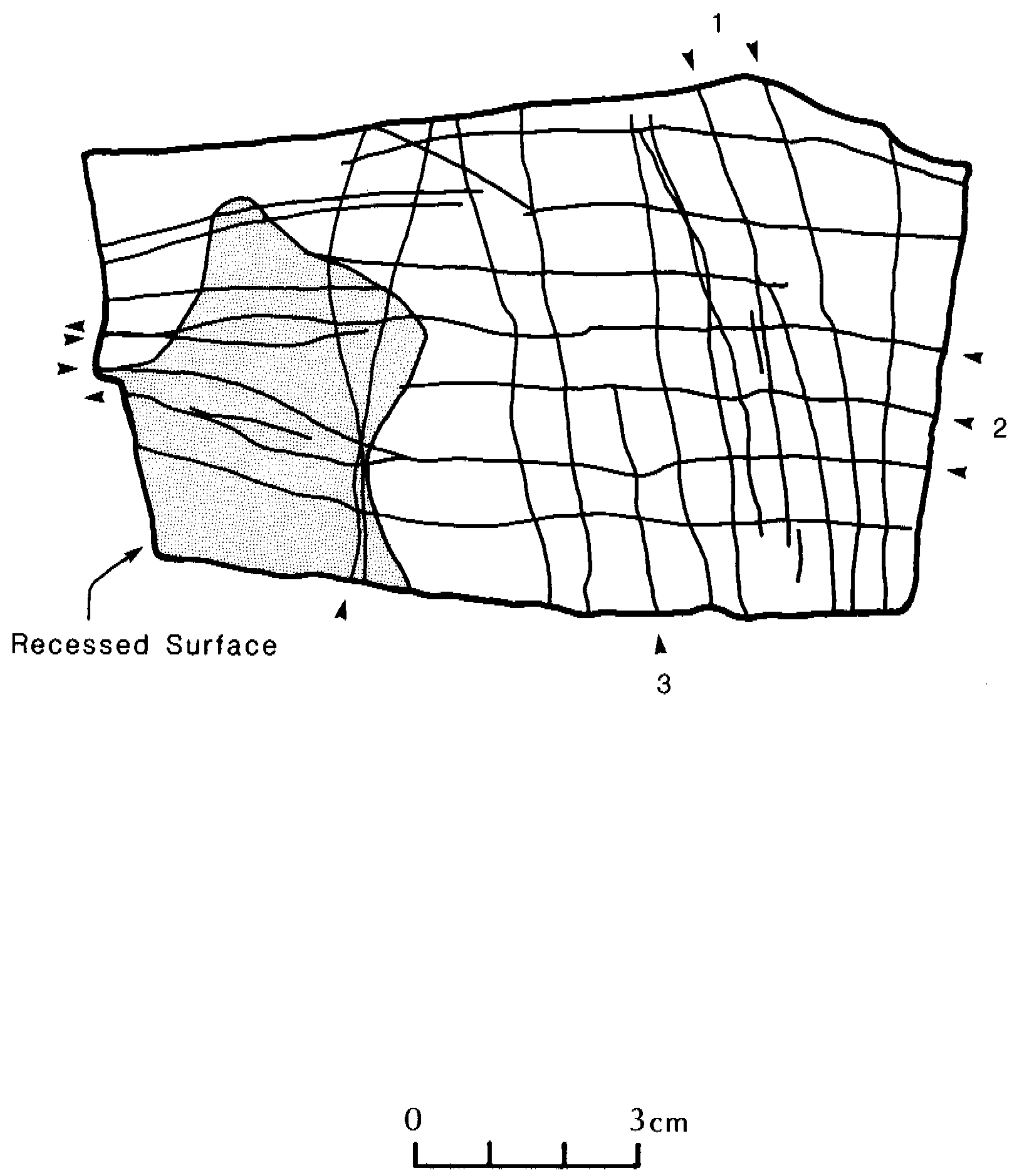
The crosshatch pattern apparently was made during a single carving episode (Figure 26). A rounded, fairly broad (0.44 mm) tool edge was used for inscribing most (if not all) lines; most incisions are shallow, and some are just barely detected by clay impressions. A large irregularity in the surface (on the left) is recessed with rough edges, but this did not significantly affect the design which was incised across it.

There is conspicuous variation in tool track depth along the extent of the same line, reflecting variation in applied tool pressure. For example, the central horizontal lines (Figure 26) are relatively deep on the right, becoming shallow where they approach and/or cross the surface irregularity on the left. The reverse is true of the shorter horizontal lines on the left, two of which converge with existing horizontal lines (as if to amend their parallel alignment in the overall series). Vertical lines do not vary to the same degree, but similar patterns are observed from bottom to center and from top to bottom.

The incisions apparently were initiated from all edges of the stone, alternately filling in a few horizontal and vertical elements at a time. For example, vertical elements on the right of the piece were incised before some horizontal elements in the lower two-thirds of the piece; in turn, the latter were crossed by vertical elements just left of center (Figure 26).

The design on the opposite surface is composed of a series of long, individual lines which suggest they were established as initial marginal baselines in an unfinished

Figure 26. Order of incised line elements, side 1 of joined specimen 26Ln1775-700-1 and 26Ln1775-700-4. Arrows and numbers indicate direction and relative order of cutting strokes.



1
2
3
Recessed Surface
0
3cm

composition. Tool tracks are not significantly different in cross section shape, but some deep lines may represent a more basic motif (Figure 27a); a series of shallower lines is oriented with reference to deeply incised elements (parallel line pairs) or to existing divisions of enclosed spaces (note vertical and horizontal bisections) (Figure 27b).

As noted with the crosshatch pattern on the reverse surface, various vertical and horizontal lines were alternately incised over one another. In the basic, deeply carved motif (Figure 27a), vertical element 1 (from right) was incised before the bottom horizontal line, whereas horizontal element 2 (from the top) was incised over the angled vertical intersecting element at center.

Specimens 26Ln1775-1100-7 and 26Ln1775-1100-11 are joined fragments of a formerly larger tablet; together, they probably represent only about half of the original incised stone. The design was incised on a light yellow, fine-grained sandstone tablet, but the pattern is prominent due to the intensity (deep, wide) of cuts (Figure 28).

As noted earlier, the design composition is unique among the incised stones in the Panaca Summit collection; and no direct analogs were found in descriptions of other incised stone assemblages. The tablet is remarkable for its wide, deep incisions (high visibility), relatively large size, the care with which it was incised, and the complexity of its design.

The complexity of design is primarily a function of repeated design motifs. At least four motifs can be distinguished; two patterns are repeated across the stone, but are composed so as to contrast with similar patterns.

The most obvious design motif is the repetition of rectangular blocks filled with numerous, deeply cut, narrowly spaced lines, all similarly oriented (Figure 29). Though it seems logical to assume the blocks were incised first and then filled, in fact, most cross section observations indicate the parallel "filling" lines were incised first; then, perpendicular outlines were joined to the top and bottom lines to form corners, so completing the rectangular outline.

Contrast between repeated block motifs is established by the direction of the filling lines. Blocks are <u>perceived</u> as contrasting vertical and horizontal alignments, based on the opposing orientation of the lines used to fill each block (Figure 29).

Figure 27. Order of incised line elements, side 2 of joined specimens 26Ln1775-700-1 and 26Ln1775-700-2. a. Basic motif with deeply incised line elements; b. final design, with shallow lines added.

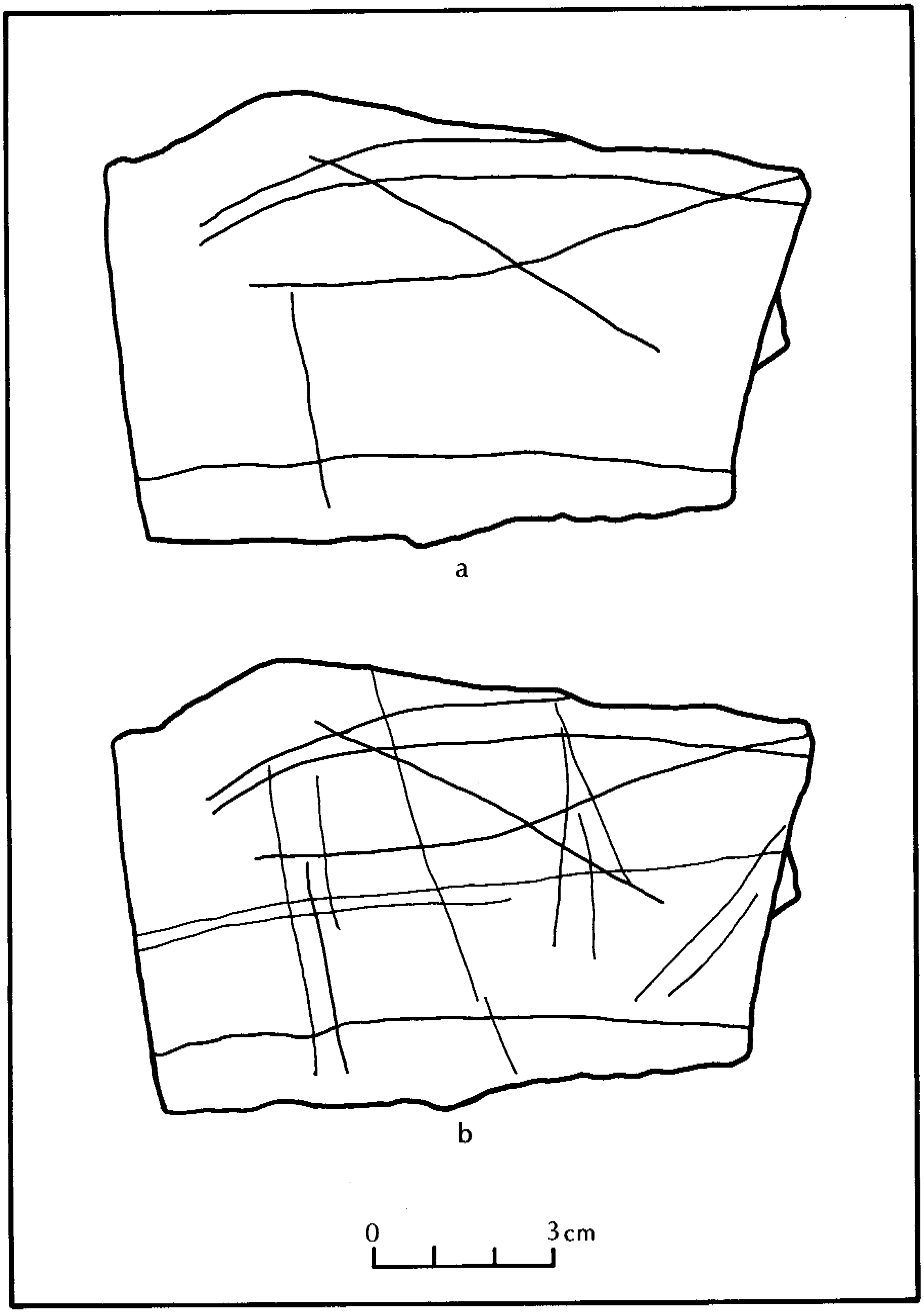

a
b
0
3 cm

Figure 28. Incised Tablet, joined specimens 26Ln1775-100-7 and 26Ln1775-1100-11.

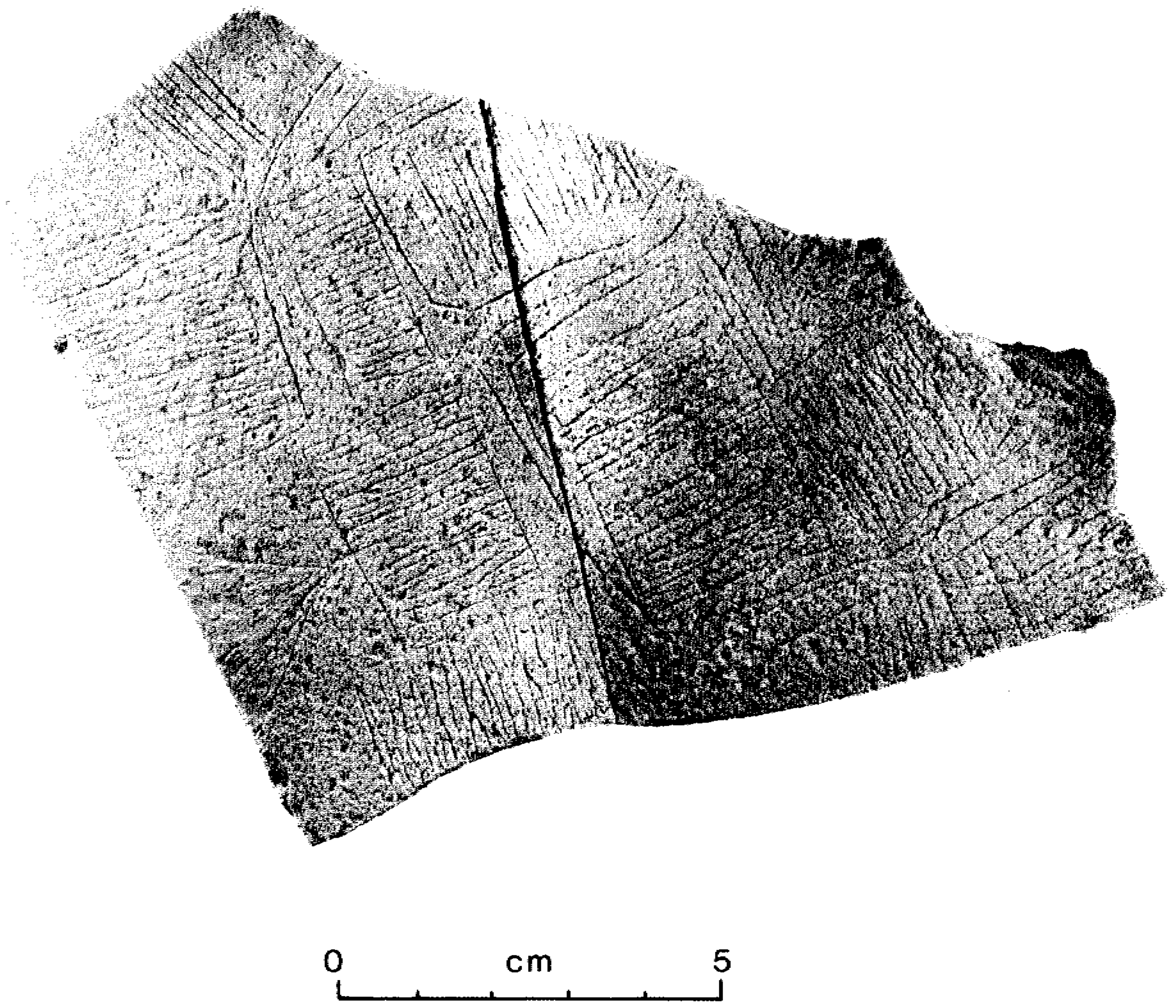
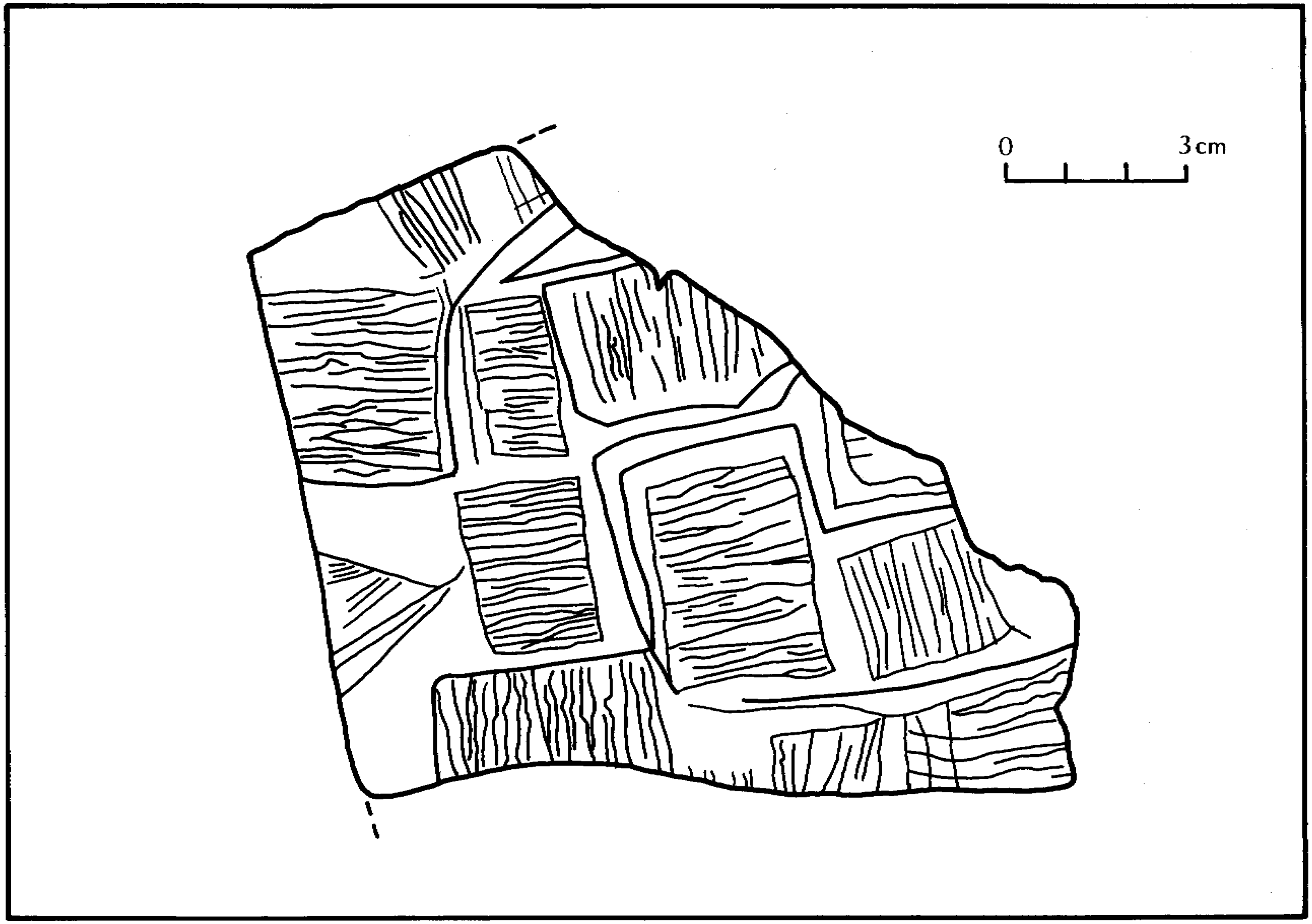

0
cm
5

Figure 29. Line drawing of incised design on joined specimens 26Ln1775-1100-7 and 26Ln1775-1100-11.


0
3cm

Near the top center of the tablet, only a small portion of an apparently crescent-shaped motif is preserved. Whatever its true shape, the joined curving and straight lines form an unrepeated pattern which organized other elements along the upper edges of the design (Figure 29).

Perhaps the most basic motif, but not necessarily the most obvious one, is the primary division of space by regularly stepped, heavily incised lines extending across the stone from the left edge to beyond the point of the break on the right. Two primary stepped lines remain; one underlines the upper left and two uppermost central block motifs; the other marks a division between three small blocks at upper center and three large blocks at lower center. A third stepped line probably further separates the two blocks at lower right from the center, but damage to the surface of the stone removed the assumed vertical step near bottom center (Figure 29).

The stepped lines establish contrasts in the repeated patterns by variously mimicking adjacent elements. For example, the uppermost extension of upper stepped lines is gently curved, mimicking the curve of the adjacent crescent-shaped element. The central, dividing stepped line diverges near the bottom left corner of the central block motif; one divergence repeats the outline of the central block; the other mimics the outline of the block above (Figure 29).

The fourth motif is apparent in the series of radiating lines forming an isolated example along the left center of the tablet (Figure 29). Considering the fragmentary nature of the tablet, and the few preserved edge sections, this may represent a repeated pattern which was used only along edges (or between stepped lines dividing block elements along edges).

Extreme control was used to incise the patterns on this unique artifact. Corners are joined carefully so that converging lines rarely overlap; the series of lines used to fill rectangular blocks rarely extend beyond enclosing margins.

Contrary to other observations of variation in tool tracks (from which use of different tool edges may be inferred), tool edges apparently were maintained and/or modified (and tool pressure controlled) to produce lines of nearly uniform depth and visual intensity. Tool track variation is apparent across the piece, but the most conspicuous establishes contrast between the heaviest (widest and deepest) incisions used for stepped lines and fill in blocks, and the somewhat lighter (narrower) incisions used for joining rectangular block margins.

The pattern of incisions, and the control exercised during design execution, indicates the design was conceived carefully in advance of its transcription in stone. The absence of apparent differences in wearing further suggests it was carved by a single individual within a short period of time.

The elaborately carved, repeated motifs and the attention to overall composition organization are similar to Fremont ceramic designs (cf. Madsen 1977), although there are no analogs for this particular design among either pottery motifs, petroglyph designs, or stone incising traditions. As discussed later in the chapter, the artifact may reflect a rare transcription of a Fremont "decorative" motif onto a stone tablet.

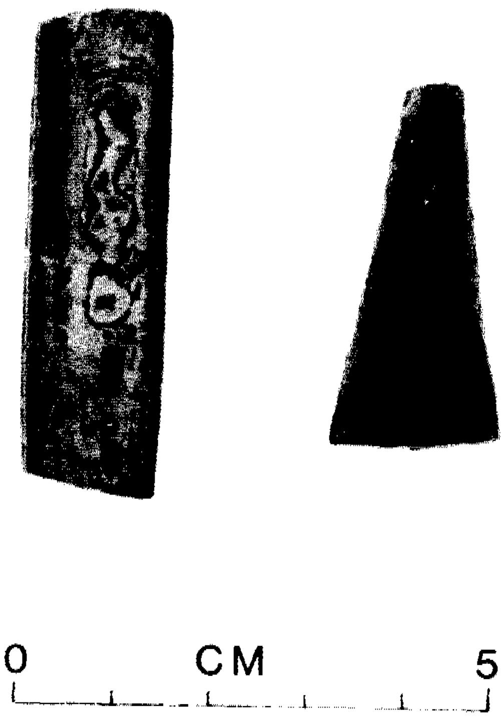
Incised Polished Stones

Two small stones were modified intensively by edge and surface grinding; both are incised as well. Similar enigmatic polished stone artifacts are found in archaeological contexts (see Jennings 1957:215; Dalley 1976:46-47), but their function remains obscure. The two items found at 26Ln1775 seem to represent manufacturing stages rather than finished artifact forms.

Specimen 26Ln1775-700-2 is a small, thin tabular piece made from a fine-grained, light grey siltstone with distinctively patterned, red mineral staining. Jennings (1957:215) tentatively identified a similar artifact from Danger Cave as a representative of "...special whetstones or abraders used for special materials." However, the Danger Cave specimen was not incised and the present specimen is quite similar to gaming pieces (usually made from bone) found in Fremont village sites (cf. Dodd 1982:81).

All edges of the specimen were ground heavily, as evidenced by deep, directional striae and small areas of high polish. One tool face was polished smooth (apparently to enhance a distinctive mineral stain pattern) and evidences only fine, unidirectional striae (Figure 30a). The reverse face was ground heavily with a hard, gritty medium, resulting in numerous deep abrasion striae. Only a faint trace of a former mineral pattern remains; it may be that heavy grinding on this surface was applied to remove the pattern and make it "white." Ethnographic dice (usually cane or bone) were

Figure 30. Incised polished stones. a. Specimen 26Ln1775-700-2; b. Specimen 26Ln1775-903-3.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frequently red on one side (marked) and white (unmarked) on the other (cf. Steward 1941:248).

The "white" face is also incised. A fine, thin vertical line bisects the long axis, and a series of deeper horizontal incisions were cut at an angle from the upper left.

Specimen 26Ln1775-903-3 is a wedged-shaped piece of dark-and-light banded sandstone which has been modified to be a plano-convex cross section. The convex edges are ground heavily and intentionally rounded; deep unidirectional abrasion striae are visible along both rounded edges. A series of short, roughly parallel lines were incised along the left edge (Figure 30g). The flat (reverse) side was only incompletely smoothed, and a single series of unidirectional abrasion striae are apparent; no incised lines can be distinguished clearly on this surface. The stone is similar to polished (and incised) stone pendants occasionally found in archaeological deposits (cf. Aikens 1966:45-46), but it lacks the distinctive, identifying perforation. It may be an unfinished piece.

Carved and Polished Stone Pipe

Specimen 26Ln3358-5201-1 (Figure 31), a carved stone pipe, was discovered and collected during the initial survey of site 26Ln3358. The artifact is made of a very soft white stone with rust-colored mottling. The material has the hardness and texture of soapstone. It can be cut easily with a steel knife. The resulting powder is very fine-grained and feels greasy to the touch.

The artifact is essentially a tube, 45.6 mm long, flared at both ends. Its smallest outside diameter, slightly offset toward the stem from the midpoint of the piece, is 13.7 mm. At the mouthpiece, the diameter is 15.3 mm and at the widest point on the bowl, 19.3 mm. A carved, raised bead or collar, about 3 mm wide and 1 mm high, rings the piece at its midpoint. The exterior surface of the artifact is covered with cut marks and stria, partially obscured by wear from handling. These marks are not obviously decorative, but more detailed analysis might demonstrate otherwise.

The pipe is biconically drilled. Work marks in both the stem and bowl ends are concentric. In the bowl, hcwever, the concentric marks are overlain by deep, longitudinal scratches, possibly created by cleaning the bowl. The bowl terminates, not in a plane orthagonal to the long axis but at a diagonal (54 degrees). The termination is a relatively flat, but not

Figure 31. Carved and polished stone pipe.

smooth, plane suggesting a fracture or bedding plane in the raw material. The thinnest, weakest wall of the bowl failed, destroying the utility of the artifact as a smoking pipe. Dark gray residue is present in the throat of the piece.

Tubular stone pipes have been recovered from Fremont sites (Jennings 1979), but these are straight or slightly flared on one end. Tubular stone pipes are also known ethnographically throughout the Great Basin (see index in d'Azevedo 1986). In fact, Thomas (1986:274; Fig. 14) illustrates a western Shoshone "cloudblower" pipe of black-slate, decorated with a crenate collar and cross-hatched lines, nearly identical in form to the artifact from site 26Ln3358.

Conclusions

All but one of the incised tablets from Panaca Summit have simple, rectilinear abstract designs; patterns common throughout the Great Basin, dating to at least 3300 B.C. (T. Thomas 1983a:255). At site 26Ln1775, incised stones were associated with Fremont pottery (Snake Valley Black-on-Gray, Corrugated), strongly suggesting a Fremont affiliation. It seems the Fremont participated in an ancient incising tradition whose significance of design transcends cultural or linguistic differences. T. Thomas (1983c:349) suggests "... the symbol system on the portable stones [from Gatecliff Shelter] referred, at least in part, to the ritual dramatization of concepts relevant to communal hunting and gathering activities." Indeed, incised tablets are found most commonly in rockshelters used as short-term camps and in seasonal pinyon camps (cf. Santini 1974). In the case of the Fremont, this pattern is quite restricted. No incised tablets are known from excavated village sites (cf. Aikens 1966; Dodd 1982; Jennings and Sammons-Lohse 1981; Marwitt 1968, 1970), but several tablets are reported in Fremont ceramic-bearing strata at Cowboy Cave (Jennings 1980), Sudden Shelter (Dalley 1976), Hogup Cave (Aikens 1970), and Promontory Caves (Steward 1937). Many of the stones in the Santini collection are from open sites in southeastern Nevada and may derive from Fremont occupations. One incised tablet, with a simple rectilinear abstract design, is reported from tests at site 26Ln2629, an open Fremont site near Pioche (Bunch 1986). In short, the distributions of these incised tablets suggest they were used by hunter-gatherer groups (Archaic as well as Fremont) for encoding information about periodically available resources.

The 26Ln1775 collection includes one apparently unique incised tablet reminiscent of Fremont pottery motifs (cf. Madsen 1977). Attention to composition space and careful craftsmanship are characteristic of Fremont decorative traditions, notably those used on ceramic vessels, clay figurines, and bone (cf. Dalley 1976; Jennings 1978). Three similarly well crafted, but differently designed, tablets were found in Stratum 9, a Fremont occupation, at Swallow Shelter (Dalley 1976:46-51). It would seem that artistic traditions usually reserved for decorating ceramic artifacts and bone tools occasionally were worked onto stone tablets, but perhaps only when the artist camped some distance from the usual residential base.

The incised stones from Panaca Summit may represent two distinct carving traditions. One reflects Fremont participation in an ancient, widespread method of incising stone tablets, possibly relating to encoding environmentally significant information basic to hunter-gatherer economies. The other seems to be more clearly related to Fremont decorative traditions, possibly reflecting an occasional transference of ceramic patterns to stone tablets.

Chapter 8. CERAMIC ARTIFACTS
by Kenneth E. Juell

Ceramic sherds were collected from three archaeological sites in the Panaca Summit area. A total of 233 sherds was recovered from 26Ln1775 and 2 from 26Ln3357. One sherd collected from site 65W-1 during site survey is included in the present analysis.

Ceramics from 26Ln1775

Initially, five ceramic types were recognized and sorted from 233 sherds collected at the site, including Snake Valley Corrugated, unknown Type 1, and unknown Type 2. Snake Valley types appeared similar to Parowan Fremont subarea types under low-power magnification, while the unknown types appeared distinct from known Fremont types (see Madsen 1977).

Petrographic thin-section analysis (see Appendix A) demonstrates the unknown types are similar to each other, but different from Snake Valley ware in terms of tempering material (although one unknown Type 2 sherd contained rhyolite rock fragments not present in other samples). Consequently, the two unknown types were combined to become one new ceramic type called here Pioche Gray (see Appendix A). Clay and temper used to construct Pioche Gray are both derived from a poorly sorted welded (glassy) tuff. Since rhyolitic tuff abounds in the study are and surrounding region (Tschanz and Pampeyan 1970), Pioche Gray is considered a locally manufactured ceramic type.

Snake Valley ceramics at the site generally relate to Parowan Fremont subarea ceramic types in terms of ceramic manufacture, design elements, and surface manipulation, but petrographic thin-section analysis shows that the Panaca sherds employ clay and temper materials that are different from those typical of Snake Valley ceramics in Parowan Valley (see Appendix A). Panaca temper is principally angular feldspar and quartz grains, similar to Parowan Valley ceramics, but includes several altered, silicate-rich, volcanic rock fragments, probably rhyolite. Biotite particles are abundant in the clay. The rhyolite present in the temper, and the similarities between Snake Valley ceramics at this site and at site 26Ln2969, south of Pioche (Bunch 1986; Appendix A, this report), suggest local production of Snake Valley types rather than transport or trade from the Parowan Valley.

Thus, 193 sherds (82.8%) from 26Ln1775 appear similar to Parowan Fremont subarea ceramics in form and material but differ in clay and temper material. Stylistic similarities suggest these sherds should be considered Pioche varieties of the Snake Valley type. The remaining 40 sherds (17.2%) which have distinct welded tuff (ignimbrite) temper, comprise the new ceramic type, Pioche Gray. All sherds from 26Ln1775 thus appear to be from ceramic vessels manufactured locally. Potsherd frequencies are given by type in Table 14, and sherd provenience is shown by type in Table 15.

Table 14. Pottery Types at 26Ln1775

Ceramic Type	Number	Relative Percent
Snake Valley Gray	147	63.1
Pioche Gray	40	17.2
Snake Valley Black-on-gray	33	14.2
Snake Valley Corrugated	13	5.6
	233	100.0

Descriptive Attributes

Painted designs, decorative techniques, and vessel shapes associated with Parowan Fremont pottery are all present in the 26Ln1775 assemblage. Fugitive red (hematite) wash is present on 42.4% (n=14) of Snake Valley Black-on-gray sherds, but is found on only 4.8% (n=7) of Snake Valley Gray sherds. The wash is found only on exterior (convex) surfaces. Two sherds have wash applied over Black-on-gray corrugated designs on exterior surfaces. Fugitive red wash is present on three Snake Valley Black-on-gray bowls and one Snake Valley Gray bowl, and on one possible Snake Valley Gray bowl.

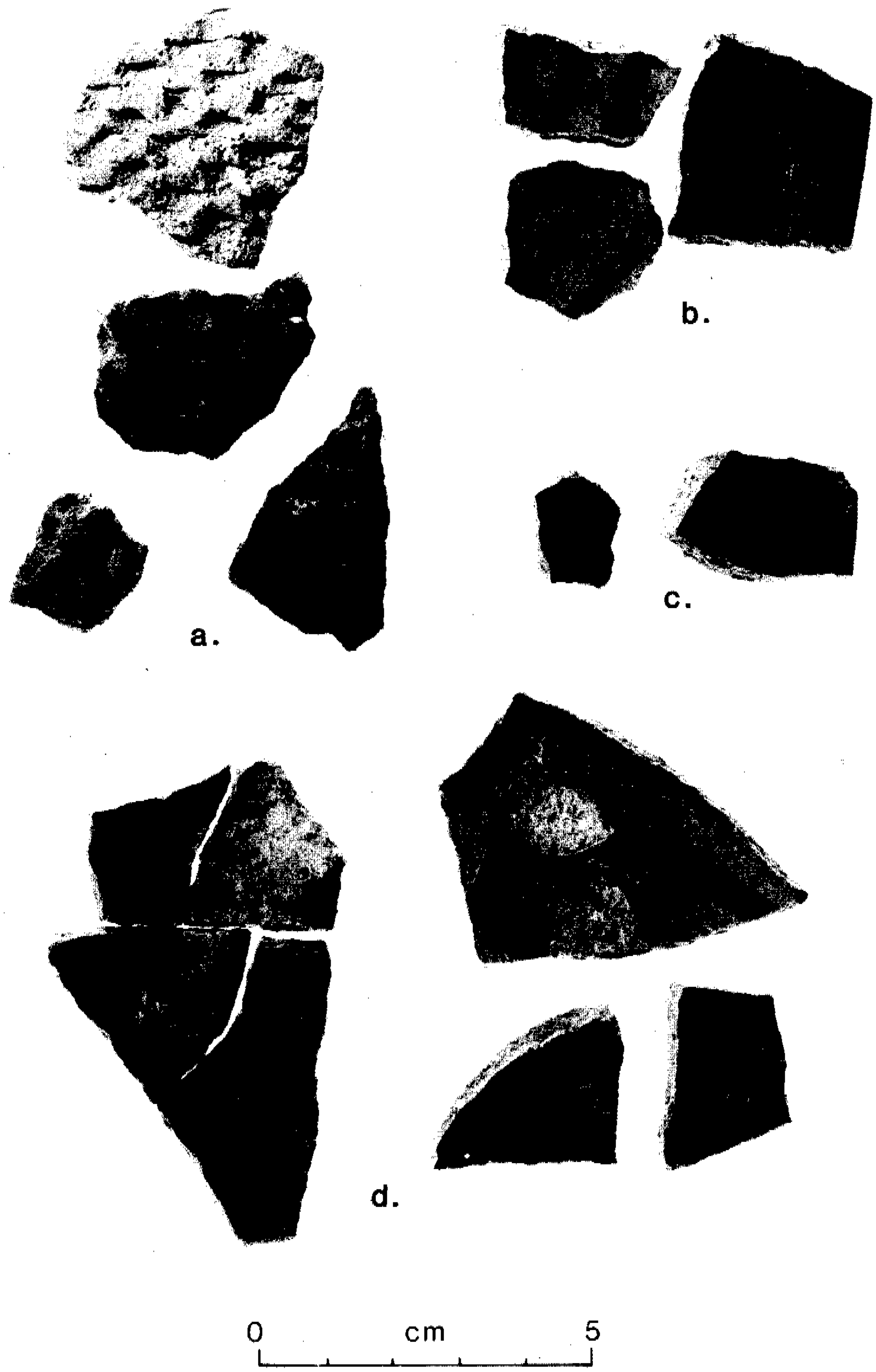
Carbon painted designs on Snake Valley Black-on-gray sherds are present exclusively on interior (concave) bowl surfaces (Figure 32b-d). Interior rim banding is found on all six Black-on-gray rimsherds: one thick band on five, and one thin band on the sixth (with a corrugated exterior surface). Other design elements include straight lines, straight lines with right (90 degree) angles, curved lines, small right triangles, a checkerboard, a line with small dots on one edge, and large triangles with "feet" extending off one side. On the latter design element, "feet" are either isosceles triangles or short rectangles. A similar design element was found on a bowl sherd at O'Malley Shelter (Fowler et al.

TABLE 15. PROVENIENCE OF CERAMIC SHERDS AT Site 26Ln1775.

Reference No.	Provenience	Snake Valley Gray	Snake Valley Black-on-Gray	Snake Valley Corrugated	Pioche Gray	Totals
700-	Locus A, Surface	4	0	0	0	4
800-	Locus I, Surface	45	13	1	2	61
900; 901; 902-	Station 7, Surface	8	1	6	0	15
903-	Test Unit 2, Level 1	2	0	1	0	3
950-	Test Unit 3, Level 1	0	0	0	1	1
1000-	Locus H, Surface	22	0	0	14	36
1001-	Test Unit 6, Level 1	0	0	0	3	3
1005-	Test Unit 7, Level 1	3	0	0	0	3
1006-	Test Unit 7, Level 2	4	0	0	0	4
1050-	Test Unit 8, Level 1	1	0	0	2	3
1051-	Test Unit 8, Level 2	2	0	0	0	2
1055-	Test Unit 9, Level 1	2	0	0	0	2
1056-	Test Unit 9, Level 2	1	0	0	0	1
1100-	Locus M, Surface	12	10	5	3	30
1200-	Locus E, Surface	2	0	0	0	2
1300-	Station 2, Surface	8	6	0	13	27
1400-	Locus K, Surface	18	3	0	2	23
1500-	Locus B, Surface	12	0	0	0	12
1502-	Test Unit 5, Level 1	1	0	0	0	1
		147	33	13	20	233

1973:Figure 6h), and similar designs are present in Median Village collections in the Parowan Valley (Marwitt 1970:Figure 40c).

Figure 32. Fremont Pottery. a. Snake Valley Corrugated; b. Snake Valley Black-on-gray; c. Snake Valley Black-on-gray with Corrugated exterior; d. Snake Valley Black-on-gray.


a.
b.
c.
d.
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Thirteen Snake Valley Corrugated sherds were collected (Figure 32a); in addition, two Snake Valley Black-on-gray sherds have corrugated exterior surfaces (Figure 32c). The corrugated pattern was produced by finger pinching unobliterated horizontal coils together (Madsen 1977:10).

Snake Valley Corrugated pottery dates between A.D. 1100-1200 in the Parowan Valley (Madsen 1977), and its presence at 26Ln1775 probably indicates the site was occupied sometime during this brief period, assuming that design traits for the locally manufactured Snake Valley Corrugated type were similar. Six Corrugated sherds, believed to be from the same vessel (see Table 15), are particularly noteworthy because of the firing techniques used during manufacture. On these sherds, the interior half of the vessel core and surface are red, produced by an oxygen-rich firing atmosphere. But the exterior half and surface are gray, produced by an oxygen reduced firing atmosphere. Thus, the vessel was fired so as to expose the interior to much more oxygen than the exterior.

Another noteworthy piece (26Ln1775-903-7) is a light brown colored Snake Valley Gray sherd on which coils are visible on the interior surface. The sherd is from a vessel shoulder area directly below a constricted neck, in a position apparently not visible to the potter, so that the coils were not scraped and smoothed prior to firing.

Nineteen rimsherds of three types are present in the collection: Snake Valley Gray (n=11, 57.9%), Snake Valley Black-on-gray (n=6, 31.6%), and Pioche Gray (n=2, 10.5%). Two Snake Valley Gray rimsherds have straight vertical cross sections and a high horizontal curvature characteristic of narrow-necked jars, or ollas (Figure 33a). Seven Snake Valley Gray rimsherds have out-curved or flaring rims inferred to be from wide-mouth jars or cooking pots (Figure 33b). Two Snake Valley Gray rimsherds have bowl-like, low, vertical and horizontal cross-sectional curvatures relative to vessel rimsherds are all from bowls with painted interior surfaces. The Pioche Gray rimsherds are from unpainted bowls. Examples of vessel rimsherd cross sections are shown in Figure 34.

The small numbers and spatial separation of sherd concentrations at the site allowed a determination of number of vessels represented. Every attempt was made to "lump" sherds by technological and design attributes, so the derived number should be considered an estimate of the minimum number of vessels. A total of 49 vessels is inferred for the ceramic assemblage. Inferred function, based on vessel form and ethnographic use of those forms, for each ceramic type are shown in Table 16. The majority (n=27, 55.1%) of vessels have unknown forms and, therefore, unknown functions. A lack of rimsherds prevented function determinations for Snake Valley Corrugated vessels, and for the majority of Snake Valley Gray and Pioche Gray vessels.

Table 16. Inferred Vessel Functions by Type.

Pottery Type	Bowl	Bowl?	Cooking Pot	Jar	Unknown	Totals
Snake Valley Black-on-gray	10	-	-	-	-	10
Snake Valley Corrugated	-	-	-	-	3	3
Snake Valley Gray	2	1	6	1	15	25
Pioche Gray	1	-	-	1	9	11
Totals	13	1	6	2	27	49

Of the 22 identified vessels forms, most (n=14, 63.6%) are bowls, and most (n=10, 71%) bowls are Snake Valley Black-on-gray. Six (27.3% of 22) wide-mouth jars or cooking pots, all Snake Valley Gray, are identified. Primary vessel characteristics are flared rims with constricted necks. The shape enabled cooks to remove hot vessels from the hearth by lifting them with sticks placed under the rims (Walter A. Dodd, personal communication 1985). The two remaining identified vessels are inferred to be narrow-neck jars or ollas, based on straight neck sherds with pronounced horizontal curvature relative to vessel orientation; one is Snake Valley Gray and one is Pioche Gray.

Vessel forms indicate that food storage, preparation, and consumption took place at 26Ln1775.

Modified Sherds

Six artifacts in the assemblage are made from modified ceramic sherds. Five artifacts are made from broken Snake Valley Gray sherds, and one is made from the same temper and paste as Snake Valley Gray vessels.

Slight convexities have been lightly ground in one (26Ln1775-700-5, 26Ln1775-900-1) or two (26Ln1775-800-6) edges (Figure 35b,c,e, respectively). Similarly modified sherds are inferred to be pottery scrapers at Fremont sites (Dodd 1982:54; Marwitt 1970:Figure 45c-f; Fowler et al. 1973:17), based on similarities to ethnographic examples associated with

Figure 33. Rim Forms of Functional Vessel Types. a. olla; b. cooking pot; c. bowl.


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Figure 34. Rimsherd Cross-Sections.

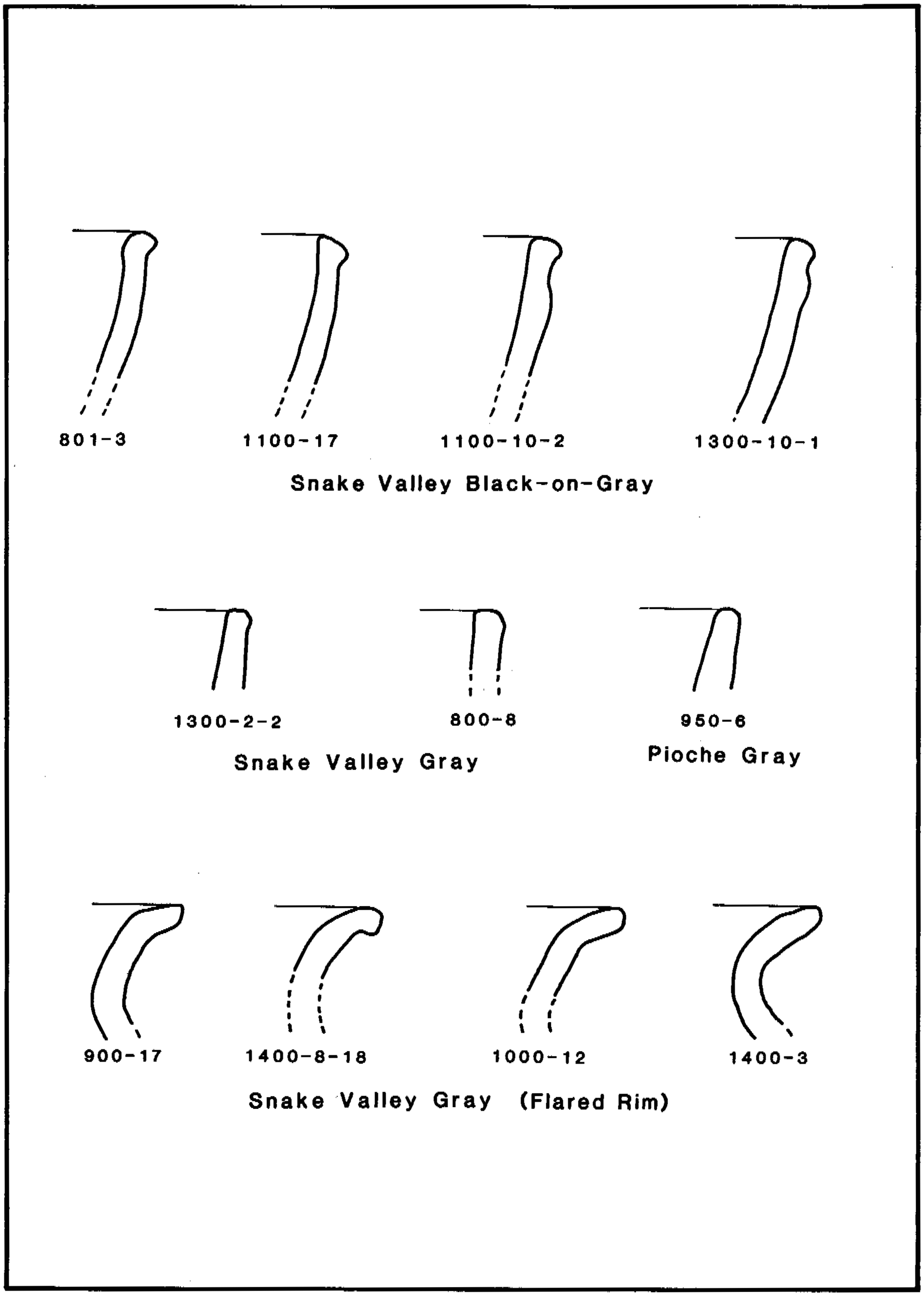
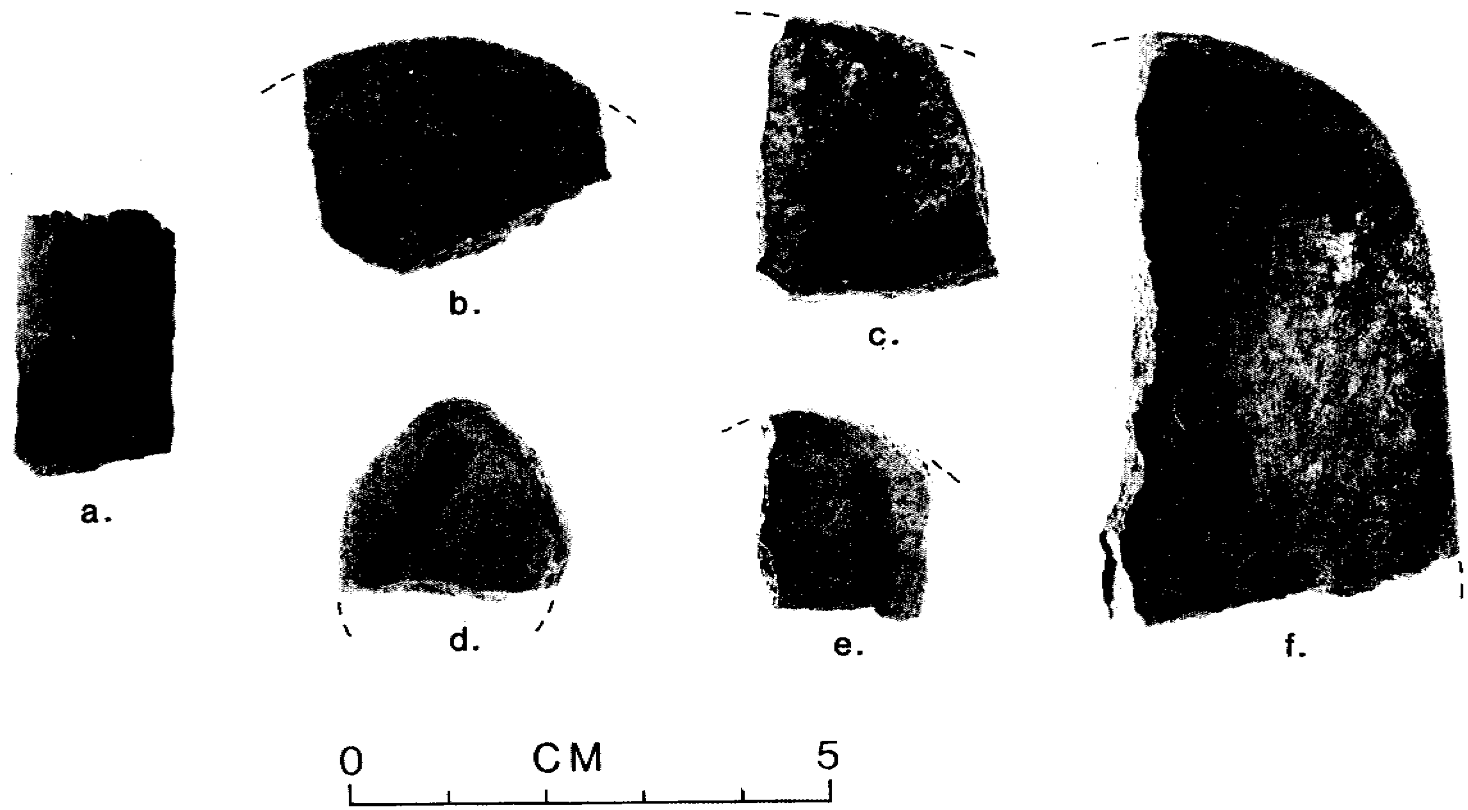

801-3
1100-17
1100-10-2
1300-10-1
Snake Valley Black-on-Gray
1300-2-2
800-8
950-6
Snake Valley Gray
Pioche Gray
900-17
1400-8-18
1000-12
1400-3
Snake Valley Gray (Flared Rim)

Figure 35. Modified sherds. a. tubular sherd; b,c,e. edge ground sherds; d. pottery disc; f. scoop.


a.
b.
c.
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e.
f.
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the scraping or smoothing wet and drying pottery (e.g., Stanislawski 1978:221-222). Their occurrence on the site with locally manufactured pottery suggests some vessels were made on-site. Size of utilized sherds varies from 26 to 34mm in greatest dimension.

One subtriangular shaped sherd (26Ln1775-1400-2) has two ground and smoothed edges (Figure 35d). It differs in appearance from those above by having markedly rounded edges. The artifact may be an unfinished or broken pottery disk (see Dodd 1982:Figure 19c; Marwitt 1970:Figure 46a-d; Fowler et al. 1973:19, figures 23g, 28a-e). The artifact is 25mm in greatest dimension.

A fifth artifact (26Ln1775-1055-5) is an elongated, modified sherd that has two broken edges and two ground and rounded edges. The piece probably broke longitudinally during use, but the broken lateral edge may have been left unmodified (Figure 35f). Modified sherds of similar form are commonly inferred to be ladles or scoops at Fremont sites (e.g., Dodd 1982:Figure 19a,b; Marwitt 1970:Figure 45a,b; Fowler et al. 1973:62). The artifact is 50mm long, 37mm wide, and 6.7mm thick at greatest dimensions.

The sixth piece (26Ln1775-1200-2) is made from Snake Valley gray paste and tempering material. The artifact is 28mm long, 17mm wide, and 3.0mm thick in greatest dimension. It has extreme transverse curvature relative to its long-axis and appears to be a rim fragment from an originally tubular artifact (Figure 35a). If so, the piece is about one-third the circumference of a tube 22mm in external diameter.

The interior surface exhibits transverse and longitudinal striae from scraping (similar to the interior of the bowl of the stone pipe previously described from site 2726Ln3358), and the exterior surface has numerous longitudinal striae and is highly polished. Short (2.9 - 4.7mm) longitudinal grooves, spaced 0.7 mm to 2.8 mm apart, were cut into the exterior surface of the rim prior to firing, creating a serrated edge. The serrated edge also exhibits high polish, possibly indicating the piece was used as a soft-material scraper after being broken. The fragment is probably the bowl-end fragment of a ceramic smoking pipe (cf. Jennings 1978:Figure 222a; Marwitt 1970:Figure 47a,b).

An additional ceramic artifact was recorded at Locus E during site survey, but the item could not be found during site testing. It is described here from surveyor notes and sketches. The modified sherd was field identified as Snake Valley Gray. The piece had two lateral edges and one end rounded and well-smoothed by grinding, and one broken edge. The tool, 28mm long and 36mm wide, probably was used as a ladle or scoop.

Site 26Ln3357

Two edge ground Snake Valley Gray sherds (26Ln3357-300-1-1, 26Ln3357-300-1-2) were surface collected at this site. The sherds were found together and articulate to form a teardrop shape (Figure 36). The periphery of both sherds is lightly and irregularly ground, and was left unsmoothed. The broken artifact resembles "scoops" or "ladles" found at Parowan Fremont villages (e.g., Dodd 1982:Figure 19a,b; Marwitt 1970:Figure 45a,b). A similar artifact was recovered from Conaway Shelter (Fowler et al. 1973:62). The articulated artifact is 89mm long, 71mm wide, and 6mm thick at greatest dimension.

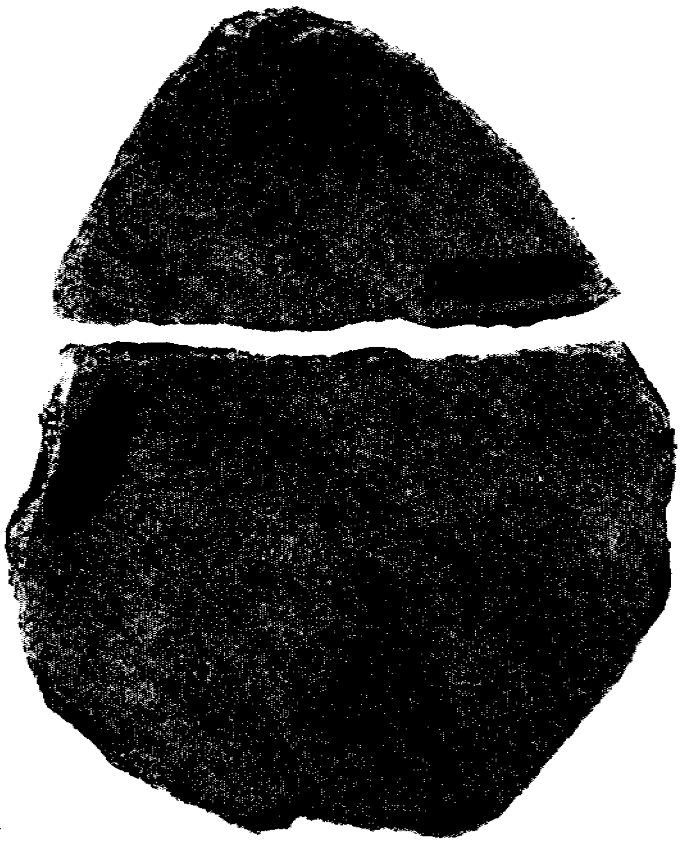
Site 65W-1

One Numic (Shoshonean) Brownware sherd was recorded, mapped, and collected at the site during ground survey (see Stornetta 1987). The sherd was the only time-diagnostic artifact found at the site.

The sherd, medium brown in color with rough, irregular surfaces (Figure 37), appears to be from a vessel constructed by coiling, based upon the presence of two distinct ridges and three troughs. Five superimposed horizontal rows of closely spaced vertical fingernail impressions are present on the exterior surface, with lines parallel to ridges and troughs. Fingernail impressions are oriented in the same direction. The sherd is probably a neck fragment, based on similarity to complete or reconstructed Numic Brownware vessels, or to rimsherds (e.g., Fowler et al. 1973:17; Tuohy 1986:Figure 6). The temper was not mineralogically identified, although subangular, coarse-grained, blue-gray to black opaque inclusions were noted in the vessel core under low-power magnification. The vessel wall is 8mm thick at greatest dimension.

Figure 36 (left). Pottery Scoop.

Figure 37 (right). Numic Brownware sherd.



b.

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a.

0 CM 5

Chapter 9. PANACA SUMMIT SITE CLASSIFICATION
by Kenneth E. Juell

Understanding an archaeological site, or a small group of sites like those under scrutiny here, is best achieved in a broad context. To this end, the following discussion is concerned with the classification and analysis of data collected from 52 sites recorded during the archaeological survey of a single transect between the Nevada-Utah border and Ninemile Rocks (see Stornetta 1987).

Archaeological site density in the study area is high. With the exception of seven sites apparently comprised of secondary deposits, the sample consists of 52 prehistoric sites. The place of each of these sites in regional prehistoric settlement and subsistence systems, addressed in the survey report (Stornetta 1987: Appendix C), is recapitulated here. Using data gathered during survey (Table 17), the 52 sites are grouped into one of three functional site types (residential bases, short-term camps, locations), through application of the key described in Chapter 3. Analysis of assemblage content allows subdivision of short-term camps and locations into subtypes.

In the latter part of the chapter, the functional classification of sites based on assemblage content is tested through statistical analysis of relative assemblage diversity, following Thomas (1984).

Residential Bases

Residential bases account for five (9.6%) sites. They are large, averaging 20,688 sq m with a standard deviation of 6959 sq m (hereafter standard deviations are reported as a ± value given after the mean). All are located on flat or gently sloping terrain in the pinyon-juniper zone.

In other regions, proximity to water is often an important consideration for the placement of long-term residential sites, but residential locations in the project area suggest that water transport costs may have been outweighed by other factors. Three of the four residential bases on the eastern slopes of the Cedar Range are located within 1.0 km of Summit Spring, but one is 2.3 away. On the western slope of the Cedar Range, the spring closest to the fifth residential base is Dow Spring at 3.2 km. The latter two sites may have been occupied during seasons when water flowed in nearby streams (springtime) or when water was

Table 17. Site Survey Data for Panaca Summit Sites.

	Environment				Raw Material Types				Debitage		Artifacts/Features																			
Site No.	Elevation (ft.)	Vegetation	Landform	Deposition	Obsidian	Chalcedony	Chert	Other	Count	Types	No. of Cores	Biface thinning Flakes	No. of Bifaces	No. Scrapers	No. Drills	No. Flake Tools	Projectile Points	No. Boulder Metates	No. Other Metates, Manos	No. Heavy Tools	Recreational Items	Hearth	FAR Scatters	Rock Alignments	No. Pottery Sherds	Site Type	Cultural Affiliation	Site Area (sq. meters)	Distance to Permanent Water (km)
71W-1	5725	J-S	EHOD	H	1	0	1	0	15	03000	0	No	0	0	0	1	0	0	1	0	0	0	0	0	0	STC	U	491	9.5
Ln21	5720	J-S	EHOC	H	2	1	1	0	500+	13121	1	Yes	2	0	0	6	E	0	2	0	0	0	0	0	0	STC	MA	188496	8.8
71W-3	5770	J-S	EHPC	I	1	0	0	0	2	03000	0	No	0	0	0	0	0	0	0	0	0	1	0	0	0	STC	U	10	8.3
71W-4	5770	J-S	EHOC	H	1	1	0	0	7	03020	0	No	2	0	0	2	0	0	0	0	0	0	0	0	0	LOC	U	79	7.9
70W-1	5775	J-S	EHOC	H	1	1	0	0	8	03000	0	No	1	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	157	7.6
70W-2	5780	J-S	EHOC	H	2	1	0	0	10	13000	0	No	1	0	0	0	0	0	0	0	0	0	0	0	0	QUA	U	314	7.5
70W-3	5790	J-S	EHOC	H	1	1	0	0	2	03000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	5	7.3
70W-4	5790	J-S	EHOC	H	1	1	0	0	±200	13101	2	Yes	1	0	0	0	0	0	0	0	0	0	0	0	0	STC	U	314	7.2
70W-5	5795	J-S	EHOC	H	1	1	0	0	3	03000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	39	7.2
70W-6	5810	J-S	EHOC	H	2	0	0	0	20	03200	0	No	1	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	314	7.0
70W-7	5830	J-S	EHOC	H	1	0	0	0	14	23202	2	No	1	0	0	3	H	0	0	0	0	0	0	0	0	STC	MA	118	6.8
Ln3356	5850	P-J	EHRC	H	1	0	0	0	±250	13110	0	Yes	5	0	0	2	0	0	0	0	0	0	0	0	0	LOC	U	1787	6.7
69W-1	5920	P-J	EHRA	H	1	0	0	0	1	03000	0	No	1	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	5	5.6
69W-2	5942	P-J	EHRB	D	1	0	0	0	9	03000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	0	--	U	?	5.5
69W-3	5880	P-J	EHPC	H	1	0	1	0	15	23000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	0	QUA	U	628	6.5
69W-4	5900	P-J	EHPC	A	0	0	0	0	0	00000	0	No	1	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	<1	6.1
69W-5	5920	P-J	EHPC	A	1	0	1	1	17	13100	1	Yes	2	0	0	0	0	0	0	0	0	0	0	0	0	STC	U	353	5.9
69W-6	5990	P-J	EBAD	A	1	1	0	0	±100	23010	0	Yes	2	0	0	0	0	0	0	0	0	0	0	0	0	QUA	U	11781	5.0
68W-1	5985	P-J	EBPP	A	1	1	0	1	±100	13111	1	Yes	3	0	0	0	0	0	2	0	0	0	0	0	0	STC	U	628	4.9
68W-2	5980	P-J	EBJC	K	1	1	0	0	10	03000	0	No	0	0	0	1	0	0	0	0	0	0	0	0	0	--	U	79	4.9
68W-3	6000	P-J	EBPA	A	1	0	1	0	±200	13201	1	No	0	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	785	4.7
68W-4	5995	P-J	EBRC	A	1	1	0	0	6	03000	0	No	0	0	0	0	E	0	0	0	0	0	0	0	0	LOC	MA	39	4.6
68W-5	6010	P-J	EHOC	H	1	0	0	0	10	03000	0	No	1	0	0	1	0	0	0	0	0	0	0	0	0	LOC	U	353	4.4
68W-6	6050	P-J	EBAD	A	1	1	0	0	20	23001	1	No	0	0	0	1	0	0	0	0	0	0	0	0	0	QUA	U	157	4.3
68W-7	6095	P-J	ACPA	I	2	0	3	0	2000+	23111	4	Yes	22	1	1	2	1G 2E	0	3	0	0	0	0	1	0	STC	MA	63620	3.5
67W-2	6070	P-J	DDRB	D	1	1	0	0	50	03000	0	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	--	U	2356	3.1
67W-3	6080	P-J	DCQD	A	1	0	0	0	100	13000	0	Yes	1	0	0	0	0	0	0	0	0	0	0	0	0	QUA	U	1414	3.0
Ln3357	6110	P-J	ACPA	I	2	1	1	1	±1000	13211	7	Yes	16	2	0	6	1G 1R	0	4	0	0	0	2	2	2	STC	MA,LA FR	15708	2.8
67W-6	6120	P-J	DDJD	K	1	0	1	0	50	03000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	0	--	U	3927	2.4
67W-7	6140	P-J	ACPA	I	1	0	1	0	1000+	13111	4	Yes	13	0	0	0	0	1	1	0	0	0	0	2	0	RB	U	9818	2.3
67W-8	6140	P-J	DDRC	R	1	0	1	0	±200	13210	0	Yes	3	0	0	0	1E	0	0	0	0	0	0	0	0	STC	MA	3534	2.1
67W-9	6100	P-J	ACPC	I	1	1	0	0	2	03002	1	No	0	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	?	2.5
66W-3	6200	P-J	ACPC	I	0	0	0	0	0	00000	0	No	1	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	<1	1.3
66W-4	6210	P-J	ACJC	K	1	0	1	1	±200	13111	2	Yes	1	0	0	0	0	0	0	0	0	0	0	0	3	--	FR	4000	1.1
66W-5	6270	P-J	ACPA	I	1	2	2	1	2000+	23111	8	Yes	10	1	0	0	0	1	6	0	0	0	0	0	1	RB	FR	20735	0.9
66W-6	6230	J-S/ P-J	ACRA	D	1	0	0	0	10	13000	0	No	1	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	?	0.9
65W-1	6330	P-J	ACPA	I	1	1	1	1	500+	23211	4	Yes	5	1	0	0	0	2	6	*1	0	0	1	0	1	RB	Numic	30159	0.7
65W-2	6350	P-J	ACPA	I	1	1	1	1	±30	03000	0	Yes	2	0	0	1	0	0	0	0	0	0	0	0	0	LOC	U	1414	0.8
65W-3	6390	P-J	ACPA	I	1	0	2	1	500+	13111	0	Yes	5	0	0	0	E	1	4	**2	0	0	1	0	0	RB	MA	17279	1.0
65W-4	6390	P-J	ACJC	K	1	0	0	0	17	03000	1	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	--	U	?	1.2
65W-5	6420	P-J	ADRA	D	1	0	1	0	20	03000	0	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	1885	1.2
64W-1	6560	P-J	ACPC	I	2	0	1	0	±300	13210	0	Yes	3	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	4418	1.8
64W-2	6525	P-J	DCQA	I	1	0	1	0	20	03000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	707	2.1
64W-3	6520	P-J	DDRB	D	1	0	1	0	±100	03000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	0	--	U	1649	2.3
64W-4	6530	P-J	DDRC	D	1	0	0	0	±100	03000	0	Yes	1	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	15708	2.4
64W-6	6540	P-J	ACPC	I	1	0	0	0	6	03202	1	Yes	0	0	0	0	0	0	0	0	0	0	0	0	1	STC	FR	471	2.6
64W-7	6600	P-J	ACPC	I	0	0	0	0	0	00000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	1	LOC	FR	<1	2.7
63W-1	6660	P-J	ACAC	A	1	1	0	1	20	03000	0	No	0	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	118	3.3
63W-2	6710	P-J	ACPP	I	1	0	0	0	20	03200	0	No	1	0	0	0	frag	0	0	0	0	0	0	0	0	LOC	U	157	3.3
63W-3	6700	P-J	AARC	D	1	0	1	0	±100	03111	1	No	0	0	0	0	R	0	1	*1	0	0	0	0	0	STC	LA	32673	3.3
Ln3358	6450	P-J	ACPC	I	1	1	3	0	±200	13001	1	Yes	2	0	0	1	0	0	1	0	#1	0	0	0	0	STC	U	6283	3.0
62W-3	6500	P-J	ACAC	A	1	0	0	0	1	03000	0	No	1	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	?	2.0
62W-4	6440	P-J	ACAC	R	0	0	0	0	0	00000	0	No	3	0	0	0	0	0	1	0	0	0	0	0	0	STC	U	?	3.1
62W-5	6390	P-J	ACAC	A	1	0	1	0	30	03100	0	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	236	3.1
62W-6	6360	P-J	ACPA	I	1	1	2	0	100+	03110	0	Yes	4	0	0	0	0	0	0	0	0	0	0	0	0	LOC	U	1964	3.2
Ln3359	6370	P-J	ACPA	I	1	0	1	0	100+	13111	1	Yes	1	0	0	0	0	0	0	0	0	0	0	0	0	STC	U	707	3.1
Ln1775	6340	P-J	ACAC	A	1	1	5	1	500+	23111	2	Yes	4	0	1	1	0	0	15+	*1	##1	2	0	0	100+	RB	FR	25447	3.2
61W-2	6270	P-J	BCAC	A	1	0	8	0	±300	13121	2	Yes	1	0	0	0	0	0	0	0	0	0	0	0	0	STC	U	4398	3.2
Ln6	6120	P-J	ACRC	D	1	1	6	1	50+	13112	3	No	±1	1	0	0	0	0	0	0	0	0	0	0	1	STC	FR	9425	3.5

KEY:

Vegetation: J-S - Juniper-Sagebrush community
P-J - Pinyon-Juniper Woodland community

Landform, Description: See IMACS User Guide Part A, Nos. 32 and 33

Debitage Types: See IMACS User Guide Part B, No. 9

Projectile Points: E = Elko Series
H = Humboldt Series
G = Gatecliff Series (Pinto)
R = Rosegate Series

Heavy Tools: *chopper
**chopper and large scraper

Recreational Items: #stone smoking pipe
##ceramic smoking pipe

Site Types: LOC = Location
QUA = Quarry
STC = Short-term camp
RB = Residential base
-- = Secondarily deposited artifacts

Cultural Affiliation: FR = Fremont
LA = Late Archaic
MA = Middle Archaic
U = Unknown

present as snow (winter). Considering that both plant (e.g., pinyon nuts) and animal (e.g., large game) resources are much more abundant and clustered during the late fall and early winter than during spring, these sites probably represent winter settlements.

Functional tool categories present at residential bases are shown in Table 18. Residential equipment is present at four of five residential bases: fire-cracked rock concentrations (65W-1, 65W-3); deflated, slab-lined hearths and a ceramic smoking pipe fragment (26Ln1775); and two rock alignments which may represent either habitation structures or large cache pits (67W-7). Food processing equipment (i.e., grinding stones) is present at all five sites. The mean number of grinding stones at each is 7 ±4, and three sites each contain one large, non-portable boulder metate. Three sites have ceramics. General utility tools are present at all five sites, fabricating or processing tools are present at four sites, and a food acquisition tool (i.e., projectile point) was found at one site. Debitage counts exceed 500 flakes per site, with a mean of 900 ±583. Total tools per site is 20 ±5.

Table 18. Functional Tool Classes Present in Residential Bases (n=5).

Tool Category	Number of Sites	Frequency (%)
Residential	5	80.0
Food Processing	5	100.0
General Utility	5	100.0
Fabricating and Processing	4	80.0
Food Acquisition	1	20.0

Short-Term Camps

Seventeen sites (32.7%) are identified as short-term camps by the site classification key. Residential features are present at four (23.5% of 17), groundstone at eight (47.1%), and ceramics at three (17.6%). Functional tool categories present at short-term camps are shown in Table 19.

Table 19. Functional Tool Classes Present in Short-term Camps (n=17).

Tool Category	Number of Sites	Frequency(%)
General Utility	15	88.2
Fabrication and Processing	13	76.5
Food Processing	10	58.8
Food Acquisition	6	35.3
Residential	4	23.5

The data suggest that short-term camps can be divided into three groups: sites with food processing equipment and, sometimes, residential equipment (Type A camps); sites without food processing and residential equipment (Type B camps); and sites with only residential equipment (Type C camps). The inferred difference between Type A and Type B camps is group composition. Type A camps probably were occupied by single or multiple family groups (men and women), while Type B camps probably were occupied by large or small hunting groups (men only). Type C camps (one example) lack tools that provide clues to group composition.

Type A Short-term Camps

Ten sites are included in the Type A group, which is further divided into three subtypes, based on number of functional tool categories, abundance of lithic debitage, number of tools, and site area. Four or five functional tool classes are present at three Type A1 sites (Table 20). These sites occupy large areas (89,275 ±72,836 sq m), have debitage counts exceeding 1,000 flakes (1,167 ±624), and large numbers of tools (28 ±12). These sites key out as residential bases, but contain clues that they probably are palimpsests, or superimposed groups of artifacts deposited during different occupations.

Table 20. Functional Tool Classes Present in Type A1 Camps (n=3).

Tool Category	Number of Sites	Frequency(%)
Residential	2	66.7
Food Processing	3	100.0
Fabricating and Processing	3	100.0
Food Acquisition	3	100.0
General Utility	3	100.0

For example, one Type A1 site 26Ln3357 contains artifacts diagnostic of different time periods, including a Middle Archaic projectile point, a Late Archaic or Fremont projectile point, and Fremont pottery sherds, suggesting two or possibly three temporally distinct occupations. Type A1 sites 68W-7 and 26Ln21 are the largest sites recorded (63,620 and 188,496 sq m, respectively), but each appears to represent several occupational accumulations. Both sites have several distinct concentrations of occupational debris. At Type A1 site 26Ln21, these are separated by topographic boundaries, with debris on low rises. At Type A1 site 68W-7, one concentration contains grinding stones and a rock alignment, while other concentrations have only hunting equipment.

As palimpsests, Type A1 sites may represent sequential use as residential bases, short-term camps, locations, or combinations of the three. However, considering the kinds of artifacts present and their spatial distribution, it appears likely that most occupations of these sites were short-term camps.

Type A2 includes five sites; functional tool classes present at Type A2 camps are shown in Table 21. Site 62W-4 was disturbed by construction of Civilian Conservation Corps erosion control dams on the west slope of the Cedar Range. Artifacts observed at this site consist of three bifaces and a metate fragment resting on the tops of three adjacent check dams, each separated by about 10 meters. The site is excluded from debitage and site area descriptive statistics presented below for Type A2 sites. Another site was collected in 1939, so debitage and tool counts are considered subsets of original numbers and are excluded from analysis, but site area is considered to have been affected only slightly.

Table 21. Functional Tool Classes Present in Type A2 Camps (n=5).

Tool Category	Number of Sites	Frequency(%)
Food Processing	5	100.0
General Utility	5	100.0
Fabrication and Processing	4	80.0
Food Acquisition	1	20.0

For the three sites with representative debitage and tool counts, flake totals average 133 ±47 and average tool count is 5 ±1. Site areas range from 628 to 32,673 sq m, with an average of 12,252 ±12,204 sq m.

Type A3 sites (n=2) each have a food processing tool and either a general utility tool or a fabrication tool present. Both sites are identified as short-term camps because of the presence of food processing equipment (metate or pottery sherd). If these items had not been present, the sites would have been identified as locations. Type A3 camps are small in terms of debitage, and tool count, and site area. Debitage counts average 10 ±4 flakes, with two tools at each site. Site areas are quite similar, averaging 481 ±10 sq m. If these sites are indeed short-term camps, duration-of-stay was limited, perhaps to only overnight.

Discussion, Type A Short-Term Camps

Type A camps as a whole show considerable variation in terms of site area, debitage and tool counts, and number of artifact classes represented. In terms of size and amount of debris, Type A1 sites compare to residential bases, while Type A3 camps are little different from locations. The co-occurrence and abundance of hunting-related tools and food processing tools, particularly groundstone at Type A2 sites, suggest that both hunting and seed collecting/processing activities were carried out by mixed groups (men and women) from these sites. Type A1 palimpsests probably represent both male only (hunting) and mixed group occupations.

Type B Short-Term Camps

Six sites which lack food processing and residential equipment represent Type B short-term camps. Type B camps are divided into two subtypes, based on debitage counts (see Table 17). Both subtypes contain small numbers of general utility, fabrication, or food acquisition tools (Table 22).

Type B1 camps (n=5) have debitage counts that average 200 $\pm$ 71 flakes; tool counts average 3 $\pm$1; and, site areas average 2238 $\pm$1760 sq m. Type B2 camps (n=2) have rather smaller debitage counts, averaging 16 $\pm$2 flakes, and smaller site areas, averaging 236 $\pm$118 sq m. Type B2 camp tool counts, however, are similar to Type B1 camps, with an average of 5 $\pm$2 tools.

Table 22. Functional Tool Classes Present in Type B Camps.

Tool Category	Type B1 (n=4) No. of Sites	Type B1 (n=4) Frequency(%)	Type B2 (n=2) No. of Sites	Type B2 (n=2) Frequency(%)
General Utility	4	100.0	2	100.0
Fabrication	3	75.0	2	100.0
Food Acquisition	1	25.0	1	50.0

Type B camps appear related to hunting, based on the presence of hunting tools (i.e., projectile points), and/or fabrication (i.e., cores) and general utility (i.e., bifaces and flake tools) tools, and the absence of food processing equipment. Activities at Type B camps include toolstone core reduction, biface manufacture, and game processing or other tool fabrication (i.e., flake tools). With the expectation that lithic debitage increases with duration of stay or number of site occupants (Elston and Budy 1987), Type B1 camps probably were occupied for longer periods or by more hunters than were Type B2 camps.

Type C Camp

One site (71W-3) is comprised of a hearth-like feature and two obsidian secondary flakes about three meters away. The feature was manifest on the surface as an oval ashy deposit containing small pieces of fire-cracked rock and numerous burned large mammal and rabbit bones. This site is anomalous. Hearths are rare on sites in the study area, even at residential bases and larger short-term camps, and the paucity of other artifacts is puzzling as well.

Locations

Locations are the most abundant (n=30) type site, accounting for 57.7% of prehistoric sites at Panaca Summit. Three locations are isolated finds (two biface fragments and a pottery sherd). Of the other locations, 21 have both debitage and tools; 6 contain only debitage. Considering functional tool categories by site, only general utility tools (n=18 of 30, 60.0%) are widely distributed, while fabrication (n=3, 10.0%), food acquisition (n=2, 6.7%), and food processing (n=1, 3.3%) tools are rare. No residential equipment was found at locations. Only one site (3.3%) has more than one functional tool category represented. Types of locations and their artifact content are shown in Table 23.

Table 23. Functional Tool Classes Present in Locations (n=30).

Site Type/Tool Type	Number	Frequency(%)
Isolates		
General Utility Tool	2	6.7
Food Processing Tool	1	3.3
Lithic Scatters		
Debitage Only	6	20.0
Debitage, General Utility Tool(s)	12	40.0
Debitage, Fabrication Tool	2	6.7
Debitage, Food Acquisition Tool	1	3.3
Debitage, Food Acquisition Tool, and General Utility Tool	1	3.3
Toolstone Acquisition Sites		
Debitage Only	1	3.3
Debitage, General Utility Tool(s)	3	10.0
Debitage, Fabrication Tool	1	3.3
	30	99.9

Lithic Scatters with Only Debitage

Six locations contain only debitage. Two patterns are evident when examining debitage counts and reduction stages. The first group consists of two sites which have two or three secondary flakes. The second group consists of four sites which have 20 or 30 flakes (22 ±4), derived principally or exclusively from secondary reduction. Two of these sites also have biface thinning flakes, and one site contains low numbers of tertiary flakes.

Lithic Scatters with Both Debitage and Tools

Sixteen locations consist of lithic debitage and one or more stone tools. These locations are divided into groups based on functional tool classes present. Debitage is present at twelve locations, along with one or more general utility tools. Five of the 12 sites are small debitage scatters (8 ±7 flakes), each containing 1 biface fragment. Four of 12 consist of large debitage scatters (167 ±94 flakes) with 1 to 5 biface fragments (3 ±1); 1 of these (26Ln3356) also contains two flake tools. The remaining three sites are small debitage scatters (16 ±10 flakes), with one or two biface fragments and one or two flake tools.

Two locations have debitage and one fabrication tool (i.e., core) present. One site is a workshop with 200 flakes, most of which are secondary; tertiary flakes are also common and primary flakes are rare. The other location has only two secondary flakes.

One location has debitage (6 secondary flakes) and a food acquisition tool (Elko point). Finally, one site has debitage (20 flakes), one food acquisition tool (point fragment), and a general utility tool (biface).

Toolstone Acquisition Sites

Five locations involve toolstone acquisition, where naturally occurring obsidian, chalcedony, or chert nodules were obtained nearby and utilized for stone tool manufacture. During reconnaissance, small nodules of toolstone were observed in alluvial gravels in the immediate vicinity of these sites, although never in great abundance. These special-purpose locations are distinct from others when examining debitage reduction stages; most debitage is comprised of secondary flakes, while primary decortication flakes range from rare (>10%) to common (>25%). Relatively low counts of primary decortication flakes suggest that toolstone raw material size was small. Tertiary flakes, indicative of finished tool manufacture, are not present. Three sites have one or two early stage biface fragments; one site has a core and an expedient flake tool. Debitage variety and counts support our field observation that while raw material was present at these sites, it was not abundant.

Summary of Locations

The 30 locations show remarkable consistency in lack of functional tool class diversity (only one has more than one class), but differ in amount of debitage present. When examining debitage totals at locations, two groups emerge (see Table 17): small locations with 30 or fewer flakes (n=23, 76.7%) and large locations with 100 or more flakes (n=7, 23.3%). Tool count at small locations is 1 ±1, while large locations are double that, 2 ±1 tools. Site areas also differ; average area for small locations (when area was recorded; n=18) is 378 ±497 sq m, and for large locations, 6012 ±5696 sq m.

The great majority of locations appear to have been produced by lone hunters or hunting parties during brief stops on forays. Activities that occurred at locations, inferred from functional tool classes and debitage reduction stages, include interior core (no cortex) reduction, biface and other tool manufacture or resharpening, faunal acquisition (and possibly field processing), and toolstone acquisition. Only one location, an isolated ceramic vessel fragment, is the exception. This site may represent a pot dropped in transit.

Discussion of Criteria Used in Functional Site Classifications

In the site type definitions introduced in Chapter 4, three major criteria were used to group sites with the site type key. These include assemblage content, abundance of lithic debitage, and number of lithic raw material types. Overall, the site type key works well with these criteria. As discussed below, sites clustered by the key exhibit a fair number of intra-group consistencies and inter-group differences. As we shall see, site area also appears to be useful in distinguishing among site types.

Functional Tool Classes

Site types are distinct with regard to numbers of functional tool classes represented, as shown in Table 24. For instance, residential bases generally have more functional tool classes than short-term camps. Likewise, short-term camps typically have more functional tool classes than do locations. The trend is consistent except at Type A1 short-term camps, which have more tool classes than residential bases. High assemblage diversity is expected when the functional use of a site varies from occupation to occupation. This further supports the hypothesis that Type A1 sites are palimpsests of different kinds of occupations.

Table 24. Functional Tool Classes by Site Type and Subtype.

	Number of Classes Represented						
Site Type	0	1	2	3	4	5	mean
Residential Bases				1	4		3.8
Short-Term Camps							
Type A1					1	2	4.7
Type A2			1	2	2		3.2
Type A3			2				2.0
Type B1		1	3				1.8
Type B2			1	1			2.5
Type C		1					1.0
Locations							
Large		6	1				1.1
Small	7	15	1				0.7

Amount of Lithic Debitage

Site types are also distinct when comparing the amount of lithic debitage present at each (Table 25). In general, the longer a site is occupied, the more debitage will accumulate (Elston and Budy 1987). Residential bases should contain more debitage than short-term camps, and short-term camps should contain more than locations. When comparing average amounts of debitage among major site types, this trend is obvious in the site data. But when comparing residential bases with short-term camp and location subtypes, the trend breaks down. Type A1 short-term camps have slightly more debitage than residential bases, but this also likely relates to the palimpsest nature of Type A1 camps, wherein debitage accumulates over several occupations. Note that large locations have as much debitage as Type A2 and Type B1 camps, and more debitage than either Type A3, Type B2, or Type C short-term camps. This suggests that large locations also may be palimpsests of occupations.

Table 25. Debitage Count by Site Type and Subtype.

Site Type	N	Mean	Standard Deviation
Residential Bases	5	900	583
Short-Term Camps	15*	333	508
Type A1	3	1167	624
Type A2	3*	133	47
Type A3	2	10	4
Type B1	4	200	71
Type B2	2	16	2
Type C	1	2	2
Locations	30	39	66
Large	7	188	89
Small	23	11	9

* Excludes destroyed site and previously collected site.

Raw Material Diversity

Major site types generally cluster with regard to number of toolstone types found in debitage. All other things being equal, the longer a site is occupied, the more types of lithic material it is likely to contain (Elston and Budy 1987). The number of lithic types observed in debitage is shown in Table 26. The clearest trend is that debitage from locations contains the fewest number of lithic types, when compared to all short-term camps and residential bases. But Type A3 and Type C short-term camps have lower lithic diversity than either type of location. Residential bases have a slightly greater number of lithic types (5 ±2) than short-term camps (3 ±2), but numbers overlap at one standard deviation.

Table 26. Debitage Raw Material Diversity by Site Type and Subtype.

Site Type	Number of Lithic Types 0	1	2	3	4	5	6	7	8	9	mean
Residential Bases			1		2		1		1		4.8
Short-Term Camps											
Type A1					1	2					4.7
Type A2*			1	1		1				1	4.8
Type A3		1	1								1.5
Type B1			3							1	3.8
Type B2		1		1							2.0
Type C		1									1.0
Locations											
Large		3	2	1	1						2.0
Small	3	5	12	2	1						1.7

* Excludes destroyed site.

However, when comparing residential bases with all short-term camp subtypes and location subtypes, there is considerable variation in lithic diversity. Lithic diversity is as high in Type A1 and Type A2 short-term camps as it is in residential bases; once again, perhaps a reflection of the palimpsest nature of Type A1 sites. But the high diversity of mixed group, Type A2 short-term camps is not explained similarly. In this case, increased duration of occupation may have been operative. Lithic diversity is extremely low in Type A3 sites, suggesting that these sites actually may represent some form of location, rather than camps. Clearly, lithic raw material diversity alone is of limited value in differentiating site types and subtypes at Panaca Summit. Other factors, such as palimpsest accumulation and raw material availability in the immediate vicinity, may well be as important as duration of occupation for numbers of lithic types on sites.

Site Area

Mean site area for each site type and subtype is shown in Table 27. These data illustrate that site type usually correlates well with site area. When Type A1 camps (palimpsests) are excluded from consideration, a progression in mean size from location to short-term camp to residential base is evident. Also, a nice progression appears among short-term camp and location subtypes with regard to inferred durations of occupation discussed earlier. Overall, site area provides a useful way to characterize site types and subtypes in the Panaca Summit data set.

One observation worth noting is the size differential between Type A2 and Type B1 camps. As mentioned above, both subtypes are large camps believed to have been occupied by larger groups or for longer durations. Type A2 camps are inferred to be family group occupations, while Type B1 camps represent hunting party (males only) occupations. Type A2 camps are over five times larger than Type B1 camps, but similar quantities of debitage and tools appear at both. These statistics tend to support inferences regarding group composition: mixed group camps, compared to hunting party camps of similar duration, are occupied by more people. With more site inhabitants, refuse disposal and activity areas are correspondingly larger, which increases site area.

Table 27. Site Area by Site Type and Subtype.

Site Type	N	Mean	S.D.
Residential Bases	5	20,688	6,959
*Short-Term Camps	15	21,815	47,551
Type A1	3	89,275	72,836
Type A2	4	12,252	12,204
Type A3	2	481	10
Type B1	4	2,238	1,760
Type B2	2	236	118
Type C	1	10	0
Locations	23	1,786	3,698
Large	7	5,408	5,477
Small	18**	378	497

*When Type A1 camps (palimpsests) are excluded, site area drops to 4950 ±8828.
**Excludes isolates and sites without areal data.

Chronological Implications of Settlement Types

Of the 52 Panaca sites, 14 (26.9%) contained time-diagnostic artifacts. The majority of sites (n=38, 73.1%) are of unknown cultural affiliation. This is attributed, in part, to unauthorized collection and vandalism; in addition, numerous sites represent special task locations or short-term uses where temporally sensitive artifacts may not have been discarded.

Site type distribution according to time period is shown in Table 28 (for sites where temporal application is known). Sites with only one time period represented are included in the distributions; Type A1 palimpsests are excluded. Fremont (n=5) and Numic (n=1) sites were identified by diagnostic ceramics. Late Archaic (n=1) and Middle Archaic (n=4) sites were identified by Rose Spring and Elko/Humboldt projectile points.

Table 28. Chronology by Site Type.

Site Types	Late Middle Fremont	Numic	Archaic	Archaic
Residential Bases	2	1		1
Short-Term Camps				
Type A2	1		1	
Type A3	1			
Type B1				1
Type B2				1
Locations				
Large				
Small	1			1

The age of only a small sample of sites is known, allowing only qualitative statements to be made regarding prehistoric use of the area. Four different settlement types are representative of Middle Archaic use, including one residential base (65W-3), one large hunting camp (67W-8, Type B1), one small hunting camp (70W-7, Type B2), and one small location (68W-4). The residential base is located in the pinyon-juniper community and may be a winter camp associated with pinyon nut and large game procurement. Two short-term hunting camps suggest that a logistical collector strategy was employed by Middle Archaic groups; and the small location, consisting of six flakes and a projectile point, may be a large-game procurement and field processing site.

Only one site each is identified for Late Archaic and Numic utilization of the area. The Late Archaic site (63W-3) is a large, short-term camp with animal acquisition and processing tools and plant processing equipment. The site represents short-term occupation by small family group(s) and possibly indicates a forager strategy. The lone Numic site (65W-1) is a large residential base, located in the pinyon-juniper community near Summit Spring. Numerous grinding stones and flaked stone tools indicate both animal and plant resource utilization. The site probably represents a winter settlement associated with pinyon nut procurement.

Of particular interest are the Fremont settlement types, since little presently is known regarding Fremont adaptations in southeastern Nevada (see Berry 1974). Two large residential bases were identified, one on the eastern slopes of the Cedar Range (66W-5) and the other on the western slope (26Ln1775). Both are located in the pinyon-juniper community and may be winter settlements associated with pinyon nut procurement. One large (Type A2) and one small (Type A3) short-term camp also were identified. The large camp (26Ln6), located at Ninemile Rocks, was collected in 1939, so that the present artifact assemblage is quite limited. It is not presently possible to document subsistence activity with any degree of certainty for this site. The small camp (64W-6) consists of six flakes, one core, and one pottery sherd. Duration of stay was limited, perhaps to overnight. The final Fremont site (64W-7) is a pottery sherd isolate. Snake Valley Corrugated pottery, which dates between A.D. 1100 to A.D. 1200, is present at three of the five Fremont sites.

Relative Versus Absolute Assemblage Variability at Panaca Summit

Recently, Thomas (1984) discussed a common misconception regarding the classification of sites in prehistoric settlement systems. Many archaeologists assume that larger, more diverse site assemblages equate with residential use "residential bases," while smaller, less diverse site assemblages are inferred to represent places of diurnal resource extraction "locations". In this logic, sites of intermediate size and absolute diversity are considered to be logistic settlement "short-term camps" (Thomas 1984:4). Thomas argues that this reasoning is incorrect, pointing out that absolute assemblage diversity (number of artifact classes) is a direct, linear function of the absolute sample size (Thomas 1984:4; see also Jones et al. 1983).

Absolute Assemblage Diversity

Using data from 10 excavated sites in Monitor Valley, Nevada, Thomas employs a variety of methods to quantify absolute assemblage diversity (number of tool classes) and absolute assemblage size (number of artifacts). He shows that regardless of how size and diversity are defined in the Monitor Valley data, the relationship between absolute assemblage diversity and absolute assemblage size is always highly correlated. That is, absolute assemblage size predicts nearly all the variability present within absolute assemblage diversity. Thomas's calculated correlation coefficients range from r=0.92 to r=0.98n (1984:figures 2-5), which means that absolute assemblage size never accounts for less than 85 percent of variability in assemblage diversity in the Monitor Valley sites (Thomas 1984:9-15). Thomas, therefore, concludes that extreme caution is necessary when interpreting the behavioral meaning of absolute diversity in archaeological assemblages. Large assemblages will almost always contain many artifact types (Thomas 1984:16; see also Jones et al. 1983).

Relative Assemblage Diversity

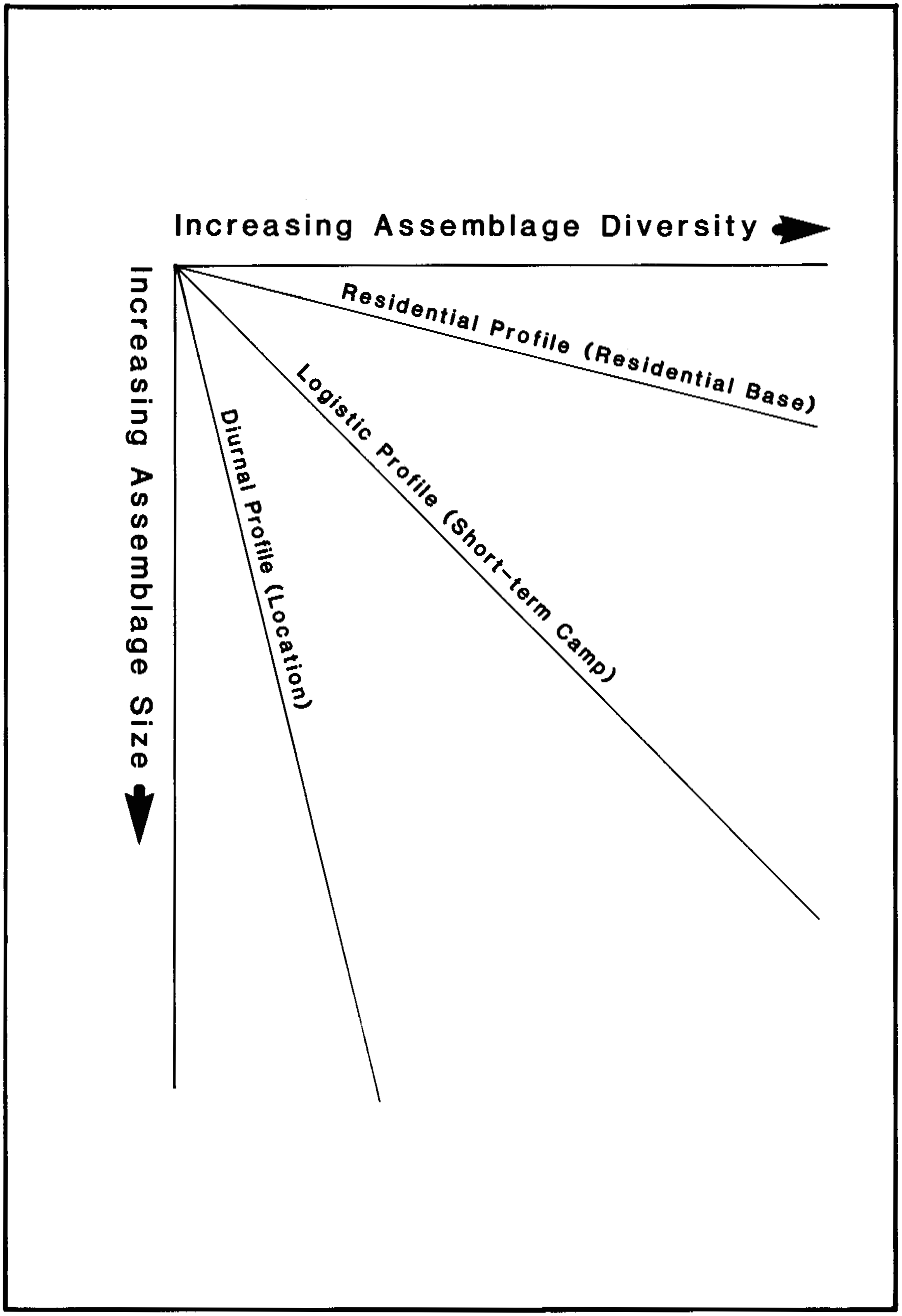
Assemblage diversity is not, however, unrelated to site function. Is there another way of examining assemblage diversity to attempt inference of site function? Thomas suggests the exact nature of the relationship between assemblage diversity and assemblage size can be appreciated only by examining the relative (rather than absolute) degree of diversity (Thomas 1984:4).

Long-term residential sites (residential bases) are where the greatest variety of artifact producing activities occur and, in relation to the overall techno-economic system, should be characterized generally by technologically and typologically diverse assemblages (Thomas 1984:4-5). Short-term camps are typically task limited and ephemeral and should contain a relatively less diverse assemblage than the average base camp inventory. Diurnal use area "locations" should contain an even more task specific technology. Location assemblages should be the least diverse, relative to their size, in any given system (Thomas 1984:5).

The relationship between assemblage diversity and assemblage size in groups of sites can be calculated through linear regression (least squares) (Blalock 1979), and plotted as a regression line (Figure 38). The independent variable (absolute assemblage size) is plotted along the horizontal (x) axis, while the dependent variable (absolute assemblage diversity) is plotted along the vertical (y) axis (Thomas 1984:6).

Within a given settlement system, the slope of the regression line for residential bases should be steep, since assemblage diversity is expected to increase rapidly relative to sample size in such sites. The slope of the regression line calculated for logistic assemblages (here, short-term

Figure 38. Relative assemblage diversity model (after Thomas 1984).



Increasing Assemblage Diversity
Increasing Assemblage Size
Residential Profile (Residential Base)
Logistic Profile (Short-term Camp)
Diurnal Profile (Location)

camps) should be intermediate in steepness; in sites of this kind, assemblage diversity is expected to increase moderately with increase in sample size. The slope of regression lines for diurnal activity assemblages (locations) should be relatively flat, since assemblage diversity increases very slowly relative to sample size in such sites (Thomas 1984:6). The degree of observable assemblage diversity may, however, be obscured in the archaeological record, given, as we have seen, that multiple residential occupations (and/or diurnal uses) at any one place can produce highly diverse palimpsest assemblages (Thomas 1984:7).

In the site type model presented above, absolute assemblage diversity was not used to infer site function; rather, we employed a hierarchy of functional tool categories. Does our site type model produce the same results as merely scaling absolute assemblage diversity to absolute assemblage size? If so, the validity of the site type model is questionable. But if not, the site type model may reflect the true nature of site utilization.

Panaca Summit Absolute Assemblage Diversity

To address the effects of assemblage size on absolute assemblage diversity in the Panaca Summit study area, site survey data were employed (see Table 17). First, total number of tools and tool categories were counted for each site. Debitage was counted as one tool and one tool category, therefore, allowing sites with only debitage present to be included in the data set. Also, pottery sherds were counted as one tool due to the uncertainty of the original numbers of vessels present. The following tool inventory was used for each site: debitage, core, biface, scraper, drill, flake tool, projectile point, ground stone, chopper, recreational item, and pottery. The destroyed site (62W-4) and previously collected site (61W-4) were excluded, as artifacts present were considered a subset of the original assemblage.

Paired values (number of tools, number of tool categories) for each site then were logged (Log 10) and plotted. The resulting graph shows a non-linear, monotonic relationship, even with logged data. The plotted sites describe a curve, with a tendency for the paired values at the upper right end of the distribution to flatten out. This pattern was produced by diminishing returns (Hartwig and Dearing 1982:48-49); that is, as assemblages get larger they become more redundant. One must observe many new artifacts at a site to obtain additional artifact classes and a corresponding increase in sample diversity.

In order to calculate a linear regression, the paired logged values for each site were logged again (Log 10-Log 10). Sites with one tool and one tool category, including three isolates and eight lithic scatters without tools (seven locations and the Type C short-term camp), were excluded since the Log-Log values were Log 10=0 (Log of 0 is infinity).

Plotting the remaining 39 sites (Figure 39) shows that the Log 10-Log 10 distribution is linear, and the correlation coefficient (Pearson's rho) was calculated for the sample. The correlation coefficient is $r=0.90$ ($df=37$, $p<0.000$), indicating that 81 percent of the assemblage diversity in the Panaca Summit prehistoric archaeological sites may be explained by sample size alone. This correlation coefficient compares to those derived from Thomas' Monitor Valley site data, although the relationship is not as strong (cf. Thomas 1984:figures 2-5).

The assemblage size (diversity relationship) in Figure 39 is described by the Log 10-Log 10 - linear regression function involving two variables and two constants:

$$\text{Log 10-Log 10 } \underline{Y}' = \underline{b} \text{ Log 10-Log 10 } \underline{X} + \text{Log 10-Log 10 } \underline{a}$$

where $\underline{X}$ is the independent variable and $\underline{Y}'$ is an estimate of the dependent variable. The constant $\underline{a}$ is the y-intercept and $\underline{b}$ is the coefficient of regression, or simply the <u>slope</u> (Thomas 1984:17). The regression equation allows one to explore size/diversity autocorrelation on a site-by-site basis, and the <u>slope</u> permits one to scale these data points along a more behaviorally relevant settlement continuum (Thomas 1984:17). To illustrate, the highly correlated linear relationship shown in Figure 39 is described by the equation:

$$\text{Log 10-Log 10 } \underline{Y}' = 0.636910 \text{ (Log 10-Log 10 } \underline{X}) - 0.183934$$

where $\underline{X}$ = assemblage size (number of recorded tools) and $\underline{Y}'$ = estimated assemblage diversity (number of tool classes present).

This regression equation permits projection, within a definable degree of error, of the actual value of $\underline{Y}$. For example, at site 26Ln21 we recorded 13 tools, classified into 6 tool classes. Given the number of tools present, we can predict the number of artifact classes at that archaeological

Figure 39. Absolute size and diversity for Panaca Summit sites.

site, with a high degree of accuracy. The absolute assemblage size at 26Ln21 is $\underline{X}$=13, so we project the following:

$$\text{Log 10-Log } \underline{Y}' = 0.636910 \text{ (Log 10-Log 10 } \underline{X}) - 0.183934$$

$$\text{Log 10-Log 10 } \underline{Y}' = 0.636910 \text{ (Log 10-Log 10 13)} - 0.183934$$

$$\underline{Y}' = 5.0$$

Rounding the results, the regression relation predicts that 2626Ln21 should contain about 5 artifact classes. As it turns out, the observed value ($\underline{Y}$=6) is well predicted. Similar relationships occur for the other 38 sites in Figure 39: the closer the observed point to the line, the better the prediction (see Thomas 1984:20). At site 65W-1, for instance, 20 artifacts were recorded. The regression relation predicts that $\underline{Y}$=5.9 artifact classes should be recovered. Six types occurred at 2626Ln21.

Also noteworthy in Figure 39 is the relative positioning of Panaca Summit site types. Sites classified by the site type key as residential bases and Type A1 short-term camps (palimpsests) are clustered at the upper right end of the distribution, while sites classified as locations are clustered at the lower left end of the distribution. Short-term camps (types A2, A3, B1, and B2) are positioned in the intermediate distributional range. The site type distribution and the high correlation coefficient ($\underline{r}$=0.90) evident in Figure 39 confirms that inferences of site function based on absolute assemblage diversity are limited and probably erroneous: the larger the assemblage size, the greater the resulting assemblage diversity (cf. Thomas 1984).

But what about the inferred site functions derived from a hierarchy of functional tool classes present, rather than from absolute assemblage diversity and absolute sample size? Do the functional site types -- residential bases, short-term camps, and locations -- inferred for Panaca Summit show relative assemblage diversity independent of absolute sample size?

Relative Assemblage Diversity Between Sites Grouped by Function

As previously discussed, the regression constant $\underline{b}$ (slope) provides a method for assessing relative assemblage diversity independent of absolute sample size, as long as assemblage size and diversity are highly correlated. Slope (b) measures the rate of change in Y per unit change in X. The predictive value of b decreases as r (correlation coefficient) decreases. This statistical relationship provides an operational measure of relative assemblage diversity (Thomas 1984:21). As the regression line becomes steeper (i.e., as the rate of diversity increases), the regression (b) becomes greater. As rate of assemblage diversity decreases, the slope approaches horizontal, and b approaches zero. This is always the case, regardless of sample size (Thomas 1984:21).

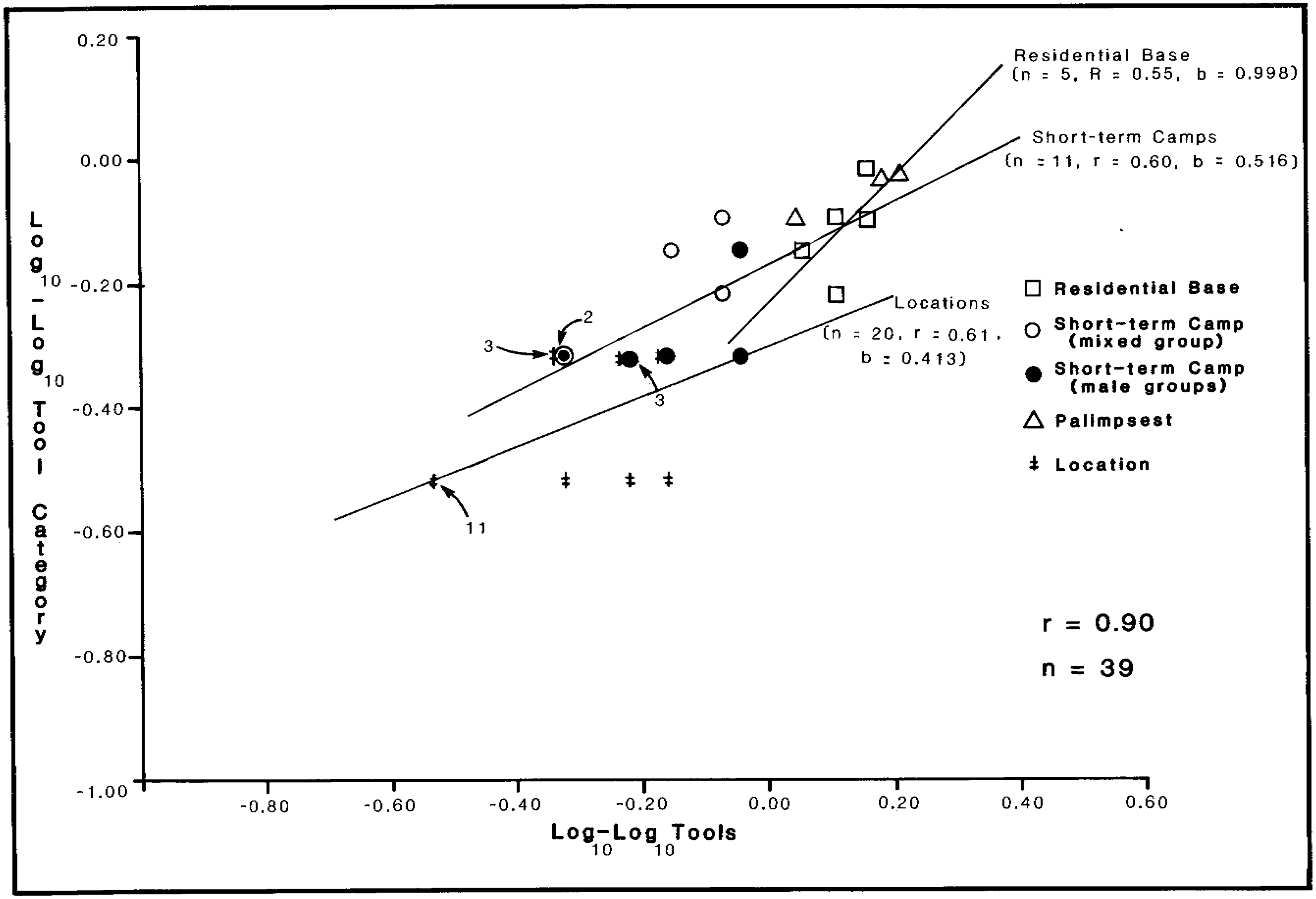
If rates of increase in artifact diversity are influenced by human behavior in the ways outlined above, relative assemblage diversity can be used to distinguish among groups of sites (see Figure 38). To ascertain whether the assemblage groupings for the Panaca Summit area -- residential bases, short-term camps, and locations -- exhibit relative assemblage diversity in relation to one another, linear regressions were calculated for each site type.

Results are shown in Figure 40, which illustrates the variability among the various pooled assemblages (i.e., residential bases, short-term camps, excluding type A1 palimpsests, and locations) for the Panaca Summit study area. Although the regression lines intergrade statistically, the various slopes do provide a means of scaling relative assemblage diversity (cf. Thomas 1984:Figure 6). Slopes of regression lines are all positive; the slope of the line for all pooled assemblages is b=0.637 (Log 10-Log 10 - linear regression equation, above), and individual assemblage values vary between b=0.413 ("locations") to b=0.998 ("residential bases"). The small sample sizes require caution, but on the basis of Figure 40, the following observations are made regarding relative assemblage diversity in Panaca Summit study area.

Relative diversity is least in Panaca Summit assemblages classified as locations using the site type key (b=0.413). The correlation coefficient is not high (r=0.61) but, it is significantly different from random (r=0.44, df=17, p=0.05) (Thomas 1976:Table A.11).

Relative diversity is intermediate in assemblages classified as short-term camps using the site type key (b=0.516). Again, the correlation coefficient is low (r=0.60), but significantly different from random (r=0.58, df=10, p=0.05).

Figure 40. Relative assemblage diversity among functional site groups.


Residential Base
(n = 5, R = 0.55, b = 0.998)
Short-term Camps
(n = 11, r = 0.60, b = 0.516)
Locations
(n = 20, r = 0.61, b = 0.413)
Residential Base
Short-term Camp (mixed group)
Short-term Camp (male groups)
Palimpsest
Location
r = 0.90
n = 39
0.20
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
-0.80
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
Log10-Log10 Tool Category
Log10-Log10 Tools
2
3
3
11

Relative diversity is greatest in Panaca Summit assemblages classified as residential bases using the site type key (b=0.998). However, the correlation coefficient is low (r=0.55) and <u>not</u> significantly different from random (r=0.88, df=3, p=0.05). This is due to very small sample size for residential bases (n=5).

<u>Discussion</u>

The pattern of relative assemblage diversity shown in Figure 40 approximates the theoretical pattern in Figure 38. Relative diversity is different among groups of sites segregated by the functional key. We tentatively conclude that these groupings probably reflect the position of sites in the residential-logistic-diurnal continuum.

Thus, the functional site model and relative diversity analysis produce complementary results. The model groups sites and the analyses demonstrate their distinctive character. An advantage of the functional model is that it works independently of sample size. As we have seen, relative diversity analysis may also distinguish among the groups of sites on the basis of <u>b</u> (slope). However, statements of statistical significance, or <u>r</u> (correlation coefficient), are sample size dependent. In the case of sites classified by the key as residential bases, the rate of diversity is high (the slope of the regression line is steep). But because of small sample size, <u>r</u> is low and not significantly different from random distribution. These results are suggestive, but inconclusive, until a larger sample of residential bases (classified by the site type key) from the Panaca summit area can be analyzed.

As a caution against oversimplification (see Thomas 1984:25), these results do <u>not</u> mean that diurnal utilization assemblages derive from locations classified by the site type key or that artifacts found at short-term camps or residential bases result only from short-term or long-term residential uses. But if locations occur at all in the Panaca Summit area, they most likely will be represented by locations identified by the site type key. The same can be said for short-term (or logistical) camps and, probably, for residential bases, pending further study of the project area.

Chapter 10. INTENSIVE INVESTIGATION OF SEVEN SITES ON PANACA SUMMIT

by
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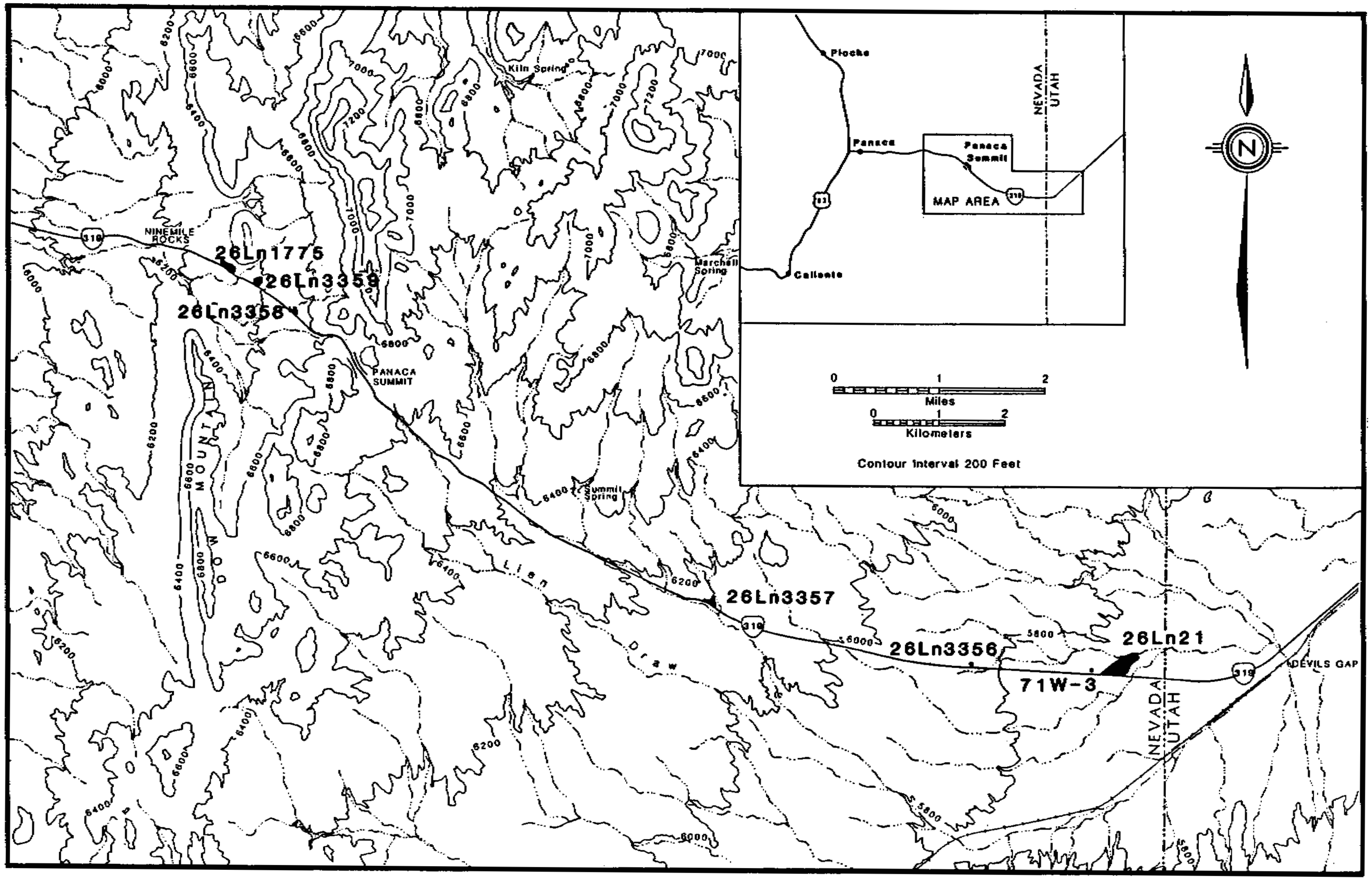
Chapter 9 presents a site classification study for a portion of the Panaca Summit Archaeological District. Ultimately, seven sites were selected, on the basis of a need for impact mitigation, for intensive investigation: a residential base (26Ln1775), five short-term camps (26Ln21, 26Ln3357, 26Ln3358, 26Ln3359, 71W-3), and one location (26Ln3356). Site locations appear in Figure 41, tool categories associated with each are summarized in Table 29, and assemblage inventories recorded during survey are given in Table 30.

Each site classification served as a hypothesis tested during the intensive investigations described in the following discussion.

Figure 41. Locations of tested sites, Panaca Summit study area.



NINEMILE ROCKS
26Ln1775
26Ln3359
26Ln3358
PANACA SUMMIT
Kiln Spring
Marchell Spring
Summit Spring
MOUNTAIN
WOOD
Lion Draw
26Ln3357
26Ln3356
26Ln21
71W-3
DEVILS GAP
NEVADA
UTAH
319
Pioche
Panaca
Panaca Summit
MAP AREA
Caliente
93
N
0 1 2
Miles
0 1 2
Kilometers
Contour Interval 200 Feet

Table 29. Functional Site Types and Associated Tool Categories at Tested Sites.

Tool Categories

Site No.	Site Type	Resid.	Food Proc.	Food Acq.	Fabric.	Gen. Util.
26Ln1775	Residential Base	X	X		X	X
26Ln21	STC Type A1		X	X	X	X
26Ln3357	STC Type A1	X	X	X	X	X
26Ln3358	STC Type A2	X	X		X	X
26Ln3359	STC Type B1				X	X
71W-3	STC Type C	X				
26Ln3356	Large Location					X

STC = Short term camp

Table 30. Survey Recorded Assemblage Inventories for Tested Sites.

Tool/ Feature Category	Site 1775	Site 3357	Site 21	Site 3358	Site 3356	Site 3359	Site* 71W-3
Debitage	500+	1000+	500+	200+	250+	100+	2
Raw material types	8	5	4	5	1	2	1
Core	2	7	1	1		1	
Biface	4	16	2	2	5	1	
Flake tool	1	6	6	1	2		
Projectile point		2	1				
Scraper		2					
Drill	1						
Chopper	1						
Groundstone	15	4	2	1			
C. sherds	100+	2					
Stone pipe				1			
Ceramic pipe	1						
Rock alignment		2					
Hearth	2?						1
FAR** scatter		2					

*prefix 26Ln deleted from site numbers
**FAR = fire-affected rock

The Archaeology of Site 71W-3

Site 71W-3 is located in open juniper-sage woodland on the east slope of the Cedar Range about 0.68 miles west of the Nevada-Utah border. The site is comprised of an ovate charcoal and ash stain (Figure 42) exposed at the top of a low rise above an active (but ephemeral) drainage channel, and two obsidian flakes located about 3 m south of the feature. The feature measures approximately 1.5 m across the long axis, with numerous burnt bones and fire altered rocks on its surface. Although this site was not originally scheduled for testing, it appeared to be in danger of destruction from erosion and so its study was undertaken.

As discussed in Chapter 9, site 71W-3 appeared to be an anomaly. Containing a hearth, but very few associated artifacts, it was the only Type C short-term camp in the sample. Subsequent test excavation of the hearth-like feature and analysis of materials collected from soil flotation suggest a non-cultural origin for this feature.

Test Excavation

Field methods employed at 71W-3 were designed to recover a large soil sample for flotation analysis and to expose a cross section of the feature in order to examine it in profile and evaluate its integrity.

Data recovery involved excavation of a small trench, 1.5 m long by 30cm wide and 10cm deep. Bones exposed on the feature surface were also collected. Exposure of the feature in cross section showed it to be thin (less than 10 cm thick) and lens-shaped, with a slightly convex upper surface. The lower surface was relatively flat, and the soil beneath was oxidized to a bright red color. There was no sign of a pit, or any rock lining or enclosure.

Flotation Analysis

The excavated soil sample (sample weight = 11,330 grams; sample volume = 7,969 milliliters) was processed through an agitated soil flotation system (described in Chapter 4).

Figure 42. Hearth-like Feature, site 71W-3.

Flora

Seed and other plant material recovery is given in Table 31. The light fraction included 206 seeds, 75% of which were charred. Most (52%) of the identifiable seeds are juniper (Juniperus sp.), and a large quantity of juniper twigs (715 grams) were also present. The remaining seeds include only a few specimens of pinyon (Pinus monophylla), amaranth (Amaranthus sp.), locoweed (Astragalus sp.), globe mallow (Sphaeralcea sp.), rose (Rosa sp.), and grasses (Oryzopsis sp. and undifferentiated Graminae). All species but pinyon are present in the modern vegetation community surrounding the feature. The large number of fresh juniper seeds suggests local derivation (i.e., from a nearby tree).

Table 31. Seeds Recovered from 71W-3 Soil Flotation Sample.

Taxa	Total Recovered	Number Burned
Rosa sp.	1	1
Amaranthus sp.	8	0
Astragalus sp.	11	11
Oryzopsis sp.	1	0
Graminae	3	1
Sphaeralcea sp.	1	1
Juniperus*	108	66
Pinus monophylla	3	3
**Unidentified	67	67
	206	152

*Large quantity (+15 gm) of juniper twigs were also recovered.

**Includes 5 distinct species (herbaceous plants?).

Fauna

A total of 324 faunal specimens was recovered from the surface and flotation sample. Faunal remains were identified to the most specific level possible (cf. Lyman 1979), including the identification of bone fragments to animal size class (Table 32).

Table 32. Animal Size Classes, Site 71W-3 (after Thomas 1969:393).

Class I	-	Mice, Shrews
Class II	-	Rats, Gophers
Class III	-	Hares, Rabbits
Class IV	-	Coyote, Bobcat
Class V	-	Deer, Sheep

Details of the faunal assemblage from Site 71W-3 are given in Table 33. Hares (Lepus sp.) and cottontails (Sylvilagus sp.) represent the most abundant taxa. Two species of each genus currently inhabit Lincoln County (see Hall 1946). Although there are characteristics which differentiate species within each genus (Grayson 1977; Neusius and Flint 1985), the recovered specimens are too fragmentary for more specific identification.

Other identified specimens in the collection include desert woodrat (Neotoma lepida), a possible deer (cf. Odocoileus sp.), and an unidentified bird (Aves).

Although faunal remains are numerous, the total weight of the assemblage is only 19.2 grams (.06 grams per item). The heaviest item is a 3.2 gram class V mammal longbone fragment. Low weight per item is due in part to the abundance of small mammalian species in the collection (i.e., classes I - III) and to the highly fragmented condition of the assemblage.

Table 33. Attributes of Faunal Remains from Site 71W-3.

Species or Size Class	Element	Total	Burned	Unburned	% Burned	Soil Flotation Sample Scat Bones	Soil Flotation Sample Gnawed Bones
I	---	13	12	1	92	--	--
II	Incisors	3	3	0	100	--	1
II	Phalanges	2	2	0	100	--	--
II	Caudal Vertebrae	1	1	0	100	--	--
II	Distal Tibia	1	1	0	100	--	--
II	Distal Radius	1	1	0	100	--	--
II	Cranial	1	1	0	100	--	--
II	---	43	39	4	90	3	2
III	---	107	98	9	91	5	8
II-III	---	91	83	8	90	14	1
IV	---	2	2	0	100	--	2
III-IV	---	3	3	0	100	--	--
V	Distal Humerus	1	1	0	100	--	--
V	---	21	21	0	100	--	--
Aves	Distal Tibiotarsus	1	1	0	100	--	--
Neotoma lepida	Mandible	1	1	0	100	1	--
Neotoma lepida	Maxilla	1	1	0	100	--	--
cf. _Neotoma_ sp.	Isolated Tooth Fragments	2	2	0	100	--	--
Sylvilagus sp.	Distal Humerus	2	2	0	100	--	--
Sylvilagus sp.	Proximal Ulna	1	1	0	100	--	--
Sylvilagus sp.	Squamosal	1	1	0	100	--	--
cf. _Sylvilagus_ sp.	Distal Metapodial	2	2	0	100	--	1
cf. _Sylvilagus_ sp.	Tarsal	1	1	0	100	--	--
Lepus sp.	Distal Tibia	1	1	0	100	--	1
Lepus sp.	Calcaneum	1	1	0	100	1	1
Lepus sp.	Pelvis (Acetabulum)	1	1	0	100	--	1
Lepus sp.	Pelvis (Illium)	1	1	0	100	--	1
Lepus sp.	Metapodial	1	1	0	100	--	1
Lepus sp.	Phalange	1	1	0	100	--	1
Lepus sp.	Scapula (Glenoid)	1	1	0	100	--	--
Lepus sp.	Proximal Tibia	1	1	0	100	--	--
Lepus sp.	Premaxilla	1	1	0	100	--	--
Lepus sp.	Distal Phalange	1	1	0	100	--	--
Lepus sp.	Patella	1	1	0	100	--	--
Lepus sp.	Distal Humerus	1	1	0	100	--	--
Lepus sp.	Distal Radius	1	1	0	100	--	--
Lepus sp.	Mandible	2	2	0	100	--	--
Lepus sp.	Tooth Fragment	1	1	0	100	--	--

Table 33 (Continued). Attributes of Faunal Remains from Site 71W-3.

Species or Size Class	Element	Total	Burned	Unburned	% Burned	Soil Flotation Sample Scat Bones	Soil Flotation Sample Gnawed Bones
cf. Lepus sp.	Distal Metapodial	1	1	0	100	--	1
cf. Lepus sp.	Distal Phalange	1	1	0	100	--	1
cf. Lepus sp.	Vertebrae Fragments	2	1	1	50	--	--
cf. Lepus sp.	Tooth Fragments	1	1	0	100	--	--
cf. Odocoileus sp.	Proximal Ulna	1	1	0	100	--	--
Total		324	301	23	92	24	23

Ninety-two percent of the recovered bones are burned. When bone is heated by open flame, it passes through a continuum of morphological stages directly related to the duration and intensity of heating (Schmitt 1986a; Shipman et al. 1984). Specimens from 71W-3 show a great deal of variation along this continuum, including color change (i.e., black to gray-blue to chalky white) and bone damage (i.e., shrinkage cracks).

Several gnawed and digested bones are present in the collection. Twenty-three bones (7%) possess parallel, flat-bottomed striations indicative of rodent gnawing (see Shipman 1981). Twenty-four bones (7%) display polished surfaces and rounded edges: both are diagnostic attributes of carnivore scatological remains (Dansie 1984; Juell and Schmitt 1985; Schmitt 1986b).

Coprolites

Twelve coprolites were recovered from the soil flotation sample. Four specimens are fully carbonized rodent pellets, seven are fresh rabbit pellets, and one is a fresh deer(?) pellet.

Discussion and Conclusions

Lack of cultural material (debitage, tools, ceramics, etc.), the presence of a variety of plant species, abundance of bone (and bone damage), and the recovery of animal feces suggest that the 71W-3 feature is not cultural but, more likely, represents a burned woodrat house.

The faunal data alone support the burned woodrat house hypothesis.

The bushy-tailed woodrat (Neotoma cinerea) and desert woodrat (N. lepida) currently are found in northeast Lincoln County and throughout most of the Great Basin (Hall 1946). Also known as packrats, these small mammals collect a variety of items from their immediate surroundings and transport them to their nests where they are used in nest construction (e.g., Bonaccorso and Brown 1972; Thompson and Hattori 1983; Wells 1976). Woodrats collect virtually anything they are able to transport (i.e., items lighter than 100 grams; Wells 1976:228), including sticks, rocks, coprolites, small animal carcasses, and bone (Stones and Hayward 1968; Wells 1976).

Woodrat houses appear to be randomly deposited masses of debris when, in fact, they are often complex structures. Stones and Hayward (1968) dissected numerous Neotoma lepida houses in western Utah and found many to possess several chambers and passages, including areas for sleeping and food storage. Woodrats tend to prefer rocky areas (i.e., caverns and crevices) for habitation sites, but will utilize juniper tree (Figure 43), dead limbs/logs (Figure 44), and even open sagebrush areas when more optimum rocky habitats are not available (Llewellyn 1981; Stones and Hayward 1968).

First, all the faunal specimens are within the weight and size range of items transported by woodrats. Second, the number of bones collected from the soil sample (324 per .023 m^3) is close to the size of bone assemblages recovered from unburned woodrat house samples of similar volume (411 per .025 m^3; Juell and Schmitt 1986). Further, rodent-gnawed bone and scat bones are common in woodrat houses (Juell and Schmitt 1985, 1986): gnawed bone is the result of tooth sharpening/maintenance and feeding behavior, and scatological bones are the result of collected carnivore scats disaggregating in the woodrat house. The occurrence of pinyon seed hulls may also be explained by woodrat collection of carnivore scats.

The woodrat house at Site 71W-3 probably was located either in a juniper tree (Figure 43) that had been struck by lightning, or under a log (Figure 44) burned by a nearby strike. Remains of a lightning struck tree were observed a few meters south of 71W-3, and others were observed throughout the project area.

Over two decades ago, Heizer and Brooks (1965) addressed the reality of "hearths" as cultural features at the Louisville site. Their argument that the Louisville features were burnt woodrat houses was not supported due to the lack of data concerning the contents of modern woodrat houses. Since then, actualistic and taphonomic research has helped elucidate our recognition and understanding of site formation processes (e.g., Juell and Schmitt 1985, 1986). The study of the feature form site 71W-3 contributes to this knowledge.

The Archaeology of Site 26Ln21

Site 26Ln21 is located .5 miles west of the Nevada-Utah state line and east of Panaca Summit. The site is one of the largest recorded in the study area (18,496 square meters), and is comprised of several discrete artifact concentrations. The present study was confined to a small portion of the site

Figure 43 (upper). Woodrat house built in the base of a juniper (from Stones and Hayward 1968:463).

Figure 44 (lower). Woodrat house built under a dead juniper limb (from Stones and Hayward 1968:465).

represented by a small, diffuse lithic scatter on the slopes of two ridges and the surface of gravelly alluvial deposits in the bottom of an ephemeral drainage. The small scatter covers an area of approximately 1800 square meters (30 N/S by 60 E/W).

Soils on the site consist of brown stony loam with increased stoniness at depth. Vegetation is open juniper woodland, with an understory of big sagebrush, rabbitbrush, and ricegrass. Sheetwash erosion was moderate to heavy on slopes, and ridge, and it appeared that artifacts were being washed off the slopes and into the drainage.

Surface Collection

In order to characterize artifact density across the site, three 5 x 5 m collection units were placed parallel to the main channel of the wash, along the south bank (Figure 45). Debitage recovery is given in Table 34. Since we observed high debitage density on the slopes and top of the ridge, we assumed that artifacts were being washed from the ridge into the drainage bottom. Consequently, we expected that artifact density would decrease downstream of the ridge. As it happened, debitage density increased downstream from collection unit C to collection unit A, suggesting that cultural material on the surface of the alluvium in the drainage bottom represents primary deposition.

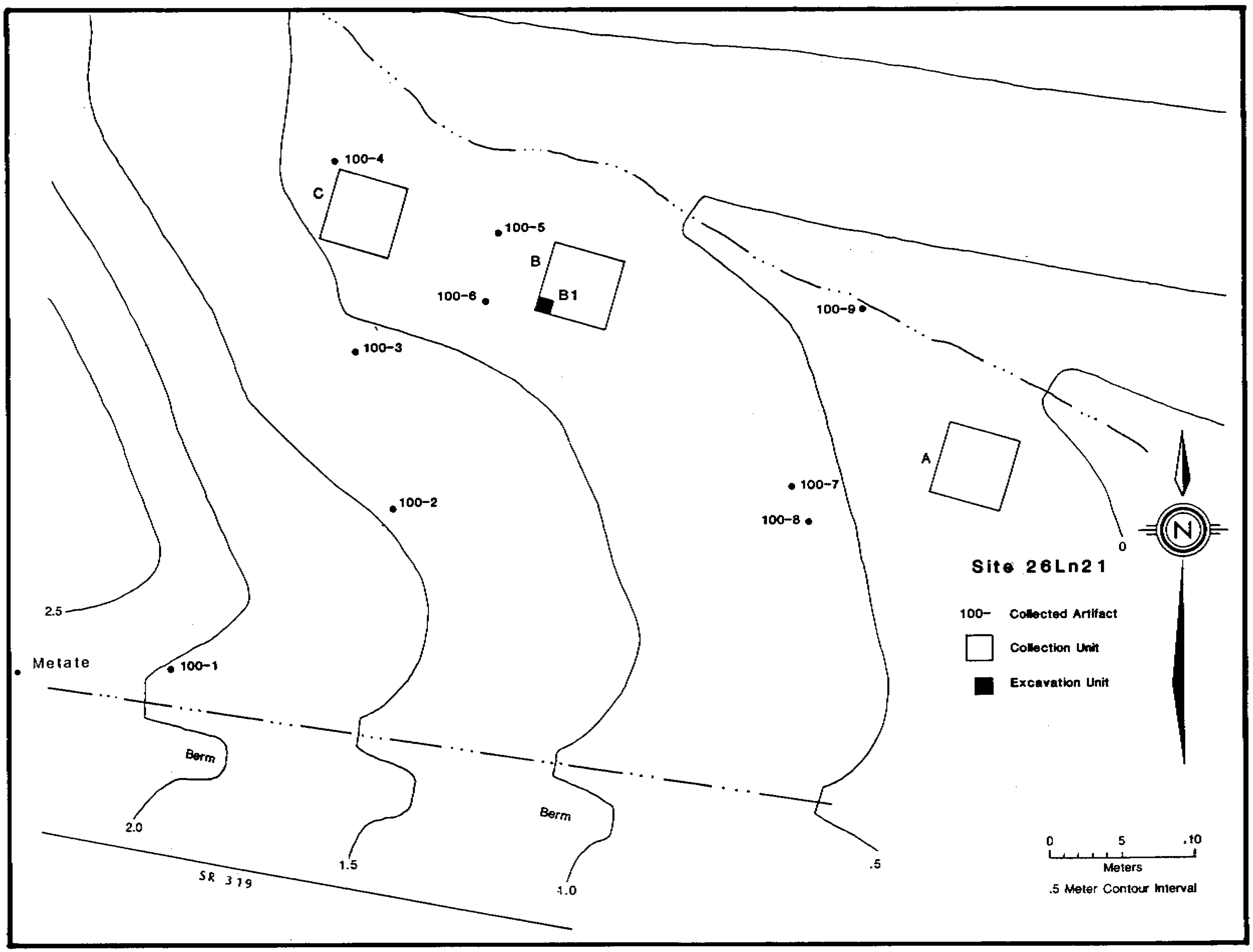
Table 34. Debitage Count by Sampling Unit at Site 26Ln21.

Site Area	N	Percentage
Collection Unit A	55	42.3
Collection Unit B	35	26.9
Collection Unit C	12	9.2
Test Unit B1 (0-30 cmBS)	28	21.5

Figure 45. Site map, 26Ln21.

Key to Artifacts

- 100-1 core
- 100-2 modified flake
- 100-3 large biface
- 100-4 large biface
- 100-5 utilized flake
- 100-6 core
- 100-7 large biface
- 100-8 Elko corner notched point



100-4
C
100-5
B
B1
100-6
100-3
100-9
A
100-7
100-8
100-2
Site 26Ln21
100- Collected Artifact
Collection Unit
Excavation Unit
0
2.5
Metate
100-1
Berm
2.0
1.5
Berm
1.0
.5
SR 319
0 5 10
Meters
.5 Meter Contour Interval
N

Test Excavation

The soils of the ridge slope were stony and obviously shallow. The most likely place for buried cultural material to occur was in the alluvial deposits of the drainage bottom, and this is where we placed the test pit. The 1 by 1 meter test unit was excavated to a depth of 30 cm in the southwest corner of collection unit B. The first 4 cm comprised a layer of light colored, loose, dry sandy gravel. Thereafter, the soil was sandy silt loam with stringers of fine gravel; a B soil horizon was not encountered.

The vertical distribution of debitage recovered from the test unit is given in Table 35. Three flakes were recovered from the surface. Debitage abundance was greatest in the upper 10 cm of the deposit. Thereafter, debitage counts dropped steadily indicating most cultural materials are near the surface and are being bioturbated downward. Excavation was, therefore, terminated at 30 cm below the surface.

Table 35. Vertical Distribution of Debitage in Test Unit 1 at Site 26Ln21.

Depth	N	Frequency
Surface	3	10.7
Level 1	15	53.6
Level 2	6	21.4
Level 3	4	14.3
	130	100.0

Artifact Assemblage and Inferred Activities

The artifact inventory from Site 26Ln21 includes debitage, cores, large bifaces, flake tools, a projectile point, and a large boulder metate (not collected) (Table 36). This is the kind of generalized assemblage characteristic of short-term base camps, suggesting such activities as lithic processing and manufacture (cores and bifaces), food acquisition (hunting), food processing (metate), and general maintenance (flake tools).

The Elko Corner-Notched point from the site may indicate occupation during late Archaic. However, this tool has been resharpened extensively and could represent reuse of an old point by later groups.

Table 36. Tool Assemblage Composition of Site 26Ln21.

Artifact Class	N	Percentage
Cores	2	16.7
Large Bifaces	5	41.7
Modified Flakes	2	16.7
Utilized Flake	1	8.3
Projectile Point (ECN)	1	8.3
Metate	1	8.3
	12	100.0

ECN = Elko Corner-notched

Over 90% of the debitage recovered from the site is gray banded obsidian, with only a few items of chert, basalt and mahogany obsidian (Table 37). The latter rarely is found on sites west of the crest of the Cedar Range, and its abundance seems to increase moving east. However, it is never the dominant material on a site and we observed no tools made from it.

Table 37. Debitage Material Types at Site 26Ln21.

Material Type	N	Percentage
Banded Obsidian	122	93.8
Chert	5	3.8
Basalt	2	1.5
Mahogany Obsidian	1	0.8
	130	100.0

Since there are so few pieces of anything but banded obsidian in the debitage (Table 38), little can be said of reduction involving other materials. For banded obsidian, debitage representing the earliest stage of reduction (shatter, primary flakes) is scarce (5.8%) at Site 26Ln21, suggesting that initial processing most likely took place elsewhere. On the other hand, flakes with cortex (Table 39) are relatively abundant (31.1%), indicating the source of raw material was nearby. In any case, core reduction is suggested, not only by the presence of cores, but by the relatively large number (32.8%) of secondary flakes.

Table 38. Debitage Class by Material Type, Site 26Ln21.

Debitage Class	Banded Obsidian		Chert		Basalt		Mahogany Obsidian	
	N	%	N	%	N	%	N	%
Shatter	4	3.3	1	20.0	1	50.0	0	100.0
Primary	3	2.5	0	-	0	-	0	-
Secondary w/Cortex	21	17.2	0	-	0	-	0	-
Secondary, Interior	19	15.6	4	80.0	0	-	0	-
Biface Thinning	4	3.3	0	-	0	-	0	-
Tertiary	7	5.7	0	-	0	-	0	-
Fragment w/Cortex	11	9.0	0	-	1	50.0	0	-
Fragment, Interior	53	43.4	0	-	0	-	1	100.0
	122		5		2		1	

Table 39. Cortex by Material Type, Site 26Ln21.

Cortex	Banded Obsidian		Chert		Basalt		Mahogany Obsidian	
	N	%	N	%	N	%	N	%
Present	38	31.1	0	-	1	50.0	0	-
Absent	84	68.9	5	100.0	1	50.0	1	100.0
	122		5		2		1	

Large bifaces (all of which are early stage artifacts) comprise the most abundant artifact class at the site, suggesting the importance of biface manufacture. Yet, biface thinning flakes are only 3.3% of the debitage. Biface thinning flake recognition is obviously difficult and the most abundant debitage class is interior flake fragments, or pieces of flakes without cortex and usually without platforms.

As we shall see at the conclusion of this chapter, there is a strong positive correlation between numbers of obsidian biface thinning flakes and numbers of obsidian interior flake fragments. This suggests that a great many interior flake fragments are actually fragments of biface thinning flakes which shattered as they were detached. The correlation does not seem to hold for chert or siltstone debitage, possibly because these materials are tougher and less likely to shatter.

No stage III bifaces were recovered from the site, and the abundance of tertiary flakes is low, both indications that "finishing" or maintaining stone tools were relatively unimportant activities.

The Archaeology of Site 26Ln3356

Site 26Ln3356 is located east of Panaca Summit, 1.8 miles west of the Nevada-Utah state line. The site lies mostly on the toe of a low ridge extending eastward into the alluvium of a wash (Figure 46). The wash parallels the ridge and then turns southward across its toe.

The site consists of three lithic concentrations. One is located along the upper slopes of the ridge and the other toward the base of the ridge slope. The lower concentration is cut by a shallow drainage and berm associated with State Route 319. The smallest concentration is located north of the wash. The main concentrations cover an area of approximately 500 sq m (50m by 10m). Widely scattered flakes and tools cover an additional 500 sq m to the north.

Vegetation is open pinyon-juniper woodland in the immediate vicinity of the site, but trees are more dense in surrounding areas. The understory consists of sage, rabbitbrush, and cheatgrass. Soils are of brown to grayish brown stony loam to 10 cm, with increasingly clay rich soils below. Carbonate nodules and stringers become apparent at approximately 30 cm below surface.

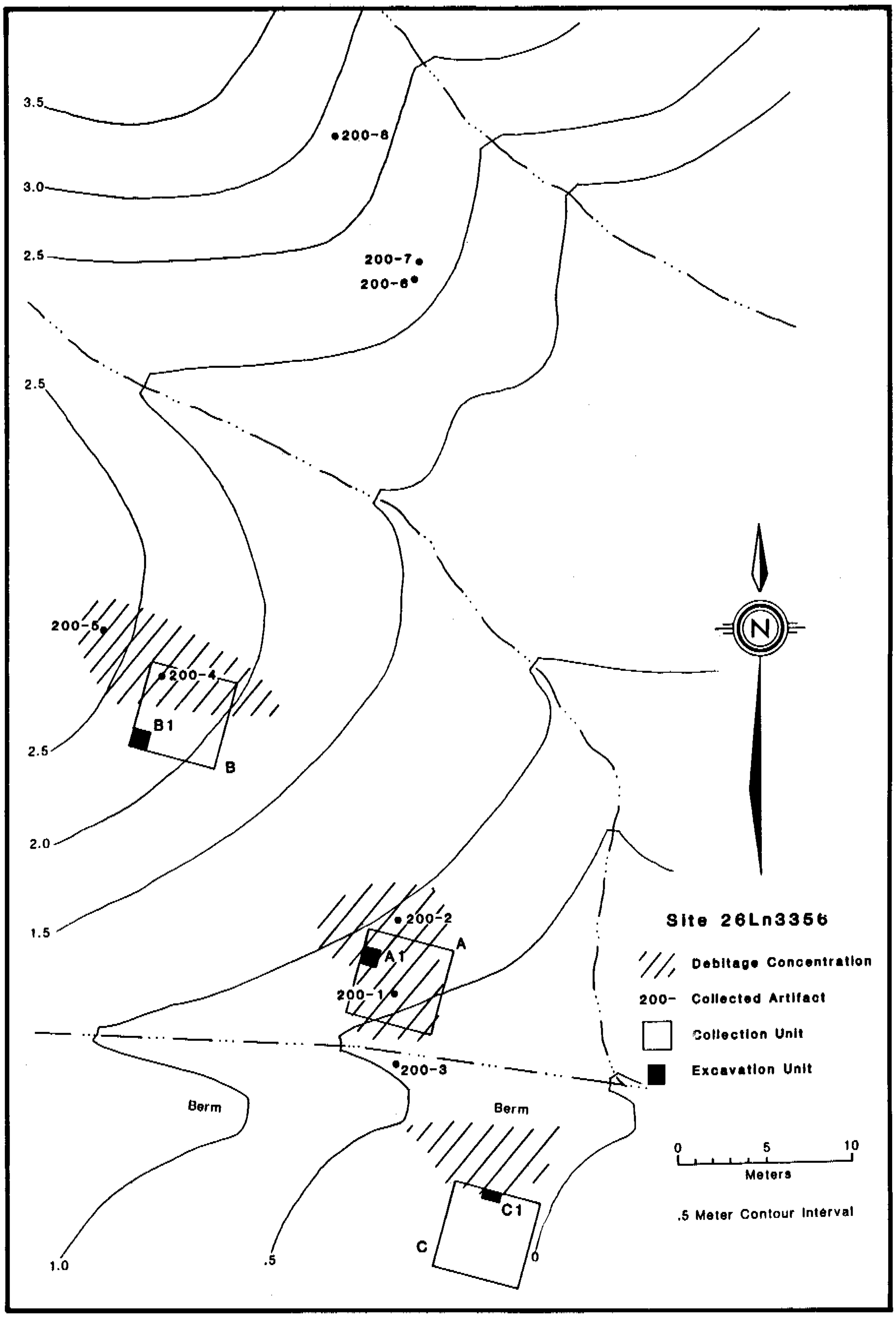
Surface Collection

A 5 x 5 m collection unit was placed in each of the main lithic concentrations. In addition, a 1 by 1 collection unit was located south of the berm and ditch in order to characterize that portion of the concentration prior to test excavation. Amounts of debitage recovered from each sampling unit are given in Table 40.

Figure 46. Site map, 26Ln3356.

Key to Artifacts

200-1 small biface
200-2 large biface
200-3 large biface
200-4 large biface
200-5 utilized flake
200-6 large biface
200-7 large biface
200-8 large biface



3.5
3.0
2.5
2.5
2.5
2.0
1.5
1.0
.5
0
200-8
200-7
200-6
200-5
200-4
200-2
200-1
200-3
B1
B
A1
A
C1
C
Berm
Berm
N
Site 26Ln3356
Debitage Concentration
200- Collected Artifact
Collection Unit
Excavation Unit
0 5 10
Meters
.5 Meter Contour Interval

Table 40. Debitage Count by Sampling Unit, Site 26Ln3356.

Site Area	N	Percentage
Mapped Surface Artifacts	2	0.3
Collection Unit A	200	28.7
Test Unit A1 (0-30cm BS)	266	38.2
Collection Unit B	127	18.2
Test Unit B1 (0-10 cm BS)	25	3.6
Collection Unit C	5	0.7
Test Unit C1 (0-40cm BS)	72	10.3
	697	100.0

Surface debitage density is greatest in Area A. It appears that the loose, surficial layer found everywhere is being removed here through rilling and sheet erosion associated with the highway drainage feature. This appears to have exposed and concentrated artifacts on the surface that otherwise would have been mixed into the upper soil layer.

Test Excavation

One by one meter test units were excavated in each of the 5 by 5 collection units, and a 1 by .5 meter test unit was located in the smaller 1 x 1 meter collection unit. The vertical distribution of debitage shown in Table 41 is typical of surface deposits essentially being mixed downward through bioturbation. Most cultural materials are confined to the upper 20 cm of the deposit with highest densities in the top 10 cm.

Table 41. Vertical Distribution of Debitage from Test Units, Site 26Ln3356.

Depth	Unit A1	Unit B1	Unit C1
Surface	15	2	5
Level 1	152	23	36
Level 2	35		23
Level 3	6		10
Level 4			3
	208	25	77

Artifact Assemblage and Inferred Activities

The artifact assemblage from Site 26Ln3356 is dominated by bifaces (Table 42), and all tools are made of gray banded obsidian; a few items of debitage are mahogany obsidian (Table 43). Most tools are large, early stage bifaces, but there is one small biface and a flake tool. The lack of structures, residential equipment, or food procurement or processing tools mark this site as a location.

Table 42. Assemblage Composition, Site 26Ln3356.

Artifact Class	N	Percentage
Large Bifaces	10	83.3
Small Biface	1	8.3
Utilized Flake	1	8.3
	12	

Table 43. Debitage Material Types, Site 26Ln3356.

Material Type	N	Percentage
Banded Obsidian	693	99.4
Mahogany Obsidian	4	0.6
	697	100.0

At Site 26Ln3356, debitage representing the earliest stage of reduction (shatter, primary flakes) is even less abundant than at Site 26Ln21 (Table 44), and the proportion of debitage with cortex is also very low (Table 45). Thus, initial processing of raw materials probably was not performed at the site. The paucity of debitage with cortex could indicate either a distant source or large nodule size.

Table 44. Debitage Class Material Type, Site 26Ln3356.

Debitage Class	Banded Obsidian		Mahogany Obsidian	
	N	%	N	%
Shatter	5	0.7	0	-
Primary	5	0.7	0	-
Secondary w/Cortex	97	14.0	1	25.0
Secondary, Interior	152	21.9	2	50.0
Biface Thinning	24	3.5	0	-
Tertiary	102	14.7	0	-
Fragment w/Cortex	26	3.8	0	-
Fragment, Interior	282	40.7	1	50.0
	693	100.0	4	100.0

Table 45. Cortex by Material Type, Site 26Ln3356.

Cortex	Banded Obsidian		Mahogany Obsidian	
	N	%	N	%
Present	133	19.2	1	25.0
Absent	560	80.8	3	75.0
	693	100.0	4	100.0

The dominance of large bifaces in the tool assemblage suggests the major activity performed at Site 26Ln3356 was biface manufacture. Biface thinning flakes comprise only 3.5% of the banded obsidian debitage, but interior flake fragments are numerous (40.7%), as they were at Site 26Ln21. Although no stage III bifaces were recovered, the proportion (14.7%) of tertiary flakes is the highest of any site in the study area, indicating tool finishing and/or maintenance.

The Archaeology of Site 26Ln3357

Site 26Ln3357 is located on the east side of Panaca Summit, 4.3 miles west of the Nevada-Utah state line. 26Ln3357 is an extensive artifact scatter covering approximately 7000 sq m (140m by 50m), situated on top and along the edges of a low southeast trending ridge, lying near the head of a heavily dissected alluvial fan. Vegetation is dense pinyon/juniper woodland with a sage and cheatgrass understory.

26Ln3357 has two distinct artifact concentrations or loci, separated by an area in which artifacts are much more dispersed. One locus, covering 3250 sq. meters (50m by 65m), contains a number of bifaces and groundstone fragments and is located atop a low knoll at the southern edge of the ridge (Figure 47). A concentration of rocks containing a boulder metate fragment was located near the center of the locus, just east of the crest of the knoll. Seven other boulder metates occurred elsewhere on the knoll. Two shallow circular depressions were located on the southeastern slope of the knoll.

The other locus, covering an area 35 meters in diameter (962 sq. meters), is associated with a small ephemeral drainage west of the knoll. Artifacts are not as dense, and the scatter contains a circular stone hearth and pottery, as well as bifaces and groundstone. A small check dam lies further down the intermittent channel; a metate, projectile point, and large biface were nearby.

Surface Collection

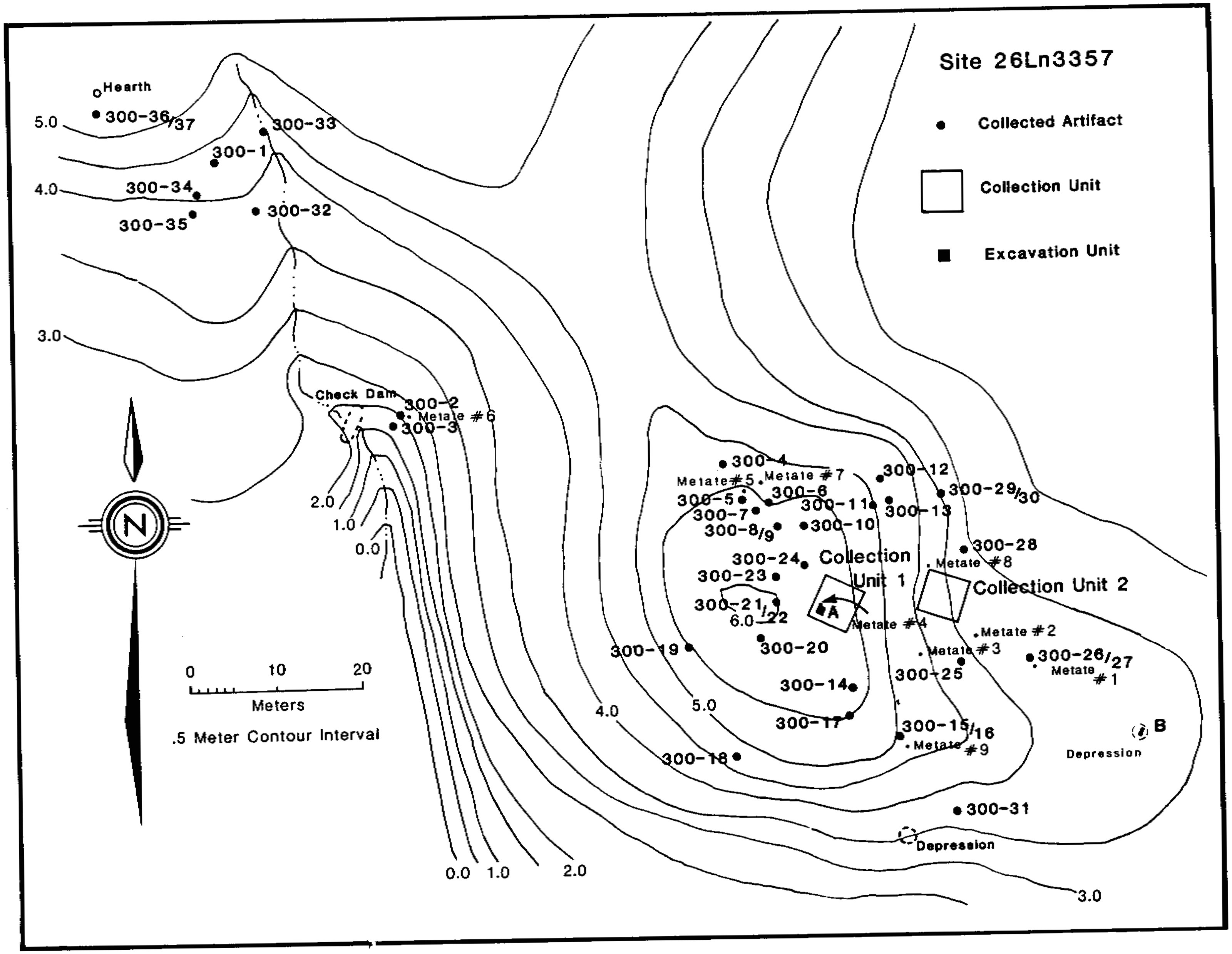
In order to characterize assemblage composition and artifact density in the eastern locus, we flagged all tools. Lithic tools were collected, but groundstone was field recorded and left *in situ*. We observed that debitage density seemed to increase downslope to the east. This was confirmed with two 5 x 5 m collection units placed on the eastern slope of the knoll, in which all debitage and lithic tools were collected. Collection unit 1 was placed so as to sample the area around the rock concentration near the summit of the knoll. Debitage counts from each collection unit and the test pit are given in Table 46.

The western locus contained fewer artifacts. Consequently, we merely flagged and collected lithic tools and pottery there.

Figure 47. Site map, 26Ln3357.

Key to Artifacts

300-1	pottery scoop
300-2	Gatecliff Contracting stem point
300-3	large biface
300-4	large biface
300-5	large biface
300-6	untypable projectile point
300-7	large biface
300-8	small biface
300-9	drill
300-10	large biface
300-11	modified flake
300-12	large biface
300-13	large biface
300-14	large biface
300-15	core
300-16	small biface
300-17	large biface
300-18	utilized flake
300-19	large biface
300-20	large biface
300-21	large biface
300-22	large biface
300-23	large biface
300-24	Elko Corner-notched point
300-25	large biface
300-26	small biface
300-27	large biface
300-28	large biface
300-29	large biface
300-30	core
300-31	untypable projectile point
300-32	cobble scraper
300-33	large biface
300-34	large biface
300-35	large biface
300-36	large biface
300-37	Gatecliff Contracting stem point



Site 26Ln3357
Collected Artifact
Collection Unit
Excavation Unit
Hearth
300-36/37
300-33
300-1
300-34
300-32
300-35
5.0
4.0
3.0
Check Dam
300-2
Metate #6
300-3
2.0
1.0
0.0
0 10 20
Meters
.5 Meter Contour Interval
300-4
Metate #5
Metate #7
300-5
300-6
300-7
300-11
300-8/9
300-10
300-12
300-13
300-29/30
300-28
300-24
Collection Unit 1
300-23
Metate #8
Collection Unit 2
300-21/22
6.0
A
Metate #4
Metate #2
300-19
300-20
Metate #3
300-26/27
Metate #1
300-25
300-14
4.0
5.0
300-17
300-15/16
Metate #9
B
Depression
300-18
300-31
Depression
0.0
1.0
2.0
3.0

Table 46. Debitage Count by Sampling Unit, Site 26Ln3357.

Site Area	N	Percentage
Surface Collection Unit 1	179	31.1
Surface Collection Unit 2	344	59.8
Test Unit A (0-10cm BS)	52	9.0
	575	100.0

Test Excavation

In order to assess the nature of the rock concentration near the top of the knoll, a 1 by 1 meter test unit was excavated over the feature. This revealed a very thin (3 cm), loose, reddish gray loam A horizon, underlain by a reddish brown stony clay loam B horizon. All cultural materials were limited to the upper 5 cm of the deposit. The rock feature contained no ash or charcoal or any signs of burning. The unit was excavated to 10 cm below the surface in only its south half, and excavation was terminated at the bottom of level one.

A 1 by .5 meter test pit was excavated downslope along the ridgeline where a shallow surface depression was evident, but surface artifacts were absent. The unit was excavated through loose, sandy loam, completely devoid of artifacts. The B horizon was never contacted, and the unit was terminated at 80 cm below surface. The depression thus appeared to be non-cultural, possibly a tree-throw crater.

Artifact Assemblage and Inferred Activities

As shown in Table 47, broken down by site area and collection unit, site 26Ln3357 contains a hearth (residential structure) and many classes of artifacts, including groundstone, pottery, debitage, cores, a hammerstone, large and small bifaces, flake tools, and functionally specialized tools such as projectile points, an end scraper, a drill, and more than 100 flakes. Thus, the functional site key classifies the site as a residential base. However, as discussed in Chapter 10, there is reason to believe the site is a palimpsest of occupations. The western locus is the best case for a single occupation; the eastern locus almost certainly was created by multiple occupations.

Table 47. Assemblage Composition, Site 26Ln3357.

Artifact Class	Site Area West	East	Unit 1	Unit 2	Total	%
Cores		2			2	2.6
Large Bifaces	4	17	3	13	37	48.7
Small Bifaces		3		3	6	7.9
Drill		1			1	1.3
Flake Scraper		1		1	2	2.6
Cobble Scraper		1			1	1.3
End Scraper		1			1	1.3
Mod. Flake Tools		1	3	2	6	7.9
Util. Flake Tool		1			1	1.3
Hammerstone				1	1	1.3
Projectile Points	3	3	1	2	9	10.5
Metates	1	7	1		9	11.8
Ceramic Ladle/Scoop (Snake Valley Gray)	1				1	1.3
	9	38	8	22	77	

Western Locus

The assemblages from each of the two loci share some of the same artifact classes, but they are different in important ways. The western locus has a residential feature (hearth), food processing tools (metate, cobble scraper, pottery), and food acquisition (points) and general utility (bifaces) tools. According to the site classification key, the western locus is a Type A2 short-term camp.

The presence of the check dam is also suggestive of a residential occupation, although check dams are not features presently employed by the functional site classification key.

Historic erosion control check dams are common on the western slopes of the Cedar Range area; these features were constructed by CCC crews between 1933 and 1942 (Stornetta 1987:48-49). The historic check dams employ one of three different construction methods. Most are earthen dams, constructed of local fill (usually obtained from the streambed immediately upstream of the dam), ranging from 1 to 5 feet high and 7 to 30 feet long. In rocky areas, dams are stone walls constructed of several courses of neatly laid medium to large angular cobbles and boulders. Coursed dams range from 3 to 7 feet high and 5 to 30 feet long. Dams employing a third construction style are present on the lower reaches of the western slopes. These dams consist of rows of upright juniper poles with earth piled up around them.

The CCC erosion control features always occur in complexes over large areas, most commonly on major drainages in dissected alluvial fans. Every major channel is damed, with dams 20 to 40 feet apart along each drainage. The largest complex recorded in the present study (62W-4) included more than 200 dams.

The water control feature at 26Ln3357 is quite different from the historic dams, both in physical setting and construction technique. It is the only water control feature observed during the present study on the eastern slopes of the Cedar Range. In contrast to the historic dams which are found in large drainages, the feature at 26Ln3357 is positioned across a small, ephemeral channel draining only the ridge top to the north. It is much smaller than historic dams: about 1 foot high, 3 feet wide, and 11 feet long, and is constructed of piled (rather than coursed), angular and subangular cobbles.

All these differences suggest the feature is an aboriginal (prehistoric) water control or snow storage dam. Notice (Figure 47) that the dam is placed just upstream from a section of channel having a steeper gradient, at a point where water could pool behind the structure. Fine sediments have accumulated behind the dam, indicating it successfully slows water velocity. The presence of a metate, projectile point, and a large biface nearby may indicate an activity area in association with the feature.

The association of Snake Valley Gray pottery and Contracting Stem points in the western locus is what might be expected, at first glance, in a palimpsest of Middle Archaic and Fremont occupations. However, Fremont pottery and Contracting Stem points were found together in Level V at O'Malley Shelter (Fowler et al 1973:28; Table 4). Perhaps the use of Contracting Stem points, like Elko Series points, extended into the Horticultural Period in southeastern Nevada.

Thus, it is possible that the western locus of site 26Ln3357 represents a small Fremont residential base. Arguing against this interpretation is the relative paucity of pottery and lack of habitation structures,although these might be revealed through excavation and more intensive surface collection.

Eastern Locus

The eastern locus has food processing tools (metate, scrapers), food acquisition tools (points), fabrication tools (cores, hammerstone, drill, bifaces), and general utility tools (flake tools, bifaces); and the debitage count is much greater than 100. Thus, the key classifies this area as a residential base, even without the putative hearth and lack of structures.

How many people could have occupied the eastern locus? If each metate there (n = 8) was used by a different woman, there easily could have been about 30 people, counting children, at the site. It is interesting to compare this estimate with that derived using O'Connell's recent site structure model. Using ethnoarchaeological data from Australian Alyawara groups, O'Connell (1987:85-86) models the relationship between number of households and site area with the regression equation:

$$y = 650.0(x)^{1.51}$$

where x is the number of households occupying the site, and y is the area occupied.

The eastern locus covers 3,250 m^2. Substituting this number for y and solving for x yields an estimate of 2.9 households. The mean household size of O'Connell's Alyawara data was 5.2 $\pm$2.4. Using these numbers (which may be somewhat too large for southeastern Nevada) produces an estimate of 15.08 individuals, with ranges between 22.04 and 8.12.

However, this does not mean that all those people occupied the site at the same time. Arguing against a single, long-term occupation is the lack of well-defined hearths, shelters, and storage features, and the presence of intensive wear on metates. It seems more reasonable to assume the knoll was an attractive place for a camp and was used over and over, occupied sequentially by smaller groups.

Lithic Production

As shown in Table 48, nearly 90% of the debitage from the site is gray banded obsidian. Chert is also present at 10%, and there are a few items of basalt rhyolite. Mahogany obsidian is absent.

Both primary and secondary debitage is relatively scarce at site 26Ln3357. Debitage with cortex (tables 49 and 50) is extremely rare. This suggests that obsidian procurement and initial processing took place some distance from the site. With the large number of bifaces from the site, it would appear that biface manufacture was an important activity that one might expect to see reflected in the debitage. This may be the case since interior flake fragments (many of which are probably shattered biface thinning flakes) are abundant (47.6%), even though the frequency of biface thinning flakes is low (4.5%).

Table 48. Debitage Material Types, Site 26Ln3357.

Material Type	N	Percentage
Banded Obsidian	511	88.9
Chert	60	10.4
Rhyolite	3	0.5
Basalt	1	0.2
	575	100.0

Table 49. Debitage Class by Material Type, Site 26Ln3357.

Debitage Class	Banded Obsidian		Chert		Rhyolite		Basalt	
	N	%	N	%	N	%	N	%
Shatter	14	2.7	10	16.7	0	-	0	-
Primary	5	1.0	2	3.3	0	-	0	100.0
Secondary w/Cortex	48	9.4	11	18.3	0	-	0	-
Secondary, Interior	100	19.6	17	28.3	3	100.0	0	-
Biface Thinning	23	4.5	2	3.3	0	-	0	-
Tertiary	59	11.5	1	1.7	0	-	0	-
Fragment w/Cortex	19	3.7	2	3.3	0	-	0	-
Fragment, Interior	243	47.6	15	25.0	0	-	0	-
	511		60		3		1	

Table 50. Cortex Material Type, Site 26Ln3357.

Cortex	Banded Obsidian N	Banded Obsidian %	Chert N	Chert %	Rhyolite N	Rhyolite %	Basalt N	Basalt %
Present	77	15.1	19	31.7	0	-	1	100.0
Absent	434	84.9	41	68.3	3	100.0	0	-
	511		60		3		1	

Higher proportions of primary and secondary reduction flakes are present in chert debitage, as well as more flakes with cortex. This suggests that chert was obtained near the site and processed there. However, chert was not made into bifaces at the site. In fact, the three chert artifacts recovered from site 26Ln3357 (hammerstone, endscraper, projectile point) are all highly curated items which likely were manufactured elsewhere.

The Archaeology of Site 26Ln3358

Site 26Ln3358 is located on the west side of Panaca Summit 1.3 miles east of Ninemile Rocks (Figure 41). The site lies on the end of a low, northwest trending ridge (Figure 48). The southern end of the ridge has been truncated by State Route 319, which apparently removed an unknown portion of the site. A well traveled jeep trail intersecting the highway follows the ridge top. Several recent hearths and debris scatters suggest the ridge top serves as a favored campsite for hunters. A series of large, historic earthen check dams occur in the drainage east of the ridge (Figure 48).

The site is located in pinyon-juniper woodland with a sparse understory of bitterbrush. Soils on the ridge are shallow and rocky, attaining a maximum depth of 20 cm before encountering bedrock. The A horizon is very thin, but on the ridge crest was very dark gray in color, due in large part, to charcoal from modern campfires.

During initial survey of the site, a stone pipe and mano were recorded just above the road cut (Figure 48), along with the usual sparse scatter of debitage. Further examination revealed several discrete lithic concentrations. Laminated siltstone and chert are common lithic materials on the site, which covers an area of approximately 1200 square meters (30m by 40m).

Surface Collection

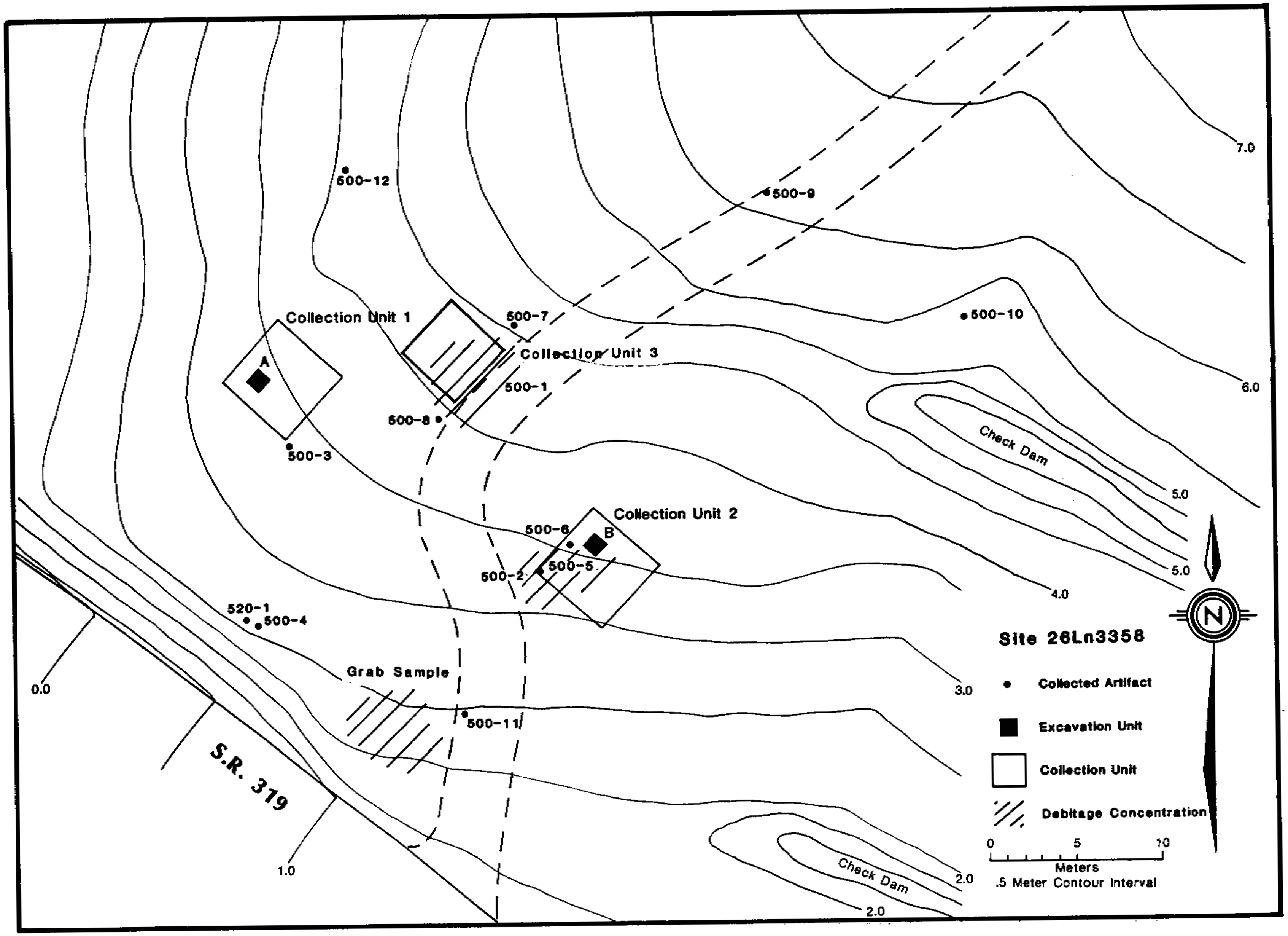
Two 5 by 5 meter collection units were placed on the site (Figure 48). Collection unit 1 is located along the ridge top in an area about 10 m north of the pipe and mano finds. Surface artifacts were sparse here, but the soil was very dark and midden-like. Unit 2 was located further east on the ridge slope in an artifact concentration containing debitage, a large biface, a small square biface, and an incised stone. A 4 x 4 m collection unit (Unit 3) was placed on a lithic concentration just west of the jeep trail and east of collection unit 1. In addition, a grab sample was obtained from another lithic concentration on the south side of the site between the highway and jeep trail where tabular chert debitage and an incised stone were located. Amounts of debitage recovered from each sampling unit are given in Table 51.

Table 51. Debitage Count by Sampling Unit, Site 26Ln3358.

Site Area	N	Percentage
Grab Sample	32	14.0
Surface Collection Unit 1	16	7.0
Test Unit A (0-10cm BS)	1	0.4
Surface Collection Unit 2	47	20.6
Test Unit B (0-20cm BS)	53	23.2
Surface Collection Unit 3	79	34.6
	228	100.0

Debitage and tool density was lowest on the ridge crest and highest in the area of the grab sample. However, it is difficult to say whether the concentrations are a result of prehistoric activity or historic disturbance to the site.

Figure 48. Site map, 26Ln3358.


Site 26Ln3358
Collected Artifact
Excavation Unit
Collection Unit
Debitage Concentration
0 5 10
Meters
.5 Meter Contour Interval
Collection Unit 1
Collection Unit 2
Collection Unit 3
Grab Sample
Check Dam
Check Dam
S.R. 319
A
B
500-1
500-2
500-3
500-4
500-5
500-6
500-7
500-8
500-9
500-10
500-11
500-12
520-1
0.0
1.0
2.0
2.0
2.0
3.0
4.0
5.0
5.0
6.0
7.0
N

Test Excavation

A 1 x 1 m test pit was excavated in collection units 1 and 2. In unit A, on the ridge crest, the A horizon consists of 3 to 8 cm of ashy, sandy loam overlying bedrock. The first (and only) level in this unit produced a single chert flake. In unit B, the upper soil layer was also thin. Four centimeters of duff mixed with loose, dark gray sandy loam overlay a stony, reddish brown, clay rich B horizon. Bedrock lay at 20 cm below surface. Artifacts were confined to the A horizon.

Artifact Assemblage and Inferred Activities

The artifact assemblage at site 26Ln3358 is small and, as at other sites in the study area, dominated by bifaces (Table 52). However, only one of these bifaces is made from obsidian; one is chert and seven are laminated siltstone. These are all early stage bifaces made on tabular cores.

Table 52. Assemblage Composition, 26Ln3358.

Artifact Class	N	Percentage
Tabular Cores	3	17.6
Large Bifaces	9	52.9
Small Bifaces	1	5.9
Expedient Scraper	1	5.9
Mano	1	5.9
Stone Smoking Pipe	1	5.9
Incised Stone	1	5.9
	17	100.0

The debitage from site 26Ln3358 is not dominated overwhelmingly by any one material type, although laminated siltstone is most abundant (Table 53). There is also more chert than banded obsidian, and one sandstone flake which may possibly be related to the manufacture of metates (Table 54).

Table 53. Debitage Material Types, Site 26Ln3358.

Material Type	N	Frequency
Silicified Siltstone	126	55.3
Chert	61	26.8
Banded Obsidian	40	17.5
Sandstone	1	0.4
	228	100.0

Table 54. Debitage Class by Material Type, 26Ln3358.

Debitage Class	Silicified Siltstone		Chert		Banded Obsidian		Sandstone	
	N	%	N	%	N	%	N	%
Shatter	1	0.8	10	16.4	3	7.5	0	-
Primary	21	16.7	3	4.9	0	-	0	-
Secondary w/Cortex	38	30.2	14	23.0	2	5.0	0	-
Secondary, Interior	32	25.4	24	39.3	18	45.0	0	-
Biface Thinning	17	13.5	1	1.6	1	2.5	0	-
Tertiary	0	-	2	3.3	3	7.5	0	-
Fragment w/Cortex	4	3.2	0	-	2	5.0	0	-
Fragment, Interior	13	10.3	7	11.5	11	27.5	1	100.0
	126		61		40		1	

The siltstone debitage assemblage from site 26Ln3358 is distinctive, reflecting both the qualities of this material and the reduction strategy used with it. Bifaces were manufactured from tabular siltstone blanks at the site. The proportion of biface thinning flakes is higher for siltstone at 26Ln3358 than for any other material in the entire study. More of these flakes are detached intact from siltstone bifacial cores, since the proportion of interior flake fragments is low. Repair and maintenance of siltstone was not a common practice at the site, however, since there are no tertiary flakes.

Both banded obsidian and chert have high proportions of shatter and secondary interior flakes, and low proportions of biface thinning and interior flake fragments without cortex, suggesting that while some obsidian and chert core reduction was practiced at the site, there was little manufacture of obsidian or chert bifaces.

As indicated by relative proportions of cortex across material types (Table 55), siltstone is the most local source, followed by chert. Pebbles of these raw materials were, in fact, observed in the soil of the site.

Table 55. Cortex by Material Type, 26Ln3358.

	Silicified Siltstone		Chert		Banded Obsidian		Sandstone	
Cortex	N	%	N	%	N	%	N	%
Present	69	54.8	23	37.7	6	15.0	0	-
Absent	57	45.2	38	62.3	34	85.0	1	100.0

The site key classified site 26Ln3358 as a Type A2 short-term camp. However, the site has been so disturbed that this assignment may not truly reflect its prehistoric function. For instance, it contained neither projectile points nor pottery. This could be due to collecting by contemporary hunters who favor the site as a camp. Shaped manos seem to be associated with residential sites elsewhere in the study area, while incised stones are associated with Fremont pottery (see Chapter 7). The pipe and mano seem to be valuable and highly curated items, although the pipe was broken and, thus, probably was discarded on purpose. The function of the incised stone is unknown.

The Archaeology of Site 26Ln3359

Site 26Ln3359 is located on the west side of Panaca Summit, a mile east of Ninemile Rocks (Figure 41). The site consists of a very diffuse lithic scatter located on a low southeast trending ridge, roughly parallel to the highway (Figure 49). Vegetation on the site is dense pinyon-juniper woodland with a sage and forb understory.

The site is confined primarily to an area of 300 sq. meters (10m by 30m) along the ridge top, with a very diffuse scatter of debitage extending downslope to the northeast (Figure 49). The highest surface artifact density is located within a 100 sq. meter area of the ridge top.

The soil here was typical. A thin (5 cm) dark brown gravelly, sandy loam A horizon overlay a stony, reddish brown, clay rich B horizon.

Surface Collection

Surface collection consisted of one 5 by 5 meter collection unit and two grab samples from small lithic concentrations (Figure 49). Amounts of debitage recovered from each sampling unit are given in Table 56. Debitage density is consistently low across the site.

Table 56. Debitage Count by Sampling Unit, 26Ln3359.

Site Area	N	Percentage
Grab Sample (600-1)	13	10.2
Grab Sample (600-2)	36	28.3
Surface Collection Unit A	68	53.5
Test Unit 1 0-10cm BS)	10	7.9
	127	100.0

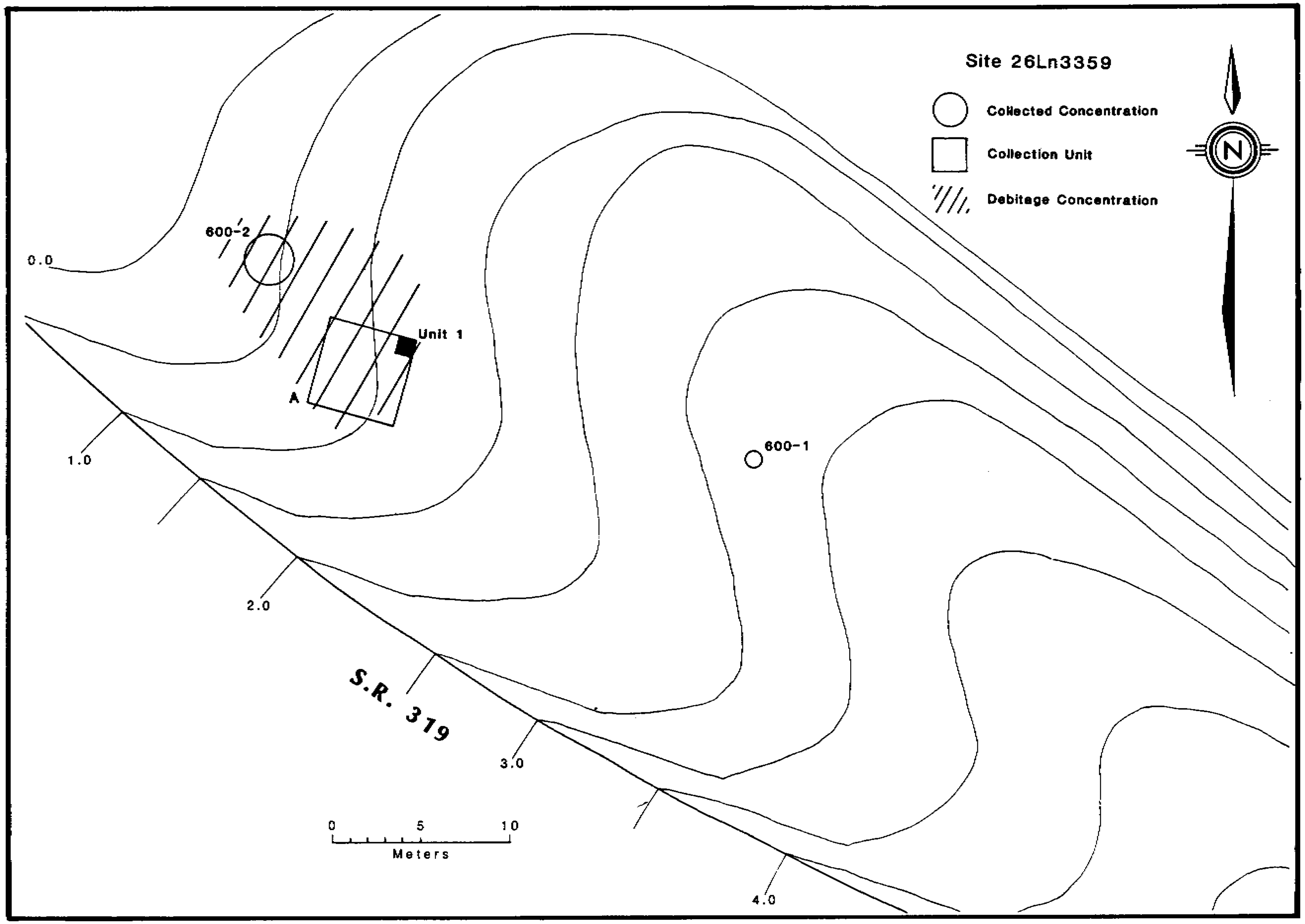
Test Excavation

A single 1 by 1 meter test unit was placed within the main artifact concentration. Excavation was taken to a depth of 10 cm below surface, but all artifacts were confined to the upper 5 cm.

Artifact Assemblage and Inferred Activities

Site 26Ln3359 was classified as a location by the site key and confirmed by the present study. Only one tool was recovered from the site, a large obsidian biface fragment. Debitage from the site is dominated by banded obsidian, but chert is also present, as well as a few items of other materials, including mahogany obsidian (Table 57). Low amounts of early stage debitage, and relatively high amounts

Figure 49. Site map, 26Ln3359.



Site 26Ln3359
Collected Concentration
Collection Unit
Debitage Concentration
N
600-2
0.0
Unit 1
A
1.0
2.0
600-1
S.R. 319
3.0
4.0
0 5 10
Meters

of biface thinning flakes (Table 58), suggest that obsidian biface manufacture was more important than obsidian core reduction. This is further supported by low frequencies of obsidian debitage with cortex.

Table 57. Debitage Material Types, 26Ln3359.

Material Type	N	Percentage
Banded Obsidian	99	78.0
Chert	24	18.9
Chalcedony	1	0.8
Mahogany Obsidian	2	1.6
Rhyolite	1	0.8
	127	100.0

Table 58. Debitage Class by Material Type*, 26Ln3359.

	Banded Obsidian		Chert	
Debitage Class	n	%	n	%
Shatter	4	4.0	11	45.8
Primary	0	-	0	-
Secondary w/Cortex	3	3.0	3	12.5
Secondary, Interior	33	33.3	3	12.5
Biface Thinning	4	4.0	1	4.2
Tertiary	5	5.1	0	-
Fragment w/Cortex	4	4.0	0	-
Fragment, Interior	46	46.5	4	16.7
Potlids	0	-	2	8.3
	99		24	

* Amounts of Chalcedony, Mahogany Obsidian, and Rhyolite too small to include.

The sample of chert flakes is very small, but suggests the initial processing of locally occurring materials on the site.

The Archaeology of Site 26Ln1775

Site 26Ln1775 is west of Panaca Summit, 10.2 miles east of Panaca town and one mile east of Ninemile Rock (see Figure 41). The site is large and complex, covering 80,000 square meters (400m by 200m). It lies on the southwestern slopes of a bedrock ridge extending southward from a butte. Vegetation is dense pinyon-juniper woodland with bitterbrush and sage understory. Forest canopy over the site averages 50%.

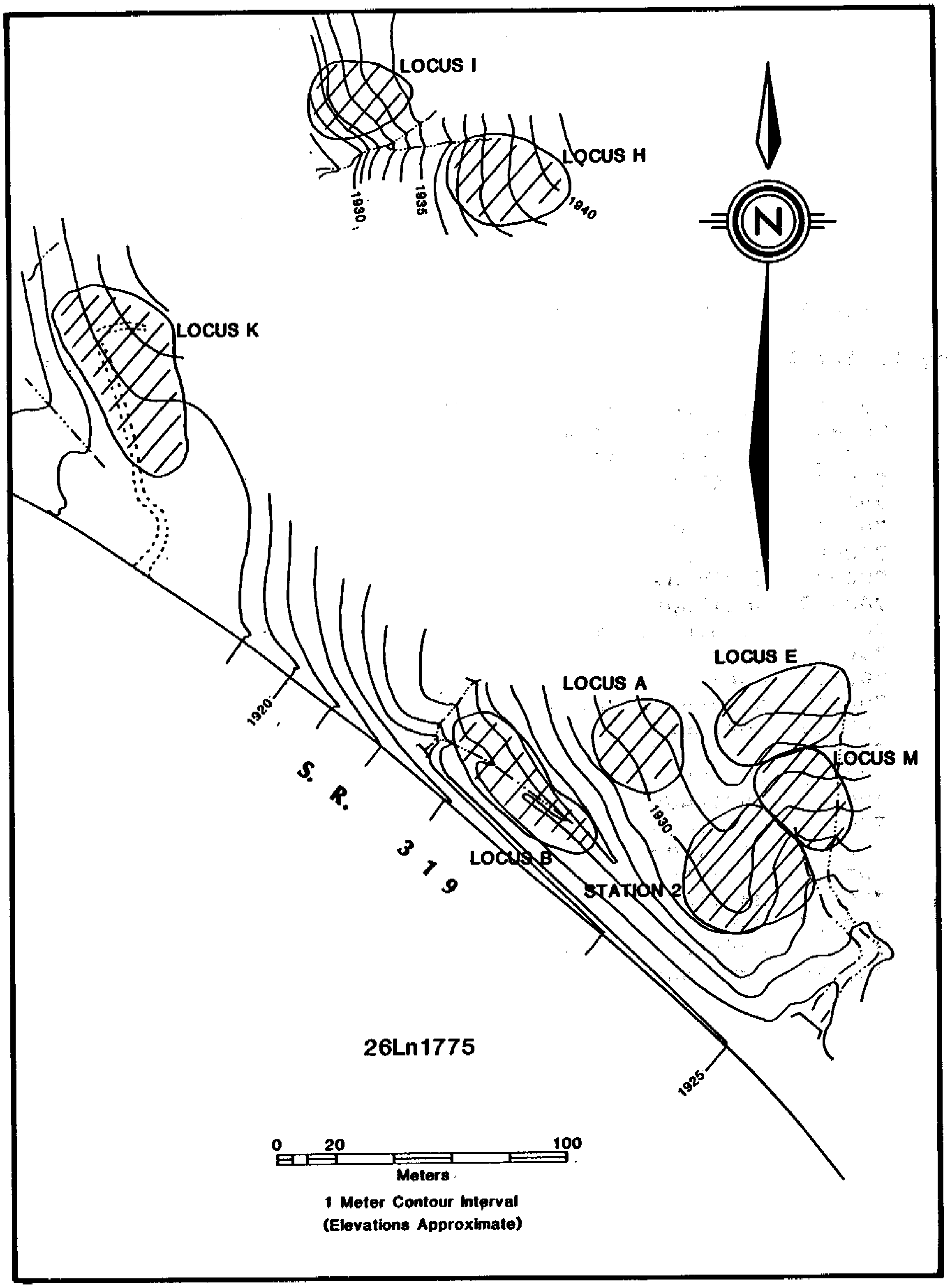
The soil is a sandy loam thinly mantling bedrock on the ridge crest and slopes, or overlying a stony, clay-rich B horizon in the drainages. This material is highly mobile and is being moved rapidly downslope by sheetwash and rilling. Topography is a critical factor in this process. Soil is easily removed from narrow ridge crests and steeper slopes, and accumulates on flatter bedrock benches and broad ridge crests where sheet wash is less effective. This process is impeded by vegetation; soil tends to collect in small benches against trees on the upslope side.

A thin scatter of debitage is found across the ridge, but several discrete loci are defined by concentrations of lithic waste, pottery sherds, and other artifacts (Figure 50). The soil is often darker in these loci, particularly at the upslope of the scatter. Three loci (Station 2, Locus M, Locus E) form a close group on the crest and eastern slope of the ridge overlooking a major drainage. Two other loci (Locus A, Locus B) are close by on the western slopes of the ridge. Locus B has been disturbed by construction of the highway. At about the same elevation as the southeasternmost group of loci, but on the western slope of the ridge further to the north, Locus H and Locus I form another group. Locus K is a more diffuse artifact scatter than the others, loci, and located at a somewhat lower elevation further to the west.

Collection and Testing at Locus A

Locus A (Figure 51) is just downslope (west) of the ridge crest, above a break in the slope (Figure 50). It covers approximately 400 sq. meters (20m by 20m). Exposed rock outcrops lie to the south along State Route 319 between Locus A and Locus B. The surface scatter contained debitage, ceramics, incised and polished stones, and cores and a flake tool, occurring mostly along a shallow rill (Figure 51). The soil on the upslope side of Locus A was darker than in the surrounding vicinity. Within the dark patch, a cluster of cobble-sized rocks appeared to be a hearth, and most of the

Figure 50. Site map, 26Ln1775.

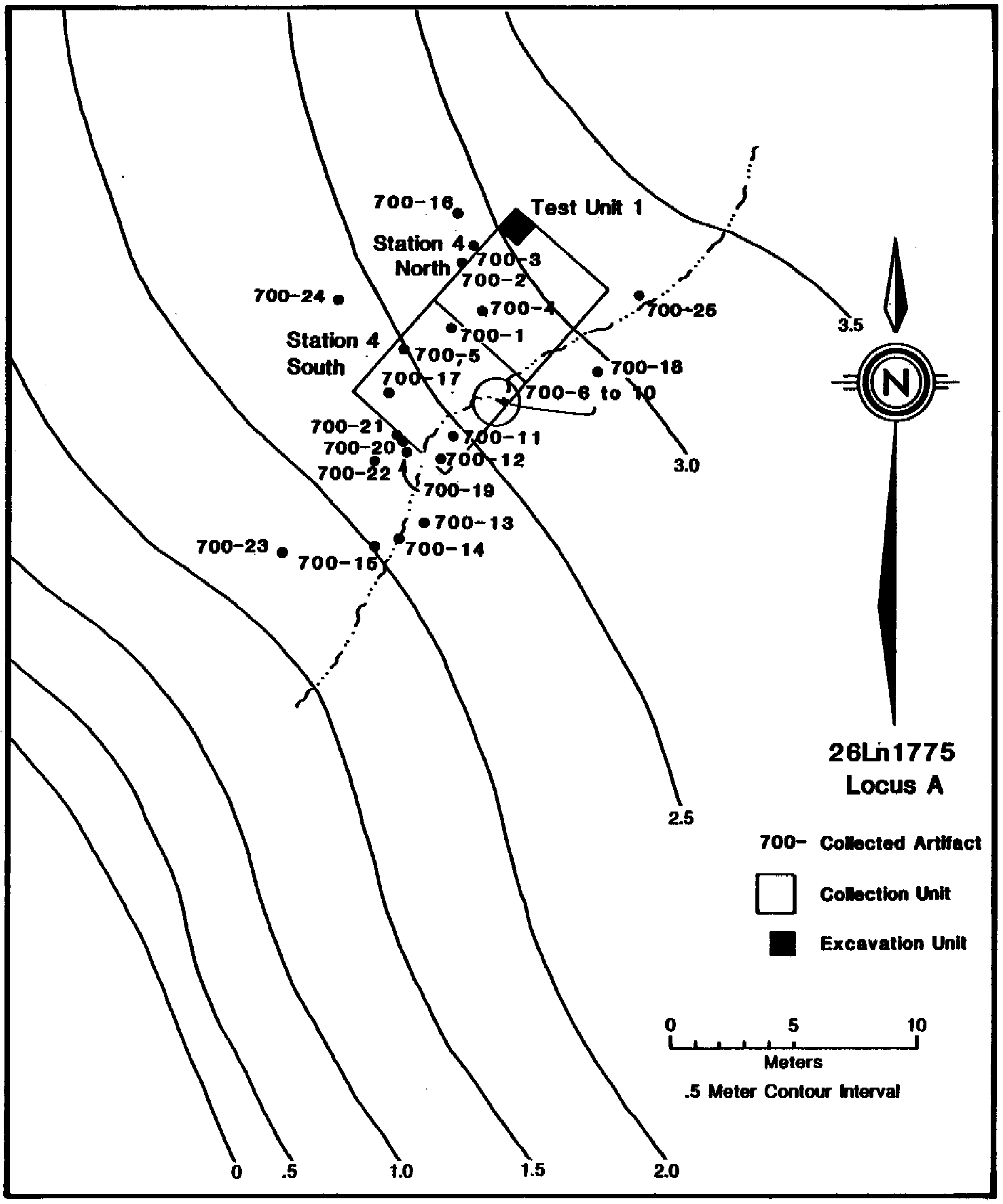


LOCUS I
LOCUS H
1930
1935
1940
LOCUS K
LOCUS E
LOCUS A
LOCUS M
1920
1930
S. R. 319
LOCUS B
STATION 2
26Ln1775
1925
0 20 100
Meters
1 Meter Contour Interval
(Elevations Approximate)

Figure 51. Map of Locus A, 26Ln1775.

Key to Artifacts

700-1	incised stone (joins w/700-4)
700-2	polished stone
700-4	incised stone
700-5	potsherd
700-6	debitage
700-7	incised stone
700-8	debitage
700-9	debitage
700-10	debitage
700-11	metate fragment
700-12	core
700-13	core
700-14	metate fragment
700-15	potsherd
700-16	potsherd
700-17	potsherd
700-18	debitage
700-19	debitage
700-20	debitage
700-21	debitage
700-22	debitage
700-23	debitage
700-24	modified flake
700-25	debitage


700-16
Test Unit 1
Station 4
North
700-3
700-2
700-24
700-4
700-25
700-1
3.5
Station 4
South
700-5
700-18
700-17
700-6 to 10
700-21
700-11
700-20
700-12
3.0
700-22
700-19
700-13
700-23
700-14
700-15
26Ln1775
Locus A
2.5
700- Collected Artifact
Collection Unit
Excavation Unit
0
5
10
Meters
.5 Meter Contour Interval
0
.5
1.0
1.5
2.0

the sampling effort was concentrated in that area. Another cluster of rocks (Figure 51:location 700-1) was not tested.

Two adjacent 5 by 5 meter collection units were placed in Locus A, and a 1 by 1 meter test pit was excavated over the rock feature in the northernmost collection unit.

The test unit was excavated in two 10 cm levels to a depth of 20 cm below surface. A loose brown loamy sand layer 3 cm thick overlay an organic, dark reddish brown loamy sand 3 cm thick. Thereafter was 13 cm of dark brown loamy sand overlying sterile brown gravelly coarse sand, which is essentially decomposed tuff bedrock.

Exposure of the rock feature at locus A produced no positive evidence of its use as a hearth. No charcoal or burnt bone was evident and surrounding rocks did not appear fire affected. However, in addition to debitage, the test unit produced several tools. Recovered from the first ten centimeter level were a siltstone tabular core, a chert core, a chert hammerstone, a utilized chert flake, and an intact double sided metate which may have been cached. Artifacts recovered from the second level included a tabular chert core, an obsidian large biface, and two chert cobble scrapers.

Although the soil is very shallow at Locus A, it is apparently less mobile than at Locus E or Locus M, even though the average slope is about the same. At Locus A, the soil is quite dark, and <u>in situ</u> subsurface artifacts are present. The northern cluster of rocks was not a hearth, but numerous artifacts, including the metate, were recovered around and below it. Perhaps it is the remains of a small cache marker. The nature of the southern rock cluster remains unknown, since it was not excavated. Additional intact deposits are likely upslope of the surface scatter at Locus A.

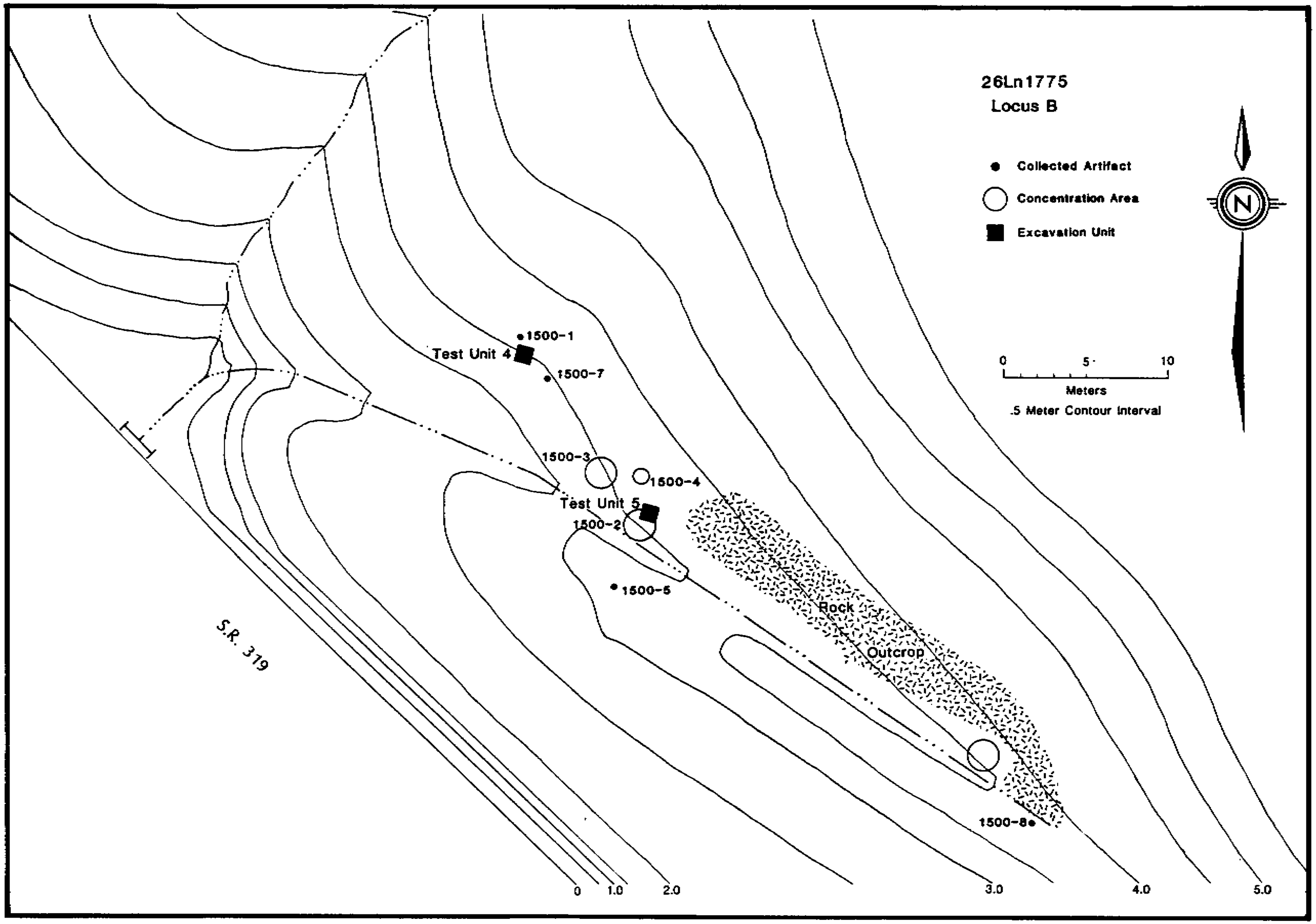
<u>Collection and Testing at Locus B</u>

Locus B is situated about 40 m southwest of Locus A, south of the rock outcrop and north of State Route 319. A ditch has been cut parallel to the highway through the locus for highway drainage (Figure 52). Debitage, lithic tools, and ceramics are scattered thinly on both sides of the ditch over an area of 450 m^2 (10m by 45m). It seemed possible that the highway ditch had exposed buried cultural material at Locus B. A hearth-like, oval patch of firecracked rock and dark soil containing charcoal was located on the western end of the scatter. This feature measured 1.5 m x 2 m.

Figure 52. Map of Locus B, 26Ln1775.

Key to Artifacts

1500-1	debitage
1500-2	6 potsherds; 1 flake
1500-3	3 potsherds; 1 small biface; 1 flake
1500-4	2 flakes
1500-5	1 potsherd; 1 flake
1500-7	1 potsherd
1500-8	1 metate; 1 potsherd; 1 end scraper; 1 core


26Ln1775
Locus B
Collected Artifact
Concentration Area
Excavation Unit
N
0
5
10
Meters
.5 Meter Contour Interval
1500-1
Test Unit 4
1500-7
1500-3
1500-4
Test Unit 5
1500-2
1500-5
Rock
Outcrop
1500-8
S.R. 319
0
1.0
2.0
3.0
4.0
5.0

Since the distribution of surface artifacts was so patchy, we merely picked up all the items in each little concentration and mapped the location (Figure 52). In addition, we excavated a 1 x 1 m test pit in the hearth-like feature and a 1 x 1 m unit adjacent to three lithic and pottery concentrations.

The soil at Locus B consists of a 2 cm layer of loose tan sandy loam, over 8 to 12 cm of dark brown sandy loam which, in turn, overlies bedrock. The hearth-like feature contained very dark gray soil with patches of light gray ash; charcoal fragments were common throughout. The soil at the bottom of the feature was burned red in places. However, artifacts were limited to a few items of debitage, and there was no bone present. In retrospect, the feature closely resembled the burned pack rat house at site 71W-3 and probably is not cultural. The eastern test unit in Locus B also produced very little: one potsherd and a few items of debitage. We conclude that Locus B is badly disturbed, and there is no subsurface component there.

<u>Collection and Testing at Locus M, Locus E, and Station 2</u>

Three loci are clustered along the southern end and eastern slope of the ridge, and within the adjacent sandy wash (Figure 53). Divisions between these artifact scatters are somewhat arbitrary, since they tend to intergrade. However, their core areas are sufficiently distinct to distinguish between them. They are all marked by scatters of lithics and ceramics containing similar amounts and kinds of artifacts, and each occupies a similar sized space. Total area for the three loci is 4500 sq. meters (90m N/S by 50m E/W). Of particular note are the four incised tablets and one polished stone from this complex, as well as the ceramic pipe fragment from Locus E and the Elko Corner-Notched point from Station 2.

It appeared that each locus was associated with a patch of darker soil, and/or fire-cracked rock (Figure 53:1300-8, Test Unit 2 and Test Unit 3). As at Locus A, these seemed to be present at the upslope margin of each artifact scatter, suggesting the artifacts were eroding out of midden deposits.

Surface collection was accomplished by flagging, mapping, and collecting all tools, ceramics, and concentrations of debitage (Figure 53). Closer examination revealed that bedrock was exposed at the surface of the ridge crest and slopes in Station 2. The artifact scatter associated with the patch of dark soil at Locus E was sampled with two adjacent 5 by 5 m collection units, as well as a 1 x 1 m test pit (Test

Figure 53. Map of Loci E, M, and Station 2, 26Ln1775.

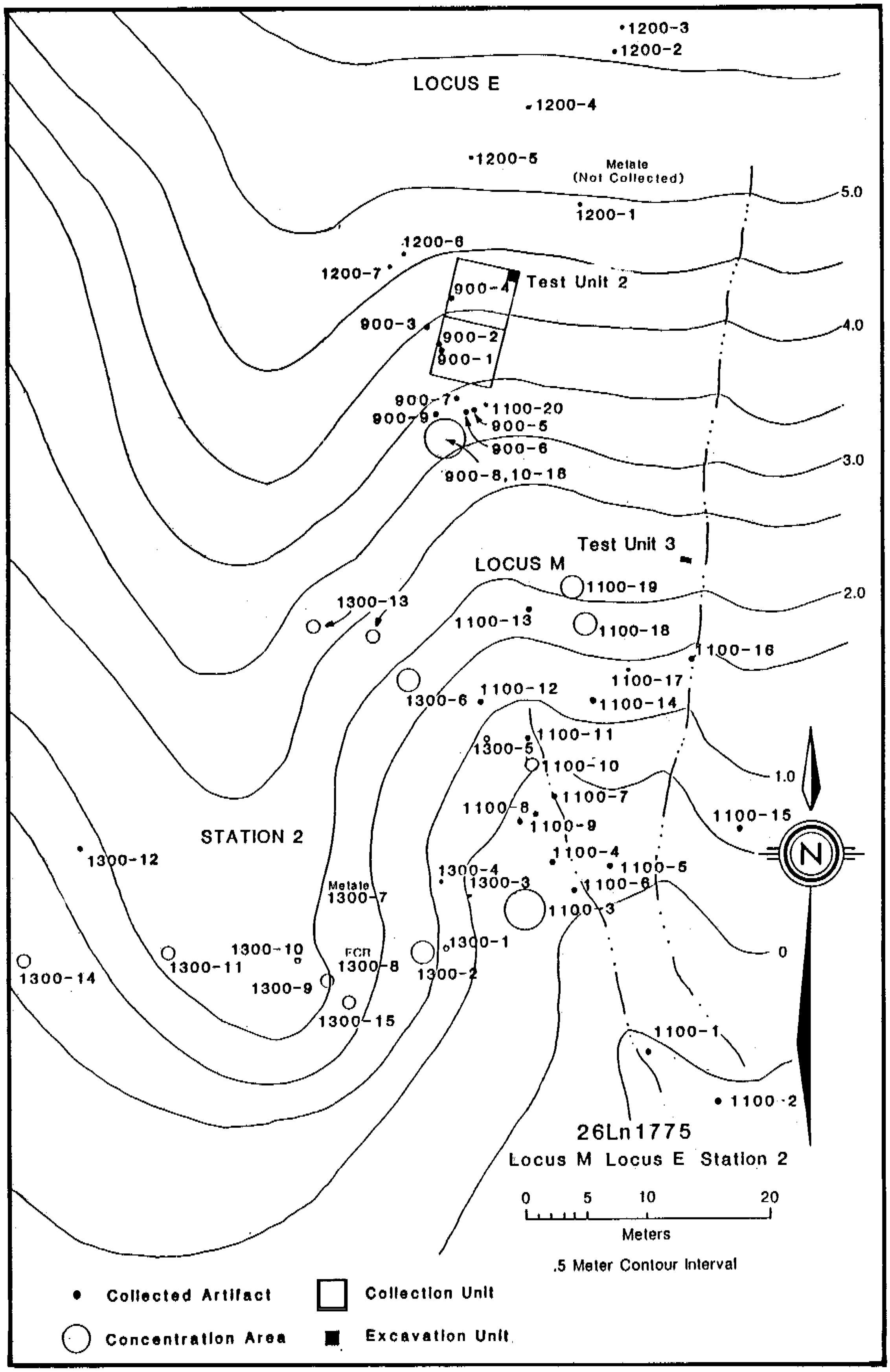
Key to Artifacts

900-1	pottery scraper
900-2	potsherd
900-3	potsherd
900-4	debitage
900-5	potsherd
900-6	potsherd
900-7	potsherd
900-8	large biface
900-9	metate
900-10	potsherd
900-11	incised tablet
900-12	potsherd
900-13	potsherd
900-14	potsherd
900-15	potsherd
900-16	potsherd
900-17	potsherd
900-18	potsherd

1100-1	small biface
1100-2	incised tablet
1100-3	potsherds
1100-4	potsherd
1100-5	potsherd
1100-6	potsherd
1100-7	incised stone (fits 1100-11)
1100-8	potsherd
1100-9	large biface
1100-10	potsherd
1100-11	incised tablet (fits 1100-7)
1100-12	potsherd
1100-13	potsherd
1100-14	potsherd
1100-15	metate
1100-16	palette
1100-17	potsherd
1100-18	potsherd tabcore, end scraper point
1100-19	potsherds
1100-20	flaked palette

1200-1	small biface
1200-2	ceramic pipe
1200-3	incised tablet
1200-4	potsherd
1200-5	core
1200-6	metate
1200-7	small biface

1300-1	potsherd
1300-2	other; potsherd
1300-3	potsherd
1300-4	utilized flake
1300-5	potsherd
1300-6	hammerstone; tabular core; potsherd
1300-7	metate; potsherd
1300-8	core; potsherd
1300-9	large biface, potsherd
1300-10	potsherd
1300-12	Elko Corner-Notched point
1300-13	palette
1300-14	burnisher; potsherd
1300-15	potsherd


LOCUS E
•1200-3
•1200-2
•1200-4
•1200-5
Metate
(Not Collected)
1200-1
1200-6
1200-7
Test Unit 2
900-4
900-3
900-2
900-1
900-7
900-9
1100-20
900-5
900-6
900-8,10-18
5.0
4.0
3.0
2.0
1.0
0
Test Unit 3
LOCUS M
1100-19
1300-13
1100-13
1100-18
1100-16
1100-17
1300-6
1100-12
1100-14
1100-11
1300-5
1100-10
1100-7
1100-8
1100-9
1100-15
STATION 2
1300-12
1100-4
1100-5
1300-4
1300-3
1100-6
Metate
1300-7
1100-3
1300-10
FCR
1300-8
1300-1
1300-14
1300-11
1300-9
1300-2
1300-15
1100-1
1100-2
N
26Ln1775
Locus M Locus E Station 2
0 5 10 20
Meters
.5 Meter Contour Interval
Collected Artifact
Collection Unit
Concentration Area
Excavation Unit

Unit 2). A 1 x 0.5 m test pit (Test Unit 3) was placed to sample a fire-cracked rock feature in the wash bottom at Locus M.

Test Unit 2 revealed that the darker soil layer was only 7 to 10 cm thick, overlying essentially sterile decomposed bedrock. All artifacts were contained in this layer, including a tabular chert core, two Snake Valley Gray sherds, one Snake Valley Corrugated sherd, three metate fragments, a polished stone artifact, a polished bone artifact, bone fragments, and 16 chert flakes. The anthropic nature of the dark soil is suggested by the relatively high artifact yield.

However, the dark layer was not present in Test Unit 3, even though the distance to bedrock was greater. Here too, artifacts were confined largely to the upper 10 cm of the deposit. The surface cluster of fire-cracked rocks included three metate fragments, two of which fit together. The test pit produced two additional metate fragments, an unknown Type 2 rim sherd, a mammal bone, an obsidian flake, and four chert flakes.

We conclude the sandy soils on the ridge slopes and drainage bottom in this part of site 26Ln1775 are highly mobile. Cultural materials on the surface or in the upper soil horizon are being exposed, moved, and redeposited by sheet wash. However, intact deposits probably remain in places, particularly in and just upslope of Locus E.

Collection at Locus K

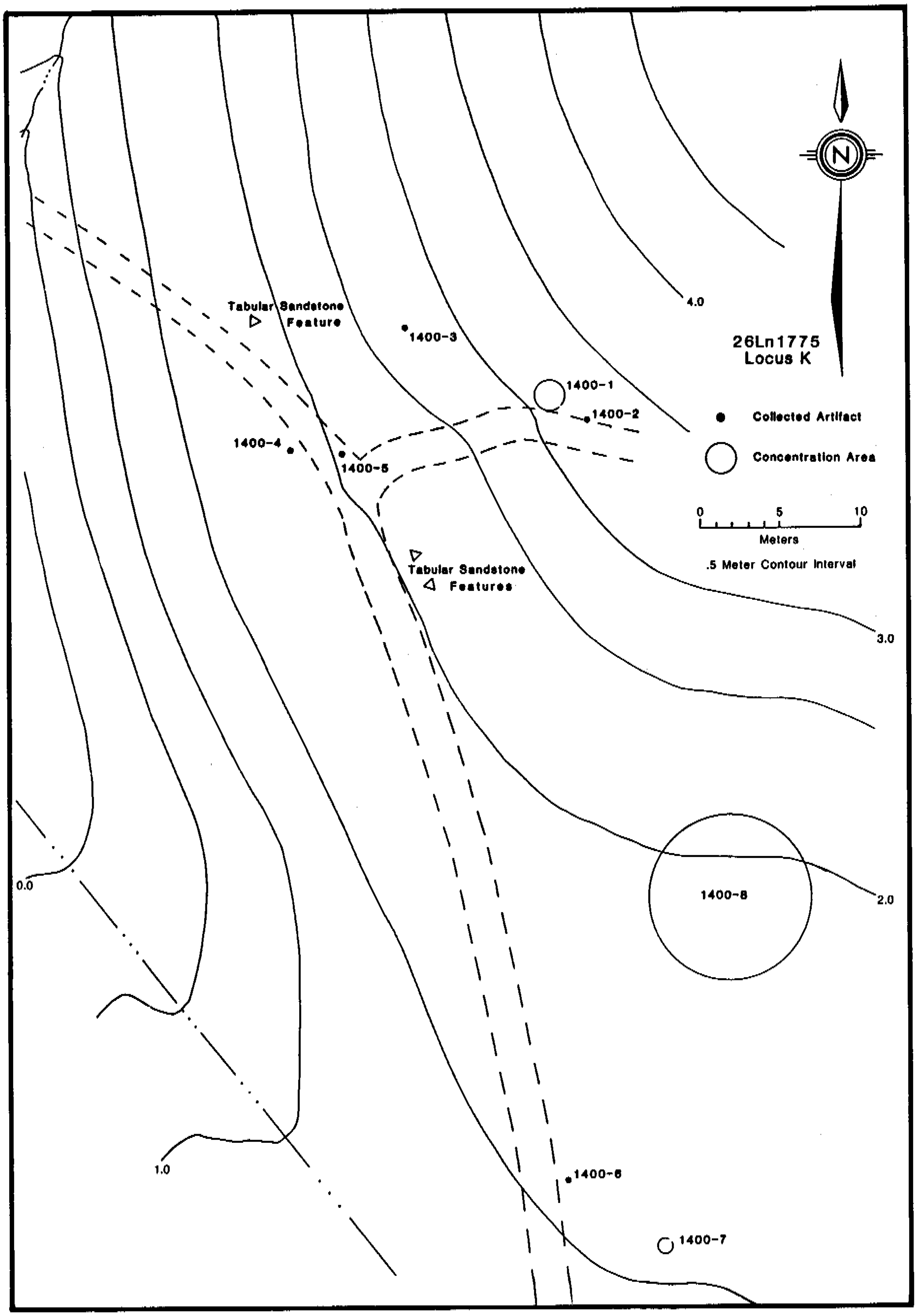
Locus K is a very thin scatter of debitage and ceramics located relatively low on the western slope of the ridge, north of State Route 319. The locus covers approximately 1800 sq. meters (60m by 30m), and is bisected by a jeep trail. Soils are sandy loam. Individual artifacts and concentration areas were mapped and collected at Locus K. The artifact scatter is comprised of three small artifact clusters (1400-1, 1400-7, and 1400-8) and several isolated sherds (Figure 54).

Individual artifacts and artifact clusters were mapped and collected. Pottery types present are Snake Valley Gray, Snake Valley Black-on-gray, and Unknown Type 2. Lithic tools include a drill, two small bifaces, a large biface, and a utilized flake. Three features made of large, thin sandstone slabs were present on the surface, two of which consisted of numerous thin angular slabs arranged in a roughly circular pattern. Small fire-cracked rocks were noted scattered within the features, between the small tabular slabs. These appear

Figure 54. Map of Locus K, 26Ln1775.

Key to Artifacts

1400-1	6 sherds
	1 sherd
1400-2	pottery disc
1400-3	1 sherd
1400-4	1 sherd
1400-5	1 sherd
1400-6	metate
1400-7	3 sherds
1400-8	drill, 2 small bifaces, large biface, utilized flake, 12 sherds


26Ln1775
Locus K
Tabular Sandstone Feature
Tabular Sandstone Features
1400-1
1400-2
1400-3
1400-4
1400-5
1400-6
1400-7
1400-8
Collected Artifact
Concentration Area
0
5
10
Meters
.5 Meter Contour Interval
0.0
1.0
2.0
3.0
4.0
N

to be deflated, slab-lined hearths, but were not investigated. The third tabular sandstone feature is two superimposed large slabs which may represent cistern or cache lids. The tabular sandstone seems out of depositional context, at least in the immediate area.

It is possible that artifacts are present on the surface at Locus K because they have been turned up by use of the jeep trail. However, since Locus K was not tested, the presence of subsurface cultural material is not demonstrated. No groundstone artifacts were collected from Locus K, and the sandstone slabs remain enigmatic.

In passing, note that two other loci (Locus J and Locus L) were observed northwest of Locus K. Although lacking sandstone slabs, their content and artifact density appear similar.

Collection and Testing at Locus H and Locus I

Locus H and Locus I are in the northern portion of site 26Ln1775 on the western slope of the ridge at about the same elevation as Locus A (Figure 50). Each locus is situated on a bedrock bench, and both have similar artifact assemblages.

Locus I

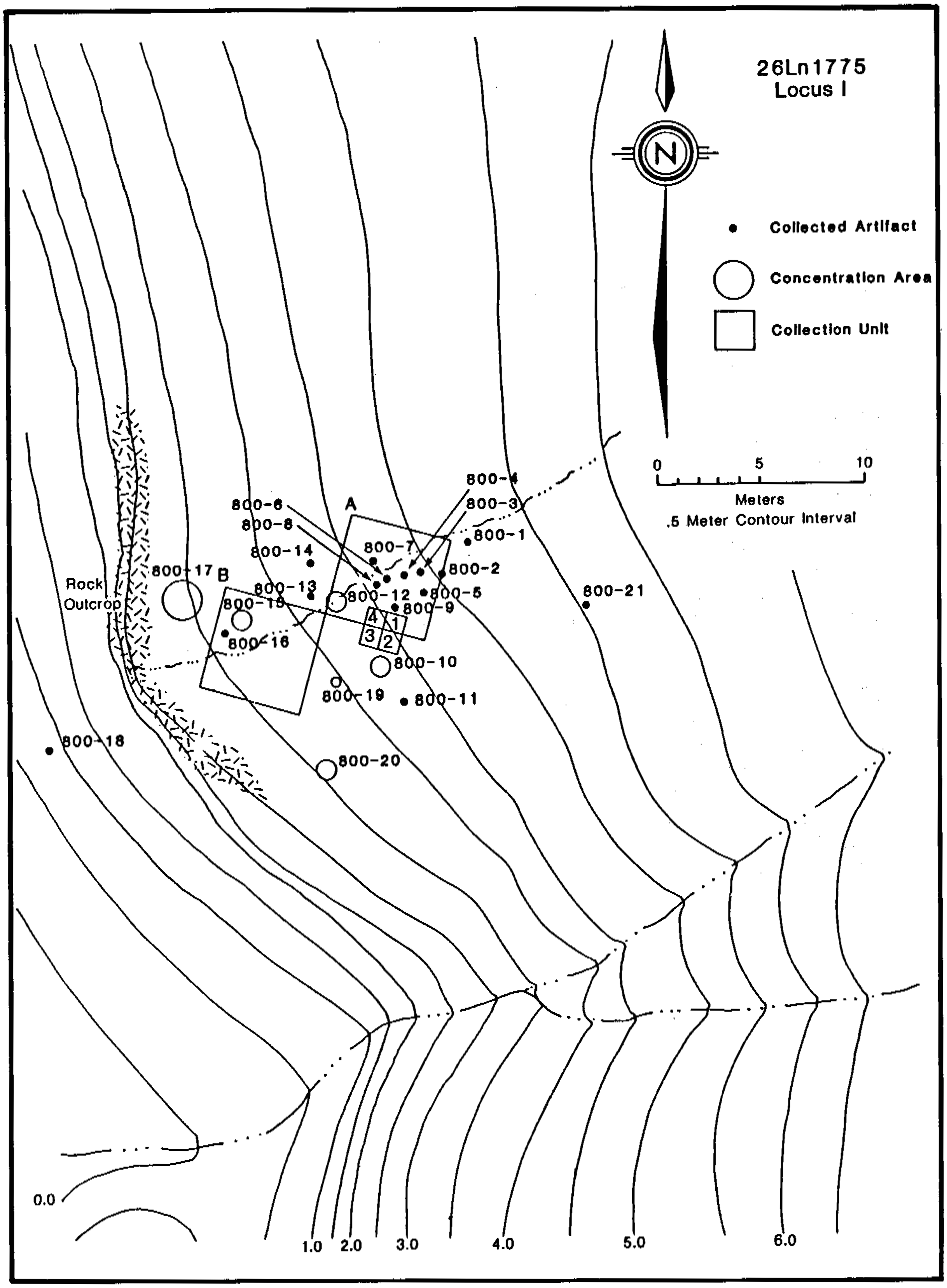
Locus I (Figure 55) is about 50 m northwest of Locus H at a slightly lower elevation. It lies atop a gently sloping bench with an exposed rock face along its western edge. The soil mantle at Locus I is very thin. The artifact scatter covers an area of approximately 500 sq. meters (25 m diameter) and is bisected by a shallow rill. Artifact density is highest adjacent to the rill.

At Locus I, lithic tools and ceramics were mapped and collected. Systematic collection included two 5 by 5 meter units (A and B) and a group of four 1 x 1 one units (1 through 4). The soil mantle was so obviously thin at Locus I that no test excavation was conducted. Most of the artifacts at Locus I are ceramic sherds, including a modified potsherd (pottery scraper?). Lithic debitage and a few lithic artifacts were also present, including a small biface, two drills, a flake scraper, a utilized flake, and a Parowan Basal-notched point.

Figure 55. Map of Locus I, 26Ln1775

Key to Artifacts

800-1	hammerstone
800-2	pottery
800-3	pottery
800-4	debitage
800-5	pottery
800-6	pottery scraper
800-7	pottery
800-8	pottery
800-9	pottery
800-10	pottery
800-11	Parowan projectile point
800-12	pottery
800-13	pottery
800-14	drill, pottery
800-15	pottery
800-16	pottery
800-17	pottery
800-18	pottery
800-19	pottery
800-20	pottery
800-21	pottery



26Ln1775
Locus I
N
Collected Artifact
Concentration Area
Collection Unit
0
5
10
Meters
.5 Meter Contour Interval
800-4
800-3
800-1
800-6
800-8
A
800-7
800-2
800-14
800-17
B
800-13
800-12
800-5
800-21
Rock
Outcrop
800-15
800-9
4
1
3
2
800-16
800-10
800-19
800-11
800-18
800-20
0.0
1.0
2.0
3.0
4.0
5.0
6.0

Locus H

Locus H (Figure 56) lies on two narrow, relatively flat bedrock benches. These are separated by a section of steeper slope (Figure 56:between contours 2.5 and 3.0) in which patches of bedrock are exposed. Artifacts are scattered over an area of 960 m^2; artifact density is highest on the upper bench.

At Locus H, all lithic tools and ceramics were mapped and collected. Most artifacts are ceramic sherds, but lithic artifacts include five cores, a large biface, a drill, and debitage.

Since the soil on the upper, eastern bench was dark in color and appeared to have relatively great depth, we excavated five test pits at Locus H. Test units 6 and 10 were 1 x 1 m; Units 7, 8, and 9 were 1 x 0.5 m. Soils here consist of a loose, sandy surficial layer (2 cm thick) over 10 to 20 cm of very dark gray, sandy gravelly loam with small pieces of fire cracked rock. This overlies an undulating bedrock surface.

Artifacts recovered from the test units are given by level in Table 59. Several of these units produced lithic tools, debitage, bone fragments, and ceramics. It is interesting that artifact yield falls very little with depth in units 7, 8, and 9. Units 6 and 10, where the bedrock was only 7 to 12 cm below surface, were much less productive. There is no essential difference between the surface and subsurface assemblages.

Figure 56. Map of Locus H, 26Ln1775.

Key to Artifacts

1000-1	tabular core
1000-2	core
1000-3	debitage
1000-4	pottery
1000-5	pottery
1000-6	pottery
1000-7	pottery
1000-8	pottery
1000-9	pottery
1000-10	large biface
1000-11	pottery
1000-12	drill
1000-13	pottery
1000-14	potsherds
1000-15	tabular core, other core, pottery

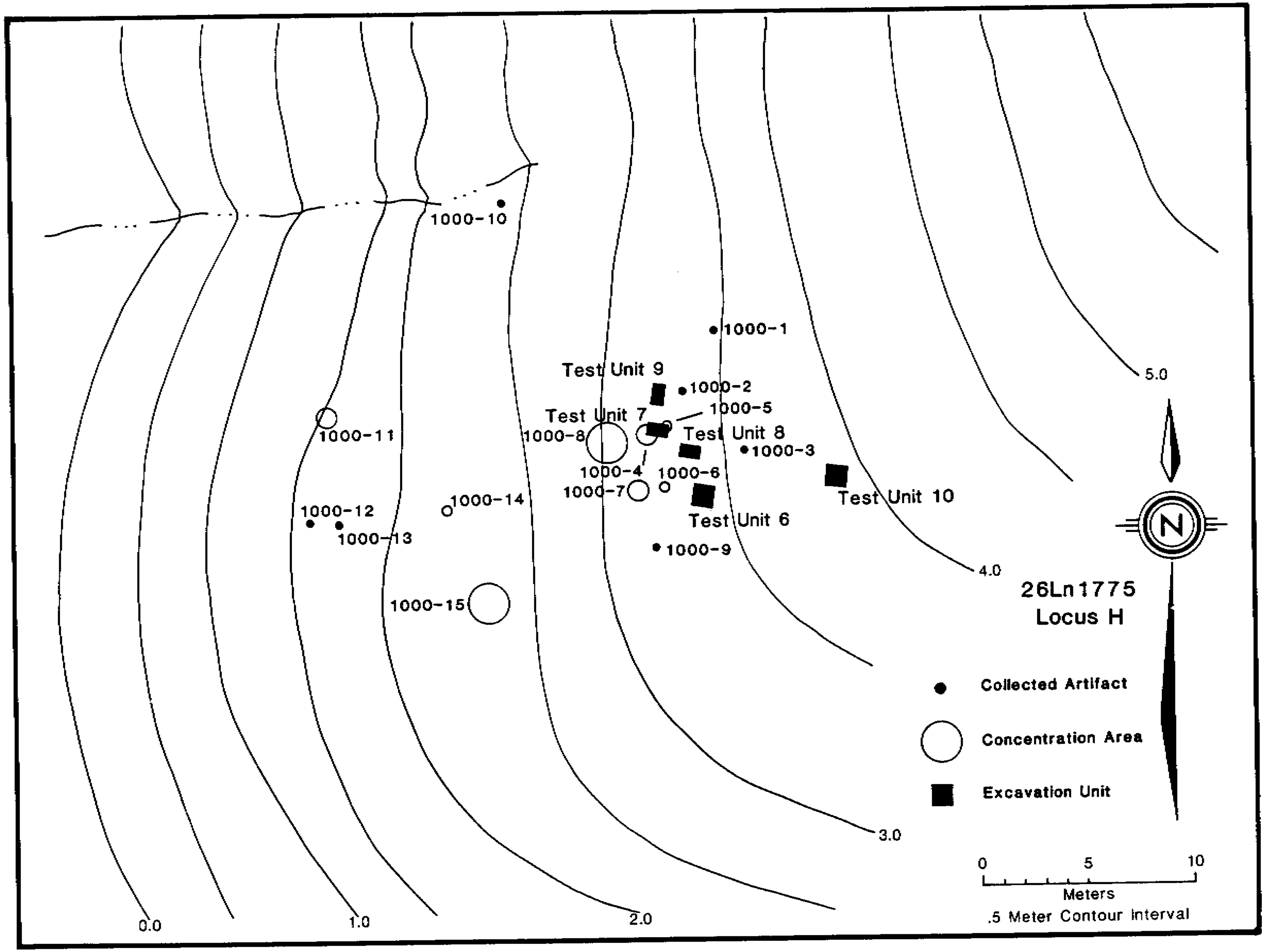

1000-10
1000-1
Test Unit 9
1000-2
1000-5
Test Unit 7
1000-8
Test Unit 8
1000-3
1000-11
1000-4
1000-6
1000-7
Test Unit 10
1000-14
Test Unit 6
1000-12
1000-13
1000-9
1000-15
0.0
1.0
2.0
3.0
4.0
5.0
N
26Ln1775
Locus H
Collected Artifact
Concentration Area
Excavation Unit
0
5
10
Meters
.5 Meter Contour Interval

Table 59. Artifacts Recovered From Test Units in Locus H, 26Ln1775.

	Test Units				
	6	7	8	9	10
Level 1: 0-10 cm					
Tabular core		1		1	
Other core	1	2			
Utilized flake	1				
Point fragment		1			
Hammerstone		1			
Pottery scoop				1	
Potsherds	3		3	1	
Obsidian debitage	3	1		2	
Chert debitage	3	6	8	9	3
Bone		4	4	3	
	11	16	15	16	3
Level 2: 0-20 cm					
Tabular core		1			
Other core					
Utilized flake					
Point fragment		1			
Hammerstone					
Pottery scoop					
Potsherds		5	2	1	
Obsidian debitage		3		4	
Chert debitage		7	2	7	
Bone		4	7	3	
	0	21	11	15	0

Ceramic Vessels from 26Ln1775

Ceramic vessel attributes are shown in Table 60. A minimum of 49 vessels is inferred for the collection: 17 (34.7%) from the Station 7/Locus M/Station 2 site area, while 12 (24.5%) were found at Locus I, 8 (16.3%) at Locus H, and 8 (16.3%) at Locus K. Few vessels were found at Locus B (n=2, 4.1%), Locus A (n=1, 2.0%), and Locus E (n=1, 2.0%).

Three vessel forms were recovered, including bowls, cooking pots, and ollas. At Station 7/Locus M/Station 2,

Table 60. Ceramic Vessel Attributes by Location, Site 26Ln1775.

Reference - Specimen No.	Area	Vessel Type	No. Sherds	Function	Remarks
700-15, 16, 17	Locus A	Snake Valley Gray	3	unknown	light gray interior, dark gray exterior
800-12; 802-4, 6, 9	Locus I	Snake Valley Black-on-gray	4	bowl	painted interior; one rim sherd
800-18-1, 2, 3; 801-3	Locus I	Snake Valley Black-on-gray	4	bowl	painted interior; one rim sherd
800-19-1; 802-3, 7	Locus I	Snake Valley Black-on-gray	3	bowl	painted interior, faint
800-10-2, 803-17	Locus I	Snake Valley Black-on-gray	2	bowl	painted interior, faint
802-6	Locus I	Snake Valley Corrugated	1	unknown	buff color
800-3, 5, 10, 12, 13, 15, 16, 17, 20, 21; 801-4, 5; 803-8	Locus I	Snake Valley Gray	19	unknown	buff gray to light gray interior; medium gray to dark gray exterior
800-2, 7, 9, 12, 14, 17, 20; 802-5; 803-3; 804-6	Locus I	Snake Valley Gray	11	unknown	buff to gray, color variable
800-10, 19; 801-2	Locus I	Snake Valley Gray	4	unknown	burnished interior; light gray exterior
800-19; 802-4; 804-4	Locus I	Snake Valley Gray	4	unknown	burnished interior and exterior
800-19; 802-8; 803-5	Locus I	Snake Valley Gray	4	bowl?	fugitive red wash exterior
800-8, 12	Locus I	Snake Valley Gray	2	bowl	buff gray, one rim sherd
800-15, 17	Locus I	Pioche Gray	2	unknown	grayish brown color
1000-4, 5, 11, 13, 14, 15; 1005-10; 1006-7; 1051-3	Locus H	Snake Valley Gray	16	cooking pot	buff gray to light gray, one out-curving rim sherd
1000-6, 7, 8, 9; 1055-6, 7	Locus H	Snake Valley Gray	7	unknown	medium gray, thin walled
1000-4, 8, 13, 15; 1005-9; 1006-9, 1051-4	Locus H	Snake Valley Gray	7	unknown	buff gray to medium gray, thick walled
1005-11; 1006-6, 8; 1050-3	Locus H	Snake Valley Gray	4	olla	narrow-necked, two rim sherds, black mineral residue on exterior surface
1000-6, 7, 8, 11	Locus H	Pioche Gray	9	unknown	buff color
1001-5, 6, 7; 1050-5	Locus H	Pioche Gray	5	unknown	gray, blackened exterior surface
1000-6; 1000-8	Locus H	Pioche Gray	4	unknown	light brown, blackened paste
1050-4	Locus H	Pioche Gray	1	olla	narrow-necked; thin neck sherd; medium brown
1200-4	Locus E	Snake Valley Gray	1	unknown	buff gray
1100-18, 19; 1300-1, 2, 9, 10	Sta. 7/Locus M/Sta. 2	Snake Valley Black-on-gray	9	bowl	buff gray interior, painted; fugitive red wash exterior
1100-5, 8, 10	Sta. 7/Locus M/Sta. 2	Snake Valley Black-on-gray	4	bowl	gray interior, painting faint; one rim sherd
900-13; 1100-17	Sta. 7/Locus M/Sta. 2	Snake Valley Black-on-gray	2	bowl	corrugated exterior; fugitive red wash exterior
1100-6	Sta. 7/Locus M/Sta. 2	Snake Valley Black-on-gray	1	bowl	light gray interior, painting faint
1300-14-3	Sta. 7/Locus M/Sta. 2	Snake Valley Black-on-gray	1	bowl	dark gray interior, mica present on surface

Table 60. (continued)

Reference - Specimen No.	Area	Vessel Type	No. Sherds	Function	Remarks
900-6, 7, 12; 903-6; 1100-18, 19	Sta. 7/Locus M/Sta. 2	Snake Valley Corrugated	7	unknown	interior 1/2 vessel wall red from oxidized firing, exterior 1/2 gray
900-10, 13, 16; 1100-18, 19	Sta. 7/Locus M/Sta. 2	Snake Valley Corrugated	5	unknown	gray interior and exterior
900-15, 17, 18; 1100-3, 4, 12, 14, 18, 19; 1300-2	Sta. 7/Locus M/Sta. 2	Snake Valley Gray	11	cooking pot	light gray interior, medium gray exterior; one out-curving rim sherd; two out-curving neck sherds
900-14; 903-5; 1100-3, 4; 1300-4	Sta. 7/Locus M/Sta. 2	Snake Valley Gray	6	unknown	burnished interior; light gray exterior
900-2, 3, 5; 903-7	Sta. 7/Locus M/Sta. 2	Snake Valley Gray	4	cooking pot	buff color, partially oxided; one out-curving rim sherd; one out-curving neck sherd with unobliterated coils on interior surface
1300-2, 9, 15	Sta. 7/Locus M/Sta. 2	Snake Valley Gray	3	bowl	light to medium gray, fugitive red wash exterior; one rim sherd
1300-2, 3, 4	Sta. 7/Locus M/Sta. 2	Snake Valley Gray	3	cooking pot	burnished interior; dark gray exterior; one out-curving neck sherd
1100-3	Sta. 7/Locus M/Sta. 2	Snake Valley Gray	2	unknown	light gray interior, very smooth
1300-3, 5, 6, 7, 8, 9, 10	Sta. 7/Locus M/Sta. 2	Pioche Gray	7	unknown	light brown interior; grayish brown exterior
950-6; 1100-3, 13	Sta. 7/Locus M/Sta. 2	Pioche Gray	4	bowl	medium brown to dark gray interior; light brown to dark exterior; two rim sherds; unpainted
1300-14	Sta. 7/Locus M/Sta. 2	Pioche Gray	5	unknown	medium brown surfaces
1300-2	Sta. 7/Locus M/Sta. 2	Pioche Gray	1	unknown	dark brown interior; brownish gray exterior
1400-1	Locus K	Snake Valley Black-on-gray	3	bowl	fugitive red wash on exterior surface
1400-8	Locus K	Snake Valley Gray	10	cooking pot	rim and neck sherds burnished on interior surfaces, 3 out-curving rim sherds
1400-1	Locus K	Snake Valley Gray	3	unknown	medium brown to light gray surfaces
1400-8	Locus K	Snake Valley Gray	2	unknown	blackened interior surface
1400-3	Locus K	Snake Valley Gray	1	cooking pot	out-curving rim sherd
1400-5	Locus K	Snake Valley Gray	1	unknown	
1400-1	Locus K	Pioche Gray	1	unknown	light gray surfaces
1400-4	Locus K	Pioche Gray	1	unknown	light gray surfaces
1500-2, 3, 5, 7; 1502-2	Locus B	Snake Valley Gray	12	unknown	light gray surfaces
1500-8	Locus B	Snake Valley Gray	1	unknown	dark gray surfaces; partically oxided

7 bowls and 3 cooking pots were found, indicating on site food preparation and consumption. Locus K has two cooking pots and one bowl represented, indicating activities similar to these at Locus M. In contrast, at Locus I, the only vessel forms are bowls; at Locus H, bowls are apparently absent, and vessels include one cooking pot and two ollas. The distribution suggests patterned activity areas, with storage and cooking at Locus H and food consumption at Locus I.

Flotation Samples from Locus H

Two bulk soil samples taken from Test Unit 9, Locus H were processed by flotation methods. One sample (591-2) was from 3 to 10 cm below surface; the other (592-3) was taken between 10-20 cm below surface. Light and heavy fraction recoveries are summarized in Table 61.

Table 61. Flotation Recovery, Locus H, Site 26Ln1775.

LIGHT FRACTION

Sample Number	Depth B.S. (cm)	Dry Wt. (gm)	Dry Vol. (ml)	Seeds N	Charcoal (gm)	Rootlets (gm)	Organic Residue (gm)
591-2	3-10	1438	1175	25	0.1	0.7	3.1
591-3	10-20	1779	1400	32	0.3	3.0	4.8

HEAVY FRACTION

Sample Number	Lithics N	Bone N	Mineral Residue (gm)
591-2	7	20	395
591-3	7	22	607

Plant species identified by seeds recovered from the light fraction include Indian rice grass (<u>Oryzopsis hymenoides</u>), unidentified grasses (GRAMINAE), globe mallow (<u>Sphaeralcea</u> sp.), amaranth (<u>Amaranthus</u> sp.), and juniper (<u>Juniperus</u> sp.) (Table 62). All but globe mallow were used as foods by ethnographic Great Basin groups (Steward 1938; d'Azevedo 1986; Kelly and Fowler 1986).

Table 62. Plant Taxa, Flotation Samples, Locus H, Site 26Ln1775.

Plant Taxa	Sample 591-2 N	Sample 591-3 N
Sphaeralcea sp.	0	1
GRAMINAE	5	21
Amaranthus sp.	0	1
Oryzopsis sp.	1	0
Juniperus sp.	1	0
Unidentified	18	9
	25	32

The near surface context of sediment samples may be reflected in the incorporation of seeds from the modern surface, but several indicators suggest the bones and possibly the seeds are cultural in origin. All recovered seeds were charred; no indicators of recent intrusions (such as fresh floral remains and/or rodent pellets) were present. Grass seeds and amaranth, important aboriginal foods, dominate the seed collection; however, none of the seeds appeared to have been "popped," which is frequently a result of parching. Also interesting is the lack of pinyon nuts or cone parts which precludes use of the site for pinyon roasting. Small fragments of rabbit-sized bones (Class III mammals) dominate (60%) both samples. The condition of these bones (fragmentation, charring) suggests they are human food refuse (see faunal discussion below).

Faunal Remains from Site 26Ln1775

Analyses of archaeofaunas from open sites in southeast Nevada are rare. Data concerning faunal remains from caves and rock-shelters are available (see Fowler et al. 1973), but lack descriptive detail and interpretations necessary for inferring human behavior and subsistence/dietary patterns. Although few in number, analysis of animal bones from 26Ln1775 suggests that several mammalian species were exploited as food resources and, at least in some instances, were processed at the site.

Thirty-one mammalian bone fragments were recovered from test 26Ln1775 (Table 63). Most are identifiable only to animal size class (see Table 32). Identified specimens include a jackrabbit (Lepus sp.) distal humerus, a possible canid vertebra, an artiodactyl mandible fragment (i.e., a tooth socket), and three artiodactyl-sized long bone fragments. The mandible fragment probably represents one of these extant species in the project area: Odocoileus hemionus (mule deer), Antilocapra americana (antelope), or Ovis canadensis (mountain sheep) (Hall 1946).

While numerous taphonomic processes may have modified bones in the assemblage (see, for example, Gifford 1981; Lyman 1982), two bone fragments exhibit butcher marks. Evidence of butchering consists of striae and flake scars on bones (e.g., Binford 1981; Bonnichsen and Will 1980). Specimen 1005-1-4 is a large mammal long bone (shaft) fragment with a flake scar within its medullary cavity. Traditional interpretations equate flake scars with marrow extraction (e.g., Binford 1981), but may also be indicative of animal disarticulation by percussion (Schmitt 1986a). Excavations at O'Malley Shelter recovered numerous split large mammal bones (Fowler et al. 1973:50).

Specimen 1050-1-3 is a large mammal long bone fragment with three parallel striae on its outer surface. Although two specimens with butcher marks are a small sample, their presence in the site does indicate on-site processing of large mammal resources.

The 17 burnt bones in the collection probably represent kitchen refuse. Many natural processes can burn bone, but archaeological context and the paucity of other carbonized materials in the site suggest these are cultural, burnt by food preparation techniques and/or refuse disposal into a hearth.

Bone Artifact

One fragmentary bone artifact (specimen 903-9) was recovered from level 1 of Test Unit 2. The specimen measures 13.3mm x 4.0mm x 2.8mm, is highly polished, and has pronounced striations diagonal and parallel to its long axis. Location and morphology of the striae suggest they are the result of manufacturing techniques. The function of the artifact is unknown.

Table 63. Faunal Remains from 26Ln1775.

Specimen No.	Unit	Level	Size Class	Species or Element	Total	% Burned
903-1	2	Surf.	III	Long Bone Fragments	2	100
903-2-1	2	1	III	Long Bone Fragments	2	50
903-2-2	2	1	IV	---	1	100
950-7	3	1	III	Long Bone Fragment	1	100
1005-1-1	7	1	Lepus sp.	Distal Humerus	1	0
1005-1-2	7	1	cf. Canis sp.	Vertebrae Fragment	1	0
1005-1-3	7	1	IV-V	Long Bone Fragment	1	0
1005-1-4	7	1	V	Long Bone Fragment	1	0
1006-1-1	7	2	III	Long Bone Fragments	2	100
1006-1-2	7	2	IV-V	---	1	0
1050-1-1	8	1	III	Long Bone Fragment	1	0
1050-1-2	8	1	IV-V	---	2	0
1050-1-3	8	1	V	Long Bone Fragment	1	0
1051-1-1	8	2	II	Cranial Fragment	1	0
1051-1-2	8	2	III	---	4	25
1051-1-3	8	2	V	---	2	100
1055-1-1	9	1	III	Long Bone Fragment	1	100
1055-1-2	9	1	IV-V	---	2	100
1056-1-1	9	2	IV-V	---	2	100
1056-1-2	9	2	Artiodactyl	Mandible Fragment	1	100
1100-18-10	M	Surf.	III	Long Bone Fragment	1	100
Total					31	55

Assemblage Variability and Function Among Loci at Site 26Ln1775

Sample sizes are small, so care must be exercised, but comparison of artifact assemblages shows some interesting similarities and differences among loci of site 26Ln1775 which probably reflect their function (Table 64).

Loci can be divided into two groups. Loci B, H, and I have lithic tools and pottery but lack groundstone and incised or polished stone. The latter is present at loci A, M, E, and Station 2, while groundstone is present at all other loci. Since we know more about Locus H than any of the others, we begin our discussion there.

Loci H, I, and B as Short-term, Male Occupant Camps

At first glance, the presence of a relatively deep pocket of dark, midden-like soil at Locus H might suggest a pinyon-roasting pit or a residential base, with perhaps a shelter (even a house pit), in the vicinity of Test Units 7, 8, and 9. However, pinyon processing is ruled out by the lack of pinyon remains, while residential use is inconsistent with the small (n=71) artifact assemblage from this area. Most (76.1%) artifacts are potsherds representing cooking pots and jars. Other than potsherds, we recovered only 16 lithic tools and one pottery scoop. Moreover, Locus H yielded only 80 items of debitage, less than might be generated in the production of a single projectile point.

Table 64. Assemblage Composition of 26Ln1775.

Artifact Class	A	B	2	Site Loci M	E	H	I	K	Total n	Total %	% w/out sherds
Tabular Cores	3		2	2	1	5			11	3.4	11.8
Other Cores	3	1	1		1	5			11	3.4	11.8
Large Bifaces	1		1	1	2	1		1	7	2.2	7.5
Small Bifaces		1		1	2		1	2	7	2.2	7.5
Drills						1	2	1	4	1.2	4.3
Flake Scraper	1								1	0.3	1.1
Cobble Scrapers	2								2	0.6	2.2
End Scrapers		1		1					2	0.6	2.2
Mod. Flake Tool	1								1	0.3	1.1
Util. Flake Tool			1			1	1		3	0.9	3.2
Hammerstones	1		1				1		3	0.9	3.2
Projectile Points			1	1		1	1		5	1.5	5.4
Flaked Palette				1					1	0.3	1.1
Metates	4		1	1	5			1	12	3.7	12.9
Mano					1				1*	0.3	1.1
Palettes		1	1	1	1				4	1.2	4.3
Burnisher			2						1	0.3	1.1
Ceramic Sherds	4	13	27	30	21	54	61	23	233	71.5	
Pottery Scrapers	1				1		1		3	0.9	3.2
Ceramic Scoop						1			1	0.3	1.1
Ceramic Disk?								1	1	0.3	1.1
Ceramic Pipe					1				1	0.3	1.1
Incised Tablet	3				2				5	1.5	5.4
Polished Stone	1			2	1				4	1.2	4.3
Other			1						1	0.3	1.1
	25	17	37	41	39	70	67	30	326		(93)

*disappeared from site prior to testing

The flotation study and faunal analysis show that the soil at Locus H contains charred seeds and burned, butchered bones. Species of identifiable plants and animals are those available in the late summer or fall. However, the absence of groundstone at Locus H is puzzling. Would seeds be collected and parched (charred) without processing on grinding equipment? If groundstone artifacts were used at Locus H, fragments should remain behind even if all the serviceable tools were carried away by their owners or scavenged by others for use elsewhere (Simms 1983).

All things considered, Locus H most resembles a short term, male occupied hunting camp. Aside from the pottery, the tool assemblage is essentially "male": cores, a hammerstone, a drill, a utilized flake, spent projectile points. The artifact assemblage (particularly debitage) is small, suggesting short-term occupation. The identifiable plants and animals are available in the late summer or fall. The dark soil apparently was produced by burning; this could have involved fires used to smoke and dry meat or render bone grease. The latter activity would help account for the cooking pot. Alternatively, a temporary shelter may have burned at the site. In either case, the burned seeds may have been from plants growing on the site and incidentally charred. This would explain the absence of "popped" seeds from the flotation sample.

If this interpretation is correct, loci B and I may represent the same phenomenon. Neither has any accumulation of dark soil, or as many lithic artifact classes as Locus H, but otherwise both are much the same.

Other Loci as Short-Term Mixed Group Camps

If loci B, H, and I are short-term, male hunting camps, the rest may represent short-term, mixed group camps. The presence of groundstone suggests seed processing, and pinyon nuts seem a good candidate. Incised and/or polished stone artifacts are present at some, but not all, the loci with groundstone. Other artifacts cross-cut the two groups. Since the function of incised and polished stone artifacts is unknown, it is difficult to derive functional significance from their presence or absence. Still, we note that these objects are present in more of the putative mixed group loci than in the hunting camps. Ceramic scrapers (pottery making equipment?) were found in loci A and E as well as in locus I. Stone palettes are present in loci M, E, and Station 2 of the putative mixed camp group, and at Locus B as well.

Loci in both groups share characteristics of short-term occupations: small assemblage size, paucity of debitage, and lack of well defined hearths or other features. The sandstone slabs at Locus K may represent another exception if they are, in fact, hearths, cisterns, or other features.

It is interesting to note, that whatever else the occupants of 26Ln1775 may have been doing, they were not manufacturing bifaces. Small bifaces probably were brought to the site as completed tools. Large bifaces (stage forms) make up a relatively small proportion of the total assemblage (Table 64). Table 65 shows that the frequencies of biface thinning flakes and associated interior flake fragments are very low. On the other hand, chert cores and flakes with cortex are abundant, and we assume that chert was procured nearby and processed at the site.

Table 65. Debitage Class by Material Type, 26Ln1775.

	Chert		Banded Obsidian		Silicified Siltstone		Chalcedony		Rhyolite		Quartz	
Debitage Class	N	%	N	%	N	%	N	%	N	%	N	%
Shatter	21	9.8	1	1.1	1	11.1	0	-	0	-	1	100.0
Primary	14	6.5	5	5.4	2	22.2	0	-	1	16.7	0	-
Secondary w/Cortex	79	36.9	14	15.1	3	33.3	1	14.3	1	16.7	0	-
Secondary, Interior	59	27.6	37	39.7	1	11.1	3	42.8	3	50.0	0	-
Biface Thinning	4	1.9	2	2.2	2	22.2	1	14.3	0	-	0	-
Tertiary	4	1.9	12	12.9	0	-	0	-	0	-	0	-
Fragment w/Cortex	6	2.8	1	1.1	0	-	0	-	0	-	0	-
Fragment, Interior	25	11.7	21	22.5	0	-	2	28.6	1	16.7	0	-
Potlid	2	0.9	0	-	0	-	0	-	0	-	0	-
	214		93		9		7		6		1	

Chapter 11. CONCLUSIONS
by Robert G. Elston

Most previous archaeological investigations in southeastern Nevada have focused on the valley floors to the neglect of the surrounding uplands. The Panaca Summit project has provided a detailed look at a transect through the Cedar Range, and we now know a great deal more about prehistoric upland archaeology in the region than we did prior to the survey and testing programs. The seven archaeological sites intensively investigated during the present project appear to represent the range of variety of sites within the transect.

In addition, we have had the opportunity to apply some new ways of classifying and evaluating archaeological sites. In this concluding chapter, we critique the performance of the site type key as an evaluative technique, explore some systematic relationships in our data that may be of use in future studies and examine certain implications of our data for Fremont archaeology.

Performance of the Site Type Key

The site key has proved to be a useful tool for the evaluation of cultural resources. By classifying sites into functional types, the key provides an objective basis for ranking and assigning priorities to various kinds of cultural resources. An objective measure of what is redundant and what is unique is invaluable when dealing with an archaeological district that has such a high site density as Panaca Summit.

David H. Thomas (personal communication) has observed, as a function of the sample-size effect, the tendency for classification of sites to vary with the amount of attention given to them. With each step upward in intensity of investigation, the size of the sample increases and the absolute diversity of the assemblage increases, as discussed in Chapter 9. If site classification is based only on absolute diversity, sites initially classified as locations during survey, tend to become short-term camps after testing, residential bases when extensively excavated.

Thus, the value of a classification scheme is increased with what we might term its stability. That is, classifications should change as little as possible with intensity of investigation. A test of stability is to see if site classifications based on survey data change when more detailed information becomes available through surface collection and testing of the kind reported here. The measure of classification stability is merely the proportion of classification changes in the sample.

Survey recorded assemblages and archaeological test assemblages for the six prehistoric sites are compared in Table 66, showing that relative proportions of artifact classes varied little between survey data and test data. Using artifact classes collapsed into the functional categories employed in the site type key, Table 67 compares pre-and post-testing site type assignments for all seven sites reported here.

Site 26Ln3359 was classified as a short-term camp during survey. However, a "core" recorded during survey either could not be relocated or subsequently was regarded as debitage. In any case, the absence of this fabrication tool changed the classification of the site from short-term camp to location. Similarly, the absence of cultural materials from the hearth-like feature at site 71W-3 makes it a location too. Thus, there are two changes in classification, according to the key, and classification stability is 71.4 %. However, as we have seen, site 26Ln1775 should also be reclassified downward to a Type A1 palimpsest. Classification stability then would be 57%. Of course, we are dealing with a very small sample (n=7) of sites, so that change in classification of only a few sites causes a relatively large decrease in classification stability.

These changes also highlight the fact that the key is overly sensitive when assemblages are small, and the presence or absence of a single artifact or feature can cause a change in classification. On the other hand, it is not sensitive enough when assemblages are large and/or diverse. According to the key, site 26Ln1775 remains classified as a residential base after testing, even though we suspect that it is really a cluster of Type A2 (mixed group) and Type A3 (male group) short-term camps. Moreover, there is currently no way for the key to respond to the kind of data likely to turn up during testing, such as the presence of midden, debitage density, or relative abundance among artifact classes. The net result is that with survey data, the key tends to be too liberal and overclassify, particularly at either end of the classification scale.

Table 66. Comparisons of Survey Assemblages and Archaeological Test Assemblages.

Prehistoric Archaeological Sites @

Tool/Feature Category	26Ln1775				26Ln3357				26Ln21				26Ln3358				26Ln3356				26Ln3359			
	Survey		Test		Survey		Test		Survey		Test		Survey		Test		Survey		Test		Survey		Test	
	N	%*	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Core	2	1.6	22	6.8	7	16.3	2	2.5	1	8.3	2	16.7	1	16.7	3	17.6					1	50.0	0	-
Hammerstone	0	0.0	3	0.9	0	0.0	1	1.2																
Biface	4	3.1	14	4.3	16	37.2	42	52.5	2	16.7	5	41.7	2	33.3	10	58.8	5	71.4	11	91.7	1	50.0	1	100.0
Flake Tool	1	0.8	4	1.2	6	14.0	5	6.2	6	50.0	3	25.0	1	16.7	0	0.0	2	28.6	1	8.3				
Projectile Point	0	0.0	5	1.5	2	4.7	9	11.3	1	8.3	1	8.3												
Scraper	0	0.0	5	1.5	2	4.7	6	7.5					0		1	5.9								
Drill	1	0.8	4	1.2	0	0.0	1	1.2																
Chopper	1	0.8	0	0.0																				
Groundstone	15+	11.8	18#	5.6	4	9.3	9	11.3	2	16.7	1	8.3	1	16.7	1	5.9								
Pottery Sherds	100+	78.7	227	70.3	2	4.7																		
Worked Sherd	0	0.0	6#	1.9	0	0.0	2	2.5																
Ceramic Pipe	1	0.8	1	0.3																				
Stone Pipe													1	16.7	1	5.9								
Incised/polished Stone	0	0.0	9	2.8									0		1	5.9								
Flaked Palette	0	0.0	1	0.3																				
Hearth	2?	1.6	2?	0.6																				
Midden	0	0.0	1	0.3																				
Rock Alignment					2	4.7	3	3.8																
FAR Scatter	0	0.0	1	0.3	2	4.7	0	0.0																
Debitage	500+		330#		1000+		1429		500+		130		±200		228		±250		971		100+		127	
Raw Material	8		18		5		14		4		7		5		17		1		2		2		19	

= includes one not collected
* = collected debitage
@ = site 71W-3 is not listed in this table

Table 67. Comparison of Functional Tool Categories and Site Type Assignments for Tested Sites

Site No.	Site Type Key Classification Before Testing	Level of Investigation	Residential	Food Processing	Food Acquisition	Fabrication	General Utility	Site Type Key Classification After Testing
			Functional Tool Categories Present					
Ln1775	Residential Base	Survey	X	X		X	X	Residential Base
		Testing	X	X	X	X	X	
Ln21	Short Term Camp Type A1	Survey		X	X	X	X	Short Term Camp
		Testing		X	X	X	X	
Ln3357	Short Term Camp Type A1	Survey	X	X	X	X	X	Short Term Camp Type A1
		Testing	X	X	X	X	X	
Ln3358	Short Term Camp Type A2	Survey	X	X		X	X	Short Term Camp
		Testing	X	X		X	X	
Ln3359	Short Term Camp Type B1	Survey				X	X	Location
		Testing					X	
Ln3356	Large Location	Survey					X	Location
		Testing					X	
71W-3	Short Term Camp Type C	Survey					X	Location/ Non-cultural
		Testing	X					

Sample Size Effect

The sample size effect predicts that when the assemblage size increases, a corresponding rise in numbers of classes will occur. However, our study shows that this may not necessarily happen. For instance, consider Figure 57, which compares the relative diversity of survey and test assemblages from the six prehistoric sites. Subjected to more intensive study, the number of classes at these sites decreased in two cases, remained about the same in three cases, and increased substantially in only two cases. One implication is that in four cases (57%), something new was learned through testing, and, in three cases (43%), testing produced no additional information. This suggests that survey crews may have over-recorded smaller sites, placing artifacts into more categories than warranted and seeing "features" which later turned out to be non-cultural. On the other hand, it is apparently more difficult for survey crews to adequately sample large, complex sites such as 26Ln1775 and 26Ln3357.

Interior Flake Fragments as Indicators of Biface Manufacture

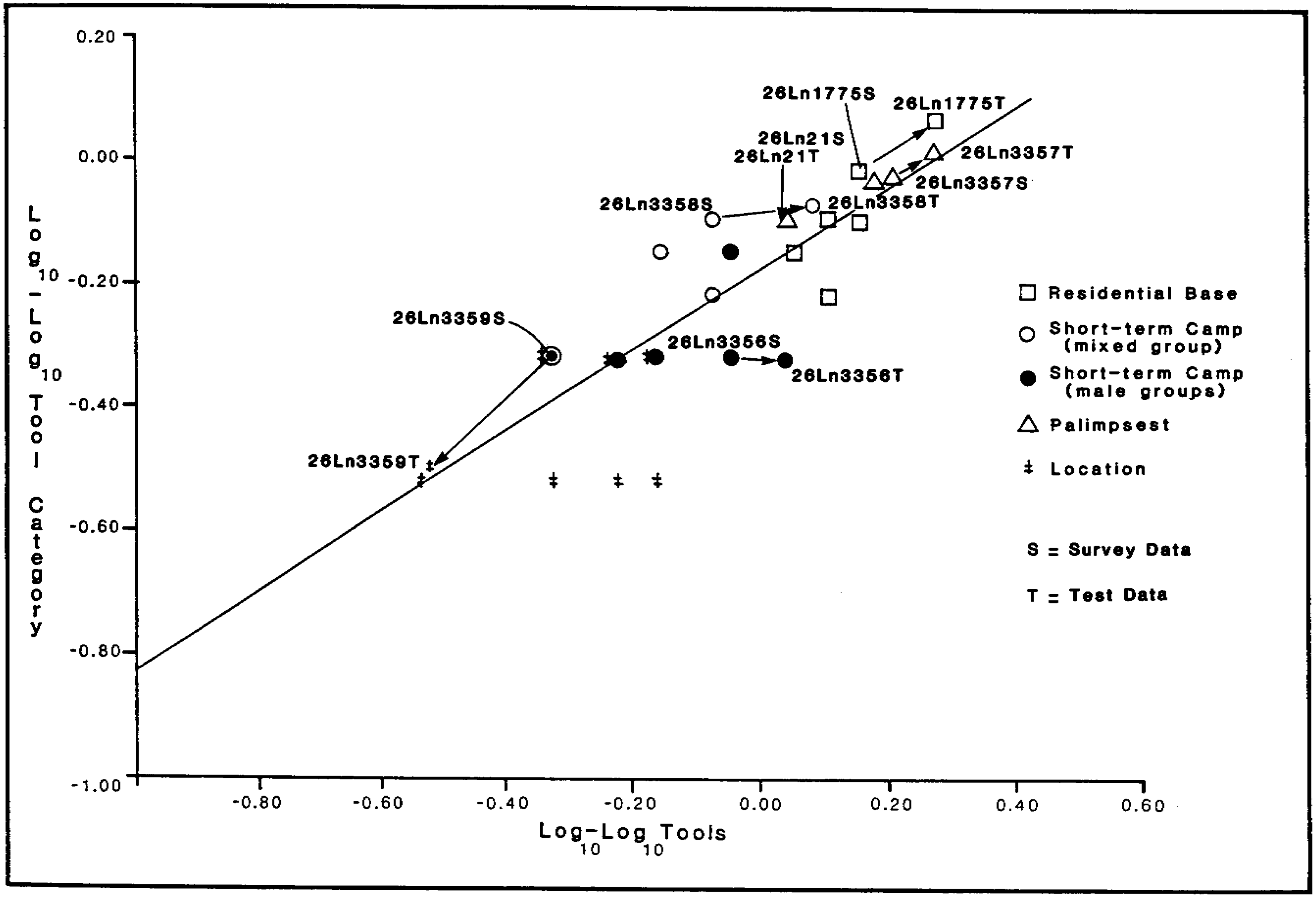
We noticed a direct relationship between the numbers of biface thinning flakes and interior flake fragments in assemblages of obsidian debitage. That is, as biface thinning flakes increase, so do interior flake fragments. We interpret this to mean that many, perhaps most, interior flake fragments are actually shattered biface thinning flakes. It is useful to monitor biface production, but this is often difficult to do if the bifaces have been removed from the site. It is also more difficult to recognize consistently biface thinning flakes, while interior flake fragments are very easy to recognize.

The relationships between both obsidian and chert biface thinning flakes and interior flake fragments are plotted in Figure 58. With the sample size used here, the correlation for obsidian is very strong, but not significant for cryptocrystalline materials. This is probably because the latter are tougher, and biface thinning flakes are less likely to shatter on detachment.

Implications For Fremont Archaeology

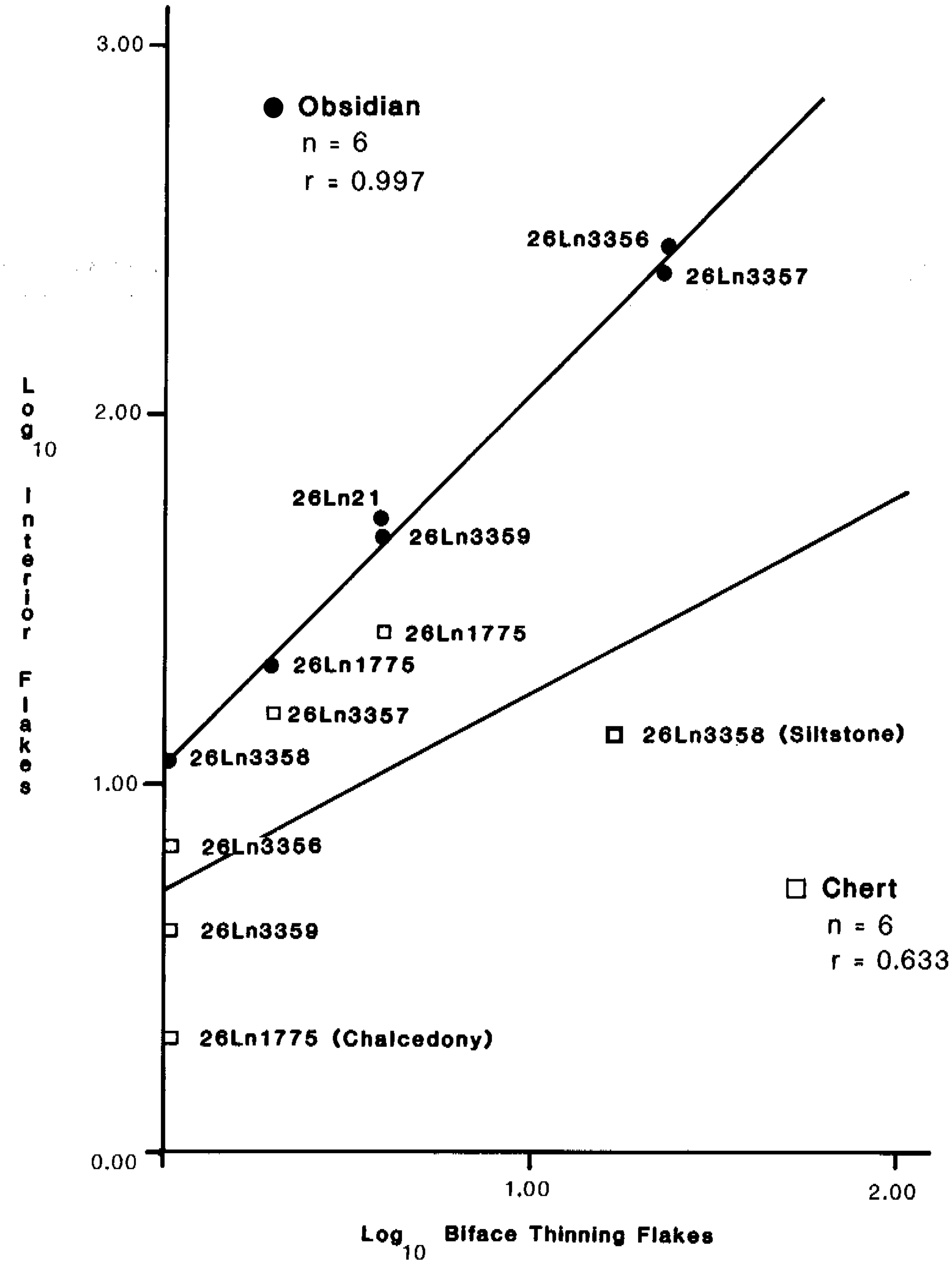
The function of site 26Ln1775 has interesting implications for competing models of Fremont settlement and subsistence patterns. Although classified by the site key as a residential base, we have seen that site 26Ln1775 is more

Figure 57. Sample size effect: variation between survey and test data.



Log10 - Log10 Tool Category
0.20
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
-0.80
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
Log10-Log10 Tools
26Ln1775S
26Ln1775T
26Ln21S
26Ln21T
26Ln3357T
26Ln3357S
26Ln3358S
26Ln3358T
26Ln3359S
26Ln3356S
26Ln3356T
26Ln3359T
Residential Base
Short-term Camp (mixed group)
Short-term Camp (male groups)
Palimpsest
Location
S = Survey Data
T = Test Data

Figure 58. Relationship between biface thinning flakes and interior flake fragments, plotted for obsidian and chert.


3.00
2.00
1.00
0.00
Obsidian
n = 6
r = 0.997
26Ln3356
26Ln3357
26Ln21
26Ln3359
26Ln1775
26Ln1775
26Ln3357
26Ln3358 (Siltstone)
26Ln3358
26Ln3356
26Ln3359
26Ln1775 (Chalcedony)
Chert
n = 6
r = 0.633
Log10 Interior Flakes
1.00
2.00
Log10 Biface Thinning Flakes

likely a cluster or palimpsest of short-term, male occupied hunting camps and mixed group pine nut camps. Thus, site 26Ln1775 does not represent occupation of an upland residential site in the pinyon-juniper "refugium" by horticultural groups from the Parowan Valley. Rather, it appears to represent logistical foraging by local Fremont hunting and gathering groups resident in nearby valleys, perhaps at sites like O'Malley Shelter or elsewhere in Meadow Valley. The presence of locally made pottery at site 26Ln1775 fits this model, as does the paucity of artifacts (particularly debitage), implying very short intervals of occupation. For Parowan Valley groups to have made short-term logistical forays to the Cedar Range seems very unlikely.

Directions for Future Research

Several lines of inquiry for future research are suggested by the Panaca Summit study, as discussed below.

Local Group Characterization

Panaca Summit (and Meadow Valley Wash) is located in an interesting archaeological region: at the southwestern periphery of the horticultural Fremont, just beyond the northern limits of the horticultural Anasazi, and just east of non-horticultural, hunters and gatherers. It is a place where interaction among all three groups could take place. The discovery of locally manufactured "Fremont" grayware pottery and indications of short term occupancy at Panaca Summit sites suggest their use by local people rather than by groups from Parowan Valley.

The local groups apparently made their own pottery and practiced limited horticulture, but did not construct pueblos or villages. To what degree, then, were Meadow Valley groups actually "Fremont"? One possibility is that they were basically non-horticultural hunter-gatherers; exogamous marriage or exchange involving Fremont women could then account for the presence of limited horticulture and local manufacture of pottery.

A test of this hypothesis would be to look for similar relationships between local groups and the Anasazi. If Anasazi women were also brought into the local area, Anasazi pottery from Meadow Valley should be locally manufactured as was Fremont ceramics. If so, this would explain why Fremont and Anasazi ceramics are often found together in the same deposits.

Sampling Site Variety

Although the Panaca Summit study has provided a look at prehistoric use of pinyon-juniper uplands, it is unknown to what extent our sample is representative, derived as it is from the survey of a single narrow corridor through a major pass in the Cedar Range. A larger, random sample for which one could estimate variance would allow the investigation of several problems involving site density, site function, and assemblage variability.

For instance, site density is very high along our transect. Is this true for the entire Cedar Range? None of the sites in our sample appear to represent long term occupation. Do such sites exist elsewhere in the uplands, perhaps in proximity to springs? Only one possible aboriginal check dam (26LN3357) was observed in the study area. It is possible that construction of historic check dams destroyed most evidence of such features on the west side of the Cedar Range. Are prehistoric check dams present elsewhere? Evidence for intensive use of pinyon (caches, roasting pits) was absent from our transect. Is such evidence present at other sites?

Site Function and Structure

While additional survey can address problems such as those just outlined, details of site function and structure require detailed mapping, surface collection, and excavation. For instance, the presence of structures, cache pits, and other features, as well as the internal structure of discrete localities and the nature of the patches of dark soil in site 26LN1775 (and similar large, complex sites), can be determined only through additional excavation. Excavation is also necessary to obtain faunal materials, flotation samples, and charcoal for radiocarbon dates.

Chronology and Trade

The sites we tested contained so little charcoal that dates could not be obtained. Chronology might also be addressed through obsidian hydration, which in turn requires obsidian sourcing. Sourcing can inform on trade, and sourcing obsidians in the Cedar Range would provide baseline data useful in studies of Fremont and Anasazi sites in other regions.

Ceramics Analyses

Additional samples of both Fremont and Anasazi ceramics from the Meadow Valley area should be subjected to petrographic analysis. Survey and excavation in the Cedar Range would generate additional ceramic samples from the uplands. Large ceramic collections from lowland sites such as Conaway Shelter, O'Malley Shelter, and Etna Cave should be restudied in this light.

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Appendix A

PETROGRAPHIC THIN-SECTION ANALYSIS OF SELECTED SHERDS FROM 26Ln1775

by Patricia Dean

INTRODUCTION

Ten pottery sherds from site 26Ln1775 were submitted for mineralogical identification (Table 1) and a thin-section was cut from each sample.

Two specific questions were asked of the analysis: what is the identification of the rocks used as temper material in the unknown types and how do they relate to known Fremont types; and, what is the identification of the rocks used as temper material in the Snake Valley ceramics and how do they relate to the "classic" Snake Valley ceramic material?

Table 1. Field Identification of Sherds Selected for Petrographic Analysis.

Ref. No.	Type
1000-8-5	Unknown Type 1
1000-6-2	Unknown Type 1
1000-8-7	Unknown Type 2
1300-14-5	Unknown Type 2
800-4	Snake Valley Black-on-gray
1400-7-3	Snake Valley Black-on-gray
1500-2-3	Snake Valley Gray
800-4	Snake Valley Gray

GENERAL FINDINGS

The materials used to construct Unknown Types 1 and 2 are roughly the same: a poorly-sorted welded tuff, which serves as the source of both clay and temper material. A slight difference is noted in specimen 1300-14-5 (labelled Unknown Type 2), which has the same welded tuff material, but also contains rhyolite rock fragments. The geological relationship between the rhyolite and tuff materials cannot be determined by mineralogical analysis alone; however, in many cases (in the Mineral Mountains of Utah, for example) they co-occur (see Lipman et al. 1978). The unknown types from 26Ln1775 are similar in composition to a sherd found at 26Ln2969, which I have tentatively labelled "Pioche Gray".

Interestingly, the Snake Valley ceramics do not appear to be composed of the same clay or temper material as Snake Valley ceramics from Utah. The rock fragments used as temper are primarily angular feldspar and quartz grains with abundant biotite particles in a tan-brown clay which shows the lamination characteristic of a coiling of the clay during shaping (rolling the clay in coils "lines up" rock fragments and minerals). In contrast, Snake Valley sherds from the Parowan Valley, as well as those found in sites outside the region (see Dean 1983) all have temper material which is composed of plagioclase feldspar Andesine 50.

It is possible that the clay and temper used in Snake Valley ceramics from Panaca Summit are related to the material used to construct the unknown types, but this is speculation. The fact that a Snake Valley Corrugated sherd has identical mineral temper material as a Snake Valley Black-on-gray sherd certainly suggests that both types were constructed of materials from the same geologic source. The exception to this uniform material content in the Snake Valley assemblage is a sherd of Snake Valley Black-on-gray with very silty clay and few temper particles (which may be a function of the small sample size). The fragments that are present, however, are roughly similar to the other Snake Valley sherds, especially as they are intermediate between an altered volcanic and sedimentary rock.

LOCAL GEOLOGY

Geologic descriptions for the region are derived from Tschanz and Pampeyan (1970).

Most of the geology of the area, including the Highland Range, Black Canyon Range and The Bluffs, the Pioche Hills, Ely Springs Range and the Burnt Springs Range, are composed of a bedrock of volcanic rocks, the nature of which, at least by 1970, was unknown. A shale and/or limestone deposition consisting of Upper Cambrian, Ordovician, and/or Silurian rocks overlays the bedrock and is covered by generally Tertiary volcanic rocks (many of which are largely ignimbrites). Massive thrusting and tilting has occurred through time and the resulting formations are complex.

The ignimbritic material, called pyroclastic rocks, which make up much of the material from which the ceramics are made are generally bewildering. In the simplest of terms, when volcanic eruptions occur, small rock fragments are thrown into the air. This volcanic material (called ignimbrite, ash, tephra, or tuff) is transported through eruption and wind forces over wide areas. The mineral composition of tuff is dependent, of course, on the type of magma from which it originated, but the classification of tuffaceous material is generally by depositional environment (e.g. lacustrine tuff, submarine tuff, or subaerial tuff) or manner of transport (e.g. fallout tuff or ash-flow tuff) (Fisher and Schmincke 1984:91). Sometimes tuffs are small-grained particles; other times they are partly molten "bombs" which solidify during flight or immediately after landing. They can be discrete grains or melted (welded) together. Thus, grain size, shape, type of deposition and transport alteration, and mineral content all contribute to identifying tuffaceous materials.

But even the simple recognition of a material as tuffaceous is not easy: many of the lower layers of bedrock tuff material in the study area are submarine, deposited during the Paleozoic ocean basin (see Churkin 1974), and are surrounded by material that is more sedimentary than the later Tertiary tuff deposits. Mixing of the two volcanic materials by regional thrust and faulting complicates the picture, particularly at outcrops which might be used as clay sources.

The origin of the granitic material, particularly that in the Snake Valley ceramics, is uncertain. The lack of strained quartz and twinned feldspar minerals which alter to other material, such as amphibole and white mica, indicate they are not derived from an alkali granite. The degree of rounded grain boundaries and lack of twinning and straining indicate a probable surficial granite deposit. Prospect Mountain in the Chief Range is composed almost entirely of quartzite and a granite source might not be entirely improbable in such a complicated geological area as the study region.

A COMPARISON OF 26Ln1775 AND 26Ln2969

Bunch, through the Nevada Department of Transportation, surveyed and tested site 26Ln2629 in 1986. The sherds I examined for that study included black-on-gray and plain gray samples. Don Tuohy had previously identified the black-on-gray sherds as characteristic of Snake Valley ceramics found in Nevada; he observes wide variation in the types of material used for Snake Valley construction. This is quite different from the Snake Valley material in Utah, where remarkably homogeneous clay and temper materials prevail: volcanic temper, a plagioclase andesine 50, and clay which is formed from this same material. It generally has been assumed that we were dealing with a single source for Snake Valley ceramics in Utah. Tuohy, however, is quite correct: all the Nevada painted Fremont ceramics I have seen (an admittedly small sample), are much less uniform in clay and temper than those from Utah. The similarities between a sherd from 26Ln2969 and those from 26Ln1775 do suggest local production rather than trade.

A problem is that the classification system for Fremont ceramics is based on temper types. Thus, if temper differs from the traditional Snake Valley material, are the ceramics Fremont? Bunch included several large painted sherds for analysis, but, since no one has ever done a stylistic analysis of Snake Valley painted ceramics, I could not even state that the sample was stylistically similar. A few elements (opposing solid triangles and a ubiquitous line around the mouth) suggest relationships to Fremont designs, but the designs are also similar to those found in Virgin/Kayenta Western Anasazi assemblages.

As I have mentioned, the Snake Valley Black-on-gray sherd from 26Ln2969 is very much like those from 26Ln1775: weathered volcanic rocks associated with granitic debris (interestingly, these sherds often had fragments of plant material in them, suggesting a clay source near the surface). Indeed, the sherd identified as Snake Valley gray has granite temper. Both the Snake Valley ceramics in the Bunch sample and those sent from 26Ln1775 have small amounts (less than 1%) of zircon in them, indicating a probable plutonic origin of the rock fragments, but both these collections are complex and altered enough to suggest an intermediate force--the 26Ln1775 collection is more sedimentary in nature, while 26Ln2969 is sort of metamorphic. The difference is less distinct than one might think. Specific knowledge of the local geology, therefore, is critical to determining the relationship of the sherds between these two sites.

CONCLUSION

Without detailed knowledge of the geology of the study area, it is difficult to determine whether the ceramics are of local origin. My impression, however, based on both sites (26Ln1775 and 26Ln2969), is that they are indeed local. All the sherds I have seen from these two sites suggests temper and clay sources which are ignimbritic in nature, but with a variety of alteration and inclusions indicating a complicated volcanic region--which certainly qualifies the study area.

The nature of ignimbrites, as mentioned, is complex. Looking at thermal expansion as an indicator of possible function (see Bronitsky 1986), most feldspars have a wide expansion rate depending on mineral composition (Skinner 1966). Plagioclase Andesine 44 expands 1.75% of its overall volume at 1000°; quartz expands to 4.26% of its volume at 1000°. Rocks composed of several minerals are difficult to ascertain except individually. An average thermal expansion of 21 samples of granites and rhyolites indicates that they have a third more thermal expansion than basalts (Skinner 1966.84). Thus, a tentative suggestion is that the selection of rhyolitic rocks for construction of ceramics is due to their ability to expand during firing and thus provide better thermal shock absorption properties for the fired vessel.

In summary, the 10 sherds sent for petrographic analysis can be divided into two groups: one group is composed of the four unknown sherds, which I tentatively call Pioche Gray. In keeping with the use of temper material as a classification criteria for Fremont ceramics, Pioche Gay is characterized by welded tuff ignimbrite temper. The second group is composed of the six Snake Valley sherds: two Snake Valley Gray, two Snake Valley Black-on-gray; and two Snake Valley Corrugated. All sherds have feldspar and quartz temper with several altered silicic-rich volcanic rock fragments, probably rhyolite. As rhyolite is also present in one of the Pioche Gray sherds, consideration of relationship between these two groups should be given.

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THIN SECTION ANALYSIS

Site: 26LN1775
Date: March, 1987
Petrographer: Eric L. Sonnenthal, University of Oregon, Department of Geology

NOTE: I have divided the thin section analysis into several sections but this division is based on the mineralogical identification not the function of the minerals in the potsherd. That is, feldspar and quart are listed as secondary minerals in the Snake Valley sherds, for example, and not in the "temper" category. This is not really the case--they seem to have been processed expressly and added to the clay and are not related to the rock fragments listed as temper. Thus, the rock fragments and the feldspar/quartz material both served as temper material. It is possible, of course, that the rock fragments were the parent rock of the clay source and are simply inclusions in the clay. Clay mineralogy is very difficult as the grains are small and the minerals are destroyed/altered in firing temperatures above 500o C.

I have arbitrarily put those secondary minerals I feel were deliberately added to the clay as temper material in bold print.

Sample: FS# 1300 14-5
Identification: Unknown #2

Paste: 70% of the sherd is composed of a dark-brown, laminated clay with abundant shrinkage crack which run parallel to the lamination of the clay.

Temper: 22% of the sherd is composed on rock fragments. 19% of these rocks are mostly welded tuff or altered volcanic tuff material of unknown origin; 2% of these rocks are glassy and finely crystallized volcanic material, probably rhyolite; 1% are siltstone or sandstone (sedimentary) fragments with accessory minerals of feldspar, quartz and muscovite. These rock fragments are fairly small, averaging less than 1.5 mm in maximum dimension.

Secondary Minerals: 8% of the sherd is composed of secondary mineral material. 6% is mostly subrounded and sericitized (with mica) anorthoclase and plagioclase feldspar minerals; 1% is well-rounded quartz (this percentage includes that in the tuff); less than 1% is magnetite and another < 1% is mica, probably related to the sedimentary rock fragment noted above.

Description: The sample contains abundant welded tuff fragments and silicic volcanic fragments (probably rhyolite) in a porous deep-brown, well-laminated paste. This sherd and FS# 100 8-7 show a greater diversity of source rocks than FS# 1000 6-2 and 1000 8-5, although many of the tuffaceous rock fragments are similar in all four samples. Sorting of the rock fragments is poor to fair and it is well-mixed throughout the thin section.

Sample: FS# 1000 8-7
Identification: Unknown #2

Paste: 59% of the sherd is composed of very dark brown, poorly and irregularly laminated clay which shows some shrinkage cracks.

Temper: 25% of the sherd is composed of rock fragments which are from a volcanic tuff material.

Secondary Minerals: 16% of the sherd is composed of secondary mineral material. 9% of this is subangular to rounded anorthoclase and plagioclase which is commonly twinned; 4% is subangular to well-rounded quartz; 2% is biotite; < 1% is a green-brown hornblende; and < 1% magnetite.

Description: The sample is composed of very poorly sorted material with large tuff fragments (up to 3 mm in maximum dimension) and is similar to FS# 1300 14-5, except that the paste is darker and possibly organic-rich.

Sample: FS# 1000 6-2
Identification: Unknown #1

Paste: 67% of the sherd is composed of tan clay which is poorly laminated.

Temper: 12% of the sherd is composed of rock fragments of welded tuff. It is glassy, pale tan to beige in color and contains crystals of quartz, feldspar, magnetite, hornblende, and biotite. The fragments exhibit differing degrees of devitrification and the rock fragments are of the same sizes as the secondary mineral material.

Secondary Minerals: 21% of the sherd is composed of secondary minerals: 15% is plagioclase and anorthoclase; 4% quartz; < 1% amphibole; < 1% magnetite; and < 1% mica. A trace amount of zircon is also present.

Description: This sherd contains an abundance of feldspar, welded tuff, and quartz in an irregularly laminated paste. The rock fragments are solely welded tuff of the same parent rock, as is the case with the other very similar sample FS# 1000 8-5.

Sample: FS# 1000 8-5
Identification: Unknown #1

Paste: 70% of the sherd is composed of a pale tan, irregularly laminated clay with small tuff fragments and mineral grains identical with the rock fragments.

Temper: 12% of the sherd is composed of rock fragments of welded tuff whose size varies from clay size on up. It is obviously the source of both the temper and clay material.

Secondary Minerals: 18% of the sherd is composed of secondar minerals: 11% is an albitic plagioclase feldspar which is often untwinned, through some albite and Carlsbad albite twinning occurs. Some feldspar appears to be alkali. 5% is quartz; < 1 % is a colorless clinopyroxene; < 1% green-brown hornblende; < 1% magnetite; < 1% biotite; and a trace of zircon (contained in the tuff material).

Description: The sherd contains an abundance of welded tuff fragments with feldspar and quartz minerals derived from the same tuff material. There is fair lamination, though the directions differ throughout the slide. This may be due to the joining of the coils in construction. The rock fragments are generally well-rounded and glassy. Most of the secondary mineral grains have some of the glassy tuffaceous matrix adhering to their edges. Some biotite and rarer hornblende are scattered throughout the sample.

Sample: FS# 800-4
Identification: Snake Valley Gray

Paste: 73% of the sherd is composed of dark brown clay which is strongly laminated.

Temper: 3% of the sherd is composed of fine-grained, altered volcanic (?rhyolite) or sedimentary rock fragments.

Secondary Minerals: 24% of the sherd is composed of secondary minerals: 12% are unzoned, untwinned, yet unaltered feldspar; 7% are mostly angular, though some rounded, quartz mineral; < 1% magnetite; and 4% biotite and muscovite mica minerals.

Description: The sample is from a very narrow (about 2.5 mm) sherd which is strongly laminated. It has predominantly angular feldspar and quartz minerals with an abundance of micaceous material. The narrowness of this sherd corresponds with the smaller rock and mineral fragments: all these fragments are less than 1 mm in maximum dimension. The mineral grains, especially the micas, are strongly aligned in the laminated paste, running parallel to the edge of the sherd. This is probably due to the coiling of the clay during the manufacturing process.

Sample: FS# 1500 2-3
Identification: Snake Valley Gray

Paste: 75% of the sherd is composed of dark chestnut-brown, strongly laminated clay.

Temper: 3% of the sherd is composed of the same fine-grained, quartz-rich rock fragments as is found in the other Snake Valley samples. This rock fragment may be altered volcanic in a sediment matrix which may have originally a tuffaceous deposit.

Secondary Minerals: 23% of the sherd is composed of secondary minerals: 16% feldspar with some rounding, though most are angular. They are rarely twinned, are unzoned and unaltered; 3% is mostly angular, though some rounded, quartz; , $<$ 1% magnetite; 4% mica, mostly large flakes of biotite with a few muscovite flakes; $\ll$ 1% epidote (a greenish, hard crystal often found in metamorphic rocks of mafic [composed predominately of ferromagnesian minerals such as olivine, pyroxene, etc.] composition.

Description: The clay in this sherd is strongly laminated yet slightly less well mixed and sorted than the other Snake Valley sherds. The clay is also fairly porous due to the abundant shrinkage cracks parallel to the laminations and the edge of the sherd. The minerals are mostly angular and are composed entirely of feldspar, quartz and micas.

Sample: FS# 802-4
Identification: Snake Valley Black-on-gray

Paste: 65% of the sherd is composed of a tan-brown, laminated, biotite-rich clay.

Temper: 2% of the sherd is composed of the same fine-grained, quartz-rich altered volcanic or sedimentary rock fragments as found in FS# 1100 19-2.

Secondary Minerals: 33% of the sherd is composed of secondary minerals: 23% are unzoned, unaltered feldspar (though one grain has Carlsbad twinning); 8% quartz with some fluid inclusions; $<$ 1% magnetite; 2% large and small flakes of mica, mostly biotite with some muscovite.

Description: The clay in this sherd is also strongly laminated with coarser, though identical, mineral material as found in FS#1100 19-2 (identified as Snake Valley Corrugated). There is slightly less micas than in the corrugated sherd though more muscovite. As muscovite decomposes rapidly at higher firing temperatures, both sherds may have had the same micaceous materials to start. There are mostly angular quartz and feldspar minerals with some mica and fine-grained, generally rounded rock fragments. This sherd, compared to the Unknown sherds, is very poor in oxides and accessory minerals are virtually absent. The very low amount (2%) of rock fragments suggests that the minerals were used as the temper material and were effectively separated from the parent rock which was still angular--indicating no or little transport or weathering prior to crushing. Some shrinkage cracks have developed parallel to the lamination.

Sample: FS#1400 7-3
Indentification: Snake Valley Black-on-gray

Paste: 76% of the sherd is composed of a tan-brown, laminated clay which is very rich in silt and biotites.

Temper: 3% of the sherd is composed of fine-grained volcanic or sedimentary rock fragments.

Secondary Minerals: 21% of the sherd is composed of secondary minerals: 12% are unzoned, untwinned, and unaltered feldspar; 2% mostly angular, unstrained quartz, though there are some rounded grains; < 1% magnetite with small, irregular grains; 7% micas, mostly biotite with some muscovite.

Description: This sherd has well-laminated, fairly porous clay with an abundance of quartz and feldspar-rich mineral fragments. The mineral grains are typically angular and do not contain accessory minerals, similar to the other sherds in the Snake Valley group. The mixing of the minerals and clay is somewhat poor as the mineral fragments tend to occur together. The sherd is biotite-rich and the mineral grains, as in the other Snake Valley sherds, are mostly elongate and oriented parallel to the lamination of the paste.

Sample: FS# 1100 19-2
Identification: Snake Valley Corrugated

Paste: 68% of the sherd is composed of tan-brown, laminated clay which is biotite-rich.

Temper: 5% of the sherd is composed of a fine-grained altered volcanic rock fragment, possible rhyolite. This material is similar in size as the secondary mineral fragments.

Secondary Minerals: 26% of the sherd is composed of secondary minerals: 17% are unaltered, untwinned feldspar; 5% quartz with some fluid inclusions; < 1% magnetite with small, irregular grains; 4% mica, with both large and small flakes of mostly biotite, with a few muscovite flakes; « 1% zircon, which is rounded.

Description: This sherd has strongly laminated, fairly porous paste with an abundance of biotite in the temper and clay. The minerals are mostly angular feldspar and quartz. The biotite has undergone expansion when it was fired. Again, the rock fragments are not the surce rock for the secondary minerals.

Sample: FS# 1100 18-5
Identification: Snake Valley Corrugated

Paste: 71% of the sherd is composed of chestnut-brown, laminated clay.

Temper: 5% of the sherd is composed of a fine-grained, silica-rich altered volcanic rock (possibly rhyolite)or a fine-grained sedimentary mud- or siltstone. This material is the same as the other Snake Valley rock fragments.

Secondary Minerals: 22% of the sherd is composed of secondary minerals: 16% unzoned, unaltered feldspar, though a few have Carlsbad twinning; 3% quartz, some of which are well-rounded; < 1% magnetite; 3% mica, large flakes of biotite and muscovite.

Description: The clay in this sherd is darker than in FS# 802-4 or 1100 19-2 but this may be an artifact of the thickness of the thin section. It is otherwise similar in all respects to the latter two sherds. The mineral and rock fragments are fairly wel distributed in this sherd.

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