An Evaluation of Ceramics at the Sand Dune Site, Hubbell Trading Post, NHS

Peter J. McKenna

Division of Anthropology
Southwest Cultural Resources Center
National Park Service
Santa Fe, New Mexico

1987

NN028944

Test excavations at the Sand Dune Site in 1983 and 1985 recovered a mixed assemblage of 283 Anasazi and historic Navajo and Puebloan ceramics. This report provides a typologically based identification of those ceramics, a discussion of typologically related ceramic problems at the Wide Reed-Sand Dune site complex, and, insofar as possible, the distributional ceramic patterns at the Sand Dune Site.

Background

Five projects have been undertaken which are relevant to interpreting the Sand Dune Site. A survey of Hubbell Trading Post (Scurlock 1979:45-46) formally identified the Sand Dune Site or HUTR-4 (Ariz.K:6:11) as a scatter of prehistoric sherds, lithics, and charcoal. Scurlock (ibid) lists Brugge's (1969) survey sherd collection as de facto evidence of a multicomponent occupation on the locality. In the winter of 1978-1979 the long threatened erosion of the Sand Dune Site began in earnest and resulted in the salvaging of one pithouse and additional testing to determine the full extent of the site (Adams 1982). In 1983, additional tests were done by Steve Adams near the bridge and at the northeast edge of the site where further erosion had exposed new features and by Jim Bradford along the access road. In 1985 further tests and salvage work were conducted by Bradford and others following yet another catastrophic erosional event (Figure 1).

The fifth project, the excavation of Wide Reed Ruin (Mount 1973), did not directly impact the Sand Dune Site, yet the prehistoric component of the Sand Dune Site has consistently been linked by oral tradition and archeological inference (Brugge in Mount 1973:128-134; Adams 1982:5) to the occupation of Wide Reed as an area of temporary occupation or special, extramural activity.

The occupation of Wide Reed Ruin has been established for the last quarter of the thirteenth century (A.D. 1276-1277, Mount 1973:45-48) while Brugge (in Mount 1973:129-131) has placed the Navajo occupation of the Sand Dune site in the last half of the eighteenth century (ca A.D. 1750-1790). The Sand Dune Site has been dated largely on the basis of ceramic chronology: ca. A.D. 1250 (Adams 1982:4) and A.D. 1750-1800 (Brugge 1963) for Dinetah Utility. Because the type-variety method is the sole source for prehistoric dating at the Sand Dune Site and because ceramic types have been consistently used for comparisons with Wide Reed Ruin, it is necessary that the ceramic background of the two sites be evaluated prior to further ceramic research and interpretation at the Sand Dune Site.

Features at the Sand Dune Site

A total of 13 or 14 features have been identified at the Sand Dune Site (Figure 1). The following discussion briefly describes these features and identifies the primary associated ceramics. A more complete discussion of the ceramics will follow.

In 1981 Adams (1982) excavated the southern half of a small (2.5 m NE-SW by 1.5 m NW-SE) pitstructure ('81-Unit 1, Figure 1). The structure contained a slab-lined hearth along the east-central wall, lacked roof support posts, and evidenced a short, southwesterly oriented vent. Associated ceramics were Anasazi and of the late 1200s.

Additional excavation in 1983, at the same vicinity, revealed three more Anasazi features with associated ceramics. One, or possibly two simple hearths, were located in Adams' Grid M-5. Another pitstructure remnant was found in Trench 4, just south of the Adams' 1981 pitstructure. This new structure, estimated at 3.3 m along the E-W axis, had one 10-12 cm diameter posthole for roof support on its southern margin. No other internal features were present, having been lost to continued erosion in the area. The extremely small size of these Anasazi pitstructures suggests they more accurately might be described as pitrooms rather than pithouses. Other trenches by Adams revealed additional Anasazi ceramics but no further features.

Excavations in 1985 were the most extensive and located at least eight features. Feature 1 consists of tabular rubble with an associated ash and charcoal concentration suggesting an informal hearth. Feature 2, designated a pitstructure, was largely lost to erosion in the 1985 runoff. Feature 2, estimated to be 3 m in diameter, exhibits an uneven, featureless, ephemeral occupation surface, no evidence of roof supports, and an association of Dinetah Utility sherds. Feature 3 is actually a complex of three related features in the west-central area of the site. Feature 3 itself is a well defined, burned occupation surface of a possible structure (ramada or shallow hogan?) estimated to be 3.5 m in diameter. Feature 3 was, aboriginally, completely surfical with no evidence of pit construction similar to Feature 2. Within Feature 3 is a probable hearth (Feature 3A) and a possible slab-lined posthole (Feature 3B) along its eastern margin. Associated extramural Features 5 and 6 are open hearths, Feature 5 being an informal pit excavated into native soil while Feature 6 is slab-lined. The densest concentration of Dinetah Utility is associated with the Feature 3 complex. Feature 4 is a roasting pit with burned rock and a sizable basalt slab metate fragment; no sherds were associated. Feature 8 is a bell-shaped pit profiled in the cut-bank in which a corrugated sherd is indicated in a profile of the fill. This sherd, probably Anasazi, was not collected, but would suggest a possible Anasazi affiliation for this feature. Features 7 and 9 were not excavated but show in the bank profile as shallow pitstructures similiar to Feature 2. Finally, Grid 702, just northeast of test B83-TT2 (Figure 1), contained evidence of slabs and ash concentrations suggesting a hearth.

Anasazi Ceramics at the Wide Reed Ruin Complex

Based on previous research, it is assumed that the Sand Dune Site and Wide Reed Ruin are, in part, if not exclusively, contemporaneous portions of an extensive, interrelated prehistoric complex. The ceramic assemblages at the two localities should, therefore, be roughly comparable. A comparison,

however, of ceramic assemblages at the Sand Dune Site (Table 1) and Wide Reed Ruin (Table 2) show such significant differences that assertions of an extended site complex hardly seem credible.

Mount (1973:30) identified late White Mountain Redwares (St. Johns B/r and Polychrome) as the most abundant decorated ware, Klageto B/w as the most common whiteware bichrome, and Tusayan Grayware as the exclusive utility ware at Wide Reed (see also Table 2). However, ceramic identifications from the Sand Dune Site indicate local orangewares at the terminus of the Tsegi Orange Ware sequence as the most common decorated type with a variety of utility wares representing at least three traditions, present. Klageto B/w remains the most common whiteware bichrome (Table 1).

This inconsistency in ceramic identification, even to a level so basic as the ware, has important consequences to subsequent site interpretations based on culture-history approaches. It is argued that large portions of the Wide Reed collection have been misidentified which accounts for both some misinterpretation of Wide Reed and the apparent disparity in ceramic assemblages between Wide Reed and the Sand Dune Site. The correct taxonomic assignment, at least to the ware level, is important because in the type or type-variety system (Colton and Hargrave 1937; Wheat et al. 1958) these units make up some of the key building blocks for statements about the past. For example, some statements about past lifeways and economics at Wide Reed:

> "High percentages of Cibola White Ware and St. Johns Polychrome are consistent with the geographical distribution of these wares. Interaction - possibly trade - is indicated by the presence of wares such as Mesa Verde White Ware, Tusayan White Ware, and even two sherds of Roosevelt Redware. Ceramically, at least, most affiliations are to the south and east". (Mount 1973:116)

> ".... A small number of exotic pottery types may indicate nothing more than informal trade between individuals. There is nothing in the data from Wide Reed to indicate that it was a specialized trade site." (Mount 1973:118)

fall prey, in the virtual absence of any recognition of local late Tsegi Orange Ware in the collection, to the indefensible position of justifying as "local" the high levels of St. Johns at a site removed from the epicenter of production (Carlson 1970).

In part, this confusion may be explained by the uneven development of Southwest ceramic taxonomy, and, in part, by the remarkable uniformity of Southwestern ceramic stylistic horizons across large areas. The delineation of various wares involved has changed over the years. Colton and Hargrave originally defined the White Mountain Redware, and included the Klageto and Kintiel Series (1937:123-127). Following critical reviews, Colton (1956), presented revised ware sequences for San Juan and Tsegi Orange Ware. Within the new Tsegi Orange Ware series were included the bichrome and polychrome

NN028947

types of the old Klageto and Kintiel Series as the southern, terminal types in the early Hopi sequence. This taxonomic fiddling is, in itself, a tacit admission of the Leroux Wash area orangeware affiliation with the Jeddito Series as well as their similarity to the more southern White Mountain Redwares. A review of Colton and Hargrave (1937) and Colton (1956) shows, as practically indistinguishable, the orange (or red) bichrome and polychrome types of Jeddito, Klageto, and Kintiel. Smith's detailed and comprehensive study of the Jeddito school likewise debunks the southern Tsegi variants (1971:472-473) as independant types (i.e. distinctive), and subsumes Klageto and Kintiel with the Jeddito material. No matter the status of the Klageto and Kintiel series within Tsegi Orange Ware, these are the established, indigenous orangeware types for the Pueblo Colorado drainage.

A Klageto style of design is recognized, if grudgingly, in the literature (Colton and Hargrave 1937:244; Reed 1944:168; Reed 1955; Cibola Whiteware Conference 1958), the concensus being that Klageto style is a boldly executed Tularosa style with much less of the opposed banded fine-line hatchure. Large opposed solid interlocked frets or stepped elements are common (Reed 1944:Plate 14; Mount 1973:Figure 5), with some opposed framed linear-parallel line motifs (versus oblique hatchures) occurring (Mount 1973:Figure 8) in a continuous band design with "Mesa Verde-like" band framers (Mount 1973:Figure 5; Carlson 1970: Figure 19h) consisting of a broad line just below the rim followed by several narrower parallel lines encircling the band design. Tularosa style, Klageto's predecessor, has been described as "... the interaction of design units ... in which a wide hatched unit with complicated edges is interlocked with a medium width solid unit of approximately the same form. The motifs formed in this manner are closely massed and are usually repeated six to eight times in a banded layout" (Carlson 1970:90), and Tularosa style (with "Wingate") has been identified as composing up to 75% of the decorative milieu on St. Johns Polychrome (Carlson 1970:37). While Carlson (ibid) has recognized Klageto style as appearing on St. Johns in a distinct minority, it has been categorically excluded from recent appraisals of design styles for St. Johns (Graves 1984). Mount (1973:Figures 11-12) shows polychrome vessels of exclusively Klageto style, similar to both the style illustrated on bichromes at Wide Reed Ruin and to the Klageto-Kintiel examples in Colton (1956). Mount's illustrations, whether bichromes or polychromes, all show a remarkably homogeneous style of design and execution in terms of line width and craftsmanship.

Paste attributes of Tsegi Orange Ware and White Mountain Redware differ as well. Clear descriptive distinctions of paste between wares is not one of Colton's strong points, as the range of variation and not major differences is emphasized. A reading with hands-on experience is invaluable and shows that, generally, White Mountain Redware paste tends to be coarser, with a more blocky, angular texture as a result of tempering with abundant, coarsely crushed sherds that readily crumble when broken. Pastes of late Tsegi Orange Ware show a considerable reduction in sherd content from their "oatmeal paste" antecedents and results in a much finer texture and, subjectively, stronger

NN028948

vessels than in White Mountain Redware. The sacrifice of technology for investment in surface appearance emphasized by Bronitsky (1980) for St. Johns Polychrome is not superfically evident in the redware material at the Sand Dune Site.

Widespread schools of design traditionally demark decorative horizons which are, to a degree, temporally distinct. The use of red or orange slips, and polychrome decorative schools emphasizing the use of kaolin in independent motifs (usually on bowl exteriors) or as contrastive embellishment of the black primary design, is common during the A.D. 1200s in the central border areas of Arizona and New Mexico and extends into the traditional Hopi heartland of northeastern Arizona. Confusion of these polychrome types can easily occur when attention to surface finish alone is considered. While paste characteristics readily identify the general technology of manufacture, the consistency of paste between vessels more certainly marks a production group than aspects of surface treatment. Surface treatment, although not insensitive to temporal or regional variation, requires attention at the attribute level rather than as broad styles, which, by their nature, mask more refined subgroups such as generational-length decorative expressions (see Plog 1980; Hantman 1983).

Despite Smith's (1971) justified desire to include the Klageto and Kintiel Series in the Jeddito Series, there is some evidence that Colton (1956) has identified a regional pottery of generational duration that may be useful for workers in the area to recognize--dependent on problem orientation. First, there is a much clearer trend toward the Klageto style of design in the Wide Reed-Wide Ruin (Kin Tiel) area. A comparison of various illustrations suggests Klageto-Kintiel material tends to make greater use of bandframers than does Jeddito. Klageto paints tend to show more occurrence of a glaze-like black while Kintiel paint tends more often to browns, and vessel surfaces of Kintiel exhibits some mica-like particles in contrast with Jeddito ceramics. This may be too fine a reading of Colton and needs verification; for example, no mica is evident on the Kintiel material at the Sand Dune Site. The consistency of associated dates (eg., A.D. 1276-1277, Mount 1973; Haury and Hargrave 1931:94) with pottery described in the Klageto-Kintiel Series suggests these "types" may indeed be of very localized, short-lived production contemporary with, and analogous to such useful time markers as Kiet Siel Polychrome. To obscure this chronological sensitivity by subsuming these types under the Jeddito Series may not be desirable in some studies. Kintiel B/r and Polychrome, and Klageto B/w (as part of the Kin Tiel Phase at Wide Reed and Kin Tiel Ruins) are kindred to temporally analogous ceramic markers that developed in other short-lived late thirteenth century communities (such as Kiet Siel in the Tsegi, Big House in Manuelito Canyon, Atsinna at El Morro, Gallinas Springs in the Magdalena Mountains, and Galisteo Pueblo in the Galisteo Basin) just prior to population aggregation nearer what became early historic puebloan population centers.

NN028949

Ceramics at the Sand Dune Site

Anasazi ceramics were identified based on published descriptions in Colton (1955, 1956), Smith (1971), Gifford and Smith (1978), and Windes (1977) with Carlson (1970) for comparison of the decorated redwares. Historic Puebloan and Navajo ceramics were identified following Colton (1956) and Brugge (1963), respectively. Distributions of all ceramics from Adams' 1983 and Bradford's 1985 excavations are shown in Table 3. No comparative ceramics were available during the identifications. Provenience tracking follows major features or areas of excavation only (as shown on Figure 1), with finer subdivisions, such as grids, mentioned in relation to features where possible but not individually accounted for in text or figure.

Dinetah Utiltiy (Transitional) is the most abundant (54.2%) ceramic type recovered from the Sand Dune Site, the overwhelming proportion being found during the 1985 season. All samples of Dinetah Utility were sand tempered, exhibited a moderately coarse textured dark paste, and showed vertical or obliquely vertical exterior striations from corn husk finishing. An interior residue, presumably pinon pitch, was observed on several specimens associated with Feature 3, but no specimens retained any exterior residue. Of the seven small rim fragments observed, none exhibited any evidence of applique fillets. Dinetah Utility (ca. A.D. 1750-1800 for Transitional) is found in practically all horizontal and vertical proveniences excavated by Bradford in the western side of the site. The majority (40.1%) of the Dinetah Utility was recovered from areas peripheral to Feature 3. Dinetah Utility was also the predominate type recovered in the nominal sample taken from the floor of Feature 3; the majority of Feature 3 floor associated ceramics were left in situ at the site. Other concentrations of Dinetah Utility were located northwest of Feature 3 (30.0%), and along the southwest side of Feature 2 (22.4%), just east of Feature 3. The majority of Hopi Yellow Ware was also located on the eastern periphery of Feature 3 and is probably part of the Navajo use assemblage. The Navajo assemblage conforms well with the ethnohistorical record of occupation outlined by Brugge (in Mount 1973).

Anasazi ceramics (Figure 2) were concentrated at the east end of the Sand Dune Site. The large areas opened by Bradford in 1985 showed relatively weak concentrations of temporally segregated pottery. Grid 495, on the southwest margin of Feature 2, contained 12 fragments of early Lino tradition grayware, possibly a single Kana'a Gray vessel. All Kana'a Gray was represented by small specimens of single, narrow, neckcoil bands; associated plain gray may represent the lower body. This narrow style of coiling on Kana'a Gray is contemporary with the Red Mesa B/w (Figure 2a) bowl fragment from Trench 4 and represents the trace continuum of A.D. 900s ceramics also noted by Mount (see Table 2) for Wide Reed Ruin (a 900s occupation has not been architecturally identified). Grid 458, just north of Feature 3 had five sherds of late mineral- on-white, possibly all Klageto B/w. All identified Klageto B/w sherds were from ladles (Figure 2b). Grids 420-422, the open space northwest of

Feature 3, showed a similar smattering of late red and white bichromes (see Table 3).

Orangeware in the present sample from the Sand Dune Site has been identified as varieties of "Kintiel" (Figure 2). This material tends to show a greater number of fine parallel lines in the band-framers, a thin brown paint, a bolder execution of white design on bowl exteriors, a yellowish to orange core, and a more orange slip than was generally described for Klageto. The Klageto style of design is evident on the larger sherds. Given that no comparative material was available, some specimens may be "Klageto" but none were White Mountain Redware.

Both Bradford's and Adams' tests at the east end of the site, adjacent to the arroyo separating the Sand Dune Site from Wide Reed Ruin, showed complementary concentrations of diverse Anasazi wares. Adams recovered portions of a Little Colorado Corrugated vessel in the 1981 and 1983 tests, and Bradford recovered more of what appears to be the same vessel in 1985. A Chuskan corrugated jar, represented by four sherds, was recovered from the 1985 Trench 4 a little south of a roasting pit (Feature 4). This Chuskan vessel was the only sooted utility ware recovered in 1983 or 1985. This is a clear indication of use in cooking not evident in the other utility wares from the Sand Dune Site and may be related to use of Feature 4. The preferred use of Chuskan utility ware for cooking, as evidenced by disproportional amounts of soot residue, has also been noted in Chaco Canyon (Toll and McKenna 1983:120). Tusayan Corrugated was the second most common utility ware in terms of sherds, but all the utility probably represents no more than three or four vessels. Paste differences between these utility wares signal technological differences that may be more related to mechanical or functional performance than producer ethnicity (see Braun 1983; Bronitsky 1986:209-212); and such differences have been demonstrated for some aspects of technology between the producers of Chuskan and Cibolan culinary ceramics (Windes 1977:293-298).

Adams and Bradford also recovered a number of Kintiel Polychrome (Figure 2e-h) and associated unidentified Tsegi Orange Ware sherds in this area. The ratio of Anasazi culinary to decorated (66.4% to 33.6%) in this portion of the Sand Dune Site is considerably lower than that noted at Wide Reed Ruin (84% to 16%, Table 2). Adams' (1982) pithouse, however, showed similar culinary-to-decorated proportions (78.6% to 21.4%) to Wide Reed Ruin.

Concentrations of Anasazi and Navajo ceramics, then, are evident at the Sand Dune Site. The Navajo remains concentrate to the west and the Anasazi material is more abundant on the east. Intermixing of Anasazi material with the Navajo is more evident than the Navajo with the Anasazi. The Anasazi ceramics in the Navajo section of the site are temporally mixed: PI and PIII in age. This may indicate an earlier Anasazi occupation in the area than is currently evident in the ceramics from the east side of the site, but probably the distribution is the result of generalized refuse broadcast and collection by later Navajo occupants. Collection for use as temper is not indicated in the Dinetah Utility. Anasazi ceramics are likewise found out of context in

NN028951

various historic deposits within the main Hubbell building complex (Scurlock 1979:43-45).

The ceramic distributions suggest features on the west side of the Sand Dune site are Navajo and, as the former resident, Jihaal, reputedly had several wives (Brugge in Mount 1973:131), a larger complex of buildings is indicated than is nominally granted in the Park oral tradition which allows that "there was a hogan out there, too". Estimated feature dimensions fall well within the range of contemporary structures excavated by James (1976:25-31) for Canyon de Chelly. Early hogans of the region, James' Del Muerto Phase (1976:100-101), likewise show slightly excavated saucer-shaped floor plans with considerable variability in internal features. Strictures of the Blessing Way, requiring removal of broken vessels from habitation areas, had not yet come fully into play (Brugge 1963:22) so that disposal of broken Navajo pottery might still be expected to occur within the occupational area. The lack of vertical integrity evidenced for ceramics is another matter and may relate to post-occupational use of the site, such as sheep grazing, or to processes unique to deposition in aeolian environments (Shelly and Nials 1983).

Interpreting the Radiocarbon Dates

Radiocarbon dates from the Sand Dune Site all concentrate in the Feature 3 complex (Table 4). The dates initially appear to indicate an early historic component, but one that predates the known, historic occupation at the site. On inspection alone, these dates might ordinarilly be rejected, but their consistency suggests they form populations worthy of interpretation. The distribution of theses dates suggest that two populations exist which require calibration to tree-ring dates and statistical evaluation. The statistical techniques and tests, discussed by Spaulding (1958) and Long and Rippeateau (1974), permit the identification of contemporary radiometric date groups. Calibrations to tree-ring dates (Damon et al. 1974; Klein et al. 1982) take into account discrepencies inherant in radiocarbon dating, and allow assessment of the radiocarbon estimates in terms of calendar years more useful to archeological interpretation.

Through the application of Chauvenet's rejection criteria (Long and Rippeateau 1974:208) the A.D. 1730 date can be rejected from the group for purposes of non-coevalness testing. The calibrated date range for the A.D. 1730 date places this sample squarely in the known period of Navajo occupation (Table 4). Averaging of samples from the same stratigraphic unit or living floor is particularly appropriate when dispersed dates are suspected of being coeval (Long and Rippeateau 1974:206). An F-test of the remaining three dates clearly shows no significant difference (F=0.06) in this group and indicates that they represent an activity-using material with an averaged, uncalibrated radiocarbon date of A.D. 1522±32, or an average, tree-ring calibrated date at the 95% confidence level of A.D. 1485±78.

These dates are probably more informative of wood use than in pinpointing different occupations. The A.D. 1730 radiocarbon date may represent the

2 dates 1730s early [illegible] wood dead for 200 yrs would be too dry or rather to burn well.

possible use of fresh cut wood in some construction element of Feature 3. The earlier dates, all coming from firepits or possible firepits, suggest the use of gathered, dead wood for fuel. The calibrated A.D. 1548 date from Feature 3B (posthole?) is somewhat ambiguous. The identification of this feature is not certain--it may be a firepit. Conversely, the use of dead wood in Navajo construction is not unheard of (Scott and Dean 1985) and if this sample represents the use of dead wood in construction such wood might be expected to be sounder (younger?) than dead material routinely selected for fuel. Although several interpretions of the radiocarbon dates may be offered, all the samples appear related to the late eighteenth century Navajo occupation and cannot be categorically dismissed as "bad dates". ?

Summary

at odds with tree rings date

The Sand Dune Site is a multicomponent site with evidence of Navajo occupation dating circa A.D. 1750-1790, and an Anasazi occupation dating approximately A.D. 1275-1300. Traces of A.D. 900s ceramics are evident in the Wide Reed-Sand Dune complex, but no firm evidence of occupation during that period has been identified. Evidence of pithouses, roasting pits, and hearths with associated Anasazi ceramics have all concentrated along the arroyo separating the Sand Dune Site from Wide Reed Ruin. These Anasazi features may have been more extensive but erosional episodes removing the body of the Sand Dune Site make the argument moot.

Structures or occupational surfaces strongly associated with Navajo ceramics are situated in the western portion of the site remnant. Radiocarbon dating and ceramics place this Navajo occupation in the last half of the eighteenth century. The burning of Feature 3 suggests potential archeological returns may be high, particularly if this feature is the remains of a forked-stick ch'ʻidii hogan. During the remaining work at the site, horizontal control of occupation surfaces may be more useful in evaluating the cultural affiliation of ephemeral and undiagnostic structural fragments than precise control of ceramic associations as marked vertical displacement of ceramics is evident.

Numerous workers have identified ceramics from the Sand Dune Site. The assessment here is that the Anasazi material is largely attributable to occupation during the Kin Tiel Phase, a very short span of typological and actual time. This not withstanding, a broad range of types have been attributed to the Sand Dune Site alone; further ceramic work should consolidate these collections and reevaluate the entire assemblage. In order to accurately evaluate the relationship between the Sand Dune Site and Wide Reed Ruin the ceramics from Wide Reed should also be reexamined and analyzed.

The Anasazi component of the Sand Dune Site contains a variety of wares and forms which indicated that while activity involving ceramics may have been "limited," it was not necessarily "special." Assuming that ware differences are functional and reflect some task-specific selection, the variety of utility wares alone indicates a broad range of functions were undertaken.

NN028953

Last, it must be noted that, while a typological framework may be practical for comparisons on a limited basis, attribute based study of the Sand Dune and Wide Reed Ruin ceramic collections would provide more objective data for intrepretations of affiliations of time, space, and function between the two sites.

NN028954

References Cited

Adams, Stephen E.
1982 Salvage Excavation: The Sand Dune Site. Ms on file SWRO, NPS, Santa Fe.

Braun, David P.
1983 Pots as tools. In Archaeological Hammers and Theories, edited by A.S. Keene and J.A. Moore, pp. 107-134. Academic Press, New York.

Bronitsky, Gordon J.
1980 Ceramic analysis: a ceramic engineering perspective. Paper presented at the 46th Annual Meeting of the Society for American Archaeology. San Diego.

1986 The use of materials science techniques in the study of pottery construction and use. In Advances in Archaeological Method and Theory Vol. 9, edited by Michael Schiffer, pp. 209-275. Academic Press, New York.

Brugge, David M.
1963 Navajo Pottery and Ethnohistory. Navajoland Publications Series 2. Navajo Tribal Museum, Window Rock.

1969 Hubbell Trading Post Museum Journal Vol 1. 1 August 1968 to 3 October 1969. Ms on file at Hubbell Trading Post, NHS, Ganado.

Carlson, Roy L.
1970 White Mountain Redware. Anthropological Papers of the University of Arizona 19. University of Arizona Press, Tucson.

Colton, Harold S.
1955 Pottery Types of the Southwest. Museum of Northern Arizona Ceramic Series No. 3. Flagstaff

1956 Pottery Types of the Southwest. Museum of Northern Arizona Ceramic Series No 3c. Flagstaff.

Colton, Harold S. and Lyndon L. Hargrave
1937 Handbook of Northern Arizona Pottery Wares. Museum of Northern Arizona Bulletin 11. Flagstaff.

Damon, P.E., C.W. Ferguson, A. Long, E.I. Wallick
1974 Dendrochronologic calibration of the radiocarbon time scale. American Antiquity 39(2):350-366.

NN028955

Eighth Southwestern Ceramic Seminar
1958 Cibola Whiteware Conference. Xerox ms. Museum of Northern Arizona, Flagstaff.

Graves, Michael W.
1984 Temporal variation among White Mountain Redware design styles. The Kiva 50(1):3-24.

Hantman, Jeffery L.
1983 Social Networks and Stylistic Distributions in the Prehistoric Plateau Southwest. Unpublished Ph.D. Dissertation, Department of Anthropology, Arizona State University, Tempe.

Haury, Emil and Lyndon L. Hargrave
1931 Recently dated Pueblo Ruins in Arizona. Smithsonian Institution Miscellaneous Collections 8 (11). Washington D.C.

Gifford, James C. and Watson Smith
1978 Gray Corrugated Pottery from Awatovi and other Jeddito Sites in Northeastern Arizona. Papers of the Peabody Museum of Archaeology and Ethnology 69. Cambridge.

James, Charles D. III
1976 Historic Navajo Studies in Northeastern Arizona. Museum of Northern Arizona Research Paper 1. Flagstaff.

Klein, J., J.C. Lerman, P.E. Damon, and E.K. Ralph
1982 Calibration of radiocarbon dates. Radiocarbon 24(2):103-150.

Long, Austin and Bruce Rippeteau
1974 Testing contemporaneity and averaging radiocarbon dates. American Antiquity 39(2):205-215.

Mount, James E.
1973 Wide Reed Ruin. Ms. on file SWRO, NPS. Santa Fe.

Plog, Stephen
1980 Stylistic Variation in Prehistoric Ceramics: Design Analysis in the American Southwest. Cambridge University Press, New York.

Reed, Erik K.
1944 Pottery types of the Manuelito District. American Antiquity 10 (2):161-173.

NN028956

1955 Painted pottery and Zuni prehistory. Southwestern Journal of Anthropology 11:178-193.

Russell, Scott C. and Jeffery S. Dean
1985 The sheep and goat corral: a key structure in Navajo site analysis. The Kiva 51(1):3-18.

Scurlock, Dan
1979 Archeological Assessment: Hubbell Trading Post National Historic Site. Center for Anthropological Studies NPS Contract PX-7029-8-0686.

Shelly, Phillip H. and Fred L. Nials
1983 A preliminary evaluation of aeolian processes in artifact dilocation and modification: an experimental approach to on edepositional environment. Proceedings: New Mexico Archeological Council 5 (1):50-56.

ref

Smith, Watson
1971 Painted Ceramics of the Western Mound at Awatovi. Papers of the Peabody Museum of Archaeology and Ethnology 38. Cambridge.

Spaulding, Albert C.
1958 The significance of differences between radiocarbon dates. American Antiquity 23(3):309-311.

Toll, H. Wolcott and Peter J. McKenna
1983 The Ceramography of Pueblo Alto. Ms on file SWRO, NPS, Santa Fe.

Wheat, Joe B., J.C. Gifford, and W.W. Wasely
1958 Ceramic variety, type cluster, and ceramic system in Southwestern pottery analysis. American Antiquity 24 (1):34-47.

Windes, Thomas C.
1977 Typology and technology of Anasazi ceramics. In Settlement and Subsistence Along the Lower Chaco River: The CGP Survey, edited by Charles A. Reher, pp. 279-370. The University of New Mexico Press, Albuquerue.

NN028957

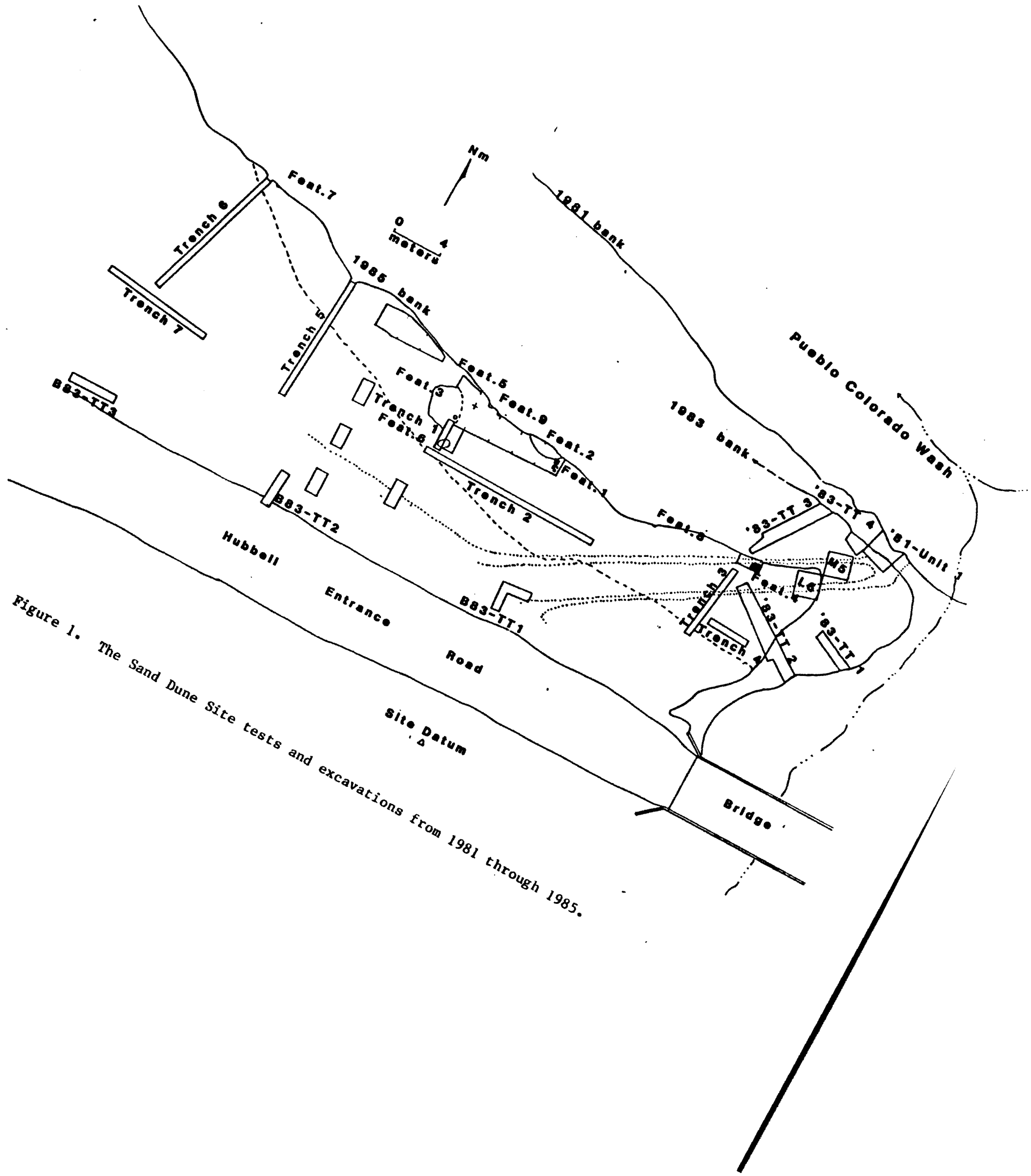

Figure 1. The Sand Dune Site tests and excavations from 1981 through 1985.

NN028958

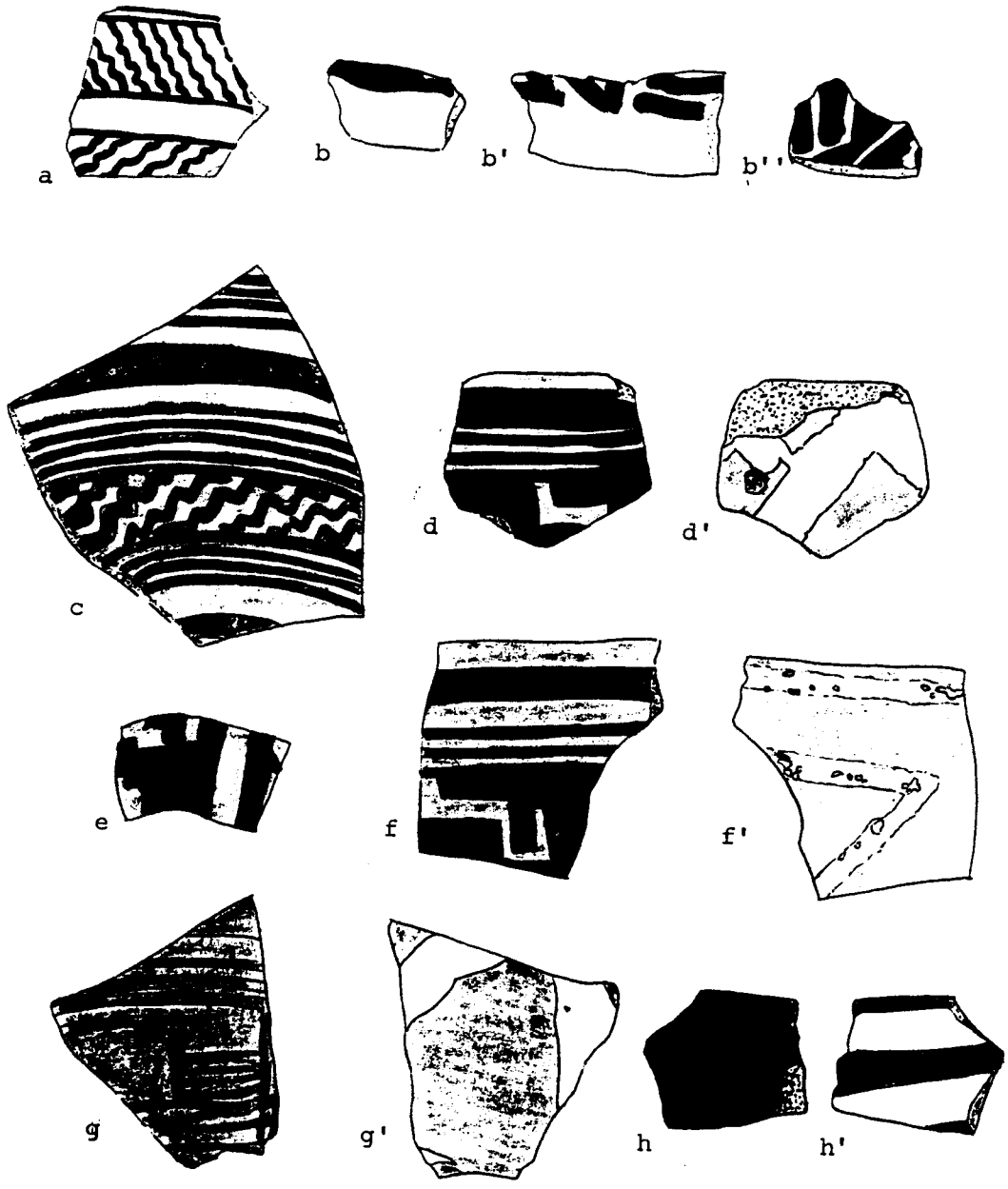

Figure 2. Anasazi ceramics from the Sand Dune Site. a) Red Mesa B/w, b) Klageto B/w, c&e) Kintiel B/o, d,f,g,h) Kintiel Polychrome.

NN028959

Table 1. Ceramic Collections from the Sand Dune Site, Hubbell Trading Post.

	Brugge 1969	Adams 1982	Adams 1983	Bradford 1985	N	%
Dinetah Utility	8		1	152	161	42.6
Navajo Polychrome	1				1	0.3
Hopi Yellow Ware				8	8	2.1
plain gray				14	14	3.7
Kana'a Gray				2	2	0.5
Tusayan Corrugated		15	3	6	24	6.3
Moenkopi Corrugated		2			2	0.5
Tusayan Grayware	1	2			3	0.8
Little Colorado Corr.		18	11*	55*	84	22.2
Chuskan Corrugated				4†	4	1.1
Jeddito Corrugated		1			1	0.3
unidentified utility		19			19	5.0
Sosi-Dogoshi B/w	2				2	0.5
Holbrook B/w		1			1	0.3
Little Colorado C/w			1		1	0.3
Red Mesa B/w				1	1	0.3
Klageto B/w				5†	5	1.3
PIII M/w				3	3	0.8
unidentified B/w		1			1	0.3
whiteware			2		2	0.5
unidentified ware	5	2			7	1.8
Alameda Brown		2			2	0.5
Showlow Smudged			1		1	0.3
San Juan Red Ware	1				1	0.3
St. Johns Polychrome	1				1	0.3
Tsegi Orange Ware		2	4	2	8	2.1
Jeddito Yellow Ware	1	2			3	0.8
Kintiel B/o				2	2	0.5
Kintiel Polychrome			4†	2	6	1.6
Klageto B/y		3			3	0.8
Kokop B/o		5			5	1.3
Total	20	75	27	256	378	100.0%

* 2 vessels
† 1 vessel

NN028960

Table 2. Summary of Wide Reed Ruin Ceramics (after Mount 1973).

	N	%
Little Colorado C/w	14	0.2
Black Mesa B/w	15	0.2
Sosi B/w	11	0.1
Tusayan B/w	2	t
Kayenta B/w	1	t
Tusayan C/w	1	t
McElmo B/w	6	0.1
Mesa Verde B/w	5	0.1
Mesa Verde "Crude" B/w	33	0.3
San Juan C/w	55	0.6
Red Mesa B/w	2	t
Gallup B/w	18	0.2
Chaco B/w	12	0.1
Reserve B/w	42	0.4
Tularosa B/w	30	0.3
Klageto B/w	162	1.7
Cibola PII-III M/w	139	1.5
Awatobi Yellow Ware	9	0.1
Sikyatki Polychrome	1	t
Tsegi Orange Ware	21	0.2
Tusayan Polychrome	127	0.3
Kiet Siel Polychrome	4	t
Kintiel Polychrome	7	0.1
White Mountain Redware	192	2.0
Wingate Polychrome	5	0.1
St. Johns B/r	117	1.2
St. Johns Polychrome	501	5.3
Springerville Polychrome	34	0.4
Pinedale Polychrome	4	t
Gila Polychrome	2	t
Smudged Red	10	0.1
Corrugated	4491	47.2
Rippled	3026	31.8
Other Utility	498	5.2
Totals	9518	100.0%

Utility = 8015 or 84.2%
Decorated = 1503 or 15.1%

NN028961

Table 3. Distribution of Ceramics from Tests at the Sand Dune Site 1983-85, Hubbell Trading Post.

	Dinetah Utility	Hopi Yellow Ware	plain gray	Kana'a Gray	Tusayan Corrugated	Little Colorado Corrugated	Chuskan Corrugated	Red Mesa B/w	Klageto B/w	PII-III M/w	Little Colorado C/w	whiteware	Tsegi Orange Ware	Kintiel B/o	Kintiel Polychrome	Showlow Smudged
1983																
Surface	1				1						1	1	1		1	
Trench 1 10cm															1	
Trench 3 21cm												1				
Trench 4 Ly2													1			1
Ly3						9							1			
GM-6 Ly4					2											
GL-5 Ly3															1	
Ly4						2							1		1	
subtotal	1				3	11					1	2	4		4	1
1985																
Surface	1												1			
G420 Ly3 43-58cm	2															
G421 Ly3 62-67cm	16															
Ly4 54-56cm															1	
Ly4 67-77cm	22								1							
Ly4 77-87cm	3												1			
Ly5 87-90cm														1		
G422 Ly2 62-68cm	2															
Ly3 73cm	2								1							
Ly3-6 70cm+	1	2														
G451 Ly4 51-59cm	1			1												
G458 Ly4 70-80cm	3															
Ly4 80-90cm	7															
Ly5 90-100cm	1									2						
Ly5 100-110cm	1								3							
G469 Ly1 0-40cm	1															
Ly1 46-50cm		1														

continued

NN028962

Table 3. Ceramic Distributions cont.

	Dinetah Utility	Hopi Yellow Ware	plain gray	Kana'a Gray	Tusayan Corrugated	Little Colorado Corrugated	Chuskan Corrugated	Red Mesa B/w	Klageto B/w	PII-III M/w	Little Colorado C/w	whiteware	Tsegi Orange Ware	Kintiel B/o	Kintiel Polychrome	Showlow Smudged
1985 cont.																
G494 Ly1 10-20cm	1															
Ly1 20-30cm																
Ly3 32cm+	1															
G495 E. TT 32-60cm+	2															
Shovel Test	5															
G497 Ly3 50cm	6	4	1													
Ly4 51-66cm+	13	1														
G498 Ly2 38-41cm	1															
Ly3 41-48cm	1															
G505 Ly1 0-20cm			1													
Feature 3 G498	21															
fill	3		1													
Feature 2 boundary	25		10													
fill	2		1	1												
fl fill	1				1					1						
GM-6 Ly5					1	53										
Trench 4 Ly1					1	2		1						1		
fill					3		4								1	
subtotal	152	8	14	2	6	55	4	1	5	3			2	2	2	
Total	153	8	14	2	9	66	4	1	5	2	1	2	6	2	6	1
Percent	54.1	2.8	4.9	0.7	3.2	23.3	1.4	0.3	1.8	0.7	0.3	0.7	2.1	0.7	2.1	0.3

Note: G=grid, all depths are below present ground surface.

NN028963

Table 4. Carbon 14 dates from the Sand Dune Site.

Feature	Lab #	Date
Feature 3B posthole	Dic-3188	A.D. 1590±50 1540-1640 1540-1640
Feature 5 hearth	Dic-3189	1480±50 1430-1530
Feature 3 occupation surface	Dic-3190	1730±70 1660-1800
Feature 6 hearth	Dic-3191	1470±70 1400-1540

Corrected Tree-ring Dates:

	Dic#	Tree-ring Dates 1 s.d.	2 s.d.	A.D. Date Range at 95% Confidence
Damon et al. 1974	3188	1548±63	1548Y±126	1422-1674
Klein et al. 1982				1415-1645
Damon et al. 1974	3189	1450±63	1450±126	1324-1576
Klein et al. 1982				1350-1495
Damon et al. 1974	3190	1440±80	1440±160	1280-1600
Klein et al. 1982				1345-1490
Klein et al. 1982	3191			1705-1810

NN028964