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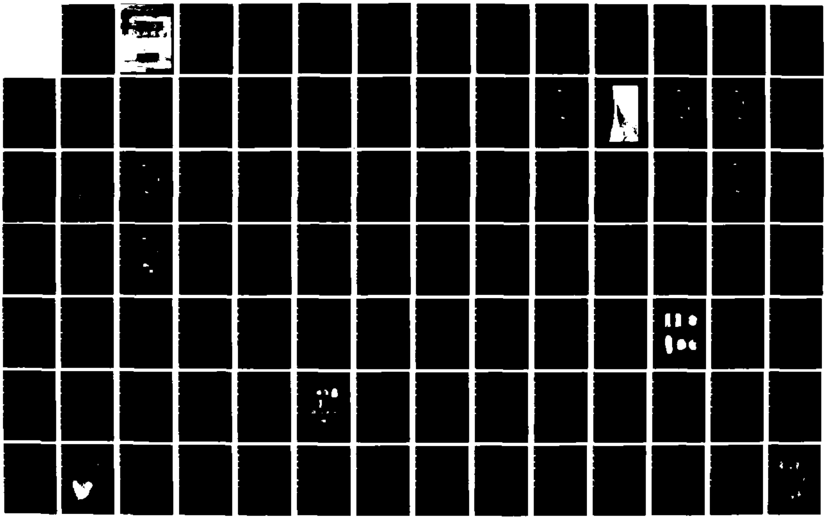

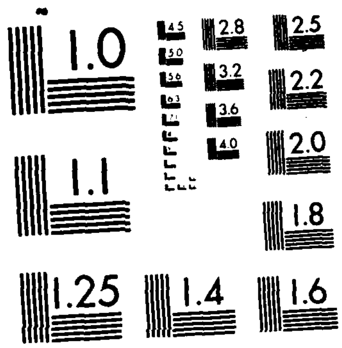

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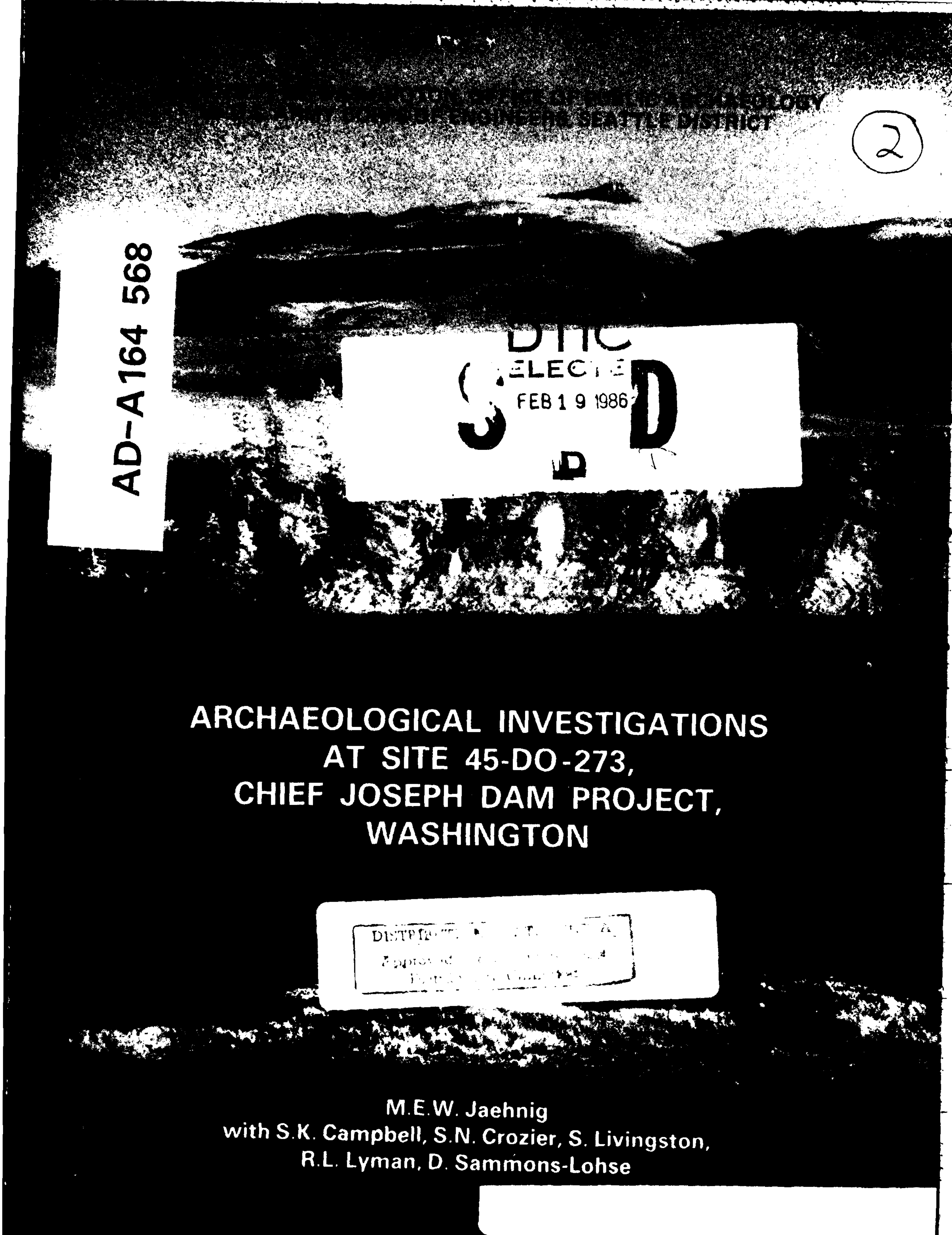

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ARCHAEOLOGICAL INVESTIGATIONS AT SITE 45-DO-273, CHIEF JOSEPH DAM PROJECT, WASHINGTON

M.E.W. Jaehnig
with S.K. Campbell, S.N. Crozier, S. Livingston,
R.L. Lyman, D. Sammons-Lohse

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BLOCK 20 (Continued)

Site 45-DO-273 is on the south bank of the Columbia River (River Mile 561), near the Okanogan Highland-Columbia Plateau boundary, in an Upper Sonoran life zone. The University of Washington excavated 158.6 cubic meters in 1979 for the U.S. Army Corps of Engineers, Seattle District, as part of a mitigation program for a 10-foot pool raise at the Chief Joseph Dam Project. Systematic aligned random sampling with 1 x 1 x 0.1-meter units of record in 1 x 2 or 2 x 2-meter cells disclosed three prehistoric occupations on an alluvial fan built onto an early point bar deposit, interbedded with overbank sediments. The two carbon dates obtained are unreliable, several serrated lanceolate projectile points suggest that the first occupation occurred more than 5,500 years ago. The second, more intensive occupation probably occurred about 4,500 years ago. Both of these early occupations fall within the Kartar Phase. The third occupation, in the Coyote Creek Phase, probably took place between 1,500 and 1,000 years ago. The occupations show little change in more than 4,500 years; all are lithic and bone concentrations with microblade technology and lithic stations. The earlier two occupations yielded mussel shell fragments, which are lacking in the later two. No earth ovens or hearths were found.

ARCHAEOLOGICAL INVESTIGATIONS AT SITE 45-DO-273, CHIEF JOSEPH DAM PROJECT, WASHINGTON

by

Manfred E.W. Jaehnig

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Principal Investigators

R.C. Dunnell 1978-1984
D.K. Grayson 1978-1981
M.E.W. Jaehnig 1981-1984
J.V.Jermann 1978-1981

Final report submitted to the U.S. Army Corps of Engineers, Seattle District, in partial fulfillment of the conditions and specifications of Contract No. DACW67-78-C-0106.

The technical findings and conclusions in this report do not necessarily reflect the views or concurrence of the sponsoring agency.

Office of Public Archaeology
Institute for Environmental Studies
University of Washington

1984

ABSTRACT

Site 45-DO-273 is on the south bank of the Columbia River (River Mile 561), near the Okanogan Highland-Columbia Plateau boundary, in an Upper Sonoran life zone. The University of Washington excavated 158.6 cubic meters in 1979 for the U.S. Army Corps of Engineers, Seattle District, as part of a mitigation program for a 10-foot pool raise at the Chief Joseph Dam Project. Systematic aligned random sampling with 1 x 1 x 0.1-meter units of record in 1 x 2 or 2 x 2-meter cells disclosed three prehistoric occupations on an alluvial fan built onto an early point bar deposit, interbedded with overbank sediments. The two carbon dates obtained are unreliable, several serrated lanceolate projectile points suggest that the first occupation occurred more than 5,500 years ago. The second, more intensive occupation probably occurred about 4,500 years ago. Both of these early occupations fall within the Kartar Phase. The third occupation, in the Coyote Creek Phase, probably took place between 1,500 and 1,000 years ago. The occupations show little change in more than 4,500 years; all are lithic and bone concentrations with microblade technology and lithic stations. The earlier two occupations yielded mussel shell fragments, which are lacking in the later two. No earth ovens or hearths were found.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

PREFACE

The Chief Joseph Dam Cultural Resources Project (CJDCRP) has been sponsored by the Seattle District, U.S. Army Corps of Engineers (the Corps) in order to salvage and preserve cultural resources imperiled by a 10-foot pool raise resulting from modifications to Chief Joseph Dam.

From Fall 1977 to Summer 1978, under contract to the Corps, the University of Washington, Office of Public Archaeology (OPA) undertook detailed reconnaissance and testing along the banks of Rufus Woods lake in the Chief Joseph Dam project area (Contract No. DACW67-77-C-0099). The project area extends from Chief Joseph Dam at Columbia River Mile (RM) 545 upstream to RM 590, above seven miles below Grand Coulee Dam and includes 2,015 hectares (4,979 acres) of land within the guide-taking lines for the expected pool raise. Twenty nine cultural resource sites were identified during reconnaissance, bringing the total number of recorded prehistoric sites in the area to 279. Test excavations at 79 of these provided information about prehistoric cultural variability in this region upon which to base further resource management recommendations (Jermann et al. 1978; Leeds et al. 1981).

Only a short time was available for testing and mitigation before the planned pool raise. Therefore, in mid-December 1977, the Corps asked the OPA to review the 27 sites tested to date and identify those worthy of immediate investigation. A priority list of six sites was compiled. The Corps, in consultation with the Washington State Historic Preservation Officer and the Advisory Council on Historic Preservation, established an interim Memorandum of Agreement under which full-scale excavations at those six sites could proceed. In August 1978, data recovery (Contract No. DACW67-78-C-0106) began at five of the six sites.

Concurrently, data from the 1977 and 1978 testing, as well as those from previous testing efforts (Osborne et al. 1952; Lyman 1976), were synthesized into a management plan recommending ways to minimize loss of significant resources. This document calls for excavations at 34 prehistoric habitation sites, including the six already selected (Jermann et al. 1978). The final Memorandum of Agreement includes 20 of these. Data recovery began in May 1979 and continued until late August 1980.

Full-scale excavation could be undertaken at only a limited number of sites. The testing program identified sites in good condition that were directly threatened with inundation or severe erosion by the projected pool raise. To aid in selecting a representative sample of prehistoric habitation sites for excavation, site "components" defined during testing were characterized according to (1) probable age, (2) probable type of occupation, (3) general site topography, and (4) geographic location along the river (Jermann et al. 1978:Table 18). Sites were selected to attain as wide a diversity as possible while keeping the total number of sites as low as possible.

The Project's investigations are documented in four report series. Reports describing archaeological reconnaissance and testing include (1) a management plan for cultural resources in the project area (Jermann et al. 1978), (2) a report of testing at 79 prehistoric habitation sites (Leeds et al. 1981), and (3) an inventory of data derived from testing. Series I of the mitigation reports includes (1) the project's research design (Campbell 1984d) and (2) a preliminary report (Jaehnig 1983b). Series II consists of 14 descriptive reports on prehistoric habitation sites excavated as part of the project (Campbell 1984b; Jaehnig 1983a, 1984a,b; Lohse 1984a-f; Miss 1984a-d), reports on prehistoric nonhabitation sites (Campbell 1984a) and burial relocation (Campbell 1984c), and a report on the survey and excavation of historic sites (Thomas et al. 1984). A summary of results is presented in Jaehnig and Campbell (1984).

This report is one of the Series II mitigation reports. Mitigation reports document the assumptions and contingencies under which data were collected, describe data collection and analysis, and organize and summarize data in a form useful to the widest possible archaeological audience.

ACKNOWLEDGEMENTS

This report is the result of the collaboration of many individuals and agencies. During the excavation and early reporting stages, Coprincipal Investigators were Drs. Robert C. Dunnell and Donald K. Grayson, both of the Department of Anthropology, University of Washington, and Dr. Jerry V. Jermann, Director of the Office of Public Archaeology, University of Washington. Dr. Manfred E. W. Jaehnig served as Project Supervisor during this stage of the work. Since the autumn of 1981, Dr. Jaehnig has served as Coprincipal Investigator with Dr. Dunnell.

Three Corps of Engineers staff members have made major contributions to the project. They are Dr. Steven F. Dice, Contracting Officer's Representative, and Corps archaeologists Lawr V. Salo and David A. Munsell. Both Mr. Munsell and Mr. Salo have worked to assure the success of the project from its initial organization through site selection, sampling, analysis, and report writing. Mr. Munsell provided guidance in the initial stages of the project and developed the strong ties with the Colville Confederated Tribes essential for the undertaking. Mr. Salo gave generously of his time to guide the project through data collection and analysis. In his review of each report, he exercises that rare skill, an ability to criticize constructively.

We have been fortunate in having the generous support and cooperation of the Colville Confederated Tribes throughout the entire length of project. The Tribes' Business Council and its History and Archaeology Office have been invaluable. We owe special thanks to Andy Joseph, former representative from the Nespelem District on the Business Council, and to Adeline Fredin, Tribal Historian and Director of the History and Archaeology Office. Mr. Joseph and the Business Council, and Mrs. Fredin, who acted as liaison between the Tribe and the project, did much to convince appropriate federal and state agencies of the necessity of the investigation. They helped secure land and services for the project's field facilities as well as helping establish a program which trained local people (including many tribal members) as field excavators and laboratory technicians. Beyond this, their hospitality has made our stay in the project area a most pleasant one. In return, conscious of how much gratitude we wish to convey in a few brief words, we extend our sincere thanks to all the members of the Colville Confederated Tribes who have supported our efforts, and to Mrs. Fredin and Mr. Joseph, in particular.

Before we excavated site 45-DO-273, the Seattle District U.S. Army Corps of Engineers purchased a flowage easement on the land. The property is owned by Martin J. Rilett of Bridgeport.

As authors of this report, we take responsibility for its contents. What we have written here is only the final stage of a collaborative process which is analogous to the integrated community of people whose physical traces we have studied. Some, by dint of hard labor and archaeological training, salvaged those traces from the earth; others processed and analyzed those traces; some manipulated the data and some wrote, edited and produced this report. Each is a member of the community essential to the life of the work we have done.

Jerry V. Jermann, Coprincipal Investigator during the field excavation and artifact analysis phase of the project, developed site excavation sampling designs that were used to select data from each site. The designs provided a uniform context for studying prehistoric subsistence-settlement patterns in the project area. Bruce Freyburger directed excavations at 45-DO-273.

S. Neal Crozier did the initial data summary for the stratigraphic analysis; he also performed the chemical and mechanical sort analyses. Sarah K. Campbell compiled the data for analytic zone definitions. The laboratory staff under the direction of Karen Whittlesey did the technological and functional artifact analysis. Janice Jaehnig did keypunching and John Chapman and Duncan Mitchell manipulated the computerized data.

The writing of the report itself is a cooperative effort. Dr. Jaehnig served as principal author. He wrote Chapter 1 in consultation with Dr. Jermann, who designed the sampling plan. He also wrote Chapters 3 and 6, and coordinated and integrated the contributions of the other authors. Chapter 2 was written jointly by S. Neal Crozier and Sarah K. Campbell. Stephanie Livingston and R. Lee Lyman analyzed the faunal assemblage and wrote Chapter 4. Dorothy Sammons-Lohse wrote Chapter 5.

Marc Hudson and Linda Leeds edited the text; Dawn Brislawn typed it, and coordinated production. Melodie Tune and Bob Radek drafted the final versions of the figures and Larry Bullis took the artifact and cover photographs. Karen Whittlesey printed the site overview photograph. Production of the final camera-ready copy was accomplished by Julie Tomita and Philippa Colley under the direction of Sarah Campbell.

1. INTRODUCTION

Site 45-DO-273 is a small site without housepits on Rufus Woods Lake, the reservoir behind Chief Joseph Dam on the Columbia River in north central Washington (Figure 1-1). It is on the left bank of the river approximately 225 m (738 ft) upstream from RM 561 in the SW 1/4 of the SW 1/4, Section 36, T. 30N, R. 27E, W.M. (U.T.M. Zone 11, N. 5,325,587, E. 319,502) at elevation 290 m (952 ft) above mean sea level (m.s.l.).

The site is just east of Gaviota Bend at the downstream end of Allen Bar (Figure 1-2), which is approximately 2.7 km (1.7 miles) long and .2 km (.12 miles) wide and at elevation of 295 m (968 ft) above mean sea level (m.s.l.). The bar is bounded on the north by the Columbia River. On the east and west it gives way to the river and granitic outcrops; to the south it abuts a higher terrace which slopes up to more granitic outcrops beyond which the steep wall of the Columbia River canyon begins in earnest. Before Chief Joseph Dam was built, there were unnamed rapids approximately 1.5 km (.93 miles) downstream and 3.2 km (2.0 miles) upstream.

The site is on a sloping section of terrace between two short but deep draws (Figure 1-3). The present reservoir level is less than 1 m below the terrace, but the former river level (January 1931 elevation) was approximately 25 m below. The site has a slight northern exposure, and the southern rim of the Columbia River canyon, (about 672 m or 2,204 ft m.s.l.) lies within 1.5 km (.93 miles) of the river, blocking the winter sun for all but a short time each day. During the summer, however, the site is exposed to intense sunlight. An overview of the site is shown in Plate 1-1.

Both the semiarid climatic zone and the Columbia River water source are major influences on the pattern of vegetation found in the vicinity of the site. The vegetational community is that of Piper's Upper Sonoran Zone, (1906:36), Daubenmire's Artemesia tridentata-Agropyron association (1970:10-16), and Erikson's shrub-steppe habitat type (Erickson et al. 1977).

INVESTIGATIONS AT 45-DO-273

The site was first recorded in 1976 (Munsell and Salb 1977). It is one of 27 sites recommended for investigation in the project's management plan (Jermann et al. 1978) and included in the final Memorandum of Agreement. The site was excavated for the following reasons. First, the oldest site component was surmised to belong to Rufus Woods Lake Period II (before 5500 B.P) because a lanceolate projectile point was found in association with Mazama tephra. At that time only a few other such components had been found in the project area: we believed that investigations of this component would shed light on the nature of the first occupations along this stretch of the Columbia. Second, the site is a non-housepit component with relatively high densities of debitage and fire-modified rock. Because we wished to describe as many aspects of the subsistence settlement system as possible, it was important to investigate sites which may have been transient summer camps as well as the more permanent occupations with housepit components. Third, the site was imperiled by the pool raise.

During 1978 test excavations at 45-DO-273, two 1 x 2-m sampling units were excavated near the current river bank. For full-scale excavation in 1978, a two-stage sampling design was used. (1) A **probabilistic** (randomly chosen) sample of units was selected to provide unbiased data on site content. (2) A **purposive** (chosen on the basis of judgement) sample was designated to provide additional information about site structure in specific areas.

Probabilistic sampling was conducted within a **simple random** sampling design. Sampling strata were developed by superimposing a 2-m^2 grid of 42 units on the original site area (336 m^2) and numbering each unit serially from 1 to 42 (Figure 1-4), beginning at the northwestern most unit (4N2W) and proceeding from west to east and north to south. Ten sample units were then selected using a table of random numbers. Figure 1-4 shows the final set of 10 random sample units and the order of their selection.

Because excavation of random sampling units showed that artifacts were not very dense, particularly in the earliest component, 15 purposive units were excavated to increase the total assemblage (Figure 1-5). Of these, 14 were 2 x 2 m and one was 2 x 1 m in size. The units were placed to maximize exposure of the buried Mazama ash deposit.

Excavations at 45-DO-273 began on 16 May 1978 with a crew of four excavators and one site supervisor. All ten of the random sampling units were begun. Two weeks later, excavations were halted temporarily when the water table was reached. A reservoir drawdown from 12 July to 3 August enabled a larger crew of nine field assistants and one site supervisor to renew the excavation. On 3 August 1982, excavations were terminated. All but three of the 25 units were were excavated to depths of 1.4 to 2.3 meters, the exceptions were less than 1.0 m deep. A total volume of 158.6 m^3 was excavated using methods described in the project's plan of action (Jermann and Whittlesey 1978) and research design (Campbell 1984d). During the final two weeks waterscreening was used to speed work.

The recovered assemblage includes 3,663 lithic artifacts (including 510 tool objects) 1,087 bone fragments, 204 fire-modified rocks, 9 pieces of shell, and five cultural features. Carbon samples yielded two radiocarbon dates that indicate an age range of about 1200-900 B.P. However, projectile points indicate a longer span of site use, from about 5,500 to 1,000 B.P.

REPORT ORGANIZATION

The following chapters provide a guide to data from 45-DO-273. Chapter 2 discusses the site's sedimentary stratigraphy and the definition and dating of vertical analytic units, termed **analytic zones.** Chapters 3, 4, and 5 summarize the results of artifactual, feature, and faunal analyses. Chapter 6 includes

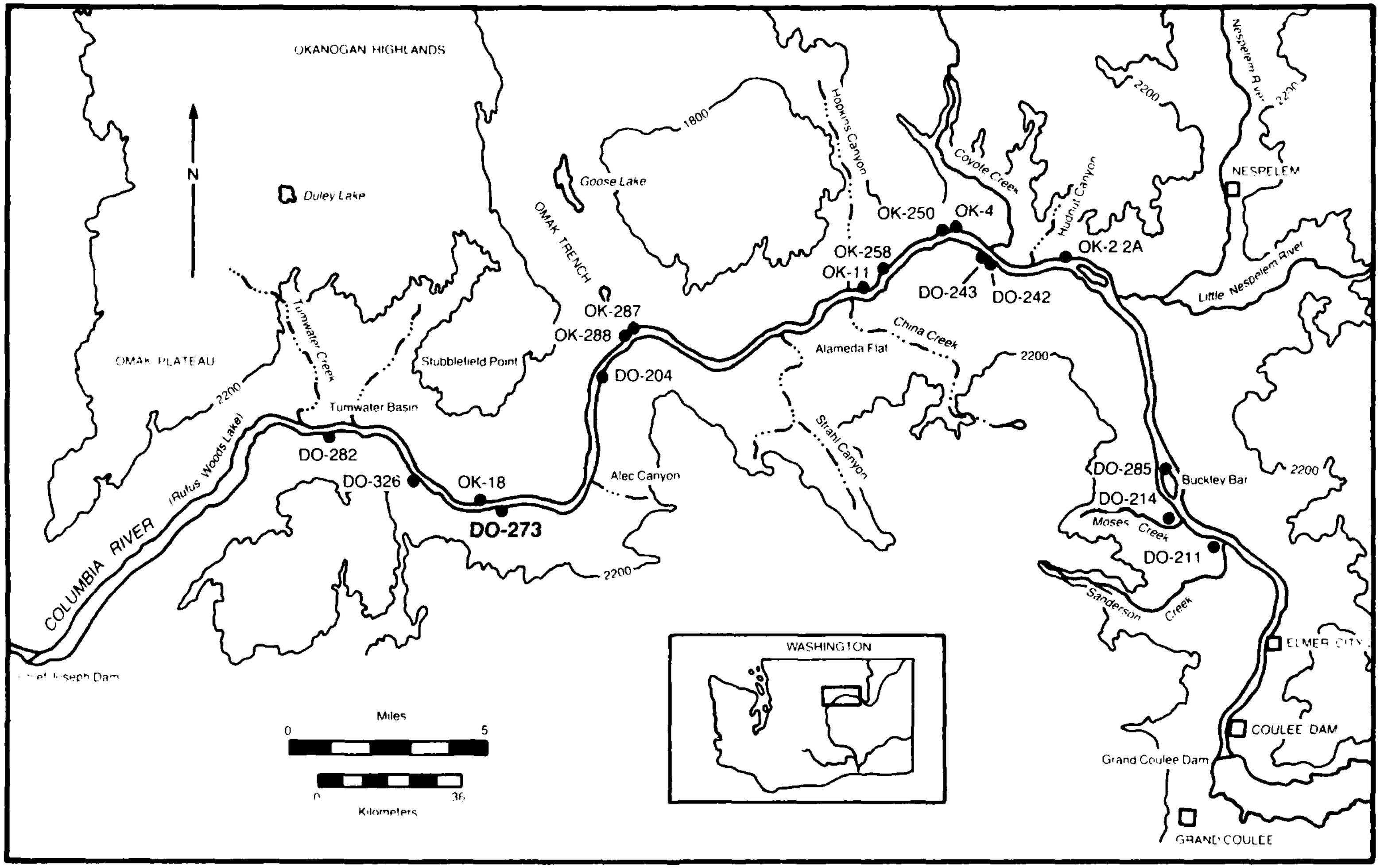


Figure 1-1. Map of project area showing location of 45-DO-273.

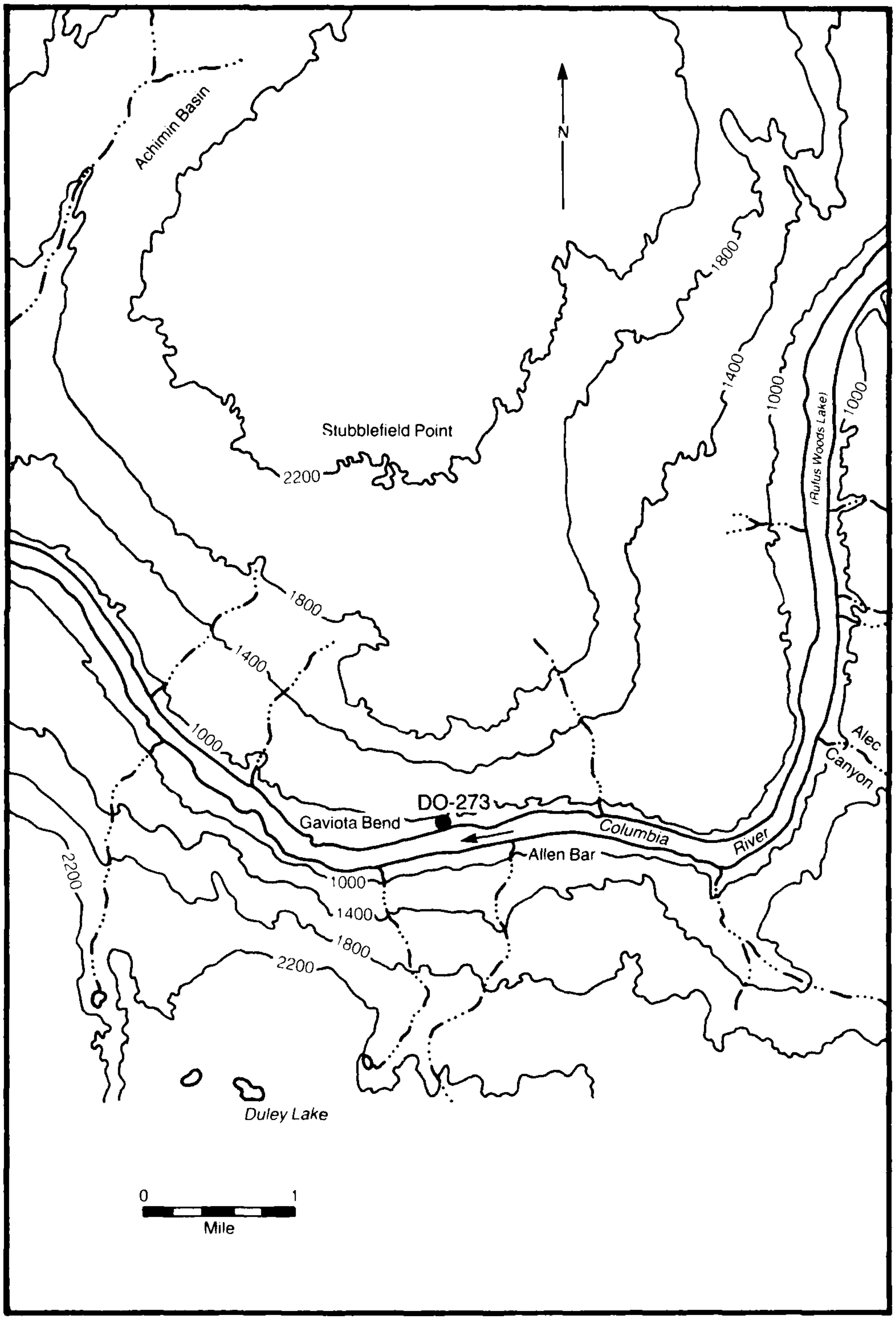


Figure 1-2. Map of site vicinity, 45-DO-273.

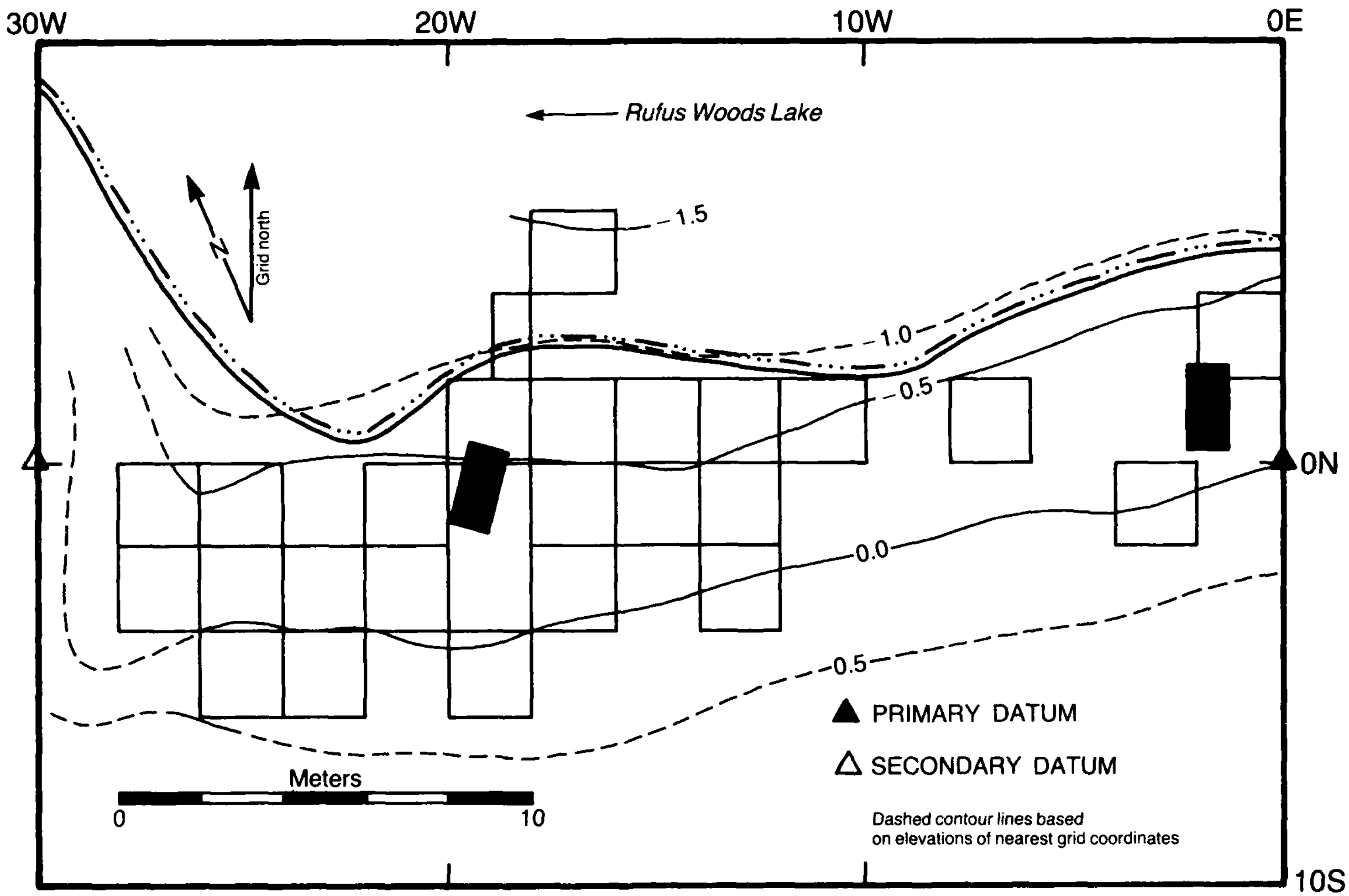


Figure 1-3. Topographic map of 45-DO-273.

Plate 1-1. Overview of 45-DO-273 to the east-northeast.

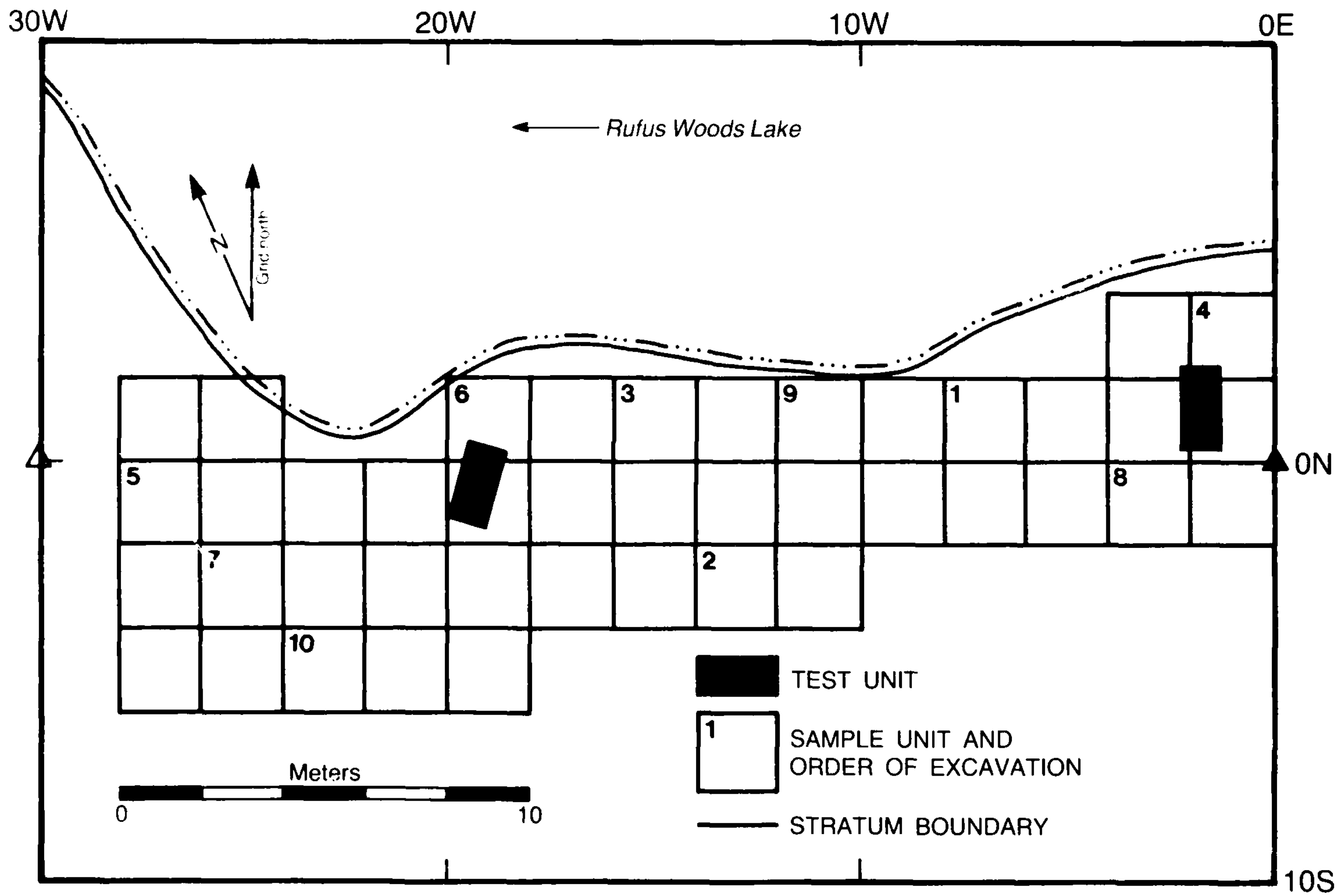


Figure 1-4. Random sampling design, 45-DO-273

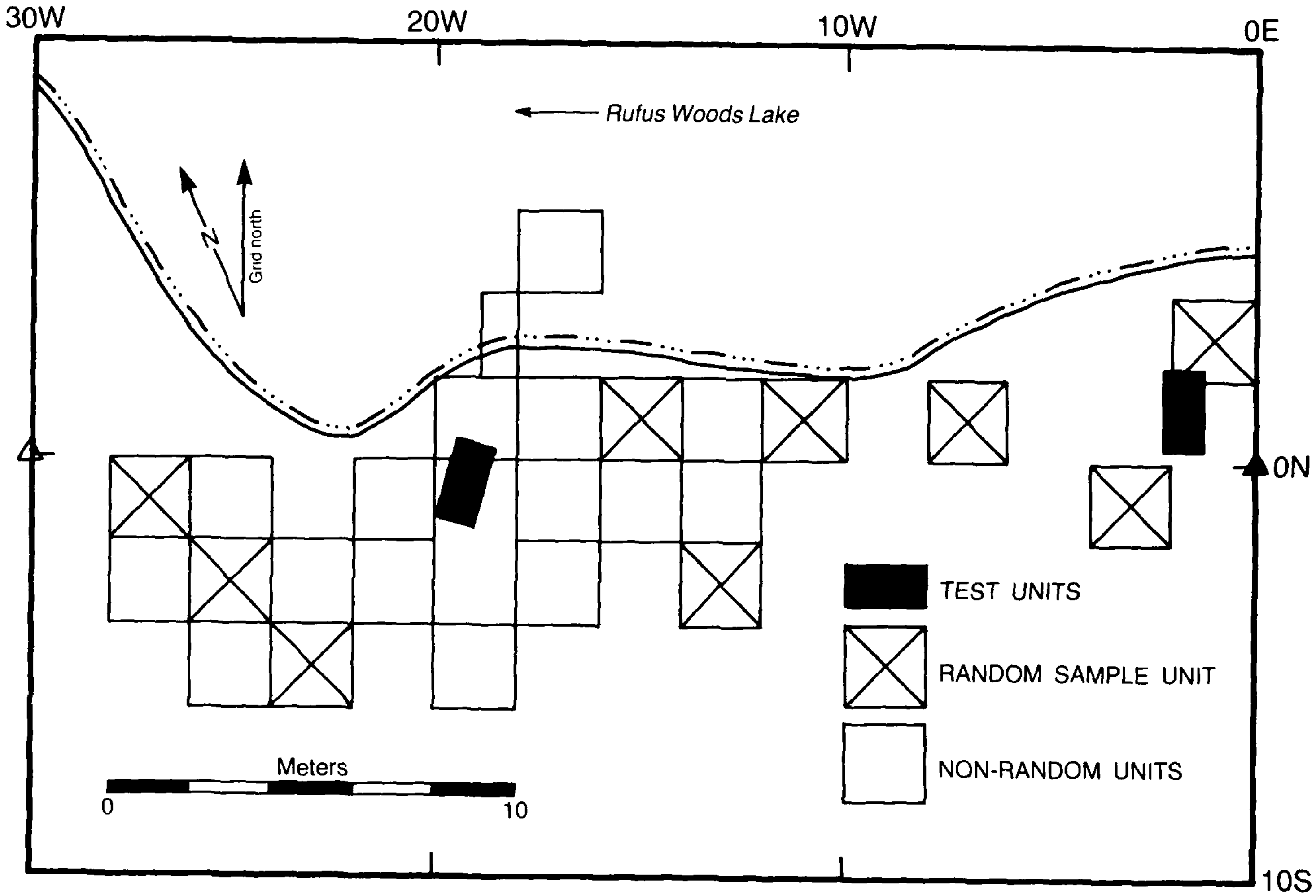


Figure 1-5. Excavated units, 45-DO-273.

a site chronology and a discussion of possible activities indicated by the assemblages from each analytic zone.

2. STRATIGRAPHY AND CHRONOLOGY

This chapter discusses the geologic setting of 45-DO-273 with reference to local geologic history and describes the depositional history of the site itself in detail. Strata mapped in excavation units are grouped into sitewide depositional units, which provide a basis for interpretation of the depositional environment and for correlation of cultural materials between units. Episodes of cultural deposition, or **analytic zones,** are defined in terms of the natural depositional units. The contents of the zones are summarized and additional chronological information such as radiocarbon dates and projectile point styles introduced.

GEOLOGIC SETTING

Site 45-DO-273 is in the lower canyon of the project area, below the mouth of the Omak Trench and south of the Omak Plateau. The site lies between two deep drainage channels at the river margin of a small alluvial fan at the downstream end of a 1000 ft (300 m) terrace, Allen Bar (Figure 2-1). The terrace is cut into glaciolacustrine sediments (Qn and Qpg) and the upstream portion is capped by channel deposits of the Columbia River (Qcr). Above the 1000 ft contour is a steeper slope, of colluvial deposits, and cliffs of gneissic granite (Mzg) rise above the 1050 ft or 1100 ft contour.

Deposits of Mazama tephra in the alluvial fan reveal that it was being formed at the time of the ash-fall, approximately 6700 B.P. It may be inferred that the Columbia River was then near this elevation (Hibbert 1984) and that the fan postdates the terrace cutting. Within the alluvial fan, materials derived from tributary streams are interbedded with Columbia River deposits.

PROCEDURES

In June through August 1979, the stratigraphic crew recorded all walls of all units at 45-DO-273, a total of 154 m of profile. One column sample (Figure 2-2) and 16 other selected samples were collected, and the column sample was subjected to mechanical and chemical analyses. A tephra sample was analyzed by Dr. T. Davis, Mount Holyoke College.

Stratigraphic procedures were modified slightly to coordinate with the special excavation procedures necessitated by changing water levels. Walls of both complete and temporarily terminated units excavated in the May excavation

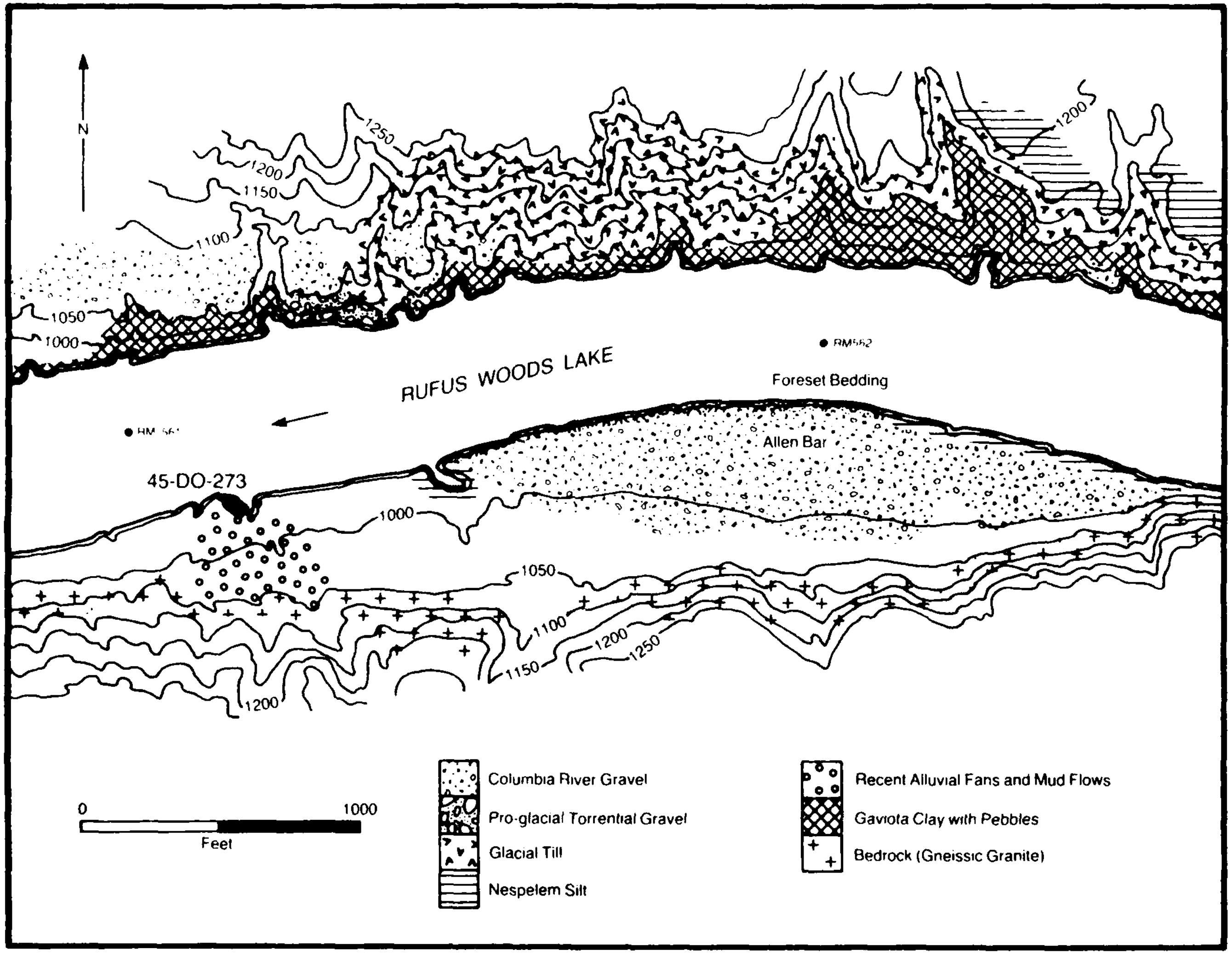


Figure 2-1. Geologic map of 45-DO-273 vicinity. Adapted from U.S. Army Corps of Engineers Reservoir Geology: Plate C-12.

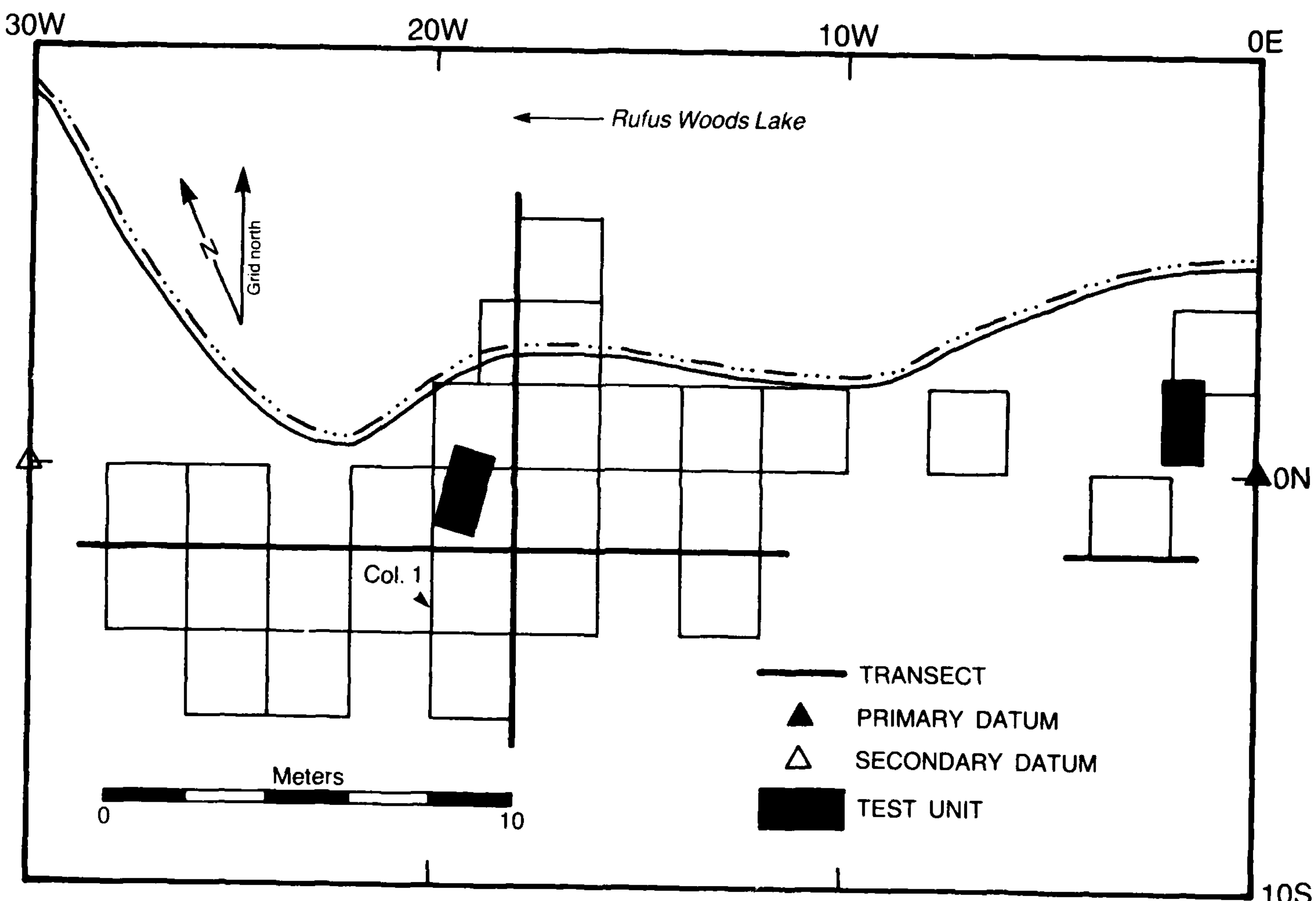


Figure 2-2. Location of soil sample column and stratigraphic transects, 45-DO-273 (all walls were profiled).

phase were profiled in June when excavation was temporarily halted. During the drawdown in July and August, units were excavated in stages corresponding to the stages of the drawdown; that is excavation was completed to a particular level in all units, and then resumed when the water was lowered further. Thus, within the block area, the internal walls were removed as excavation proceeded, and the profiles had to be drawn in vertical segments. External block walls and the walls of isolated units were still standing when excavation was terminated and were drawn in their entirety.

Because the site was initially only slightly above the water level, it was considerably affected by a two foot pool rise in June. The upper strata were eroded away in some places, while new sediment was deposited in other areas. During the subsequent drawdown, drying of the previously saturated coarse sands cause considerable slumping, destroying parts of profiles.

The natural depositional sequence discussed below is an interpretation based primarily on field profile descriptions. The results of microscopic examination and physical and chemical analyses of the column sample, and analysis of the tephra sample, are referred to where pertinent. Physical descriptions are given for each depositional unit; sediment sources, transport mechanisms, environment of deposition, and post-depositional alteration are discussed where applicable. We use these natural depositional units in the final section of the chapter to define cultural depositional episodes. Methods and procedures used in stratigraphic profiling, column sampling and sediment analysis, stratigraphic interpretation, and definition of analytic zones are described in more detail in the project's research design (Campbell 1984d).

DEPOSITIONAL HISTORY

Four stages of deposition characterized by distinct mechanisms of transport were defined as depositional units. The characteristics of the deposits are summarized in Table 2-1 and discussed in more detail below. Vertical and horizontal relationships of the depositional units are illustrated in east-west and north-south transects (Figures 2-3 and 2-4).

DEPOSITIONAL UNIT I

The oldest depositional unit (DU I) encountered during excavation of 45-DO-273 is a series of interbedded, fine and coarse sediments with a complex sedimentary structure (Figures 2-5 and 2-6 illustrate representative profiles). Vertical exposure of this unit never exceeded 0.75 m, and its base was not exposed. Much of the lower part of the exposed portion is composed of inclined beds of sand to loamy sand with occasional gravel, showing either graded bedding or laminae, especially of magnetite. These are interbedded with smaller lenses predominantly of fine sediments such as clay loam, but also including occasional lenses of sand and gravel. Viewed along the north-south grid axis, these beds have an apparent dip to the west ranging from 5.5 degrees to 11 degrees. An apparent dip to the north, ranging from 12 degrees

Table 2-1. Summary of depositional units, 45-DO-273.

Depositional Unit	Type of Deposit	Physical Description
IV	Recent flood and median deposits	Littermat: grayish brown to brown (10YR5/2-5/3) organic littermat. Texture varies with substrate but generally sandy loam. Sand is fine-grained, soft to slightly compact. Poorly to moderate sorted, grasses, roots, twigs abundant, fine gravel occasional. Boundary generally abrupt smooth, may be wavy. Does not occur on present beach.
		Flood deposits: brown (10YR5/3) sandy loam, moderately compact, blocky structure, poorly sorted, some roots and gravel. Texture fine upwards, also varies with topography. Thin, discontinuous bands of laminated sandy loam or silt, of grey, light brownish grey, or pale brown (10YR 6/1, 6/2, or 6/3) may occur at the top of the unit, medium sand to fine gravel lenses at the bottom. Red or yellow mottling may occur in low areas.
III	Upper bar deposit (overbank deposits)	IIIb: grayish brown to brown to pale brown (10YR 5/2, 5/3, 6/3) loamy sand to sand. Sand is fine, moderately sorted occasional fine gravel. Moderate to weak blocky structure, or structureless. Boundary clear to gradual, wavy. Gravel/pebble/cobble/sand lenses occur, also a few erosional channels filled with sand to loamy sand with abundant gravel.
		IIIa: Brown to pale brown (10YR5/3-6/3) sand to loamy sand. Sand fine but coarser than IIIb occasional fine to coarse gravel. Weakly developed blocky structure to structureless, boundary clear, smooth.
II	Alluvial fan deposit	Tephra: major deposit is pinkish white (7.5YR8/2) mottled, tephra with some fine sand. Occurs in lens over 2 m long, 30 cm thick, boundary clear, wavy, underlain by white (10YR8/1) ash in lenses 5 cm to 1 m long, 5 cm thick, boundary abrupt, broken, smooth. Occurs elsewhere as lenses in coarse sand, 5-40 cm long, 2-6 cm thick.
		Sand: pale brown to light brownish gray to light grey (10YR6/3, 6/2, 7/2) sand. Texture varies from fine to coarse but predominantly medium and always coarser than DU III or DU I. Moderately sorted fine to coarse subrounded gravel ranges from absent to 10%. Structureless, loose, unconsolidated, ash in lenses or Krotovina is rare to common.
		Gravel: fine to coarse gravel and occasional cobbles in medium to coarse sand, poorly sorted. Texture variable but always coarse and more gravel than the rest of DU II. Occurs as lenses 10 to 20 cm thick and 3 m long at upper and lower boundaries.
I	Lower bar deposit	Dominant matrix: pale brown to light grey (10YR 6/3-7/2) sand to loamy sand, sand texture very fine, occasional fine gravel increasing to abundant fine to coarse gravel towards the river. Moderately well sorted to well sorted, graded bedding may be apparent. Laminae of magnetite 1-4mm thick rare to abundant. Boundary abrupt, wavy to smooth.
		Finer lenses: silt or clay loam, very compact. Blocky structure. May occur as discontinuous nodules.
		Coarser lenses: sand matrix fine to coarse, fine to coarse subrounded gravel rare to abundant, occasional cobbles towards the river. Generally poorly sorted but may be bedded.

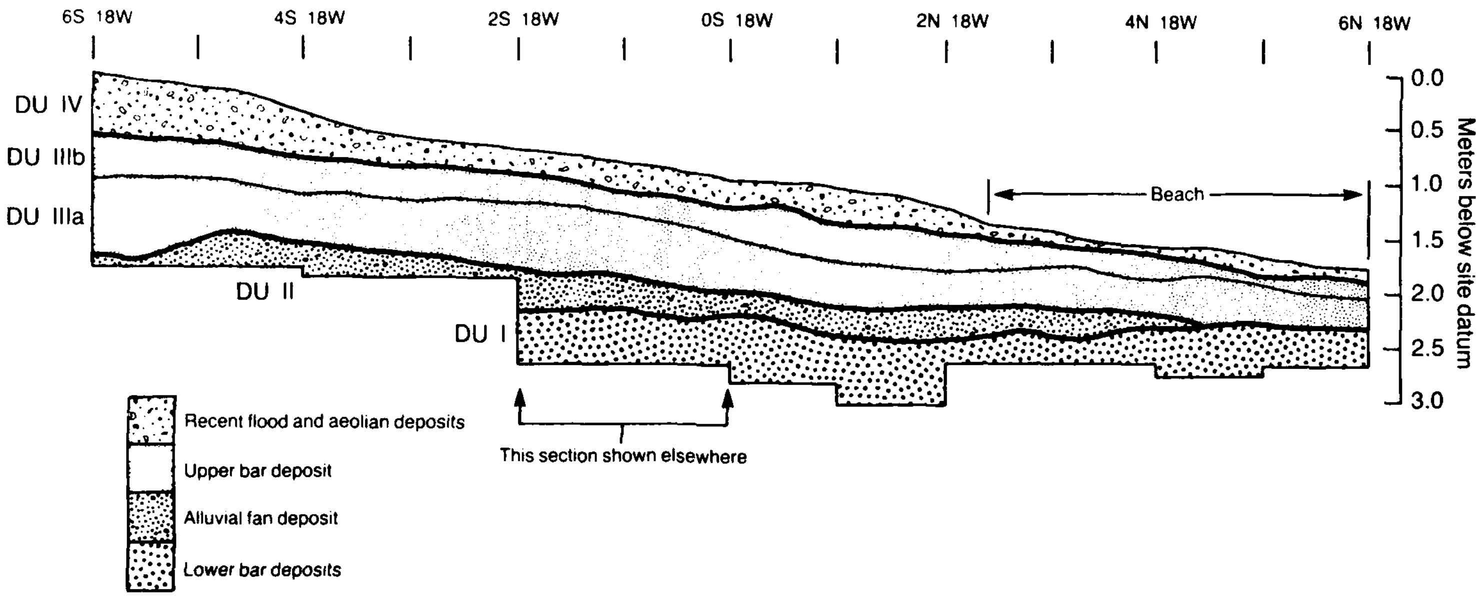


Figure 2-3. North-south stratigraphic transect of 45-DO-273. (For plan map of transect see Figure 2-2. Depositional units are described in Table 2-1.)

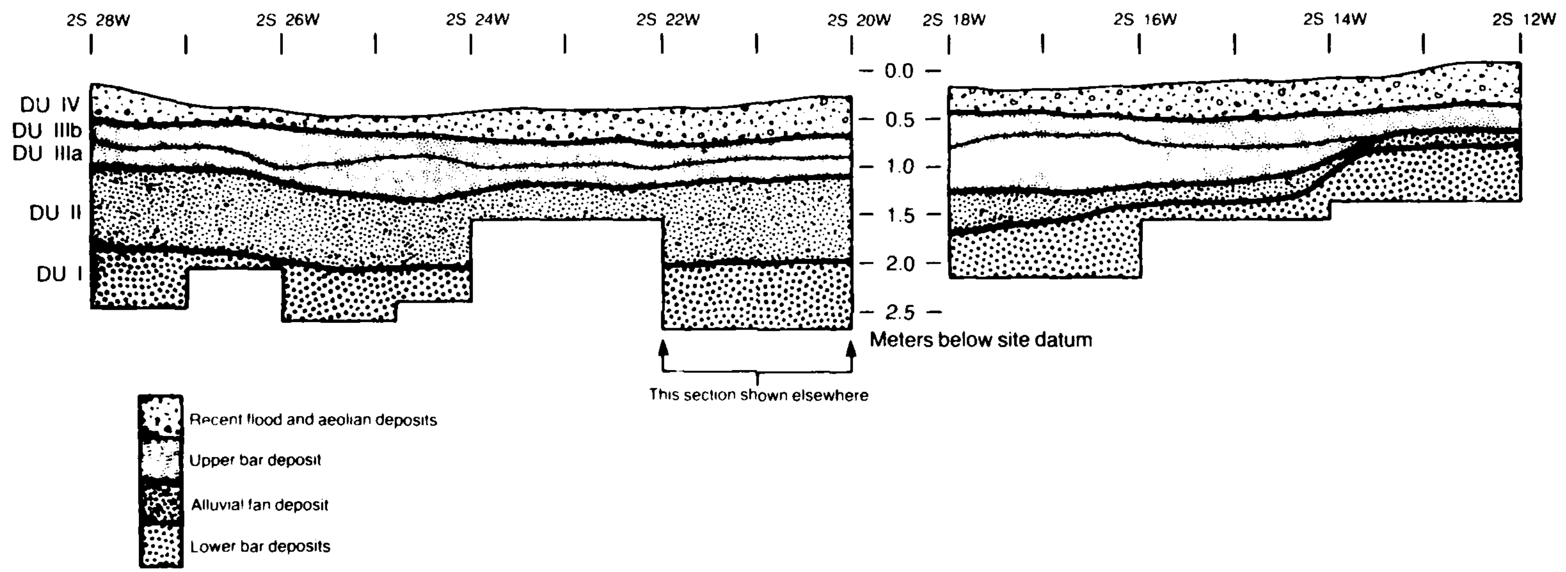


Figure 2-4. East-west stratigraphic transect of 45-DO-273. (For plan map of transect see Figure 2-2. Depositional units are described in Table 2-1.)

Strata descriptions for Figure 2-5.

A Litter Mat
1 Brown loamy sand, slightly hard, poorly sorted.
2 Brownish-grey loamy sand, fine, soft, moderately well sorted.
3 Pale brown, loamy sand; medium fine, moderately well sorted.
4 Pale brown and dark grey, fine to medium sand; loose soft, moderately well sorted.
5 Brown sand, coarse, unconsolidated, well sorted with inclusions of ash in rodent holes to the south.
6 Medium coarse, subrounded gravel in a well sorted, loose, medium sand matrix.
9 Light grey sand, fine, loose, well sorted, with some fine, subangular gravel with thin bands of magnetite in some areas.
10 Subrounded fine to coarse gravel in same matrix as preceding layer.
11 Olive brown clay loam, slightly plastic non-sticky, quite compact.

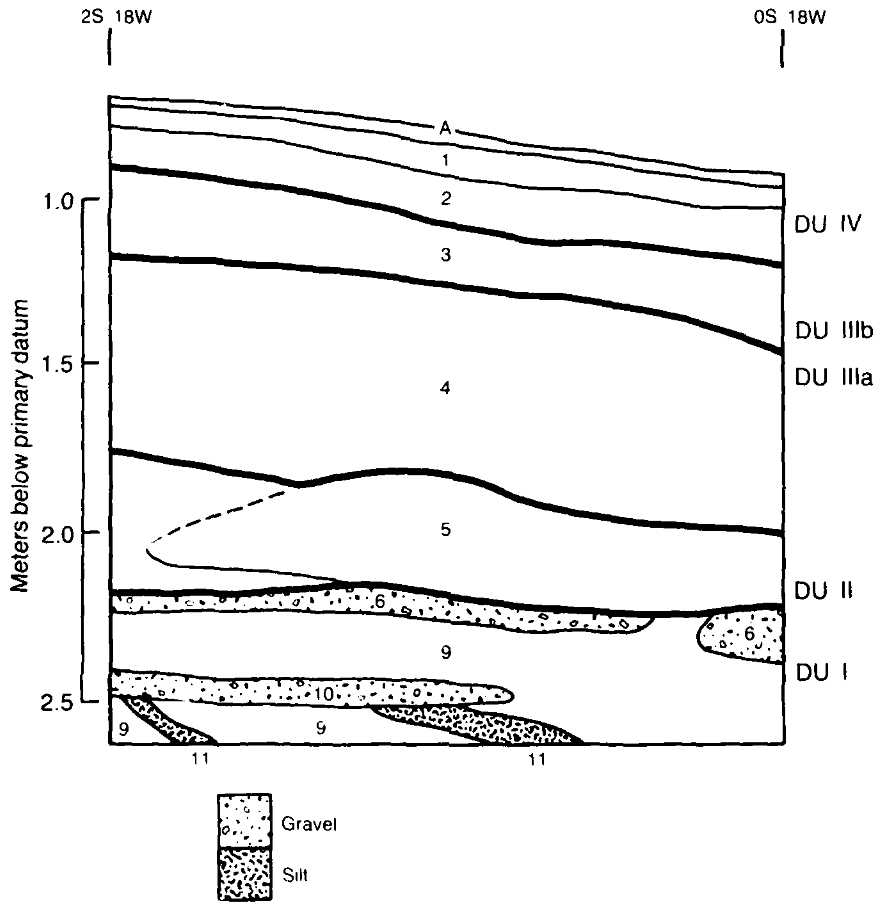


Figure 2-5. Profile of 0S18W, 45-DO-273.

Strata descriptions for Figure 2-6.

A Litter Mat
1 Compact sandy loam, some gravel. Blocky.
2 Loose sand, some gravel, poorly sorted, blocky.
3 Coarse sand and gravel.
4 Sand, medium to coarse.
5 Sand, fine to coarse with some ash.
6 Salt and pepper coarse sand, sone fine gravel, soft friable.
7 Tephra, pinkish-white, with some fine sand.
7A Tephra, white, always in lenses.
8 Salt and pepper medium to coarse sand, moderately sorted, slightly lighter in value than Level 6. Soft boundary: clear;smooth.
9 Gravel to pebble in coarse sand.
11 Fine sand to loamy sand, with lenses of fine to coarse gravel and laminae of magnetite.
12 Dark grayish brown (10YR4/2) moist, sand and gravel. Poorly sorted, well rounded. Boundary: clear, wavy.
13 Dark grayish brown 10YR (4/2) moist-loamy sand. Quite fine, well sorted-moisture holding capacity high.

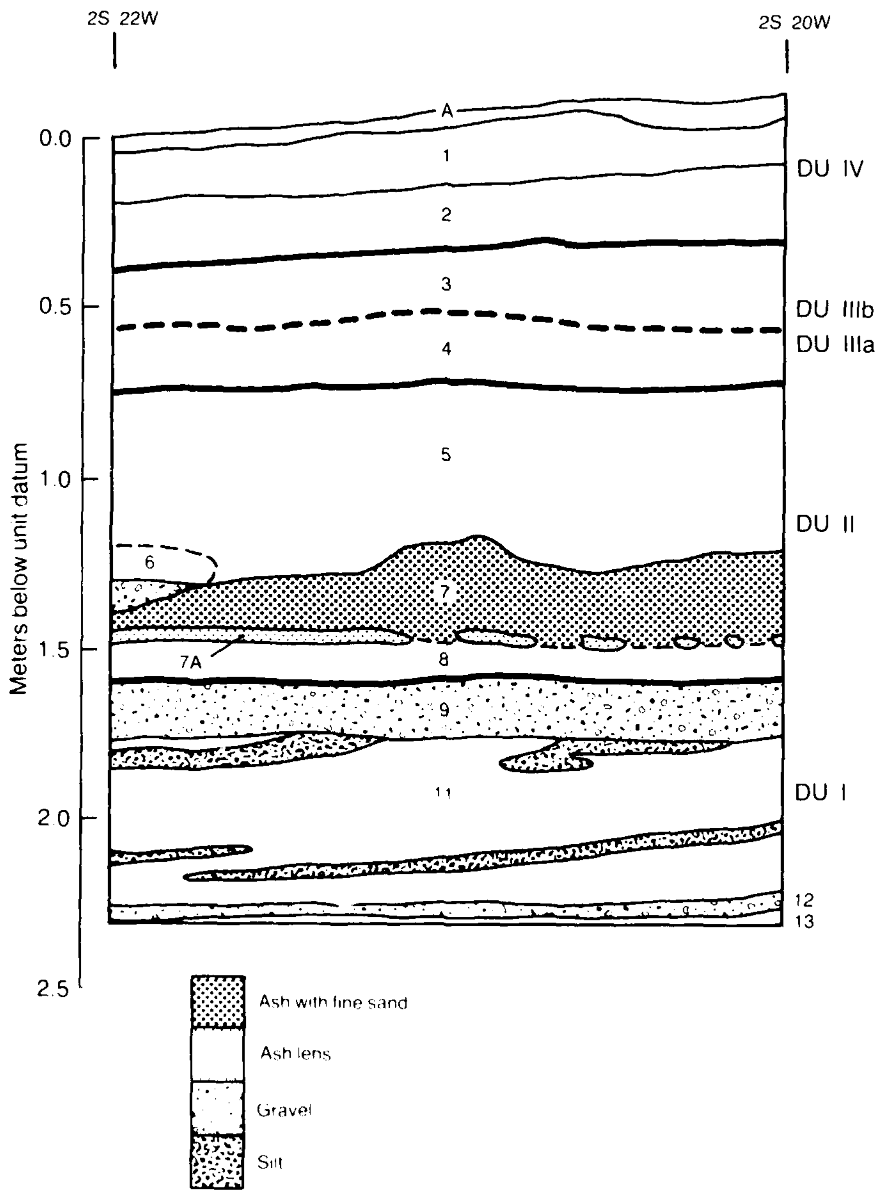


Figure 2-6. Profile of 2S22W, 45-DO-273.

to 30 degrees, can be seen in the east-west grid plane. Although the strike cannot be measured directly from the vertical exposures, it is apparently to the NW. Between 2S and 4S, at 24W, beds inclined as described above truncate a lower set of beds with a more westerly strike.

At the top of the unit are relatively horizontal beds of much coarser material, which truncate the inclined beds. These strata of fine to coarse sand with rare to abundant fine to coarse gravels are 10 to 40 cm thick and up to 5 m long. Toward the river both the sand and the gravel become coarser and the strata also become thicker. These may be interbedded with parallel strata of loamy sand like the dominant sediment in the lower part of the writ or with smaller, less extensive lenses of clay loam or sandy loam with clay nodules.

The cross-bedded strata of DU I are interpreted as channel bank, or laterally accreted point bar, deposits of the Columbia River. The sediments decrease in size away from the river and there is a predominance of subrounded gravel. The cross-bedding, with inclination of the foreset beds toward the center of the channel, indicates channel bank deposition. DU I is presumably a downstream facies of the Qcr mapped on Allen Bar. The inferred strike of the foreset beds in DU I is very similar to that shown for the Qcr (Figure 2-1).

DEPOSITIONAL UNIT II

Overlying the upper gravels of DU I are clean sands grading from coarse to medium and fine from southwest to northeast (Figure 2-6). The deposit is thickest in the southwest, thinning and pinching out to the northeast. The conformation of the deposit and the decrease in particle size to the southeast indicate that it is an alluvial fan deposit deriving from tributary channels upslope.

Contained within the sand are deposits of tephra (volcantic ash), reworked or redeposited to various degrees. The largest and purest deposit is located near the center of the site (Figure 2-7). This lens of pinkish white tephra, at least 2 m long and 30 cm thick, is underlain by thin lenses of white tephra and overlain by a thin gravel lens at the margins (Figure 2-7). A sample from this deposit was analyzed by P.T. Davis (Davis 1984). The modal refractive index of the glass (1.509$\pm$0.002.) and the assemblage of ferromagnesian minerals (hornblende (68%), hypersthene (20%), and augite (12%)), identify this sample as Mazama tephra.

The distribution of tephra in DU II (Figure 2-7) suggests downslope transportation along a channel, consistent with our interpretation of this deposit as an alluvial fan. Tephra, in small lenses or mixed with sand, occurs upslope and downslope of the large deposit, but was not noted to either side. The abundance of tephra throughout DU II, the presence of one large, relatively pure deposit, and the stratification of tephra of two different colors indicate that the sediments were deposited soon after the eruption, which is dated around 6,700 B.P. The tephra was probably carried in mass by a network channel and buried rapidly by alluvial fan material.

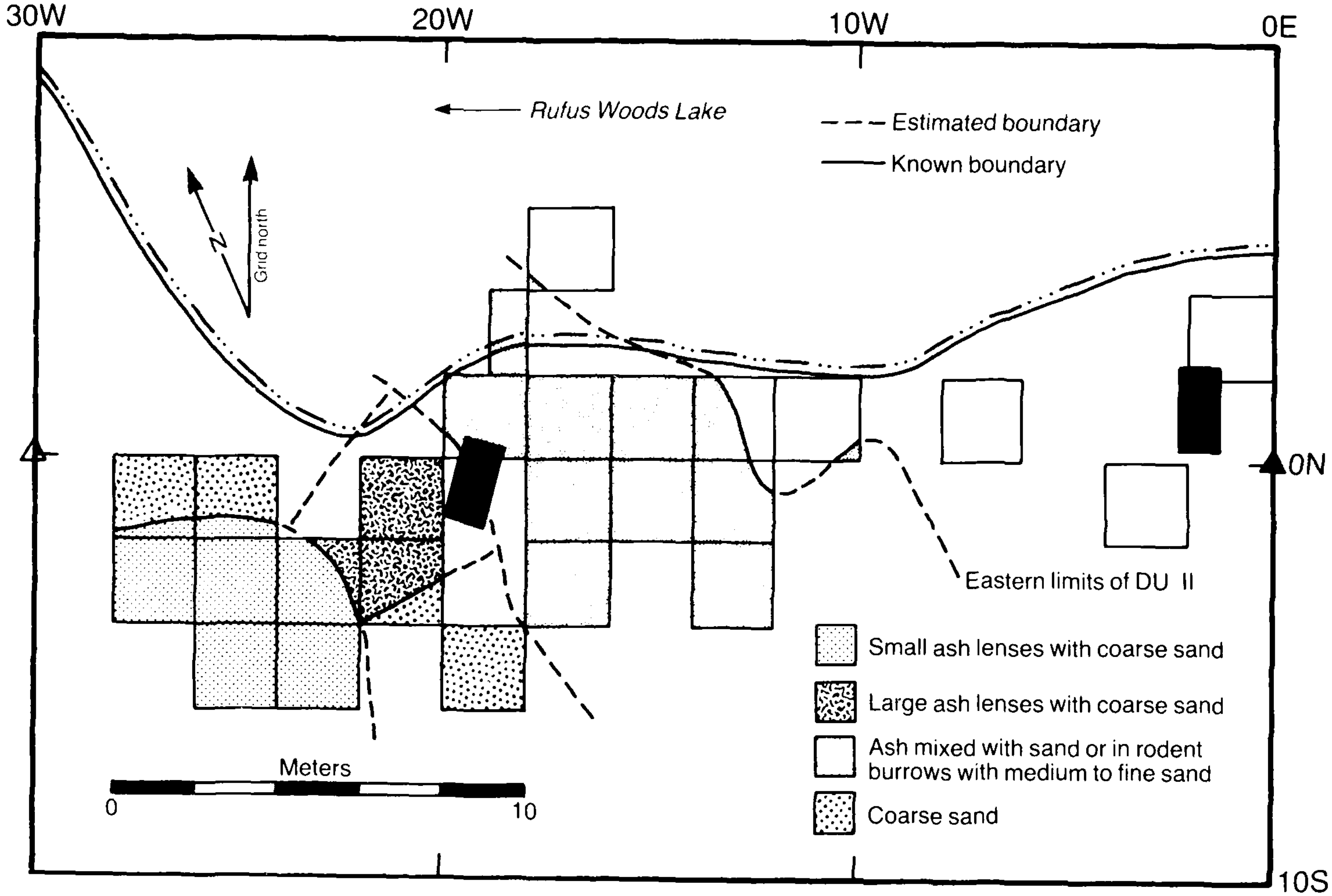


Figure 2-7. Sand texture variation and distribution of tephra in DU 4, 45-DO-273.

DEPOSITIONAL UNIT III

Depositional Unit III, above the alluvial fan deposit, consists of several massive, horizontal strata that are relatively uniform in texture except for occasional stream channels and gravel lenses. The sediments grade from sands to loamy sands, becoming finer upwards. The thickness, uniformity, and graded texture indicate that the strata are at least partly Columbia River overbank deposits. The angular granitic gravel scattered through the strata and in lenses, as well as small erosional channels, suggest that alluvial fan deposition continued. A surface which may be an erosional unconformity occurs within the depositional unit as defined here. Because of a lack of detailed information about this surface, and the similarity of deposits above and below it, we have defined subunits DU IIIa and DU IIIb rather than making these separate depositional units.

DEPOSITIONAL UNIT IV

The uppermost depositional unit at the site, DU IV, consists of flood and wind deposited sediments that may date from historic times, perhaps even postdating the creation of Rufus Woods Lake. Thin, discontinuous bands of laminated sandy loam are probably flood deposits, while the sediments associated with the litter mat may be flood or wind deposited. Two coins, dated 1945 and 1946, were found in these upper sediments just beneath the surface. If these are in situ, they would suggest that some of deposition dates to the 1948 flood.

PHYSICAL AND CHEMICAL ANALYSIS OF SEDIMENTS

The logistics involved in profiling segments of unit walls as excavation progressed limited the collection of column sediment samples. The analytic results from the one column sampled (Unit 2S22W) are shown in Appendix A, Table A-2.

In July 1980, when the samples were analyzed at the field laboratory in Nespelem, the dry-sieve method of determining particle size was still being used. Only samples with a suspected high content of clay were subjected to the hydrometer method. In the case of the 24 samples from excavation unit 2S-22W, only samples containing a significant amount of tephra (Samples 8-12) were analyzed by hydrometer. All other samples were put through the dry sieves and thus there is no record of the clay fraction. the results clearly show the fine texture of samples containing tephra: they range between a clay and a sandy clay loam classification. Samples with little or no tephra are classified as sand or loamy sand.

The samples containing tephra and silt slackwater sediments are consistently high in calcium and low in phosphate. This phenomenon is characteristic of samples of similar depositional histories throughout the project area, as well as in other regions (F. Ugolini, personal communication 1983).

Organic matter was not detectable with the photospectrometer in any of the samples. The poor preservation of organic may be related to the alkalinity of the soil, which has pH values ranging from 8.3 to 9.1.

Generally, in a relatively undisturbed sediment profile, a pattern of grain rounding and grain surface texture is discernible between different environmental episodes. This is not the case at 45-DO-273 where alluvial fan debris, network channel alluvium, river alluvium, and aeolian material are mixed in the sediments. Angular and sub-rounded, and pitted and glossy grains are found throughout the profile with no clear boundaries.

ANALYTIC ZONES

The vertical distribution of cultural materials was compared, unit by unit, to the depositional sequence defined above. Cultural materials occur throughout the sequence in varying densities, with the minimum corresponding to the stratigraphic boundaries which separate the depositional units. Within DU II, two distinct vertical peaks, separated by a minimum, correspond to the depositional subunits. In other words, each of the depositional units and subunits contains a temporally discrete cultural deposit. The five cultural analytic zones and their relationship to depositional structure is shown in Table 2-2. The contents of the analytic zone assemblages, including artifacts, features, and radiocarbon dates, also are summarized in Table 2-2. Below, brief discussions of each zone indicate the nature of the cultural deposit, the possible effects of natural deposition, chronological placement, and the size and distribution of the sample recovered.

ZONE 5

Cultural materials in the channel deposits of Depositional Unit I were assigned to Zone 5. Only a very small assemblage, including lithics and a few pieces of bone and shell, was recovered. The excavated volume of Zone 5 is even smaller than that of Zone 4 because many units were terminated prior to reaching this zone (see Figure 2-8). No radiocarbon dates were obtained for Zone 5. However, projectile points from Zone 5 are very similar to those in Zone 4 (see Chapter 3: stylistic analysis) suggesting that DU I and DU II may have been deposited very rapidly. Because Zones 4 and 5 each have such small assemblages, and the available chronological information indicates they are very close in time, the two zones are usually discussed together in the following chapters.

Table 2-2. The analytic zones of 45-DO-273: their stratigraphic definition, radiocarbon dates, and contents.

Zone	OU	Major Description	Radiocarbon[1] Dates (years B.P.)	Lithic Artifacts N	Nonlithic Artifacts N	Bone N grams	Shell N grams	FMR N grams	Misc./ Historic N	Total	# Features N	Volume (m^3)	Density (objects per m^3)
1	IV	Recent flood slopewash deposits	-	418	-	232 284	-	44 28,405	6	700	1	43.1	16.24[2]
2	IIIb	Upper over-bank deposits	-	1,012	-	634 139	1 2	99 19,276	3	1,749	2	29.6	59.09
3	IIIa	Lower over-bank deposits	-	1,953	2	202 48	3 10	59 12,070	3	2,222	2	37.7	58.94
4	II	Alluvial fan	968±361 1036±163	208	-	18 13	3 9	2 186	1	232	-	28.8	8.06
5	I	Point bar	-	56	-	1 1	2 10	- -	1	60	-	19.4	3.09

[1] See Appendix A.
[2] Sod was not screened.

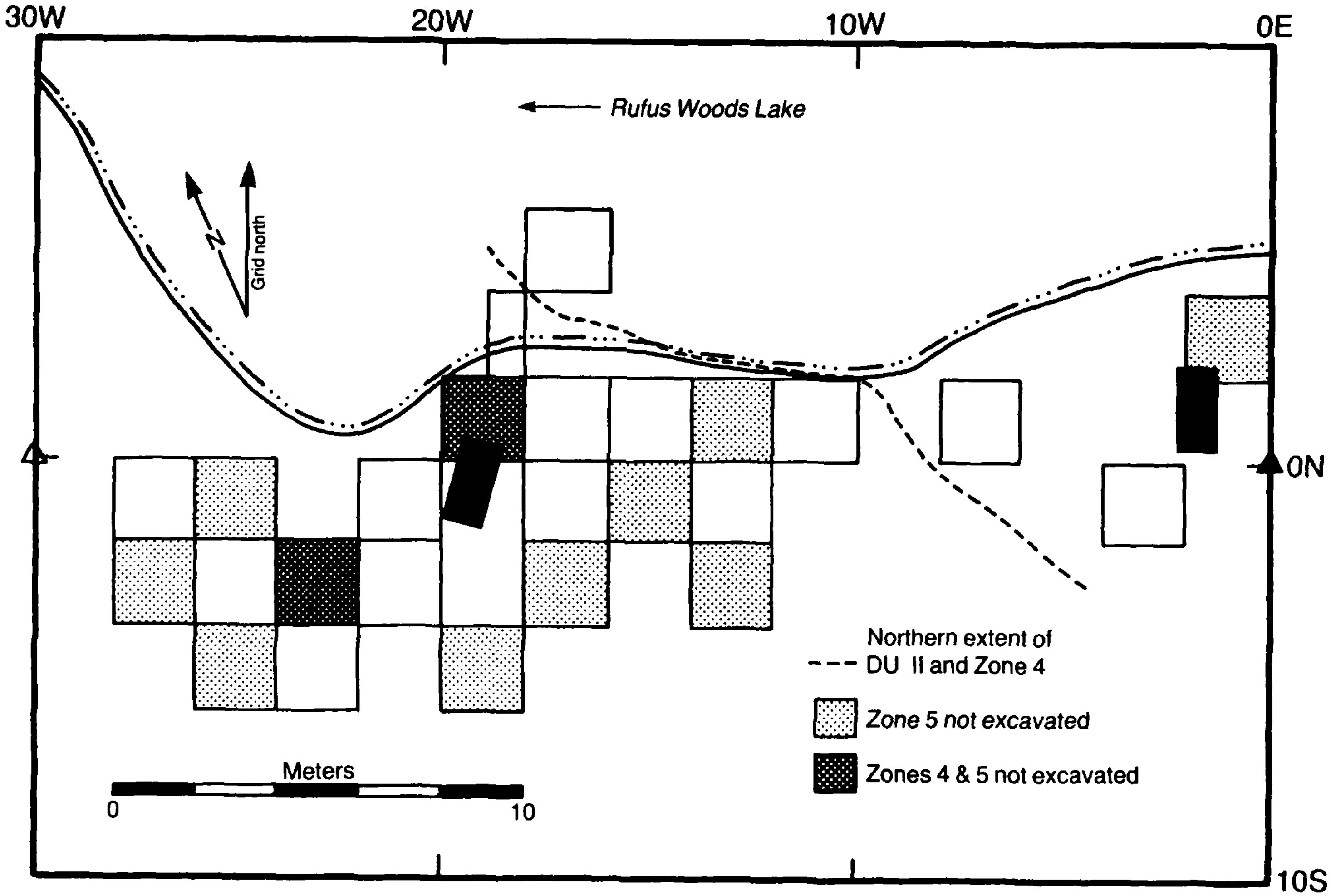


Figure 2-8. Excavated units, Zones 4 and 5, 45-DO-273.

ZONE 4

Zone 4 corresponds to the coarse sands and ash deposits of DU II, in which was found a small cultural assemblage of lithics, FMR, bone, and shell, but no features. This natural deposit immediately postdates 6700 B.P. Cultural materials included in this deposit may have been transported in the high energy environment of the alluvial fan, but probably are very close in age. The two radiocarbon dates obtained from this zone, 1036±163 (TX-4170) and 968±361 (TX-4171) are inconsistent with the geochronological information. Both samples are from the same context, Feature 31, which contains ash but is almost certainly a rodent burrow. In spite of the questionable context, these samples were selected for dating because if they had not been disturbed, they would have allowed us to date the ash. This zone has a smaller excavated volume than the overlying zones because in some units (Figure 2-8) excavation was terminated in or above Zone 4, and because DU II itself pinches out to the north, where Zone 3 directly overlies Zone 5.

ZONE 3

Zone 3 includes the cultural materials associated with the lower strata of DU III (DU IIIb). Like the upper strata of DU IIIa, these are massive horizontally bedded overbank deposits that provided a good preservation environment for cultural materials. The largest assemblage was recovered from this zone, as well as two features. No radiocarbon dates were obtained from this zone. Zone 3 was excavated in all units at the site except 0N4W and 4N2W where it is missing because the overbank deposits pinch out to the northeast. It was not screened in 4N19W.

ZONE 2

Zone 2 includes the cultural materials associated with the uppermost strata of DU III (DU IIIa). These are relatively horizontal, massive overbank deposits, with little evidence of erosion, providing a good environment for the preservation of cultural materials. This zone yielded an assemblage of two features and the second largest assemblage of other cultural materials. No radiocarbon dates were obtained. Zone 2 was excavated in all units except for 0N26W, where an erosional channel, originating in DU IV, had eroded Zone 2 deposits. Zone 2 was not screened in 4N19W.

ZONE 1

Zone 1 includes the cultural materials recovered from DU IV, the most recent sediments at 45-DO-273. This depositional unit includes a litter mat, aeolian deposits, and laminated flood deposits which may date entirely to the twentieth century. Materials associated with the present beach surface are also included in this zone. Although this erosional surface crosscuts older strata, the erosion itself postdates the reservoir. Cultural materials from these deposits, therefore, result from use of the area, or erosion of older site materials, in the twentieth century. They were defined as a zone primarily to separate these historic materials and beach lag from older *in situ* materials. The assemblage of cultural materials, including lithics, FMR, and bone is quite small, and the density is low. The single feature, a rock and fire-modified rock concentration on the sloping surface of the beach, may originate on an older surface exposed by beach erosion. No radiocarbon dates were obtained for this zone. Zone 1 was excavated in all units, but was not screened in 4N19W, a unit excavated to recover the older materials of Zones 4 and 5.

3. ARTIFACT ANALYSES

Artifacts from 45-DO-273 have been subjected to three separate analyses. Technological analysis describes elements of manufacture with emphasis on identification of raw materials and lithic reduction sequences. Functional analysis focuses on attributes of manufacture and wear to infer tool use. Stylistic analysis describes morphological elements that have demonstrated temporal and/or spatial significance and compare recovered objects with types outside the project area. Taken together, these analyses provide a basic description of the artifacts collected at the site and highlight points of research interest. They also serve as a guide to the data available in the project's computerized data base. Detailed descriptions of analytic procedures are included in the project's research design (Campbell 1984d).

Data recovery at 45-DO-273 yielded 4,963 artifacts. The artifact assemblage is divided into bone, shell, fire-modified rock (FMR), lithics, <1/4-inch flakes, non-lithics (here, utilized bone fragments), and indeterminate material objects. The <1/4-inch flake category also includes two flakes <1/8-inch in size that were recovered in the field but are not included in the data presented in the chapter. They are ignored in this report because of inconsistent field recovery; the 1/8-inch meshed screen meant that most such flakes were not recovered. The following analyses apply only to lithics, <1/4-inch flakes, and a few bone tools.

TECHNOLOGICAL ANALYSIS

Technological analysis of artifacts from this site involves five dimensions of classification: **object type, material, condition, dorsal topography,** and **treatment** (Appendix B, Table B-1). The attributes of **length, width, thickness,** and **weight** supplement the five primary dimensions. Of these, the following discussion refers only to object type, material, and dorsal topography (presence or absence of cortex), as well as length, width, and thickness. All lithic objects except unmodified flakes and chunks were given **formal type** names during functional analysis. These names are based on traditionally used terms, rather than on functional analysis of manufacture and/or wear patterns on the objects. All data presented below, in this and the following sections, are sorted according to the formal type designations.

Table 3-1 summarizes lithic formal types by zone. For easier reference and comparison, formal types are subdivided into four groups: formed objects; modified objects, including worn and/or manufactured objects that are not formed; miscellaneous objects; and debitage. The remainder of the materials in each zone assemblage consists of bone, shell, FMR, non-lithic, and indeterminate material objects.

Table 3-1. Formal object types by zone, 45-DO-273.

Formal Type Group	Formal Type		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone N	Total Col % of Subtotal
Formed Objects	Projectile point		2	1	4	2	1	10	8.5
	Projectile point base		1	1	3	-	-	5	4.3
	Projectile point tip		3	1	1	1	-	6	5.1
	Biface		3	8	12	6	2	31	26.5
	Chopper		1	6	3	-	1	11	9.4
	Drill		-	-	2	2	-	4	3.4
	Graver		-	2	2	1	-	5	4.3
	Millingstone		-	-	1	-	-	1	0.9
	Netsinker		-	-	1	-	-	1	0.9
	Peripherally flaked cobble		-	3	4	-	-	7	6.0
	Scraper		3	6	7	1	-	17	14.5
	Shaft abrader		-	1	-	-	-	1	0.9
	Spokeshave		-	-	1	-	-	1	0.9
	Tabular knife		3	6	7	-	1	17	14.5
	Subtotal	N	15	35	48	13	5	117	.
		Col %	3.8	3.4	2.5	6.2	8.8	3.2	
Modified Objects	Hammerstone		2	9	5	-	2	18	4.6
	Large linear flake		1	2	2	-	1	6	1.5
	Small linear flake		10	32	53	7	2	104	26.5
	Indeterminate object		2	-	4	-	-	6	1.5
	Unifacially retouched object		2	9	13	1	-	25	6.4
	Bifacially retouched object		2	-	4	-	1	7	1.8
	Utilized only object		27	58	117	21	4	227	57.8
	Subtotal	N	46	110	198	29	10	393	
		Col %	10.8	10.8	10.1	13.9	17.9	10.7	
Miscellaneous Objects	Weathered objects		3	-	-	-	-	3	12.0
	Core		2	1	11	-	1	15	60.0
	Resharpening flake		-	2	5	-	-	7	28.0
	Subtotal	N	5	3	16	-	1	25	
		Col %	1.2	0.3	0.8		1.8	0.7	
Debitage	Conchoidal flake		309	780	1,579	153	35	2,856	91.4
	Tabular flake		26	46	29	3	2	106	3.4
	Chunks		21	41	84	11	3	160	5.1
	Indeterminate		1	-	-	-	1	2	0.1
	Subtotal	N	357	867	1,692	167	41	3,124	
		Col %	84.2	85.4	86.6	79.9	71.9	85.4	
	Total		424	1,015	1,954	209	57	3,659	

Fifteen different lithic materials occur at 45-DO-273, as well as the separate categories of bone/antler, and indeterminate materials (Table 3-2). In the following discussion, several of the lithic types are combined into groups. Jasper, chalcedony, petrified wood, and opal are discussed jointly as "cryptocrystalline silica" (CCS) because they occur naturally in similar situations, and they fracture in the same manner. Basalt and fine-grained basalt are grouped together for the same reason. Quartzite and fine-grained quartzite are considered separately because of different fracturing

Table 3-2. Material type frequencies by zone, 45-DO-273.

Material	Zone					Total
	1	2	3	4	5	
Jasper	247	537	1,079	133	33	2,034
Chalcedony	104	330	645	55	10	1,144
Petrified wood	5	22	23	4	-	54
Obsidian	-	1	1	-	-	2
Opal	6	9	9	3	1	28
Quartzite	35	66	81	4	5	191
Fine-grained quartz	4	12	38	3	1	58
Basalt	6	19	35	3	-	63
Fine-grained basalt	4	2	7	1	-	14
Silicized mudstone	1	-	16	1	-	18
Argillite	2	5	9	-	-	16
Granitic	3	7	10	1	1	22
Siltstone/mudstone	1	-	-	-	-	1
Scoria	-	1	-	-	-	1
Very fine-grained red sandstone	-	1	-	-	-	1
Bone/antler	-	-	2	-	-	2
Indeterminate	6	3	3	1	1	14
Total	424	1,015	1,958	209	57	3,663

characteristics. Obsidian, fine-grained quartzite, silicified mudstone, argillite, granitic objects, silt/mudstone, very fine-grained red sandstone, and indeterminate lithic objects are grouped as "other lithics" in this report because they occur in very small frequencies at 45-DO-273.

Table 3-3 summarizes material group frequencies by zone. A chi-square determination of the differences between the numbers of CCS and quartzite objects in Zones 1 through 3 demonstrates that they are due to causes other than chance on the 0.99 level of confidence. Explanations for the differing frequencies remain to be sought.

Table 3-3. Grouped material type frequencies by zone, 45-DO-273.

Material Type		Zone				Total
		1	2	3	4/5	
CCS (jasper, chalcedony, petrified wood, opal)	N	362	898	1,754	244	3,258
	Col %	85.4	88.5	89.8	91.7	89.0
Quartzite	N	35	66	81	9	191
	Col %	8.3	6.5	4.1	3.4	5.2
Basalt (basalt, fine-grained basalt)	N	10	21	42	4	77
	Col %	2.4	2.1	2.1	1.5	2.1
Other lithics	N	17	30	77	9	133
	Col %	4.0	3.0	3.9	3.4	3.6
Total	N	424	1,015	1,954	266	3,659

Table 3-4 presents cryptocrystalline artifact types by zone. Conchoidal flakes represent the highest frequency of CCS objects. Linear flakes (which includes blades and microblades), utilized only objects, and chunks, occur at higher relative frequencies than the remaining objects. The high frequency of flakes shows that much lithic reduction of CCS materials occurred at the site. Comparison of formal type frequencies between zones is not warranted at this site because all but conchoidal flakes occur in frequencies too low to make valid interpretations.

Table 3-5 presents the metric attributes of cryptocrystalline conchoidal flakes by zone. Flakes with maximum dimensions less than 1/4 inch and all broken flakes that could not be measured along the broken axis are not included in this table. It is interesting to note that flakes are longer, wider, and thicker, on the average, in the lower zones.

Table 3-6 shows information about primary and secondary debitage. **Primary debitage**--objects initially detached from a block or nodule of raw material--includes flakes with cortex and chunks. **Cortex** is defined as the weathered surface of a nodule or block of raw material. **Chunks** are angular

Table 3-4. Cryptocrystalline industry: formal types by zone, 45-DO-273.

Formal Type		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Total
Projectile point	N	1	1	4	2	1	9
	Col %	0.3	0.1	0.2	1.0	2.0	0.3
Projectile point base	N	1	1	3	-	-	5
	Col %	0.3	0.1	0.2			0.2
Projecile point tip	N	2	1	1	-	-	4
	Col %	0.6	0.1	0.1			0.1
Biface	N	3	8	10	6	2	29
	Col %	0.8	0.9	0.6	3.1	4.1	0.9
Drill	N	-	-	1	2	-	3
	Col %			0.1	1.0		0.1
Graver	N	-	1	2	1	-	4
	Col %		0.1	0.1	0.5		0.1
Scraper	N	3	6	7	1	-	17
	Col%	0.8	0.7	0.4	0.5		0.5
Spokeshave	N	-	-	1	-	-	1
	Col %			0.1			<0.1
Linear flake	N	11	34	53	7	3	108
	Col %	3.0	3.8	3.0	3.6	6.1	3.3
Core	N	2	1	10	-	1	14
	Col %	0.6	0.1	0.6		2.0	0.4
Resharpening flake	N	-	1	5	-	-	6
	Col %		0.1	0.3			0.2
Bifacially retouched flake	N	2	-	3	-	1	6
	Col %	0.6		0.2		2.0	0.2
Unifacially retouched flake	N	2	9	13	1	-	25
	Col %	0.6	1.0	0.7	0.5		0.8
Utilized only flake	N	26	55	112	20	4	217
	Col %	7.2	6.1	6.4	10.3	8.2	6.7
Indeterminate	N	-	-	4	-	-	4
	Col %			0.2			0.1
Conchoidal flake	N	293	745	1,464	145	35	2,682
	Col %	80.9	83.0	83.5	74.4	71.4	82.3
Chunk	N	15	35	61	10	2	123
	Col %	4.1	3.9	3.5	5.1	4.1	3.8
Weathered	N	1	-	-	-	-	1
	Col %	0.3					<0.1
Total	N	362	898	1,754	195	49	3,258

Table 3-5. Cryptocrystalline industry: metric attributes of conchoidal flakes by zone, 45-DO-273.

Attribute	Statistic	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Total
Length (mm)	$\bar{x}$	11.8	12.6	13.5	14.0	18.1	13.2
	s.d.	6.4	7.4	7.6	7.2	11.4	7.5
	n	127	345	691	82	24	1,269
Width (mm)	$\bar{x}$	12.1	11.9	12.7	14.8	19.2	12.7
	s.d.	6.3	6.2	6.7	7.8	10.8	6.8
	n	129	345	707	72	24	1,277
Thickness (.1 mm)	$\bar{x}$	22.1	21.2	22.8	24.7	32.2	22.6
	s.d.	17.6	17.8	18.0	16.5	27.4	18.0
	n	220	535	1,105	118	33	2,011

Table 3-6. Cryptocrystalline industry: kinds of debitage by zone, 45-DO-273.

Kind of Debitage		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Total
Secondary	N	249	644	1,265	130	30	2,318
	Col %[1]	88.6	88.2	87.1	87.2	81.1	87.5
Primary	N	24	64	129	19	4	240
	Col %	8.5	8.8	8.9	12.8	10.8	9.1
Indeterminate	N	8	22	59	-	3	92
	Col %	2.8	3.0	4.1		8.1	3.5
Subtotal	N	281	730	1,453	149	37	2,650
<1/4-in flakes	N	27	50	72	6	-	155
Total	N	308	780	1,525	155	37	2,805

[1] Percent of subtotal.

objects without striking platforms or bulbs of percussion that are detached from a block of raw material where it has cracked along weakness planes. **Secondary debitage** includes all flakes without cortex that are not resharpening flakes. This debitage is subdivided into flakes greater or lesser than 1/4-inch. Flakes <1/4-inch are measured along the longest axis regardless of presence, absence, or position of striking platforms and bulb of percussion. Since **tertiary debitage**--small flakes detached mostly through pressure flaking to produce a working edge--is not identified as such in our analysis, flakes smaller than 1/4-inch are presented as a rough substitute for this category. Indeterminate flakes are included here because their numbers modify percentages of primary and secondary flakes. This group is composed of flakes so broken or sc small that presence or absence of cortex cannot be determined.

A comparison of percentage frequencies of primary and secondary detritus, including small flakes, between zones shows that the relative frequency of primary flakes decreases through time from Zone 5 to Zone 1. Conversely, the relative frequencies of secondary and less than 1/4 inch flakes increase from Zone 5 to Zone 1. These data indicate that artifacts underwent the initial stages of manufacture at the site more frequently during the earlier occupations than during the later ones. Data presented in Table 3-5, discussed above, support this interpretation because flakes tend to get smaller as the desired artifact shape is approached during the manufacturing process.

Formal types of artifacts made of quartzite raw material are shown in Table 3-7. Tabular flakes represent the largest relative frequency of all quartzite formal object types, followed by concholdal flakes and, to a much lesser degree, chunks. Of the formed objects, tabular knives have the highest relative frequency, followed by choppers and hammerstones. The presence of tabular knifes and tabular flakes is expected because quartzite fractures along parallel bedding planes rather than concholdally. However, bifaces, choppers, and drills made from quartzite are rare in the project area.

Table 3-7. Quartzite industry: formal types by zone, 45-DO-273.

Formal Type		Zone					Total
		1	2	3	4	5	
Biface	N	-	-	1	-	-	1
	Col %			1.2			0.5
Chopper	N	-	1	1	-	1	3
	Col %		1.5	1.2		20.0	1.6
Drill	N	-	-	1	-	-	1
	Col %			1.2			0.5
Peripherally flaked cobble	N	-	1	-	-	-	1
	Col %		1.5				0.5
Tabular knife	N	2	6	4	-	1	13
	Col %	5.7	9.1	4.9		20.0	6.8
Hammerstone	N	-	1	-	-	1	2
	Col %		1.5			20.0	1.0
Conchoidal flake	N	4	11	44	1	-	60
	Col %	11.4	16.7	54.3	25.0		31.4
Tabular flake	N	26	42	27	3	2	100
	Col %	74.3	63.6	33.3	75.0	40.0	52.4
Chunk	N	3	4	3	-	-	10
	Col %	8.6	6.1	3.7			5.2
Total	N	35	66	81	4	5	191

Metric attributes of quartzite objects, shown in Table 3-8, include measurements of concholdal flakes only. Because of the small number of flakes in all but Zone 3, comparison among zones is inadvisable. It does appear, however, that flakes are smaller in the upper zones than in the lower ones.

Table 3-8. Quartzite industry: metric attributes of concholdal flakes by zone, 45-DO-273.

Attribute	Statistic	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Total
Length (mm)	$\bar{x}$	25.0	21.0	26.7	51.0		26.2
	s.d.	-	17.4	17.7	-	-	17.6
	n	1	8	36	1		46
Width (mm)	$\bar{x}$	23.5	18.1	28.6	52.0		27.1
	s.d.	7.8	12.1	18.3	-	-	17.5
	n	2	8	36	1		47
Thickness (.1 mm)	$\bar{x}$	45.5	51.3	64.9	107.0		62.1
	s.d.	23.7	57.9	57.3	-	-	55.2
	n	4	9	42	1		56

Table 3-9 presents data on primary and secondary quartzite debitage. Neither frequencies nor sizes of the various debitage types change markedly between zones. Absolute frequencies are very small for primary debitage, less than 1/4 inch flakes, and secondary debitage in Zones 4 and 5.

Table 3-9. Quartzite industry: kinds of debitage by zone, 45-DO-273.

Kind of Debitage		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Total
Secondary	N	26	39	54	3	1	123
	Col %[1]	78.8	69.6	75.0	75.0	50.0	-
Primary	N	7	16	16	1	1	41
	Col %	21.2	28.6	22.2	25.0	50.0	24.6
Indeterminate	N	-	1	2	-	-	3
	Col %		1.8	2.8			1.8
Subtotal	N	33	56	72	4	2	167
<1/4-in flakes	N	-	1	2	-	-	3
Total	N	33	57	74	4	2	170

[1] Of subtotal

Table 3-10 presents data on basalt artifacts, including both basalt and fine-grained basalt. Conchoidal flakes are present in high relative frequency, followed by chunks. Among formed and modified objects, the presence of a small number of tabular knifes is noteworthy. These implements are usually made from quartzite because of its tabular fracturing characteristic.

Table 3-10. Basalt industry: formal types by zone, 45-DO-273.

Formal Type		Zone				Total
		1	2	3	4	
Projectile point	N	1	-	-	-	1
	Col %	10.0				1.3
Chopper	N	-	4	-	-	4
	Col %		19.0			5.2
Peripherally flaked cobble	N	-	1	2	-	3
	Col %		4.8	4.8		3.9
Tabular knife	N	1	-	3	-	4
	Col %	10.0		7.1		5.2
Hammerstone	N	-	6	1	-	7
	Col %		28.6	2.4		9.1
Millingstone	N	-	-	1	-	1
	Col %			2.4		1.3
Core	N	-	-	1	-	1
	Col %			2.4		1.3
Bifacially retouched flake	N	-	-	1	-	1
	Col %			2.4		1.3
Utilized only flake	N	1	1	3	-	5
	Col %	10.0	4.8	7.1		6.5
Indeterminate	N	1	-	-	-	1
	Col %	10.0				1.3
Conchoidal flake	N	4	7	21	4	36
	Col %	40.0	33.3	50.0	100.0	46.8
Tabular flake	N	-	-	1	-	1
	Col %			2.4		1.3
Chunk	N	1	2	8	-	11
	Col %	10.0	9.5	19.0		14.3
Weathered	N	1	-	-	-	1
	Col %	10.0				1.3
Total	N	10	21	42	4	77

Table 3-11 shows the metric attributes of basalt conchoidal flakes and Table 3-12 presents the data of primary and secondary basalt detritus. In both cases, absolute numbers of objects per zone is too small to make valid comparisons. However, the relative frequency of primary flakes in the Total column is higher than it is for any other type of debitage.

Table 3-11. Basalt industry: metric attributes of conchoidal flakes by zone, 45-DO-273.

Attribute	Statistic	Zone					Total
		1	2	3	4	5	
Length (mm)	$\bar{x}$	33.7	57.0	38.6	40.0	-	40.6
	s.d.	8.5	39.0	36.0	31.5		32.1
	n	3	3	13	4		23
Width (mm)	$\bar{x}$	30.0	59.0	74.2	48.7	-	63.7
	s.d.	17.0	50.9	162.3	45.4		128.4
	n	2	2	13	4		21
Thickness (.1 mm)	$\bar{x}$	78.5	106.2	73.9	98.0	-	83.8
	s.d.	49.2	129.2	50.9	83.0		72.7
	n	4	6	17	4		31

Table 3-12. Basalt industry: kinds of debitage by zone, 45-DO-273.

Kind of Debitage		Zone				Total
		1	2	3	4	
Secondary	N	-	6	17	3	26
	Col %[1]		66.7	56.7	75.0	54.2
Primary	N	4	3	13	1	21
	Col %	80.0	33.3	43.3	25.0	43.7
Indeterminate	N	1	-	-	-	1
	Col %	20.0				2.1
Total	N	5	9	30	4	48

[1] Of subtotal

Table 3-13 presents metric attributes of objects made from all other lithic materials. Zones 4 and 5 have been combined in this table because only very few objects are in each and the two zones are part of the same component. Conchoidal flakes again occur in large numbers, followed by chunks. Most of the relatively large number of hammerstones are made of granite, as are several of the peripherally flaked cobbles.

Table 3-14 shows the metric attributes of other lithics. Variations are due to small sample size and variation in raw materials. Kinds of debitage of this group are presented in Table 3-15 for comparative purposes. Variation

Table 3-13. Other lithics[1]: formal types by zone, 45-DO-273.

Formal Type	Zone				Total
	1	2	3	4/5	
Projectile point tip	1	–	–	1	2
Biface	–	–	1	–	1
Chopper	1	1	2	–	4
Graver	–	1	–	–	1
Shaft abrader	–	1	–	–	1
Peripherally flaked cobble	–	1	3	–	4
Hammerstone	2	2	4	1	9
Linear flake	–	–	2	–	2
Resharpening flake	–	1	–	–	1
Utilized only object	–	2	2	1	5
Conchoidal flake	8	17	50	3	78
Tabular flake	–	4	1	–	5
Chunk	2	–	12	2	16
Weathered	1	–	–	–	1
Indeterminate	2	–	–	1	3
Total	17	30	77	9	133

[1] Includes obsidian, fine-grained quartzite, silicized mudstone, argillite, granitic, mudstone, scoria, very fine-grained red sandstone, and indeterminate.

Table 3-14. Other lithics: metric attributes of conchoidal flakes by zone, 45-DO-273.

Attribute	Statistic	Zone				Total
		1	2	3	4/5	
Length (mm)	$\bar{x}$	15.0	23.2	17.2	26.3	19.0
	s.d.	9.9	15.5	2.9	10.8	8.3
	n	2	9	30	3	44
Width (mm)	$\bar{x}$	9.5	20.3	17.7	29.0	18.6
	s.d.	3.5	21.2	3.9	10.0	10.8
	n	2	8	29	3	42
Thickness (.1 mm)	$\bar{x}$	22.0	47.3	41.8	39.3	41.4
	s.d.	11.5	37.8	12.1	7.6	20.5
	n	4	12	38	3	57

among zones is probably also due to small sample size and variability in raw material types.

Table 3-15. Other lithics: kinds of debitage by zone, 45-DO-273.

Kind of Debitage		Zone				Total
		1	2	3	4/5	
Secondary	N	8	16	37	2	63
	Col %[1]	80.0	80.0	63.8	40.0	67.7
Primary	N	2	2	12	3	19
	Col %	20.0	10.0	20.7	60.0	20.4
Indeterminate	N	-	2	9	-	11
	Col %		10.0	15.5		11.8
Subtotal	N	10	20	58	5	93
<1/4-in flakes	N	-	1	5	-	6
Total	N	10	21	63	5	99

[1] Of subtotal

DISCUSSION

At the beginning of the previous section, the results of a chi-square test was summarized as indicating that the relative frequencies of CCS and quartzite objects changes significantly from Zone 5 to Zone 1. Quartzite and CCS objects vary inversely, that is, CCS objects decrease from Zone 3 through Zone 1 while quartzite objects increase. We explained similar significant change at 45-OK-18 by observing that the tool makers showed an increasing preference for quartzite knives as (Jaehnig 1984a). At 45-DO-273, however, such a change is not indicated for tabular knifes, nor for any other formal object type category. This may be due to the extremely low numbers of formal type objects.

A contemplation of the category, "weathered objects," leads to an interesting observation. These objects have been rounded or smoothed by one natural agent or another. Causes of weathering include water rolling, sandblasting--erosion caused by wind-blown sand--and silt acting on objects lying on the ground. Table 3-1 lists three weathered objects, all from Zone 1. Weathered on more than one face, these objects were recovered in the matrix rather than on the surface, suggesting that they were water worn. This indication that the archaeological materials of Zone 1 are either redeposited or have been reworked by water action from the Columbia River corroborates the depositional environment interpreted for DU IV.

Table 3-16 presents a summary of the formal types of each lithic industry. The largest relative number of formed objects are made from basalt, followed by quartzite and other materials and, lastly, by CCS. A measure of diversity as expressed in a ratio of number of formal types in each group presents a different picture. CCS has the highest ratio of 0.67 (8 object types represented of 12 possible object types), followed by other materials, quartzite, and basalt with ratios of 0.50, 0.42, and 0.33, respectively. The ratio of quartzite is surprisingly high when compared to that of 45-OK-18 (Jaehnig 1984a), where only tabular knifes are made from quartzite.

Among modified objects, the largest relative number of object types is made from basalt, followed by other materials, followd by CCS, and, at a very low frequency, quartzite. Diversities are highest for CCS and basalt with ratios of 0.67 each, followed by other materials with 0.50 and quartzite with a 0.17 ratio. Only the very low ratio of quartzite is surprising. It indicates that quartzite debitage was not utilized at all.

Miscellaneous object types occur in frequencies too low for comparison. Relative frequencies of debitage are very high for quartzite and cryptocrystalline, moderately high for other materials, and lowest for basalt. In other words, a large portion of basalt objects are tools and a rather low portion of quartzite and CCS objects are tools. A chi-square test of observed versus expected numbers of debitage indicates that the differences between material types are due to causes other than chance on the 90 to 95% level of confidence.

An inspection of Table 3-16 suggests that formed and modified objects can be divided into two groups of implements: (1) large and massive objects, including choppers, peripherally flaked cobbles, hammerstones, and milling stones; and (2) the remaining, smaller, more finely made implements. A count of large implements per material types gives the following results. There are 14 large basalt implements, comprising 18.2% of all basalt objects; 14 large implements made from other materials, comprising 10.5% of all other objects; six large quartzite implements, making up 3.2% of all quartzite objects, and no large CCS implements. These large implements almost always consist of cobbles or blocks of raw material that are partially modified, while small implements are reduced much more extensively or are even produced from flakes. Raw material types, then, that include higher percentages of small, finely made implements also have to include higher percentages of debitage.

Table 3-17 summarizes metric attributes of flakes by lithic industry. Despite the large differences in absolute numbers of specimens among industries, general trends are readily apparent. CCS flakes are relatively short, narrow, and thin, followed by flakes of other materials and quartzite. Basalt flakes are longer, wider, and thicker than those of the other material types.

Sizes of flakes probably are influenced by size of raw material nodules that were brought to or collected at the site, fracturing characteristics of the materials, and the stage of the manufacturing process the flake represents. The summary of primary, secondary, and less than 1/4 inch flakes debitage presented in Table 3-18 shows that percentage frequencies of primary debitage are highest in basalt, followed by quartzite, other materials, and

Table 3-16. Summary of formal types by lithic industry, 45-DO-273.

Group	Formal Type	CGS N	CGS Col %[1]	Quartzite N	Quartzite Col %	Basalt N	Basalt Col %	Other N	Other Col %	Total N	Total Col %
Formed objects	Projectile point	9	0.3	-	-	1	1.3	-	-	10	0.3
	Projectile point base	5	0.2	-	-	-	-	-	-	5	0.1
	Projectile pint tip	4	0.1	-	-	-	-	2	1.5	6	0.2
	Biface	28	0.9	1	0.5	-	-	1	0.8	31	0.8
	Chopper	-	-	3	1.6	4	5.2	4	3.0	11	0.3
	Drill	3	0.1	1	0.5	-	-	-	-	4	0.1
	Graver	4	0.1	-	-	-	-	1	0.8	5	0.1
	Peripherally flaked cobble	-	-	1	0.5	3	3.9	4	3.0	8	0.2
	Scraper	17	0.5	-	-	-	-	-	-	17	0.5
	Shaft abrader	-	-	-	-	-	-	1	0.8	1	<0.1
	Spokeshave	1	<0.1	-	-	-	-	-	-	1	<0.1
	Tabular knife	-	-	13	6.8	4	5.2	-	-	17	0.5
	Subtotal	72	2.2	19	9.9	12	15.6	13	9.8	116	3.2
Modified objects	Hammerstone	-	-	2	1.0	7	9.1	9	6.8	18	0.5
	Millingstone	-	-	-	-	1	1.3	-	-	1	<0.1
	Linear flake (blade)	108	3.3	-	-	-	-	2	1.5	110	3.0
	Bifacially retouched object	6	0.2	-	-	1	1.3	-	-	7	0.2
	Unifacially retouched object	25	0.8	-	-	-	-	-	-	25	0.7
	Utilized only object	217	6.7	-	-	5	6.5	5	3.8	227	6.2
	Subtotal	356	10.9	2	1.0	14	18.2	16	12.0	388	10.6
Miscellaneous	Indeterminate	4	0.1	-	-	1	1.3	3	2.3	8	0.2
	Weathered object	1	<0.1	-	-	1	1.3	1	0.8	3	0.1
	Core	14	0.4	-	-	1	1.3	-	-	15	0.4
	Resharpening flake	6	0.2	-	-	-	-	1	0.8	7	0.2
	Subtotal	25	0.8	-	-	3	3.9	5	3.8	33	0.9
Debitage	Conchoidal flake	2,682	82.3	60	31.4	36	46.8	78	58.6	2,856	78.1
	Tabular flake	-	-	100	52.3	1	1.3	5	3.8	106	2.9
	Chunk	123	3.8	10	5.2	11	14.3	16	12.0	160	4.4
	Subtotal	2,805	86.1	170	89.0	48	62.3	99	77.7	3,122	85.3
Total		3,258		191		77		133		3,659	

[1] Of total

CCS. This seems to indicate that the site was used as a source for basalt raw materials which were trimmed down early in the manufacturing process. However, the relative high frequency of basalt implements indicates that the entire manufacturing process took place at the site. Quartzite,is also available at the site. Since quartzite has the highest percentage of debitage (Table 3-16) but a higher percentage of secondary debitage than basalt, it is suggested that the quartzite implements were more extensively reduced than the basalt implements.

Table 3-17. Summary of metric attributes by lithic industry, 45-DO-273.

Attribute	Statistic	CCS	Quartzite	Basalt	Other	Total
Length (mm)	$\bar{x}$	13.2	26.2	40.6	19.0	14.3
	s.d.	7.5	17.6	32.1	8.3	10.2
	n	1,269	46	23	44	1,380
Width (mm)	$\bar{x}$	12.7	27.1	63.7	18.6	14.1
	s.d.	6.8	17.5	128.4	10.8	18.5
	n	1,277	47	21	42	1,387
Thickness (.1 mm)	$\bar{x}$	2.26	6.21	8.38	4.14	2.50
	s.d.	1.80	5.52	7.27	2.05	2.43
	n	2,011	56	31	57	2,155

Table 3-18. Summary of kinds of debitage by lithic industry, 45-DO-273.

Kind of Debitage		CCS	Quartzite	Basalt	Other	Total
Primary flakes and chunks	N	240	41	21	19	321
	Col %	8.8	24.6	44.7	21.6	10.6
Secondary flakes	N	2,318	123	26	63	2,530
	Col %	85.4	73.7	55.3	71.6	83.9
<1/4-in flakes	N	155	3	-	6	164
	Col %	5.7	1.8	-	6.8	5.4
Total	N	2,713	167	47	88	3,015

CCS materials, probably were not available at the site. The relatively low frequency of primary debitage suggests much of the initial reduction took place elsewhere, probably at the source site for the material. The relatively high frequency of debitage, moreover, indicates that extensive secondary reduction took place. Finally, the <1/4-inch and resharpening flakes show that tertiary reduction and resharpening of tools was also done.

In summary, it appears that local materials went through the complete manufacturing process, from initial reduction to the last stage of finishing. The basalt objects, for the most part, underwent only primary reduction; none of them show any signs of tertiary reduction or resharpening. Quartzite objects frequently underwent secondary reduction, though a considerable number underwent tertiary reduction. On the other hand, CCS objects underwent primary reduction to a lesser degree than either basalt or quartzite. For these objects, secondary reduction, and, to a lesser extent, tertiary reduction, are most noteworthy. These marked differences in the manufacturing process suggest that CCS objects were brought in from elsewhere.

Table 3-19, showing metric attributes of all lithic flakes by zone, is presented to highlight differences among components. This table indicates that the length of flakes decreased from Zone 4/5 to Zone 1. A similar decrease is seen in both width and thickness, except here the trends stop at Zone 2. These size decreases are particularly noteworthy because they parallel decreases in the relative frequency of CCS (see Table 3-3). This material type, moreover, yielded the smallest flakes (see Table 3-17). The decrease in size through time can therefore not be attributed to a change in raw material types. It is suggested that the flake size data reflect a technological change through time.

Table 3-19. Total lithics: metric attributes of conchoidal flakes by zone, 45-DO-273.

Attribute	Statistic	Zone				Total
		1	2	3	4/5	
Length (mm)	$\bar{x}$	12.5	13.4	14.7	16.4	14.3
	s.d.	7.3	9.8	10.5	11.4	10.2
	n	133	365	770	114	1,380
Width (mm)	$\bar{x}$	12.5	12.4	14.6	16.3	14.1
	s.d.	6.9	8.4	23.1	12.4	18.5
	n	135	363	785	114	1,387
Thickness (.1 mm)	$\bar{x}$	23.5	23.2	25.6	29.0	25.0
	s.d.	20.0	25.5	24.2	25.7	24.3
	n	232	562	202	159	2,155

FUNCTIONAL ANALYSIS

Functional analysis of artifacts from site 45-DO-273 involves two kinds of dimensions--those that are object specific and those that are specific to individual areas of wear (Appendix B, Table B-2). The first includes three dimensions: (1) **utilization/modification**; (2) **type of manufacture**; and (3) **manufacture disposition** (whether manufacture covers the entire artifact or only part of it). Seven dimensions describe individual wear areas on objects: (1) **condition of wear** (whether worn areas on broken objects is complete or partial); (2) **wear/manufacture relationship**; (3) **kind of wear**; (4) **location of**

wear on the object; (5) **shape of worn area**; (6) **orientation of wear**, and (7) **object angle**.

Of the object specific dimensions, only utilization/modification and type of manufacture data are used in the following section. Table 3-20 shows the relationship between presence of wear/manufacture and type of manufacture for formed objects. In our analyses, **manufacture** has been defined strictly as the shaping of an object for a specific function. All formed objects exhibiting manufacture are either chipped or of indeterminate manufacture (Table 3-20). Several of the implements that we are terming "formal objects" here do not actually exhibit manufacture. Instead, flakes with shapes required for specific tasks were utilized for chopping, drilling, scoring, and scraping. The shaft abrader was formed by an undetermined type of manufacture, though it is readily apparent that it was not formed by chipping (Plate 3-1;a).

Table 3-21 presents the same information for modified objects other than formed objects. This table includes two kinds of objects: those defined on the basis of wear, like hammerstones, and retouched and utilized objects; and those defined on the basis of form, such as linear flakes, cores, and resharpening flakes. Nearly one third of the modified objects exhibit neither wear nor manufacture.

Only slightly more than 11% of the modified objects have been manufactured. Utilized only objects and linear flakes make up most of the nonmanufactured objects. Implements of indeterminate formal type exhibit manufacture of indeterminate type. All remaining objects are flaked; no other manufacturing type occurs. It should be noted that most of the nonmanufactured implements, such as linear flakes, cores, and utilized only objects were produced by flaking. Hammerstones, on the other hand, are typically cobbles unmodified by manufacture.

In the tool specific analysis, each wear area on an object is treated separately. A pointed biface, for example, might have wear areas on its point and on one or more of its edges. If this wear is continuous from the point along the edge, it is treated as one wear area. If, however, wear areas are separated by an unworn stretch of edge, they are treated separately.

Table 3-22 shows numbers of wear areas on objects by formal category for formed objects. Ratios represent the average number of wear areas per object for each type. Scrapers have the largest average ratio, followed by drills, gravers, tabular knives, projectile points, projectile point tips, and spokeshaves. All of these object types average at least one wear area per object. The remaining formed objects exhibit fewer than one wear area per implement, but the ratio is misleading for the shaft abrader. Although this implement has no wear attribute like crushing, chipping, or smoothing, it does exhibit at least four separate grooves that could also be interpreted as wear areas (see Plate 3-1;a).

Comparing total ratios per zone indicates that the number of wear areas per object increases from Zone 4/5 to Zone 2, and then declines in Zone 1. A chi-square statistical manipulation shows that the differences between all zones are due to causes other than chance on the 90% level of confidence. A similar test between Zones 4/5 through 2 increase the level of confidence to

Table 3-20. Wear/manufacture and type of manufacture of formed objects by zone, 45-DO-273.

Formal Type	Wear/ Manufacture[1]	Type of Manufacture[2]	Zone				Total
			1	2	3	4/5	
Projectile point	3	2	2	-	1	3	6
	4	2	-	1	3	-	4
Projectile point base	3	2	1	-	3	-	4
	4	2	-	1	-	-	1
Projectile point tip	3	2	1	-	1	1	3
	4	2	2	1	-	-	3
Biface	3	2	2	4	5	5	16
	4	2	1	4	7	3	15
Chopper	2	1	1	1	-	-	2
	3	2	-	3	1	1	5
	4	2	-	2	1	-	3
	5	2	-	-	1	-	1
Drill	2	1	-	-	2	2	4
Graver	2	1	-	1	1	1	3
	4	2	-	1	1	-	2
Peripherally flaked cobble	3	2	-	-	2	-	2
	4	2	-	1	3	-	4
	5	2	-	2	-	-	2
Scraper	2	1	1	-	1	-	2
	4	2	2	6	6	1	15
Shaft abrader	5	9	-	1	-	-	1
Spokeshave	4	2	-	-	1	-	1
Tabular knife	2	1	-	1	4	-	5
	3	2	-	1	-	-	1
	4	2	3	4	3	1	11
Total			16	35	47	18	116

[1] Wear/manufacture:
2. Wear only
3. Manufacture only
4. Wear and manufacture
5. Indeterminate

[2] Type of Manufacture:
1. None
2. Chipping
9. Indeterminate

Table 3-21. Wear/manufacture and type of manufacture of modified objects by zone, 45-DO-273.

Formal Type	Wear/ Manufacture[1]	Type of Manufacture[2]	Zone 1	Zone 2	Zone 3	Zone 4/5	Total
Hammerstone	2	1	2	8	4	2	16
	4	2	–	1	1	–	2
Millingstone	3	2	–	–	1	–	1
Linear flake (blade)	1	1	10	34	53	10	107
	2	1	1	–	2	–	3
Bifacially retouched object	3	2	–	–	1	–	1
	4	2	2	–	3	1	6
Unifacially retouched object	3	2	–	–	3	–	3
	4	2	2	9	10	1	22
Utilized object	2	1	27	58	117	25	227
Indeterminate formal type	5	9	2	–	2	–	4
	6	9	–	–	2	–	2
Resharpening flake	3	2	–	1	–	–	1
	4	2	–	1	5	–	6
Core	1	1	2	–	10	1	13
	2	1	–	1	1	–	2
Total			48	113	215	40	416

[1] Wear/manufacture:
1. None
2. Wear only
3. Manufacture only
4. Wear and manufacture

[2] Type of Manufacture:
1. None
2. Chipping

95%. Therefore, it is suggested that use of formed objects increased from the earliest component, Zone 4/5, to the latest _in situ_ component, Zone 2.

Table 3-23 presents the same data for modified objects other than formed objects. The ratios here clearly show a difference between formal types defined on the basis of wear areas (hammerstones and utilized only objects) with average ratios of over 1.4, and formal types defined on the basis of form only (linear flakes and cores) with ratios of 0.5 or less. Peripherally flaked cobbles. retouched objects and resharpening flakes have intermediate ratios. One millingstone exhibits no wear areas: though shaped for use, it evidently was never used.

KEY

Master Number:
Morphological Type:
Tool:
Provenience/Level:
Zone:
Material:

a.	b.	
301	221	
Shaft abrader	Netsinker	
1S17W/30	1S14W	
2	3	
Scoria	Basalt	

c.	d.	e.
449	292	339
Hammerstone	Hammerstone	Chopper
0N18W/40	1N19W/70	0N28W/160
2	3	5
Basalt	Granite	Quartzite

Plate 3-1. Shaft abrader, hammerstones, netsinker, and chopper, 45-DO-273.

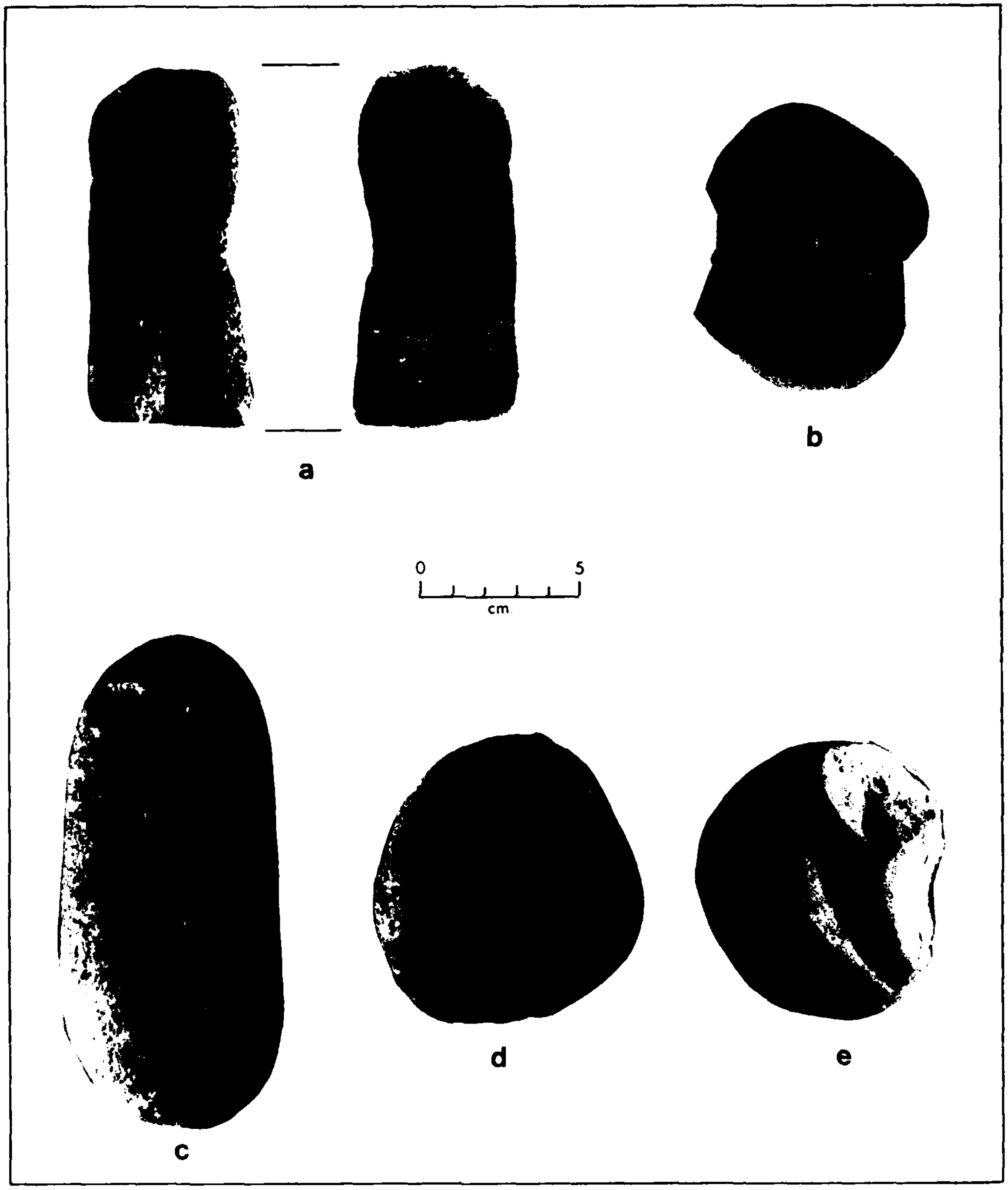

a
b
0
5
cm.
c
d
e

Table 3-22. Ratio of wear areas to objects for formed objects, 45-DO-273.

Formal Type	Number of Wear Areas per Object	Zone 1		Zone 2		Zone 3		Zone 4/5		Total
		Object Count	Wear Areas/Object	Object Count	Wear Areas/Object	Object Count	Wear Areas/Object	Object Count	Wear Areas/Object	Wear Areas/Object
Projectile point	-	2	0/2	-	3/1	1	8/4	3	0/3	11/10
	1	-	(0.00)	-	(3.00)	1	(2.00)	-	(0.00)	(1.10)
	2	-		-		1		-		
	3	-		1		-		-		
	5	-		-		1				
Projectile point base	-	1	0/1	-	1/1	3	0/3	-	-	1/5
	1	-	(0.00)	1	(1.00)	-	(0.00)	-		(0.20)
Projectile point tip	-	1	3/3	-	3/1	1	0/1	1	0/1	6/6
	1	1	(1.00)	-	(3.00)	-	(0.00)	-	(0.00)	(1.00)
	2	1		-		-		-		
	3	-		1		-		-		
Biface	-	2	1/3	4	9/8	5	9/12	5	4/8	23/31
	1	1	(0.33)	2	(1.13)	5	(0.75)	2	(0.50)	(0.74)
	2	-		1		2		1		
	5	-		1		-		-		
Chopper	-	-	1/1	3	6/6	2	1/3	1	0/1	8/11
	1	1	(1.00)	1	(1.00)	1	(0.33)	-	(0.00)	(0.73)
	2	-		1		-		-		
	3	-		1		-		-		
Drill	-	-	-	-	-	-	2/2	-	4/2	6/4
	1	-		-		2	(1.00)		(2.00)	(1.50)
	2	-		-		-		2		
Graver	-	-	-	-	2/2	-	3/2	-	1/1	6/5
	1	-		2	(1.00)	1	(1.50)	1	(1.00)	(1.20)
	2	-		-		1		-		
Scraper	-	-	12/3	-	19/6	-	21/7	-	3/1	55/77
	1	-	(4.00)	2	(3.33)	2	(3.00)	-	(3.00)	(3.24)
	2	-		-		1		-		
	3	-		2		3		1		
	4	3		1		-		-		
	7	-		1		-		-		
	8	-		-		1		-		
Shaft abrader	-	-	-	1	0/1 (0.00)	-	-	-	-	0/1 (0.00)
Spokeshave	-	-	-	-	1/1	-	-	-	-	1/1
	1	-		1	(0.00)	-		-		(1.00)
Tabular knife	-	-	3/3	1	7/6	-	9/7	-	1/1	20/17
	1	3	(1.00)	3	(1.17)	6	(1.29)	1	(1.00)	(1.18)
	2	-		2		-		-		
	3	-		-		1		-		
Total Ratios			20/16 (1.25)		51/33 (1.55)		53/41 (1.29)		13/18 (0.72)	137/108 (1.27)

Table 3-23. Ratio of wear areas to objects for modified objects, 45-DO-273.

Formal Type	Number of Wear Areas per Object	Zone 1		Zone 2		Zone 3		Zone 4/5		Total
		Object Count	Wear Areas/Object	Object Count	Wear Areas/Object	Object Count	Wear Areas/Object	Object Count	Wear Areas/Object	Wear Areas/Object
Hammerstone	-	-	3/2	-	16/9	-	8/5	-	4/2	31/18
	1	1	(1.50)	3	(1.78)	2	(1.60)	-	(2.00)	(1.72)
	2	1		5		3		2		
	3	-		1		-		-		
Millingstone	-	-	-	-	-	1	0/1	-	-	0/1
							(0.00)			(0.00)
Peripherally flaked cobble	-	-	-	2	2/3	2	6/5	-	-	8/8
	1	-		-	(0.67)	1	(1.20)	-		(1.00)
	2	-		1		1		-		
	3	-		-		1		-		
Indeterminate	-	2	0/2	-	-	2	2/4	-	-	2/6
	1	-	(0.00)	-		2	(0.50)	-		(0.33)
Large linear flake	-	-	3/1	2	0/2	2	0/2	1	0/1	3/6
	3	1	(3.00)	-	(0.00)	-	(0.00)	-	(0.00)	(0.50)
Small linear flake	-	10	0/10	32	0/32	51	2/53	9	0/9	2/104
	1	-	(0.00)	-	(0.00)	2	(0.04)	-	(0.00)	(0.02)
Core	-	2	0/2	-	1/1	10	1/11	1	0/1	2/15
	1	-	(0.00)	1	(1.00)	1	(0.09)	-	(0.00)	(0.13)
Resharpening flake	-	-	-	1	2/2	-	5/5	-	-	7/7
	1	-		-	(1.00)	5	(1.00)	-		(1.00)
	2	-		1		-		-		
Bifacially retouched object	-	-	2/2	-	-	1	4/4	-	3/1	9/7
	1	2	(1.00)	-		2	(1.00)	-	(3.00)	(1.29)
	2	-		-		1		-		
	3	-		-		-		1		
Unifacially retouched object	-	-	2/2	-	13/9	3	15/13	-	3/1	33/25
	1	2	(1.00)	5	(1.44)	6	(1.15)	-	(3.00)	(1.32)
	2	-		4		3		-		
	3	-		-		1		1		
Utilized only object	1	16	43/27	42	79/58	84	168/117	15	42/25	332/227
	2	7	(1.59)	12	(1.36)	21	(1.44)	7	(1.68)	(1.46)
	3	3		3		8		2		
	4	1		1		3		-		
	6	-		-		1		-		
	7	-		-		-		1		
Total Ratios			53/48		113/116		211/220		52/40	429/424
			(1.10)		(0.97)		(0.96)		(1.30)	(1.01)

The ratios of wear areas to objects tend to decrease from Zone 4/5 through Zone 2, and then increase again. A chi-square test indicates that that differences may be due to causes other than chance only on the 75% level of confidence. Deleting Zone 1, the level of confidence rises to almost 90%. Therefore, it may be inferred that the different ratios are probably significant for the lower three zones. If this is correct, it would appear that use of modified and formed objects varied inversely from Zone 4/5 through Zone 2.

Table 3-24 summarizes kind of wear, shape of worn area, and edge angle groups. Percentage frequencies are not given because absolute numbers are small, particularly for zonal totals of each object type. The following discussion will center on each object type in order of presentation on the table. It should be noted that if a bifacially retouched object has wear on only one face, the location will be expressed as "unifacial edge". Conversely, a unifacially retouched object may exhibit wear on both manufactured and unmanufactured sides. This will be expressed as "bifacial edge" wear. Wear listed as "edge only" is on the very edge of the object; it does not extend up either side. In the dimension "shape of worn area", areas listed as "abruptly convex" and "slightly convex" are lumped under "convex". The same is done for concave shapes. Areas of wear extending over a combination of convex, straight, and/or concave areas are called "irregular". Edge angles have been grouped into groups of 30 degrees each. This arbitrary division is meant to simplify the data; it does not result from discovery of natural groupings or modes in 5 degree interval edge angle measurements.

PROJECTILE POINTS

Wear data for projectile points identified during functional analysis are presented in Table 3-24. For present purposes, the table combines the formal types "projectile point", "base", and "tip". This increases the number of wear areas to 18, a small number indeed.

Kinds of wear on projectile points include smoothing, feathered chipping, hinged chipping, and combinations of these types of chipping with smoothing. Smoothing, alone and in combination with chipping, is surprisingly frequent for objects supposedly used as tips of projectiles, possibly the result of quiver induced wear. **Smoothing** is defined as reduction that results in an area smooth to the touch and with no striations or gloss. Areas of smoothing are not confined to sides of points; they occur on tips as well as as edges. Smoothing occurs on one-third of the projectile point wear areas.

Both feathered and hinged chipping are noted. **Feathered chipping** is defined as flake scars that show detachment of whole flakes without breakage. **Hinged chipping** consists of flake scars with step or hinge fractures, indicating that the flake broke off the object. The two types of chipping occur in equal frequencies in just over one third of the assemblage.

Table 3-24. Summary of kind of wear, location of wear, and grouped edge angle for formed objects, 45-DO-273.

Formal Type and Wear Variables	Zone				Total
	1	2	3	4/5	
Graver					
Kind of Wear					
Smoothing	-	1	-	-	1
Feathered chipping	-	1	-	-	1
Feathered chipping/smoothing	-	-	1	-	1
Hinged chipping	-	-	2	1	3
Location of Wear					
Unifacial edge	-	-	1	-	1
Point only	-	1	1	-	2
Point and unifacial edge	-	-	1	-	1
Point and two edges	-	1	-	1	2
Grouped Ege Angle					
31-60 degrees	-	2	1	1	4
>60 degrees	-	-	2	-	2
Total	-	2	3	1	6
Peripherally flaked cobble					
Kind of Wear					
Smoothing	-	-	2	-	2
Crushing/pecking	-	2	4	-	6
Location of Wear					
Edge only	-	2	3	-	5
Bifacial edge	-	-	3	-	3
Grouped Edge Angle					
31-60 degrees	-	-	2	-	2
>60 degrees	-	2	4	-	6
Total	-	2	6	-	8
Scraper					
Kind of Wear					
Feathered chipping	6	13	7	-	26
Feathered chipping/smoothing	-	-	2	-	2
Hinged chipping	6	5	13	3	27
Hinged chipping/smoothing	-	1	-	-	1
Location of Wear					
Unifacial edge	11	17	19	3	50
Bifacial edge	1	1	3	-	5
Point and two edges	-	1	-	-	1
Grouped Edge Angle					
1-30 degrees	-	1	3	-	4
31-60 degrees	10	15	11	3	39
>60 degrees	2	3	8	-	13
Total	12	19	22	3	56
Tabular knife					
Kind of Wear					
Smoothing	3	5	8	1	17
Crushing/pecking	-	2	1	-	3
Location of Wear					
Edge only	3	7	6	1	17
Unifacial edge	-	-	1	-	1
Bifacial edge	-	-	1	-	1
Terminal surface	-	-	1	-	1
Grouped Edge Angle					
1-30 degrees	3	3	1	-	7
31-60 degrees	-	1	3	1	5
>60 degrees	-	3	4	-	7
Surface	-	-	1	-	1
Total	3	7	9	1	20

Table 3-24. Cont'd.

Formal Type and Wear Variables	Zone				Total
	1	2	3	4/5	
Projectile point					
Kind of Wear					
Smoothing	1	1	2	-	4
Feathered chipping	1	1	4	-	6
Feathered chipping/smoothing	-	-	1	-	1
Hinged chipping	-	5	1	-	6
Hinged chipping/smoothing	1	-	-	-	1
Location of Wear					
Unifacial edge	1	6	5	-	12
Bifacial edge	1	1	2	-	4
Point only	1	-	-	-	1
Point and two edges	-	-	1	-	1
Grouped Edge Angle					
1-30 degrees	1	-	-	-	1
31-60 degrees	2	6	7	-	15
>60 degrees	-	1	1	-	2
Total	3	7	8	-	18
Biface					
Kind of Wear					
Smoothing	-	-	1	-	1
Feathered chipping	-	2	3	3	8
Feathered chipping/smoothing	-	1	2	-	3
Hinged chipping	1	3	2	-	6
Hinged chipping/smoothing	-	3	1	1	5
Location of Wear					
Unifacial edge	-	6	5	2	13
Bifacial edge	1	3	4	2	10
Grouped Edge Angle					
1-30 degrees	-	-	1	-	1
31-60 degrees	1	4	7	2	14
>60 degrees	-	5	1	2	8
Total	1	9	9	4	23
Chopper					
Kind of Wear					
Crushing/pecking	1	-	-	-	1
Feathered chipping/smoothing	-	-	1	-	1
Hinged chipping/smoothing	-	5	-	-	5
Hinged chipping/crushing	-	1	-	-	1
Location of Wear					
Unifacial edge	-	-	1	-	1
Bifacial edge	1	6	-	-	7
Grouped Edge Angle					
31-60 degrees	1	1	-	-	2
>60 degrees	-	5	1	-	6
Total	1	6	1	-	8
Drill					
Kind of Wear					
Polishing	-	-	1	-	1
Feathered chipping	-	-	1	1	2
Hinged chipping	-	-	-	3	3
Location of Wear					
Unifacial edge	-	-	-	2	2
Point only	-	-	1	-	1
Point and two edges	-	-	1	2	3
Grouped Edge Angle					
1-30 degrees	-	-	1	-	1
31-60 degrees	-	-	1	3	4
Indeterminate	-	-	-	1	1
Total	-	-	2	4	6

Comparisons of kinds of wear among zones is not possible because of the small number of wear areas per zone. However, it is interesting to note that none of the points from Zone 4/5 exhibit wear other than the breakage observed on one specimen.

Locations of wear include unifacial edges, bifacial edges, and point only and point and two edges in one case each. Two-thirds of the wear areas are located on unifacial edges, suggesting that the projectile points were used for scraping.

Grouped edge angles of wear areas include all groups but surfaces. However, over 83% of wear occurs on areas with edge angles between 31 and 60 degrees. The grouped edge angle frequencies, as well as frequencies of kinds of wear and location of wear, are similar to those on scrapers, presented below. It is suggested, then, that projectile points were frequently used for scraping and other tasks performed by scrapers, at least in zones above Zone 4/5.

Eight (61.5%) of the thirteen projectile points (see Plate 3-5, Stylistic Analysis) are broken. Three have broken tips (Plate 3-5;c, h, and l); four have broken blades (Plate 3-5;b, f, k, and m); and two have broken bases (Plate 3-5;d and j). One of the latter was broken during manufacture as indicated by the disposition of the flake scars and is not analyzed.

Two of the broken points have been reworked (Plate 3-5;c and f). The breaks on all other specimens are either diagonal or slightly diagonal to the central axis of each object. Assuming that impact fractures produce transverse breaks, it is likely that the blades and bases were broken when the points were used as tips of projectiles.

BIFACES

Bifaces wear patterns also are summarized in Table 3-24. Several examples are illustrated in Plate 3-2;a-f. Bifaces show all types of wear seen on projectile points, albeit in different frequencies. Only one of 23 wear areas exhibits smoothing only, but over one-third of the areas have smoothing in combination with chipping. Feathered chipping and hinged chipping, alone and in combination with smoothing, are each seen on almost one half of the examples.

Location of wear includes unifacial and bifacial edges. Unifacial edge wear is present on just over half of the wear areas, while bifacial edge wear comprises the remaining examples. The high frequency of unifacial wear is unexpected if the formal type "biface" is viewed as a cutting implement. Grouped edge angles include all three groups, but slightly over 60% fall in the 31 to 60 degree group. This frequency seems high, but many of the bifaces are quite crude, as seen in Plate 3-2.

KEY

Master Number:
Morphological Type:
Tool:
Provenience/Level:
Zone:
Material:

a.
466
Biface
6N18W/20
1
CCS

b.
456
Biface
4N19W/20
2
CCS

c.
251
Biface
0N13W/60
3
CCS

d.
275
Biface
0N16W/50
3
CCS

e.
450
Biface
1N19W/100
4
CCS

f.
463
Biface
3N19W/110
4
CCS

g.
226
Scraper
2S13W/10
1
CCS

h.
474
Scraper
6N17W/40
2
CCS

i.
241
Scraper
3S13W/40
2
CCS

j.
82
Scraper
3S24W/30
2
CCS

k.
166
Scraper
4S23W/60
2
CCS

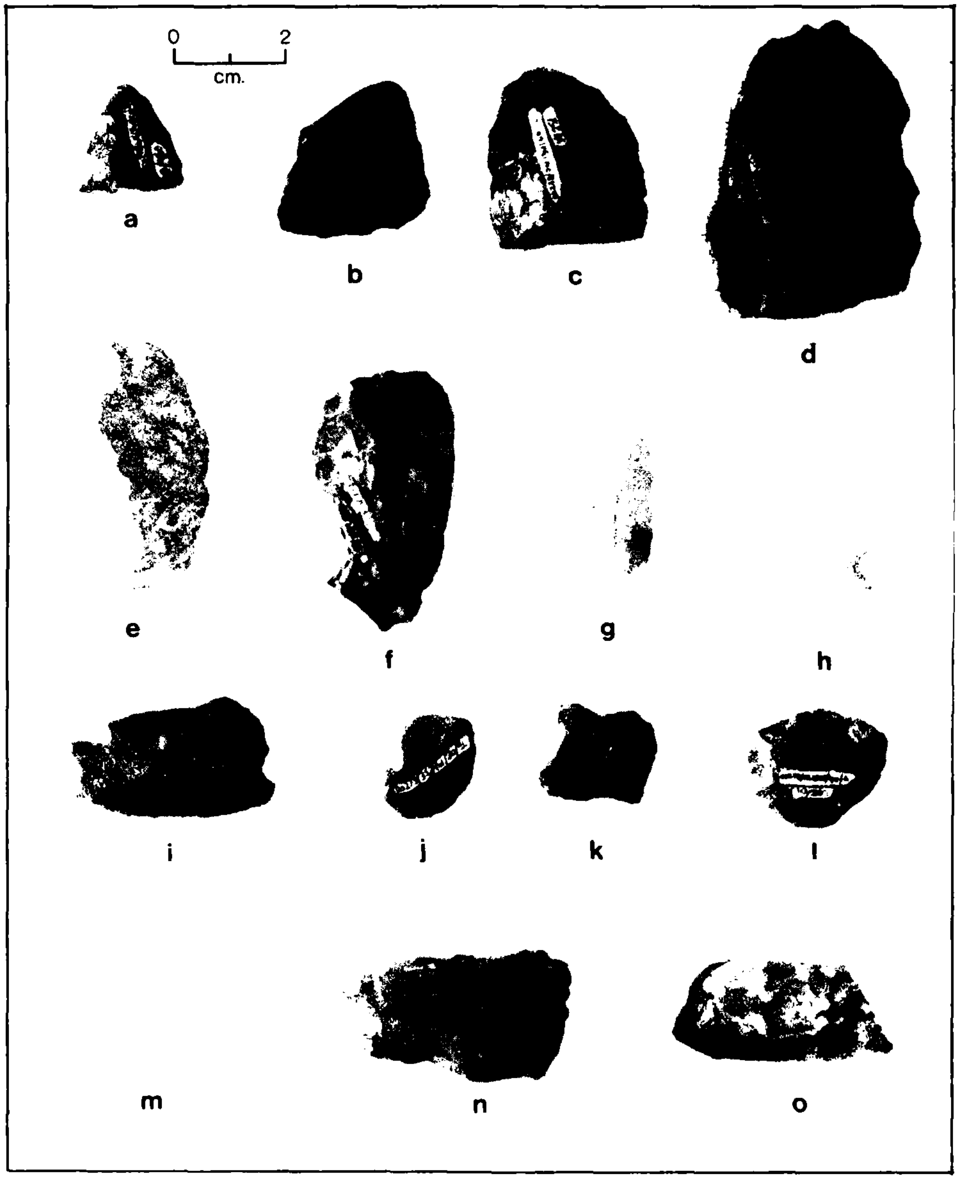
l.
263
Scraper
1S13W/40
3
CCS

m.
120
Scraper
4S25W/80
3
CCS

n.
210
Scraper
5S23W/90
3
CCS

o.
148
Scraper
5S25W/120
4
CCS

Plate 3-2. Bifaces and scrapers, 45-DO-273.


0
2
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g
h
i
j
k
l
m
n
o

CHOPPERS

Wear for choppers is presented in Table 3-24 also. A quartzite chopper is illustrated in Plate 3-1;e. It is flaked unifacially. One of the eight wear areas on choppers consists of crushing and pecking, one shows feathered chipping and smoothing, and another exhibits feathered chipping and crushing. The remaining five wear areas show hinged chipping and smoothing. The **crushing/pecking** category is defined by the presence of at least three pits in close proximity on a surface; if this type of wear is identified on an edge, crushed crystals must be visible. Crushing/pecking and hinged chipping are expected on choppers, but the presence of smoothing, and the high frequency of smoothing in combination with hinged chipping, indicate that choppers were utilized for other tasks in addition to chopping.

Wear occurs on both unifacial and bifacial edges of choppers, though the latter show the most wear (almost 90%). Interestingly, the single occurrence of feather chipping with smoothing occurs on a unifacial edge, suggesting that this implement was used for scraping. The remaining wear areas indicate that the implements probably were used for chopping and, in five instances, for scraping also. One quarter of the wear occurs on edge angles between 31 and 60 degrees and the remaining three quarters are on edge angles over 60 degrees.

Small numbers of wear areas on choppers per zone preclude valid comparisons. However, it is interesting to note that choppers, although present (see Table 3-22), were not used in Zone 4/5 and were used sparingly in Zone 3. The single example of a chopper with unifacial feathered chipping and smoothing is from Zone 3. Only Zones 2 and 1 yielded implements used for chopping.

DRILLS

Wear on drills is also shown in Table 3-24. Two examples are illustrated in Plate 3-3;a and b. Kinds of wear include polishing, feathered chipping, and hinged chipping. These types of wear reflect use of the implement on materials of different hardness; implements with polishing were used on soft materials and implements with hinged chipping were used on hard materials.

Location of wear falls into three categories, including unifacial edge, point only, and point and two edges. The breakdown per object of these wear areas is of interest. Point only wear occurs on one drill, as does point and two edges wear. The unifacial edge wear and the point and two edge wear occur on both drills.

Edge angles fall into groups of 1 to 30 degrees and 31 to 60 degrees, and cannot be determined for one wear area. The drill with the smoothed point is in the 31 to 60 degree groups.

GRAVERS

Gravers are illustrated in Plate 3-3;c and d. One implement (Plate 3-3;c) exhibits two gravers, including one that is well-worn. Data for gravers are presented in Table 3-24. Kinds of wear include smoothing, feathered chipping, feathered chipping with smoothing and, on half of the wear areas, hinged chipping. Wear is located on a unifacial edge, point only, point and unifacial edge, and point and two edges. Edge angles fall into groups of 31 to 60 degrees and over 60 degrees. These data will be used for comparative purposes with information from modified ojects.

PERIPHERALLY FLAKED COBBLES

Peripherally flaked objects, that is, fist-sized to boulder-sized rocks that have been flaked around the edges, are found in a number of sites in the project area. Although their function is unknown, it is hoped that sufficient data can be gathered to postulate uses. One of the smallest from 45-DO-273 (Plate 3-1;b) is actually a netsinker.

Functional data available for peripherally flaked cobbles from the site are shown in Table 3-24. One quarter of the wear areas consist of smoothing and the other three quarters show crushing and/or pecking. Over half of the wear is located on edges only and the remainder is situated on bifacial edges. One-fourth of the wear areas occur on edges with angles between 31 and 60 degrees, and three quarters are on edges with angles greater than 60 degrees.

Wear area data suggest that the peripherally flaked cobbles may have been used for scraping soft materials and for hammering. Other sites in the project area yielded even larger peripherally flaked cobbles, so it is hoped by closer scrutiny of these cobbles, some more precise judgement of their function can be made.

SCRAPERS

Wear for scrapers are also shown in Table 3-24. Just over one half of these implements are illustrated in Plate 3-2;g-o. Note that several scrapers (Plate 3-2;l, k, and n) exhibit wear on a concave edge, suggesting that they were used as spokeshaves. An object classifified as a spokeshave is included in the following discussion because all other spokeshave wear areas are on implements classified as scrapers and a spokeshave, after all, can be viewed as a particular kind of scraper.

Wear areas on scrapers include four kinds of wear (Table 3-24). Almost one half of the areas exhibit chipped hinging, and nearly as many areas are feather chipped. A small number of each type of chipping in combination with smoothing also occurs. Almost 90% of the wear areas are located on unifacial edges, but slightly less than 10% of the wear is situated on bifacial edges. Only one wear area extends from a point along two edges. A little over two-thirds of the wear areas are on edges between 31 and 60°. Almost a quarter of the wear areas occur in the greater than 60° group, and a few others between 1 and 30°.

KEY

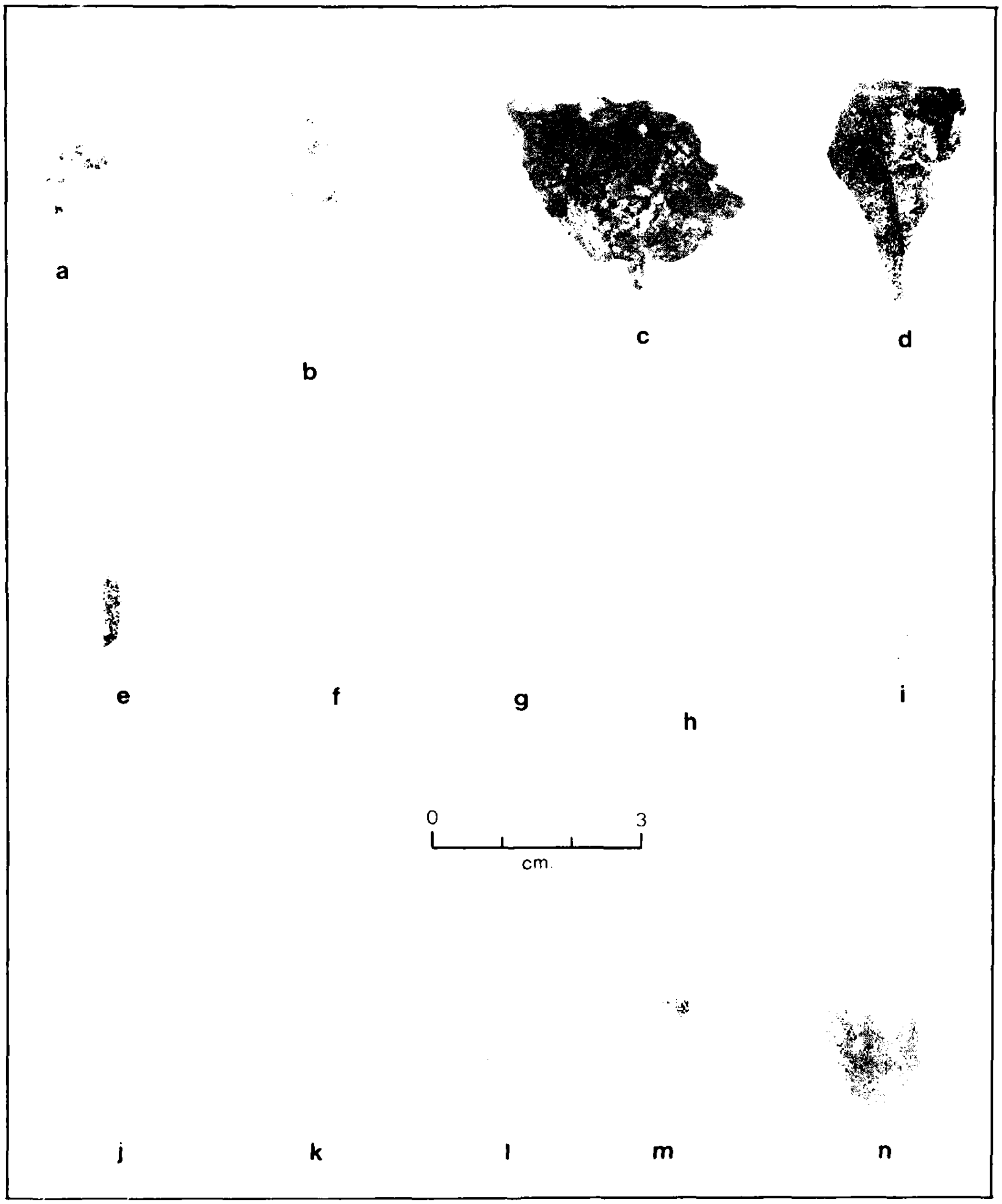
Master Number:
Morphological Type:
Tool:
Provenience/Level:
Zone:
Material:

a.	b.	c.	d.
38	535	279	482
Drill	Drill	Graver	Graver
4S19W/70	2S22W/130	1S16W/0	5N18W/50
3	4	2	3
CCS	CCS	Argillite	CCS

e.	f.	g.	h.	i.
273	431	546	117	291
Microblade	Microblade	Microblade	Microblade	Microblade
0N16W/0	1N17W/30	3S21W/50	4S25W/40	1S15W/70
1	2	2	2	3
CCS	CCS	CCS	CCS	CCS

j.	k.	l.	m.	n.
337	23	162	580	266
Microblade	Microblade	Microblade	Microblade	Microblade core
1S25W/50	4S20W/80	4S24W/110	4S28W/110	1S13W/60
3	3	3	4	3
CCS	CCS	CCS	CCS	CCS

Plate 3-3. Drills, gravers, microblades, and microblade cores, 45-DO-273.


a
b
c
d
e
f
g
h
i
0
3
cm.
j
k
l
m
n

These data show that the scrapers have been used on materials that are from medium hard to hard. Location of wear suggests that most of them were used for scraping, but several may have been used for cutting purposes, as shown by the bifacial wear. An inspection of Plate 3-2;g, h, k, and n shows that all bifacial wear is located on relatively straight edges, supporting this inference.

The information concerning wear areas on scrapers presented in Appendix B, Table B-3, shows several interesting patterns in the kinds and location of wear by grouped edge angle. Edge angle group 1 to 30° includes feathered chipping, feathered chipping and smoothing, and hinged chipping. However, only unifacial edge wear is represented on these finely edged wear areas. Small sample size of the group may be responsible for this distribution, but the data suggest that these implements were used exclusively for scraping tasks performed on a variety of materials.

Wear areas with edge angles greater than 60° exhibit hinged chipping on just over three quarters of the examples. Feathered chipping and hinged chipping with smoothing occur relatively infrequently. In comparison with wear areas on scrapers, then, hinged chipping is underrepresented and feathered chipping is overrepresented, suggesting that softer materials were scraped with steeply edged implements rather than with scrapers having medium edge angles.

Over two-thirds of the wear areas in the high edge angle group are located on unifacial edges, and almost one quarter of the wear areas in this group are on bifacial edges. The point and two edges location is also included in this group. Barring small sample size error, bifacial edge wear appears to be slightly overrepresented in this group in relation to the freqencies of all wear areas on scrapers. This suggests that these implements were used for cutting as well as scraping tasks.

TABULAR KNIVES

Wear data on the last formed object type, tabular knives, are also shown in Table 3-24. Tabular knives are illustrated in Plate 3-4. Most wear on tabular knives (85%) consists of smoothing, the remainder is crushing/pecking. Edge only wear occurs on 85% of the sample, and unifacial edge, bifacial edge, and terminal surface are also represented in small relative frequencies. Edge angles are more evenly distributed, with 35% of the cases falling into the 1 to 30° and greater than 60° groups, 25% represented in the 31 to 60° group, and 5% being on a surface.

In comparing kind of wear, location of wear, and grouped edge angle (see Appendix B, Table B-3, for data), several observations can be made. Crushing and pecking wear occur on edges only in Zone 2 and on a terminal surface in Zone 3. The former are on edge angles falling into the greater than 60° group. All but two examples of smoothing wear occur on edges only. The two exceptions, from Zone 3, occur on a unifacial and a bifacial edge. Smoothing wear is included in all of the three edge angle groups, but not in the group called "surface".

These data indicate that tabular knifes were used for two distinct functions: to scrape soft materials (the primary use) and to peck or hammer hard materials. Hammering resulted in, or was carried out with, objects that had either steep edge angles or, in one case, a terminal surface.

OTHER MODIFIED OBJECTS

Kinds of wear, location of wear, and grouped edge angle data for modified objects other than formed objects is presented in Table 3-25. All of these objects except hammerstones occur in very small numbers. Two examples of hammerstones, made of basalt and granite, are illustrated in Plate 3-1;c and d. Kind of wear on hammerstones are restricted to crushing/pecking and, one instance, smoothing. All wear occurs on terminal edges. The single example of smoothing is noteworthy because it indicates that one of these implements was used for purposes other than hammering. Moreover, the implement has two separate wear areas, one of which exhibits smoothing and the other, crushing/pecking. Thus the implement may have been used for rubbing a soft material such as hide in addition to hammering.

Among the other modified objects, linear flakes exhibit a few wear areas with feathered chipping on unifacial edges and fine to medium angles. These data suggest that they may have been used for scraping activities. Wear area data on resharpening flakes indicate that they were detached from implements used for tasks that resulted in feathered and hinged chipping wear. Two cores were used, apparently for scraping purposes.

Table 3-25 presents wear area data for worn debitage, including conchoidal flakes, tabular flakes, and chunks that have been unifacially retouched, bifacially retouched, or utilized only. The three object types have been lumped together, but the three kinds of modifications are shown separately.

Only a small number of worn areas are identified on bifacially retouched objects. These data and their percentage frequencies resemble those of bifaces (see Table 3-24), indicating that the bifacially retouched objects may have been used for similar tasks. These uses probably include both scraping and cutting of moderately hard materials.

Unifacially retouched objects exhibit higher numbers of wear areas than bifacially retouched flakes. Data presented in Table 3-25 for these objects are very similar to wear area data from scrapers, including kinds of wear, location of wear, grouped edge angles, and frequency distributions of all three groups.

It is not particularly surprising that wear areas on bifacially retouched objects are similar to those of bifaces, nor that wear areas on unifacially retouched objects are very similar to those of scrapers. After all, the difference in manufacture between bifaces and bifacially retouched objects and scrapers and unifacially retouched objects is one of degree, not kind. Often, the division between these formed objects and their modified counterparts is a subjective judgement of the analyst distinctions. Also, only complete objects were assigned to the scraper category. All fragments of scrapers would have been assigned to unifacially retouched flakes.

Table 3-25. Summary of kind of wear, location of wear, and grouped edge angle for modified objects, 45-DO-273.

Formal Type and Wear Variables	Zone				Total
	1	2	3	4/5	
Hammerstone					
Kind of Wear					
Smoothing	-	1	-	-	1
Crushing/pecking	3	15	8	4	30
Location of Wear					
Terminal surface	3	16	8	4	31
Grouped Edge Angle					
Surface	3	16	8	4	31
Total	3	16	8	4	31
Large Linear flake (blade)					
Kind of Wear					
Feathered chipping	3	-	2	-	5
Location of Wear					
Unifacial edge	3	-	2	-	5
Grouped Edge Angle					
1-30 degrees	1	-	2	-	3
31-60 degrees	2	-	-	-	2
Total	3	-	2	-	5
Indeterminate					
Kind of Wear					
Crushing/pecking	-	-	1	-	1
Location of Wear					
Point only	-	-	1	-	1
Grouped Edge Angle					
Indeterminate	-	-	1	-	1
Total	-	-	1	-	1
Resharpening flake					
Kind of Wear					
Feathered chipping	-	1	2	-	3
Hinged chipping	-	1	3	-	4
Location of Wear					
Unifacial edge	-	2	5	-	7
Grouped Edge Angle					
1-30 degrees	-	1	1	-	2
31-60 degrees	-	-	3	-	3
>60 degrees	-	1	1	-	2
Total	-	2	5	-	7
Core					
Kind of Wear					
Feathered chipping	-	-	1	-	1
Hinged chipping	-	1	-	-	1
Location of Wear					
Unifacial edge	-	1	1	-	2
Grouped Edge Angle					
31-60 degrees	-	-	1	-	1
>60 degrees	-	1	-	-	1
Total	-	1	1	-	2

Table 3-25. Cont'd.

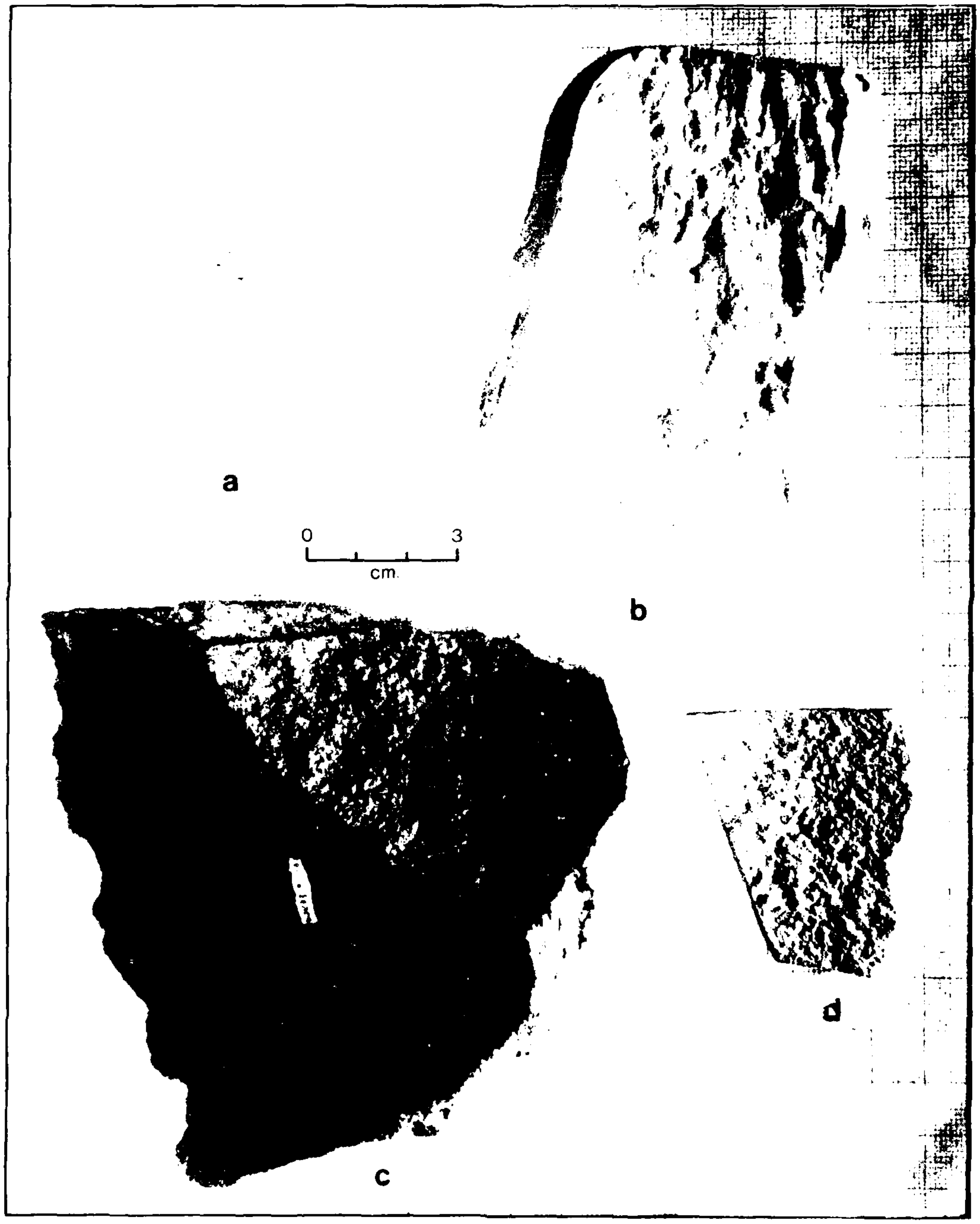
Formal Type and Wear Variables	Zone				Total
	1	2	3	4/5	
Bifacially retouched object					
Kind of Wear					
Feathered chipping	1	-	-	3	4
Hinged chipping	-	-	4	-	4
Hinged chipping/smoothing	1	-	-	-	1
Location of Wear					
Unifacial edge	1	-	3	-	4
Bifacial edge	1	-	1	3	5
Grouped Edge Angle					
1-30 degrees	-	-	-	2	2
31-60 degrees	2	-	3	1	6
>60 degrees	-	-	1	-	1
Total	2	-	4	3	9
Unifacially retouched object					
Kind of Wear					
Feathered chipping	1	6	5	1	13
Feathered chipping/smoothing	-	2	-	-	2
Hinged chipping	1	5	10	2	18
Location of Wear					
Unifacial edge	2	11	14	3	30
Bifacial edge	-	2	1	-	3
Grouped Edge Angle					
1-30 degrees	1	-	-	-	1
31-60 degrees	1	8	11	2	22
>60 degrees	-	5	4	1	10
Total	2	13	15	3	33
Utilized only object					
Kind of Wear					
Smoothing	-	-	6	1	7
Crushing/pecking	-	-	1	-	1
Feathered chipping	34	63	124	33	254
Feathered chipping/smoothing	2	-	5	3	10
Hinged chipping	7	16	31	5	59
Hinged chipping/smoothing	-	-	1	-	1
Location of Wear					
Edge only	-	1	1	1	3
Unifacial edge	36	72	151	37	296
Bifacial edge	6	6	14	4	30
Point only	1	-	2	-	3
Grouped Edge Angle					
1-30 degrees	23	36	75	27	161
31-60 degrees	17	39	70	15	141
>60 degrees	3	4	23	-	30
Total	43	79	168	42	332

KEY
Master Number:
Morphological Type:
Tool:
Provenience/Level:
Zone:
Material:

a.	b.
278	382
Tabular knife	Tabular Knife
0N15W/30	1N14W/20
2	2
Quartzite	Quartzite

c.	d.
128	338
Tabular knife	Tabular knife
5S26W/90	5S26W/90
3	3
Basalt	Quartzite

Plate 3-4. Tabular knives, 45-DO-273.


a
0
3
cm
b
c
d

Data for utilized only objects is also presented in Table 3-25. Just over three quarters of kind of wear consists of feathered chipping, and hinged chipping is present in amost one-fifth of the examples. Remaining kinds of wear include, in descending order of frequency, feathered chipping and smoothing, smoothing, hinged chipping and smoothing, and crushing.

Almost 90% of the wear areas are located on unifacial edges. The remaining wear areas are situated mostly on bifacial edges, but a few examples of edge only and point only wear are also present. Grouped edge angles include all three groups, but wear on surfaces is absent. Almost one half of all edge angles are in the 1 to 30° group, and most of the remainder are in the 31 to 60° group. Fewer than 10% of the angles are larger than 60°.

Utilized only objects comprise sightly over two-thirds of the analysed lithic assemblage of 45-DO-273. Wear areas identified on utilized only objects comprise three-fourths of all identified wear areas. These high frequencies are partially reflected in the diversity of kinds of wear, location of wear, and grouped edge angle. However, the high relative frequencies of feathered chipping and unifacial edge wear suggest that these objects were more restricted in use than we would expect from a group with such large numbers. Moreover, the combination of feathered chipping on unifacial edges is not reflected in formal types of either formed or modified objects. This indicates that utilized only tools supplemented the use of formed and modified objects. Feathered chipping points to their use on materials that were softer than those worked with scrapers and bifaces, but harder than materials worked with smoothed tabular knives. Location of wear indicates that utilized only objects may have been used for scraping activities. These scraping tasks differed from those performed with formed scarpers and unifacially retouched objects as indicated by the relatively high frequency of low edge angles.

We restricted zonal comparisons of wear area data of utilized only objects to feathered chipping and unifacial edge wear data because these types of wear occur in such high frequencies. Percentage frequency differences between zones differ very little in both cases. Both feathered chipping and unifacial edge wear were subjected to chi-square statistical tests. The differences between zones for feathered chipping could be attributed to causes other than random distribution on the 5% level of confidence. The differences between zones of unifacial edge wear could be attributed to causes other than chance on the 0.5% level of confidence. In other words, all variation between levels is statistically insignificant. Use of utilized only objects did not vary significantly through time at site 45-DO-273.

Another kind of information may also be gleaned from the wear and formal type data: the frequency of use of each formal object type on the site. Table 3-26 shows the frequencies of objects with wear area.

Used objects fall into four groups based on percentage frequencies of use. In the first group--drills, gravers, scrapers, hammerstones, and utilized objects--all specimens are worn. Although no wear areas were identified on the shaft abrader, its grooves probably resulted from use, and so we include it in this group. Hammerstones and utilized only objects, identified on the basis of wear areas, will always be in this group.

Table 3-26. Frequencies of objects with wear areas by formal type, 45-DO-273.

Formal Type	Objects N	Worn Objects N	% Worn of Object Type
Projectile points			
breakage only	13	5	38
wear areas only	21	8	42
wear areas and breakage	21	14	67
Bifaces	31	15	48
Choppers	11	5	46
Drills	4	4	100
Graver	5	5	100
Peripherally flaked cobbles	8	4	50
Scrapers and spokeshave	18	18	100
Shaft abrader	1	1*	100
Tabular knife	17	17	100
Hammerstone	18	18	100
Milling stone	1	0	0
Blades	6	1	17
Microblades	104	2	2
Bifacially retouched objects	7	6	86
Unifacially retouched objects	25	22	88
Utilized only objects	227	227	100

* shaft abrader included under worn object because of grooves

The second group of objects includes tabular knives, and bifacially and unifacially retouched objects. From 85% to 90% of them exhibit wear areas, indicating that they have been used very extensively.

Objects with intermediate wear area frequencies include projectile points, bifaces, choppers, and peripherally flaked cobbles. Percentages of these objects exhibiting wear area range from 38% to 67%. Projectile points are listed in the table three times: once for wear areas only for comparison with other objects, once for breakage, and once for both. Their wear areas indicate they were used for various purposes at the site. Their breakage patterns further suggest that they also were used in hunting. While small game may have been hunted near the site, the small number of recovered deer and elk bones suggests that larger game was hunted at some distance from the site (see Chapter 4 for faunal data). The projectile point frequency that includes both wear area and breakage data is lower than the total of both frequencies because several points had both wear areas and breaks. Although two-thirds of the implements were used, this frequency is lower than that for other implements, such as scrapers discussed above. Choppers and peripherally flaked cobbles were used at similar rates.

Linear flakes exhibit the lowest frequency of worn objects. However, all these objects have sharp edges that make them particularly serviceable as cutting tools. If they were used to cut soft materials, like meat, few, if any, wear areas would result. Perhaps the few wear areas on these implements are the result of cutting through meat onto bone. From the unifacial nature of the wear patterns, we infer that the direction of cutting was diagonal to the surface of the bone, thus resulting in wear areas suggesting scraping instead of cutting action. Absence of wear does not thus necessarily mean that the linear flakes were not used.

This caution is also to be applied to the other implements. Use of implements on materials of varying hardness result in different kinds of wear. If an implement is used on hard materials, either crushing/pecking or detachment of hinged chips will result, depending on the applied force and the direction of this force. Implements used on objects made of somewhat softer materials will exhibit feathered chipping or abrasion/grinding. If implements are used on soft materials, smoothing or polishing will result. However, if implements are used on soft materials with little force, or if they are used on very soft materials, no visible wear may result.

DISCUSSION

Despite these qualifications, a number of inferences about site function may be made. It has been argued that many implements have been used for scraping. Two kinds of scraping activities can be inferred from the data. Wide wear areas that are smoothed probably indicate implements used on soft materials, such as hides. Tabular knives exhibit a high frequency of smoothing; and most have wide wear areas. Along with other implements that could serve the same function, they were probably made to be used on soft materials, such as hides or salmon.

Scraping implements with feathered and hinged chipping may have been used for scraping materials like wood. Because woods vary in hardness, this single task could result in the two flake types. Implements with high frequencies of chipping wear on unifacial edges include scrapers, unifacially and bifacially retouched objects, utilized only objects, bifaces and projectile points. The last two object types were used for other tasks, too. All of the other implements include very high freqencies of objects with wear areas, indicating that they were made for use at the site. Moreover, scrapers, retouched objects, and utilized objects make up more than half of all implements listed in the table. This indicates that scraping was a very important task at 45-DO-273.

Crushing/pecking wear on the surfaces and edges of implements could have resulted from a number of activities: hammering of hard objects like other lithics; crushing of bone, seeds, nuts, and perhaps even freshwater shellfish; and chopping of wood. Such implements include hammerstones, peripherally flaked cobbles, tabular knifes and, in relatively low frequencies, choppers and utilized only objects. Only hammerstones appear to have been used for this purpose extensively; the other implements were occasionally used for hammering tasks.

Wear indicating hammering occurs at a frequency similar to that of scraping on soft materials. Both occurred less frequently than the scraping of hard materials. Taken together, these three detectable activities must have been of great importance to the site's occupants. Use of drills for perforating relatively soft materials and of gravers to score bones occurred sporadically. A shaft abrader was used a number of times to work on long, round objects that were probably relatively soft, as indicated by the absence of much wear. No other activities left detectable traces on the artifacts.

STYLISTIC ANALYSIS

Projectile points have been subjected to a detailed, project-wide analysis. We also consider the small linear flakes from 45-DO-273 in the light of other studies of Plateau lithics to determine if they are indeed microblades.

PROJECTILE POINTS

Two separate but conceptually related analyses are used to classify projectile points. A morphological classification is used to define descriptive types that do not directly correspond to recognized historical types. This is intended as an independent check on the temporal distribution of projectile point forms in the Rufus Woods project area and as a means to measure the distribution of formal attributes as well as point styles. An historical classification correlates these projectile points with recognized types that have discrete temporal distributions. A multivariate statistical program that compares line and angle measurements taken along the outlines of the points is used to classify the specimens. Together, these analyses allow us to (1) assess formal and temporal variation in our collection without first imposing prior typological constructs, (2) correlate specimens recovered from our study area with those found elsewhere on the Columbia Plateau in a consistent, verifiable manner, (3) develop a typology that incorporates both qualitative and quantitative scales of measurement, and (4) examine the temporal significance of specific formal attributes as well as aggregates viewed as ideal types.

Morphological Classification

Eleven classificatory dimensions have been defines for morphological classificaton: **blade/stem juncture, outline, stem edge orientation, size, basal edge shape, blade edge shape, cross section, serration, edge grinding, basal edge thinning,** and **flake scar pattern.** Of these, the first four (D1-D4) define 18 morphological types. The other seven describe these types more fully and permit the identification of variants within the types. Table 3-27 outlines these dimensions and associated attributes.

By defining the margins of projectile points, we are able to place them within one of the 18 morphological types. This is done by drawing straight lines from nodes where the outline of the specimen changes direction. Figure 3-1 illustrates the technique, and Table 3-28 lists the 18 morphological types with descriptions, classification codes, and line definitions.

Table 3-27. Dimensions of morphological projectile point classification.

DIMENSION I: BLADE-STEM JUNCTURE

N. Not separate
1. Side-notched
2. Shouldered
3. Squared
4. Barbed
9. Indeterminate

DIMENSION II: OUTLINE

N. Not applicable
1. Triangular
2. Lanceolate
9. Indeterminate

DIMENSION III: STEM EDGE ORIENTATION

N. Not applicable
1. Straight
2. Contracting
3. Expanding
9. Indeterminate

DIMENSION IV: SIZE

N. Not applicable
1. Large
2. Small

DIMENSION V: BASAL EDGE SHAPE

N. Not applicable
1. Straight
2. Convex
3. Concave
4. Point
5. 1 or 2 and notched
9. Indeterminate

DIMENSION VI: BLADE EDGE SHAPE

N. Not applicable
1. Straight
2. Excurvate
3. Incurvate
4. Reworked
9. Indeterminate

DIMENSION VII: CROSS SECTION

N. Not applicable
1. Planoconvex
2. Biconvex
3. Diamond
4. Trapezoidal
9. Indeterminate

DIMENSION VIII: SERRATION

N. Not applicable
1. Not serrated
2. Serrated
9. Indeterminate

DIMENSION IX: EDGE GRINDING

N. Not applicable
1. Not ground
2. Blade edge
3. Stem edge
9. Indeterminate

DIMENSION X: BASAL EDGE THINNING

N. Not applicable
1. Not thinned
2. Short flake scars
3. Long flake scars
9. Indeterminate

DIMENSION XI: FLAKE SCAR PATTERN

N. Not applicable
1. Variable
2. Uniform
3. Mixed
4. Collateral
5. Transverse
6. Other
9. Indeterminate

Table 3-28. Morphological types.

Type	Description	Classification	Definition
1	Large Triangular	N 1 N 1	aA
2	Small Triangular	N 1 N 2	aA
3	Large Side-notched	1 N N 1	aA123, aA1234, aA12345
4	Small Side-notched	1 N N 2	aA123, aA1234, aA12345
5	Lanceolate	N 2 N N	aA
6	Shouldered Lanceolate	2 2 N N	aA, aA1, aA12
7	Large, Shouldered Triangular, contracting stem	2 1 2 1	aA, aA1
8	Small, Shouldered Triangular, contracting stem	2 1 2 2	aA, aA1
9	Large, Shouldered Triangular, non-contracting stem	2 1 (13) 1	aA12, aA123
10	Small, Shouldered Triangular, non-contracting stem	2 1 (13) 2	aA12, aA123
11	Large, Squared Triangular, contracting stem	3 1 2 1	aA1
12	Small, Squared Triangular, contracting stem	3 1 2 2	aA1
13	Large, Squared Triangular, non-contracting stem	3 1 (13) 1	aA12, aA123
14	Small, Squared Triangular, non-contracting stem	3 1 (13) 2	aA12, aA123
15	Large, Barbed Triangular, contracting stem	4 1 2 1	aA1
16	Small, Barbed Triangular, contracting stem	4 1 2 2	aA1
17	Large, Barbed Triangular, non-contracting stem	4 1 (13) 1	aA12, aA123
18	Small, Barbed Triangular, non-contracting stem	4 1 (13) 2	aA12, aA123

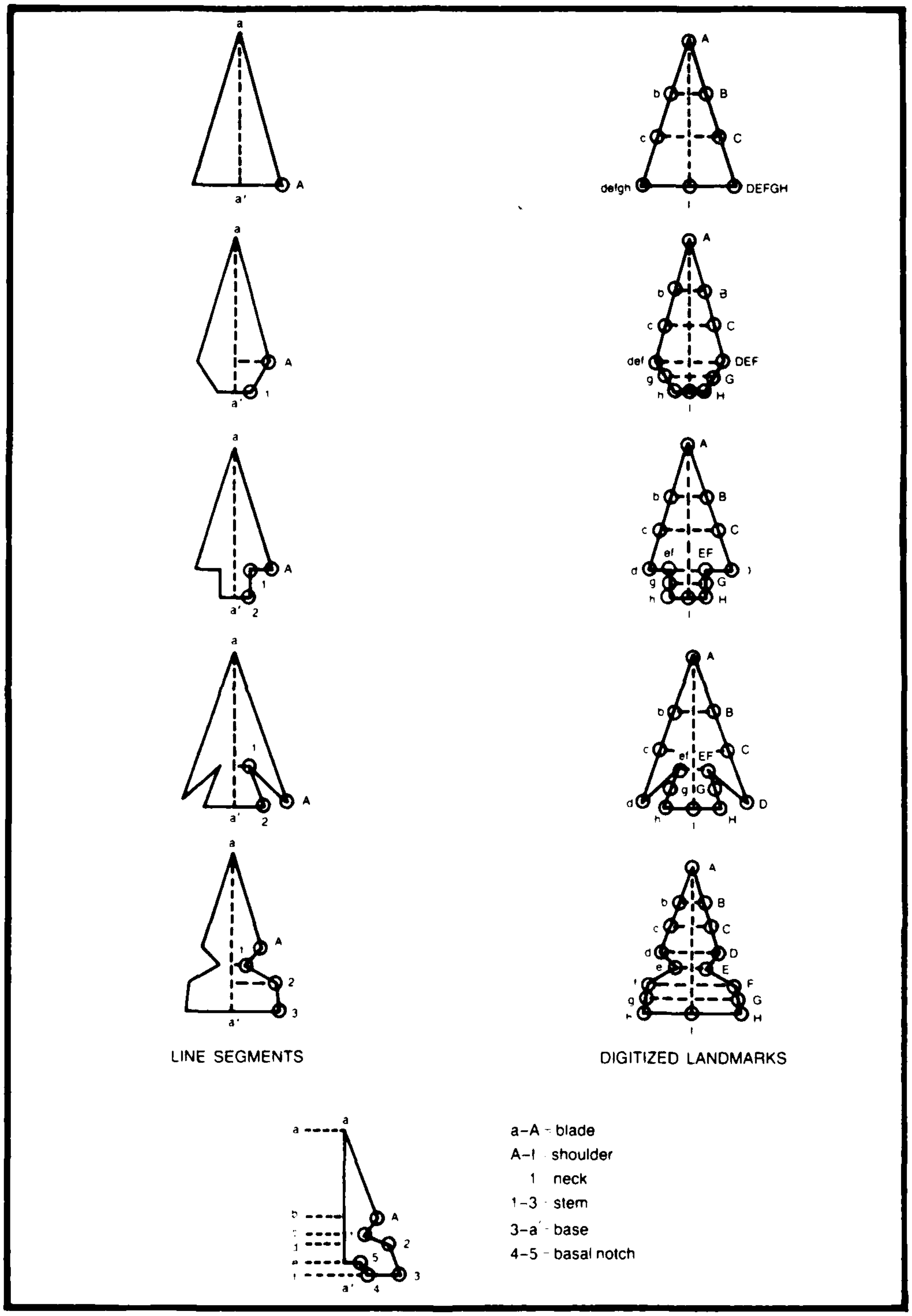


Figure 3-1. Definition of projectile point outline.

Historical Classification

We have defined historical types on the basis of line and angle measurements in order to have a consistent classification method that utilizes published illustrations of projectile points. Other measurements, such as weight and thickness, were taken on projectile points in our collection, but problems of cost and efficiency precluded handling of specimens from other study areas. These measurements can be included in analysis of our points and, hence, for the definition of types and type variants that will correlate with acknowledged types, but they are not part of the initial typological exercise. Justification for this decision is found in prior research emphasizing the outline of projectile points as the basis of classification (Benfer 1967; Ahler 1970; Gunn and Prewitt 1975; Holmer 1978).

Our desire for a statistically derived classification led us to select a multivariate statistical method termed discriminant analysis (Nie et al 1975). In this analysis, individual specimens are sorted into selected groups on the basis of mathematical equations derived from analysis of cases with known memberships. First, we assembled representative specimens for each acknowledged historical type, and tested group autonomy through analysis of specified discriminating variables. Then, we used derived equations called discriminant functions to assign specimens in our collection to the statistically defined projectile point types. All cases are given a probability of group membership, calculated as the distance a given case score is away from a group score. Discriminating variables--those providing the most eparation between groups--are ranked and serve as type definitions. The outcome is a statistically defensible projectile point typology based on traditional, intuitively derived classifications. The resulting classification is consistent, and produces mathematically defined ranges of variability. It enables the researcher to quickly categorize a large collection. It also offers a sound, rational basis for definition of new types as well as an explicit definition of accepted types. We can thereby correlate the Rufus Woods Lake projectile point sequence with other chronologies in both a quantitative and qualitative manner. For a detailed discussion of procedures and assumptions involved in discriminant analysis see Johnson (1978) and Klecka (1980).

We assembled a type collection for the Columbia Plateau of over 1200 projectile points that constituted originally defined type examples, labeled specimens of recognized types, or type variants that were reasonably well dated. By critically reviewing the archaeological literature, we identified 23 historical types, which we arranged in six formal type series (Figure 3-2). We consistently applied distinctions based on the original type definitions, modified, where appropriate, by subsequent research. We routinely defined type variants, usually suggested by prior researchers, which segregate specimens according to diagnostic patterns in morphology. Historical types identified here represent a synthesis of projectile point types and cultural reconstructions postulated by researchers in different areas of the Columbia Plateau, and were not taken from any single typology or chronological sequence (e.g., Butler 1961, 1962; Nelson 1969; Leonhardy and Rice 1970).

HISTORICAL TYPE CLASSIFICATION

DIVISION	LANCEOLATE		TRIANGULAR			
SERIES	SIMPLE	SHOULDERED	SIDE-NOTCHED	CORNER-REMOVED	CORNER-NOTCHED	BASAL-NOTCHED
TYPE	11 LARGE LANCEOLATE	12 LIND COULEE	41 COLD SPRINGS	51 NESPELEM BAR	61 COLUMBIA A Corner notched	71 QUILOMENE A Basal-notched
	15 WINDUST C Contracting base	13 WINDUST A	42 PLATEAU Side-notched	52 RABBIT ISLAND A	62 QUILOMENE Corner notched	72 QUILOMENE B Basal notched
	21 CASCADE A	14 WINDUST B		53 RABBIT ISLAND B	63 COLUMBIA B Corner notched	73 COLUMBIA STEM A
	22 CASCADE B	31 MAHKIN SHOULDERED			64 WALLULA Rectangular stemmed	74 COLUMBIA STEM B
	23 CASCADE C					75 COLUMBIA STEM C

Types are numbered consecutively within formal series a two-digit code indicates the approximate temporal sequence of defined series and types

Type names are those most commonly applied Mahkin Shouldered and Nespelem Bar are types defined for the Rufus Woods Lake project area

Figure 3-2. Historical projectile point types.

Names are usually those applied by the first researcher to define a specific type. We developed variant labels by using the accepted type name followed by a letter denoting diagnostic variation. For a complete discussion of procedures, see Lohse (1984g).

The 45-DO-273 Assemblage

The complete classification of projectile points from 45-DO-273 is presented in Appendix B, Table B-4. Thirteen projectile points are classified, including those labeled as projectile points and several labeled bases in the lithic analysis tables. Points fall into six morphological types and six historical types, with a minimum of one and a maximum of four members. The two classifications do not completely overlap, however. The relationship between morphological and historical types is shown in Table 3-29. Projectile points are illustrated in Plate 3-5 and the digitized outlines shown in Appendix B, Figure B-1.

Table 3-29. Relationship of morphological and historical projectile point types, 45-DO-273.

Historical Type		Morphological Type and Code						Total
Number	Name	1 M1M1	3 1NM1	5 N2NN	6 22NN	7 2121	10 2112	
	No historical type	1	-	-	-	-	-	1
21	Cascade A	-	-	2	-	-	-	2
23	Cascade C	-	-	2	-	-	-	2
31	Mahkin Shouldered Lanceolate	-	-	-	4	-	-	4
41	Cold Springs Side-notched	-	2	-	-	-	-	2
51	Nespelem Bar (?)	-	-	-	-	-	1	1
52	Rabbit Island A	-	-	-	-	1	-	1
Total		1	2	4	4	1	1	13

Projectile points are found in all zones at 45-DO-273, but in numbers too small for a meaningful discussion of percentage frequency distributions (Table 3-30 and 3-31). Nevertheless, a number of the projectile points' morphological characteristics have been selected for comparison, shown in Table 3-32. The selection of morphological characteristics is based on diversity. Dimensions D3 (stem-edge orientation), D6 (blade edge angle), D7 (cross section), D9 (edge grinding), and D10 (basal edge thinning) are excluded from the table because nine or more examples have the same characteristic, thus providing too little diversity for consideration. For

KEY

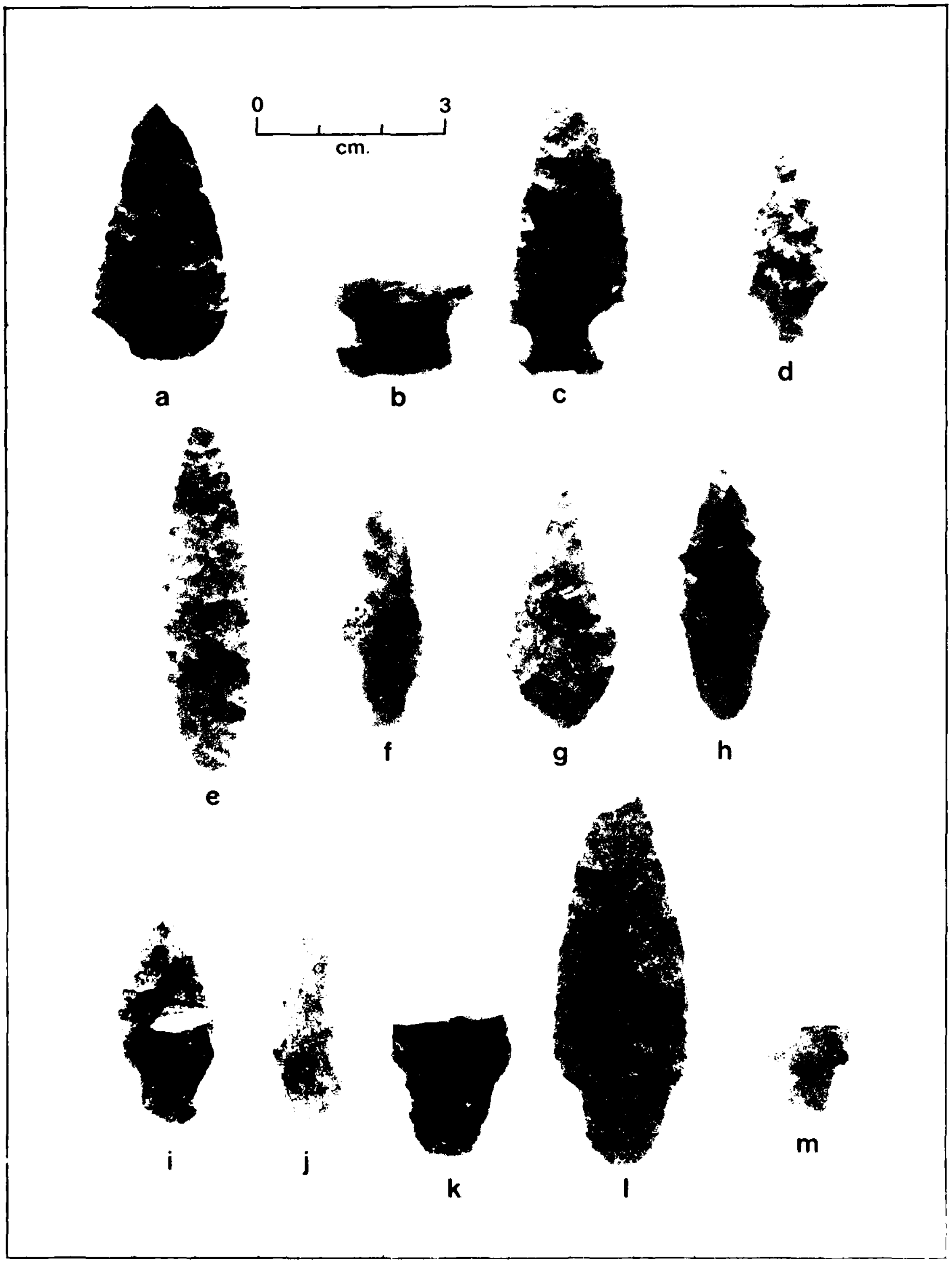
Master Number:
Morphological Type:
Historical Type:
Provenience/Level:
Zone:
Material:

a.	b.	c.	d.
400	519	132	272
1	3	3	5
-	Cold Springs Side-notched	Cold Springs Side-notched	Cascade A
2N15W/30	3S17W/90	5S26W/110	1S13W/100
3	3	4	4
CCS	CCS	CCS	CCS

e.	f.	g.	h.
554	408	10	487
5	5	5	6
Cascade A	Cascade A	Cascade C	Mahkin Shouldered Lanceolate
3S21W/140	1N16W/110	Testpit 2/140	5N17W/0
4	5	5	1
CCS	CCS	CCS	CCS

i.	j.	k.	l.	m.
578	490	434	423	349
6	6	6	7	10
Mahkin Shouldered Lanceolate	Mahkin Shouldered Lanceolate	Mahkin Shouldered Lanceolate	Rabbit Island A	Nespelem Bar
3S28W/30	5N17W/50	2N20W/60	2N17W/70	2N8W/40
1	3	3	3	2
Basalt	CCS	CCS	CCS	CCS

Plate 3-5. Projectile points, 45-DO-273.


0
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a
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i
j
k
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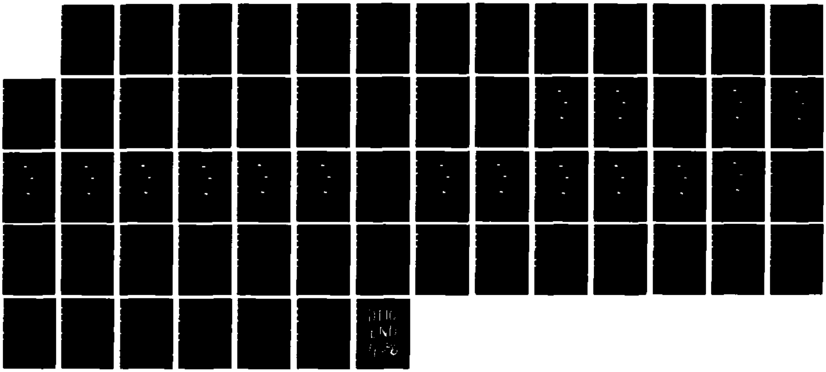
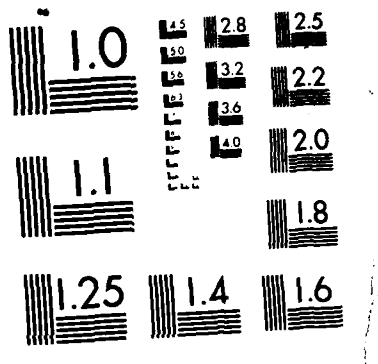
m

AD-A164 568 ARCHAEOLOGICAL INVESTIGATIONS AT SITE 45-DO-273 CHIEF JOSEPH DAM PROJECT WASHINGTON(U) WASHINGTON UNIV SEATTLE OFFICE OF PUBLIC ARCHAEOLOGY 2/2

UNCLASSIFIED M E JAEHNIG ET AL 1984 DACW67-78-C-0106 F/G 5/6 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

Table 3-30. Frequency of historic projectile points by zone, 45-DO-273.

Zone	Historic Type						Total
	Cascade A	Cascade C	Mahkin Shouldered Lanceolate	Cold Springs side-notched	Nespelem Bar[1]	Rabbit Island	
1	-	-	2	-	-	-	2
2	-	-	-	-	1	-	1
3	-	-	2	2	-	1	5
4	1	1	-	-	-	-	2
5	1	1	-	-	-	-	2

[1]Assignment questionable.

Table 3-31. Morphological projectile point types by zone, 45-DO-273.

Zone	Morphological Type and Code						Total
	1 M1M1	3 1NM1	5 N2NN	6 22NN	7 2121	10 2112	
1	-	-	-	2	-	-	2
2	-	-	-	-	-	1	1
3	1	2	-	2	1	-	6
4	-	-	2	-	-	-	2
5	-	-	2	-	-	-	2
Total	1	2	4	4	1	1	13

example, one projectile point has a planoconvex cross section and the remaining 12 points have biconvex cross sections.

Several trends are apparent in the change of morphological characteristics listed in Table 3-32. In Dimension 1, blade-stem juncture, unstemmed projectile points (i.e., lanceolate outline) are restricted to the lower three zones, and they occur in highest relative frequencies in Zones 4 and 5. Side-notched forms are found in Zone 3, while shouldered forms occur in Zones 1 through 3. The trend, then, is from unstemmed points in the earlier Kartar component to a diversity of forms, including side-notched specimens, in the late Kartar component. After that, projectile point frequencies and depositional problems preclude further comparison. All other dimensions follow a similar distribution. The four projectile ponts from the earlier Kartar component (Zones 4 and 5) almost always exhibit a single characteristic, while those of the Hudnut Phase (Zones 1 and 2) are more diverse. This is probably attributable to small sample error in the present assemblage, but the distribution of morphological characteristics listed in the table follows that suggested by other Columbia Plateau researchers (cf. Butler 1961, 1962; Nelson 1969; Leonhardy 1970; Leonhardy and Rice 1970; Rice 1969, 1972; Swanson 1962).

Historic projectile point types from 45-DO-273 are briefly discussed below, detailing possible correlates with types illustrated by other Columbia Plateau researchers. Metric attributes are listed in Table B-4, Appendix B.

Cascade A (21) N=2

These projectile points are broad, elongate Cascade types with variable flaking and cross section. One specimen, MN (Master Number) 272, has fine serrations on both edges. The blade of the other (MN 408) has been reworked with fine but irregular serrations. These are good examples of defined Cascade (or Vantage) forms, corresponding to type specimens illustrated by Butler (1962), Rice (1969, 1972), Leonhardy (1970), and Leonhardy and Rice (1970).

Cascade C (23) N=2

These projectile points are a little less regularly flaked than those of Type 21. Both points are also serrated, with fine serrations at the upper one-third of the blade and coarse serrations from there toward the base. One specimen (MN 554) has serrations almost to the base, while the other one (MN 10) is serrated to just below its midsection. These two projectile points are good examples of the forms assigned to the earlier Cascade subphase (ca. 8000-7000 B.P.) and illustrated by Rice (1972) and Leonhardy (1970).

Mahkin Shouldered Lanceolate (31) N=4

This is the most common historic type of projectile point recovered at site 45-DO-273. It consists of large to medium large, squat, slightly

Table 3-32. Selected morphological characteristics of projectile points by zone, 45-DO-273.

Zone	Blade/Stem Juncture			Outline			Size			Basal Edge Shape				Serration			Flake Scar Pattern					Zone Total
	Not Applicable	Side-notched	Shouldered	Triangular	Lanceolate	Indeterminate	Not Applicable	Large	Small	Straight	Convex	Concave	Indeterminate	Not Serrated	Serrated	Indeterminate	Variable	Uniform	Mixed	Collateral	Indeterminate	
	N	1	2	1	2	9	N	1	2	1	2	3	9	1	2	9	1	2	3	4	9	
1	-	-	2	-	2	-	2	-	-	-	2	-	-	2	-	-	1	-	-	1	-	2
2	-	-	1	1	-	-	-	-	1	-	1	-	-	-	-	1	1	-	-	-	-	1
3	1	2	3	3	2	1	2	4	-	2	2	1	1	4	-	2	-	1	3	-	2	6
4	2	-	-	-	2	-	2	-	-	-	1	-	1	-	2	-	-	-	-	2	-	2
5	2	-	-	-	2	-	2	-	-	-	2	-	-	-	2	-	1	-	-	1	-	2
Total	5	2	6	4	8	1	8	4	1	2	8	1	2	6	4	3	3	1	3	4	2	13

shouldered lanceolate forms with variable outlines and flaking patterns. The only projectile point made from basalt found at the site is in this class. This is not a well-defined type elsewhere on the Plateau, although comparable specimens have been found scattered throughout Cascade (or Vantage) and Tucannon (or Frenchman Springs) assemblages (Rice 1969, 1972; Leonhardy 1970; Nelson 1969; Greengo 1982; Grabert 1968). Frequencies of these points appear to increase in assemblages on the upper Columbia River (cf. Nelson 1969; Chance and Chance 1982; Sanger 1970; Lohse 1984g). Since no suitable type definition is available, we named these specimens Mahkin Shouldered. The definition is based on a large number of specimens recovered in the project area (Lohse 1984g). They appear to represent an early form transitional from the defined Cascade to the defined Rabbit Island series. They are likely ancestors of the smaller, shouldered triangular points that are common in the late Frenchman Springs (our Hudnut) phase.

Cold Springs Side-notched (41) N=2

Two projectile points were identified as Cold Springs Side-notched. They are large side-notched forms with a lanceolate outline and variable cross section. These indicate a late Cascade (or Vantage) subphase affiliaton, sometime after the 7000 B.P. date given to the Mt. Mazama eruption, and characteristic of the Cold Springs Horizon (Butler 1962, 1965). This type, as presently defined, is a large, variable class of related forms. Illustrated examples (Rice 1965, 1969, 1972; Leonhardy 1970; Butler 1962; Nelson 1969; Leonhardy and Rice 1970) include a variety of forms with triangular to lanceolate outlines, collateral to variable flaking, and well-defined side notches and squared basal margins to slight lateral indentations and rounded basal margins. Both specimens from this site appear to be projectile ponts. Infrequent in our project area and in excavations along the Middle and Upper Columbia, it is not possible for us to assess accurately the temporal distribution of these forms at this time.

Nespelem Bar (51) N=1

A frequent type in the Rufus Woods Lake project area, this variant of the Rabbit Island Stemmed projectile point type, like the Mahkin Shouldered Lanceolate type discussed above, is not well documented in the Columbia Plateau as a whole. Isolated examples are fairly common, however, and are usually classified as variants of the Rabbit Island Stemmed type (e.g., Nelson 1969; Swanson 1962; Greengo 1982). These specimens are thick, squat, triangular forms with slightly to well defined, sloping shoulders and contracting, rounded stems. The point from 45-DO-273 is broken approximately half way along the blade. It was originally defined as a morphological type 10: small, shouldered triangular , non-contracting stem projectile point (Plate 3-5;m). Apparently, digitizing of this specimen deemphasized the true nature of the stem, and the point was assigned to historical type 51. This assignment is questionable (compare illustration in Plate 3-5 with computer plotted outline in Figure 3-2). The specimen does not closely resemble those illustrated by Rice (1969, 1972), Nelson (1969), Greengo (1982), and Chance and Chance (1982).

Rabbit Island B (52) N=1

The recovered projectile point is a medium large, thick, triangular form with a contracting stem and rough serrations. This type of point is characteristic of the Frenchman Springs phase defined by Swanson (1962) and Nelson (1969). Infrequent in collections from the Lower Columbia and Snake River regions, where they are occasionally found in Tucannon phase assemblages with Columbia Corner-notched forms, this type is considered as characteristic of the period from about 4000-2000 B.P. Comparable specimens are illustrated by Nelson (1969), Swanson (1962), Rice (1969, 1972), and Greengo (1982).

The percentage frequency distribution of historical types by zone is shown in Table 3-30. These types are the same for the lowest two zones. After that, a change occurs in Zone 3 towards more diversity and different historical types. Zone 2 includes a single projectile point of a different type from zones below it. Zone 1 yielded only two projectile points from a redeposited matrix.

Only limited chronological inferences can be drawn from the projectile points at 45-DO-273. Numbers of points per type and per zone are very low and sample size does play a role in relative frequency distributions. Second, there are only two radiocarbon dates, both from Zone 4 (see Chapter 2). However, these two dates of approximately 1000 B.P. do not correlate with the known chronological position of Cascade lanceolate projectile points determined at other sites in the project area (i.e., 45-OK-11, Lohse 1984f) and on other areas of the Plateau, as pointed out in the discussion of historical types above. These dates may date Zone 2 but not Zones 3 through 5, unless we completely disregard the historical projectile point typology and the Mazama ash deposition from Zone 5.

The Mazama tephra from Zone 5 dates it to approximately 6500 B.P. The similarity of projectile points in both morphological characteristics and historical types suggests a similar date for Zone 4. Small sample error makes this a tenuous assignment acceptable only because data to the contrary is absent. These two zones, then, are the oldest Kartar components recovered in the Rufus Woods Lake project area.

Projectile points from Zone 3 include two Mahkin Shouldered Lanceolate, two Cold Springs Side-notched, one Rabbit Island B, and one triangular point that may be a blank. The Mahkin Shouldered points are found scattered throughout Cascade-Vantage-Kartar and Tucannon-Frenchman Springs-Hudnut phases, as elaborated above in the type discussion. Cold Springs Side-notched, the most diagnostic point type from this zone, is restricted to late Cascade-Vantage-Kartar phase along the Columbia River. Rabbit Island B projectile points are characteristic of the Frenchman Springs-Hudnut phase and are also found in the Tucannon phase of the Lower Columbia-Snake River region. The triangular point is not restricted to particular phases.

Based on four of the six projectile points, Zone 3 represents a late Kartar phase component. This interpretation is supported by data from the well-dated Component A from site 45-OK-11 (Lohse 1984f). This component, dated from 5400 to 4200 B.P., includes Cascade, Mahkin Shouldered Lanceolate, and Cold Springs Side-notched projectile points. Cascade points are absent from Zone 3 of 45-DO-273. Their occurrence as the only point type in the lower zones may indicate that they served a specific function, thus explaining their absence from Zone 3, but their presence and absence in the various zones may be due to sampling error. The singular Rabbit Island B point may have been redeposited from a later use of the site.

Only one projectile (MN 349) point is from Zone 2. This broken specimen is included in Morphological Type 10 and in Historical Type 51, Nespelem Bar Stemmed. Both classifications are problematical because the stem is of a configuration that is difficult to characterize (see Plate 3-5), depending on where along its outline primary emphasis is placed. The sides of the stem are contracting, parallel, and diverging depending on whether it is viewed near the shoulder, the middle, or the base of the stem. For this reason, the point is classified as straight stemmed in the morphological classification and contracting stemmed in the historical classification (see Appendix B, Table B-1). Furthermore, visual inspection shows the projectile point to be similar to many small, shouldered, triangular specimens with expanding stems that have been dated from 2500 to 500 B.P. at other project sites (i.e., 45-DO-214, Miss 1984a; 45-DO-285, Miss 1984b; 45-OK-2/2A, Campbell 1984b; 45-OK-250/4, Miss 1984c; 45-OK-258, Jaehnig 1983a).

The problematical stem shape, large time span, and very small sample size of this projectile point preclude a valid component assignment for Zone 2. If the projectile point is assumed to be a reliable time indicator, then two radiocarbon dates from Zone 4 of approximately 1000 B.P. could be from carbonized material redeposited from Zone 2 to Zone 4. However, field excavators did not record evidence for this redeposition. Therefore, Zone 2 will not be assigned to a phase, but we suggest that it may be a component of the Coyote Creek phase.

Zone 1 includes two Mahkin Shouldered Lanceolate projectile points. They are assigned to the late Kartar phase, as discussed above, and we assume they are redeposited. Evidence for redeposition is both geological (see Chapter 2) and cultural (see technological analysis, above).

SMALL LINEAR FLAKES

Previous sections on technological and functional analyses cite small linear flakes without referring to them as **microblades**. This section presents data to show that most of these flakes are indeed microblades as defined by other researchers.

Several researchers, including Borden (1950), Munsell 1968, Browman and Munsell (1969), and Sanger (1968,1970), have discussed microblade industries on the Columbia Plateau. Sanger (1968:95, 1970:106) suggests that microblade cores provide the best evidence of the industry. Where cores are absent, an assemblage of small parallel-sided flakes in which more than 25% of the specimens have a trapezoidal cross section (evidence of successive flake removal) may be considered evidence of a microblade technology. At site 45-DO-273, the site assemblage includes two microblade cores, one core fragment, and 104 small, linear flakes which examination suggests are microblades.

Microblades are illustrated in Plate 3-3;e-m, and one microblade core is shown in Plate 3-3;n. Metric attributes are represented in Table 3-33. Microblade core metric and nonmetric attributes are shown in Table 3-34. A comparison of Table 3-33 with metric attributes of microblades published by Sanger (1968:114 and 117, Tables 1-3 and 10-11) shows that those from 45-DO-273 are generally shorter but as wide and thick as those from Sanger's sites. The number of blades from our site is also much larger. Microblade core data from 45-DO-273 compares favorably with that presented by Sanger (1968:116, Table 6; 117, Table 9), given the small number of complete cores from our site. It is interesting to note that the dimensions of microblade cores from 45-DO-273 (Table 3-34) correspond closely to those from Ryegrass Coulee (Dunsell 1968, Table 20, p.128) with the difference that striking platforms on the Ryegrass Coulee specimens tend to be a little shorter.

Table 3-33. Metric dimensions of microblades, 45-DO-273.

Category	Statistic	Length (mm)	Width (mm)	Thickness (mm)
All microblades	Range	5.8-23.8	2.5-9.3	0.5-3.1
	$\bar{x}$	12.40	5.78	1.31
	s.d.	3.87	1.51	0.44
	n	104	104	104
Complete microblades only	Range	7.8-23.4	2.7-9.0	0.5-3.1
	$\bar{x}$	13.60	5.68	1.34
	s.d.	3.78	1.56	0.49
	n	51	51	51

Table 3-34. Dimensions and attributes of microblade cores, 45-DO-273.

Zone	Master Number	Striking Platform Length (mm)	Striking Platform Width (mm)	Core Height (mm)	Core Edge Angle (degrees)	Number of Flutes	Flute Width Range (mm)	Remarks
2	184	36	15	20	81	3	2-4	-
3	266	18	13	19	65,70,91	11	1.5-8	Conchoidal flake off microblade core
3	161	NA	NA	NA	4	4	1.5-6	-
$\bar{x}$		27	14	19.5	76.3	6		

SUMMARY

The technological, functional, and stylistic analyses of lithics from 45-DO-273 have been presented and discussed in this chapter. Results of the technological analysis show that numbers of objects made from cryptocrystalline material (CCS) vary inversely with numbers of quartzite objects from Zone 4/5 to Zone 1. This change through time is statistically significant, indicating that flintnappers changed their preference in materials or the function of the site changed through time. A change of lithic technology is also reflected by a decrease in size of flakes from the lower to the uppermost zone. This decrease in size occurs despite the decrease in objects made from CCS (CCS tends to generate smaller and more numerous flakes than all other materials).

Basalt, a locally available material, yields the highest relative frequency of primary debitage and the highest frequency of implements. Therefore, we apparently have evidence of the complete manufacturing sequence of basalt implements which were made without extensive secondary reduction. Quartzite, also available at the site, included more secondary reduction than basalt. The complete manufacturing sequence of quartzite implements also took place at the site. Cryptocrystalline material was apparently transported to the site from a source some distance away. Primary reduction took place, in part, elsewhere, but secondary reduction was carried out extensively at the site. Some tertiary modification of CCS objects also took place here.

Our functional analysis data indicates that a relatively low percentage of objects were manufactured. Of these, all but a few, of indeterminate manufacture, were flaked. An examination of object use shows that the number of wear areas per formed object increased from Zone 4/5 to Zone 1 while those of modified objects decreased at the same time. Worn areas are nost frequent on drills, gravers, scrapers, hammerstones, utilized only objects, and shaft abraders. Tabular knifes, bifacially retouched objects, and unifacially retouched are next in frequency of use, followed by projectile points, bifaces, choppers, and peripherally flaked cobbles. Microblades are have the lowest number of recognizable wear areas per object.

Wear areas on objects indicate that scraping and, to a lesser extent, cutting of materials of intermediate hardness, such as wood, were the tasks most frequently performed by the site's occupants. Less frequently, they scraped soft materials, such as hide, and hammered hard objects, such as stone, or softer objects placed on stone. The use of the projectile points for hunting implements is inferred from their breakage patterns. Other activities, such as chopping, also were done. Of course, our functional analysis may well have missed other uses of the recovered objects.

Projectile points and small linear flakes were subjected to stylistic analyses. A total of 13 points were grouped into six morphological types with a minimum of one and a maximum of four members each. These low frequencies made chronological placement of zones difficult, particularly in view of the two problematical radiocarbon dates. However, three projectile point styles represented at the site are relatively reliable chronological indicators serrated lanceolate points; large, side-notched points; and shouldered lanceolate projectile points. The lanceolate projectile points date Zone 4/5 to Cultural Period I, while associated Mazama tephra deposits date this zone at about 6500 BP. Shouldered lanceolate projectile points in Zone 3 indicate that this is a component of Cultural Period II or III, and the associated large, side-notched points date the cultural materials more precisely to 4500 B.P. Zone 2 has been assigned provisionally to Cultural Period VII because of one projectile point and two dates that were recovered out of context below this zone. Projectile points indicate that redeposited Zone 1 is of the same age as Zone 3.

4. FAUNAL ANALYSIS

Faunal remains from archaeological sites provide a source of data on the ecology and historic biogeography of animal species living in the area, and on their utilization by human occupants. This chapter describes the faunal assemblage recovered from 45-DO-273, and summarizes the implications of the assemblage for understanding the archaeology of the site.

THE FAUNAL ASSEMBLAGE

The faunal assemblage from this site consists of a total of 1,087 bone fragments weighing 485 g. Of these fragments, only 87, slightly more than 8% of the sample, are identifiable. All of the identified specimens are mammalian. The relatively small proportion of identifiable fragments indicates the highly fragmented nature of the sample. Nine shell fragments weighing 31 g were recovered. Shell materials have not been identified. The distribution of counts and weights of vertebrate and invertebrate faunal remains among zones is shown in Table 2-2. Taxonomic composition and distribution of vertebrate remains for the site as a whole and by zone are presented in Table 4-1.

The following summarizes the elements identified for each taxon. Where necessary, criteria used to identify the specimens are included, as well as remarks concerning past and present distributions of the taxa and the possible cultural significance of taxa.

SPECIES LIST

MAMMALS (NISP=87)

Marmota cf. flaviventris (yellow-bellied marmot) -- 2 elements.

All marmot remains have been assigned tentatively to the species *M. flaviventris* on the basis of present distribution; this species is the only marmot now living in the project area and is a common resident of talus slopes. *M. monax* has been recorded in extreme northeastern Washington and *M. calagata* occurs in the Cascades to the west of the project area (Ingles 1965; Dalquest 1948). The three species are indistinguishable on the basis of osteological morphology, and the size ranges of the three overlap extensively. The possibility of changes in distrubution or cultural transport of animals preclude dismissing the possible occurence of one or both of the more montane species in this assemblage.

Marmots were small game for ethnographic inhabitants of eastern Washington (Ray 1932; Post 1938). Their presence in this faunal assemblage may indicate prehistoric use.

Table 4-1. Taxonomic composition and distribution of vertebrate remains, 45-DO-273.

Taxa	Site Total		Zone									
			1		2		3		4		5	
	NISP	MNI	NISP[1]	MNI[2]	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI
MAMMALIA												
Sciuridae												
Marmota cf. *flaviventris*	2	1	-	-	-	-	1	1	1	1	-	-
Spermophilus sp.	1	1	-	-	-	-	1	1	-	-	-	-
Geomyidae												
Thomomys talpoides	55	10	1	1	13	1	11	2	17	4	13	3
Heteromyidae												
Perognathus parvus	4	2	-	-	-	-	3	1	-	-	1	1
Cricetidae	3	-	-	-	3	-	-	-	-	-	-	-
Lagurus curtatus	9	6	8	5	1	1	-	-	-	-	-	-
Canidae												
Canis sp.	6	1	6	1	-	-	-	-	-	-	-	-
Cervidae												
Cervus elaphus	1	1	-	-	1	1	-	-	-	-	-	-
Odocoileus sp.	6	1	5	1	1	1	-	-	-	-	-	-
Total	87	-	20	-	19	-	16	-	18	-	14	-

[1] NISP=Number of identified specimens.
[2] MNI=Minimum number of individuals.

Spermophilus spp. (ground squirrels) -- 1 element.

Three species of ground squirrels are currently found in eastern Washington: *Spermophilus columbianus*, *S. washingtoni*, and *S. townsendii*. *S. columbianus* is larger than the other two and prefers more mesic habitats. *S. washingtoni* and *S. townsendii* are smaller and prefer sagebrush and grass zones to the south and east of the project area (Dalquest 1948:268; Ingles 1965:169). These elements could not be assigned to species. Ground squirrels have been reported as a food resource in the ethnographic literature (Ray 1932:82).

Thomomys talpoides (northern pocket gopher) -- 55 elements.

Thomomys talpoides is the only geomyid rodent recorded in the project area. There is very little evidence that they were utilized prehistorically or ethnographically. Because pocket gophers burrow, their presence in this assemblage is probably the result of natural processes.

Perognathus parvus (great basin pocket mouse) -- 4 elements.

Perognathus parvus is the only heteromyid rodent recorded in the project area. Like the pocket gophers, P. parvus is most likely present as a result of natural processes.

Cricetidae (New World rats and mice) -- 3 elements.

Lagurus curtatus (sagebrush vole) -- 9 elements.

The sagebrush vole generally inhabits dry sagebrush habitat which is sparsely grassed (Maser and Storm 1970:142). Only cranial material of this genus is readily distinguished from Microtus on osteological bases (Grayson 1981). L. curtatus is probably present in this assemblage as a result of natural processes.

Canis spp. (wolves, coyotes, and dogs) -- 6 elements.

Both Canis latrans (coyote) and C. familiaris (domestic dog) are common in the project area today. C. latrans is an indigenous species, and C. familiaris has great antiquity in the northwest (Lawrence 1968). C. lupus (wolf) was a local resident in the past but has been locally extinct since about 1920 (Ingles 1965). It was not possible to determine the species represented by these specimens, but all fall within the size range of the coyote/dog; all elements are too small to represent the larger wolf.

Odocoileus spp. (deer) -- 6 elements.

These materials may represent one or both of two species of deer (O. hemionus and/or O. virginianus), but it was not possible to make species-level identifications on any of the recovered elements.

Deer were an important food resource to indigenous peoples of eastern Washington (Post 1938; Ray 1932). While none of the recovered elements displayed evidence of human intervention, such as butchering marks, these elements probably entered the site as a result of human activities.

Cervus elaphus (elk) -- 1 element.

Cervus elaphus, while once widespread across most of the forest areas of eastern Washington, became extinct locally about A.D. 1910 (Dalquest 1948:391). They have been reintroduced to parts of northeastern and southeastern Washington in historic times.

Remains of elk have been recovered from many archaeological sites in eastern Washington and occur throughout the Holocene. They were taken by indigenous peoples. While the single recovered specimen displays no evidence of human intervention, the bone probably owes its presence in the assemblage to human activity.

DISCUSSION

The collection of vertebrate remains from 45-DO-273 is small, but representative of fauna expected in the project area. All identified taxa live in the project area at present or lived there in early historic times. None of the identified elements were burned, and none displayed evidence of human intervention in the form of butchering marks. On the basis of faunas recovered from the other sites in the project area, it seems safe to speculate that the sciurid (ground squirrels and marmots), canid (dog and/or coyote) and artiodactyl (deer, elk) bones are present because of human activity. Further, deer, elk, marmot, and squirrel, were part of the diet of the native people living in the project area as recorded in ethnographies.

Seasonality data is limited to the inferences that may be made from the presence of two marmot elements (one each in Zones 3 and 4). Marmots (*Marmota flaviventris*) estivate from late June and may pass directly into hibernation in August. They do not reappear until some time in February or March (Dalquest 1948; Ingles 1965). This suggests that Zones 3 and 4 may have formed sometime from March through July. The small sample size, however, limits our confidence in this inference (Monks 1981).

5. FEATURES ANALYSIS

During excavations at 45-DO-273, 35 features were recorded in the field. Some of these represented natural strata and are not considered in the features analysis. Others were found to be redundant and combined, or inconsequential and discarded. The remaining cultural features were classified according to a two-tiered classification (described in Campbell 1984d) which considers, on the one level, feature provenience, shape, and patterning; and, on the second level, the abundance of various material contents. By combining the information of the paradigmatic classes with information on the size and absolute material counts, we have classified the features into functional types. These types are broadly defined as housepits, firepits, other pits, exterior occupation surfaces, and debris scatters. At 45-DO-273, fire-modified rock scatters, possible firepits, and a single log constitute the cultural features. The types of features are extremely limited when compared to all the feature types recorded by the project. This indicates that the cultural occupations of 45-DO-273 probably were limited in terms of frequency and duration and that they did little to alter the surface of the site.

ZONE 3

Two features are recorded in Zone 3 (Figure 5-1), a cluster of stone tools and a decomposing log. The latter may be a naturally deposited piece of driftwood.

A concentration of lithic artifacts (Feature 12) was found in the southeast corner of 3S21W (Figure 5-1). A chopper, peripherally flaked cobble, utilized flake, and six pieces of debitage make up the feature; no charcoal or staining was observed. The concentration, which covered an area 75 x 20 cm, did not extend into the unit adjacent to the east.

A decomposing log (Feature 23) was exposed *in situ* across the northeast quadrant of 2S18W (Figure 5-2). The log was in varying stages of decay, ranging from intact chunks of wood to dark flecks in the sand matrix. It measured 1.5 m long. A microblade, 37 flakes, three unidentified bone fragments, and a single basalt fire-modified rock were recovered as part of this feature. Elsewhere in the unit, material counts are also slightly higher than in surrounding levels.

ZONE 2

Two groups of fire-modified rocks make up the features of Zone 2 (Figure 5-2). They occur in the same geologic stratum roughly a meter apart horizontally.

A group of four fire-modified granite rocks (Feature 11) form a rough semicircle in the southeast corner of 1N16W. The rest of the circle was not uncovered in the excavations of 0N16W. This feature may represent an eroded hearth area, or may be the result of redeposition. Other fire-modified rocks

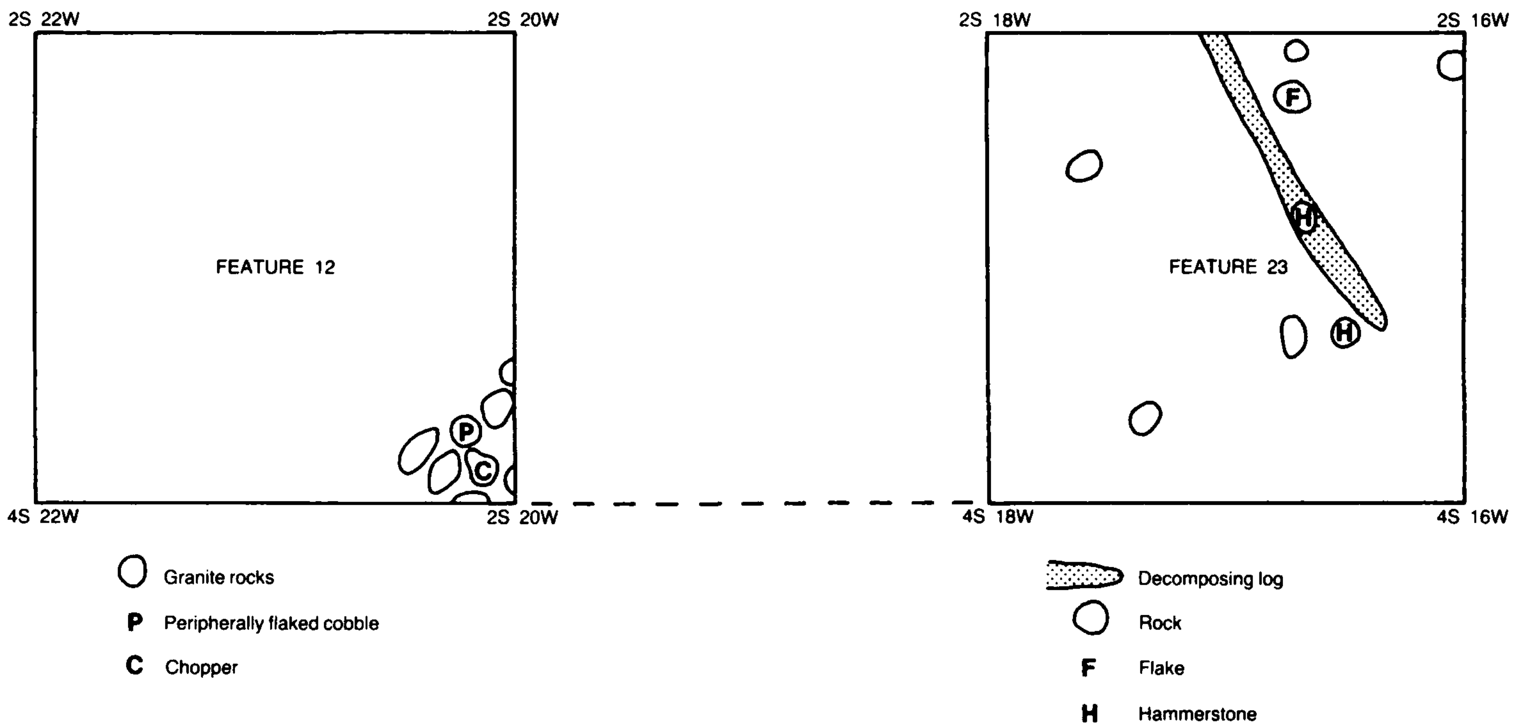


Figure 5-1. Location of Features 12 and 23, Zone 3, 45-DO-273.

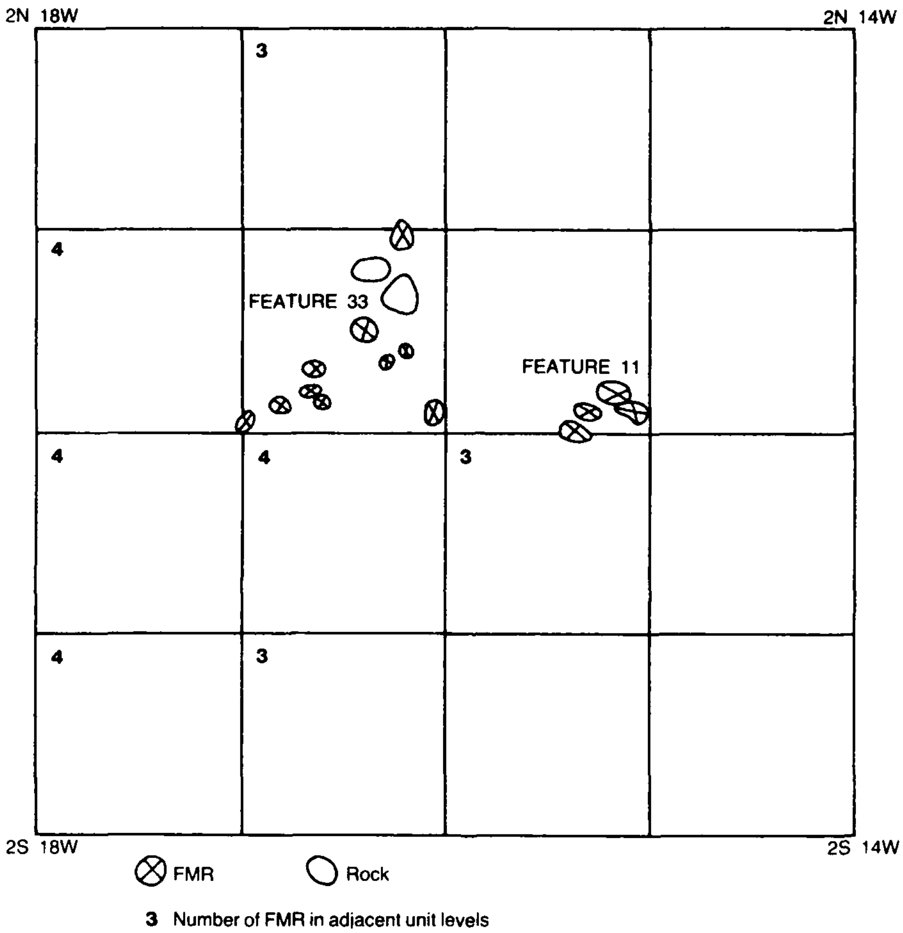


Figure 5-2. Location of Features 11 and 33, and counts of FMR in the vicinity, Zone 2, 45-DO-273.

occur in similar quantities in units nearby (see Feature 33). Nine flakes also were collected from this cluster of FMR.

The second scatter of FMR (Feature 33) in Zone 3 is a "content" feature; that is, it consists solely of the material collected and does not include any soil, staining, or other artifacts which may also have occurred within the defined area. It was defined by the site director after excavation had ended. Laboratory analysis confirmed that the number of fire-modified rocks in Unit Level 10 of 1N17W was unusually large for the site as a whole; therefore, the 1 x 1-m square was designated a feature (Figure 5-2). Fifteen fire-modified rocks make up the feature, along with four pieces of debitage and a bone fragment.

ZONE 1

Only one feature was identified in this zone (Figure 5-3). A large concentration of rock and fire-modified rock on and among the disturbed beach sand was designated Feature 27. A scraper, a flake, one bone fragment and 15 fire-modified rocks were collected. The exposed portion of the features measures 100 x 75 cm. The feature has been subjected to a great deal of disturbance, including downslope erosion and wave action, so its original function is unclear, although it may represent remnant firepits.

DISCUSSION

The cultural features at 45-DO-273 represent two distinct kinds of activity, including tending fires and lithic artifact manufacture and/or use. The decomposing log is an enigma because the maximum age of dated undecomposed wood in other project sites is approximately 2500 B.P., and Zone 3 probably dates to 4500 B.P. (see Chapter 3). The log, therefore, is redeposited, probably in an animal burrow. The absence of structural features, and the low number of features at the site, indicate that occupations were of short duration, and that the site probably served a limited function.

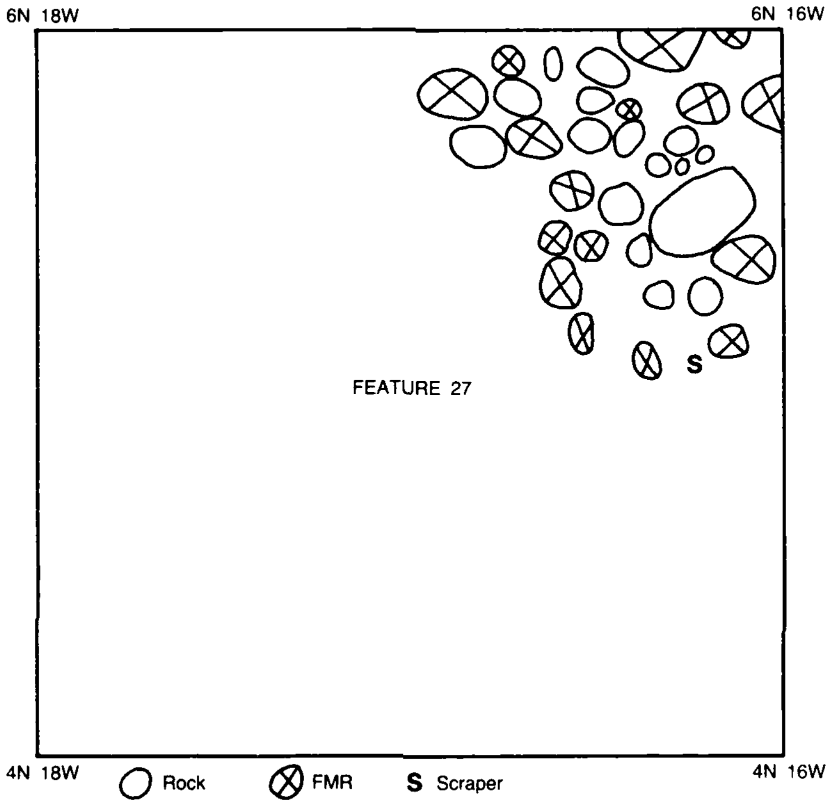


Figure 5-3. Location of Feature 27, Zone 1, 45-DO-273.

6. SYNTHESIS AND INTERPRETATION

This chapter presents a short discussion of all analyses of data from 45-DO-273. Most of the information cited here is summarized from previous chapters on stratigraphy and chronology, artifacts, features, and archaeofaunal analysis. New data are presented on artifact distributions.

GEOCHRONOLOGY

The earliest cultural occupation (Zone 5), is on or in a Columbia River point bar deposit (DU I). The age of the point bar can only be inferred indirectly from geological and archaeological evidence. Alluvial fan deposits (DU II), including Mazama tephra, cover the bar in the vicinity of the site. We have argued in Chapters 2 and 3 that this tephra although redeposited, probably dates the lower part of the alluvial fan to about 6500 B.P. The point bar, then, must predate that. On the other hand, lanceolate projectile points in the upper point bar deposit are similar in age to points in the lower part of the alluvial fan. We infer, then, that the point bar buildup ended just before alluvial fan deposits began covering the bar.

It is suggested that the point bar, Allen Bar, became inactive approximately 6000 years ago. Buildup of the bar may have ceased when an almost vertical granitic outcrop approximately 60 m high prevented the river about one km upstream from continuing to erode the outside of a bend.

At approximately 6000 B.P., an alluvial fan covered the downriver part of Allen Bar at the location of the site. This fan was deposited by rapidly moving waters sweeping down from the slopes behind the bar. This indicates that seasonal run-off occurred, perhaps intermittently, over a long period of time.

In DU III, alluvial fan deposits are interbedded with Columbia River overbank or lesser fan deposits. Cultural materials in these deposits include materials from both Zones 3 and 2. Zone 3 is dated to approximately 4500 B.P. by the presence of Cold Springs Side-notched points, and Zone 2 tentatively dated to 1000-1500 B.P. by a single point.

Depositional Unit IV, including the cultural material of Zone 1, apparently postdates the construction of Chief Joseph Dam. The flood deposits, at least, may be the result of the great flood of 1948. Interbedded aeolian deposits perhaps date to the "dustbowl" days of the 1930 is and, in part, may also be the result of modern dryfarming practices on the Columbia Plateau.

Evidently, alluvial fan buildup continued for at least 2,000 years following 6000 B.P. and perhaps for as long as 5,000 years. The relatively thin deposit, however, indicates that this buildup occurred very infrequently.

Moreover, it was interrupted repeatedly by overbank deposits laid down by the Columbia River. In addition, the blocky soil structure described in Table 2-1 shows that soil development took place during this time, suggesting a moister climate.

Thus, both the alluvial fan buildup and the in situ development, suggest a climate considerably moister than it is now. The repeated overbank deposits may reflect conditions upriver in the Columbia's drainage basin. Both the intermittent nature of the deposits and the soil genesis further suggest that these processes were intermittently active.

CULTURAL CHRONOLOGY

Because the zonal association of two radiocarbon assays is problematical, the temporal placement of cultural components at 45-DO-273 is based primarily on a stylistic analysis of projectile points. At least three components are represented at the site. Zone 4/5 is assigned to the Kartar Phase (before 6000 B.P.) because of the presence of lanceolate points found in association with Mazama ash. Zone 3 is a later Kartar Phase component dating to approximately 4500 B.P. Zone 2 is tentatively dated at 1500 to 1000 B.P., which places it in the Coyote Creek Phase. Zone 1 is also in the Coyote Creek Phase but includes redeposited materials that may be part of the same component as Zone 3.

These data indicate the site was occupied intermittently for approximately 5,000 years. Although separated by thousands of years, the components lie in close vertical proximity to each other. It is possible that culture-bearing deposits of intermediate age have been deflated, or that conditions between occupations were not conducive to human habitation at the site. Our information does not allow us to choose between the alternatives, but it would be interesting to determine if the same conditions that influenced site deposition also influenced decisions by the prehistoric inhabitants of the area about site occupation.

SEASONALITY

The number of cultural remains, particularly the relative scarcity of artifacts and features in comparison with other sites in the project area, suggest that the site was occupied for very short periods of time and, possibly, only during certain seasons. The meager data on seasonality consists of two marmot bones, one from Zone 3 and one from Zone 4. Since marmots are only available from February to late June, the site may have been occupied at that time during Kartar Phase times.

FAUNAL REMAINS

A total of 86 identified skeletal elements represent nine species. Four of these, including pocket mice, pocket gophers, New World rats and mice, and sagebrush voles, are natural inclusions.

Squirrels, marmots, deer-sized ungulates, elk, and canids, represented by only 16 identified elements, are probably part of the cultural assemblage. The canid remains, found in Zone 1, are not considered in the following discussion because they may represent dogs that would not have been hunted, even if they were part of the diet. The small number of bones of probable game animals makes zonal comparisons extremely unreliable. However, it is interesting to note that squirrels and marmots are restricted to Zones 3 and 4/5, the Kartar Phase components, while deer-sized animals and elk are found only in the Coyote Creek components, Zones 1 and 2.

The presence of fresh water shellfish remains in the Kartar Phase components and their virtual absence from the Coyote Creek component is also noteworthy (Table 2-2). Again, these remains occur in very small numbers in the lower zones.

The differences in animal remains between the Coyote Creek and the Kartar components suggest that either the site was occupied during different seasons in these periods or that a change in site function occurred. Since indicators of seasonality are present only in the lower zones, this first interpretation lacks adequate support. The other hypothesis rests on the assumption that squirrels and marmots may have been more readily available near the site, while the large mammals which would avoid the site would have to be hunted afar. The paucity of data, however, insures that this remains only a speculation.

ARTIFACT DISTRIBUTIONS

The following distributional data of selected artifact groups is presented to determine location of activity areas, such as artifact manufacturing stations and/or food processing areas. The exact determination of activity areas for this site is difficult because excavation units cover too small a horizontal area to define the activity areas rigorously. Nor do we venture to discuss Zone 1 because it includes redeposited material. Also, the reader should be aware that our method of conflating all excavated levels pr zone creates the illusion that we are dealing with buried occupation surfaces. This may not be the case, and care has to be taken when the distributional data are interpreted. Despite the simplification inherent in this data manipulation, we believe that tentative conclusions can be drawn.

In presenting this data, all numbers are totals for 2 x 2-m units and all excavated levels within each zone. High concentrations mentioned in the text are based on comparison among all zones, rather than each zone separately. Thus, Zone 4/5 has no high concentrations because only small numbers of lithics, bone, and fire-modified rock (FMR) occur per unit in comparison with other zones.

ZONE 4/5

Distributions of artifacts in Zone 4/5 are shown in the first five figures. Figure 6-1 presents the distribution of all lithics. No concentrations are apparent, but lithics are present in all units that

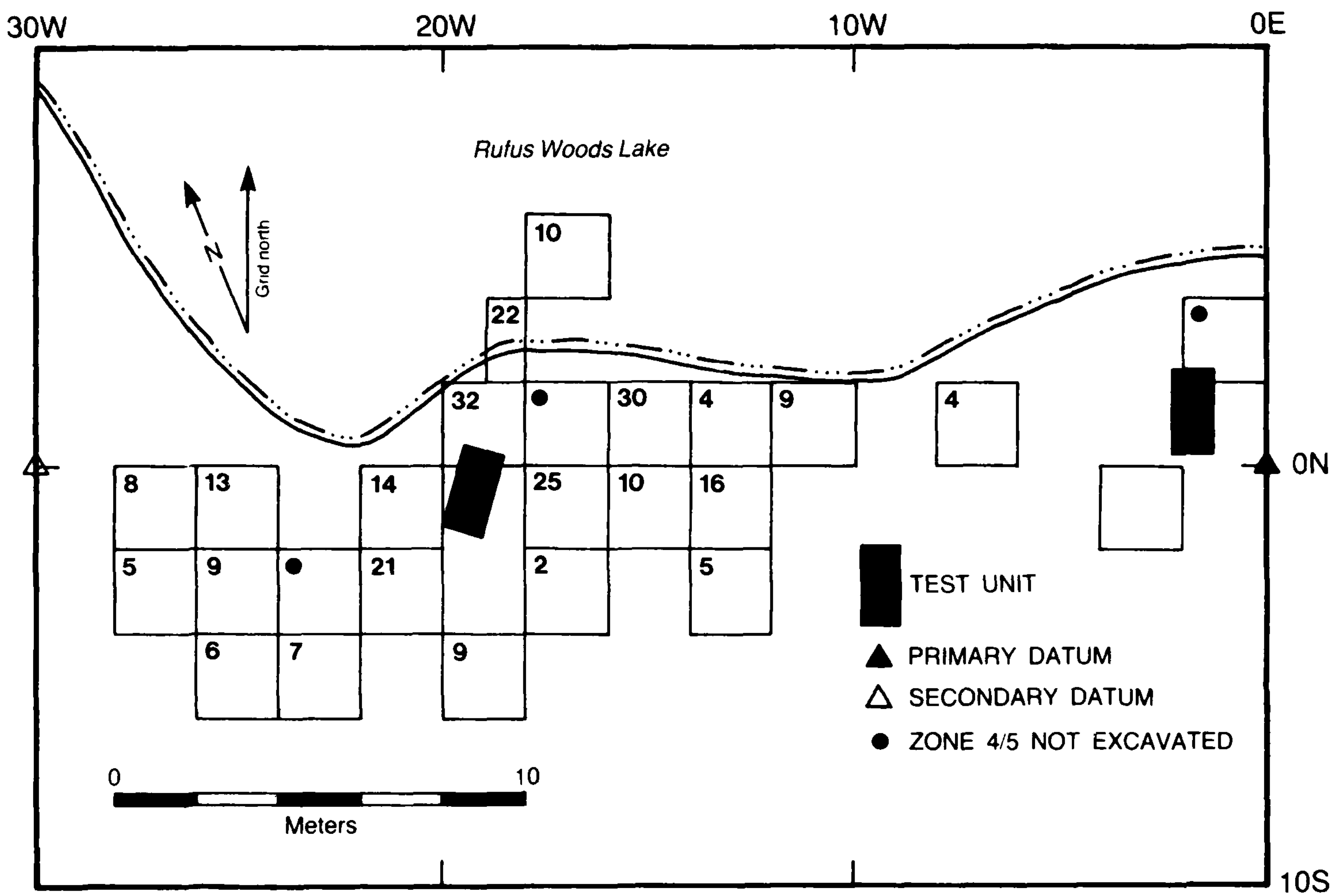


Figure 6-1. Distribution of all lithics, Zone 4/5, 45-DO-273.

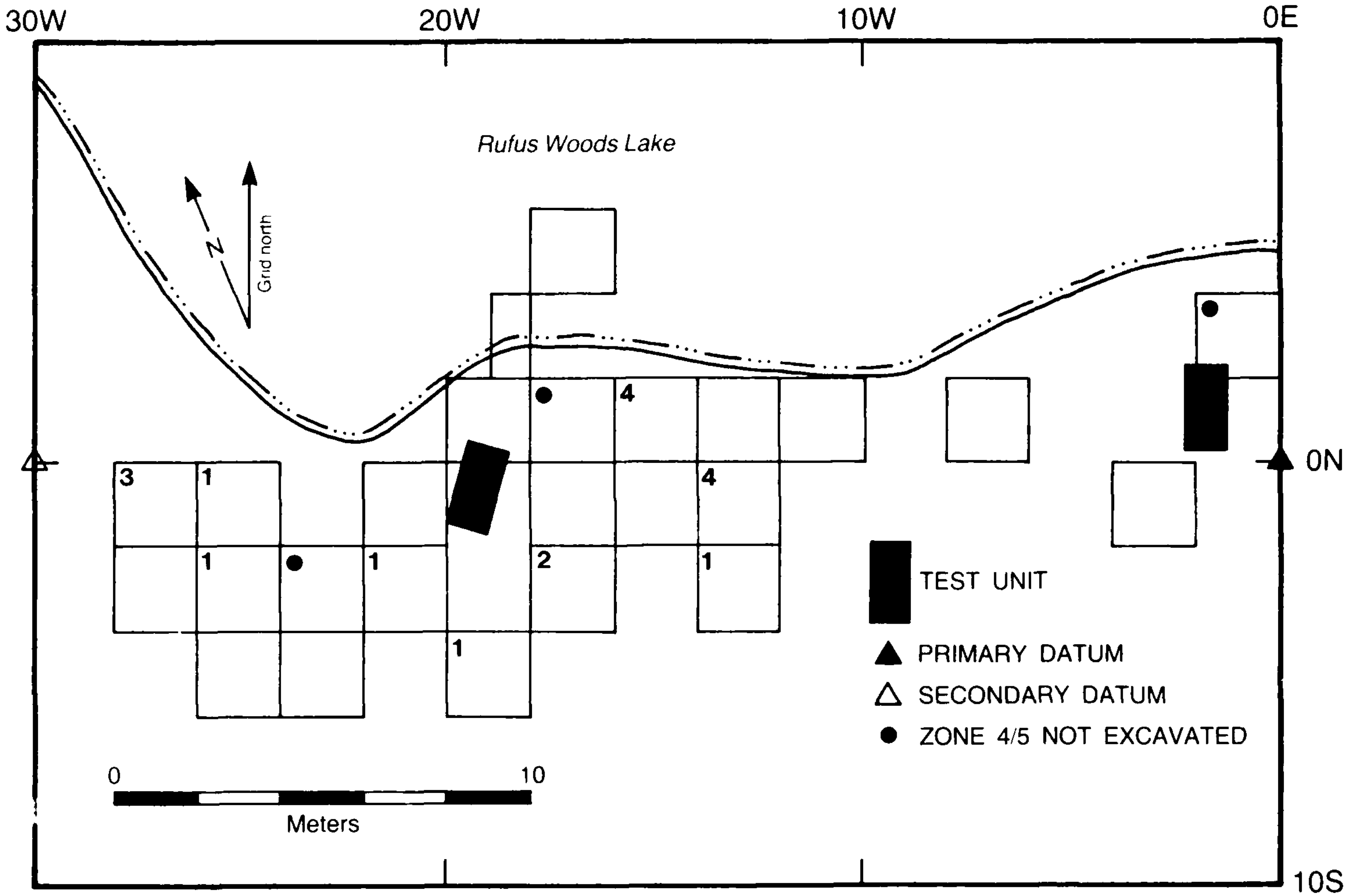


Figure 6-2. Distribution of bone in Zone 4/5, 45-DO-273.

included this zone. Bone, shown in Figure 6-2, occurs too infrequently to show food processing areas. Figure 6-3, presenting distributions of shell and FMR, is of interest because the eight FMR from unit 4S14W suggest that excavations were terminated just west of an area that may contain more of these artifacts, indicating that fire may have been used at the site in this zone.

Formed and modified objects, shown in Figure 6-4, tend to cluster in the northern site area, immediately south of the present beach. Projectile points tend to occur in the east-central part of the site, but their low numbers preclude interpretation of distributional data. The relatively large number of bifaces indicates that here occurred the cutting and scraping of medium-hard objects such as wood. The ratio of implements to debitage is higher in this zone than in the others, and this may mean that lithic manufacture was not as important here as it was in the upper zones. During this occupation, tool kits may have been repaired or implements of wood manufactured.

Microblades and tabular knifes, shown in Figure 6-5, occur in low numbers; however, microblades tend to be restricted to the central and western site areas. Although this distribution differs somewhat from that of other artifact types, we can draw no certain inference.

The picture presented by this artifact distribution is one of a short-term camp. While no charcoal was recovered, the fire-modified rocks suggest there may have been a fireplace just east of them.

ZONE 3

For Zone 3, which has a larger artifact assemblage than Zone 4/5, it is possible to define activity areas based on the distributions of lithics, bone, FMR, formed and worn/manufactured lithics, microblades, and tabular knives (Figure 6-6 through 6-10).

Lithic counts are high in the southern part of the site, with the greatest number occurring in unit 4S24W (Figure 6-6). Implements of various kinds, shown in Figure 6-9, tend to occur in larger numbers in the areas of high and intermediate lithic concentration. These artifacts may well have been manufactured in these areas. The numbers of microblades correlate well with the numbers of total lithics. All units with more than 150 lithics yielded at least five microblades, and only one unit (4S26W) with more than five microblades included fewer than 150 lithics. These distributions show that microblades were also manufactured in those units. A high concentration of bone is located immediately to the northwest of the lithic concentration (Figure 6-7) and a concentration of FMR lies just east of the bone concentration and north of the lithic concentration (Figure 6-8). The very large number of FMR in unit 0S14W is unusual at this site.

Based on the above information we define a primary lithic manufacturing area (Area 1, Figure 6-16). The ratio of all lithics to tools averages approximately 55:1, with a range of 99:0 to 32:1 and a median of 65:1 (compare Figure 6-6 and 6-9). A secondary lithic tool manufacturing area is located in the area of the present beach (Area 2, Figure 6-16). Here the ratio of lithics to formed and worn/manufactured objects is 14:1. For all other units

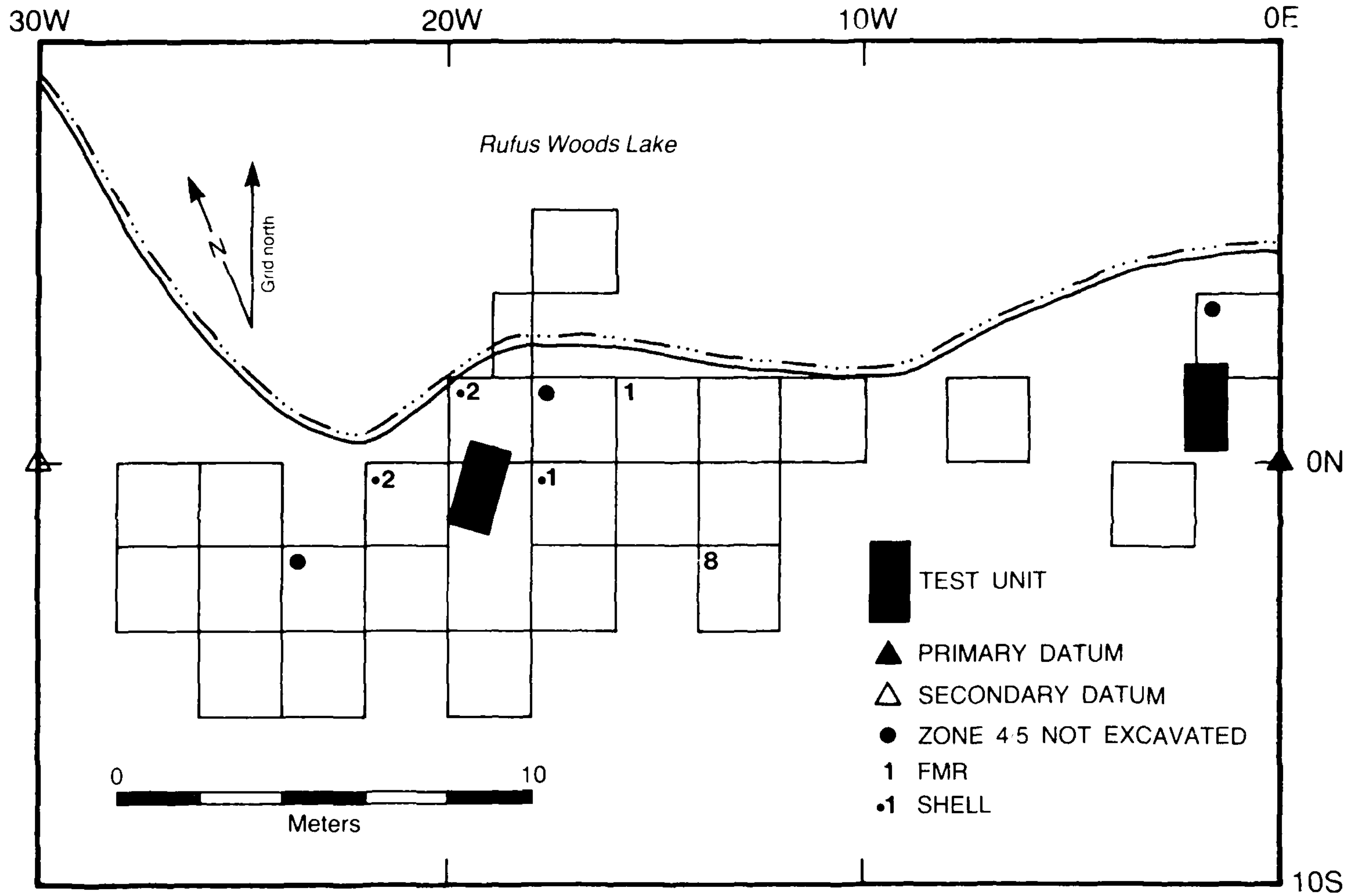


Figure 6-3. Distribution of FMR and shell, Zone 4/5, 45-DO-273.

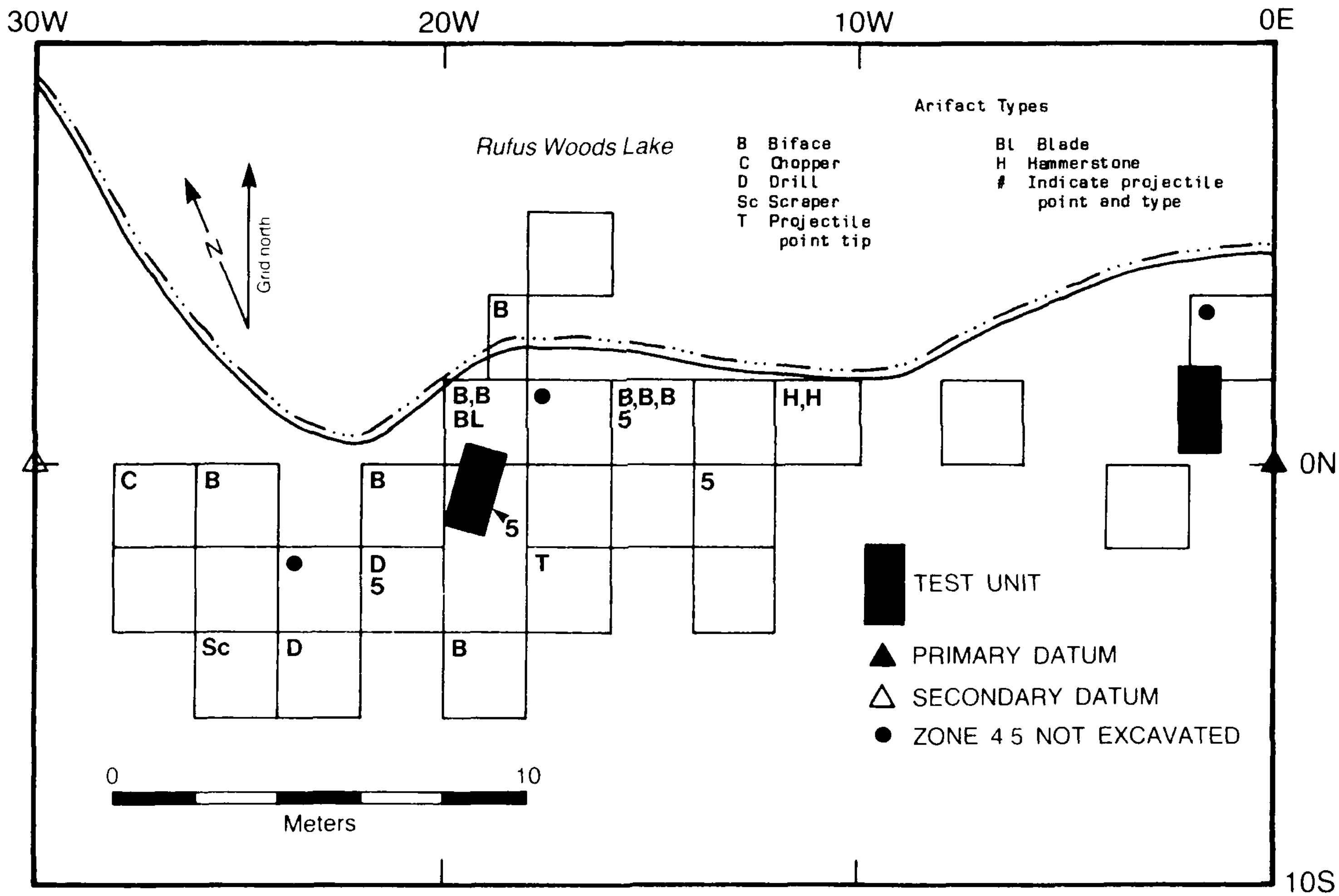


Figure 6-4. Distribution of formed and worn/manufactured objects, Zone 4/5, 45-DO-273.

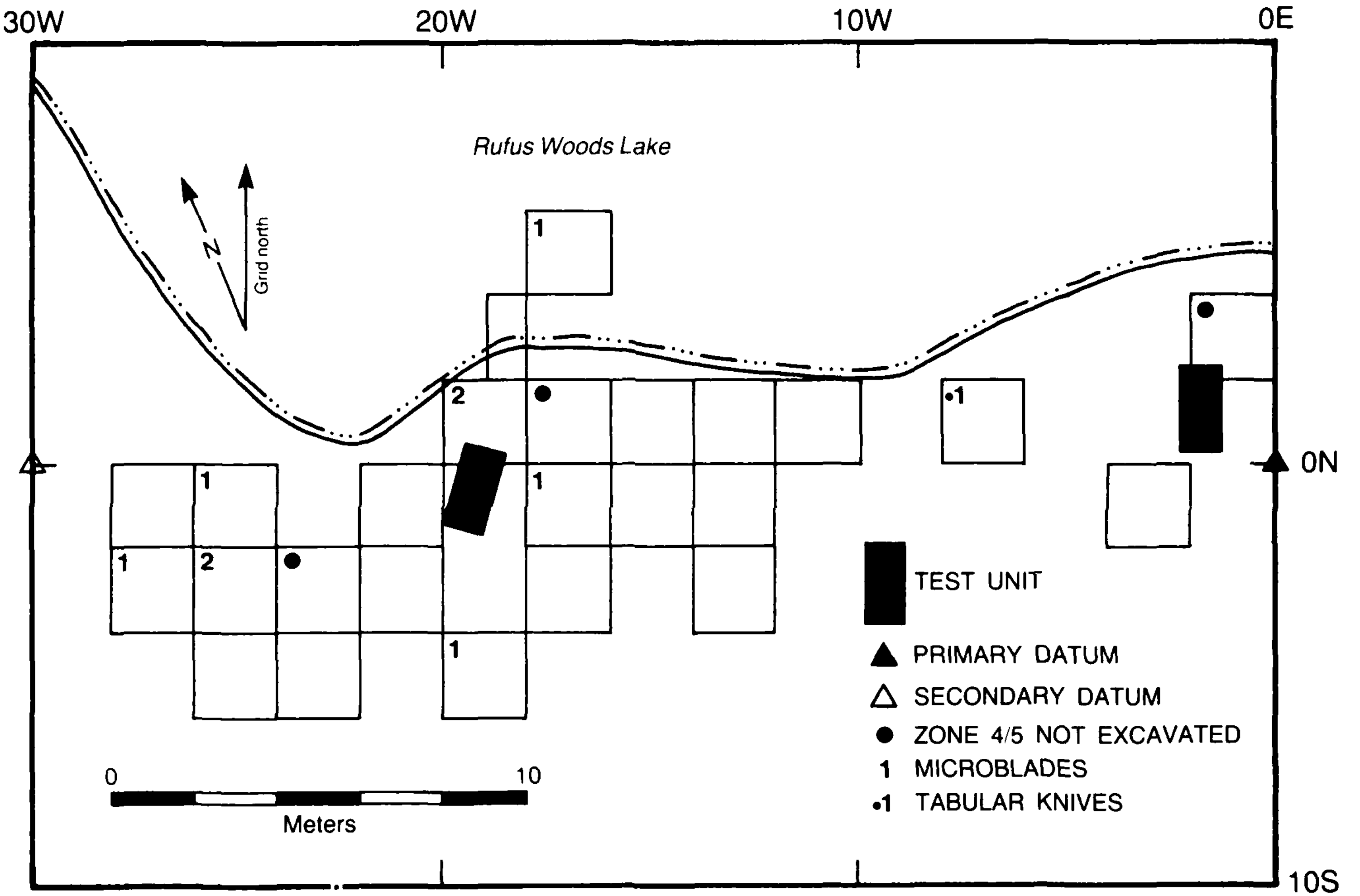


Figure 6-5. Distribution of microblade industry and tabular knives, Zone 4/5, 45-DO-273.

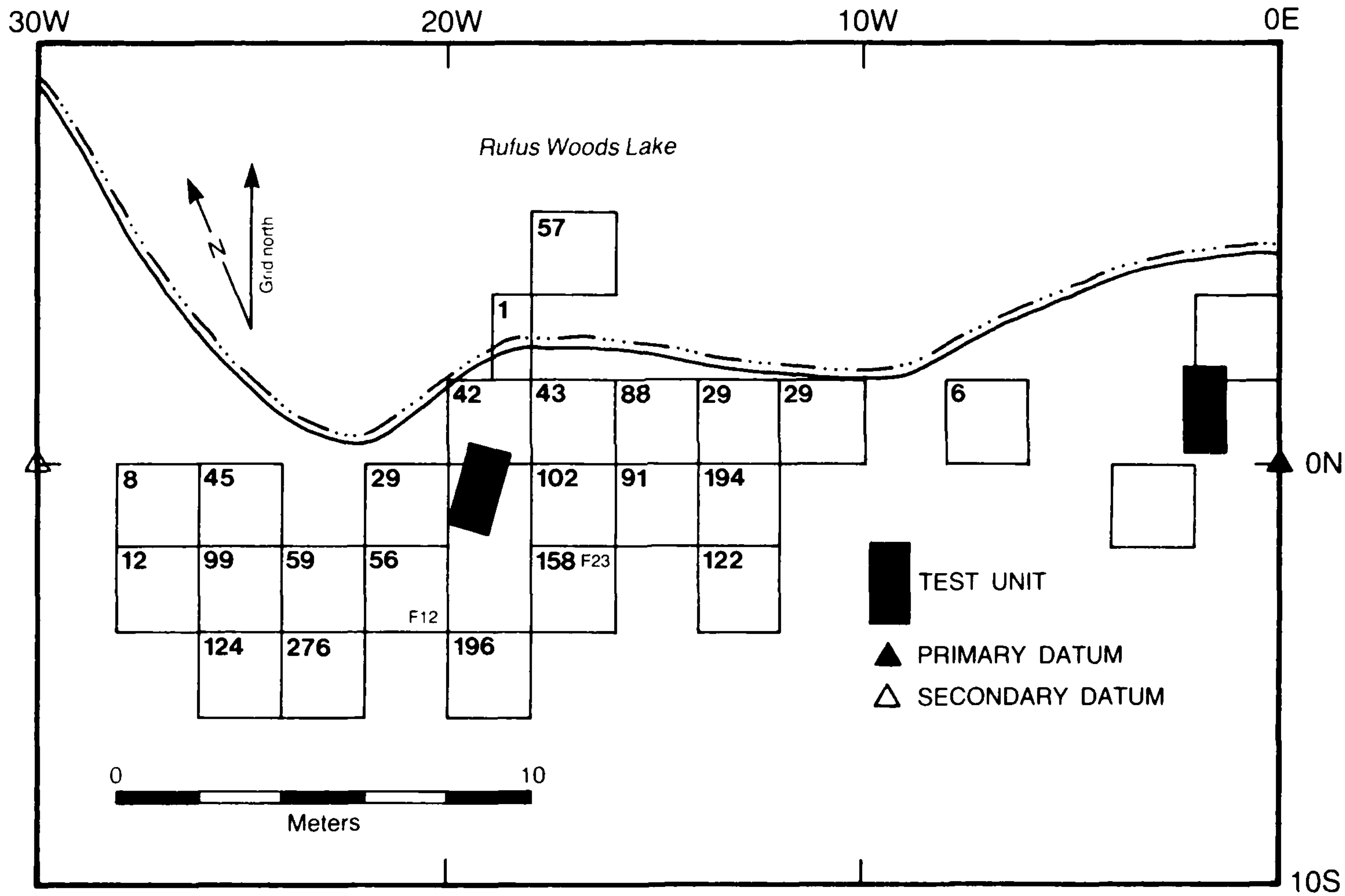


Figure 6-6. Distribution of lithics, Zone 3, 45-DO-273.

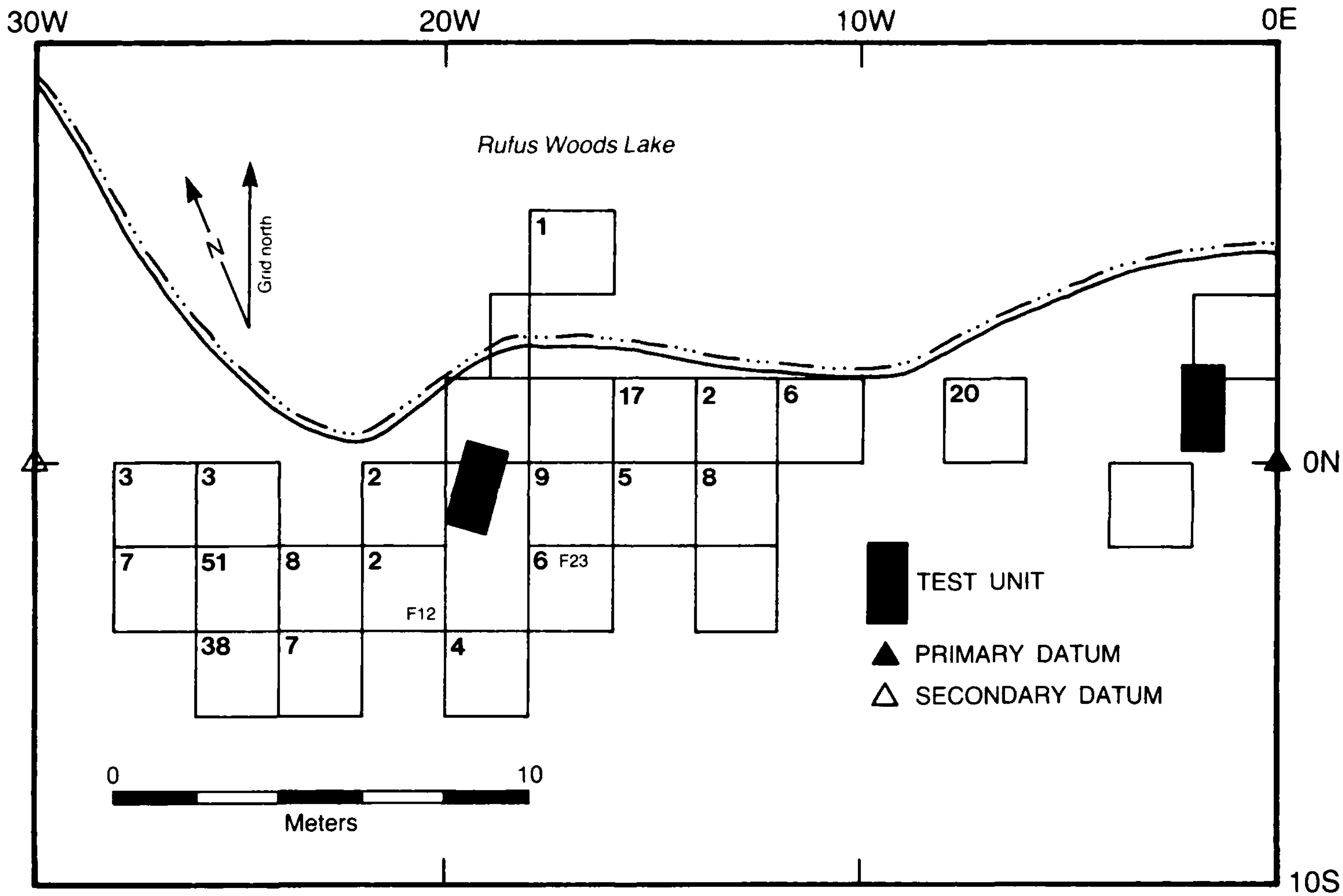


Figure 6-7. Distribution of bone, Zone 3, 45-DO-273.

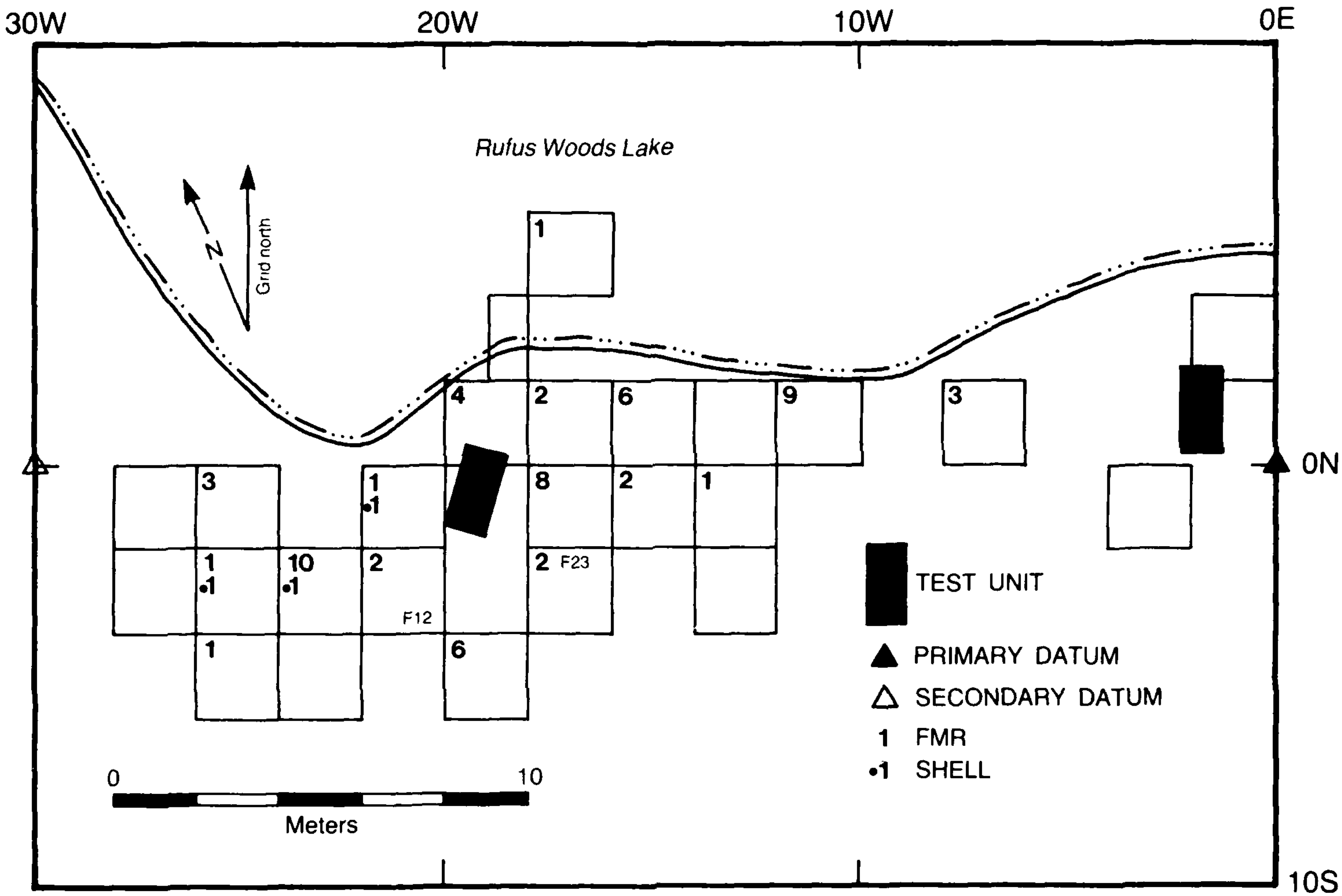


Figure 6-8. Distribution of FMR and shell, Zone 3, 45-DO-273.

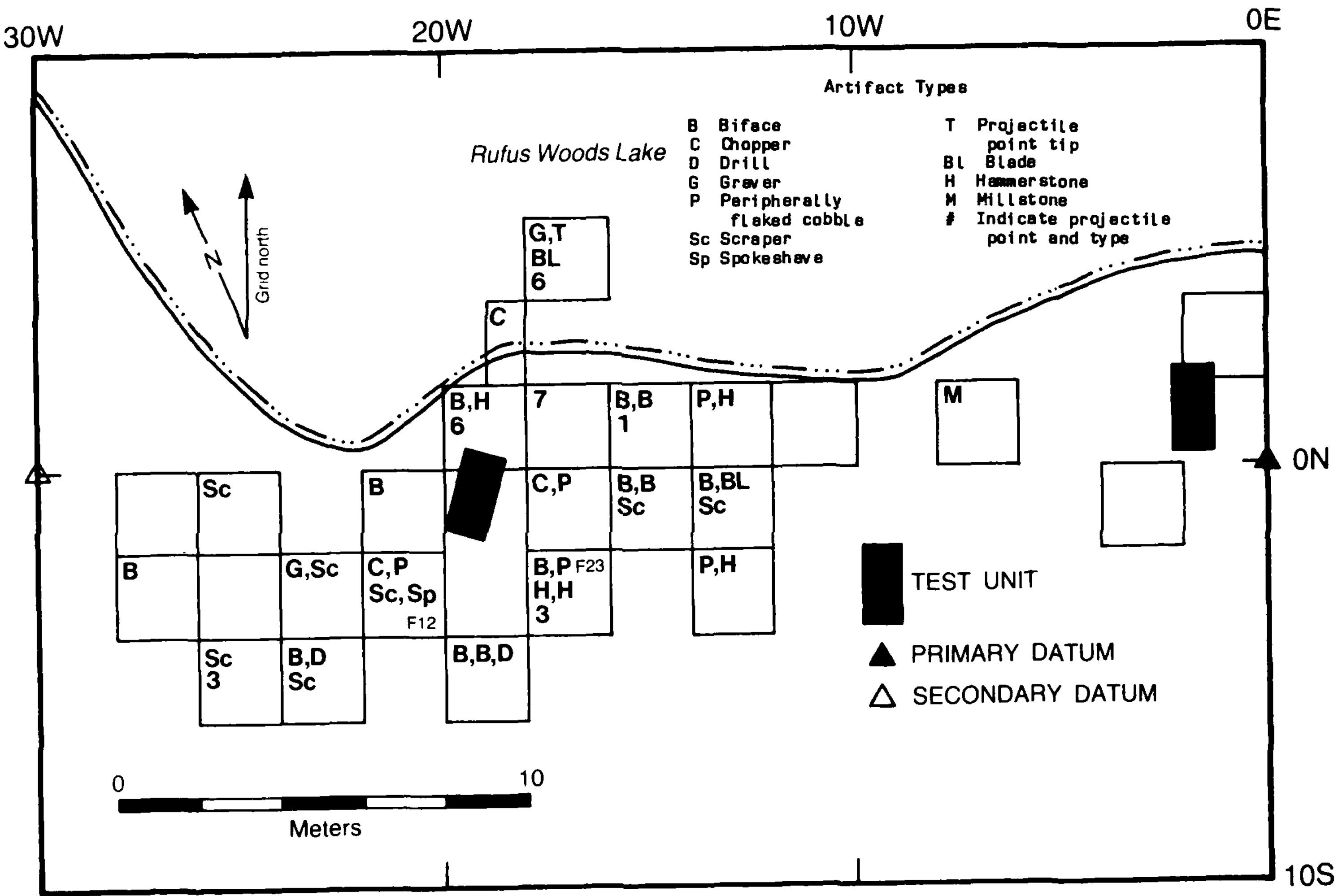


Figure 6-9. Distribution of formed and worn/manufactured objects, Zone 3, 45-DO-273.

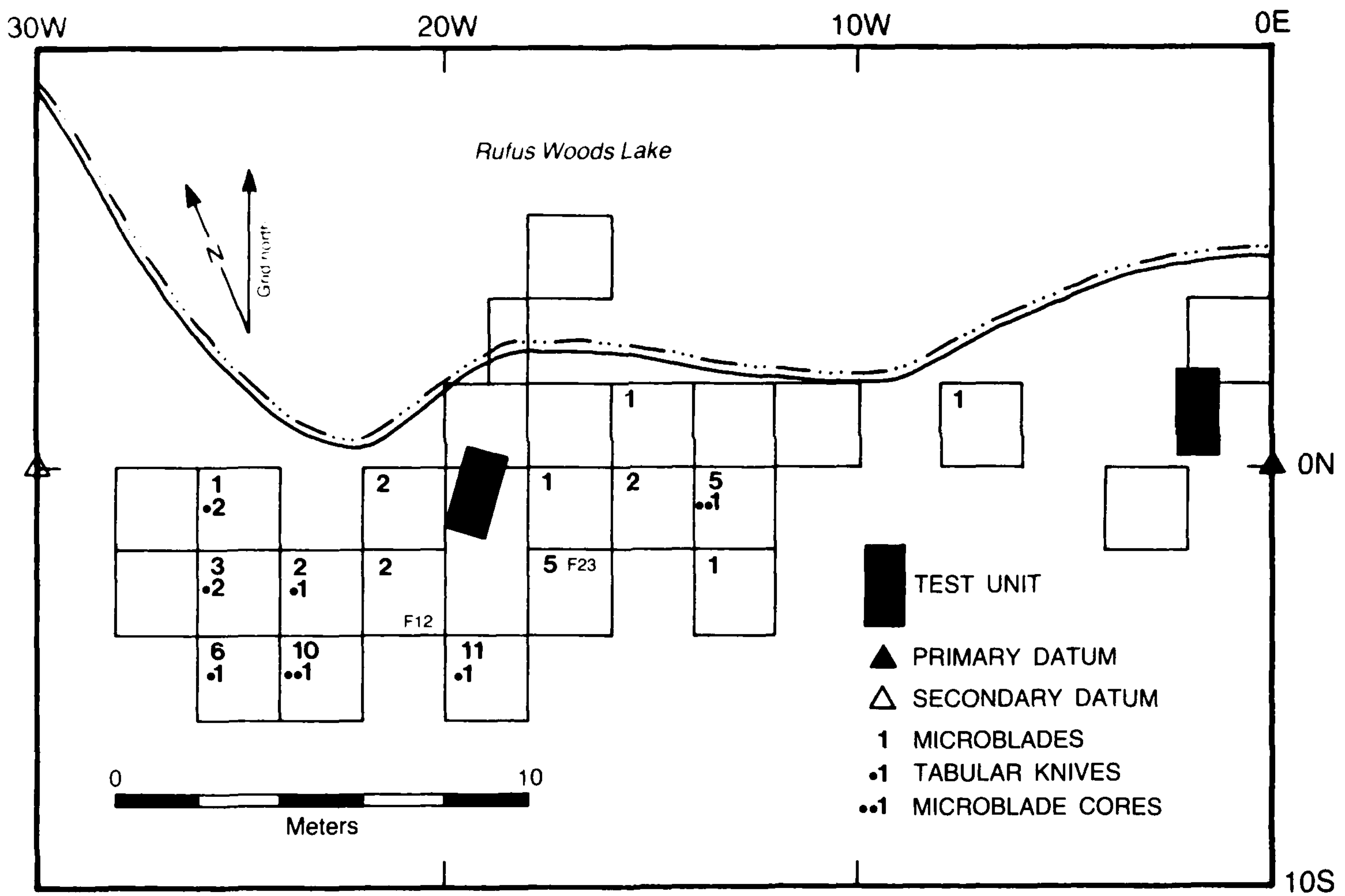


Figure 6-10. Distribution of microblade industry and tabular knives, Zone 3, 45-DO-273.

between areas 1 and 2, this ratio averages 30:1, ranging from 45:1 to 6:1 with a median of 29:1. High frequencies of FMR indicate where stones were heated (Area 3, Figure 6-16). Area 4 (Figure 6-16) is distinguished by large numbers of both FMR and bone: here food was prepared and consumed. A few pieces of shell were recovered nearby, indicating that freshwater shellfish formed a small part of the diet. As the distribution of microblades does not correspond to that of bone, we infer that they were not used to cut meat at the site, but were manufactured for use elsewhere.

In summary, we suggest that primary reduction of lithics took place in Area 1 and that tools were shaped and maintained in Area 2. In the southern part of the site, adjoining concentrations of bone, FMR, and lithics indicate a large outdoor occupation surface where artifacts were manufactured, food prepared and eaten, and fires laid. The absence of charcoal in Zone 3 is probably due to deflation. However, deflation has not affected the distribution of other, heavier types of artifacts.

ZONE 2

Distributions of lithics in Zone 2 are shown in Figure 6-11. Two concentrations are present, one in the north-central and one in the south-central site area. Because the area between these concentrations was not excavated, they may represent one single larger concentration. The bone distribution, presented in Figure 6-12, shows a general scattering, though greater numbers of bones are present in units near the lithic concentrations. Clusters of FMR, shown in Figure 6-13, occur in the north-central site area and two meters east of there. Relatively large numbers of implements, shown in Figure 6-14, also occur in areas with clusters of lithics. The unit with the mot lithics--over 150--included only one implement. On the other hand, this unit yielded the largest number of microblades in the zone, (Figure 6-15). Tabular knives, also shown in this figure, are restricted to the northeast part of the block excavation.

SUMMARY

Site 45-DO-273 was occupied at wide intervals during a 5,500 year span from approximately 6500 to 1000 years ago. The presence of three zones of cultural materials separated by several thousand years indicates that visits to the site occurred more or less at random.

Zone 4/5 apparently includes one or more small, generalized camps left behind by a small group of people that stayed at the site for a short period. Since this zone was recovered from two distinct depositional units, people may have camped at the site twice. These people manufactured lithics and worked other materials. They probably hunted small game near the site and then prepared and ate the animals--squirrels and marmots--there. Also they manufactured, repaired, and perhaps used leaf-shaped projectile points for hunting.

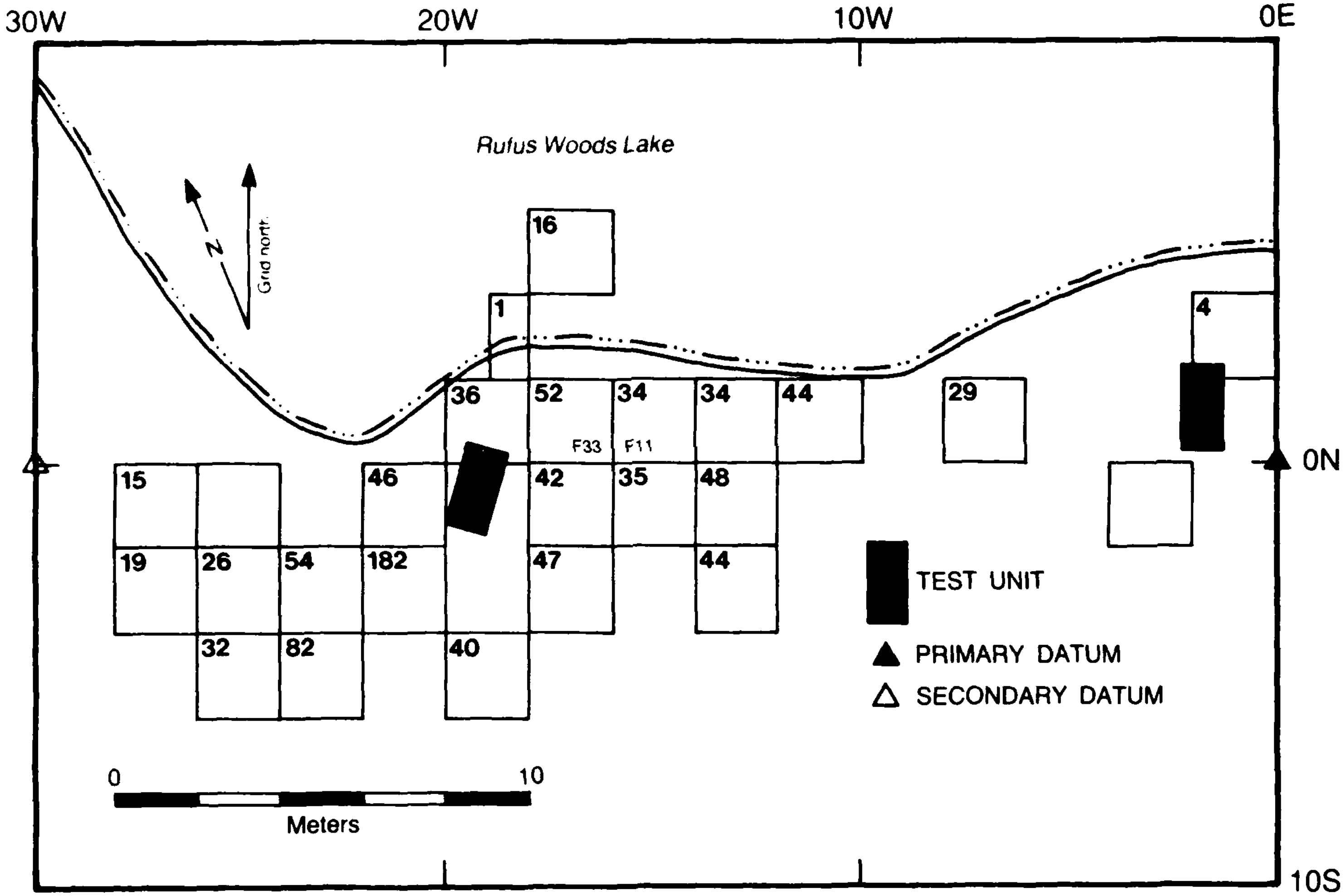


Figure 6-11. Distribution of lithics, Zone 2, 45-DO-273.

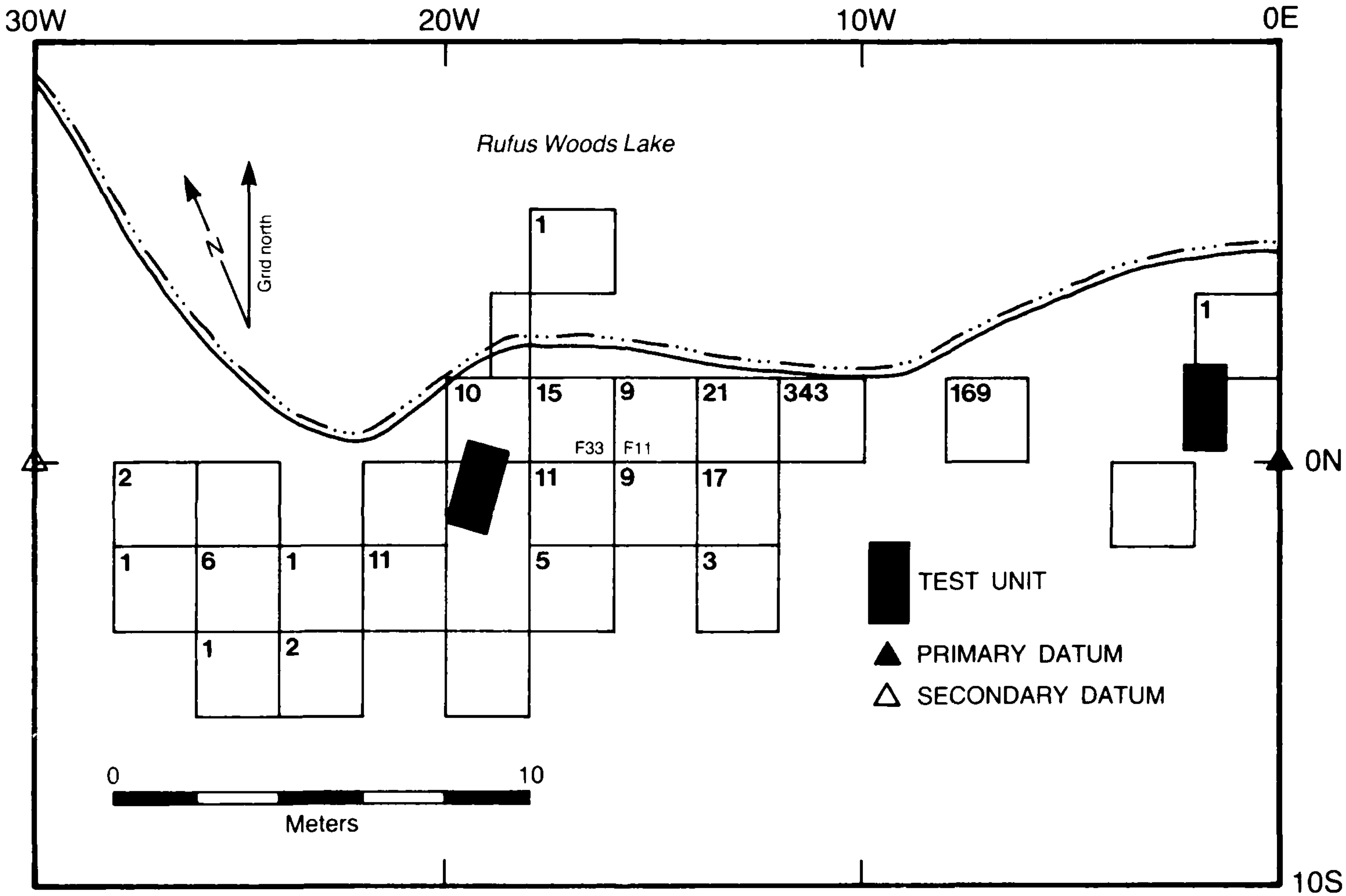


Figure 6-12. Distribution of bone, Zone 2, 45-DO-273.

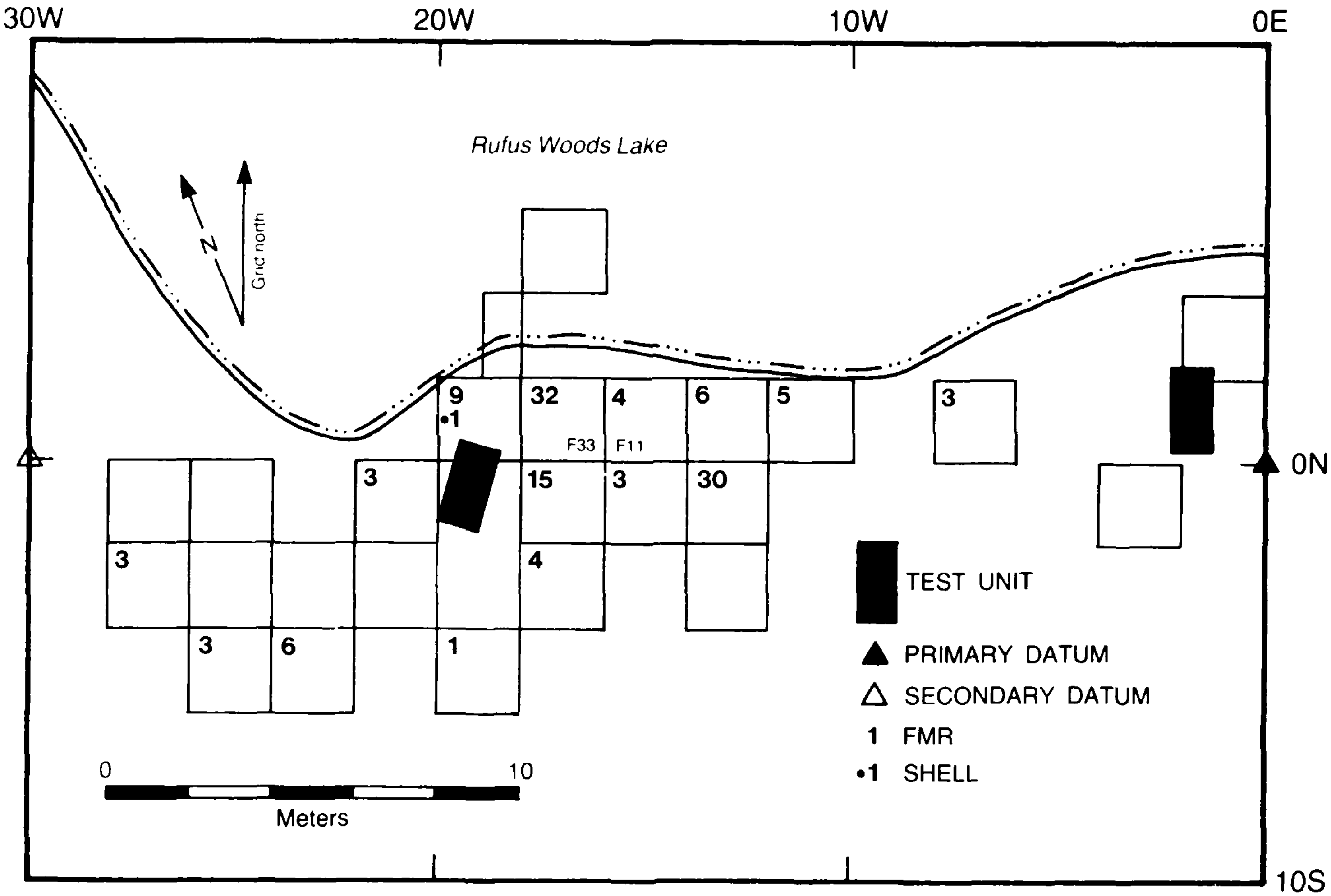


Figure 6-13. Distribution of FMR and shell, Zone 2, 45-DO-273.

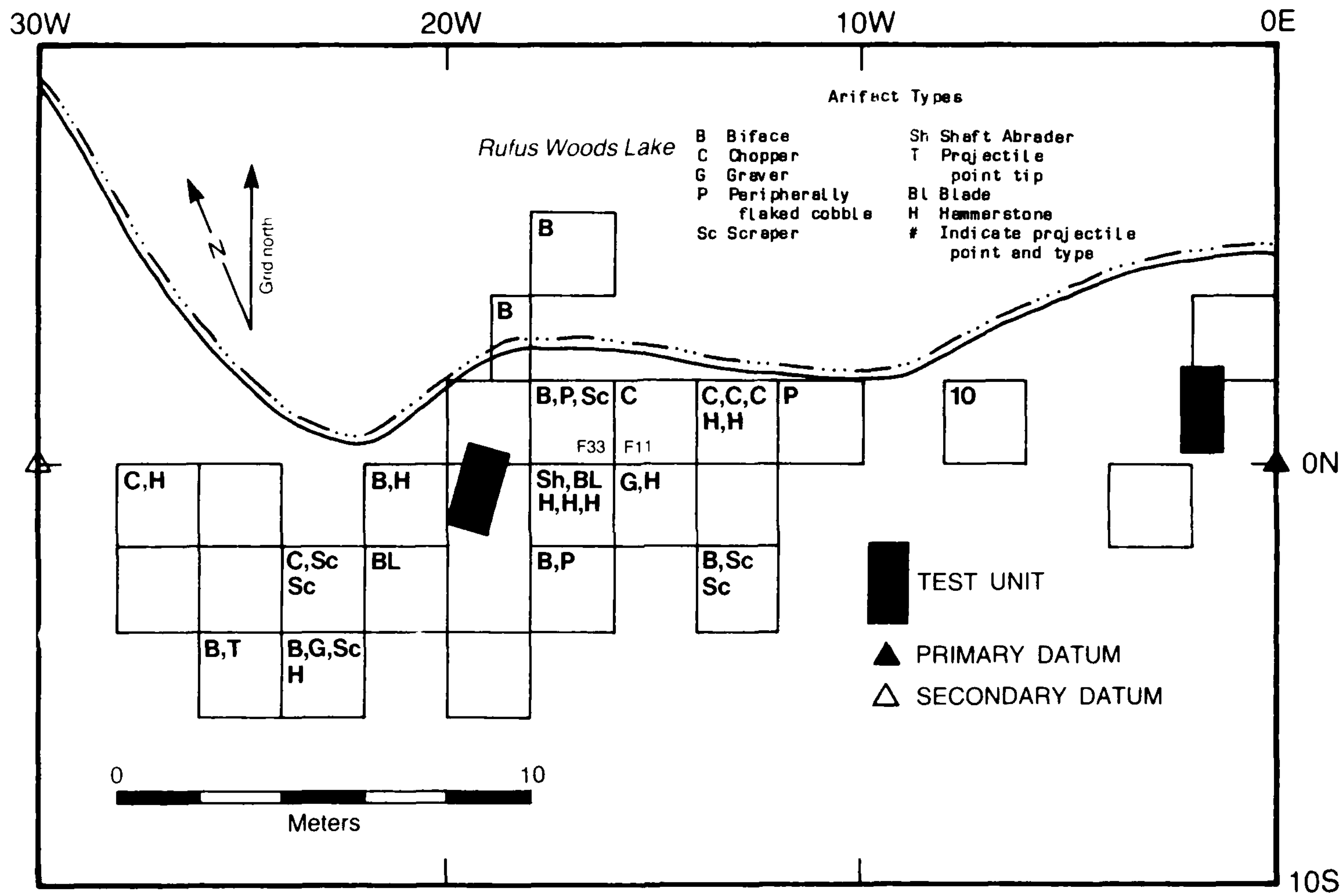


Figure 6-14. Distribution of formed and worn/manufactured objects, Zone 2, 45-DO-273.

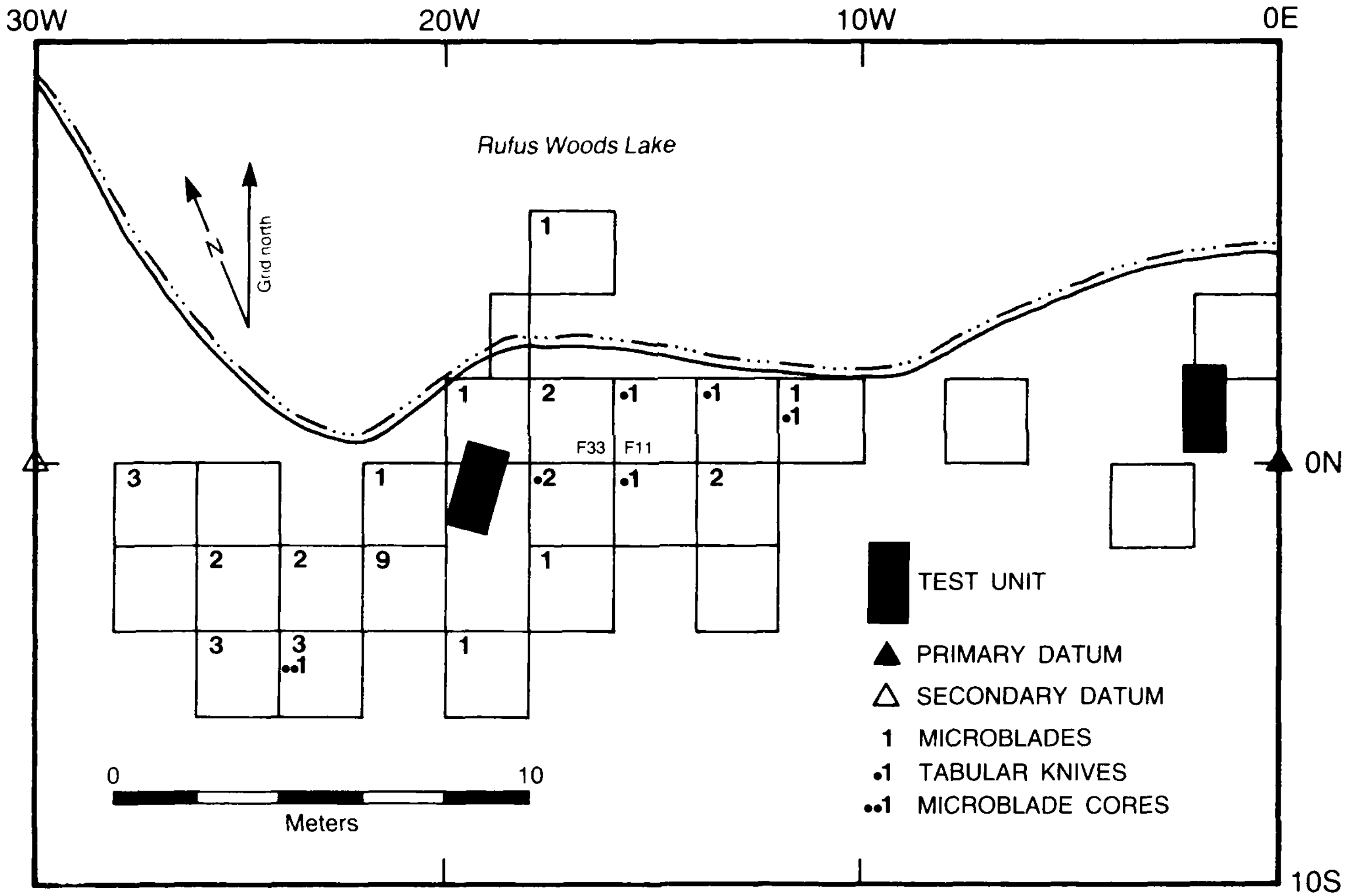


Figure 6-15. Distribution of microblade industry and tabular knives, Zone 2, 45-DO-273.

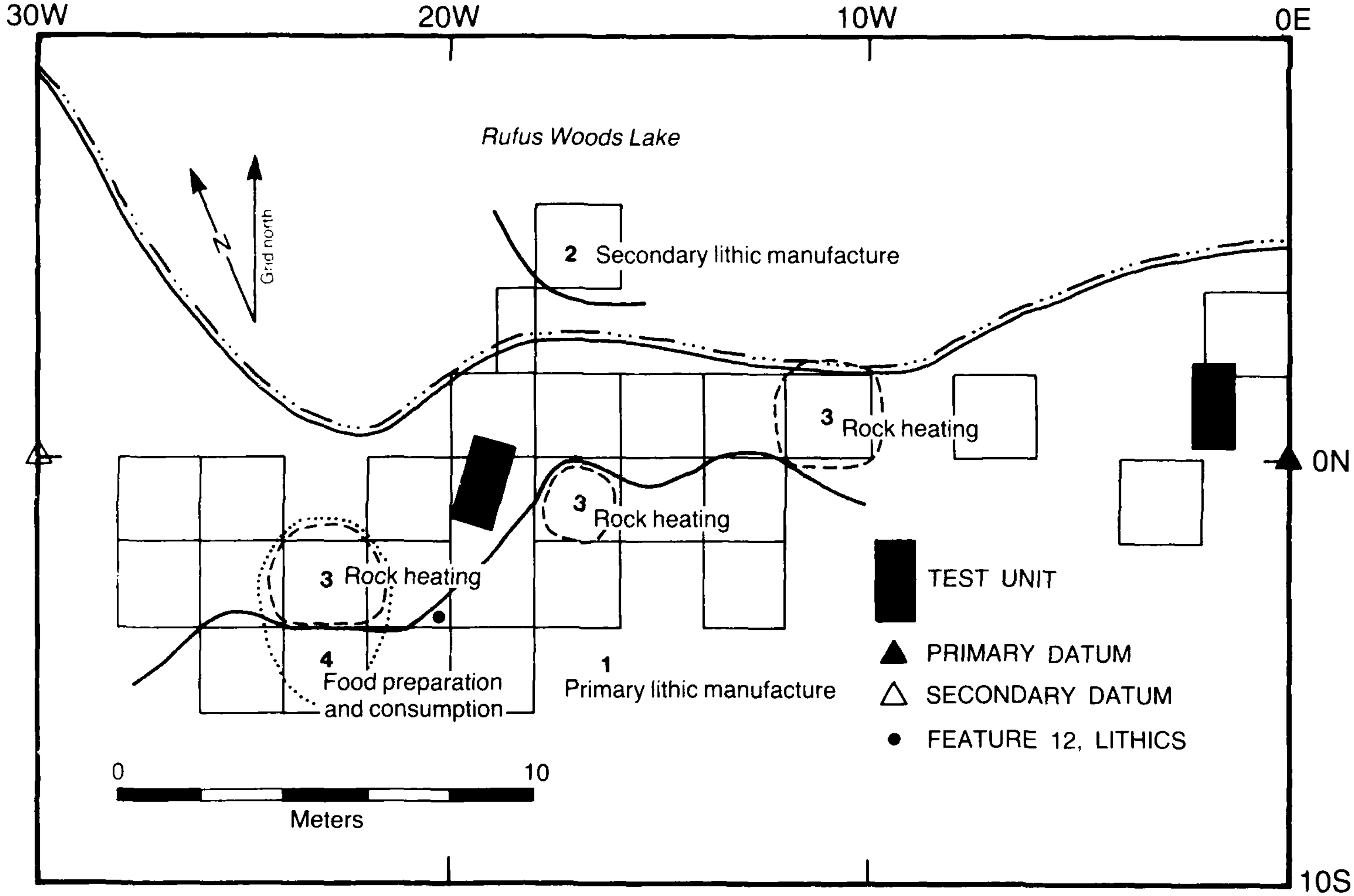


Figure 6-16. Activity areas in Zone 3, 45-DO-273.

Zone 3 has the only well-defined activity area. There lithics--and, by inference, other materials--were manufactued. Again, small game of the marmot and rodent kind were probably hunted locally and shellfish gathered. The quantities of lithics recovered indicate the occupation of a larger group. Several occupations may have occurred during this period.

The cultural deposits from Zone 2 leads us to infer the occupation of a small group of people for one or two very short intervals. The activities of these people resemble those of previous periods except they probably hunted deer and elk.

Perhaps the most remarkable aspect of our findings is the scanty change evident in the artifact assemblage throughout the 5500 years of sporadic occupation. Tenative as our reading of the data must remain, we may partly attribute this to the constancy of the site function: similar artifacts were used for the same tasks.

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APPENDIX A:

RADIOCARBON DATE SAMPLES AND RESULTS OF SOIL ANALYSES, 45-DO-273

Table A-1. Radiocarbon date samples, 45-DO-273.

Lab Sample #[1]	Zone	DU	Stratum	Unit	Level	Feature #	Material/gms	Radiocarbon Age (Years B.P.) T1/2=5730	Dendrocorrected Age[2] (Years B.P.)
TX-4170	4	II	180	1N19W	100	31	Decomposing wood/7.8	1050±180	1036±183
	F31 is supposedly a rodent run. But wood is said to be redeposited, "located in buried stream channel.								
TX-4171	4	II	180	2N19W	100	31	Decomposing wood/11.5	990±360	968±361

1 TX samples were dated by University of Texas-Austin, Radiocarbon Laboratory.
2 Dendrocorrected according to Damon et al. (1974).

Table A-2. Results of chemical and physical soil analyses, 45-DO-273.

Field Stratum	DU	Sample No.	cm Below Surface	Physical Analyses: Munsell Color (dry)	Particle Size: Sand/Silt/Clay (%)	Constituents: Charcoal (%)	Mazama Tephra[1] (%)	Bone (%)	Shell (%)	Organic Matter (%)	Minerals (%)	Grain Rounding[1]	Chemical Analyses: pH	Organic Matter (%)	Exchangeable Calcium (ppm)	Phosphate (ppm)
IV	3a	1	60- 70	10YR(7/3)	82/18/0	Trace	Trace	2	Trace	Trace	95	1-2	7.1	-	140	80.2
		2	70- 74	10YR(7/3)	80/17/0	Trace	Trace	-	1	1	86	1-4	7.1	-	-	83.7
V	2	3	74- 80	10YR(7/3)	82/18/0	-	-	-	1	-	99	1-4	7.2	-	-	63.0
		4	80- 90	10YR(7/3)	95/5/0	Trace	-	Trace	Trace	Trace	97	1-4	7.0	-	-	64.4
		5	90-100	10YR(7/2)	82/15/3	Trace	-	Trace	Trace	-	98	1-4	7.2	-	-	64.4
		6	102-110	10YR(7/3)	95/2/3	Trace	Trace	Trace	Trace	-	98	1-2	7.1	-	-	48.2
VIa		7	112-118	10YR(8/2)	90/10/0	-	Trace	-	Trace	-	98	1-2	7.7	-	1400	26.9
VII		8	114-120	5YR(8/1)	35/57/8	-	25	-	Trace	-	74	1-4	7.9	-	3045	51.1
		9	120-126	5YR(8/1)	30/65/5	-	70	-	Trace	Trace	29	2	7.9	-	1120	32.2
		10	126-130	5YR(8/1)	27/65/8	-	50	-	-	-	50	1-4	7.7	-	2870	35.7
		11	130-137	5YR(8/1)	22/65/13	-	60	-	-	-	40	1-4	7.8	-	2975	24.5
VIIa		12	137-143	5YR(8/1)	37/58/5	-	25	-	-	-	75	1-2	7.6	-	1575	18.9
VIII	1	13	143-150	10YR(7/2)	92/5/3	-	Trace	-	Trace	-	99	1-4	7.6	-	378	36.4
IX		14	150-160	10YR(7/3)	90/7/3	-	Trace	-	Trace	-	98	1-4	7.8	-	1400	56.0
		15	162-168	10YR(7/2)	85/15/0	-	-	-	Trace	-	99	1-4	7.6	-	910	37.1
X		16	168-175	10YR(7/3)	55/42/3	-	-	-	Trace	-	85	2-4	7.4	-	3150	32.9
XI		17	175-180	10YR(7/2)	77/20/3	-	-	-	Trace	-	99	2-4	7.6	-	3157	23.1
		18	181-190	10YR(7/2)	80/20/0	-	-	-	Trace	-	99	2-4	7.5	-	182	28.7
		19	181-190	10YR(7/2)	95/5/0	-	-	-	Trace	-	99	2-4	7.4	-	140	38.9
XIa		20	190-200	10YR(7/2)	85/15/0	-	-	-	Trace	-	99	2-3	7.3	-	182	38.5
		21	200-210	10YR(7/2)	80/17/3	-	-	-	Trace	-	98	2-3	7.4	-	980	37.1
XIII		22	210-220	10YR(7/2)	75/22/3	-	-	-	Trace	-	96	1-4	7.6	-	1960	30.1
		23	210-108	10YR(7/2)	62/35/3	-	-	-	Trace	-	94	1-4	7.5	-	959	30.1
		24	220-230	10YR(7/2)	57/40/3	-	-	-	Trace	-	96	1-4	7.5	-	379	56.8

[1] 1=angular, 2=sub-angular, 3=rounded, 4=sub-rounded.

APPENDIX B:

ARTIFACT ASSEMBLAGE, 45-DO-273

Table B-1. Technological dimensions.

DIMENSION I: OBJECT TYPE

Conchoidal flake
Chunk
Core
Linear flake
Unmodified
Tabular flake
Formed object
Weathered
Indeterminate

DIMENSION II: RAW MATERIAL*

Jasper
Chalcedony
Petrified Wood
Obsidian
Opal
Quartzite
Fine-grained quartzite
Basalt
Fine-grained basalt
Silicized mudstone
Argillite
Granite
Siltstone/mudstone
Schist
Graphite/molybdenite
Bone/antler
Ochre
Shell
Dentalium

DIMENSION III: CONDITION

Complete
Proximal fragment
Proximal flake
Less than 1/4 inch
Broken
Indeterminate

DIMENSION IV: DORSAL TOPOGRAPHY

None
Partial cortex
Complete cortex
Indeterminate/not applicable

DIMENSION V: TREATMENT

Definitely burned
Dehydrated (heat treatment)

ATTRIBUTE I: WEIGHT

Recorded weight in grams

ATTRIBUTE II: LENGTH

Flakes: length is measured between the point of impact and the distal end along the bulbar axis

Other: length is taken as the longest dimension

ATTRIBUTE III: WIDTH

Flakes: width is measured at the widest point perpendicular to the bulbar axis

Other: width is taken as the maximum measurement along an axis perpendicular to the axis of length

ATTRIBUTE IV: THICKNESS

Flakes: thickness is taken at the thickest point on the object, excluding the bulb of percussion and the striking platform

Other: thickness is taken as the measurement perpendicular to the width measurement along an axis perpendicular to the axis of length

* Only those raw materials recorded from the site are listed here; a complete list is available in the Project's Research Design (Campbell 1984d).

Table B-2. Functional dimensions.

DIMENSION I: UTILIZATION/MODIFICATION

- None
- Wear only
- Manufacture only
- Manufacture and wear
- Modified/indeterminate
- Indeterminate

DIMENSION II: TYPE OF MANUFACTURE

- None
- Chipping
- Pecking
- Grinding
- Chipping and pecking
- Chipping and grinding
- Pecking and grinding
- Chipping, pecking, grinding
- Indeterminate/not applicable

DIMENSION III: MANUFACTURE DISPOSITION

- None
- Partial
- Total
- Indeterminate/n t applicable

DIMENSION IV: WEAR CONDITION

- None
- Complete
- Fragment

DIMENSION V: WEAR/MANUFACTURE RELATIONSHIP

- None
- Independent
- Overlapping - total
- Overlapping - partial
- Independent - opposite
- Indeterminate/not applicable

DIMENSION VI: KIND OF WEAR

- Abrasion/grinding
- Smoothing
- Crushing/pecking
- Polishing

DIMENSION VI: Continued

- Feathered chipping
- Feathered chipping/abrasion
- Feathered chipping/smoothing
- Feathered chipping/crushing
- Feathered chipping/polishing
- Hinged chipping
- Hinged chipping/abrasion
- Hinged chipping/smoothing
- Hinged chipping/crushing
- Hinged chipping/polishing
- None

DIMENSION VII: LOCATION OF WEAR

- Edge only
- Unifacial edge
- Bifacial edge
- Point only
- Point and unifacial edge
- Point and bifacial edge
- Point and any combination
- Surface
- Terminal surface
- None

DIMENSION VIII: SHAPE OF WORN AREA

- Not applicable
- Convex
- Concave
- Straight
- Point
- Notch
- Slightly convex
- Slightly concave
- Irregular

DIMENSION IX: ORIENTATION OF WEAR

- Not applicable
- Parallel
- Oblique
- Perpendicular
- Diffuse
- Indeterminate

DIMENSION X: OBJECT EDGE ANGLE

- Actual edge angle

Table B-3. Detailed wear data, DO-273.

Object Type	Kind of Wear	Location of Wear	Grouped Edge Angle	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Total
Microblade	Feathered chipping	Unifacial edge	Medium	2	-	-	-	-	2
			Fine	1	-	2	-	-	3
Utilized flake	Smoothing	Edge only	Fine	-	-	-	1	-	1
			Steep	-	-	1	-	-	1
		Unifacial edge	Medium	-	1	3	-	-	4
		Bifacial edge	Medium	-	-	2	-	-	2
		Point only	Medium	-	-	1	-	-	1
	Feathered chipping	Unifacial edge	Fine	14	30	66	15	3	128
			Medium	13	28	40	9	3	93
			Steep	2	1	8	-	-	11
		Bifacial edge	Fine	2	4	4	1	1	12
			Medium	2	2	2	1	-	7
		Point only	Fine	1	-	-	-	-	1
	Hinged chipping	Edge only	Steep	-	1	-	-	-	1
		Unifacial edge	Fine	2	2	3	-	2	9
			Medium	3	10	12	-	2	27
			Steep	1	2	11	-	-	14
		Bifacial edge	Fine	2	-	1	-	-	3
			Medium	-	-	3	1	-	4
			Steep	-	-	1	-	-	1
	Feathered chipping and smoothing	Unifacial edge	Fine	2	-	1	3	-	6
			Medium		-	3	-	-	3
			Steep	-	-	1	-	-	1
		Bifacial edge	Fine	-	-	-	1	-	1
	Hinged chipping and smoothing	Bifacial edge	Steep	-	-	1	-	-	1
	Crushing/Pecking	Point only	Medium	-	-	1	-	-	1
Unifacially retouched flake	Feathered chipping	Unifacial edge	Medium	1	4	3	-	-	8
			Steep	-	1	2	1	-	4
		Bifacial edge	Medium	-	1	-	-	-	1
	Feathered chipping and smoothing	Unifacial edge	Medium	-	1	-	-	-	1
			Steep	-	1	-	-	-	1
	Hinged chipping	Unifacial edge	Fine	1	-	-	-	-	1
			Medium	-	1	8	2	-	11
			Steep	-	3	1	-	-	4
		Bifacial edge	Medium	-	1	-	-	-	1
			Steep	-	-	1	-	-	1
Bifacially retouched flake	Hinged chipping	Unifacial edge	Medium	-	-	3	-	-	3
		Bifacial edge	Steep	-	-	1	-	-	1
	Hinged chipping and smoothing	Bifacial edge	Medium	1	-	-	-	-	1
	Feathered chipping	Unifacial edge	Medium	1	-	-	-	-	1
		Bifacial edge	Fine	-	-	-	-	2	2
			Medium	-	-	-	-	1	1

Table B-3. Cont'd.

Object type	Kind of Wear	Location of Wear	Grouped Edge Angle	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Total
Resharpening flake	Feathered chipping	Unifacial edge	Fine	-	1	-	-	-	1
			Medium	-	-	1	-	-	1
			Steep	-	-	1	-	-	1
	Hinged chipping	Unifacial edge	Fine	-	-	1	-	-	1
			Medium	-	-	2	-	-	2
			Steep	-	1	-	-	-	1
Core	Feathered chipping	Unifacial edge	Medium	-	-	1	-	-	1
	Hinged chipping	Unifacial edge	Steep	-	1	-	-	-	1
Chopper	Crushing/ Packing	Bifacial edge	Medium	1	-	-	-	-	1
	Feathered chipping and smoothing	Unifacial edge	Steep	-	-	1	-	-	1
	Hinged chipping and crushing	Bifacial edge	Medium	-	1	-	-	-	1
	Hinged chipping and smoothing	Bifacial edge	Steep	-	5	-	-	-	5
Hammerstone	Crushing/ Packing	Terminal surface	Very steep	3	16	8	-	4	31
	Smoothing	Terminal surface	Very steep	-	1	-	-	-	1
Peripherally flaked cobble	Crushing/ Packing	Edge only	Steep	-	2	1	-	-	3
		Bifacial edge	Medium	-	-	2	-	-	2
			Steep	-	-	1	-	-	1
	Smoothing	Edge only	Steep	-	-	2	-	-	2
Biface	Feathered chipping	Unifacial edge	Medium	-	1	2	1	-	4
			Steep	-	1	-	-	-	1
		Bifacial edge	Medium	-	-	1	-	1	2
			Steep	-	-	-	-	1	1
	Smoothing	Bifacial edge	Fine	-	-	1	-	-	1
	Feathered chipping and smoothing	Unifacial edge	Medium	-	-	2	-	-	2
		Bifacial edge	Steep	-	1	-	-	-	1
	Hinged chipping	Unifacial edge	Medium	-	1	-	-	-	1
			Steep	-	1	1	-	-	2
		Bifacial edge	Medium	1	-	1	-	-	2
			Steep	-	1	-	-	-	1
	Hinged chipping and smoothing	Unifacial edge	Medium	-	2	-	-	-	2
			Steep	-	-	-	1	-	1
		Bifacial edge	Medium	-	-	1	-	-	1
			Steep	-	1	-	-	-	1

Table B-3. Cont'd.

Object type	Kind of Wear	Location of Wear	Grouped Edge Angle	Zone					Total
				1	2	3	4	5	
Projectile point	Feathered chipping	Unifacial edge	Medium	–	–	4	–	-	4
	Feathered chipping and smoothing	Point and unifacial edge or both	Medium	–	-	1	–	-	1
	Hinged chipping	Unifacial edge	Medium	–	1	–	–	-	1
			Steep	–	1	1	–	-	2
	Smoothing	Bifacial edge	Medium	-	1	2	–	-	3
Projectile point base	Feathered chipping	Unifacial edge	Medium	–	1	–	–	-	1
Projectile point tip	Feathered chipping	Unifacial edge	Medium	1	–	–	-	-	1
	Hinged chipping	Unifacial edge	Fine	–	3	.	–	–	3
	Smoothing	Point only	Steep	1	.	.	-	–	1
	Hinged chipping and smoothing	Bifacial edge	Steep	1	–	–	-	-	1
Drill	Feathered chipping	Unifacial edge	Medium	–	–	–	1	–	1
		Point and unifacial edge or both edges	Fine	–	–	1	–	–	1
	Hinged chipping	Point and unifacial edge or both edges	Indeterminate	–	–	–	1	–	1
		Unifacial edge	Medium	–	–	–	1	–	1
		Point and unifacial	Medium	–	–	-	1	–	1
	Polishing	Point only	Medium	–	–	1	-	–	1
Graver	Feathered chipping and smoothing	Point only	Medium	–	–	1	–	.	1
	Feathered chipping	Point and unifacial or both edges	Medium	–	1	–	–	–	1
	Hinged chipping	Unifacial edge	Steep	–	–	1	–	–	1
		Point and unifacial edge	Medium	–	–	–	1	–	1
			Steep	–	–	1	–	–	1
	Smoothing	Point only	Medium	–	1	–	–	-	1
Tabular knife	Crushing/pecking	Edge only	Steep	–	2	–	–	-	2
	Smoothing	Edge only	Fine	3	3	1	–	–	7
			Medium	–	1	2	–	1	4
			Steep	–	1	3	–	–	4
		Unifacial edge	Steep	–	-	1	–	–	1
		Terminal surface	Very steep	–	-	1	–	–	1
		Bifacial edge	Medium	–	-	1	–	–	1

Table B-3. Cont'd.

Object type	Kind of Wear	Location of Wear	Grouped Edge Angle	Zone					Total
				1	2	3	4	5	
Scraper	Feathered chipping	Unifacial edge	Fine	-	1	1	-	-	2
			Medium	5	11	4	-	-	20
			Steep	-	-	2	-	-	2
		Bifacial edge	Medium	1	1	-	-	-	2
	Hinged chipping	Unifacial edge	Fine	-	-	1	-	-	1
			Medium	4	3	6	3	-	16
			Steep	2	1	2	-	-	5
		Bifacial edge	Steep	-	-	3	-	-	3
		Point and unifacial edge of both edges	Steep	-	1	-	-	-	1
	Feathered chipping and smoothing	Unifacial edge	Fine	-	-	1	-	-	1
			Medium	-	-	1	-	-	1
	Hinged chipping and smoothing	Unifacial edge	Steep	-	1	-	-	-	1
Spokeshave	Hinged chipping	Unifacial edge	Steep	-	-	1	-	-	1
Indeterminate	Crushing/ pecking	Point only	Indeterterminate	-	-	1	-	-	1
Total				73	183	264	44	21	565

Table B-4. Complete morphological description of projectile points, 45-DO-273.

Master #	Zone	Morphological Type	Morphological Type Description	Historical type Description	Length (mm)	Width (mm)	Thickness (mm)	Material	Complete Morphological Description	Remarks
400	3	1	Large, triangular	-	40.8	22.5	4.3	Jasper	N1N12221NN3	Preform
132	3	3	Large side-notched	Cold Springs Side-notched	45.3[1]	19.7	5.4	Jasper	11313221NN3	Tip reworked
519	3	3	Large side-notched	Cold Springs Side-notched	-	24.2	6.9	Jasper	19N11929NN9	Broken above notches
272	4	5	Lanceolate	Cascade A	43.0[1]	14.8	5.4	Chalcedony	N2NN8221194	Base broken
408	5	5	Lanceolate	Cascade A	39.3[1]	18.1	4.8	Jasper	N2NN2321121	Blade reworked
554	4	5	Lanceolate	Cascade C	57.4	15.6	8.7	Jasper	N2NN2222124	-
10	5	5	Lanceolate	Cascade C	41.0	15.4	7.2	Jasper	N2NN2222124	From test excavations
487	1	6	Shouldered, lanceolate	Mahkin Shouldered	33.5[1]	17.0	6.7	Jasper	22NN2221121	Tip broken
578	1	6	Shouldered, lanceolate	Mahkin Shouldered	65.0[1]	22.2	7.3	Basalt	22NN2221124	Tip broken
434	3	6	Shouldered, lanceolate	Mahkin Shouldered	-	21.4	6.9	Jasper	22NN1919129	Blade broken
490	3	6	Shouldered, lanceolate	Mahkin Shouldered	43.2[1]	16.6	5.0	Chalcedony	22NN8221192	Base broken
423	3	7	Large, shouldered triangular contracting stem	Rabbit Island A	31.3	14.1	4.8	Jasper	21212221NN3	-
349	2	10	Small, shouldered triangular, contracting stem	Nespelem Bar	-	13.9	4.7	Jasper	21122929NN1	Blade broken

[1] Actual measurements on broken specimens.

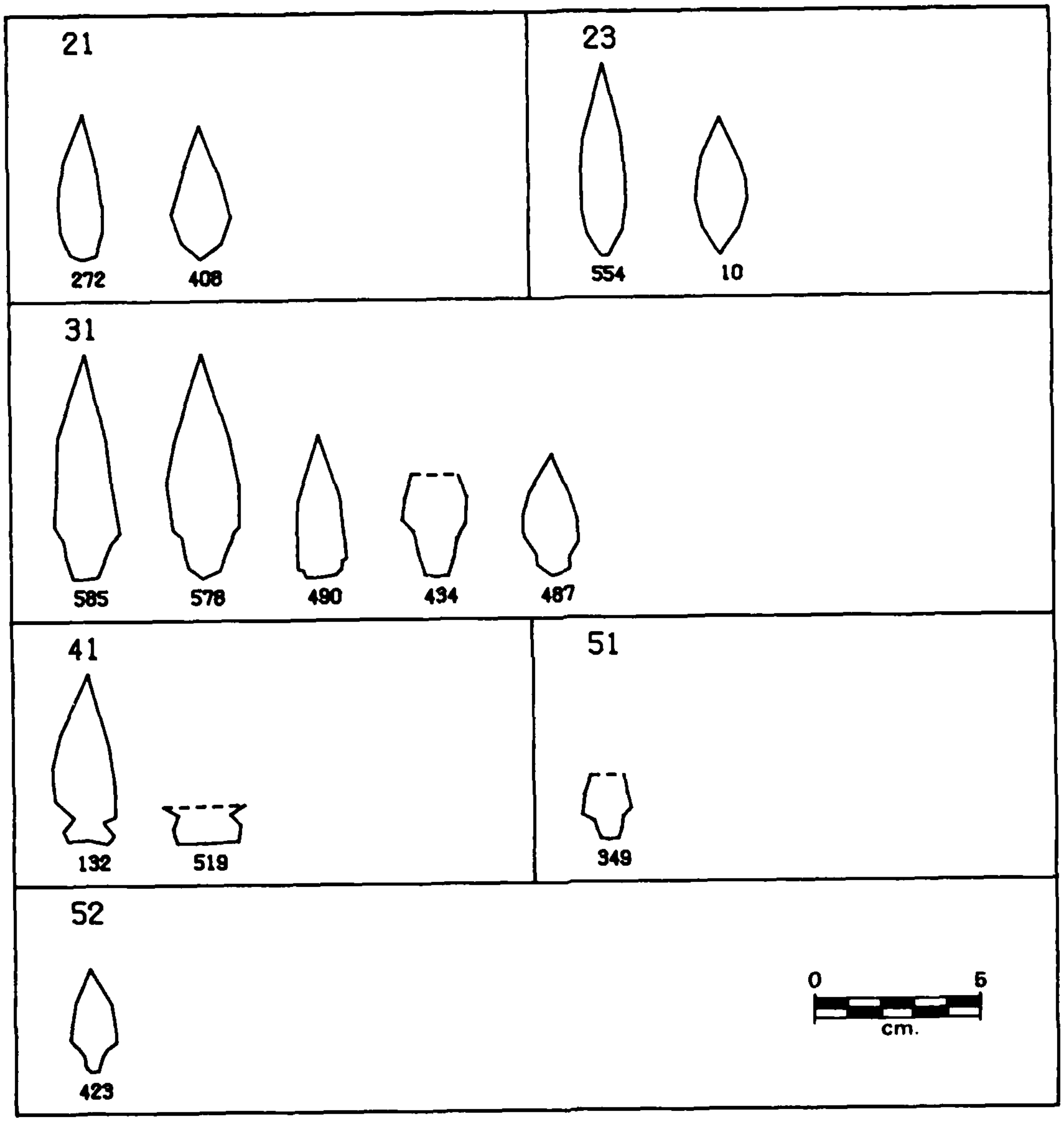

Figure B-1. Projectile point outlines from digitized measurements, 45-DO-273. Upper number is the historic type (see Figure 3-2 for key). Lower number is master number.

APPENDIX C:

FAUNAL ASSEMBLAGE, 45-DO-273

Family Sciuridae

Marmota flaviventris

Zone 3: 1 humerus fragment.

Zone 4: 1 mandible fragment.

Spermophilus sp.

Zone 3: 1 mandible fragment.

Family Geomyidae

Thomomys talpoides

Zone 1: 1 femur.

Zone 2: 1 mandible, 1 mandible fragment, 1 maxilla fragment, 2 humeri, 2 ulnae, 3 innominates, 2 femora, 1 tibia fragment.

Zone 3: 1 skull, 3 mandibles, 1 mandible fragment, 1 maxilla, 1 scapula, 1 innominate, 1 femur, 2 tibiae.

Zone 4: 3 skulls, 2 mandibles, 5 mandible fragments, 2 maxilla, 1 humerus, 1 ulna fragment, 1 femur, 1 femur fragment, 1 tibia.

Zone 5: 1 mandible, 6 mandible fragments, 1 scapula fragment, 2 humerii, 1 radius, 2 femora.

Family Heteromyidae

Perognathus parvus

Zone 3: 1 femur, 1 mandible fragment, 1 maxilla.

Zone 5: 1 femur fragment.

Family Cricetidae

Zone 2: 2 mandible fragments, 1 maxilla fragment.

Lagurus curtatus

Zone 1: 7 mandibles, 1 maxilla.

Zone 2: 1 mandibile.

Family Canidae

Canis sp.

Zone 1: 1 skull fragment, 1 scapula fragment, 1 humerus fragment, 1 innominate fragment, 1 femur, 1 calcaneus.

Family Cervidae

Odocoileus spp.

Zone 1: 1 distal fibula, 1 metatarsal, 1 astragalus, 1 naviculocuboid, 1 carpal.

Zone 2: 1 molar fragment.

Cervus elaphus

Zone 2: 1 metapodial fragment.

APPENDIX D:

DESCRIPTION OF CONTENTS OF UNCIRCULATED APPENDICES

Detailed data from two different analyses are available in the form of hard copies of computer files with accompanying coding keys.

Functional analysis data include provenience (site, analytic zone, excavation unit and level, and feature number and level (if applicable); object master number; abbreviated functional object type; and coding that describes each tool on a given object. Data normally are displayed in alphanumeric order by site, analytic zone, functional object type, and master number. Different formats nay be available upon request depending upon research focus.

Faunal analysis data include provenience (site, analytic zone, excavation unit and level, feature number, and level (if applicable); taxonomy (family, genus, species); skeletal element; portion; side; sex; burning/butchering code; quantity; and age. Data normally are displayed in alphanumeric order by site, analytic zone, provenience, taxonomy, etc.

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