FINAL REPORT ON THE 1983/1984 EXCAVATIONS AT THE MUD LAKE STREAM SITE (BkDw 5), SOUTHWESTERN NEW BRUNSWICK

BY: MICHAEL DEAL

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FINAL REPORT ON THE 1983/1984 EXCAVATIONS AT THE MUD LAKE STREAM SITE (BkDw 5), SOUTHWESTERN NEW BRUNSWICK

A report prepared for the Project Steering Committee representing Parks Canada, National Parks Branch, Co-operative Heritage Planning Section, and the Management Committee, St. Croix Waterway Recreation Area

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ABSTRACT

The Mud Lake Stream site, located on Spednic Lake, southwestern New Brunswick, provides a rare glimpse of prehistoric utilization of the interior portion of the Chiputneticook-St.Croix Drainage area. The most extensive evidence of aboriginal use dates to the Ceramic period, while Early Ceramic period (Meadowood), and Late Archaic Susquehanna materials have also been uncovered. In particular, the Susquehanna component at Mud Lake Stream represents the first undisturbed deposit dating to that period found thus far in New Brunswick.

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CHAPTER ONE

Introduction

The following study represents the final report on the excavations at the Mud Lake Stream site (BkDw 5). This site is located on the northwestern end of Spednic Lake in southwestern New Brunswick (Figure 1). This lake is the largest of the sixty-one lakes which drain into the St. Croix River (Davis 1950), and thus forms an integral part of the Chiputneticook-St. Croix Drainage System.

Three distinct cultural components have been identified at the site. While the entire site appears to have been utilized during the Ceramic period, one major cultural feature is believed to date to the Early Ceramic (Meadowood) period, and evidence of Late Archaic Susquehanna utilization of the site was also recovered in an isolated area at the center of the site. Although Susquehanna materials have been identified from at least thirteen sites along

the Chiputneticook-St. Croix drainage, the Susquehanna component from Mud Lake Stream is the first to come from a stratified context. Two charcoal samples from this deposit have been dated to around 4000 B. P. Moreover, this is the oldest undisturbed prehistoric occupation yet found in New Brunswick.

In the Maine-Maritimes region, the Ceramic period began with the introduction of the knowledge of pottery manufacture, sometime in the first half of the first millenium B.C., and ended with the first contact with the Europeans (that is, the beginning of the Historic period). While several coastal sites have contributed information concerning the Ceramic period occupation of this region (e.g. Baird 1881; Davis 1978; Matthew 1892; Pearson 1970; Sanger 1971; 1973, 1977, 1982), relatively few interior sites have been excavated (for discussion see Sanger 1979; Deal 1984a). Useful comparative information on interior sites is drawn from two recently excavated sites on Spednic Lake, namely the Diggity Beach (BjDu 4) and Diggity (BjDu 17) sites (Allen 1983; Deal 1984), as well as the Hodgdon site in central Maine (Lahti et. al. 1981).

One great disadvantage with the excavation of any interior sites is the fact that organic materials such as bone and wood do not survive in the highly acidic soils of the interior. On coastal sites, however, this acidity is neutralized by calcium carbonate from large concentrations of shell in the midden deposits.

Considerable information is lost at interior sites concerning organic tool industries, as well as most data on native diet and the season of site occupation which is derived from the faunal remains. However, as the present study illustrates, a limited amount of information concerning diet and seasonality are recoverable at interior sites in the form of calcined bone and charred seeds.

The following report is divided into six sections dealing with the environmental setting of the site, the historic use of the site within the regional context, a summary of the excavation procedures and site stratigraphy, a summary of the macroplant and faunal remains recovered, the artifact analysis, and the distribution of artifacts and cultural features over the site. In the final chapter, an attempt is made to place the above information into the perspective of local prehistory.

CHAPTER TWO

Environmental setting

The Mud Lake Stream site is located on a spit of land on the eastern bank of the mouth of Mud Lake Stream (Latitude 45°, 41', 05"; Longitude 67°, 43', 30"). The eastern side of this land mass forms part of a sheltered cove in Spednic Lake. In historic times, Mud Lake Stream was an important portage route between Grand and Spednic lakes (Ganong 1899:242-245). Today, Mud Lake Stream forms a segment of the Canadian and U. S. border, and several international bench marks are found in the vicinity of the site.

In recent times, a series of dams were constructed in order to control the level of water within the waterway for the movement of logs by the Georgia-Pacific Corporation. The water level in Spednic Lake, for example, can vary from 113 to 118 meters above sea level (Allen 1983:5). Each year, in the late fall, large tracts of previously drowned shoreline are exposed. At this time, Mud Lake Stream is reduced to a narrow, deep channel which runs along the

southwest beachface of the site (see Plate 1). A large mud flat, with numerous, large, dead tree stumps on the newly exposed (U.S.) side of the stream is a bleak reminder of the former extent of the site along both banks of the stream (see Allen 1983:19). Artifacts from this submerged portion of the site have been reported in the Wheaton collection, in Forest City, Maine (Kopec 1985).

The Mud Lake Stream site is situated approximately 100 kilometers above the headwaters of the St. Croix. According to Loucks (1962:99), the physiography of this portion of the drainage area can be characterized as having a rolling drumlinoid topography, with surface materials composed mainly of variable-textured glacial drift (Rowe 1972:125). Much of the area rises more than 300 meters above sea level, while below the headwaters the elevation drops to below 150 meters above sea level. Large granite boulders, left as glacial till, are a common feature throughout the drainage area, both on the shoreline and in the waterway, and present a constant boating hazard.

The Chiputneticook Lakes represent a series of ice-scoured and drift-dammed basins, which are part of a deranged drainage pattern, flowing southward via the St. Croix River to Passamaquoddy Bay (Seaman 1982:8). Geologically, the Chiputneticook Lakes area is characterized by a granitic bedrock formation of Lower Devonian age (Smith 1966; Wicklund and Langmaid 1953:9). According to Rowe

(1972:125, 164) the dominant soils of this area are humo-ferric podzols, that is, leached soils which are strongly acidic, with distinct accumulations of dark organic material. Of these soils, the most common is Carleton shaly loam; a stony, moderately compact, brown shaly loam overlying a yellowish-brown shaly loam (EFS 1953). While this soil is classified as good to fair crop land, excessive amounts of stones in the soil (especially along the lake shores) reduce the agricultural value of the drainage area (Ganong 1904:map 4; Wicklund and Langmaid 1953).

Palynological studies from southwestern New Brunswick (Mott 1975a, 1975b) give us a glimpse of the major vegetation changes since Susquehanna times. At the beginning of Susquehanna occupation in this area, the landscape was probably covered by a mixed hardwood forest, dominated by birch (*Betula*), beech (*Fagus*), and hemlock (*Tsuga*). By 3000 B. P. hemlock had gained dominance. Pollen deposition rates seem to point to a gradual amelioration of the climate after 11,300 B. P., which had reached an apex at about that same time. This was followed by a cooler moister climate during the last one thousand years (Mott 1975a: 287).

Loucks (1962) places the entire present day Chiputneticook-St. Croix drainage area within a Sugar maple-hemlock-pine zone. According to Rowe (1972:125), tolerant hardwoods, especially sugar maple (*Acer saccharum*), beech, and yellow hardwoods dominate, while

at lower elevations these are mixed with white birch (*Betula alba*), eastern hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), red spruce (*Pieca rubens*), and eastern pine (*Pinus strobus*). Pioneer hardwoods (aspens, birches, and red maples) tend to dominate those areas with long fire histories. Dogtooth violet (*Erythronium americanum*), cucumber-root (*Medeola virginiana*), yellow violet (*Viola eriocarpa*), and zigzag smilacina (*Smilacina racemosa*) dominate the forest floor vegetation along the lake shores.

A wide variety of modern fauna inhabit the woodlands bordering Spednic Lake. The dominant large mammals are the white tailed deer (*Dama virginiana*), black bear (*Euarctos americanus*), and moose (*Alces alces*). Up until the last century, the woodland caribou (*Ranifer tarandus caribou*) was also common (Fisher 1825:17; Squires 1968:51; Ward 1878). Smaller mammals inhabiting the lakes include muskrat (*Ondata zibethicus*), beaver (*Castor canadensis*), mink (*Musetela vison*), otter (*Lutra canadensis*), porcupine (*Erethizon dorsatum*), rabbit (*Lepus americanus*), and squirrel (*Tamiasciurus hudsonicus*).

A number of game birds are also common in the area (see Squires 1952), including ruffed grouse (*Bonasa umbellus togata*), woodcock (*Philohela minor*), black duck (*Anas rubripes*), and the common Canada goose (*Branta canadensis canadensis*). The common loon (*Gavia immer immer*) is a summer and fall resident of the upper portion of Spednic

Lake. The most conspicuous birds of prey on the lakes are the osprey (*Pandion haliaetus carlinensis*) and the southern bald eagle (*Haliaeetus leucocephalus leucocephalus*).

The Chiputneticook Lakes are well suited for various species of game fish and therefore attract numerous sport fishermen (see Allen 1983:4; Boardman 1903:316-319; Gorham 1970). The most common species include landlocked Atlantic salmon (*Salmo salar*), smallmouth bass (*Micropterus dolomieui*), yellow perch (*Perca fluviatilis flavescens*), chain pickerel (*Esox niger*), white perch (*Roccus americanus*), lake whitefish (*Coregonus clupaeformis*), rainbow smelt (*Osmerus eperlanus mordax*), and the eel (*Anguilla rostrata*).

CHAPTER THREE

Historic use of site

The historic use of the Mud Lake Stream area, and the greater Chiputneticook-St. Croix Drainage, focuses on the major resources exploited along its shores, namely, furs and timber. Until the fall of Quebec in 1759, the drainage area was not attractive to settlers, and remained a "remote borderland dangerously exposed during periods of war" (Davis 1950:30). Prior to that time, most European activity along the waterway was connected with the fur trade and occasional French attacks on New England settlers, originating from Fort Meductic (Caywood 1969; Lee 1970). The French iron trade axe, used for tree felling, which was distributed widely from the early seventeenth century to the 1730s, is synonymous with this period (see Jeffreys 1945; Woodward 1946).

Examples of French trade axes have been found at three sites on Spednic and Palfrey Lakes, including Mud Lake Stream, and a fourth specimen was collected from Duck Brook, on Magaguadavic Lake.

Elsewhere in New Brunswick, these axes have been found at Fort Meductic (Caywood 1969), at Letang, Charlotte County (Kain and Rowe 1901), and along the St. John River (i.e. in the George Clark collection). A large selection of similar axes from Fort La Tour have been described as having a poll-less head with an oval shaped shaft hole, a sharply down flaring blade with straight to slightly convex backs, and range in length from 15 to 24 cm., and in weight from 368 to 1361 grams (Barka 1965:235). The single Mud Lake Stream specimen (#12) represents the small end of this size range, with a length of 15.2 cm and a weight of 463 grams (Plate 2a). A single inlaid cross is exhibited on each face of the specimen, which is believed to represent a smith or guild mark (see Jeffreys 1945, Woodward 1946:29).

After the fall of Quebec, first English fishermen and traders, and then settlers, began to move into the area. Shortly thereafter, lumbering became the most important economic activity along the shores of the drainage system. The first lumber exports began around 1771, followed by a lumbering boom period in the early nineteenth century which made the area one of the greatest timber exporting areas in North America (Davis 1950). Pine, spruce, and hemlock were the major commodities and Britian and the British West Indies were the major customers. For example, exports to Great Britain in 1824 included squared timber, masts, spars, oars,

lathwood, and deals, with the volume of squared timber shipped to Great Britain having increased by 73,817 tons from five years before (Fisher 1825:77-78).

By contrast, large parts of New England were deforested by the end of the eighteenth century due to poor forest management and the encroachment of farming (see Cronon 1983). American colonists had begun exporting timber to England, at first, to pay back financial backers, and later for profit. By the middle of the seventeenth century, present day Maine and New Hampshire were the major suppliers of lumber products to Britain, especially white and black oak, cedar, chestnut, pitch pine and white pine for the Royal Navy (Cronon 1983:109).

Three Passamaquoddy reserves were established and abandoned along the waterway during this period, namely, the Scoodic Reserve at Milltown, the Canoose Reserve at the confluence of the Canoose and St. Croix Rivers, and the St. Croix Reserve on Spednic Lake, opposite Indian Island (Erickson 1978; Wherry 1971). The latter was located only a short distance from the Diggity (BjDu17) and Diggity Beach (BjDu4) sites.

One of the most diagnostic artifact types of the early lumbering period along the Chiputneticook-St. Croix is the clay tobacco pipe. These pipes were used by both lumbermen and Indians,

and specimens have been found on several sites in the area. Among the seventeen clay pipe specimens known to have come from sites on Spednic and Magaguadavic Lakes, nine can probably be safely dated to the eighteenth and nineteenth centuries (see Deal 1984a; Hale 1985). Five of the above fragments were collected from the Mud Lake Stream site (Plate 2b,c,e,f). Two of these are pipe bowl fragments which were collected by J. Bliss Goodwin (JGB-35 and JBG-688), and the other three are pipestem fragments uncovered during the 1984 excavation. Two of the stem fragments (#301 and #303) are conjoinable and bear the mold-imparted letters "GLAS..." which presumably stand for Glasgow. Glasgow pipe makers had succeeded Bristol makers as the major suppliers of clay pipes to the New World market by the mid eighteenth century, and continued to dominate the trade throughout the following century (Faulkner 1980:33; Walker 1971:22), with the period of 1870-1885 being the time of greatest prosperity (Walker 1977:340). The second pipestem (#489) is made from a yellowish brown clay and is pared to make a bit mouthpiece. Both stem fragments have a bore diameter of approximately 5/64".

The second stem fragment can be reasonably dated to the mid to late nineteenth century due to its association with a variety of cut nail which Hume (1970:253) dates as post-1820. The latter specimen (#482) was the only nail found during the excavation (Plate 2h). It has a roughly rectangular head measuring approximately 7.5 mm by 9

mm, and which is 4 mm thick. It closely resembles the common (rosehead) variety, 2 1/2" (66 mm) nail, made by the Tremont Nail Company of Massachusetts.

Another artifact which probably dates to the early lumbering era on the lakes, is a single drawn glass bead (#541: Plate 2i)). This bead seems to belong to the Class 1b category presented by the Kids (1970). It is a very large (15 mm in length), light agua blue, translucent bead, with nine simple white stripes, which were added before drawing. It is 3 mm in diameter, and has a 5/64" bore.

One additional historic item which is difficult to date with any certainty, is a fragment of copper sheeting (#681:Plate 2d). The fragment is 35 mm wide, 64 mm long, and 1 mm thick, and it is bent at one end at an angle of about 130 degrees. A narrow groove (8 mm wide) runs the length of the sheet, and may represent a depression to hold a restraining strap. Six small, lenticular-shaped, grooves, unevenly spaced, run along one edge of the piece. The fragment probably represents a portion of a copper utensil or container. Copper containers, especially kettles (Kain and Rowe 1901), were popular items of trade from the beginning of the Contact period onward.

Twentieth century lumbering activities along on Spednic Lake has been dominated by the Georgia-Pacific Corporation . A small

logging camp, built over the Ceramic period site at Diggity (BjDu17), provides a representative sample of artifacts of the mid twentieth century lumbering industry on the waterway. The 873 artifacts from this camp include items of hardware, heating materials, personal items, and foodstuff containers (see Deal 1984b). The camp burned to the ground in the early 1960s, and since that time the site has served as an overnight campsite for fishermen, hunters, and canoeists. Coins found during the excavation of the site give a rough estimate of the twentieth century use of the site to between 1937 and 1972. By contrast, twentieth century use of the Mud Lake Stream site is represented only by the occasional liquor bottle fragments (Plate 2g), probably discarded by sportsmen.

CHAPTER FOUR

Excavation proceedures and site stratigraphy

Excavation

The Mud Lake Stream site was originally located and surface-collected by a local collector named Bliss Goodwin. It was first officially recorded and given a site designation number by David Sanger in 1972. The site was relocated during a 1982 survey and three test units were excavated in the fall of that year (Allen 1983). During the late summer and fall of 1983, the author directed a more extensive excavation of the site, in which 57 one meter square units were excavated. During the summer and fall of 1984, 56 additional units were excavated (see Figure 2). The excavated units represented about 20 percent of the known surface area of the site.

The international bench mark seventy-five was established as the site datum and an alidade was used to align a row of grid stakes

from this point to serve as the north-south axis (Plate 3). This proceedure was supervised by Anna Regan, an engineering student at the University of New Brunswick (see Regan 1983). A series of test units dug along this axis permitted the delineation of the main area of prehistoric utilization of the site to an area along the southwestern beach face. The central interior area of the site also yielded aboriginal materials from test units, and these areas deserve further testing at some future date.

At the beginning of the 1983 excavation, 10 cm arbitrary levels were excavated. This was abandoned when it was realized that once the sod layer was removed the Ceramic period soil horizon was rarely more than 10 to 20 cm deep. Although shallow cultural deposits seem to be the norm with interior, non-shell midden, sites (also see Deal 1984b; Lahti et. al. 1981), these shallow deposits can also mean a compact and complex stratigraphy on sites with a long occcupational sequence. The use of arbitrary levels was continued, however, for the excavation of features, as well as in areas were a Ceramic period deposit was underlain by a Susquehanna deposit. During the 1984 season, the use of 10 cm arbitrary levels were resumed and all units were excavated to at least 40 cm below the surface for the purpose of profiling.

Each season, until the middle of August, most of the site was under water. When the water level dropped, a dense growth of sedge

(*Carex lenticularis*) was revealed and a border of driftwood remained to delineated the high water level. It was found that a hooked-bladed linoleum knife was the most effective means of removing the sod layer with its deep-rooted sedge cover.

Until the sun could dry out this area, the soil remained waterlogged and adherred to trowels. Since smaller artifacts and ecofacts might easily be lost under such conditions a new water screening system was developed for the 1984 season in hopes of increasing the recovery sample. The water screening system adopted consisted of a protable, 1.3 HP Shindaiwa GP-25 water pump, and a portable water-screening table which held two screens. An upper screen was made of 1/4" mesh wire screening, and a lower screen was made with 1/16" nylon screening. The upper screen served to trap larger pebbles, lithic debitage, and fragments of pottery and charred bone (including a single barbed bone harpoon head). Samples were taken from the sediments trapped in the lower screen in order to recover charred macroplant remains.

Site stratigraphy

Interpreting the stratigraphy of any archaeological site can be a perplexing matter. At the Mud Lake Stream site the matter is doublely perplexing since 4000 years of cultural deposits are often

packed into 20 to 30 cm of actual soil. However, a number of distinct archaeological sediments have been recognized at the site. After Shackly (1975), an archaeological sediment is a deposit which is directly or indirectly related to past human activity. For example, even the culturally sterile sediments underlying an archaeological site are affected by the leaching of chemicals from overlying cultural sediments. An archaeological sediment which was almost entirely, or very strongly influenced by human activity is distinguished as a cultural matrix (after Crozier 1981:9). The following discussion provides a physical description of the archaeological sediments identified at Mud Lake Stream, also indicating their interrelationships, and their artifact contents.

The basic stratigraphy of the site closely follows the natural soil classification for the area, with the addition of several textural changes which are directly linked to the aboriginal use of the site (see Gladfelter 1977). As mentioned above, the dominant soil bordering Spednic Lake is classified as Charleton Shaly Loam (see Wicklund and Langmaid 1953:25-27). This soil is developed from a glacial till, which is principally composed of local granites, slates, shales, and quartzites, but also contains substantial amounts of lithic materials transported from other geological provinces. It is characteristic of the *podsol* soil type, with a pronounced ash-grey color directly below the sod layer, due to the

removal of iron and humus, and a pronounced underlying horizon in which iron and humus accumulates (see Evans 1978:78). This lower horizon can have more than one subdivision which can vary from yellowish brown to black in color. The initial (A) horizon, or sod layer, of Charleton Shaly Loam is the black organic layer of forest litter, while the parent material (the C horizon) is described by Wicklund and Langmaid (1953:27) as a massive, hard, compact, olive brown clay loam.

Sixteen, non-feature, archaeological sediments have been recognized at the Mud Lake Stream site. Each of these is given an alphameric designation (e.g. A1, A2...F1) which follows major color changes (i.e. grey/black, grey, brown, reddish brown, yellowish brown, and olive brown). The relative stratigraphic sequence for these sediments and the corresponding natural soil horizons of the area is outlined in Table 1, while variations in the sequence and their distributions are illustrated in four profile drawing taken from accross the site (Figures 3 to 6).

Table 1: Comparison of the natural soil horizons of Carleton Shaly Loam and the archaeological sediments of the Mud Lake Stream site.

Natural Horizon: *	*Archaeological Sediments*: **
A O (Black organic, pH 4.0)	A1 - Very dark grey (5YR 3/1) A2 - Black (10 YR 2/1)
A 2 (Light grey, shaly loam, 10 YR 7/2, pH 4.5)	B1 - Pale grey (7.5 YR 6/2) B2 - Greyish brown (10 YR 5/2) B3 - Light greyish brown (10 YR 6/2)
B (Yellowish brown, shaly loam, 10 YR 5/4, pH 4.7-5.1)	C1 - Pale brown (10 YR 6/3) C2 - Brown (10 YR 5/3) C3 - Dark brown (7.5 YR 3/2) C4 - Strong brown (7.5 YR 5/6) D1 - Yellowish red (5 YR 5/8) D2 - Dark reddish brown (5 YR 3/4) E1 - Light yellowish brown (10 YR 6/4) E2 - Yellowish brown (10 YR 5/6) E3 - Dark yellowish brown (10 YR 4/4)
C (Olive brown, clay loam, 2.5 YR 4/4, pH 4.8)	F1 - Olive brown (2.5 YR 4/4)

* after Wicklund and Langmaid 1953:27.

** more than one Munsell code was recorded for several of the sediments, but only the most common is listed here.

Sediments A1 and A2 correspond to the natural sod layer, and consist primarily of silt and organic matter. During the 1984 season, Munsell color codes were recorded for the sediment in which each aritfact was found (see Table 2). In this regard, a large amount of cultural materials were incorporated into the A zone sediments, including a mixture of historic and Ceramic period artifacts. Sediments B1 to B4 are pale grey to light brownish grey loams (or sandy clay loams). These sediments are generally tightly compacted and very shallow (often only 2 to 3 cm thick), and they contain the densest concentration of cultural materials, including artifacts, lithic debitage, fire-cracked rock, and ecofacts. Sediment B2, a dark greyish brown loam, is the major cultural matrix among the B zone sediments. In particular, it contains several bifaces and inferred pottery vessels. Sediment B3 included the single contracting-stem projectile point found at the site.

Table 2: Artifactual content of non-feature archaeological sediments at the Mud Lake Stream site.

	Archaeologcial Sediment zones:					
	A	B	C	D	E	F
Historic artifacts:						
Iron nail	0	0	0	1	0	0
Clay pipe stem	1	0	1	0	0	0
Trade bead	1	0	0	0	0	0
Copper fragment	0	0	0	1	0	0
Ceramic artifacts:						
(pottery)						
Cord wrapped stick (Group 1)	2	0	2	2	0	0
Linear dentate (Group 2)	5	6	12	9	9	0
Pseudo s. shell (Group 3)	1	2	3	2	2	0
Dragged (Group 4)	0	1	1	0	1	0
Cord marked (Group 5)	0	0	0	1	0	0
Undecorated (Group 6)	1	3	0	1	2	0
(lithics)						
utilized flakes/cores	5	2	1	0	1	0
scrapers	15	7	7	8	3	0
bifaces/fragments	4	11	8	10	11	0
graver	0	0	0	1	0	0
expanding stem point	0	0	1	0	0	0
corner-notched point	0	0	1	1	0	0
side-notched point	0	0	0	1	0	0
contracting stem point	0	1	0	0	0	0
abrading stone	0	0	1	0	0	0
gaming stone	0	0	0	0	1	0
Archaic artifacts:						
Large stem point	0	2	1	0	2	0
gouge	0	1	0	0	0	0
fully grooved axe	0	0	1	0	0	0
Totals:	35	34	40	33	34	0

Sediments C1 to C4 are brown to strong brown loams (or sandy clay loams). Sediment C3, a dark brown sandy clay loam, is the major cultural matrix for the C zone. It contains the largest number of identified pottery vessels (especially linear dentate decorated vessels), as well as one expanding stem projectile point and one corner-notched projectile point. Sediments D1 to D3 consist of yellowish red to reddish brown sandy clay loams. Sediment D2 is the major cultural matrix for the D zone. It contains a similar distribution of artifacts to sediment C3, and includes one corner-notched projectile point and one side-notched projectile point.

Sediments E1 to E3 consist of yellowish brown loams (or sandy clay loams). Sediment E3 contains the greatest amount of cultrual materials. This may be deceiving since the yellowish brown sediments are generally sterile over most of the site, and it is likely that artifacts occuring in these sediments are intrusive, due to trampling, or to excavation and reburial of the sediments. When artifacts due occur, they are usually near the top of the layer. Sediment F1 is an olive brown sandy loam, which is the first completely sterile deposit in the profiles.

Soil samples from eight of these sediments, along with samples from 12 features were sent to the Plant Industry Branch of the New Brunswick Department of Agriculture and Rural Development for

Phosphorus (P_2O_5) and pH ratings, and a particle size analysis (see Table 3). In addition, Garnet Demerchant, a soils technician with Agriculture Canada, analyzed the same samples for mercury (Hg) content.

Table 3: Summary of soil analyses for non-feature archaeological sediments at the Mud Lake Stream site.

Zone	*Mercury (ppb)*	*pH*	*Phosphorous kg/hect*	*(Rating)*	*Gain Size Distribution %Sand*	*%Silt*	*%Clay*
A2	87	4.8	180	(High)	0.0	94.3	5.8
B2	34	4.7	286	(Very High)	47.8	27.8	24.5
B2	21	4.7	478	(Very High)	45.4	32.6	22.0
C1	21	4.6	364	(Very High)	47.8	30.3	22.0
C3	73	5.0	2077	(Very High)	56.1	19.4	24.5
D1	95	5.1	470	(Very High)	54.0	24.0	22.0
E1	78	4.9	1071	(Very High)	45.9	29.6	24.5
E2	105	5.3	266	(Very High)	52.0	28.5	19.5
E2	84	5.4	125	(Moderate)	64.9	8.1	27.0
F1	53	5.3	1357	(Very High)	82.0	0.0	18.0

Soil pH was determined in water by the glass electrode pH meter method (Peech 1965:920-923). Measures of pH for 10 samples range form 4.6 to 5.4. According to the Canadian System of Soil Classification (see Crozier 1981:43), the sediments are strongly acid (5.1-5.5) to very strongly acid (4.6-5.0). Acidity tends to increase toward the higher strata. In general, these sediments appear to be slightly less acid than the natural sediments of the area (see Table xx).

The phosphorus content of an habitation site can be considerably altered due to the accumulation of phosphorus-rich human and animal wastes, food residues, and especially bone (Cook and Heizer 1965; Proudfoot 1976). The relative permanance of soil phosphorus, due to its low solubility and limited movement, facilitates the use of measures of phosphorus content as indicators of presence and intensity of human occupation. The Mud Lake Stream samples were tested for available phosphorus content (that is, the amount useful for growing crops, rather than total phosphorus), which is expressed in kilogram per hectare. The phosphorus was extracted using the Bray method, and the phosphorus content was determined colorimetrically using auto-analyzer II (Olsen and Dean 1965:1040-1041; also see Dietz 1957).

The phosphorus content for the Mud Lake Stream samples ranged

from 125 to 2077 kg/he. The phosphorus content tends to increase downward toward the major cultural matrix at C3, then begin to fluctuate to F1, where it is relatively high. The relatively high reading for C3 is not surprizing, but the content in F1 seems too high. It should be noted that the latter sample was the only one not taken from the north wall profile for units B11 to H11. Instead, it was taken from the east wall profile of Units A24 to A26. The latter units are close to the present beach face, where chemical leaching from overlaying sediments may be more pronounced.

The above samples were also examined for mercury content. Both freshwater and marine fish, and shellfish, have the ability to accumulate mercury in the form of methalmercury, with concentrations of total mercury below 200 ppb (parts per billion) assumed to be due to naturally occuring environmental mercury (see Hammond 1971; Jonasson and Boyle 1971:19; Zitko et. al. 1971). By comparison, mercury levels in terrestrial animals are normally less than 100 ppb, while levels in terrestrial plants are usually less than 50 ppb (Jonasson and Boyle 1971). Further, mercury content in uncontaminated soils is generally low, with the highest levels appearing in the A horizon (Jonasson and Boyle 1971:15). If we assume that mercury levels in fish in the pre-industrial setting were relatively high compared to plants and animals sharing the same environment, then soils from sites were fish resources were

exploited prehistorically might be expected to contain relatively high levels of mercury. Concentrations might also be expected to be higher in areas of such sites were fish were prepared, cooked, and disposed of. For example, Dincauze (1976:97) suggests that the high concentrations of mercury recorded in the Neville site profile can be tied to anadromous fishing since no mammalian or floral species can be identified as the source.

The total mercury content for the Mud Lake Stream soil samples were determined using a one-step digestion procedure which involved digesting the samples with concentrated HNO_3 and $K_2Cr_2O_7$ for four hours at 60 degrees Centigrade, and analyzing mercury in the extract by flameless atomic absorption (see Flyod and Sommers 1975). The resulting values for mercury concentrations in the samples appears to be relatively low and are generally comparable to the average values given by Jonasson and Boyle (1971:15) for normal B and C soil horizons. In fact, in only one sample from Mud Lake Stream, taken from Feature #6, was the mercury concentration (287 ppb) higher than most natural levels. These results seem to suggest that either fishing was not the primary function of the campsite or that any accumulated fishing wastes did not significantly affect the mercury content of the soil. While the fact that few fish remains were found at the site seems to support the first hypothesis, the actual location of the site in relation to a rich fishing resource area

seems to indicate that the second hypothesis is more likely to be correct.

In summary, as might be expected with such a condensed stratigraphic sequence, there tends to be considerable mixing of cultural materials among the non-feature archaeological sediments. This is certainly true of the Ceramic period materials and even the few Archaic artifacts not found in features were well distributed among the B2, C3, and E3 sediments. It seems that the only realistic way to interpret artifact associations at this site is to look for undistrubed cultural features, and to compare artifact distribrutions in terms of their horizontal provenience rather than their vertical provenience (see Chapter seven). In terms of the chemical characteristics of the archaeological sediments, higher values for pH and phosphorus tend to be associated with the major cultural matrices, while mercury values tend to give the opposite impression, that is, they are higher in the initial organic sediment and the sterile (E2) sediment (see Figure 7).

CHAPTER FIVE

Ecofact analysis

Ecofacts are the non-artifactual remains recovered from an archaeological site (Binford 1964). The ecofact sample recovered from the Mud Lake Stream site consists of macroplant specimens (especially charred seeds) taken from soil samples, and calcined bone specimens collected in each unit in which they occurred. The following discussion treats each of these categories in more detail.

Macroplant assemblage

Seventy-eight soil samples were collected at the Mud Lake Stream site. Most of these were taken from cultural features and arbitrary level samples from the smaller mesh water screen, while some were collected as concentrations of soils and calcined bone. The entire sample from each feature was subjected to flotation

analysis in order to recover paleobotanical remains, and 100 ml samples from each of the general level and bone/soil samples were also floated. The 50 macroplant samples collected by flotation were analyzed by Dr. Hal Hinds, a biologist with the University of New Brunswick.

Samples were floated in large plastic basins and the flotate was removed with a fine mesh strainer. Flotates were allowed to dry for 24 hours and were then examined with the aid of a 7X magnifying glass. Charred seeds were removed with tweezers and stored in improvised tinfoil sacks. The flotates were saved for possible future identification of charred wood remains. Besides charred seeds, various flotates contained rootlet fragments, charred insect egg coverings, and charcoal. Further, most flotates contained a large quantity of "carbonized spheroids," which Dr. Hinds tentatively identifies as fungal fruiting bodies.

As a general rule of thumb, unless there is reason to suspect disturbance, archaeologists consider all charred seeds to be of prehistoric origin, and all uncharred seeds to be modern (Largy 1983:13; Minnis 1981:147). Seeds taken from hearth features are assumed to have (1) fallen into the hearth during food preparation, (2) been discarded into the hearth after a meal, or (3) been blown into the hearth as prehistoric seed rain (Largy 1983:12; Minnis 1981:145). Seeds found in non-hearth areas could have come from

dispersed hearth features, or resulted from a more extensive burning of the site (either natural or man-initiated).

A summary of the identified charred seeds from Mud Lake Stream is presented in Table 3. The majority of seeds from the Mud Lake Streamsite were of the genus *Sambucus* and the genus *Rubus*. In fact, most of the seeds recovered represented edible berries, including *Sambucus canadensis* (elderberry), *Rubus* (blackberry or raspberry), *Mitchella repens* (partridge berry), and *Prunus pensylvanica* (pin cherry). Of these berries, blackberries, raspberries, partridge berries, and elderberries are included among the principal berries collected by the historic Micmac and Maliseet (Speck and Dexter 1951:257, 1952:5). In historic times, some of these berries would have been dried for winter use (Speck and Dexter 1952:5). In general these plants point to a possible summer to fall occupation for Mud Lake Stream, and all of them, except the partridge berry, were also represented at the Diggity site (Deal 1984b). In addition, one strawberry (*Fragaria*) specimen was found at the Diggity site. Further, the berries of the *Sorbus americana* (Mountain ash), which is a shrub of the rose family, are popular among several species of birds, and the twigs are browsing food which attract deer and moose (Harlow 1957:211). The Red Osier Dogwood (*Cornis stolonifera*) is another berry producing shrub, which is common in wet habitats (Roland and Smith 1969:553).

The *Aralia hispida* (bristly sarsaparilla) and *Aralia nudicaulis* (wild sarsaparilla) are available in summer to fall, and are commonly boiled to make tea, as are the berries of the partridge berry (Speck and Dexter 1952:256-257). The bulrush (*Scirpus sp.*) is an excellent food source, since the young shoots are edible (raw or cooked) in the spring, the pollen and seeds can be made into flour in the summer to fall, and the rootstocks can be roasted in the fall to spring (Peterson 1978:230). The sedge seeds found in four soil samples probably represent *Carex lenticularis*, which is found over the entire site.

Table 3: Charred seed remains from the Diggity and Diggity Beach sites, identified by Dr. Hal Hinds, University of New Brunswick.

Feature:	#2	#15	#19	#20	A26*	B22*	F14*	C8*
Genus:								
Rubus	1	-	7	-	-	-	2	-
Sambucus	1	-	17	3	-	-	-	-
Mitchella	-	-	-	-	-	1	-	-
Prunus	-	-	-	-	3	-	-	1
Panicum	-	-	-	3	-	-	-	-
Aralia	-	2	-	1	1	-	-	1
Sorbus	-	-	-	1	-	-	-	-
Scirpus	1	-	-	-	-	-	-	-
Cornus	-	-	-	-	-	-	-	1
Carex	3	-	2	-	1	1	-	-
Total:	6	2	26	8	5	2	2	2

* General level soil samples from water screen.

Faunal remains

Whenever faunal remains were encountered during excavation they were carefully collected. Individual specimens were placed in separate level or feature bags, while concentrations of bone were collected as bone and soil samples. Specimens were collected using a trowel and were not cleaned in the field. This material has been analyzed by Gwyn Langemann, a graduate student at Simon Fraser University.

The 9049 faunal specimens recovered from the site were all calcined and comminuted. Most fragments were less than 2 cm. in maximum dimension and the average weight was .08 grams (Langemann 1985). Langemann (1984) describes the calcined fragments as generally showing deep rectangular cracks on the surface, and occasionally the cortical surfaces have peeled away from the underlying cancellous tissue following the cracks. She also indicates that some of the specimens, such as the minute fragments of cortical surface, must have resulted from the intense drying and shrinkage due to burning. Further, the comminution of the bone specimens obscured any traces of butchering patterns or rodent gnawing. Only a single specimen from unit A23 showed any evidence

of wear.

Langemann was able to identify about 4% of the total number of specimens (i. e. 385 of 9049 fragments) and about 11% of the total weight (i. e. 88 of 839 grams). The identified specimens from Mud Lake Stream consisted primarily of beaver *(Castor canadensis)*, while 67 elements classed as medium mammal, are probably, by association, also beaver (see Table 5). Other mammnal remains included one element identified as a small mustelid, one identified as muskrat *(Ondatra zibethicus)*, one element identified as a large ungulate (possibly moose), and three others classed as small mammal. The latter group falls within the size range of a squirrel or small rodent (Langemann 1985). Further, 24 elements from the Meadowood feature, which were classed as medium mammal, are believed to be too large to be beaver, and are likely canid (possibly dog or wolf).

A summary of the identified specimens by species is outlined in Table 6. The beaver elements represent at least three individuals, although the spatial distribution of the specimens suggests that as many as a dozen individuals are included in the sample. Similarly, beaver dominated the Diggity site faunal sample, while black bear *(Ursus americanus)* elements were also well represented. Further, the few identifiable elements from the Diggity Beach site have also been identified as beaver (Patricia Allen, personal communication), and forty-one of forty-two identified specimens recovered from the

Hodgdon site have been identified as beaver (Lahti et. al. 1981). The presence of muskrat in the sample is also significant, since was considered a delicacy among the historic Malecite (Speck and Dexter 1952:3).

Table 5a: Distribution of identified mammal specimens.*

	Beaver	Medium Mammal	Muskrat	Small Mustelid	Small Mammal	Large Ungulate
Feature 2						
(Unit B21)	17	4	-	-	-	-
Feature 5						
(Units G12, F11, F12, E13)	1	3	-	-	-	-
Feature 15						
(Units C12, D11, D12)	6	2	-	-	1	-
Feature 16						
(Unit D13)	31	8	-	-	-	-
Feature 19						
(Unit H59)	7	11	-	-	1	-
Feature 20						
(Units A23, B23, A24)	-	38**	-	-	1	-
Feature 21						
(Units E34 to H34, F33 to G33)	-	-	-	-	-	-
Non-feature						
(Unit D15)	3	9	-	-	-	-
(Unit E29)	16	5	-	-	-	-
(Unit F12)	-	1	-	-	-	-
(Unit E34)	3	1	-	1	-	-
(Unit F31)	-	1	-	-	-	-
(Unit B22)	1	1	-	-	-	-
(Unit A28)	4	1	1	-	-	-
(Unit I66)	4	-	-	-	-	-
(Unit A17)	2	-	-	-	-	-
(Unit F29)	7	1	-	-	-	-
(Unit B30)	-	-	-	-	-	-
(Unit B31)	1	-	-	-	-	-
(Unit H75)	-	1	-	-	-	-
(Unit E13)	4	-	-	-	-	-
(Trench cut)	5	2	-	-	-	-
(Beach finds)	4	1	-	-	-	1
Totals:	116	90	1	1	3	1

* The totals presented here for beaver do not agree completely with those reported in Langemann 1984 and 1985, since 42 of the specimens included here were only tentatively identified in her reports.

** 23 of these specimens are tentatively identified as large canid, and possibly wolf or dog.

Table 5b: Distribution of identified fish and bird specimens.

	Large Bird	Salmonoid	Clupeidae (Herring)	Fish
Feature 2				
(Unit B21)	-	3	-	68
Feature 5				
(Units G12, F11, F12, E13)	-	-	-	-
Feature 15				
(Units C12, D11, D12)	-	-	-	36
Feature 16				
(Unit D13)	-	-	-	19
Feature 19				
(Unit H59)	-	-	-	22
Feature 20				
(Units A23, B23, A24)	-	-	-	2
Feature 21				
(Units E34 to H34, F33 to G33)	-	-	17	-
Non-feature				
(Unit D15)	-	-	-	-
(Unit E29)	-	-	-	-
(Unit F12)	-	-	-	-
(Unit E34)	-	1	-	-
(Unit F31)	-	-	-	-
(Unit B22)	-	-	-	-
(Unit A28)	-	-	-	1
(Unit I66)	-	-	-	-
(Unit A17)	-	-	-	1
(Unit F29)	-	-	-	-
(Unit B30)	1	-	-	2
(Unit B31)	-	-	-	1
(Unit H75)	-	-	-	-
(Unit E13)	-	-	-	2
(Trench cut)	-	-	-	-
(Beach finds)	-	-	-	-
Totals:	1	3	170	14

Table 6: Identified bone by species at Mud Lake Steam; based on Langemann 1984: Tables 1 and 2, 1985: Tables 1 and 3.

Element:	Right	Indeterminate or Axial	Left
Castor canadensis			
palatine, with alveoli for cheek teeth	-	3	-
occipital condyle	1	-	-
occipital, nuchal crest	1	-	-
interparietal	-	1	-
frontal, anterior piece with suture for premaxilla	2	-	-
zygomatic, posterior portion	-	-	1
, anterior portion	2	1	2
squamous part of temporal	1	-	-
mandible, ventral border near angle	-	1	-
, symphysis and incisor alveoli	-	-	1
, condyle and small part ascending ramus	1	-	1
incisor enamel piece	-	1	-
cervical vertebra, unfused centrum	-	1	-
caudal vertebrae	-	2	-
acetabulum, ilial piece	-	1	-
ischium, unfused posterior border	-	1	-
scapula, glenoid and neck	1	-	-
femur, supracondylid process	1	-	-
humerus, medial/distal shaft	1	-	-
, distal articular condyles only	1	-	1
, lateral condyle and epicondyle	-	-	1
, distal condyle, proximal end unfused	1	1	-
radius, proximal	1	-	-
ulna, three shaft fragments	1	-	-
, distal shaft fragment with deep lateral groove	-	1	1
, shaft fragment with distal to lunar notch	1	-	-

Table 6: continued.

Element:	Right	Indeterminate or Axial	Left
Castor canadensis			
carpal, pisiform?	2	-	1
metacarpal I	-	-	1
II	1	-	-
III	-	1	-
IV	1	-	-
patella	-	-	1
tibia, unfused proximal end	-	1	-
, shaft section	1	-	-
calcaneum, fragmented	1	-	1
astragalus	-	-	2
tarsal, navicular	1	-	-
central tarsal	1	-	1
tarsal 2, whole	1	-	-
tarsal 3, whole	1	-	-
tarsal 4, whole	-	-	1
metatarsal II	3	-	2
III	1	-	2
IV	1	-	1
V	-	-	1
1st phalanx, whole	-	2	-
3rd phalanx, whole	-	4	-
Ondata zibethicus			
tibia, distal end and 1/4 shaft	-	-	1
Family Mustelidae			
mandible, canine and premolar section, no teeth	-	-	1
Small Mammal			
proximal metapodial	-	1	-
1st phalanx	-	1	-
2rd phalanx	-	1	-
Large ungulate			
proximal sesamoid, partial	-	1	-

Table 6: continued.

Element:	Right	Indeterminate or Axial	Left
Medium Mammal			
maxillary fragment, with alveoli	-	2	-
zygomatic arch, posterior	-	1	-
cervical vertebra, unfused centrum	-	4	-
thoracic vertebra, neural arch	-	1	-
lumbar vertebra, spine and process	-	1	-
, anterior articular process	-	1	-
caudal vertebra	-	1	-
vertebral process or spine fragment	-	7	-
vertebral centrum fragment	-	9	-
rib, tubercle and shaft fragment	-	6	-
scapula, acromion fragment	-	1	-
humerus, distal	-	2	-
radius, mid shaft section	-	1	-
, proximal fragment	-	1	-
ischium	-	-	2
patella	1	-	-
pubis	-	3	-
tibia, shaft section	-	1	-
, proximal end	-	1	-
femoral head	-	1	-
astragalus	1	1	1
carpal	-	1	1
tarsal	-	1	-
metapodial, proximal end	-	5	-
, distal end	-	9	-
1st phalanx, proximal	-	2	-
, distal	-	6	-
2nd phalanx, proximal	-	5	-
, whole	-	4	-
3rd phalanx, distal end	-	1	-
phalanx, distal end	-	5	-

Table 6: continued.

Element:	Right	Indeterminate or Axial	Left
Large Bird			
terminal phalanx, distal part with proximal articular surface gone	-	1	-
Salmonidae			
vertebra	-	3	-
mesocoracoid	-	1	-
Clupeidae			
articular	1	-	1
vertebral body	-	4	-
atlas vertebra	-	1	-
ultimate vertebra	-	1	-
prootic	-	3	-
maxillary	-	3	-
Unidentified Fish			
vertebra	-	47	-
dorsal ray, proximal end	-	32	-
pterygiophore	-	10	-
rib, spine, or ray fragment	-	518	-
supraoccipital	-	1	-
premaxilla	-	1	-
parietal	-	1	-
pterotic	-	1	-
quadrate	-	1	-
cranial fragments	-	51	-
unknown	-	2093	-

While there seems to be a conspicious absense of bird and fish remains from most interior sites, faunal samples from Mud Lake Stream included 2760 fish elements, and one bird element. The latter is a large claw which is probably from a raptor, and possibly a hawk (Langemann 1985:2). Although fish remains were found in 11 units, the levels of mercury in the soil samples from the site were surprisingly low. Only a single sample tested for mercury content yielded a rating higher than that expected for natural soil horizons (i.e. 287 ppb).

Of the 17 fish elements identified by species, three specimens from Feature #2 were classed as salmonidae, while fourteen specimens from the Susquehanna deposits (Feature #21) have been identified to the herring family (genus *Alosa*, or *Clupea*). The most likely species identification for the salmonidae specimens is the Atlantic salmon (*Salmo salar*), which travels inland to spawn in the late fall (Langemann 1985:5;Scott 1967:16). Langemann (1985:5) includes the brook trout ((*Salvelinus fontinalis*), and lake trout (*Salvelinus namaycush*) as other possiblities.

The Susquehanna sample includes at least two individuals. The most likely representative of the herring family is the alewife (*Alosa pseudoharengus*), which was harvested in large numbers at the falls near Milltown in historic times (Champlain 1611:82-83; for

discussion see Davis 1950:4; Wherry 1981:5). This practice may therefore date to the Susquehanna use of the area. These fish may have been smoked for preservation before being transported so far into the interior of the drainage area. No landlocked herring are presently found in Spednic Lake, and it is unlikely that they could have climbed the Milltown falls in Susquehanna times. Interestingly, Turnbaugh (1975) places considerable importance on alewife and American shad in his interpretation of broadpoint distribution in the Northeast. Further, Spiess, Bourque, and Cox (1983) have suggested the possibility of a spring focus on anadromous fish resources due to the frequent occurrence of Susquehanna components at interior riverine and lacustrine sites in Maine.

Langemann also points out that concentrations of calcined and comminuted bone on archaeological sites are generally interpreted as the result of bone reduction for the manufacture of bone grease (1984:8). Numerous ethnographic descriptions of bone grease production are available (eg. Binford 1979; Hurleburt 1977:18-21; Leechman 1951; Vehick 1977). In New Brunswick, both LeClerq (1691:118) and Denys (1672:422-423) give accounts of bone grease production by the northeastern Micmacs. They describe the crushing of leg and thigh bones of moose, deer, and caribou. This crushed bone is boiled in a kettle. The grease rises to the surface where

it can be skimmed off and stored as cakes. The processed bone fragments are subsequently disposed of and presumably burned after disposal.

Langemann stresses the fact that all the ethnographic descriptions of bone grease manufacture refer to ungulates. She suggests that the calcined bone may be merely the result of a number of food preparation habits, followed by periodic refuse dumping. During the contact period, roasting and boiling were the usual methods of preparing most faunal species (see Bennett 1955:379-381; Hoffman 1955:190; Stoddard 1966). Almost any available meat or vegetable might end up in a stew. The fact that much of the bone was recovered from hearth features, suggests that at least some bone refuse was dumped into hearths. It seems that the historic taboo against burning beaver bones (Denys 1672:430) was not practiced by the Ceramic period peoples on Spednic Lake.

Ceramic period exploitation of beaver

Perhaps the most significant association between interior sites and the coastal sites of Passamaquoddy Bay is the apparent importance of beaver. Seven of the site reports from Passamaquoddy Bay provided enough information to permit the rank ordering of identified species both by counts and MNI (Deal 1984a). In every

case, beaver ranked first in both categories, and further, beaver was the only species represented in all twelve the available site reports.

Beaver were important for a number of reasons. Beaver furs were used for clothing, the teeth (especially the lower incisors) were used as tools, and the flesh was eaten. Futher, beavers could be trapped year round and their lodges and dams were highly visible. A noticable increase over time in beaver remains in coastal midden sites on Passamaquoddy Bay was noted by Churcher (1963; Pearson 1970:188), who equated the increase with an increase in importance of beaver to the Ceramic period diet. More recently, a noticable increase in beaver and other fur bearers, during the occupational sequences at Turner Farm and the Goddard site, in central Maine, as well as butchering practices similar to those of the historic fur trade, lead to the suggestion that the historic fur trade may have fortuitously tapped a pre-existing late Ceramic period trade network involving furs (Speiss et. al. 1983:107). The Passamaquoddy Bay evidence certainly does not preclude this hypothesis. Further, historic Indian values, stressing the ritual significance of the beaver and bear and the related efforts to conserve wildlife resources (eg. Speck 1938; Will 1982:192) undoubtedly have a precontact origin.

Early faunal studies accepted the historic model of late

spring/summer coastal occupation and winter interior occupation, which was based primarily on accounts by Lescarbot (1618) and Biard (1616) concerning the southern Micmac (for discussion see Burley 1983; Stewart 1982). Archaeological research in Passamaquoddy Bay and along the coast of central Maine in the 1960s and 1970s lead some archaeologists to view this model as a reversal of the true Ceramic period subsistence pattern, which was brought about to accomodate the European fur trade (Bonnischsen and Sanger 1977; Bourque 1973; Sanger 1971).

More recently, such "seasonal round" models have been rejected in favour of more flexible, generalized hunting and gathering models (Burley 1983; Sanger 1982). In Central Maine, this includes the possibility of year round occupation at some coastal sites (Sanger 1982; Stewart 1982:7). Further, Stewart (1982) has recognized regional diversity in the ethnohistoric accounts concerning Micmac seasonality. For example, LeClerq (1691) and Denys (1672), in northern New Brunswick and the Gaspe, refer to the year round hunting of major land mammals, rather than the neat seasonal hunting patterns described by Lescarbot (1618) and Biard (1616) at Port Royal. It is likely that intra-regional resource diversity created some very localized and specialized subsistence strategies during the Ceramic period as well (see Allen 1983a; Burley 1983:158; Nash 1980; Will 1982).

Any seasonal assessment of Ceramic period occupation on Spednic Lake, based on faunal material, must draw support from both ethnohistoric evidence and modern wildlife studies (see Will 1982). In terms of beaver Lescarbot (1618:224) and Biard (1616:79-83), and later, Diereville (1708:133-134), claimed that beaver were hunted in late fall and winter. LeClerq (1691:429-433) and Denys (1692:433) describe both summer beaver hunting from canoes and winter hunting through the ice, although summer hunting was by far more productive and less dangerous. A special, single-barbed, harpoon (like that illustrated by Speck 1922:40, plate 28c) was used during the historic period. Spring is probably the least secure season for hunting beaver, since it is during this period that the kits of two years before are ejected from the colony (Banfield 1974:161; CWS 1973a). These two year olds, as well as otherwise dislocated individuals and colonies are important since they recolonize areas depleted by overtrapping (Nordstrom 1972). Interestingly, at least one of the individuals recovered at Mud Lake Stream was a juvenile of about two years (Langemann 1985).

CHAPTER SIX

Artifact analysis

The Mud Lake Stream site artifacts are analyzed according to attribute variation. The methodology and terminology are similar to that utilized in the Teacher's Cove (Davis 1978) and Young site (Borstel 1982) reports. The four major artifact categories represented at the site, namely bone, pottery, chipped stone, and pecked and ground stone, are divided into artifact series which reflect variations in workmanship (e.g. bifaces versus unifaces). The first category consists of only one two artifacts, one of which is only tentatively included. Within the chipped and pecked and ground stone series, subseries are established according to major size or shape variations (e.g. small formed bifaces versus large formed bifaces). Within each series (or subseries), groups are established, based on clusterings of formal attributes, or in the case of pottery, based on variations in decorative design elements. In terms of lithic artifacts, formal attributes concentrate on technological variation in terms of basic formal descriptions (such

as convex versus concave blade edge) or quantitative characteristics (such as maximum length or width of the specimen), as well as raw material types.

Bone

The bone category consists of two artifacts. The first specimen is a small barbed bone point section (#530; Plate 4). It is calcined, and exhibits tiny hairline transverse fractures. This specimen was found in the water screen among the other calcined bone from unit H59, and Feature #19 (see Chapter Seven). The specimen measures 10.5 mm in length, 3.5 mm in width, and 2 mm in thickness. It has two small barbs, and the maximum width of the specimen to the tip of the upper barb is 5.5 mm. The tip is missing, but the barbs are the two closest to the distal end of the tool. This is the first bone tool yet to be found at an interior site in southwestern New Brunswick. An almost identical specimen has been reported at the Flye Point site, on the central Maine coast. (Cox 1983).

The second bone artifact is the talon of a raptor, probably representing a large hawk or eagle (Langemann 1985). The specimen (#725) measures 15 mm in length, but the tip is missing. It is only tentatively included here, since it does not exhibit any evidence of wear associated with tool use. However, it is unlikely that such birds were actively hunted for food, and it is possibly that the talon had be saved as an ornament or for some ritual function.

Pottery

The pottery category from the Mud Lake Stream site includes 2712 individual specimens. Among this total, 546 specimens (20%) are true sherds (i.e. retaining a portion of both interior and exterior surfaces), while 1403 specimens (52%) retain only one surface (i.e. incomplete sherds), and the remaining 763 specimens (28%) are merely fragments. Only 74 specimens (3%) are from vessel rims (representing 42 different vessels), while most of the remainder are from vessel bodies. Further, 379 specimens (14%) exhibit decorative design elements.

In the initial phase of analysis, an attempt was made to reduce the total sherdage from the site into a measure of total vessel frequency (i.e. a number of inferred vessels). Individual vessel "batches" were established based on the conjoinability of specimens, as well as specimen provenience, feature associations, paste characteristics, dimensions and design element similarities. Any specimen which could not be assigned, with relative certainty, to a recognized vessel batch was given a separate vessel number. In this manner, a minimum number of 102 vessels was established.

The 102 inferred vessels are divided into five groups, four of

which represent different primary design elements, and a sixth which represents all vessels which were originally undecorated or from which no decorated specimens were recovered. In 25 cases, secondary design elements were also exhibited. The vessels in each group are individually described below, in terms of vessel dimensions, as well as morphological and decorative attributes.

The terminology used for vessel morphological attributes is illustrated in Figure 8. Points of minimum and maximum vessel diameter, as well as points of inflection indicating an alteration in (or change in direction of) the curvature of the vessel wall are used as reference points for delineating rim, neck, shoulder, and body zones. The rim zone includes the area between the vessel lip and the point of inflection perceived as the vessel shoulder. The latter is often indicated by an increase in wall thickness toward the body. On non-collared vessels, such as those at Mud Lake Stream, an upper rim zone is delineated between the lip of the vessel and the point of minimum neck diameter (see Allen 1981). The neck zone is delineated within the rim zone, and includes the area between the point of inflection where the vessel rim is perceived to begin (often indicated by a decrease in vessel wall thickness toward the lip) and the point of inflection at the shoulder of the vessel. The shoulder zone includes the area between the inflection at the vessel shoulder and the point of maximum body diameter. The body

zone includes the shoulder zone and the area below the point of maximum body diameter to the point of inflection at the base. The base can be identified by another change in vessel wall curvature accompanied by a thickening of the vessel wall.

The primary design elements observed on Mud Lake Stream vessels are commonly referred to as cord wrapped stick, linear dentate, and pseudo scallop shell. A summary of the presence of each of these elements, as well as secondary elements, is presented in Table 3, and the location of design elements on individual vessels is illustrated in Figures 9 to 11. According to Bishop (1983:184), the cord wrapped stick element is usually observed as a series of tightly or loosely arranged oblong or rectangular impressions, often with the stick imprint visible as a trough running through the center of these impressions. The linear dentate design element usually appears as a series of roughly rectangular impressions (Foulkes 1981: 289-290). The pseudo scallop shell design element appears as a rounded, sinuous, alternating impression (Foulkes 1981:289). Generally, each of these designs is applied as a simple stamp; that is, they are impressed into the clay surface "in a constant direction oriented vertically or obliquely relative to the plane of the vessel surface" (Keenlyside 1977:330). Often, a variation on this technique, called rocker stamping, is employed, "wherein the tool is pressed, then swung or pivoted at one end to

create an impression at an angle to the first, and so on" (Foulkes 1981:286). A fourth design element, termed "dragged" in this study, appears to be the major element on seven vessels. It consists of a group of impressions (often appearing as parallel lines) made by drawing or trailing of a blunt tipped tool over the clay surface.

Table 7: Presence of design elements on Mud Lake Stream pottery.

	Location of design element:			
	Lip	Rim Interior	Rim Exterior	Body
Tool/Decorative technique:				
Cord wrapped stick, Simple stamped:	2	1	3	7
Cord wrapped stick, Rocker stamped:	0	1	1	3
Linear dentate, Simple stamped:	17	7	7	19
Linear dentate, Rocker stamped:	1	3	3	22
Pseudo scallop shell, Simple stamped:	2	0	2	2
Pseudo scallop shell, Rocker stamped:	0	1	1	6
Dragged:	6	0	6	6
Punctate:	2	0	9	1
Node:	0	0	0	2
Cord marked:	1	1	1	1

The use of the ends (or corners) of the tools used to produce the above impressions (or occasionally a separate tool form) to make a non-linear impression into the clay surface is identified as a separate stamping technique, termed punctating (see Keenlyside 1977:330-331). Some pottery vessels from Spednic Lake sites also exhibit subconical projections (termed here nodes) on the exterior of the vessels, which result when punctates are deeply impressed into the opposing wall surface. This is a variant of the punctate stamping technique which is called bossing. In addition, vessel #47 appears to have been decorated by a stamping tool with a lenticular shaped tip, and vessel #64 exhibits crescent-shaped impressions.

Evidence of pottery production at the site is indicated by a single quartzite pebble with striations on the lateral edges. These striations are reminiscent of use wear caused by polishing of unfired, calcite tempered, pottery surfaces which the author has observed elsewhere (Deal 1983:75-76). There are also ample clay deposits in the vicinity of the site. In terms of vessel construction, evidence of coiling seems to be relatively rare at the Mud Lake Stream, as well as at the Diggity site. All of the vessels contain a grit temper, composed primarily of grains of crystal quartz. A likely source of quartz temper, as has also been indicated for Iroquoian pottery in Ontario (Pavlish 1980), is from chemically decomposed granite cobbles, which are common in the local

acidic soils. Grains of mica are also common in the vessel pastes, but the author has observed large amounts of mica in local clay deposits. Therefore, the inclusion of mica grains in the pastes of these vessels may be fortuitous.

The presence of grit versus shell temper in pottery pastes seems to be related to availability of tempering materials (also see Foulkes 1981:232). All of the pottery thus far examined from Spednic Lake sites have only grit temper. Similarly, pottery from the St. John River esturary, interior sites on Grand Lake, in central New Brunswick (McIntosh 1909), as well as the Hodgedon site (Lathi et. al. 1981:25), and Hirundo site (Foulkes 1981:232), in the interior of Maine, exhibit almost exclusively grit temper. By contrast, pottery assemblages at post-1000 B.P. sites on Passamaquoddy Bay are almost equally represented by shell tempered vessels. It seems likely that groups exploiting both the Passamaquoddy Bay area and the upper regions of the Chiputneticook-St. Croix Drainage were using the most readily available tempering materials when making pottery in either area.

Vessel surfaces which were not sooted (or were least sooted) were color coded using the Munsell soil color charts. Most vessels have exterior surfaces which are light greyish brown (23 cases), pale brown (27 cases), brown (17 cases), greyish brown (10 cases) or yellowish brown (nine cases), while 14 vessels were grey to dark

grey in color (sometimes, partly due to slight sooting), and one vessel had a reddish yellow color.

In thirteen cases, enough of the vessel rim (or internal rim curvature) was recovered to allow an estimate of the original vessel orifice diameter and the percentage of rim surviving (for discussion see Deal 1983; Egloff 1973). Estimated orifice diameter varied from 10 to 42 cm, with a mean of 22.5 cm, while the percentage of rim surviving varied from as low as 3% up to 15%. By comparison, two vessels measured in this way from the Diggity site were approximately 26 cm and 12 cm in diameter.

Group 1: Cord wrapped stick decorated vessels (Figure 12a, b)

Group 1 includes 14 vessels which exhibit the cord wrapped stick design as the primary decorative element (see Table 8). The tool used to produce this design element probably consisted of a wooden bar (stick) wrapped tightly or loosely in fibre or cordage. On the vessels studied, this element is usually applied horizontally or obliquely on the body of a vessel. The slant of the plys in the cord is referred to as its twist (Hurley 1979). The direction of the slant is referred to as either S (to the right) or Z (to the left). Twelve of the 14 specimens exhibited impressions made by a tool with Z-twist cordage (i.e. the impression on the vessel is the opposite,

or S-twist). Similarly, the four cord wrapped stick vessels found at the Diggity site were decorated with Z-twist cordage.

Table 8: Quantitative summary of Mud Lake Stream site

Group 1 pottery

	Units	Number of Sherds	Number of Incomplete Sherds	Number of Fragments	Number of rims	Number of Decorated Specimens
Group 1:						
Vessel 2	E11	10	5	2	1	1
Vessel 3	B16,B17	5	0	0	3	5
Vessel 14	F33	2	7	1	0	3
Vessel 15	D32,E31	2	11	5	1	5
Vessel 19	D32	4	9	1	0	3
Vessel 24	D34	0	21	26	1	17
Vessel 55	615	6	60	15	5	13
Vessel 56	615	22	62	49	8	14
Vessel 57	615	6	10	4	0	16
Vessel 70	B22	1	0	0	1	1
Vessel 79	A24	1	0	0	0	1
Vessel 80	A26	0	1	0	0	1
Vessel 83	A24,A26	7	226	237	0	18
Vessel 97	H59,I59	295	343	91	2	11

It is generally viewed that a given aboriginal group will adopt only one type of twist, with the opposite twist occurring only rarely (see Doyle et. al. 1982; Petersen and Hamilton 1984). It is therefore likely that Z-twist cordage may represent a distinctive technological characteristic of the aboriginal group occupying the Spednic Lake area during the Ceramic period. Interestingly, the two vessels made with S-twist cordage are physically (i.e. in terms of paste and texture) more similar to pottery found in Passamaquoddy Bay sites. Future research may indicate that interior and coastal sites along the Chiputneticook-St. Croix Drainage System may have been occupied by two distinct ethnic populations.

Dragged designs occur as secondary elements on two vessels (#15 and #18), while punctates occur as a secondary element on two other vessels (#55 and #56). This group is comparable to Group 1 pottery from the Diggity site, while it is also stylistically similar to Group 1 pottery from Teacher's Cove. Davis (1978:28) equates the latter with Bourque's Grindle ware pottery from Maine. Vessel #79 from Group 1 at Mud Lake Stream is comparable with the Group 2 category at Teacher's Cove (dentate and cord wrapped stick together), which Davis (1978:28) considers to be relatively rare in the Maine-Maritimes area. The latter combination also occurs on one vessel from the Diggity site (Deal 1984b).

Group 2: Linear dentate decorated vessels (Figures 12c;13a,c,d;14a,b)

Group 2 includes 47 vessels which exhibit the linear dentate or rocker stamp dentate design as the primary decorative element (see Table 9). The two variants occur together on five vessels (#7, #17, #22, #28, and #86). The linear dentate tool is made "by cutting a series of notches directly across a long thin linear object to produce a toothed instrument" (Finlayson 1977:89). The individual teeth are approximately square or rectangular, and in one case like a triangle split at the top (vessel # 35). This element is generally applied horizontally on the vessel body and obliquely on the lip or rim. Secondary design elements employed on these vessels included dragged designs (in four cases with simple stamped and in one case with rocker stamped), punctates (in two cases with simple stamped and two cases with rocker stamped), and nodes (one case with simple stamped and one case with rocker stamped). This group is comparable with Group 2 at Diggity and is stylistically comparable to Davis's Group 3 vessels from Teacher's Cove, which he equates with Bourque's Eaton ware designation for Maine (Davis 1978:28).

Table 9: Quantitative summary of Mud Lake Stream site

Group 2 pottery

	Units	Number of Sherds	Number of Incomplete Sherds	Number of Fragments	Number of rims	Number of Decorated Specimens
Group 2:						
Vessel 4	B16,C16,B	3	0	0	3	3
Vessel 7	B16,B17	4	118	68	3	35
Vessel 8	B17	0	4	1	0	2
Vessel 10	B25	1	16	6	1	12
Vessel 12	D30	0	1	2	0	1
Vessel 13	D31	1	1	0	0	2
Vessel 17	D32	1	0	0	1	1
Vessel 18	C31,D31,C	12	63	13	4	5
Vessel 20	F32	1	1	1	0	1
Vessel 22	D32,F31	4	3	0	1	3
Vessel 23	F31	1	0	0	1	1
Vessel 25	F34	1	6	5	0	6
Vessel 28	L32	3	21	3	1	16
Vessel 29	L32	2	7	1	2	2
Vessel 30	P49	6	25	19	0	11
Vessel 31	P49	8	20	8	0	5
Vessel 35	C2	2	0	0	0	2
Vessel 36	C2	0	1	0	1	1
Vessel 39	F11	0	3	0	0	3
Vessel 42	B11	1	0	0	1	1
Vessel 46	C12	1	0	0	1	1
Vessel 47	B14,C12,D C13,D13	6	23	19	3	9
Vessel 48	D13	0	1	0	0	1
Vessel 50	B14	0	1	0	0	1
Vessel 51	B14	2	1	0	0	2

Table 2: continued:

	Units	Number of Sherds	Number of Incomplete Sherds	Number of Fragments	Number of rims	Number of Decorated Specimens
Group 2:						
Vessel 52	B14	1	2	0	0	3
Vessel 58	B16,C16	11	27	4	4	25
Vessel 60	C16	1	0	0	1	0
Vessel 61	B17	0	1	0	0	1
Vessel 62	A17	1	7	1	1	6
Vessel 63	C12	1	0	0	0	1
Vessel 65	B21	1	2	0	0	2
Vessel 68	B21	0	3	0	0	3
Vessel 72	A23,B23	5	34	6	0	8
Vessel 73	B23	1	0	0	1	1
Vessel 74	B22	0	8	1	0	7
Vessel 76	A23	1	0	0	0	1
Vessel 78	A24	1	18	3	0	6
Vessel 81	AA26,A26	0	2	0	0	2
Vessel 82	AA26	3	9	5	2	2
Vessel 85	A28	1	0	0	1	1
Vessel 86	A28	4	24	14	1	18
Vessel 91	B30	1	0	0	1	1
Vessel 93	C32	1	1	0	1	1
Vessel 94	H75	1	0	0	0	1
Vessel 99	I71	0	2	0	0	2
Vessel 100	K63	1	0	0	0	1
Totals:		99	456	180	36	220

Group 3: Pseudo scallop shell decorated vessels

(Figure 14d)

Group 3 includes seven vessels which exhibit the pseudo scallop shell design or rocker stamped pseudo scallop shell as the primary decorative element (see Table 10). The tool used to produce this design is similar to the linear dentate tool, except that the notches alternate on the side of the tool, thus leaving a sinuous row of rounded or triangular impressions. The tool is generally applied as a simple stamp, horizontally, vertically, or obliquely on the vessel rim and body. Secondary design elements include rocker stamped dentate elements on one vessel (#32), and punctates on one other (#64), while simple stamped linear dentate elements and dragged designs occur with rocker stamped pseudo scallop shell designs on two vessels (#26 and #6, respectively). This group is comparable to Group 3 at Diggity and seems to be stylistically comparable to Bourque's (1971) Wiesenthal ware designation for Maine pottery.

Table 10: Quantitative summary of Mud Lake Stream site

Group 3 pottery

	Units	Number of Sherds	Number of Incomplete Sherds	Number of Fragments	Number of rims	Number of Decorated Specimens
Group 3:						
Vessel 6	B17	5	8	0	0	6
Vessel 26	F36	1	3	0	0	4
Vessel 32	P49	8	11	0	1	12
Vessel 34	JBG Coll.	0	1	0	0	1
Vessel 38	F12	4	2	3	0	1
Vessel 54	E14	7	38	78	0	5
Vessel 64	B21	12	57	33	3	14
Totals:		35	120	114	4	33

Group 4: Dragged design decorated vessels (Figures 13b;14c)

Group 4 includes six vessels which exhibit dragged designs as the primary decorative elements (see Table 11). This element occurs most often on the exterior of rimsherds in the study collection, and occasionally linear dentate designs or rocker stamped pseudo scallop shell designs occur on the interior portion of these rimsherds. The combination of dragged elements on exterior rim zones and linear dentate designs on the vessel body occurs commonly on prehistoric pottery found in this province (Patricia Allen, personal communication, 1985). It is likely that the missing body sherds from the dragged decorated vessels in the study collection were also dominated by these design elements.

Table 11: Quantitative summary of Mud Lake Stream site

Group 4 pottery

	Units	Number of Sherds	Number of Incomplete Sherds	Number of Fragments	Number of rims	Number of Decorated Specimens
Group 4:						
Vessel 5	B17	2	14	10	2	2
-Vessel 33	P49	5	0	0	0	1
Vessel 45	C12	4	1	0	2	5
Vessel 71	B22	1	0	0	0	1
Vessel 84	A27	1	2	0	1	1
Vessel 89	F29	1	1	0	1	2
Totals:		14	18	10	6	12

Group 5: Cord marked vessels. (Plate 5)

Group 5 consists of a single inferred vessel (#77), comprising eight sherds, which exhibits deep cord markings over both the interior and exterior surfaces of all sherds. The two conjoined rim sherds have a lip thickness of 7.5 mm and the maximum sherd thickness is 11 mm. The rim form is straight, and the lip is flat and slopes slightly toward the exterior surface. The paste is a pale brown (Munsell 10 YR 6/3) color with medium to coarse grit temper. The curvature of the rim sherds indicates a large orifice diameter, probably more than 40 cm. Cord markings are applied horizontally on the exterior of sherds and obliquely on the interior surface and lip. Moderate sooting is exhibited on the interior of all sherds.

Vessel #77 is unique within the Mud Lake Stream pottery assemblage, and it most closely resembles the Vinette 1 ware of New York (Ritchie 1980:194), Maine (Doyle et. al. 1982; Petersen and Hamilton 1984), Southern Ontario (Spense and Fox 1983:19-20), and Quebec (Clermont and Chapdelaine 1982:66-67). In particular, exterior-interior cordmarking is prominant on vessels from the Bruce Boyd site, in southwestern Ontario (Spence et al 1978), and the Pointe du Buisson and Batiscan sites in southern Quebec (Clermont and Chapdelaine 1982). According to Ritchie (1980:189-190), Vinette

1 pottery is part of the Meadowood complex. The identification is supported by the close proximity of the sherds of this vessel to the single Meadowood feature at Mud Lake Stream (see Chapter Seven). Assuming that the Vinette 1 identification is correct, then Vessel #77 is the first *in situ* discovery of Vinette 1 pottery in New Brunswick.

Group 6: Undecorated vessels (Figure 12d)

Group 6 includes twenty-seven vessels which do not exhibit decorative elements (see Table 12). Of the 108 sherds and fragments, only two rimsherds are represented. It is likely that many of the sherds represent body or basal sherds of decorated vessels from which decorated sherds were not recovered during excavation.

Table 12: Quantitative summary of Mud Lake Stream site

Group 6 pottery

	Units	Number of Sherds	Number of Incomplete Sherds	Number of Fragments	Number of rims	Number of Decorated Specimens
Group 6:						
Vessel 1	E11	0	1	0	0	
Vessel 9	TC1	0	3	0	0	
Vessel 11	D29	1	14	6	0	
Vessel 16	E30	0	1	0	0	
Vessel 21	D33	0	3	8	0	
Vessel 27	F36	0	0	1	0	
Vessel 37	C10	0	1	0	0	
Vessel 40	F11	2	4	0	0	
Vessel 41	E11	0	2	0	0	
Vessel 43	B11	2	0	0	1	
Vessel 44	AA13,A13	6	1	0	0	
Vessel 49	AA13,A13	1	1	7	0	
Vessel 53	E14	0	5	4	0	
Vessel 59	C16	1	0	0	0	
Vessel 66	B21	0	3	0	0	
Vessel 67	B21	1	0	0	1	
Vessel 69	B23	3	8	0	0	
Vessel 71	B22	1	0	0	0	
Vessel 87	A29	2	1	0	0	
Vessel 88	B29	0	2	0	0	
Vessel 90	C30	0	2	0	0	
Vessel 92	C32	1	0	0	0	
Vessel 95	C33	0	2	0	1	
Vessel 96	C34	2	0	0	0	
Vessel 98	H75	3	0	0	0	
Vessel 101	K63	1	0	0	0	
Vessel 102	K75	1	0	0	0	

Vessel functions

In terms of vessel functions, little can be said at present concerning the Mud Lake Stream vessels. Some of these vessels exhibit considerable sooting, which is generally considered as evidence of cooking over an open fire (for discussion see Hally 1983). The fragmentary nature of the sherds precludes the positive identification of the location of this sooting on most vessels. As indicated in Chapter Four, boiling was a common method of cooking meats and wild plant foods during the historic period, as well as the production of bone grease. Elsewhere (Battle 1922), boiling was also a common method for procurring various animal and plant oils for domestic use. Current research, being conducted by the author, concerning the absorption of animal oils by pottery, may be lead to the interpretation of the function of some vessels.

Chipped Stone

The Chipped stone category includes the vast majority of aritfacts collected from the Mud Lake Stream site (i.e. 9307 specimens). These are discussed under three separate series headings, including (1) bifaces (projectile points, formed bifaces, drills, gravers, etc.), (2) Unifaces, and (3) Non-formed chipped stone (i.e. cores, utilized flakes, and non-utilized flakes). The terminology used to describe attributes of knapped artifacts follows MacKay and Sanger (1972), and is illustrated in Figure 15. Each specimen was studied using a 7x geologist's hand lense.

Raw materials

The chipped stone raw materials utilized at Mud Lake Stream include a variety of siliceous, igneous, and sedementary rock. Each of the identified materials is defined in Appendix A, and the frequencies of each material associated with each subseries of chipped stone is presented in Table 7. The most common material is

chert (i.e. 40% of all specimens), while felsite was also very common (i.e. 31% of all specimens). These materials are commonly available around the lake as outcrop surfaces or as glacier erratics and till cobbles (Gaunce 1984). Most specimens were probably collected locally in cobble form and reduced at the site. One variety of jasper, which a waxy, reddish brown material with greenish veins of chert, is generally only found in tool form or as utilized flakes, and is very similar in appearance to one of the Munsungun cherts from northeastern Maine.

Table 7: Chipped stone raw materials from the Mud Lake Stream site.

	Chert	Jasper	Agate	Chalcedony	Quarts	Quartzite
Biface series:						
Projectile points						
Group 1	4	0	0	0	0	0
Group 2	2	0	0	0	0	0
Group 3	4	0	0	1	1	0
Group 4	6	1	1	0	0	0
Large stemmed	13	2	0	0	0	0
Large side-notched	2	0	0	0	0	0
Sub-triangular	61	16	12	2	9	1
Ovaloid	2	1	0	0	1	0
Drills	4	1	0	0	2	0
Gravers	1	1	1	0	1	0
Serrated (saw)	0	0	0	0	0	0
Celt	0	0	0	0	0	0
Uniface series:						
Formed uniface						
Group 1	32	19	11	2	10	3
Group 2	26	22	8	4	1	1
Cores						
Group 1	14	9	1	2	5	0
Group 2	1	0	3	2	5	0
Utilized flakes:						
Group 1	5	6	6	0	0	0
Group 2	15	11	5	0	0	0
Group 3	14	22	1	2	0	1
Group 4	0	0	1	1	1	0
Non-utilized	3697	841	177	186	1087	18
Totals:	3897	952	226	202	1122	24

Table 7: continued.

	Basalt	Felsite	Siltstone	Slate	Diabase
Biface series:					
Projectile points					
Group 1	0	4	1	0	0
Group 2	0	0	0	0	0
Group 3	0	3	0	0	0
Group 4	0	0	2	0	0
Large stemmed	0	8	0	0	0
Large side-notched	0	0	1	0	0
Sub-triangular	2	55	5	1	0
Ovaloid	0	1	0	0	0
Drills	0	2	0	0	0
Gravers	0	0	0	0	0
Serrated (saw)	0	1	0	0	0
Celt	0	0	0	1	0
Uniface series:					
Formed					
Group 1	0	16	0	0	0
Group 2	1	7	0	0	0
Cores					
Group 1	1	5	0	0	0
Group 2	0	0	0	0	0
Utilized flakes					
Group 1	0	2	0	0	0
Group 2	0	2	0	0	0
Group 3	0	4	0	0	0
Group 4	0	0	0	0	0
Non-utilized flakes	289	2952	0	0	18
Totals:	293	3062	10	1	18

Besides chert, other crytocrystalines included jasper, chalcedony, and the agate variety of chalcedony. While these materials are generally preferred for toolmaking, the difficulties with working quartz are well known (e.g. see Crabtree 1967). A relatively high percentage of quartz debitage (i.e. 12% of the specimens) versus formed quartz tools (i.e. 5% of specimens) at the site seems to attest to this fact. Similarly, felsite cores and debitage constituted 32% of that sample compared to 21% of the formed tool sample. By comparison, the percentage of chert specimens is very similar among utilized and non-utilized specimens (i.e. 38% and 40% of the sample, respectively), while the other cryptocrystalines were more common among the formed tools than among the non-utilized specimens (i.e. 31% versus 13%).

Many of the chert specimens are heavily bleached. Bleaching is a distinctive form of patination which produces an earthy, crumbly texture to the surface of an artifact (Gaunce 1984). Bleaching can be various colors, although it is generally white to grey on the above specimens. Bleaching is produced by several complex chemical reactions, involving various ions in groundwater, and colloidal silica in the artifacts (see Honea 1964; Thompson and Wright 1974). Basically it is caused by long exposure to acid groundwater. While it is not considered to be closely correlated to the age of the artifact (Thompson and Wright 1974), bleached chert occurs only

rarely among Ceramic period lithics, and at least indicates something about the raw material preferences of Late Archaic peoples.

Biface series: Projectile points

Group 1: Expanding stem projectile points (Plate 6). The nine specimens in this category are made from chert, siltstone, and felsite (see Tables 8 and 9). They are characterized by an expanding stem with wide side-notching, and convex blade edges. The specimens average 44.4 mm in length, 17.8 mm in width, and 6.6 mm in thickness. The stem length averages 12.3 mm, compared to 7.9 mm for Group 3 and 10.6 mm for Group 4. The index of expansion (neck width/basal width) for this group is 1.0. These points are comparable to the Group 3 specimens from the Diggity site (Deal 1984b).

Table 8: Summary of Projectile point dimensions.

Index	Group 1 (N=9)	Group 2 (N=2)	Group 3 (N=11)	Group 4 (N=9)
Length				
mean	44.4	48.3	49.6	46.6
s.d.	9.3	4.6	7.9	7.9
Width				
mean	17.8	21.6	19.6	20.4
s.d.	1.2	1.1	2.0	7.8
Thickness				
mean	6.6	8.0	5.7	6.2
s.d.	1.3	.7	1.1	1.8
Neck Width				
mean	10.9	13.0	11.3	17.4
s.d.	0.9	0	2.8	1.8
Basal Width				
mean	10.9	8.0	17.0	19.4
s.d.	1.3	0	2.8	1.8
Index of Expansion	1.0	1.6	0.7	0.7
Edge Angle	50.0	40.0	38.0	35.0
mean	12.3	15.0	7.9	10.6
s.d.	2.0	0	0.4	1.7
Raw material:				
Chert	4.0	1.0	4.0	6.0
Felsite	4.0	0	3.0	0
Siltstone	1.0	0	0	1.0
Jasper	0	0	0	1.0
Quartz	1.0	0	2.0	0
Chalcedony	0	0	1.0	0
Slate	0	0	1.0	0

Table 9: Formal characteristics of biface series: projectile points.

Blade edge	Convex	Concave	Straight
Group 1	6	0	3
Group 2	2	0	0
Group 3	4	0	2
Group 4	5	0	3

Stem Form	Contracting	Expanding
Group 1	0	9
Group 2	2	3
Group 3	0	9
Group 4	0	3

Base Form	Convex	Straight	Pointed
Group 1	5	1	0
Group 2	1	0	1
Group 3	2	1	0
Group 4	1	9	0

Notch Form	Corner: Wide	Side: Narrow	Narrow
Group 3		0	5
Group 4	0	0	8

Shoulder Form	Wide Angle	Narrow Angle	Wide Rounded	Narrow Rounded	Aysmmetric
Group 1	0	5	2	1	1
Group 2	2	0	0	0	1
Group 3	0	8	0	0	0
Group 4	0	6	0	0	3

Group 2: Contracting stem projectile points (Plate 6i; Plate 16i). The two specimens in this group are made from bleached chert. They are characterized by convex blade edges, asymmetric-wide angle shoulders, and contracting stems. Specimen #419 is 51.1 mm long, 22.5 mm wide, and 7.5 mm thick, while specimen #356 is 45 mm long, 21 mm wide, and 8.5 mm thick. The latter specimen might be considered a bipoint. It seems to represent a larger biface tip and body fragment that was reworked, but not finished because of a bulbous section near the base. There is a slight restriction in the bottom third of the point to facilitate hafting.

Group 3: Small corner-notched projectile points (Plate 7). Eleven specimens are included in this group. Four specimens are made from chert, three from felsite, two from quartz, one from chalcedony, and one from slate. They are characterized by an expanding stem with narrow corner-notching, convex bases, and convex blade edges. The specimens average 49.6 mm in length, 19.6 mm in width, and 5.7 mm in thickness, and the index of expansion for this Group is .7.

Group 4: Small side-notched points (Plate 8). Nine projectile points fall into this group. Six of the specimens are made from chert, one from jasper, and two others from siltstone. They are characterized by an expanding stem, which is generally straight at the base, with a narrow side-notch. The blade edges are convex or

straight, and the shoulder form narrow angled or asymmetric. The three complete specimens average 46.7 mm. in length, while the width of all specimens ranges from 16-28 mm, with an average of 20.4 mm, and the average thickness for all specimens is 6.2 mm. All specimens are basally thinned. The index of expansion (neck width/basal width) averages .7 This group is comparable to the Group 2 projectile points of Teacher's Cove (Davis 1978:19), and the Group 1 points from the Diggity site (Deal 1984b).

Biface series: Large stemmed bifaces

The large stemmed biface subseries consists of 23 specimens (Plate 9, and Plate 10:a,b,e-k,j,o), eight of which are complete or nearly complete, while six have a transverse fracture above the shoulder, and nine others are fragmentary. These bifaces are characteristically asymmetrical in form, with straight to convex blade edges, straight to slightly expanding stems, straight to convex bases. Opposing shoulders are never identical and this fact is exhibited in the inside angle measurement, which can vary by as little as two degrees and as much as 14 degrees, with a mean of 5.7 degrees. One crude specimen (#475), which is only tentatively included in this group, has an inside angle difference of 22 degrees. For the indices which could be measured, the mean length

was 72.1 cm, the mean width was 34.5 cm, the mean thickness was 9 cm, and the mean edge angle was 39 degrees (Table 10). Thirteen of the specimens were made from chert (eight bleached), while eight were made from felsite and two from jasper.

Table 10: Dimensions of large stemmed bifaces.

	Length	Width	Thickness	Neck Width	Basal Width	Stem Width
Group 1:						
Artifact #						
145	-	38.0	10.0	19.0	14.0	18.0
179	-	39.0	10.0	22.0	17.0	16.0
153	-	38.0	9.0	21.0	17.0	14.5
164	-	32.0	10.0	21.0	16.0	17.0
156	53.0	42.0	10.0	19.0	17.0	14.0
159	-	36.0	10.0	23.0	21.0	14.0
168	81.0	37.0	10.0	22.0	16.0	13.5
226	-	32.0	8.0	19.0	19.0	11.5
28	73.0	23.0	6.0	14.0	10.0	12.0
151/154	65.5	36.0	10.0	23.0	21.0	17.0
DLS6	83.0	43.0	12.0	22.0	17.0	18.0
474	-	-	5.0	16.0	18.0	16.0
454	-	-	8.0	-	16.0	-
515	-	-	12.0	-	-	-
524	-	38.0	8.5	20.0	21.5	22.0
530	66.0	23.0	8.5	13.0	9.0	12.5
88	100.0	30.0	8.0	21.0	12.0	19.0
475	55.0	37.0	7.0	26.0	18.0	24.0
276	-	-	-	-	14.0	11.0
120	-	28.0	8.0	14.5	-	-
Group 2:						
Artifact #						
31/32	124.0	32.0	10.0	15.0	17.0	24.0
95	-	-	5.0	19.0	22.0	16.0
75	-	31.0	7.0	20.0	-	16.0
628	-	29.0	6.0	17.0	-	9.0
622/630	28.0	29.0	7.5	-	-	-

These large, stemmed, bifaces have been found in at least two other sites on Spednic Lake and two sites on Magaguadavic Lake (Deal 1984a), and are believed to be a diagnostic tool type of the Susquehanna period. Elsewhere in New Brunswick, these bifaces have been found at the Portland Point (Harper 1956) and Teacher's Cove (Davis 1978:plate Vd, Vh) sites, and in various private collections, as well as surface-collected specimens from Deer Island, Woodstock, and Grand Lake (on the St. John Drainage), in the New Brunswick Museum collection. Similar specimens have also been reported in Maine at the Hirundo (Sanger 1979:47; Sanger et. al. 1977), Young (Borstel 1982), and Turner Farm (Bourque 1971:figure 38, 1975) sites. Further, similar stemmed bifaces have been reported in Nova Scotia, at the Bear River and Gaspereau Lake sites (Connolly 1977; Erskine n.d.). In general, these tools are reminiscent of a larger family of broadpoints which includes Snook Kill (Ritchie 1961), Atlantic (Dincauze 1972), Koens-Crispin/Lehigh (Kinsey 1972), and Satchell (Kenyon 1980a) points. The Savannah River points of the Carolina Piedmont are generally considered to be the original broadpoint prototype (Tuck 1978:37-39).

Since the early 1950s (after Witthoft 1953), these bifaces have generally been referred to as spearpoints in the archaeological literature. However, recent use-wear studies have indicated that these tools were more likely used for cutting/cleaving functions

(Ahler 1971; Dunn 1984). The transverse fractures, which are common on the Mud Lake Stream specimens, and include most of the Young site specimens (Borstel 1982:Plate 5), were also common among the study collection used by Dunn. He notes that this type of fracture can occur when the tools are used in a "pry-bar" fashion (Dunn 1984:16). Dunn also speculates that these broad-bladed knives were hafted into split or socketed handles, and secured by a combination of lashing and glueing to reduce movement within the half (1984:17).

Biface series: Large side-notched bifaces

This subseries consists of five specimens (Plate 10:c,i,m, and Plate 11:c,g). Two of these specimens consist of two conjoined sections (#31/32 and #622/630), one is a base to mid-section fragment (#628), and two are basal fragments (#75 and #95). The two complete specimens measure 124 mm and 87 mm in length, and the mean width of four specimens is 30.3 mm (compared to a mean width of 20.4 mm for the side-notched, Group 4, projectile points). Three of the specimens are made from chert and the other two from felsite.

Three of the specimens (#31/32, #75, and #95) are probably of Late Archaic origin, yet earlier than Susquehanna. The latter two are reminiscent of the Lake Forest (Laurentian) manifestation (see Snow 1980:216-222), while the former is similar to Ritchie's larger

Lamoka phase points (1961: Plate 14;1980: Plate 14), of the Mast Forest manifestation (see Snow 1980:223-231). Specimen #75 was a beach find, while the other two specimens were found in association with Ceramic period materials, and are suspected of being intrusive.

The other two specimens were found in the Meadowood feature and thus believed to date to that period. Specimen #628 has a concave base, but lacks basal grinding. Similar specimens are included in collections from the Bruce Boyd site in Ontario (Spence et al. 1978: Figure 3a), the Riverhaven No. 2 and Sinking Pond sites in New York (Granger 1978:Plates 3 and 16; Ritchie 1980:186, Plate 64:16), as well as sites in New England (e.g. Snow 1980:Figure 7.12). The other specimen (#622/630) was conjoined from three fragments and was probably heat damaged.

Biface series: Formed bifaces

This subseries includes 169 specimens, divided into two groups according to general body shape. The Group 1 formed biface specimens can be characterized as roughly triangular (or sub-triangular) in shape and approximately twice as long as they are wide, while the Group 2 formed bifaces are characterized as roughly ovaloid in shape, and about two-thirds as wide as they are long.

Most of the Group 1 specimens are made from chert (61 cases) or felsite (55 cases), while 16 are made from agate, 12 from jasper, nine from quartz, five from siltstone, two from chalcedony, two from basalt, and one each from slate and quartzite. Of the specimens which were complete enough to be measured (Table 11), the average length is 59.2 mm, average width 29 mm, and the average thickness is 7.9 mm. Edge angles on these specimens average 43 degrees. Blade edges on the complete and nearly complete bifaces are straight to convex (or asymmetric-convex). Most of these bifaces were biconvex (or asymmetric-biconvex) in cross section. Flake scars generally cover the surface of these bifaces, and step and hinge flake scars are common on many specimens. Basal thinning is exhibited on most specimens. Several specimens have transverse or diagonal fractures which are probably heat-initiated (see Plate 13). Some specimens exhibit a bulbuous lump just below the midsection of the specimen, which sometimes coincides with a fracture point.

Table 11: Summary of biface dimensions.

	Group 1	(N=164)	Group 2	(N=5)
Length				
mean	59.2	(N=27)	64.4	(N=4)
s.d.	15.8		10.3	
Width				
mean	29.0	(N=83)	37.7	(N=5)
s.d.	8.2		9.8	
Thickness				
mean	7.9	(N=132)	12.4	(N=5)
s.d	3.5		2.3	
Edge Angle				
mean	43	(N=151)	50	(N=5)
s.d	12		10	
Raw Materials:				
Chert	61		2	
Jasper	16		1	
Agate	12		0	
Chalcedony	2		0	
Quartzite	1		0	
Felsite	55		1	
Siltstone	5		0	
Quartz	9		1	
Slate	1		0	
Basalt	2		0	

Secondary retouch on these specimens is bifacial, suggesting cutting rather than scraping functions. Some of the incomplete specimens, as well as several of the tip fragments, probably represent damaged projectile points, while it is likely that most of the other specimens in this group were originally preforms for projectile points. However, a few specimens (e.g. Plate 12:k,m) have thick convex bases, suggesting that they were originally intended to be worked further into scraping tools.

The five Group 2 specimens in the collection average 64.4 mm in length, 37.7 mm in width, and have an average thickness 12.7 mm. Edge angles for the five specimens range from 40 to 60 degrees. Two specimens are made from chert, and one each from quartz and felsite. The blade edges for these specimens are convex or asymmetric-convex, and specimens are biconvex or asymmetric-convex in cross section. Since there is no modification for hafting, these specimens were probably hand-held, and probably served primarily as cutting implements.

Biface series: Drills

This subseries includes eight specimens, divided into two groups (Plate 15:a-c,f; Plate 16:e-h). Group 1 drills includes a single large stemmed drill base (#41) and three long drill bit

sections (#89, #236, and #487). Two of these specimens are made from bleached chert, one from jasper, and the base segments are made from felsite. The bit sections average 7.8 mm wide and 3.8 mm thick at the distal end and 12.5 mm wide and 5.8 mm thick at the proximal end. The base section is 9 mm thick, with a neck width of 21 mm, basal width of 17 mm, and stem length of 17 mm. These drills are believed to belong to the Susquehanna component, and similar specimens are associated with the Susquehanna components of Hirundo and Turner Farm sites in Maine (Sanger 1979:47; Spiess et al. 1981).

As at the Diggity site (Deal 1984b) Group 2, Ceramic period, drills only receive a tentative identification. At Mud Lake Stream, four specimens are included in this group. The attributes used to distinguish these drills from other bifaces are similar to those used by Feher (1975) and Wylie (1975), and include (1) evidence of use-wear, (2) width/thickness ratio, and (3) cross-section shape. The Group 2 drills from the Mud Lake Stream site can be characterized as being bifically formed and as being approximately twice as wide as they are thick. The average width/thickness ratio for the four specimens is 1.9 compared to 2.8 for Group 1 projectile points, 2.8 for Group 2 projectile points, 3.3 for Group 3 projectile points, and 3.8 for Group 4 projectile points. One of the specimens is made from chert (#JBG-190), two of quartz (#21 and

#703), and the other is made from felsite (#228). All four are missing tips and one is also missing a base. The latter specimen (#JBG-190) narrows to 4.5 mm in thickness toward the proximal end. They are biconvex in cross-section and bases are straight to convex. Three of the specimens exhibit extensive crushing along one or both blade edges.

Biface series: Gravers

The graver subseries consists of five specimens. Two specimens are made from chert, one from jasper, one from quartz, and one from agate. In each case the tip of the tool is bifacially worked to form a functional point (i.e. the graving spur), probabaly for the purpose of incising softer materials such as bone (see Crabtree 1972:68). One specimen (#DLS-3) may represent a reworked, large stemmed biface. However, the presence of a 30 mm section of cortex along one edge near the graving spur, and the absence of interior flake scars, suggests that the original biface was never finished. What remains is the tip and body section of the scale of the large stemmmed bifaces with a graving spur at the basal end. This artifact was a beach find, but because of the size and pattern of flake scars and material type (i.e. bleached chert), the author has included it in the Susquehanna component.

Two of the specimens (#2 and #JBG-576) are unifacial scraping tools with one or more graving spurs. The former is made from the Munsungun-like jasper with chert inclusions, and 37 mm in length, and 29.5 mm in width. The spur is 11.5 mm long and 10 mm wide at the shoulder. The second specimen is made from agate, and mesures 29.5 mm in length, and 25.5 mm in width. The two spurs are approximately 3 mm in length. A third Ceramic period graver (#613) is made from crystal quartz. Only the spur itself is worked, and it measures 18 mm in length, 14 mm maximum width, while the total length is 45 mm, and maximum body width is 27.5 mm. This specimen exhibits extensive crushing at the tip. The last specimen is only tentatively included in this category. It is an incomplete artifact (#59), made from chert, and measures 16.5 mm in width, and 8 mm in thickness. The spur has been damaged and cortex is exhibited on three of the five surfaces on the spur. Flake scars cover the remainder of the specimen and the base is also incomplete.

Biface series: Serrated biface

The serrated biface subseries consists of a single specimen (#623; Plate 11j). Both the base and dip of this specimen are missing. It is made from felsite, and measures 28 mm in width, 8 mm in thickness, and is lenticular in cross-section. Four saw-like

teeth are formed on one blade edge, which are all approximately 4 mm apart and 2 mm high. Several hairline transverse fractures are exhibited which are probably heat-initiated. This specimen was included in the Meadowood feature, and is therefore considered part of the Meadowood component. Ritchie (1980) included such "saws" as a typical Meadowood burial inclusion, and a cutting/sawing function is implicit.

Biface series: Chipped stone celt

This subseries consists of a single badly erroded artifact (#180), made from siltstone. The maximum thickness of the specimen end is 29 mm, and it measures 122 mm in length. Both ends are bifacially shaped by the removal of large flakes, and the edge spans are 58 mm and 60 mm respectively. Such a masive bifacial working edge probably served a heavy chopping function. Its inclusion in Feature #1, in association with a large stemmed bifaces, indicates a Susquehanna date for this artifact.

Uniface series

The uniface series includes 163 artifacts characterized by the intentional shaping of one or more working edges on a single face of the tool (Plate 17). This sample is divided into two groups which are distinguished by the location of the major working edge in relation to the longitudinal axis of the tool. Group 1 formed unifaces have their primary working edge at the distal end of the tool, while Group 2 formed unifaces have their primary working edge on one of the lateral edges of the tool.

Some of the specimens were obviously prepared for hafting, but the majority exhibit no evidence of hafting preparation. Many specimens were very small and may have had mastic hafts (ie. attached to a haft by a resin, or glue), however such materials may not survive in the local acidic soils. In the future, residue studies may allow us to identify traces of such materials when they survive and thus provide us with a better understanding of the use contexts of these tools.

Group 1 formed unifaces include 93 specimens. Seven different raw materials are identified, including (according to frequency of occurrance) chert, felsite, jasper, agate quartz, quartzite, and

chalcedony (see Table 12). The maximum length of Group 1 specimens ranges from 12 to 60.5 mm, with a mean of 27.6, while the maximum width ranges from 12 to 36 mm, with a mean of 22.4 mm. The dimensions of the working edge among these tools varies considerably. For example, the angle of the working edge ranges from 40 to 90 degrees (with a mean of 64 degrees), while the edge span (or length of the working edge) ranges from 10 to 36 mm, with a mean of 21.6 mm, and the height of the working edge ranges from 2 to 14.5 mm, with a mean of 5 mm. Many of the specimens are sub-triangular in shape.

Table 12: Summary of Uniface dimensions.

	Group1 (N=93)	Group 2 (N=70)
Length		
mean	27.8	27.7
s.d.	7.4	11.0
Width		
mean	22.4	20.8
s.d.	5.2	7.8
Edge Span		
mean	21.6	25.5
s.d.	5.3	10.4
Height		
mean	5.0	5.2
s.d.	1.9	2.2
Edge Angle		
mean	64.0	58.0
s.d.	15.0	16.0
Raw Materials:		
Chert	32.0	26.0
Jasper	19.0	22.0
Agate	11.0	8.0
Chalcedony	2.0	4.0
Quartz	10.0	1.0
Quartzite	3.0	1.0
Basalt	0	1.0
Felsite	16.0	7.0

Some of the specimens exhibit intentional shaping of the proximal end of the tool, presumably for hafting, while the majority exhibit intentional retouch only on the working edge. Many of these were presumably hand-held tools. As with the Diggity site unifaces (Deal 1984b), a tentative analysis of use wear on the working edges indicates relatively little crushing and moderate utilization retouch. Most of these tools probably served for light scraping tasks, such as the maintenance of bone or wooden tools, or the flensing and softening of hides.

Group 2 formed unifaces include 70 specimens. Eight raw material types are represented, including (according to frequency of occurance), chert, jasper, agate, felsite, chalcedony, quartz, quartzite, and basalt. As with the Group 1 specimens, considerable variation exists in the dimensions of the Group 2 formed unifaces. The maximum length of these specimens ranges from 16.5 to 70 mm, with a mean of 27.7 mm, while the mean width ranges from 7.5 to 50 mm, with a mean of 20.8 mm. The edge span for these specimens ranges from 14 to 72 mm, with a mean of 25.5 mm, while the height of the working edge ranges from 2 to 11.5 mm, with a mean of 2.4 mm, and the edge angle ranges from 30 to 90 degrees, with a mean of 58 degrees. These tools tend to be slightly smaller than the Group 1 specimens and are generally roughly circular or ovaloid in shape. None of these specimens exhibit intentional modification for

hafting, and most of them were probably hand-held implements. Use wear patterning on these specimens also suggest light scraping functions.

Non-formed chipped stone series

The remainder of the chipped stone material from the Mud Lake Stream site is classified as "non-formed," that is, none of the specimens have been intentionally retouched to produce a working edge. This category includes core fragments, utilized flakes, and non-utilized flakes, and is represented primarily by chert (40%), felsite (32%), and quartz (12%); the most commonly available materials around the lake. The more preferred materials such as jasper, chalcedony, and agate are relatively rare and much less wastage is observed (i.e. a total of 13%). By comparison, quartz is very difficult to work and the ratio of debitage to formed tools is very high. To some extent, the high frequency of quartz flakes in the sample may be affected by the occasional difficulty in distinquishing between natural and utilized quartz specimens. Whenever in doubt, the specimen was considered a culturally produced flake.

Non-formed chipped stone series: Cores

Chipped stone cores refer to the original nodules of raw

material from which flakes are struck for subsequent tool manufacture. Most of the core material found at the Diggity site consists of large angular fragments, bearing multiple flake scars on most faces. A second group of core material exhibits clusters of attributes which are characteristic of bipolar core production.

Group 1 cores include 37 fragmented specimens. Very little similarities occur in terms of general morphology among the specimens, except that most are large and thick compared to the bipolar cores, and faces tend to be angular. Large overlapping flake scars cover the entire surface of most specimens.

Group 2 cores include 11 specimens. Five of these are quartz, three are agate, two are chalcedony, and one is chert. Most of th specimens are bi-convex asymmetric (or roughly lenticular) in cross section. The maximum length for the complete specimens (i.e. those with both ends preserved) ranges from 16 to 28 mm, with a mean of 21.8 mm, while the maximum width ranges from 12.5 to 24 mm, with a mean of 13.5 mm.

All of these specimens exhibit attributes reminiscent of bipolar core reduction. According to Binford and Quimby (1963:289-296), each bipolar core has two opposed striking platforms or zones of percussion produced by hammer-and-anvil percussion, and generally they have a ridge of percussion opposite a basal area of

percussion (also see Crabtree 1972:10-11). Hayden (1980:3) summarizes the various attributes which have been exhibited by bipolar cores. Several of these are observed on the Mud Lake Stream specimens, including:

(1) Presence of damage in the form of crushing and intensive (multiple) flaking on both ends (11 specimens). Crushing refers to macroscopic, irregular, angular, and fractured edge damage (Ahler 1971:38).
(2) Absence of ventral scar, thus precluding classification as a flake or blade (10 specimens).
(3) Presence of flake scars that extend along the entire length of the core (8 specimens).
(4) Presence of cortex remnants on several faces, indicating a pebble origin (4 specimens).
(5) Absence of true striking platforms, but exhibiting striking ridges or points (10 specimens).
(6) Presence of flake scars, originating from opposed directions on each face (9 specimens).
(7) Presence of primary flake scars (often very small) on one or more faces (6 specimens).
(8) Presence of a concave, gouge-like ridge (heavily damaged) at one end (6 specimens).

The material from the Mud Lake Stream site seems to suggest a compromise between efficiently reduced materials (chalcedony, chert, and agate) and available materials (quartz). A similar situation is also noted for bipolar core materials recovered from the Diggity site (Deal 1984b), as well as the Ceramic period component at the Old Mission Point site (Chris Turnbull, personal communication). However, the hammer-and-anvil technique may have been a more efficient method for reducing quartz than free hand percussion.

Further, chalcedony and agate are relatively rare and represented by smaller-sized cores, so that the bipolar technique might have been a useful method for exhausting valuable raw materials. One of the sandstone abrading stones (#593) recovered at Mud Lake Stream is heavily pitted in the center of one end and may have served as an anvil stone for bipolar core flake production.

According to Hayden (1980:4), bipolar core reduction is a quick and economical method for obtaining sharp slivers for skinning and gutting game, or for mounting in split stick hafts for gutting and preparing fish (also see Flenniken 1979). The majority of ethnographic examples of this practice concern cutting flesh in either ritual or butchering contexts (Hayden 1980). Sometimes the core itself is used, but none of the above specimens exhibited any obvious evidence of use wear. Only three bipolar core flakes have been identified in the sample (see below).

Non-formed chipped stone: Utilized flakes

While no extensive use wear study was conducted on the flakes recovered from the Mud Lake Stream site, each flake was examined to determine material type, and all flakes exhibiting use wear were separated for future analysis (see Table 13). A tentative study of this sample was undertaken to determine the location and orientation

of the observed use wear (ie. unifacial versus bifacial wear patterning). Among the 99 specimens examined, using a 7X hand lense, 52 specimens exhibited unifacial utilization retouch similar to that observed on the formed uniface series. Nineteen of these specimens have a working edge located on the distal end of the tool, comparable to the Group 1 formed unifaces, while the remaining 33 specimens exhibit lateral working edges, comparable to the Group 2 formed unifaces. The majority of the specimens are chert (20), while the remainder include six jasper, six agate, and two chalcedony.

Table 13: Summary of Utilized flake dimensions.

	Group 1 (N=19)	Group 2 (N=33)	Group 3 (N=44)
Length			
mean	29.3	32.0	29.5
s.d.	9.3	11.2	12.6
Width			
mean	24.0	21.7	20.5
s.d.	7.2	7.9	8.6
Edge Span			
mean	20.4	29.1	39.0
s.d	8.1	16.1	24.3
Height			
mean	3.1	3.7	0
s.d	1.6	2.1	0
Edge Span			
mean	42.0	44.0	
s.d.	14.0	16.0	
Raw Materials:			
Chert	5.0	15.0	14.0
Jasper	6.0	11.0	22.0
Agate	6.0	5.0	1.0
Chalcedony	0	0	2.0
Quartzite	0	0	1.0
Felsite	2.0	2.0	4.0

The 44 Group 3 specimens in this series exhibit bifacial utilization retouch. Most specimens exhibit bifacial use wear along at least one edge, and often on two opposing blade edges. One jasper specimen, which was triangular in cross section, exhibited bifacial utilization retouch on all three blade edges. A few specimens exhibit heavy use wear (mostly unifacial) on a concave edge section. These edges may have been used in a spokeshave fashion (i.e. being drawn toward the user), such as in the preparation and maintenance of wooden tool hafts. Most of these specimens probably served for a variety of domestic cutting requirements, such as food preparation and hideworking.

Only three bipolar core flakes were identified (#699, #702, and #734). These were made from agate, chalcedony, and quartz, and averaged 24.2 mm in length, 13.7 mm in width, and 3.7 mm in maximum thickness. Each specimen exhibited some bifacial use retouch on blade edges. The major attribute used for recognition was the occurence of a crushed area at the proximal end of the specimen replacing a striking platform. This crushed area is considered a remnant of the working end of the core.

Non-formed chipped stone series: Non-utilized flakes

Non-utilized flakes form the largest single lithic category,

and are predominated by chert, felsite, and quartz specimens (see Table 7). Several excavation units contained dense concentrations of waste flakes, and these units generally correspond with the units of densest artifact distributions. The analysis of non-utilized flakes has not been taken beyond a lithological study, and an examination for evidence of use wear. However, the 9259 specimens have been saved for future study.

Pecked and ground stone series

The pecked and ground stone category includes tools which were produced by some degree of rough pecking with a hammerstone (to pulverize the surface fo the tool blank), followed by the use of an abrasive stone (or sand) to grind down, to polish, and to form a working edge on the tool. Further, the tools which exhibit pecking or abrading use (i.e. hammerstones and abrading stones) are also included in this series. The series consists of 21 artifacts, which are divided into nine subseries, including (1) axes, (2) gouge, (3) plummet, (4) gorget, (5) celts, (6) hammerstones, (7) abrading stones, (8) ground facets, and (9) problematicals. Artifacts of the first three subseries are believed to date to the Late Archaic, the fourth to the Meadowood, and the last five to the Ceramic period.

Pecked and ground stone series: Axes

This subseries includes two specimens of similar construction (Figure 15). Both are large ovaloid cobbles with a groove pecked around the complete circumference of the cobble, and minimal polishing at the working edge. Specimen #599 is made from

sandstone, while specimen #JBG-369 is made from quartzite. On specimen #599 the widest proportion is 13.5 mm at a point below the groove, while on specimen #JBG-369, the widest proportion is 9.6 cm at a point above the groove. The former measures 21.5 cm in length, a maximum thickness of 4.7 mm, and a restriction at the groove of 11.9 cm. The latter measures 15.9 cm in length, and a restriction of 7.6 cm at the groove. Some spalling is exhibited at the bit of each specimen. Specimen #599 also has a large spall scar at the poll end, while the other specimen exhibits some piting at the poll end.

Pecked and ground stone series: Gouge

This subseries consists of a single specimen made from sandstone (Figure 15). It measures 13.8 cm in length, 4 cm in maximum width, and a bit length of 3 cm. The groove is shallow, measuring about 7.5 mm in depth, and 65 mm in length. The surface of this specimen is badly weathered and a large spall scar is exhibited at the poll. Although this specimen was found in a Ceramic period sediment, it is probably intrusive, and properly belongs with the Late Archaic component.

Pecked and ground stone series: Plummet

This subseries consists of a single specimen (Figure 15). It is made from sandstone, is crudely worked, and badly weathered. Several large spall scars are exhibited on the body of the specimen. It is roughly ovate in form, with a groove completely encircling the narrower end. It measures 7.3 cm in length, 4.2 cm in maximum width, and 2.1 cm in maximum thickness. The specimen was found on the beach, and is believed to be an artifact characteristic of the Late Archaic period.

Pecked and ground stone series: Gorget

This subseries consists of a single artifact (#629:Plate 11:d). It was found in the Meadowood feature, and is one of the diagnostic artifacts of that occupation period. The specimen measures 94 mm in maximum width and 5 mm in maximum thickness. It was reconstructed from five fragments, and was probably heat damaged. The missing half of the specimen was probably similar in dimensions to the recovered specimen. One face is slightly convex, tappering to the sides, while the other side is flat to slightly concave. The single perforation begins 70 mm form the existing end, and 48 mm from each side. Both surfaces have been polished, as well as the edges. A small depression (from use?) occurs in one corner.

Pecked and ground stone series: Celts

The celt subseries includes two specimens, one fashioned from a sandstone cobble, and a second fragment made from greenstone (Plate 18:a,d). The latter material, as identified by Pool and Turay (1973:156) at the Cow Point site, is characterized as a green to gray-green, water-lain tuff, with well developed laminations and scattered black, ilmenite porphyroblasts.

The working edge (or distal end) of these tools is referred to as the bit element, while the proximal end of the tool is referred to as the poll element (see Figure 15). According to Sanger's terminology (1973), the bit element of specimen #112 is convex-asymmetric in planar view, symmetric in longitudinal section, and biconvex-symmetric in laterial section. The body element is expanding in planar view, and symmetric in longitudinal section. The poll element is rounded in planar view and symmetric in longitudinal section. Specimen #112 measures 119 mm in length, 51.1 mm in width, and 17 mm in thickness. At the bit, the width is 40 mm, and the edge angle is 60 degrees, while the width at the poll is 24 mm. Specimen #112 is heavily waterworn.

Pecked and ground stone series: Hammerstones

This subseries consists of three specimens, made from chert (#203), sandstone (#63), and siltstone (#204). The distal end of each tool is heavily pitted, suggesting that they had been used as a hammerstones. No intentional modification of the specimens is exhibited. Specimen #63 measures 158 mm in length, 59 mm in width, and 30 mm in thickness, and the pitted working area is about 60 mm in length. Specimen #203 measures 100 mm in length, 84 mm in width, and 46 mm in thickness. It is characterized by numerous flake spalls, and several striations from blade edges on the one intact surface, suggesting an alternate use as a sharpening stone. Specimen #204 measures 113 mm in length, and 90 mm in width. It is characterized by three large flake spall scars from two opposing surfaces.

Pecked and ground stone series: Abrading stones

The abrading stone subseries includes six artifacts (Plate 18a,b,g). Four of the specimens are sandstone cobbles and two others are siltstone. One specimen, made from fine sandstone (#259) exhibits deep striations along the edges, and may have been used as a smoothing stone in pottery manufacture. It measures 47 mm, by 30 mm, by 13.5 mm. Specimen #472, made from sandstone, is heavily

abraded on one surface and one edge, and exhibits some spalling along one edge. It measures 84 mm, by 40 mm, by 13 mm. Specimen #593, made from sandstone, exhibits polish at three places along edges, and a large spall scar is exhibited at one edge. An area of pitting at one end (see Plate 18b) may indicate an alternate use as an anvil stone. the specimen measures 103 mm, by 39 mm, by 21 mm. Specimen #139, made from sandstone, has a single facet smoothed by abrasion. It measures 135 mm, by 53.5 mm, by 27 mm. Specimen #27, made from siltstone, has abraded facets on three surfaces, and measures 119 mm, by 43.5 mm, by 22 mm. Specimen #34, made of siltstone, consists of three segments, and has three longitudinal surfaces which exhibit abading facets.

Pecked and ground stone series: Ground facets

This subseries consists of two specimens made from chert. Each specimen has two ground facets on opposing faces. Specimen #62 is a heavily bleached chert core. The two facets meet at a corner, and the smaller facet slants inward (about 70 degrees), while the larger one slants outward (about 110 degrees). Specimen #184 is a blue-gray chert. The two facets appear as thin bleached white cortex, meeting at right angles. The juncture between the facets is about 51 mm long. Both specimens are probably fragments from ground

stone tool edges. The edge opposite the larger facet on specimen #62 exhibits steep scraper retouch (about 70 degrees).

Pecked and ground stone series: Problematicals

This subseries includes two roughlt circular cobbles (#537 and #572; Plate 18e,f). The former is a fine sandstone cobble measuring 22 to 23.5 mm in diameter. It is finely polished. The second specimen is a rough sandstone cobble measuring 29.5 to 37 mm in diameter. The function of these artifacts is an enigma. The former specimen was found in a hearth feature (#19), which contained pottery and faunal remains. It may therefore have served as a boiling stone. Another possibility is a gaming piece.

CHAPTER SEVEN

Feature analysis

Twenty-one cultural features are recognized at the Mud Lake Stream site. Two of these are associated with the Susquehanna utilization of the site, one with the Meadowood utilization, and the remaining 18 represent the following Ceramic period. The distribution of these features in relation to the distribution of artifacts is illustrated in Figures 23 and 24. The following discussion gives a detailed description of each feature, including its size, sediment, as well as its ecofact and artifact content. The discussion begins with the Susquehanna features and ends with the Ceramic period features.

Archaic features

The two Archaic period features (# 1 and #21) are located in the central area of the site, and are separated by a huge granite

boulder (see Figure 17). A second large boulder protects Feature #1 from the eroding beach face (Figure 19). Ceramic period disturbance was noted along the northern edges of each feature. Feature #1 is an irregular, elongated pit, occupying Units C33 to E33, and C34 to E34. The maximum depth is approximately 73 cm below the surface in unit D33. A layer of fire-cracked rock directly overlays the feature in that unit. The soil matrix of the feature is a compact, grayish brown loam (Munsell 10YR 5/2). Two soil sample taken from C34 indicated mercury concentrations of 24 and 85 ppb, pH levels of 4.8 and 4.9, and phosphorous values of 186 and 347 kg/hect. (Table 14). No calcined bone or seeds were associated with the feature, but two carboniszed spheroids were recovered (see Chapter Five). The artifact content consisted of two specimens; a complete large stemmed biface (#168) and a rude chipped stone celt (#130). A charcoal sample taken from within 20 cm of the stemmed biface has yielded a radiocarbon date of 4010 +/- 180 B.P (Beta 11206).

Feature #21 is an irregular, elongated pit located in units E34 to H34, and F33 to G33 (Figure 17). The soil matrix is a reddish brown loam (Munsell 10YR 5/2), with a maximum depth of 35 to 40 cm below the surface in Unit E34 (Figure 20). A soil sample taken from this feature indicated a pH value of 5.2, and a phosphorous value of 411+ kg/hect. The ecofact content of the feature consisted of 31 calcined fish bones, 14 of which could be identified as herring (see

Chapter Five). Two of these were stained green, and were possibly in contact with copper. The artifact content of the feature consisted of eight large stemmed bifaces (Figure 17). Two charcoal sample were taken. One of these, assocated with artifacts #153 and #154, and the faunal sample, yielded a date of 4000 +/- 100 B.P (Beta-7639). A second sample taken from the disturbed area of Unit F34, yielded a much earlier date of 6820 +/- 180 B.P. (Beta-8164).

Meadowood Feature

The Meadowood component of Mud Lake Stream consists primarily of a single feature (#20) located in Units A23 to A24, and B23, which has the appearance of a classic Meadowood burial pit. The feature is roughly semi-circular in outline, with a maximum depth of about 20 cm below the surface in Unit A23. Probably at least one-half of the feature has eroded away a the beach face. The soil matrix is a dark, reddish brown laom (Munsell 5YR 2/2). A soil sample taken from the feature indicated a mercury content of 46 ppb, a pH reading of 5.2, and a very high phosphorous value of 2403 kg/hect. The latter finding is consistent with the large ecofact content of the unit, including 38 calcined bone identified as medium mammal, one specimen identified as small mammal, and two identified as fish. Twenty-three of the medium mammal bones are believed to

represent a large canid, probably dog, but possibly wolf (Gwyn Lanegmann 1985, personal communication). The possibility of a dog burial cannot be ruled out. Charred macroplant recovered from the feature included three elderberry seeds, three panic grass seeds, one wild sasparilla seed, and one mountain ash seed, as well as 200 to 300 carbonized spheroids. The artifact content of the feature included half of a ground slate gorget, a serrate biface (or saw), two large side-notched bifaces, a formed biface, a biface body fragment, and three unifacial tools (Plate 11).

Ceramic period features

Feature #2 is a shallow hearth in Unit B21, composed of a black patch of loam and charcoal (Munsell 2.5YR 2/0) and two small adjacent patches of light brownish gray soil and ash (Munsell 2.5 YR 6/2). The latter two patches continue into the north and south walls of the unit. The black patch is roughly ovaloid in shape, measuring 55 mm by 25 mm. Three samples of calcined bone were collected but no elements could be identified, although some were stained with copper. However, three macroplant samples yielded one bulrush seed, one elderberry seed, one raspberry seed, three sedge seeds, 13 carbonized spheroids, and one earthworm puparium. Pottery sherds from for inferred vessels were collected, one of which exhibited

linear dentate design elements. One biface fragment (#653) may also have been associated with the feature.

Feature #3 is a deep pit of indeterminate shape, located along the south wall of E27 and E28. It is most clearly distinguished in the south wall profile of those units (Figure 20). The principal soil matrix is a brown loam (Munsell 5YR 4/4). The only artifact associated with the feature is an expanding stemmed projectile point (#205), which was found at the very base of the pit, at a depth of about 50 cm. The size of this feature suggests the possibility of a storage pit, and further excavation of the units to the south sould be recommended.

Feature #4 is a shallow, semi-circular hearth, composed of a dark brown clay loam and ash. It is located in Unit F32, and continued into the south wall of that unit. It is about 1 m long and 35 cm wide to the south wall. A bone sample was taken but no elements were identified. Th artifact content of the feature includes a felsite uniface (#121) and sherds from inferred vessel #20, which exhibits linear dentate design elements. An expanding stemmed projectile point (#111) may also be associated with the feature.

Feature #5 is a relatively deep pit, located in Units F12 to G12, F11, and E13. It is composed of dark reddish brown loam

(Munsell 10YR 4/2) and calcined bone. The pit is elongated, and irregular in outline, and measures about 2.4 m by 1 m, and bottoms out at about 30 cm below the surface in Unit F12. Two macroplant samples were taken but only five carbonized spheroids were identified. The calcined bone sample contained four elements identified as medium mammal (and probably beaver). A single unifacial tool (#385) was included in the feature, along with sherds from four inferred vessels (#2, #38-40). One of the latter exhibited cord wrapped stick design elements, and one other (#39) exhibited pseudo-scallop shell design elements.

Feature #6 is a shallow hearth feature, located in Unit B17. It is roughly ovaloid in outline, and measures 1.2 m by 1 m in maximum dimensions. It is composed of dark brown loam, pebbles, and ash, as well as numerous flakes and pottery sherds. In particular, a dense ash deposit was located in the northeast corner of the unit. Although no macroplant or faunal remains were collected, there presence is indicated by very high mercury and phospherous values. The mercury content of this unit (i.e. 287 ppb) is the highest reading for the entire site, and is well above the levels expected for nature soil sediments (see Chapter Five). Three biface specimens were included in this feature, as well as one large stemmed biface (#475). The pottery sample included vessels representing each of the major design categories, including one dragged, four dentate, one

pseudo-scallop shell, and one cord wrapped stick decorated vessel. The latter is associated with the dense ash deposit, which may overlays the main area of the feature, and may thus represent a later deposit.

Feature #7 is a deep pit, located in Units F34 and G34. The pit is ovaloid in outline, and measures about 1 m by 55 cm in maximum dimensions, and the deepest portion is 33 cm below the surface. The soil matrix of the feature is a light yellowish brown loam (Munsell 10YR 6/4) overlain by a thick layer of black humus containing two small boulders (Figure 21). The artifact content of this unit includes a single jasper unifacial tool, and sherds from inferred vessel #25. This feature disturbs the northeastern border of the large Archaic feature (#21).

Feature #8 is a deep hearth, located in Units L32 and L33. It is irregular in shape, measuring about 1.2 m by .9 m in maximum dimensions, and a depth of 29.5 cm below the surface. It is composed primarily of ash and charcoal, forming a gray matrix. The only artifacts contained in the feature were sherds from two linear dentate decorated vessels (#28 and #29).

Feature #9 is a deep pit, located in Units E33 and F33. This feature partially covers a large boulder to the west, and disturbs the northern border of the large Archaic feature (#21). It is

elongated in outline, and measures about 1.7 m by .9 m in maximum dimensions, and is 18.6 cm deep in Unit F33. The feature is composed of a dark brown loam, mixed with bone, flecks of charcoal, flakes, and pottery sherds. It contained several artifacts, including eight bifaces and fragments, four unifacial tools, one epanding stemmed projectile point (#142), and sherds from a cord wrapped stick decorated vessel (#14).

Feature #10 is a shallow hearth, located in Unit E27. It is irregular in outline, and measures about 60 cm by 60 cm in maximum dimensions, and has a maximum depth of about 22 cm below the surface. It is composed partially of reddish gray loam, and partially of a gray clay loam mixed with charcoal flecks, pottery sherds and flakes. About 20 hand-sized fire-cracked rocks were taken from the top of this hearth, possibly indicating a roasting pit function.

Feature #11 is a thin lense of brown loam, mottled with ash, fire-cracked rock, and red and black stains. It covers Units D29 to E29, and D30 to E30 and is oriented to the northwest on the site grid. It has an irregular outline with maximum dimensions of 2.4 m by 1.7 m, and is less than 5 cm in depth throughout. the artifact content of the feature includes two undecorated pottery vessels (#11 and 16), four biface fragments, severn unifacial tools, two side-notched projectile points and one corner-notched projectile

point. Not surprizingly, a charcoal sample taken from Unit D29 has yielded the recent date of 300 +/- 80 B.P. (Beta-8163). The nature and size of the deposit, and scattered artifact content, suggests that this feature was a living floor (or trampled work area) dating to the late Ceramic period.

Feature #12 is a small shallow hearth located in Unit A13/AA13. It is semi-circular in shape, extending into the southern wall of the unit, and measures 36 cm by 50 cm in maximum dimensions, and has a maximum depth of 34 cm below the surface. It is composed of a thick concentration of ash, charcoal, flakes, and pottery fragments, dark grayish brown in color (Munsell 10YR 4/2). A soil sample from this unit registrered a pH reading of 5.1, a mercury content of 66 ppb, and a very high phosphorous value of 1414 kg/hect. The total artifact contents consist of a biface fragment and sherds from an undecorated pottery vessel (#49).

Feature #14 is a deep hearth, lined with several large cobbles, located in Unit C2. The soil matrix of the feature is a gray loam (Munsell 5YR 5/1) and ash. It has an irregular outline with maximum demensions of .8 m by 1 m, and a maximum depth of about 30 cm below the surface. A soil sample from the feature provided a pH reading of 4.7, a mercury content of 58 ppb, and a phosphorous value of 233 kg/hect. Three macroplant samples yielded only about 75 carbonized spheroids. The only artifact content of the feature were two linear

dentate decorated pottery vessels.

Feature #15 is a deep pit, located in Units D11, C12 and D12 (Figure 22). It is composed of dark reddish brown loam (Munsell 5YR 3/4) and a concentration of calcined bone. It has an elongated outline, measuring 1 m by .5 m in maximum dimensions, and has a maximum depth of about 35 cm below the surface. A soil sample from the feature yielded a relatively high mercury content of 95 ppb, a pH value of 5.1, and the highest phosphorous value recorded at the site (i.e. 2289 kg/hect). The two macroplant samples taken from the unit included two bristly saraparilla seeds and 19 carbonized spheroids. The faunal sample from the unit contained 606 fish bones and 22 mammal bones, the latter including two beaver elements, and one other from a small mammal. The artifact content of the unit included two biface fragments (#333 and #334), and four inferred pottery vessels (#45-47, 63).

Feature #16 is a large patch of black stained soil (Munsell 10YR 3/2; very dark grayish brown) included several small cobbles and flakes, located in Unit D13. It is roughly ovaloid in outline, with maximum dimensions of 90 cm by 30 cm, and a maximum depth of 12 cm below the surface. A soil sample from the feature provided a pH reading of 4.9, a mercury value of 49 ppb, and a phorphorous value of 613 kg/hect. Three macroplant samples yeilded only one carbonized spheriod. A faunal sample from the feature contained

bones representing beaver, small and medium mammals, as well as fish. Sherds from one undecorated vessel (#48) were also included.

Feature #17 is a deep refuse pit, located in Units C32 and C33. It is irregular in outline, measuring 1.5 m by 1 m in maximum dimensions, and has a depth of about 42 cm below the surface. The deepest part of the pit, in the southwestern corner of Unit C32, is dug into the Archaic feature (#1) in C33. A profile of this portion of the pit is included in Figure 6, and is represented by a pale brown loam (Munsell 19YR 6/3) and black loam (Munsell 10YR 2/1) overlain by a dark brown soil (Munsell 7.5YR 3/2). In the center of Unit D32 a circular area of dark brown soil and a layer of pebbles overlays the pit. A soil sample from the pit provided a pH reading of 4.9, a mercury value of 52 ppb, and a phorphorous value of 670 kg/hect. A macroplant sample yielded on a single insect egg, and a single faunal sample contain no identifiable elements. However, the pit was rich in material culture, including sherds representing seven inferred vessels (#15, #17-22). Two of the latter exhibited linear dentate design elements (#17, and #22), and one other exhibited cord wrapped stick design elements (#15). Other artifacts included a unifical tool (#440), a biface (#443), and three expanding stemmed projectile points (#182, #189, and #190). Two of the latter were found in the deepest part of the pit.

Figure #18 is a relatively deep pit, located beside a large

boulder in Units F15 and G15. It is irregular in outline, measuring 70 cm by 50 cm in maximum dimensions, and has a depth of about 30 cm below the surface. The major soil component is a light brownish gray loam (Munsell 10YR 6/2), mixed with fire-cracked rock, and numerous fragments of pottery. A soil sample from this feature has provided a pH reading of 4.9, a mercury value of 79 ppb, and a relatively high phosphorous value of 1014 kg/hect. A macroplant sample yielded only nine carbonized spheroids. The artifact content of the feature consisted of three cord wrapped stick decorated vessel (#55-57), a biface tip (#508) and a unifacial tool (#470). A charcoal sample was taken from a black stain charcoal deposit underlying the brownish gray loam, and it yielded a date of 2470 +/- 110 B.P. (Beta-1105). This date is much earlier than can be accepted for the artifact content of the feature, and would seem to indicate that the black stained deposit is a remnant from an earlier occupation of the site.

Feature #19 is a deep hearth, located in Units H59 and I59. It is irregular in outline, measuring 1.2 m by .4 m in maximum dimensions, and has a maximum depth of about 40 cm below the surface. The central portion of the feature consists of a pinkish gray loam (Munsell 7.5YR 6/2), mixed with ash and tiny charcoal flecks. A huge collection of 729 pottery fragments, representing a single cord wrapped stick decorated vessel (#97), and a large faunal

sample, begins in the dark gray sod layer and continues into the pinkish gray level. A soil sample fromt he feature provided a pH reading of 5.2, a mercury value of 20 ppb, and a very high phorphorous value of 1226 kg/hect. Five macroplant samples from this feature yielded a wide variety of flora, including two raspberry seeds, one blackberry seed, four seeds of either raspberry or blackberry, 18 elderberry seeds, two sedge seeds, about 60 carbonized spheroids, as well as one invertibrate animal egg, and several charcoal fragments. Further, three faunal samples yielded seven beaver elements, one small mammal and 11 medium mammal elements, and 19 identified fish elements. Besides the pottery, mentioned above, a biface tip (#559) and one of the problematical gound stone artifacts (#537) came from this feature.

CHAPTER EIGHT

Summary and interpretations

The Mud Lake Stream site is unique to New Brunswick archaeology for several reasons. It contains the first undisturbed deposits representing the Susquehanna and Meadowood occupations of this province, as well as the first *in situ* find of Vinette 1 pottery. Further, it is one of the few interior (non-shell midden) sites to be excavated in the province, and it is the only large, intact, interior site thus far found on the Chiputneticook-St. Croix Drainage System. The following discussion summarizes the information provided in the previous chapters, and attempts to place the Mud Lake Stream site into the perspective of our current understanding of the prehistory of the Maine-Maritimes region. Several of the sites mentioned below, and elsewhere in the text, are presented in Figure 25.

Late Archaic (Susquehanna) component

The Susquehanna were a Late Archaic people, possessing a distinctive toolmaking tradition, who appeared in the Maine-Maritimes region sometime around 3700 B. P. Their arrival is generally accepted by Northeastern archaeologists as an actual migration of people from the Middle Atlantic Coast area (see Snow 1980:247-248), although Tuck (1977:37) believes that these people were assimilated by the indigenous Maritime Archaic peoples, so that there was little disruption in the cultural continuity of the region. The Susquehanna possessed a less elaborate woodworking technology than their Maritime Archaic predecessors, and the general burial practice was cremation rather than interment. The Susquehanna are also generally considered to be the technological innovators responsible for the transition, via soapstone vessels, toward the use of pottery in the Northeast (Coe 1964;Tuck 1978:37-39).

The most diagnostic artifact of the Susquehanna toolkit is the large stemmed biface, or broadpoint, which probably functioned as a knife/cleaver (Dunn 1984; see Chapter 5 for discussion). Other tool types associated with the large stemmed points exhibit considerable regional variation (e.g. Cook 1976; Witthoft 1949, 1953; Tuck 1978). In particular, fully grooved axes and hammerstones are generally recognized as being related to the Susquehanna tradition (Dincauze 1968; Sanger 1973; Ritchie 1980:99), and large stemmed drills,

gravers, and perforators are persistently associated with Susquehanna assemblages (e.g. assemblage 3 at Hirundo, Sanger 1979:47; and Turner Farm, Spiess et. al. 1981). Ritchie (1980:151) suggests that the latter forms are probably represent reworked stemmed points. The soapstone bowls associated with the Susquehanna occupations further to the south are rare in this region, although fragments from a single bowl were found at Portland Point, in St. John Harbour (Harper 1956), and a complete bowl was surface collected at French Lake, on the St. John River, early in this century. Similarly, atlatl weights (bannerstones), common in the Middle Atlantic area (Kraft 1970; Regensberg 1971, 1974), are rare in this region.

In general, the Susquehanna occupation in the Northeast has been characterized by an early riverine focus with deer and other terrestrial mammals as a subsistence base, with a later incorporation of marine resources, notably shellfish (Tuck 1978). However, a maritime economy had probably developed earlier in association with broadpoint use in the southern portion of this area (e.g. Claflin 1931; Cook 1976; Stoltman 1974). The clearest evidence of Susquehanna diet in the Maine-Maritimes region is occupation III at Turner Farm, which Spiess, Bourque, and Cox (1981,1983) interpret as less marine oriented than the former Maritime Archaic or later Ceramic period occupations. They place the primary subsistence

emphasis on deer-bear-moose hunting, with shellfish gathering, inshore bird and marine mammal hunting, and fishing, all playing a more minor role.

The Mud Lake Stream Susquehanna component consists of 23 large, stemmed projectile points and point fragments, two small bifaces (one a medial section), a drill base and three drill tips, an unfinished chipped stone celt, a large complete grooved axe, and possibly a shallow groove gouge. A second complete grooved axe and an ovate plummet, surface collected at the site, are included with this component, although the latter may be more representive of earlier (Maritime Archaic) use of the site.

Most of the provenienced artifacts came from two features. The original function of feature #21 is a mystery. It contained seven stemmed projectile points, and a small sample of calcined bone. A charcoal sample from unit E34, which was directly associated with one stemmed point (#151/154), has yielded a firm date of 4010 +/- 100 B. P. (Beta-7639). A second sample taken from Feature #1 has yielded a date of 4000 +/- 180 B.P., while a third sample, taken from unit F34 has yielded an early date of 6820 +/- 180 B.P. However, the charcoal from this sample was scattered near an edge of the Susquehanna deposit that had been disturbed by a deep Ceramic period pit feature extending from Unit F34 into G34 (see Chapter Seven). In other words, there is some question as to the

stratigraphic integrity associated with this third charcoal sample. The first two samples seem to justify an assumption of approximately 4000 B.P. for the Susquehanna utilization of the Mud Lake Stream site.

Early Ceramic (Meadowood) component

The Meadowood people are distinquished by their full scale adoption of pottery technology, a greater degree of social interaction, and an elaborate mortuary complex. In some areas of the Northeastern United States, there is evidence that these people harvested and stored a variety of plant foods (Snow 1980), especially *Chenopodium* (lamb's quarter). In general, the Meadowood occupation of the Maine-Maritimes region is very likely an *in situ* developement, primarily involving the exchange of new technological innovations and exotic raw material, rather than an actual movement of people, as postulated for the earlier Susquehanna groups. The center of Meadowood culture seems to have been the eastern Great Lakes area, and especially northern New York State, southern Ontario, and southern Quebec.

The Meadowood materials thus far recovered from Mud Lake Stream come from a single feature which has the appearance of a classic Meadowood cremation burial. In particular, a ground slate gorget, a

side-notched projectile point, and a serrated biface (saw) are characteristic of Meadowood grave offerings. A large sample of burned bone from the feature included a large *canid* (probably dog), non-salmonoid fish, and probably beaver; all of which may represent burned offerings to the deceased. While none of the fragmented bone was positively identified as human, more than half of the feature has been eroded away at the beachface, and these cremated remains may have been lost. Alternately, the deceased may not have been cremated, or only partially cremated, and the bones subsequently disintegrated in the acids soils of the site. A similar burial situation has been reported at the Bruce Boyd site, in southern Ontario (Spence et al. 1978:40-41). Burial F1 at that site was the only one of several which contained animal remains, and which also did not include red ochre. The burial consisted of an incomplete adult skeleton, with the skull covered with the bone of several species, including four deer, woodchuck, ground squirrel, beaver, small rodent, wild turkey, catfish, bowfin, and chub.

Only two other sites in New Brunswick have yeilded Meadowood materials, namely, the Tozer and Wilson sites on the Northwest Miramachi River. These two sites represent the most eastern extension of Meadowood culture (Allen 1983c). The Tozer site consisted of two burials containing red ochre, charred bone and several burial offerings, including 18 triangualr cache blades, one

lanceolate knife, a stemmed projectile point, a copper awl, and a nearly complete gorget. Both the copper and chert cache blades suggest trade with areas to the west (Allen 1983c). By contrast, the Wilson site contained only a few Meadowood projectile points, scrapers and drills made from local rhyolite. Unfortunately, both of these sites were badly disturbed by road building and agriculture, and the artifacts recovered are unprovenienced.

Although Meadowood settlement sites are rare in comparison to burial sites, they tend to be located on large lakes and streams, and seem to show some seasonal preferences (Ritchie and Funk 1973:96, 115, 348). For example, in southern Ontario, Granger (1978:295) notes a close association with small Meadowood sites and former shallow lakes (such as the Dawson Creek site: Jackson 1980) where weir-net and leister fishing could be practiced, while larger sites are located on larger streams and deep lakes. Granger equates this preference for locating sites near streams, lakes, and marshes, with a primary fishing economy. The limited Meadowood data from New Brunswick sites seems to be consistent with this kind of interior riverine-lacustrine adaptation.

Middle and Late Ceramic period component

By definition, pottery is the most distinctive artifact class

associated with Ceramic period sites. At Mud Lake Stream, the three major decorative stylistic trends associated with this period in the Maine-Maritimes region are well represented among the 102 infered vessels. These trends, which involve the employment of dentate, pseudo scallop shell and cord wrapped stick design elements, are also well represented at the Diggity site, as well as in a large sample of pottery in the J. Bliss Goodwin collection. The latter specimens were surfaced-collected at an undesignated site on the southern end of Palfrey Lake. Only four decorated fragments were recovered in the 1982 excavations at the Diggity Beach site (BjDu4). These were all from the same vessel and exhibited only cord wrapped stick design elements.

Following a review of previous research in Quebec and the Maine-Maritimes region, Foulkes (1981:231) suggests that the dentate and rocker-stamped dentate motifs were popular between 2200 and 1050 B.P., and possibly as much as four hundred years earlier in some areas (see Allen 1980, n.d.). Very few radiocarbon dates have been associated with the pseudo scallop shell motif. In New Brunswick, the most recent date thus far reported is a date of 2030 +/- 120 B/P. from Old Mission Point, while a more recent date of 1670 +/- 100 B.P. is reported at Cap a l'Orignal-1, Quebec (see Foulkes 1981:228-229; Turnbull and Turnbull 1974). Foulkes (1981:234) notes that the thick-walled, coarse-tempered, cord wrapped stick pottery

(often with circular punctates around the rim) is generally believed to be a late Ceramic period phenomenon in the area, not predating 1000 B. P. (see Bourque 1971; Sanger 1979). However, cord wrapped stick design elements have been reported earlier at several New Brunswick sites (see Foulkes 1981:228-229).

Ceramic period projectile point styles are also considered to be chronologically sensitive. Previous work on the central Maine coast (Bourque 1971) and Passamaquoddy Bay (Sanger 1971, 1979), seem to indicate a general "evolution" of projectile point morphology (and specifically the nature of basal treatment) from the Late Archaic into the Ceramic period. Large stemmed Late Archaic points are seen to evolve into wide corner-notched points, followed by narrow corner-notched, and finally side-notched points (Sanger 1971:2). In general, corner-notched projectile points are considered to be a relatively late phenomenon in New Brunswick prehistory (Foulkes 1981:92).

All of the Ceramic period forms discussed above are represented at Mud Lake Stream (see Chapter Five). The latter include nine of the expanding stem variety believed to be early in the projectile point evolution, and which Sanger (1979:152) dates between 400 and 2000 B. P. There are eleven of the corner-notched variety, comparable to Davis's Group 2 bifaces from Teacher's Cove (1978) and Foulkes Group 1 corner-notched bifaces from Fulton Island (1981).

Nine specimens represent the small corner-notched variety which identify with the late Ceramic period points. These are similar to the Group 1 side-notched biface variety from Fulton Island, and one of the miscellaneously classed projectile points from Teacher's Cove (Davis 1978:56, VIIi).

As with the pottery sample, the projecile point specimens seem to indicate a long span of occupation for the site during the Ceramic period. However, two charcoal samples, taken from Ceramic period deposits, both yielded recent dates of 300 +/- 80 B.P. (Beta-8163) and 440 +/- 50 B.P. (Beta-9707). The most recent diagnostic artifacts found on the site include an iron French trade axe, of a type widely distributed from the early seventeenth century to the 1730s (see Jeffreys 1945; Woodward 1946), several Scottish clay pipe fragments from the eighteenth and nineteenth century, and a common cut nail dating to post-1820.

In terms of the spatial distribution of Ceramic period occupation of the Mud Lake Stream site, the earlier expanding stem projectile points and corner-notched points were almost all found in the central excavation area, just to the north of the Archaic features (Figure 26). By contrast, the later side-notched projectile points are found further back from the beach face. Further, both the lithic and ceramic materials from the northern excavation area of the site had a later Ceramic period makeup.

The remainder of the lithic assemblage of the site includes numerous chipped stone bifaces and biface fragments, drill fragments, graving tools, and a large sample of formed unifaces. Use wear patterning of the formed unifaces seem to indicate light scraping function such as hideworking (also see Sanger 1979:152). The raw materials utilized for the chipped stone tools are all available around the lake as outcrop surfaces or as glacial erratics and till cobbles (Gaunce 1984). Pecked and ground stone artifacts from Mud Lake Stream include celts, cobbles with ground facets, hammerstones, abrading stones, and one pottery smoothing stone. The chipped stone, and pecked and ground stone assemblages from Mud Lake Stream are comparable to those from coastal sites. Further, only a single barbed bone point survived the local acidic soils to represent a bone tool assemblage which probably also included projectile points, needles, awls, fleshing tools, and fish and mammal harpoons.

A review of the faunal records from twelve Passamaquoddy Bay sites (Deal 1984a), indicated that thirty-one species of mammal alone were represented. This includes over 40% of the modern and extinct mammalian species recorded by Squires (1968) for New Brunswick. The number of identified species per site ranges from three to twenty, with a median value of 17 species, and a mean value of 12.6. By comparison, faunal diversity reported from interior

sites appears meagre. In addition to terrestial mammals such as beaver and white-tailed deer, coastal inhabitants exploited a variety of shellfish (softshell clam, blue mussel, oyster, etc.), finned fish, sea mammals, shore birds, (Sanger 1979:108). In general, seasonality studies from sites in Passamaquoddy Bay and Penobscot Bay have indicated that coastal sites were occupied primarily in late fall until spring (Bonnichsen and Sanger 1977; Bourque 1973; Sanger 1979). However, some sites do indicate summer residency (e.g. Partridge Island, Goddard, and site 30-68), while the Turner Farm site was probably occupied year round (Black 1983; Sanger 1982).

While there is an abundance of faunal material from the Mud Lake Stream site, this material yields relatively little evidence concerning seasonality. If the most of the Ceramic period faunal materials come from a single sequence of occupation, then the fish species recovered from the site indicate both late fall and spring spawning runs, while moose and beaver are generally hunted in the winter. Botanical remains from Mud Lake Stream, as well as Diggity, are dominated by charred seeds from edible berries, which are available in late summer and fall. At present, the combined faunal and botanical evidence seem to point to some time between late summer and early spring as the most probable time of occupation for both of these sites, with full summer being the only season not

represented (Langemann 1985).

Based on our current inventory of sites for the Chiputneticook-St. Croix drainage area, Ceramic period occupation seems to have been relatively sparse. When the distribution of surface collected projectile points is considered, at least ten Ceramic period sites were located on Spednic and Palfrey Lakes, four on Magaguadavic Lake, one on North Lake, and one other on Canoose Lake. The three excavated sites are located near stream entrances to Spednic Lake, which are also throughfares between Spednic, Mud, and First Lakes. This is consistent with favoured locations of Ceramic period sites in the interior of Maine (Sanger 1979:106).

Undoubtedly, this inventory greatly under-represents the Ceramic period occupation of the area. While all of our Archaic period materials come from sites eroded away by fluctuations in the water levels of the lakes, some known Ceramic period sites have been largely undistrubed. However, two surveys conducted during the fall of 1984 (Hale 1985; Kopec 1984), did not located any additional undisturbed sites.

Artifacts recovered from the Mud Lake Stream site seem to indicate that the site was utilized throughout most of the last 4000 years of Northeastern prehistory. The Susquehanna and Meadowood components at Mud Lake Stream are the only such deposits thus far

found in New Brunswick. Of particular interest is the association of calcined herring bones with the Susquehanna deposit, which suggests that the anadramous fish runs at the Milltown falls, about one hundred kilometers by water to the south, were being exploited during Susquehanna times.

Both decorative stylistic trends on pottery and projectile point morphologies seem to indicate a continuous utilization of the site throughout the Ceramic period. Except for the absence of bone and wood tool industries (explanable by preservation factors), the Ceramic period materials from Mud Lake Stream are similar to those from Passamaquoddy Bay sites.

APPENDIX A

Chipped stone raw materials utilized at the Mud Lake Stream site*

Siliceous Rocks:

Quartz: Quartz is represented in these artifacts as a massive white crystalline material with irregular fracture.

Chert: This is a white to black rock characterized by conchoidal fracture and a plastic-like appearance.

Bleached Chert: This material is any chert which has been altered to a kaolin by acid groundwater, and appears to be "chalky" with an earthy fracture. Generally, but not always, this alteration is a shell around a normal chert core.

Jasper: This is a generally red or green material exhibiting conchoidal frature properties and often having small clay inclusions. Its texture resembles that of chert, but it is more likely to exhibit a mat rather than a glossy appearance.

Chalcedony: This material is "waxy" appearing rock with

excellant conchoidal fracturing properties. It has a wide range of colors, and is transparent to translucent.

Chalcedony-Agate: This is an opaque chalcedony which may be multicolored and is generally mottled or banded.

Igneous Rocks:

Felsite: This is a volcanic rock which generally has a light coloration. It may have inclusions. It may also be mottled, or banded, or appear to be stratified. Generally, this rock has small pits and hollows in its surface which are diagnostic of volcanic rocks.

Basalt: This rock is similar to felsite in all respects except that is is dark grey or black. It also tends to be somewhat denser.

Diabase: This is a medium to small grained igneous dike rock. It may resemble granite or diorite but generally has smaller grains.

Sedimentary Rocks:

Quartzite: This is a sandy rock which has the grains of sand firmly cemented together with some variety of silica gel. This rock is recognized by its sandy texture when low grade, and its grainy texture in which sand grains are not easily seen, but which produce small bumps on the surface of fracture scars.

Siltstone: This is a material composed of silt-sized particles in a cement of silica or calcium carbonate.

Slate: This is a very fine-grained material with a perfect cleavage in one plane.

* From Gaunce 1984.

Figure 1: Map of the Chiputneticook-St. Croix Drainage area, indicating locations of known prehistoric sites.

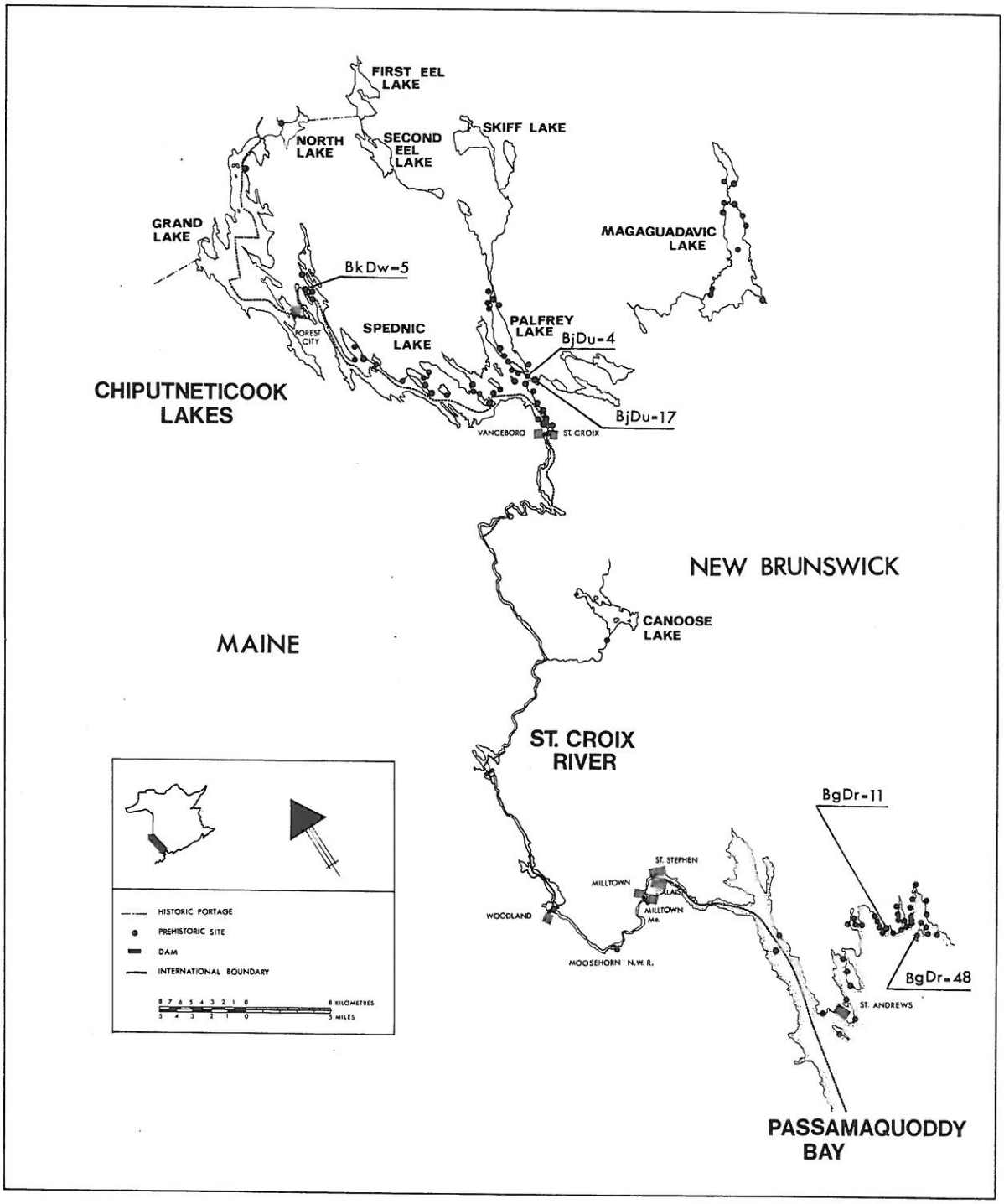

FIRST EEL LAKE
NORTH LAKE
SECOND EEL LAKE
SKIFF LAKE
GRAND LAKE
MAGAGUADAVIC LAKE
BkDw-5
FOREST CITY
SPEDNIC LAKE
PALFREY LAKE
BjDu-4
CHIPUTNETICOOK LAKES
BjDu-17
VANCEBORO
ST CROIX
NEW BRUNSWICK
CANOOSE LAKE
MAINE
ST. CROIX RIVER
BgDr-11
ST. STEPHEN
MILLTOWN
CALAIS
MILLTOWN Me.
WOODLAND
MOOSEHORN N.W.R.
BgDr-48
ST. ANDREWS
PASSAMAQUODDY BAY
HISTORIC PORTAGE
PREHISTORIC SITE
DAM
INTERNATIONAL BOUNDARY
8 7 6 5 4 3 2 1 0
8 KILOMETRES
5 4 3 2 1 0
5 MILES

Figure 2: Grid and contour map of the Mud Lake Stream site.

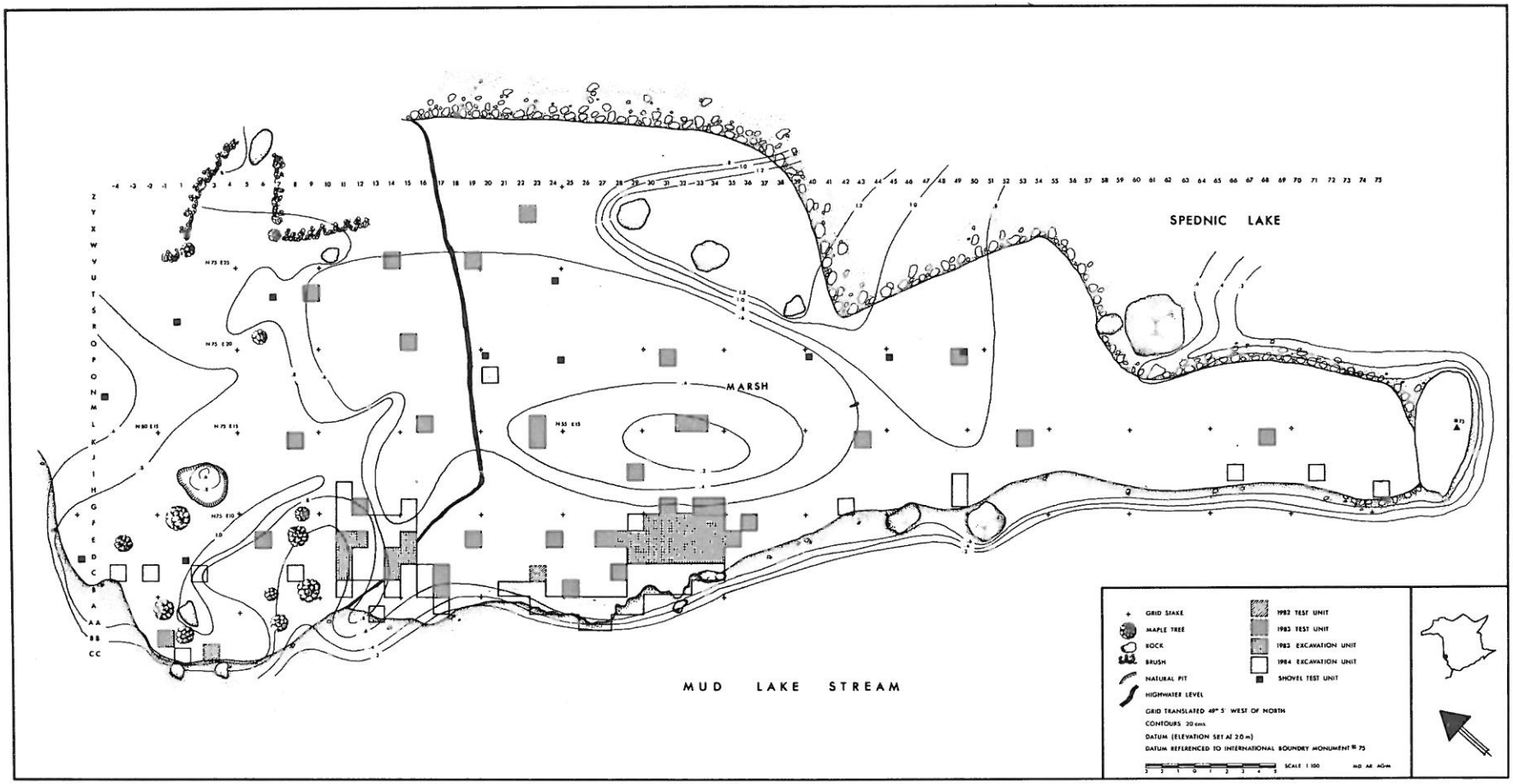
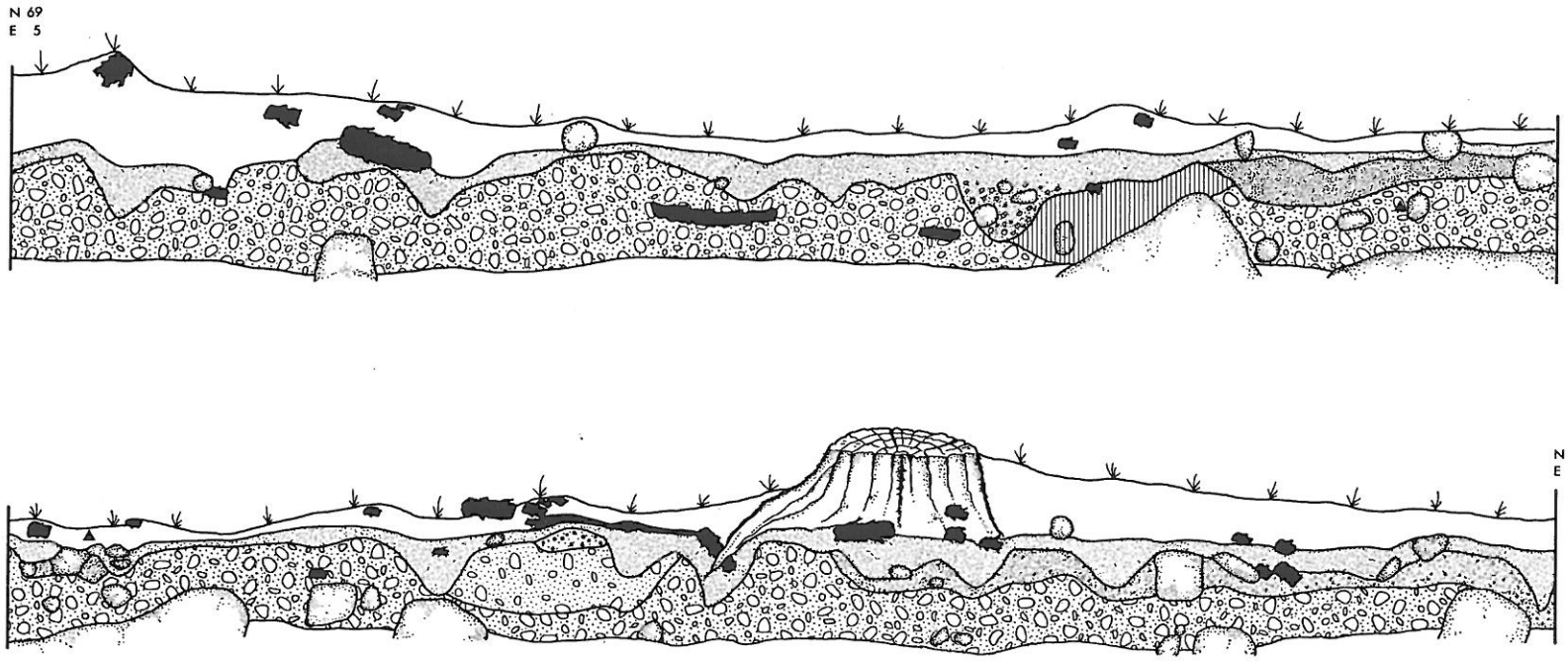

SPEDNIC LAKE
MARSH
MUD LAKE STREAM
GRID STAKE
MAPLE TREE
ROCK
BRUSH
NATURAL PIT
HIGHWATER LEVEL
1982 TEST UNIT
1983 TEST UNIT
1983 EXCAVATION UNIT
1984 EXCAVATION UNIT
SHOVEL TEST UNIT
GRID TRANSLATED 49° 5' WEST OF NORTH
CONTOURS 20 cms
DATUM (ELEVATION 581 AT 20 m)
DATUM REFERENCED TO INTERNATIONAL BOUNDRY MONUMENT # 75
SCALE 1:100
MD AR AGm

Figure 3: North wall profile drawing of Units B11 to H11.



BkDw 5

NORTH WALL PROFILE

UNITS B 11 TO H 11

11/10/84

M.D. B.A. A.G-M.

0 50cm

VERY DARK GREY (5 YR 3/1)

BLACK (10 YR 2/1)

PALE GREY (7.5 YR 6/2)

DARK BROWN (7.5 YR 4/4)

YELLOWISH BROWN (10 YR 5/6)

YELLOWISH BROWN (10 YR 5/8)

LIGHT YELLOWISH BROWN (10 YR 6/4)

YELLOWISH RED (5 YR 5/8)

DARK REDDISH BROWN (5 YR 3/4)

SCRAPER

ROCK

ROOT

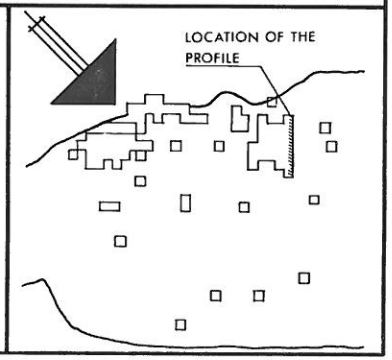
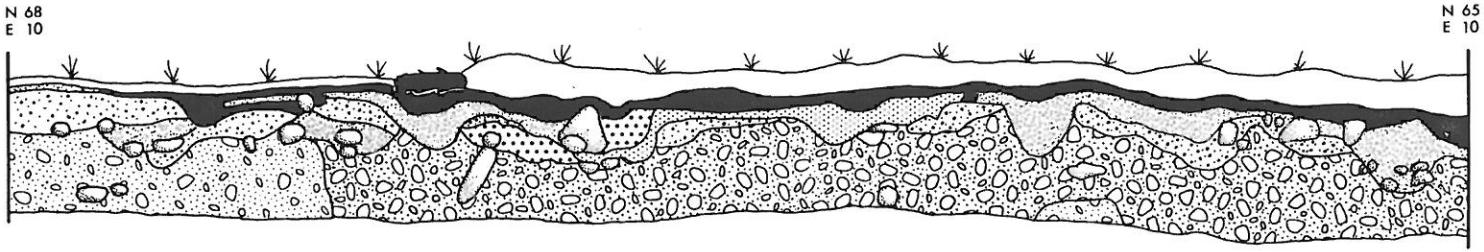


Figure 4: West wall profile drawing of Units F12 to F14.



Bk Dw 5

WEST WALL PROFILE

UNITS F 12 TO F 14

11/10/84

MD. BA. A G-M.

0 50 cm

VERY DARK GREY (5 YR 3/1)

BLACK (10 YR 2/1)

PALE GREY (7.5 YR 6/2)

DARK BROWN (7.5 YR 4/4)

YELLOWISH BROWN (10 YR 5/6)

YELLOWISH BROWN (10 YR 5/8)

PALE BROWN (10 YR 6/3)

DARK GREYISH BROWN (10 YR 4/2)

ROCK

ROOT

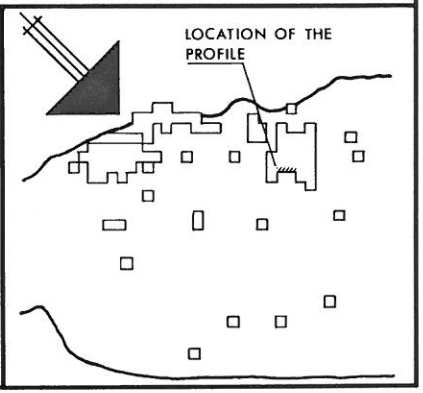
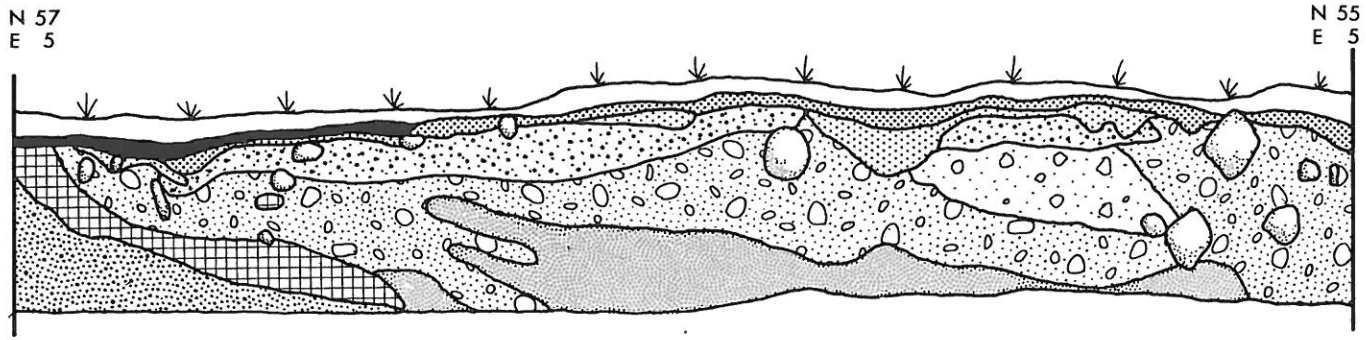


Figure 5: East wall profile drawing of Units A24 to A25.



Bk Dw 5

EAST WALL PROFILE

UNITS A 24 TO A 25

15/10/84

MD. BA. A G-M.

0 50cm

OLIVE BROWN (2.5 YR 4/4)
DARK BROWN (7.5 YR 3/2)
YELLOWISH BROWN (10 YR 5/6)
STRONG BROWN (7.5 YR 5/6)
VERY DARK GREY (10 YR 3/1)
YELLOWISH BROWN (10 YR 5/4)
ROOT DISTURBANCE
BLACK (10 YR 2/1)
BROWN (10 YR 5/3)
SOD LAYER
ROCK

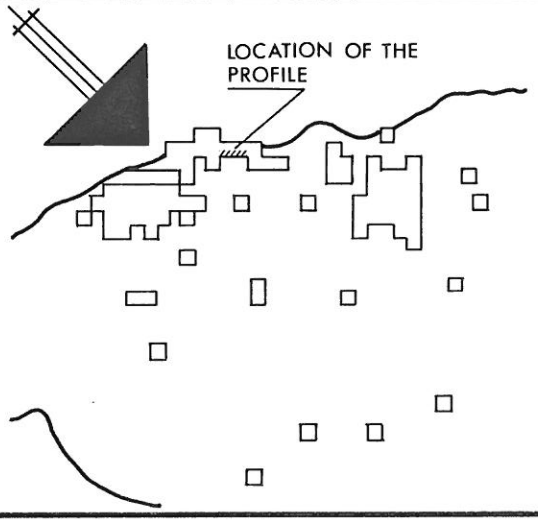


Figure 6: West wall profile drawing of Units D29 to D35.

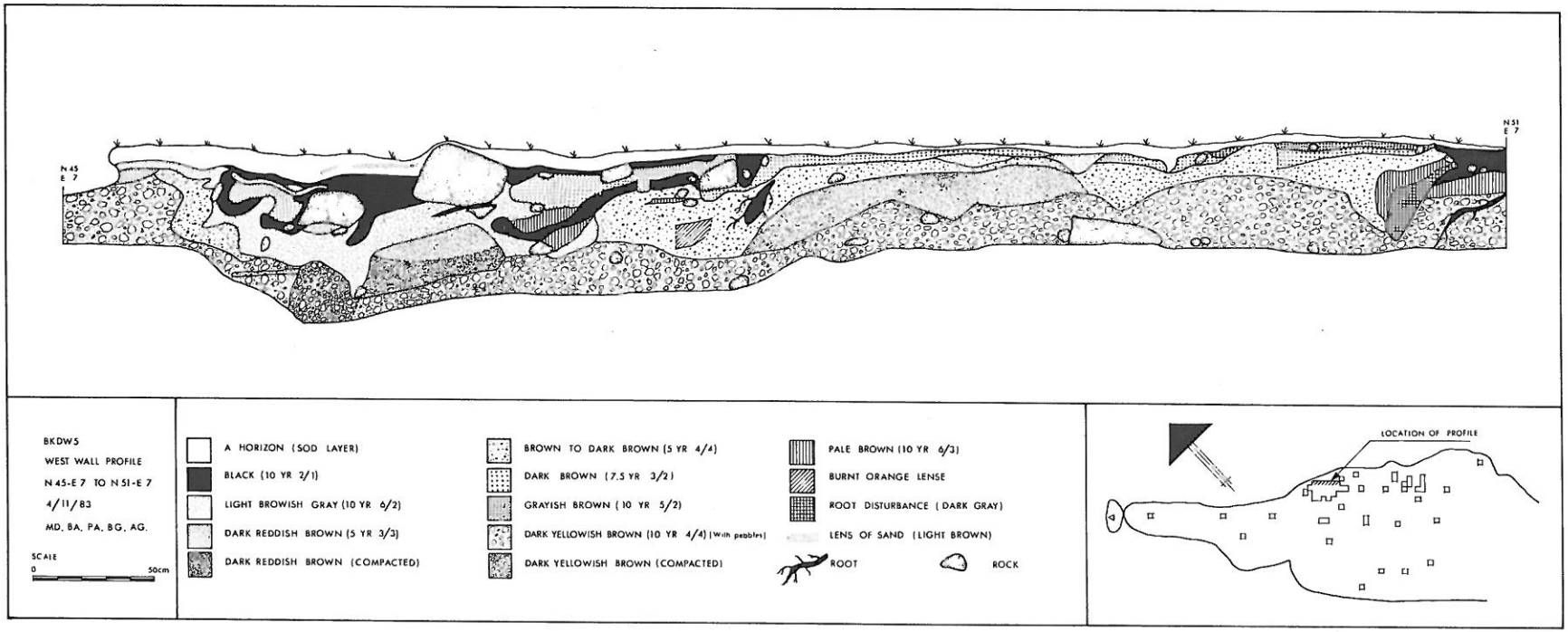
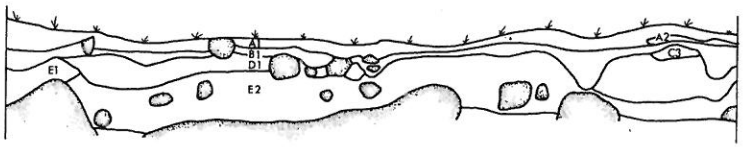
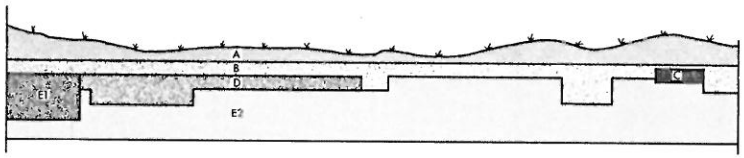

N 45
E 7
N 51
E 7
BKDWS
WEST WALL PROFILE
N 45-E 7 TO N 51-E 7
4/11/83
MD, BA, PA, BG, AG.
SCALE
0
50cm
A HORIZON (SOD LAYER)
BLACK (10 YR 2/1)
LIGHT BROWISH GRAY (10 YR 6/2)
DARK REDDISH BROWN (5 YR 3/3)
DARK REDDISH BROWN (COMPACTED)
BROWN TO DARK BROWN (5 YR 4/4)
DARK BROWN (7.5 YR 3/2)
GRAYISH BROWN (10 YR 5/2)
DARK YELLOWISH BROWN (10 YR 4/4) (With pebbles)
DARK YELLOWISH BROWN (COMPACTED)
PALE BROWN (10 YR 6/3)
BURNT ORANGE LENSE
ROOT DISTURBANCE (DARK GRAY)
LENS OF SAND (LIGHT BROWN)
ROOT
ROCK
LOCATION OF PROFILE

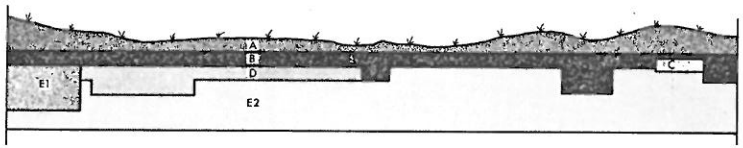
Figure 7: North wall profile drawing of Units D11 to F11, comparing the visual profile with the pH, phorphorous, and mercury profiles. (Note that a value of 4.0 is considered a higher value than 5.0 for pH.)



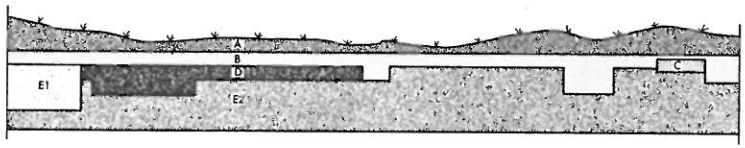
VISUAL PROFILE



PHOSPHORUS PROFILE



pH PROFILE



MERCURY PROFILE

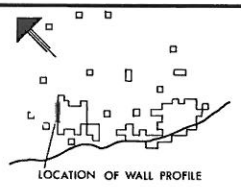
Bk Dw 5

NORTH WALL PROFILE,
UNITS D11 TO F11.

COMPARISON OF VISUAL PROFILE WITH pH, PHOSPHORUS, AND MERCURY PROFILES.

SCALE 0 5cm

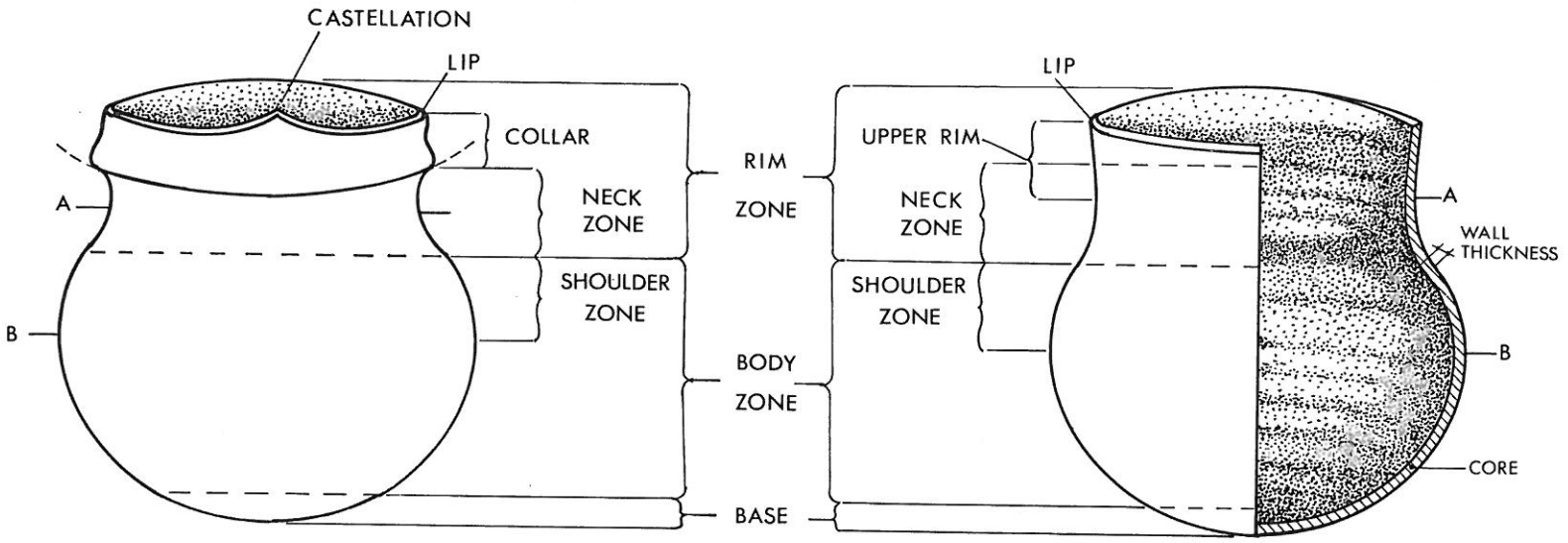
M.D., A.G.-M.



LOCATION OF WALL PROFILE

LEVEL 1 (HIGHEST VALUE)
LEVEL 2
LEVEL 3
LEVEL 4
LEVEL 5
LEVEL 6

Figure 8: A illustration of pottery vessel terminology use in the text.



POTTERY VESSEL MORPHOLOGY

---INFLECTION POINTS DENOTING BEGINNING OF NECK, SOULDER & BASE

A= MINIMUM NECK DIAMETER

B= MAXIMUM BODY DIAMETER

(ADAPTED FROM ALLEN 1980, BISHOP 1983, MAROIS 1979)

MD AG 1984

Figure 9: Summary of design elements on Mud Lake Stream pottery #2 to 34.

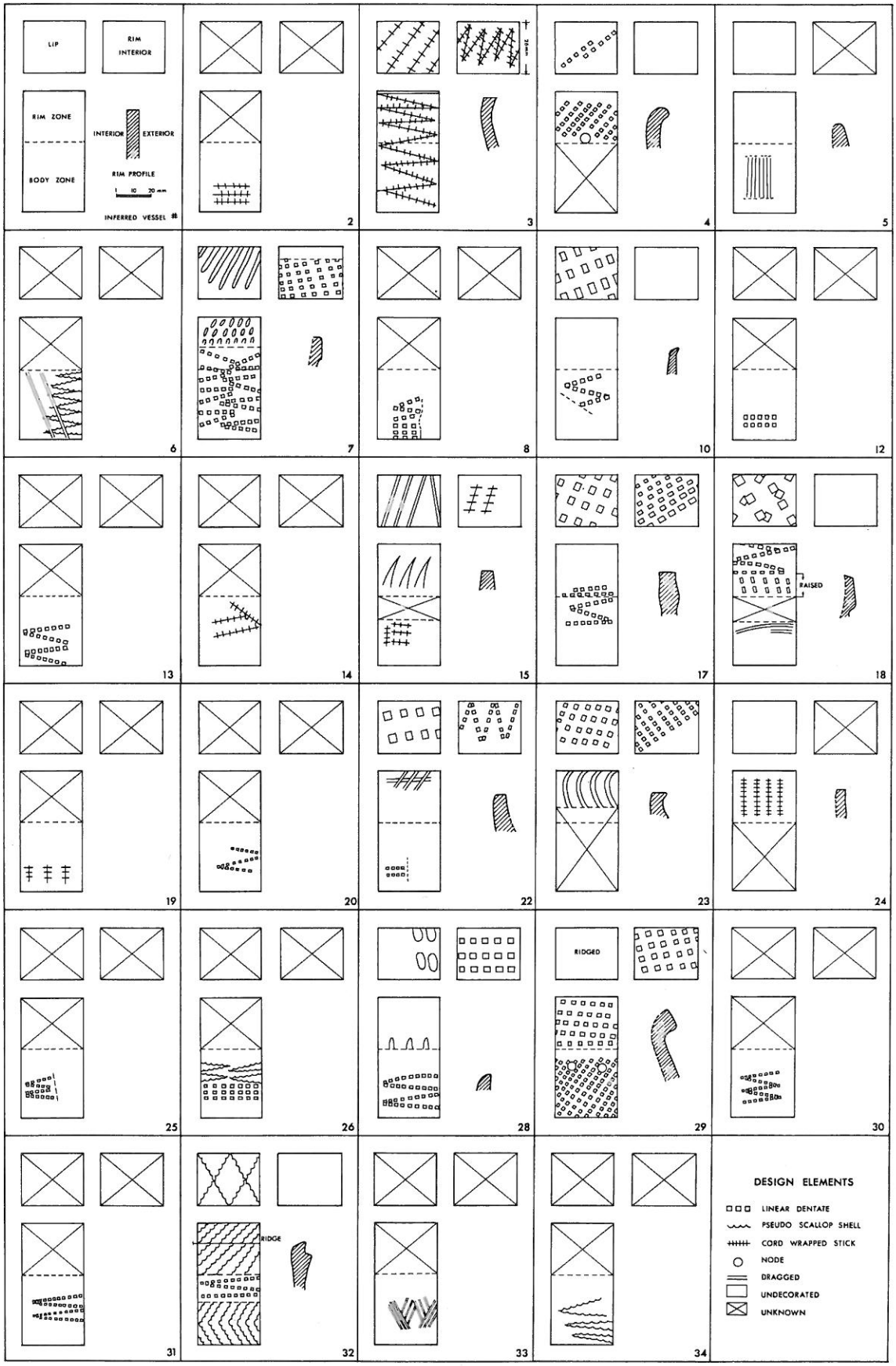

LIP
RIM INTERIOR
RIM ZONE
BODY ZONE
INTERIOR
EXTERIOR
RIM PROFILE
1 10 20 mm
INFERRED VESSEL #
2
3
4
5
6
7
8
10
12
13
14
15
17
RAISED
18
19
20
22
23
24
25
26
28
RIDGED
29
30
31
RIDGE
32
33
34
DESIGN ELEMENTS
LINEAR DENTATE
PSEUDO SCALLOP SHELL
CORD WRAPPED STICK
NODE
DRAGGED
UNDECORATED
UNKNOWN

Figure 10: Summary of design elements on Mud Lake Stream pottery #35 to 70.

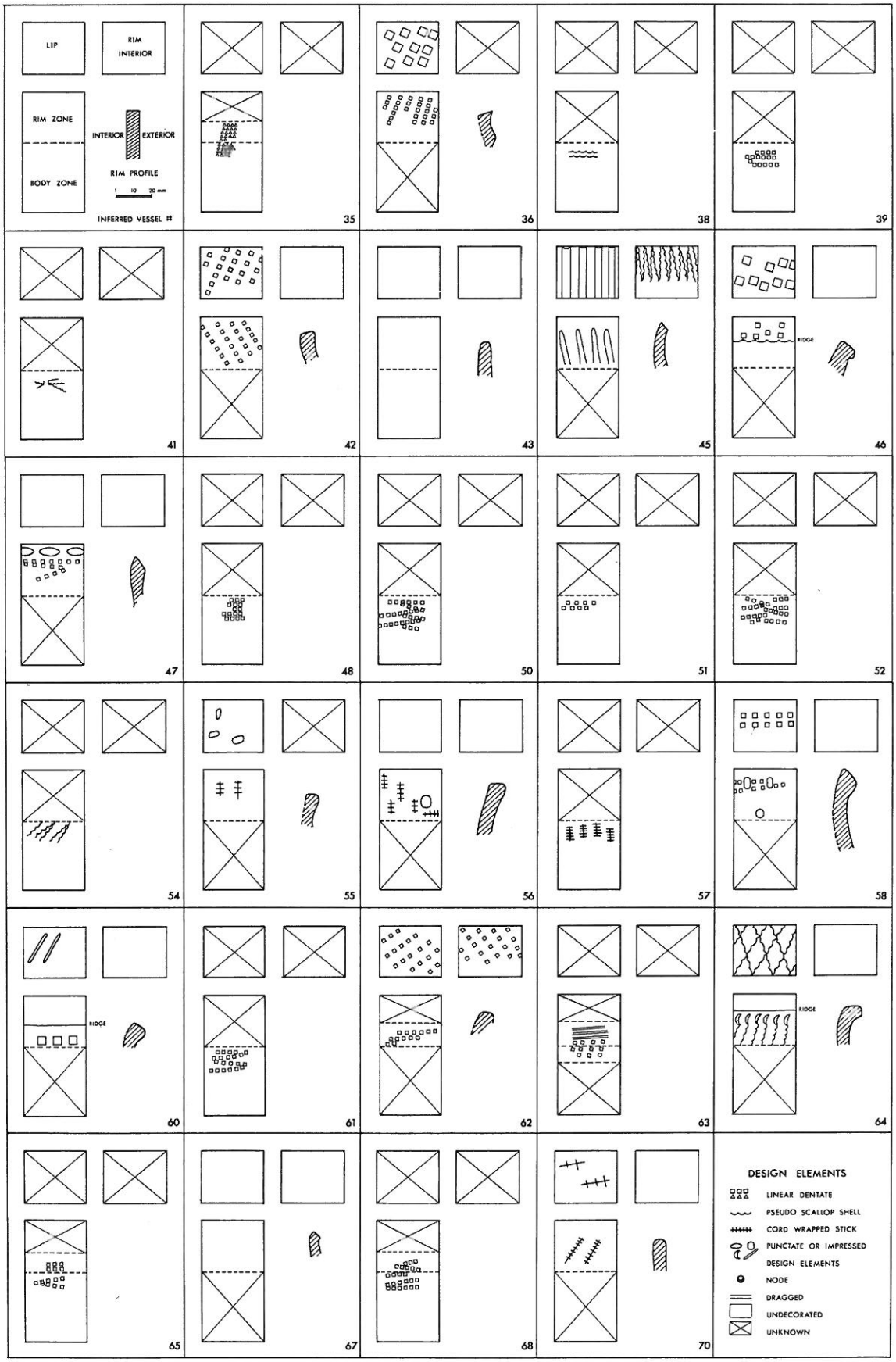

LIP
RIM INTERIOR
RIM ZONE
BODY ZONE
INTERIOR
EXTERIOR
RIM PROFILE
INFERRED VESSEL #
35
36
38
39
41
42
43
45
RIDGE
46
47
48
50
51
52
54
55
56
57
58
RIDGE
60
61
62
63
RIDGE
64
65
67
68
70
DESIGN ELEMENTS
LINEAR DENTATE
PSEUDO SCALLOP SHELL
CORD WRAPPED STICK
PUNCTATE OR IMPRESSED DESIGN ELEMENTS
NODE
DRAGGED
UNDECORATED
UNKNOWN

Figure 11: Summary of design elements on Mud Lake Stream pottery #71 to 100.

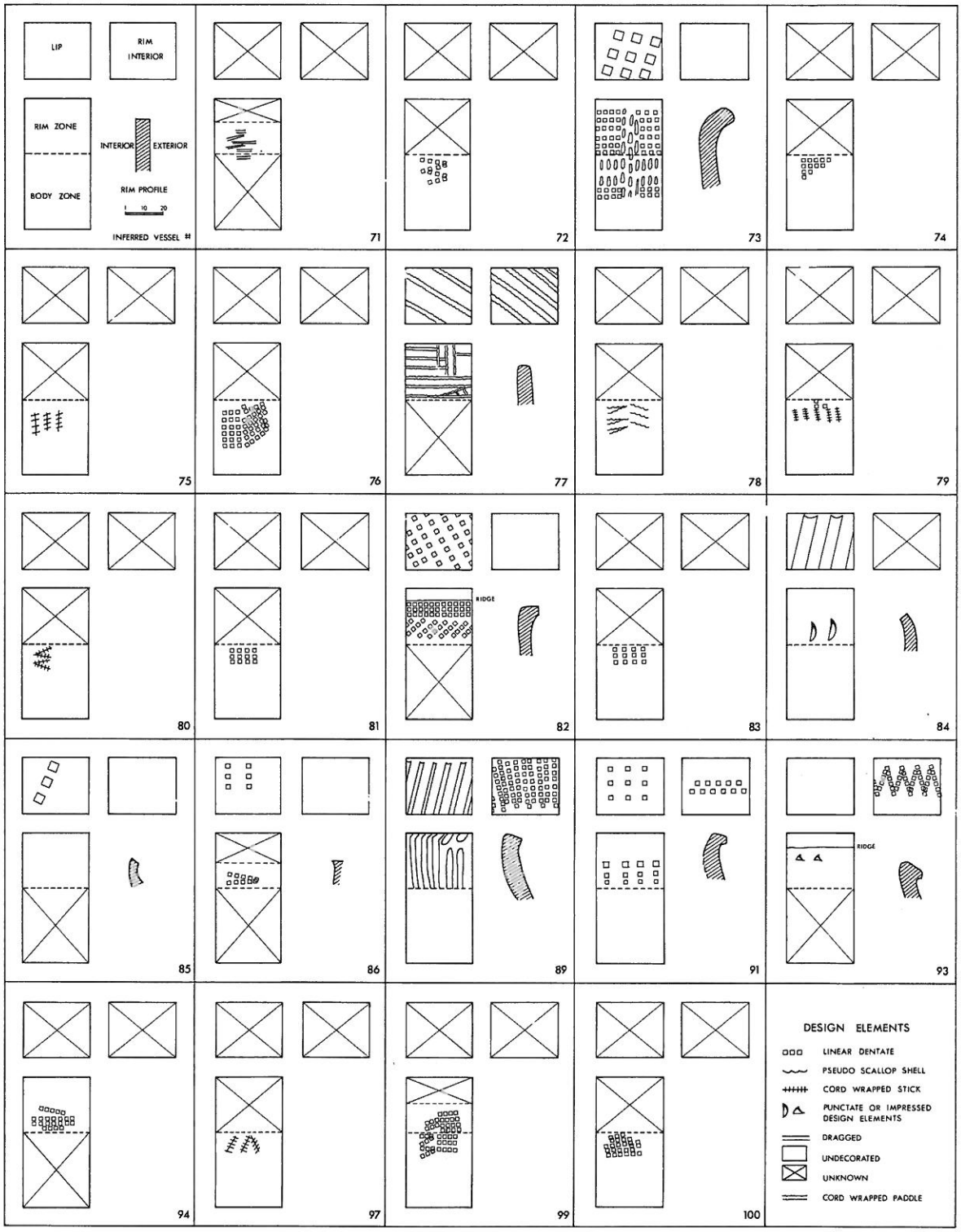

LIP
RIM
INTERIOR
RIM ZONE
BODY ZONE
INTERIOR
EXTERIOR
RIM PROFILE
1 10 20
INFERRED VESSEL #
71
72
73
74
75
76
77
78
79
80
81
RIDGE
82
83
84
85
86
89
91
RIDGE
93
94
97
99
100
DESIGN ELEMENTS
LINEAR DENTATE
PSEUDO SCALLOP SHELL
CORD WRAPPED STICK
PUNCTATE OR IMPRESSED DESIGN ELEMENTS
DRAGGED
UNDECORATED
UNKNOWN
CORD WRAPPED PADDLE

Figure 12: Line drawings of inferred vessels #3, #56, #58, and #43.

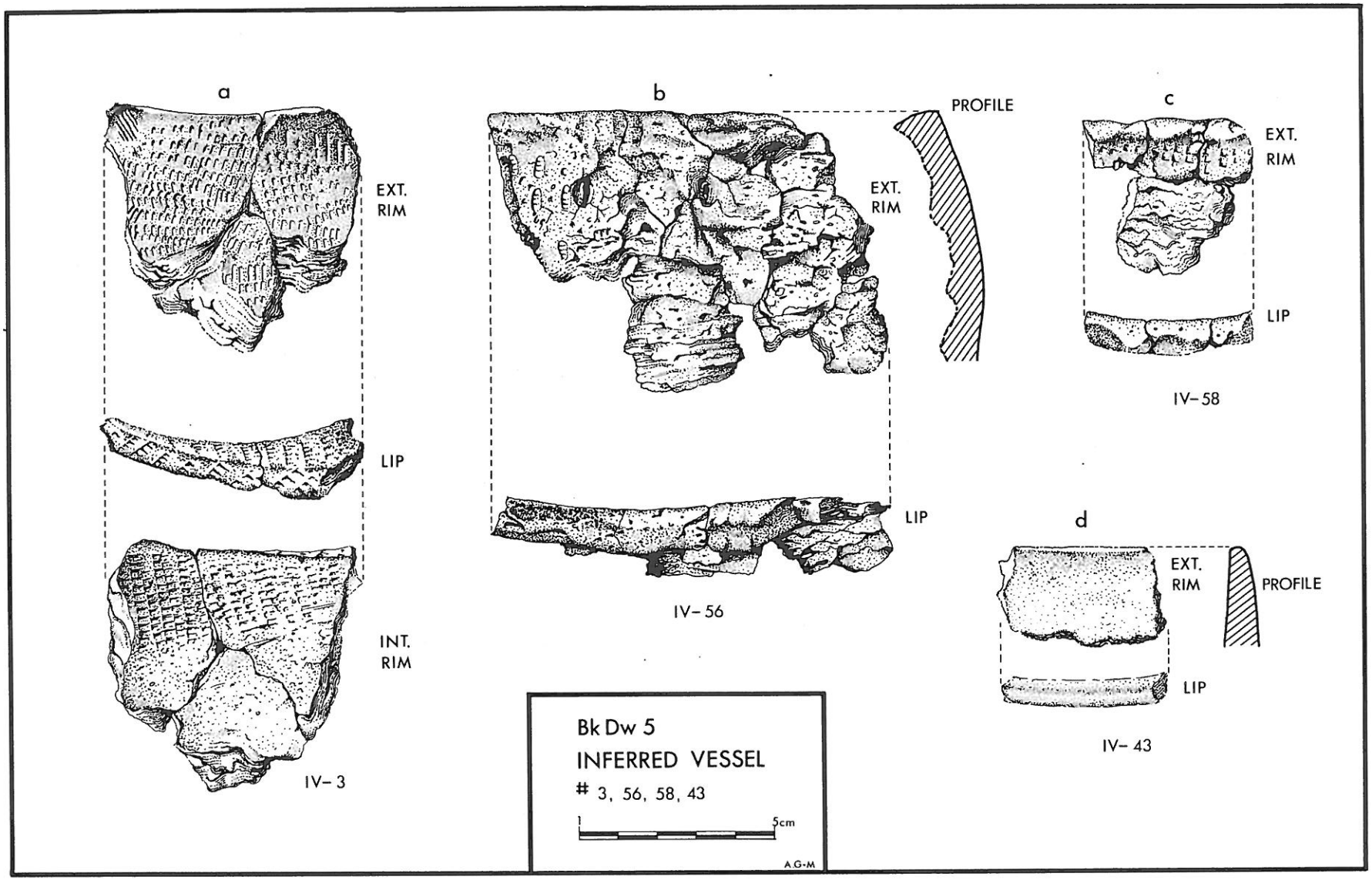
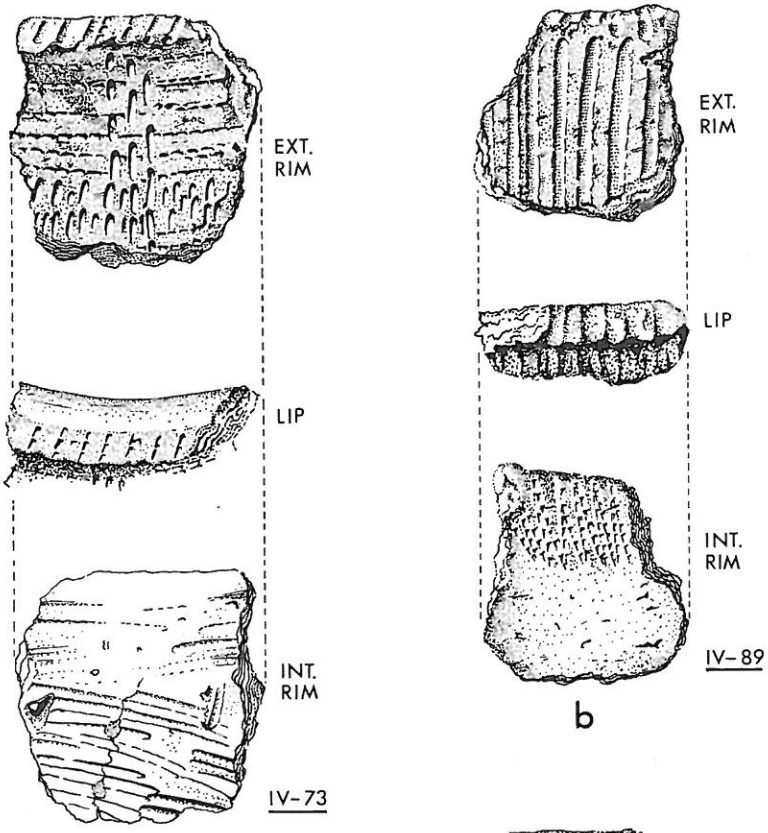

a
EXT.
RIM
LIP
INT.
RIM
IV–3
b
PROFILE
EXT.
RIM
LIP
IV–56
c
EXT.
RIM
LIP
IV–58
d
EXT.
RIM
PROFILE
LIP
IV–43
Bk Dw 5
INFERRED VESSEL
3, 56, 58, 43
1
5cm
A.G.-M

Figure 13: Line drawings of inferred vessels #73, #89, #29, and #82.

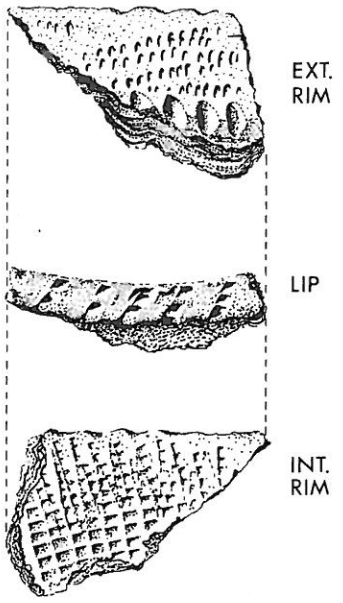


BkDw 5
INFERRED VESSELS
73, 89, 29, 82

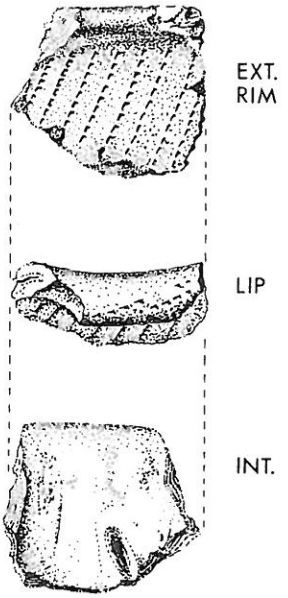
5cm

A.G-M 85

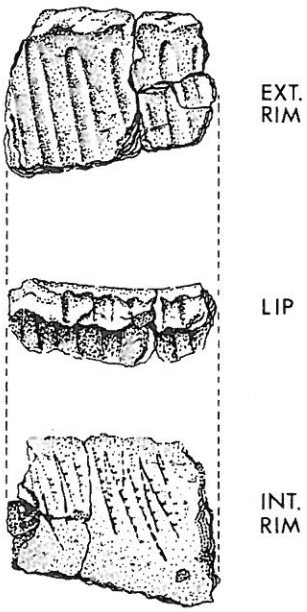
Figure 14: Line drawings of inferred vessels #17, #4, #45, and #64.



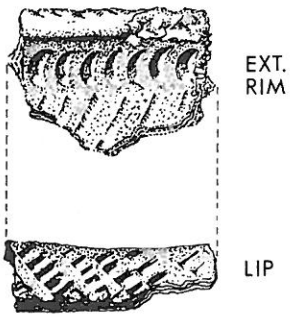
a IV–17



b IV–4



c IV–45



d IV–64

BkDw 5
INFERRED VESSELS
17, 4, 45, 64

1 5cm

A.GM

Figure 15: An outline of the terminology use to describe chipped stone and pecked and ground stone artifacts.

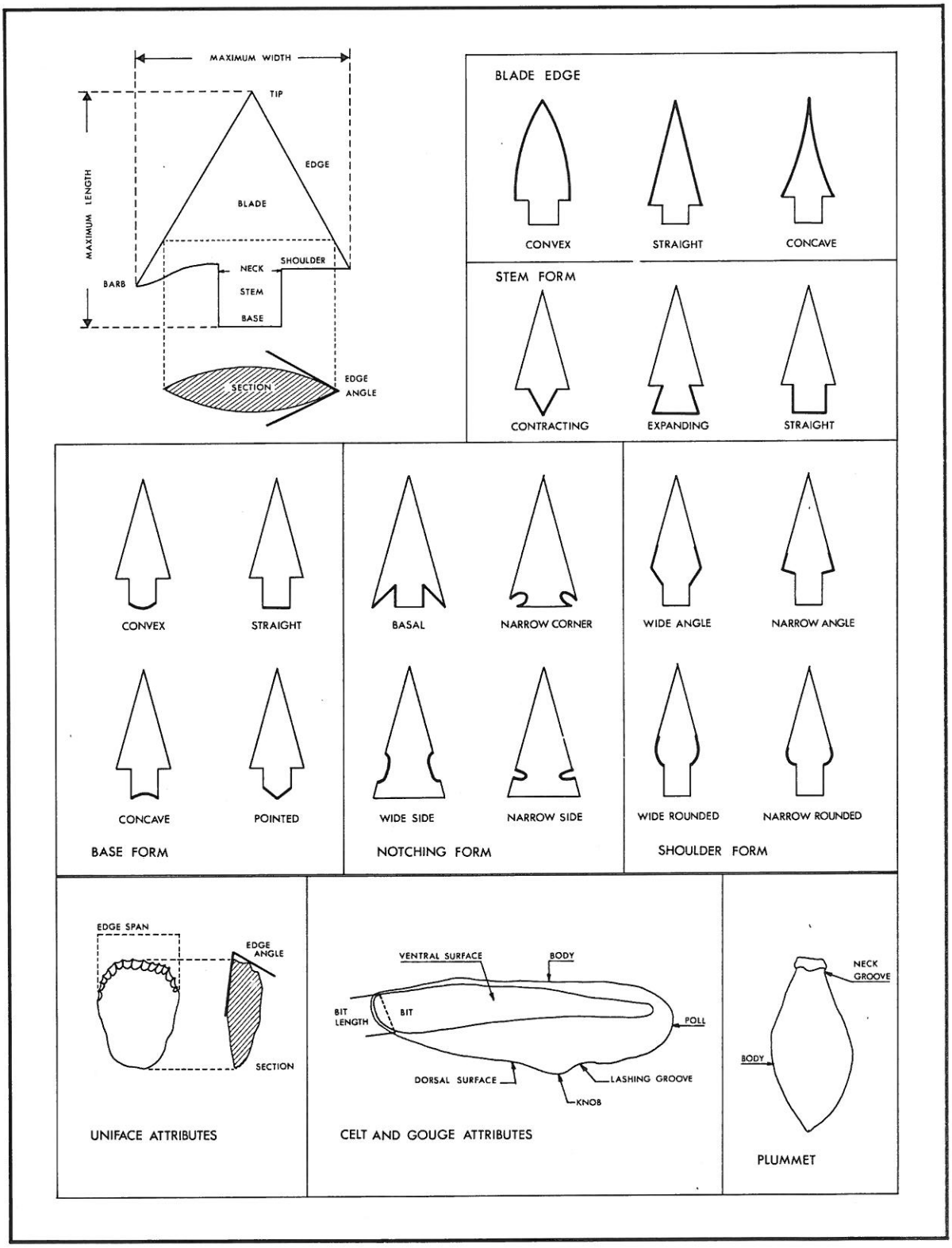
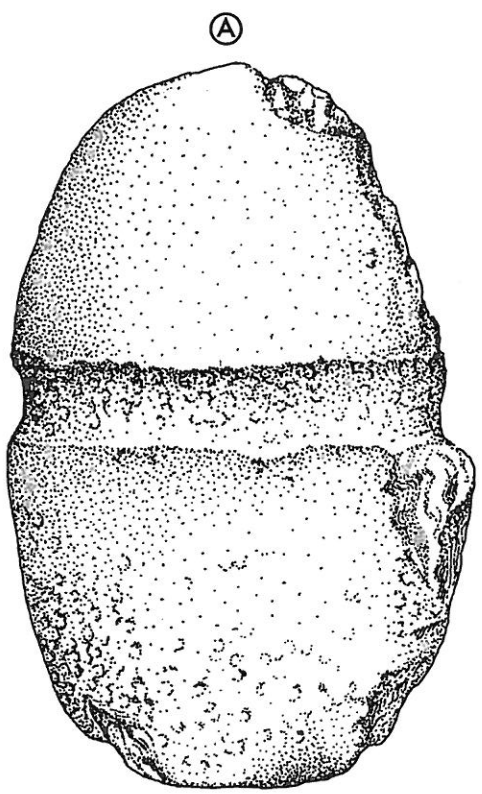
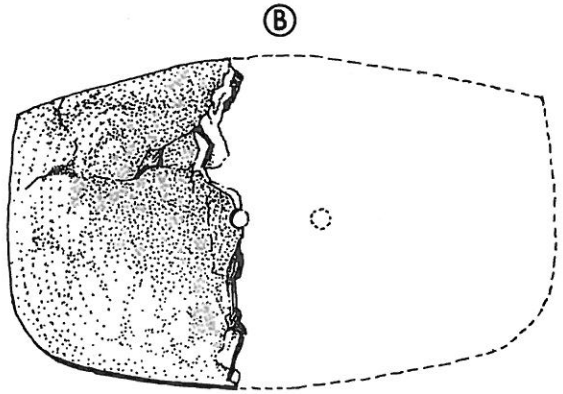
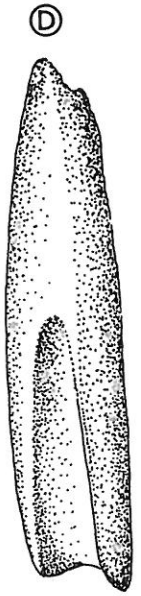

MAXIMUM WIDTH
TIP
EDGE
BLADE
MAXIMUM LENGTH
BARB
NECK
SHOULDER
STEM
BASE
SECTION
EDGE ANGLE
BLADE EDGE
CONVEX
STRAIGHT
CONCAVE
STEM FORM
CONTRACTING
EXPANDING
STRAIGHT
CONVEX
STRAIGHT
CONCAVE
POINTED
BASE FORM
BASAL
NARROW CORNER
WIDE SIDE
NARROW SIDE
NOTCHING FORM
WIDE ANGLE
NARROW ANGLE
WIDE ROUNDED
NARROW ROUNDED
SHOULDER FORM
EDGE SPAN
EDGE ANGLE
SECTION
UNIFACE ATTRIBUTES
VENTRAL SURFACE
BODY
BIT LENGTH
BIT
POLL
DORSAL SURFACE
LASHING GROOVE
KNOB
CELT AND GOUGE ATTRIBUTES
NECK GROOVE
BODY
PLUMMET

Figure 16: Line drawings of four pecked and ground stone artifacts recovered from the Mud Lake Stream site.







MUD LAKE STREAM SITE (BkDw5):

PECKED AND GROUND STONE ARTIFACTS

(A) FULLY-GROOVED AXE (B) GORGET

(C) PLUMMET (D) GOUGE.

SCALE 1:2

0 5 10cm

AG-M

Figure 17: An illustration of the Late Archaic period artifact and feature distribution at the Mud Lake Stream site.

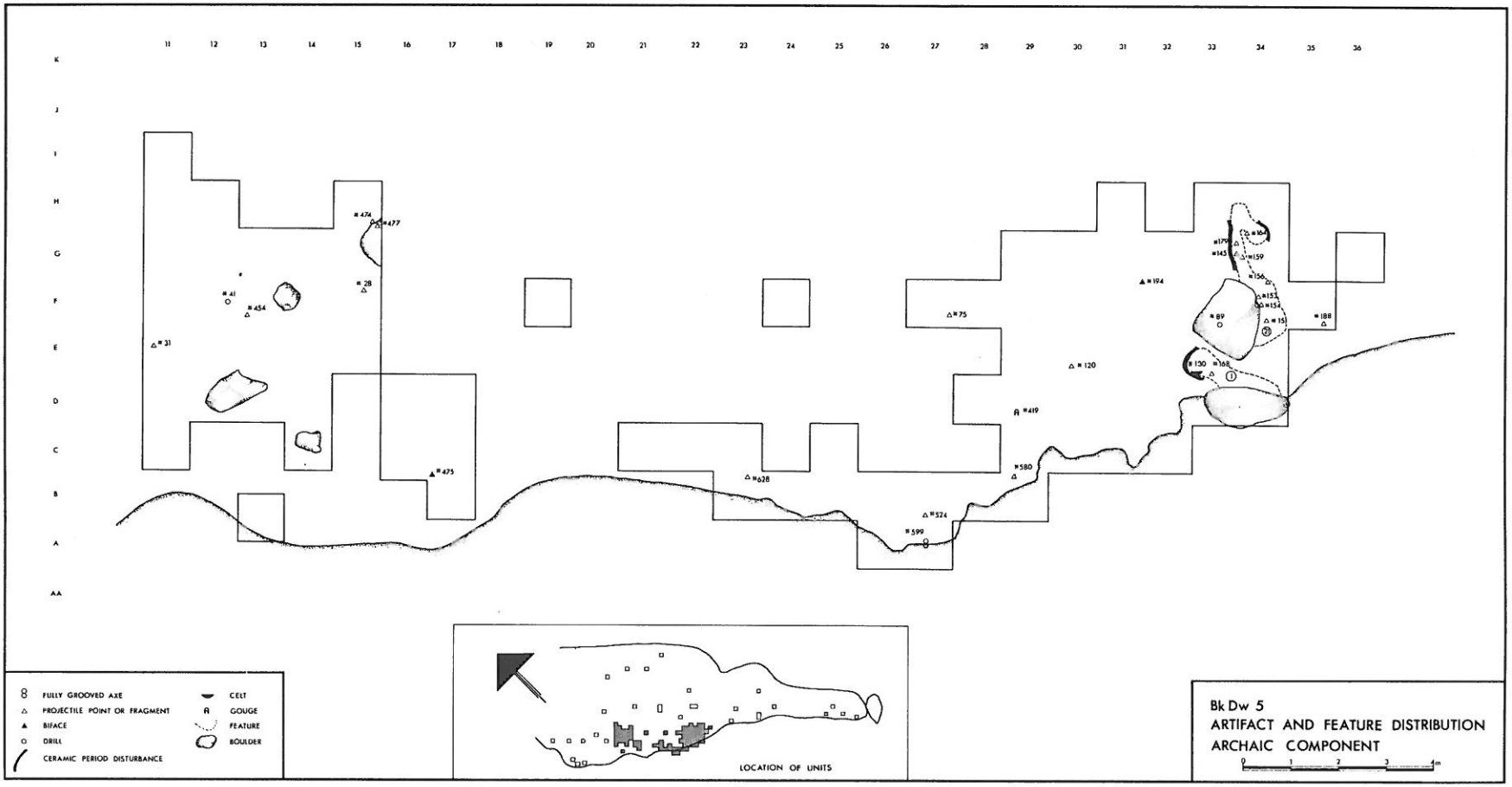

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
K J I H G F E D C B A AA
#474 #477 #28 #41 #454 #31 #475 #628 #524 #599 #75 #194 #120 #419 #580 #89 #188 #130 #168 #179 #145 #164 #159 #156 #153 #154 #151
FULLY GROOVED AXE
PROJECTILE POINT OR FRAGMENT
BIFACE
DRILL
CERAMIC PERIOD DISTURBANCE
CELT
GOUGE
FEATURE
BOULDER
LOCATION OF UNITS
Bk Dw 5
ARTIFACT AND FEATURE DISTRIBUTION
ARCHAIC COMPONENT
0 1 2 3 4m

Figure 18: An illustration of the Ceramic period artifact and feature distribution at the Mud Lake Steam site.

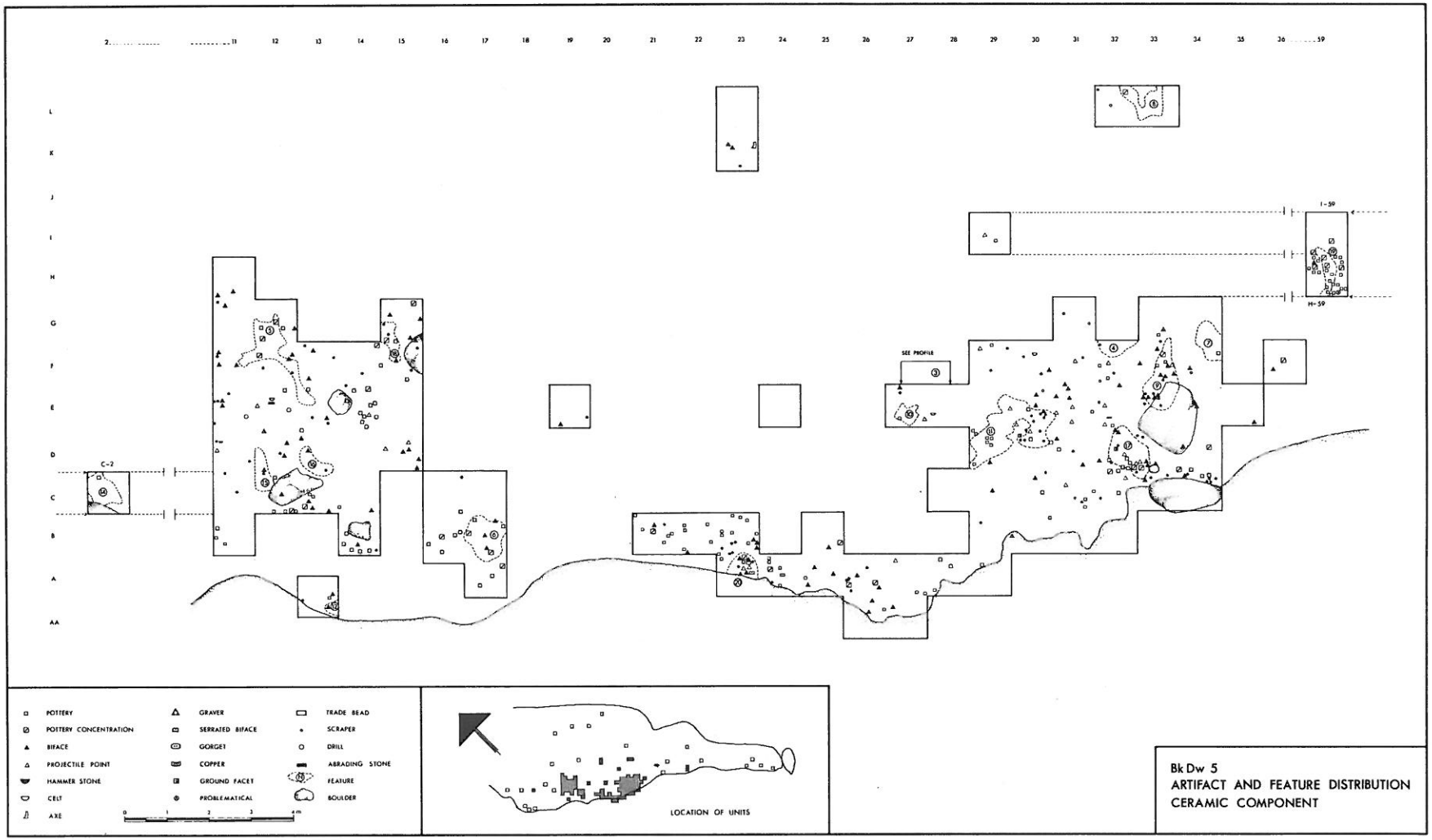
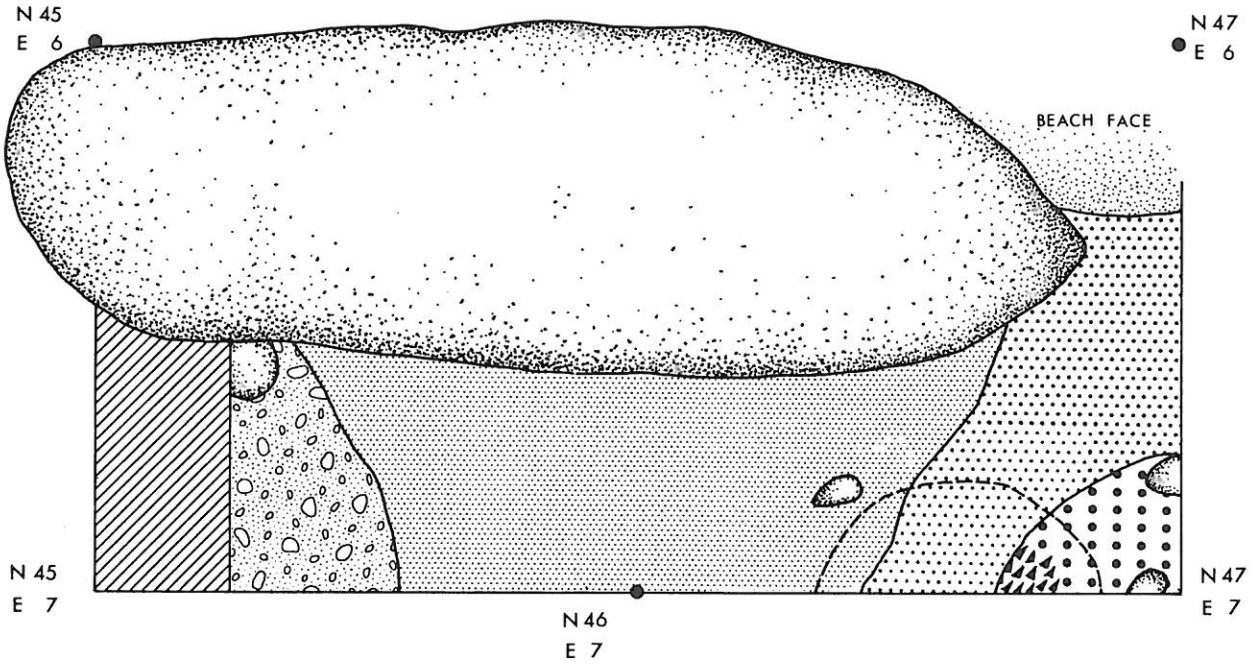

2 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 59
L K J I H G F E D C B A AA
C-2
SEE PROFILE
I-59
H-59
POTTERY
POTTERY CONCENTRATION
BIFACE
PROJECTILE POINT
HAMMER STONE
CELT
AXE
GRAVER
SERRATED BIFACE
GORGET
COPPER
GROUND FACET
PROBLEMATICAL
TRADE BEAD
SCRAPER
DRILL
ABRADING STONE
FEATURE
BOULDER
0 1 2 3 4m
LOCATION OF UNITS
Bk Dw 5
ARTIFACT AND FEATURE DISTRIBUTION
CERAMIC COMPONENT

Figure 19: Feature #1: a floor plan of Units C33 and C34, level 2.



BkDw 5

UNITS C33, C34

LEVEL 3

FLOOR PLAN

10/9/84

M.D. A.G-M.

0 50 cm

DARK YELLOWISH BROWN (10 YR 4/4)

GRAYISH BROWN (10 YR 5/2)

YELLOWISH BROWN (7.5 YR 5/6)

BROWN (10 YR 5/3)

CHARCOAL

BOULDER REMOVED FROM LEVEL 2

ROCK

UNEXCAVATED

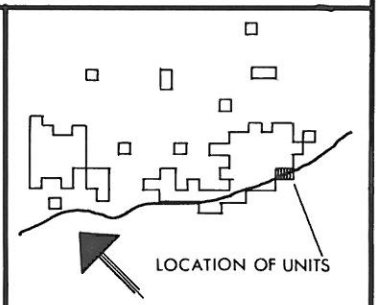
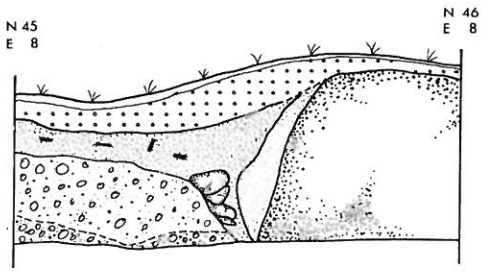
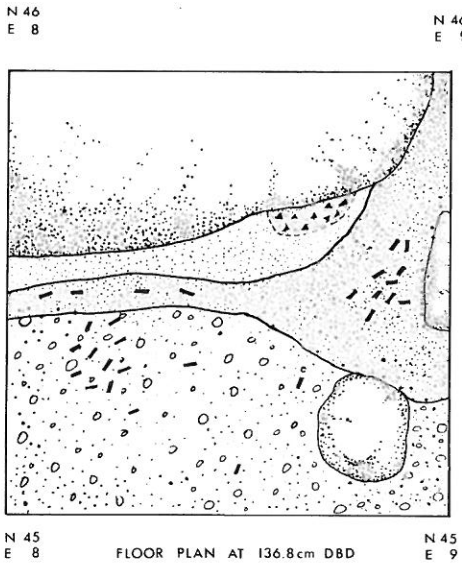


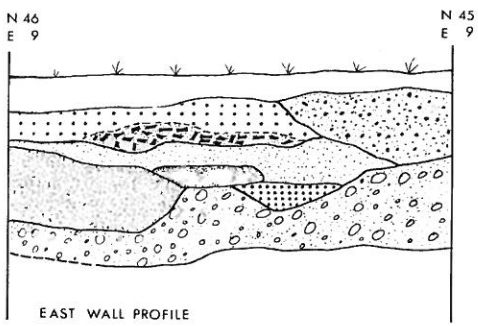
Figure 20: Feature #21: a floor plan and west and east wall profiles of Unit E34.



WEST WALL PROFILE



FLOOR PLAN AT 136.8cm DBD



EAST WALL PROFILE

A HORIZON (SOD LAYER)

BROWN TO DARK BROWN (7.5 YR 4/4)

DARK BROWN (7.5 YR 3/2)

BONE/SOIL CONCENTRATION

VERY DARK GRAY (10 YR 3/1)

GRAYISH BROWN (10 YR 5/2)

DARK REDDISH BROWN (5 YR 3/3)

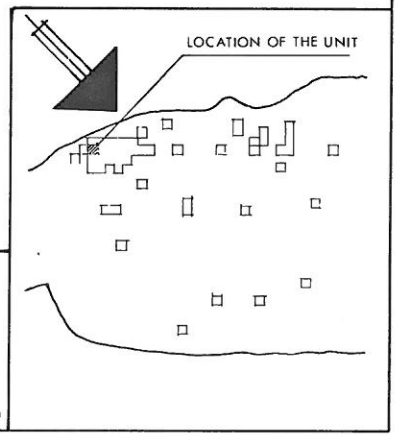
DARK YELLOWISH BROWN (10 YR 4/4)

DARK YELLOWISH BROWN (COMPACTED)

CHARCOAL CONCENTRATION

BONE FRAGMENTS

ROCK



Bk Dw-5
UNIT E34
15/09/83
PA; AG.

SCALE
0 50cm

Figure 21: Feature #20: a floor plan of Units A23, A24, and B23.

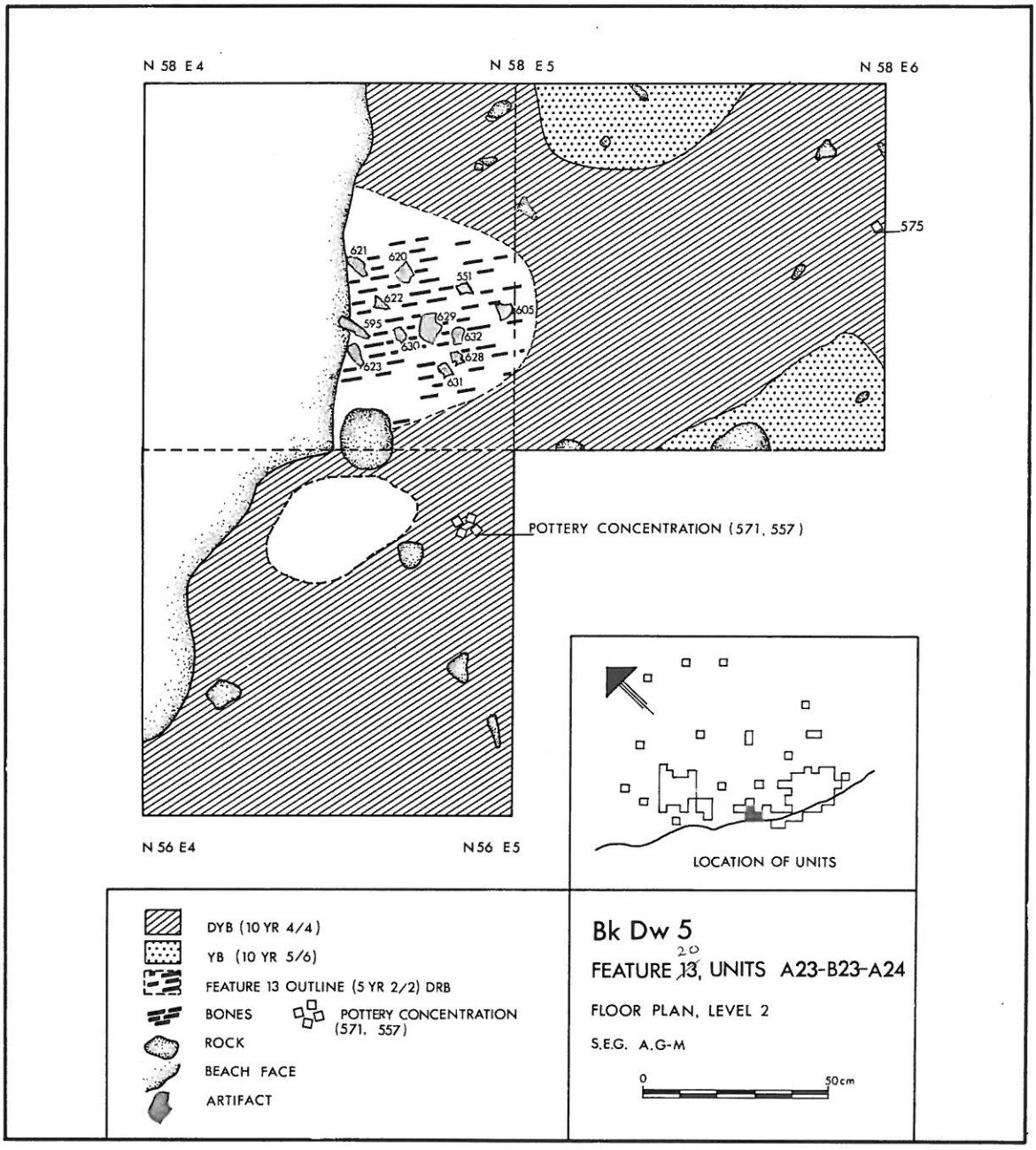
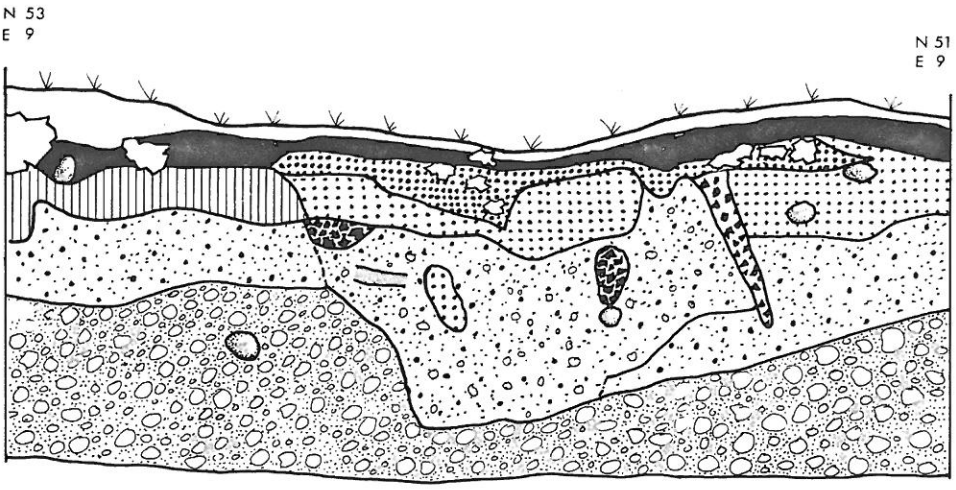

N 58 E4
N 58 E5
N 58 E6
575
621
620
551
622
605
595
629
632
630
628
623
631
POTTERY CONCENTRATION (571, 557)
N 56 E4
N56 E5
LOCATION OF UNITS
DYB (10 YR 4/4)
YB (10 YR 5/6)
FEATURE 13 OUTLINE (5 YR 2/2) DRB
BONES
POTTERY CONCENTRATION (571, 557)
ROCK
BEACH FACE
ARTIFACT
Bk Dw 5
FEATURE 20/13, UNITS A23-B23-A24
FLOOR PLAN, LEVEL 2
S.E.G. A.G-M
0
50cm

Figure 22: Feature #3: an East wall profile of Units E27 and E28.



A HORIZON (SOD LAYER)

BLACK (10YR 2/1)

GRAYISH BROWN (10 YR 5/2)

DARK BROWN (7.5 YR 3/2)

BROWN TO DARK BROWN (5 YR 4/4)

DARK YELLOWISH BROWN (10YR 4/4)

BROWN TO DARK BROWN WITH MORE PEBBLES

PALE BROWN (10 YR 6/3)

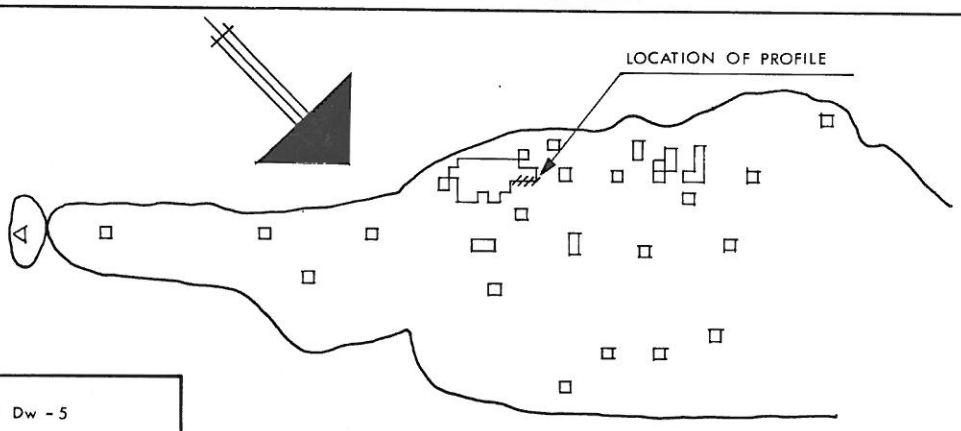
ASH AND CHARCOAL LENSE

ROCK

FIRE CRACKED ROCK

RODENT DISTURBANCE

SCALE 0 50 cm



Bk Dw - 5

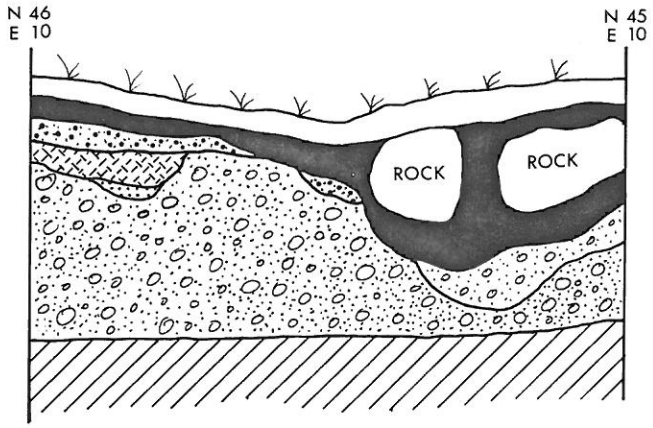
E WALL PROFILE

N51 E9 TO N53 E9

PA. MD. BA. AG.

29/09/83

Figure 23: Feature #7: an East wall profile of Unit F34.



A HORIZON (SOD– 10 YR 3/2)

LIGHT YELLOWISH BROWN (10 YR 6/4)

DARK YELLOWISH BROWN (10 YR 4/4)

BROWN TO DARK BROWN (7.5 YR 4/4)

GRAYISH BROWN (10 YR 5/2)

VERY DARK GRAY (10 YR 3/1)

BLACK (5 YR 2/1)

Bk Dw 5
UNIT # F 34
EAST WALL PROFILE
N 45 E 10 – N 46 E 10
AF 21/09/83
SCALE 0 50 cm

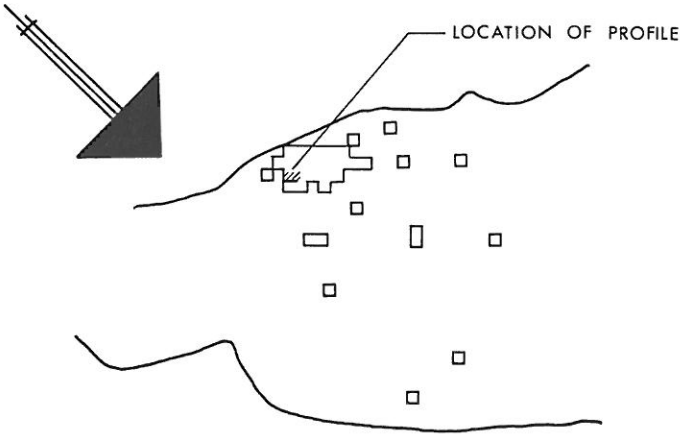
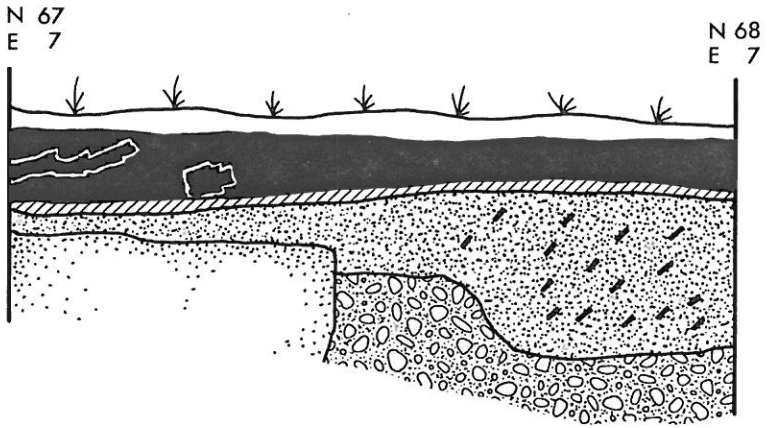


Figure 24: Feature #15: a West wall profile of Unit D12.



Bk Dw 5

WEST WALL PROFILE

UNIT D 12

15/8/84

MD. AG-M

0 50 cm

VERY DARK GREY (5 YR 3/1)

BLACK (10 YR 2/1)

GRAYISH BROWN (10 YR 5/2)

DARK REDDISH BROWN (5 YR 3/4)

DARK YELLOWISH BROWN (10 YR 3/4)

BONE FRAGMENTS

ROCK

ROOT

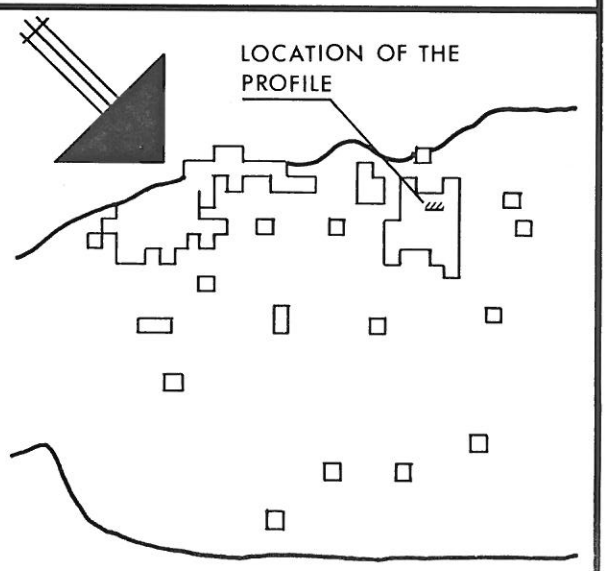


Figure 25: A map of Northeastern North America, above Lake Erie, indicating the sites and specific components discussed in the text.

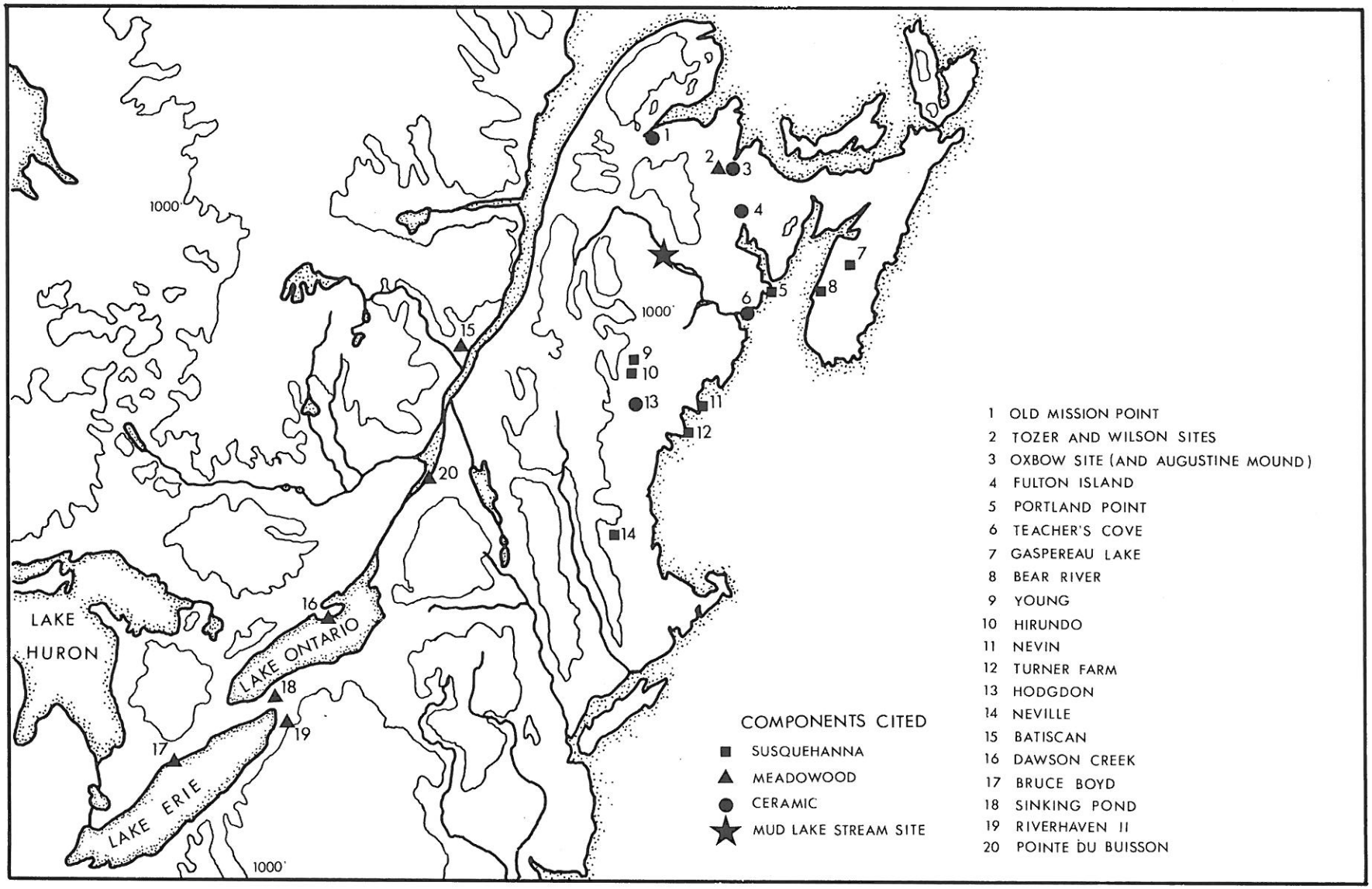

1000'
1000'
1000'
LAKE HURON
LAKE ONTARIO
LAKE ERIE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
COMPONENTS CITED
SUSQUEHANNA
MEADOWOOD
CERAMIC
MUD LAKE STREAM SITE
1 OLD MISSION POINT
2 TOZER AND WILSON SITES
3 OXBOW SITE (AND AUGUSTINE MOUND)
4 FULTON ISLAND
5 PORTLAND POINT
6 TEACHER'S COVE
7 GASPEREAU LAKE
8 BEAR RIVER
9 YOUNG
10 HIRUNDO
11 NEVIN
12 TURNER FARM
13 HODGDON
14 NEVILLE
15 BATISCAN
16 DAWSON CREEK
17 BRUCE BOYD
18 SINKING POND
19 RIVERHAVEN II
20 POINTE DU BUISSON

Figure 26: An illustration of the distribution of diagnostic Ceramic period pottery and projectile point groups at the Mud Lake Stream site.

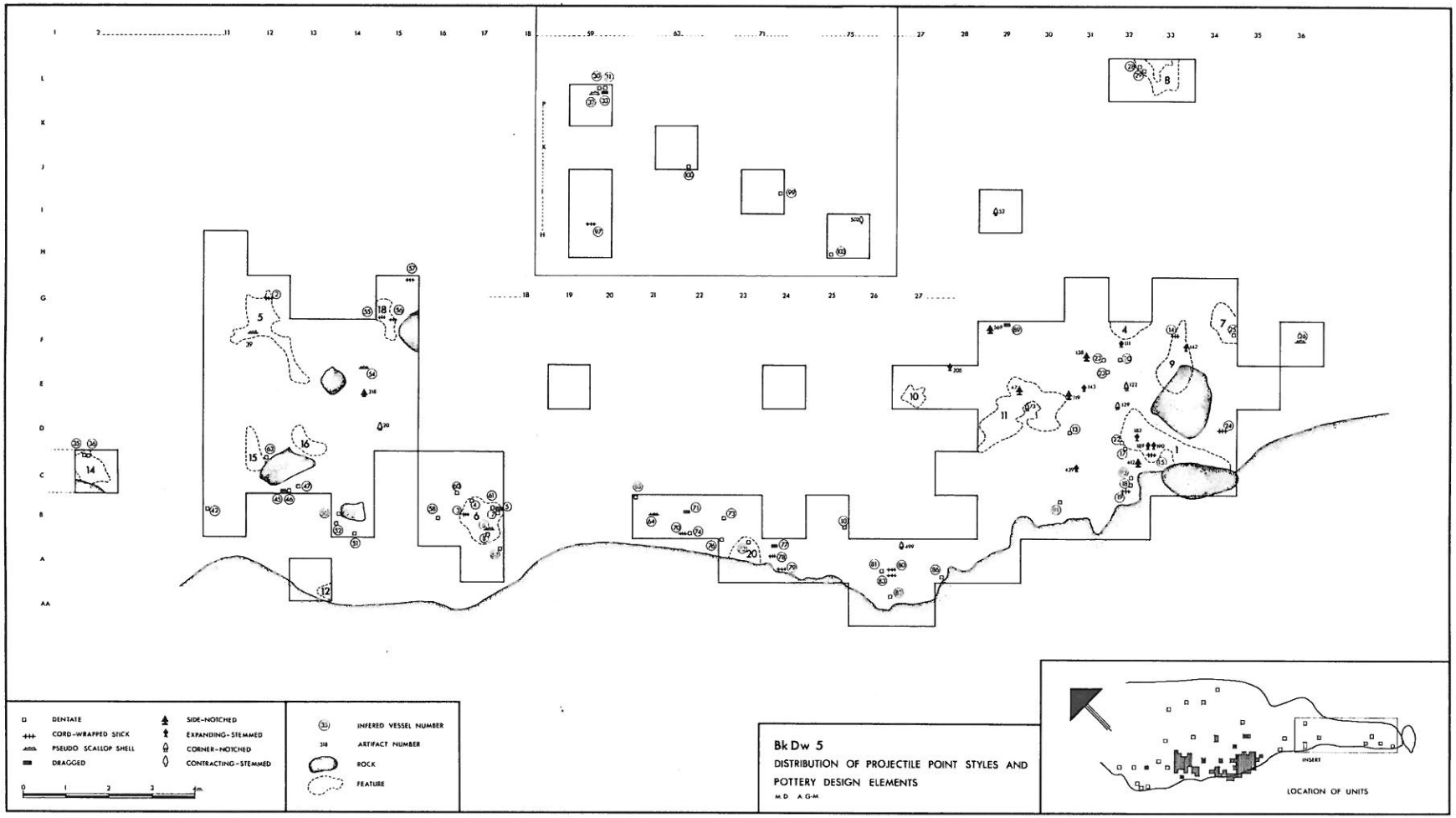

DENTATE
CORD-WRAPPED STICK
PSEUDO SCALLOP SHELL
DRAGGED
SIDE-NOTCHED
EXPANDING-STEMMED
CORNER-NOTCHED
CONTRACTING-STEMMED
INFERED VESSEL NUMBER
ARTIFACT NUMBER
ROCK
FEATURE
Bk Dw 5
DISTRIBUTION OF PROJECTILE POINT STYLES AND POTTERY DESIGN ELEMENTS
M.D. A.G-M
INSERT
LOCATION OF UNITS

Plate 1: Aerial photograph of Mud Lake Stream site. Dashed lines indicate extent of former site, which is now only visible at maximum high water level.

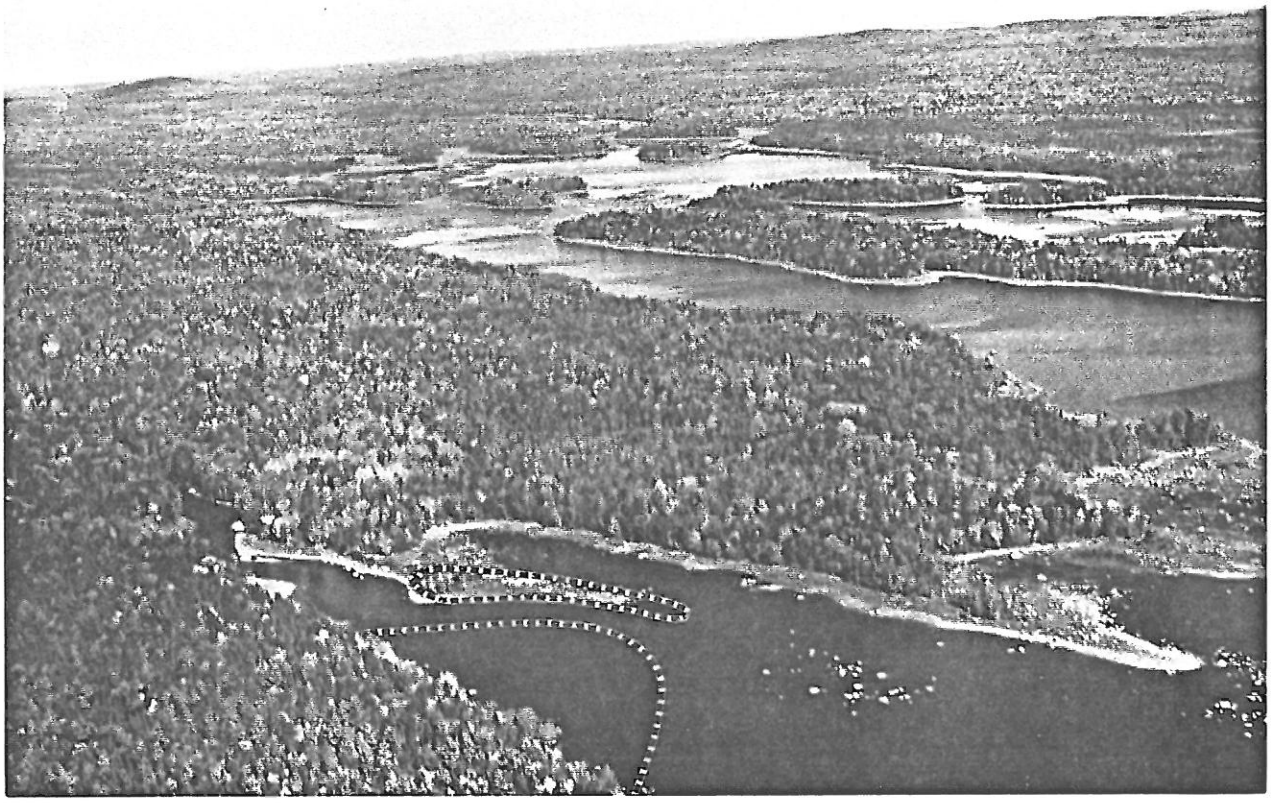


Plate 2: Historic artifacts recovered from the Mud Lake Stream site: (a) French trade axe, (b, c, e, f) clay pipe fragments, (d) fragment of copper sheet, (g) glass bottle shard, (h) common iron nail, and (i) glass trade bead.

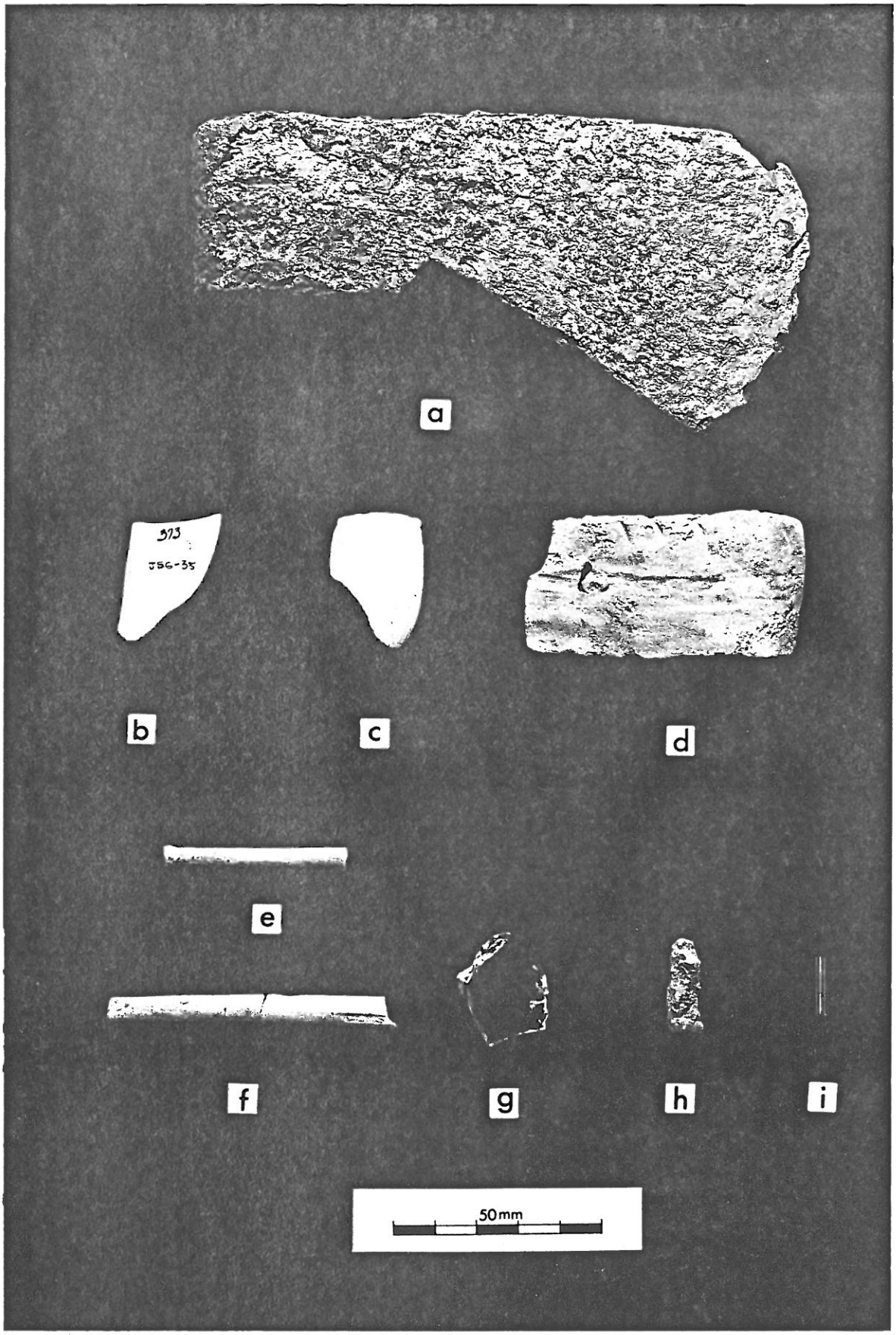

a
b
c
d
e
f
g
h
i
50mm

Plate 3: Grid surveying and excavation, during August 1983.

Plate 4: Calcined barbed bone point.

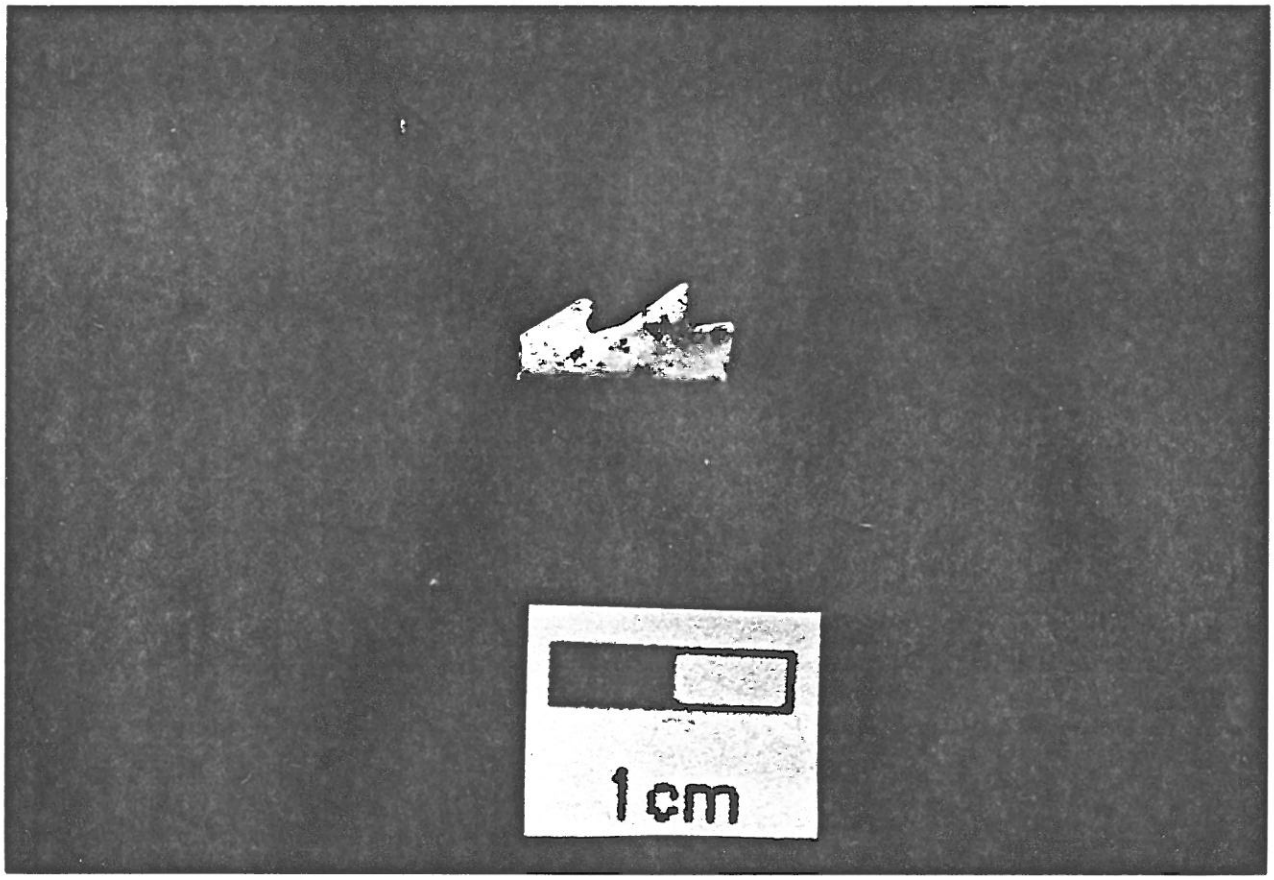

1 cm

Plate 5: Sherds of Vinette 1 pottery.

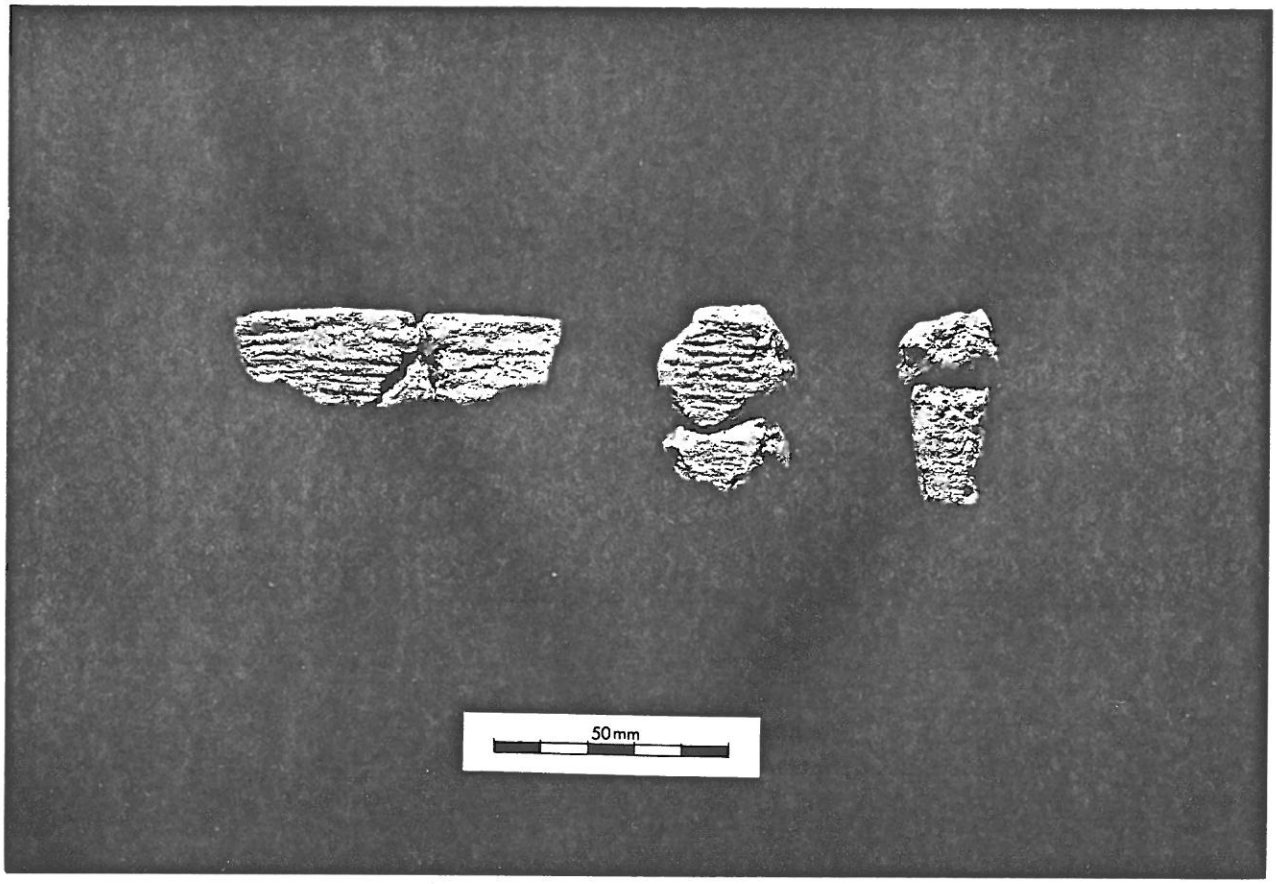

50mm

Plate 6: Group 1, expanding stemmed projectile points, and one Group 2, contrating stem projectile point (i).

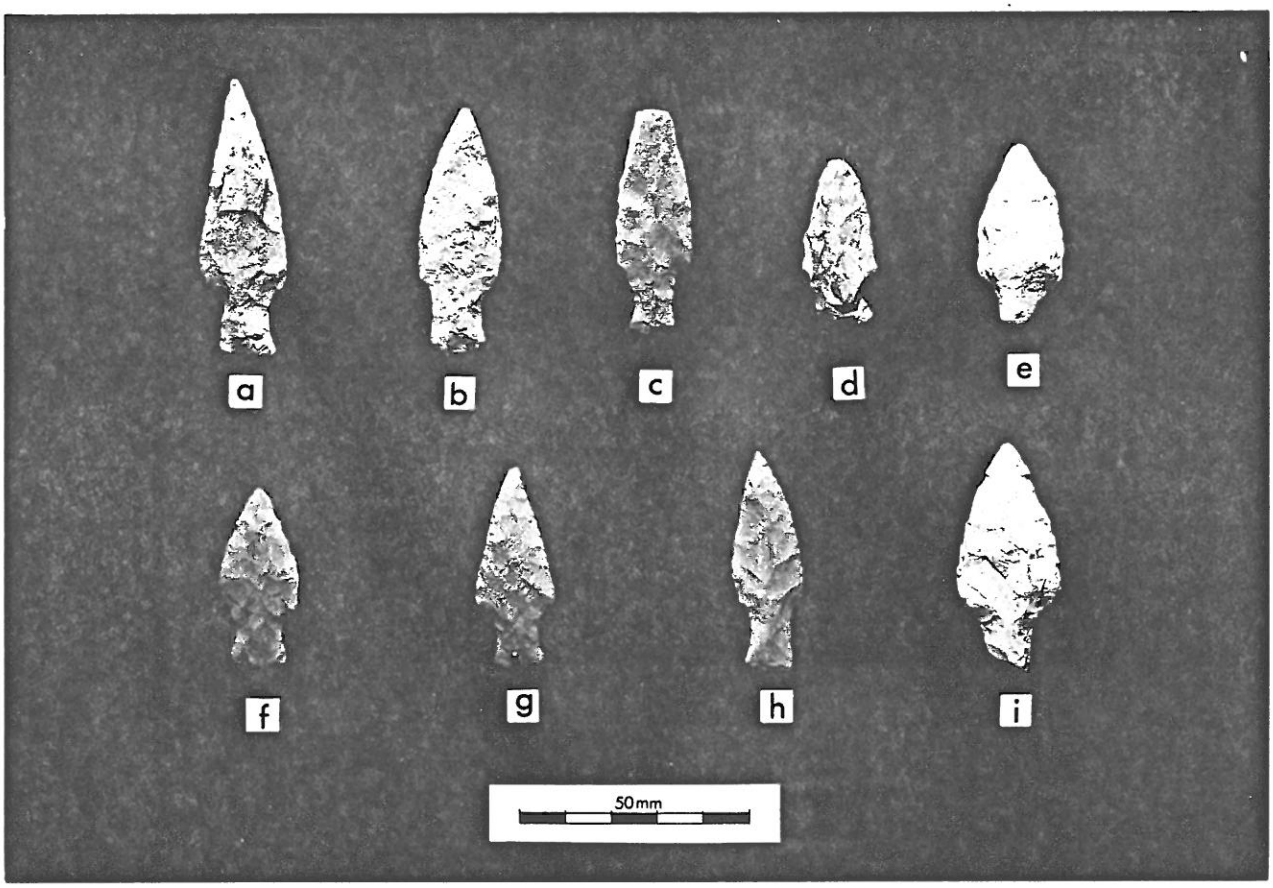

a
b
c
d
e
f
g
h
i
50mm

Plate 7: Group 3, corner-notched projectile points.

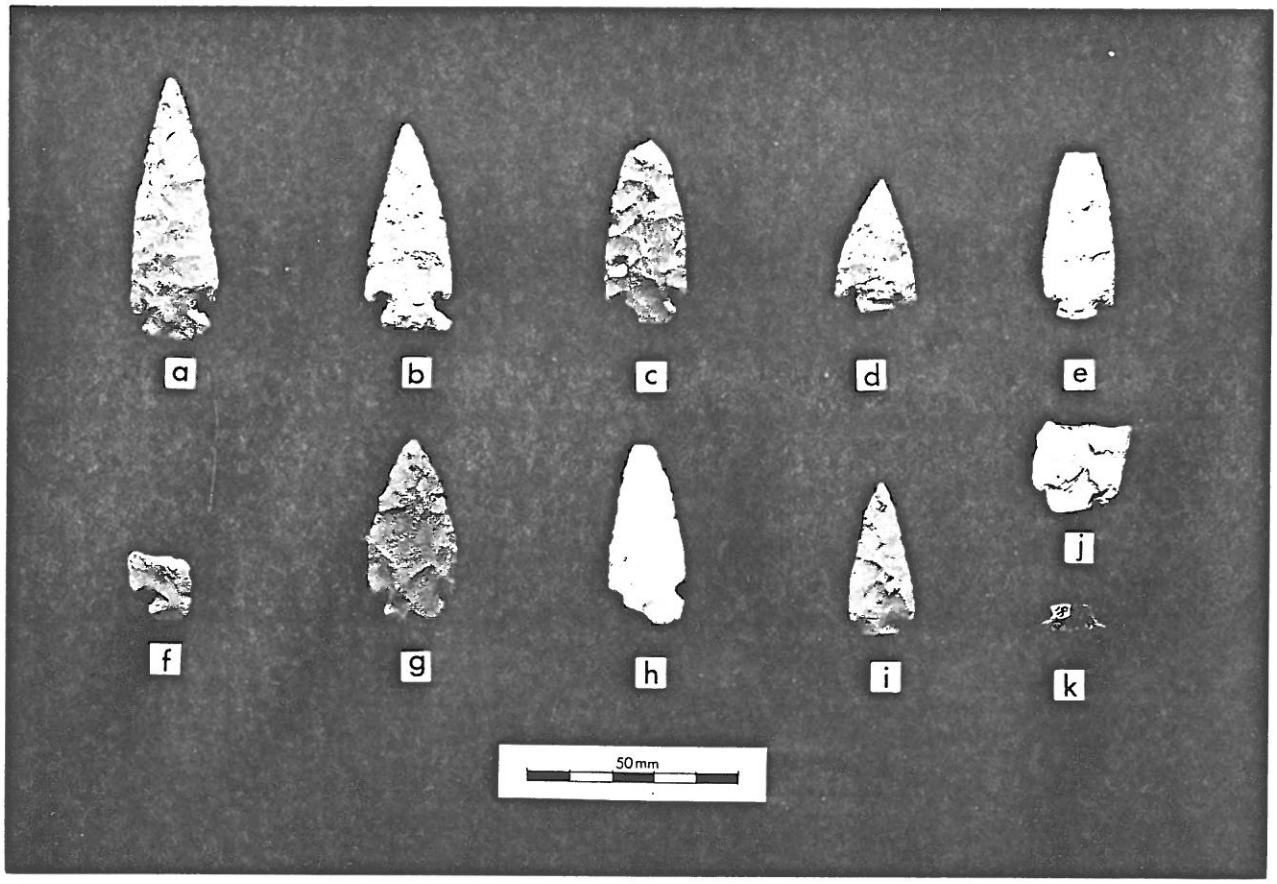

a
b
c
d
e
f
g
h
i
j
k
50mm

Plate 8: Group 4, side-notched projectile points.

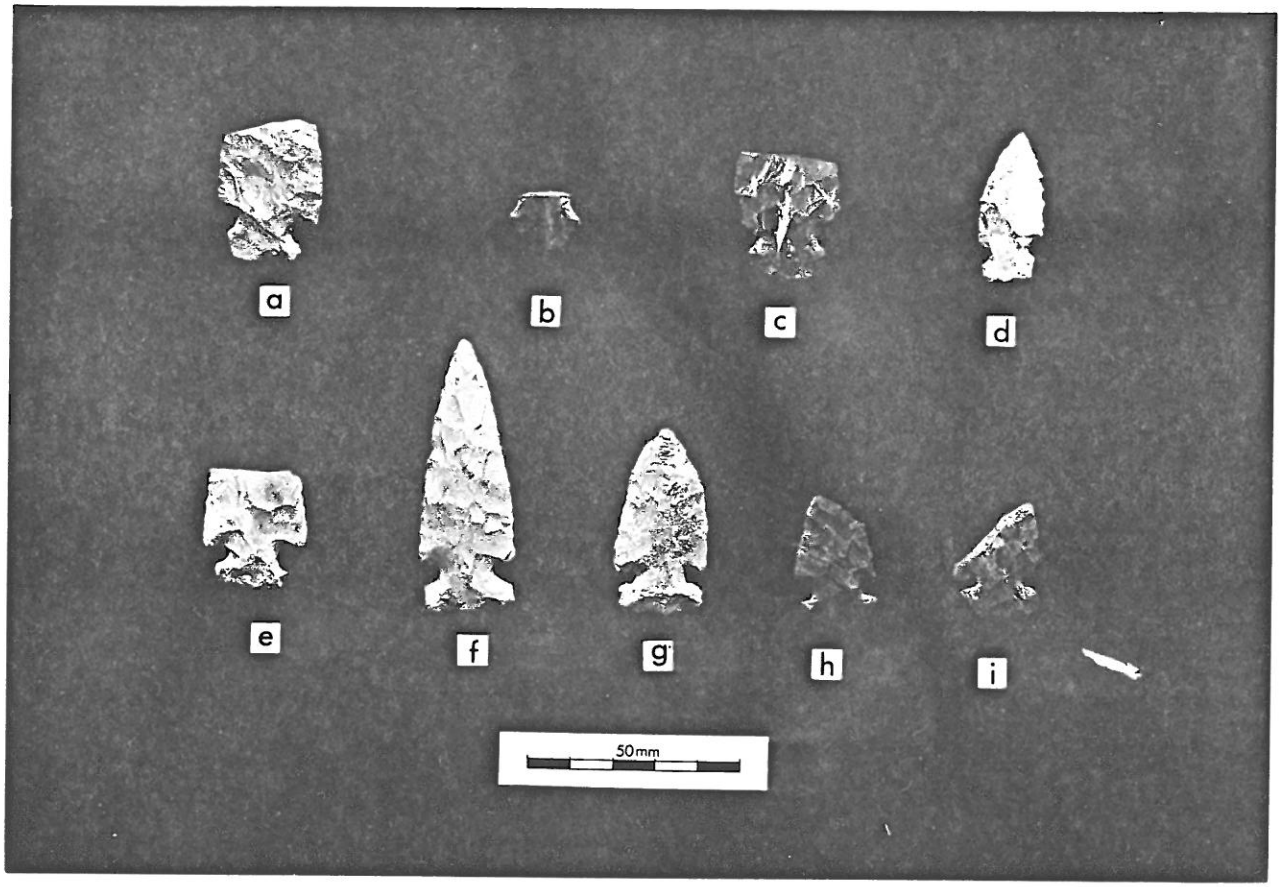

a
b
c
d
e
f
g
h
i
50mm

Plate 9: A selection of Large stemmed bifaces.

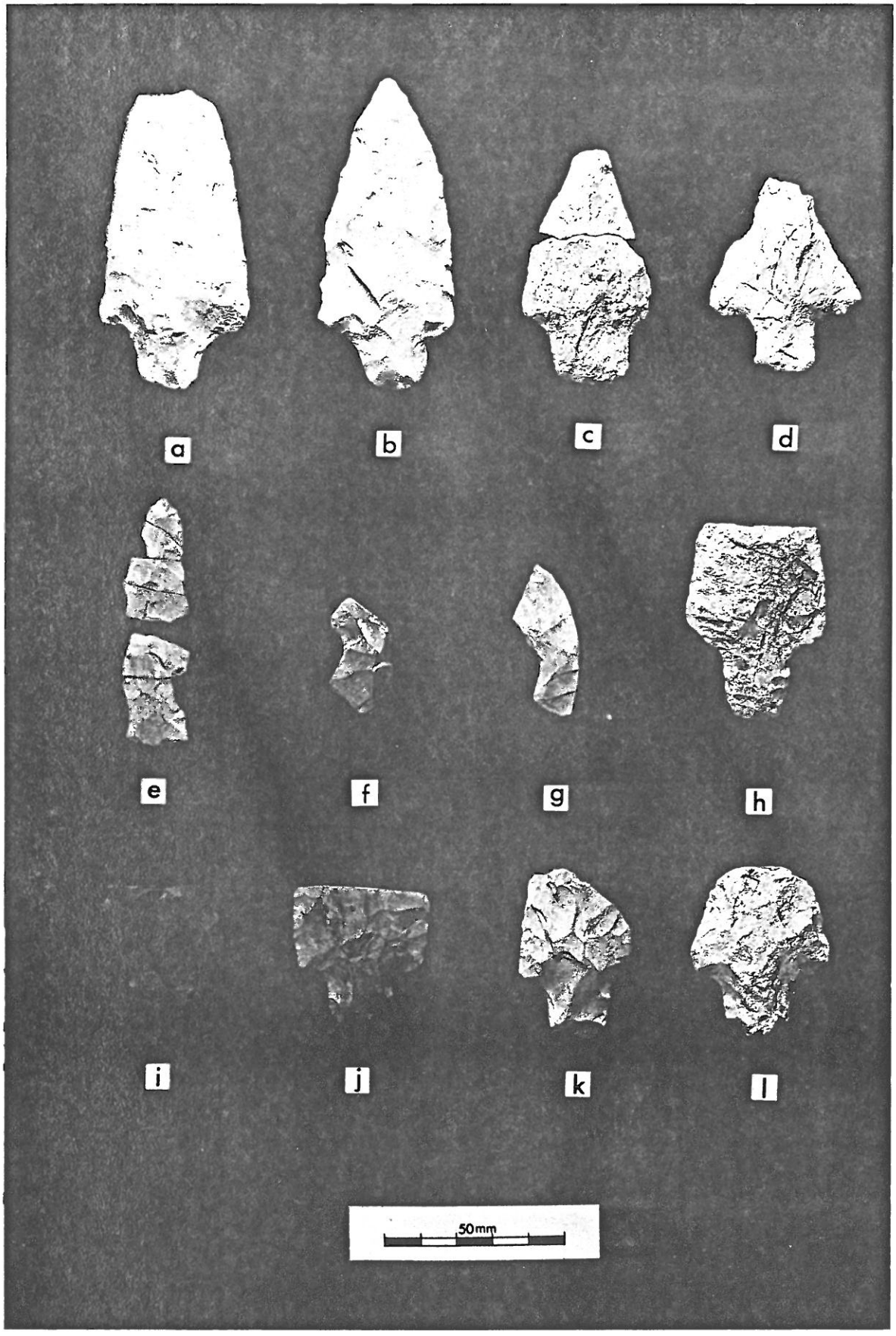

a
b
c
d
e
f
g
h
i
j
k
l
50mm

Plate 10: A selection of Large stremmed, side-notched (i, m), and sub-triangular (l, n) bifaces.

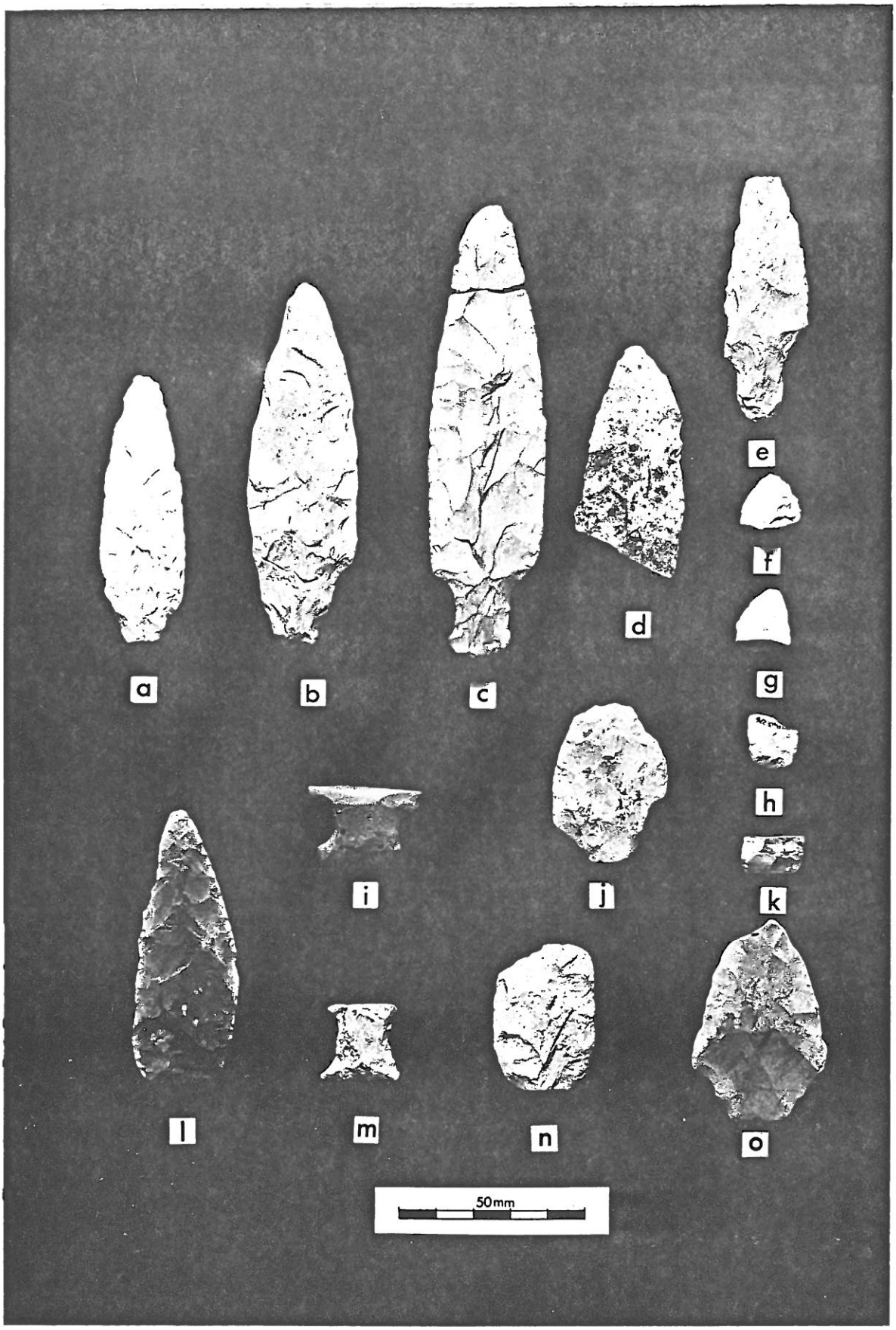

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
50mm

Plate 11: Meadowood cache: (a, b, e) Formed unifaces, (c, g) Large stemmed biface, (d) gorget, (f, h, i) bifaces and fragment, and (j) a serrated biface (saw).

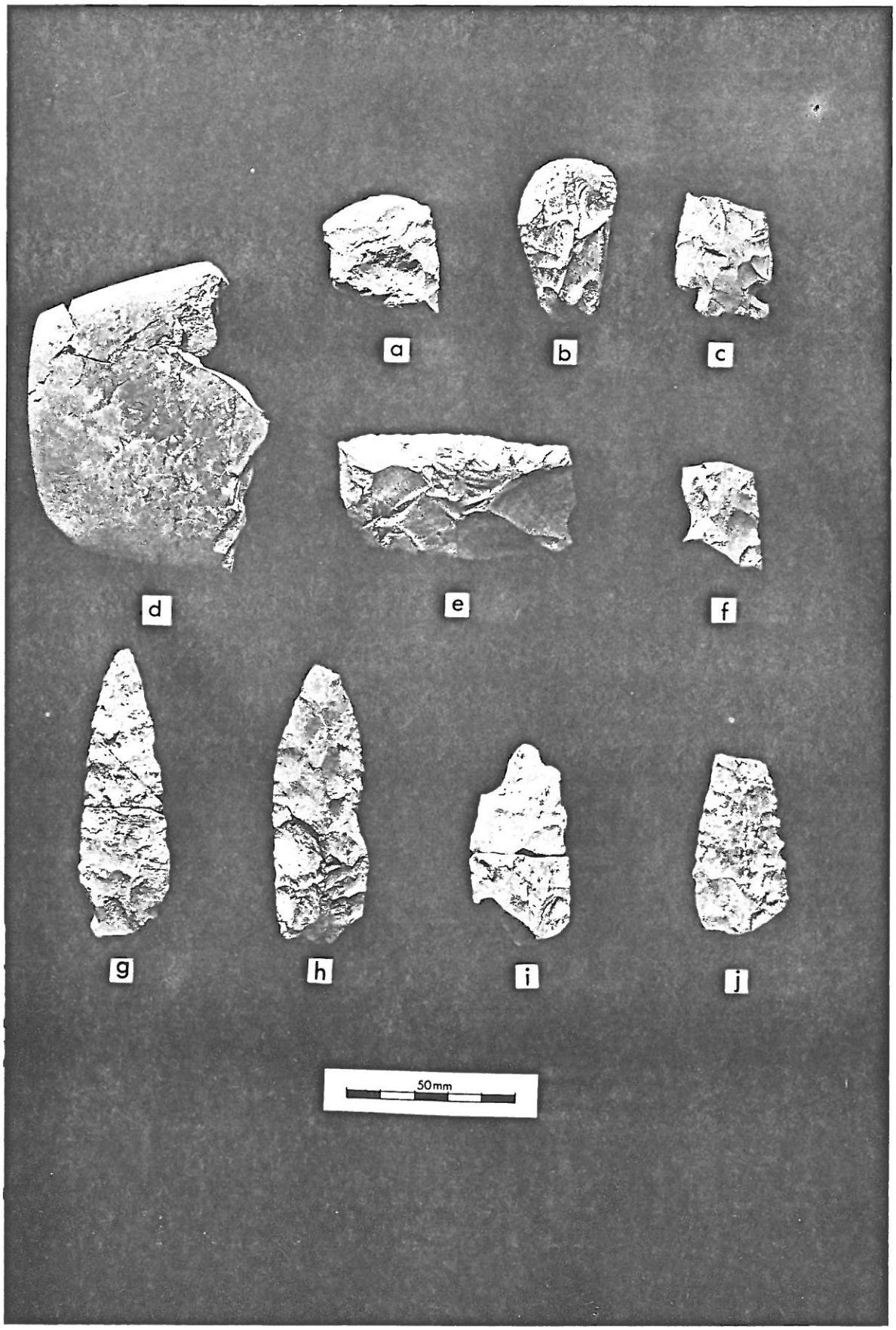

a
b
c
d
e
f
g
h
i
j
50mm

Plate 12: A selection of sub-triangular bifaces.

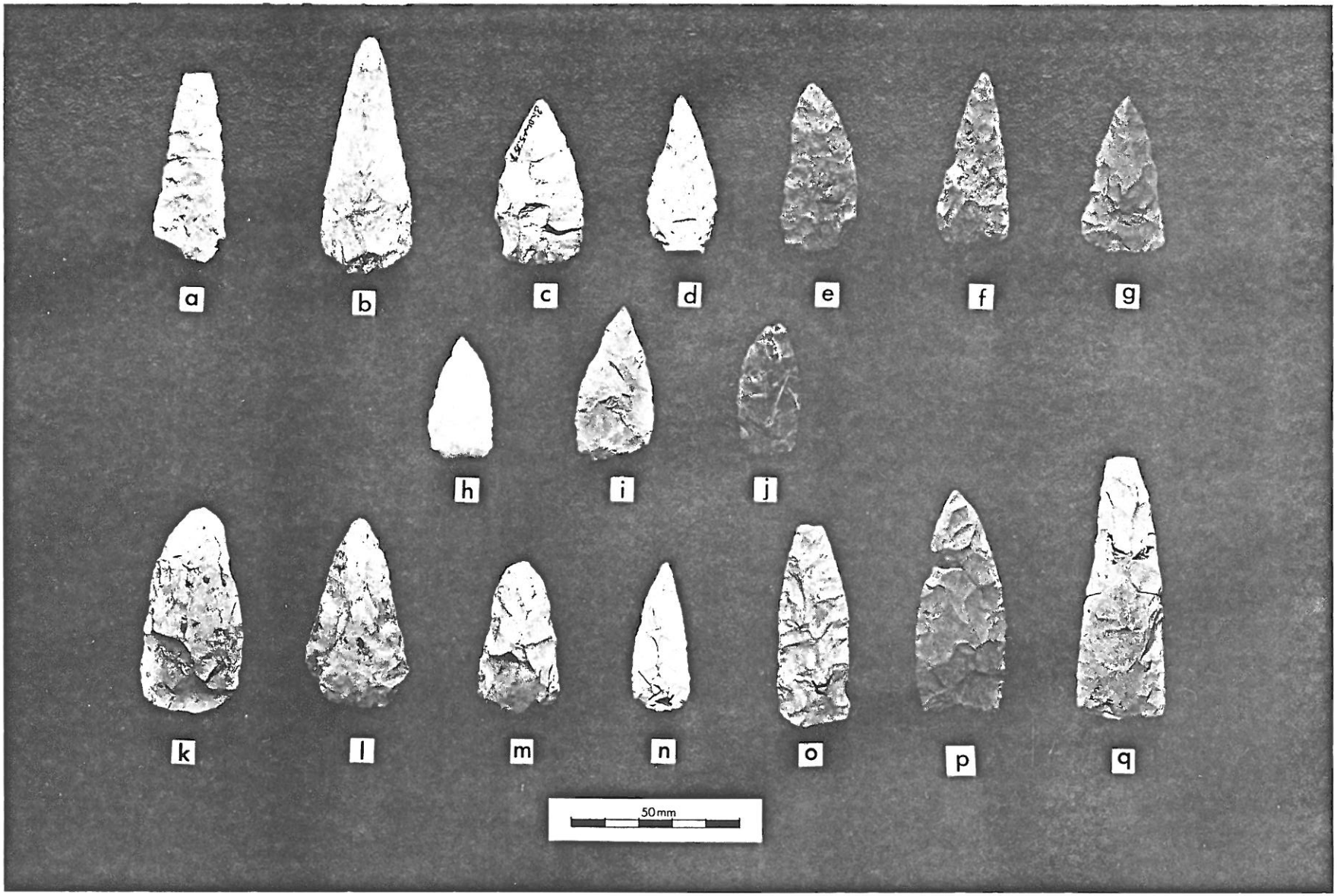

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
50mm

Plate 13: A selection of biface bass and tip fragments.

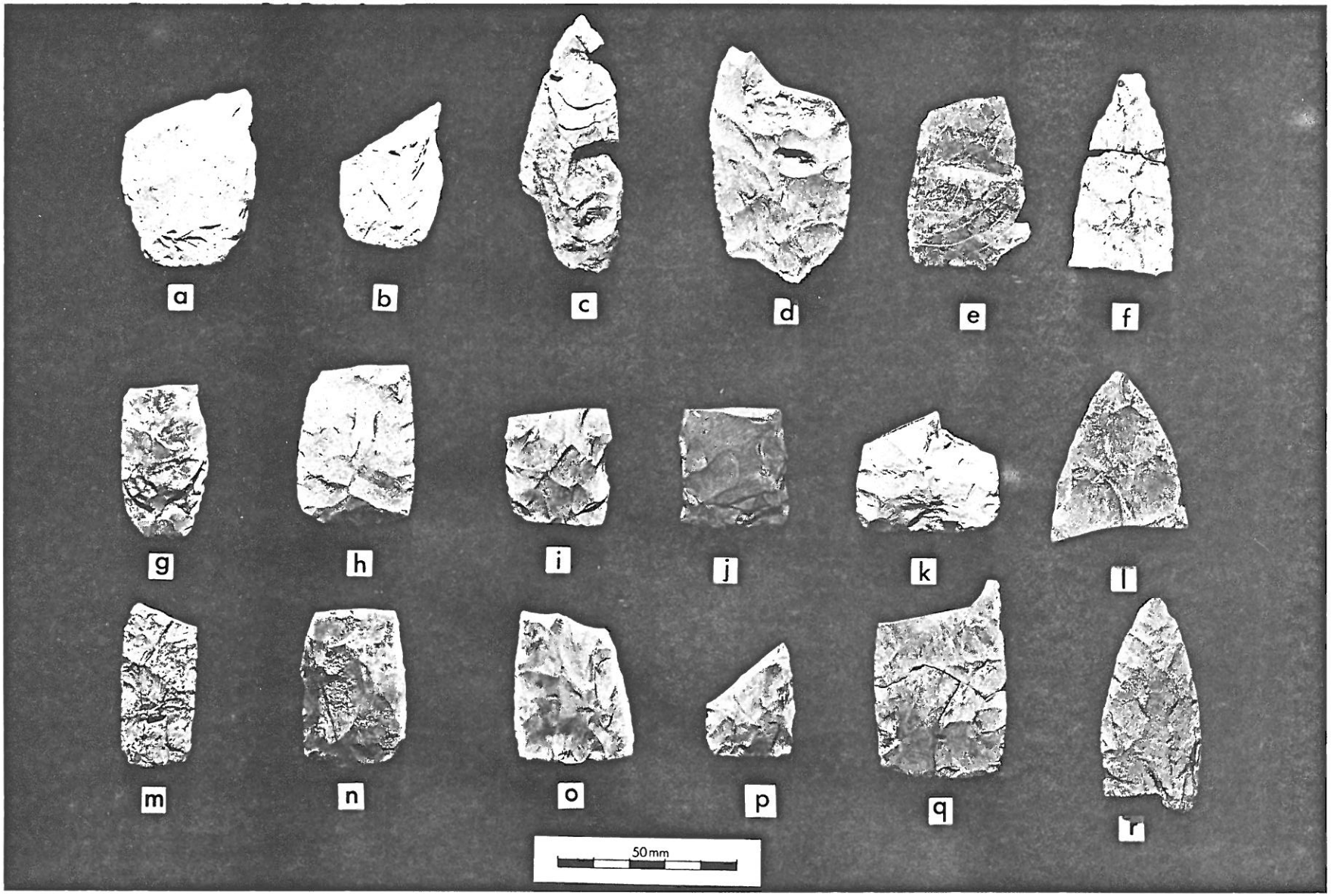

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
50mm

Plate 14: A selection of large sub-triangular (a, e-k), and ovaloid (b-d) bifaces.

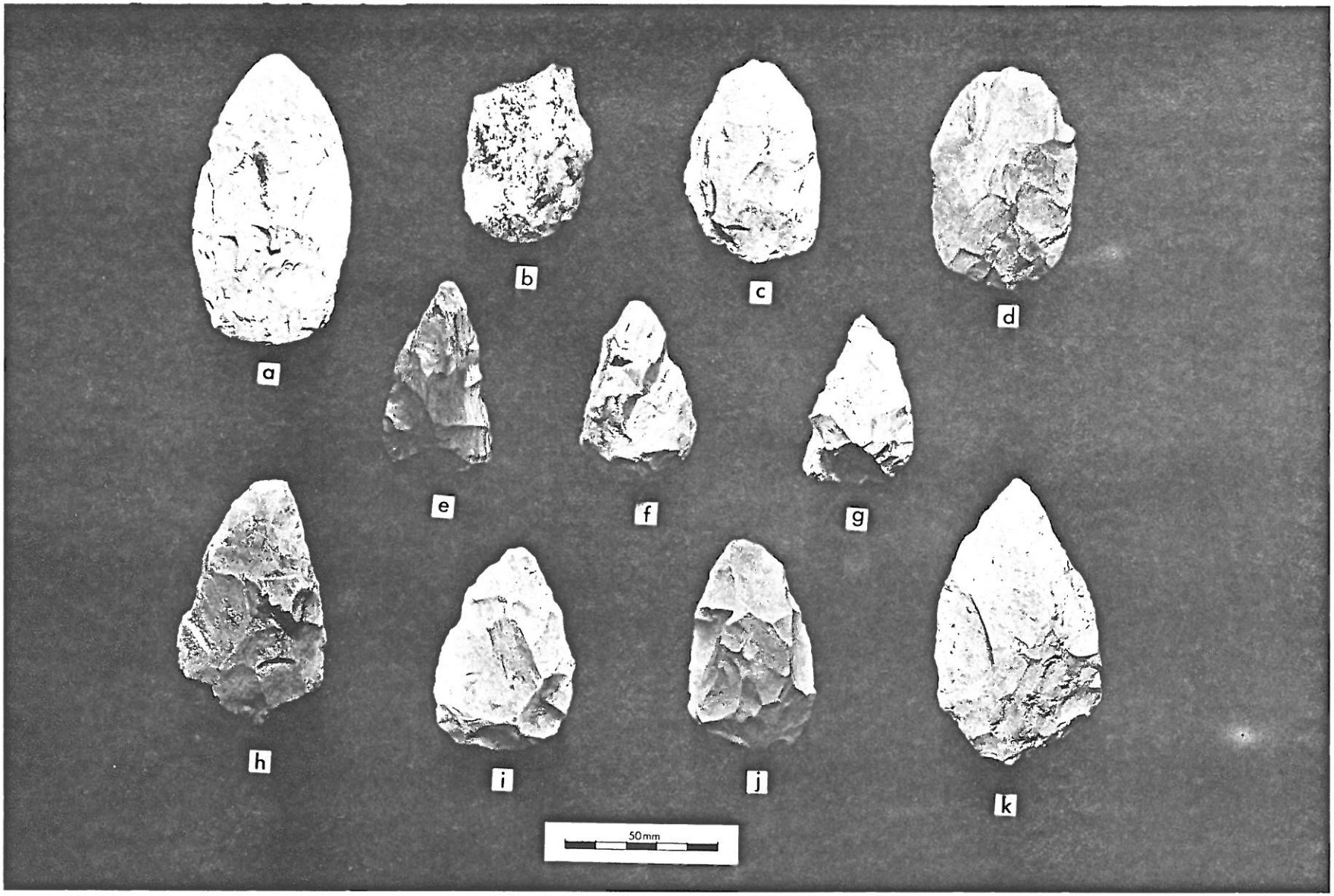

a
b
c
d
e
f
g
h
i
j
k
50mm

Plate 15: A selection of drill fragments (a-c, f), an expanding stemmed projectile point (d), and a graver (e).

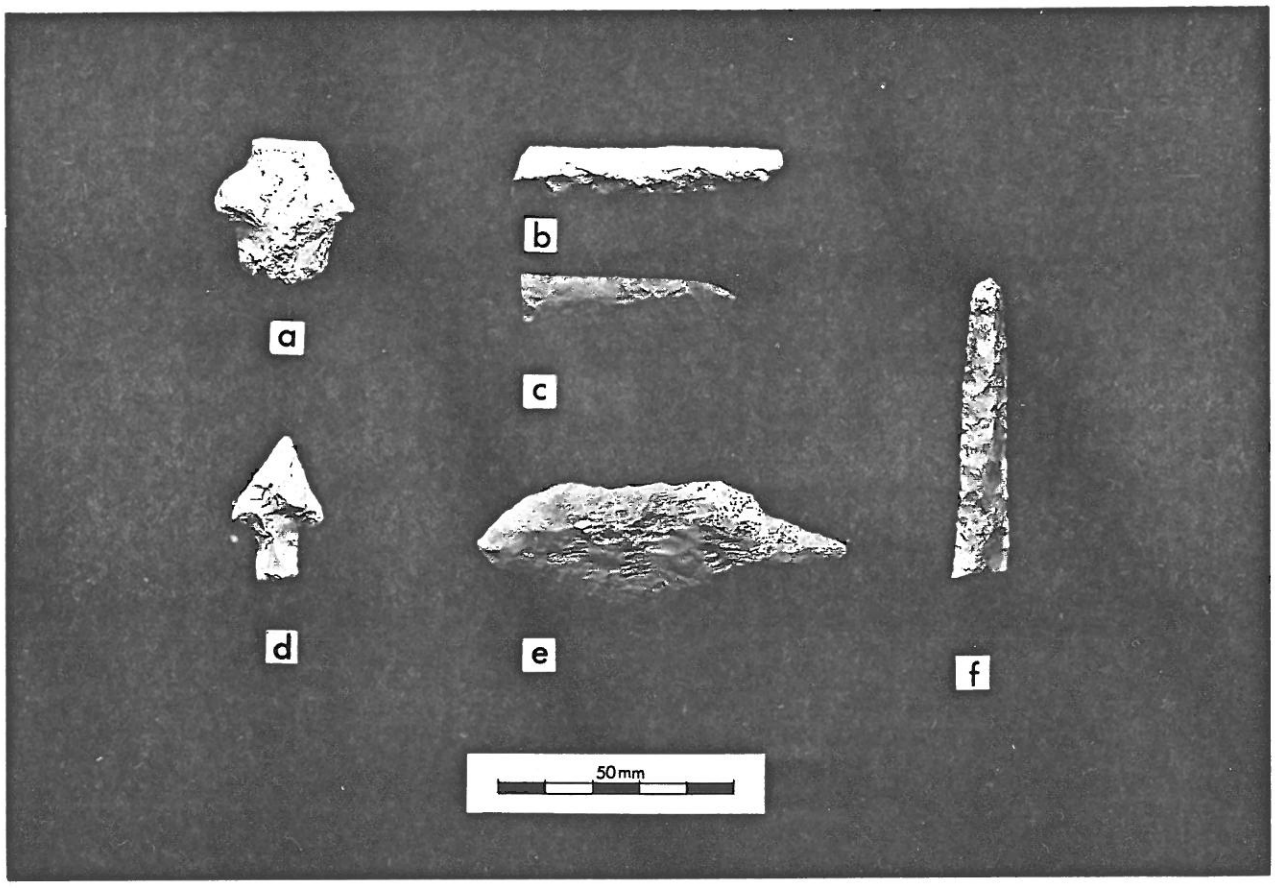

a
b
c
d
e
f
50mm

Plate 16: A selection of gravers (a-d), drill bases (e-h), and a contracting stem projectile point (i).

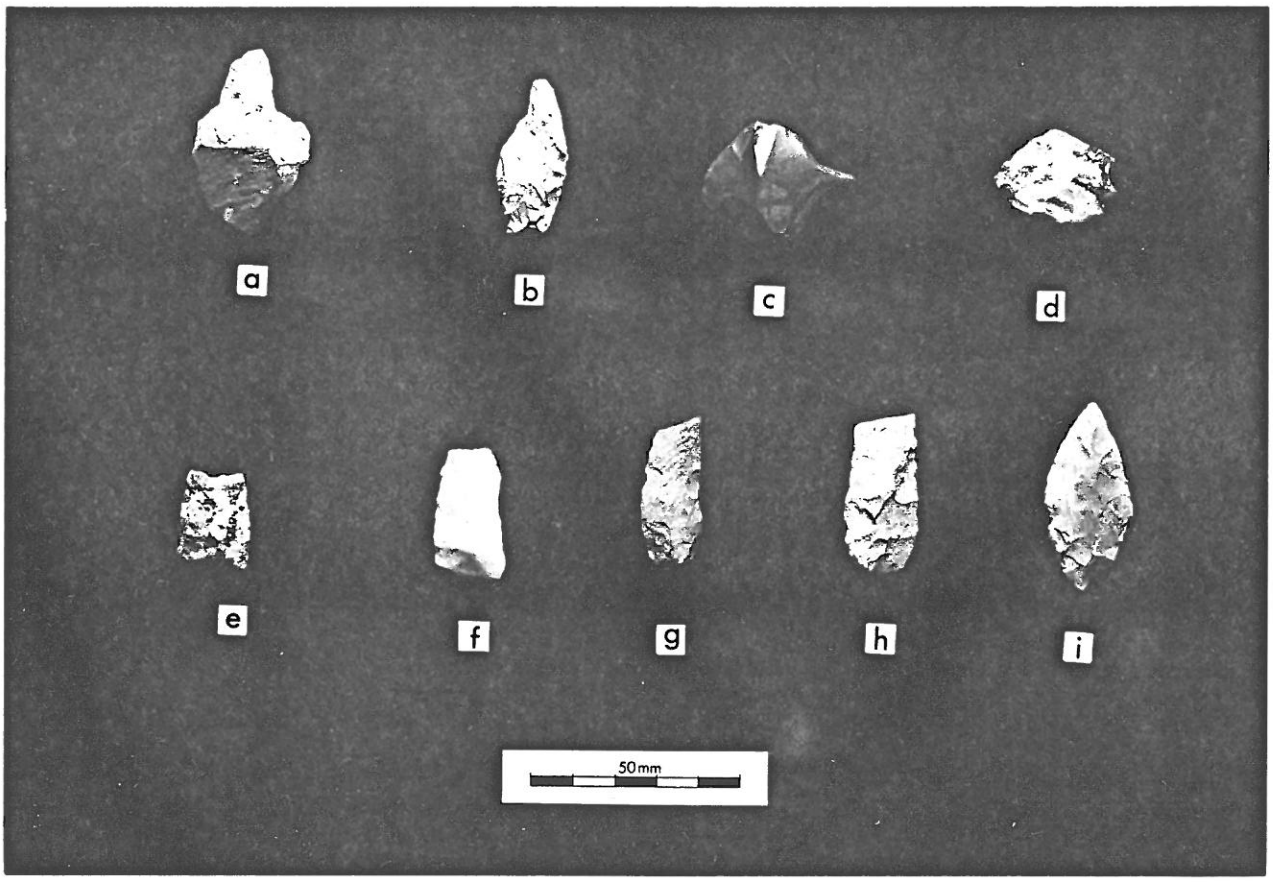

a
b
c
d
e
f
g
h
i
50mm

Plate 17: A selection of Formed unifaces.

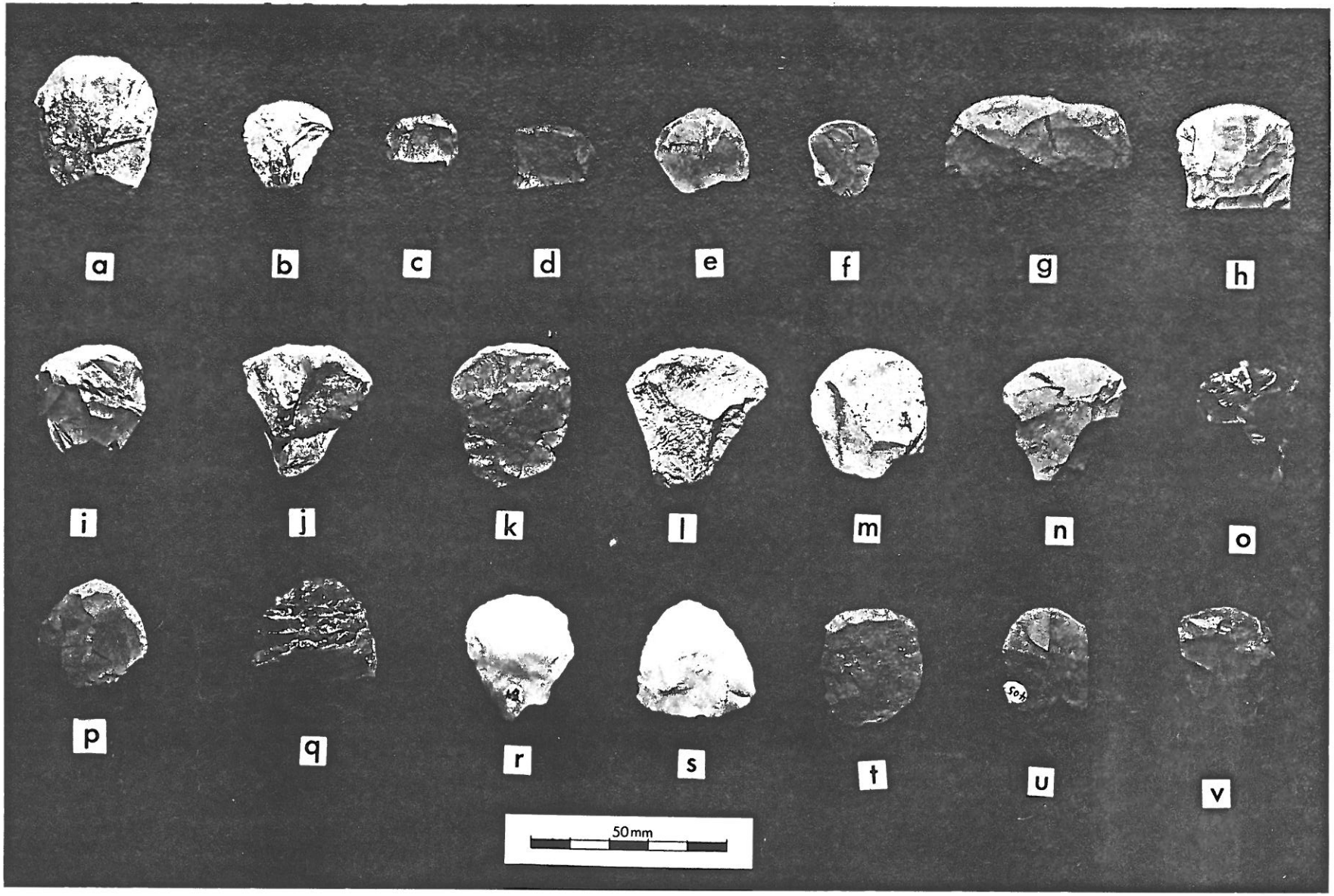
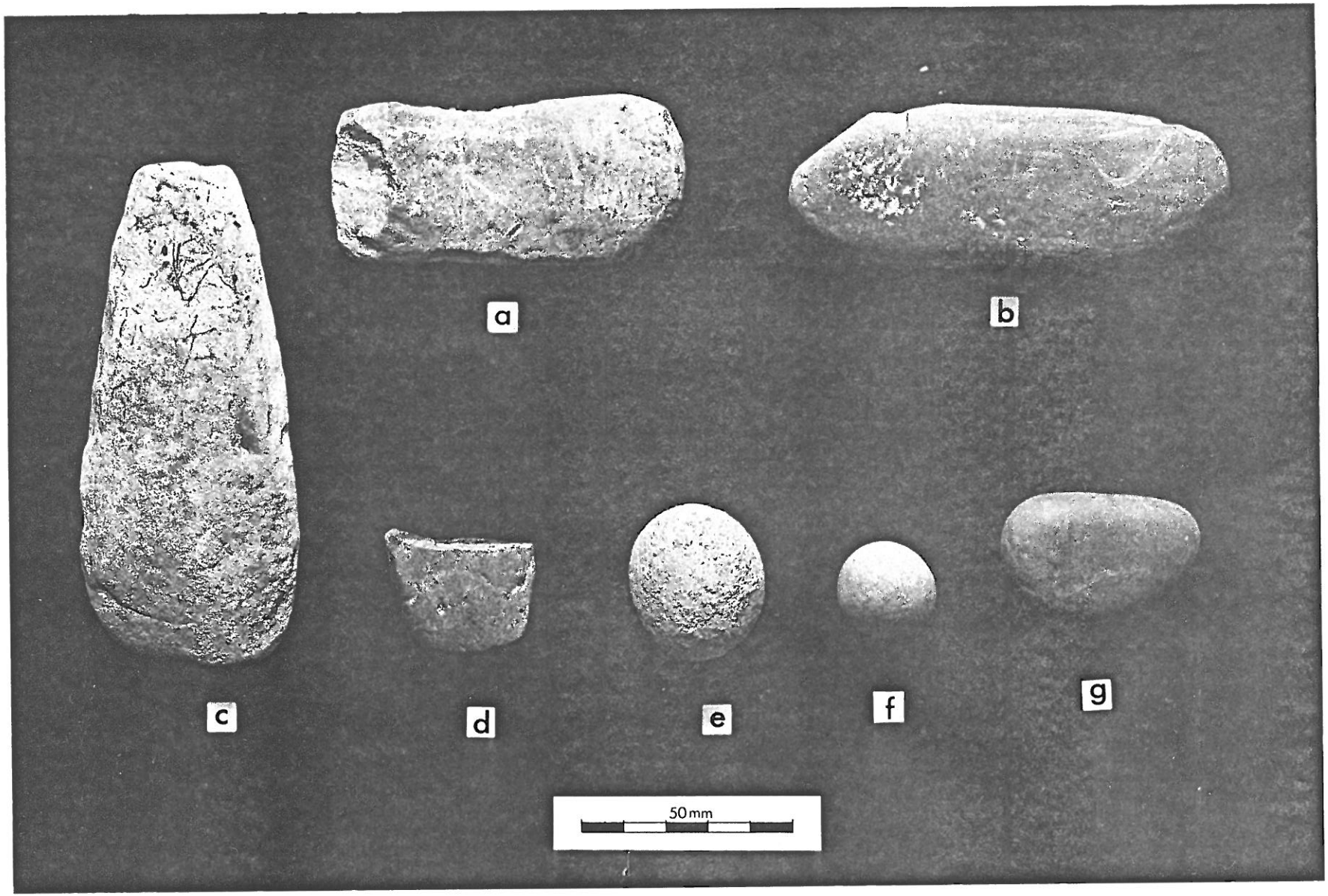

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
50mm

Plate 18: A selection of pecked and ground stone tools: (a-b, g) abrading stones, (c-d) celt and celt fragment, and (e-f) problematicals.


a
b
c
d
e
f
g
50mm

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