Archaeological Investigations at George Washington Carver National Monument 1978

by

Ervan G. Garrison, Robert T. Bray & David Denman

Department of Anthropology
American Archaeology Division
University of Missouri - Columbia

Prepared for

The National Park Service
Midwest Archaeological Center

P. O. No. PX-6115-7-0146

December, 1979

UNIVERSITY OF MISSOURI-COLUMBIA

College of Arts and Science

Department of Anthropology

210 Switzler Hall
Columbia, Missouri 65211
Telephone (314) 882-4731

November 4, 1979

F.A. Calabrese, Chief
Midwestern Archaeological Center
100 Centennial Mall Room 474
Lincoln, Nebraska 68508

Dear Cal:

Inclosed herewith are the required eight (8) copies of a paper entitled "Archaeological Investigations at George Washington Carver National Monument" by Ervan G. Garrison, Robert T. Bray, and David Denman. This constitutes the final report of work accomplished under Purchase Order PX-6115-7-0146, dated September 13, 1977.

The 1976 artifacts and the 1979 conservation and catalog records are presently being curated at the Lyman Archaeological Research Center, Miami, Missouri. Field notes, photographs, and the 1950 (Beaubien) artifacts have not yet been forwarded to me by Dr. Garrison, who completed his part of the final report after moving to Texas A&M from UMC. As soon as these materials can be assembled, they will be forwarded to your office.

If you prefer, the artifacts and catalog cards can be delivered to G.W. Carver National Monument rather than to your office. Please advise in this matter.

We appreciate your support of the G.W. Carver project and believe the proton magnetometer research, in particular, has pointed more positively toward the value of remote sensing in archaeological surveying.

Sincerely yours,

Robert T. Bray

Robert T. Bray
Manager, Lyman Archaeological Research Center

Archaeological Investigations at George Washington Carver National Monument 1978

by

Ervan G. Garrison, Robert T. Bray & David Denman

Department of Anthropology
American Archaeology Division
University of Missouri - Columbia

Prepared for

The National Park Service
Midwest Archaeological Center

P. O. No. PX-6115-7-0146

December, 1979

TABLE OF CONTENTS

Part 1. FIELD WORK AND DATA ANALYSIS
By: Ervan G. Garrison & Robert T. Bray

Part 2. CONSERVATION AND CATALOGING OF ARTIFACTS
By: David Denman

PLATES

FIGURES

TABLES

ACKNOWLEDGMENTS

The authors would like to thank all the personnel, present and past, at George Washington Carver National Monument for their aid during the course of our studies. Mr. Alf Sjöberg is thanked for his timely study of the soil samples. Ms. Anita Demirs, Ms. Liz Hill are thanked for their typing and Mr. Mark Grady for his preparation of figures.

Introduction

In accordance with the conditions outlined in NPS Purchase Order No. PX6115 7 0146, Garrison and Bray, of the American Archaeology Division of the University of Missouri-Columbia's Department of Anthropology* have, to date, completed the following:

1) field investigation at the Monument to include:
   a) shovel testing along all waterways;
   b) magnetometric examination of 23NE120 and 23NE121 and correlation of these results with previous instrumental surveys.
2) recovery and study of all artifacts excavated by Beaubien's 1953 investigations at 23NE119, and
3) cleaning and stabilization of selected artifacts recovered by field work in 1976, and chosen for use in the conservation experiments.

Field Work

In March (24th-28th) field work was conducted at the Monument. A magnetometric survey of the "barn" area at 23NE120 was carried out utilizing the Division's Geometrics Model G-816 Proton Magnetometer. A 2 x 2 m grid (14 x 10 m) was sampled on 1 γ sensitivity settings. The original grid (10 x 10 m) was placed in the area where the density of artifacts detected by earlier metal detector tests was highest. This grid was extended to allow definition of a magnetic feature.

*Principal Author now at Cultural Resources Laboratory, Texas A&M University.

In an attempt to ascertain the nature of the feature indicated by instrumental tests, a crossing transect grid was sampled at 2 m intervals on a N-S axis for total inorganic phosphate concentrations. The results of this latter analysis, carried out at the Division's soils laboratory, indicated amounts of phosphate, typically found near habitation structures. This evidence, conjoined with magnetometric and artifactual data, clearly supports the hypothesis of a farm outbuilding or barn-type structure at 23NE120.

At 23NE121, a 2 m grid, 20 x 20 m, was sampled utilizing the magnetometer. The results clearly indicate the presence of the remains of a large structure. The grid was extended on the south and a second 8 x 14 m grid was examined to the east of the 20 x 20 m grid. A large linear anomaly was detected in this grid. It is interesting to note that these anomalies occur in the areas of highest artifact densities found in 1976. The phosphate technique was applied on a 5 m interval within the 20 x 20 m grid. The results clearly define a rectangular area 10 x 10 m in size. It is concluded that two separate structures are indicated in this area of 23NE121. Together with the "house mound," a complex of at least three structures existed on this site.

Further examination of the mound at 23NE122 yielded little in the way of new information. It obviously was a structure as indicated by the associated brick rubble. No artifacts were recovered. Two phosphate samples, one from within the periphery of the mound and the other without, were not very informative as to the nature of the building.

Shovel tests were made along each bank of Harkins and Carver Branches. The interval varied from 10 m to 15 m, depending upon ground accessibility. A clear geomorphic difference was noted between T_1 and T_2 type terraces

and a well developed mollisol was seen between the two streams, typical of a grassland area. No evidence of aboriginal sites was found. A soda-lime glass sherd found 22 m north of the "Hanging Tree" at 23NE119.

After field work was completed, laboratory analyses were begun and artifact stabilization was completed in the summer of 1979.

Analysis

Shovel Testing

A systematic shovel testing survey was conducted along the banks of Carver and Harkins Branches (see Fig. 1). The objectives were to

(1) establish the presence or absence of subsurface aboriginal sites, and

(2) derive as much information relative to soil structure that was allowed by shallow testing.

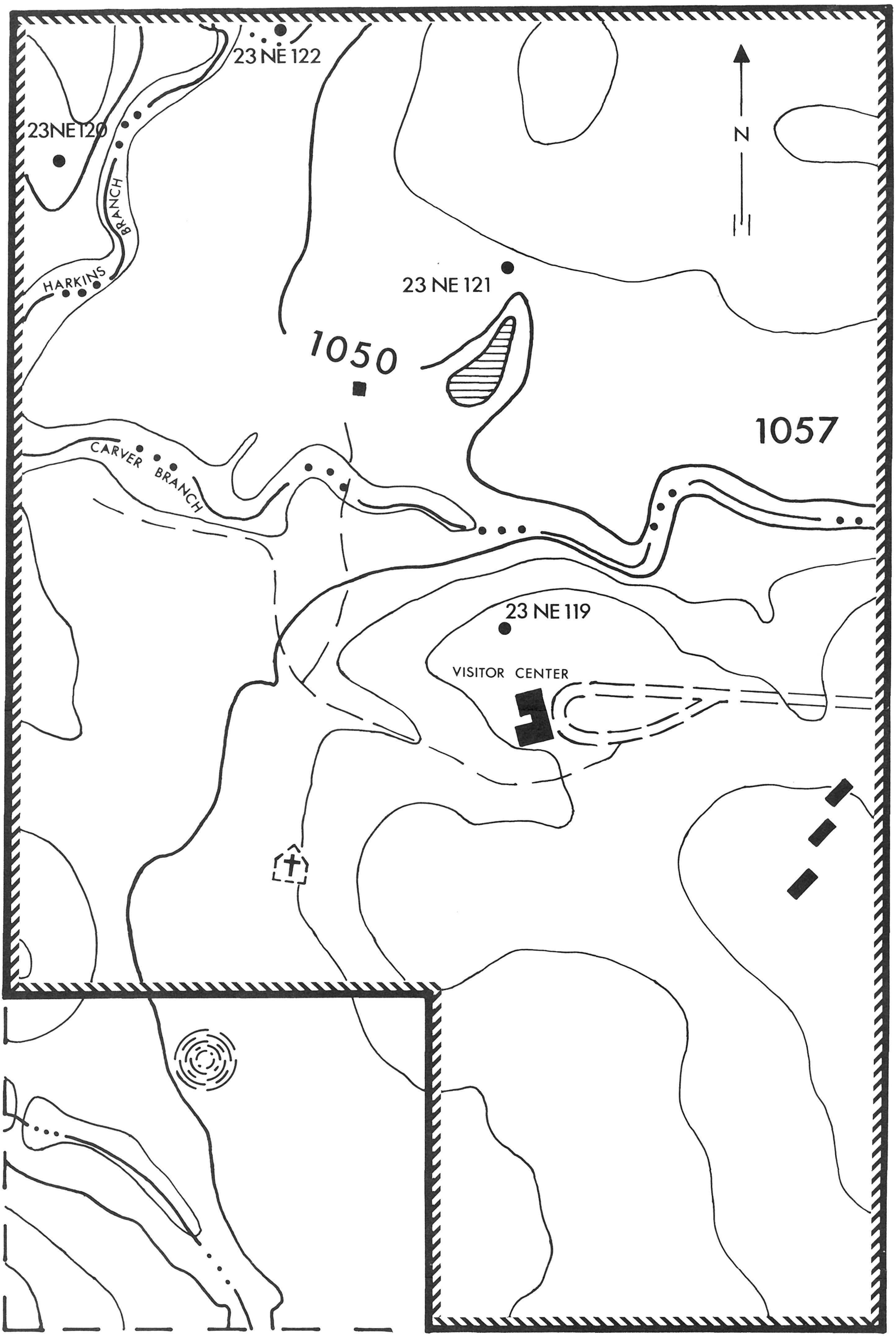
While the instrumental survey techniques used were very useful in locating historic sites at the Monument, they were of limited utility in prospecting for aboriginal sites of the kind typical of southwestern Missouri (see Chapman 1975 for a more complete description of aboriginal cultures known for southwestern Missouri).

In general, aboriginal settlement in the western aspect of the Ozark Uplift is a reflection of cultural traditions that are indigenous to the Ozarks as well as intrusive. It is believed that all major cultural periods defined for the Western Ozarks were present in Southwest Missouri. These include the Paleo-Indian, Archaic, Woodland Proto-historic and Historic Periods.

Examination of materials excavated by Beaubien at 23NE119 show two

FIGURE 1

Archaeological base map of
George Washington Carver
National Monument.



200 m

Contour Interval 10 feet

LEGEND

Park Boundary

Road

Stream

Site

Structure

Cemetery

Lake

Mine

GEORGE WASHINGTON CARVER NATIONAL MONUMENT

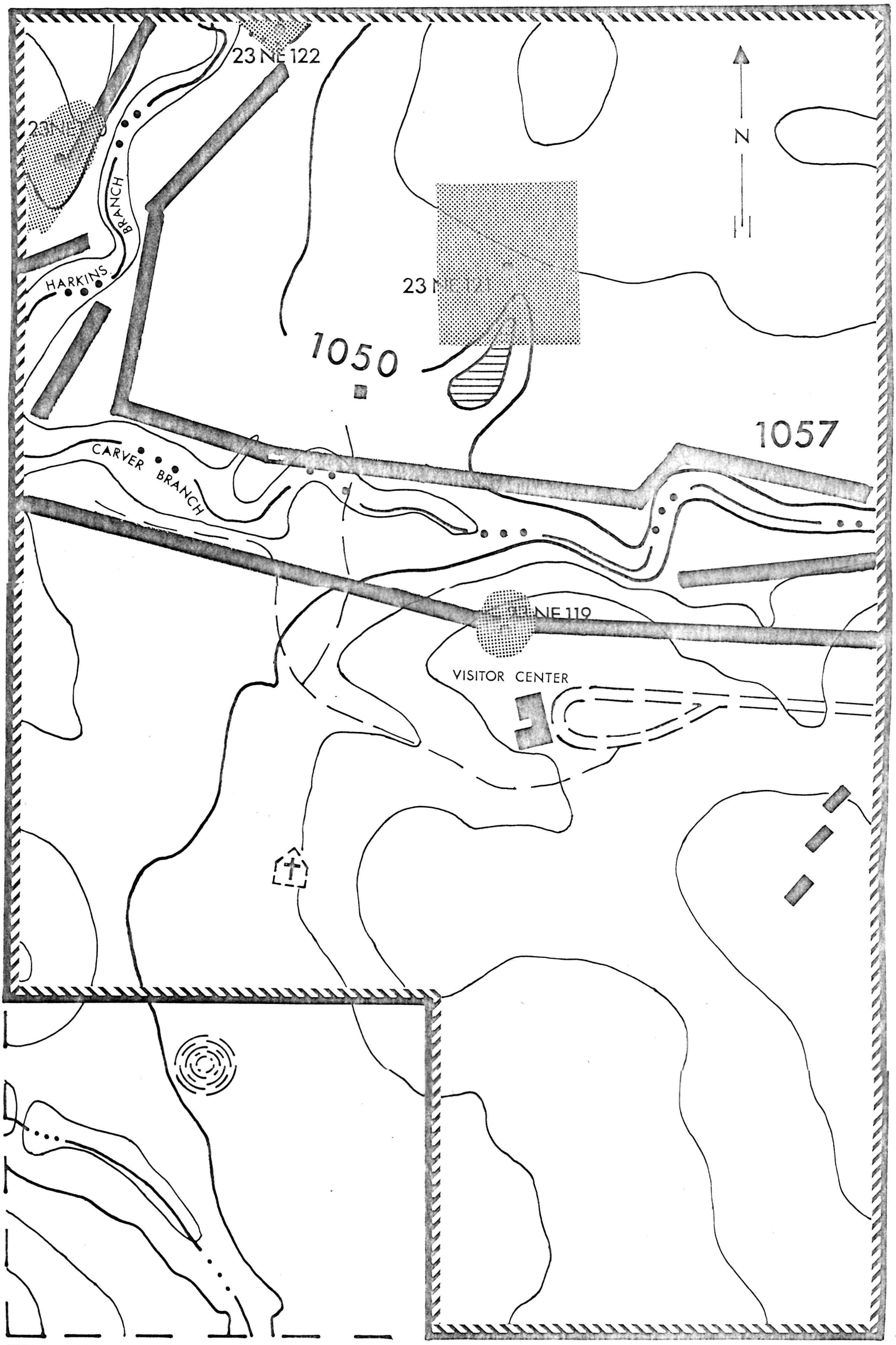
ARCHAEOLOGICAL BASE MAP. DATA FROM SURVEYS OF AUGUST 1975; MARCH 1976. E.G. GARRISON AND R.T. BRAY. TOPOGRAPHY FROM USGS GRANBY, MO. QUADRANGLE MAP.

23 NE 119	CARVER CABIN
23 NE 120	GILMORE FARM
23 NE 121	WILLIAMS FARM
23 NE 122	UNKNOWN HISTORIC SITE

as

PLATE 1

Shovel test along T_2 terrace
west of Harkins Branch.



200 m

Contour Interval 10 feet

LEGEND

Park Boundary

Surve ed Area

Road

Stream

Site

Structure

Cemetery

Lake

Mine

GEORGE WASHINGTON CARVER NATIONAL MONUMENT

ARCHAEOLOGICAL BASE MAP. DATA FROM SURVEYS OF AUGUST 1975; MARCH 1976. E.G. GARRISON AND R.T. BRAY. TOPOGRAPHY FROM USGS GRANBY, MO. QUADRANGLE MAP.

Shovel Test Transect

Site Area

23 NE 119	CARVER CABIN
23 NE 120	GILMORE FARM
23 NE 121	WILLIAMS FARM
23 NE 122	UNKNOWN HISTORIC SITE

as

PLATE 2

Soil profile of east side of Harkins Branch just north of old trace from Gilmore Farm Site, 23NE120, to ford across Harkins Branch.

projectile point fragments typical of the Archaic Period (see Plate 6). One is a deeply corner notched bifacially worked point which had been re-sharpened in the past. The other bifacial form resembles the earred lanceolate forms typical of Early-Middle Archaic Periods. Few other lithic remains were recovered at 23NE119 so it is difficult to assess the type or extent of aboriginal occupation occurred here. The presence of these lithic forms certainly justified the attempt to determine if others were present at the Monument. Shovel testing is one accepted method to survey for these types of cultural remains and indeed is mandatory at the Monument where little land is now cultivated, exposing subsurface artifacts.

The survey consisted of making shovel tests to roughly 20 centimeters in depth, with a spade (see Plate 1). An interval between pits was maintained of between 10-15 meters, depending upon the terrain. A well developed mollisol was evident along the T_1 terraces of Harkins and Carver Branches. This was prevalent along the southern and northern banks of Carver Branch and the east bank of Harkins. The T_2 terrace along the west side of Harkins is more characteristic of upland soils found in the Ozark Uplift east and south of the Monument. These soils are cherty, iron enriched, acidic and thinly overlay more clayey B and C horizons. The A and upper B horizons along this terrace were thin and poorly developed. This is in sharp contrast to the east T_1 terrace of Harkins Branch (see Plate 2). No aboriginal cultural materials were found associated with any geomorphic form at the Monument other than the site indicated at 23NE119 by the Archaic Component found by Beaubien (1953). The only artifact recovered by the shovel testing was one soda-lime glass sherd found 22 meters north of the "Hanging Tree" at 23NE119.

PLATES 3 AND 4

Layout of western aspect of 1978 magnetometer grid at 23NE121; Surveyor and portable proton magnetometer at 23NE121, 1978 survey.

FIGURE 2

1976 magnetometer and metal
detector survey blocks.

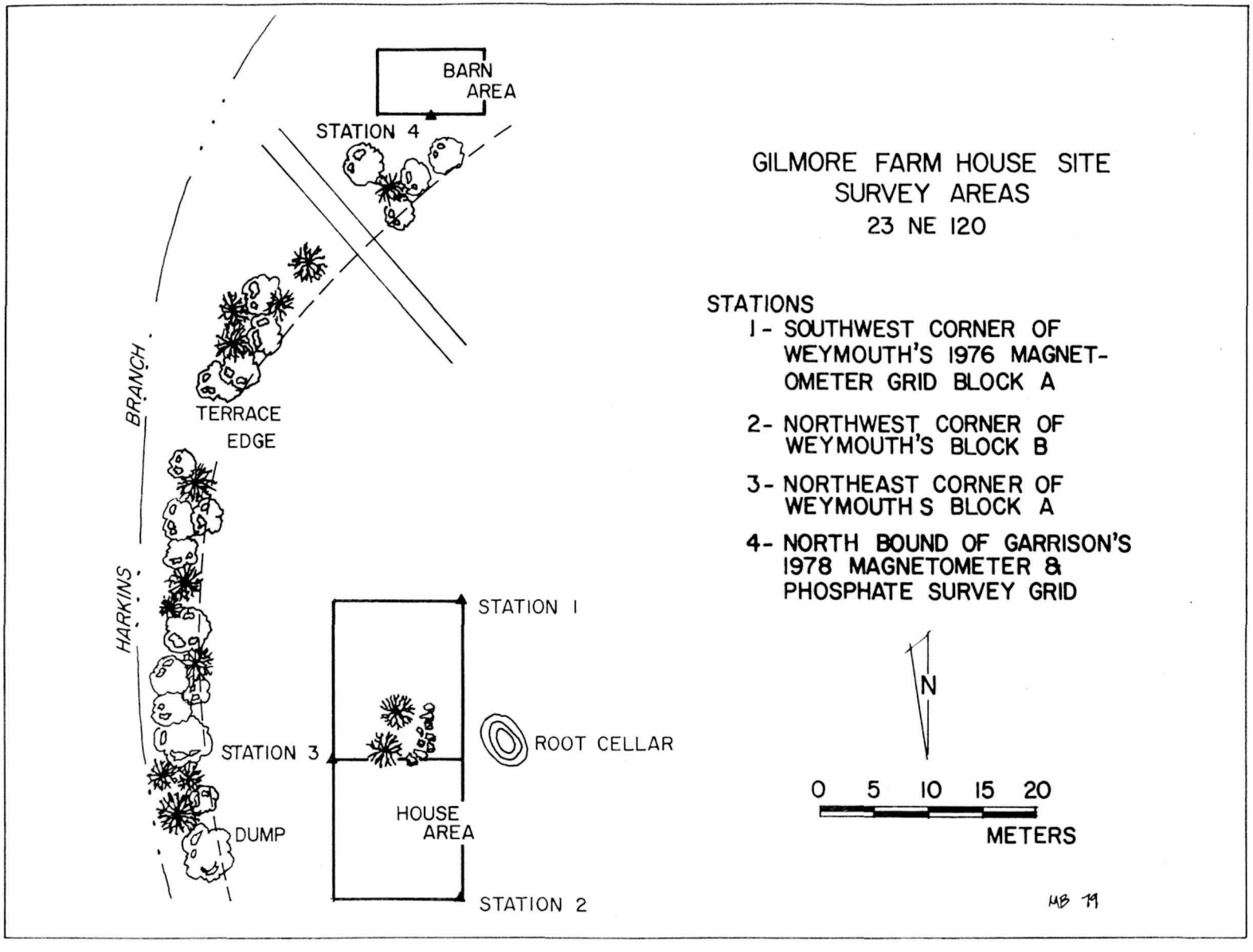
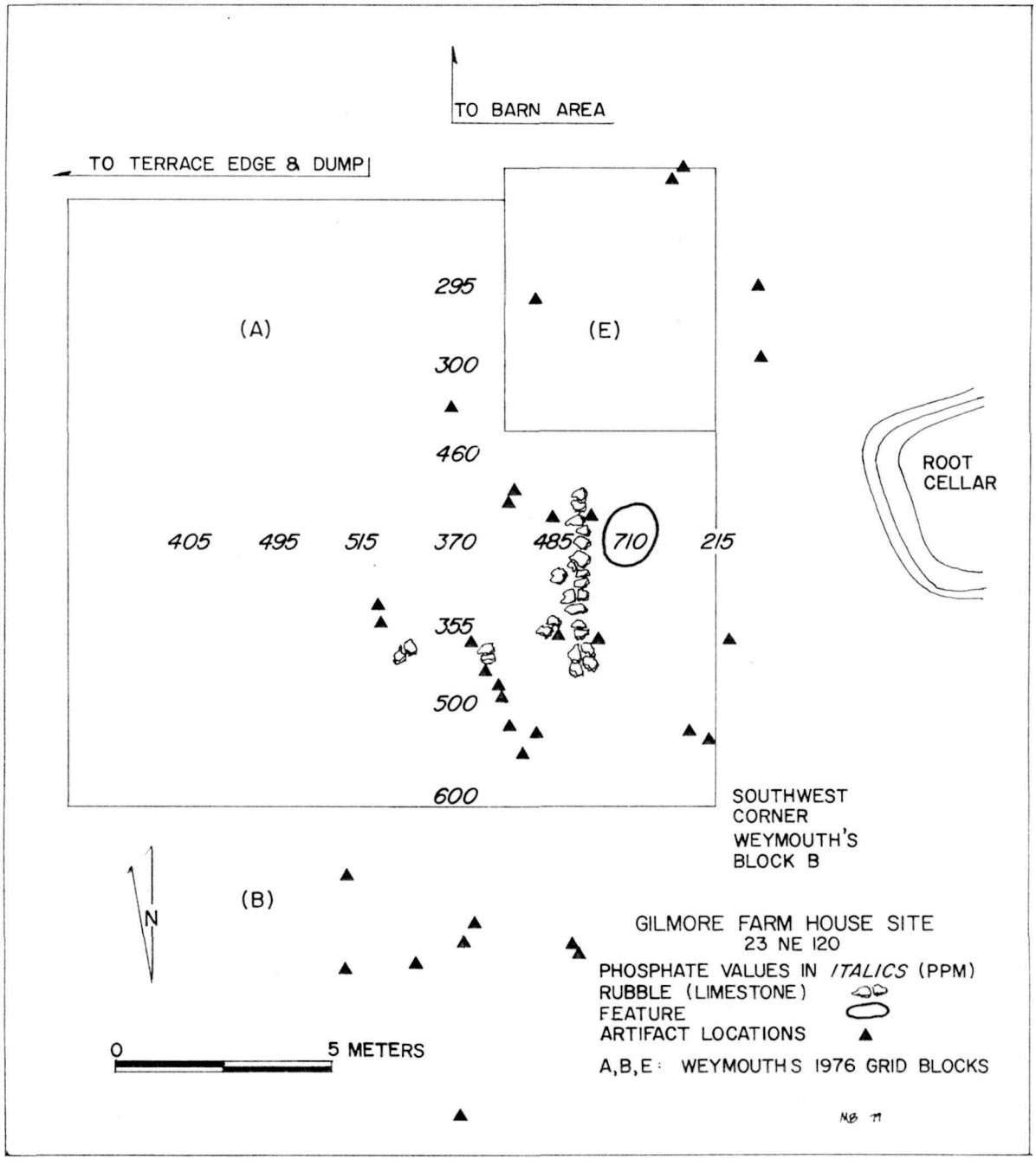

BARN
AREA
STATION 4
BRANCH
TERRACE
EDGE
HARKINS
STATION 1
STATION 3
ROOT CELLAR
HOUSE
AREA
DUMP
STATION 2
GILMORE FARM HOUSE SITE
SURVEY AREAS
23 NE 120
STATIONS
1- SOUTHWEST CORNER OF WEYMOUTH'S 1976 MAGNET-OMETER GRID BLOCK A
2- NORTHWEST CORNER OF WEYMOUTH'S BLOCK B
3- NORTHEAST CORNER OF WEYMOUTH S BLOCK A
4- NORTH BOUND OF GARRISON'S 1978 MAGNETOMETER & PHOSPHATE SURVEY GRID
N
0 5 10 15 20
METERS
MB 79

FIGURE 3

Correlation of magnetometer and metal detector surveys; blocks A, B, and E (after Weymouth 1976).


TO BARN AREA
TO TERRACE EDGE & DUMP
(A)
(E)
295
300
460
405
495
515
370
485
710
215
355
500
600
ROOT CELLAR
SOUTHWEST CORNER WEYMOUTH'S BLOCK B
(B)
N
0
5 METERS
GILMORE FARM HOUSE SITE
23 NE 120
PHOSPHATE VALUES IN ITALICS (PPM)
RUBBLE (LIMESTONE)
FEATURE
ARTIFACT LOCATIONS
A,B,E: WEYMOUTH'S 1976 GRID BLOCKS
NB 77

Magnetometer Survey and Correlation of Previous Instrumental Results

Following Weymouth (1976:8), more extended survey of areas was conducted at 23NE120 and 23NE121, the Gilmore and William Farm Sites, respectively. The results of the survey conducted by Garrison and Bray (1976) clearly indicated concentrations of cultural materials within or near Weymouth's surveys (see Figure 2). This latter survey recovered all detected metal artifacts within the surveyed areas thus removing all shallow point source anomalies. This procedure then allowed for the reexamination of the areas only traversed (23NE121) or not surveyed at all with a magnetometer ("Barn Site," 23NE120). With the point sources removed broader magnetic features could be examined utilizing the American Archaeology Division's G-816 GeoMetrics proton magnetometer.

23NE120 - With regard to the correlation of metal detected and recovered with Weymouth's results we see a convergence of the artifact distribution with anomaly areas detected in his survey (see Figures 2, 3). The broad, linear anomaly Weymouth suspected as a foundation at 23NE120 (ibid. 1976:8) proved to be such. This was indicated by dressed stone debris, brick fragments, plate window glass and other artifacts most associated with a domestic dwelling (see Garrison and Bray 1976). A dump located near the terrace edge, east of the feature, must have been associated with the dwelling (Figures 2, 3).

Weymouth did not survey the "Barn Site" at 23NE120. Garrison and Bray (1976) found a high density of utilitarian artifacts in this area (see Figure 2). It was decided to examine this area with the magnetometer. The results of the survey are shown in Figure 4. A magnetic feature was implied by the results along the central and west portion of the grid. The nature of

the magnetic signatures tend to support the interpretation of a subsurface anomaly (or anomalies) linear in form but localized in areas much like disturbed or eroded soil areas such as of drip-lines under caves or potholes created by stock or excavation and fill.

23NE121 - Here Weymouth's traverses only broadly hinted to anomalies associated with buried features. Garrison and Bray's 1976 survey again found areas of artifact concentrations distinctly non-random and localized in three main areas (see Figure 5). Again, removal of the strong point sources allowed the resurvey with the magnetometer to detect broader anomalies more typical of buried structural features. Three grid areas surveyed found a very high qualitative association of the artifact concentrations with magnetic features. This is true for Weymouth's cursory traverses and Garrison and Bray's grids. Clearly two and most probably three structures existed at 23NE121 located in the areas shown in Figure 6.

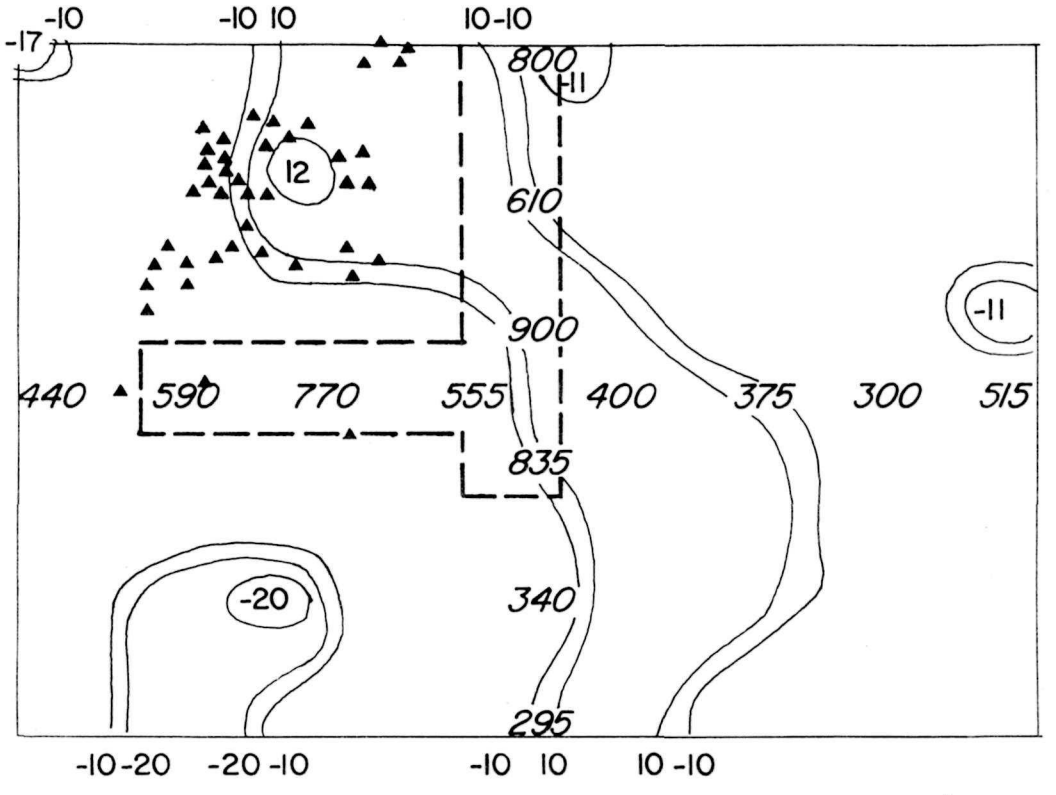
Phosphate Testing

Inorganic phosphate analysis of soils has been long proven a viable technique for the detection of cultural features (Sjöberg 1976: 447). The buildup of phosphorous in anthropic soils is a direct function of human habitation with high concentrations of the element associated with living areas, refuse pits and butchering areas. The waste of man and his animals contribute greatly to the non-random patterning of phosphorous across habitation sites. This is true for historic as well as prehistoric sites.

To test for phosphate content of soil, shovel tests are made systematically across a site by transect or grid methods. A small soil sample (20 gms) was removed from a cleaned profile in the shovel test at a depth, below the modern land surface, that is typically 20 centimeters. These samples are then chemically digested, typically by the perchloric acid process, and

FIGURE 4

1978 magnetometer and phosphate survey grid, 23NE120, the Gilmore Farm Site; barn area. Plot of 1976 metal detector survey results.



N

MAGNETOMETER MAP
23 NE 120

PHOSPHATE VALUES IN *ITALICS* (PPM)
FEATURE — — — —
ARTIFACT LOCATIONS ▲

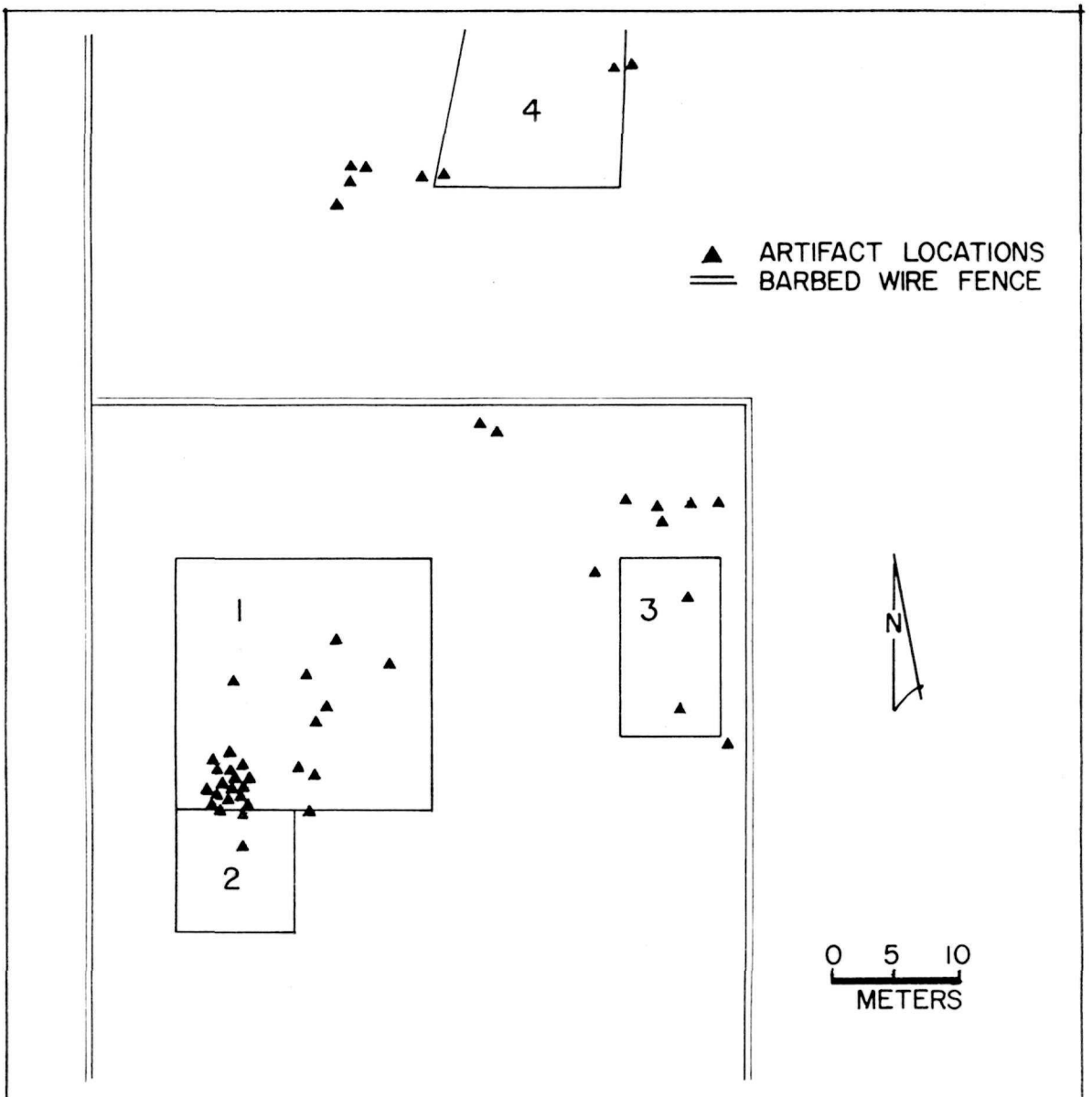
0 5 10 METERS

CONTOUR INTERVAL: 10 gammas

ND 79

FIGURE 5

Location of 1978 survey blocks at 23NE121, The Williams Farm Site.



23 NE 121

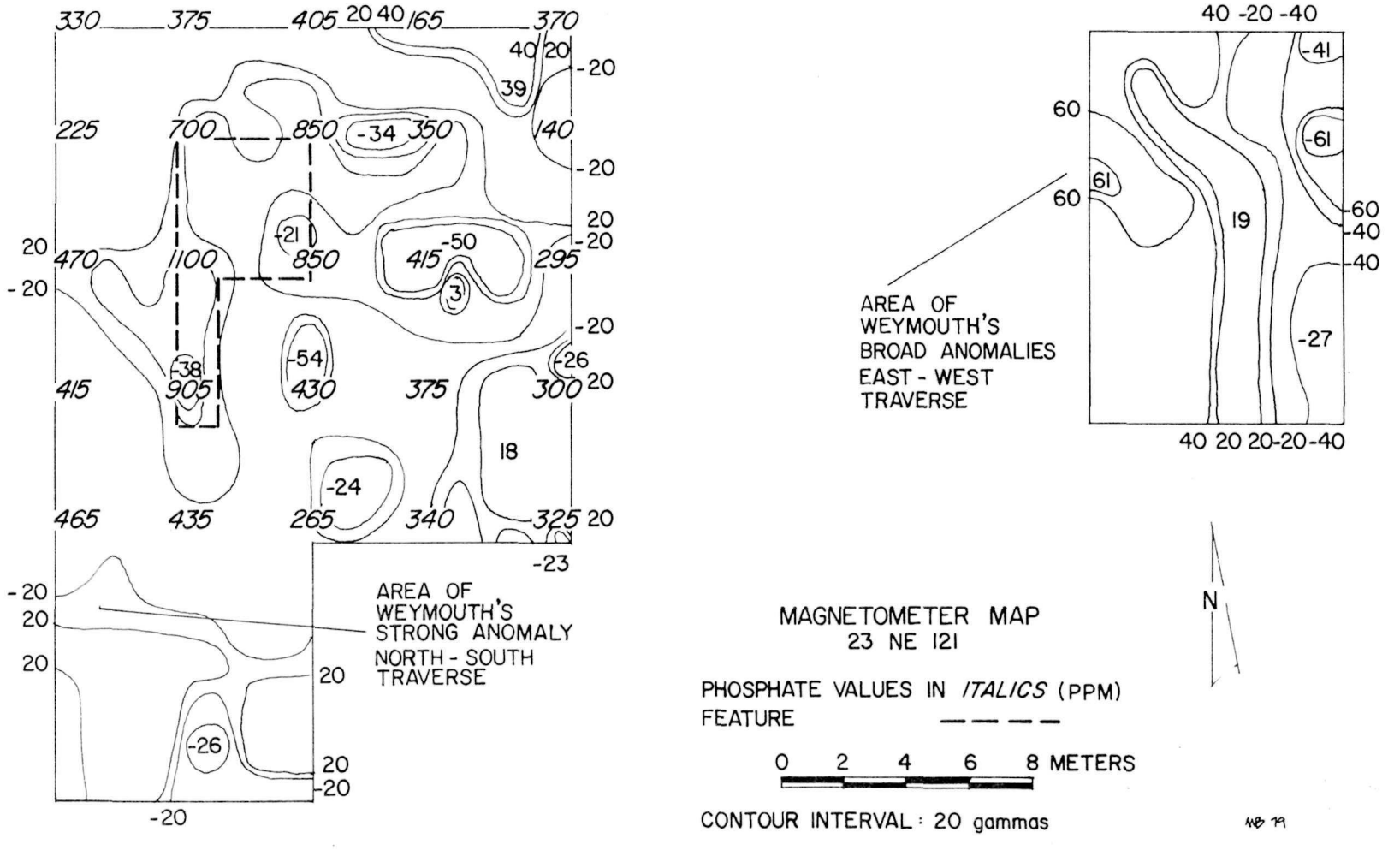
NUMERALS INDICATE
GRID AREAS

1: 20 X 20 M. MAGNETOMETER AND PHOSPHATE GRID
2: 10 X 10 M. MAGNETOMETER GRID
3: 8 X 14 M. MAGNETOMETER GRID
4: HOUSE MOUND

MB 79

FIGURE 6

Magnetic contour map and phosphate distribution of 1978 survey results. Plot of 1976 metal detector survey results.


330 375 405 20 40 165 370
40 20
39
-20
225 700 850 -34 350 140
-20
20
-21
-50
20 470 1100 850 415 295
-20
-20
3
-20
-54
-26
415 905 430 375 300 20
38
18
-24
465 435 265 340 325 20
-23
-20
20
20
AREA OF WEYMOUTH'S STRONG ANOMALY
NORTH - SOUTH TRAVERSE
20
-26
20
-20
-20
40 -20 -40
-41
60
-61
61
60
19
-60
-40
-40
-27
AREA OF WEYMOUTH'S BROAD ANOMALIES EAST - WEST TRAVERSE
40 20 20-20-40
N
MAGNETOMETER MAP
23 NE 121
PHOSPHATE VALUES IN ITALICS (PPM)
FEATURE
0 2 4 6 8 METERS
CONTOUR INTERVAL : 20 gammas
48 79

the phosphate measured quantitatively by colorometric means (ibid. 1976: 447-454).

Table 1 shows the results of total inorganic phosphate analysis of samples from three sites at the Monument; 23NE120, 23NE121 and 23NE122.

23NE120 - In an attempt to ascertain the nature of the feature, indicated by magnetometric survey, at the "Barn" area, crossing transects were sampled at 2 meter intervals (see Figure 4). The analysis indicated significantly high phosphate values in the area of magnetic disturbance coincidently with the known concentration of artifacts recovered in 1976.

23NE121 - At this site, a 5 meter grid, 20 x 20 meters, was sampled within the magnetometer grid (see Figures 5, 6). The results of the analysis clearly define a 10 x 10 meter area of extremely high phosphate values. Again, the convergence of the magnetometric, artifactual, and phosphate data imply the presence of a structure in the past.

23NE122 - The presence of a grass-covered mound with associated brick rubble (Plate 5) is the result of the deterioration of a structure. Two phosphate samples were taken; one within the mound and one outside the edge of the mound. Both samples were of low phosphate content and added little to the interpretation of this singular feature.

Re-Study of the 1953 Excavation Materials

Paul L. Beaubien, in his archaeological study of 23NE119, was attempting to locate the site of the original cabins of Moses Carver (Beaubien 1953). Necessarily, and in his defense, his analysis of the recovered items was directed at supporting the hypothesis of 23NE119 being the Carver cabin site. Certainly, in rejoinder to James Robinson's (a resident of Diamond, Missouri and contemporary of Carver) remark, "You could dig for the next five years and would never find anything,"[1] Beaubien could say, "I didn't and I did."

[1] As quoted in "The Early Life of George Washington Carver, Parts I and II," Merrill J. Mattes and Robert Fuller, 1957.

PLATE 5

Mound at 23NE122.

TABLE 1

George Washington Carver National Monument

Phosphorus Analysis

Provenience	ppm P	Provenience	ppm P	Provenience	ppm P
23NE122;		15,20	340	S,2	520
4mE Mound	155	20,0	370	S,4 *	355
23NE122;		20,5	140	S,8	460
Inside Mound	145	20,10	295	S,10	300
23NE121;		20,15	300	S,12	295
Barn Grid;		20,20	325	E,0	215
0,0	330	23NE120;		E,2	710
0,5	225	Gilmore Barn		E,4	485
0,10	470	S,0	295	E,6	370
0,15	415	S,2	340	E,8	515
0,20	465	S,4	835	E,10	495
5,0	375	S,6	900	E,12	405
5,5	700	S,8	610		
5,10	1100	S,10	800		
5,15	905	W,0	440		
5,20	435	W,2	590		
10,0	405	W,4	770		
10,5	850	W,6	555		
10,10	850	W,8	400		
10,15	430	W,10	375		
10,20	265	W,12	300		
15,0	165	W,14	515		
15,5	350	Gilmore Farm			
15,10	415	House;			
15,15	375	S,0	600		

TABLE 2

Analysis of 1953 Excavation Materials

Site No: 23NE119

Provenience: 11R1 through 11R5

Category: Ceramics

Ware: Whiteware

2 - sherds, undecorated
1 - sherd, annular (green)
1 - sherd, spatter ware (blue)

Category: Glass

Class: Bottle

2 - brown sherd, bottle
5 - clear sherds, window
1 - clear sherds, bottle

Category: Metal

Class: Nails

3 - cut nails, 4d
4 - cut nails, 3d
3 - cut nails, 7d
4 - cut nails, 12d (2 fragments)

Class: Utensils

1 - knife blade fragment

Class: Miscellaneous

1 - metal strap fragment

Category: Faunal

Class: Bone

9 - fragments (avian)

Category: Miscellaneous

1 - hard rubber fragment

Provenience: 11R4, 11R8, 11R10

Category: Ceramics

Ware: Whiteware

2 - sherds, undecorated

Ware: Stoneware

6 - sherds, brown, glazed stoneware, buff paste

TABLE 2 (Continued)

Ware: Stoneware (Continued)

3 - sherds, gray, glazed stoneware, gray paste
1 - sherds, tan salt glaze stoneware, buff paste
1 - sherds red - brown glaze stoneware, buff paste
1 - brown salt-glazed stoneware sherd, buff paste
1 - salt-glazed stoneware sherd, buff paste

Ware: Earthenware

1 - glazed, red paste earthenware (micaeous inclusions)
1 - non-glazed, red paste earthenware
7 - bisque-like sherds

Category: Glass

Class: Bottle

1 - soda-lime glass sherd, embossed with "...son" (1860-1900)
1 - soda-lime glass sherd, shoulder and lip fragment, heavily patinated; widemouthed jar
1 - soda-lime glass basal fragment, machine mold, lightly patinated
1 - soda-lime glass basal fragment, machine mold
4 - soda-lime glass sherds, bottle
2 - clear glass jar sherds, screw lid lip, widemouthed, one lightly patinated and ground on edge of lip
1 - brown glass sherd, bottle, embossed with "...Co.", patinated
1 - bottle lip, clear glass, machine mold, seam to top of lip (after 1900)
1 - clear glass sherd, bottle
1 - brown glass sherd, embossed letters, unintelligible markings
1 - cased glass sherd; red exterior, clear interior

Category: Metal

Class: Nails

1 - cut nail, 3d
2 - cut nail, 4d
3 - cut nail, 6d
1 - cut nail fragment, 7d (?)
1 - cut nail, 7d
2 - cut nail, 8d
2 - wire nail, 6d
5 - wire nail, 8d
1 - fragment, 7d (?)
1 - wire nail, 16d
1 - wire nail, 8d (finishing)
1 - wire nail fragment (?)

Class: Miscellaneous

1 - wire strand

TABLE 2 (Continued)

Class: Miscellaneous (Continued)

1 - "tin" base
1 - blade (?) fragment
2 - unidentified
1 - rubber boot snap, adjustable
1 - cast iron fragment
1 - button, "Marclous Mfg. Co."
1 - iron clevis pin, (15mm) 6" in length
1 - lock assembly fragment, 3 screws with hand forge heads
1 - "Mason" lid

Category: Faunal

Class: Bone

1 - fragment, (Aves)

Provenience: 11R11 through 11R13; 11R12 through 11R14

Category: Metal

Class: Nails

1 - cut nail (2 fragments), 10d (?)

Provenience: 6R2; 7R2; 8R2

Category: Ceramic

Ware: Whiteware

3 - sherds, undecorated

Ware: Pearlware

1 - sherd, undecorated

Ware: Stoneware

1 - sherd, brown glaze
1 - sherd, gray, salt glaze

Category: Glass

Class: Bottle

1 - milk glass "Mason" lid insert
2 - clear glass sherds, bottle
3 - soda-lime sherds, bottle
1 - brown glass sherds, bottle embossed with "...LIQU"
4 - brown glass sherds, bottle

Category: Other

3 - window sherds (?)

TABLE 2 (Continued)

Category: Metal

Class: Nails

3 - cut nail, 3d
6 - cut nail, 4d
2 - cut nail, 5d
10 - cut nail, 6d
5 - cut nail, 7d
2 - cut nail, 8d
8 - cut nail fragments, various sizes
1 - wire nail, 8d
1 - wire staple

Class: Miscellaneous

1 - unidentified cast iron fragments

Category: Faunal

Class: Bone

1 - fragment, rib (Aves)
4 - teeth fragments; 1 canine, 3 Sus. (?)

Category: Miscellaneous

2 - brick sherds
11 - rocks

Provenience: 3R3, 3R4, 4R1

Category: Ceramics

Ware: Whiteware

4 - sherds, undecorated
1 - cup base fragment

Ware: Procelin

1 - sherd, undecorated

Category: Glass

Class: Bottle

2 - sherd, clear, bottle

Class: Other

7 - sherds, window

Category: Metal

Class: Nails

2 - cut nail, 4d
2 - cut nail, 6d
1 - cut nail fragment

TABLE 2 (Continued)

Category: Miscellaneous

1 - brick fragment, glazed exterior
1 - mortar fragment
1 - rock fragment

Provenience: 3R9 - 3R10 - 3R13 - 3R14 - 3R15; 5 - 5R1 - 5R2 - 5R3

Category: Ceramics

Ware: Whiteware

8 - sherds, undecorated
1 - sherd, hand painted, sprig design
2 - sherds, embossed edge
3 - sherds, basal fragments with foot rings

Ware: Stoneware

1 - sherd, dark brown glaze (lead)
1 - sherd, salt glaze, one side only

Category: Glass

Class: Bottle

8 - sherds, soda-lime, bottle (?)
1 - rim fragment, Mason
1 - sherd, brown, bottle
1 - sherd, "black glass", bottle (pre-1860)
1 - sherd, embossed rim
1 - sherd, embossed lettering, bottle
9 - sherds, clear, bottle

Class: Other

2 - sherds, clear, window (?)

Category: Metal

Class: Nails/fasteners

1 - cut nail, 4d
1 - cut nail, 6d
4 - cut nail fragments
1 - cut nail, 8d (clinched)
1 - wire nail, 10d
2 - wood screws
1 - cotter pin

Class: Miscellaneous

1 - iron harness buckle
1 - unidentified strap fragment

TABLE 2 (Continued)

Category: Faunal

Class: Bone

1 - fragment

Category: Miscellaneous

6 - rocks
1 - brick fragment
1 - coal fragment

Provenience: SR5 - 6R5 - 7R5; 8R5 - 4R5 - 10R5

Category: Ceramics

Ware: Whiteware

1 - sherd, partial backmark (unintelligible)

Ware: Stoneware

2 - sherds, salt glaze
1 - sherd, lead glaze (brown)

Category: Glass

Class: Bottle

1 - basal fragment, 4 (?) side panel bottle, soda-lime glass
1 - basal fragment, bottle, clear glass
1 - basal fragment, pontil mark (no grinding)
1 - sherd, soda-lime, bottle
1 - sherd, shoulder, soda-lime, bottle
1 - sherd, milk glass Mason lid insert

Class: Other

3 - sherds, soda-lime (window ?)

Category: Metal

Class: Nails

3 - cut nail, 3d
2 - cut nail, 6d
4 - cut nail, 7d
1 - wire nail, 6d

Class: Miscellaneous

1 - unidentified iron fragment, beveled (?)
1 - 9mm Luger shell case, brass, center fire

Category: Miscellaneous

5 - rock fragments
5 - charcoal fragments

TABLE 2 (Continued)

Provenience: 5R7 - 6R7 - 7R7 - 8R7

Category: Ceramics

Ware: Whiteware

1 - basal sherd (cup ?)
1 - rim sherd (cup ?)

Ware: Stoneware

4 - salt glaze sherds
6 - lead glaze sherds (light - dark brown)

Category: Glass

Class: Bottle

1 - bottle base, "...ΔseptiC" embossed letters
1 - sherd, paneled bottle
1 - machined glass lip, clear
1 - sherd, bottle, liquor or beer
1 - sherd, clear glass

Category: Metal

Class: Nails

1 - wire tack
1 - wire nail, 3d
1 - wire nail, 4d
1 - wire nail, 8d
5 - cut nail, 4d
3 - cut nail, 6d
1 - cut nail, 8d
1 - cut nail, fragment

Category: Miscellaneous

2 - slate sherds
1 - hard rubber ferrule of pen holder; cylindrical 4 · 5mm in length, 0.8mm in diameter

Category: Faunal

1 - canine (species: Sus)

Provenience: 7R7

Category: Ceramics

Ware: Stoneware

1 - sherd, lead glaze (brown)

TABLE 2 (Continued)

Category: Glass

Class: Beads

1 - aquamarine, "hollow cane" type bead, non-faceted
1 - peach color, spherical bead, molded (?)

Class: Bottle

1 - milk glass sherd, lid insert

Category: Metal

Class: Miscellaneous

1 - cast iron fragment, rectangular
1 - plated ring, hollow

Provenience: 5R8 - 6R8 - 7R8 - 9R8 - 10R8

Category: Ceramics

Ware: Earthenware

4 - unslipped sherds, red paste

Ware: Stoneware

1 - sherd, salt glaze
3 - sherds, lead glaze (brown)

Ware: Whiteware

1 - basal sherd, undecorated

Category: Glass

Class: Bottle

1 - neck fragment, packer lip, clear
1 - rim fragment, clear glass
3 - soda-lime, sherds

Category: Metal

Class: Nails

1 - cut (?) nail, 7d (finish)

Class: Miscellaneous

1 - shotgun shell base, "REM UMC"
1 - fastener, eye-loop

Category: Miscellaneous

1 - brick fragment

TABLE 2 (Continued)

Provenience: 5R11 - 8R11; 6R11 - 9R11; 7R11, 10R11, 11R11

Category: Ceramics

Ware: Whiteware

2 - transfer print, floral, pastel palette, embossed rim
1 - red and green "spatterware" (1840-50's) sherd
1 - "flow blue" sherd
2 - banded, hand-painted, sherds
7 - undecorated sherds

Ware: Stoneware

6 - salt glaze sherds
3 - lead glaze, sherds (brown)
1 - lead glaze sherd, red paste

Category: Glass

Class: Bottle

1 - neck fragment, machine mold (ca. 1900), clear glass
1 - shoulder fragment, applied lip (ca. 1880), soda-lime
3 - sherds, soda-lime
1 - sherd, "black glass"
1 - stopper fragment, clear
1 - basal sherd, embossed with EL(?)P, soda-lime glass
4 - sherds, clear glass
1 - sherd, cut glass
1 - milk glass sherd, lid insert

Category: Metal

Class: Nails

8 - cut nails, 3d
3 - cut nails, 4d
2 - cut nails, 5d
8 - cut nails, 6d
1 - cut nail, 7d
1 - cut nail, 8d
1 - cut nail, 20d
5 - cut nail fragments
2 - wire nails, 6d
1 - wire nial, 8d
1 - wire nail, 5d
1 - wire nail, 4d (shingle)

Class: Miscellaneous

1 - tug-iron, 2 unidentified pieces

TABLE 2 (Continued)

Category: Faunal

3 - bone fragments

Category: Miscellaneous

1 - brick fragments
4 - rocks
1 - coal fragment
2 - unidentified

Provenience: Unknown

Category: Ceramics

Ware: Whiteware

18 - undecorated sherds
1 - hand painted, gilt edge sherd
1 - lavender transfer print, floral
1 - hand painted, rouletted sherd, green
1 - floral, pastel palette, transfer print
2 - hand-painted (?), brown over glaze sherds
1 - porcelian cup sherds

Ware: Stoneware

10 - lead glaze sherds, butt paste
3 - salt glaze sherds
1 - alkaline glaze (?) sherd
1 - lead glaze, red paste sherd
1 - red paste fragment

Category: Glass

Class: Bottle

13 - soda-lime sherds
3 - milk glass sherds
1 - hand painted milk glass sherd
2 - brown sherds
16 - clear glass sherds

Category: Metal

Class: Nails

2 - cut nail, 3d
5 - cut nails, 4d
1 - cut nail, 5d
5 - cut nails, 6d
7 - cut nail fragments
3 - wire nails, 2d
5 - wire nails, 7d
1 - wire nail, shingle

TABLE 2 (Continued)

Class: Bolts

1 - wood screw, 3d

Class: Miscellaneous

1 - buckle, brass
1 - cotter pin
1 - lock section
1 - Mason lid
1 - can lid
1 - unidentified wire fragment
1 - button "F1T2"
1 - barrel rim strap (?)

Provenience: Unknown 10R1 (?) Box 1

Category: Ceramics

Ware: Whiteware

6 - undecorated sherds

Ware: Stoneware

3 - salt or alkaline glaze sherds

Category: Glass

Class: Bottle

2 - clear glass sherds

Category: Metal

Class: Nails

1 - cut nail fragment

Category: Miscellaneous

1 - rubber fragment

Provenience: Unknown 10R1 (?) Box 2

Category: Ceramics

Ware: Whiteware

1 - flow blue sherd
1 - undecorated sherd

Category: Glass

Class: Bottle

4 - clear glass sherds
2 - milk glass sherds

TABLE 2 (Continued)

Category: Metal

Class: Nails

1 - cut nail, 4d
1 - wire nail, 8d
4 - nail fragments

Class: Miscellaneous

1 - buckle

Category: Miscellaneous

1 - turtle carapace plate
1 - hard rubber fragment

Provenience: Unknown 10R1 (?) Box 3

Category: Ceramics

Ware: Whiteware

2 - undecorated sherds, one heavily burned

Ware: Stoneware

1 - lead glazed sherd

Category: Glass

Class: Bottle

2 - manganese glass sherds
1 - soda-lime glass sherd (melted)

Category: Metal

Class: Nails

3 - cut nail fragments

Category: Miscellaneous

3 - rocks

Provenience: Unknown (Sack label: Omaha Calcite)

Category: Ceramics

Ware: Whiteware

1 - undecorated sherd

Category: Glass

Class: Bottle

1 - sherd, basal

TABLE 2 (Continued)

Category: Metal

Class: Miscellaneous

1 - unidentified

Category: Prehistoric

Class: Lithic

1 - corner notched projectile point
1 - Dalton-like projectile point
1 - calcite fragment

Other:

12 fragments of chinking

21 bone fragments, non-human, splintered, cut

miscellaneous non-provenienced wire and cut nail fragments

1 hand painted, banded (green) whiteware sherd

Beaubien's analysis of the recovered artifacts was directed at the identification of structural remains and chronological indicators such as clay pipes, early ceramics and the like.(Beaubien and Mattes 1954:21-2). In this he was successful. There can be no doubt that the materials recovered in the 1953 excavations are chronologically and typologically related to the early cabins of Moses Carver.

The re-study of these artifacts was directed at categorizing the materials in light of 26 years of historic archaeological studies, particularly in regard to ceramics. Typologically, the understanding of the distribution of 19th century earthenwares on the frontier is better today than it was in Beaubien's day. Studies such as South (1972), Lofstrom (1976) and Price (1979) have heightened our understanding of the distribution of these wares in Frontier contexts.

Another good indicator of cultural context and chronology is the distribution and kind of bottle forms. Beaubien was most probably aware of these forms as many excellent studies existed for perusal in the 1950's.

Structural indices such as brick, window plate, chinking, and nails were present and appreciated by Beaubien as indicated by his understanding of cabin construction (in Fuller-Mattes 1957(1):24).

Re-Study Conclusions - The predominant portion of the artifacts fall within the broad categories of: ceramics, glass and metal. Faunal remains were found but only given a cursory treatment. These latter items deserve a more thoughtful study by a specialist in zooarchaeology.

Within the category of ceramics, two wares predominate: stonewares and glazed earthenwares such as whiteware. The stonewares found were certainly products of frontier industries. The variety of stonewares evident were salt and lead glazed wares (see Plate 6).

PLATE 6

Selected artifacts, 1953 Collection.
Row 1 (top): two aboriginal projectile points; a ring and two beads; remains of a blade (metal).
Row 2: three pieces of stoneware; (left to right) lead glazed, salt glazed, unglazed.
Row 3 (bottom): two stoneware sherds and chinking fragment.

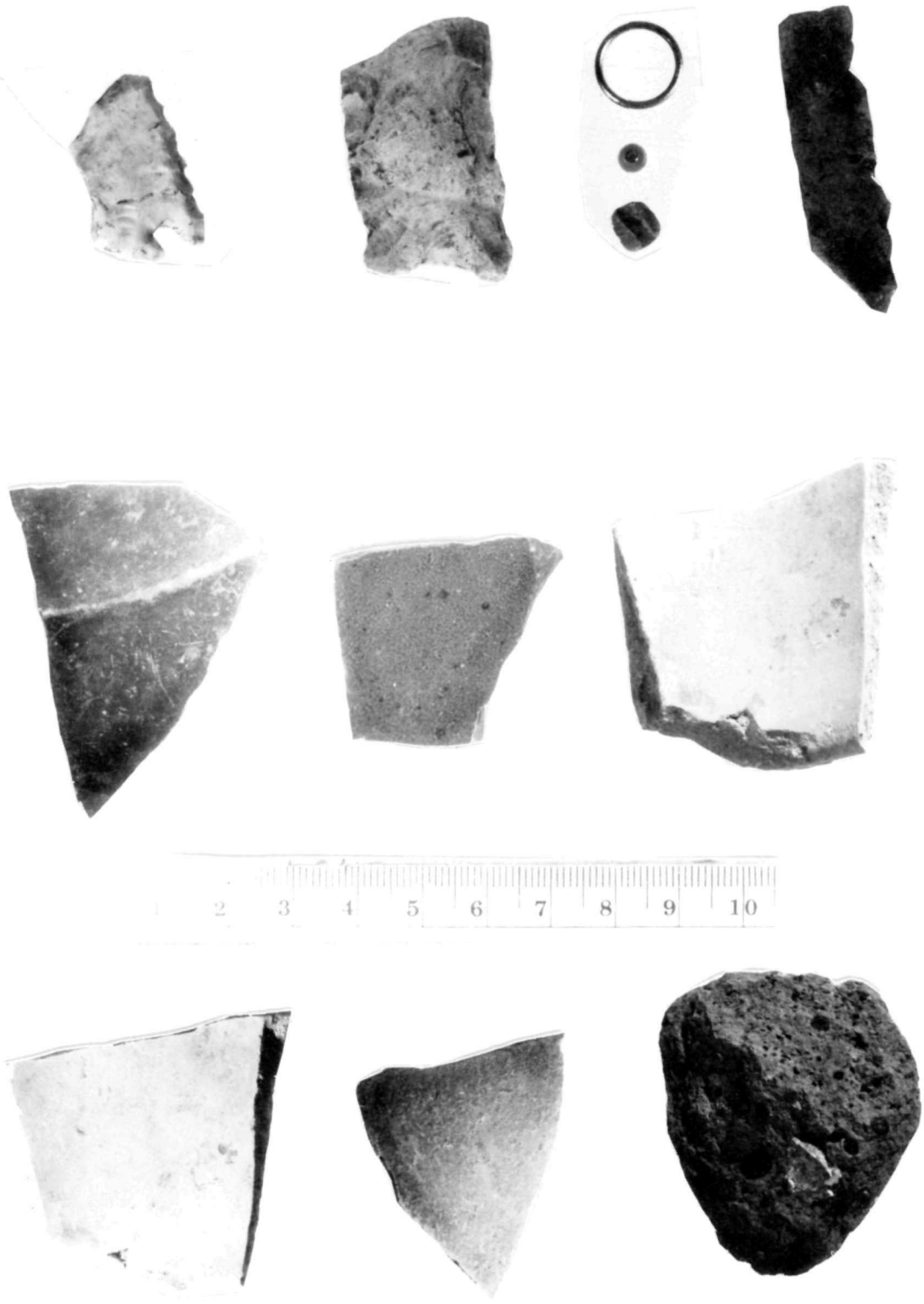

1 2 3 4 5 6 7 8 9 10

PLATE 7

Selected metal artifacts, 1953 collection.
Row 1 (top): unidentified cast iron; tug iron, wrought iron.
Row 2: harness buckle; belt buckle; blade fragment.
Row 3 (bottom): fasteners; cotter pin; cut nails (4d - 10d); one wood screw.

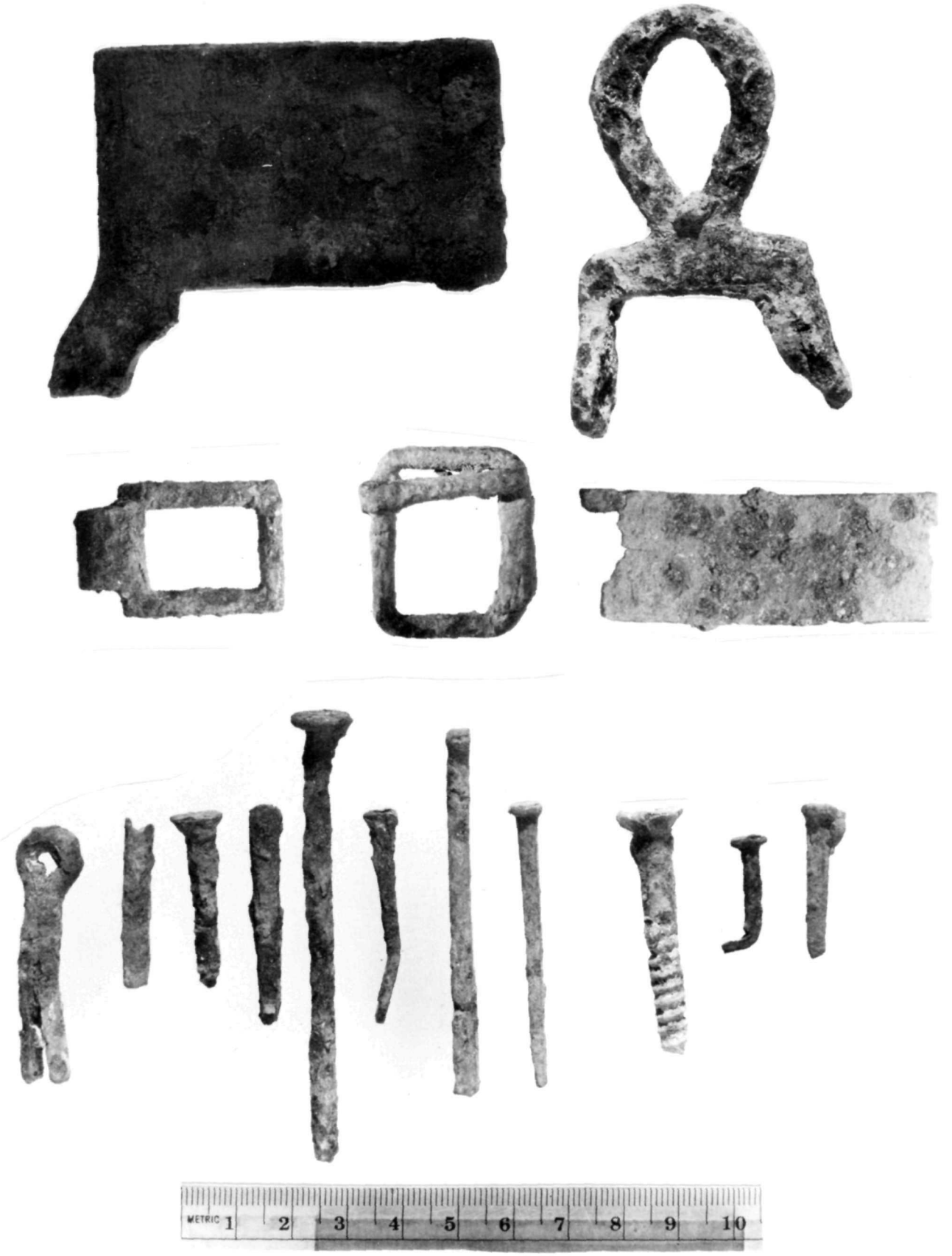
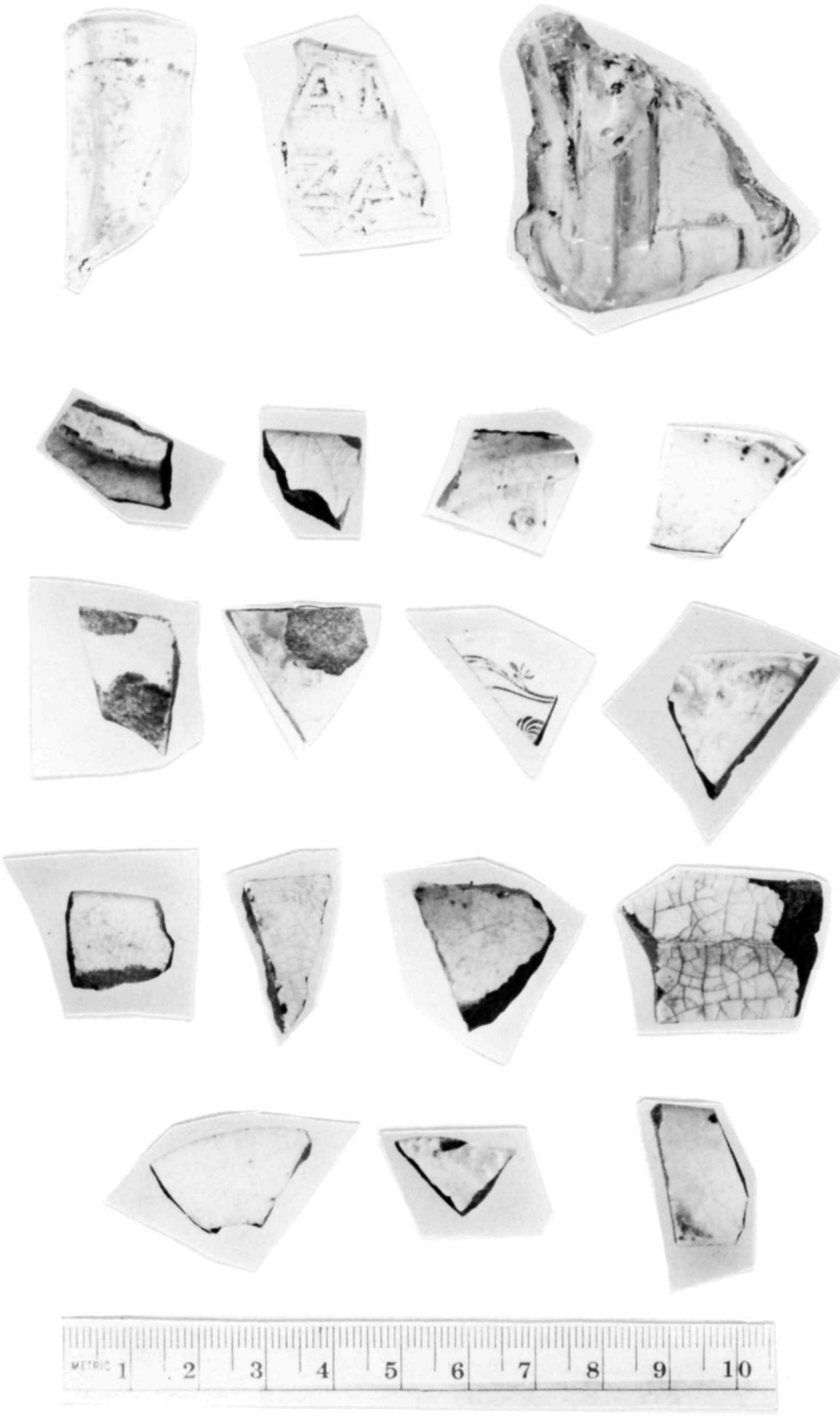

METRIC 1 2 3 4 5 6 7 8 9 10

PLATE 8

Selected glass and ceramic artifacts, 1953 collection.
Row 1 (top): mold blown bottle neck with cut lip; embossed sherd; paneled bottle, mold made.
Row 2: whiteware sherds; two footring sherds; one plain edge sherd; one annular edge sherd.
Row 3: two whiteware sherds, plain; one gilt painted sherd, paint overglaze; one embossed edge sherd.
Row 4: various whiteware sherds, plain ware.
Row 5 (bottom): two plain edge sherds; one embossed sherd (whiteware).


METRIC 1 2 3 4 5 6 7 8 9 10

The slipped earthenwares were generally undecorated as a rule. Those that were decorated reflected techniques and designs common to the mid-nineteenth century; annular, "sprig," spatter or sponge, transfer printed, and "flow-blue" designs the rule. The hand painted wares were in a minority. The palette reflected in the whitewares varied but showed preference for darker tones such as blue or green. Pastels were present but again were the exception. The presence of iron stone and porcelain sherds indicate an occupation into the latter nineteenth century (see Plate 8).

Analaysis of the glass fragments, particularly the bottle remains, support the results of ceramic analysis. Soda-lime glass, notably green although not "black" glass predominated in the collection. Brown sherds of bottles indicated the presence of medicinal containers and perhaps the ubiquitous bitters bottle. Again the overall picture indicated by the glass remains points to a middle nineteenth century occupation of the site. The primary index of this chronological assignation is a comparison of mold seams, lip characteristics, base characteristics and color. For a bottle to be pre-1860 implies a free-blown piece with pontil marks, little embossing, no mold seams, cut or appliqued lips, and dark colored, either green or brown. Few sherds found by Beaubien fit these criteria although a few "black glass" sherds were found together with one pontil marked base. The spectrum of glass bottle sherds included a continuum of evolutionary features in glass bottle design. The transition from free blown to mold blown to machine made bottles is seen quite clearly. The change in the color of bottle glass, from dark hues of green and brown to light green or clear types is seen.

The other glass forms other than bottles (jar lid inserts, drinking glass fragments, and vessel sherds) are typical of a rather utilitarian, nineteenth century glass technology.

The metal artifacts were predominately cut nails. The analysis of their distribution of sizes indicate the gamut of nails from finish to common. The variety and number found confirms Beaubien's conclusion that a domestic structure or structures existed where he dug. In structures such as cribs and barns, fewer finish and light fastening sizes are seen (Plate 7).

An interesting aspect of the nail analysis concerned the preservation and form of the various nails. Generally, the nails were not heavily corroded and straight. The bent forms seen generally were clinched at some time in the past. A pulled nail is rarely straight so the demise of the cabin or cabins may have involved fire wherein the nails would be somewhat "case-hardened" and non-bent when they went into the archaeological deposits that Beaubien found.

The remainder of the artifacts such as iron pins, utensils, faunal remains, coal, and chinking are all typical of a domestic log dwelling or dwellings.

Summary

The results of this most recent archaeological study at George Washington Carver National Monument can be summarized as follows:

(1) the shovel testing produced no new evidence of aboriginal sites along the principal streams on the Monument;

(2) convergence of previous magnetometric surveys (Weymouth 1976), the surveys done during this study, together with metal detector survey results clearly defined magnetic features at 23NE120 and 23NE121. These features are interpreted as

a. 23NE120 - a house and a barn

b. 23NE121 - a house, a barn, and an outbuilding (crib?);

(3) inorganic phosphate testing done during the recent study demonstrated further that the magnetic anomalies were associated with occupation features;

(4) re-study of the 1953 excavation materials only strengthens Beaubien's interpretation of the assemblage as that of the original dwellings built by Moses Carver.

Recommendations concerning the cultural resources on the Monument all derive from a conservation attitude on the part of the investigators. Surely more artifacts and information can be obtained by excavation at 23NE120, 121 and 122. The question to be asked now is whether one should dig further destroying all or part of the remainder of cultural resources on the Monument. In the opinion of the present investigators, further work would be counterproductive except maybe in the case of the root cellar at 23NE120. Certainly the recent studies, done mainly by instrumental and chemical means, have located the buried structural features at the historic sites across the monument. Interpretative programs could be constructed around these new data that would enhance the historical nature of the Monument without detracting from its primary objective, the commemoration of Dr. Carver's birthplace.

References

Beaubien, P.L.
1953 Report of Archaeological Investigations, George Washington Carver National Monument, 1953. Manuscript on file with the National Park Service, Omaha, Nebraska.

Beaubien, P.L. and M.J. Mattes
1954 "The Archaeological search for George Washington Carver's birthplace," Negro History Bulletin, Vol. XVIII, No. 2, pp. 22-38.

Chapman, C.H.
1975 The Archaeology of Missouri, Vol. 1. Columbia. The University of Missouri Press.

Fuller, R.E. and M.J. Mattes
1957 The Early Life of George Washington Carver, Part I. Manuscript on deposit at Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.

Garrison, E.G. and R.T. Bray
1976 Archaeological Investigations at George Washington Carver National Monument, 1975-76. A report by the American Archaeology Division, Department of Anthropology, University of Missouri-Columbia on file at the Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.

Lofstrom, W.A.
1976 An analysis of temporal change in a nineteen century ceramic assemblage from Fort Snelling, Minnesota. The Minnesota Archaeologist, 35(1), pp. 16-47.

Price, C.J.
1979 Nineteenth Century Ceramics in the Eastern Ozark Border Region. Monograph Series: Number 1. Center for Archaeological Research, Southwest Missouri State University, Springfield.

South, S.
1972 Evolution and horizon as revealed in ceramic analysis in historical archaeology. The Conference on Historic Site Archaeology Papers, 1971, edited by Stanley South, Institute of Archaeology and Anthropology, University of South Carolina.

Sjoberg, A.H.
1976 Phosphate analysis of anthropic soils. Journal of Field Archaeology, Vol. 3(4), pp. 447-454.

Weymouth, J.
1976 A Magnetic Survey of Portions of the George Washington Carver National Monument. Manuscript on deposit at Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.

COMPARISON AND CONTRAST OF SEVERAL METAL CLEANING TECHNIQUES

DAVID DENMAN

INTRODUCTION

All the identified artifacts from the G.W. Carver sites were associated with activities common to life on small Ozarks farms of the late 19th and early 20th centuries. There are none which indicate special, or highly specific activities or crafts. Also, a fairly large percentage are simply fragments of iron which defy functional identification. Certainly, none of them are "museum quality" in the sense in which one usually thinks of museum specimens.

In view of the nature of the artifacts, and the fact that they were obtained at sites unassociated with the main theme of the park, it was decided that no useful purpose would come from carrying each artifact through indicated conservation techniques. Instead, a project was devised which involved the comparison and contrast of various conservation techniques applied to appropriate specimens selected from the different categories of artifacts. It was thought that this approach would be of greater value than simply a repetitious exercise involving each and every object regardless of its identification, physical condition, and potential for contributing to the success of the experiment. Thus, not every object was subjected to conservation procedures. Those that were not, in time to come, will provide control specimens to compare with those that were so treated.

In short, the approach held promise of revealing the best conservation procedures or combination thereof to be used on objects destined for museum display; for study specimens; and, simply for stabilization against further deterioration.

This report is concerned with the comparison and contrast of various methods for the cleaning of ferrous metal artifacts. The particular list of methods employed is by no means complete; however, two of the most widely recognized methods, electrolytic reduction and mechanical sand blasting, were used. One wholly new chemical reduction approach, ammoniacal citric acid was used in illustration of chemical techniques of metal cleaning. All of the above procedures, as well as the treatment after cleaning, are detailed so as to allow precise replication.

Cultural materials used as subjects were recovered from the Gilmore farm (23NE120), and Williams farm (23NE121), farmsteads occupied from the mid to late nineteenth century. Both are located on the George Washington Carver National Monument, in Newton County, Missouri. The artifacts were recovered during a metal detector survey conducted on the two farm sites in 1976 (Garrison and Bray, 1976).

First, it should be explained just what "cleaning" a ferrous metal object means. In short, it means removing rust from the surface of a corroded piece of cast iron or steel.

Rust is a by-product of the corrosion of ferrous metals, and is composed of ferric hydroxides in the initial reaction time, and with the passage of time it becomes simple ferric

oxide. Obviously, as the term implies, oxygen is an element in the formation of rust. Together with moisture, oxygen reacts on the metal and begins the decomposition process. This process is applicable to artifacts lying at or near the surface. The situation is complicated when ferrous metal is placed in proximity to salts naturally occurring in the soil. Salts rapidly accelerate the decomposition of iron and steel. The presence of salts create an electro-chemical environment, turning certain areas of the object into anodes and cathodes. This reaction creates the "pitting" of the surface commonly found on artifacts recovered archaeologically. If nothing is introduced to remove the salts, which would terminate the electro-chemical reaction, an artifact may rapidly mineralize completely leaving absolutely no metal core under the encrustation.

The artifacts from the Gilmore and Williams farm sites were subjected to the action of salts, but the severity was never to the extent of complete decomposition.

The cleaning of a ferrous metal artifact is the removal of rust to reveal what remains of the metal core, and even more importantly, must include the removal or neutralization of salts present on the object. In this project the neutralization of salts was accomplished by painting artifacts with a rust retardant. In this case it was the commercially available, Rust-Oleum. This coating was allowed to dry over a 24 hour period. About five minutes of vigorous sanding with 000 steel wool re-exposed the high parts of the surface, but left untouched the pits where the salts were accumulated.

Plate 9

Conservation of Iron Artifacts, Four Steps. (right to left) a: untreated; b: electrolytic reduction 12 hours plus wire brushing; c: coated with flat black Rust-Oleum and buffed with 0000 steel wool; d: sealed with Rust-Oleum Clear acrylic.

This coating was allowed to dry over a 24 hour period. About five minutes of vigorous sanding with 000 steel wool re-exposed the high parts of the surface, but left untouched the pits where the salts were accumulated. Immediately upon completion of this stage, the artifact was coated with a clear acrylic paint. This serves to permanently seal the surface of the object, effectively rendering the artifact impervious to contact with oxygen, moisture, or salts. Plate 9 illustrates the process step by step.

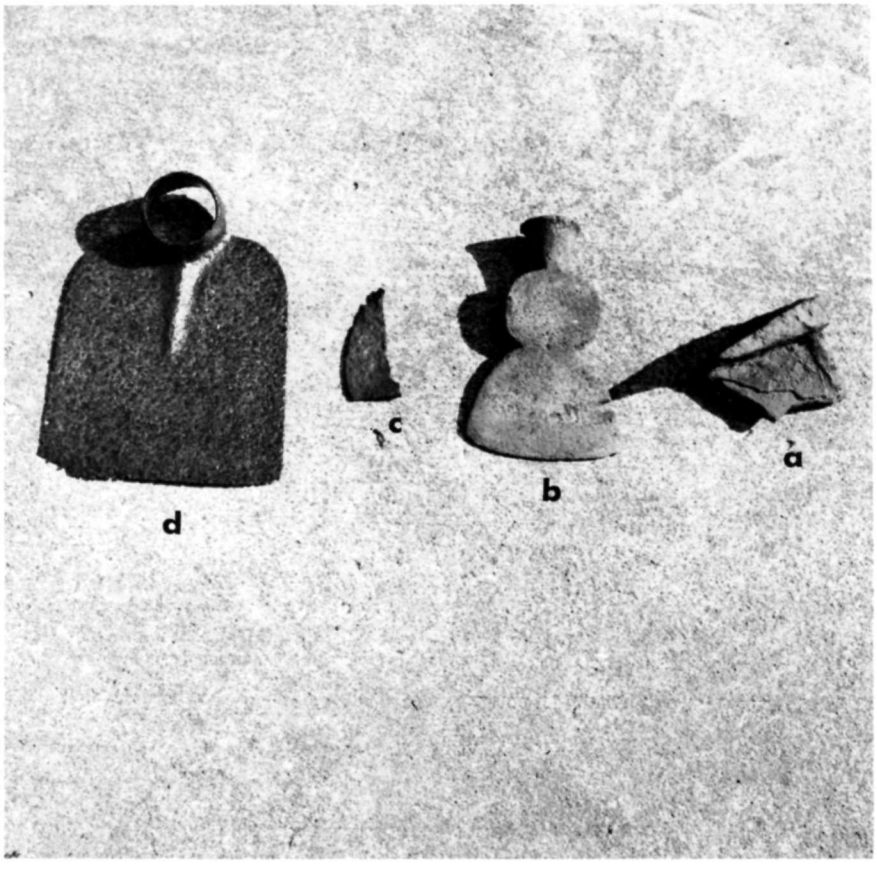
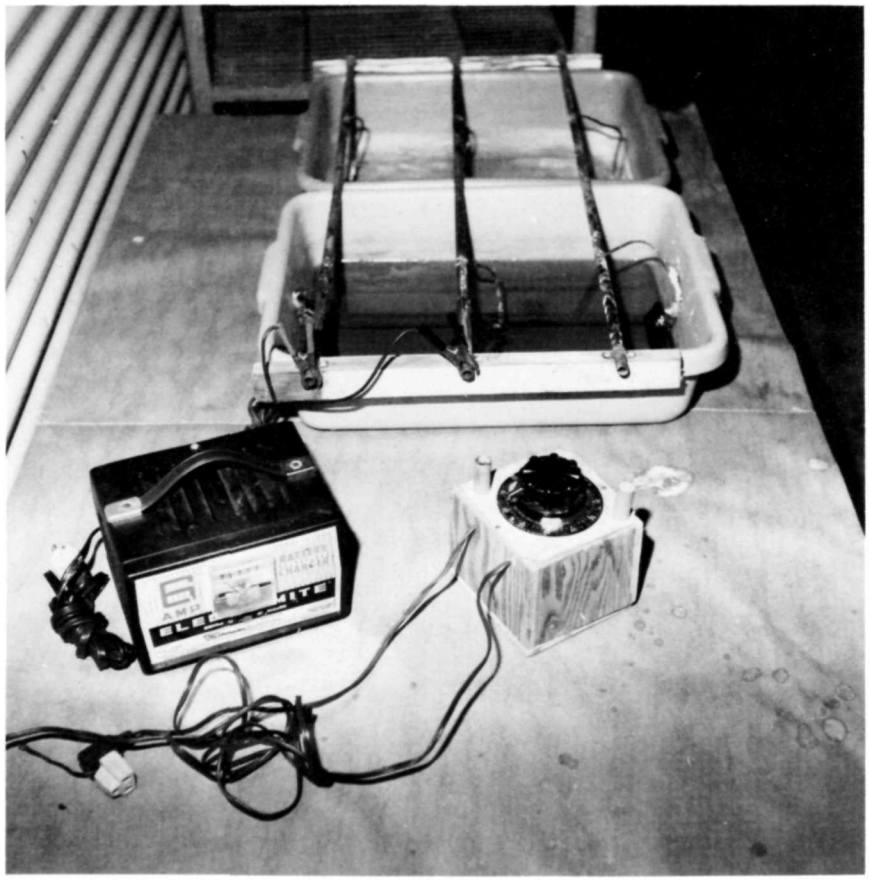


Plate 10

Electrolytic Reduction Apparatus in use at the Lyman Archaeological Research Center. Left foreground: 12-volt battery charger, with ammeter. Right foreground: variable transformer; Background: cleaning vats containing electrolyte (water solution of sodium hydroxide).

The first cleaning method to be discussed is possibly the most popular--electrolytic reduction. Basically, this involves the passage of electrical current through the object while it is immersed in an electrolyte. The object to be reduced is made the negative electrode, and two iron plates also in the bath become the positive electrodes. The current passes through a tank full of electrolyte, which in this case was a five percent solution of caustic soda (one part lye to twenty parts of water). Plastic trays were used successfully as reducing vats. See Plate 10 for illustration of the set up used for this study.



The electric current must be direct rather than the alternate current from an ordinary wall outlet. The current was stepped down and rectified by using a 12 amp battery charger. A small variable transformer was hooked into the electrical circuit in order to control the density of the current to approximately 3.5 to 4.0 amperes. The current passing through the object releases hydrogen gas in the process of removing accumulated oxides. Electrolysis has the added benefit of dissolving salts during the process.

It is imperative that the negative pole clip is in direct contact with exposed metal on the artifact to be cleaned. This means a careful mechanical cleaning of a small spot on the object.

Generally it takes from 6-8 hours to complete the reduction of rust from the surface of the artifact. The next step is to wash the object throughly and allow it to air dry. While the artifact is held under running water it is vigorously brushed with a steel wire brush to remove sludge and rust scales which might still be adhering to the surface. The microporous surface of the cleaned metal will still retain chloride salts, which are extremely difficult to remove. To obviate the danger of renewed corrosive action, the artifact is given a coating of a rust inhibitor as soon as it is throughly dry.

Another popular cleaning method is the mechanical process using an air abrasive, commonly known as sand-blasting. Using compressed air, generally between

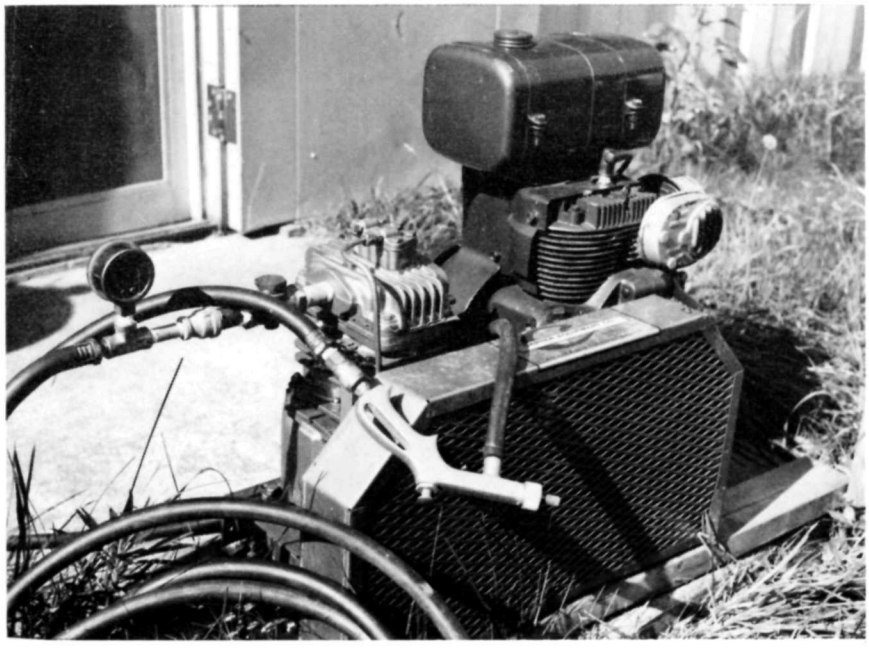
Plate 11

Air abrasive apparatus in use at Lyman Archaeological Research Center. Gasoline powered air compressor, connecting hoses, and pistol-grip nozzle.

60-80 psi's and is forced through a controlled nozzle at the object to be cleaned. The sand physically removes scaly rust, and cleans the surface of mineral deposits, leaving the solid metal beneath. It takes anywhere from five to ten minutes to clean an artifact of approximately seven centimeters square. But this is a highly variable time frame. Many artifacts with multiple surfaces, angles, etc..., will take much longer.

Common sand is not the only abrasive available for 'sand-blasting'. Flint shot, glass beads, and carborundum may all be used in the same manner, each with its own qualities. These will be discussed later in this paper.

A six and one half horsepower gasoline engine was used in conjunction with a commercial air compressor to achieve air pressure. The air was forced into two holding tanks so that it would not be necessary to run the compressor at all times. See Plate 11 for illustration of apparatus.



Ammoniacal citric acid was used to chemically remove rust from the surface of the artifacts. To produce one half gallon, five and one half grams of ammonia is added to fifty grams of powdered citric acid. This is then mixed in water to make a five percent solution. The artifact (or artifacts) are placed in a pan and enough of the solution is added to cover entirely. The pan is then heated to between 130 and 160 degrees F. For iron and steel the cleaning action can take up to twelve hours, and sometimes longer dependent on the artifact. Copper is cleaned in about two to three hours. The artifact must be throughly washed after removal from the chemical solution. At the same time they were individually scrubbed very heavily with a wire brush for several minutes.

Artifacts cleaned by this method must be dried rapidly. In some cases, acetone was applied to speed up the process. Surface rust will be initiated if allowed to sit for as long as an hour. As soon as the artifact was free of moisture a coating of rust inhibitor was immediately applied.

One highly visible commercial rust remover, Naval Jelly, was used in comparison to the other techniques. The application involved simply brushing on the solution and allowing it to sit for three or more hours and then washing it off.

EFFICACY, COMPARISON AND CONTRAST OF VARIOUS CLEANING METHODS

Electrolytic reduction was, with a few reservations, the best employed vehicle for cleaning ferrous artifacts. The requisite equipment can be obtained virtually anywhere for under 75 dollars, and is easy to set up. But its greatest advantage is that there is little need for supervision once the artifact is placed in the bath. Thus the investment in time and money necessary for this procedure is small.

For the majority of ferrous artifacts recovered archaeologically, electrolytic reduction is sufficient, and in this authors' opinion, there is no need to employ other cleaning procedures. However, this is describing the ideal, and few real life laboratory conditions conform perfectly to this ideal. In short, electrolytic reduction has its problem situations where other techniques alone, or in combination, are better employed.

The first and most simple exception to the ideal is that in which an artifact has many convoluted surfaces, holes, or any other metal surfaces difficult or impossible to reach with conventional wire brushes for post-electrolysis cleaning. It is imperative that these areas be cleaned of loose rust scales and reduction residue as they contain salts which will ultimately reactivate the decomposition process, and prevent the rust inhibitor solution and acrylic finish to adhere to the metal surface. To remedy

this problem the sand blast apparatus was engaged to reach these difficult areas.

Another problem rectified through the use of the air abrasive equipment was concerned with ferrous artifacts that were particularly heavily corroded. Electrolysis is dependent upon direct metal contact with a small part of the artifact surface. Many times the simplest expedient was to scrape a section with a screwdriver and expose a portion of the metal. Unfortunately, this frequently left permanent scratch marks on the artifact. Naturally, for an artifact potentially destined for display this is not recommended. Many other types of artifacts do not lend themselves to such gross manipulation--specifically, fragile steel knife blades, tin cans, decorated metal surfaces, etc. In each of these cases the sand blast equipment was employed to clean a small spot to connect the negative pole clip in the electrolysis bath.

A greater problem is encountered when dealing with a multiple component artifact. What is meant by this is, for example, a horseshoe with several shoe nails still attached, or a piece of machinery with nuts and bolts inserted. But perhaps more common on nineteenth century agricultural sites are chains with many links and attachments such as link pins, harness rings, tug iron, etc. Twenty percent of the artifacts from the Gilmore and Williams farm sites were one of more pieces of iron attached to one another. One section of chain contained ten links

and a link pin. The inherent problem with artifacts of this type is that electrolytic reduction can accomodate only one piece at a time since there is an inevitable layer of oxidation between the parts through which the current will pass only imperfectly. The length of time required to clean many of this type of artifact is quite unreasonable if there is an acceptable alternate at hand. Chemical reduction is the obvious answer for it is not restricted by the necessity of having a clean metal contact point to insure cleaning action. Ammoniacal citric acid, used as described previously, was used with complete success on multiple component ferrous artifacts.

Small metal artifacts may be cleaned by electrolysis with complete success, of course however, there is a quicker method. Once again, the chemical method gives good results. The advantage in the use of the latter lies in the option of placing numerous smaller objects in the chemical solution, rather than affixing each artifact to an electrode as required in electrolysis. Obviously, it is quicker and much easier to resort to chemical reduction in this situation.

Sand-blasting as a prime method of cleaning ferrous artifacts is, in this authors' opinion, unacceptable. Cleaning an iron or steel artifact with the usual rust accumulation is entirely too labor and energy intensive to be of widespread utility. It requires the total active

participation of the conservator, and the constant operation of the gasoline engine powered compressor to clean an artifact. To circumvent the latter, two empty 20 gallon propane storage bottles were used as holding tanks, but without success. Their volume was not sufficient to allow efficient use. Compressed air was bled out at too rapid a rate to maintain effective pressure. But the primary argument against the air abrasive process is the heavy investment of man-hours relative to other available alternatives. About twenty artifacts could be cleaned in about the same amount of time as two using electrolysis, however, it only takes fifteen minutes in pre-and-post electrolysis handling, as opposed to total participation of the conservator in using the sand-blaster.

The effectiveness of the air abrasive process is also dependent on the abrasive used. White sand was cheap ($.03/lb.), but unfortunately the least effective abrasive. It took nearly four minutes to clean a flat iron surface two inches square. Carborundum, the most expensive ($1.75/lb.) took just over two minutes. Flint shot, also three cents a pound, took less than three minutes. All three abrasives were used at between 60-80 psi air pressure.

Added to the time and energy requirements is the larger cost needed to set up for this procedure. The gasoline engine and compressor used in this project cost 325 dollars. Total cost for rubber pressure lines, gun, abrasive receptacle,

etc., was approximately 80 dollars. Another element not used by the author, but recommended for anyone in the future, is a shot closet. This is a closed, controlled, box that allows the recycling of abrasive materials, and eliminates the need of protective garb for the conservator while operating the blaster.

Sand blasting has its use despite its poor rating as the primary cleaning agent. Two important uses for it were detailed in conjunction with electrolytic reduction. Another is its value in post cleaning treatment. Abrading the surface of the metal object after electrolysis or chemical reduction leaves it with a cleaner, polished appearance. Glass beads, used as an abrasive, provide a burnished surface, which is particularly effective on steel and copper. It also is useful in clarifying decorative detail and stamped lettering on a metal surface. The effect rendered by use of the air abrasive as a secondary cleaning agent is desirable for metal artifacts intended for museum display. But if strict conservation of the artifacts is the sole consideration, then it would be superfluous to treat the artifacts in the above manner.

Ammoniacal citric acid is not recommended as the primary cleaning method, but it is a superior process in certain given instances, making it an invaluable adjunct to electrolytic reduction of ferrous materials. These situations were described under the section dealing with

electrolysis. Briefly, chemical reduction, via ammoniacal citric acid, was found superior with multi-component artifacts, and for large quantities of small metal artifacts.

Larger ferrous objects were treated (5 cm. - 15cm.) with success. The disadvantages are relative. The time required is much greater for reduction in ammoniacal citric acid, approximately 12 to 18 hours, opposed to 6 to 8 hours for electrolysis. The former method requires periodic checking to maintain heating temperature, and to insure total liquid coverage to make up for the inevitable evaporation factor. Moreover, the liquid solution is spent after each reduction period. Wholesale cleaning of a large number of artifacts would require a tremendous quantity of the solution. Heating a large receptacle at 140-160 F. would also represent an inordinate energy input. Electrolytic reduction is a much more acceptable method for cleaning artifacts larger than approximately five centimeters.

Ammoniacal citric acid cleans copper exceptionally well, and is recommended for all sizes of copper objects. The reason for this is that it does not require heat to speed the reaction. It was found that a maximum of two hours was all that was needed to clean the limited number of copper artifacts in the George Washington Carver collection (one copper ring, 5cm. in diameter, one copper shotgun cartridge, ten fragments of a copper wash board most of which were less than 5cm. in length and width). After reduction the copper is left with

a bright metallic surface with very little surface residue. This is more than can be said for electrolytic reduction which usually deposits a black sludge on the copper artifact necessitating vigorous mechanical action after removal from the electrolyte.

Other advantages exist for the ammoniacal citric acid. Its cost is incredibly small. A gallon of solution costs around 40 cents to produce.

Another side benefit is that there is no risk in direct skin contact with the solution. The caustic soda electrolyte causes skin burns after prolonged contact.

Naval Jelly was tried as an additional chemical reduction method. It was found to be totally inadequate to the job of cleaning the heavy corrosion deposits on most of the ferrous material from the George Washington Carver collection. Instructions on the jar indicate that for heavy rust the jelly should be thickly applied and allowed to sit for several hours. After just two hours the water based jelly had evaporated from the surface, and a fresh application made. Even after twelve hours only a small amount of the rust was removed. For light rust deposits Naval Jelly was partially effective.

It also acts as a rust inhibitor, and thus can conceivably be used as a post cleaning treatment, however, it leaves an unsightly opaque film which makes it inferior to the flat black Rust Oleum rust inhibitor used in this study.

CATALOGUEING SYSTEM USED WITH GEORGE WASHINGTON CARVER ARCHAEOLOGICAL MATERIALS

Iron objects from archaeological contexts often do not lend themselves as conveniently as some others to direct application of catalog numbers. If the object is not cleaned, the rust scales and indurated earth effectively prevent numbering directly on the specimen. In such instances, numbers may be applied to a cardboard tag, and the tag tied or wired to the object. This is not a very good way, however, because tags become tangled and eventually come off. A better way is to contain the object in a bag and write the catalog number to the outside, along with a brief description of the object. This allows examination of the object without confusion of context--provided reasonable care is exercised. It obviously cannot be used with objects set aside for museum display.

The bag method was used with a number of the G.W. Carver specimens--specifically, those which were not among those chosen for conservation.

All objects that were cleaned emerged from the proceedure with eroded, pitted and dark-colored surfaces. It was necessary to provide both a smooth and color-contrasting surface on which to print the catalog number. This was done by painting on a rectangular swatch of porcelain enamel; allowing it to dry; then, writing a catalog number on the opaque, white, background. This worked well on most specimens, but a few enamel swatches resisted the ink, which tended to ball up on the surface. Presumably, this was caused by the complete lack of porosity of the enamel.

The catalogueing system itself, is a minor modification of the one in general use at the Lyman Archaeological Research Center-UMC. It employs the official numbering system of the Archaeological Survey of Missouri. The same number appears on the artifact as on the site record (ASM Survey form) on file with the Survey.

Each artifact recovered from the metal detector surveys was given a field number. These designations along with artifact identifications are listed in Archaeological Investigations at George Washington Carver National Monument 1975 (Garrison and Bray 1977: 15,16,21). Correspondingly, each artifact was given a permanent catalog number in the laboratory to facilitate their storage, future retrieval and differentiation from other collections. The first two numerals (76) refer to the year in which the materials were recovered. The numbers following are consecutive enumerations of the entire collection. This number, together with pertinent information regarding each artifact was recorded on a 5 by 8 inch card (Figure 7).

The site number, from the Archaeological Survey of Missouri files, together with the site name are given at the head of the card. Information relevant to the recovery and formal recording of the artifact are given on the second and third lines: The field number, method of recovery (in detector survey), the date the artifact was recovered, and finally, the published report reference that deals with the interpretation of the artifact context.

The artifact description follows, beginning with the classification category, which for most of this collection was: METAL, followed by iron, or less frequently, steel or copper. Identification of the use and function of the artifact was made on the following line. If the identification was positive, as, for instance, "horseshoe," then nothing was recorded under 'description' unless there was something to distinguish it from others. If use and function were indeterminate then the identification line was left blank, and a rough description was made in the appropriate space. A line drawing of the artifact was made should the artifact prove to be noteworthy in some fashion.

The extent of conservation of the artifact was placed on the reverse of the card. This record is relevant to metal artifacts alone, listing the method of cleaning, and subsequent treatment of the object.

Figure 7

Sample Catalog Card used for
G. W. Carver Collections

ASM NO. 23NE120 SITE NAME Williams CATALOG NO. 76-15

FIELD NO. WW-10 HOW OBTAINED Metal Detector Survey

DATE OBTAINED March '76 REPORT REF. Garrison & Bray 1976

CATALOGED BY David Denman DATE July 8, 1979

CLASSIFICATION METAL, Copper DETERMINED BY RT Bray

IDENTIFICATION Washboard BY RT Bray

DESCRIPTION:

3X4 inch piece of corrugated copper scrubber from hand wash (laundry) board.

CONSERVATION RECORD (over) Electrolytic reduction, 4 hours at 3.5 amps. Washed and sealed.

SOURCES CONSULTED

Foley, Vincent P.

1965 "Another Method for the Treatment of Ferrous Artifacts," The Florida Anthropologist 18 No. 3, Part 2, 65-68.

Garrison, Ervan and Bray, Robert T.

1976 Archaeological Investigations at George Washington Carver National Monument 1976 American Archaeology Division, Department of Anthropology, University of Missouri-Columbia.

Madsen, H. Brinch

1974 "The Cleaning of Iron with Ammoniacal Citric Acid," Arbeitsblatter fur Restausatoren 2 64-73. Abstract Translation in Art and Archaeology Technical Abstracts 14(1974), 141.

Organ, R. M.

1968 Design for Scientific Conservation of Antiquities. Smithsonian Institution Press, Washington D.C..

Plenderleith, H. J.

1962 The Conservation of Antiquities and Works of Art: Treatment, Repair, Restoration. Oxford University Press, London.