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The Nineteenth Century ceramic industry at Coal Valley: archaeology of 13BN111 (Noah Creek Kiln)

Barbara Schulte

Iowa State University

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The Nineteenth Century ceramic industry at Coal Valley: Archaeology of 13BN111 (Noah Creek Kiln)

by

Barbara Schulte

A Thesis Submitted to the Graduate Faculty in Partial Fulfillment of The Requirements for the Degree of

MASTER OF SCIENCE

Department: Sociology and Anthropology
Major: Sociology (Anthropology)

Signatures have been redacted for privacy

Iowa State University of Science and Technology
Ames, Iowa

1974
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CHAPTER 1.

INTRODUCTION

General Background

The United States federal government has sponsored many dam construction projects in Iowa and other states for the general purpose of flood control along the Missouri and Mississippi River systems. The Saylorville Reservoir, located northwest of Des Moines, Iowa, along the Des Moines River, is presently under construction and is scheduled for completion in 1975 (Figure 1). Also, federal, state, and county governments have sponsored local construction projects such as road building, road relocation and bridge building in connection with the reservoirs. All of these construction projects entail the potential destruction of archeological sites. The archeological site investigated in this report, Noah Creek Kiln, was threatened by the construction of the Saylorville Reservoir.

Prior to this work, research had been done on an earlier pottery works, the Coalport Kiln, near Pella, Iowa, which was eventually destroyed by the construction of the Red Rock Reservoir (Reynolds 1970). At the present time, research is being conducted on two pottery works, the Moingona Pottery Works and the Flint Stone Pottery in Moingona, Iowa (Schroeder 1974). These individual studies are part of a larger program involving the analysis of the beginnings and eventual decline of the pottery industry along the Des Moines River Valley (Gradwohl 1973).

The site investigated in this report was originally named Noah Creek Kiln because of the surficial evidence which indicated the presence
Figure 1. Map of the location of Noah Creek Kiln in relationship to the Saylorville Reservoir, Iowa (U. S. Army Corps of Engineers, 1964)
of a historic ceramic industry, and because of the site's location near Noah Creek, a tributary of the Des Moines River. Noah Creek Kiln (13BN111) was assigned a site number in the Smithsonian Trinomial System---13 specifies Iowa, BN designates Boone County, and 111 refers to the specific site within the county. Later in the investigations, the single archival reference found referred to this pottery as the "Coal Valley Pottery Works," but due to a variety of circumstances, the author had decided to continue to refer to the site as the Noah Creek Kiln.

Noah Creek Kiln was located in the settlement of Coal Valley along the Des Moines River southwest of the present city of Boone. The site dates from the late 1860's to the early 1870's. The Noah Creek Kiln is an important archaeological site in that it provides primary artifactual and structural evidence for the interpretation of the early historic ceramic industry in Iowa. It also provides information on the ecological resources which were being exploited by the early settlers of the area, particularly the use of clay and coal for the development of the pottery industry.

At the Noah Creek Kiln, remnants of a potter's shed with a hearth, portions of the kiln structure and most of the waster dump of a nineteenth century salt-glazing stoneware pottery kiln were uncovered. The artifacts included broken pottery and manufacturing debris which were found in a heavy accumulation surrounding the potter's shed. The site was excavated as a part of the salvage archaeological program of the Iowa State University-National Park Service archaeological crew during the summer of 1968. Two years later, the site was totally destroyed by the relocation of county road R18.
Statement of Purpose

There is a relative lack of information about the ceramic industry in the written records of Iowa and, in fact, in the written history of the American frontier. We can judge from existing ceramic wares something of the range and variety of vessel forms made, but we have only superficial knowledge of the nature of individual pottery operations and of the level and extent of technology involved in production. Even less is known about the period of operation of a pottery and the potters themselves. The specific purposes of this thesis are (1) to determine, primarily from archival data, the period of operation of the Noah Creek Kiln and the men who worked there in relationship to the historic settlement of Coal Valley, (2) to describe and functionally classify the structural remains, the types of wares and the industrial debris produced by the archeological investigations of the kiln site, and (3) based upon the analysis of the archeological and archival data, to reconstruct the nature and level of technology employed at the Noah Creek Kiln.

The discussion of these particular problems should provide a framework for viewing this pottery in relation to other pottery kilns in the Des Moines River Valley, and thereby add to knowledge of the frontier culture of this area. Therefore, it has been necessary to briefly examine the ecological resources of this microenvironment and to trace the settlement of the Coal Valley locality and the development of the ceramic industry in Boone County with regard to the exploitation of these valuable natural resources.
Methodology

It is essential to a better understanding of a historic site to synthesize general and specific history from the period with material evidence derived by standard archaeological methods. Ivor Noel Hume (1969:18) emphatically states that: "Historical research is just as much a part of historical archaeology as digging holes in the ground...." Yet, he warns that all historical evidence must be used with extreme caution. Considerable disagreement over interpretation of documentary evidence exists. Many feel that the lay reader is incapable of drawing his own conclusions from a simple statement of evidence. Noel Hume (1969:27), however, contends that:

Whenever possible, the documents should be allowed to speak for themselves; for, once written down, the historian's interpretation of the evidence can become indistinguishable from the facts themselves.

Therefore, in the section of this report that deals with archival data, every attempt has been made to include the exact archival material which has been discovered. This enables the reader to appreciate the limitations of archival data in terms of its quality and quantity. It is important to realize that written records are merely the writer's interpretation of the material he is reporting, and that this interpretation is influenced by his level of expertise in a particular subject. Also, the quantity of information available through archival research limits the degree to which a particular historical era can be reconstructed.

There were only limited archival resources which produced relevant data on Coal Valley. The available sources included an 1896 plat map of Coal Valley, various county maps showing the location of Coal Valley,
the Boone County land and tax records, a 1914 History of Boone County, Iowa by N. E. Goldthwait, and the Boone newspapers from 1865 to 1900. Although these sources were extensively examined, relatively little relevant material was found due to a general lack of written information on Coal Valley in the Boone County literature, and gaps in information that was available. The newspaper articles and Goldthwait's work provided brief glimpses of the settlement of Coal Valley, but little in the way of detailed information on the socio-cultural activities of this pioneer community. James Meehan, a present-day landowner in Coal Valley, provided additional information about the existence of a potter's shed on his land when his father bought the land in the 1890's.

As part of the analysis of the archeological evidence from the Noah Creek Kiln, an attempt was made to set up consistent terminology for the various wares and manufacturing debris found at the site. The process of setting up terminology for identifying wares is problematic in that assigning a name to a ware attributes a function to that ware. In most cases, artifacts, especially ceramic wares, indicate their function by their form and contextual aspect. However, the archeologist must be aware that one artifact may have performed several different functions in its original cultural context (Binford 1972:23). The cultural context of ceramic wares found at a kiln site can reveal very little about these wares compared to the amount of information about function which can be derived from wares found at a habitation site. Therefore, cultural context as a criterion for determining function must be disregarded for the Noah Creek wares. Much more em-
phasis must then be placed on the formal attributes of these ceramic wares in interpreting function and setting up terminology. Detailed descriptions are given and a variety of measurements were taken on the Noah Creek wares. These observations not only aided in setting up functional categories of wares, but also produced information on the method of manufacture of each ware category.

Since this report is concerned with historic ceramics, an additional source of information on terminology and function was available in the form of written records. Although there is very little written material on pioneer potteries west of the Mississippi River, there is considerable written information on ceramic wares from early potteries further east. Using descriptions of wares produced at eastern potteries in conjunction with the limited archival data on Boone County potteries, the author was able to produce what she feels to be fairly accurate functional categories for describing Noah Creek wares. For example, the "milk bowl" or "milk pan" was a common form found throughout the eastern United States during the eighteenth and nineteenth centuries. From illustrations and descriptions of the function of milk bowls in the pioneer kitchen, the term "milk bowl" was assigned to one of the largest vessel categories found at the Noah Creek Kiln, even though there are some rather pronounced differences in rim form between milk bowls produced at Coal Valley and those produced at potteries further east.

A second focus of the analysis of the archeological evidence is the technology involved in the production of wares at the Noah Creek Kiln. In this case, the archeological context of the wares and the
manufacturing debris were essential in interpreting the type of technology used in producing the wares. Unlike earlier potteries in Iowa, the potters at this kiln and at the Moingona potteries were using a technique known as "jollying" to produce some of their wares. This technique is described in detail, and the archeological and technological evidence to support this interpretation is given. The use of jollying at a pottery represented a shift from a wheel-thrown, hand-craft industry to a more diversified, mechanized, and more uniform industry. By describing the change in technology at this particular kiln, the author is focusing in on the beginnings and area development of a process involving greater population nucleation in towns, change in transportation systems, and more intensive and specialized industrial bases which was to change the early agrarian nature of the frontier.

Plan of Presentation

The following discussion is divided into several sections. Chapter Two deals with the ecological resource system of the central Des Moines River Valley, and the exploitation of this ecological system by the early pioneers in response to their changing needs. Chapter Three is concerned with a reconstruction of the history of Coal Valley, the settlement and socio-cultural milieu in which the kiln and pottery operation functioned. Chapter Four is a brief summary of the development of the ceramic industry in Boone County which shows the increasing industrialization of the early pioneer craft. The fifth Chapter is the archeological site report of 13BN111, the Noah Creek Kiln. This
section is by far the longest and most detailed in the thesis. It includes attempts by the author to set up consistent terminology for the pottery industry, the establishment of functional vessel categories, and a description and classification of the manufacturing debris left behind at a stoneware pottery industry. Chapter Six correlates the ecology, history and archeology of the kiln area in an attempt to reconstruct the technology of the Noah Creek Kiln. The reconstruction not only contributes to the knowledge of the ceramic industry along the Des Moines River Valley, but provides a broader perspective in which to view the various strategies involved in the white pioneer settlement of the prairie- plains.
CHAPTER 2.

ECOLOGY OF BOONE COUNTY

Location and Geomorphology

Coal Valley is located directly west of a sharp bend of the Des Moines River in the north-central part of the Des Moines River Valley. The Des Moines, the largest river in Iowa, flows through Boone County in a southeasterly direction, dividing the county into eastern and western halves (Figure 1). The valley of the Des Moines in Boone County varies from a half mile to two miles in width. The present flood plain comprises about one-third of the area, though, during periods of ultra high water, at least one-half of the valley is inundated. The stream meanders from side to side of its flood plains, but very rarely impinges upon its restraining bluffs. It has cut through the drift and deep into the coal measure strata throughout its course in the county.... Terraces marking distinct stages in the development of the river are characteristic features in this region.... The valley farms are largely located on this bench, and amply testify to the value of its soil for agricultural purposes (Beyer 1896:182).

The town of Coal Valley was located on terraces immediately to the west of the Des Moines River, and along Noah Creek, a tributary of the Des Moines (Figure 2). The town, as indicated on plat maps, was directly on the banks of the Des Moines and extended approximately one-half mile to the west (Figure 3). It is doubtful that the settlement pattern of Coal Valley ever reached the proportions indicated on this 1896 plat map. After the settlement was abandoned, the land was used for agricultural purposes until the relocation of county road R18 destroyed much of the locality.

The geology of the central Des Moines River Valley has been exten-
Figure 2. Map of Yell, Des Moines, Marcy and Worth Townships in Boone County, Iowa. (Modified from Andreas 1875:100)
Figure 3. Map of Coal Valley. (Modified from Atlas of Boone County, Iowa, 1896)
sively studied beginning in 1849 (Owen 1852; Worthen 1858; White 1870; Keyes 1894; Lees 1916; Anderson and Welp 1960). The central Des Moines River Valley is fairly youthful in appearance because of the Wisconsin glaciation of the post-Kansas River Valley. Lees (1916:541-542) states that:

... the detritus of the Gary moraine in Boone and Webster counties would so conceal any pre-Wisconsin drainage lines that the survival of even the master valley is a marvel and its immaturity and youthful appearance are quite to be expected.... The presence in the valley of terraces, in-so-far as these are built of glacial materials, indicates that when the Wisconsin ice covered central Iowa, the Des Moines valley had attained practically its present dimensions, that while the ice was melting the valley was filled to a depth of seventy-five to one-hundred feet with waste from the glacier, and that this has been largely swept away since, leaving mere remnants along the valley sides as terraces and benches.

Topographically, Boone County is characterized by a glacial moraine which marks the southern-most advancement of the Des Moines lobe of the Cary stadial (Ruhe 1969:54). The surface configuration of the moraine is composed of a series of overlapping hills from two to three miles in width, and extends three-fourths of the way across the county. The area outside of the moraine covers the central and southern parts of the county. This area is characterized by a rolling landscape which is inclined slightly to the south. This glacial surface is crossed by many streams which support a luxuriant growth of timber (Beyer 1896:180). Included in the flora of the central Des Moines River Valley are various species of hardwood, shrubs and vines; the only softwood commonly occurring is Red Cedar (cf. Aikman and Gilly 1948; Kallmer 1967).

The settlement of Coal Valley was located on one of the alluvial
terraces produced by the erosional activity of the river. It was in an advantageous position to utilize the geological deposits exposed by the action of the river as well as the timber resources along the banks of the river. This area was, and in fact still is, prime agricultural land due to the glacial activity and alluvial depositions. Most important in a description of the geological factors which contributed to the settlement of the central Des Moines River Valley is the abundant occurrence of coal and clay deposits.

Bedrock outcrops, consisting principally of Upper Mississippian limestones and Middle Pennsylvanian shales, limestones, sandstone and conglomerates, occur in several localities along the course of the Des Moines... Within historic times, these formations have been exploited commercially for coal, brick, and pottery clay, building and construction stone, and portland cement (Gradwohl 1969:2).

Coal Resources

The geological strata in which coal occurs are termed coal measures (or the Des Moines Series of the Pennsylvanian Formation). In Boone County these strata are composed primarily of sandstones and shales which contain several seams of coal varying in thickness and extent (Beyer 1896:200). According to Lees (1916:444-45):

These coal beds form the basis of Iowa's greatest mineral industry, and because of the fact that the Des Moines River has cut into the beds and exposed the coals, the mining industry of the state has always centered along the valley.

The coal and clay deposits found in the bluffs of the Des Moines River and Honey Creek were of economic importance to early settlers in the Coal Valley area; coal as fuel and clay for pottery, brick and tile. As
early as 1856, settlers were aware of the potential richness of the coal deposits near Boonsboro. An early settler of Boonsboro, Judge Holcomb, wrote to friends in the East in May, 1856:

The indications are that there is enough [coal] on this land to supply the State of Iowa with fuel for one thousand years. The coal is overlaid with potter's clay of the best quality (Brainard 1896: 265).

White (1870) reports that two coal mining companies in the nearby towns of Moingona and Boonsboro are in the process of mining coal. Before industrialized mining began, individuals were mining the coal to meet personal needs. White describes two beds of coal being mined:

the principal one being the lowest and about four feet thick. The upper one is from two and a half to three feet thick. The quality of the coal is equally good as that of the other, but requiring, proportionally, more labor, it is not so extensively mined. These being the only mines yet opened on the line of that railway [Chicago and Northwestern Railroad] in Iowa, they are of great value and importance (1870:259).

No. 1 Sample from the top of the Northwestern Coal Company's Mine, Moingona. This is a hard, compact, and brittle coal. It is distinctly laminated, and cleaves well. There is considerable mineral charcoal, and the coal is quite dusty. Quite a number of seams of calcareous matter are found and some pyrite. The coke is tolerably compact, with brilliant, metallic lustre. The ash is red (1870:390).

Stratigraphic sections from three coal mines in the central portion of the county were recorded by Beyer (1896). The following sections, taken from a mine along Honey Creek, and mines directly north of Moingona, illustrate the depth and thickness of the coal deposits being exploited in the mid-1800's, as well as the co-occurrence of clay strata which were economically significant. The Honey Creek section was located in T83N,
8. Drift containing an abundance of selenite crystals near the base.... 40+
7. Shale, compact, brittle, calcareous and highly fossiliferous.... 2
6. Shale, bituminous.................. 2
5. Coal................................ 2
4. Fire clay and alternating shales and argillaceous sandstone..... 50
3. Shale, black, containing many clay-ironstone concretions—
nigger heads................................ 2
2. Coal................................ 2
1. Fire clay to bottom of creek...... 1

Coal measure strata were exposed one-half mile northwest of the town of Moingona along the Chicago and Northwestern railroad (Beyer 1896:191):

11. Drift, in the main, a light blue gritty clay, with numerous small lime concretions, extends about fifteen [sic] feet below the road bed.................................. 50
10. Sandstone, shaly, alternating with sandy shales; predominantly ash-gray in color and calcareous........................ 12
9. Shale, blue.......................... 4
8. Sandstone, shaly and sandstone, compact......................... 4
7. Shale, black.......................... 2
6. Coal................................ 1
5. Fire clay and shale.................. 7
4. Shale, containing many ferruginous concretions and stem of Lepidodendra....................................... 4
3. Shale, blue-black, containing Lingula umbonata Cox, in places..... 2
2. Coal................................ 2
1. Fire clay, exposed.................... 2

The third stratigraphic section was taken from a mine located in T83N, R27W, Section 1, SE\(\frac{1}{4}\) of the S\(\frac{1}{4}\) (Beyer 1896:192):
7. Drift and displaced material ........ 40
6. Sandstone, compact ledge ............ 1
5. Sandstone, ash-colored, clayey and somewhat fissile; state of induration very variable, pockets of fine sand occur in the upper portion while the lower part takes on a concretionary structure ......... 45
4. Shale, blue-black ..................... 2
3. Coal .................................. 2
2. Fire clay .............................. 3
1. Sandstone, exposed .................... 3

In the spring of 1968, the Iowa State University archaeological crew observed evidence of the abandoned coal mine slag heaps to the west of the Des Moines River and north of Noah Creek and the abandoned Chicago and Northwestern railroad. At the present time, coal is no longer mined in the central part of Boone County.

Clay Resources

Clay is the product of the geological weathering of granite deposits on the surface of the earth, and since this weathering process is continuous and goes on everywhere, clay is an extremely common and abundant material in nature. Pure clay or kaolin is almost totally composed of silica, aluminum, hydrogen and oxygen. Any other oxides present in the clay change the color, consistency and firing properties of the particular clay (cf. Rhodes 1957; Chandler 1967). Rhodes (1957:19-20) describes the characteristics of stoneware clays:

Stoneware clays are plastic clays which mature or become vitreous at 1200°C. to 1300°C. (Cone 8-12). Their fired color ranges from a very light grey or buff to a darker grey or brown. The small country potteries of the last century...usually employed a single stoneware clay which was dug in the neighbor-
hood and pugged ready for use without the addition of any other clay. Such a natural clay body may burn to very pleasing colors and textures and may take salt glazes, slip glazes, or high-fired stoneware glazes.

Several detailed studies of Iowa clays have been published in the Iowa Geological Survey and in other publications (cf. Iowa Geological Survey, Volume 14; Gwynne 1943; Galpin 1924; Staley and Beecher 1916). The principal stoneware clays in Iowa are "fire clays" that occur in the Des Moines Series of the Pennsylvanian deposits which form the bedrock in Boone County and many other areas of the state (White 1870: 222; Beyer and Williams 1904:419; Gwynne 1943:296; Staley and Beecher 1916: 18). The stoneware clay is very plastic, but with the addition of feldspar and flint, it can be successfully used for the production of a good grade of stoneware pottery (Whitford and Whittemore 1920:27). However, it is not sufficiently refractory to produce fire brick and wares requiring extremely high heat resistance (Gwynne 1943:298).

The stoneware clays used in Boone County are found in association with coal deposits in the coal measure strata as indicated in the previously discussed stratigraphic sections of coal mines along Honey Creek and Moingona. Outcrops of clay are found in the immediate vicinity of the Des Moines River and its tributaries (Beyer and Williams 1904:419). Although there is no primary evidence that clay was mined from these deposits for use at the Noah Creek Kiln, there is considerable evidence that clay was being mined for use in ceramic production at other potteries in the area. In June, 1856, Judge Holcomb wrote that:

The stoneware manufacturers in town are working from a bed of potter's clay about five feet thick, clear from grit... (Brainard 1896:266).
And, in 1870 White reported that:

Potteries of considerable importance have been successfully established at Boonsboro, using the clay found there in association with the coal strata (White 1870:259).

In an early Boone newspaper article entitled "Potteries of Boone County" (Montana Standard, November 27, 1869) a description is given of the clay deposits being mined by the Boonsboro Pottery and the Moingona Pottery.

At the Boonsboro Pottery the clay:

...is obtained from the bluffs skirting the Des Moines River, one and one half miles west of the town. The overlay is what is popularly called fire-clay, the underlay a sandstone rock. No clay is known to outcrop, but is found a few feet in from the face of the bluffs. The bed is 30 inches thick. The beds have been excavated, by drift or level mining, to a distance of about 200 feet, and longitudinally about one-eighth of a mile, the deposit showing no signs of diminishing body. In all places where potter's clay has been examined, it lies about fifteen feet perpendicularly below the surface.

At the Moingona Pottery:

The clay is obtained from the bluff on the brow of which the buildings stand, the underlay sandstone, and the overlay a bed of soapstone above which is sandstone. The mining of it is as yet very little trouble as the bed is practically and [sic] outcrop.

A section taken from the pit of the Boone Paving Brick and Tile Company at Logansport illustrates the local stratigraphy (Figure 4). Samples tested from Layers A and B fire "harder than steel" to a grey color and a dirty white color, respectively, at Cone 10 (Galpin 1924:81).

The pit at the Boone Clay Works, located southwest of Boone, on a small tributary of the Des Moines River, shows the following sequence of beds (Beyer and Williams 1904:420):
Figure 4. Stratigraphic section of the clay pit from the Boone Paving Brick and Tile Company. (Taken from Galpin 1924:80)
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Drift</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>Potter's clay</td>
<td>1½</td>
</tr>
<tr>
<td>7</td>
<td>Clay shale, gray-blue</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Clay shale, gritty, ash colored, iron-stained in the upper part</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Clay shale, variegated, red, blue, gray</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Shale, ochreous band, stained a deep red</td>
<td>2/3</td>
</tr>
<tr>
<td>3</td>
<td>Clay shale, similar to No. 6</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Fire clay</td>
<td>1½</td>
</tr>
<tr>
<td>1</td>
<td>Shale, impure, exposed</td>
<td>3</td>
</tr>
</tbody>
</table>

These examples, along with the stratigraphic sections of the coal mines along Honey Creek and at Moingona, give sufficient evidence that good stoneware clay was present in the vicinity of Coal Valley and was being mined from the 1850's into the early decades of the present century.

As described earlier, stoneware clays fire to maturity between 1200°C and 1300°C. Tests done on the clays from the Boone Paving Brick and Tile Company indicated that they fire to maturity at Cone 10 (1260°C) and showed the following composition (Weems 1904:345):

- Clay—74.90%
- Quartz—12.70%
- Feldspar—8.81%
- Carbonates and sulfates of calcium and magnesium—3.59%

The presence of fluxes (calcium and magnesium) enable the clay body to vitrify, and also reduce the thermal expansion of the fired ware to decrease breakage in the cooling process (Chandler 1967:51).

The possibility of using surface clays for pottery manufacture still remains to be examined. Beyer (1896:222), for example, comments that:

At the present time the numerous clay-working factories in Boone County utilize the alluvium, the drift soil and the coal measure clays. The first of these has been adopted by several of the brick makers at and in the vicinity of Moingona. The drift soil
is being extensively used at the yards west and southwest of Boone, and the shale clays at points east of the river in the same region. Only common structural brick are made of the unconsolidated clays, but the indurated beds are successfully manufactured into different grades of building brick, fire brick, tile and pottery.

When good clays are available from the coal measure strata, however, it would seem unlikely that the potters would utilize deposits of secondarily deposited surface clays for their wares.

**Experimental work**

Mary E. Miller, a present-day potter from Boone, Iowa has been conducting tests on clays from Boone and adjacent counties to determine their potential usefulness as potter's clay. Since 1964, Mrs. Miller has closely reproduced, using only local clays, many of the stoneware clays and slip glazes found at the Noah Creek Kiln. She has found that by using both single-source clays and combinations of clays, she can reproduce the colors of the mature clay bodies used in the manufacture of the wares from the Noah Creek Kiln. She records every clay sample by assigning it a number in her cataloging system and indicating where it was found, its original appearance and the degree of plasticity. Mrs. Miller has tested hundreds of clay samples from central Iowa including clays found in Coal Valley, Worth Township, along Stringer Creek and Honey Creek (Figure 2). While a complete analysis and review of all of Mrs. Miller's test clays would go well beyond the scope of the present study, the results of her tests on the two samples from Coal Valley are germane to this particular discussion.

Tests made on Clay 82, obtained from a pit in the excavations of
the Noah Creek Kiln, fired a light cream color at Cone 04 (1050°C.) and could have been fired to a much higher temperature. Clay 88, collected from the excavations for the relocation of county road RL8, was fired to Cone 5 (1180°C.) and produced a speckled cream color; it also could have been fired to a higher temperature. Mrs. Miller has used these clays, both alone and in combination with other local clays, to produce good stoneware pottery.

It is not unusual to find potters using local clays to make utilitarian forms such as those produced at the Noah Creek Kiln. However, both experimental and archaeological evidence indicate that the Coal Valley potters could also have been using local clays to produce facsimiles of the popular "Albany slip." This glaze fires to a deep brown (sometimes almost black) color. Albany slip gets its name from clay obtained near Albany, New York, and is a very common glaze used throughout the East and Midwest during the nineteenth century on earthenware and stoneware vessels. According to Rhodes (1959:34) the "Albany slip as a glaze material apparently came into general use about 1840, and it was shipped to potteries in various parts of the country." Albany slip covers the inside of most wares from Coal Valley, and both the interiors and exteriors of the jugs and milk bowls from the site. Mrs. Miller has been able to reproduce "Albany-like" slips glazes using combinations of local clays. These slips fire to maturity at Cone 8 to Cone 10 (1225-1260°C.).

Although Mrs. Miller's tests suggest that suitable brown slip glazes could be produced from Boone County clays, the Boonsboro potters seem to have been importing their slip clays (Montana Standard, December 11, 1869):
"Slip" or "slip clay" is a clay peculiarly affected by heat, and is found in the state of New York whence it is brought for use in these potteries. This clay is mixed in water till the mixture has about the consistency of fresh cream, while its color is a reddish brown.

However, it is possible that these potters were mixing local clays with the imported slip clay to reduce the cost of importing large quantities of the slip (Guillard 1971:42, 82). Since most of the wares that were produced were glazed with this type of slip, the potter may have eventually switched over completely to local clays for slipping.
CHAPTER 3.

HISTORY OF COAL VALLEY

Original Settlement

In discussing the early settlement of Boone County, an article in the Boone News-Republic (September 13, 1965, Centennial Edition) stated that 735 people were living within the county in 1850. By 1870 the number had risen to 14,484. In addition to the essentially agrarian population living on scattered farmsteads, nucleated settlements had begun to form around various commercial enterprises and transportation routes. Of particular importance were the villages and incipient towns which sprang up around the exploitation of local coal and clay resources. One such settlement, significant though ephemeral in the history of Boone County, was Coal Valley. Certain aspects of the Coal Valley settlement can be reconstructed from a synthesis of cartographic and archival data, evidence collected through archaeological excavations, and verbal recollections from Mr. James C. Meehan who was born in the locality after his family had settled there in the latter part of the nineteenth century.

The archival or written documentation for the Coal Valley community is not overwhelming. The settlement is noted as a place name on early maps of Boone County (Figure 2). There are also fleeting newspaper references to incidents in the community during the 1860's, 1870's, and 1880's. A plat map of Coal Valley was published as late as 1896 (Figure 3), although it is dubious that the actual settlement pattern ever resembled that drawn plan. Perhaps the fullest published description
of Coal Valley is that given by N. E. Goldthwait in his *History of Boone County, Iowa* (1914:284):

Coal Valley was the third of the towns platted in Marcy Township. It was laid out by Amos Elliott, in September, 1867, and is located on section 2, township 83, range 27. It was intended to be a miners' town only and while the supply of coal lasted it was a place of considerable activity. Coal in abundance was for several years mined and shipped from Coal Valley. But when the mines were worked out the miners moved to other places to obtain work and the place ceased to be a town of business interest. Very few people live there now, but it is nearer the geographical center of the county than any town within its borders.

All in all, however, the archival data are incomplete and must be evaluated in a critical light.

The 1896 plat map of Coal Valley shows the layout of blocks and lots within the town limits (Figure 3). Walnut Street, which runs north and south, marks the section line between section one on the east and section two on the west. Most of the lots were 25-foot business and residential lots (Brown 1968). This plat map, as a legal instrument for marking off pieces of land, was probably fairly accurate. Much of the land within the Coal Valley settlement was bought in town lots (Figure 5). However, it is extremely doubtful that this map represented the actual settlement pattern of Coal Valley. Most of the streets marked on the map probably never existed. Certainly, Walnut Street was never there.

A 1913 plat map of Coal Valley showed the estate of Martin Meehan, a settler who bought land in the Coal Valley locality in 1891 (Town Lots Transfer Book E, Boone County Auditor's Office). This map shows the area marked off in town lots similar to the 1896 map. At the time the 1913 map was drawn, however, most of the area was owned by a few
<table>
<thead>
<tr>
<th>Grantee</th>
<th>Grantor</th>
<th>Instrument</th>
<th>Date</th>
<th>Book</th>
<th>Page</th>
<th>Description of Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johannet Carroll</td>
<td>Amos Elliott &amp; Wife</td>
<td>Quit Claim Deed</td>
<td>14 Jan 67</td>
<td>LT A</td>
<td>242</td>
<td>Section 2, NE 40 of the SE\</td>
</tr>
<tr>
<td>Jeremiah Elliott</td>
<td>Amos Elliott &amp; Wife</td>
<td>Warranty Deed</td>
<td>16 Jan 67</td>
<td>LT A</td>
<td>242</td>
<td>Section 2, NE 15 of the SE\</td>
</tr>
<tr>
<td>Chas. A. Sherman</td>
<td>Amos Elliott &amp; Wife</td>
<td>Deed Coal Interest</td>
<td>24 Jan 67</td>
<td>LT A</td>
<td>242</td>
<td>Section 2, NE 40 of the SE**</td>
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<tr>
<td>William Morris</td>
<td>Amos Elliott &amp; Wife</td>
<td>Warranty Deed</td>
<td>12 Dec 67</td>
<td>LT A</td>
<td>242</td>
<td>Section 2, part of the SE\ of the SE\</td>
</tr>
<tr>
<td>Albert Elliott</td>
<td>James G. Elliott &amp; Wife</td>
<td>Warranty Deed</td>
<td>16 Sep 69</td>
<td>LT A</td>
<td>242</td>
<td>Section 2, 10 acres off on the side of the NW\ of the SE\</td>
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<tr>
<td>Charles Merchant</td>
<td>Amos Elliott &amp; Wife</td>
<td>Warranty Deed</td>
<td>3 May 72</td>
<td>LT A</td>
<td>242</td>
<td>Section 2, NE 15 of the SE\</td>
</tr>
<tr>
<td>E. M. Comfort</td>
<td>Amos Elliott &amp; Wife</td>
<td>Warranty Deed</td>
<td>21 Aug 72</td>
<td>TT C</td>
<td>226</td>
<td>Block 14, Undivided 1/2 share of Lot 5 and 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>(Town Transfer Book)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. M. Comfort</td>
<td>L. A. Caswell &amp; Husband</td>
<td>Warranty Deed</td>
<td>24 Jan 74</td>
<td>TT C</td>
<td>231</td>
<td>Block 22, Lots 1 and 3**</td>
</tr>
<tr>
<td>Robt. J. Teeby</td>
<td>Edwin M. Comfort &amp; Wife</td>
<td>Warranty Deed</td>
<td>16 Oct 75</td>
<td>TT C</td>
<td>231</td>
<td>Block 22, Lots 1 and 3**</td>
</tr>
<tr>
<td>E. M. Comfort</td>
<td>Amos Elliott &amp; Wife</td>
<td>Warranty Deed</td>
<td>21 Sep 72</td>
<td>TT C</td>
<td>232</td>
<td>Block 25, Undivided 1/2 share of Lots 1, 2 and 3</td>
</tr>
</tbody>
</table>

**Sale of Mineral Rights

Figure 5. Selected land sales in Coal Valley
people and was probably being used for agricultural purposes. James Meehan, the son of Martin Meehan, recalled that his father had bought up land by town lots rather than by the acre. These town lots correspond to the town lots drawn on the 1896 plat map.

Amos Elliott is listed in the Patrons' List of Andreas' 1875: *Illustrated Historical Atlas of the State of Iowa* as a farmer who came to Boone County in 1856 from Stark County, Ohio. The mailing address listed for him is the nearby town of Moingona (Andreas 1875:549). Besides Amos Elliott, there are several other people with the name of Elliott who owned land in the settlement of Coal Valley. These include Jeremiah Elliott, Albert Elliott, John D. Elliott, and James G. Elliott (Land Transfer Book A, Boone County Auditor’s Office). Current research has not produced information regarding the relationship of these men. However, it seems probable that these men represented an extended family of early Iowa settlers. County land transfer records show few land transactions before the establishment of Coal Valley as a town. However, these records do show that Amos Elliott owned at least 40 acres in the locality which was later platted as Coal Valley (Figure 5). The Elliots begin to sell land by town lots in November, 1867 (Town Transfer Book C, Boone County Auditor’s Office). This evidence supports the September, 1867 date given by Goldthwait as the founding date for Coal Valley as a town.
Economy and Subsistence

Undoubtedly, the primary interest of early Iowa pioneers was agriculture. The very early settlers probably practiced a subsistence-type of agriculture, but by the 1860's the steel plow, barbed wire, and clay tile for drainage had reached central Iowa (McFarland 1969:153). Before the advent of the railroads in Boone County, the farmers also had difficulty in getting grain to market. In the Boone County Democrat from December 23, 1868, a report is given on the status of agriculture in Boone County:

The soil is well adapted to spring wheat, oats and corn. Rye and barley have not yet been raised to any considerable extent, but the soil and climate are equally adapted to them, as well as all kinds of garden vegetables common to this latitude. The tame grasses, especially timothy and blue grass, do well. Wild grass, however, is so abundant that farmers have not engaged extensively in the cultivation of the tame grasses. About 40,000 acres of land are now enclosed, and mostly in cultivation. The people have engaged in hedging to some extent, with a promise of success.

Early settlers had to locate in valleys where the land was easiest to cultivate and where a ready supply of timber and water was available. The water was of particular importance for the location of mills to grind the grain. There were six mills operating in Boone County during the latter half of the nineteenth century (Swisher 1940:247).

One significant resource of the central Des Moines River Valley was the easily accessible supply of coal. At first, individuals mined or collected coal for personal use. By the mid-1860's, however, with the opening of the Chicago and Northwestern Railroad, commercial coal mining was
beginning to attain industrial proportions. The Boone County Democrat 
from June 3, 1868, gave a description of the three coal companies 
which were in operation in 1868 in Coal Valley and Moingona.

The Northwestern has been in operation about one year, 
and was organized and is now running under the im-
mediate control of the U.P.R.R., who are supplied with 
coal entirely by this mine. This mine is now producing 
150 tons per day, and gives employment to one hundred 
men which force the company intend to increase to two 
hundred. The coal is screened and freed from sulphur 
before transportation, and the intention is that it 
shall be at least equal to any in the valley of the 
Des Moines....With the well known reputation of the 
Union Pacific Railroad, there is not the least doubt 
that other shafts will be sunk and pushed forward with 
the same energy that has ever distinguished them.

Des Moines Valley Coal Co. commenced operations in 
October, 1867, and during the four following months 
shipped two thousand and seventy-five tons....They 
have one shaft now sunk, said to be of sufficient 
capacity to raise 125 tons per day.

Moingona Coal Co. has been in operation two years... 
has three shafts, two drifts, and can raise and ship 
300 tons daily, and gives employment to over four 
hundred men.

These statements indicate the relationship of the coal industry to the 
railroad transportation system. The decade between 1870 and 1880 saw an 
increased production in all coal-producing areas. This increased pro-
duction was a result of the railroads which consumed large quantities of 
coal and provided better transportation facilities for shipping coal to 
non-producing regions (Stahlman 1938:9-13). The Boone County Democrat 
(December 23, 1868), reported the route for the railroad in Boone County:

The Chicago & Northwestern Railroad passes across the 
county near the middle, with 4 stations on the line in 
Boone County viz: Montana [later Boone], Moingona, 
Ogden, and Beaver. Montana is the end of the eastern 
and western divisions of the Iowa portion of the road.
The 1875 map of Boone County and the 1896 plat map of Coal Valley show that the Chicago and Northwestern Railroad passed through Coal Valley.

The name Coal Valley indicates the topography of the settlement and the natural resource found there. This settlement was composed of miners' houses and very little else. A general impression of the size of the town and its activities during the 1870's can be obtained from reading the Boone newspapers from that period. Coal Valley is infrequently mentioned and then only in a cursory manner. One article from the Boone County Democrat (May 22, 1878) describes a train collision within the town of Coal Valley, referring to the accident location as: "Just within the western boundary of the village (if the half score of houses around the mines can be called a village)." This quote indicates that it was a small community, seemingly dependent upon mining for its existence.

In 1868, the Northwestern Coal Company moved its headquarters from Boone (at that time called "Montana") to Coal Valley.

The Northwestern Coal Co. of this county, has been reorganized by the election of new officers, changing some of its powers, and making its headquarters at Coal Valley instead of this city (Montana Standard, June 6, 1868).

This coal mining company continued mining operations in Coal Valley into the early part of the 1890's when most of the coal companies sold their land to private individuals (Land Transfer Book G, Boone County Auditor's Office). Stahlman (1938:13) reported that the production of Iowa coal decreased in the period beginning in 1885 and continuing to 1890. This was due to a series of mild winters which decreased the demand for coal and strikes which lowered output enough to make the importation of Illinois coal more profitable.
From the September 5, 1868 edition of the *Montana Standard*, one finds that there are enough men in town to form a baseball team known as the Miners Club. The name of the baseball team seems to indicate that the occupation of these men was mining. There is the possibility that a store was located in or near Coal Valley. The *Boone County Democrat* (September 23, 1868) reported that "C. R. Collins has purchased the crossing store with its books." The location of the "crossing," however, is questionable. Various reports of coal mines located at the crossing seem to indicate that the crossing was near Coal Valley (*Boone County Advocate*, December 8, 1870; December 22, 1870). Also, a record of delinquent taxes for Coal Valley showed that C. R. Collins was behind in taxes (*Boone County Democrat*, September 7, 1881). However, the likelihood of the crossing store being located in Coal Valley cannot be verified with present evidence. By 1881, there were enough people in Coal Valley to justify the opening of a saloon. According to the *Boone County Democrat* (June 12, 1881): "We hear that a saloon has been started in Coal Valley. This will hurt our [Moingona] saloon keepers somewhat."

By the early 1890's, the town had lost most of its inhabitants following the closing of many of the mines (Land Transfer Book G, Boone County Auditor's Office). However, the Clyde Coal Company still had a mine in operation until 1907 (Brown, 1968). Beginning in 1877, an Edmund Lindsey began buying lots in Coal Valley. Much of this land was obtained through the Treasurer of Boone County, indicating that the land had probably been abandoned and was being sold for unpaid taxes. Lindsey continued buying land almost up to the turn of the century (Land Transfer
Book D. Boone County Auditor's Office). Martin Meehan also began buying land in Coal Valley toward the turn of the century. These men were undoubtedly turning the land back into agricultural land, as it remained until the present day.
CHAPTER 4.

CERAMIC INDUSTRY IN BOONE COUNTY

The clays in Boone County provide an abundant resource for the manufacture of many types of ceramic products, including building brick, fire brick, drainage tile and stoneware pottery. The potential of these clays has been recognized since the early settlement of the county, and attested to by an early settler, Judge Holcomb. There is considerable evidence, both archaeological and historical, for potteries in the immediate vicinity of Coal Valley. Due to the primarily agrarian nature of the pioneer community, durable containers were needed for the preparation and storage of foods. As summarized by Rhodes (1959:33):

Vessels were needed for storing liquids such as cider, vinegar, beer and whiskey. The pottery churn was superior to churns made from wood or metal because of the ease with which it could be cleaned. Crockas and large jars were needed for storing pickles, butter, sauerkraut, and other foods preserved for the winter. Cooking vessels, including baking dishes and the familiar bean pot, were made. In addition to these common items, the stoneware potter was called upon to make inkwells, pitchers, cuspidors, doorstops, footwarmers, and drainpipes....

These needs were met by the local production of earthenware and stoneware utilitarian products. Local ceramic industries could usually provide vessels less expensively than goods imported from the East. This was due to the excessive weight and breakage factors involved in transporting them. Often times transportation was inadequate or entirely missing (Reynolds 1970). Because of the agrarian nature of the pioneer population, "Many of the potteries which supplied these useful forms were small
establishments employing only a few workers, and in many cases they operated seasonally, closing down in the summer when farming chores became demanding" (Rhodes 1959:33).

Boonsboro and Boone

The first pottery in the county appears to have been that started in 1856 by Keigley and Terry in Boonsboro. According to a newspaper article in the *Boone County Advocate* (October 3, 1872) this pottery was also the oldest in the state. This statement is definitely not true, because there is evidence that William Welch, an itinerant potter from South Carolina, moved to Van Buren County, Iowa, in 1836 and started a pottery operation (Donnell 1872; Welch 1876). This error indicates the nature of the evidence derived from newspaper articles, and that this type of evidence must be viewed in a critical light.

The Keigley and Terry pottery was still in operation in 1869 and turned out 3,000 gallons of ware per week and employed nine men. Its wares were apparently being shipped as far away as San Francisco. The manufacture of Boonsboro Pottery wares was supervised by a Justus McBurney who supposedly had prior experience in pottery making in various potteries in the eastern United States and Canada (*Montana Standard*, November 27, 1869). A contemporary description of the Boonsboro Pottery states that:

The buildings of the Boonsboro Pottery consist of a series of five or six structures which have been added to the original building as the increase of business demanded. The kiln is well constructed having stone walls of an average thickness of about five feet. The immense heat necessary to burn the ware properly, often results in the destruction of many a kiln, as was the case with the first one put up by this company.
Another pottery which began operation in the mid-1860's was the Griffee Pottery Works located in West Boone. This pottery was still producing wares in 1895 when Samuel Beyer reports on it in his "Geology of Boone County" (1896:225-226):

The raw material is obtained from the east bank of Diamond Hollow, about one-third of a mile eastward from the Des Moines River. The bed worked is but two feet thick. The upper two or three inches are of a dark gray color, and of good quality; under this is a buff, siliceous clay, sandier in the lower portion. A mixture of the two grades affords the best results. One ordinary down draft rectangular potters' kiln is used for burning. The product consists of the ordinary vessels in various sizes and shapes, the extreme capacities being one quart to twenty gallons. In addition to the plain ware, fancy ornamental pieces and toys are made. A ready market is found for the finished product at various points along the Chicago and Northwestern Railway and branches, between Marshalltown and Council Bluffs.

The Griffee pottery is also known from an archaeological surface collection of stoneware sherds, kiln furniture and glazed brick. The presumed locus of the Griffee Pottery and the artifact collection have been designated as archaeological site BB138 by the Iowa State University Archaeological Laboratory.

Outside of Boone, along Stringer Creek, the Franklin kiln is known from a surface collection of stoneware sherds and the visible outline of clay pits and information provided by the son of the former operator of the firm (Gradwohl, 1973). This site has been designated archaeological site 13BB131.

In the Patrons' List of Andreas' Illustrated Historical Atlas of the State of Iowa (1875:549), there are listed four potters for Des Moines township: M. A. Griffee, Jno. F. Hyten (Boonsboro Pottery), Wm. F.
Stringer, and W. D. Wright. Two brick makers, John F. Yagge and Joseph Yagge, are also listed.

Besides these potteries, there are several brick yards which were in operation in the latter half of the nineteenth century. These include the Boone Clay Works, the Boone Paving Company, and the Jacob Yagge Brickyard (Beyer 1896).

Moingona

The earliest pottery in Moingona was the Moingona Pottery Works established in 1869 which operated intermittently until 1877 (Schroeder 1974). A description of the operation is given in the Montana Standard, November 27, 1869:

In June last the buildings of the Moingona Pottery were commenced at Moingona by Messrs. Parkhurst and Atchison. These gentlemen have put up a large building of 40 by 45 feet and three stories high. There are also sheds for fuel, the storage of ware, and grinding clay, covering an area of 64 by 24 feet.... Twelve hands are in employ, and they are now burning a kiln of about 2,800 gallons every ten days. The capacity of the institution is much greater, and the second kiln which is to be immediately built will allow of making 5,000 gallons per week....

This pottery is also known from archeological evidence which includes a surface collection of stoneware sherds, kiln furniture and glazed brick as well as surficial evidence of the waster dump, kilns and other probable buildings. The Iowa State University Archaeological Laboratory has designated this site 13BN120.

The Flint Stone Pottery was begun in 1871 and operated intermittently until 1883 (Schroeder 1974). It produced stoneware, drain tile
and fire brick (Boone County Democrat, May 7, 1873). This pottery known archaeologically as site 13BN132, is also represented by a surface collection of stoneware sherds, kiln furniture, glazed brick and some structural evidence. A more detailed discussion of the Moingona potteries can be found in a Masters' thesis done by Allen Schroeder (1974).

In addition to the Moingona potteries, two brickyards operated in Moingona at various times. The Slater Brickyard was started in 1866 and was still producing brick in 1895. The Everett Brickyard started considerably later, and was also still operating in 1895 (Beyer 1896:226-227).

Coal Valley

A pottery here discussed as the Noah Creek Kiln (13BN111) was located in the town of Coal Valley. Very little is known about the kiln from archival data. The only reference to this pottery, so far as known, is from the Boone County Advocate (October 3, 1872):

Next and last is the Coal Valley Pottery Works, owned by Comfort and Elliott. This firm [has] been doing a handsome little business, having made during the last year about 20,000 gallons of ware. They are now directing their attention to the manufacture of Well Tubing, and intend to make this specialty.

The Land Transfer Deeds in the Boone County Recorder's Office show that Amos Elliott and Edwin M. Comfort jointly owned Lots 5 and 6 in Block 14 and Lots 1, 2, and 3 in Block 25, and two acres south of Block 25 in Coal Valley (Town Lots Transfer Book E:226, 232). Comfort bought this half ownership in 1872 for four hundred dollars (Deed Record 7-56) (See Figures 2 and 5). These lots correspond generally with the structural and arti-
factual location of 13BN111. Comfort also bought the mineral rights to Lots 1 and 3 in Block 22 in January, 1874 for one hundred and fifty dollars. The mineral rights included rights to "all coal coal mines mineral mineral products and oil beneath the surface" (Deed Record 7-255). According to Figure 2, Lot 3 in Block 22 has a "coal bank." One might reasonably assume it was from this source that Comfort obtained clay.

The dates of operation for the Noah Creek Kiln can only be estimated and generally bracketed. A search of archival sources has so far yielded no mention of the pottery prior to that in the above quoted Boone County Advocate of October 3, 1872. This article intimates that the pottery was in operation for at least a portion of 1871. Even less can be said about the termination of operation. Sometime during the period from 1881 to 1884, Edmund Lindsey bought the land on which the pottery was located from the Boone County Treasurer for unpaid taxes (Tax Deed Records 2-228 and 37-124). James Meehan also recalled that his father said the pottery shed and kiln were gone by the time he bought land in Coal Valley in the early 1890's. (James Meehan to David Gradwohl, Personal Communication, 1968). This indicates that the pottery had probably ceased production sometime during the 1880's.

One can only speculate on whether Comfort and Elliott were both potters. Amos Elliott, as mentioned earlier, is listed as a farmer in 1875, whereas, the Boonsboro potters were listed as potters (Andreas 1875: 549). Elliott's name does appear, however, on a cobalt-blue marked crock in the State Historical Museum in Des Moines (Figure 6). There are also cobalt-blue marked pottery sherds from the excavations at 13BN111 which bear his name. It is possible that Elliott could have been both a potter
Figure 6. Crock with the name "A. Elliott" marked in cobalt-blue (State Historical Museum, Des Moines, Iowa)
and a farmer, or that he only provided the money and the land for a pottery. An alternate hypothesis would be that by 1875, the kiln was defunct and Elliott had become a full-time farmer. Comfort's name only appears in the one previously quoted newspaper article and in the land transfer records. The present search of archival materials has revealed no further information about him.

The best evidence for the existence of the pottery operation at Coal Valley is of an archaeological nature. This site referred to as 13BN111 (Noah Creek Kiln) was excavated and abundant wares and industrial materials were recovered. The excavations produced large quantities of broken stoneware vessels, glazed brick, kiln furniture, waste material and other manufacturing debris. Structural evidence for the potter's shed and the kiln arch were also recovered. The general location of the potter's shed was indicated by James Meehan before the excavations of the site were begun. A detailed description and analysis of these materials is presented in the following chapters.

Thus, one can see that Boone County was an area where the ceramic industry flourished during the latter half of the nineteenth century. Wares were being "constantly shipped from this county by the carloads, into Nebraska, Dakota, Minnesota and Colorado and the business is constantly increasing. From $40,000 to $60,000 is brought into the county every year from the sale of ware" (Boone County Advocate, October 3, 1872). The following chapters describe the types of wares being produced at Coal Valley and technology involved in producing them.
CHAPTER 5.

ARCHAEOLOGICAL INVESTIGATIONS

Location and Description of the Site and Surroundings

Archaeological site 13BN111 (Noah Creek Kiln) is located in the Des Moines River Valley on the western edge of the designated flood control pool of the Saylorville Reservoir in Boone County. The valley at this point is approximately one and one-half miles wide. Located at the base of the bluffs which mark the western limits of the valley, 13BN111 is situated on a low alluvial terrace above the left bank of Noah Creek, a tributary which joins the Des Moines River to the east. Specifically, the site is located in the NE\text{\textsuperscript{1}} of the SE\text{\textsuperscript{1}} of Section 2, T83N, R27W (Figure 7).

When first investigated as part of the Iowa State University-National Park Service archaeological survey of Saylorville Reservoir, this locality contained the remains of the historic white settlement of Coal Valley as well as a few scattered evidences of prehistoric Woodland and Great Oasis occupations. These prehistoric materials are probably associated with sites 13BN109, 13BN110, and 13BN121, also designated within this locality.

At the time of the investigations of 13BN111, in the area immediately surrounding the site, there were remnants of recent fences and the cement foundations of a farmhouse and barn (Plate 1). The old Chicago and Northwestern Railroad bed and an old slag heap from the coal mining operations were still present (Plate 2). At the time of the excavations of the site, the land was in crops and pasture. Parts of the area were
Figure 7. Topographic map showing location of sites 13BEM111 and 13BEM110.
poorly drained, thus forming marshy areas which remained wet well into the summer months.

This part of the valley is still being farmed today, even though the U. S. Army Corps of Engineers has acquired the land for the reservoir. Scattered farmsteads and fences still dot the bottomlands which are still being cultivated or used for pasture. However, the Noah Creek Kiln site has now been totally destroyed by the relocation of county road R18.

Initial Surface Reconnaissance and Designation of Coal Valley Sites

The presence of archaeological sites in the Coal Valley locality was first reported in 1967 to Dr. David Gradwohl by Mr. Herbert Sovereign and Mr. Lyndon Evans, members of the Iowa Archaeological Society. The following spring, the Iowa State University Archaeological Laboratory undertook a survey of the Coal Valley area in order to locate and record these sites as a part of the salvage archaeological program in Saylorville Reservoir. In the area which was later designated 13BN111, surface collections produced numerous stoneware sherds and manufacturing debris indicative of a historic pottery operation. Gradwohl and members of the survey crew immediately questioned James Meehan, the land owner, about the existence of a pottery on his land (Gradwohl, personal communication). Meehan reported that his father, Martin Meehan, had been told that a shed located on their land had been used previously as a potter's shed. Martin Meehan had bought the land, by town lots, during the early 1890's and by that time the pottery operation was already gone. The Meehan family used the shed for livestock. According to James Meehan, his father did not recall ever hearing the names of the potters or the name of the pottery works at
Coal Valley. James Meehan had only a vague memory of the shed which he, as a small child, had helped his father tear down sometime near the turn of the century. Meehan was aware of the high concentration of industrial debris near the former location of the shed. He commented that the area was so difficult to plow through that it had been used instead as a feed lot and later as a pasture. Meehan also mentioned the existence of the small coal mining community of Coal Valley which had been located along Noah Creek.

A mixing of surficial artifacts at several loci within Coal Valley seemed to indicate continued reuse of the general locality by various groups through time. Specific concentrations of diagnostic historic pioneer, Great Oasis and Woodland artifacts were apparent, however, in the surface collections. The decision to divide the Coal Valley locality into several separate sites was made on the basis of these suspected differential distributions in addition to topographic features and modern land use factors. Later excavations of undisturbed cultural zones at three sites substantiated the apparent surface evidence: 13BN111 yielded primary evidence of a historic pottery operation; 13BN110 produced remnants of a Great Oasis occupation; and 13BN121 provided primary evidence for the Woodland habitation of the locality (Gradwohl, personal communication).

Excavations at 13BN111

With this historical information and the surface collection of artifacts as a basis, the decision was made to excavate 13BN111 as a part of the 1968 archaeological field season. During the months of June and July,
the Iowa State University–National Park Service archaeological crew excavated 13BN1ll as well as several other sites in Saylorville and Red Rock Reservoirs. Besides the fact that 13BN1ll was a potential source of information on American history, there were several other reasons which led to the decision to excavate the site. First, in terms of the salvage archaeology program, the site was located on the edge of the flood control pool for the Saylorville Reservoir and was in potential danger of being flooded. Second, information from 13BN1ll would add to the reconstruction of the local cultural sequence, and also to the understanding of the development of the Iowa ceramic industry. Third, the exploration of this site was a part of the Iowa State University archaeological field school, providing an opportunity for training in the techniques of historic as well as prehistoric investigations. Finally, and possibly most important, was the cooperation and active interest of both the land owner (James Meehan) and the land tenant (Harold Schell) in obtaining permission to dig the site.

The first ten-foot test squares were opened in the area which James Meehan recalled as the location of the potter's shed, where surface collections had produced concentrations of historic materials. This area produced the major portion of the waster dump and the apparent outline of the shed and a hearth. In addition to the principal excavation area, three five-foot test pits were also dug. These were located south of the fence line northeast of the main excavation unit, in an area where surface collections had produced concentrations of glazed brick. A portion of the kiln arch was found in one of the test pits, as well as scatterings of
broken wares and manufacturing debris.

By the end of the 1968 field season, a sufficient sample of materials from 13BN111 had been collected, and the site was closed. This was done with the knowledge that the relocation of county road R18 through 13BN111 was to occur sometime within the next two years. Although the site was scheduled for total destruction by the completion of the new county R18 road, the archaeological crew planned to monitor the road grading process in the hope of obtaining additional information about the pottery works and the settlement of Coal Valley. The possibility of locating the kiln in relationship to the rest of the site was of special interest.

No further work was undertaken at 13BN111 during 1969 due to the delay in the R18 road construction schedule. In the spring of 1970, the road construction was begun on the uplands to the south of 13BN111 and was not scheduled to cut through Coal Valley until July of that year. By June 1, however, the road bed had been bulldozed through Coal Valley, completely obliterating 13BN111 and parts of 13BN110 without the Iowa State University Archaeological Laboratory's having been apprized of the change in construction schedules (Plate 3). This occurred with the full knowledge on the part of the county engineer's office that archaeological sites were located within the road construction axis. Unfortunately then, 13BN111 was completely destroyed without the planned archaeological monitoring. Therefore, this report is based solely upon one field session's excavations and no subsequent survey of the area to additionally ascertain the spatial dimensions of the industrial site and the associated settlement of Coal Valley.
Excavations at 13BN111 were designed to obtain a large controlled type collection of ceramic materials and to determine the location of the potter's shed. The area was eventually gridded into 10' x 10' squares. A total of 95 square feet was opened in the area containing the shed and the waster dump (Plate 4). The excavated areas and the method of numbering the squares are shown in Figure 8. Each square is designated by the coordinates of its southeast corner. A 5' x 5' stratigraphic test was made at N2005/W1970 to determine depth of the cultural zone (Plate 4). This test square was taken down to three feet, which was well below the historic cultural zone.

Stratigraphy at 13BN111

Since the cultural zone of the site was generally undifferentiated and very shallow, usually only 1 to 1 1/2 feet, no attempt was made to dig in "natural" stratigraphic levels. A heavy concentration of cultural materials began directly under the sod layer with some cultural materials intruding through the sod to the surface (Plate 5). This breccia-like concentration of cultural debris made it difficult, and often times impossible, to determine any definite stratigraphic sequence. In some instances, portions of a single broken vessel were distributed throughout the entire depth of the cultural zone. Therefore, arbitrary levels were used in excavating the site. Portions of the excavated area did show four major stratigraphic levels (Figure 9). These four levels extended throughout the entire site with the top two levels containing the cultural materials. There were various other deposits, such as fine gray clay
Figure 8. Site plan of 13BN111 showing main excavation unit, features 1-48, and post hole pattern.
Zone
1. Dark loamy topsoil with cultural materials
2. Light gray-yellow clay, slightly sandy, with cultural materials
3. Sterile yellow clay
4. Sterile fine sand

Figure 9. Vertical stratigraphic section along W1970 from N2005 to N2010
Zone
1 Dark, humic soil filled with cultural material (Feature 48)
2 Gray clay (possibly potter's clay)
3 White to tan ash with cultural material
4 Charcoal and cinders embedded in dark gray clay
5 Gray clay with some cultural material
6 Sterile orange clay

Figure 10. Vertical stratigraphic section along W1980 from N1991 to N1999
and ash, found in several areas of the site (Figure 10).

The uppermost major stratigraphic level was a dark humic topsoil filled with a heavy accumulation of cultural materials. This humic zone probably represented the deposition of soil from the feedlot and pasture described by James Meehan. This first zone varied in depth from $\frac{1}{2}$ foot to 1 foot. The second layer was a gray to yellow-gray clay with a scattering of cultural material. Its depth ranged from $\frac{1}{2}$ foot to 2 feet below the surface. This zone probably represented the rubble and detritus from the waster dump and destruction of the potter's shed. The third layer was composed of a yellow clay which yielded no artifacts. A fine gray clay was often found in pockets scattered throughout the site. This clay could possibly have been used by the potters to make some of their wares. Some of this clay was fired by Mary Miller and proved to be an adequate stoneware clay. These deposits were very localized and will be described in the discussion of the designated features from the site.

Structural Evidence

Excavations yielded structural evidence of a potter's shed with a hearth and portions of the kiln arch. There is both primary and secondary evidence for a potter's shed and a kiln at this site. The primary evidence for the kiln is the kiln arch. The secondary evidence is represented by the scattered brick and firing rubble. The primary evidence for the potter's shed is the post hole pattern and hearth. The waster dump represents secondary evidence for the existence of a pottery operation in the immediate vicinity.
Kiln

The recovered portions of the kiln arch were found in a test pit approximately fifty feet northeast of the main excavation south of the fence line among trees. This portion of the kiln arch is composed of approximately fifteen fire bricks and is covered by heavy deposits of glaze with broken pieces of kiln furniture on the upper surface (Figure 11). This portion of the kiln probably represents an arch from the firing chamber beneath the floor of the kiln. There are deposits of salt glaze on the underside of the arch which were probably caused by salt being introduced into the firing chamber sometime during the firing process. The kiln furniture on the upper surface of the arch suggest that this upper surface was probably part of the kiln floor.

There were 556 fire bricks and pieces of fire brick and 362 red bricks scattered throughout the excavation. Almost every fire brick had one face covered with a heavy deposit of salt glaze. Only a very few red bricks had any deposits of salt glaze. The large number of fire bricks suggest the presence of a kiln at the site, particularly since the salt glaze would rule out the possibility that they had been used for a hearth. However, it is difficult to determine whether the red bricks were used in the kiln structure, or if they were used primarily for the construction of the hearth. In addition to the brick, there are 226 pieces of firing rubble—large masses of wares and kiln furniture imbedded in salt glaze. From this limited amount of information, it is practically impossible to determine the type of kiln used at 13BN111.
Figure 11. Portion of kiln arch showing fused fragments of kiln furniture on upper surface
Waster dump

A considerable portion of the site consisted of a waster dump. According to Webster (1971:239), waster dumps are:

... the piles of pottery, rejected for one reason or another, that came to grief somewhere in the production-firing process and were thrown away, usually somewhere adjacent to the kiln.

The waster dump at 13BN111 extended over most of the excavation units with areas of concentration located in squares N2000/W1970, N2000/W1960, N2010/W1970 and N2010/W1960 and Feature 21. In most places, the depth of the cultural material ranged from 1.0 to 1.2 feet, with the exception of Features 21, 38 and 48 which extended to approximately 2.0 feet.

Potter's shed

Evidence for a shed or some similar wooden structure at 13BN111 consists of a pattern of post holes and remnants of a hearth exposed in the main excavation unit. Individual posts, post holes, the hearth, and other such apparent evidence were designated as specific "features" during the process of excavation. A feature is a formal-spatial unit arbitrarily designated in the field to aid in future interpretation of the site. It is designed to allow separate excavation of the feature as a whole, and to retain exact provenience for all artifacts recovered from a feature.

The posts and post holes from 13BN111 appear to be the residue of a floor plan and walls of a wooden structure. Post holes were characterized as circular stains in the soil that ranged in diameter from 0.3 feet to 0.9 feet, extended 1.0 to 1.5 feet straight into the ground. Most of the stains were circular in form; however, there were two, Features 5 and 28,
which were square to rectangular in form. These were both interpreted as post holes because of the wood fragments found within them. Most of the wood fragments from the site were identified as either softwood (e.g. pine, fir, cedar) or hardwood (oak, willow, elm) with the hardwoods further identified as to genus and occasionally species. The humic fill inside of the post holes contained the same type of cultural material as found in the rest of the site—historic pot sherds, manufacturing debris and brick fragments. There were two long, narrow depressions formed by decayed fallen posts. These are represented by Features 22 and 23 (Figure 8). Feature 22 was 8.2 feet long and 0.5 feet wide. Feature 23 extended beyond the border of the square, but the portion which was uncovered was 6.0 feet long and 0.5 feet wide.

The hearth is represented by Feature 37, an irregular rectangular area of orange burned earth and concentrated brick fragments bounded on the west by four whole bricks and several large brick fragments (Plate 6). A post hole, Feature 46, appears in the middle of the hearth area. One explanation for the presence of this post hole is that the shed was originally built without a hearth. Then, when a hearth was added, a post was removed from the wall, thus leaving a post hole beneath the burned earth area.

A pattern of post holes emerges from the plotting of their locations on a horizontal profile map (Figure 8). Some of the post holes which seem to be extraneous to the general outline of the shed may well be posts which could have supported shelves on the interior of the shed. Guillard (1971:15) gives a conjectural painting of the interior of a potter’s shed
illustrating how wares were left out to dry on various shelves within the shed. It is also likely that some of the stains called post holes were of more recent origin. James Meehan, however, indicated that there never was a fence or any recent structure in the area. He did say that the area had been used as a feed lot, but did not indicate if there were any structures related to this use of the land. There is also the possibility that some of the stains were natural, and indeed, not even post holes at all.

Webster feels that given the types of structural evidence found at a historic pottery site, the production buildings are archaeologically the least important. He states:

*Any structure could serve as a pottery shop, and pottery shop and storage buildings typically were abandoned and completely empty before they finally fell down or were demolished (1971:239).*

This is indeed the case at the Noah Creek Kiln. The potter's shed was used as a livestock shelter and eventually torn down. In itself it provides relatively little information about the activities of the Coal Valley potters, but the probable structural evidence does provide part of the basis for inferring an industrial site at this locus.

**Shallow depressions and other features**

A variety of irregularly-shaped, ill-defined stains were also designated features. These include Features 6, 21, 24, 25, 31, 36, 38, 40, 41, and 48. All of these features could be interpreted as either natural depressions in the land surface which were filled with manufacturing debris, or, purposeful man-made pits. Some of these pits could be inter-
interpreted as "bunging pits" where clay was mixed with water. This method of preparing clay was done to obtain a uniform consistency in the clay and to allow rocks and pebbles to sink to the bottom. These "bunging pits" were usually fairly shallow (Guilland 1971:16). All of the depressions at 13BN111 were filled with broken pots and refuse from the kiln firing. Feature 48 contained a layer of ash with charcoal and cinders beneath it (Figure 10). These ashes and cinders were by-products of the burning of coal and may represent the refuse from the kiln or the hearth.

General Characteristics of the Ceramic Wares

The most abundant artifacts found at the Noah Creek Kiln were those directly associated with the pottery industry. Over 35,000 artifacts related to the production of ceramics were recovered. The most numerous of these were pot sherds and ceramic industrial waste products. In addition to the artifacts connected with the pottery industry, artifacts indicative of the more general pioneer settlement were found on the surface and in the waste dump. In this section, the artifacts of the ceramic industry are discussed first and in greater detail than the other artifacts. Complete identification and analysis of the artifacts not directly associated with the kiln operation will not be made here but will be undertaken at a later date.

A fair idea of the types of pottery produced at a site can be determined from the broken wares in a dump. However, one cannot infer from proportions of wares found in a dump that this was the proportion in which they were being produced; only that this is the ratio in the dump.
The reason for this is that we have no way of determining whether the dump was continuous over a period of time. Perhaps the potters discarded wares in one area for a while, and when it began to get too deep, they started a new dump. Despite this drawback in interpretation of a waster dump, there is important evidence here to compensate for this deficiency. Much can be learned about the process of making pottery at a particular kiln. Every piece of pottery thrown on a waster dump usually shows some visible reason for its rejection—over-firing, under-firing, structural weakness, or inappropriate glaze mixtures. Also, all of the kiln furniture used in the firing process eventually ends up in the waster dump (Webster 1971:239-244). Therefore, one can see that a waster dump is a valuable resource in discovering the nature and level of technology of a particular pottery operation, as well as the types of wares being produced.

The wares made at Noah Creek Kiln were heavy utilitarian wares with generally thick (\(\frac{1}{2}\) to \(\frac{1}{2}\)) walls. The vessel categories included in the artifact sample were crocks, jugs, butter churns, well tubing and drain tile which were wheel-thrown; and milk bowls and lids which were mold-made. The wares were typically covered with a salt glaze or a brown slip glaze. Some of the wares had both types of glazes on their surfaces.

One of the most characteristic features of the ceramic wares found at Coal Valley is the regularity in form within categories of wares. This is considerably different from the wheel-thrown pottery found at the Coalport Kiln where every pot was different (Reynolds 1970:107). This regularity in wares can be explained in terms of the use of molds and
templates in forming many of the wares. Excavations yielded over 3,000 rim sherds and thousands of base and body sherds. Sherds were assigned to functional categories based upon form, glaze and diameter of the vessel. The rim sherds were studied in greater detail than any of the other artifact classes because rims were the most diagnostic portions of any other of the ceramic wares. All rim sherds were assigned to functional categories if they exhibited enough of their original form and glaze. There were approximately 2,400 sherds which could not be categorized due to their small size, fragmentary nature and lack of glaze. A variety of measurements or observations were made on all partially and completely reconstructed vessels to provide the basic data for the analysis of the Noah Creek wares. This section will consist of a general discussion of the characteristics of Noah Creek wares followed by a more detailed discussion of vessel types.

Clay color and properties in cross-section

Samples of various wares were subjected to Electron Microprobe Analysis by Denton Wirkus in the Iowa State University Ceramic Engineering Department. The results of this analysis provided information on the chemical composition of the clays and tempering materials. The technique can not prove that two clays are the same, but it can show that they are very similar and possibly they come from the same deposit. The clays from the wares and the kiln furniture proved to be very similar clays, composed of silica, alumina, and potassium with iron and titanium present in small quantities. However, the kiln furniture sample had many more
grains of pure silica oxide than the pottery samples, suggesting that a sand was being used to temper the kiln furniture. Tempering decreases the drying time and increases the stability of the form during firing. The clay also had natural impurities in it and some of these were quite large—up to \( \frac{1}{4} \)" in diameter. These large impurities in the clay suggest that the preparation of the clay was rather haphazard. This preparation process is discussed further in Chapter Six.

Maturely fired pots consistently had a core color of buff, light buff or grey. In some cases, the same vessel had one or more of these colors in cross-section. A dark grey on the outside surfaces and a lighter grey in the middle was common. When samples of both of these colors were tested, they proved to have the same composition. This color difference could have been caused by differential heat transmission throughout the vessel during the firing process. Wares which were not fired to a high enough temperature characteristically had a light cream color and seemed more porous. These wares were immaturely fired because they lacked the deep brown color of a mature brown slip glaze and usually lacked any salt glaze.

**Glazes**

The Noah Creek Kiln was primarily a salt-glazing kiln. Most vessels had a combination of salt-glazed and brown-slipped surfaces. Salt-glazing was used because it was probably cheaper, faster, and required less effort than other types of glazing methods. Common salt (NaCl) was the only material needed. No extra steps were necessary in applying the
glaze because the salt was thrown into the kiln firing chambers during firing. To attain the most efficient use of kiln space, wares were stacked together. This created the problem of glazing parts of the vessels which the salt fumes could not reach. These covered surfaces were either left unglazed or glazed with a brown slip.

**Salt glaze** The salt glaze is a thin vitreous coating formed on the surface of a clay vessel by subjecting it to common salt fumes during the firing of a kiln. The salt glaze method was probably developed in Germany during the 12th century. It was brought to the American colonies by the early potters and became an essential part of the stoneware industry until the 1880's when the Bristol glaze replaced it (Parmelee 1951: 176).

The salt glaze varies in color, thickness and texture on the wares from Noah Creek Kiln. The colors range from a light grey to a green-brown, yellow-brown or orange-brown. Rhodes (1959:34) describes the appearance of a good salt glaze:

The best of the old salt-glazed stonewares have a rich, varied surface with an orange-peel texture, and some color variation caused by flashing in the fire. In color they may be warm gray, tan, or a rich golden brown.

Most of the Noah Creek wares exhibit unevenness in the salt glaze, enough so that some wares do not have the characteristic orange-peel texture. It is fairly certain, though, that these wares are salt-glazed, because of the lack of drip marks and glaze lines which normally occur on wares that have had slips applied by dipping, pouring or brushing.
Albany slip

The Albany slip is an earth glaze prepared from naturally occurring clays with the addition of necessary fluxes, cementing agents which bind the pigment to the surface of the ware (Parmelee 1951:285). The chemical composition of Albany slip clay is:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica</td>
<td>56.75%</td>
</tr>
<tr>
<td>Alumina</td>
<td>15.47%</td>
</tr>
<tr>
<td>Ferric oxide</td>
<td>5.73%</td>
</tr>
<tr>
<td>Lime</td>
<td>5.78%</td>
</tr>
<tr>
<td>Magnesia</td>
<td>3.23%</td>
</tr>
<tr>
<td>Titania</td>
<td>(1.00 ca.)</td>
</tr>
<tr>
<td>Alkalies</td>
<td>3.25%</td>
</tr>
</tbody>
</table>

The Albany slip from Noah Creek Kiln was subjected to Electron Microprobe Analysis and revealed the following qualitative chemical composition: silica, alumina, iron, magnesia, potassium and calcium (lime) in the form of oxides. Silica was the largest component with significant portions of calcium, aluminum, and potassium (Wirkus 1974). The similarity in these chemical compositions suggest that the Albany slip used at the Noah Creek Kiln was probably imported rather than collected locally (Wilder 1974). The experiments done by Mary Miller, however, illustrate that the local clays could have been used as a brown slip on the Noah Creek wares. It is also possible that the potters were mixing imported clay with local clay to reduce the cost of importing large quantities of the New York clay (Guilland 1971:42, 82). The Boonsboro and Moingona potteries were importing their slip from New York (Montana Standard, December 11, 1869).

Albany slip as a glaze has a very long heat range which makes it very practical for early pioneer potters who often times had poor control of kiln firing temperatures. The Albany slip characteristically develops "a dark glossy brown at about 1170°C., a brilliant brownish
black glaze at 1210°C. to 1250°C., and a yellowish-brown glaze at 1290°C." (Parmalee 1951:183).

The brown slip on wares from the Noah Creek Kiln fired to various shades of a deep warm brown color at maturity. The basic brown color is frequently mottled in appearance with shades of yellow, orange and green. The variety in the shades of brown seen on the Noah Creek wares could possibly be due to slight differences in the chemical composition of the clay used for the slip. Since the imported Albany slip would have a consistent chemical composition, this color variation may be due to either the mixing of imported and local clays, local clays used by themselves as slips, or differences in firing temperatures.

Decoration The only decoration which was present on any of the wares was cobalt blue designs underneath a salt glaze. This will be discussed in greater detail in the section on crocks.

Description of Vessel Types

This section describes and illustrates the various wares produced at the Noah Creek Kiln. Whenever possible, these wares are categorized as to function, with historical documentation as a basis for the assigning of the functional category. However, there are a few vessel forms for which alternate suggested functions are proposed. This is primarily due to the incompleteness of the sample and lack of historical documentation for a particular vessel type. The problems with assigning functional categories to vessel forms has been previously discussed in the
section on methodology in the first chapter. The processes involved in producing these wares are mentioned here but are discussed in detail in Chapter Six.

Milk bowls

The milk bowl form (Figure 12A) was one of the two most common vessel forms found during excavation of the Noah Creek Kiln. The milk bowls were made by a process known as "jollying," which involves the use of a mold to form one surface of the vessel. The typical ridges left by the fingers of the potter when wheel-throwing are not present in a jollied ware. The milk bowl sample includes 46 whole or reconstructable vessels, 2,317 rim sherds, 2,979 body sherds and 2,750 base sherds. Milk bowls are typically slant-walled with a heavy straight rim or collar. They were made in two sizes, half gallon and one gallon, with by far the largest number in the one gallon category. Volumetric measurements indicated that a one gallon milk bowl held exactly that amount when filled to the top. The exterior surface is perfectly smooth, while the interior surface shows very shallow concentric rings. These rings show up particularly well on the base.

The 46 reconstructed milk bowls were measured for total vessel height, rim height, external rim diameter, rim thickness, wall thickness and base thickness. Total vessel height is approximately 4½" with minor variations. Rim heights are either 1½" or 1 3/4", and rim thickness is 3/8" on all vessels measured. Rim thickness was measured at the base of the rim and included only the thickness of the rim on the external surface
Figure 12. Two milk bowl forms

A. The predominant jollied milk bowl form;
B. A single wheel-thrown milk bowl
External rim diameters are either $10{1/2}''$ or $11''$. Wall and base thicknesses were extremely variable ranging from $1''$ to $3/4''$ at various places on the wall and base. The thinnest portions were usually the base center and half-way down the side of the vessel. These measurements were designed to determine whether or not molds were indeed used in milk bowl production. Measurements were much more consistent in milk bowls than the other vessels produced at this site. Minor variations in milk bowls were due to various methods of finishing the rims (Figures 12A, B, C) and warpage during firing, which are discussed in Chapter Six. The author is convinced that the only dimension of the milk bowl which can account for the two different sizes is the external rim diameter. This is the only measurement that significantly varied between the two sizes.

The arrangement of glazes on the milk bowls is one of their most characteristic features. The exterior surface of the rim is always salt-glazed with the lip and base of the rim unglazed. The interior and exterior surfaces are Albany-slipped with a band one-half inch wide beneath the rim unglazed. The milk bowl form is very simple with no decoration and no writing or numbers. The glaze pattern aided in both distinguishing milk bowl sherds from other vessel sherds, and also indicates a great deal about the firing process, which will be discussed in the following chapter.

One very unusual milk bowl was recovered from the site (Figure 12B). This milk bowl was wheel-thrown, as evidenced by the finger ridges on the interior and exterior surfaces. It was completely salt-glazed. It
Figure 13. Variations in milk bowl rim cross-sections. (A, B, C. Normal rim variations; D. Milk bowl rims showing stress lines from differential shrinkage)
seems that this example of a milk bowl could have been an experimental form made before the mold was commonly used at the Noah Creek Kiln.

The milk bowl form made at Coal Valley was probably widely used locally as both a kitchen utensil and a storage vessel. Milk bowls are also referred to as milk skimming bowls, cream pans and milk pans. Suggested uses for the milk bowl include milk skimming, mixing, milk storage, and possibly baking.

Almost without exception, milk bowls are included in lists of items manufactured at various potteries and in great quantities at each. Various potteries turned them out for a dollar per dozen or a gross for $18.00. In Connecticut in 1793, Thomas Bugbee found that "the demand for milk-pans alone always kept his kiln running all summer" (Earle 1892: 83). Various sources refer to the presence of milk bowls as common household utensils:

... the old farm home where pottery utensils such as these were used in grandmother's time,—row upon row of preserve jars on the shelves in the cellar, milk pans on the old bench on the stoop... (Holden 1921:30).

... over the fireplace earthen milk pans, candlesticks, and snuffers sat on the high mantletree (Bowles 1926: 732).

An article taken from the Montana Standard (October 10, 1867, page 7) entitled "Making Butter," illustrates precisely why milk bowls have certain form and dimensions.

My own experiments have demonstrated that to put the milk more than three inches deep in the pans, entails a loss in the amount of cream; the cream is so near of the same specific gravity as the milk, that it cannot rise through a very great depth; again, in a large body of milk, it requires a longer time for it to lose its animal heat, which must all be destroyed
before the cream commences to rise, if anyone will take the trouble to set a shallow pan with not more than three inches of milk away with a bucket full from the same kind he will find that the pan will raise nearly, if not as thick cream as the bucket.

I would not put away milk deeper than from two and a half to three inches, and have found that the increased outlay for pans is more than made up by the increase in butter.

Therefore, we can assume that milk bowls were an essential commodity for the frontier housewife and a profitable ware for the pioneer potter.

Crock

The crock form at the Noah Creek Kiln represents the single largest category of wares. The sample is represented by 9 reconstructable vessels, 784 rims, 6,466 body sherds and 824 bases. They are characterized as straight-sided vessels with the majority having handles, and several rim forms (Figures 14 and 15). They range in size from very small forms which hold approximately one quart to large forms holding up to six gallons. The vast majority are salt-glazed on the exterior and Albany-slipped on the interior. There are a few crocks which are Albany-slipped on all surfaces. All crocks are wheel-thrown with finger ridges on the interior and fairly smooth exteriors. The vessel heights range from 6" to 14" and have external rim diameters from 5½" to 11½". Wall and base thicknesses are extremely variable depending on the vessel size.

Over 95% of the crocks have reserve rims (Figure 17). There are two types of reserve rims—Type A and B (Figures 16A, B, C, respectively). Reynolds (1970:121) defines a reserve rim as:
Figure 14. Large salt-glazed crock with handle
Figure 15. Small Albany-slipped crock
Figure 16. Variations in crock rim cross-sections. (A, B. Type A reserve rims; C. Type B reserve rim; D. Folded rim; E, F, G. Miscellaneous rims)
Crock Rims

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Type A</td>
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</tr>
<tr>
<td>Type B</td>
<td>40</td>
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<tr>
<td>Reserve rims with handles</td>
<td>55</td>
</tr>
<tr>
<td>Reserve rims with Albany slip exterior</td>
<td>17</td>
</tr>
<tr>
<td>Straight rims</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>763</strong></td>
</tr>
</tbody>
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Crock with Stamped Numbers

<table>
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</tr>
</thead>
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<tr>
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<td>4</td>
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<td>5</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Unidentifiable</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19</strong></td>
</tr>
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</table>

Crock with Cobalt Blue

<table>
<thead>
<tr>
<th>Designs</th>
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<tbody>
<tr>
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<tr>
<td>Number 2</td>
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</tr>
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<td>Number 3</td>
<td>5</td>
</tr>
<tr>
<td>Number 4</td>
<td>2</td>
</tr>
<tr>
<td>Number 5</td>
<td>1</td>
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<tr>
<td>Number 6</td>
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</tr>
<tr>
<td>Number 3</td>
<td>1</td>
</tr>
<tr>
<td>Number 4</td>
<td>1</td>
</tr>
<tr>
<td>Writing</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 17. Data on rim forms and designs on crock
... a rim made by bringing a "reserve" ridge of clay up the side of the pot while it is spinning and then finishing this in a variety of ways at the top of the vessel.

Almost all of the reserve rims have striations beneath the rim which may have been caused by the use of a template to finish the rim or a gauge used to measure the height of the pot during turning. These striations also may have been decorative. These striation occur directly below the rim to two inches below the rim. In some instances, handles have been applied over the striations. There are very few folded rims (Figure 16D) and several rim types which are represented by a sample of one (Figure 16 E, F, G).

Handles are crescent-shaped with the concave portion pointing down. They were probably made by bending a coil of clay into a crescent and then attaching it to the side of the vessel, usually 1 to 1½ inches below the rim.

Cobalt blue The most distinctive feature of crocks is the use of cobalt blue for designs, lettering and numbering. The use of cobalt blue makes these wares the most attractive of all the wares produced at the Noah Creek Kiln.

The lettering with cobalt blue was done with a stencil or by free-hand writing (Figures 18 and 19). Figure 18 represents the stencilled name Elliott and the location Moingona, Iowa found on two different crocks. Figure 18A is on the complete crock displayed in the Iowa Historical Museum in Des Moines and Figure 18B is on a crock body sherd from a surface collection of 13BN11. The similarity in letter form
Figure 18. Cobalt blue lettering showing the name "Elliott." (A. Crook from Iowa State Historical Museum; B. Body sherds from surface collection at 13BN11)
Figure 19. Fragmentary examples of cobalt blue lettering. (A–D. Stencilled; E. Script)
and in arrangement of words is evident. Several other crock body sherds found in the excavated cultural zone show the same type of stencilled lettering (Figure 19A, B, C, and D) and script lettering (Figure 19E).

Numbers are also found on many crocks in a stencilled form or script form as part of a design (Figure 20). The stencilled numbers are most frequently found as part of a star arrangement, while the script numbers are usually a part of other designs (Figures 23A and 24B). Stamped numbers (Figure 17) also occur on many crocks, but never as a part of any design element. All of these numbers perform a function other than design—an indication of the size of the crock in gallons.

A variety of designs—including "cyclones," stars, and flowers occur on one side of many crocks (Figures 20–24). The stars and flowers were used throughout the eastern and midwestern United States to decorate salt-glazed stoneware during the 19th century (Guilland 1971). The "cyclone" design, however, seems to be distinctive to the kilns from central Iowa. The term "cyclone" was used to designate this particular design because of its formal similarity to the weather phenomenon of the same name. Cyclones are a frequent occurrence in Iowa during the spring and summer months, and undoubtedly presented a very real threat to early Iowa settlers. The Iowa State University campus has even been named "Cyclone Country," and the Iowa State football team is known as the "Cyclones." Therefore, when the design was first noted by the Iowa State University archaeological survey crew, it was very appropriately dubbed the cyclone design. There seems to be three basic ways in which the
Figure 20. Cobalt blue stars and numbers pattern
Figure 21. Cobalt blue cyclone design
Figure 22. Portions of cobalt blue cyclone designs
Figure 23. Portions of cobalt blue designs
Figure 24. Portions of cobalt blue designs (Note the script "3" on design C)
design was made—using a spiralling motion (Figure 22A, B); a back-and­
forth motion (Figure 22C); and a combination of the two (Figure 21).

Crock were primarily used as storage vessels for a variety of 
foods and other household necessities. A common name given to the 
straight-sided variety is "butter crock." According to Guillard (1971:
125):

Straight-sided butter crocks ranged in sizes from one 
quart to six gallons. The larger sizes, called tubs, 
were used for shipping butter to market.

Another common use of crocks was preserving cooked meats by packing 
them and covering them with clarified butter or lard. These crocks 
were then stored either top down in a cool place or top up with a dust 
cover of thin leather or wetted bladder tied over the mouth. Crocks 
were also used as storage containers for dye, soap, bleach, grease, 
lye, oil, tallow, lard, pickles, sugar, flour, eggs, salt meat and 
fish, sauerkraut, mincemeat, corned beef, fresh fruit and vegetables 
(Guillard 1971:106, 125).

**Butter churns**

The butter churn category is based on 54 large rims sherds which 
have internal channels for the replacement of lids (Figure 25). Al­
though there were no complete vessels recovered from the site, a number 
of complete butter churn lids were found which seem to fit the internal 
channeled rims. Therefore, the term butter churn is tentatively applied 
to rims with internal channels and slightly sloping shoulders (as opposed 
to straight sides). Churns were evidently of quite large size with ex-
Figure 25. Reconstructed butter churn
ternal rim diameters ranging from 8" to 10". All of the rims have salt-glazed exteriors and Albany-slipped interiors. No numbers or cobalt decorations were present in the sample, although approximately half showed horizontal incised lines as shown in Figure 25. All of the rim types were very similar (Figure 26); minor variations occur due to the vagaries of all wheel-thrown pottery. Several rims have crescentic lug handles located on the shoulder (Figure 26C).

Seven butter churn lids were recovered from the excavations. This lid form is a shallow dish-shape with a hole in the center encircled by a flange-rim (Figure 29). All of these lids are Albany-slipped on the top with the bottom left unglazed. The hole in the center is for the plunger of the butter churn. This hole measures about 1½" in diameter. The flange-rim would act as a guide for the plunger. The diameter of the lid is approximately 8".

Jars

A variety of jar forms represented solely by rims, were found at the Noah Creek Kiln (Figure 27, 28). Of the 19 jar rims identified, all had constricted necks. Several had internal channels for some type of lid. Most of them were Albany-slipped on the interior and exterior, with a few rims salt-glazed on the exterior. None of the jars have any numbers or decorations except for striations, which in this case, probably are decorations. The author suggests these are decorations rather than gauge marks because of the irregularity in jar forms from the site.

Figure 27F may be the rim from an "airtight jar" used for home
Figure 26. Butter churn rim profiles. (Rim C has portion of handle attached)
Figure 27. Jar rim form profiles. (A, B. Jar rims with no internal channel; C-E. Jar rims with internal channels; F. Rim from "airtight jar")
canning. They were used much like a glass canning jar, and sealed with melted beeswax and a metal lid (Guilland 1971:161-162).

The following figure summarizes the data on jar rim categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>13</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

Figure 28. Sample size of jar rim categories

Lids

Five lid forms were found at the Noah Creek Kiln which probably represent coverings for several types of containers (Figure 29). Type A is represented by 3 lids, and is a small lid measuring approximately 4" to 5" in diameter. They tend to be dish-shaped with a raised outer rim, a flat base, and a flat knob handle. One is bisque-fired and the others are salt-glazed. There are 2 Type B lids that are somewhat larger lids with diameters of approximately 8". This type has a series of three ascending ridges to some type of a handle on the top. These bases are also flat, and the entire lid is Albany-slipped. Type A and Type B lids were probably used on containers which had internal channels to hold the lids in place.

Type C and Type D lids are fairly large with diameters from 8" to 11". There are 20 Type C lids and 4 Type D lids in the lid sample. Flanged lids are characterized by a dish shape with a basal flange and an overhanging rim and flat handle. Albany slip and salt glaze are used
Butter churn lid

Figures 29. Lid forms. (A, B. Lids for internal channel containers; C, D. Lids for crocks; Butter churn lid)
on both types in a variety of arrangements: some are totally salt-glazed, others have Albany slip on the top with an area left unglazed around the outside edge; some are left unglazed on the inside. These lid types were probably made for vessels with a reserve or straight rim. The basal flange and overhanging rim would keep the lid from slipping off of the crock. Some Type C lids have stamped numbers on the top surfaces (Figure 30). The stamped numbers on the lids seem to correspond with the stamped numbers on the crocks; e.g. a #5 lid fits a #5 crock. Figure 30 summarizes the data on lid types.

<table>
<thead>
<tr>
<th>Butter Churn lids</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Type A lids</td>
<td>3</td>
</tr>
<tr>
<td>Type B lids</td>
<td>2</td>
</tr>
<tr>
<td>Type C lids</td>
<td>20</td>
</tr>
<tr>
<td>Stencilled numbers</td>
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<td>Number 3</td>
<td>1</td>
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<tr>
<td>Number 5</td>
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<tr>
<td>Type D lids</td>
<td>4</td>
</tr>
<tr>
<td>Handles</td>
<td>5</td>
</tr>
<tr>
<td>Lid fragments</td>
<td>118</td>
</tr>
</tbody>
</table>

**Figure 30. Sample of lid and lid handle categories**

**Jugs**

The jugs made at Coal Valley were of half-gallon and one gallon capacities, and were used for storing liquids. All were wheel-thrown and had strap handles (Figure 31). They have fairly small bases (5½" to 7½" in diameter) and smoothly rounded expanding shoulders (6" to 7½" in diameter). Half-gallon jugs stand around 8" high, and one gallon jugs around 10" high. They are all flat-bottomed. External rim diameter ranges from 1 5/8" to 2 1/8" and the internal rim diameter is
Figure 31. Jug form (Note interior finger channels)
approximately 1 1/8".

The large majority of jugs are Albany-slipped on the interior and exterior with bases left unglazed. The color of the Albany slip is extremely variable on the jug form. The colors which occur are various shades of yellow, green and brown. Many times all of these colors will occur on the same vessel, giving a mottled appearance to the surface of the jug. This color variation is due to the method of firing the jugs which is explained in the following chapter. There are four jugs which are salt-glazed on the exterior. The jug sample included 10 whole or reconstructable vessels, 98 rims, 2,678 body sherds, 277 bases and 26 handles. None of the jugs had any numbers or decorations, except for striations on the shoulders which were caused by a gauge used to help standardize the size or merely used for decoration. The various rim forms are shown in Figure 32.

The jug handles were formed by pulling them from a stiff lump of clay. The handles are then attached to the side of the rim and then to the body. The base of the handle is attached to the body of the jug by a downward wiping motion and then a lateral wiping motion across the first wiping (Figure 33A). This method of attachment left characteristic finger marks on the base of the handles on all of the jugs except one. Figure 33B illustrates the exception. In this case, it appears that the potter didn't finish attaching the handle with the lateral motion, but left it the way it was after the first downward motion. This single method of handle attachment used at the Noah Creek Kiln may indicate that only one potter was making jugs at this kiln, since
Figure 32. Jug rim forms
Figure 33. Two methods of handle attachment on jugs. (A. Predominant finished form of handle attachment; B. Single unfinished form of handle attachment)
individual potters have distinctive ways of attaching handles.

**Simple bowls**

Only 13 simple bowl rims were found at the Noah Creek Kiln (Figure 34A). They are wheel-thrown and have salt-glazed exteriors and Albany-slipped interiors. They resemble the simple bowl form found at the Coalport Kiln (Reynolds 1970:138).

**Plates**

Twenty-five rims from shallow vessels or plates were found during the excavations of Noah Creek Kiln (Figure 34B). They are fairly thin (1/8") and approximately 8" in diameter. The majority are poorly salt-glazed, and a few are Albany-slipped.

**Flower pots**

The number of flower pot fragments found at Coal Valley was small—only six. There are three rims with punctate lips, two pinched rims, and one base with attached dish. All were unglazed, except for an immature Albany slip on two of the pinched rims. The fact that these forms are unglazed and are very similar in form to modern flower pots suggests that they are indeed flower pots.

**Miscellaneous wares**

This category includes one small, Albany-slipped inkwell; four small Albany-slipped rims with spouts which are probably pitchers; and 43 thin rims with small diameters. There is also one form which is cylindrical and twice as wide at the base than at the top. It stands
Figure 34. Miscellaneous wares. (A. Simple bowl rim; B. Plate rim; C. Reconstructed ceramic ware, probably a milk strainer)
5" high and has two, 2-inch holes in the sides. This vessel might possibly be a chicken waterer. Another one-of-a-kind ware is illustrated in Figure 34C. It is bell-shaped with a collar on one end, no base, and is completely salt-glazed. The height is 12". The constricted end diameter is 8" and the flaring end diameter is approximately 16". A suggested function for this form is a milk strainer. It might have been used by tying a piece of muslin over the large end, and setting the narrow end inside a crock, thereby functioning as a filter and a funnel.

**Well tubing and drain tile**

During the 1860's in the eastern United States, the demand for the traditional vessels of the folk potter decreased because of the increasing availability of less expensive containers made of glass or tin. Many potters turned to producing ceramic wares for other industries. These wares included bricks and tiles, water pipes, drain tiles, "stone tubes," and flue tiles (Guillard 1971:74). In Iowa, the soils of the last glacial advance are poorly drained. Even today, areas near the location of the Noah Creek Kiln remain marshy most of the year. Therefore, drain tiles were of particular importance to early settlers because tiles enabled farmers to use land which ordinarily would have been too wet to farm. The function and production of "drainpipes" is discussed by Beckwith (1872:82):

> They are made permeable, for draining wet ground, or impervious for conducting water.... To produce a permeable channel two methods are available. The worst consists in selecting a meagre clay and half burning it; the porous body thus produced is weak and the pores soon fill up. The better way is to burn a stiff and
fatter clay mixed with sand to a semi-vitreous state, and in putting together, leave passages for the water.

The drain tiles from the Noah Creek Kiln are of two kinds; both are completely salt-glazed which would indicate that they functioned to conduct water (Figure 35). The Noah Creek potters were undoubtedly salt-glazing their drain tiles because it would have been more expensive and time-consuming to try and protect these wares in a salt-glazing kiln.

One type of drain tile produced at the Noah Creek Kiln is an open-ended cylindrical form with an internal channel at one end (Figure 36). This type stands 12" high and has an external diameter of 10" at the channeled end, and 9" at the plain end. The second type of drain tile is a larger, open-ended cylinder with no channeled end. This form has 1-inch cuts or ½-inch holes through the walls. There are no complete pieces of this type of drain tile, but diameter estimates range from 7" to 21".

It was impossible to distinguish base and body sherds of channeled drain tile from body sherds of unchanneled drain tile and saggers (a form of kiln furniture), since all three forms have fairly thick walls (3/4"), are salt-glazed on both sides, and have cut edges for bases. There were 1,254 body sherds and 294 bases of this nature.

One form found at the Noah Creek Kiln has been tentatively designated well tubing (Figure 35). The name for this functional category was derived from passage in an 1872 paper that stated that the Coal Valley pottery would be concentrating on the production of "well tubing," and would be making it their specialty (Boone County Advocate,
October 3, 1872). The well tubing found at this site is an open-ended cylindrical form with a recessed internal rim and an external channel on one end (Figure 37). It is 13" high and has a diameter at the middle of 4". The well tubing is completely salt-glazed and has deep finger ridges on the interior indicating that this form was wheel-thrown. Figure 35 summarizes the data on well tubing and drain tile.

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<td>—</td>
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<tr>
<td>Rims</td>
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<td>14 (cut marks)</td>
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<tr>
<td>Bases</td>
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<td>—</td>
<td>9 (holes)</td>
</tr>
<tr>
<td>Bodies</td>
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<td>—</td>
<td>—</td>
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<tr>
<td>Total</td>
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</table>

Figure 35. Sample size of drain tile and well tubing categories

Kiln Furniture

"Kiln furniture" is here used as a general term for the ceramic industrial waste products which were used to help "set" or stack unfired ware in kilns prior to firing (Leach 1940:207; Reynolds 1970:163; Webster 1971:35). These crude forms were used to keep glazed pieces from touching, and to stabilize stacks of wares so that they would not collapse or so that the weight of uppermost pieces would not crush the lower pieces. Most kiln furniture found at early pottery sites was made quickly from moist clay, used for one firing of the kiln, and then discarded. All pieces have a heavy coating of sand to prevent them from sticking to
Figure 36. Ten-inch, internal channeled drain tile
Figure 37. Well tubing
to the wares. The kiln furniture at the Noah Creek Kiln was made with clay similar to that used for wares, with the addition of sand to temper the clay. This was shown by Electron Microprobe Analysis (Wirkus, 1974).

At 13BN1ll, there were at least six different and distinguishable functional categories of kiln furniture, three of which have been divided into sub-categories based on form (Figure 38). The kiln furniture categories were set up based on observations made on form and the way these pieces were arranged in the kiln during firing. This arrangement was determined by observing how various kiln furniture forms were stuck to one another or to broken wares. For example, leveling props are found adhering to kiln shelves or setting tiles, but never to wares, and they always have one fairly flat surface. These observations tend to indicate that leveling props were primarily used on the floor of the kiln to provide a level surface upon which the kiln shelves and wares could be stacked. In naming these categories, the author has used the terms applied by Reynolds (1970) for the Coalport kiln furniture.

**Leveling props**

Leveling props are crudely formed pieces of clay which were used to level stacks of vessels or the shelves upon which vessels were stacked. There were two types of leveling props found at the Noah Creek Kiln (Figure 39). Type A is a short, squat lump of clay, apparently made by flattening a cylindrical piece of clay at both ends. Leveling props of this type are approximately 2" high and 3" in diameter. They were placed on the floor of the kiln under the kiln shelves to provide a level surface upon which wares could be stacked. Type A leveling props
### Leveling props

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
<tr>
<td>Type A</td>
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</tr>
<tr>
<td>Type B</td>
<td>591</td>
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</tbody>
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### Setting Tiles

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</thead>
<tbody>
<tr>
<td>Ring tiles</td>
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</tr>
<tr>
<td>Cut tiles</td>
<td>430</td>
</tr>
<tr>
<td>Rhomboid cut tiles</td>
<td>282</td>
</tr>
<tr>
<td>Irregular tiles</td>
<td>711</td>
</tr>
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</table>

### Cross-wedge supports

| Quantity | 517 |

### Kiln shelves

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<tr>
<td>Type A</td>
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</tr>
<tr>
<td>Type B</td>
<td>273</td>
</tr>
<tr>
<td>Type C</td>
<td>91</td>
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</table>

### Saggers

| Quantity | 2 |

### Miscellaneous

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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Type B</td>
<td>5</td>
</tr>
<tr>
<td>Type C</td>
<td>41</td>
</tr>
<tr>
<td>Type D</td>
<td>6</td>
</tr>
</tbody>
</table>

| Compound kiln furniture | 66 |

### Unidentifiable fragments

| Quantity | 4,340 |

### Draw trials

| Quantity | 234 |

Figure 38. Sample sizes of kiln furniture categories
Figure 39. Leveling props. (A. Type A leveling prop; B. Type B leveling prop)
correspond to Reynold’s Category A kiln furniture (1970:166). Type B leveling props are cylindrical pieces of clay which are flattened along the longitudinal axis (Figure 40B). Examples of this type occur in a variety of sizes ranging from 2" to 7" long. They were also placed on the kiln floor under the kiln shelves, and served the same purpose as Type A. Both Type A and Type B leveling props show deep impressions of contact with kiln shelves.

Setting tiles

Four types of setting tiles were found at the Noah Creek Kiln (Figure 40). This category of kiln furniture was used as bases for stacks of wares, and are usually found placed on top of kiln shelves and directly under the wares. They also may have been used in between wares to separate rims from bases or rims from rims (Reynolds 1970:167). However, there is little evidence for this method of stacking at this site.

Ring tiles (Figure 40A) are flattened annular pieces of clay which were placed directly beneath a stack of wares. Although no ring tiles were found adhering to the bases of vessels, the diameter of ring tiles (8") suggests that they were used underneath jugs. They would have functioned to seal off glaze fumes from the base of the jug, since most jug bases are unglazed. Ring tiles correspond to Reynolds’ Category B kiln furniture (1970:170).

Cut setting tiles (Figure 40B) are flat rectangular pieces of clay with cut edges. They are 2" wide and 2" to 5" long. The tiles show impressions of rims, and occasionally have portions of rims and
Figure 40. Setting tiles. (A. Ring tile; B. Cut tile; C. Rhomboid tile; D. Irregular tile)

Rhomboid setting tiles (Figure 40C) are narrow, flat setting tiles that are rhomboid-shaped in cross-section, and have cut edges. They are $\frac{1}{2}$" to $\frac{3}{4}$" wide and 2" to 4" long. These may have been used between milk bowl rims to level the bowls as they were being stacked. These tiles have rim impressions and portions of milk bowl rims adhering to them.

Irregular setting tiles (Figure 40D) are formed by hand rather than by cutting. They are lozenge-shaped with rounded edges and range in size from 3" to 7" in length and 1 1/2" to 3" in width. Many have rim impressions or portions of rims adhering to them. This category of setting tiles corresponds to Reynolds' Category D kiln furniture (1970:170).

Cross-Wedge Supports

Cross-wedge supports are cylindrical pieces of clay slightly flattened at each end and molded by hand (Figure 41A). Reynolds (1970:167) indicates that the cross-wedge supports found at Coalport Kiln could be categorized as right-handed or left-handed. Right or left handedness can be observed on Noah Creek cross-wedge supports by placing a hand around one of the wedges because few of them are distorted from their original shape. They range in length from 3" to 5". Concave impressions on both ends reflect the function of these pieces. Cross-wedge supports were used between pots to keep the pots separate and rigid. They were also probably used between the outside row of pots and the kiln wall. The wedges were set between pots while still in a plastic
Figure 41. Cross-wedge support
state, and squeezed to the proper length to support the pots. This category of kiln furniture corresponds to Reynolds' Category B kiln furniture (1960:167).

**Kiln shelves**

Kiln shelves are circular slabs of fired clay which were either mold-made or wheel-thrown and fired prior to use. There were three types of kiln shelves found at Noah Creek Kiln. They were used as leveling bases for stacks of pottery and probably covered the kiln floor during firing. They also may have been used as intermediate platforms within the kiln or as covers for crocks. Kiln shelves correspond to Reynolds' Category F kiln furniture (1970:170).

Type A kiln shelves are wheel-thrown and have a dished out area in the center. They are approximately 2" high and 8" to 10" in diameter. The dished-out center is approximately 9" in diameter. A suggested function of Type A kiln shelves is to prevent the warpage of the base of drain tile during firing (Figure 42A).

Type B kiln shelves are mold-made by packing tempered clay into rough molds. There is no evidence for molds used for this purpose at the site. However, the uniformity of the shape and the ridges on the sides of these shelves suggest the use of molds in their manufacture.

Cross-sections of these shelves reveal many air pockets and occasional folds which suggest that the clay was pressed into a mold. They are approximately 2" high and about 10" in diameter (Figure 42B). Nineteen of these kiln shelves have holes in the center, and five have multiple ¼-inch holes completely penetrating the shelves. Reynolds (1970:}
Figure 42. Kiln shelves. (A. Type A kiln shelf; B. Type B kiln shelf)
suggests that these holes may have functioned to allow the circulation of hot air and salt fumes in the kiln.

Type C kiln shelves are wheel-thrown, circular discs about 1" high and 11" to 14" in diameter (Figure 43A).

**Saggers**

According to Rhodes (1968:157), a sagger is:

... a protective box made of clay, which holds the ware in the kiln. Its purpose is to support the pottery, making it possible to fill the kiln to any height, and to protect the ware from direct contact with the flame and hot gases from the fire.

Saggers are an important type of equipment for use in a salt-glazing kiln where non-salt-glazed wares are also being fired. Non-salt-glazes are destroyed by salt fumes and must be protected. The possible saggers from the Noah Creek Kiln were cylindrical rather than box-shaped. It is difficult to determine the number of saggers which were recovered because of their similarity to the drain tile category. They were cylindrical forms with no tops or bottoms and had a heavy build-up of glaze on the surfaces. These saggers were thrown on a wheel, and then the bottoms were cut off with a wire. There are only two pieces which have been positively identified as saggers. Both of these have heavy accumulations of glaze on the exterior surface and portions of jars adhering to the inside surface. Large crocks could have been used as saggers also, although there is no direct evidence for it. Jugs were probably the principal ware which was fired in saggers since they were Albany-slipped on the exterior and had to be protected from the salt fumes.
Figure 43. Kiln furniture. (A. Kiln shelf Type C; B. Compound kiln furniture)
Draw trials

Kiln temperature was tested by means of draw trials (Figures 38, 44A) placed inside of spy holes in the kiln during firing. Rhodes (1957:150) describes the function of draw trials:

Draw tiles are sometimes used as an aid in judging when a firing is complete. Small rings of clay may be set up in the kiln inside the spy-hole. These rings are made of the same clay and coated with the same glazes as the pots in the kiln. The rings are drawn out with an iron rod, dipped in water to cool, and examined for fusion and maturity of the glaze. Before the invention of the pyrometric cone, draw trials were the chief means of judging when a firing was finished.

The draw trials used at the Noah Creek Kiln were cut from damaged pieces of unfired pots. A hole was cut in one end so that the draw trial could be pulled out of the kiln. There is no evidence in the examined literature that indicates that this form of draw trial was common in early potteries. However, Reynolds (1970:201) found the same method being used at the Coalport Kiln in the 1850's. Apparently, this was one of the earliest methods used to determine whether the firing process was complete.

Miscellaneous kiln furniture

This category includes types of kiln furniture which occur in small numbers and are questionable as to their function. Type A are small cylindrical pieces of clay which have been bent to form a rough triangle (Figure 44B). They are approximately 2" by 2" in size and are hand-made. They have deep flat impressions on the top and bottom surfaces which suggests that they were used between wares in stacking. They correspond to Reynolds' Category K kiln furniture (1970:173).
Figure 44. Kiln furniture. (A. Draw trial; B. Type A miscellaneous kiln furniture)
Type B are small (¼" by 1"), flattened balls of clay which were made by hand. They correspond to Reynolds' Category H kiln furniture (1970:172). Type C are small irregular cylindrical forms which were made by hand. These pieces are about ½" in diameter and 2" to 3" long. They correspond to Reynolds' Category I kiln furniture (1970:172).

Type D are small flat discs with no glaze or sand on them. Seams which occur on the narrow edge suggest that they were mold-made. They were bisque-fired prior to use. These pieces are all exactly ½" high and 2 3/4" in diameter. The consistency in size also suggests that they were mold-made. There were also over 4,000 fragmentary pieces of fired clay which were unidentifiable.

**Compound kiln furniture**

Compound kiln furniture is a category which includes pieces of kiln furniture which are stuck together (Figure 43B, 45). Most of these are kiln shelves which have one or more types of kiln furniture attached to them. Figure 45 represents a kiln shelf with leveling props adhering to the bottom surface and setting tiles adhering to the top surface. Thus, compound kiln furniture is important evidence for interpreting methods of stacking wares in the kiln and firing practices.

**Non-Kiln Associated Artifacts**

A number of artifacts were found at this site which were indicative of the general historic settlement and the earlier prehistoric habitation of this area. Because of time limitations and lack of expertise in
Figure 45. Compound kiln furniture. (A) Upper surface of a Type C kiln shelf with attached setting tiles; (B) Lower surface of Type C kiln shelf with attached leveling props; (C) Cross-section of kiln shelf showing attached leveling props and setting tiles.
identifying glass, metal and china, these will not be analyzed in this report. The prehistoric component of the site was mainly recovered from surface collections and from disturbed areas within the excavation of the site. Therefore, this component was not felt to be the primary occupation of the site, and the prehistoric-related artifacts are only listed. The artifacts in this section are organized into four groups: (1) Historic (Coal Valley) Component; (2) Prehistoric Component; (3) Faunal Remains; and (4) Plant Remains.

**Historic (Coal Valley) Component**

**Earthenware or stoneware**
- 18 earthenware rectangular drain tile
- 1 earthenware body sherd with clear glaze
- 1 earthenware body sherd with Albany-slipped exterior
- 6 Rockingham ware sherds with mottled brown glaze—one rim, four body sherds, one base sherd and one doorknob
- 13 clay pipes and fragments

**Porcelain (Hard paste)**
- 1 cup rim with grey transfer design

**China (Soft paste porcelain)**
- 1 Luster band base sherd
- 1 base sherd of white granite ware from the James Carr Pottery, New York
- 1 base sherd with a lion mark and the words "Stone, James Edwar, Daleha"
- 1 base sherd with the letters "Ent, DDA"
- 1 base sherd with the name "Bishop"
- 1 painted body sherd with green background, black leaves and blue border lines
- 1 base sherd with purple transfer design
- 8 sherds with blue feather edge design
- 1 base sherd with a black painted floral edge
- 1 body sherd with a painted red and yellow floral design
- 1 rim sherd with a gold band design
- 1 body sherd with a painted strawberry design
- 1 rim sherd with a red band design
- 2 body sherds with a blue floral transfer design
2 body sherds with a yellow floral transfer design
1 body sherd with a painted red floral design
29 sherds with a yellow glaze
41 plain white china sherds—135 rims, 203 body sherds, 67 base sherds and 6 handles
3 china doll fragments—one head with painted features

Glass containers
1 clear bottle, 5" high
8 clear bottle necks, one with metal lid still attached
3 green bottle necks
1 amber bottle neck
3 clear bottle bases with writing—"J. Walker's," "Jacob Ries, Shakopee, Minn.," "McG & S"
1 amber bottle base
16 clear bases from round bottles
2 clear bases from square bottles
163 clear body sherds from round containers
29 clear body sherds from square containers
7 clear body sherds from octagonal containers
1 heavy collared rim—possibly from a mug
1 clear jar rim
19 clear glass sherds with relief designs—either pressed or molded—probably from dishes
18 white milk glass sherds
1 blue milk glass sherd
5 amber body sherds
3 green body sherds
1 blue body sherd

Miscellaneous glass
2 clear glass sherds with red exteriors—possibly from a railroad warning light
5 glass buttons
248 clear plate glass sherds—probably window glass

Metal fasteners
893 square iron nails
348 round iron nails
119 nail fragments
34 iron staples
21 square iron spikes measuring from 4" to 12" long
3 metal rivets
3 iron hinges
9 iron bolts—one with the nut attached—measuring from 5"
to 14"
2 iron nuts
1 metal tack
1 metal washer
1 iron screw
Metal tools
1 iron animal trap
1 hammer head
1 small pocket knife

Coin
1 1867 nickel

Industrial or farm equipment
17 large pieces of cast iron with attached bolts—traces of red paint are still visible
2 heavy iron discs with holes in the centers—3" in diameter and 1" thick
1 heavy iron rod 11" long and 1½" in diameter
1 heavy iron rod 10" long and 1" in diameter, squared off at one end
163 unidentifiable fragments of cast iron
14 unidentifiable pieces of sheet metal
1 copper thermometer plate from an incubator with the words "Des Moines Incubator Co."
1 heavy spoon-shaped object 3" long
80 pieces of wire
32 pieces of barbed wire

Miscellaneous metal
1 copper container
2 metal buttons, both with rings for attaching to cloth
1 metal and glass button
2 iron casters—one with a ceramic roller
2 lead bottle caps
1 tin lid with words "Fruit Industries Ltd."
1 iron horse shoe
1 metal drain stopper
1 toy gun
3 shotgun shells
1 brass bar 4" long and 1" wide with one end shaped into an arrow

Miscellaneous historic material
1 polished black bead
1 strip of leather—may have been used for finishing pottery
1 cork
2 leather shoe heels with iron nails
1 fire brick with name "A. P. Green"

Prehistoric Component

Pottery (Grit tempered)
5 cord-roughened rim sherds
21 cord-roughened body sherds
9 plain body sherds
Stone artifacts and waste materials

2 biface fragments
7 worked or utilized flakes
51 waste flakes
15 pieces of chert shatter
1 possible mano or grinding stone
1 hematite celt ½" long--polished
1 unworked piece of hematite

Faunal Remains

Bone
1 bovine long bone
50 mammalian bone fragments
5 herbivore teeth

Shell
7 freshwater clam shell fragments
1 snail

Plant Remains

5 nutshells
wood fragments from posts and post holes--identified as mostly softwoods

Some general observations can be made about the pioneer activities of central Iowa from the residue of the Coal Valley settlement. It is probably coincidental that the 1867 nickel bears the same year as the year Coal Valley was platted as a town. The heavy metal fragments found at the site suggest some type of farm or industrial activities, possibly remnants of mining or railroad equipment. The large quantities of china present at the site are of the general variety of soft paste porcelain which was made available to the masses by Josiah Wedgwood during the 18th century. This type of ceramic ware became increasingly popular for everyday household use during the latter half of the 19th century, and remains today the most common variety of household china.
CHAPTER 6.

TECHNOLOGY OF THE NOAH CREEK KILN

Historical records, archaeological data, ecological, geological and technological information all provide clues that help in reconstructing the technology involved in the operation of the Noah Creek Kiln. But even taken together these do not at this time tell the complete story of this early pioneer pottery industry. In this section, all of these various types of information about the Noah Creek Kiln will be summarized and brought together to provide a picture of the activities at an early stoneware pottery.

In looking at the background of the pottery industry in Iowa it is obvious that there was a certain minimum of environmental factors that had to be present in an area before this industry could be established. The main ingredients necessary from the environment were coal, clay, timber and water. As shown in the second chapter, the area of Boone County where the Noah Creek Kiln was located was rich in all of these resources. Coal and clay were provided from the rich Pennsylvanian coal measures and timber and water from the Des Moines River Valley and from the Des Moines River. Experimental evidence provided by Mary Miller indicates that the Coal Valley potters could have utilized local clays for their wares. The gray clay from the excavations at 13BN111 was subjected to Electron Microprobe Analysis and proved to have a similar chemical composition as the wares produced at the Noah Creek Kiln (Wirkus 1974). Both the Boonsboro and
Moingona potteries were mining local clays for the production of their wares (*Montana Standard*, December 11, 1869). This is not absolute proof that the Coal Valley potters were using local clays, but it strongly suggests this possibility.

**Preparation of the Clay**

Any industrial pottery operation involves basic steps in the preparation of clay and manufacture of ceramic wares. The clay must be obtained from some source, pugged, and wet to a proper consistency in order to form the wares. There is no record of where the Coal Valley potters obtained their clay or how it was mined. However, in an article from the *Montana Standard* from December 11, 1869 on the manufacturing of pottery at the Boonsboro and Moingona potteries, there is a description of how their clay was mined and prepared prior to forming it into vessels.

The mining or digging of the clay is dirty work, and no more enticing to a dandy than coal mining. The mines here are drifts or levels, being entered by an opening on the side of the bluffs. The clay is not soft and pliable when taken out, but is a soft stone. It is carried to the factory and while piled up is soaked about two days in water till it softens down to a workable state. It is first ground by the same process as brickmakers employ, and then is kneaded and "spanked" by hand while all impurities are detected by skilled means and picked out. The air is also worked out by this means, the same as the baker uses to get air in. It is then taken to the turners' and moulders' wheels in balls weighed out in such sizes as are necessary for the particular utensil they are to form.
It is questionable as to how skilled the potters were at picking out impurities, because most of the wares show many large impurities which caused spalling on the surface of vessels, and in some cases, probably caused a vessel to break during firing. The process of "spanking" the clay to remove air bubbles is today known as "wedging" and is an essential process in clay preparation. When heated in the kiln, an air bubble will expand, and the clay piece will crack or blow up.

Method of Manufacture

The Noah Creek potters used two methods of forming their vessels—wheel-throwing and jollying. The jugs, crocks, butter churns, jars and drain tile were wheel-thrown and the milk bowls and most of the lids were jollied. The Moingona and Boonsboro potters were using two different methods for forming their wares:

The shaping of the articles made is done in two ways, by moulding or by turning. Such things as plates, milk basins, deep dishes, etc., are moulded... in plaster-of-paris moulds... (Montana Standard, December 11, 1869).

This newspaper article makes no reference to jollying, but it is the first mention of molds being used in Boone County, and from this we can infer the use of jollying.

Wheel-throwing

Throwing was probably done in one operation at the Noah Creek Kiln. The pots were produced by first throwing the pot into fairly finished
form, trimming the bottom edge, and then cutting the pot off the wheel with a wire. Many of the bases of crocks and jugs show wire cut bases and trimmed bottom edges (Figures 14 and 31). It is doubtful that the Coal Valley potters did much finishing after a pot was removed from the wheel, except in the case of handles which are applied after the wares reach a leather-hard state.

Most of the wares produced by early potters were utilitarian wares, and did not require a great deal of finishing to make them sellable to the general public. Also, many of these potters got paid by the pot instead of by the hour or day. A skillful turner employed by the Boonsboro pottery was said to be able to make about 200 gallons of ordinary ware of average size in one day. For this he got paid 2½ cents per gallon (Montana Standard, December 11, 1869). Therefore, it is unlikely that these potters would spend a great deal of time putting a lot of finishing touches on a pot. This also explains the lack of decoration on most wares.

The reserve rims of crocks are almost identical in form with only slight variations in height. In order to easily produce identical rims, a wooden rib or template is often used by the potter in finishing the rim (Roy 1959:57; Webster 1971:27). These templates were held against the top of the vessel while it was turning, and thus produced the desired rim form (Figure 46). To attain identical sizes and capacities, rough wooden gauges were mounted on the side of the wheel, and aided in determining height and diameter (Leach 1940:76;
Figure 46. Various devices used in the production of pottery. (A. Template; B. Slip trailer or "Quill box" (Leach 1940:112)
Webster 1971:27). Both crocks and jugs from the Noah Creek Kiln exhibit striations near the rims which may have been made by some type of measuring gauge or were merely decoration.

**Jollying**

Various data suggest that the milk bowls from the Noah Creek Kiln were produced by the technique known as "jollying." Jollying is a type of a more general process known as "jiggering." The term jiggering is used to refer to the process which utilizes a mold to form the interior surface of a vessel, such as a plate. The term "jollying" refers to the process which utilizes a mold to form the exterior surface of a vessel, such as a bowl. In both cases, the surface which is not mold-formed is formed by a template. The milk bowls from the Noah Creek Kiln were produced by jollying, but information which applies to jiggering can be applied equally well to jollying.

The jigger was developed about 1825 to work from molds so that pieces could be made more and more alike (Norton 1970:15). In the early jollying and jiggering machines, the profiling was produced by hand rather than by a template controlled by a machine (Chandler 1967: 66). The potter's jolly consists of essentially two parts, a mold placed on top of the rotating wheel, in which the clay is placed, and a template for shaping the interior of the bowl. The mold then gives the bowl its exterior shape (Figure 47). Norton, in his book *Fine Ceramics*, gives a good description of the process of jiggering and the factors involved in producing good wares by this method. The following factors must be considered in jiggering:
A Movable jolly arm holding metal profile B for inside of bowl
B Metal bowl profile
C Plaster mold
D Clay sponged into mold ready to be shaped by profile
E Hollow bowl-head to take molds, instead of flat wheel-head

Figure 47. A jolly. (Modified from Billington 1962:96)
1. The mold must run true.
2. The bat must be uniform.
3. The bat must be centered on the mold.
4. The bat must often be run down to remove air trapped under it.
5. The rpm must be correct for the piece.
6. Exactly the right amount of water must be applied during the jiggering operation to give a polished surface and yet leave no water at the end.
7. The drying must be even to allow release and freedom from warping (Norton 1970:143).

Although the process of jiggering seems rather simple, it takes considerable skill and practice to produce wares which are marketable. The process has inherent problems which become recognizable in the wares which were discarded at L3BNI. Norton (1970:144-45) describes some of these problems:

A jiggered piece has a very distinct alignment of the clay plates parallel to the surface on the upper side...due to differential shrinkage, there is often a lifting of the rim in drying and firing which must be allowed for. Jiggering is confined to circular or oval pieces. However, outside profiles other than circles, such as scalloped edges, squares, etc., may be made by properly recessing the mold. Jiggered pieces come from the mold with a fin on the outer edge which must be removed by fettling and sponging. There seems to be no way in which this can be eliminated,... As the drying rate of the jiggered ware is more or less governed by the safe working temperatures of the mold, it would seem advantageous to use biscuit molds.... Of course, they would be much more expensive than plaster molds but would have an almost infinite life.

Leach (1940:93) states that biscuit molds were used in pre-industrial times on a small scale, and had the advantages of their durability, ability to yield sharp impressions, and the continued use of the potter's familiar material, clay. At the Noah Creek Kiln, there
is no evidence for either bisque or plaster molds, however, there are several other Iowa potteries which did use plaster molds. In Webster County, at 13WB150, a waster dump associated with the White Pottery and Fort Dodge Stoneware Company, plaster molds were recovered in surface collections. At the Boonsboro and Moingona potteries, plaster molds were used to make plates, milk basins and deep dishes (Montana Standard, December 11, 1869). The absence of molds at the Noah Creek Kiln would lead one to assume that there were very few molds in use and probably treated with a good deal of care and not discarded readily.

The measurements on milk bowls given in Chapter Five show a consistency in milk bowl size which is not evident on the wheel-thrown vessels. However, there is some variation in the diameters of milk bowls due to several reasons. One reason for this rim variation is warpage caused by differential shrinkage during drying and firing. This causes lifting of the rim which is a common occurrence on many of the milk bowls from the Noah Creek Kiln. Figure 14D shows how the heavy collar has pulled away from the body of the bowl. Another factor contributing to rim variation is due to finishing the rim of the milk bowl when it comes from the mold. The mold leaves a "fin" which must be smoothed away by cutting or smoothing with a piece of leather or just the thumb. The way milk bowls were stacked in the kiln for firing caused a problem which led to rim variation. Milk bowls were stacked inside of each other and upside down during firing. This would increase the stress put on the base of the rim, thus increasing the probability of the
rim pulling away from the body of the bowl, or even cracking of the whole piece.

The absence of striations or finger ridges on both the interior and exterior surfaces of the milk bowls would suggest that these bowls were made with a mold. When striations do occur on the interior, they are faint and very shallow and do not resemble the deeper finger ridges made by wheel-throwing. The striations on the milk bowls are parallel and horizontal as opposed to the spiral ridges formed by wheel-throwing.

Two of the lid types were also made by jollying. Types C and D have no striations on the exterior surfaces and only very shallow striations on the interior surface. The exterior surfaces (except for the handles) were formed by the mold, and the interior surfaces by a template while the mold was spinning on a potter's wheel. Handles, separately molded or thrown, were then applied to the lids. Lids are one of the more difficult forms for a potter to make, since a great deal of accuracy is involved in getting a lid to fit the container for which it was designed. Using the jollying method would decrease significantly the amount of time needed to produce a lid of a desired size.

Glazing the Wares

Stoneware pottery that was intended for use as liquid containers had to be glazed in some manner, even though stoneware is considerably
more vitreous than other varieties of early pottery. The salt glaze and the Albany slip were the two glazes which were used at the Noah Creek Kiln.

Albany slip

A slip is a clay in liquid suspension (drip marks on the sides and tops of vessels prove this), and therefore, can be applied to a vessel in several different ways. The application usually occurs when the vessel is in a leather-hard state. The liquid slip could be brushed on the pots or poured or sprayed into the interiors of pots and then poured out to remove the excess and leave a thin layer. Also, pots could have been dipped into the liquid clay kept in a large container. Boonsboro and Moingona potters applied slip:

... by means of a pump set in a vat of this "slip," a jet of it is thrown into the jar turned up side down over the pump, thus covering the whole inside with a coating of the reddish mixture. Jugs that are finished outside with "slip" are dipped into the vat (Montana Standard, December 11, 1869).

The Noah Creek wares exhibit run and drip marks on both the interior and exterior surfaces. These marks indicate that the slip was applied by pouring and dipping. There is no evidence for slip being applied by spraying.

Salt glaze

Salt-glazing is an efficient way of glazing a large number of vessels at one time since it is done during the firing process. Common salt (NaCl) is shoveled into the fireboxes of the kiln when the firing temperature has reached its maximum point. The salt, in the
presence of water vapor, disassociates and the sodium reacts with the water vapor to produce a soda which coats everything in the kiln (cf. Iowa Geological Survey 1904; Leach 1940; Rhodes 1957). One difficulty which occurs with this method is that salt fumes will not go down inside of pots, therefore the insides must be covered with another type of glaze, in this case, Albany slip. The Albany slip must be protected from salt fumes, otherwise it will not melt smoothly (Rhodes 1957:185). The various methods Coal Valley potters used to protect their slipped wares will be discussed later in this chapter.

Decoration

The principal form of decoration used by the Noah Creek potters was the application of designs done in cobalt blue underneath the salt glaze on crocks. The use of cobalt oxide mixed with a clay slip was a common method of decoration for early stoneware potters (Guilland 1971; Rhodes 1959). The Boonsboro and Moingona potters used cobalt blue extensively as a means of decorating and signing their wares. An account of the method those early Boone County potters used to apply the blue designs appeared in the Montana Standard (December 11, 1869):

The other process in the store room is the "blueing," in which a skill and correctness is not attainable by every one. Every body has noticed the figures and tasteful flourishes in blue which adorn much of pottery ware. These stripes and designs are done by hand, each piece [sic] is in its turn. The "bluer" takes a jar on his lap, and, holding a quill box, which nearly every one has seen, marks by his eye the outline of the design. It is a steady hand and true eye that can scratch off rapidly and so accu-
rately these pictures, each being so near like its fellow, that one at first supposes a pattern or stencil plate had been employed.

The "quill box" used to apply the designs is described by Leach (1940:112) as being "a clay vessel with a narrow spout on one side. They controlled the flow of slip with the mouth or thumb" (Figure 46B). It is doubtful that the Noah Creek pottery had one man to do the "blueing," since this pottery was a rather small operation. It is also very likely that a stencil was used to put lettering and numbers on the crocks, since these letters are so uniform on Noah Creek vessels.

Stacking Wares in the Kiln

The setting of a kiln is an important and critical part of preparing a kiln for firing. The procedure involved packing the unfired wares as tightly as possible in the firing chamber of the kiln. The various levels of stacked wares had to be level so that the wares would not warp or fall while being fired. Some space had to be maintained between the pots so that air could circulate around and between them and so that salt fumes could reach all of the pots. However, if pots were packed together with nothing separating them from each other, they could become fused together and ruined. The potter used various types of kiln furniture to help in loading and leveling the kiln. These included some materials that were made up and fired beforehand and some which were made while the kiln was being set. Although there are no written descriptions of kiln setting methods used at the Noah Creek Kiln, the Montana Standard (December 11, 1869) discussed this
process at the Boonsboro and Moingona potteries.

The first thing to be attended to, is the proper "setting" of the ware. It must be set in the kiln perfectly perpendicularly, one piece [sic] on another with no tendency to incline, or it will warp and bend when heated, making crooked wares. The inside "slipped" jars are turned bottom upwards, having within each a smaller vessel "slipped" on the outside, thus presenting no "slipped" surface to the outside air.

The Boonsboro and Moingona potters were also salt-glazing in their kilns; therefore, it is interesting to note the special measures taken to protect the slipped wares.

Special difficulties are encountered when setting a salt-glazing kiln, because the floors and walls of the kiln become uneven due to repeated deposits of glaze. The kiln arch and fire bricks from the Noah Creek Kiln are heavily coated with deposits of salt glaze. Therefore, a variety of kiln furniture was used to level and secure the wares to be fired in the kiln.

The use of saggers, or crocks as saggers, was essential in firing the wares which were Albany slipped on their exterior. Figure 48 shows the probable method of stacking jugs within the kiln prior to firing. Webster (1971:163) suggests that jugs were stacked rim-to-rim at many potteries. However, there is no evidence to support this conclusion for the Noah Creek Kiln.

The uniformity in size and form of milk bowls would allow them to be stacked one inside of the other in the kiln (Figure 49). The lips and bases of the rims were wet and dipped in sand prior to stacking. This sand still remains on the rims and rim bases of many milk bowls.
Figure 48. Reconstruction of stacking method used for jugs.

A Cross-section of a sagger
B Setting tiles
C Kiln shelf
D Leveling prop
Figure 49. Reconstruction of method of stacking milk bowls
Figure 50. Reconstruction of method of stacking drain tile
This stacking arrangement also explains why no slip glaze is found directly below the rim on the exterior surface of the bowls. Strips of moist clay may also have been placed on the interior of the bowls between vessels to seal out the fumes from the salt glaze. There are a few milk bowls that still have these strips adhering to the interior surfaces. The bowls were most likely stacked upside down to provide a more stable base. This is indicated by concave bases, and lack of sand on the inside and bottom of the bases.

Drain tile were stacked rim-to-rim inside of the kiln (Figure 50). Evidence for this method of stacking is two drain tile rims which are stuck together with one rim having melted down over the other. It is difficult to determine if setting tiles were used in between drain tiles to allow salt fumes to circulate inside of the tile. Since the inside of the drain tiles are so poorly glazed, whatever method was used was rather inefficient.

Stacking methods at the Noah Creek Kiln must have been fairly efficient for keeping wares from sticking to one another or falling over during firing. There are very few pieces stuck together, and very few wares stuck to kiln furniture.

Firing the Kiln

Each kiln load of pottery was probably fired only once at the Noah Creek pottery, and each firing process probably took four to five days to complete (Montana Standard, December 11, 1869). It is doubtful that these early potters would have spent the time and the
fuel on bisque firing their wares before applying the glaze. There was very little bisque ware found at the site. Chandler (1924:178) comments on the firing practices of early American potters:

The apparently haphazard manner in which glaze effects were accomplished on early American pottery may be explained by the fact that, to save time and expense, the biscuit, glaze and decoration were not secured by successive firings, as in the case of many finer wares, but, usually by a single operation of the kiln.

Much of the wares from the Noah Creek Kiln exhibited a wide range of color—sometimes on the same pot. This is undoubtedly due to the unevenness of temperature, and the variation between oxidizing and reducing atmospheres. Salt-glazing kilns vary between oxidizing and reducing atmospheres because of the necessity of opening the sealed kiln to throw salt in at various times during firing (Rhodes 1957: 185-186).

Little can be said about the method of salting the kiln, because an insufficient portion of the actual kiln structure was recovered to determine the type of kiln being used at Coal Valley. The amount of salt used in each firing would depend upon the type of ware being fired—household wares require a thinner coat of glaze than do tiles (Parmelee 1951:179). Boonsboro and Moingona potters used about 70 pounds of salt for 3,000 gallons of ware (Montana Standard, December 11, 1869).

The temperatures required to produce mature stoneware vessels ranges from 1225° to 1260°c. Albany slip also matures at approximately the same temperature. These would have been the factors determining how high the kiln temperature must rise. Salting is done
after the wares are vitrified, to prevent the clay from absorbing the salt vapor and expanding when the kiln temperature was increased (Parmelee 1951:179). The kiln temperature was tested by means of draw trials discussed in the previous chapter.

The fuel for firing the kiln was probably either wood or coal. Wood-firing contributes to the salt-glazing process because the volatile ash from the burning wood combines with the salt vapor and enhances the glaze (Rhodes 1959:34). However, Parmelee (1951:179) states that a rapid burning fuel such as coal is preferred in order to speed up the salting process. He also feels that a clean burning fire is necessary for a good salt glaze. Both wood and coal would have been abundant and readily available in the Coal Valley area at the time the kiln was in operation. It is difficult to determine which fuel source was being utilized, or if they were both being used.

Cooling the kiln is another critical process. Too slow cooling wastes time while too rapid cooling causes the wares to crack. It is not possible to judge the effectiveness of the cooling methods used at the Coal Valley pottery, but the large heaps of broken and cracked wares found at the site suggest that, like most early potteries, the Coal Valley pottery suffered a fairly high percentage of breakage.
CHAPTER 7.

SUMMARY AND CONCLUSIONS

This investigation has been concerned with the pottery and with the evidence for the pottery industry recovered from the Noah Creek Kiln (13BN111). Both historic documents and archeological information have been used in an attempt to describe and reconstruct the pottery industry at Coal Valley. In the first portion of the paper the author attempted to describe the ecological and geological setting in which the Noah Creek Kiln was placed. This provided a framework for looking at the Noah Creek Kiln as a local manifestation of a larger phenomenon, the ceramic industry in Iowa. Then, the author briefly traced the history of the settlement of the Coal Valley locality and the development of the ceramic industry in Boone County, as known from historical records and archaeological surveys.

The major portion of this study was the archaeological site report of 13BN111 with the main emphasis on the pottery industry. In the archaeological section, the main emphasis of the author was to describe the ceramic wares produced at the Noah Creek Kiln in terms of useful functional vessel types based on historic records. The last section was an attempt to reconstruct the ceramic technology employed by the potters at the Noah Creek Kiln. This was an important aspect in the investigations of this pottery site because this pottery represented an example of change in manufacturing methods. The Coal Valley pottery and the Boonsboro and Moingona potteries were producing a good portion
of their wares by jollying, and much of the wheel-thrown ware was very standardized in size and form. Historic sources from Iowa contain few references to the methods of operation of stoneware pottery kilns, and it was thus necessary for the author to use mainly archaeological data in reconstructing these activities.

The Noah Creek Kiln probably began operations in the late 1860's and continued production until the mid 1870's. The size of the waster dump also suggests that the pottery was operating for only a short time, unless the potters were discarding waste materials in various locations. Amos Elliott and Edwin Comfort were the co-owners of this pottery. Since the operation seemed fairly small, there were probably only two or three potters working at Noah Creek. The clay for the pottery was obtained locally, probably from a coal bank on the land for which Comfort had mineral rights. Experimental work done on the Noah Creek wares and on local clays verifies the use of local clays for the Noah Creek wares. It is also known from archival data that the Boonsboro and Moingona potteries were mining local clays.

From the archaeological evidence, the Noah Creek potters were producing milk bowls by the jollying method and crocks, jugs, butter churns, jars and tile by the wheel-throwing method. The milk bowls were standardized in size and form because of the use of molds in the jollying method. The wheel-thrown wares from this site also exhibit considerable standardization in both size and form, such as the crocks which have numbers stencilled on them to indicate size. The glazes used on these wares, however, exhibit considerable variation which
indicates that perhaps the potters' knowledge of glaze preparation and application was not as advanced as their knowledge of forming wares. The glaze variation and degree of breakage of Noah Creek wares also indicates some of the problems with firing in wood or coal kilns.

The greater standardization of wares through the use of jollying indicates a shift in the pottery business from a hand-craft industry characterized by wheel-thrown wares to a more diversified, mechanized and more uniform industry. This increase in industrialization marks a trend toward greater nucleation of the population in towns, a change in transportation systems, and a general development of more intensive and specialized industrial bases.

Both the historical and archeological records are at this time incomplete; therefore, only a sketchy history could be developed for the Noah Creek Kiln. The archaeological data was described in terms of functional categories wherever historical records provided information on vessel names and functions. However, there is limited information on utilitarian wares, and even less information on pottery west of the Mississippi River. The archaeological record is incomplete, also, because there was only one season of excavation which did not allow time to locate the position of the kiln in relation to the potter's shed. Therefore, the type of kiln used at 13BN1111 could not be determined.

The historical records provided very limited data on the settlement of Coal Valley and only one reference to the pottery operation located there. This one reference did provide a temporal dimension
for the kiln and the names of the owners of the pottery. Several newspaper articles on the Boonsboro and Moingona potteries offered indications of the types of wares being produced and the methods of manufacture of pottery at kilns in the same area at approximately the same time. These were invaluable as guides for interpreting some of the archaeological data from 13BN1111. However, all of the historical material of a general nature, such as newspaper articles and local histories had to be examined and applied in a critical light.

A Perspective on the Ceramic Industry in the Des Moines River Valley

In addition to the investigations that were conducted at the Noah Creek Kiln and the discussion of other Boone County pottery industries, several other potteries are known archaeologically for the Des Moines River Valley. A sequence of developmental stages based on a cursory examination of the archaeological and historical data on potteries outside of Boone County can be tentatively proposed for the stoneware industry along the Des Moines River. These observations have been made in the light of what is known for the Noah Creek Kiln and the Moingona potteries.

The earliest of these potteries, the Coalport Kiln (13MA103) and the Pella-Welch Kiln (13MA113), were located in Marion County. They represent the earliest stage of stoneware technology in Iowa known at the present time. The Pella-Welch Kiln began operation about 1845
and the Coalport Kiln about 1850, and both produced only wheel-thrown wares (Reynolds 1970).

The second transitional stage is represented by several Marion County potteries—the Gidel Kiln (13MA106), the Whitebreast Kiln (13MA104), the Wright Kiln (13MA105) and several small potteries located in the town of Attica (Stoltz and Brooks 1966:326). The wares produced at these sites were primarily wheel-thrown, but there is some evidence for the beginning of mold-made pottery in the form of milk bowls. These milk bowls resemble those produced at the Noah Creek Kiln and other Boone County potteries operating during the 1870’s.

The Boone County potteries would represent the next stage in the development of the stoneware industry in Iowa. The milk bowls from these sites were definitely mold-made and probably jiggered. There is also an increasing standardization in form in the wheel-thrown wares. All of the potteries in the first three stages used Albany slip and salt glaze as the principal glazing materials. The Moingona Pottery was more industrialized than the Noah Creek Kiln because it employed nearly a dozen men, had specialization in the labor force, and produced larger quantities of wares (Schroeder 1974).

The most advanced stage in the development of the Iowa stoneware industry is represented by 13WB150 which is a waster dump for the White Pottery which later became the Fort Dodge Stoneware Company. The Fort Dodge Stoneware Company was still in operation in 1906. These pottery operations were considerably more industrialized than the first three stages described. Most of the wares were mold-made and the Bristol
glaze had been introduced and was gradually replacing the salt glaze and to a lesser degree the Albany slip. An interesting change occurred in jug form and glaze at the White Pottery and Fort Dodge Stoneware Company. Previously, jugs were wheel-thrown in one operation with the handle attached after the body was in a leather-hard state. Based on observations on the wares from 13WB150, jugs were made in several operations. The bottom half was mold-made separately from the top half, and then the two sections were joined together with slip. The entire jug, except for the base, was Bristol glazed. This new jug form represents a major change in the stoneware industry in Iowa. It brought standardization to a vessel form which previously had shown the greatest variability in form and glaze in earlier pottery operations.

The King Pottery located outside of Knoxville in Marion County was still in operation in 1909 (Stoltz and Brooks 1966:322), although it had turned completely to the production of brick and drain tile by 1903 (Beyer and Williams 1904:633). It may represent another example of either the third or last stage in the development of the stoneware industry. It is interesting to note, however, that the potters turned to drain tile and brick when the other country potters closed down.

There was a general decline in the Iowa stoneware pottery industry late in the nineteenth century and early in the twentieth century. Out of 300 Iowa companies that were still producing ceramic products in 1903, only four operations were involved in the production of stoneware vessels (Beyers and Williams 1904:619-641). There were
two basic processes involved in the eventual decline of the pottery stoneware industry. One of these processes emerges upon examination of the developmental stages of the stoneware industry. The original potteries were typically small operations which employed few workers and a minimum amount of mechanical equipment. Gradually these potteries were superseded by more complex and larger pottery operations, like the Fort Dodge Stoneware Company which introduced mass production into the manufacture of pottery. Thus, the small country potters were numerous in the first half of the nineteenth century, but were gradually replaced by larger potteries located in centralized localities. At this stage of development, the processes began which brought on the eventual decline of the pottery industry in the state.

A general perspective on the decline of the pottery industry in the eastern United States is presented by Guilland (1971). The main force behind the decline in the pottery industry was the technological advancement and the industrialization which the entire country was undergoing. A primary function of stoneware vessels was food preparation and food storage. With the discovery of the concepts of sterilization, food storage and pasteurization in the dairy industry, new methods of food processing were rapidly being introduced. Ceramic products for household purposes were being rapidly replaced by the introduction of inexpensive vessels made from tin and glass. By 1850, the glass industry was able to compete with the stoneware industry in the production of bottle and jugs at inexpensive prices. In 1858, the screw-top glass mason jar was patented. The discovery of petroleum
and the introduction of kerosene as a means of lighting diminished the need for candle holders and fat lamps. Factories were producing many of the household items which had previously been supplied by the country potter; and food processors supplied a larger variety of commercially prepared foods to country stores (Guillard 1971:71). Many other inventions of the late nineteenth century contributed to the decline of small country potters.

Although stoneware use has declined greatly since 1900, stoneware is still being produced and used in the United States. Many of the old vessels are now antiques and collectors items which do not perform their original functions. However, within the last five years, stoneware as a home craft has become increasingly popular as the aesthetic value of the natural earth colors and the simple forms produced with stoneware clays and glazes have become increasingly appreciated by the artist-potter and the collector.
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PLATES 1–6
Plate 1. Coal Valley locality showing excavations at 13EN8888

Plate 2. Coal Valley locality showing slag heap in lower right corner
Plate 3. Destruction of part of the Coal Valley locality by the construction of county road R18

Plate 4. Portion of the excavations of I3BN111 showing the post hole pattern and the hearth (lower left)
Plate 5. A 10' x 10' square with the sod layer removed, showing the concentration of material

Plate 6. Portion of the hearth with bricks still in place